CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

AMC	Alandi Municipal Council
DP	Development Plan
EMP	Environmental Management Plan
ESR	Elevated Storage Reservoir
GLSR	Ground Level Service Reservoir
GSI	Geological Survey of India
IMD	Indian Meteorological Department
LPCD	Litres Per Capita Per Day
MLD	Million Litres Per Day
MJP	Maharashtra Jeevan Pradhikaran
MPCB	Maharashtra Pollution Control Board
MPN	Most Probable Number
PFR	Pre-Feasibility Report
SOI	Survey of India
STP	Sewerage Treatment Plant
SWM	Solid Waste Management
UA	Urban Agglomeration
WSAPL	Wilbur Smith Associates Private Limited

PREFACE

The religious places in India are the most important assets to be preserved since these are also the most favored destinations for the domestic as well as International tourists. The State of Maharashtra has a laudable history of saints and pilgrim places; hence it is rightfully called "Santanchi Bhoomi" (Land of Saints). The religious places in Maharashtra are mostly located in small cities or towns having population of less than 2 lakhs. The local authorities neither have adequate funds to protect the archaeological and heritage importance of such places nor do they have infrastructure that can manage the floating population that converges on the festive days or the religious occasions at such places. This puts a very heavy demand on the available, infrastructure and amenities in such towns and creates several environmental problems which adversely affect public health and environment.

The pollution problems arising out of the activities at these places include: water pollution of adjoining streams, rivers and lakes due to bathing, washing of clothes and human excreta; ground water pollution due to poor MSW management, noise and dust pollution due to unplanned vehicular traffic and poor road condition, visual pollution due to littering of plastic bags and containers and environment unfriendly landscapes etc. These problems are aggravated during the festive and other important days of religious celebrations due to poor / inadequate infrastructure management practices.

Considering the seriousness of the issues the Board considered implementation of project on environmental improvement of religious places in its 139th Meeting held on January 22, 2004. A conceptual paper regarding the environmental improvement at Shirdi, Shani-Shingnapur and Alandi Devasthan was presented at this meeting and the concept of undertaking such projects in Maharashtra was in principle approved by the Board. It is decided to engage the services of M/s. Wilber Smith Associates Pvt. Ltd., Bangalore (WSAPL) to undertake the study of Shirdi, Shani- Shingnapur and Alandi so that a detailed assessment of the environmental problems, infrastructure and financial resources required to tackle these issues at the above places can be worked out in the first phase before the actual implementation of the project can be considered by the Board. The project proposals are based on the concept of eco-city project being implemented by MoEF/CPCB at Mathura, Vrindavan etc.

Dr. D.B. Boralkar

Member Secretary
Maharashtra Pollution Control Board

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1.0 PROJECT BRIEF

1.0 BACKGROUND

The land of Maharashtra is blessed by the holy stay of many great Saints and Spiritual Leaders. Some of the most important pilgrim destinations in Maharashtra are Pandharpur, Tulajapur, Shirdi, Shani Shinganapur, Alandi, Dehu, Ashta Vinayak etc. These pilgrim towns attract large number of pilgrims for various parts of the country. However, typically all these places are small towns/villages with populations ranging about a few thousands and hence lack the necessary infrastructure to cater to the large of pilgrims visiting them every year. As a result this has put lot of stress on the local natural resources and there has been a steady degradation of the local environmental conditions.

Considering the seriousness of the issues, the Maharashtra Pollution Control Board (MPCB), considered the implementation of a project on environmental improvement of religious places in its 139th meeting held on January 22, 2004. A conceptual paper regarding the environmental improvement at Shirdi, Shani Shinganapur and Alandi was presented at this meeting and the concept of undertaking such a project in Maharashtra was in principle approved by the Board.

The objective of the project is to identify the environmental problems of these religious places, prepare PFR document stating need of the sub-projects, block estimates to enable consider the appropriate funding sources through various agencies Government/private etc. so as to improve the overall environment and serenity of these places of religious importance.

For this purpose, MPCB has engaged the services of WSAPL to carry out a detailed assessment of the environmental problems, infrastructure needs in Alandi.

Based on the initial reconnaissance survey, the typical environmental issues and the areas for improvement of the related environmental infrastructure were identified and presented in the form of a Concept Plan, by the Consultant. The findings of the Conept Plan were discussed in the meeting held on 5th May 2005 at Maharashtra Institute of Technology, Pune with MPCB officials, AMC officials, Temple Trust and Members of the Shree Kshetra Dehu Alandi Parisar Vikas Samiti.

Further to preparation of the Concept Plan, Feasibility Studies for the shortlisted environmental improvement projects were conducted. This report presents the required improvements in various projects identified/prioritised in Alandi alongwith block cost estimates for the same.

1.1 STUDY AREA STUDY AREA

Considering the fact that all the activities and development of Alandi are linked to the Dnyaneshwar Maharaj Samadhi Temple and other religious places in the town, the study area for the present project is divided into two zones namely, the "Pilgrim Zone/Core Zone" of religious activities, and the "Alandi Town" of the regular civil life in the town. The area covered under the two zones is described below.

Pilgrim Zone	Area within the circular boundary of Old bridge, Nagar Parishad, Cosmos Bank, Markal chowk, Rath, Vadgaon chowk, Pradakshina Marg, Bharav road, Chakan chowk, new bridge and the Indrayani river. This essentially comprises the old Gaothan area.
Alandi Town	Remaining area within the municipal boundary. This comprises the area on the other bank of the river (Kalewadi), Dehu road, Charholi road, Datta Mandir, Padmavati road, Vadgaon road, Chakan road, road to water treatment plant etc.

1.2 REPORT STRUCTURE

This report is organised in Seven Chapters as below.

- The ***First Chapter*** of the report i.e. the present chapter discusses the background of the project, scope and the study area.
- The Eco city guidelines in the context of Alandi are discussed in the ***Second Chapter***.
- The water supply and sewerage scheme proposed for Alandi are presented in the ***Third Chapter***.
- The projects identified for solid waste management of Alandi are discussed in the ***Fourth Chapter***.
- Various suggestions for the beautification of the Indrayani Riverfront are presented in the ***Fifth Chapter***.
- The ***Sixth Chapter*** presents the proposed sullage utilisation scheme for Alandi.
- The ***Seventh Chapter*** deals with the various projects identified for roads and traffic improvement.
- Projects for development of eco-pilgrimage in Alandi are discussed in the ***Eight Chapter***.
- Other miscellaneous projects are presented in ***Chapter Nine***.
- The likely environmental benefits which can be achieved by implementation of the suggested environmental improvement projects are discussed in ***Chapter Ten***.
- A summary of all the above projects is presented in this ***Eleventh Chapter***.

The Seventh Chapter summarises the environmental issues in the town and suggests the projects, which may help to for integrated environmental improvement of the town.

2.0 ECOCITY GUIDELINES FOR DEVELOPMENT OF ALANDI

2.1 THE NEED AND APPROACH

Preparation and implementation of Master Plans / Development Plans and formulation of Development Control Regulations are the main tools of ensuring planned growth in urban areas. The plans and regulations are generally guided by the land use planning and physical planning perspectives of cities than the environmental conservation and protection.

While these aspects are important for any rapidly growing urban area, towns/cities with special character like religious importance, tourist interest, etc. need extra care in managing their growth and conserving their environmental resources. The Development Plans of these towns, irrespective of their size and growth patterns, should be guided more by their specific characters of development and factors of environmental importance than conventional planning guide lines. In the light of the above factors, the Development Plan of Alandi was reviewed with special emphasis on its suitability to conserve environmental resources and ensuring sustainable development. The out come of the above review was further correlated with the eco-city principles and the guidelines for developing Alandi as an Eco-city were prepared.

2.2 DEVELOPMENT PLAN OF ALANDI – A REVIEW

The Development Plan (DP) of Alandi was prepared by the Pune office of Town Planning Department, Government of Maharashtra and is valid for the period 1988-98. The plan follows the standard planning process based on UDPFI Planning norms and the guidelines of the MRTP Act 1965. The landuse map proposed in the DP is presented in Figure 2.1

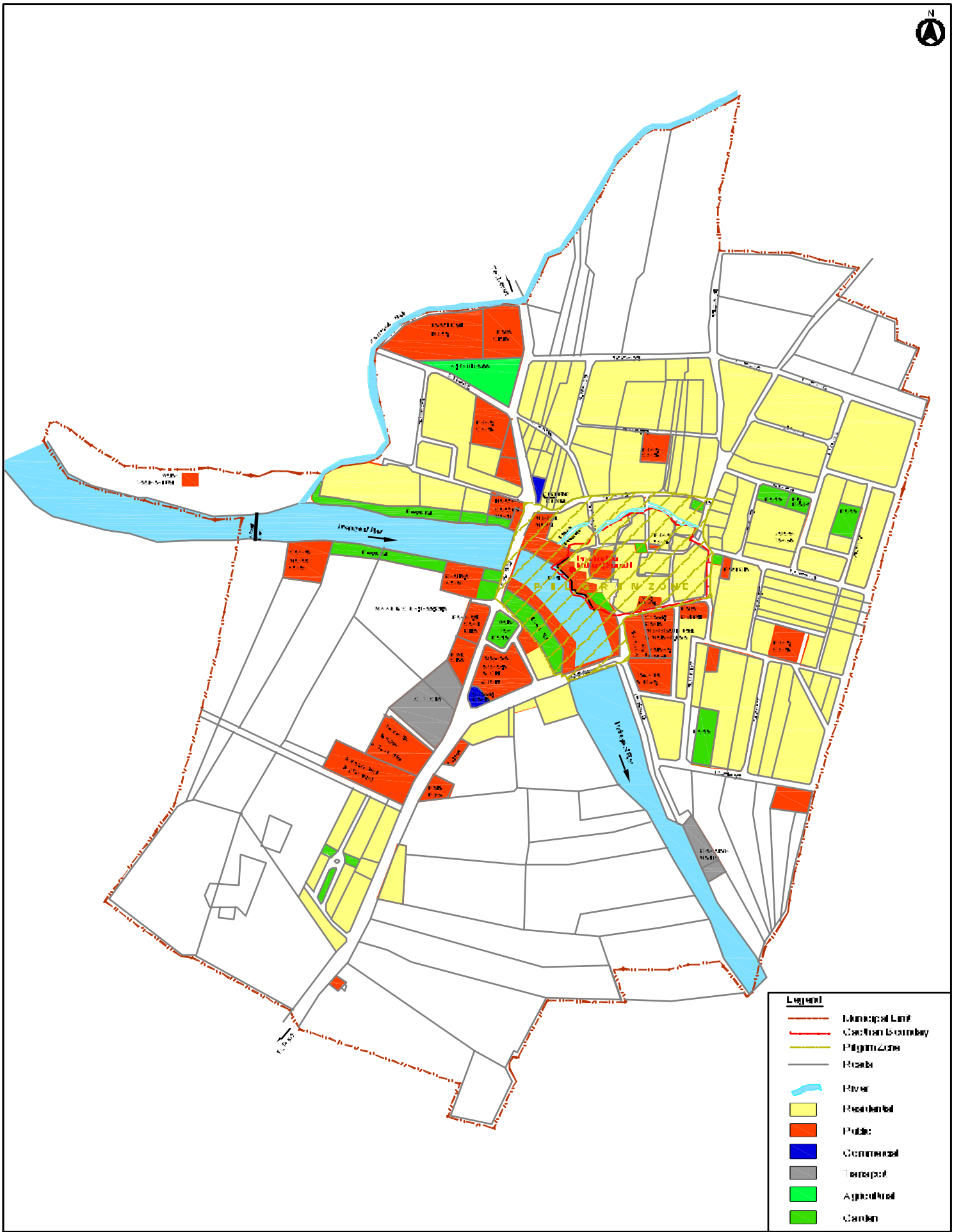
The plan proposes following land use development.

Table 1: Proposed land use for Alandi (1988 – 1998 DP)

Sl No	Landuse type	Area, ha	% to Developed area	%to Municipal area
		Ha		
1	Residential	65.31	58.31	23.90
2	Commercial	1.52	1.35	0.56
3	Public, Semi-public	13.70	12.23	5.02
4	Public utilities	1.31	1.17	0.48
5	Transport&Communication	20.96	18.71	7.67
6	Industrial	Nil	Nil	Nil
7	Open Spaces	9.22	8.23	3.38
	Total	**112.02**	**100.00**	
8	Agricultural	145.96	-	53.74
9	River and Water Bodies	15.17	-	5.55
	Total Municipal Area	**273.15**	**-**	**100.00**

Source: Development Plan for Alandi 1988 - 1998

Besides the above landuse it proposes following measures for improvement of the town.



CONSULTANT:
Wilbur Smith Associates Pvt. Ltd.

TITLE:
Figure No 2.1
Landuse Plan of Alandi - [illegible]

SCALE: Not to Scale

DATE:

CLIENT:
Maharashtra Pollution Control Board

PROJECT:
Action Plan for Environmental Improvement of Alandi

DWG. NO:

- Eight sites for garden and green belt are proposed while two sites for play ground are also proposed. In all, about 8 hectares of gardens, open spaces and play ground areas are proposed.
- A 12.20 m wide Bypass road from the old bridge near the PCMT bus stand along the eastern boundary of the municipal limits and encircling the developable area in the municipal limits is proposed. This will prevent the entry of the heavy traffic to Markal and other locations into the town and provide direct connectivity between Solu (Markal) Road, Charholi, Vadgaon Road, Bhosi Road and Chakan Road.
- The DP proposes a policy of not allowing industrial activity in the town. This will be beneficial to the town and maintaining its pilgrim town image and preventing environmental pollution.
- The existing crematorium is to be shifted to a new location 0.5 km further down.
- A compost site (approx 0.53 Ha) is proposed near the crematorium along the eastern municipal boundary.

While the above proposals cater to some of the development requirements of the Alandi town, a close analysis of the plan indicates the following.

- The DP has anticipated a population of 14552 by 2001 at an average growth rate of 44.51%, whereas the actual population in 2001 as per the census is 17565 at a growth rate of around 54.91% These deviations can be attributed to the tourist characters of the town that act as a catalyst to the socio-economic growth of the town and associated population growth.

  In view of the above, the Development Plan for towns like Alandi shall consider the trends of floating population and factor the growth trends into the population projections. This can be best done by adopting projection methods such as polynomial projections (graphical) that suggests the best fit population growth curve for any city.

- The Samadhi Temple of Saint Dyaneshwar, and associated religious structures are the main focus points of development in Alandi. In view of the above, the land use allocation for the area around these structures and the rest of the town shall be planned separately with a holistic view of developing the town. Such an emphasis seems to be missing in the current development plan.

- Due to large influx of tourists / pilgrims, the natural resources such as the River Indrayani, land and other environmental resources are strained to a greater extent in Alandi. It is therefore very important to include protection and conservation of natural resources and places of religious importance of the town, which is missing in the present development plan.

  This should comprise appropriate Development Control Regulations (DCR) for the built form and also the development along the river body.

- Similarly, the DP does not provide a definite direction to the growth of the town and there are no specific proposals to create an image to the town.

- The other aspects such as proximity of the town to large cities namely, Pune and Pimpri – Chinchwad, and industrial estates of MIDC at Chakan and Markal should also be considered while proposing the land use.

- The implementing agency is the Alandi Municipal Council (AMC). AMC does not

have the technical expertise and finances to implement the plan.

In the light of the above discussion, it is important to plan the city with an objective of environmental conservation and sustainable development than the conventional physical planning and land use planning approach. For this purpose, the concept of eco-city and its principles are reviewed in the following section and the same is used to evolve guidelines for the development of Alandi.

2.3 THE ECOCITY CONCEPT

No human settlement stands still--they are dynamic elements of stone, wood, flesh and exuberant energy with imprints of ancient forces of nature and history. Learning to respect these volatile forces and design less destructive ecosystems will bring nature into the cities/towns, and the cities/towns into human hearts.

Strategic planning should include following basic principles or sectors of incorporating sustainable principles to eco-city design. These seven components are interrelated, influence one another so that once transportation systems are changed with more pedestrian and cycle roads, they will in turn, minimize energy use or consumption. Eco-city planning can be divided into these elements or components; land use, water, energy, socio-economic aspect to create an ecological urban skeletal structure.

Alandi's problems are manifold, and greater control over the growth of the town must be exerted with appropriate planning and addressing environmental issues with an understanding of the local environmental system and proper assessment of the consequences of future plans.

The basic principle of the ecocity can be simplified as, "in an ecocity, people can live, work, shop, and play all within a short distance".

The more diverse and compact land use patterns with a hefty infusion of natural and agricultural restoration, appropriate technologies for energy conservation, effective recycling, widespread gardening, composting, waterbody restoration, building of lively city and neighborhood centers with plazas to host vital social and economic life and so on, we begin to visualize what ecological cities are all about."

This can be achieved by bringing together energy, transportation, trees, urban horticulture, zoning and legislation, financing and economic systems, recycling, air, development design, restoration of waterbodies, city history, work, participatory democracy, student activism, and whole systems thinking about society.

"Transportation is what you do when you're not where you want to be," says Register, so the solution to smog, gridlock, greenhouse gasses, and the expense of owning a car is to gather together the places people want to be. The transportation of choice will be feet first, bicycles second, public transit third, and only then, the automobile.

