



# Public Sanitation Facilities in Tirupati

*Project Report: Vol. II\**

\*This report has been prepared by the Centre for Development Finance, IFMR, Chennai, and IIT, Madras, for the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) under its new programme on “Advisory support to the National Urban Sanitation Policy” of the Ministry of Urban Development (MoUD), GoI

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## I. Background and Context

According to JNNURM Detailed Project Report: Preparation Toolkit for Urban Infrastructure and Governance, Ministry Of Urban Development, GoI:

*"The Detailed Project Report (DPR) is an essential building block for the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) in creating infrastructure and enabling sustainable quality service delivery. The DPR is to be prepared carefully and with sufficient details to ensure appraisal, approval, and subsequent project implementation in a timely and efficient manner."*

The report underscores that while technical considerations are a key component of DPRs, for purposes of long terms project sustainability, project proposals must be rigorous in their inclusion of elements such as cost considerations underlying technical assumptions, project financial structuring and O&M planning. Once the sources and components of funding and related project costs are established, it is also recommended to carry out a thorough exercise of project financial viability and sustainability to ensure that project planning and management are based on rational assumptions and are likely to guarantee sustained use and benefits.

This report contains the Detailed Project Reports for 5 public toilets to be constructed in locations recommended as part of our study. From a demand perspective, each of these projects can be categorized as below:

Category	Scale	Description
A	High	Daily usage levels of approximately 600-1000 per day. Typically near railway station, bus stand, religious places, busy commercial areas
B	Medium	Daily usage levels of approximately 300-600 per day. Typically near commercial areas, offices, public spaces, parking areas
C	Low	Daily usage levels 0-300 users per day, Typically near slums, in residential neighbourhoods, low-density commercial areas

Upon identification of plausible sites in the recommended demand locations, the technical team carried out a detailed site assessment and prepared technical designs/site plan layouts for each project. For purposes of design, the norms prescribed by the National Building Code of India, BIS, were adhered to. Both CPHEEO and BIS norms for demand-based planning were referred to for unit computation

Norms	Sanitary Unit	For Male	For Female*	Area
CPHEEO	Water Closet	One per 100 persons up to 400 persons; for over 400 add at the rate of one per 250 persons or part thereof	Two for 10 persons up to 200 persons; over 200 add at the rate of one per 100 persons or part thereof	Sizing for toilet is constant - 1.2 x 1.5 m
	Urinals	One for 50 persons or part thereof	Nil	Opening of basin should be 450 mm, so size 0.65 x 0.95 m
	Shower	No specified norms	No specified norms	1.2 x 1.5 m
	Ablution Tap	One per water closet	One per water closet	-
BIS	Water Closet	Three per 1000 persons	Four per 1000 persons	1.2m x 1.5m
	Urinals	Four per 1000 persons	Nil	Opening of basin should be 450 mm, so size 0.65 x 0.95 m

Norms	Sanitary Unit	For Male	For Female*	Area
	Shower	Two per 1000 persons	Two per 1000 persons	1.2 x 1.5 m
	Ablution Tap	One per water closet	One per water closet	-
	PH Toilet	One per toilet complex	One per toilet complex	1.5 m x 2.0 m

\*In both cases, norms assume 2/3rds of the number are male and 1/3rd female

Source: Draft Manual for Sewerage and Sewage Treatment, 2012, CPHEEO, MoUD and National Building Code of India, Bureau of Indian Standards

Upon developing the technical designs and layout for each project proposal, we arrived at the costs for each facility based on the indicative technical design. Costs for operations and maintenance were determined based on industry practices and benchmarks. The indicative cost heads that were taken into consideration and standard annual O&M costs that are used in these reports are tabulated below:

CAPEX			OMEX		
1.	Structural Cost	Amount (Rs.)	1.	Manpower	Amount (Rs.)
	<i>Civil-Superstructure (Cement/Sand/Brick/Fibre-reinforced Plastic, Tiles, etc.)</i>			<i>Caretaker</i>	72,000
	<i>Plumbing – pipes</i>			<i>Cleaner</i>	48,000
	<i>Electrical – wiring</i>			<i>Supervisor</i>	
	<i>Bore-well w/pump</i>		2.	Water charges	60,000
	<i>Septic Tank</i>		3.	Power charges	36,000
	<i>Rain-water harvesting</i>		4.	Waste disposal & treatment charges	
	<i>Painting (Material and Labour)</i>			<i>Sewerage</i>	
	<i>Labour – Civil</i>			<i>Septic tank</i>	
	<i>Labour – Plumbing</i>			<i>Any other</i>	
	<i>Labour – Electrical</i>		5.	Consumables	
2.	Fittings			<i>Cleaning supplies (soaps, phenyl, bleaching powder, acid)</i>	21,600
	<i>Sanitary Fittings (water closet/taps/wash basin/urinals)</i>			<i>Cleaning equipment (sponges, scraping sheets, brooms, brushes, floor wipers, gloves)</i>	21,600
	<i>PVC Doors</i>		6.	Repairs, Replacement, Maintenance	
	<i>Wooden Doors</i>			<i>Containers (buckets, mugs)</i>	2,400
	<i>PVC Water Tank</i>			<i>Mechanized cleaning equipment (compressed cleaners, choke removal tools)</i>	5,000
	<i>Mirrors</i>			<i>Apron</i>	500
	<i>Exhaust</i>			<i>Identity card</i>	200
	<i>Solar Panels</i>			<i>Provision for repairs and replacement</i>	36,000
	<i>Lighting, switches</i>		7.	Incidentals and other Overheads (~10% of above)	15,165
3.	Service Connections				
	<i>Water supply</i>				
	<i>Sewerage</i>				
	<i>Electricity</i>				
5	Signage				
	<b>Total CAPEX</b>			<b>Total OMEX</b>	<b>3,18,465</b>

Demand projections and tariff structure constitute the key determinant of usage-based revenues for each toilet block. The demand and tariff assumptions and rationale for these assumptions are listed under each of the project reports.

## II. Detailed Project Report: Porla Street

### Project Summary

<b>Project Description</b>	
<i>Project Type</i>	Retrofit/Pay and Use Toilet
<i>ULB</i>	Tirupati (Revenue Ward 13)
<i>Location</i>	Porle Street, adjacent to Gandhi Road
<i>User Profile</i>	Commercial Users
<i>Project Prioritization</i>	High
<i>Engagement Model</i>	BOT or Maintenance Contract
<i>Estimated daily footfall</i>	400 users per day
<b>Technical Description</b>	
<i>Site Size</i>	70 sq. km
<i>Number of Toilet Seats</i>	7 (M:4, F:3) (CPHEEO Norm M:2, F:2)
<i>Number of Showers</i>	3
<i>Number of Urinals</i>	5 (CPHEEO norm 4)
<b>Financial Description</b>	
<i>Project Cost</i>	Rs. 10,68,000
<i>Construction Period</i>	3-6 months
<i>Concession Period</i>	10 years
<i>Annual O&amp;M Cost</i>	Rs. 3,18,465

### Project Rationale

Based on city-wide demand assessment that was carried out, this location has been identified as one of the “sanitation hotspots” in Tirupati. There is a high prevalence of open urination in the surrounding areas owing to the highly commercial nature of the location and the absence of adequate public sanitation facilities both from a quantity and quality standpoint. Site also fits in with city-wide strategy to upgrade the infrastructure of poorly maintained facilities in the city and to provide inclusive access from a gender and disabled perspective. From a demand perspective, the project can be categorized as below:

Category	Scale	Description
A	High	Daily usage levels of approximately 600-1000 per day. Typically near railway station, bus stand, religious places, busy commercial areas
B	Medium	Daily usage levels of approximately 300-600 per day. Typically near commercial areas, offices, public spaces, parking areas
C	Low	Daily usage levels 0-300 users per day, Typically near slums, in residential neighbourhoods, low-density commercial areas

The project involves retrofitting an existing toilet complex on Porla Street, off Gandhi Road. The complex is constructed by MCT but maintained by a private contractor. Currently, the site contains a toilet complex (with toilet units, urinals and shower facilities). However, the facility is poorly maintained and has poor infrastructure, with 4 out of the 6 units lacking doors and corroded water supply pipelines.

### User Profile

User catchment in this site is primarily *commercial users* (vendors, auto drivers, floating population). The streets perpendicular and proximate to the proposed site are Gandhi Road, Tilak Road, Beri Veedi Street and Prakasam Road. All of these are commercial areas, with more than 90% of establishments being shops. The remaining are ATMs, restaurants, banks, parking spaces and a few scattered residences. Porla Street site will cater more to Gandhi Road users. Other observations based on field visits, interactions with city officials and potential users include:

- a. Currently only about 150-200 persons per day use the toilet complex (caretaker). Women users extremely low, as doors are broken and the complex is primarily used as urinals

- b. If improvement takes place, the site can attract an additional footfall of 100-200 users daily
  - o Govindaraju temple (urinals) has equal if not more usage than Porla Street (also caters to Beri Veedi). It also serves Karnala street (electrical, sanitary and hardware market) which has no PT. Surveys revealed that most respondents go home. Some use the urinals adjoining Govindaraju temple Toilets inside temple (NOT PUBLIC) used largely by women. A portion of these users is likely shift to Porla Street.



## Technical Review

Currently, the site has 2 ladies toilets, 5 open urinals, 6 men toilets and 2 showers. There is also an open water storage tank in the ground for bathing and washing clothes. The overhead tank is corroded and leaking. Two toilets out of the 6 are properly equipped with water supply and doors, but the other 4 lack doors and few have corroded pipe lines.

**Table 1 Technical Summary of Existing Facility**

Area Survey	
<i>Total length constructed</i>	20.36 m
<i>Total width constructed</i>	2.04 m
<i>Constructed area</i>	41.534 sq.m
<i>Length available for construction</i>	31.42 m
<i>Width available for construction</i>	2.45 m
<i>Total area available</i>	76.979 sq.m
Water Supply	TMC has constructed a bore well 25m from the complex and water is pumped on a daily basis. The complex also has an overhead tank with a capacity of over 2500 litres for storage
Electricity	There are 3 electrical posts near the complex at a distance of 0.45m
UGD	UGD is located in the road centre, a distance of 1.6m from the toilet drain

## Proposed Technical Design

The proposed design will consist of the following:

- Water Closets (Ladies) – 3 Nos
- Shower (Ladies) – 1 No.
- Urinals (Men) – 5 Nos.
- Water Closets (Men) – 4 Nos.
- Shower (Men) – 2 No.

The super structure will have masonry walls and roofing will have a cement concrete type structure. Flooring will be made of cement plastering or with vitrified tiles. To ensure ease of cleaning, the flooring should be finished smooth in case cement plastering is used.

