ENVIRONMENTAL IMPACT ASSESSMENT OF THE WATER AND SANITATION CONDITIONS IN THE TEMPORARY SETTLEMENTS OF TAMIL NADU

6 MONTHS AFTER THE TSUNAMI

Field assessment report of

Auroville Water Harvest and RedR India

In consultation with Catholic Relief Services (CRS) and the Tamilnadu Diocesan Social Services Societies

In the districts of

Nagapattinam, Tirunelveli, Kanyakumari

June 2005

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Introduction

Catholic Relief Services (CRS) has been supporting its local Diocesan partners in the coastal districts of Tamilnadu since the tsunami of December 26th. CRS is working towards providing mid- and long-term relief and rehabilitation in affected villages and helping people rebuild their lives. CRS funding is being used to provide water and sanitation, food, shelter, livelihoods and Community Based Disaster Preparedness in regions (Tamilnadu, Kerala, Andhra Pradesh and Andaman & Nicobar islands) affected by the tsunami. For at least the next 3-5 years funds will be used to rebuild essential infrastructure, help people restore their livelihoods, and rebuild the lives of individual communities.

It is now 6 months after the tsunami, a good time to reflect on the initial phases of relief as we look forward to rehabilitation and long-term relationships with the affected area's villages. Villages have been now allocated by the District officials for the reconstruction of permanent houses, but land for all of these people, mostly fisher folk, is still semi-elusive. The process of reconstruction is slow and people are expected to live in relief camps/temporary shelters for the next 6 months – 1 year. Some shelters hold up to 10 hamlets.

The area where the shelters are established are characteristically sandy and have a high water table. Monsoon season is around the corner. Despite that many agencies have worked hard to provide water and sanitation facilities in these shelters the quality, quantity and reliability of the facilities still remains a question.

Therefore, an assessment of Water and Sanitation impact and needs[1] in the temporary shelters of Nagapattinam, Tuticorin and Nagercoil was very much required. On 22nd to 30th, May 2005 a team that included wat-san experts from Auroville Water Harvest and RedR India conducted field studies in 19 settlements/villages in the aforementioned districts. The objectives of this assessment were:

i) To test the drinking water for salinity, pH, chlorine, and microbial contamination.

ii) To evaluate existing wat-san designs against Sphere Standards and (ascertain) best practices for high water table, coastal and monsoon environments.

iii) To assess the capacity of and understand the Training Needs of different Stakeholders.

iv) To Train the CRS staff in water quality monitoring.

It is with great hope that CRS presents the findings of this assessment. It is hoped that this report will duely inform all of the service providers working for the tsunami affected people living in temporary settlements along the coastline of the Bay of Bengal and lead to better designs, community rapport building and effective coordination between all of the major actors in the Water and Sanitation field of emergency response.

Methodology

The assessment team visited 19 settlements/villages[2] in 3 aforementioned districts during 22nd -30th May 2005. The team visited the locations, observe the status of facilities, discuss the problems either individually or in focused groups with the affected people, met with stakeholder agencies and briefed and debriefed with the concerned diocese social service society chief.

Criteria for choosing the site studies were:

- High density population

[1] Assessment in Nagapattinam was a Status Assessment while that in Tuticorin and Nagercoil was mostly Needs Assessment, since not much work has been carried out in these two districts.
[2] 7 in Nagai, 4 in Tirunelvelli and 4 in Nagercoil

- Low lying sandy area

- Allocated to TMSSS-Tanjavur Multipurpose Social Service Society, CRS' implementing partner, (with the exception of Vedyanam Chetty Street and Nambiar Nagar which has been allocated to World Vision and Samanampetthai which has been allocated to Mata Amritanandamai).

Field visits have been organized in selected areas with the support of the local partners of CRS, Tanjavur Multipurpose Social Service Society, Tuticorin MSSS, and Kottar Social Service Society.

Detailed surveys of the structures in place and their present conditions has been carried out, including water distribution systems and toilets buildings, along with detailed enquiries from the concerned population about the organization of the settlements for water and sanitation issues, and the problems people are facing.

Maps of the settlements have been tracked.

Water quality has been tested by RedR, following the scientific standards for PH, Chlorine, turbidity and fecal contamination. The water salinity has been measured by Harvest using Electrical Conductivity as an indicator. The results and observations of RedR and Auroville Water Harvest are included in this report.

General Findings

The present report will give a description of the problems encountered in every village visited, and suggestions for improvement of the sanitary conditions in the settlements, keeping in mind the Sphere standards.

15 liters (as per Sphere standard) up to 45 liters (Indian Standard) on average per person per day is considered the minimum quantity of water necessary for a person to cover all daily needs, including drinking, cooking, bathing, washing vessels, toilets and clothes.

- A community based mechanism for monitoring the quality and quantity of tanker water and maintenance of tanks/hand pumps is necessary.

- Rigorous measures be adopted for focussed hygiene education, promotion coupled with distribution of necessary hygiene items for secondary storage of water at household level.

- Boiling of water is encouraged at such places where secondary contamination was seen and also where the hand pump water was contaminated.

- Efforts be made to achieve near 'Sphere Standards' in terms of quantum and accessibility of water supply in Nagapattinam and Tuticorin.

- Arrangements for **capacity building of stakeholders** be made at different levels through following training courses;

    i) Orientation towards Sphere and Humanitarian Charter (for Local Government Officers, Partner Support Staff and Chief Functionaries of Partner agencies)

    ii) Planning Humanitarian Response (for Partner Support Staff and Partners)

    iii) Environmental Health in Emergencies (for Partner Support Officers and staff from Partner agencies)

    iv) Hygiene Education and Awareness Generation (for field staff from partner agencies) preferably in local language.

    v) PRA and Communication (for field staff from partner agencies)

vi) Maintenance of Hand pumps (for community based volunteers) at local ITI.

Water Supply

It has been accepted by humanitarian response agencies, either Government or Non-Government, that "supplying a survival level of safe drinking water is of critical importance. In most cases, the main health problems are caused by poor hygiene due to insufficient water and by consumption of contaminated water".[3] The Team examined water quantity and accessibility status and collected samples for water quality testing from about 32 different locations and sources.

Water Quality Issues

Besides confirming the availability of water to near Sphere Standards (15l pcd) the quality of water was assessed[4] for parameters like Electrical Conductivity, pH, Chlorine, Turbidity and Fecal Contamination.

People have had a practice of drinking saline water, which is more saline than the standards, to a certain extent. This may not create immediate health problems. However as the WHO standards indicate, people should be prevented from drinking water which shows even a single colony of e-coli bacterial contamination in results, as this would lead to spread of water borne diseases.

Point of concern is that the water sample from the tank at the Velankanni Konartupu Settlement (Nagai), which is said to provide shrine water to pilgrims, was found to be contaminated. It would be worth to note that tanker samples tested at Aryanatu Street (Nagai), Anthonyar Nagar (Tuticorin) and Kottilpadu (Nagercoil) did not show traces of fecal contamination but those samples collected from the houses, which used this tanker water, indicated definite traces of such contamination. This occurs from improper secondary storages without taps/covers or unhygienic usage at household level.

Very low pH (4-6) found in ALL the samples collected in Kottar Social Service Society intervention area indicate high acidity indicating the presence of corrosive metals in water which will be detrimental to health in longer run. Also in Nagercoil area the salinity of drinking water was not as much a problem, pre-tsunami, as it is now. The Team met the agency, which has been awarded contract for installing water filters in Nagercoil. However these filters have UV system linked to slow sand filters (with backwash). Normally such filters could be effective in tackling the fecal contamination, turbidity, odour etc but not useful in removing the salinity of water or even increasing the pH of the drinking water. Salinity could be reduced by Reverse Osmosis plants, which could not be a cost-effective option for the shelters. As aforementioned the salinity is bound to get diluted over a period of time, during and after monsoons.

- **It is recommended that the measures for inducing recharge of shallow groundwater aquifers (Roof Top Rainwater Recharge/Harvesting) to reduce the salinity gradually**.

Water Quantity Issues

In Nagapattinam and Tuticorin there was a huge problem of inadequate water supply. However in Kanyakumari, there was a huge problem of plenty! Municipal water taps supplied water erratically – so when the water comes it is so much that taps run for hours with no one catching the water.

2-inch dia tubewells and small lift suction pumps were normally observed in this coastal region, indicating a high water table. Settlements near the coast face problem of brackish water, enhanced by the saline ingress after the Tsunami. Hence many of the hand pumps were used for non-drinking domestic purposes. However at some places the residents had to use the ground water for drinking purposes due to unavailability of adequate and appropriate potable water. Few such hand pumps were seen to be in unhygienic locations and the samples tested indicated fecal contamination.

[3] Sphere: Humanitarian Charter and Minimum Standards in Disaster Response
[4] Refer to Annexure 1: Water Sample Testing Results

- **Water from newly drilled tube wells/hand pumps in Samanthampattai and Nambyar Nagar, Nagapattinam be henceforth shut down and alternative solutions sought.**

- **More hand pumps be installed in Samanthampattai atleast 50 meters from the latrines to ensure adequate supply of water for domestic (non-drinking) purpose.**

The municipal piped water supply schemes supply water in many shelters but mostly tasks of simple maintenance and repairs along the line (replacing the taps at stand posts, finding and rectifying the leakages) have not been taken up, resulting either in blatant wastage of resources (as in Kanyakumari) or restricting a consistent and regular usage. (As in Vellapallam, Nagai). Normally the sources of piped schemes are well chlorinated or clean but it has to be understood that the contamination may occur during transition due to leakage within the pipelines, leakages from adjacent sewer lines and bad condition of old pipes. In many cases, as observed in either Tuticorin or Nagercoil the piped water supply is erratic, irregular and therefore unreliable. People in shelters therefore have to resort to purchasing water for their daily domestic needs.

- **A regular follow-up be done with the local municipal authorities to carryout small repairs in the existing systems and ensuring adequate chlorination.**

- **Leakage detection and rectification be carried out on Vellapallam Kinvelu municipal water supply since the samples indicated fecal contamination.**

At such places where the inadequacy is still faced **water tankering** is resorted to. Mostly the contamination occurs from the tankers, which are in bad shape due to improper maintenance (rusted inner sides of tanks) or if they collect water from a source, which is not authorized by the Government and is not perceived to be clean. Moreover the number of tanker trips and the total quantum of water that it offloads in the tanks at shelter locations was not seen to be monitored, resulting in inadequate water supply, evident in the form of crowds, long queues and water 'tussles' at many places in Nagai.

- **Regular chlorination of this tank water will surely help in providing clean water to the residents. Chlorine is available in various forms in market or be procured from the Municipality.**

In Idinthakarai, Tuticorin in particular, people reportedly purchased water from the tankers at the rate of Rs.1.5 per pot. This, it was told was a norm even for those who were not affected or not living in the shelters, as in general the water supply situation in Idinthakarai was grim!

Syntex type tanks have been installed in most of the settlements and are filled by Municipal Tankers. At many places tanks were seen concentrated in one place (or even located in such by-lanes which could not be reached by a water truck) limiting the accessibility of supply. Moreover lack of proper mechanism for monitoring the operation (frequency, quantity, quality of filling) and maintenance (stands, hoists, taps, covers) leads to restricted uses of this facility, which could otherwise be an effective decentralized (temporary) water supply system. Also the lack of discipline while fetching water from the tanks (drawing *water from the top, as seen at Vedanayaga Chetti Street in Nagai*) becomes a source of unjust and inequitable supply and secondary contamination even if the water supplied by tankers is potable.

Conformance with Sphere Standards

Sphere Indicator mentions that people in disaster situation need minimum of 15 liters of water per person every day for domestic usage, including drinking. This water could be made available as a combination of different sources or systems; meaning cumulative water supply from the ground water source (bore well) and the surface source (piped

Example: ***Nambyarnagar in Nagapattinam.***
Status*: 600 families; 3000 residents. 40 syntex type tanks of capacity 500 liters each. 5 Handpumps, 1 broken.*
Need: *According to Sphere Indicator of 15 lit. per person per day, the settlement needs atleast 45000 liters.*
Actually *what it gets at the most is 20000 liters per day, which is stored in 40 syntex type tanks plus 4 hand pumps yielding about 100 liters of water in a day.*
Remedy*: Increase the water storage capacity by either increasing the number of tanks or doubling the capacity to 1000liters. Ensure proper filling and maintenance.*

water supply) or any other exogenous source (tanker) must be atleast equal to or more than 15 liters per person. Moreover if the supply is available, absence of 'instruments' for storage in adequate quantity also restrict the per capita usage of water, thereby leading to unhygienic conditions and possible spread of water borne diseases.

- **In Nagapattinam and Tuticorin, the efforts for providing adequate quantum of water and facilities for storage need to be taken up on priority.**

Sanitation

Open defecation has been a routine behaviour-*something people do regularly without a conscious decision* - of fishing people living along the coastal South India, ever since pre-Tsunami days. The men going right on the beach while the women resorting to the young casuarinas plantations, has almost been a norm for rich and poor alike. Some households did have an attached ablution space and even the Government is seen to have constructed a number of public toilet facilities. However lack of hygiene awareness, complete disregard to utilisation of toilets and absence of initiative and mechanism for operation and maintenance of community (toilet) infrastructure has led to continuation of such abysmal practice. Moreover lack of adequate water supply at an accessible distance from the toilets is also seen as an impediment for use of toilets by those whom it is meant for. Inadequacy of water further leads to open defecation, resulting in groundwater contamination as is seen in the coastal area. Also building without understanding the soil permeability conditions leads to failure of the facilities.

Excreta disposal facilities in the settlements in all 3 districts follow a basic common trend, be it a high water table area or otherwise. The structures include 2-4 blocks of toilets (one each for men and women) with about 8-10 units in each block. These common toilets are fitted with (costly) ceramic toilet pans but have no roofing and the walls are made up of feeble black coloured corrugated bitumen sheets. Most of these sheets are either torn or broken. All these toilets are connected to a collection tank (called as Septic Tank!) at the back, which at many places were soiled by excrement.

In Nagapattinam, the children friendly toilets were constructed by Gramalaya. These were elevated toilets with, open corridor, smaller size pans connected to elaborate arrangement of septic tanks and soak pit. A small lift suction pump with a storage tank was also provided to enable water supply. However maintenance, as always is the key to the usage of facilities, along with availability of water.

- **Child Friendly Toilets should be constructed in all settlements**

Operation and Maintenance

A system of scavenging (hiring scavengers/Safai Karmacharis) is practiced in Nagapattinam shelters to maintain the public facilities created in the temporary shelters. It is a caste based system and efforts are made to involve Self Help Groups in maintenance of public toilet facilities in temporary shelter areas, however it appears that the SHGs are not entirely ready as they fear of being looked down upon by other communities!

Detailed maintenance plans should be made with the communities involved before any new latrines are built.

- **Those responsible for cleaning latrines should be treated with dignity and given proper cleaning materials (brushes and disinfectants), gloves, uniforms, shoes/boots, and masks.**

Bathing and Washing Spaces

Normally men use the space near or outside the latrine blocks for bathing. Hand pumps are also provided herein. To make these facilities more hygienic, an apron could be constructed near the bathing area and the effluent be channeled into a septic/collection pit. Men talked about the bad odour of water here. However what is lacking is a private and dignified enclosure for bathing for women folks**.** All the women interviewed complained about the lack of such a facility and the embarrassment that they face. Moreover, It was seen that lack of appropriate provision for washing

and drying clothes leads to misuse of facilities provided, formation of cesspools due to sullage and eventually nuisance of mosquitoes. Therefore,

- **Bathroom construction be prioritized since women in shelters severely lacked the facility for washing in privacy and in dignified manner**

- **Washing platforms be made available for clothes and utensils washing. Clotheslines be supplied in shelters.**

3.5 Solid Waste Management

Solid waste and refuse generated in the settlements is obviously creating a big problem by becoming a breeding ground for rodents and vectors (flies, mosquitoes, cockroaches). In addition, poor collection and disposal of solid waste may also lead to ground water contamination apart from spreading foul smell. (Not to mention, such dumping become big eyesores!) Dispersion of such refuse by either wind or (now) rain will create more nuisances. Agencies like Exnora are functional in managing solid waste but more efforts need to be made, viz;

- **Refuse should be segregated as per type (domestic/ market/clinics) and nature (wet/dry). Seasonal variations are bound to be there in quantity.**

- **Refuse containers should be installed in settlements and made accessible not only for the dwellers but the refuse removal vehicles**

- **Collection should be done regularly and disposal monitored properly.**

- **Composting is one way of disposing the wastes but needs special care. Incinerators could be provided in larger settlements**

- **If burial of waste is taken up it should be in shallow pits (no more than 1 meter in depth) and covered in 15cm of dirt everyday.**

- **Sanitary napkins must be incinerated.**

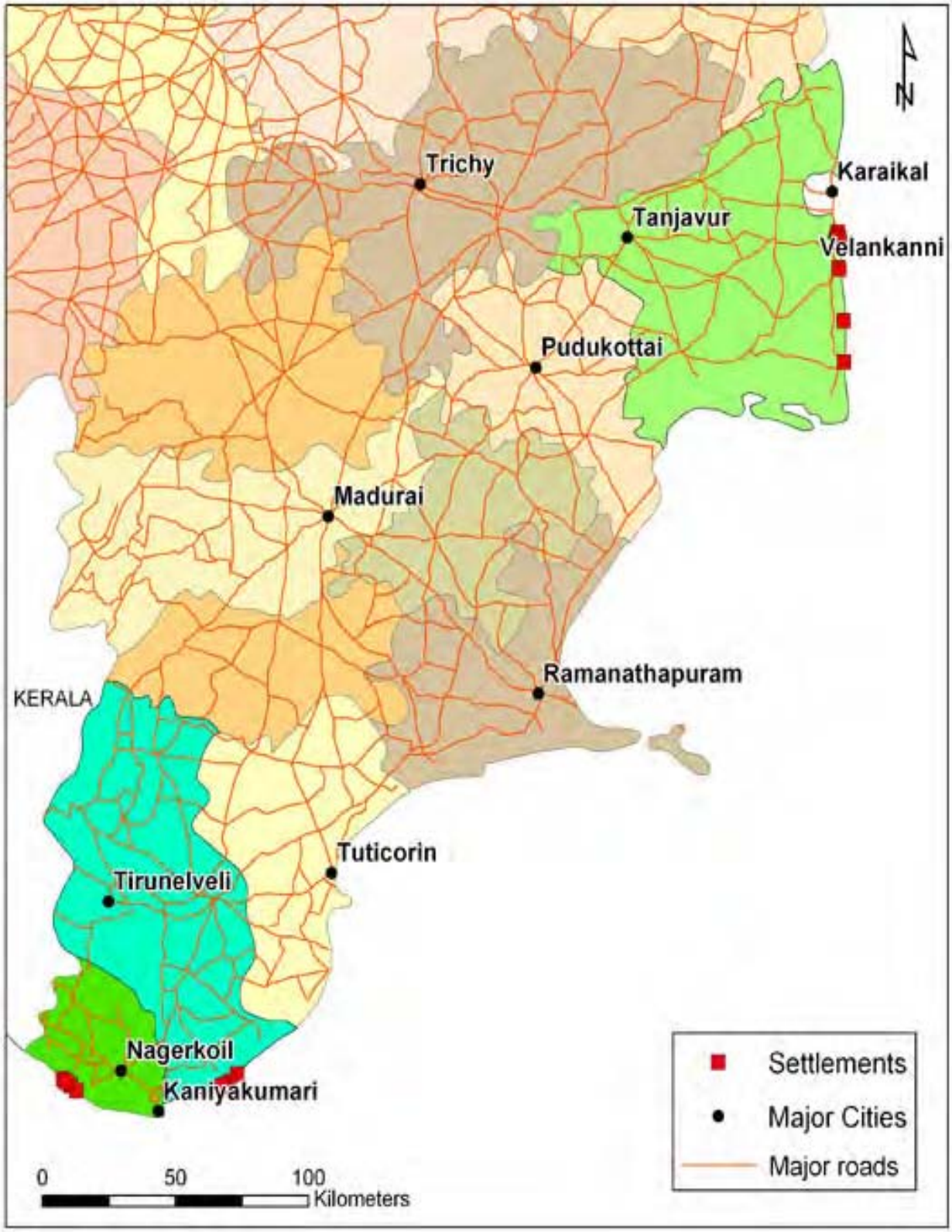
3.6 Storm water Drainage

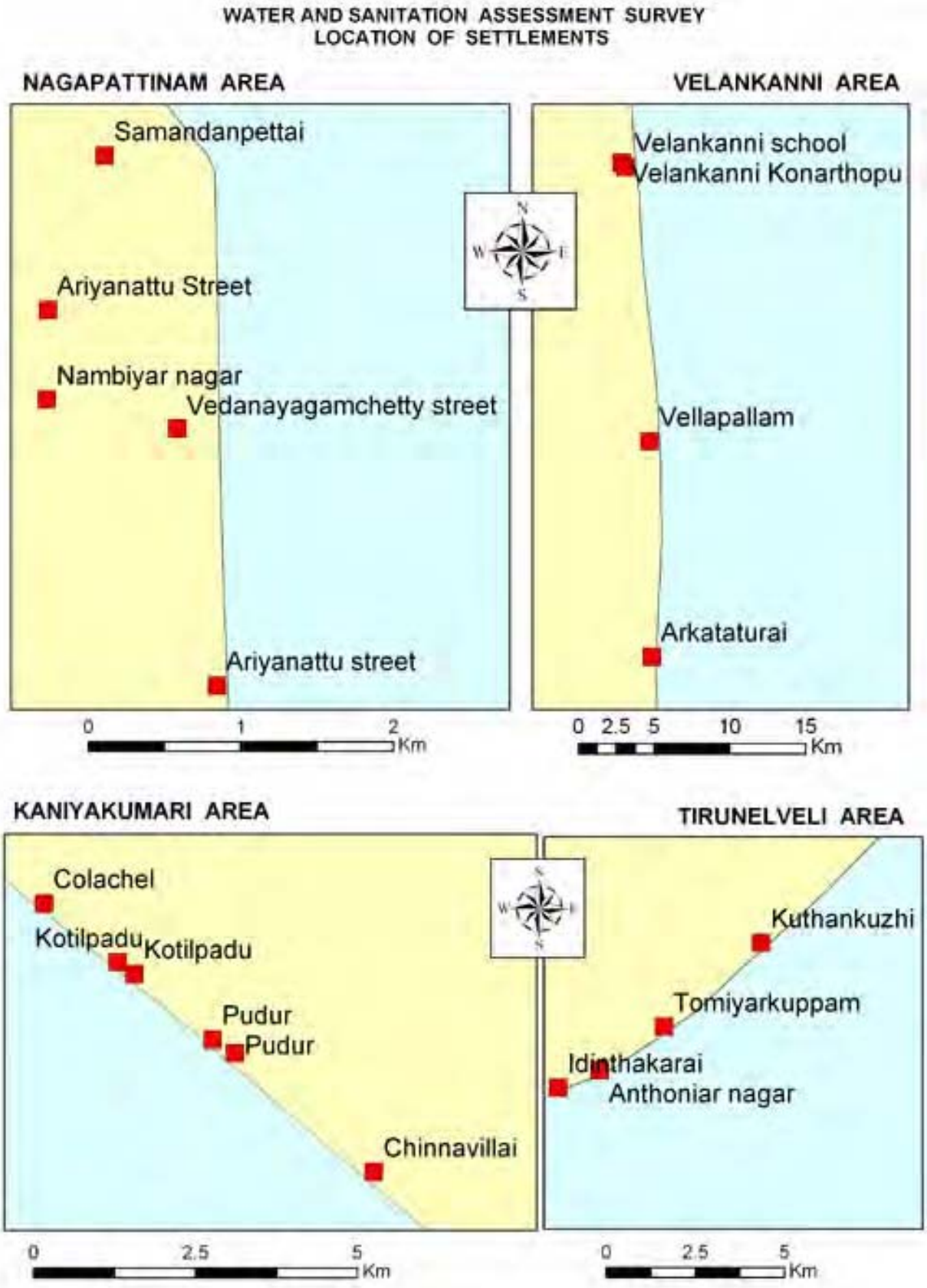
It is recommended that

- **Appropriate Storm Water Drainage be developed in shelters to take care of the monsoon rains. Small Pipe Culverts be constructed at 'Chauks' (intersections/ crossings) so as to avoid the storm water flowing on to the main street**

WATER AND SANITATION ASSESSMENT SURVEY

LOCATION OF SETTLEMENTS




WATER AND SANITATION ASSESSMENT SURVEY
LOCATION OF SETTLEMENTS
NAGAPATTINAM AREA
Samandanpettai
Ariyanattu Street
Nambiyar nagar
Vedanayagamchetty street
Ariyanattu street
0 1 2 Km
VELANKANNI AREA
Velankanni school
Velankanni Konarthopu
Vellapallam
Arkataturai
0 2.5 5 10 15 Km
KANIYAKUMARI AREA
Colachel
Kotilpadu
Kotilpadu
Pudur
Pudur
Chinnavillai
0 2.5 5 Km
TIRUNELVELI AREA
Kuthankuzhi
Tomiyarkuppam
Idinthakarai
Anthoniar nagar
0 2.5 5 Km

Key Issues Observed District-wise

A detailed statement[5] showing a comparison between the existing facilities against the Sphere Norms (for excreta disposal) and the subsequent shortfall in provision of facilities will provide an overview of the sanitation status in the settlements in these 3 districts.