2.4 MODEL ECOCITY PRINCIPLES

- Model areas should be structured for mixed use with optimum ratio between residential, commercial, production and recreational uses.

- Density of development should be optimised with regard to the contradictory requirements of transport, ecology, economy, and social and hygienic aspects.

- Local culture and historical heritage should be protected and further cultivated.
- Green spaces for recreation are inevitable for human health and must be present in all neighbourhoods.
- Lines of new urban structure should be derived from the existing urban and regional environment to back up continuity.
- Urban structures and buildings should be designed to allow variability, extensibility, retrofitting, reusing or functional conversion.
- Housing should be provided at all levels and scales serving different needs of different groups of population, including affordable and social housing.
- Streets and squares should respect the human scale and be shaped in interconnected structure of specialised and logically composed public open spaces, with attractive and user friendly design.
- Urban environment should not contain architectural barriers to accessibility so that also disabled and disadvantaged people could be able to use al facilities without discomfort.
- Non-toxic and natural building materials from a renewable resource should be preferred, considering also the durability and the life cycle of the building.
- Local sources (materials, labour) should be preferred wherever possible.
- Layout and location of buildings should take advantage of the natural daylight and of passive cooling/heating.
- Compact buildings (such as terraced houses and multi-storey building complexes) bring considerable energy savings and should be preferred by developing new structures in model settlements.
- Pedestrians' and cyclists' paths should represent the main grid of the inner district traffic.
- Basic facilities should be located to allow best accessibility by pedestrians
- Motor traffic should be reduced as much as possible.
- Inhabitants, especially in the residential areas, should be released from the negative impacts of transport and industry such as noise, air pollution and vibrations.
- All the important targets in the city district should be serviced by public transport.
- Traffic speeds should be reduced to make the street safer and pedestrian friendly.
- The consumption of land through car parking as well as other negative effects of car parking should be reduced to the lowest possible level.
- Previously disturbed areas should be restored and/or redeveloped.
- The extent of impervious surfaces should be kept at minimum.
- All resources must be recycled and reused keeping the waste production to the lowest

possible level.

- Water consumption should be reduced while assuring equal distribution of potable water for all inhabitants and households.

- Energy consumption of the settlement should be reduced using energy-efficient technologies and saving programmes.

- In addition to the reduction of energy demand, also alternative sources should be introduced.

- Natural elements such as trees, vegetation and water are to be used to improve climatic conditions, ecological stability as well as aesthetic values of the urban environment.

Broadly, an ecocity should have the following aspects installed into its function.

A. Energy conservation and efficiency

a. Use of available options of alternative energy technology
b. A city can formulate policies that can promote the use of alternative energy sources. All aspects of energy consumption and use of petrol/diesel should be targeted to enable energy efficiency in real sense.
c. Emphasis on city forms and policies that reduce reliance on fossil fuels such as petrol and diesel.
d. Efficient public transit that reduces individual energy consumption.
e. Promotion of architectural principles that utilize maximum available natural light and ventilation.
f. Promotion of green products that save on energy costs
g. Community awareness on energy conservation.

B. Effective solid waste management

a. Installing waste to energy mechanisms to create a cyclic closed urban system.
b. Exploring alternatives wherein industry waste exchanges are facilitated
c. Creating proper mechanisms of handling bio-medical and hazardous waste.
d. Establishing norms for effective disposal and treatment of all waste, including bio-medical and hazardous waste.
e. Promotion of composing technologies to convert bio-degradable waste into rich composts for gardens/agriculture (organic farming, vermicomposting).
f. Promoting green products that utilize less packaging, use less resources and create less non-degradable waste after use.
g. Community mobilization for cleanups and awareness.

C. Efficient transportation

a. Promote the use of non-polluting public transit by creating easy, fast and assured service.
b. Promote bicycling and install infrastructure to allow easy and efficient cycling within the city.
c. Restrict polluting vehicles and establish stringent norms for pollution control.
d. Remove polluting public transit operations, facilitate non-polluting options by creating easy demand and supply mechanisms.
e. Develop and maintain proper road networks, streamline roads to avoid congestions, implement stricter driving regulations.

D. Addressing environmental issues and risks

a. Air quality monitoring and setting in place policies that control and reduce air emissions and improve ambient air quality.

b. Water quality monitoring and setting in place policies and actions to improve the existing water quality of natural sources such as wells, lakes, rivers etc.
c. Addressing land contamination issues, land use planning etc.
d. Bio-diversity protection and conservation actions and strategies.
e. Promoting green areas and open spaces and installing mechanisms to effectively protect, improve and sustain existing natural areas.
f. Global environmental issues like climate change, ozone depletion etc need to be addressed at all levels.

E. Self sufficiency and sustainable economic development

a. Plan for city's ecological carrying capacity limits.
b. Install mechanisms to implement environmental considerations in trade transactions.
c. Promote locally grown foods and facilitate distribution networks to bridge the gap between food demand and supply.
d. Encourage local enterpreneurship by focussing on marketing of traditional skills and techniques.
e. Local capacity building through training and awareness programmes.
f. Facilitate mechanisms for affordable housing, housing improvements etc.

F. Community participation and decision making

a. Mobilize community groups to come and act together to improve social and environmental health.
b. Utilize community participation for a consultative as well as decision making role.
c. Continuous education and capacity building of the community to enable informed decision making.
d. Evolving public-private partnerships, industry private sectors participation and collaborations within local NGOs and various community organisations.

G. Improving environmental governance and municipal services

a. Local authorities and processes should be flexible enough to incorporate changes and affect implementation without delay.
b. Transparent decision making with citizen's support.
c. Free sharing of information and open discussions with the community and experts.
d. A shift to efficient processes and mechanisms to facilitate innovative solutions.
e. Installing effective financial management, municipal expenditures, personal management etc.
f. Improved and efficient public facilities and municipal services, developing eco-sensitive infrastructure like roads, water supply, wastewater collection etc.

2.5 GUIDELINES FOR REVISION OF DEVELOPMENT PLAN FOR ALANDI ON ECOCITY PRINCIPLES

Based on the above principles and the 1988-98 DP of Alandi and assessments of existing development through reconnaissance survey in 2005 within the municipal area, the following guide lines / activities are recommended to develop Alandi as an Eco-City:

Since the existing development plan is has expired in 1998, the development plan to be revised shall be prepared with the integration of eco-city principles to the convention development planning process. This shall comprise the following.

- A detailed survey of the existing land use should be carried out to map the changes in land use, and identify areas of mixed land use, which is an important feature of all Indian Towns that have grown organically.
- A survey (or analysis based on secondary data) should be undertaken to ascertain the number of pilgrim visiting the time during lean season, peak season and festival times and a realistic estimate of floating population.
- Divide the town in two broad zones one which has more of the pilgrim activities called the "Pilgrim Zone" and the other area regular civil life of the town called as "Alandi Town". Land use and infrastructure planning shall be carried for each of the zone separately, keeping their special characteristics.
- The Pilgrim Zone in Alandi would comprise of an Area within the circular boundary of Old bridge, Nagar Parishad, Cosmos Bank, Markal chowk, Rath, Vadgaon Chowk, Bharav road, Chakan chowk, new bridge and the Indrayani River. This essentially comprises the old Gaothan area.
- Declare a Pilgrim zone as an entirely pedestrian zone with access only to 2 – 3 wheelers and emergency vehicles.
- The significant land uses in the town are temples, Dharmashalas, commercial area (shops) and residential areas. It is necessary to allocate land for new Dharmashalas, Hotels and Lodging areas keeping in mind their proximity to the temple area. These need not be in the Pilgrim Zone but can be on the fringe of the Pilgrim Zone.
- The Dharmashalas in Pilgrim Zone, which are old and need reconstruction, can be allocated land in the fringe area. The area vacated can be used for developing open spaces / gardens.
- The land requirement for these should take into account the number of visitors, number of vehicles (Parking spaces) and sanitation facilities to be provided to the pilgrims.
- Land use in the Pilgrim Zone should be restricted to those associated with the temples other uses such as government offices. Bus stand can be relocated to suitable areas outside the Pilgrim Zone.
- During the two festivals of Ashadhi and Kartiki Ekadashi in the months of July and November respectively, lakhs of pilgrims (Varkari) gather in Alandi for 2 to 3 days. Since these events are fixed annual events and the influx of pilgrims during this period is significantly large compared to the resident population of the town and the available infrastructure, appropriate reservation of lands within the town and on its outskirts should be made in the DP for making temporary shelters and tents arrangements for the pilgrims.
- Similarly, additional open area in the Pilgrim Zone should be identified and reserved for temporary commercial activities during these periods.
- The Bypass Road proposed in the DP should be taken up for implementation immediately to avoid through traffic passing from the town. The alignment of the road shall be finalised based on detailed traffic / engineering surveys and also, based on the existing and proposed new industrial and other regional developments.
- It shall be made mandatory in the DP that all the large paved areas such as the AMC

parking lot; PCMC and PMT bus stands and other government / public institutions shall have rainwater-harvesting systems installed.

- In addition to the green belt proposed along the riverbank, suitable land uses such as institutional areas, meditation centres; ashrams etc should be proposed along the river bank upstream of new bridge and downstream of old bridge.
- Non- conforming uses such as commercial complexes, hotels, lodging boarding areas etc should not be permitted along the riverbanks these could be allotted land in new developing areas near Dehu Pahta, Kalewadi etc in Haveli Taluk and other areas in Khed Taluk.
- It should be mandatory for large commercial buildings, office complexes, hotels and dharmashalas to install rainwater-harvesting systems. A norm for the plot area and built up area should be fixed above which all buildings should have a rainwater harvesting system.
- Hotels and Dharmashalas should be encouraged to use non conevtional energy sources to the maximum possible, such as solar panels for water heating.
- The portion of the Pradakshina Marg from Vadgaon Chowk to Chakan Chow has many old Dharmashalas, this is the only street which has retained the old vernacular character. It can be declared as a heritage zone and appropriate guidelines be developed. A detail survey for other individual building of such importance should also be undertaken.
- A tourist Map of Alandi should be prepared and displayed at important places such as the Samadhi Temple, ghats entry points to the town etc. Appropriate signage for road names, junctions should also be developed and installed.
- The Temple trusts, Municipal council and citizens groups, non-governmental organizations, associations of pilgrims ("Phads" and "Mandals") should work in close co-ordination in developing and implementing proposals for Alandi.
- An environmental monitoring system should be developed to assess the impact of the high volume of pilgrim traffic on Alandi. This will serve as a guideline for future planning proposals.
- Citizens and Pilgrims should be encouraged to minimize the use of plastic and other non-biodegradable waste.

3.0 SEWERAGE SCHEME

3.1 INTRODUCTION

Alandi town, spread over an area of 6.83 sq. km. and located on the banks of River Indrayani presently does not have a sewerage scheme. Most houses of the town have water seal latrines with septic tank arrangement. The town has a predominant population belonging to the lower economic strata and sanitation situation is inadequate in such areas. In many areas of the town, sullage water and domestic sewage are let into storm water drains. As there is no Sewage Treatment Plant (STP) in the town, untreated sewage from the open drains is discharged into open areas resulting in unsanitary conditions. Overall, sanitation situation in the town is not satisfactory and hence needs improvement.

3.2 EXISTING SYSTEM

Alandi is a pilgrim town in Maharashtra near to Pune. The Town has a population of 17565 persons as per 2001 census. The average daily floating population is estimated to be 8000. Based on the information provided by Maharashtra Jeevan Pradhikaran (MJP), during normal season the town is supplied with potable water at the rate of 80 to 90 litres per capita per day (lpcd). The water supply rate for the floating population is 20 lpcd. The expected wastewater generation rate is about 80% of water supplied. The water utilized for domestic activities such as bathing, floor washing, cooking, utensil washing etc., forms about 70% of wastewater generated. This wastewater, called Sullage, is allowed separately though underground drainage system. The wastewater generated from water closets (about 30% of wastewater generated) are either disposed into septic tanks followed by dispersion trenches or to the two pit dry latrine system.

3.3 PROPOSALS FOR THE NEW SEWERAGE SYSTEM

Design of the sewage collection system for Alandi shall be performed, to the extent possible, by gravity assistance. From the land use plan for Alandi municipality, it is determined that the town to a significant extent maintains residential status with adjoining areas having the industries.

Trunk mains are used to collect and convey the sewage flow received from secondary collection systems through a network of lateral sewer lines. The maximum depth of excavation for laying the sewer shall be limited to six meters. Based on the available survey data on topographical and prepared contour maps, the proposed sewerage system shall be divided into three distinct sewerage zones. The alignment of trunk gravity main in each zone shall be selected with due consideration to natural slope and other important landmarks.

Pump Stations are normally required in a sewage collection system to lift the sewage against a gradient or to limit the depth of cutting of the pertinent sewer line. A simplified form of the pump station, called a Lift Station, is also employed for the same purpose. The primary difference between a pump station and a lift station is that the pump station shall handle greater flows with arrangements for removal of floating material and grit prior to pumping through a force main. Lift stations will have only an enlarged manhole as a wet well with pumps installed and a small control room adjacent to it, for lifting the sewage to ground level. Lift stations are generally used to restrict the depth of cutting and discharging normally to the manhole in a downstream trunk sewer. No screens and grit wells are provided in lift stations

Based on the CPHEEO manual, for the cities provided with piped water supply where sewerage system is contemplated, the water supply demand is 135 lpcd.

The projected population for the year 2031 is 60505 and presuming the increase in floating population of the same tune. The water demands for the domestic purpose is considered as 135 lpcd as cited in the CPHEEO manual and for the floating population it is considered as 70 lpcd. The following table indicates the sewage generation including 1000 lit/Km-d of infiltration flow.

Table 3.1 : Sewage Generation in Alandi

Status	Resident Population	Demand @135lpcd (MLD)	Floating Population	Demand @ 70 lpcd (MLD)	Total Demand (MLD)	Sewage Generation (MLD)	Infiltration in MLD @ 1000 lit/Km-d	Total Sewage (MLD)
Census (2001)	17565	2.37	8000	0.56	2.93	2.35	0.02	2.37
Ultimate (2011)	26988	3.64	10000	0.70	4.34	3.47	0.02	3.49
Ultimate (2031)	60515	8.17	20000	1.40	9.57	7.66	0.02	7.68

The total sewage generation in Alandi in the year 2031 is estimated to be 7.68 Mld Alandi is a pilgrim place attracting many of pilgrims. Hence it is essential to have additional sanitation facilities for the pilgrims during the festival periods. A marginal provision of 10% additional sewage is considered in the system. As the capital cost of the sewerage system depends on population and water demand considered and the festival period will be conducted four days in a year. Hence it is better to meet the additional facilities required through tankers collection system / septic tanks and soak-pits.

Based on the above considerations, an underground sewerage system covering the entire Alandi town has been designed for a period of thirty years to improve sanitation facilities for the residents of the town. The costing is done based on the proposals of underground sewerage scheme which consists, but not limited to, the following:

Features of Proposed Underground Sewerage Scheme and Sewage Treatment Plant

- A sewage collection system comprising manholes, lateral sewer lines and trunk sewers which shall cover a minimum 85% of the town road length and convey sewage to the maximum possible by gravity assistance
- All the streams presently carrying sewage should be collected to this network, to not to allow direct disposal of untreated sewage into the river.
- Alandi being a at elevated place and possibility of groundwater table being low, the depth of excavation may be limited to 6 m below GL
- At locations where the depth of excavation exceeds to stipulated depth, a sewage pump station shall be installed to convey sewage through pumping to a downstream manhole through a bell-mouth chamber
- Sewage collected from all zones through gravity/pumping shall be pumped from the Main Sewage Pump Station to the influent distribution chamber of the STP
- An STP of 8 MLD capacity is proposed to be constructed in two phases of 4 MLD each.
- Additional Holding Ponds with precast revetment, of 2 MLD capacity each are proposed to be provided to collect the sewage generated during the festival period. The sewage collected in the Holding Ponds would be passed through the treatment units subsequently.

Table 3.2 Area calculations for STP

Sl.No.	Type of Treatment	Area / MLD		Total Area Required for 8 MLD (Ha)
		Range	Nominal	
		Ha. / MLD	Ha. / MLD	
1	Multiple Pond System (An.P+FP+MP)	1.00 - 2.80	1.5	12.0
2	Aerated Lagoon System (AnP+AL+MP)	0.60 - 0.80	0.7	5.6
3	UASB System (UASB + AL + MP)	0.50 - 0.70	0.6	4.8
4	Conventional ASP	0.20 - 0.25	0.25	2.0
5	Extended ASP	0.18 - 0.22	0.2	1.6

- Pursuant to availability of land it is a better option to go for a conventional ASP.
- Based on site visits and discussions with pertinent officials, municipal land for an extent of 4-5 acres is available for installation of the STP
- Also, looking into the availability of agricultural land, proposed development of green belts in the town , the treated sewage can be used for land irrigation.
- It is also suggested that other advanced technologies such as Submerged Aerobic Fixed Film Reactor (SAF), Fluidized Aerobic Bioreactor (FAB) and Membrane Bioreactor (MB) may be suitably adopted for sewage treatment. However, these technologies require most cost investment, skilled manpower and supervision and hence have been generally used in adopted in controlled conditions such as industries for their townships, hotels.