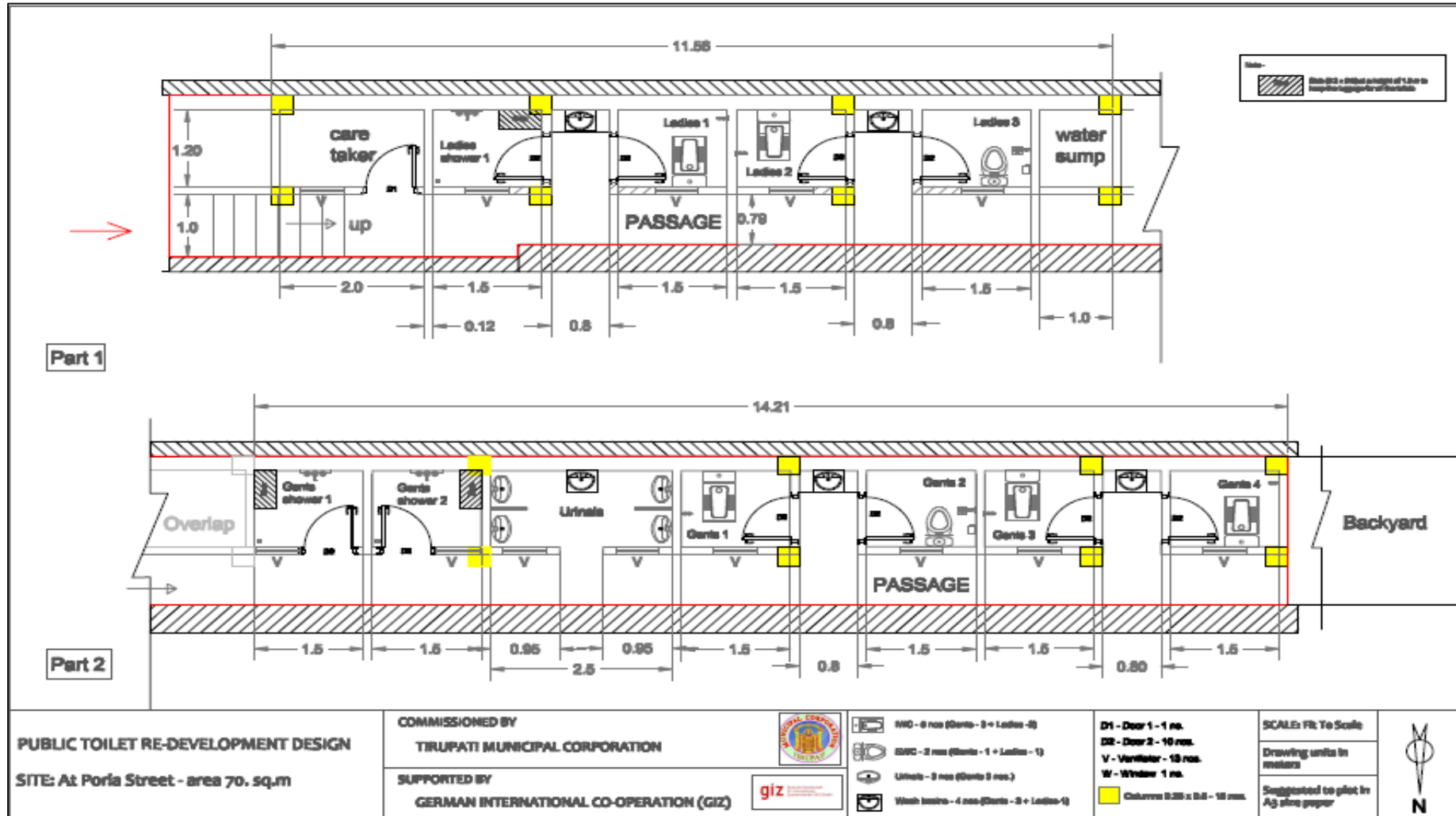
Urinals will be designed and constructed as water through to circumvent odour related issues. The physically challenged toilet will be a European type toilet with hand rails and enough space for wheel chairs. The wash basin will be placed a little lower than other wash basins. The door in the PH toilet will be a sliding door to facilitate ease of use.

Doors will be made of PVC, which is cost-effective and corrosion free. Every toilet will have ventilation of dimension 0.4 m x 0.3 m (as per BIS). The complex will be provided an exhaust fan of dimension 0.3 m x 0.3 m (as per BIS). Three wash basin with mirrors of dimension 0.3 m x 0.3 m (as per BIS) will be provided at ladies toilet complex and two wash basins will be provided near the urinals. The waste basket will be provided in every toilet at the base of the wash basin. There will be a 3 numbers of wash basin provided next to the walls of gent's toilets. The common waste basket will be kept in the passage area near to the door or where the space is available.

The proposed design will allow for modular expansion based on future requirement and availability of space



# Overall Layout



## Financial Analysis

This segment will involve a review of project feasibility as measured by the project IRR and Net Present Values<sup>1</sup>. The viability of the project is contingent upon factors ranging from estimated demand, project cost, O&M costs, concession period, unit rates and corresponding annual growth of these various parameters.

### Demand Assumptions

Component	Unit	Value	Rationale
Footfall	Users per day	400	Based on daily use in comparable location
Annual increase	%	1.06	Average annual population growth rate of Andhra Pradesh state, Census 2011
Capacity Utilization	%	100	Important commercial area in city

### Cost Estimates

CAPEX			OMEX		
1.	Structural Cost	Amount (Rs.)	1.	Manpower	Amount (Rs.)
	<i>Civil-Superstructure (Cement/Sand/Brick/Fibre-reinforced Plastic, Tiles, etc.)</i>			<i>Caretaker</i>	72,000
	<i>Plumbing – pipes</i>			<i>Cleaner</i>	48,000
	<i>Electrical – wiring</i>			<i>Supervisor</i>	
	<i>Bore-well w/pump</i>		2.	<i>Water charges</i>	60,000
	<i>Septic Tank</i>		3.	<i>Power charges</i>	36,000
	<i>Rain-water harvesting</i>		4.	<i>Waste disposal &amp; treatment charges</i>	
	<i>Painting (Material and Labour)</i>			<i>Sewerage</i>	
	<i>Labour – Civil</i>			<i>Septic tank</i>	
	<i>Labour – Plumbing</i>			<i>Any other</i>	
	<i>Labour – Electrical</i>		5.	<i>Consumables</i>	
2.	<i>Fittings</i>			<i>Cleaning supplies (soaps, phenyl, bleaching powder, acid)</i>	21,600
	<i>Sanitary Fittings (water closet/taps/wash basin/urinals)</i>			<i>Cleaning equipment (sponges, scraping sheets, brooms, brushes, floor wipers, gloves)</i>	21,600
	<i>PVC Doors</i>		6.	<i>Repairs, Replacement, Maintenance</i>	
	<i>Wooden Doors</i>			<i>Containers (buckets, mugs)</i>	2,400
	<i>PVC Water Tank</i>			<i>Mechanized cleaning equipment (compressed cleaners, choke removal tools)</i>	5,000
	<i>Mirrors</i>			<i>Apron</i>	500
	<i>Exhaust</i>			<i>Identity card</i>	200
	<i>Solar Panels</i>			<i>Provision for repairs and replacement</i>	36,000
	<i>Lighting, switches</i>		7.	<i>Incidentals and other Overheads (~10% of above)</i>	15,165
3.	<i>Service Connections</i>				
	<i>Water supply</i>				
	<i>Sewerage</i>				
	<i>Electricity</i>				
5	<i>Signage</i>				
	<b>Total CAPEX</b>	<b>10,68,000</b>		<b>Total OMEX</b>	<b>3,18,465</b>

<sup>1</sup> Both IRR and NPV are measures of the profitability of any investment. Generally, the higher the IRR or NPV, the more desirable it is to undertake a project. An IRR or NPV less than zero are indicative of a financially unviable investment.

## Financial Assumptions

Component	Unit	Value	Rationale
Unit rate – Urinal	Rs.	0	Use of urinals in city free in city and across the state
Unit rate – WC	Rs.	3	Prevailing unit rate in city
Unit rate – Shower	Rs.	5	Prevailing unit rate in city
Annual escalation in unit rates	%	5	Minimal escalation assumed. Per existing contracts in TMC, the annual fee escalation is 15-20%. However, this increase appears unduly high. GHMC, for example, has fixed user fees w/o any escalation, while CDMA GO allows for escalation only once in 3 years. In this instance, annual unit rates that drive revenues are assumed to increase at a rate that is slightly higher than the cost escalation rate
Annual OMEX	Rs.	3,18,465	Indicative costs, based on discussions with service providers in TMC
Annual escalation in OMEX	%	7	Expected to increase in line with inflation
Debt ratio	%	30	
Debt duration	Years	5	
Interest rate	%	12	Prevalent bank lending rates
Toilet Timings	Hours	14	All PTs in comparable, non-transit and/or commercial locations in TMC operate between 5am-8pm/9pm

## Financial Projections

Under baseline footfall assumptions (400 users per day), the project is viable and can be undertaken through varied financing models. The project appears most viable at concession periods between 10 - 11 years, at either the prevailing unit rate of Rs. 3 or higher. Assuming these conditions, the location allows for a range of management models – management by the city, BOT or Maintenance contract.

1. Under maintenance contract model, the city will up-front capex funding and outsource O&M to a private contractor. The project cash flows allow the city to recover its construction costs along with a nominal quarterly interest of 4%, over a period of 10 years.

Capex	Rs. 1,068,000
Capex recovery (with quarterly interest of 4%)	Rs. 1,580,901
Reserve Price (Maximum, Daily footfall 400)	Rs. 99,195
Reserve Price (Minimum, Daily footfall 300)	Rs. 67,012
Annual growth in Reserve Price	10%
Capex recovery period	10 years

2. Under the BOT model, the city will bid out construction and maintenance to a private contractor. The project cash flows under the BOT model indicate that the private contractor can expect reasonable rates of return (~18%) after about 8-10 years of operations, assuming a daily footfall of 375 and above.