Also presented here are the recommendations, people's perceptions and needs as told and observed in each settlement.

NAGAPATTINAM DISTRICT

Nagapattinam city, Velankanni city, and surrounding villages

Shelter residents in Nagapattinam rely entirely on the number of water tankers coming to the settlement. This is the only source of drinking water as well as non drinking water used for all domestic purposes, including bathing. The water table is relatively low (3-4 in dryer period) but will up rise during the monsoon. However, heavy fecal contamination of the hand pumps water is observed around the toilets, indicating lack of proper design of the excreta disposal systems (leach pits).

For 3496 families/ shelters in 7 settlements of Nagapattinam district that the team visited, about 517 toilets were seen to be built but there were very few bathrooms for women. Thus, in conformance with the Sphere Standards **359 more toilets and 352 new bathrooms** need to be constructed in Nagapattinam immediately.

Major Findings in Nagapattinam

Water Supply - IMMEDIATE REMEDIAL MEASURES

- Water from newly drilled tube wells/hand pumps near the latrines in Samanthampattai and Nambyar nagar should be shut down and removed – high levels of fecal contamination were found.
- More hand pumps be installed in Samanthampattai **atleast 50 meters AWAY from the latrines** to ensure adequate supply of water for domestic (non-drinking) purpose.
- Regular chlorination of the tanker water will surely help in providing clean water to the pilgrims. Chlorine is available in various forms in market or be procured from the Municipality
- A regular follow-up be done with the local municipal authorities to carryout small repairs in the existing systems and ensuring adequate chlorination.
- Leakage detection and rectification be carried out on Velappalam Kinvelu municipal water supply since the samples indicated fecal contamination.

Sanitation – IMMEDIATE REMEDIAL MEASURES

- Additional Toilet and bathroom construction be taken up immediately.
- **Raised / Elevated toilets** be constructed so that the protection from high water table is available
- Existing **Septic tanks** be modified (concreting the floor, plastering the walls, providing vent pipe) to improve functional efficiency. New Septic Tanks be constructed as per standard specimen design in consultation with the Municipal Authorities or the Technical Support Agencies. In high water table areas the height / depth of septic tanks should be achieved by proper adjustment below and above ground.

[5] Refer Annexure 2 Status of Sanitation Facilities

- Disposal of the sludge is more pertinent than just collection. Arrangements be made for regular emptying of tanks and disposal of sludge in an environment friendly manner which is neither detrimental to human health. Consultations with agencies involved in eco-friendly effluent treatment be done & implemented.

- Child friendly toilets be constructed in all settlements. Bathroom construction be also prioritized since women in shelters severely lacked the facility for washing in privacy and in dignified manner

- Appropriate **Storm Water Drainage** be developed in shelters to take care of the monsoon rains. (Strengthening the shelters would also be necessary since many of these shelters have no space or provision for guttering to divert the rainwater)

- Small Pipe Culverts be constructed at 'Chauks' (intersections/ crossings) so as to avoid the storm water flowing on to the main street.

- Washing platforms be constructed for clothes and utensils washing and the sullage diverted to the septic tanks

Excreta Disposal

Soils in coastal area are characteristically sandy with a high water table. During the monsoons the water table is expected to come higher up. With open defecation in practice and also with such public toilets that have shallow collection tanks unsuitable to withstand the uplift of water, the likeliness is that there will be high incidences of people coming in contact with excreta. This will lead to increased risk for pathogen transmission, insect nuisance and in general an epidemic of cholera, diarrhea in waiting.

Classically the solution is to build raised latrines or to build watertight tanks. To prevent contamination of the ground water the bottom of the pit should be at least 1m above the water level. In areas of very shallow water tables it is very important to ensure that any ground water sources (if any) are up-hill and more than 30m away from the latrine. In these situations it is especially important to know how many people will be using the latrines and to calculate the rate of solid and liquid accumulation in the pit, so often pits are larger than they need to be. A large number of small capacity latrines, wide rather than deep, are preferable to a few large capacity latrines.

- **Raised / Elevated toilets be constructed as per design[6] specs so that the high water table is not contaminated**

- **Additional Toilet and bathroom construction be taken up immediately.**

Septic Tanks

The logic:

Effluent flows directly from the toilets/bathrooms into a watertight, underground 2 compartment tanks. Solid wastes settle as sludge into bottom of the first compartment and the oils/fats float on the top. Between these two layers is a zone of clarified liquid, which is piped into second compartment for additional settling. When the effluent fills the first compartment, the clarified fluids in 2nd are forced to leave the tank into a soakage /leach pit, where the liquid gets purified by percolation into soil. Anaerobic processes help in breaking down /purification of the incoming material. Gases are produced in the process and must be vented out.

The practice:

[6] The depth of the pit could be adjusted partly below and above groundwater level and pits could continue within water table if sealed properly.

The tanks in high water table area (Nagapattinam) are about 5 feet deep while those in lateritic belts of Tuticorin and also in Nagercoil are deeper. These tanks are covered with concrete slab panels. They are supposed to be emptied regularly but no such incident was reported at any of these places. Though the tanks were seen to have two compartments little calculation seems to have gone in for compartment design considering the inflow, settlement time etc. As seen in the adjacent picture the baffle walls were right at the centre of the tank. Tank walls are not plastered, the bottom is not sealed with concrete, and neither is any vent pipe provided to let the obnoxious gasses out. The 'tank tops' are mostly used for excrement. Even at such places (Chinnavellai in Nagercoil,) where the concrete rings are used for septic tanks the vent pipes were absent.

It has to be understood that disposal of the sludge in a manner which is neither detrimental to health nor environment is more important than just collection in a tank.

The recommendation:

- **Existing Septic tanks be modified to improve functional efficiency.**
- **New Septic Tanks be constructed as per standard specimen design[7] in consultation with either the Municipal Authorities or the Technical Support Agencies. Arrangements be made for regular emptying of the septic tanks and disposal of sludge in environment friendly manner[8].**
- **In high water table areas the height / depth of septic tanks should be achieved by proper adjustment to a sealed pit 1.1 m below ground and 1m above ground. (See Raised Block Latrine)**
- **The wastewater coming from the septic tank need either to be fully treated on site, or disposed off to a remote and safe selected area for dumping.**

A full scale on site wastewater treatment could be made cost effective, keeping in mind the short life of temporary shelters. Alternatives for movable systems are to be investigated for as it may then be dismantled and reused in the final shelters. To collect and dump can be done at various scales, and can be eventually linked to a sanitation scheme for the concerned surrounding area, including a whole village, or linking several close-by settlements. Velankanni can be a good site for such a structure. The second option is to drain the waste water by sewage pipe or/and sewage pump to another location, at a minimum distance of 250 meters from any settlement and water sources location, in a casuarinas or coconut grove for example. This can be a rather cheap and easy to handle solution if site conditions allow for it.

Toilet usage

The use of toilet is also a key of the sanitation program success. It has been observed in all the places that toilet use is a failure. The toilets have been spoiled in two months duration and are not any more usable.

The failure in the use of toilet is first due to the lack of education for the people, not used to go to toilet. The main cause is the lack of a proper plan of maintenance for sustainability of the structure. The difficulty to run public toilets is well known and therefore a program of maintenance should be well thought and solid, according to the condition and situation of the people (victims) of Tsunami. Responsibility of cleaning has to be clearly defined and followed. A support should be given in the form of cleaning materials, including masks, gloves, and cleaning products, preferably bio-products as Effective Micro-organisms. The density of people per toilet should also be adjusted for an easier maintenance. Additionally, an easy access to water has to be provided for toilet use and flush, and cleaning. A distribution system with taps is needed.

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[7] For Eg., Refer Page II 28/29 Septic Tank; Public Health Engineering in Emergency Situations, A Handbook for implementing health programmes in deprived communities, published by MSF.

[8] Consultations with agencies involved in eco-friendly effluent treatment (E.M, DeWats etc.) be done & implemented considering the soil permeability, space availability.

Since the settlements are located in urban areas, far from the seashore, and with limited land available around for open defecation, the need for proper toilets must be seriously considered. Implementation of toilet and bathrooms will also help to reduce the risk of health problems, specifically gynecological problems.

Hygiene

Awareness on hygiene education is also an immediate necessity, as it is also a key for success for the overall sanitation program. Along with the set up of a good safe water distribution system, and toilet facilities, people need to be trained and motivated to follow hygienic practices to keep clean their drinking water and their environment.

Medical camps have to be organized for treatment of diseases, vaccination and prevention.

There is a need to clean the environment of the shelters; particularly the ponds with dirty water should be entirely cleaned, as well as additional locations of stagnant water.

Solid waste

Solid waste management is very poor, inappropriate and often of the time inexistent. The collection process supported by the municipality is made by very poorly equipped and untrained people.

It is essential to provide appropriate training, equipment, dumping sites, including separation and composting. The shelters must be cleaned immediately as the monsoon will generate wild and fast spray of diseases in the actual conditions. Solid waste management programs are needed. Dustbins must be provided in a systematic way, and basic hygiene devices like gloves, boots etc must be made available on site. Waste should be dumped in specific locations to avoid pollution in the settlement.

VELANKANNI SCHOOL

Nagapattinam district

General Background

Population:	685
Number of Shelter:	137
Number of persons per shelter:	5
1 Community:	Fishermen
Activities:	Fishing
Average income:	1500 per month
NGOs present on site:	None
Aid received:	4000 Rs
Social groups:	4 Women Self Help Group

The sanitary condition in the settlement is appalling. A heavy contamination of the ground water by the toilet waste is happening at the site and living condition of the residents is also seriously affected by this direct pollution from faecal matters, wastewater and waste disposal dumped in the compound.

There is 1 concrete toilet structure built with 8 seats and one set of septic tanks behind the toilet before tsunami. These septic are not real septic tank but only collection tanks and are not built with impermeable materials and leaks into the compound. They are not sealed and the top cover are partly broken or open.

There is 1 temporary toilet structure with 10 seats. There are two large collection tanks, of 8 per 4 feet, in between the temporary toilet building and the shelters, which are also not built with impermeable materials and are leaking in the compound. They are not sealed properly and the top cover is broken.

The sewage water from the neighboring lodges and houses situated outside the compound also drain into these tanks. The pipes into the tanks are connected through holes dug on sides of the tanks, which are not sealed. All this leads to a heavy deposit of fecal wastewater in the compound, at 2 meters distance from the shelters.

In addition to this, domestic wastewater drains into this area and forms pools of stagnant water. A large amount of solid waste is also dumped in the same location.

The pollution is mainly concentrated on one side of the settlement, between the shelters and the compound wall surrounding the settlement. There are also additional high-polluted spots of stagnant water around.

The Women of the Self Help Group that the team spoke with in Velankanni School said that they were willing to clean the toilets and areas if they were given proper clothing, protection and materials.

Water supply

There are 2 tanks of 3000 liters and 5000 liters, which would hold sufficient water for drinking and bathing purposes, however the 5000 liters tank is not in working condition. Water supplied is only sufficient for drinking purpose but there is not enough for other activities. One family can get 5 pots of water for drinking and cooking for one day. Therefore, for all washing work and bathing, people are using the hand pumps on site, which are extracting heavy contaminated water.

Water quality

The drinking water supplied by Kinvellur Municipal Water Supply in the settlement's tanks has been tested and has shown high bacterial contamination. The contamination is probably due to a bad maintenance of the sintex storage tanks. **This water is unfit for drinking and immediate remedial measures should be taken to decontaminate the supply coming from outside, i.e. proper chlorine addition and boiling of water.**

The water taken from the hand pumps is saline and fecally contaminated; this water is used for bathing. This water is unfit for any use due to its very poor quality. **This handpump should be shut down and removed from the settlement.**

The large amount of sewage (cesspools) leaking from breaches (both due to lack of sealed internal walls and floor as well as man-made from hostels on the other side of the school wall) in the collection tanks seriously contaminates any groundwater source in the area.

Toilet use

The settlement is located near the school, in Velankanni city, and has a compound wall and fences on all sides. It is an urban area – densely packed both within and without the compound walls. For women, there is no space for open defacation. However for men, they tend to go for defacation at the seashore on their way to work.

The Toilets were being used, but lack of maintenance has rendered the toilets unusable. The pollution, leakage, stagnation and stench have made the toilets unsafe. The women clearly stated that they needed someplace to go both for toilet and bathing needs so new, safe construction of toilet and bathing areas is urgently needed.

The current sanitary system in Velankanni school settlement is not sustainable and needs an emergency action, which involves the neighboring houses and lodges, as they share the same drainage and sewage system. The present system needs to be closed and an alternate drainage and waste water treatment system needs to be setup.

Remedial actions needed

- Closing the present toilets and septic tanks
- Rebuilding the toilets and septic tanks with appropriate designs.
- Start hygiene education programs

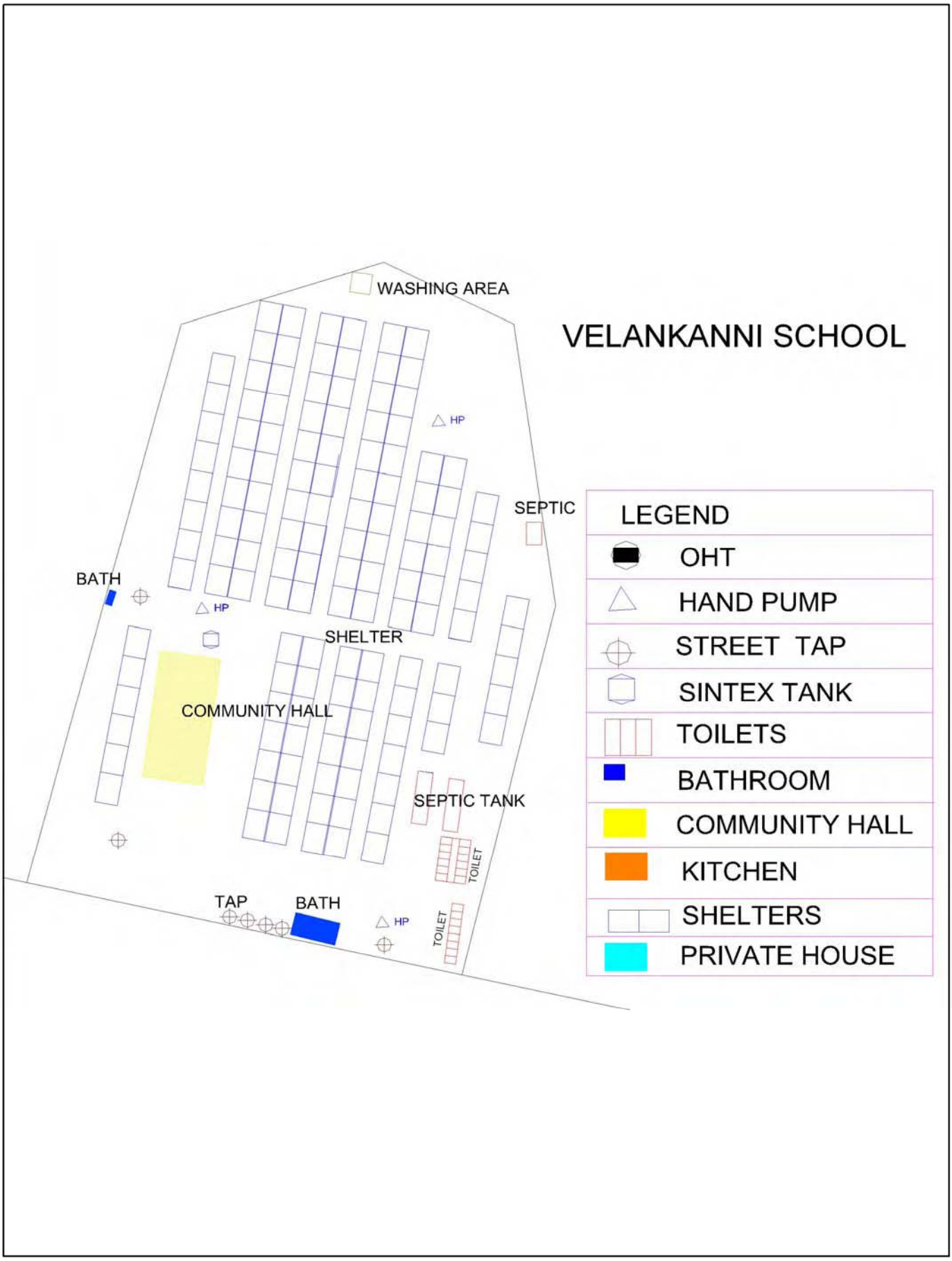
- Implement a waste water treatment system
- Clean the shelter off solid waste
- Start a solid waste and maintenance of sanitation management program involving the Self Help Groups
- Supply additional storage tanks
- Supply extra water
- Supply appropriate purification process to water sources
- Treat drinking water and regularly monitor its quality

Number of toilets to be build:	35 latrines
Quantity of extra water needed for the new toilets:	7,350 liters
Number of bathrooms to build:	14
Minimum quantity of water needed for the bathrooms:	10,500 liters

(15 liters per use with 50 user per bathroom = for 750 liters per day per bathroom)

VELANKANNI SCHOOL Recapitulative

Water availability from public supply (in liters)	
Number of Shelter	137
Population	685
Standard quantity for all needs / head /day	*45*
Total water requirement	**30,825**
Quantity actually supplied to the settlement per day	11000
Shortfall / head / day	*29*
Shortfall for settlement / day	**19,825**


VELANKANNI SCHOOL
WASHING AREA
HP
SEPTIC
BATH
HP
SHELTER
COMMUNITY HALL
SEPTIC TANK
TOILET
TAP
BATH
HP
TOILET
LEGEND
OHT
HAND PUMP
STREET TAP
SINTEX TANK
TOILETS
BATHROOM
COMMUNITY HALL
KITCHEN
SHELTERS
PRIVATE HOUSE

VELANKANNI KONARTHOPU

Nagapattinam district

General Background

Population:	3400
Number of Shelters:	664
Block A:	200 families
Block B:	202 families
Block C:	172 shelters with 88 families staying permanently
Block D:	90 families
Number of persons per shelter:	5

1 Community:	Fishermen, SC, Muslims and others
Activities:	Working for church and Velankanni business
Average income:	1200 per month
NGOs present on site:	TMSSS
Aid received:	1000 Rs per month for 3 months
Social groups:	20 Self Help Group

The settlement consists of 4 blocks of temporary shelters, on an open wasteland within the city of Velankanni. This is a very densely populated area. The settlement is divided into 4 blocks by community and the conditions are different from one to another. The condition of Dalit community block is the worst since it is neglected in the public help.

The general sanitary situation of this big temporary settlement is unsafe and needs attention to improve the existing condition as soon as possible, before onset of the monsoon.

Drinking water

Drinking water is supplied by public distribution system in OHT on site and then delivered by pipe to street taps, the people do not use this water for drinking purposes because of the medicinal smell and taste, instead they use it for cooking purposes.

People are buying water from outside, delivered by tankers and bullock carts. They have to pay 2 rupees for a 12 liters pot. One family daily buys from 2 to 4 pots. The second option is to drink the public water which comes only in the morning.

Water quality

The quality of the public water stored was tested 2 hours after storage in the house and was found contaminated and this could be because of the secondary contamination.

The water sold by carts was also tested and found contaminated. The contamination is probably due to the lack of cleanliness and maintenance of the storage tanks as opposed to comtamination at the source – but this should be checked.

The water from the hand pumps is yellow in color and very salty. One spot close to the toilet has been tested and showed fecal contamination. People use this hand pumps to wash their hands.

Water supply

The municipality supplies the water and there are 2 Sintex tank of 5000 liters, 7 Sintex tanks of 1000 liters.

There are 20 Hand Pumps 15 in working condition used for all domestic work and bathing.

Water is delivered every morning from 6 to 7 or 8 am. The people follow a queue system and can get one pot of 12 liters, which is not sufficient.

The water supply in Velankanni Konarthoppu is not sufficient for all of the people's needs.

Waste disposal

Waste is dumped in front of houses. The municipality comes to sweep the place close to the houses and dump the waste at 50 meters distance, with in the compound of the settlement.

Drainage

Domestic wastewater generally goes into the street and infiltrates the sandy soil. In block C, they dug a trench around the shelters.

Bathing

Females take bath inside the shelter, or in the streets. There are not sufficient bathing areas.

Sanitation

Block A, Fishermen community

15 seats for male, 15 seats for female

Block B, Fishermen community and others

12 seats for male, 12 seats for female

Not in usable condition because of no maintenance. Doors are broken by youngsters and drunken men. People continue to use it until it gets filled. Usually during nights people prefer going outside because there is no light in the toilets.

Block C, Muslim community

20 seats male, 20 seats female

The condition of the toilets is better than in other blocks.

Collection tanks are half full. Morning time it gets totally filled and then stabilizes during the day. There is no one in charge of maintenance. Some times the women pour water to clean and sometimes add some cleaning products. Bleaching powder is put outside.

In this block, the population density is less than in other blocks, and the Muslim community seems to be more organized.

D Block, Dalit community

10 seats for male and 10 seats for female

The toilets are located 10 meters from the houses. They are in bad conditions. Male toilets are not usable. Doors are broken and no maintenance at all. The septic tanks are collection tanks built in cement of 6 by 3 feet, with a 10 cm diameter opening on top. They are not properly sealed and are extremely full. They will be overflowing in the rainy season. They are at present full and they are not emptied regularly. Solid waste is dumped in the same place.

In all toilets, water is supplied by hand pumps, which are in working conditions. This also represents a risk for health, as people are extracting water contaminated by fecal matter for washing their hands.

Health problems mentioned by the population

Skin diseases, dysentery, fever, and body pain.