3.4 PHASE WISE IMPLEMENTATION

For proper functioning of the sewerage scheme, it is essential to ensure adequate flow of sewage into the network and the STP. Hence considering the present population of the town, spread of commercial and religious activities and to satisfy the immediate need of the town and phasing of the investment, it is proposed to develop the sewerage scheme in two phases for the year 2011 and 2031 as below.

Phase I – 2005 to 2011 (High Priority)

- Development of an underground sewerage scheme covering the Pilgrim Zone and adjoining area on the left bank of the river such as Markal road, Vadgaon roadetc. which has an area of about 3.5 sq. km.
- At present, most of the residences, dharmashalas, religious activities, market and commercial activities are concentrated in this area. Hence the area needs to be provided with the sewerage scheme on priority.
- Construction of an STP of 4 MLD capacity and a 2 MLD Holding Pond on the left bank of the river downstream of the old bridge near the proposed site for crematorium.

Phase II – 2011 to 2031 (Medium Priority)

- Development of underground sewerage network covering the area on the right bank of the river. This area at present has limited activities.
- Construction of an STP of 4 MLD capacity and a 2 MLD Holding Pond on the right bank of the river opposite the Phase I STP.

3.5 CAPITAL COST

Cost of the proposed improvements to the sewerage system is listed in Table 3.3. The cost estimates have been prepared based on the MJP SoR and consultants data bank.

Table 3.3 : Project Cost

Sl No.	Description	Phase I (2005 –2011)	Phase II (2011 –2031)	Total Cost (Rs. Lakhs)
1	Collection system	150.00	100.00	250.00
2	Pumping stations and pumpingmain	50.00	50.00	100.00
3	Sewage treatment plant	115.00	115.00	230.00
	Base Cost of UGD system	**315.00**	**265.00**	**580.00**
	Physical Contingency 5 %	15.75	13.25	29.00
	Supervision & quality control 2 %	6.30	5.30	11.60
	DPR cost 2 %	6.30	5.30	11.60
	Total Cost	**343.35**	**288.85**	**632.20**

4.0 SOLID WASTE MANAGEMENT

4.1 EXISTING SCENARIO OF SOLID WASTE MANAGEMENT

Collection, transportation and disposal of municipal solid waste is an obligatory function of the urban local body, in this case, the Alandi Municipal Council (AMC). The municipal solid waste mainly comprises waste from the Shri Dnyaneshwar Maharaj Samadhi Temple complex and other religious places in the town, households, markets & commercial establishments, hotels & restaurants, guest houses (dharmashala) which are also used as marriage halls, and hospitals in the town. AMC's Health Department, headed by a Sanitary Inspector, is responsible for the solid waste management in the town.

4.2 SOURCES OF SOLID WASTE GENERATION

On an average, about 8000 people visit Alandi daily. The number increases on monthly Ekadashi days. During Kartiki and Ashadhi Ekadashi days in the months of November/December and June/July respectively, the number goes as high as 5 lakhs. The pilgrims stay for 2 days in Alandi on these occasions. The prime solid waste generating sources in the town are the temple complex, households waste, and other bulk waste generating sources such as hotels, restaurants, markets, shops, and marriage halls. There are no industrial units within the limits of the Alandi Municipality or in its proximity. Hence, there is no industrial waste generated in the town.

4.3 QUANTITY OF WASTE

As per the AMC Heath Department's estimate, Alandi generates about 5 tons of waste per day that gives a per capita generation of about 285 gm for a population of 17565 (2001 census). However, considering an average daily floating population of about 8000 people visiting Alandi generating about 0.4 tons of waste (@ 50 gm/capita), the per capita waste generation in Alandi is estimated to be around 260 gms.

As per the CPHEEO manual, for towns which fall under the range of below 5 lakh population, the generation of waste shall be around 210 gm per capita per day. Similarly the Central Pollution Control Board (CPCB) in its Publication "Management of Municipal Solid Wastes – Status and Options" estimates the daily per capita solid waste generation in small, medium, and large cities / towns in India to be 0.1 kg, 0.3 to 0.4 kg, and 0.5 kg per capita respectively. Further, National Institute of Urban Affairs (NIUA), the apex body of urban management, anticipates the per capita solid waste generation to be around 0.35 to 1 kg/ cap/ day. From the above norms, the per capita waste generation for the Alandi will be in the order of

- 210 gm / capita as per CPHEEO
- 300 to 400 gm / capita as per CPCB and
- 350 gm / capita as per NIUA guide lines

However considering tourist characteristics of the Alandi, the per capita values are expected to be on the higher side and hence the estimated figure of 285 gm per capita per day is considered appropriate.

According to AMC, daily collection of waste is about 4 tons, estimate based on the vehicle capacity and number of trips per day. The vehicles, a tractor of 1ton capacity and a mini lorry of 4 ton capacity, perform totally 4 trips per day. Considering the bulk density of the

solid waste as 0.35, the actual collection of the waste is only 3.5 tons per day. About 1.5 ton of waste is left unattended, thus totalling to 5 tons waste generated per day.

4.3.1 Waste generation during fairs

During the Ashadhi and Kartiki fairs, about 5 lakh pilgrims stay in Alandi for 2 days. The waste generated during the fair season is estimated to be 30 tons during the two days.

4.3.2 Household Waste

In Alandi, the quantum of waste generated from households is about 1.5 tons per day, which is 30 percent of the total waste generation of the town. The household waste mainly consists of organic waste such as vegetable waste, food etc. Significant quantities of paper and plastic are also present in the waste.

4.3.3 Street Sweeping and Drain De-silting

The other sources of waste generation in Alandi are street sweeping and drain de-silting activities. As per the CPHEEO manual, the per capita waste generation from street sweepings is estimated at 0.05 kg/ cap / day. Similarly, the waste generated by drain cleanings is estimated at 0.1 kg/cap/day as per norms specified by the CPHEEEO manual. However, based on the discussions with the Sanitary Supervisor, it is estimated that Alandi generates around 1ton of waste per day from street sweepings and drain cleaning, which is about 20 percent of the total waste generation

4.3.4 Commercial and Hotel Waste

Commercial establishments like hotels & Dharmashala, restaurants, shops and trade centres generate solid waste to a quantum of 1.5 tons per day. Alandi being an important sacred place in the region, there are many Dharmashalas (guest houses) in the town. Their number is estimated to be about 350. These Dharmashalas are also used for performing marriages throughout the year. A significant amount of solid waste is generated from these Dharmashalas, particularly during marriage season. The total commercial and hotel waste constitute about 30 percent of the total waste generation of Alandi.

4.3.5 Vegetable Market Waste

Alandi has two vegetable markets viz; near Markal chowk and in the AMC parking area at Chakan chowk. In addition, daily vegetables shops are also set up along the stretch from New Bridge to the Chakan chowk. There is no meat markets in the town. The total waste generated from both the vegetable markets is about 0.5 tons per day constituting 10 percent of the total waste. The waste is mainly organic in nature.

4.3.6 Bio-medical Waste

Alandi has a 6-bed capacity primary health centre (PHC) of Zilla Parishad. The PHC also handles maternity cases. In addition, Alandi has about 35 clinics. The daily biomedical waste generation from the PHC is about 4 to 5 kg (0.004 ton), of which about 0.002 ton is non-infectious and non-hazardous waste. The waste generated in the PHC and maternity home is disposed off by burying / open air burning, or alongwith the municipal solid waste. Since the hospital comes under the PHC category, they do not have any boi-medical waste management system.

Table 4.1 shows the categories and quantity of waste generated by various sources in Alandi town.

Table 4.1 : Categorisation of Waste

Source of Waste Generation	Quantity	Total
	(MT/day)	*%*
Samadhi Temple complex	0.5	10.0
Households	1.5	30.0
Hotels (Dharmashala), restaurants and commercial establishments	1.5	30.0
Vegetable markets	0.5	10.0
Street sweepings, drain de-silting and others	1.0	20.0
Hospital waste (non-infectious and non-hazardous)	0.004	0.1
Total	**5.0**	**100.0**

Source : Analysis and discussions with AMC officials

4.4 COMPOSITION OF WASTE

No data on the waste composition was available with the AMC. Based on the field visit, discussions with the health department officials and the Consultant's understanding, it has been estimated that the organic content in the waste is about 50 percent. The higher organic content is due to the organic waste generated from the religious activities taking place in the town. Physical composition of waste for the town of similar size indicated in CPHEEO manual is given in Table 4.2.

Table 4.2 : Physical Composition of Waste

Parameter	% of Waste as per CPHEEO Manual	% of waste in Alandi (in %)
Total organic content	44.57	50
Paper	2.91	50
Rubber, leather & synthetics	0.78	
Glass	0.56	
Metals	0.33	
Inert Materials	43.59	

Source: CPHEEO Manual on SWM

4.5 COLLECTION OF WASTE

4.5.1 Primary Collection

At present, AMC does not have any primary collection system. The individual households dispose their waste into dustbins along the streets by their own means. AMC has provided about 100 RCC dustbins at various locations covering the entire town of Alandi for effective collection of waste. Dustbins have been provided on all major and minor roads and the average spacing of the dustbins is about 150 to 200 m (average 180 m for a road length of 18 km). However, this spacing is not uniform through out the town and it varies from place to place depending on the density and locality.

The reconnaissance survey conducted in the town and discussion with the AMC officials reveal that many of the households, shops and commercial establishments throw the waste on to the streets, drains, open spaces and along the river banks creating unhealthy conditions.

Further, the waste thrown into the open drains is leading to choking and as a result, the wastewater flows on the streets rather than in drains and forms wastewater pools at certain locations.

Street Sweeping. One of the major activities in the solid waste management is the street sweeping activity, which is time consuming, and labor intensive. In addition to street sweeping, due to the open drainage system in some part of the town, drain desilting is also essential. AMC carries out street sweeping and drain de-silting in the entire town. The total length of municipal roads and streets in Alandi is 18 km. The total length of open drains is not available. The manpower employed for the sweeping and cleaning operations include; 24 sanitary workers for street sweeping, 10 worker for drain de-silting activities, 6 workers for cleaning public toilets, 8 workers for solid waste collection from dustbins (@4 per vehicle), thus adding up to 48. In addition, there are 2 drivers and 1 supervisor. Total road length per sweeper @ 20 sweepers present per day, works out to be 0.9 km as against the desirable 0.4 to 0.6 km/sweeper. The sweeping operation is carried out in two shifts during the day covering different parts of the town.

Due to lack of sufficient manpower with the local body, frequency of the street sweeping and de-silting activities is not uniform all over the town. Depending on the locality and necessity, street sweeping is undertaken on the priority basis. However, main residential and other important areas are swept daily and some of the areas are swept occasionally.

4.5.2 Secondary Collection

The secondary collection refers to collection of waste from community dustbins and intermediate collection points or transit points. However, in Alandi, there are no intermediate collection points or transit points and the waste is directly transported to the disposal site from dustbins.

Waste is collected from dustbins and open dumping sites in the town and manually loaded onto the transportation vehicles. In addition to community dustbins provided by the AMC, there are number of places where people dump the waste. Waste is also collected from these undesignated waste-dumping points.

4.5.3 Frequency of Collection

The frequency of waste collection from the dustbins and other dumping points in the town varies depending on the quantity of waste accumulation and the locality. The waste from prime residential locations, commercial areas, public places like markets, bus stand etc is collected every day. The waste from the temple area is collected once in two days.

4.5.4 Transportation of Waste

In Alandi, waste transportation is carried out using open vehicles. AMC has two vehicles; a tractor and a mini lorry (Tata 407), for solid waste transportation. Both the vehicles are in operational condition. The total transportation capacity available with AMC with the two vehicles is around 10 tons with each vehicle making two trips per day. However, considering the bulk density of the solid waste as 0.35, the actual collection of the waste is only 3.5 tons per day. The following table shows the details of solid waste transportation vehicles.

Table 4.3 : Details of Transportation Vehicles

Description	Mfg. Year	Ownership	Nos.	Capacity	Trip/day/ vehicle	Total waste
				Ton	*No.*	*ton/day*
Mini lorry (Tata 407)	1995	AMC	1	4.0	2	8.0
Tractor	1990	AMC	1	1.0	2	2.0
Total			**2**	**5.0**	**4**	**10.0**

Source: Alandi Municipal Council

4.6 DISPOSAL OF WASTE

At present the waste is disposed by mere dumping on an open area beyond the AMC limit. Waste is dumped on the site manually in heaps and left as it is. The area is not covered after dumping.

4.6.1 Waste Disposal Sites

Presently, the solid waste is dumped in a roadside open land near Vishrant Vad on Vadgaon road. However, this site is located about 1 km beyond the AMC limits. It was observed that the light materials such as plastic and paper are carried by wind to distant places, and the situation around the site is unhygienic. It was also observed that the biomedical waste is also disposed off along with the municipal waste.

In addition to the existing solid waste disposal site at Vishrant Vad, solid waste was also used to be dumped at two locations mentioned below, without any covering.

(i) Near the existing crematorium on the right bank of the Indrayani river near old bridge
(ii) On Padmavati road near slum

These two sites have been discontinued due to the environmental hazards posed by them and the objection of the local residents. However, the waste is still lying there and finds its way into the adjacent residential area and the Indrayani river. The Padmavati road waste disposal site surrounded by a slum area having a population of about 500, which is exposed to the health hazards due to the dumping of solid waste in this area. The waste from the disposal site adjacent to the river also enters into the river. Human body parts from the crematorium are also sometimes disposed into the waste heap at this location. Both the sites need to be immediately cleared of the waste dumped there.

Table 4.4 : Details of Solid Waste Disposal Sites in Alandi

Location	Type of Disposal	Approx. Area (sq.m)	Distance from town	Year of Commissioning
Vishrantvad (Grazing land of Charholi Khurd village)	Land disposal	1500	1 km	2002-03
Padmavati road	Land disposal	900	Within town	Approximately since 1985
Crematorium along right bank of Indrayani river	Land disposal	700	Within town	Used only for 1 year in 2002

Source: AMC

The existing solid waste disposal site is located on the Vadgaon road at about 1 km from the

AMC limits. The area of the site is about 1500 sq.m. The site is in use since 2002-03. This site is adjacent to the main road and also a religious place called Vishrant Vad (a holy Banyan tree), which is visited by thousands of pilgrims during the fairs in Alandi.

Table 4.5 : Salient Features of Existing Disposal Site.

Component	Description
Area	1500 sq.m
Ownership	Site falls within the boundary of the Charholi Khurd village. Grazing land
Distance from the town	1.0 km beyond AMC limit on Vadgaon road
Approach road	BT road
Year of commencement	2002-03
Distance from nearest human habitat	1 km
Fencing around the site	No
Facilities and equipment at the site	Nil
Waste disposed per day	4 ton
Waste disposal method	Open dumping. Waste heaps formed due to unloading from the vehicle are left as it is. There is no practice of flattening the waste and covering it with inert material.
Existing condition of the area	This site is adjacent to the main road and also a religious place called Vishrant Vad (a holy Banyan tree), which is visited by thousands of pilgrims during the fairs in Alandi. The area is an open plot of land adjacent to the road. There is no fencing to the site The situation has become unhygienic and worsens during the rainy season, during which rainwater is accumulated in the site, forming mosquito breeding grounds.. The possibility of groundwater contamination due to open and haphazard dumping cannot be ruled out. It is evident from the above points that the health risk associated with the existing disposal site is very high due to its location along the road side and also its being close to an important religious place.

4.7 INSTITUTIONAL SET-UP

As described in earlier sections, municipal solid waste management is an obligatory function of the urban local body. AMC's Health Department. A Sanitary Inspector assisted by a Supervisor and Sanitary Workers, is responsible for the solid waste management in the town. However, the post of post of Sanitary Inspector is vacant since last 3 to 4 years.. At present, the solid waste management work for the town is looked after by a Supervisor.

Due to lack of sufficient staff strength AMC has engaged the contract sanitary staff on temporary basis. The total manpower employed for the sanitary operations is 51. The following table shows the manpower details.

Table 4.6 : Manpower Deployment for SWM

Description	CMC staff	Contract staff
Sanitary Inspector	1 (vacant)	-
Supervisor (Mukadam)	1	-
Sanitary Workers	14	34
Drivers	1	1
Total	**16**	**35**

Source: AMC

The manpower employed for the sweeping and cleaning operations includes; 24 sanitary workers for street sweeping, 10 worker for drain de-silting activities, 6 workers for cleaning public toilets, 8 workers for solid waste collection from dustbins (@4 per vehicle), thus adding up to 48.

4.8 SERVICE INADEQUACY AND KEY ISSUES

Based on the information collected and field visits, the key issues of solid waste management in Alandi are identified and presented in this section. Key indicators are used to assess service adequacy of CMC Alandi. Table 4.7 shows the performance indicators of AMC in solid waste management and subsequently the key issues have been presented.