Daily Footfall	400	375
Project IRR	18%	15%
Project NPV	Rs. 115,322	Rs. 19,706
Equity IRR	20%	16%
Equity NPV	Rs. 144,631	Rs. 49,015
Concession period	10 years	11 years

## Recommendations

This location appears well-suited for BOT and Maintenance Models from project viability and sustainability perspectives. The choice of management model can be determined based on availability of funding for toilet construction from the city's budgetary sources. Based on assumptions stated above and corresponding financial projections, our specific recommendations on this project location as below:

1. BOT model is most feasible under a daily footfall range of 375-400 users; the project becomes unviable for any daily footfall below 375 users. At a minimum of 375 users per day, the project will provide a 16% equity return for a concession period of 11 years. At a maximum of 400 users per day, the project will provide a 20% equity return for a concession period of 10 years.
2. Maintenance model with capital cost recovery is most feasible under a daily footfall range of 300-400 users per day; the corresponding annual reserve price range would be Rs. 65000 (minimum footfall) to Rs. 1 lakh (maximum footfall). At this reserve price range, the city will recover its capital costs along with interest in a concession period of 10 years. The project cash flows will not generate adequate revenues to offset capital costs for daily footfall below 300 users.

### III. Detailed Project Report: Opp Fortune Kences hotel

#### Project Summary

<b>Project Description</b>	
<i>Project Type</i>	Retrofit/Pay and Use Toilet
<i>ULB</i>	Tirupati (Revenue Ward 13)
<i>Location</i>	Opposite Hotel Fortune Kences, Outside APSRTC Bus stop
<i>User Profile</i>	Tourists, Commercial Users, General Users
<i>Project Prioritization</i>	High
<i>Engagement Model</i>	BOT or Maintenance Contract
<i>Estimated daily footfall</i>	450 users per day
<b>Technical Description</b>	
<i>Site Size</i>	35 sq.m
<i>Number of Toilet Seats</i>	5 (CPHEEO Norm M:4, F:2)
<i>Number of Showers</i>	3
<i>Number of Urinals</i>	3 (CPHEEO norm 8)
<b>Financial Description</b>	
<i>Project Cost</i>	Rs. 5,53,000
<i>Construction Period</i>	3 months
<i>Concession Period</i>	10 years
<i>Annual O&amp;M Cost</i>	Rs. 3,18,465

#### Project Rationale

Based on city-wide demand assessment that was carried out, this location has been identified as one of the “sanitation hotspots” in Tirupati. According to the CDP, Tirupati attracts a daily pilgrim population, an average of 55,000, which is projected to grow to at least 67,000 by 2021. As the administrative headquarters of the Tirupati Revenue Division, the government offices in the city attract high floating populations as well. Location is right at the heart of the tourist corridor of the city, near the city bus stand and the surrounding areas are highly commercial in nature. There is a high prevalence of open urination in the vicinity of the location owing to high footfall and limited availability of well-maintained public sanitation facilities. Site also fits in with city-wide strategy to eliminate open defecation/urination by improving the infrastructure of poorly maintained facilities in the city. From a demand perspective, the project can be categorized as below:

Category	Scale	Description
A	High	Daily usage levels of approximately 600-1000 per day. Typically near railway station, bus stand, religious places, busy commercial areas
B	Medium	Daily usage levels of approximately 300-600 per day. Typically near commercial areas, offices, public spaces, parking areas
C	Low	Daily usage levels 0-300 users per day, Typically near slums, in residential neighbourhoods, low-density commercial areas

The project involves retrofitting an existing toilet complex built on a *nalla*, on RTC land. Currently, the site contains a non-operational toilet complex (with toilet units, urinals and shower facilities). However, the facility is poorly maintained and has poor infrastructure and water supply.

#### User Profile

User catchment in this site is primarily *tourist and commercial users*. The area is primarily a tourist/transit hub (RTC bus stand, private bus pick up points at the end of the road (beyond Kences Hotel on either side of the road (BMR travels etc. and Kesineni Travels in the Udayee International

Hotel complex). Also, there are some small shops (selling water, cool drinks, tea) at the entrance of the bus stand, a few hawkers (fruits and trinkets) on the same side of the bus stop. There is one commercial complex (Xerox store, computer browsing etc.) which has a toilet for usage by shops in the complex. On the opposite side are largely hotels, lodges, restaurants and a few travel and tours agencies. Some of these lodges, such as Ajantha Lodge have a few shops (selling gifts, travel and tours and a tea shop) within its compound. Persons working here use the facilities built by the lodge specifically for use by their staff and drivers.

Other observations based on field visits, interactions with city officials and potential users include:

- Tourists and shops (magazines, tea, meals, cool drinks) inside the RTC bus stand will not form part of catchment for the proposed site as there are five complexes inside the bus stand
- Shops at the main entrance and auto drivers at the stand currently use the toilets inside the bus stand. Hawkers outside the main entrance also use the RTC bus stand
- Hotel, restaurants, lodges and travel and tours use toilets within their own facilities. In case of the latter, persons use toilets meant for hotel/lodge/restaurant staff.
- Tourists taking private buses organised at Kesineni Travels or travels opposite this (BMR etc.) either the RTC bus stand or Sulabh toilets. Tourists dropped off/picked up by private buses outside the RTC bus stand entrance had no idea where the toilets were

Potential users of proposed site:

- Shops at the main entrance and close to main entrance and hawkers at the entrance
- Persons who are dropped and picked up at the main RTC bus stand entrance
- Persons who take the private buses operated by travels and tours (offices at the end of the road, e.g. BMR) are currently using the Sulabh toilet and/or inside RTC bus stand. It will be more convenient for them to walk along the footpath and use the proposed toilet
- There is a toilet inside Udayee International Hotel Complex (Kesineni Travels), so the assumption is made that these tourists will use that toilet complex, and hence are not part of the footfall.



## Technical Review

Currently, the site has 3 toilets, 3 urinals and 1 shower. The toilet is connected to UGD and daily water supply was through TMC tankers during initial years. However, lack of maintenance and water supply has rendered the facility non-functional at present.

Table 2 Technical Summary of Existing Facility

Area Survey	
Total length constructed	9.65m + 4.61m
Total width constructed	4.26 m
Elevation of Toilet from ground	2.27m
Slab thickness	0.38m
Constructed area	41.109 sq.m
Total area available	60.75 sq.m
Water Supply	TMC tankers supplied water depending on need and storage was in two 500 liters sintex tank installed above the complex. PVC piping is provided from the tank to toilets and the piping inside toilets are damaged
Electricity	Electricity line runs just above the complex. The complex has partial wiring but the lights and boards are severely damaged
UGD	UGD network is 2.6m below the base of the toilet drain

## Proposed Technical Design

The proposed design will consist of the following:

- Water Closets (Ladies) – 2 Nos.
- Wash basins (Ladies) – 1 No.
- Shower (Ladies) – 1 No.
- Urinals (Men) – 3 Nos.
- Water Closets (Men) – 3 Nos.
- Wash basins (Men) – 3 Nos.
- Shower (Men) – 1 No.

The super structure will have masonry walls and roofing will have a cement concrete type structure. Flooring will be made of cement plastering or with vitrified tiles. To ensure ease of cleaning, the flooring should be finished smooth in case cement plastering is used.

Urinals will be designed and constructed as water through to circumvent odour related issues.

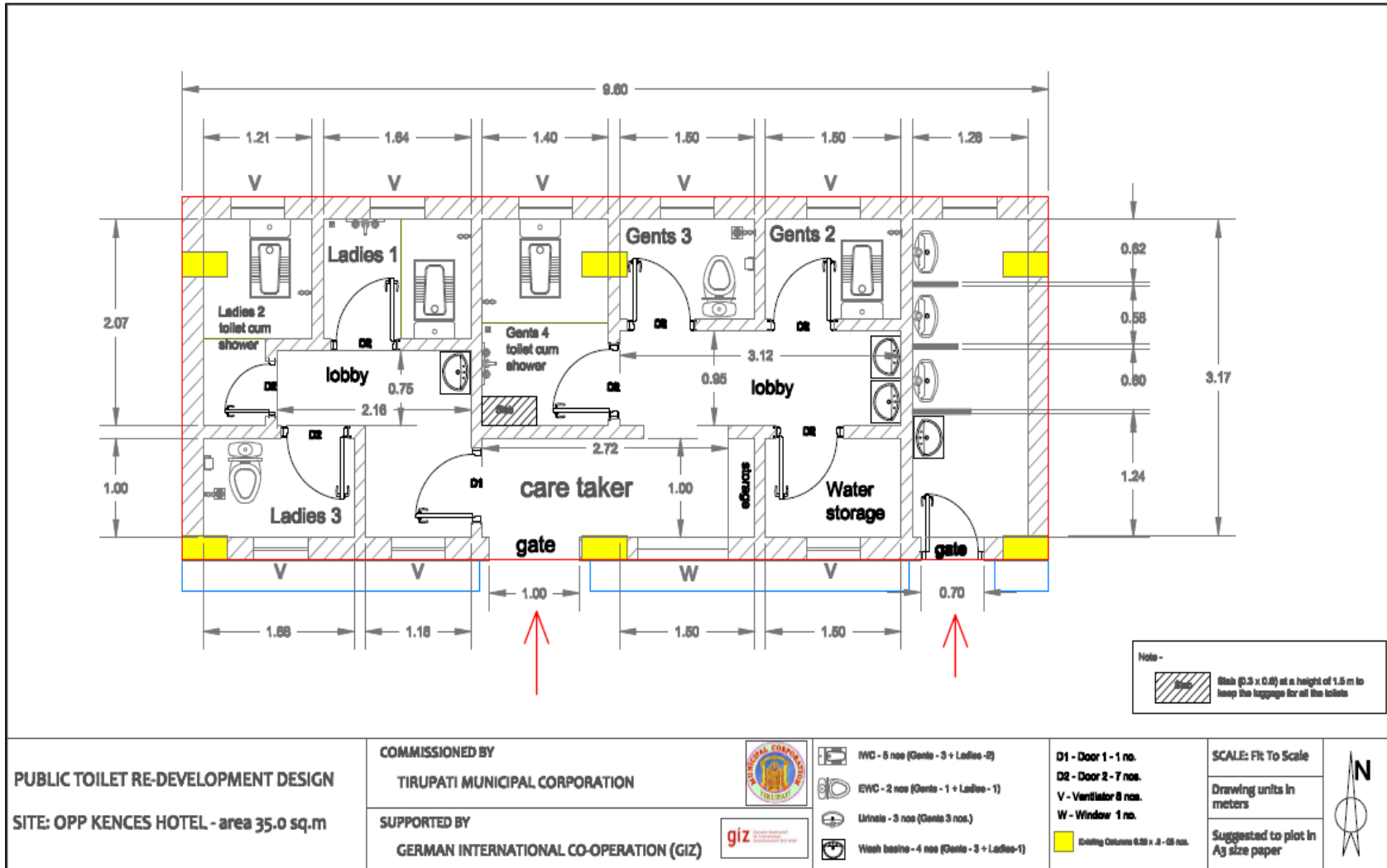
The physically challenged toilet will be a European type toilet with hand rails and enough space for wheel chairs. The wash basin will be placed a little lower than other wash basins. The door in the PH toilet will be a sliding door to facilitate ease of use.