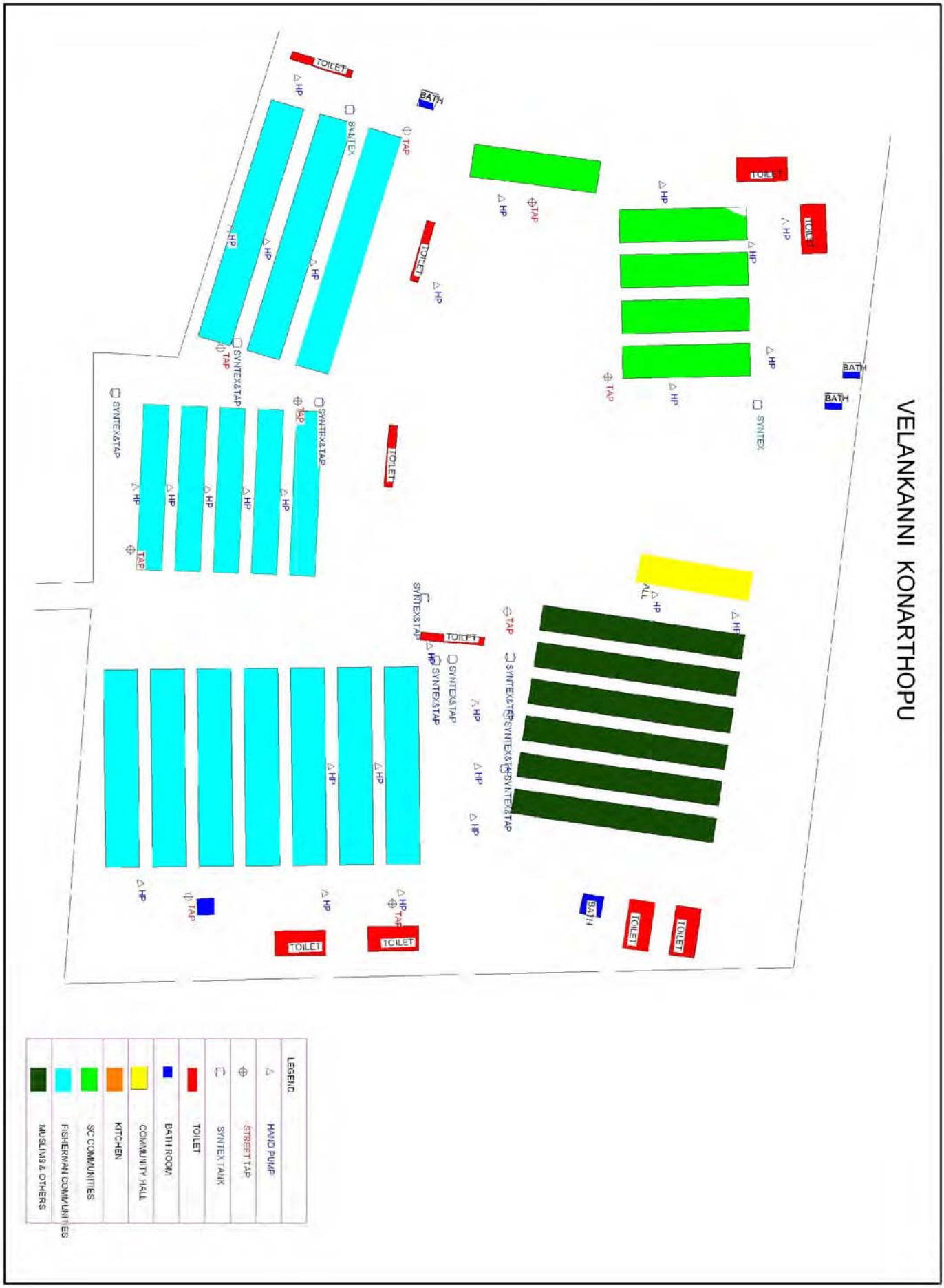
To improve

- Water quality has to be improved and regularly controlled.
- The water quantity supplied should be increased.
- Toilets need rebuilding with a proper design of septic tanks.

- A semi-concrete building is preferable with solid walls and doors.
- The toilet and septic tank have to be built 1 meter higher than ground level.
- Water should be supplied by tap inside the toilet complex. 2 or 3 taps per building.
- Wastewater could eventually be collected and treat with the wastewater of Velankanni School, located at 400 m distance.
- Bathrooms are needed.
- Drainage/sewage systems are needed.
- Hygiene education is needed
- Need for adequate water storage facility in the house

VELANKANNI Konarthopu Recapitulative

Water availability (in liters)	
Number of Shelters	664
Population	3400
Standard quantity for all needs / head /day	*45*
Total water requirement	**153,000**
Number of toilet needed	170
Water requirement for toilets	35700
Number of bathroom	68
Water requirement for bathrooms	51000


VELANKANNI KONARTHOPU
LEGEND
HAND PUMP
STREET TAP
SYNTEX TANK
TOILET
BATH ROOM
COMMUNITY HALL
KITCHEN
SC COMMUNITIES
FISHERMAN COMMUNITIES
MUSLIMS & OTHERS
TOILET
BATH
TAP
SYNTEX
SYNTEX&TAP
HP
ALL

ARKATATURAI SETTLEMENT

NAGAPATTINAM DISTRICT

General Background

Population	1040
Number of Houses	208
Number of persons per shelter	6
Community	Padayathi (Fishermen)
Income Generating Activities	Fishing
Average income	Rs. 1500/- per month
Financial Aid received	Rs. 1000/- & Ration Materials
Social Group	One Self Help Group

Sanitary Situation

The temporary shelters are located in their own territory, where they were living before the disaster occurrence. There has been no attention paid to sanitation facilities in this area.

Water Supply:

The local municipality has been providing water to the residents by tapping the ground water from the surrounding area. Water supplied was approximately 15 liters per day to the population, which reportedly is insufficient to meet their requirements.

Also the water taps are not close to the shelter and so the residents had difficulty in accessing the water supply. This has forced them to depend on the neighboring villages for water. Such procured water is the only source for cooking and washing.

Drinking Water:

The sample tested was from an untreated municipal supply of nearby groundwater to the school. This sample is highly saline and potentially contaminated. On site examination of water has shown bacterial infectivity.

At the same time, the population was found suffering from various health problems related to water, such as, diarrhea, jaundice, and stomach pain and kidney infections.

Sanitation:

A temporary toilet was constructed near the settlement area and is not used by the people due to its poor condition and maintenance.

Hygienic Practices:

Due to water scarcity, people are reluctant in maintaining their hygienic living. Deficiency in water supply has decreased their normal hygienic practices. There is the possibility that directly consumed ground water pumped from the neighbouring villages is not appropriate for drinking and cooking, but it needs to be tested. The nearest pond, which is 2.5 kms from the location, contained dark green pigments and being extensively used by the surrounding villages for washing and bathing.

Recommendations:

Additional taps connecting to the safe drinking water source available (all sources should be tested) in the neighboring villages should be linked and should be accessed by the people residing in the shelter.

Construction of Over Head Tanks on the temporary settlement site for water storage and its treatment is an important necessity.

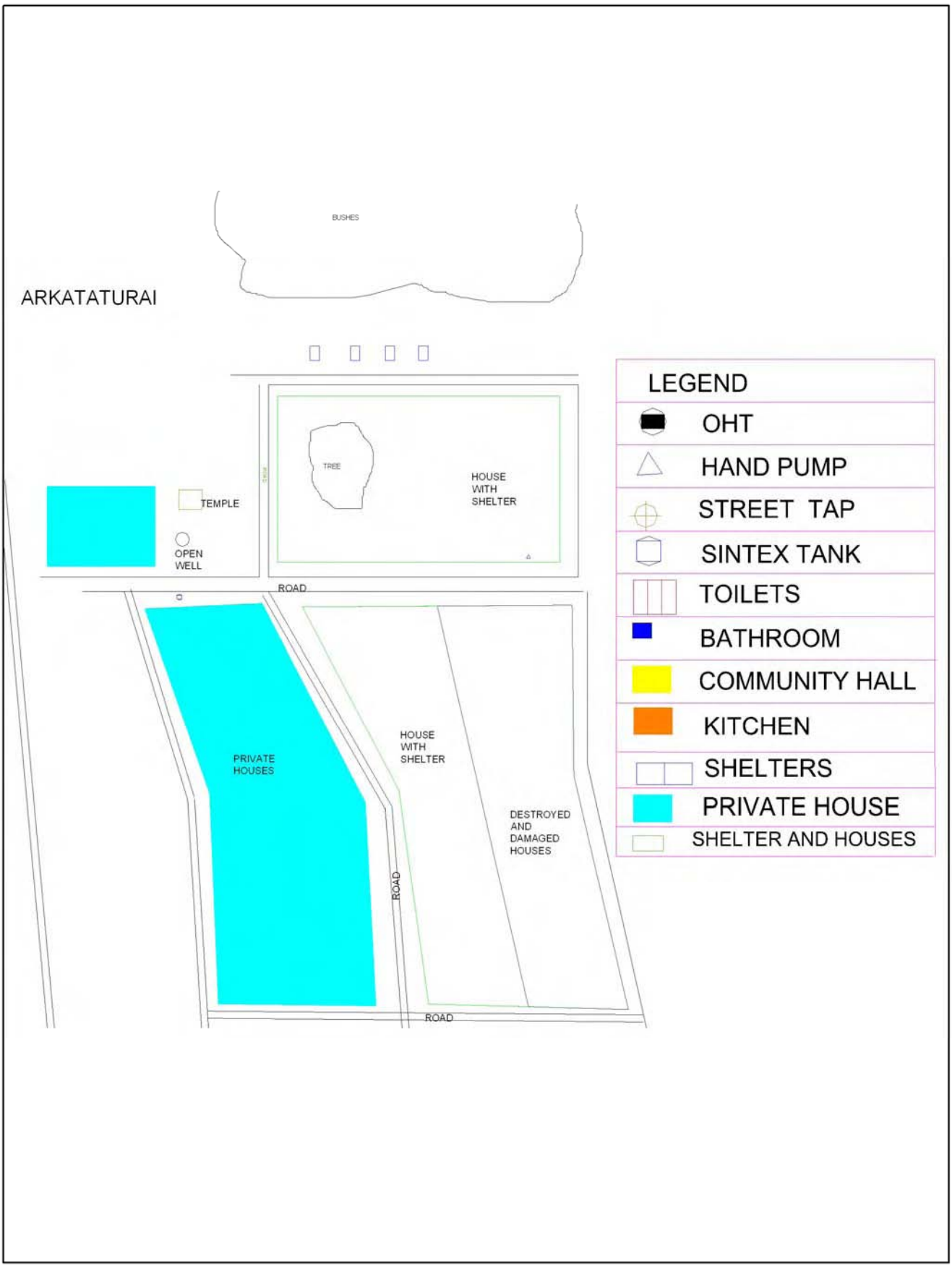
The insufficient availability of safe drinking water should be addressed in co-ordination with the municipal authorities.

Sanitation Development:

Construction of toilets and promoting its usage for maintaining hygiene and healthy living standard in the settlement area should be prioritized. Even though there were no toilet facilities available for the community before Tsunami, proper construction and usage of toilets should be emphasized to remove the prevailing health hazardous situation. Discussions with the shelter residents and generating awareness on using and maintaining the available sanitation facilities will create opportunities for safer living in the mentioned area. Sustained maintenance of toilets should be planned with the participation of women self help groups and other members residing in the area.

Arkataturai Recapitulative

Water availability (in liters)	
Number of Shelter	208
Population	1040
Standard quantity for all needs / head /day	*45*
Total water requirement (in liters)	**46,800**
Number of toilet needed (in liters)	52
Water requirement for toilets	10920
Number of bathroom	21
Water requirement for bathrooms	15600


ARKATATURAI
BUSHES
TREE
HOUSE WITH SHELTER
TEMPLE
OPEN WELL
ROAD
PRIVATE HOUSES
HOUSE WITH SHELTER
DESTROYED AND DAMAGED HOUSES
ROAD
ROAD
LEGEND
OHT
HAND PUMP
STREET TAP
SINTEX TANK
TOILETS
BATHROOM
COMMUNITY HALL
KITCHEN
SHELTERS
PRIVATE HOUSE
SHELTER AND HOUSES

VELLAPALLAM

Nagapattinam district

General Background

Population	2085
Number of Houses	326
Number of persons per shelter	5
Communities	Fishermen, SC, and others
Major Occupation	Fishing
Average income	Rs. 1500/- per month
Aid received	Rs 2000/- & Rs 1000/- per month for 3 months
Social groups	12 Self Help Group, + 2 Fishermen group

The settlement is located within the village, with two blocks of shelters. It is generally clean, except for poor facility for waste disposal. Waste is dumped in nearby the shelter. A garbage collection structure was constructed far from the shelter, which is not used frequently by the residents.

Stagnant waters are seen on times when the taps are used frequently.

Water supply

There is a good public water supply in the village. The distribution system consists of street tap connected to an overhead tank on site with the capacity to hold 1000 liters. Sufficient water is delivered to the population based on their needs. People also use ground water for domestic purpose (non-drinking).

Drinking Water

Overhead tank water has been tested for contamination and is proven to be safe for drinking. This tank is cleaned frequently too to ensure safer drinking water.

Sanitation

There are toilets and bathrooms, one for each shelter block. They are in good working condition, and are also not very much used by the residents.

Health problems

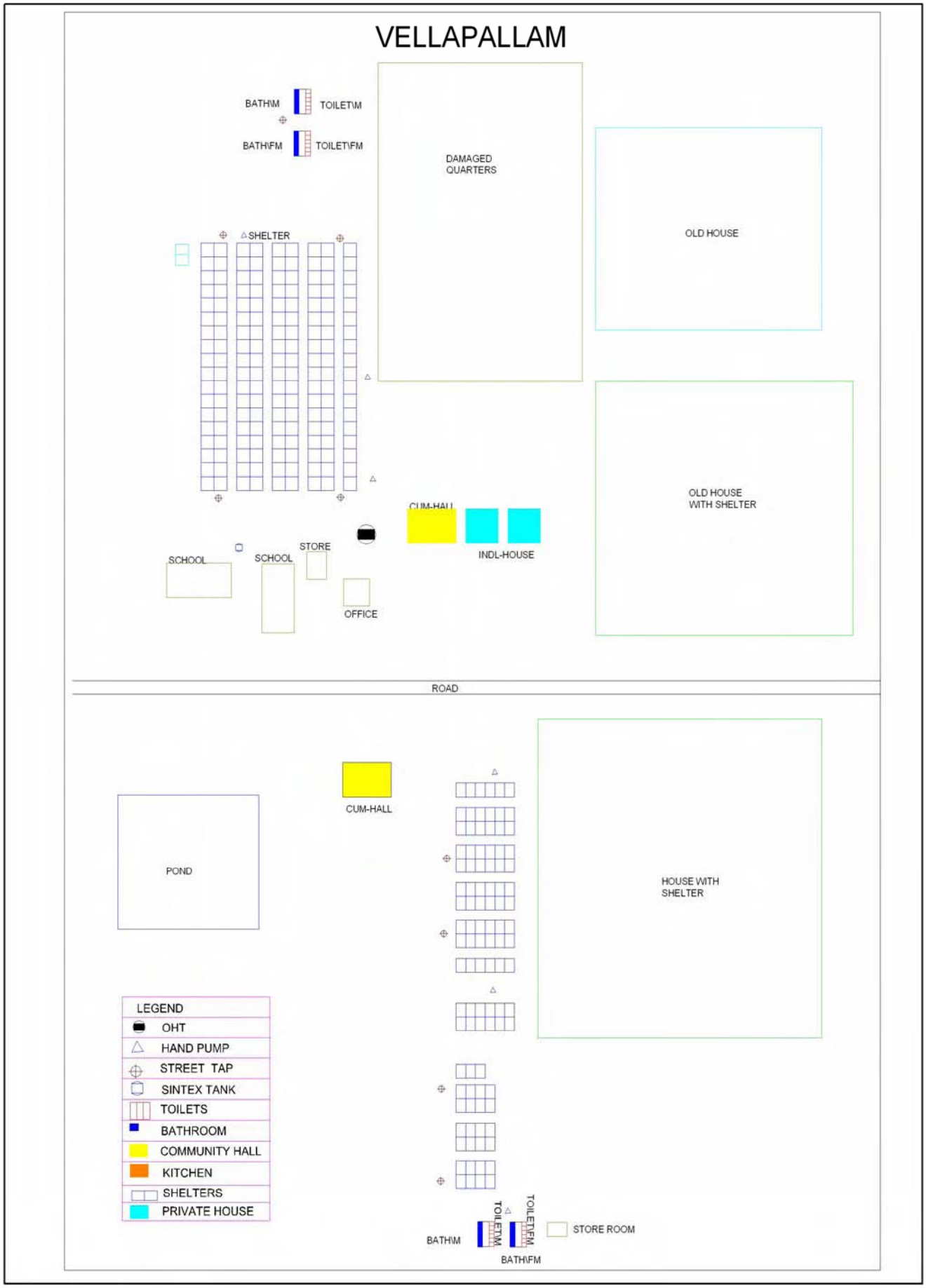
Few cases of Jaundice, diarrhea, and skin infections have been reported.

Recommendations

- Improvement of waste disposal.
- Digging of trench and soak pits for wastewater management.
- More bathrooms should be consulted based on the population size.
- Education on hygiene should be provided to the residents.

Vellapallam Recapitulative

Water availability (in liters)	
Number of Shelter	417
Population	2085
Standard quantity for all needs / head /day	*45*
Total water requirement	**93,825**
Number of toilet needed	104
Water requirement for toilets (in liters)	21893
Number of bathroom	42
Water requirement for bathrooms (in liters)	31275


VELLAPALLAM
BATH\M
TOILET\M
BATH\FM
TOILET\FM
DAMAGED QUARTERS
OLD HOUSE
SHELTER
OLD HOUSE WITH SHELTER
CUM-HALL
INDL-HOUSE
SCHOOL
SCHOOL
STORE
OFFICE
ROAD
POND
CUM-HALL
HOUSE WITH SHELTER
LEGEND
OHT
HAND PUMP
STREET TAP
SINTEX TANK
TOILETS
BATHROOM
COMMUNITY HALL
KITCHEN
SHELTERS
PRIVATE HOUSE
TOILET\M
TOILET\FM
STORE ROOM
BATH\M
BATH\FM

ARIYANATTU CHETTY STREET, KADAMBADI

Nagapattinam district

General Background

Population	3000
Number of Shelters	604
Number of persons per shelter	5
Communities	Fishermen and SC, Hindus and Christians
Major Occupation	Coolie work, Beedi making, masonry, fishing NGOs NGO's
Working	World vision, TMSS, Ramakrishna Mutt
Financial Aid received	Rs. 4000/- & Rs. 1000/- per month for 3 months
Social groups	15 Self Help Group

This is one of the biggest settlements in Nagapattinam, for those from the affected areas in the city. This shelter is installed in an open wasteland.

Water supply:

This is a new settlement where no facilities were existed before Tsunami. Water is supplied by the municipality, and is stored in the water tanks newly installed for them. With the capacity of 1000 liters, 38 tanks are serving its purpose for this shelter. They are filled twice in a day to meet out their demands. Seven hand pumps have been installed till now and 5 out of the 7 pumps are functioning.

Drinking Water:

The water tested from a tank was free from contamination but with high chlorine residue.

Other water sources:

There is pond within the settlement, with light green colour pigment.

Sanitation:

In the settlement premises 50 toilets were constructed and most of the toilets are found in poor condition. It was not properly utilized by more than 50% of the population.

Bathing:

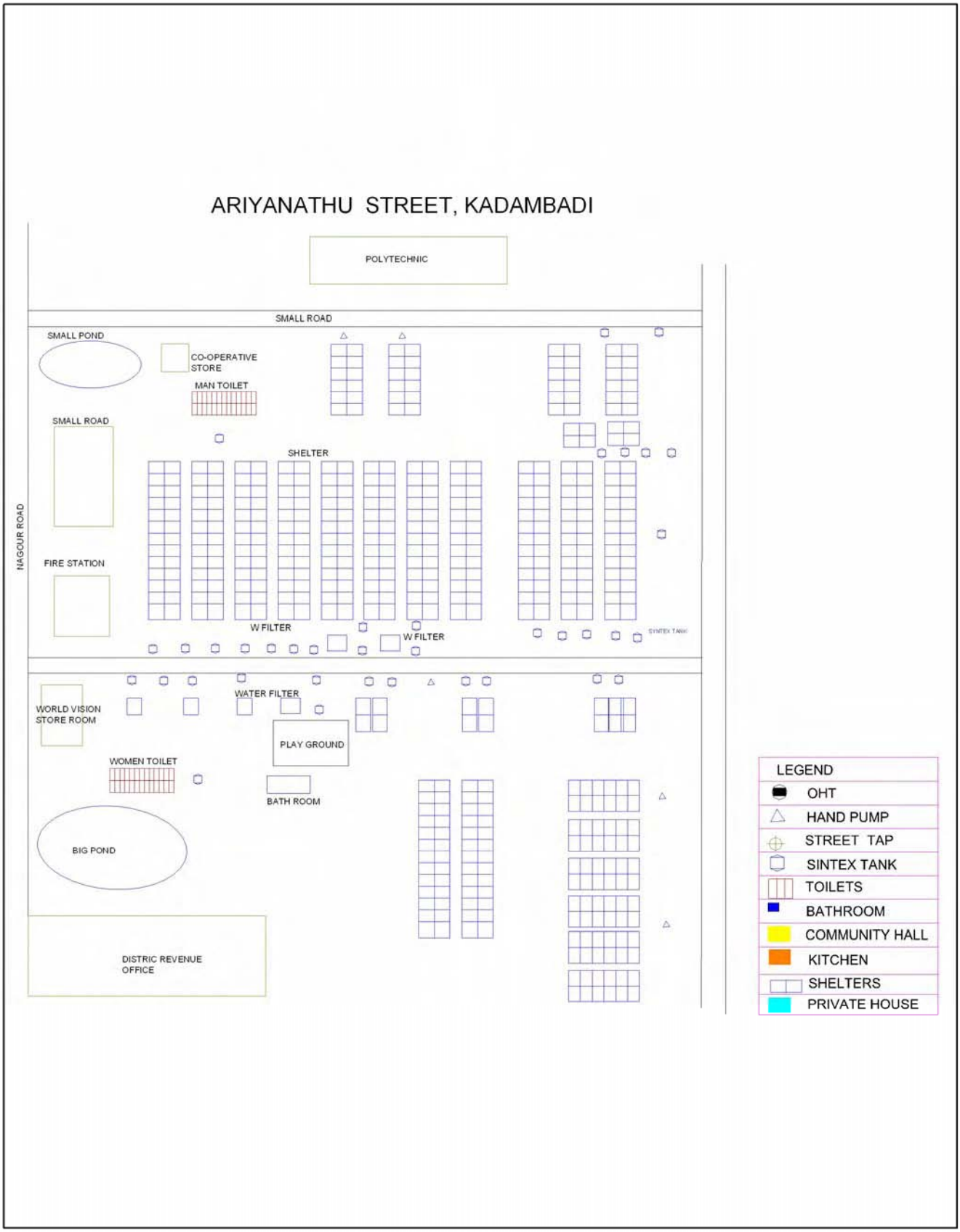
Bathrooms are not available and so women are taking bath within their shelter and men by the road side.

Recommendations:

- To meet the complete needs of the residing population, new tanks should be installed with additional water capacity.
- Monitoring of the availability of safe drinking water and treating them accordingly from bacterial contamination is necessary. It also should be suitable for consumption with balanced chlorine residue.
- Sanitation facilities should be provided immediately in the nearest future to avoid serious health problems.
- Toilets should be built in semi-concrete materials with completely sealed septic tanks.
- The wastewater coming from the tank should be either treated or disposed in a selected area.