Table 4.7 : Solid Waste Management Performance Indicators

Indicator	Norm	Existing Service Levels
Waste Collection Performance	90-95%	70%
Vehicle Capacity Adequacy Ratio	30% of total waste generation	100%
Spacing of Dust Bins	100 m	150 – 200 m (avg 180m)
Road Length per Sweeper	400 –600 m	900 m
Conservancy staff per 1000 population	3	2 (51 for 17565 + 8000 persons)

Source: Analysis.

Key issues and conclusions are based on field visits and data analysis presented below.

4.8.1 Absence of Effective Primary Collection Mechanism

The absence of the door-to-door solid waste collection system in the town is leading to unhealthy conditions in the town. The practice of throwing of the waste onto the streets by shopkeepers, restaurants, households is aggravating the problem. Segregation of waste is not being practiced in the town.

4.8.2 Street Sweeping

The frequency of street sweeping varies from one day to one week. As mentioned earlier the actual length of street per sweeper is around 900 m as against the norm of 400-600 m, which shows the lack of manpower for daily street sweeping.

4.8.3 Waste from Marriage Halls

Solid waste from the marriage halls is significant in Alandi. Being a religious place, a large

number of marriages take place in Alandi during the season. The Dharmashalas (approximately 350 in number) in Alandi are also used as marriage halls as the are not fully occupied throughout the year. Since the Dharmashalas are not registered, there is no record of the number of Dharmashala used as marriage halls. However, the average number of marriages taking places in Alandi during the marriage season is estimated to be about 200 to 250. However the trends are seasonal.

Discussions with the sanitary staff of the AMC indicated that waste generated from the marriage halls (Dharmashala) will be around 2 ton per day during the marriage season. This means that the per unit waste generated by these marriage halls to be around 10 kg/hall/day. It is also noted that marriages will be performed for about 100 days of the year (March to June, and November-December). Hence, it is necessary to make special arrangements for collection of solid waste from the marriage halls (Dharmashala).

4.8.4 Collection of Waste

At present AMC collection performance is only about 70 percent, which is less than the norm of 90 – 95 percent. As the analysis reveals about 1.5 ton of waste is not collected daily. This is creating unhygienic conditions in the city. The residual waste accumulates day-by-day forming heaps of waste in the city. Hence, there is an immediate need to increase the collection performance of the system to keep the city clean and healthy.

4.8.5 Transportation of Waste

At present waste is being transported in open vehicles to the disposal site. The spillage of waste along the route and odor from the waste is a common problem associated with open transportation of waste. Narrow lanes in the town are adding to the problem. The vehicles carrying the solid waste should be covered.

4.8.6 Unavailability of Solid Waste Disposal Site

As mentioned earlier, AMC does not have its own solid waste disposal site. The present disposal site on Vadgaon road is beyond AMC limits and is not owned by the AMC. Similarly, the previously used other two disposal sites namely Padmavati Road and Indrayani riverbank, are also found to be unsuitable. It is, therefore, necessary to designate a suitable landfill site after assessing its technical and environmental suitability, on a high priority.

4.8.7 Disposal of Waste

The waste is disposed improperly forming heaps of waste at the site. The waste is finding its way onto the roads and surrounding areas due to blowing wind, making the area around the site unhygienic, posing problem to environment and health of the people visiting the Vishrant Vad (a holy site). The nearest habitation to this site is at about 0.5 km.

4.8.8 Occupational Health Hazards

The waste collection, loading and unloading operations are done manually. The sanitary workers have not been provided with any protective equipment posing heath hazards.

Photographs

4.8.9 Clearing existing sites

The previously used other two disposal sites namely Padmavati Road and Indrayani river bank, are found to be unsuitable due to the environmental hazards posed by them and the objection of the local residents. However, the waste is still lying there and finds its way into the adjacent residential area and the Indrayani river. It is therefore necessary to immediately clear the waste dumped there.

4.9 PROJECT IDENTIFICATION

Based on the above analysis and discussion, the project components have been identified to improve the existing condition as well as to develop a comprehensive solid waste management system for the town of Alandi.

4.9.1 Future Trends of Waste Generation

This section deals with the projection of solid waste generation with respect to the growth trend of the town and per capita waste generation and the improvements need to the existing system. Based on the data analysis and key issues identified in the above sections, the projects have been identified for the improvement of the solid waste management system in Alandi.

The future trend of waste generation has been estimated based on the projected population and per capita waste generation. The population projections made in this report and a per capita waste generation rates (of 260 gm per capita for resident population and 50 gm per capita for floating population) arrived in the present study are used for estimating future waste generation trends. The rate of waste generation through out the horizon year of 2001-2031 is considered uniform i.e. 260 gm per capita per day and 50 gm per capita per day.

The following table shows the projected quantity of waste generated. As per the projections, the total population in the year 2031 will be 60515 while the quantity of waste generation will be around 17 tons per day.

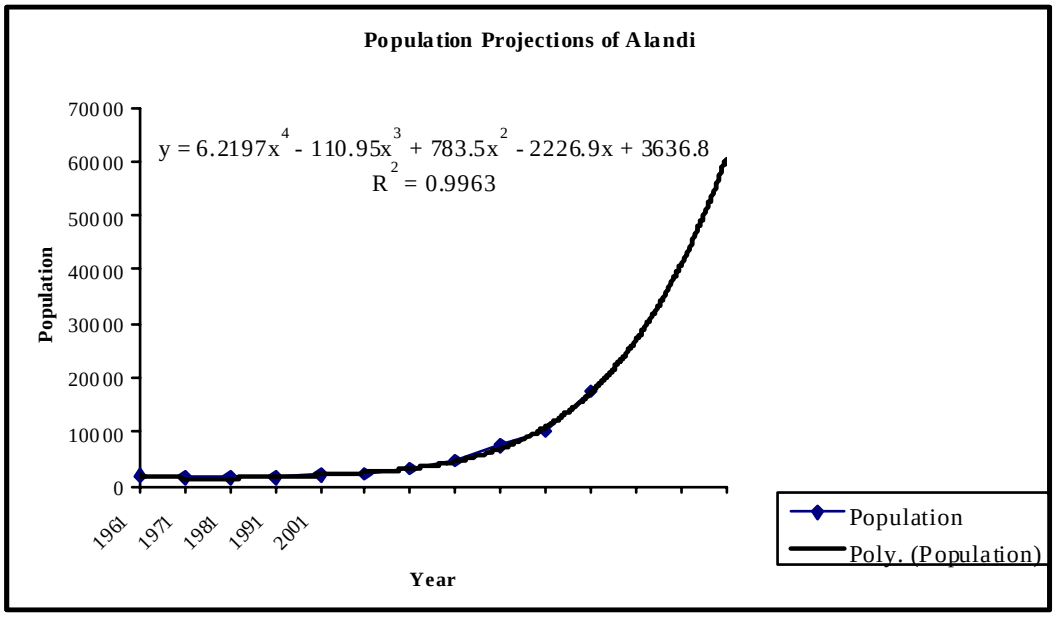


Table 4.8 : Projected Waste Generation

Year	Population	Waste Generation	Floating population	Waste generation	Waste Generation
	Nos.	*Gm/Day*	*Nos.*	*Gm/Day*	*Tons/Day*
1901	2029	-	-	-	-
1911	1624	-	-	-	-
1921	1568	-	-	-	-
1931	1666	-	-	-	-
1941	2170	-	-	-	-
1951	2432	-	-	-	-
1961	3187	-	-	-	-
1971	4788	-	-	-	-
1981	7523	-	-	-	-
1991	10249	-	-	-	-
2001	17565	260	8000	50	5.0
2011	26988	260	10000	50	8.0
2021	40982	260	15000	50	11.00
2031	60515	260	20000	50	17.00

Source: Analysis.

4.9.2 Strategies for Solid Waste Management

This section presents an approach for the development of solid waste management system and improvements in strengthening the existing practices in Alandi. The options address the physical components of solid waste management namely collection, transportation, treatment and disposal.

Based on the above analysis and discussion, the project components have been identified to improve the existing condition and as well as to develop a comprehensive solid waste management system for Alandi. The cost of biomedical waste management, however, is not included.

For the purpose of efficient management of the solid waste, the Alandi town can be divided into two areas viz.

I. ***Pilgrim zone*** *with maximum pilgrim activities* – This covers the area within Indrayani river banks and the Pradakshina marg from old bridge, Nagar Parishad chowk, Rath, Chakan chowk and New bridge. Due to its proximity to the Samadhi temple, this area has maximum concentration of Dharmashalas (marriage halls), restaurants and shops and hence the waste generated in this area has more organic component such as flowers and waste food.

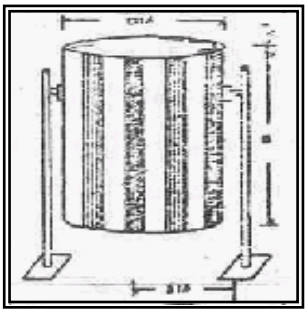
II. ***Alandi town*** – *Other areas of the town*

The waste management strategy is based on the principle of segregation of the waste at its source into organic and inorganic waste to be able to treat it effectively. The project components have been identified based on the above classification.

4.9.3 Primary collection of waste

Pilgrim Zone

Door-to-door collection using containerised push carts: Door-to-door collection of waste is recommended in the Pilgrim zone due to high population density and narrow lanes. The waste collection in this zone shall be carried out by using containerised push carts. Each cart will have four HDPE containers of 1m x 0.69m x 0.15m size. The push cart for door to door collection will be provided with a bell so that the residents will be alerted of the arrival of the cart for emptying their waste containers into the containers of the cart. The sanitary workers shall collect the waste from domestic, commercial and temple area in their push carts. Similarly, the street sweepers will make heaps of waste on the side of the roads.



Litter Bins: In addition to the door to door collection, litter Bins are also recommended to be provided in the Pilgrim zone, including ghats on the Indrayani river, for the floating population. The existing dustbins in this zone will be replaced by round tiltable litter bins of 0.02 cu.m capacity, spaced at 50 m interval. The litter bins shall be provided along the places of movement of the pilgrims such as, Samadhi temple area, Mahadwar road, Pradakshina marg, river banks, market places, and bus station. The private sector can be involved for this purpose by giving them advertisement rights on the bins for specified period. Considering the total length of roads in the Pilgrim zone as 2.5 km, total number of litter bins required is 50.

Alandi Town

Refuse Collection Bins (RCB): The existing practice of using RCBs can be continued in the other areas (Alandi town) while increasing the number of bins, so as to minimize dumping along road side and in open areas. Separate RCBs for collection of the dry and wet waste must be provided, so as to achieve segregation of the waste at the source itself. There are 100 RCC bins in Alandi, which work out to a spacing of about 180 m for 18 km of road length. However, the RCBs are not spread well over the town. This is demonstrated by the heaps of waste seen in some of the areas such as the vegetable market near AMC parking, near old bridge etc. Also, most of the bins are not in a good condition, some of them are seen lying upside down and waste is seen dumped alongside the bins. Similarly, the capacity of the bins appears to be inadequate in crowded areas such as Rath, PCMT bus stand where they are seen to be overflowing in spite of regular collection.

Hence, it is recommended that new RCBs of 0.2 to 0.3 cu.m capacity shall be provided in the Alandi town area beyond the Pilgrim zone. The bins would be of non-rusting material such as FRP or HDPE. Two separate bins for collection of organic and inorganic waste would be placed at an interval of 100m. Thus, for the road length of 15.5 km (excluding the Pilgrim zone) the number of RCBs required would be 310.

Street Sweeping

Street sweepers shall be assigned with fixed individual beats and 'pinpoint' work according to the density of the area to be swept. The following standards may be considered.

Table 4.9 : Street Sweeping Norms

Description	Name of Area	Norm (road length/sweeper)
High density area	Pilgrim zone	250 m – 300 m
Low density area	Rest of Alandi	650 m – 750 m

Source: CPHEEO Manual on SWM

The main roads and the town center areas shall be cleaned every day. The low-density areas can be cleaned on alternate days. Drain de-silting will be done on need basis.

4.9.4 Segregation of Waste at Source

Pilgrim Zone

Segregation of waste at source shall be implemented in the Pilgrim zone only, where door to door collection of waste is proposed. Separate collection and storage of the biodegradable and non-biodegradable fraction, dry and wet waste of the waste from households, dharmashala, shops and restaurants shall be carried out by the sanitary workers. For this purpose the residents would be asked to store the biodegradable and non-biodegaradable waste separately. Also, the push-carts would be provided with two separate containers in different colours for collection of the bio-degaradable and non-biodegradable waste. Awareness programs should be conducted to train the people about the segregation of waste at household level.

Alandi Town

Separate RCBs for collection of the dry and wet waste should be provided in the Alandi town area, so as to achieve segregation of the waste at the source itself. The segregation of waste can be extended to new areas of the town over a period of time. Initially, the segregation of waste would be carried out at the disposal site only.

4.9.5 Secondary Collection of Waste

The waste in the push carts shall be transferred into the secondary collection vehicles (tractor and mini lorry) which would be available at fixed location and time (secondary transfer points). The secondary transfer points are identified as Rath, Bharav Rasta, Chakan Chowk, PCMT bus stand and near Cosmos Bank.

The mini lorry shall be used for collection of waste from the rest of the Alandi town. The waste from the RCBs would be directly transferred into the lorry. An additional lorry is also proposed to be procured which would be useful in efficient collection of the waste.

The waste from the secondary transfer points would be directly sent to the disposal site.

4.9.6 Transportation

The capacities of the mini lorry (Tata 407) and tractor available with the AMC are 4 ton and 1 ton respectively. The total collection by the two vehicles considering 2 trips per vehicle per day with 35% collection efficiency works ut to be 3.5 tons. This is found to be insufficient

for the present condition. However, for a town of the size of Alandi the number of trips made by the vehicles are less. It is expected that each vehicle should make at least 3 trips by which the collection would be 5.25 tons.

Considering that the tractor is more than 15 years old, it can be upgraded by procuring a hydraulic tipper of 4 ton capacity. The tractor can be used in the Pilgrim zone only and would also provide additional capacity during the fairs season.

4.9.7 Treatment and Disposal

The characteristics and quantity of solid waste generated in the town primarily influence the disposal options. A review of the solid waste analysis results for Alandi indicate that nearly 50% of the waste generated by the town is organic in nature. In terms of the quantity, around 5 tons of waste is generated every day during normal season and around 30 tons is estimated to be generated during the fairs.

The current practice of open dumping of waste is unsafe and unhygienic. In view of the large share of organic waste in the town, Composting and Secured Land Filling are considered as the most feasible option of solid waste processing in Alandi. The organic component of the waste (50 percent of the total waste) shall be composted and the rest of the waste shall be land filled.

The other technology options will not be suitable, due to the following reasons

1. **Incineration:** Due to low calorific value and high moisture content, this technology is not suitable for Indian Solid waste. Also capital, O&M costs will be very high.
2. **Pyrolysis and Gasification:** This process involves thermal decomposition at high temperature and besides recovering energy from the waste will ensure proper destruction of waste is possible. But due to the composition of the waste and high moisture content the application of this process is only limited.
3. **Pelletisation:** making fuel pellets is another option. Low calorific value wastes will not be suitable unless ingredients are added to increase calorific value. While a few Pelletisation plants are operating in India, long periods of project development and establishment are the hindrances in their large scale replicability at this stage.
4. **Bio-Chemical Conversion:** This is based on decomposition of organic matter to produce methane Gas. Anaerobic digestion in closed container can produce bio-gas to the tune of 50 to 150 m^3 per tonne of waste .Gas can be used for cooking, heating, or generation of electricity. Several schemes of bio-methanation plants are being planned in India.

4.9.8 Composting

Considering the limited experience of above technologies, the daily quantity of waste generated and also as the surrounding areas being predominantly rural, it can be safely presumed that the composting will be suitable and will find a good market within the region. The proposed disposal strategy for Alandi will be to

- Compost the organic fraction of the waste (50% of the 5 tons – 2.5 tons in normal season and 30 tons (total) during Kartiki & Ashadhi fairs)
- Sanitary land filling of inorganic fraction of waste and 20% compost rejects (3 tons/day during normal season and 36 tons (total) during 2 fairs)
- Encouraging local level aerobic composting and
- Educating the community on 4R strategy (Reduce, Reuse. Recycle and Recover)

Sections below discuss the various aspects of implementing the above strategy.

4.9.9 Area Required for Disposal Site

Area requirement for the composting and land fill sites is assessed for the base year 2031. At 17 tons per day, the (50%) waste for composting works out to be 9 tons per day, and that for the land filling is 10.8 tons (including 20% compost rejects) by the design year. The design capacities have therefore been considered as 10 tons for composting and 11 tons for landfilling.

As summarised in Table 4.10, the area required for disposal of waste in Alandi works out to a total of 38543 sq.m. This comprises of 464 sq.m of land for composting and 37079 sq.m for land filling of the inorganic waste. These area calculations form the basis for identifying the new disposal site or assessing the adequacy of the proposed composting site.