Doors will be made of PVC, which is cost-effective and corrosion free. Every toilet will have ventilation of dimension 0.4 m x 0.3 m (as per BIS). The complex will be provided an exhaust fan of dimension 0.3 m x 0.3 m (as per BIS).

Three wash basin with mirrors of dimension 0.3 m x 0.3 m (as per BIS) will be provided at ladies toilet complex and two wash basins will be provided near the urinals. Waste basket will be provided in every toilet at the base of the wash basin. There will be a 3 numbers of wash basin provided next to the walls of gents toilets. The common waste basket will be kept in the passage area near to the door or where the space is available.

The proposed design will allow for modular expansion based on future requirement and availability of space.

# Overall Layout





## Financial Analysis

This segment will involve a review of project feasibility as measured by the project IRR and Net Present Values<sup>2</sup>. The viability of the project is contingent upon factors ranging from estimated demand, project cost, O&M costs, concession period, unit rates and corresponding annual growth of these various parameters.

### Demand Assumptions

Component	Unit	Value	Rationale
Footfall	Users per day	450 (WC) 250 (Urinals)	Based on daily use in comparable location
Annual increase	%	1.06	Average annual population growth rate of Andhra Pradesh state, Census 2011
Capacity Utilization	%	100	Important commercial area in city

### Cost Estimates

CAPEX			OMEX		
1.	Structural Cost	Amount (Rs.)	1.	Manpower	Amount (Rs.)
	<i>Civil-Superstructure (Cement/Sand/Brick/Fibre-reinforced Plastic, Tiles, etc.)</i>			<i>Caretaker</i>	72,000
	<i>Plumbing – pipes</i>			<i>Cleaner</i>	48,000
	<i>Electrical – wiring</i>			<i>Supervisor</i>	24,000
	<i>Bore-well w/pump</i>		2.	<i>Water charges</i>	60,000
	<i>Septic Tank</i>		3.	<i>Power charges</i>	36,000
	<i>Rain-water harvesting</i>		4.	<i>Waste disposal &amp; treatment charges</i>	
	<i>Painting (Material and Labour)</i>			<i>Sewerage</i>	
	<i>Labour – Civil</i>			<i>Septic tank</i>	
	<i>Labour – Plumbing</i>			<i>Any other</i>	
	<i>Labour – Electrical</i>		5.	<i>Consumables</i>	
2.	<i>Fittings</i>			<i>Cleaning supplies (soaps, phenyl, bleaching powder, acid)</i>	21,600
	<i>Sanitary Fittings (water closet/taps/wash basin/urinals)</i>			<i>Cleaning equipment (sponges, scraping sheets, brooms, brushes, floor wipers, gloves)</i>	21,600
	<i>PVC Doors</i>		6.	<i>Repairs, Replacement, Maintenance</i>	
	<i>Wooden Doors</i>			<i>Containers (buckets, mugs)</i>	2,400
	<i>PVC Water Tank</i>			<i>Mechanized cleaning equipment (compressed cleaners, choke removal tools)</i>	5,000
	<i>Mirrors</i>			<i>Apron</i>	500
	<i>Exhaust</i>			<i>Identity card</i>	200
	<i>Solar Panels</i>			<i>Provision for repairs and replacement</i>	36,000
	<i>Lighting, switches</i>		7.	<i>Incidentals and other Overheads (~10% of above)</i>	32,730
3.	<i>Service Connections</i>				
	<i>Water supply</i>				
	<i>Sewerage</i>				
	<i>Electricity</i>				
5	<i>Signage</i>				
	<b>Total CAPEX</b>	<b>5,53,000</b>		<b>Total OMEX</b>	<b>3,18,065</b>

<sup>2</sup> Both IRR and NPV are measures of the profitability of any investment. Generally, the higher the IRR or NPV, the more desirable it is to undertake a project. An IRR or NPV less than zero are indicative of a financially unviable investment.

## Financial Assumptions

Component	Unit	Value	Rationale
Unit rate – Urinal	Rs.	0	Use of urinals in city free in city and across the state
Unit rate – WC	Rs.	3	Prevailing unit rate in city
Unit rate – Shower	Rs.	5	Prevailing unit rate in city
Annual escalation in unit rates	%	5	Minimal escalation assumed. Per existing contracts in TMC, the annual fee escalation is 10-20%. However, this increase appears unduly high. GHMC, for example, has fixed user fees w/o any escalation, while CDMA GO allows for escalation only once in 3 years
Annual OMEX	Rs.		Indicative costs, based on discussions with service providers in TMC
Annual escalation in OMEX	%	10	Expected to increase in line with inflation
Debt ratio	%	30	
Debt duration	Years	5	
Interest rate	%	15	Prevalent bank lending rates
Tax rates	%	30	Prevalent tax rates/slabs
Toilet Timings	Hours	24	All PTs in comparable, transit locations in TMC operate for longer durations, 24*7

## Financial Projections

Under baseline footfall assumptions (450 users per day), the project is viable and can be undertaken through varied financing models. The project appears most viable at concession periods between 5 - 10 years, at either the prevailing unit rate of Rs. 3 or higher. Assuming these conditions, the location allows for a range of management models – management by the city, BOT or Maintenance contract.

1. Under maintenance contract model, the city will up-front capex funding and outsource O&M to a private contractor. The project cash flows allow the city to recover its construction costs along with a nominal quarterly interest of 4%, over a period of 10 years.

Capex	Rs. 1,068,000
Capex recovery (with quarterly interest of 4%)	Rs. 1,580,901
Reserve Price (Maximum, Daily footfall 450)	Rs. 1,00,000
Reserve Price (Minimum, Daily footfall 300)	Rs. 51,361
Annual growth in Reserve Price	10%
Capex recovery period	10 years

2. Under the BOT model, the city will bid out construction and maintenance to a private contractor. The project cash flows under the BOT model indicate that the private contractor can expect reasonable rates of return (~17% and above) after about 5 years of operations, assuming a daily minimum footfall of 305 and above.

Daily Footfall	450	305
Project IRR	50%	15%
Project NPV	Rs. 855,120	Rs. 8,400
Equity IRR	61%	17%
Equity NPV	Rs. 870,296	Rs. 23,576
Concession period	10 years	10 years

## Recommendations

This location appears well-suited for BOT and Maintenance Models from project viability and sustainability perspectives. The project cash flows allow for cross-subsidization with other less viable projects in the city that generate negative cash flows.

The choice of management model can be determined based on availability of funding for toilet construction from the city's budgetary sources. Based on assumptions stated above and corresponding financial projections, our specific recommendations on this project location as below:

1. BOT model is most feasible under a wide daily footfall range of 305-450 users; the project becomes unviable for any daily footfall below 305 users. At a minimum of 305 users per day, the project will provide a 17% equity return for a concession period of 10 years. At a maximum of 450 users per day, the project will provide a 61% equity return for a concession period of 10 years.
2. Maintenance model with capital cost recovery is most feasible under a daily footfall range of 300-450 users per day; the corresponding annual reserve price range would be Rs. 52000 (minimum footfall) to Rs. 1 lakh (maximum footfall). While the maximum annual reserve price is proposed at Rs. 1 lakh merely to recover capital costs with interest, the project cash flows at a high footfall allow for a sizeable surplus beyond this amount. At the proposed reserve price range, the city will recover its capital costs along with interest in a concession period of 10 years. The project cash flows will not generate adequate revenues to offset capital costs for daily footfall below 300 users.

## IV. Detailed Project Report: Next to Railway Reservation Counter

### Project Summary

<b>Project Description</b>	
<i>Project Type</i>	Retrofit/Closed Urinals (Free)
<i>ULB</i>	Tirupati (Revenue Ward 14)
<i>Location</i>	Adjacent to Railway Reservation Compound
<i>User Profile</i>	Tourists
<i>Project Prioritization</i>	High
<i>Engagement Model</i>	Maintenance Contract or Management by TMC
<i>Estimated daily footfall</i>	700 users per day
<b>Technical Description</b>	
<i>Site Size</i>	18.5 sq.m
<i>Number of Toilet Seats</i>	5 (M:3, F:2) (CPHEEO Norm M:5, F:3)
<i>Number of Showers</i>	0
<i>Number of Urinals</i>	5 (CPHEEO norm 10)
<b>Financial Description</b>	
<i>Project Cost</i>	Rs. 6,08,000
<i>Construction Period</i>	3-6 months
<i>Concession Period</i>	10 years
<i>Annual O&amp;M Cost</i>	Rs. 3,18,465

### Project Rationale

The project involves retrofitting an existing open urinal complex opposite the Railway Station, adjoining the Railway Reservation Counter. The complex was constructed by MCT but is non-operational owing to lack of water and maintenance. Location identified as “sanitation hotspot” based on city-wide demand assessment that was carried out. There is a high prevalence of open urination in the vicinity of the location owing to the high floating population in the area. According to the CDP, Tirupati attracts a daily pilgrim population, an average of 55,000, which is projected to grow to at least 67,000 by 2021. As the administrative headquarters of the Tirupati Revenue Division, the government offices in the city attract high floating populations as well. Located right at the centre of the tourist corridor, adjacent to the city railway station, railway reservation counter and pilgrim amenities complex (Vishnuvasam), the proposed site will primarily cater to tourists and floating population which place the highest demand on public sanitation within the city. Site also fits in with city-wide strategy to convert poorly maintained open urinals into closed urinal/toilet complexes that will be maintained with high quality. From a demand perspective, the project can be categorized as below:

Category	Scale	Description
A	High	Daily usage levels of approximately 600-1000 per day. Typically near railway station, bus stand, religious places, busy commercial areas
B	Medium	Daily usage levels of approximately 300-600 per day. Typically near commercial areas, offices, public spaces, parking areas
C	Low	Daily usage levels 0-300 users per day, Typically near slums, in residential neighbourhoods, low-density commercial areas



## User Profile

User catchment in this site is primarily *floating population (tourists, transit)*, who arrive to the city via buses/trains en route to Tirumala. The user profile ascertained during field visits and interactions is detailed below:

1. Persons waiting to take the government buses to Tirumala, who book their tickets at the booking counter
2. It is assumed that tourists waiting to take the bus will not use the toilet complex in RRC, as there are no signages for the same
3. It is assumed that the general public and commercial establishments on Koneru Street (east) will use the Sulabh Facility there

## Technical Review

Currently, the site has 9 open urinals.