Ariyanathu street - Kadambadi Recapitulative

Number of Shelters	**604**
Population	**3000**
Standard quantity for all needs / head /day	*45*
Total water requirement	**135,000**
Quantity actually supplied to the settlement per day	77000
Shortfall / head / day	**19**
Shortfall for settlement / day	**58000**
Number of toilet needed	150
Water requirement for toilets	31500
Number of bathroom	60
Water requirement for bathrooms	45000


ARIYANATHU STREET, KADAMBADI
POLYTECHNIC
SMALL ROAD
SMALL POND
CO-OPERATIVE STORE
MAN TOILET
SMALL ROAD
SHELTER
NAGOUR ROAD
FIRE STATION
W FILTER
W FILTER
SYNTEX TANK
WATER FILTER
WORLD VISION STORE ROOM
PLAY GROUND
WOMEN TOILET
BATH ROOM
BIG POND
DISTRIC REVENUE OFFICE
LEGEND
OHT
HAND PUMP
STREET TAP
SINTEX TANK
TOILETS
BATHROOM
COMMUNITY HALL
KITCHEN
SHELTERS
PRIVATE HOUSE

ARIYANATTU CHETTY STREET, Beach Road, Nagapattinam district

General Background

Population	1205
Number of Shelters	241
Number of persons per shelter	5
Communities:	Fishermen
Major Occupation	Daily labour work
NGOs Working	World vision, TMSSS, Pranathi
Aid received	Rs 4000/- & Rs 1000/- per month for 3 months
Social groups	One Self Help Group

The settlement is located 500 meters away from the seashore, inside Nagapattinam city, near railway station.

Water supply:

Water is supplied by the municipality twice in a day and distributed through 16 water tanks. Other than this, there are no other facilities to access water. Irregular supply of water and insufficient quantity are the major problems.

Bathing- Issues & Concerns:

Women bath inside the shelters and Men take bath in the street, or near the canal. A segment of the male population is using a public toilet with poor maintenance and no water supply.

Sanitation:

Toilet facilities were not constructed for the shelter dwellers and so open defecation is practiced. The sandy surface in the seashore is used for defecation by most of them.

Hygiene conditions:

- Soaps were used only for bathing and not for any other reasons. So strong need was felt to educate them on health and hygiene.
- Waste water after domestic use were properly channeled, which has avoided any stagnation of water.
- Solid wastages are collected by the municipality employees everyday and disposed carefully.

Health problems:

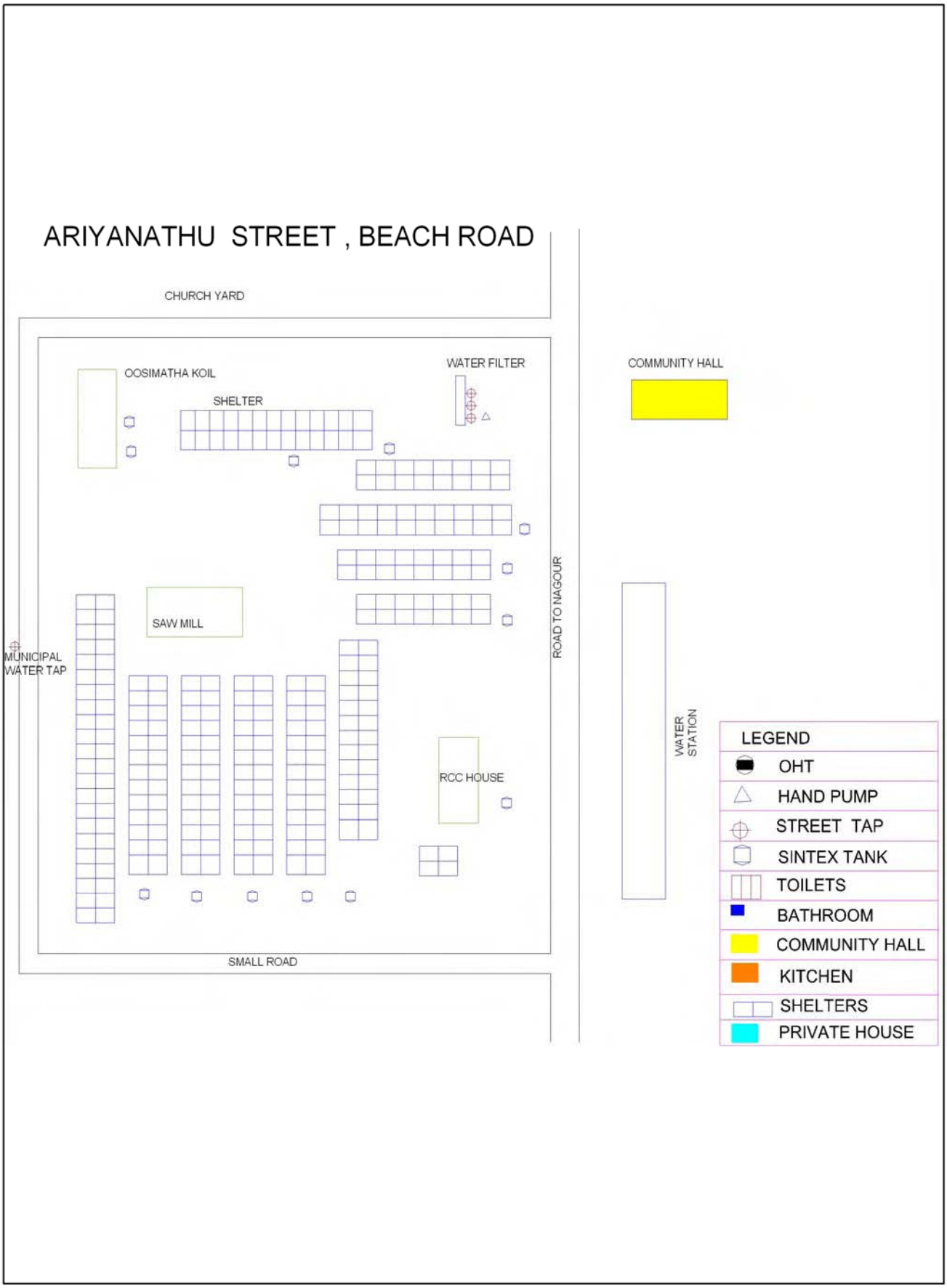
Cases of fever and jaundice have been reported.

Recommendations:

- Following the existing distribution system, water supply has to be regular and of adequate quantity.
- New tanks should be installed to meet the additional requirements of the population.
- Toilets should be constructed and maintained to increase people's hygienic practice. It should be built in semi-concrete materials with a sealed septic tank in a distance away from the shelter.

Ariyanathu street Beach road Recapitulative

Number of Shelters	**241**
Population	**1205**
Standard quantity for all needs / head /day	*45*
Total water requirement	**54,225**
Quantity actually supplied to the settlement per day	22000
Shortfall / head / day	**27**
Shortfall for settlement / day	**32225**
Number of toilet needed	60
Water requirement for toilets	12653
Number of bathroom	24
Water requirement for bathrooms	18075


ARIYANATHU STREET , BEACH ROAD
CHURCH YARD
OOSIMATHA KOIL
SHELTER
WATER FILTER
COMMUNITY HALL
SAW MILL
MUNICIPAL WATER TAP
ROAD TO NAGOUR
WATER STATION
RCC HOUSE
SMALL ROAD
LEGEND
OHT
HAND PUMP
STREET TAP
SINTEX TANK
TOILETS
BATHROOM
COMMUNITY HALL
KITCHEN
SHELTERS
PRIVATE HOUSE

NAMBIYARNAGAR

Nagapattinam district

General background

The settlement is located on a waste open land in Nagapattinam city, next to Karaikkal road.

Population: 3150

Number of Temporary shelters: 630

Number of persons per shelter: 5

Community: Fishermen

Activities: Fishing 40% others nil

Average income: 700Rs/- Per month

NGOs present on site: Sneha, World vision, TMSSS, Ramakrishnamadam.

Aid received: Stove, metal water container and 10 Boats

Social groups: 35 Self Help Group

Water supply

Water is supplied by municipality by lorry, every morning and sometimes very rarely at evening time. The water is distributed to the sintex tanks in the settlement. There are 22 tanks of 500 liters, and 3 tanks of 1000 liters. There are only 2 hand pumps installed after Tsunami, mostly not used because of bad water quality.

At first, 2 or 3 times, the lorry has dropped the water to fill the pond for people to take bath.

Water supplied is very insufficient. One family can only get 2 pots of water per day.

Water quality

The water tested from the tank collecting municipal water was not contaminated.

The water tested from the hand pump located near the toilet was contaminated. This confirmed that the groundwater on the site has been polluted by fecal matter, and **that the hand pumps should not be used, especially the ones located near the toilet buildings.**

Other sources of water

There are 3 ponds in the settlements. One pond has dirty water, green colour that people don't use. The other 2 ponds are full of water, clear colour, they are used for bathing by men and children.

The women are taking bath inside the shelters with water taken from sintex tanks or from the pond. People generally take one bath every two days.

Solid waste management

Solid waste is dumped close to the shelters. There is a big dumping place, located on the west side of the settlement where municipality collects sometimes.

Sanitation

94 latrines are installed. The design of their septic tank is not appropriate.

They have been used and spoiled and are now in bad condition because of no cleaning and maintenance. **There are hand pumps close to toilet building which should be shut down**.

Municipality came for maintenance in January and February and stopped coming.

People go for open defecation in a wide-open land with bushes next to the settlement.

Health problems

Skin diseases, chicken pox

Improvement needs

Following the existing distribution system, water supply has to be regular and of adequate quantity. To cover the minimum needs of the population, new tanks need to be installed to store an additional quantity of 127,750 liters.

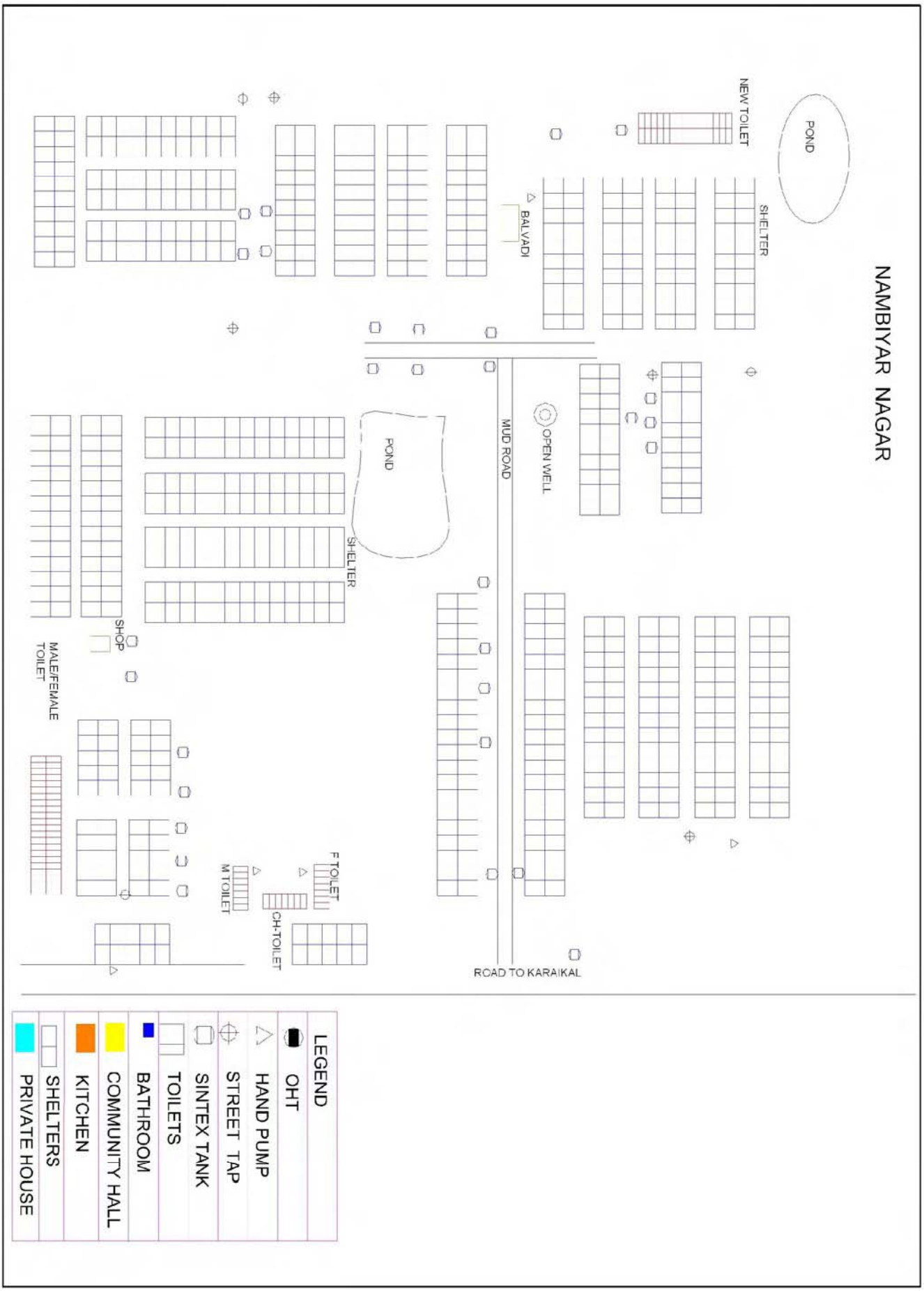
The water quality needs to be monitored and the treatment by chlorine should be adjusted and checked regularly.

Important work has to be done to improve the sanitation facilities.

Toilets have to be rebuilt with a proper designed structure. Toilets should be built in semi-concrete materials with a septic tank sealed and higher than ground level, at a distance of 50 m from the shelters. The wastewater coming from the tank should be either treated or disposed to a selected area.

Nambiyar Nagar Recapitulative

Number of Shelters	**630**
Population	**3150**
Standard quantity for all needs / head /day	*45*
Total water requirement	**141,750**
Quantity actually supplied to the settlement per day	14000
Shortfall / head / day	**41**
Shortfall for settlement / day	**127750**
Number of toilet needed	158
Water requirement for toilets	33075
Number of bathroom	63
Water requirement for bathrooms	47250


NAMBIYAR NAGAR
POND
NEW TOILET
SHELTER
BALVADI
POND
MUD ROAD
OPEN WELL
SHELTER
SHOP
MALE/FEMALE TOILET
F TOILET
M TOILET
CH-TOILET
ROAD TO KARAIKAL
LEGEND
OHT
HAND PUMP
STREET TAP
SINTEX TANK
TOILETS
BATHROOM
COMMUNITY HALL
KITCHEN
SHELTERS
PRIVATE HOUSE

SAMANTHAMPETTAI

Nagapattinam district

General background

The settlement is located on a sandy place in Nagapattinam one kilometer from the sea.

Population: 1900

Number of Temporary shelters: 350

Number of persons per shelter: 5

Community: Fishing community and Dalits (5%)

Activities: 150 families are fishing

Average income: 1000 Rs/- Per month

Presence of NGO: Amirthanamthamaye, TMSSS, ECI

Aid received: Ration materials

Community based organisations: 10 Self Help Group

Water supply:

Water is supplied by the municipality by lorry, every morning at 8 am to all the sintex tanks in the settlement. There are no street taps. There are 7 sintex tanks of 1000 liter, 3 tanks of 500 liters capacity.

One family can get 3 to 4 pots (12 liters) of water.

5 hand pumps installed are used for bathing and washing.

Water quality:

Water tested from tanks shows no bacterial contamination.

Some of the sintex tanks have a slow sand filter fixed which is successfully able to get rid of bacterial contamination.

Water tested from household was contaminated, by secondary contamination.

Water tested from 2 hand pump of newly constructed borewells near the latrine blocks (100 ft away) was contaminated. **Both of these handpumps should be closed.**

There are 4 ponds within the settlement with brackish water unusable. Solid waste is also dumped in the ponds. **These ponds should be either cleaned regularly (while using protective clothing) or filled in.**

Sanitation:

There are 100 toilets i.e. 2 blocks of 10 latrines and 1 block of 30 latrines each for men and women.

There is one toilet structure especially for the Dalits. 1 Hand pump is installed inside each toilet structure, however the water quality is deemed unsafe with foul smell. People are not willing to use the hand pumps. Maintenance was supposed to be by the municipality. The toilets are not used

anymore because of the poor condition and lack of proper maintenance. People use this place and the collection tank for open defecation around the toilet structure. The men go to the beach and the women go to the bushes next to the settlement for open defecation.

Bathing

People use the hand pumps for bathing. They generally don't wash their hands with soap.

There are no bathing rooms.

Hygiene education is needed.

Health problems:

Chicken pox, jaundice, body heat.

Improvement needs

The environment and the ponds in the settlements need to be cleaned.

Water supply has to be regular and of adequate quantity. To cover the minimum needs of the population, new tanks need to be installed to store an additional quantity of 67,043 liters.

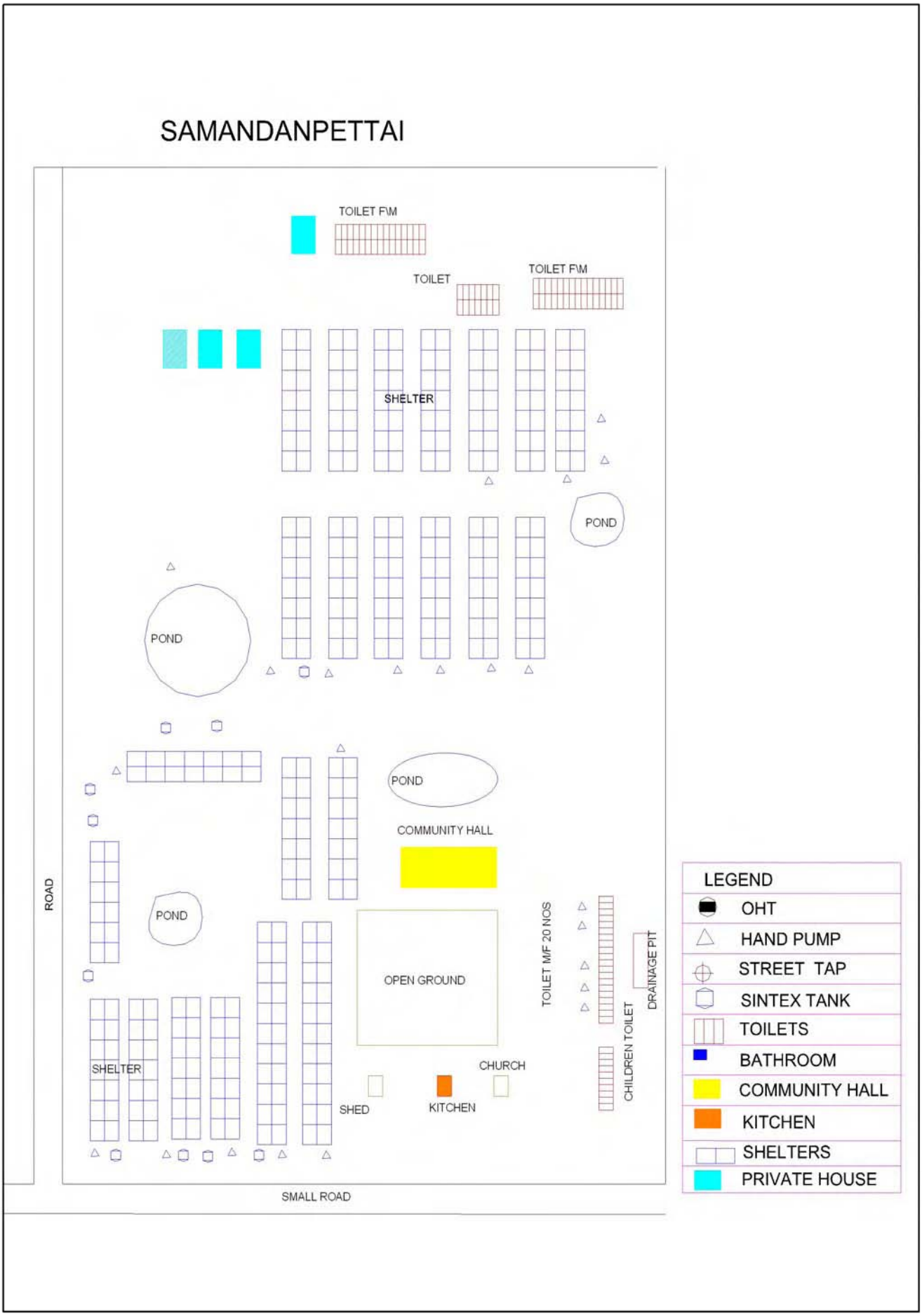
The water quality has to be regularly monitored and the treated with chlorine.

Toilets have to be rebuilt with a proper designed structure. Toilets should be built in semi-concrete materials with a septic tank sealed and higher than ground level, at a distance of 50 m from the shelters. The wastewater coming from the tank should be either treated or disposed to a selected area.

Samandanpettai Recapitulative

Number of Shelters	**350**
Population	**1900**
Standard quantity for all needs / head /day	*45*
Total water requirement	**85,500**
Quantity actually supplied to the settlement per day	17000
Shortfall / head / day	**36**
Shortfall for settlement / day	**68500**
Number of toilet needed	95
Water requirement for toilets	19950
Number of bathroom	38
Water requirement for bathrooms	28500

SAMANDANPETTAI



VEDANAYAGAM CHETTY STREET

Nagapattinam district

General background:

The settlement is located in Nagapattinam, near the railway line, close to the seashore.

Population: 830

Number of Shelters: 166

Number of persons per shelter: 5 persons

Communities: Fisher community 122 families, Dalits 44 , Hindu, Christian, Muslims

Activities: Wage labourers

NGOs Present on the site: Avval, TMSSS, Sheha, World Vision.

Aid received: Rs 4000 and ration materials per household

Community based organizations: 10 Self Help Groups

Water supply

Water is supplied by municipality by tanker once in every 2 days and distributed to the sintex tanks in the settlement. There are no street taps.

There are 8 tanks of 500 liters each.

There are 2 hand pumps. 1 Hand pump near the toilet is unfit for usage as the water is brown in colour. **This handpump should be shut down.**

Water supplied is not sufficient. One family can get only 2 to 3 pots per day.

Water quality

The water tested from the sintex tank showed fecal contamination. People were seen taking water from the open top of the sintex tanks, so there is secondary contamination even if the source is clean.

Bathing

A pond full of light green color water is only source for bathing. Water is not sufficient.

Solid waste management

Solid waste is dumped on the road-side next to the settlement. Municipality is also collecting the waste from the community.

Sanitation

There are 40 toilets constructed in the settlement.

20 latrines for men and 20 latrines for women.

Toilets are in poor condition, mostly due to lack of maintenance. Municipality was supposed to take care of the maintenance.

There are hand pumps next to the toilet structures, which should be shut down, and alternatives sought.

The women are going for open defecation on the railway track.