Table 4.10: Area Requirements for Combined Composting and Landfill Plant in Alandi

Component	Specifications	Area Requirements*, m^2
A. Composting		
Capacity of the Plant	10 tons per day (16.7 cu.m) (1 ton of waste = 1.67 cu.m)	
Type of Composting	Manual Aerobic	
1. Area for Windrows for 21 days fermentation period	21 nos of 2.0 X 1.0 m height Length of Windrows – 8.5 m	357.00
2. Spacing of Windrows	0.6 m	107.0
Total area for Composting		**464 (0.11 acres)**
B. Land Filling		
Capacity of the Plant	11 tons/day (9 t/d inert material + 1.8 t/d compost rejects)	
Total Quantity to be land filled till 2031	45661 tons (avg 5 tons/day for 25 years from 2005 to 2030, including 36 t during two fairs/year) say 50000	
Waste to be landfilled	40000 tons (@ 80% placed waste density)	
Type of Land filling	2.5 m (partly cutting and filling)	
Area Required for land fill		
Total area for Land fill	(1 ton of waste = 1.67 cu.m)	**26720 (6.6 acres)**
Total area for Disposal		**27184 sq.m (6.7 acres)**
Office, Internal roads and other common area (5%)		**1359 (0.3 acres)**
Buffer zone around the site		**10000 sq.m**
Total area of the site		**38543 sq.m (9.5 acres say 10 acres)**
***** - The above estimates for area requirement are preliminary estimates and are expected to vary during the DPR stage.		

4.9.10 Identification of Disposal Site

Identification of disposal site that meets the area requirements as estimated earlier and suits the siting criteria set out in the MoEF guide lines, is the next step in implementing the disposal options recommended for Alandi.

Presently, the solid waste is being dumped in a roadside open land near Vishrant Vad on Vadgaon road at about 1 km from the AMC limits. The area of the site is about 1000 sq.m. The site is in use since 2002-03. This site is adjacent to the main road and also a religious place called Vishrant Vad (a holy Banyan tree), which is visited by thousands of pilgrims during the fairs in Alandi. Waste is dumped on the site manually in heaps and left as it is. It was observed that the light materials such as plastic and paper are carried by wind to distant places, and the situation around the site is unhygienic. The nearest residential area is about 0.5 km from the site however, the town is developing in this direction. The above factors make this site unsuitable for composting and landfill.

The 1988-98 Development Plan (DP) of Alandi prepared by the Director Town and Country Planning Maharashtra, has identified a site for a compost plant on Survey no.9 and 10 to the south-west boundary of the town, along the proposed Bypass road. The proposed site is located about 2 km from the centre of the town i.e. AMC office. The site is rectangular in shape and total area of the site is about 5300 sq.m.

Based on the land requirement calculated in Section 4.9.9, the area of the proposed site for compost plant in the 1988-98 Development Plan is found to be inadequate. As per the Municipal Solid Waste Management Rules, 2000 of MoEF, an integrated waste disposal facility comprising composting of organic waste and landfill of inert material is recommended at a suitable location. Nevertheless, the compost plant site proposed in the DP can be used upto year 2011.

It was informed by the AMC officials that some abandoned stone quarries exist on the Vadgaon road beyond the AMC limits. These abandoned quarries could be suitable for disposal of the solid waste by landfilling. However, availability of the required area of land and feasibility of acquisition of the land has to be explored in the DPR stage as the area comes under the Charholi Khurd village. The land fill site can be developed jointly with neighbouring village authorities. Use of the abandoned quarries, if found suitable, will also reduce the cost of site development.

It is therefore proposed to use the compost plant site proposed in the DP for composting and the abandoned stone quarries for landfilling of the non-degradable solid waste upto year 2011. In the mean time a separate site of 9 acres area should be identified for disposal of the solid waste in future.

4.9.11 Layout of the Disposal Site and Operations of Land filling

The proposed site is designed to accommodate both the composting and land filling operations and hence the components of disposal site shall comprise of

- a compost plant of 10 ton capacity
- land fill site of 12 ton capacity
- demarcated areas for waste processing and storing the finished compost
- designated areas for stock piling daily cover material
- double clay liner, leachate collection and treatment system in the active land fill area
- weigh bridge and office space
- protective fencing all around and a main entry gate
- peripheral plantation 3 m wide where green belt is developed to improve the aesthetics

- main access Road of 6.00 m wide
- internal roads to provide access to all phases of the site and
- drainage facilities, etc.

A gradual method of filling the waste through cell method is recommended. Cells are so planned that it can take one years of waste completely and it can be closed after its life. The waste and compost rejects that are delivered in the site have to be spread uniformly and a two inch layer of inert material (say soil) has to be covered over the day's waste. In order to achieve better performance, the placed waste should also be compacted manually.

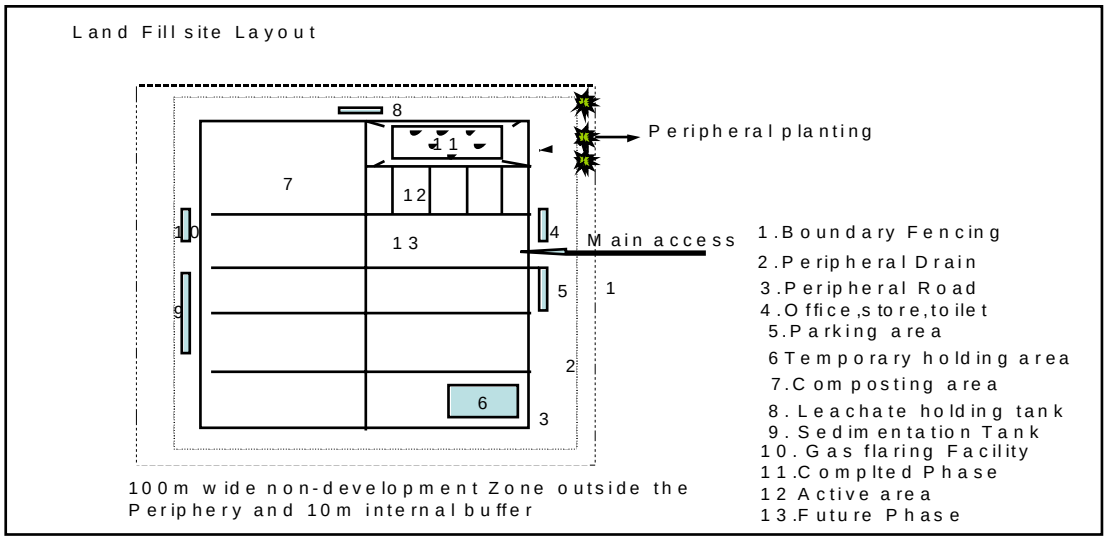
Problems of environmental pollution by way of leachates, ground water contamination, etc. from the land fill sites are minimised due to the fact that only inorganic waste is sent for land filling. However as a precautionary measure

- double clay liner at the bottom and the sides, compacted to achieve a permeability of 1x107 cm/sec
- provision of efficient drainage system to avoid storm water entry into the land fill area
- leachate collection and treatment system
- land fill gas collection and passive venting of the same

are recommended at the land fill site. A detailed design of the same however has to be carried out after fianalising during the DPR stage.

Further to asses the impacts of the land fill site operations, it is also recommended to monitor the

- quality of the leachate before and after treatment
- ground water quality in the vicinity of the land fill site by way of monitoring wells and
- land fill gas generated from the closed cells of the site



4.9.12 Processing of Bio-degradable Waste in the Compost Plant

Aerobic Composting, Vermi composting and Anaerobic digestion are the three options of biological degradation of organic components in solid waste. Of the three, the simplest to develop, operate is Aerobic Composting. As present Alandi town generates only about 2.5 tons of organic waste a day, mechanical compost plant is not viable and manual windrow composting will be the most ideal and economical option.

As estimated earlier, the compost plant needs an area of 420 sq.m and will be developed

alongwith the landfill site. The composting unit comprises of

- 21 windrows of 10m X 2m X 1.5 m arranged parallel to each other for receiving the organic waste
- a manually or motor operated rotary screen for screening the wind row outputs
- maturity area for the compost to stabilise and
- packing and storing area

Fresh organic waste form the town will be delivered directly to one of the 21 windrow spaces on the paved/unpaved but leveled and well drained area. Each day's waste will form one windrow. Windrows loaded with the organic waste will be rotated manually on the 6th and 11th day from outside to center, to provide aeration and destroy larvae.

On 21st day from the date of placing the waste on the windrow, the digested organic waste passed through a rotary screen of about 25mm square mesh to remove oversize materials. The screened compost will be stored for about 30 days in the maturity yard in heaps 2m x 1.5m wide to ensure that it gets stabilised before sale and the rejects will be disposed at land fill site.

To avoid odor, fly nuisance and the quality of the compost, a small amount of cow dung slurry is also added in the initial stages of windrow composting. Since the segregated organic waste is being used, it is estimated that around 20% of rejects will be generated from the plant and around 2 tons compost out put is expected generate from the plant.

4.10 COSTING OF SOLID WASTE MANAGEMENT PROJECTS

The following table summarises the cost estimates for the various proposals made above.

Table 4.11 : Cost Estimates for Proposed Solid Waste Management Measures

Item	Quantity	Rate	Amount
		Rs. Lakh / unit	*Rs. Lakh*
I. Equipment			
1. Refuse Collection Bins, nos	310	0.02	6.20
2. Litter bins, nos	50	0.01	0.50
3. Tools and equipment for garbage loading (Ghamela, Iron rakes, LLDPE baskets, spade, brooms)	100	0.01	1.00
II. Vehicles			
1. Containerized push carts with 4 containers, nos	5	0.075	0.38
2. Hydraulic Tipper (4 tons), nos	1	8.0	8.00
III. Land acquisition for waste disposal site, sq.m	38543		
IV. Compost and Landfill			
1. Compost plant, tons per day	10	2.0	20.00
2. Landfill, tons per day	11	7.0	77.00
V. Rehabilitation of existing SWD sites at Padmavati Road and near crematorium			2.00
Sub Total			**115.08**
E. O & M Expenditure			
E1. Compost & land fill		8%	8.00
E2. Collection & Transportation		15%	15.00
Sub Total- E			**23.00**

Note: Cost estimates are based on Consultant's experience on similar projects. Will vary depending on findings of the DPR study.

4.11 STRATEGIES FOR HANDLING WASTE GENERATED BY PILGRIMS

Large number of tourist congregate in Alandi on a pilgrimage to the Shri Dnyaneshwar Maharaj Samadhi temple situated on the bank of the Indrayani River. Due to this reason, the inflow of pilgrims suddenly raises to 5 lakh during the auspicious days of Kartiki and Ashadhi Ekadashi in the months of November/December and June/July.

In addition to the above, about 8000 pilgrims daily visit Alandi throughout the year. The pilgrim inflow is highly fluctuating with high inflow on monthly Ekadashi days, during the fairs and other festivals, and goes down to lowest levels during non-festival season.

Considering these aspects, special strategies are required to manage the solid waste generated during this peak season. Since the generation is for a very short period (2 to 3 days in a month), development of permanent infrastructure for additional capacities is not economical. In view of this the following strategies are recommended for the identified location of Alandi town during the peak season.

1. The Pilgrim Zone shall be declared as the Special Sanitation Area
2. Collection and conveyance of waste in these areas shall be assigned to a special team of sanitary workers, who will attend to the cleaning operations at least thrice a day. In case of places around temple and Bus Stand, adequate number of people should be deployed to attend the conservancy operations.
3. Specially designed litter bins as presented in section 4.3 shall be placed at 50 m interval in the Pilgrim Zone for people to place the waste in the bins.
4. Waste from these bins shall be collected thrice a day.
5. In order to take care of solid waste such as flowers, garlands etc being dumped in the river, a 'Nirmalya Kalash' will be installed along the river banks. These would be containers of sufficient size such as 200 liters plastic drum or any other containers decorated to give a look of 'Kalash'. In all six such 'Nirmalya Kalash' are proposed to be installed on both the banks of the river. (This proposal is included under Indrayani river front development)

NIRMALYA KALASH

6. The Special Sanitation Team engaged for the conservancy operations in these areas shall be provided with the a separate uniform that identifies them easily and helps to educate the pilgrims on solid waste disposal.

4.12 COMMUNITY PARTICIPATION AND NGO INVOLVEMENT

Public awareness and public involvement in the entire process of solid waste management is essential, which at present is managed through the temple administration. It is essential that the solid waste generators actively participate in mitigating hazards arising from improper waste management. One such initiative could include developing an Information, Education, and Communication (IEC) mechanism with the help of Non-Governmental Organizations (NGOs) working in the area.

Alandi has many Dharmashalas representing various communities and towns. There are also many religious educational institutes (Varkari Shikshan Sanstha) in Alandi wherein students from different parts of the State come and stay for religious studies. These Dharmashala and religious training institutes can be involved in day to day cleaning operations of the Pilgrim

Zone by allocating them specific areas turn by turn.

Similarly, various groups from Alandi as well as nearby towns and Pune contribute to maintaining cleanliness in Alandi during and after the Ashadhi and Kartiki fairs. A system for appreciation of such efforts by Appreciation Certificates by the AMC/Temple Trust would help to increase community participation in environmental improvement of Alandi.

Also, the MAEER's Maharashtra Academy of Engineering is a reputed technical institute based at Alandi. The technical expertise of the faculty and students can be utilised for carrying out environmental improvement projects in Alandi.

4.13 PHASEWISE IMPLEMENTATION OF THE SOLID WASTE MANAGEMENT PROJECTS

The solid waste management programme is proposed to implement in two phases as below.

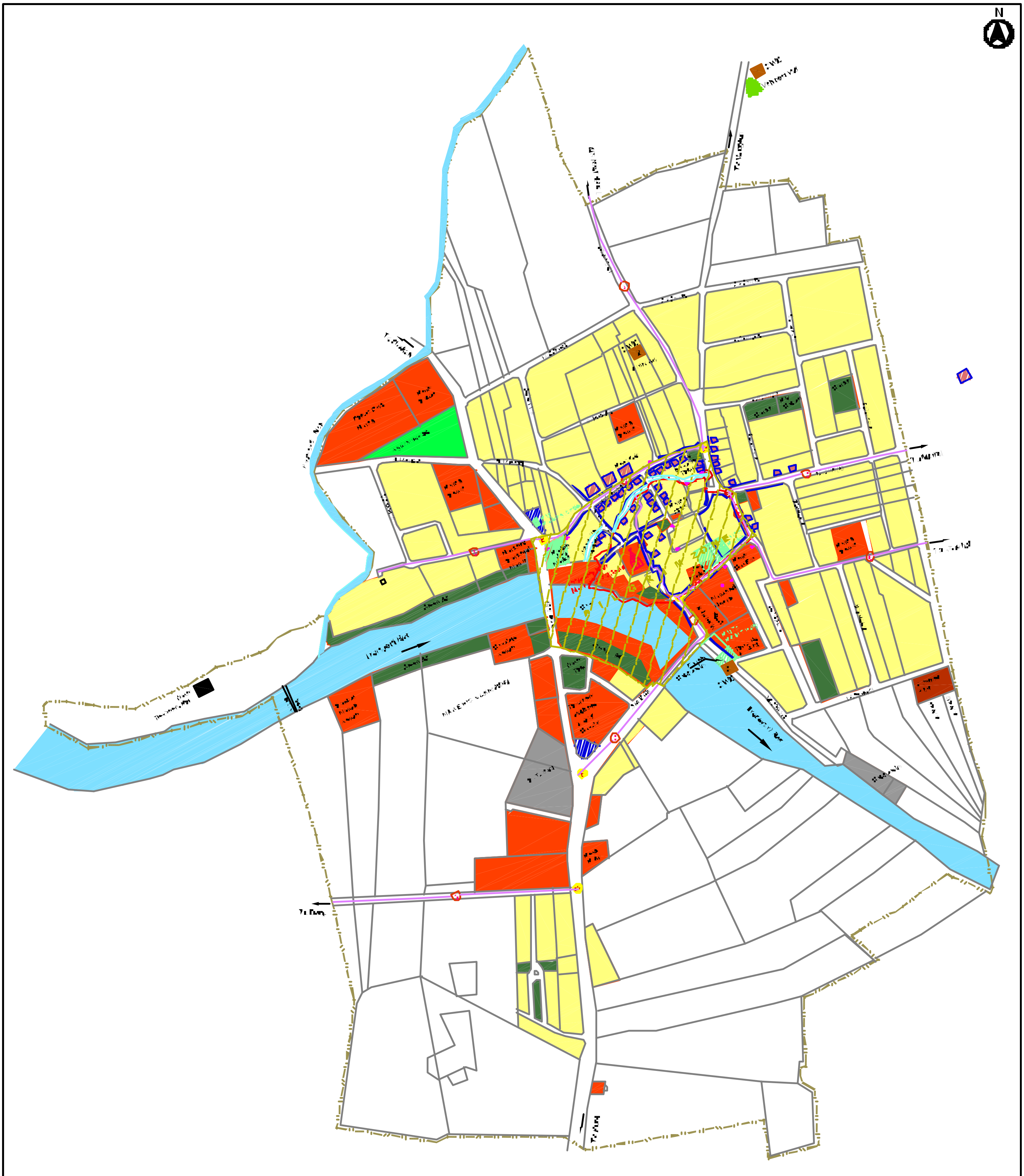
Table 4.12 : Cost Estimates for Proposed Solid Waste Management Measures

Phase	Year	Proposed Activities	Estimated Cost
Phase I	Upto year 2011	1. Implementation of waste segregation and collection system in Pilgrim Zone 2. Development of the Compost Plant site proposed in the DP. 3. Landfilling of non-degradable waste in abandoned stone quarries. 4. Rehabilitation of existing SW disposal sites 5. Community awareness programmes, IEC campaigns by NGOs on waste segregation	Rs. 50 Lakh
Phase II	2011 - 2031	Implementation of waste segregation and collection system in entire town Commissioning of new site for composting and landfill.	Rs. 75 Lakh

4.14 PRIVATE SECTOR PARTICIPATION

The following sectors shall be developed with private sector participation:

- Door to door collection of domestic, commercial and hotel wastes in pilgrim zone;
- Collection, transportation, treatment and disposal may be evolved on the pro-rata basis for door to door collection of dharmashala (marriage halls) waste, and hotel/restaurant waste;
- Awareness creation;
- Capital and maintenance cost for new vehicles/push carts; and
- Operation and maintenance of the Compost plant.