**Table 3 Technical Summary of Existing Facility**

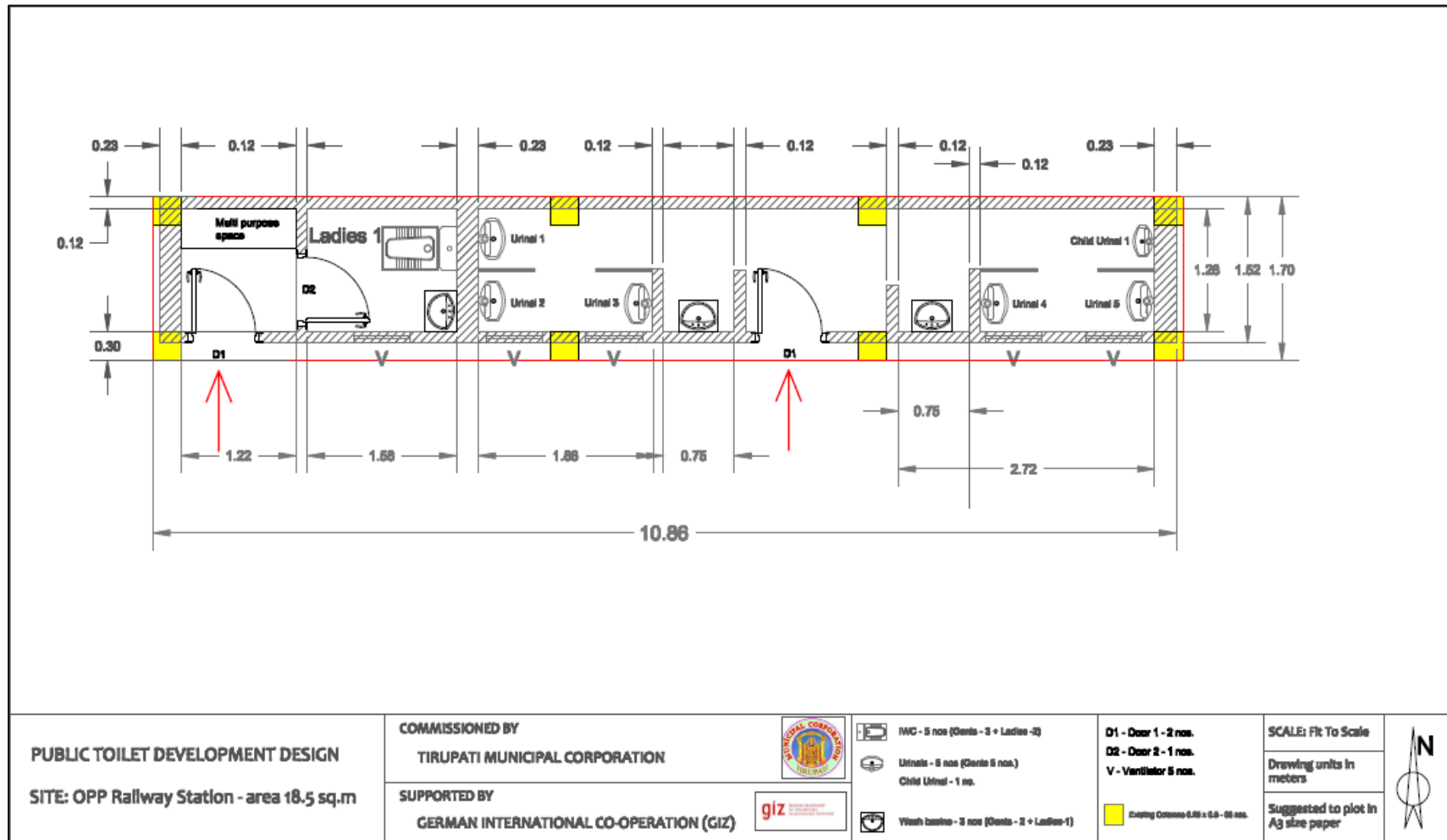
Area Survey	
<i>Total length constructed</i>	7.4m + 2.07m (water tank)
<i>Total width constructed</i>	1.07m
<i>Elevation</i>	1.34m
<i>Slab thickness</i>	0.24m
<i>Constructed area</i>	10.132 sq.m
<i>Length available for construction</i>	
<i>Width available for construction</i>	
<i>Total area available</i>	
Water Supply	TMC tankers supplied water depending on need and storage was in 1*500 liters sintex tank installed 1.07m above the complex. PVC piping is provided from the tank to toilets and the piping inside toilets are damaged
Electricity	Electricity line runs 0.67m away from the urinals
UGD	Open drain is 0.44 m distance from the base of toilet drain. The elevation of the toilet base and drain is 0.24 m

### **Proposed Technical Design**

The proposed design will consist of the following:

- Closed Urinals (Men) – 5 Nos.
- Water Closets (Ladies) – 2 Nos.
- Water Closets (Men) – 3 Nos.
- Wash basins (Men) – 2 Nos.
- Wash basins (Ladies) – 1 Nos

## Overall Layout



## Financial Analysis

This segment will involve a review of project feasibility as measured by the project IRR and Net Present Values<sup>3</sup>. The viability of the project is contingent upon factors ranging from estimated demand, project cost, O&M costs, concession period, unit rates and corresponding annual growth of these various parameters.

### Demand Assumptions

Component	Unit	Value	Rationale
Footfall	Users per day	400-700	Based on daily use in comparable location
Annual increase	%	1.06	Average annual population growth rate of Andhra Pradesh state, Census 2011
Capacity Utilization	%	100	Important commercial area in city

### Cost Estimates

CAPEX			OMEX		
1.	Structural Cost	Amount (Rs.)	1.	Manpower	Amount (Rs.)
	<i>Civil-Superstructure (Cement/Sand/Brick/Fibre-reinforced Plastic, Tiles, etc.)</i>	44,274		<i>Caretaker</i>	21,600
	<i>Plumbing – pipes</i>	10,000		<i>Cleaner</i>	14,400
	<i>Electrical – wiring</i>	15,000		<i>Supervisor</i>	7,200
	<i>Bore-well w/pump</i>	NA	2.	<i>Water charges</i>	18,000
	<i>Septic Tank</i>	NA	3.	<i>Power charges</i>	10,800
	<i>Rain-water harvesting</i>		4.	<i>Waste disposal &amp; treatment charges</i>	
	<i>Painting (Material and Labour)</i>	530		<i>Sewerage</i>	
	<i>Labour – Civil</i>	Included in capital cost		<i>Septic tank</i>	
	<i>Labour – Plumbing</i>			<i>Any other</i>	
	<i>Labour – Electrical</i>				
2.	Fittings		5.	Consumables	
	<i>Sanitary Fittings (water closet/taps/wash basin/urinals)</i>	10,000		<i>Cleaning supplies (soaps, phenyl, bleaching powder, acid)</i>	6,800
	<i>PVC Doors</i>	1,000		<i>Cleaning equipment (sponges, scraping sheets, brooms, brushes, floor wipers, gloves)</i>	6,800
	<i>Wooden Doors</i>	2,500	6.	Repairs, Replacement, Maintenance	
	<i>PVC Water Tank</i>	1,500		<i>Containers (buckets, mugs)</i>	720
	<i>Mirrors</i>	1,000		<i>Mechanized cleaning equipment (compressed cleaners, choke removal tools)</i>	1,500
	<i>Exhaust</i>	500		<i>Apron</i>	150
	<i>Solar Panels</i>	NA		<i>Identity card</i>	60
	<i>Lighting, switches</i>	350	7.	<i>Provision for repairs and replacement</i>	10,800
				<i>Incidentals and other Overheads (~10% of above)</i>	9,819
3.	Service Connections				
	<i>Water supply</i>	NA			
	<i>Sewerage</i>	NA			
	<i>Electricity</i>	NA			
5	Signage	650			
	<b>Total CAPEX</b>	<b>84,804.00</b>		<b>Total OMEX</b>	<b>1,08,009</b>

<sup>3</sup> Both IRR and NPV are measures of the profitability of any investment. Generally, the higher the IRR or NPV, the more desirable it is to undertake a project. An IRR or NPV less than zero are indicative of a financially unviable investment.



## Financial Assumptions

Component	Unit	Value	Rationale
Unit rate – Urinal	Rs.	0	Use of urinals in city free in city and across the state
Annual OMEX	Rs.		Indicative costs, based on discussions with service providers in TMC
Annual escalation in OMEX	%	10	Expected to increase in line with inflation
Debt ratio	%	30	
Debt duration	Years	5	
Interest rate	%	15	Prevalent bank lending rates
Tax rates	%	30	Prevalent tax rates/slabs
Toilet Timings	Hours	24	All PTs in comparable, transit locations in TMC operate for longer durations, 24*7

## Financial Projections

Under baseline footfall assumptions (300 users per day), the project is viable and can be undertaken through varied financing models. The project appears most viable at concession periods between 10 - 15 years, at either the prevailing unit rate of Rs. 3 or higher. Assuming these conditions, the location allows for a range of management models – management by the city, BOT or Maintenance contract.

- Under maintenance contract model, the city will up-front capex funding and outsource O&M to a private contractor. The project cash flows allow the city to recover its construction costs along with a nominal quarterly interest of 4%, over a period of 10 years.

Capex	Rs. 6.08,000
Capex recovery (with quarterly interest of 4%)	Rs. 8.99.989
Reserve Price (Maximum, Daily footfall 300)	Rs. 1,00,000
Reserve Price (Minimum, Daily footfall 200)	Rs. 38,149
Annual growth in Reserve Price	10%
Capex recovery period	10 years

- Under the BOT model, the city will bid out construction and maintenance to a private contractor. The project cash flows under the BOT model indicate that the private contractor can expect reasonable rates of return (~17% and above).

Daily Footfall	300	200
Project IRR	25%	16%
Project NPV	Rs. 219,659	Rs. 24,926
Equity IRR	28%	17%
Equity NPV	Rs. 236,344	Rs. 41,612
Concession period	10 years	13 years

## Recommendations

This location appears well-suited for BOT and Maintenance Models from project viability and sustainability perspectives. The choice of management model can be determined based on availability of funding for toilet construction from the city's budgetary sources. Based on assumptions stated above and corresponding financial projections, our specific recommendations on this project location as below:

- BOT model is most feasible under a wide daily footfall range of 200-300 users; the project becomes unviable for any daily footfall below 200 users. At a minimum of 200 users per day, the project will provide a 17% equity return for a concession period of 13 years. At a

maximum of 300 users per day, the project will provide a 28% equity return for a concession period of 10 years.