Health problems

Chicken pox, skin disease, fever

Improvement needs

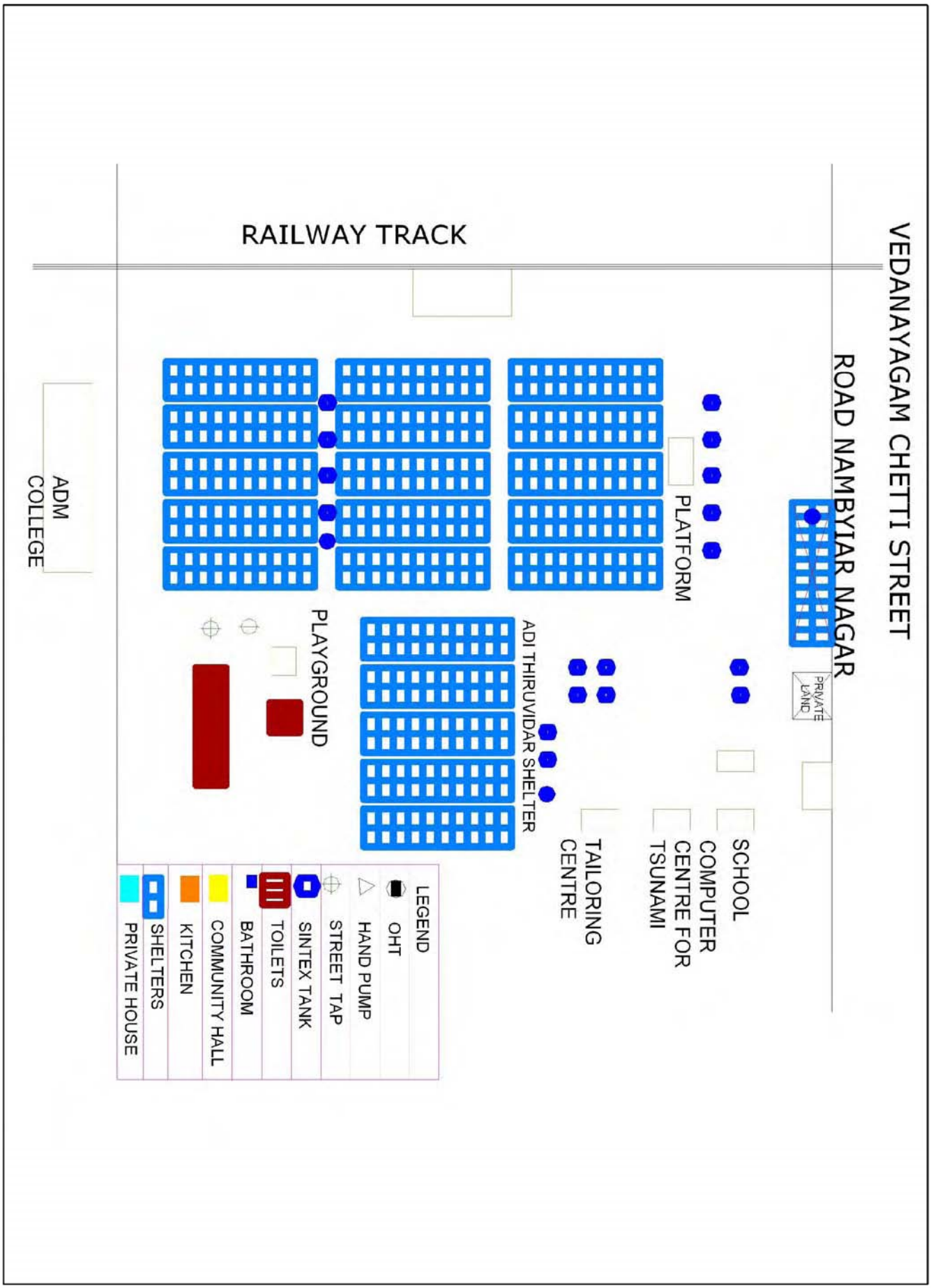
Following the existing distribution system, water supply has to be regular and of adequate quantity. To cover the minimum needs of the population, new tanks need to be installed to store an additional quantity of 33,350 liters.

Important work has to be done to improve the sanitation facilities.

Toilets have to be should be built in semi-concrete materials with a septic tank sealed and higher than ground level, at a distance of 50 m from the shelters. The wastewater coming from the tank should be either treated or disposed to a selected area.

Vedanayagam chetty street Recapitulative

Number of Shelters	**166**
Population	**830**
Standard quantity for all needs / head /day	*45*
Total water requirement	**37,350**
Quantity actually supplied to the settlement per day	4000
Shortfall / head / day	**40**
Shortfall for settlement / day	**33350**
Number of toilets needed	42
Water requirement for toilets	8715
Number of bathrooms	17
Water requirement for bathrooms	12450


VEDANAYAGAM CHETTI STREET
ROAD NAMBYIAR NAGAR
RAILWAY TRACK
ADM COLLEGE
PLATFORM
SCHOOL
COMPUTER CENTRE FOR TSUNAMI
TAILORING CENTRE
ADI THIRUVIDAR SHELTER
PLAYGROUND
PRIVATE LAND
LEGEND
OHT
HAND PUMP
STREET TAP
SINTEX TANK
TOILETS
BATHROOM
COMMUNITY HALL
KITCHEN
SHELTERS
PRIVATE HOUSE

TIRUNELVELI DISTRICT

The settlements in Tirunelveli district are located within the villages along the seashore. These villages are separated from the next villages and urban areas inland by a large dry wasteland. The population living in the settlements is Christian fisher-folk with a very low economical status and practically left over from government help.

Villages and Settlements visited in Tuticorin appeared to be left high and dry not only during the Tsunami relief operations but also in the normal development paradigm, by the Government and Non-Government agencies alike! Water supply pipelines exist but yield once in a blue moon! Emergency toilets were constructed by relief agencies (CASA in Anthonyar Nagar, TMSSS in Fatima Nagar) but these are absolutely inadequate and now in very bad shape due to lack of maintenance.

There is a serious problem of water supply and water resources in the whole area. The groundwater resources on site are highly saline and have been badly affected by the Tsunami. Therefore the water availability relies entirely on outside supply from the surrounding area. As it is now, the municipal supply is not able to cover the need of the population. There are 10 villages depending on the same bore well, located 5 km from the sea shore, and the water is supplied on irregular basis only twice or thrice a week to the settlements. Moreover, because of lack of maintenance of the distribution system, and probable leakage from the underground delivery pipes, the water is not safe for drinking in most of the cases. The people need to purchase drinking water sold by farmer of the surrounding area at the cost of 1.5 rupees per 12 liters pots. The tankers giving water to the villages are also not cleaned properly and are very often contaminated. Since the population needs to store water in the shelters for several days, this leads to secondary contamination at household level.

There is a need to implement a project for public water supply in the area, in links with the panchayats and the concerned authorities. A location with good water resources has to be selected to supply the villages, and a good distribution system has to be set up. At the same time, purification units could be installed in the villages.

The Assessment team visited 4 villages / settlements which housed not more than **130 families or 650 people.**[9]

Major Findings in Tirunelveli

Water Supply – IMMEDIATE REMEDIAL ACTIONS

- Adequate number of Water Tanks with covers and taps be installed in settlements of Anthonyarnagar and Thomayanagar.
- Tanker trips should be adequate enough to cater to the needs of shelter residents.
- Rigorous follow-up needs to be done with Government/ Local Politicians about a permanent water supply solution.
- Maintenance and chlorination of tanks in Fatimanagar be carried out on regular basis.

Sanitation – IMMEDIATE REMEDIAL ACTIONS

- Adequate number of 'sturdy' toilets and bathrooms be constructed immediately, especially in higher density population areas.
- Efforts be made to convince the people to use the existing Government Facilities (Fatimanagar) in hygienic manner

[9] No statistics available for Thomayakuppam

Apart from Fatimanagar settlement, the rest were right on or very near the sea coast. A rapid assessment of the public health situation indicates that;

i) There was poor, erratic availability of (drinking) water PreTsunami. It has now gone worse.

ii) Water availability and accessibility per person per day is well below the Sphere Standards.

iii) There is lack of promotion and awareness regarding using the existing Government facilities (Fatimanagar) in a proper manner. Hygiene Promotion aspect has been altogether overlooked by intervening agencies.

Water Availability: Case Study of Anthonyar Nagar

- *Population: 60 families/ shelters about 300 souls*
- *Total Water Requirement: 4500 liters per day*
- *Drinking Water Source: Tanker fetching water from Thomasmandapam bore well in 2 Syntex Tanks of 2000 liter capacity*
- *Actual availability:5-6 pots per family, meaning50- 60 liters per family per day or about 3000-3600 liters per day, in total.*
- *Not only that this is much lesser than the minimum standards but also that the people have to pay for this water at the rate of Rs.1.5/pot!*
- *Thus within last six months since the dreadful Tsunami the Anthonyar Nagar shelter residents have spent about*

iv) Secondary water storage facilities and practices are inadequate and unhygienic leading to further contamination of drinking water.

v) Inadequacy of water for maintaining daily hygiene has led to skin diseases amongst children and random cases of diarrhea are also reported.

vi) Chlorination of water was done at Fatima Nagar but not at rest of the locations.

vii) Women's health, particularly reproductive health issues need immediate attention, even the basic need for privacy during washing, is not considered at all.

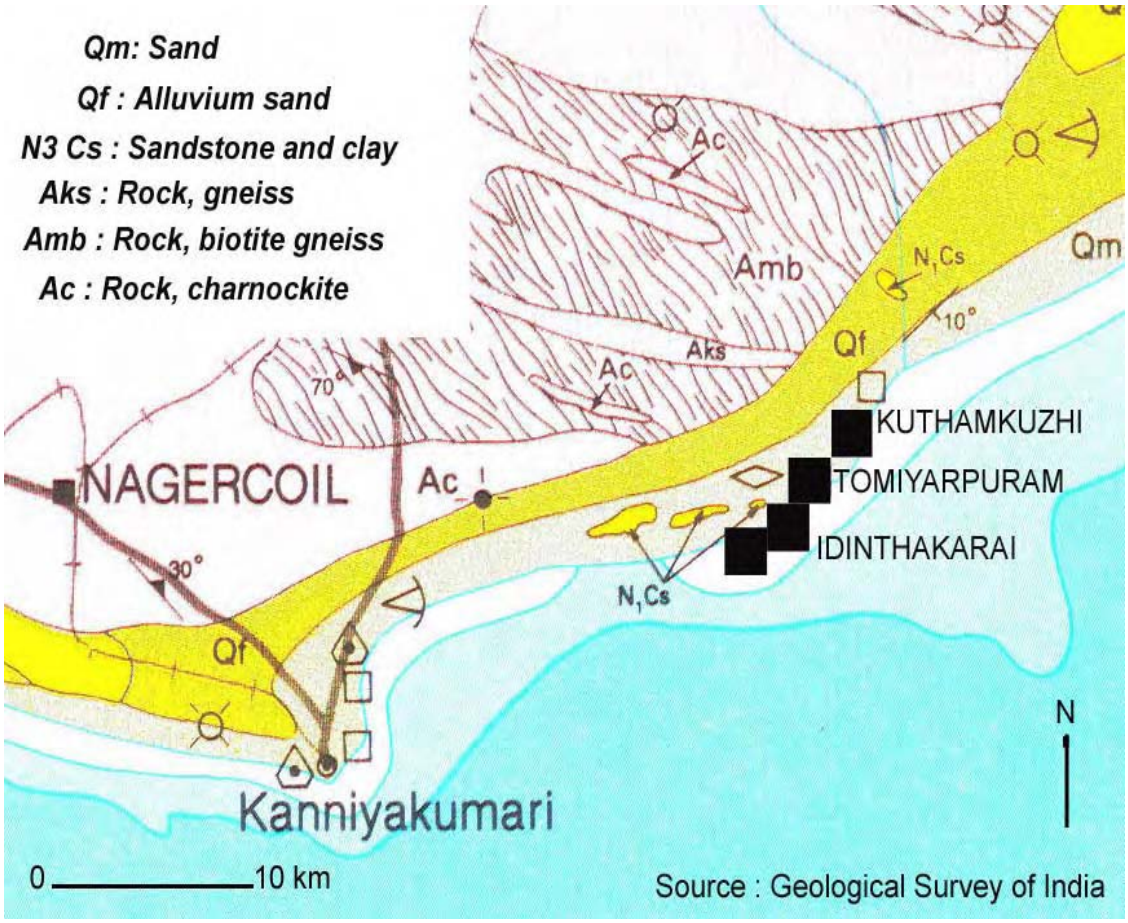
The installation of toilet in the area is not a priority as there is lots of place around, including beaches and open lands with trees and bushes, for people to continue to go for open defecation without creating immediate risks of pollution. A concentration of fecal matter and wastewater on a toilet site without any wastewater treatment system would lead to a faster pollution of the groundwater. Moreover a failure in the use of new toilets will also lead to a pollution of the shelters environment. People are not accustomed to use toilets, and therefore public toilets cannot be installed before completion of social mobilization and successful awareness campaign on the subject, including a very well defined plan of maintenance.

Hygiene education is needed to improve the conditions in the shelters. Promotion of safe hygienic practices like the systematic use of soap, betters ways to collect drinking water and keep it at home, etc…

Medical camp should be organized for these villages, where health care is presently not adequate.

These villages do not get support from the government and have only got minimum relief aid from a few NGOs.

Geological map of the settlements area



St THOMAS CHURCH SETTLEMENT

TOMIYARPURAM, TIRUNELVELI DISTRICT

General Background

Number of village houses:	100
Total population:	500
Shelter population:	130
Number of Temporary shelters:	26
Number of persons per shelter:	5
1 Community:	Catholic Paravar (Fishermen)
Activities:	Fishing and selling fish (30 women)
Average income:	1500 per month
NGOs present on site:	RUC, CASA
Aid received:	2000 Rs + 1000 Rs per month for 3 months

Social groups: 1 Self Help Group

Water supply

The water table in the village is about 4.25 m below ground level.

The groundwater is highly saline. A test done on water taken from an open well located at 300 meters from the sea shore shows an electro conductivity of 17 000 micro siemens per centimeter. The norm is 1000 micro siemens per cm for drinking purpose according to WHO standard. The average values found in coastal villages of Tamil Nadu is about 2000 to 3000. The Tsunami has severely affected the groundwater quality, therefore the population can not use hand pumps and can only rely on outside supply to get water for drinking, cooking, as well as bathing and washing.

Drinking Water supply

1 Over Head Tank is located 400 m from the village entrance and supplying 4 villages.

The water is coming through pipe from a bore well located in Thomas Mandapam Panchayat, at 5 km distance from the village. This bore well is supplying water to 10 village.

Water supply availability: Irregular supply every three days for a duration of 1 or 2 hours. The street taps are always remaining open to be able to know when the water will come. People are able to fill approximately 6 pots of 12 liters per family that they will keep for 3 days. The distribution is done by queue.

One street tap is located 15 meters from the shelters, and gives water to the 24 houses.

Non drinking water supply

The same water delivered by the panchayat is used for all domestic purpose, bathing and washing. The other option is to use the salty water from the hand pumps, for washing hands, etc…

Water quality

The result from the bacteriological test done on water collected from Panchayat supply in an OHT, and stored in a house for 5 hours, shows contamination. There was little chlorine residue detected so chlorination is a possible mode of decontamination.

The population complains about health problems related to water like kidney stones, stomach diseases and skin diseases.

Sanitation and Hygiene

There was 10 private toilets in the village used before Tsunami.

There is no common toilet in the village.

One is under construction by RUC and not yet usable. It is a concrete building with 3 toilet seats and 2 bathroom places, located 30 meters form the shelters.

People are going for open defecation. The male population goes to the beach, and the female population goes to the open places and bushes near the settlements.

Women have interest to have toilet facilities.

As for hygiene practices, people are generally not cleaning themselves on the spot after defecation but only while coming back home.

The population takes bath thrice a week only. For bathing places, people are going to the old concrete houses of the village, or in the street.

Problems and immediate suggestions for solutions

The water supplied to St Thomas church is very insufficient. There is a serious problem of water availability for the population, for drinking purpose as well as for bathing and washing.

Moreover, the distribution system in place is not providing water of safe quality for drinking purpose. Due to a bad maintenance of the water storage tank on site, as well as probable leakage from the underground delivering pipes to street taps, the water has been observed to be potentially contaminated.

Secondly, because of the inadequate supply, the water has to be stored in house for several days, and this practice leads to a secondary bacterial contamination. The risk of secondary contamination is high due to a severe lack of water for washing and bathing.

The scarcity of water is giving risk of bad hygiene and health problems.

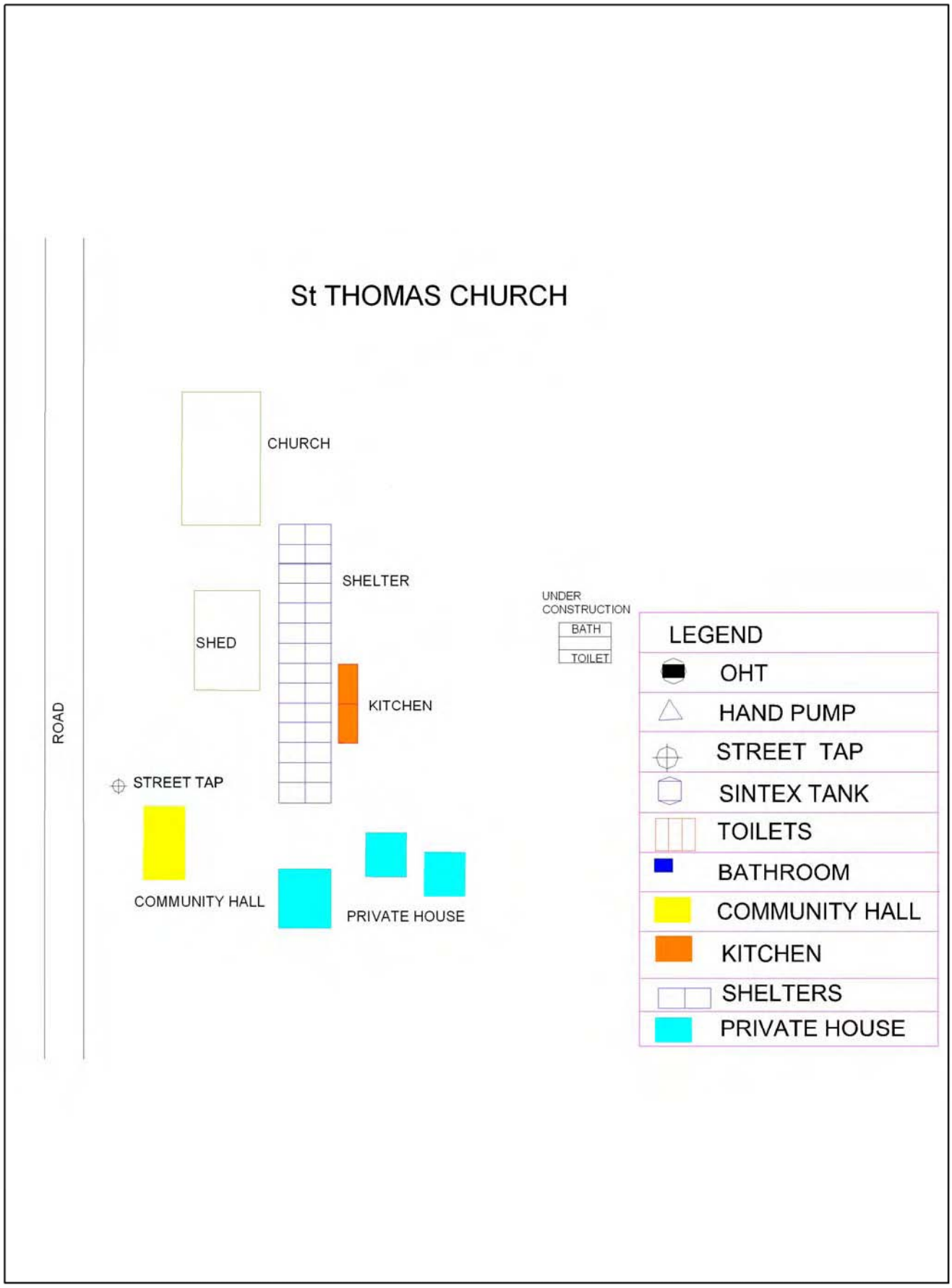
A plan with the local authorities should be set up to find an alternative solution for the water supplied to the village, according to the groundwater resources of the surrounding area. Rainwater harvesting program could be implemented.

Immediate awareness program is needed on hygiene and especially about practices to protect safe drinking water stored in house from secondary contamination.

For sanitation, there is no emergency to install toilet in the settlement. Awareness programs and maintenance plans should be established before planning the installation of latrines in the village. The success of the use and maintenance of toilet will rely on the social work done to prepare the installation of toilet. The use of toilet is not yet set up in the village where only the female population shows interest to have toilets facilities.

At the same time, the design of the latrines and the septic tanks should be appropriate to the local conditions: A semi-concrete building with a septic tank sealed and higher than ground level. The wastewater coming from the tank should be either treated or disposed to a selected area.

Number of shelters	**26**
Population of the shelters settlement	**130**
Population of the whole village	**500**
Standard quantity for all needs / head /day	*45*
Total water requirement	**22,500**
Quantity actually supplied to the settlement per day	2500
Shortfall / head / day	**40**
Shortfall for settlement / day	**20000**
Number of toilet needed	7
Water requirement for toilets	1365
Number of bathroom	3
Water requirement for bathrooms	1950


St THOMAS CHURCH
CHURCH
SHELTER
SHED
KITCHEN
ROAD
STREET TAP
COMMUNITY HALL
PRIVATE HOUSE
UNDER CONSTRUCTION
BATH
TOILET
LEGEND
OHT
HAND PUMP
STREET TAP
SINTEX TANK
TOILETS
BATHROOM
COMMUNITY HALL
KITCHEN
SHELTERS
PRIVATE HOUSE

St XAVIER CHURCH

Idinthakarai, Tirunelveli district

General background

The settlement is located on the seashore.

Population: 300

Number of shelters: 60

Number of persons per shelters: 5

1 Community: Christian Paravar

Activities: Fishing and beedies making, stopped after tsunami

School frequentation: all children up to 12th standard

Social groups: 43 women's registered Self Help Groups, 3 men Self help group (settled by MS Swami Nathan and COD NGOs)

Drinking water supply

Drinking water is bought by the outsiders and sold at the rate of 1.5 rupees per pot. The surrounding farmers also sell water from their bore wells located at a minimum of 5 km distance from the settlement.

Non drinking water supply

Water is supplied by the public system and this is irregular (once in three days from 6 to 12 am) and is inadequate. People stand in big queue at the street taps for this. This water comes from a bore well located in Thomas Mandappam panchayat, and caters to the needs of people in 10 villages.

Water quality

The water tested on site from a running street tap has shown bacterial contamination. It was reportedly not used for drinking but boiling of water is recommended.

The water tested on site from the water bought from a tanker fetched from a local bore well and stored for 2 hours has shown bacterial contamination. People are storing in pots with which they have to dip their hand inside to draw out the water. This causes secondary contamination.

The quality of the water sold is observed by the population as not good for 2 or 3 days after storage. Larvae are found in the water after this time.

Solid waste management

Solid waste is dumped in the sea, and remains on the beach.

Sanitation

There is a temporary building of 6 seats toilet, not in usable condition. They are broken and filled with sand.

People defecate on the beach. Situation is same as before Tsunami.

Bathing

There are 2-bathroom concrete building but women take bath inside their house.

People use salty water from hand pumps for bathing and washing.

Problems and improvement needs

The water supplied to St Xavier church is insufficient. There is a serious problem of water availability for the population, for drinking purpose as well as for bathing and washing.

Moreover, the distribution system in place is not providing water of safe quality for drinking purpose. Due to a bad maintenance of the water storage tank on site, as well as probable leakage from the underground delivering pipes to street taps, the water has been observed to be potentially contaminated.

Secondly, because of the inadequate supply, the water has to be stored in house for several days, and this practice leads to a secondary bacterial contamination. The risk of secondary contamination is high due to a severe lack of water for washing and bathing.

A water purification plant could be installed, along with awareness program for water safe handling and storage.

The scarcity of water is resulting in poor hygiene and health problems.

In consultation with the local authorities an alternate solution needs to be drawn for supply of water to the village. This should be done in accordance to the groundwater resources of the surrounding area. Rainwater harvesting could be an alternative.