Major Roads in Alandi

Important Junctions

Solid Waste Disposal Sites

CONSULTANT:

Wilbur Smith Associates Pvt. Ltd.

TITLE:

Figure No.8.1

Solid Waste Management Scenario in Alandi

SCALE: Not to Scale

DATE

CLIENT:

Maharashtra Pollution Control Board

PROJECT:

Action Plan for Environmental Improvement
In Alandi

DWG. NO:

5.0 DEVELOPMENT OF INDRAYANI RIVERFRONT

5.1 ABOUT THE INDRAYANI RIVER

The Indrayani River flowing through the Alandi town is the main surface waterbody in the area. It originates near Kurvande Village in the Sahyadri ranges, about 5 km southwest of Lonavala. The river basin covers major portion of Haveli Taluka of Pune District.

5.1.1 Tributaries and Drainage

The Indrayani River is formed by many small streams flowing down the Sahyadri ranges in monsoon. The River flows on the whole east through the Nane maval and further down after 26 km it is joined by the Andhra River on the left. The Andhra River is an important tributary of the Indrayani River. It then enters the open country and passes via Dehu, a place of pilgrimage sacred to the Vani Saint "Sant Tukaram". From Dehu the river flows about 20 km south-east and enters Alandi town, and after keeping south-east for about 32 km, turns and meets the Bhima near Tulapur after a course of about 100 km. The width of the River within Alandi Town is about 55 m.

5.1.2 Water Quality and Usage

The Indrayani River is an important source of drinking water for the region. It is classified under Class A-II (drinking water source with conventional treatment followed by disinfection). There are two dams on the river near Alandi namely the Vadivale Dam, which is 3 km away, and the Alandi Dam, which is 1 km away from the town. The water to Alandi Town is sourced from the Alandi Dam.

5.1.3 Adjoining Landuse and Activity Pattern

The Indrayani river can be categorized into three broad zones within the Alandi Municipal Limits namely, the Zone upstream of the New bridge, Central Zone between new and old bridge, and the Lower Zone downstream of the Old bridge. The land use and activity pattern along the river banks in this stretch are described below.

Upstream of New Bridge

- This zone covers the area between the Western limit of the Municipal Boundary and the New Bridge.
- The land use on either side includes agricultural lands and religious dwellings such as the Sakhare Maharaj Ashram, Chaitanya Ashram, Narasimha Saraswati Mandir.
- The Alandi dam is located about 400m upstream of the new bridge.
- The remains of an old bridge structure are seen in the river adjacent to the New Bridge. A small weir is also seen at this location. The river water is flowing and appears clear in this zone.

Left bank

- The intake point of the Alandi water supply scheme is situated on the left bank of the river near the dam. The water treatment plant and the main pumping station are also located nearby.
- The Mauli Bagh (a private garden for the Samadhi Temple, managed by the Temple Trust) is also located on the left bank. The area of the garden is about 3000 sq. m (0.75 acres) and it serves as floricultural garden

- The Narsimha Saraswati Mandir is situated on the left bank.
- Two public toilets are located on the left bank of the river near the New Bridge, one managed by Sulabh International and the other by the Alandi Dehu Parisar Vikas Samiti.

Right bank

- The Sakhare Maharaj Ashram and the Chaitanya Ashram are located on the right bank of the river.
- The MAEER's Engineering College campus is located on the right bank a little away from the River.

Area between New Bridge and the Old Bridge

- This area has the maximum pilgrim activities.
- A 3 m wide pedestrian bridge called the "Sopan Bridge" is located in between the two bridges.
- The Old and the New Bridge and the Sopan bridge are the three main links connecting both the banks of the river.
- Both the banks of the river between the Old Bridge and the New Bridge are being developed as bathing ghats.
- Construction of ghats between the New Bridge and the Sopan Bridge are complete, whereas construction of ghats downstream of the Sopan Bridge has not yet started.
- A 'Darshan Bari (corridor)' has been constructed on both the banks of the river from the New Bridge upto the Sopan bridge.
- An incomplete concrete structure and an abandoned weir are seen in the river near the New Bridge.
- Further down there is Kolhapur Type (KT) weir for storing water in the river for bathing and other purposes.
- The area upstream of Sopan Bridge is generally used by the devotees for bathing and washing clothes.

Left bank

- The left bank of the River has a dense built up area which is part of the Gaothan. The immediate landuse adjoining the river consists of religious (temples) and commercial areas.
- The Samadhi Temple of Shri Dnyaneshwar Maharaj is located along the left bank of the river in this zone.
- The area downstream of the Sopan Bridge near a temple (Pundalik Temple) is used for performing 'Pinda Daan' and 'Shradha' ceremony as per Hindu Religion. A permanent structure has been constructed for this purpose. The area is known as Chakratirth.
- The parking lot of the Alandi Municipal Council is located adjacent to the Darshan Corridor on the left bank.
- On the left bank of the river an intercepting sewer has been constructed by the Alandi Dehu Parisar Vikas Samiti, which receives the sullage from the town. The sullage/sewage from the town is collected in this sewer and further discharged into the Indrayani River near the Old Bridge without any treatment.
- A toilet and bathroom complex, managed by the Sulabh International, is constructed on the left bank of the river at Chakratirtha. It has 4 toilet seats and 2 bathrooms each for ladies and gents.
- On the left bank of the River near the Old Bridge the AMC has constructed a shopping complex. The river water quality behind this complex is very bad as it has become stagnant due to a weir. Flowers, garlands, plastic bags and waste food are seen in the river, which are arrested by the weir at this location. The area is also used for open defecation and dumping of municipal solid waste.

Photographs

Right Bank
- The Alandi Dehu Parisar Vikas Samiti has constructed a Coliseum on the right bank.
- The landuse along the right bank consists of the structures under construction and an agricultural land.

Area downstream of Old Bridge
- This comprises the area downstream of the Old Bridge upto the Municipal Limits.
- The river water quality in this stretch is highly polluted due to direct discharge of sewage/sullage, open defecation and dumping of municipal solid waste, and the crematorium.
- The vacant area on the right and left bank is used for open defecation by the pilgrims during the fairs.
- A stagnant pool of water is formed along the left bank of the river (during low flow conditions), which gives a bad odour. However, about 100m downstream near the Khandoba Temple the river regains good flow and water quality appears to be good.

Left bank
- Landuse on the left bank is sparsely built-up with few residential areas and dharmashalas.
- The PCMT Bus stand and a crematorium are located just adjacent to the Old bridge on the left bank.
- Solid waste is also illegally dumped by shopkeepers near the crematorium.
- Further down there is sewage pumping station, which is not functional.

Right bank
- The right bank downstream of the old bridge has vacant agricultural land.

5.2 SOURCES OF RIVER WATER POLLUTION

The sources of river water pollution, identified during the field survey, are given below. The identification and prioritization of projects under riverfront development are based on these issues, and discussions with the stakeholders taking into consideration to overall activities taking place along the river banks and the needs of the town.

Pilgrim activities
1. The area behind the Samadhi Temple experiences intense pilgrim activities such as bathing, religious activities, washing clothes, which pollute the river water.
2. The leftovers of the religious activities (Pinda Daan, Shraddha) along the river bank near the Chakratirth pollute the river water.

Discharge of untreated sewage/sullage
3. The construction of the intercepting sewer is incomplete and the raw sewage/sullage is discharged directly into the river near the old bridge.
4. The wastewater from the public toilets along the riverbanks is discharged into the river.

Dumping of solid waste along the banks of the river
5. A daily morning vegetable market is set up along road on the left bank of the river near the New Bridge. The waste from the activity finds its way into the river.
6. Solid waste from the commercial area is illegally dumped near Old bridge.
7. Large quantity of plastic bags and food leftovers from the restaurants and marriage halls are seen disposed on the river banks.
8. Similarly, the municipal solid waste has been dumped along the river bank near the crematorium.
9. The ash, unburnt body parts from the crematorium find its way into the river body as there is no proper fencing to this area.

Photographs

Open defecation

10. Open defecation takes place under the new and old bridge and along the river banks which have not been constructed.
11. The open areas along the riverbank are used by a large number of pilgrims for defecation during the fairs and festivals.

Mid-stream structures in the river

12. The presence of incomplete abandoned structures mid-stream of the river obstruct **the** flow of the water forming stagnant pool of water.
13. Solid waste such as garlands, flowers etc gets collected in the area and decompose at the same location.
14. The stagnant water also leads to breeding of algae and other plants.

General

15. In general the river water in the stretch between old and new bridge shows a dark green colour with dense growth of algae and other weeds.
16. The river section has never been dredged and the river bed is believed to be significantly silted in this stretch due to presence of two weirs and other structures.
17. The water quality results show presence of fecal coliforms in the river water, which is dangerous to public health as people drink the same water as 'Tirth'.
18. The Old Bridge is an important entry point to Alandi from Pune side and the solid waste dumped on either side and poor water quality gives an unpleasant appearance as one enters the town.
19. In particular, the left bank of the river behind the temple is in an unhygienic condition, which is not in tune with that a clean and pious surrounding expected near a temple.

5.3 PROJECTS IDENTIFIED FOR RIVER FRONT DEVELOPMENT

The above discussion reveals that except near the Dyaneshwar Ghat and the Coliseum there is very little interface between the town and the river. In all the other areas the town has turned its back to the river. Traditionally many pilgrim places in India have developed along riverbanks. The interface between the settlement and the river has evolved over the years and manifested in strong architectural expressions in the form of Ghats, Chattris, Kiosks and Pavilions along the river. These served the function of pleasure as well as a place for performing all the rituals such as bathing, praying etc. The ghats of Varanasi and Vrindavan are considered as most exemplary edifices of Indian riverfront architecture. The ghats of Varanasi have been declared as UNESCO World Heritage site. Alandi does not seem to have a recorded history of such riverfront architecture. But very recent interventions to this aspect has been made by the Alandi Dehu Parisar Vikas Samiti which has constructed four ghats, two on either bank on the Indrayani River. Riverfront development in Alandi assumes more significance as it is at a strategic location at the entry point to the town from Pune side. If developed properly the riverfront could give a new image to the town. The riverfront development in Alandi would target at preventing the pollution and maintaining clean & hygienic conditions. It will also serve the purpose of beautification of the riverfront to give a pleasing appearance and help the pilgrims in carrying out the rituals such as bathing, praying etc.

For this purpose the river in the town is divided into three zones upper, central and middle zone.

The above discussion has shown that the activities of pilgrims are concentrated in the central zone. Hence this zone is taken on priority and the projects identified are described in detail. Regarding the other two zones it is proposed to develop green belt on either side of the river, which would control erosion of the banks and illegal dumping of waste. In the lower zone the crematorium will have to be shifted further down towards the Khandoba Temple and the area vacated has to be landscaped and beautified.

5.3.1 Activity wise division of central zone

The river in its stretch between the New and the Old bridge is proposed to be divided into three compartments depending on its use, as described below.

Bathing zone – At present the area from New Bridge to Sopan Bridge on both the banks of the river is provided with well constructed ghats. This zone should be identified for **the** bathing activity only.

Religious activity and washing zone – The stretch from Sopan Bridge to Chakratirth, will be continued to be used for performing last rites as is being done presently. The downstream area will be used for washing clothes.

Recreation zone – The area on both the banks downstream of Chakratirth is suggested to be used for recreational purpose such as boating with pedal boats, water sports or passive recreation along the banks. For this purpose, both the banks in this stretch will be fully constructed in continuation of the existing ghats.

5.3.2 Removal of old structures from riverbed and dredging

There are a few old and abandoned structures in the river such as an old weir and remains of an old bridge just upstream of the New Bridge, abandoned structure with four columns downstream of the New bridge, and a partially submerged stone structure near the Sopan bridge. Further downstream a weir is constructed across the river. The flow of the river should be maintained by dredging and removal of the unwanted obstructing structures in the riverbed. Only the necessary weirs for maintaining adequate water depth near the ghats should be kept. The riverbed can be deepened by dredging the bottom sediments settled over many years. However, the quantum of dredging required can not be estimated at this stage. Hence, the cost of dredging has not been included in this report.

5.3.3 Strengthening of existing weir near old bridge

The existing weir just upstream of the old bridge is old and needs to be strengthened through reconstruction.

5.3.4 Construction of mid stream fountains

In order to maintain the cleanliness of water three fountains one in each part will be installed. The fountains will aerate the water and also add to beauty of the area.

5.3.5 Construction of ghats

The Alandi Dehu Parisar Vikas Samiti has constructed four ghats near the new bridge. These may be continued with the same design to maintain uniformity, up to Sopan Bridge measuring approximately 54 m x 15m on the left bank and similar size on the right bank. Further down from Sopan bridge similar ghats should be constructed for a length of about 50 m on the right bank and upto the Old bridge (approximately 175m length) on the right bank. The average width of the ghat is proposed to be 20 m on either banks.

The existing incomplete sewer line along the left bank should be covered and completed upto downstream of the old bridge as part of this construction.

5.3.6 Construction of steps, boat landing facility and walkway along right bank

A stretch of about 100 m length on the right bank, in the recreation zone, is proposed to be provided with riverside steps and walkway through a green belt. Also, 2 to 3 wooden platforms are proposed to be providing boating facilities in the recreation area. This would provide a recreation zone for the local residents during the non-festive season.

5.3.7 Gardens and soft landscaping

The area behind the ghats and in between the ghats on the back side of the temple is proposed to be developed as small greenbelts with shadow giving trees. A similar greenbelt is proposed in the last stretch on the right bank close to the old bridge. The trees can be provided with seating platforms around. Ornamental plants such as wilkensinea, crotons, bougainvilleas etc are proposed along the parapet walls. These will act as resting areas for the pilgrims as well as give the much-needed green spaces to the town. Similarly, a green belt of tall evergreen trees such as Ashola or other suitable trees, is proposed to be developed near the Old Bridge, to create visual barrier to block the ugly look of the backside of the shops. These will also create a sense of semi-enclosed space. The same arrangement would be repeated on the right bank.

5.3.8 Construction of steps and development of greenbelt upstream of New bridge

A greenbelt of shady trees with seating platforms around and ornamental plants is proposed on both banks from New bridge upto the Alandi weir. Similarly, the concrete steps to safely approach the river water are proposed to be constructed on both the banks of the river from New bridge upto the Alandi river. This construction is expected to help safe and comfortable the pilgrims (Varkaris) along the river banks during the Ashadhi and Kartiki fairs.

5.3.9 Construction of Toilet Blocks

At present there are three toilet blocks on the left bank of the river but no facility is available on the right bank. When ghats are developed on the right bank, toilets will have to be developed too. Thus, two toilet blocks are proposed to be constructed on the right bank. Similarly, an additional toilet block is proposed to be provided just upstream of the old bridge on the left bank, after development of the ghats. Each block will have 4 WC's and 2 bathrooms/ changing rooms each for ladies and gents.

5.3.10 Lighting on river banks

At present there are sodium vapor lamps near the coliseum and the Dnyaneshwar ghat. Similar lighting is proposed in the entire stretch of the zone between the old and new bridge.

5.3.11 Drinking water fountains

The new gardens along the ghats are proposed to be provided with drinking water fountains. This will provide the pilgrims clean drinking water in hygienic conditions. The Alandi Dehu Parisar Vikas Samiti has provided similar fountains near the Dyanenshwar ghat. It is proposed to provide five such additional water fountains, three would be on the right bank and two on the left bank. Each fountain will have two taps. The water for the same will be the treated water from the Alandi Municipal Council.

5.3.12 Provision of Nirmalya Kalash

In order to take care of soild waste such as flowers, garlands etc being dumped in the river, a 'Nirmalya Kalash' will be installed along the river banks. These would be containers of

sufficient size such as 200 liters plastic drum or any other containers decorated to give a look of 'Kalash'. In all six such 'Nirmalya Kalash' are proposed to be installed on both the banks of the river. The pilgrims will have to be sensitized to put all floral waste in these containers. The organic waste collected from these containers will be used for composting pits proposed to be set up in the Mauli Bagh or in the gardens developed along the ghats. The concept of 'Nirmalya Kalash' has been successful in Mumbai and Pune areas during the Ganesh Festivals where such containers were installed near rivers lakes and other immersion sites. The containers are also a permanent feature around these water bodies.