2. Maintenance model with capital cost recovery is most feasible under a daily footfall range of 200-300 users per day; the corresponding annual reserve price range would be Rs. 38000 (minimum footfall) to Rs. 1 lakh (maximum footfall). At the proposed reserve price range, the city will recover its capital costs along with interest in a concession period of 10 years. The project cash flows will not generate adequate revenues to offset capital costs for daily footfall below 200 users

## V. Detailed Project Report: Annamayya circle junction, near Raithu Bazar

### Project Summary

<b>Project Description</b>	
<i>Project Type</i>	New Asset/Pay and Use Toilet
<i>ULB</i>	Tirupati (Revenue Ward 19)
<i>Location</i>	Near Raithu Bazar, on Rayalcheruvu Road
<i>User Profile</i>	Commercial Users, Slums, General Users
<i>Project Prioritization</i>	High
<i>Engagement Model</i>	BOT or Maintenance Contract
<i>Estimated daily footfall</i>	350 users per day
<b>Technical Description</b>	
<i>Site Size</i>	35.5 sq.m
<i>Number of Toilet Seats</i>	6 (M:3, F:2, PH:1) (CPHEEO Norm M:3, F:2)
<i>Number of Showers</i>	2
<i>Number of Urinals</i>	3 (CPHEEO norm 5)
<b>Financial Description</b>	
<i>Project Cost</i>	Rs. 8,44,000
<i>Construction Period</i>	3-6 months
<i>Concession Period</i>	10 years
<i>Annual O&amp;M Cost</i>	Rs. 3,18,465

### Project Rationale

Based on city-wide demand assessment that was carried out, a high prevalence of open urination was observed in the vicinity of the location owing to the highly commercial nature of the location and lack of adequate public sanitation facilities. Site also fits in with city-wide strategies to: 1) tackle open defecation/urination by expanding public sanitation facilities in high demand areas and 2) provide inclusive access from a gender and disabled perspective. From a demand perspective, the project can be categorized as below:

Category	Scale	Description
A	High	Daily usage levels of approximately 600-1000 per day. Typically near railway station, bus stand, religious places, busy commercial areas
B	Medium	Daily usage levels of approximately 300-600 per day. Typically near commercial areas, offices, public spaces, parking areas
C	Low	Daily usage levels 0-300 users per day, Typically near slums, in residential neighbourhoods, low-density commercial areas

The project involves constructing a new public toilet complex on Rayalcheruvu Road, near Raithu Bazar. Raithu Bazaar is located on Rayalcheruvu Road (RC Road), which is perpendicular to AIR Bypass Road. There are no public facilities on either RC Road or AIR Bypass Road. The only toilet complex in the vicinity is inside the Raithu Bazar complex. However, the toilet inside the complex is very poorly maintained and scores very low on cleanliness and hygiene. The project site, being located at the junction of commercial areas and the market place (Raithu Bazar), will garner adequate demand and is an appropriate location for construction of a public toilet complex.



## User Profile

User catchment in this site is primarily *commercial users* (vendors, auto drivers, floating population). Established in 2001, Raithu Bazaar is a market where farmers and other sellers congregate to sell vegetables and grains. According to the data collected at the Estate office, there are 36 slots allotted to farmers (out of which 5 belong to SHGs, and 12 to Grahamithra). However, during the field visit we found that there were 10- 12 shops on either side of the square. In between the two rows of shops is the toilet complex that is being considered for retrofitting. There are two toilets each for ladies and gents. While the government has appointed a person to clean the square and the toilet, the payment for the same is made by a contribution by all shops within the bazaar. Interviews with the vegetable sellers and shop owners revealed that the bazar area and the toilet complex are cleaned twice a day (morning and evening). An amount of INR 6000 is paid as salary to cleaning personnel together. No

user fees are paid. Field level interactions vendors inside and outside the complex reveal that over 50% of vendors and other users of the complex went to their residences for use of toilet facilities owing to poor infrastructure within the complex.

**Gender perspective:** It is important to note that about 70% of sellers in the bazaar are women. i.e. 35 persons are women. These women however preferred not to use the toilet complex owing to poor maintenance and lack of cleanliness.

Project level inputs based on field visits and interviews with shopkeepers in the bazar revealed the following user profile for the location:

- Sellers inside the bazaar
- Buyers who visit the bazaar
- Shop-owners and vendors located 5-10 mins distance from Raithu Bazaar on RC Road and/or AIR Bypass Road

## Technical Review

Currently, the site is a vacant plot which belongs to TUDA (in the TUDA park area) and will shortly fall within the jurisdiction of TMC. The junction serves as an entrance for the commercial area and market place. There is enough area available for construction of a toilet complex.

**Table 4 Technical Summary of Existing Facility**

Area Survey	
<i>Length available for construction</i>	30.23 m
<i>Width available for construction</i>	3.2 m
<i>Total area available</i>	96.736 sq.m
Water Supply	There is municipal water pipe line running in the center of the RC road and M.R. Palli road at the distance of 9 m from the toilet complex. The depth of water pipe line from the surface of road is 1.2 m
Electricity	There is electric post just in front of the proposed toilet location and hence the power can be easily obtained from the post
UGD	The underground drainage in front of the proposed toilet complex

## Proposed Technical Design

The proposed design will consist of the following:

- Water Closets (Ladies) – 2 Nos.
- Wash basins (Ladies) – 1 Nos.
- Shower (Ladies) – 1 No.
- Urinals (Men) – 3 Nos.
- Water Closets (Men) – 3 Nos.
- Wash basins (Men) – 2 Nos.
- Shower (Men) – 1 No.
- PH Toilet with ramp – 1 No.

The super structure will have masonry walls and roofing will have a cement concrete type structure. Flooring will be made of cement plastering or with vitrified tiles. To ensure ease of cleaning, the flooring should be finished smooth in case cement plastering is used.

Urinals will be designed and constructed as water through to circumvent odour related issues.

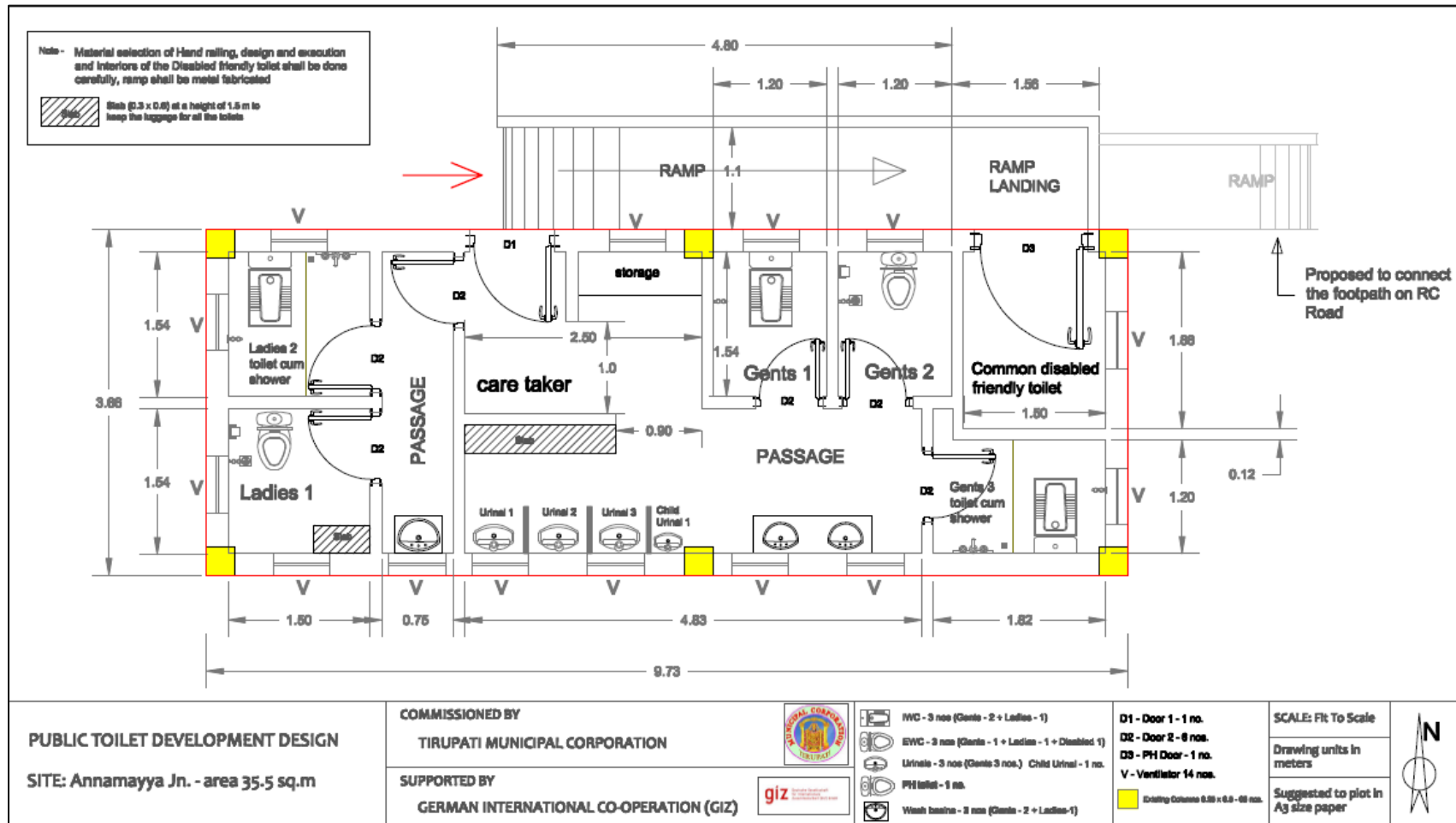
The physically challenged toilet will be a European type toilet with hand rails and enough space for wheel chairs. The wash basin will be placed a little lower than other wash basins. The door in the PH toilet will be a sliding door to facilitate ease of use.

Doors will be made of PVC, which is cost-effective and corrosion free. Every toilet will have ventilation of dimension 0.4 m x 0.3 m (as per BIS). The complex will be provided an exhaust fan of dimension 0.3 m x 0.3 m (as per BIS).

Three wash basin with mirrors of dimension 0.3 m x 0.3 m (as per BIS) will be provided at ladies toilet complex and two wash basins will be provided near the urinals. The waste basket will be provided in every toilet at the base of the wash basin. There will be a 3 numbers of wash basin provided next to the walls of gent's toilets. The common waste basket will be kept in the passage area near to the door or where the space is available.

The proposed design will allow for modular expansion based on future requirement and availability of space.

# Overall Layout



## Financial Analysis

This segment will involve a review of project feasibility as measured by the project IRR and Net Present Values<sup>4</sup>. The viability of the project is contingent upon factors ranging from estimated demand, project cost, O&M costs, concession period, unit rates and corresponding annual growth of these various parameters.