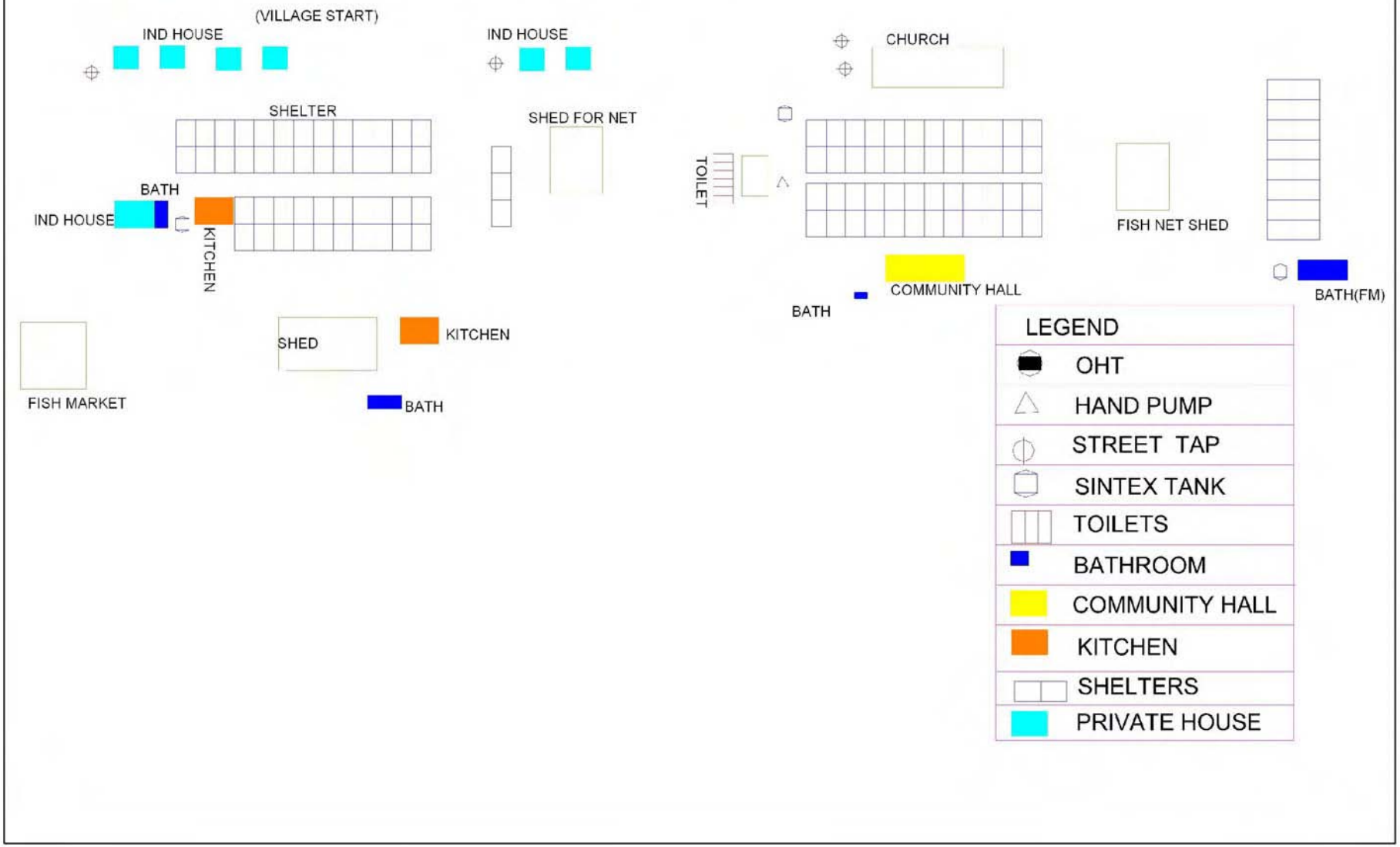
With regards to sanitation, there is no emergency for installing toilet in the settlement. Hygiene education and maintenance plans should be established before planning the installation. The community is not used to toilets and its only the female population who is showing interest to have toilet facilities. The success of the sanitation program will rely on the level of awareness and hygiene education.

At the same time, the design of the latrines and the septic tanks should be appropriate to the local conditions: A semi-concrete building with a septic tank sealed and higher than ground level. The wastewater coming from the tank should be either treated or disposed to an appropriate selected area. See DEWATS model in Annexure 4.

St Xavier church, Idinthakarai Recapitulative

Number of Shelters	**60**
Population	**300**
Standard quantity for all needs / head /day	*45*
Total water requirement	**13,500**
Quantity actually supplied to the settlement per day	1200
Shortfall / head / day	**41**
Shortfall for settlement / day	**12300**
Number of toilet needed	15
Water requirement for toilets	3150
Number of bathroom	6
Water requirement for bathrooms	4500

IDINTHAKARAI, St XAVIER CHURCH



ANTHONIYAR NAGAR SETTLEMENT

Idinthakarai, Tirunelveli district

General Background

Population:	200
Number of shelters:	60, 40 built by government, 20 by CASA
Number of persons per shelter:	5
Communities:	Catholic Paravar (Fishermen), Nadar, and SC
Activities:	Fishing and making beedies

The shelters are located in the village, in the area next to the beach.

The populations don't sleep in the shelters, but sleep outside, under a community shed on the beach. They have to stay in the church during rainy times.

Water supply:

There is no suitable source of water on site, the groundwater is highly saline and can't be used. The water availability relies entirely on the municipal supply. The water is supplied through pipe, from a bore well located in Thomas Mandapam panchayat, at a few kilometers distance from the village. This bore well is supplying water to 10 villages. The weekly frequency of the supply is irregular and not sufficient.

Water quality:

A test done from an open tank in front of the church, which stores the public supply, was contaminated.

A test done on water purchased from lorry and stored in the shelter showed contamination, probably because of secondary contamination at household level, or contamination during the storage.

A test done on water from a tanker bringing water from a borewell near Kudangulam showed no contamination.

A test done on the water from the pond where people take bath showed contamination.

Bathing and Hygiene conditions:

People bathe in a nearby pond, located 2 km from the village. Sense of hygiene is low.

Sanitation:

People are going for open defecation on the beach and in the near by bushes areas.

Problems and improvement suggestions:

The scarcity of water is increasing the risks of health problems. Due to the inadequate supply, the water has to be stored in house for several days, and this practice leads to a secondary bacterial contamination. The risk of secondary contamination is even higher due to a severe lack of water for washing and bathing.

Water supply has to be improved based on a full village program involving the panchayat and other concerned authorities. Water resources are available in the surrounding area where bore wells are extracting good quality water. A site should be identified to extract more groundwater and supply it to Anthoniyar Nagar settlement, as in the other surrounding villages.

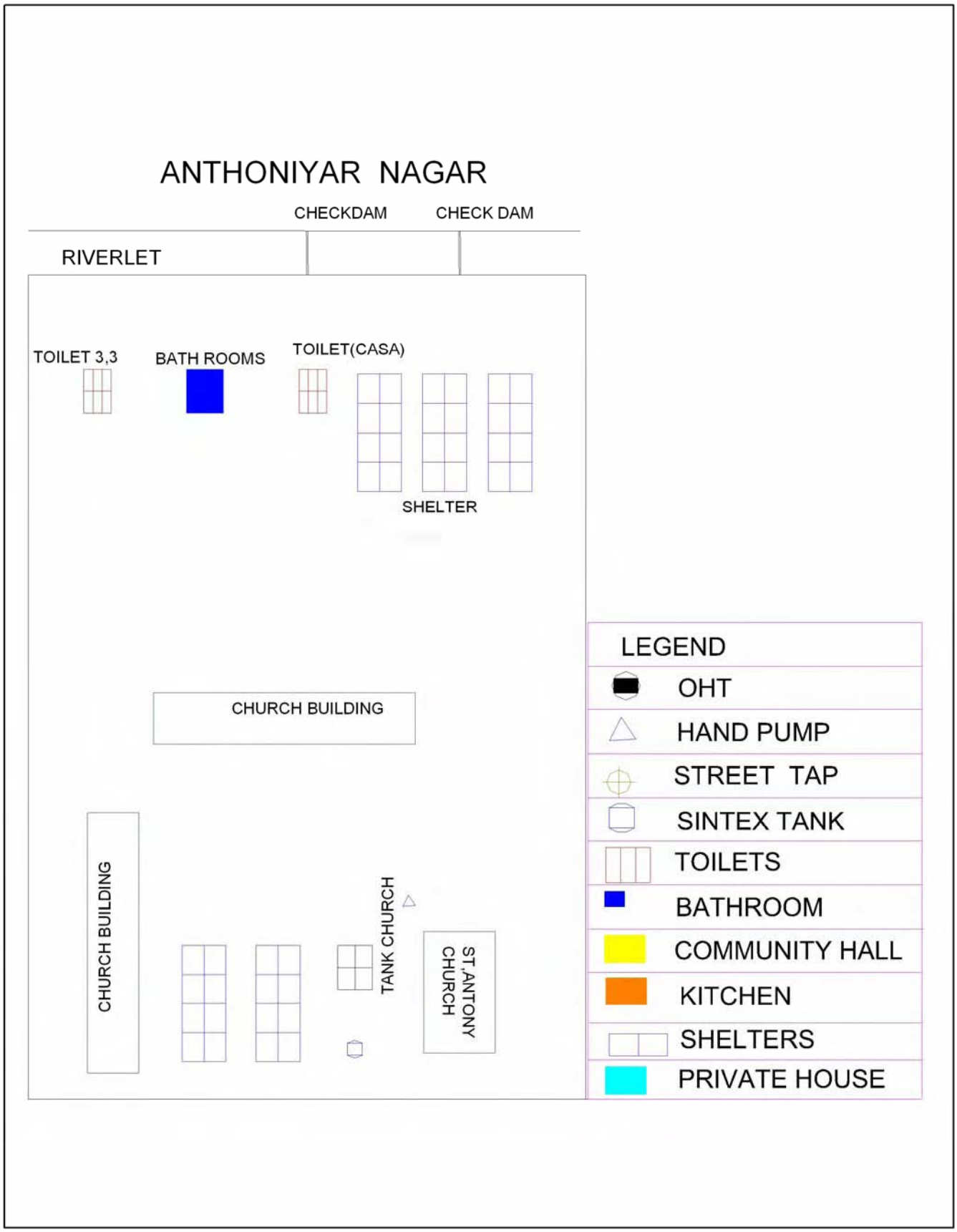
Water should be delivered daily to an overhead tank in the village, where the water can be treated and its quality regularly monitored. A water purification unit can also be installed.

With regards to sanitation, there is no emergency to install toilets in the settlement, as there are no immediate need and no risk of pollution. Sanitation program is new to the village. Only female population shows interest in having toilet facilities.

Hygiene education should be conducted before planning the installation of latrines in the village. The success of the program will depend on the level of awareness and hygiene education.

Anthoniar Nagar Recapitulative

Number of Shelters	**60**
Population	**200**
Standard quantity for all needs / head /day	*45*
Total water requirement	**9,000**
Quantity actually supplied to the settlement per day	1000
Shortfall / head / day	**40**
Shortfall for settlement / day	**8000**
Number of toilet needed	10
Water requirement for toilets	2100
Number of bathroom	4
Water requirement for bathrooms	3000


ANTHONIYAR NAGAR
CHECKDAM
CHECK DAM
RIVERLET
TOILET 3,3
BATH ROOMS
TOILET(CASA)
SHELTER
CHURCH BUILDING
CHURCH BUILDING
TANK CHURCH
ST,ANTONY CHURCH
LEGEND
OHT
HAND PUMP
STREET TAP
SINTEX TANK
TOILETS
BATHROOM
COMMUNITY HALL
KITCHEN
SHELTERS
PRIVATE HOUSE

KUTHANKUZHI

Tirunelveli district

Population: 380

Number of Temporary shelters: 74
Number of persons per shelter: 5 persons

1 Community: Fishermen

Activities: Beedi making, and fishing

NGO Present on the site: True, TMSSS, CASA, TATA, Sai Baba.

Aid received: Rs 7000 and ration materials

Social groups: 53 people registered in SHG

Water supply

A bore well in the village supplies water to two overhead tanks, which is then supplied by pipes to the Sintex tanks.

There are 4 Sintex tanks of 1000 liters. Water is supplied by the municipality every morning.

Sanitation

There are 4 toilets.

Septic tanks are mere collection tanks made up of 2 cement rings.

The toilets are not in usable conditions. The water supply was irregular and insufficient. And they are not maintenance.

Women cannot access the toilets because men play cards in the vicinity.

People go for open defecation in bushes and beach.

Solid waste management

Solid waste is dumped on the beach.

Bathroom

1 public bathroom, which existed before the Tsunami, is located inside the village; people use it for bathing purposes at the cost of 2 rupees per head. Generally people take bath once in two days.

There is no bathing place in the settlement. The other option is to bathe in the street using the municipal water.

Health problem

Jaundice, chicken pox.

Improvement needs

Water supply has to be improved based on a full village program involving the panchayat and other concerned authorities. Water resources are available in the surrounding area where bore wells are

extracting good quality water. A site should be identified to extract more groundwater and supply it to Kuthankuzhi settlement, as in the other surrounding villages.

Water should be delivered daily to an overhead tank in the village, where the water can be treated and its quality regularly monitored. A water purification unit can also be installed.

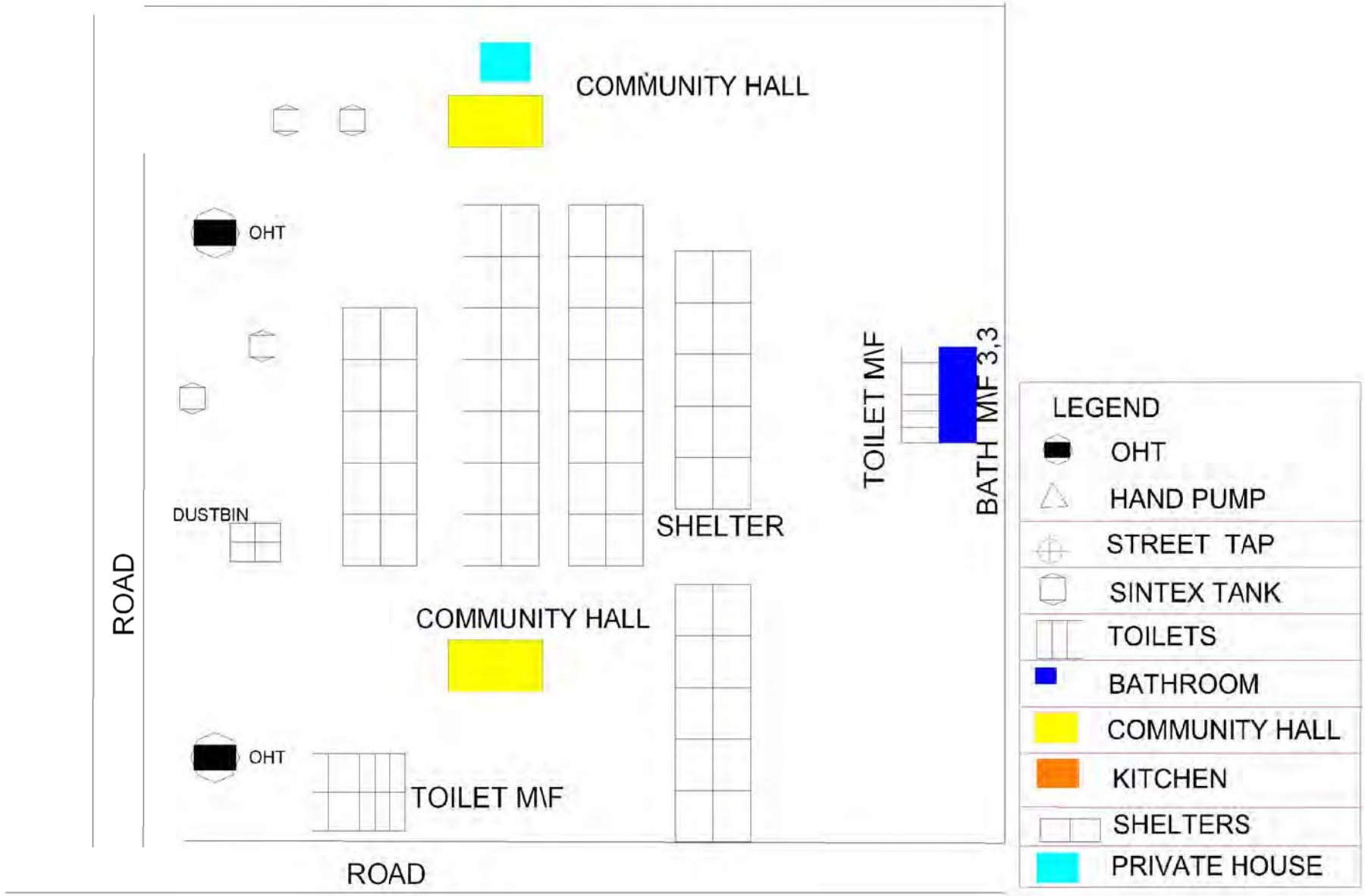
With regards to sanitation, there is no emergency to install toilets in the settlement, as there are no immediate need and no risk of pollution. Sanitation program is new to the village. Only female population shows interest in having toilet facilities.

Hygiene education should be conducted before planning the installation of latrines in the village. The success of the program will depend on the level of awareness and hygiene education.

Kuthankuzhi Recapitulative

Number of Shelters	**74**
Population	**380**
Standard quantity for all needs / head /day	*45*
Total water requirement	**17,100**
Quantity actually supplied to the settlement per day	1900
Shortfall / head / day	**40**
Shortfall for settlement / day	**15200**
Number of toilet needed	19
Water requirement for toilets	3990
Number of bathroom	8
Water requirement for bathrooms	5700

KUTHANKUZHI, FATIMA NAGAR



KANIYAKUMARI DISTRICT

The temporary settlements are located within the villages affected by the Tsunami. The shelters are installed either in between destroyed houses, or concentrated in one area, next to the beach. The villages' lands are delimited on one side by the seashore and on the other side by a canal, next to the main road. These villages have a high population density. They were before Tsunami well developed villages, with a good education level among the school students, and government structures such as public water distribution systems, and some public toilet buildings were in place. Private toilets were also present. Several NGOs (CARE, Oxfam, CHARDEP/UNICEF) have already been involved in long term work in these communities, which includes water and sanitation projects.

The assessment team visited 4 settlements in Nagercoil (Colachal region), which housed **430 families, (approximately 2150 individuals)**, situated along the seashore. Despite the fact that this area was largely catered to by the municipal water supply and was comparatively well off than the other locations hit by the Tsunami, the status of water and particularly sanitation facilities is abysmal. This could be attributed to the disregard to the existing Government built facilities or the behavioral trait of the locals, which is evident in the continued open defecation. In conformance with the Sphere Standards the population needs another **45 toilets and 40 bathrooms,** immediately.

The AVM channel, which runs parallel to the seashore, was a source of fresh water (due to less salinity), before the Tsunami people used this water to bathe. Enclosures have been built by a nearby Mandaikadu Temple complex to enable the pilgrims to take a holy dip during the festival in March. However this water has become saline and unusable.

Major Findings - Kanniyakumari

<u>Water Supply – IMMEDIATE REMEDIAL MEASURES</u>

- **Piped water supply in Colachal is highly acidic, perhaps due to the processing of radioactive mineral sands with acids by (Public Sector) Indian Rare Earths. Issue needs to be immediately raised with Government that some addition of base like lime or alum needs to be added to balance out the acidity.**

- **Monitor the water quality (changes) of the newly installed UV water purification plants periodically. DO NOT rush the installation of the others until you have several good tests. Make sure there is a maintenance plan in place because slow sand filters tend to get clogged quickly (every 6 months).**

- **Engage in rainwater recharge measures like Roof Top Rainwater structures and Ground water Harvesting to reduce salinity.**

- **Improve or lobby with the government to improve existing municipal taps with regulators/shut off valves and regular timings to avoid extreme wastage of water.**

<u>Sanitation – IMMEDIATE REMEDIAL MEASURES</u>

- **Efforts be made to convince people to use the existing facilities that are still unused (Pudur)**

- **New, semi permanent toilets be built for the temporary shelters in adequate number in consultation with local authorities and other stakeholders in such a way that near Sphere Standard results are achieved.**

- **Design for septic tanks be discussed and finalized with local authorities. Vent pipes be provided at all septic (collection) tanks**

- **There is a need to rebuilt some of the toilets at a higher level than the ground level, and with a better waste water disposal system. The easier solution is to drain the**

wastewater to another location, a safe selected area at a minimum distance of 250 meters from any residence and water sources. This needs to be studied according to the sites, which are all at the average distance of 100 m from the high tide line.

- **Improve the water distribution to the toilets. Overhead Tanks are recommended. Hand Pumps should be atleast 50 meters away from the latrines**

- **Build new toilets in areas easily accessible to women. Improve privacy screening on existing toilets.**

Interestingly, in many 'pacca' houses built by boat owners, coolies and traders within fishing communities in Kolachal area, the toilets are built either inside the house or in courtyard but invariably the septic tank, with dimensions 10 ft. X 10 ft. by 5 ft. is seen to be built under the kitchen floor. This has no vent pipe and no scope for sludge removal. People need to be alerted to the pros and cons of such toilets.

However major problem in water quality seen in this region is that of low pH or high acidity, which indicates presence of corrosive, metals in the groundwater and could be detrimental to health in longer run. This could be due to the operations of the Indian Rare Earths, a Public Sector company, nearby, which processes the coastal sand for radioactive minerals using concentrated acids. This could be contaminating groundwater in the adjacent area. Municipal water supply for Colachal is mainly groundwater based & therefore a major concern.

A rapid assessment of the public health situation indicates that

i) The availability of water pre-Tsunami was adequate and appropriate (potable.) However post-Tsunami despite the fact that quantum of water supply is still adequate - the water from the piped water supply schemes is reported/tested brackish/saline as the saline ingress has affected the bore wells.

ii) Water is abundant yet erratic so the odd timings and the lack of a shut off valve/regulator lead to extreme wastage of water.

iii) The settlement residents use the tap water for domestic purposes and the tanker fed water for drinking purposes. The tanker water is supplied by municipality (to everyone) from such sources, which do not show traces of salinity. Unicef has provided Sintex type tanks /Oxfam but lack of maintenance has rendered them useless. Long queue of pots, waiting for tankers therefore is a common sight.

iv) **Lime should be premixed with municipal water before supplying to dilute the acidic nature. However the issue of contamination due to Indian Rare Earths should be raised with the Government, at all levels.**

v) Lack of adequate secondary storages has led to contamination of household water. This emphasizes need for hygiene education and awareness generation.

vi) Coordination with other NGOs doing Water and Sanitation works is extremely important in order to avoid duplication/overlap of interventions, fill in the gaps leading to a more complete intervention, share expertise, build lobbying power with the government and ensure uniformity of strategy.

vii) There is a serious need for bathing places. There are almost no public structures built for this purpose. The population has to take bath in the street, including the women. This creates more difficulties for women to take care of themselves, who need easy access to water and privacy, especially during menstruation periods. Building appropriate bathrooms is the first priority for the settlements.

viii) As there is no place designed for bathing or waste water disposal from the homes, problems of drainage have been observed near the public taps and hand pump locations.

ix) Many groups from the villages voiced the need for a toilet as priority, due to high population density and very limited open land areas usable for open defecation.

COLACHEL

Kaniyakumari district

General Background

Colachal: 900

Number of shelters: 180

Communties: RC Mukhavai (catholic), Hindu, Muslim

Activities: Fishermen and coolies

Average income: Before Tsunami Rs. 2000, after Tsunami Rs. 700

School frequentation: all children up to 12th standard

Presence of NGOs: UNICEF, EFFICOR

Social groups: some groups are existing but are not registered

Colachel is an important village, with a high population density. The population has been badly affected by the Tsunami.

The shelters are located within the village, on the same site of the damaged houses, in between the remaining old houses, on the edge of the village, next to the beach, and spread over more than 800 meters. There are 3 blocks of shelters.