5.3.13 Removal of solid waste dumped along river bank

The municipal solid waste dumped along the left bank of the river on both the sides of the old bridge should be removed immediately. This waste can be disposed off on to the existing solid waste dumping site on Vadgaon road used by the Municipality.

5.3.14 Relocation of existing crematorium

Similarly, the existing crematorium on the left bank of the river near old bridge should be relocated to its proposed location downstream, as per the 1988-98 Development Plan of Alandi.

5.3.15 Security guards

At least six security guards, three on either bank should be employed to monitor the central zone. They would sensitize the pilgrims to use toilets and prevent open defecation. Similarly they will encourage them to put the floral waste in the 'Nirmalya Kalash' thereby preventing pollution of the river. The security guards would also be responsible to prevent illegal dumping of waste by nearby shopkeepers, restaurants along the river banks. Additional guards will be provided in the upper and lower zones during fairs and festivals to prevent defecation on the banks and maintain the green belts along the river.

The above projects have been identified to maintain clean and pleasing atmosphere around the river and help in reducing pollution load due to solid waste dumping. This will also enhance the image of the town. To tackle the problem of the sewage getting into the river is identified as a separate project for sullage utilization scheme has been proposed.

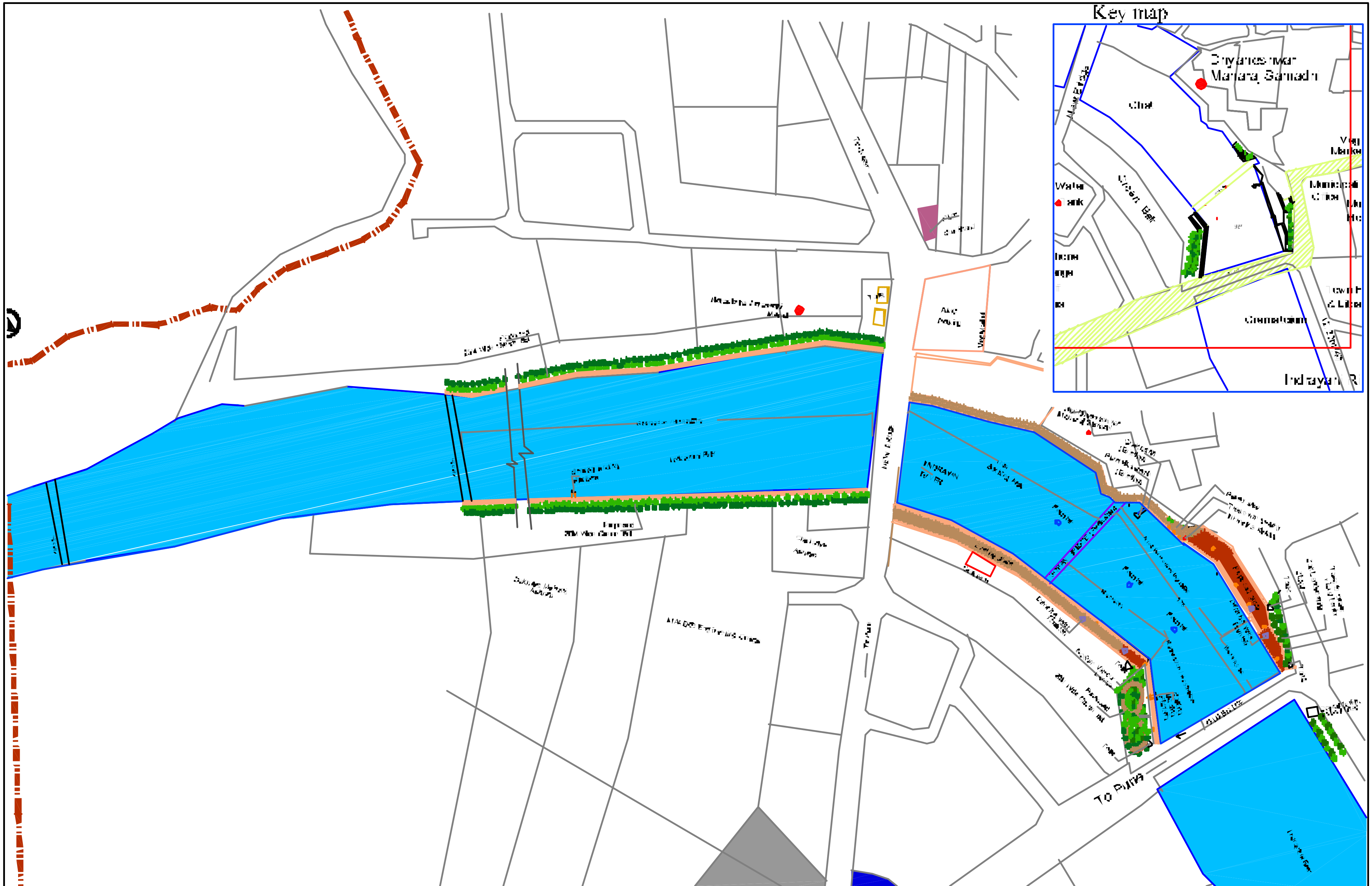
5.4 IMPLEMENTATION

The above projects can be taken-up by the Alandi Municipality with contribution from the Temple Trust. Alternatively, the projects can be implemented through private sector participation and further maintenance with physical/monetary contributions from the temple trust and the municipality.

5.5 SUMMARY OF RIVERFRONT DEVELOPMENT PROJECTS

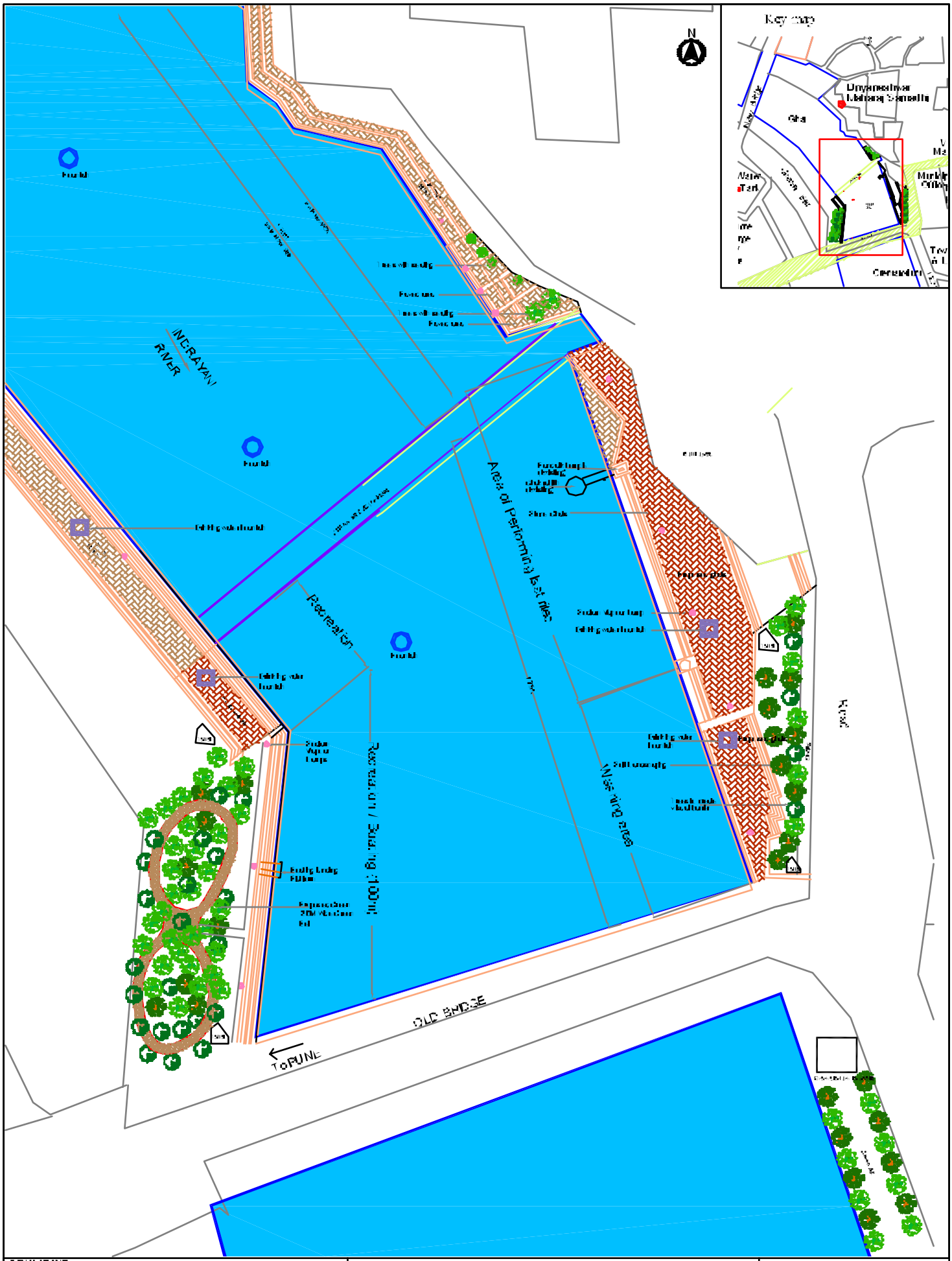
Table 5.1: Summary of Riverfront Development Projects and Their Costs

Sl No.	Project	Specifications	Estimated cost (Rs. Lakh)
1	Removal of mid-stream structures		1.0
2	Strengthening of existing weir near old bridge.		1.0
3	Construction of mid stream fountains	3 no.s	6.0
4	Construction of ghats	54 m x 15m – upto Sopan bridge 50m x 20 m – right bank after Sopan bridge 175m x 20m – left bank from Sopan bridge upto old bridge	30.0
5	Construction of steps, boat landing facility, and walkway along right bank	100 m length	4.0
6	Gardens and soft landscaping:		4.0
7	Greenbelt and construction of steps for 200 m on both banks from New bridge upto Alandi weir		10.0
8	Construction of Toilet Blocks	3 No.s (4 WC + 2 Bath in each)	5.0
9	Lighting on river banks	8 No.s sodium vapour lamps	Included in Roads improvement
10	Drinking water fountains	5 no. with 2 taps each (3 on right bank + 2 on left bank)	3.0
11	Provision of Nirmalya Kalash	6 no.s (3 on each bank)	0.25
12	Removal of solid waste dumped along river bank, Relocation of existing crematorium, and other miscellaneous works		4.25
13	Boats and other recreation facilities		1.50
14	Security guards	6 no. (3 on each bank)	1.8 (annual salary @ Rs. 2500/- pm)
	Total		**70.0**



Maharashtra Pollution Control Board	Integrated Environmental Improvement of Religious Places in Maharashtra - Alandi	Proposed Development of Indrayani Riverfront

Wilbur Smith Associates
ENGINEERS & PLANNERS



CONSULTANT:
Wilbur Smith Associates Pvt. Ltd.

TITLE:
Figure No. 3.2
Proposed Development of Indrayani Riverfront
(Near Dehu Temple)

SCALE: Not to Scale

DATE:

CLIENT:
Maharashtra Pollution Control Board

PROJECT:
Action Plan for Environmental Improvement of Mula

DWG. NO:

6.0 WATER SUPPLY

6.1 INTRODUCTION

Alandi town is in the Pune District in the state of Maharashtra. Due to its religious importance and proximity to the Pune city, the town is expected to grow fast. The existing water supply system needs to be improved and the distribution system strengthened and expanded to cover the entire town. This section of the feasibility report comprises a need assessment of the water supply system and improvements required on a short-term and long-term basis to ensure proper distribution.

6.2 EXISTING SCHEME

As per the 2001 census, the population of the Alandi town is 17565. The total domestic water requirement at is 2.61 MLD based on present stage (2001) population and per-capita consumption of is considered as 135 lpcd for resident population and 30 lpcd for the floating population. It is understood from the discussions that the present water supply is to the tune of 3.5 MLD.

The town already has an existing water supply system , which was constructed in the year 1935 and upgraded several times by modifications and augmentations to the existing system.. The present water supply scheme has the following major components

- Intake structures
- Transmission mains / Feeder mains
- Water treatment plant (WTP) of 1.68 MLD capacity
- Service reservoirs / Distribution network

The elevation difference between the maximum and minimum contours within the town boundary is around 12 m.

6.2.1 Source

Presently, the primary source of water supply to Alandi is from Indrayani River. The intake structure for abstracting 3.5 MLD of raw water, is located near the Alandi dam. Sub-surface water is abstracted from the wells and bore wells within town limits. The Bore wells are yielding a flow of nearly 20000 lit per day as per the information from municipal officials.

6.2.2 Transmission Main and Feeder Main Network

A raw water intake pipe of 350 mm dia CI-LA is laid for a length of 107 m from the Intake well to the Jackwell. A pure water transmission main of 225 mm dia CI-LA is laid for a length of 1230 m from clear water sump to service reservoirs. In addition, the feeder main network to various cisterns is a part of the distribution system.

The raw water pump house has 15 HP (2+1) and 35 HP (1+1) pumps. It is not provided with a standby generator. For pumping the treated water to the service reservoirs, clear water pumps of 15 HP (2+1) and 35 HP (1+1) capacity are provided. Based on the information available with the officials, the transmission main and feeder main network is functioning satisfactorily.

6.2.3 Water Treatment Plant (WTP)

The WTP is located within 100 m from the intake point on the Indrayani river. The treatment plant has the following main components

- Raw water pump house
- Cascade aerator
- Chemical House
- Flash mixer
- Clarifier
- Filter beds

The components like aerator and filter beds of existing treatment plant are not functioning properly as most of the electrical and mechanical components are very old. Complete revamping of the electrical and mechanical fittings is required. The WTP was constructed in the year 1974 with rapid sand filter and clarifloculator. In addition, only settling tank for a capacity of 1.68 mld is constructed to cope up with the additional demands. The water from this settling tank is bye passed and water enters the network without filtration during the festival period.

6.2.4 Distribution System

The total road length within the municipal boundary is around 18 km and it is understood from the discussions with the municipal officials that almost 25 km length of the town is covered with the distribution system. The distribution system includes;

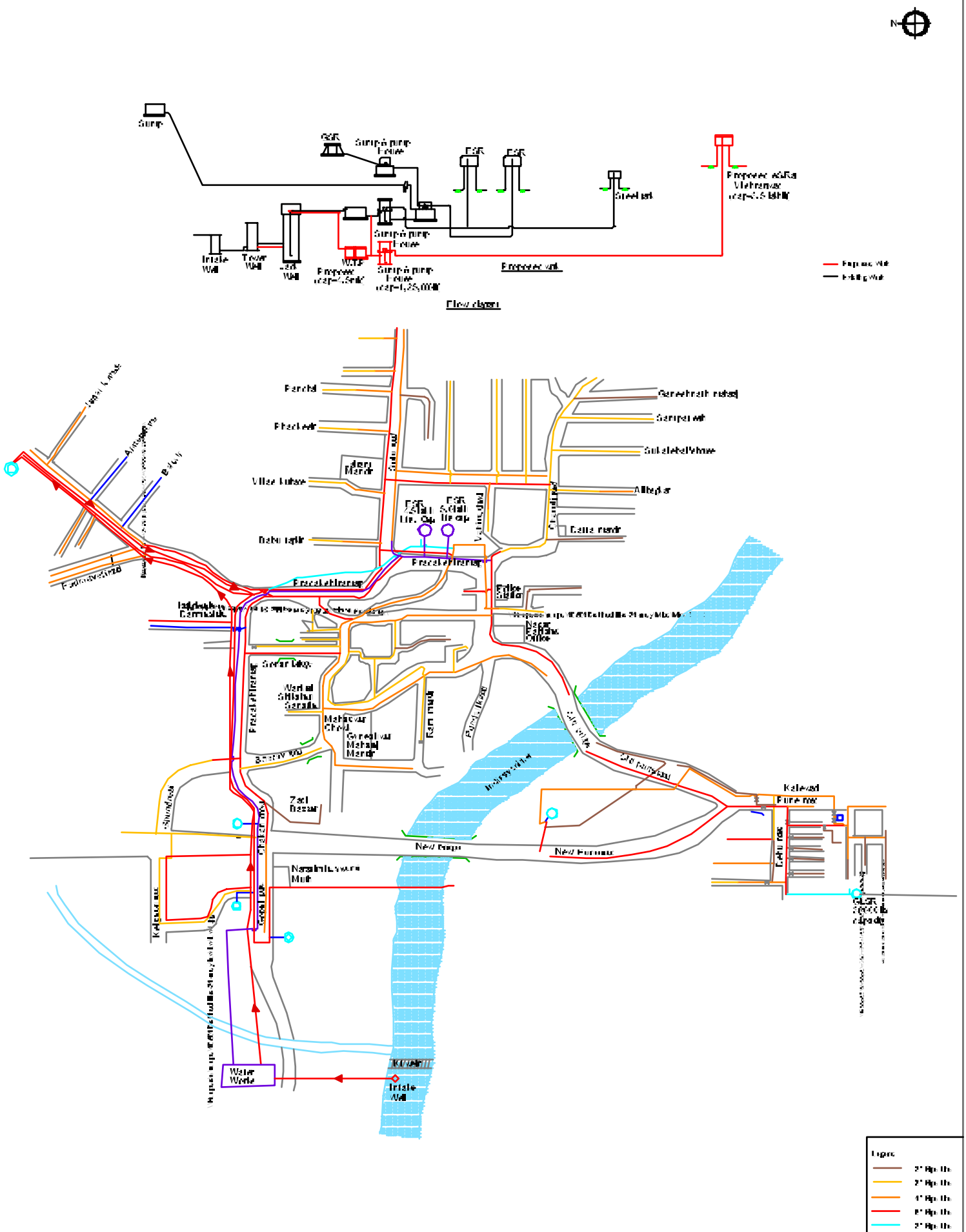
- Two Elevated service reservoirs of 4.5 LL and 5.0 LL
- Ground Service Reservoir of 0.38 LL
- 6 Cisterns to service the poor community.