### Demand Assumptions

Component	Unit	Value	Rationale
Footfall	Users per day	350	Based on daily use in comparable location
Annual increase	%	1.06	Average annual population growth rate of Andhra Pradesh state, Census 2011
Capacity Utilization	%	100	Important commercial area in city

### Cost Estimates

CAPEX			OMEX		
1.	Structural Cost	Amount (Rs.)	1.	Manpower	Amount (Rs.)
	<i>Civil-Superstructure (Cement/Sand/Brick/Fibre-reinforced Plastic, Tiles, etc.)</i>	77,760		<i>Caretaker</i>	72,000
	<i>Plumbing – pipes</i>	10,000		<i>Cleaner</i>	48,000
	<i>Electrical – wiring</i>	15,000		<i>Supervisor</i>	24,000
	<i>Bore-well w/pump</i>	NA	2.	Water charges	60,000
	<i>Septic Tank</i>	NA	3.	Power charges	36,000
	<i>Rain-water harvesting</i>		4.	Waste disposal & treatment charges	
	<i>Painting (Material and Labour)</i>	879		<i>Sewerage</i>	
	<i>Labour – Civil</i>	Included in capital cost		<i>Septic tank</i>	
	<i>Labour – Plumbing</i>			<i>Any other</i>	
	<i>Labour – Electrical</i>			5.	Consumables
2.	Fittings			<i>Cleaning supplies (soaps, phenyl, bleaching powder, acid)</i>	21,600
	<i>Sanitary Fittings (water closet/taps/wash basin/urinals)</i>	10,000		<i>Cleaning equipment (sponges, scraping sheets, brooms, brushes, floor wipers, gloves)</i>	21,600
	<i>PVC Doors</i>	9,500	6.	Repairs, Replacement, Maintenance	
	<i>Wooden Doors</i>	17,500		<i>Containers (buckets, mugs)</i>	2,400
	<i>PVC Water Tank</i>	4,000		<i>Mechanized cleaning equipment (compressed cleaners, choke removal tools)</i>	5,000
	<i>Mirrors</i>	1,500		<i>Apron</i>	500
	<i>Exhaust</i>	1,000		<i>Identity card</i>	200
	<i>Solar Panels</i>	NA		<i>Provision for repairs and replacement</i>	36,000
	<i>Lighting, switches</i>	2,000	7.	Incidentals and other Overheads (~10% of above)	32,730
3.	Service Connections				
	<i>Water supply</i>	NA			
	<i>Sewerage</i>	NA			
	<i>Electricity</i>	NA			
5	Signage	650			
	<b>Total CAPEX</b>	<b>8,44,000</b>		<b>Total OMEX</b>	<b>3,18,465</b>

<sup>4</sup> Both IRR and NPV are measures of the profitability of any investment. Generally, the higher the IRR or NPV, the more desirable it is to undertake a project. An IRR or NPV less than zero are indicative of a financially unviable investment.



## Financial Assumptions

Component	Unit	Value	Rationale
Unit rate – Urinal	Rs.	0	Use of urinals in city free in city and across the state
Unit rate – WC	Rs.	3	Prevailing unit rate in city
Unit rate – Shower	Rs.	5	Prevailing unit rate in city
Annual escalation in unit rates	%	5	Minimal escalation assumed. Per existing contracts in TMC, the annual fee escalation is 10-20%. However, this increase appears unduly high. GHMC, for example, has fixed user fees w/o any escalation, while CDMA GO allows for escalation only once in 3 years
Annual OMEX	Rs.		Indicative costs, based on discussions with service providers in TMC
Annual escalation in OMEX	%	10	Expected to increase in line with inflation
Debt ratio	%	30	
Debt duration	Years	5	
Interest rate	%	15	Prevalent bank lending rates
Tax rates	%	30	Prevalent tax rates/slabs
Toilet Timings	Hours	14	All PTs in comparable, non-transit and/or commercial locations in TMC operate between 5am-8pm/9pm

## Financial Projections

Under baseline footfall assumptions (300 users per day), the project is viable and can be undertaken through varied financing models. The project appears most viable at concession periods between 10 - 15 years, at either the prevailing unit rate of Rs. 3 or higher. Assuming these conditions, the location allows for a range of management models – management by the city, BOT or Maintenance contract.

1. Under maintenance contract model, the city will up-front capex funding and outsource O&M to a private contractor. The project cash flows allow the city to recover its construction costs along with a nominal quarterly interest of 4%, over a period of 10 years.

Capex	Rs. 8,44,000
Capex recovery (with quarterly interest of 4%)	Rs. 1,249,326
Reserve Price (Maximum, Daily footfall 300)	Rs. 78,000
Reserve Price (Minimum, Daily footfall 200)	Rs. 52,957
Annual growth in Reserve Price	10%
Capex recovery period	10 years

2. Under the BOT model, the city will bid out construction and maintenance to a private contractor. The project cash flows under the BOT model indicate that the private contractor can expect reasonable rates of return (~17% and above) for a concession period of 10 years.

Daily Footfall	300	250
Project IRR	16%	-ve
Project NPV	Rs. 18,132	-ve
Equity IRR	17%	-ve
Equity NPV	Rs. 41,293	-ve
Concession period	10 years	10 years

## Recommendations

This location appears well-suited for BOT and Maintenance Models from project viability and sustainability perspectives. The choice of management model can be determined based on availability of funding for toilet construction from the city's budgetary sources. Based on assumptions stated

above and corresponding financial projections, our specific recommendations on this project location as below:

1. BOT model is most feasible assuming a daily footfall of 300 users and above; the project becomes unviable for any daily footfall below 300 users. At this footfall, the project will provide a 17% equity return for a concession period of 10 years.
2. Maintenance model with capital cost recovery is most feasible under a daily footfall range of 200-300 users per day; the corresponding annual reserve price range would be Rs. 52000 (minimum footfall) to Rs. 78000 (maximum footfall). At the proposed reserve price range, the city will recover its capital costs along with interest in a concession period of 10 years. The project cash flows will not generate adequate revenues to offset capital costs for daily footfall below 200 users.

Given that footfall reductions below baseline is likely to render this project unviable, the financial structuring options available to the city under this scenario would include: 1) packaging project with a more viable project within the city, 2) increasing unit rates, 3) subsidize CAPEX and a portion of annual OPEX to ensure quality is not compromised, 4) monitor demand in location to ascertain capacity utilization.

The toilet complex is located in the commercial hub of the city and has considerable income potential from hoardings and advertisements. The city can leverage income from this source to offset and gaps in income through a lower footfall.

## VI. Detailed Project Report: Behind SV Cafe

### Project Summary

<b>Project Description</b>	
<i>Project Type</i>	New asset/Pay and Use Toilet
<i>ULB</i>	Tirupati (Revenue Ward 1)
<i>Location</i>	Behind SV Cafe, adjacent to Krishnapuram Tana Jn
<i>User Profile</i>	Commercial Users
<i>Project Prioritization</i>	High
<i>Engagement Model</i>	BOT or Maintenance Contract
<i>Estimated daily footfall</i>	300 users per day
<b>Technical Description</b>	
<i>Site Size</i>	50.2 sq.m
<i>Number of Toilet Seats</i>	6 (M:3, F:3) (CPHEEO Norm M:2, F:2)
<i>Number of Showers</i>	1
<i>Number of Urinals</i>	3 (CPHEEO norm 3)
<b>Financial Description</b>	
<i>Project Cost</i>	Rs. 703,000
<i>Construction Period</i>	3-6 months
<i>Concession Period</i>	10 years
<i>Annual O&amp;M Cost</i>	Rs. 3,18,465

### Project Rationale

Based on city-wide demand assessment that was carried out, this location has been identified as one of the “sanitation hotspots” in Tirupati. There is a high prevalence of open urination in the vicinity of the location owing to the highly commercial nature of the location and limited adequate public sanitation facilities in the vicinity. The site is located on Prakasam Road which does not have any public toilets and consequently demand is force to toilets inside Ambedkar Bhavan and Music College (these are not public toilets but meant for offices within the compound). Site also fits in with city-wide strategy to expand public sanitation facilities in high demand areas and to provide inclusive access from a gender and disabled perspective. From a demand perspective, the project can be categorized as below:

Category	Scale	Description
A	High	Daily usage levels of approximately 600-1000 per day. Typically near railway station, bus stand, religious places, busy commercial areas
B	Medium	Daily usage levels of approximately 300-600 per day. Typically near commercial areas, offices, public spaces, parking areas
C	Low	Daily usage levels 0-300 users per day, Typically near slums, in residential neighbourhoods, low-density commercial areas

The project involves creating a new toilet complex near SV Café, on Prakasam Road on land that belongs to TMC. The Krishnapuram tana junction is considered an important commercial area and a famous temple adjacent to the site attracts large numbers of pilgrims. Hence, the need for quality public toilet facilities is important for this location.

### User Profile

User catchment in this site is primarily *commercial users*. The proposed facility will cater to Prakasam Road up to Balaji Road junction (approx. 40 establishments), Beri Veedi (approx. 40 establishments), Giddangi Street (50 establishments) and its parallel street (50 establishments), totalling to a potential footfall (in establishment terms) of 180-200 numbers. Further, demand interviews carried out near this site revealed the following:

- Open urination on small streets off Giddangi Street and parallel road (closest toilet is a 7-10 minute walk)

- Establishments with Muslim owners (biryani places, shoe stores) use the toilet facilities in the Mosque
- Apart from SV Cafe, no other establishment (including restaurants) had a problem with toilet complex next to the temple (SOCIAL TENSION ISSUE). In fact respondents stated that next to the temple, open urination is rampant. If the complex can be maintained well (with a caretaker), there should be no problem.
- Women respondents (shoppers and shop owners) use their residences. Shoppers faced with problems and often have to cut down shopping time. Some of them use the toilet complex inside the temple
- No toilets on Prakasam Road, so complete catchment can be tapped into
- Toilet on Porla Street needs better maintenance. Although water is available, doors/windows/lighting etc. needs repair



## Technical Review

Table 5 Technical Summary of Existing Facility

Area Survey	
<i>Length available for construction</i>	12.05 m
<i>Width available for construction</i>	3.6 m
<i>Total area available</i>	46.63 sq.m
Water Supply	There is bore well present inside the shopping complex, and the entire area belongs to TMC. There is also existing toilet (private constructed/owned) inside the complex which uses the water from the overhead tank. The water for the newly constructed toilet also can use the same water after laying the pipe lines
Electricity	There is a transformer just 9.87 m from the toilet location and the power can be easily obtained from the transformer
UGD	UGD network is located at 10.54 m from the toilet location and level difference from the UGD line and floor base is 0.2 m

## Proposed Technical Design

The proposed design will consist of the following:

- Water Closets (Ladies) – 3 Nos.
- Wash basins (Ladies) – 1 Nos.
- Shower (Ladies) – 0 No.
- Urinals (Men) – 3 Nos.
- Water Closets (Men) – 3 Nos.
- Wash basins (Men) – 2 Nos.
- Shower (Men) – 1 No.