Water supply:

The government supplies water everyday for half an hour in the morning. Water is delivered from the village OHT, through pipes. There are few taps and the rest of the water is distributed directly by pipe on the ground. Some are public and some are private. In some of the houses near the shelters, people use a pump to get the water from the pipes. The distribution system is deficient; the pumps do not have a regulator so the water runs on to the streets resulting in stagnation and blockage in the drains.

There is a need to install additional taps with regulators in the lanes within the temporary shelters.

There are a few small cement drainage canals, which are insufficient, block easily and not well connected.

The drinking water is supplied by tanker thrice a week. The water is distributed in the 500 liters sintex tanks.

Water quality:

The water from the public distribution system tested in Colachel has shown no bacterial contamination, but people do not consume the water because they are not convinced of its quality.

The water tested from the sintex tank has shown no fecal contamination.

The water tested from a 20 feet deep tube well located inside the village has shown no contamination.

Water is fit for drinking, however some of the storage sintex tanks were dirty and contained larvae. **Sintex tanks should be cleaned and water should be boiled.**

Sanitation:

Colachel block 1:

50% of the houses in the village were having private toilets before Tsunami.

At present there are 4 temporary toilets and bathrooms.

They are in bad condition due to lack of cleaning and maintenance.

People are going for open defecation. The male population goes to the beach, and the female population goes in the village, beside a compound wall next to the church.

Colachel block 2:

Public toilets: 10 seats for females

They are in bad condition, but still usable. Only 20% of the female population is using it. Toilets were not maintained well and there is not sufficient availability or frequency of supply of water. Municipality is in charge of the maintenance but don't do it apart from dropping bleaching powder around the building from time to time. The people don't involve themselves in the cleaning.

People go for open defecation. Males on the beach, and females in open land and bushes, next to the settlement.

Colachel block 3:

1 public toilet building with 4 seats for males and 4 seats fro females.

20% of the female population was using it, early morning. During daytime, access is difficult for because men play cards near the toilet. The toilets are in bad condition due to lack maintenance, and sometimes there is no water available to use.

For open defecation, people use the beach, or the area next to the canal, or to bushes.

Solid waste management

Solid waste is either thrown to the sea or dumped near the settlement where it is sometimes burned.

Problems

Colachel is densely populated and the village is located between the canal and the beach, there is no open space within and close to the village, therefore there is a need for building toilet. Another reason for constructing toilets is lack of privacy and risk of pollution and contamination.

The bathroom facilities are not adequate in the settlement and people generally take bath once in 3 days, at the time of water supply. Female bathe in the shelter and men on the streets.

People had many health complaints like Psychological disorders, stomach diseases, dysentery, jaundice, and skin diseases

Improvement needed:

Need for a good water distribution system with street taps systems with regulator.

Minimum number of taps to install: 18; 1 tap for 10 households (50 persons) and need for regular quality testing and monitoring.

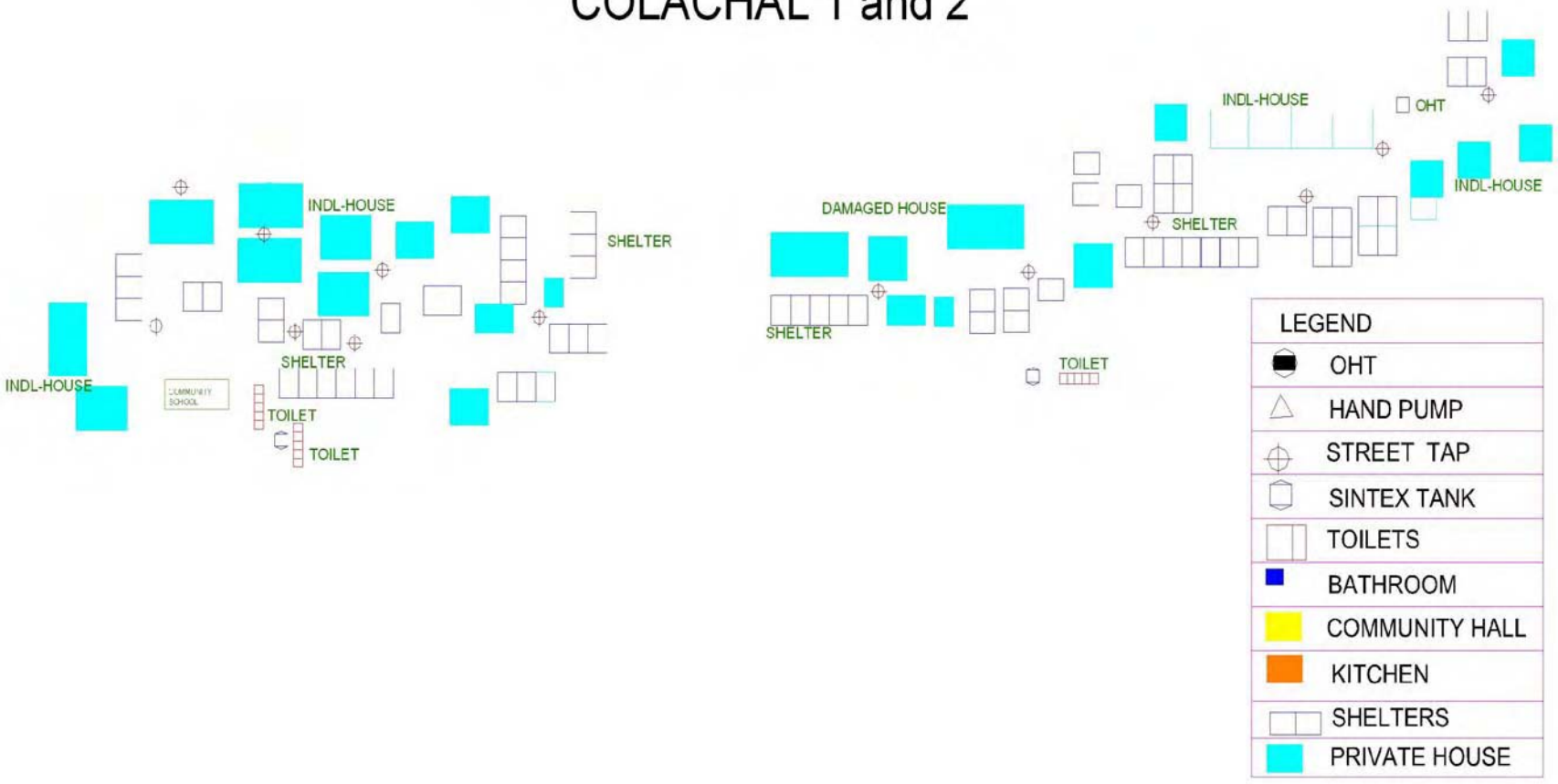
Training programs with the local NGO partner or volunteers from the shelters have to be planned. Volunteers can regularly check the PH and Chlorine contents of the water, as well as the salinity.

Awareness program for the promotion of hygiene education have to be planned.

Colachal Recapitulative

Number of Shelters	**180**
Population	**900**
Standard quantity for all needs / head /day	*45*
Total water requirement	**40,500**
Number of toilet needed	45
Water requirement for toilets	9450
Number of bathroom	18
Water requirement for bathrooms	13500

COLACHAL 1 and 2



Kottilpadu

Kaniyakumari district

General background:

Population: 500

Number of shelters: 100

1 community: Mukkavar (Parathavar) RC

Presence of NGOs: SCAD

Social groups: 6 women's self help group

Water supply

There is 1 OverHead Tank, 6 sintex tanks of 500 liters each and 3 Hand pumps in use within the settlement. There is water supply by the municipality but not regular and insufficient.

Water quality

The water extracted from the village wells is salty.

The water tested from the municipal tank was not contaminated.

Test done on water stored in house showed contamination, most probably due to to unhygienic practices leading to secondary contamination.

Sanitation

1 temporary toilet has been built, with 4 seats for Male and 4 for Female. It is not in usable condition because of lack of maintenance and regular water supply.

People go for open defecation

The male population goes to the beach and the female population goes near the canal and bushes area.

Bathing facilities

There are no bathing places; men and women take bath in the street and generally once in two days.

Improvement needs

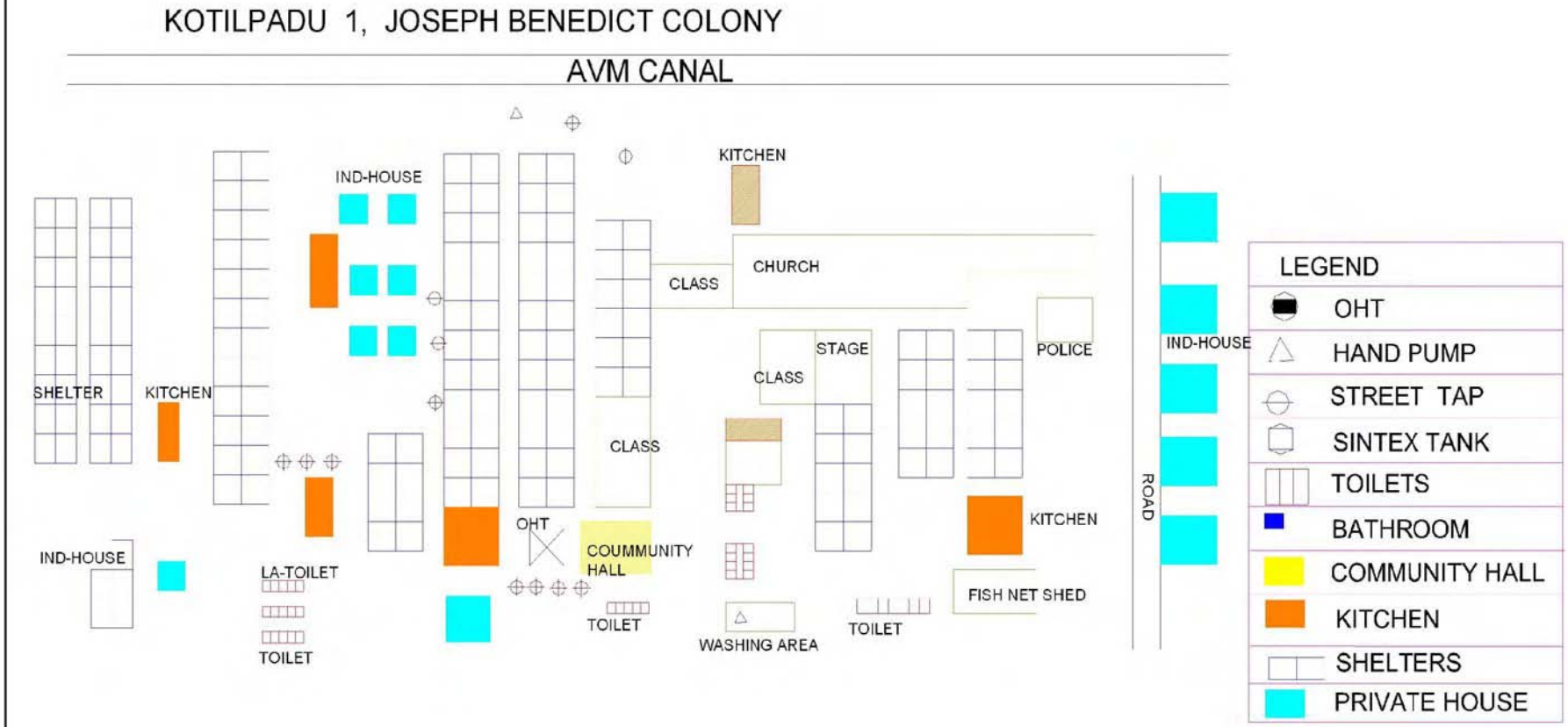
Water is available in the village but the supply is not regular, there is a need to improve the water distribution system, and the water quantity delivered to the population.

Awareness campaign for the promotion of hygiene is needed. For sanitation projects, social mobilization has to be done to promote the use of toilet and set up a community organization for this purpose, with a good support system to the women.

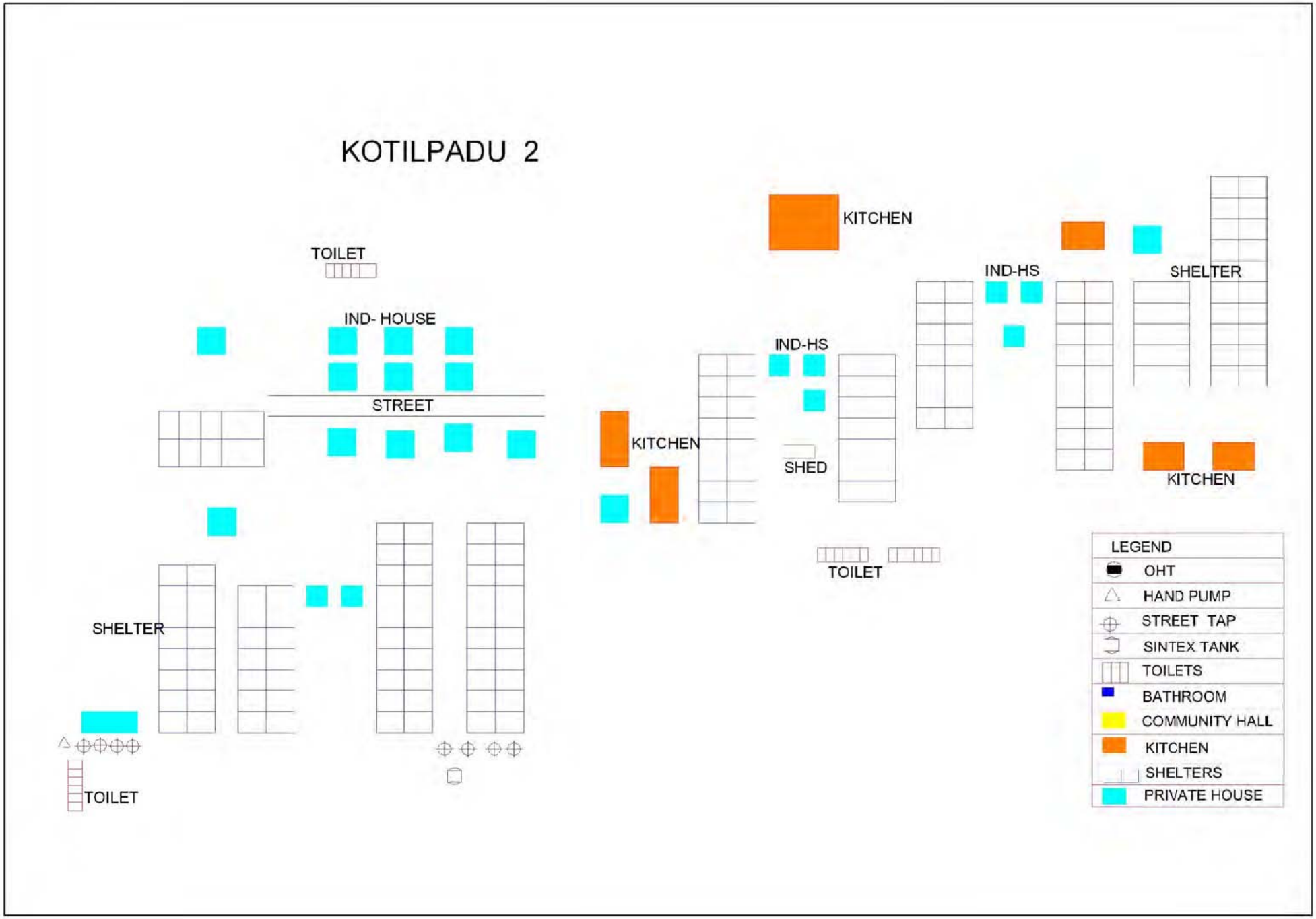
Kotilpadu Recapitulative

Number of Shelters	**100**
Population	**500**
Standard quantity for all needs / head /day	*45*
Total water requirement	**22,500**
Number of toilet needed	25
Water requirement for toilets	5250
Number of bathroom	10
Water requirement for bathrooms	7500

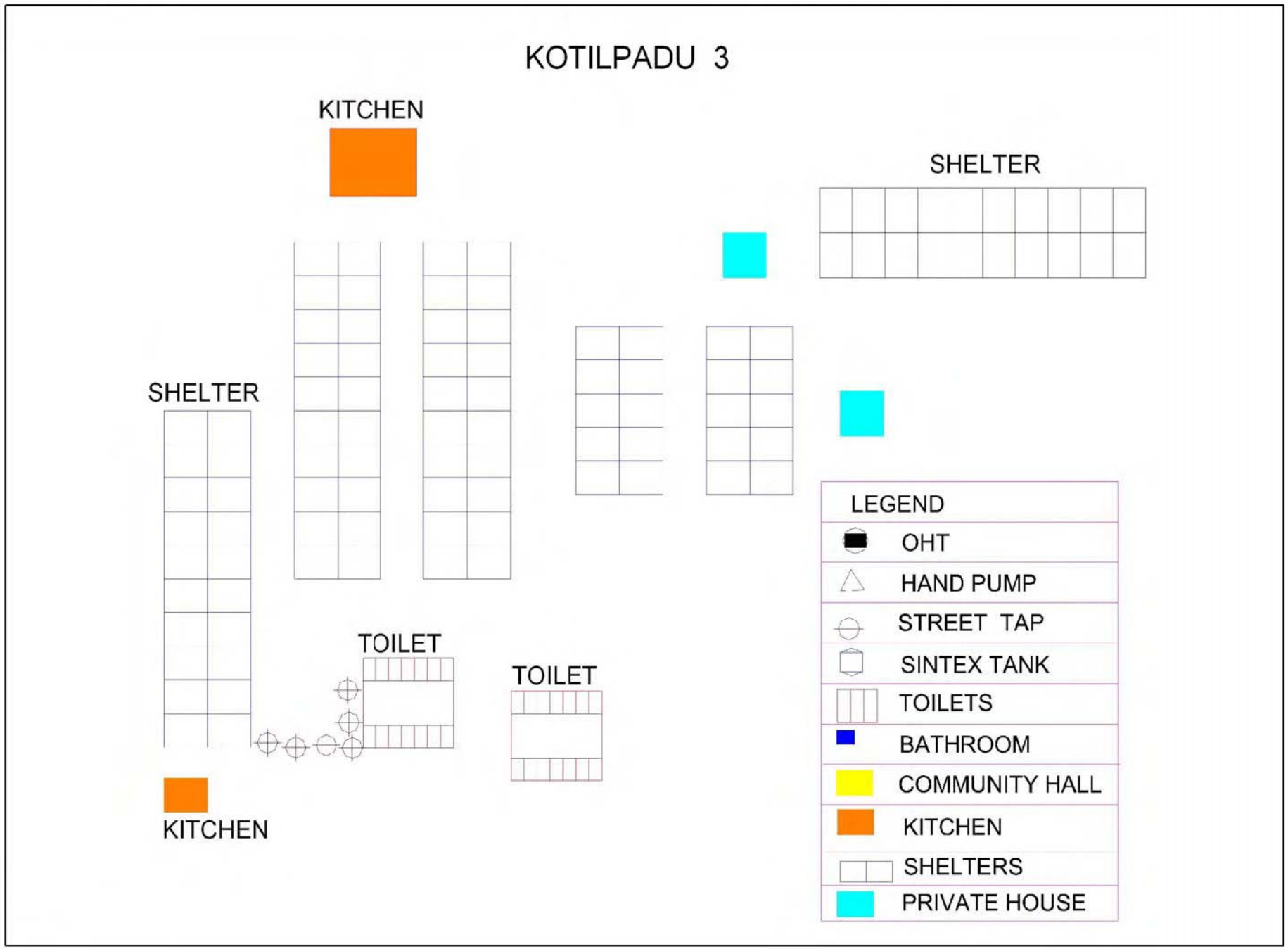
KOTILPADU 1, JOSEPH BENEDICT COLONY



KOTILPADU 2


KITCHEN
TOILET
IND-HS
SHELTER
IND- HOUSE
IND-HS
STREET
KITCHEN
SHED
KITCHEN
TOILET
SHELTER
LEGEND
OHT
HAND PUMP
STREET TAP
SINTEX TANK
TOILETS
BATHROOM
COMMUNITY HALL
KITCHEN
SHELTERS
PRIVATE HOUSE
TOILET

KOTILPADU 3


KITCHEN
SHELTER
SHELTER
TOILET
TOILET
KITCHEN
LEGEND
OHT
HAND PUMP
STREET TAP
SINTEX TANK
TOILETS
BATHROOM
COMMUNITY HALL
KITCHEN
SHELTERS
PRIVATE HOUSE

PUDUR, Eastern settlement

Kaniyakumari district

General Background

Population:	200
Number of Shelters:	40
Number of persons per shelter:	5
1 Community:	Fishermen
Activities:	no work, sea is presently too rough for fishing
NGOs present on site:	SCAD,
Aid received:	1000 Rs

Water supply

There is one OHT tank supplying water to the village every morning for two hours at 7 am. Water is stored in the sintex tanks and is not sufficient for all the purposes. People hardly manage to get around 2 to 3 pots only basically used for drinking and cooking.

Water quality

The water in the collection tank for municipal water was tested and was found not contaminated.

The water tested from a house was contaminated, by secondary contamination during handling and storage.

Sanitation

There is one temporary toilet building with 5 seats. People were using it but currently in unusable condition because of no maintenance. Building is also damaged and the women feel embarrassed to use this because of the presence of men in the vicinity. No illumination in the night is also a reason for women not using this toilet.

People defecate on the beach and next to the AVM canal.

Bathing facilities

There are 2 public bathing places and water is supplied from a bore well to the site. Men take bath daily, and women once in two days.

Health problems

Dysentery, fever, chicken pox, jaundice, psychological disorders.

Improvement needs

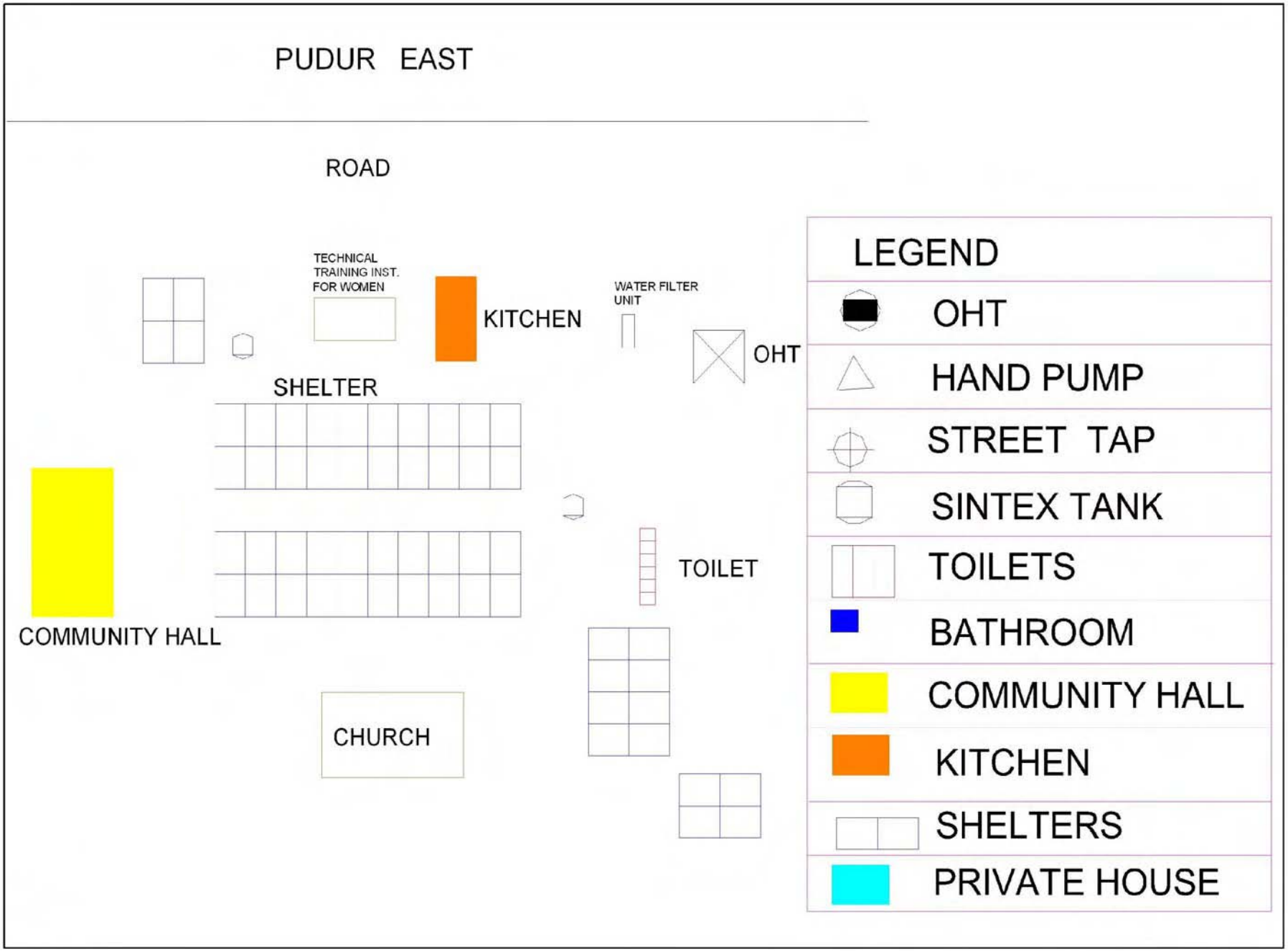
Need for checking and monitoring the quality water.

Training programs with the local NGO partner or volunteers from the shelters have to be planned. Volunteers can regularly check the PH and Chlorine contents of the water, as well as the salinity.

Awareness program for the promotion of hygiene education have to be planned, with a strong social mobilization and women empowerment programs.

Pudur East Recapitulative

Number of Shelters	**40**
Population	**200**
Standard quantity for all needs / head /day	*45*
Total water requirement	**9,000**
Number of toilet needed	10
Water requirement for toilets	2100
Number of bathroom	4
Water requirement for bathrooms	3000


PUDUR EAST
ROAD
TECHNICAL TRAINING INST. FOR WOMEN
KITCHEN
WATER FILTER UNIT
OHT
SHELTER
TOILET
COMMUNITY HALL
CHURCH
LEGEND
OHT
HAND PUMP
STREET TAP
SINTEX TANK
TOILETS
BATHROOM
COMMUNITY HALL
KITCHEN
SHELTERS
PRIVATE HOUSE

PUDUR, western settlement

Kaniyakumari district

General Background

Population:	300
Number of Shelters:	60
Number of persons per shelter:	5
1 Community:	Mukuvar
Activities:	Fishing and selling fish (30 women)
NGOs present on site:	SCAD, KSSS
Aid received:	1000 Rs

Water supply

There is one OHT tank supplying water to the village with no taps for collection. Water is supplied through pipe from Kallukuttam village in the morning for one hour. People collect water directly from the OHT in queues. Quantity of water distributed is not sufficient, only one or two pots per family per day.

Drinking water is delivered by lorries to the sintex tanks.

There are 4 syntex tanks of 500 liters capacity each, but only two are used.

Water quality

The municipal water tested from the tanks was not contaminated.

The water tested from the households was contaminated by secondary contamination during usage and storage.

Sanitation

There is one temporary toilet with 5 seats.

It has been used and soiled because of no maintenance. The construction is also damaged.

Moreover, the women were feeling uncomfortable to use the toilets as the men loiter around the toilet playing cards etc.

People go for open defecation on the beach and next to the AVM canal.

Bathing facilities

There are no bathrooms.

People also don't have enough water to take bath.

As a result, people go to the next village, Mandaikadu, opposite to the AVM canal, and take bath from farmer's bore wells at the cost of 2 rupees per head.

Health problems

The people are suffering from dysentery, fever, chicken pox, jaundice and psychological disorders etc.

Areas to be improved

Need a good water distribution system with common taps with regulators for collection.

Minimum number of taps to install: 6 at the rate of 1 tap for 10 households (50 persons)

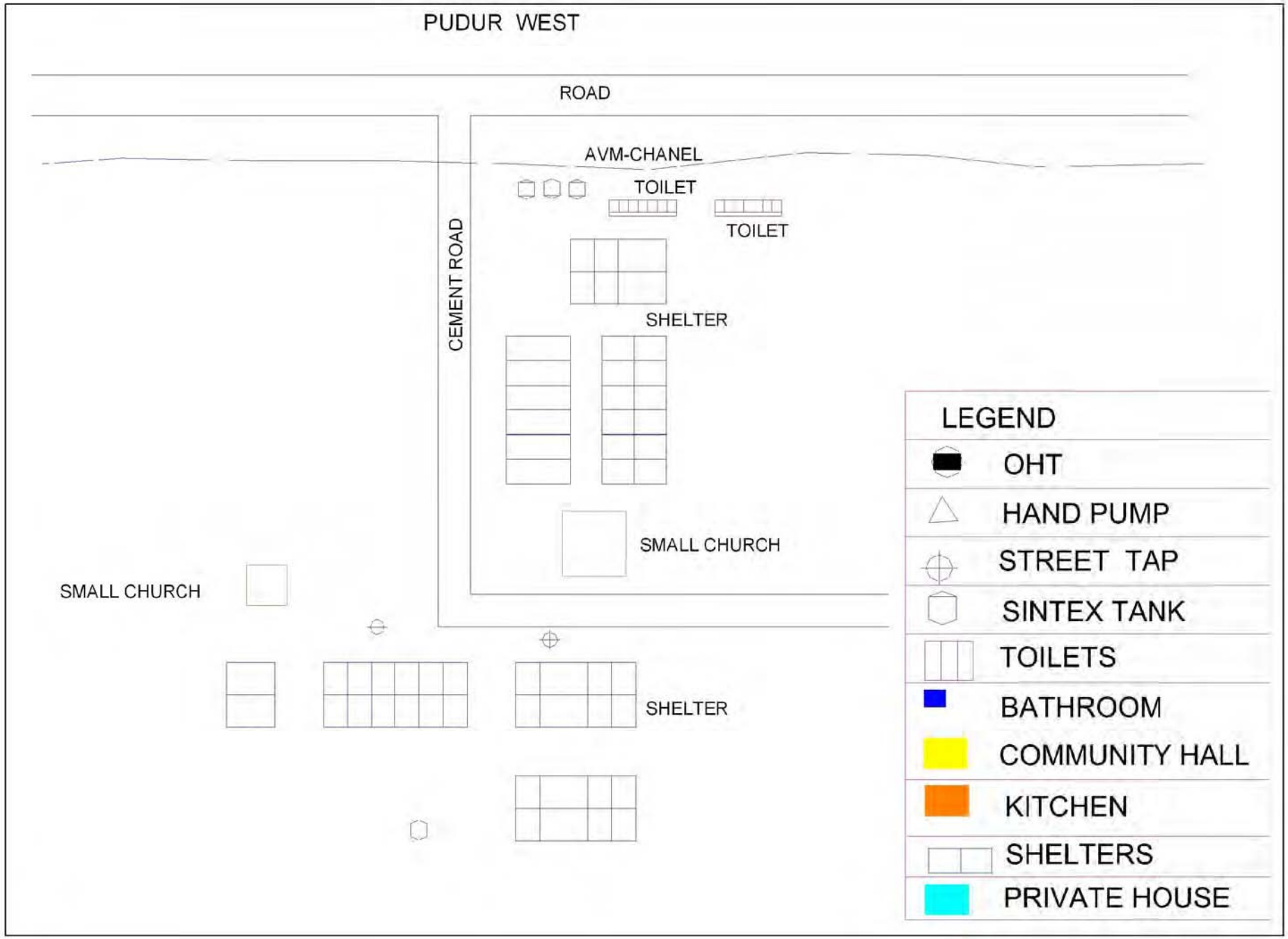
Need regular checking and monitoring of water quality

The field staff, especially the volunteers of respective shelters, should be trained in the technicalities of checking the quality of water so that the PH, Chlorine content and the salinity of water will be monitored regularly.

Awareness programs for the promotion of hygiene education have to be planned for social mobilization and women empowerment.

Pudur west Recapitulative

Number of Shelters	**60**
Population	**300**
Standard quantity for all needs per head/ per day	*45*
Total water requirement	**13,500**
Number of toilets required	15
Water requirement for toilets	3150
Number of bathrooms required	6
Water requirement for bathrooms	4500


PUDUR WEST
ROAD
AVM-CHANEL
TOILET
TOILET
CEMENT ROAD
SHELTER
SMALL CHURCH
SMALL CHURCH
SHELTER
LEGEND
OHT
HAND PUMP
STREET TAP
SINTEX TANK
TOILETS
BATHROOM
COMMUNITY HALL
KITCHEN
SHELTERS
PRIVATE HOUSE

CHINNAVELLAI SETTLEMENT

KANIYKUMARI DISTRICT

General Background

Population:	250
Number of shelters:	40
Number of persons per shelter:	5
1 Community:	RC Muchavar
Activities:	Fishing, labourers, fish vending, small businesses
Average income:	2000 rupees before Tsunami, no proper income now
Schooling:	boys and girls in the village educationedup to 12th standard

No books and uniforms to the children

NGOs present:	KSSS, Parish
Community based groups:	30 women's Self Help Groups
Shelter problems:	leakage during rainy times

Water supply

Water is supplied by public distribution system from a bore well located at 2 km from the village.

There is one storage tank built in concrete, not in use at present for technical reasons.

Water is now supplied directly to street taps in the settlement from 6 to 8 am every morning and will be collected by people in queues.

Additionally, there are 5 hand pumps in the settlement, which yield salty water.

Water quality

No contamination in water tested from public distribution system.

Drinking water supplied to the village is clean, but there is a problem of use of hand pumps for washing and bathing.

Sanitation

There is a temporary toilet built by CRS and KSSS, with 2 seats and 2 bathrooms, located at 20 meters from the shelters.

The toilets are in good condition and clean with proper water supply. There is a bore well of 60 feet deep on the site, with salty water but not brackish. The water is filled once a day and stored in a sintex tank and then distributed by tap inside each toilet room.

70 % of the population had private toilets in their houses before Tsunami.

95 % of female and children are using the temporary toilets.

The men go for open defecation on the beach.

2 toilets are not sufficient; people wait in queue to use the toilets.

Maintenance is done daily by a municipal scavenger. Bleaching powder is used outside the toilets.

Hygiene practices in the village are good. People use soap to wash their hands.

No specific health problem has come after Tsunami.

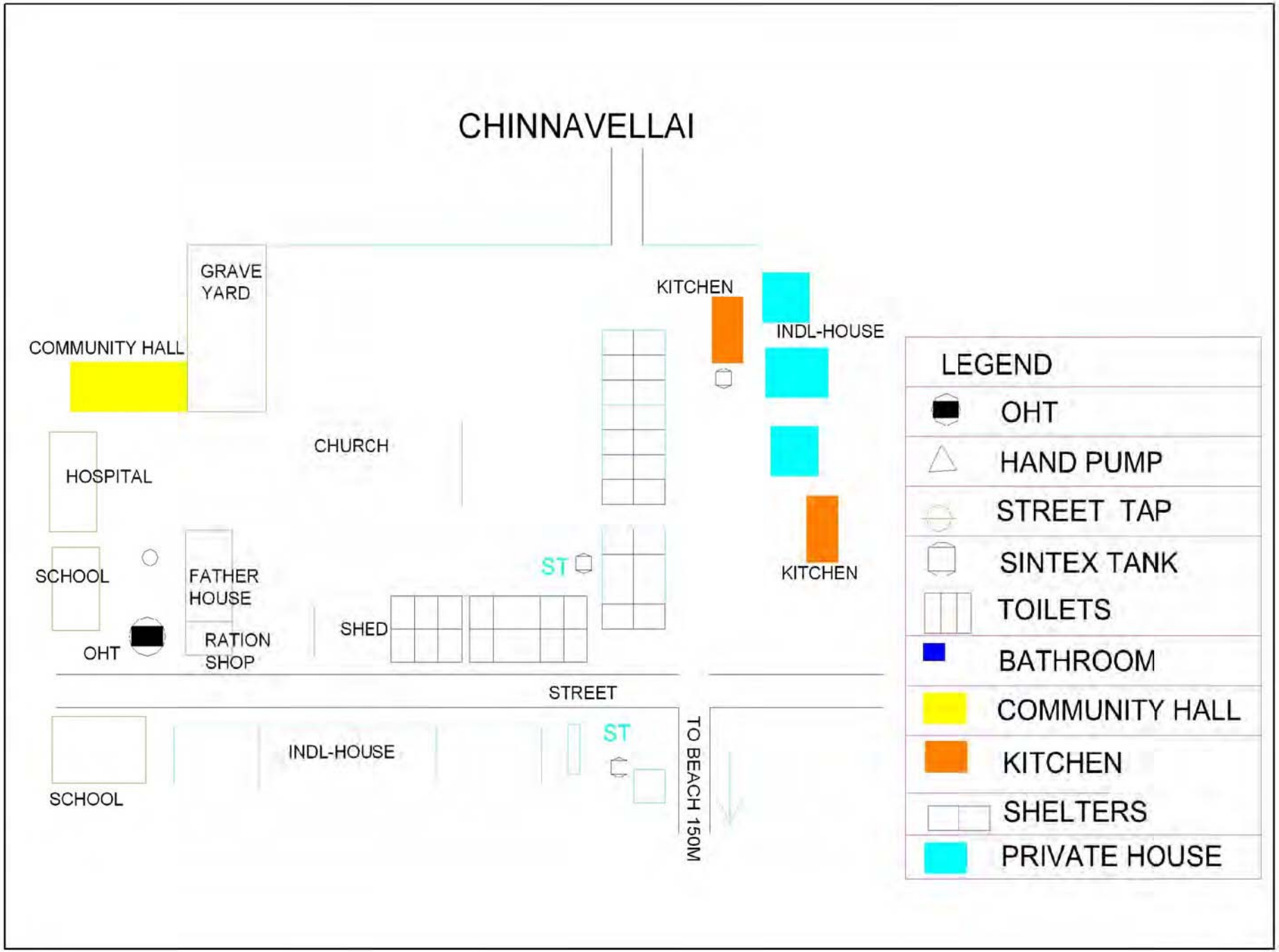
Solid waste management

Solid waste is collected from the settlement by the municipality.

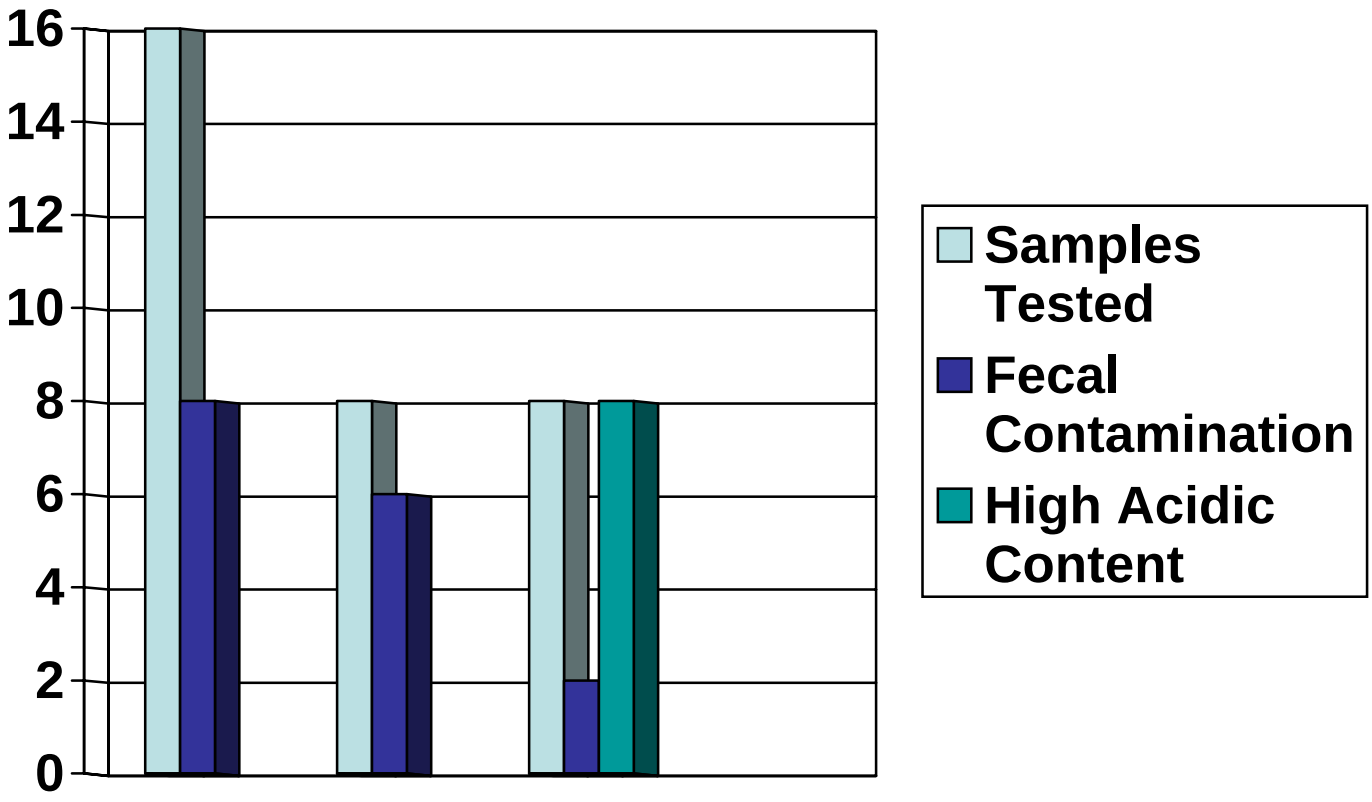
Improvement needs

Chinnavellai Recapitulative

Number of Shelters	**40**
Population	**250**
Standard quantity for all needs per head per day	*45*
Total water requirement	**11,250**
Quantity actually supplied to the settlement per day	3600
Shortfall /head /day	**31**
Shortfall /settlement /day	**7650**
Number of toilets needed	13
Water requirement for toilets	2625
Number of bathrooms	5
Water requirement for bathrooms	3750


CHINNAVELLAI
GRAVE YARD
COMMUNITY HALL
HOSPITAL
CHURCH
SCHOOL
FATHER HOUSE
OHT
RATION SHOP
SHED
ST
KITCHEN
INDL-HOUSE
KITCHEN
STREET
ST
INDL-HOUSE
SCHOOL
TO BEACH 150M
LEGEND
OHT
HAND PUMP
STREET TAP
SINTEX TANK
TOILETS
BATHROOM
COMMUNITY HALL
KITCHEN
SHELTERS
PRIVATE HOUSE

Water Sample Testing Results



WATER QUANTITY REQUIREMENTS FOR SANITATION STRUCTURES

Sphere standards:

1 public toilet per 20 persons

1 public bathroom per 50 persons,

Water needs for toilet use as per Sphere standard	
Activity	**Quantity**
Hand washing	2 liters/ user/ day
Flushing	6 liters/ user/ day
Toileting	2 liters/ user/ day
Total	10 liters/ user/ day
Toilet cleaning	10 liters/ latrine/ day

Total requirement for one toilet: 210 liters per day

Water requirement for bathroom as per Sphere Standards	
Total for 1 person	15 liters / day
Total for 50 persons	750 liters / day

Total requirement for 1 bathroom: 750 liters.

45 liters is considered as a minimum quantity of water necessary for a person to cover all daily needs, including drinking, cooking, bathing, washing vessels and clothes.

PRIORITY CLASSIFICATION OF REMEDIAL ACTIONS NEEDED

1 = First priority

District	Water supply quantity	Water distribution system	Water quality	Toilets	Waste water treatment	Bathroom	Hygiene education	Solid waste	Open waste/ drainage
Nagapattinam	2	2	2	1	1	1	1	2	1
Tirunelveli	1	1	1	4	4	2	1	4	4
Kaniyakumari	4	3	2	2	2	1	1	2	3

Settlements	Water supply quantity	Water distribution system	Water quality	Toilets	Waste water treatment	Bathroom	Hygiene education	Solid waste	Open waste/ drainage
Anthony koil street	1	1	1	4	4	3	1	4	4
Ariyanathu Kadambadi	2	2	3	1	1	1	1	1	1
Ariyanathu street	2	2	3	1	1	1	1	1	1
Arkataturai	1	1	3	4	4	2	1	4	4
Chinnavelli	4	4	4	3	3	4	4	4	4
Colachel 1	4	3	3	2	2	1	2	3	3
Colachel 2	4	3	3	2	2	1	2	3	3
Colachel 3	4	3	3	2	2	1	2	3	3
Kotilpadu	3	3	3	2	21	1	2	3	3
Kuthankuli	1	1	4	4	4	3	2	4	4
Nambiyarnagar	1	2	3	1	1	1	1	1	1
Pudur	4	3	3	2	2	1	2	3	3
Samananpettai	1	2	4	1	1	1	1	1	1
St Xavier Church	1	1	1	4	4	4	1	4	4
St_Thomas_church	1	1	1	4	4	3	1	4	4
Vedanayagam chetty street	1	2	3	1	1	1	1	1	1
Velankanni Konarthopu	2	2	1	1	1	1	1	1	1
Velankanni_school	2	2	1	1	1	1	1	1	1
Vellapallam	3	4	4	4	4	2	2	4	4

CONCLUSION

The temporary shelters, constructed at the emergency situation, require improvement for sustainability of one to two years. The sanitary conditions in the settlements are generally poor and should be improved immediately before the coming monsoon. **Emergency action is needed in Velankanni.**

Water resources

In most of the places, the drinking water quality is contaminated and requires treatment as well as a regular checking and monitoring. In every settlement, the local water resources were affected by the Tsunami and the groundwater is now highly saline. The continuous use of saline water by hand pumps will lead to health problems for the population.

The water supply has to be increased according to the needs. The figures given in this report refer only to the public distribution system. At present, people are meeting their requirements with water extracted from hand pumps, but this is not advisable since the groundwater is highly saline and contaminated by fecal matter in many places.

Along with an augmentation of the quantity of water supplied, the frequency of the daily distribution should be increased, as people should also be able to store the water in the shelters without difficulties. This should be done with the concerned authorities, at the settlement level or at the village level.

Sanitation

According to the minimum standard requirements given by the Sphere Project for disaster management, an important number of bathrooms are to be constructed. As for toilets is concerned, the structures in the temporary shelters are not fitting with environmental requirements and may become unhygienic for the community. They need to be rebuilt in a safe way, and new toilets have to be added to cover the needs.

Moreover, the previous usage of toilets has been a failure due to the lack of a proper maintenance of the structures. A strategy for setting up a participatory program for cleaning the toilets is an absolute necessity keeping the difficulties in usage of toilets in mind.

Solid waste management is also a necessary to keep the settlement clean and safe from pollution and infections. This requires social mobilization and awareness for a better understanding and involvement from the concerned communities.

Additionally, the drainage systems in the settlements also need improvement before the coming monsoon.

Education and promotion of hygiene is a priority and should be considered as a key for a successful improvement of the sanitary conditions in the settlements.

For the implementation of the sanitation projects, support to the Catholic Relief Services can be given by Auroville Water Harvest for the following activities:

- Designs of toilet structures
- Waste water management
- Water purification units for desalination and bacterial decontamination
- Training for installation of structure and equipment maintenance
- Training in bio-composting using Effective Micro-organisms.