The super structure will have masonry walls and roofing will have a cement concrete type structure. Flooring will be made of cement plastering or with vitrified tiles. To ensure ease of cleaning, the flooring should be finished smooth in case cement plastering is used.

Urinals will be designed and constructed as water through to circumvent odour related issues.

The physically challenged toilet will be a European type toilet with hand rails and enough space for wheel chairs. The wash basin will be placed a little lower than other wash basins. The door in the PH toilet will be a sliding door to facilitate ease of use.

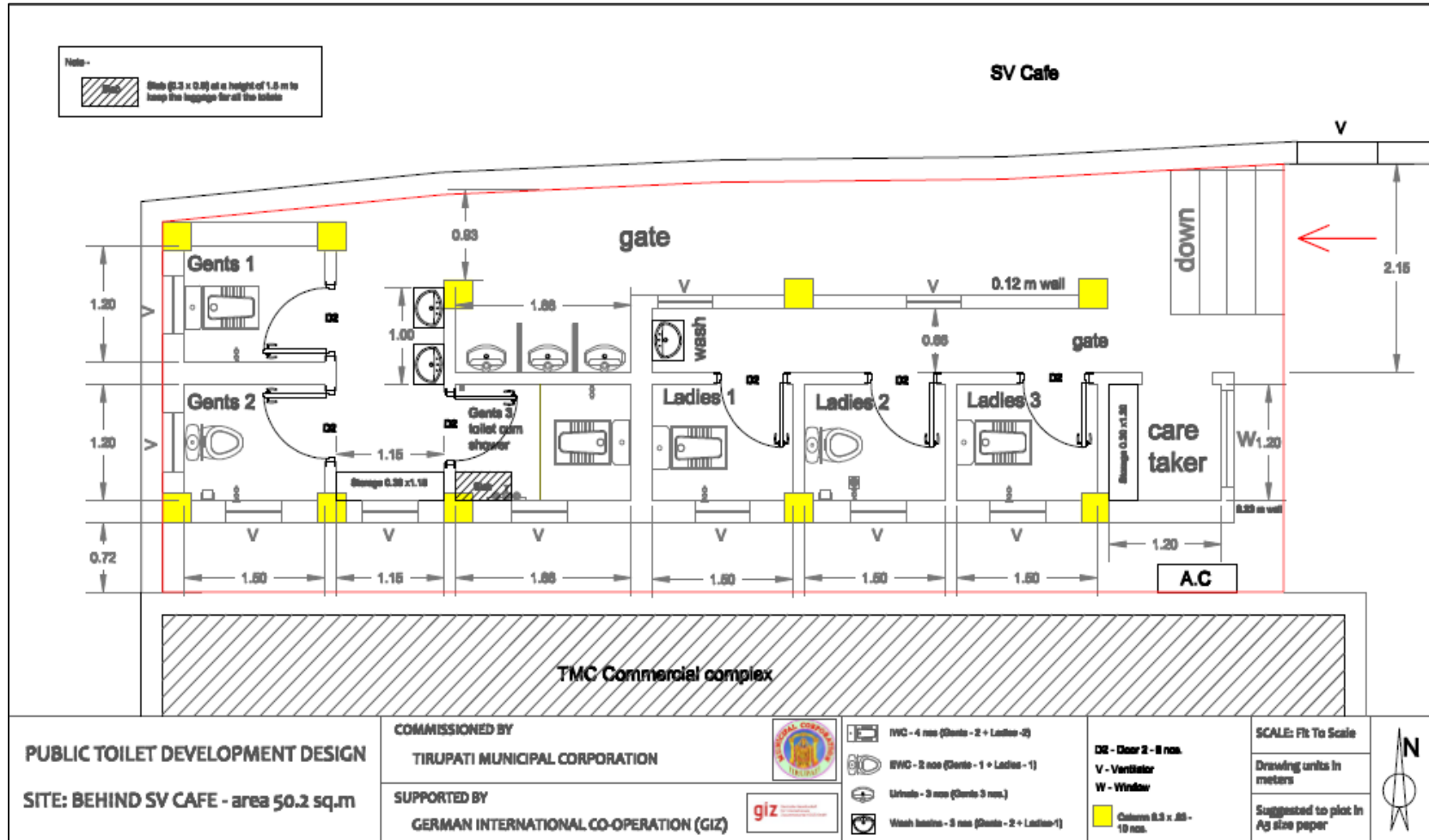
Doors will be made of PVC, which is cost-effective and corrosion free. Every toilet will have ventilation of dimension 0.4 m x 0.3 m (as per BIS). The complex will be provided an exhaust fan of dimension 0.3 m x 0.3 m (as per BIS).

Three wash basin with mirrors of dimension 0.3 m x 0.3 m (as per BIS) will be provided at ladies toilet complex and two wash basins will be provided near the urinals. The waste basket will be provided in every toilet at the base of the wash basin. There will be a 3 numbers of wash basin provided next to the walls of gent's toilets. The common waste basket will be kept in the passage area near to the door or where the space is available.

The complex will be constructed towards the shopping complex, leaving a passage of 1.2 m between the toilet complex and kitchen of SV café.

The proposed design will allow for modular expansion based on future requirement and availability of space.

## Overall Layout



## Financial Analysis

This segment will involve a review of project feasibility as measured by the project IRR and Net Present Values<sup>5</sup>. The viability of the project is contingent upon factors ranging from estimated demand, project cost, O&M costs, concession period, unit rates and corresponding annual growth of these various parameters.

### Demand Assumptions

Component	Unit	Value	Rationale
Footfall	Users per day	300	Based on daily use in comparable location
Annual increase	%	1.06	Average annual population growth rate of Andhra Pradesh state, Census 2011
Capacity Utilization	%	100	Important commercial area in city

### Cost Estimates

CAPEX			OMEX		
1.	Structural Cost	Amount (Rs.)	1.	Manpower	Amount (Rs.)
	<i>Civil-Superstructure (Cement/Sand/Brick/Fibre-reinforced Plastic, Tiles, etc.)</i>	95,430		<i>Caretaker</i>	72,000
	<i>Plumbing – pipes</i>	10,000		<i>Cleaner</i>	48,000
	<i>Electrical – wiring</i>	15,000		<i>Supervisor</i>	24,000
	<i>Bore-well w/pump</i>	NA	2.	Water charges	60,000
	<i>Septic Tank</i>	NA	3.	Power charges	36,000
	<i>Rain-water harvesting</i>		4.	Waste disposal & treatment charges	
	<i>Painting (Material and Labour)</i>	1,704		<i>Sewerage</i>	
	<i>Labour – Civil</i>	Included in capital cost		<i>Septic tank</i>	
	<i>Labour – Plumbing</i>			<i>Any other</i>	
	<i>Labour – Electrical</i>			5.	Consumables
2.	Fittings			<i>Cleaning supplies (soaps, phenyl, bleaching powder, acid)</i>	21,600
	<i>Sanitary Fittings (water closet/taps/wash basin/urinals)</i>	10,000		<i>Cleaning equipment (sponges, scraping sheets, brooms, brushes, floor wipers, gloves)</i>	21,600
	<i>PVC Doors</i>	12,000	6.	Repairs, Replacement, Maintenance	
	<i>Wooden Doors</i>	25,000		<i>Containers (buckets, mugs)</i>	2,400
	<i>PVC Water Tank</i>	4,000		<i>Mechanized cleaning equipment (compressed cleaners, choke removal tools)</i>	5,000
	<i>Mirrors</i>	2,000		<i>Apron</i>	500
	<i>Exhaust</i>	1,000		<i>Identity card</i>	200
	<i>Solar Panels</i>	NA		<i>Provision for repairs and replacement</i>	36,000
	<i>Lighting, switches</i>	1,500	7.	Incidentals and other Overheads (~10% of above)	32,730
3.	Service Connections				
	<i>Water supply</i>	NA			
	<i>Sewerage</i>	NA			
	<i>Electricity</i>	NA			
5	Signage	650			
	<b>Total CAPEX</b>	<b>1,53,284</b>		<b>Total OMEX</b>	<b>3,60,030</b>

<sup>5</sup> Both IRR and NPV are measures of the profitability of any investment. Generally, the higher the IRR or NPV, the more desirable it is to undertake a project. An IRR or NPV less than zero are indicative of a financially unviable investment.

## Financial Assumptions

Component	Unit	Value	Rationale
Unit rate – Urinal	Rs.	0	Use of urinals in city free in city and across the state
Unit rate – WC	Rs.	3	Prevailing unit rate in city
Unit rate – Shower	Rs.	5	Prevailing unit rate in city
Annual escalation in unit rates	%	5	Minimal escalation assumed. Per existing contracts in TMC, the annual fee escalation is 10-20%. However, this increase appears unduly high. GHMC, for example, has fixed user fees w/o any escalation, while CDMA GO allows for escalation only once in 3 years
Annual OMEX	Rs.		Indicative costs, based on discussions with service providers in TMC
Annual escalation in OMEX	%	10	Expected to increase in line with inflation
Debt ratio	%	30	
Debt duration	Years	5	
Interest rate	%	15	Prevalent bank lending rates
Tax rates	%	30	Prevalent tax rates/slabs
Toilet Timings	Hours	14	All PTs in comparable, non-transit and/or commercial locations in TMC operate between 5am-8pm/9pm

## Financial Projections

This project does not generate positive cash flows under any of our assumptions and is unviable. Hence, private sector interest to undertake the project under the base case assumptions will be low to minimal.

- Under a maintenance contract model where the city up fronts capex funding, the potential for capex recovery (with or without interest) is low to minimal.

Capex	Rs. 703,000
Capex recovery (with quarterly interest of 4%)	Rs. 1,040,612
Reserve Price (Maximum, Daily footfall 300)	0
Reserve Price (Minimum, Daily footfall 200)	0
Annual growth in Reserve Price	10%
Capex recovery period	10 years

- The project is unviable under the BOT model as well under existing footfall assumptions.

Daily Footfall	300	250
Project IRR	-ve	-ve
Project NPV	-ve	-ve
Equity IRR	-ve	-ve
Equity NPV	-ve	-ve
Concession period	10 years	10 years

## Recommendations

This project proposal is not feasible under any of our demand and financial assumptions. The options available to the city include: 1) packaging project with a more viable project within the city (such as Fortune Kences), 2) increasing unit rates, 3) subsidize CAPEX and a portion of annual OMEX to ensure quality is not compromised, 4) monitor demand in location to ascertain capacity utilization.