The distribution system is understood to have few leakages, which are required to be arrested. The uncovered areas have to be piped and rehabilitation of the existing structures are required to be carried out.

A flow diagram network of the entire town is shown in Fig 6.1. The details of the existing potable water distribution system are furnished below in Table 6.1.

Table 6.1: Details of Existing Potable Water Distribution System

Sl.No.	Items	Description
1	Overhead Tanks / GLSR	2 / 1
2	Total Storage Capacity	9.88 LL
3	Daily Water Supply	35 LL (Normal Season)
4	Distribution Zones	2
5	Length of distribution Network	25 Km
6	Duration of Water Supply	6.00 AM to 9.00 AM (Normal Season) 4.00 PM to 6.00 PM
7	Public Fountains	6
8	House Connections	1327



CONSULTANT: Wilbur Smith Associates Pvt. Ltd.	Title: Figure No:1 Water Distribution Network of Mandi	SCALE: Not to Scale DATE:
CLIENT: Maharashtra Pollution Control Board	Project: Action Plan for Environmental Improvement in Mandi	DWG. NO:

6.3 IMPROVEMENTS TO EXISTING SYSTEM

It is assumed for the present study that the source is reliable and permissions are available from the concerned departments to extract the additional water from the same source. Otherwise additional sources have to be identified, which requires additional estimate depending on the requirement.

Based on the CPHEEO manual the water supply demand is 135 lpcd for the cities provided with piped water supply where sewerage system is contemplated. The break up of the water demand is shown in the following Table 6.2

Table 6.2: Water Requirements for Domestic Purpose

Sr.No.	Description	Water in lpcd
1	Bathing	55
2	Washing of cloths	20
3	Flushing of WC	30
4	Washing of house	10
5	Washing of utensils	10
6	Cooking	5
7	Drinking	5
	Total Demand	**135**

The population of Alandi has been projected as 60515 for the year 2031 and presuming the increase in floating population of the same tune. The water demand for the domestic purpose is considered as 135 lpcd as cited in the CPHEEO manual and for the floating population it is considered as 70 lpcd. The following table indicates the water demands.

Table 6.3 : Water Demands

Status	Resident Population	Demand @ 135 lpcd (MLD)	Floating Population	Demand @ 70 lpcd (MLD)	Total Demand (MLD)
Census (2001)	17,565	2.37	8,000	0.56	2.93
Ultimate (2011)	26,988	3.64	10,000	0.70	4.34
Ultimate (2031)	60,515	8.17	20,000	1.40	9.57
Additional Population (for marginal treated WS during fares)			15,000	1.05	1.05

Alandi being a pilgrim place is attracting many people and it is essential to have additional facilities for the water supply during the periods of the Ashadhi and Kartiki fairs. A marginal provision of 15000 is considered for designing the system to partially serve the pilgrim population during the fairs. The fairs last for two days i.e. four days in a year. Hence it is better to meet the additional demands through water tankers.

Thus, the total water demand in short term for the year 2011 is estimated to be 5.39 MLD (i.e. 4.34 + 1.05). The capacity required by the year 2031 is estimated to be 10.62 MLD (i.e.9.57 + 1.05).

Based on the above and the discussions with the municipal officials, following are the need based proposals for the augmentation of the water supply system considering the regular population and the floating pilgrim population.

The proposals for augmentation of the scheme are

- Rehabilitation of the existing water supply system (Scheme-1)
- New proposals for the additional capacity of (Scheme-2)

Rehabilitation for Existing Water Supply Scheme (Scheme – 1)

- Providing raw water intake pipe, raw water pumping main.
- Rehabilitation of treatment plant (2 MLD)
- It is advisable to retain the existing civil structures with some rehabilitation measures and modifications to suit new technologies and providing new electrical and mechanical components in water treatment plant.
- Construction of additional capacity of treatment plant (4MLD)
- Remodelling of the distribution system for equitable distribution of water and refurbishment of service reservoirs and cisterns.

New Proposals for Additional Capacity (Scheme – 2)

- Providing raw water intake for additional capacity including the connecting pipe, raw water
- Clear water pumping main (Common for both schemes 1 & 2)
- Providing new raw water and clear water pumping machinery
- Construction of additional capacity of treatment plant (7 MLD)
- Construction of new service reservoirs to have sufficient storage.
- Laying new distribution lines in the uncovered area.

6.4 CAPITAL COST AND PHASING OF INVESTMENT

Cost of the proposed improvements to the water supply and distribution system is listed in Table 6.4. The cost estimates have been prepared based on the MJP SoR and consultants data bank.

Table 6.4 : Project Cost and Phasing of Investment

SlNo	Description	Cost (Rs. Lakhs)
	Phase I (2005 – 11) High Priority	
1	Rehabilitation of existing supply & distribution system	**19.00**
2	Rehabilitation of existing treatment Plant (Civil structures)	**4.00**
3	Raw water Intake for additional capacity (2 Mld)	50.00
4	Construction of additional capacity WTP (4 MLD) including Raw water and Clear water Transmission Main Pumping Machinery Electrical & Mechanical components of WTP	130.00
	Phase II (2011 –2031) Medium Priority	
7	Additional capacity of WTP (7 MLD)	100.00
8	Improvements to Distribution System (2 Km)	75.00
9	Additional Service Reservoirs	120.00
	Base Cost of Improvement	**498.00**
	Physical Contingency 5 %	24.90
	Supervision & quality control 2 %	9.96
	DPR cost 2 %	9.96
	Total Cost	**542.82 Say 550.00**

7.0 ROADS & TRAFFIC IMPROVEMENT

7.1 EXISTING ROAD NETWORK

Alandi is connected to the District Head Quarter Pune and nearby main urban centres through the Pune-Nashik NH-50 and a Major District Road (MDR). It is also connected to the Moshi village on the NH-50 by a road leading to Dehu, another religious town. Chakan, a village also situated on the NH-50, is connected to Alandi by a MDR passing through the town.

Internally, the entire Alandi town is connected by various small roads and lanes. The internal roads are mostly 7 m wide. However, the effective width is significantly reduced due to roadside parking, shops. Also, the roads are irregular and of awkward shape.

The major roads in the Alandi town are as below. These roads cater to the demand of the commercial traffic through the town.

Table 7.1 : Major Roads in Alandi

Sl No	Road	Type	Approx. Width (m)	Approx. Length (km)
1	Pune-Chakan Road over new bridge	BT	18	2.0
2	Branch of Pune-Chakan Road to Alandi Nagar Parishad over old bridge	BT	18	0.5
3	Dehu Phata from Pune – Chakan Road	BT	18	0.55
4	Municipality office – Rath – Vadgaon Chowk - Bharav Road	BT	8 to 12	1.0
	Municipality office to Samadhi Temple (Mahadwar Road)	BT	8	0.3
5	Markal Road	BT	12	0.4
6	Vadgaon Road	BT	15	0.5
7	Padmavati Road	WBM	15	0.5
8	Charholi Road (Cosmos Bank to Municipal boundary)	WBM + BT	9	0.5
9	Chakan Chowk to Water Treatment Plant	WBM	6	0.7
10	Kelgaon Road	BT	9	0.4

Source : Development Plan of Alandi 1988-98 and field survey 2005

At the time of the Ashadhi and Kartiki Ekadashi days, vehicles are not permitted within Pilgrim zone. However, on normal days vehicles are permitted upto the temple entrance and can be seen parked in the small open area in front of the temple.

The Pune – Markal road, via the old river bridge-AMC office through the Alandi town, witnesses movement of heavy commercial vehicles such as trucks, trailers and containers, carrying goods, machinery and materials for the industrial area near Markal village. In addition, the vehicles going towards the temple via the Mahadwar Road, PMT buses and the local traffic also move on this road. Many restaurants and shops as well as the AMC office, Police Station are located on this road. Indiscriminate parking of vehicles is seen along this road, particularly in front of the AMC office, where the road takes a sharp turn. As a result, traffic jams are common in this area even though the traffic volume could be relatively less.

Similarly, the Pradakshina Road from the Vadgaon Chowk to Chakan Chowk witnesses

traffic congestions due to indiscriminate parking of vehicles along roadside, movement of heavy vehicles and more pedestrian traffic due to location of the Holy Wall and other important temples as well as many Dharma Shalas (Guest Houses) on this stretch.

The stretch from Vadgaon Chowk to Chakan Chowk is a 30 ft (9.14 m) wide tar road. It is an important road in the town since it forms part of the circular route for the holy walk around the temple and also has the other important temples, religious places and Dharmashalas located along the road.

During the time of the Ashadhi and Kartiki Ekadashi lakhs of pilgrims take a walk along the circular route from Nagar Parishad Chowk-Markal Chowk-Rath-Vadgaon Chowk-Bharav Rasta-Indrayani River bank and Nagar Parishad chowk. This circular route is called **Pradakshina Marg**. The length of the road is about 2 km. The heavy vehicles to Markal and Chakan industrial area and the PMT buses also ply via the Nagar Parishad Chowk-Markal Chowk-Rath-Vadgaon Chowk stretch.

The road network in Alandi is about 18 km, of which 10 km are Bitumen Topped (BT) roads and about 2 km are Concrete roads. About 4 km of roads are Water Bound Macadam (WBM) roads and another 2 km of roads are Kutcha roads. The narrow bylanes in the Gaothan area and two streets from the Charholi road have been concretised. The road from Vadgaon Chowk to Padmavati and its bylanes are WBM roads.

Table 7.2 : Existing Road Network

Category of Roads	Length, km	Distribution %
Surfaced Roads		
Bitumen Topped	10	55.56
Concrete	2	11.11
Un- surfaced Roads		
WBM	4	22.22
Earthen/Kutcha	2	11.11
Total Length	**18**	**100**

Source: Alandi Municipality Annual Report 2002-03

Following roads in the Alandi town are maintained by PWD and the Zilla Parishad. Rest of the roads are maintained by the AMC.

Table 7.3 : Roads Maintained by PWD and Zilla Parishad

Sl No.	Road	Type	Approx. Length (km)
	Roads maintained by PWD		
1	Pune road (from Municipal boundary to start of both the bridges)	BT	1.25
2	Dehu Road	BT	0.55
3	Markal Road	BT	0.4
4	Charholi Road (Cosmos Bank to Municipal boundary)	WBM + BT	0.5
5	Vadgaon Road (Vadgaon Chowk to Municipal boundary)	BT	0.5
	Sub-total PWD roads		**3.2**
	Roads maintained by Zilla Parishad		
1	Kelgaon Road	BT	0.4
2	Chakan Road (Chakan chowk to Municipal boundary)	BT	0.5
	Sub-total ZP roads		**0.9**
	Total		**4.1**

Source : Alandi Municipal Council

Within the municipal limits, the width of the roads range between 3-18 m (10 to 60 ft). However, roads within the Gaothan area of the town, in particular within the ambit of the Pradakshina Marg, are narrow bylanes and have a width ranging from 3 to 8 m (10 to 25 ft). The road surface is either concrete or bituminous in nature.

Of the total 18 km of roads in Alandi, about 77 percent are maintained by the AMC, about 18 percent by the PWD, and the remaining 5 percent are maintained by the ZP. Cement concrete roads constitute only 11 percent of the roads. Most of the roads are black topped/ tar and constitute about 55 percent of the existing roads. Density of roads in the town is 2.63 km/sq. km. The per-capita road length is 1.02 m, which is less than the standard of 1.75 m.

The important traffic junctions in Alandi town are;

Table 7.4 : Important Traffic Junctions in Alandi

Sl No.	Name	No. of Roads
1	Junction in front of Municipality office (Nagar Parishad Chowk)	3
2	Markal Chowk	2
3	Rath	3
4	Vadgaon Chowk	3
5	Chakan Chowk	4
6	Y Junction (New MSRTC Bus Stand) on Pune road bifurcating entry from old and new bridge	3
7	Dehu Road	2

Of the above, the junctions at Nagar Parishad Chowk, Rath, Vadgaon Chowk and Chakan Chowk are prone to frequent traffic jams due to movement of heavy traffic, built up area, commercial activities, encroachments and haphazard parking.

7.2 PUBLIC TRANSPORT

The Maharashtra State Road Transport Corporation (MSRTC) operates only three bus services to & from Alandi every day. However, good bus and rail connectivity is available from Pune, which is well connected by city bus services to Alandi.

The Pune Municipal Transport (PMT) and Pimpari-Chinchwad Municipal Transport (PCMT) run local bus services for Alandi from Pune and Pimpari - Chinchwad, respectively. Open parking for 5 –6 buses and waiting shelters for the passengers are provided at Chakan chowk and near the old bridge near the Municipality office for the PMT and PCMT buses, respectively. By virtue of the location of their bus stations the PCMT buses do not enter the core area of the town, whereas the PMT buses take Pradakshina Marg to enter/exit the town.

The MSRTC bus station is located along the Pune Road before the new bridge on the Indrayani River. The old bus station of MSRTC was located in an area of about 900 sq. m near the municipality office.

7.4 PARKING FACILITIES

Vehicle parking is a major area of concern in Alandi. At present there is only one parking lot owned by the Alandi Municipality located near the Chakan Chowk. The area of the parking lot is about 3300 sq.m. It is an open ground which is also used for vehicle parking, and temporary vegetable shops and small restaurants along its boundary.

The PCMT buses are parked at the PCMT bus stand located near the old river bridge. This bus stand has an approximate area of 1200 sq.m and a capacity to park 5 to 6 buses at a time.

However, the bus stand is located on the designated road to the existing crematorium along the river bank. The PMT buses are parked at the PMT bus stand at the Chakan Chowk. It has an approximate area of 700 sq.m About 3 to 4 buses can be parked here.

In addition to the above, the open area in front of the Shri Dnyaneshwar Maharaj Samadhi Temple is also used for vehicle parking. It has an area of 150 to 180 sq.m (1600 to 2000 sq. ft) approximately. Vehicles and auto rikshaws are also seen parked near the PCMT bus stand, Chakan chowk, Vadgaon chowk and also along the road sides.

At the time of the Ashadhi and Kartiki Ekadashi days, vehicles are not permitted within a radius of 3 km of the Dnyaneshwar Maharaj Temples. However, on normal days vehicles are permitted upto the temple entrance and can be seen parked in the small open area in front of the temple.

Typical data on vehicles parked at the existing parking lot of the AMC near Chakan Chowk is given below. This data shows that more vehicles are parked on Thursday, Saturday and Sunday.

Table 7.5 : Details of Vehicle Parking at AMC Parking at Chakan Chowk in April 2005

Date	Day	2-Wheeler	4-Wheeler (Cars, Jeeps etc)	Heavy Vehicles (Buses, Mini Vans etc)
01-04-2005	Friday	98	76	10
02-04-2005	Saturday	60	81	9
03-04-2005	**Sunday**	**210**	**102**	**11**
04-04-2005	Monday	42	86	5
05-04-2005	**Tuesday**	**355**	**148**	**4**
06-04-2005	Wednesday	78	59	2
07-04-2005	**Thursday**	**123**	**88**	**5**
08-04-2005	Friday	47	46	2
09-04-2005	**Saturday**	**143**	**116**	**1**
10-04-2005	**Sunday**	**165**	**115**	**5**
11-04-2005	Monday	60	65	5
12-04-2005	Tuesday	72	77	0
13-04-2005	**Wednesday**	**125**	**94**	**8**
14-04-2005	**Thursday**	**193**	**96**	**5**
15-04-2005	Friday	57	93	3
16-04-2005	Saturday	44	120	17
17-04-2005	**Sunday**	**159**	**160**	**14**
18-04-2005	Monday	73	107	2
19-04-2005	Tuesday	49	158	17
20-04-2005	**Wednesday**	**170**	**157**	**10**
21-04-2005	**Thursday**	**134**	**158**	**7**
22-04-2005	**Friday**	**117**	**199**	**16**
23-04-2005	**Saturday**	**112**	**207**	**10**
24-04-2005	**Sunday**	**177**	**301**	**15**
25-04-2005	Monday	70	171	8
26-04-2005	**Tuesday**	**111**	**157**	**6**
27-04-2005	Wednesday	70	77	11
28-04-2005	**Thursday**	**156**	**94**	**14**
29-04-2005	**Friday**	**167**	**79**	**9**
30-04-2005	**Saturday**	**191**	**111**	**20**
Maximum		42	46	0
Minimum		355	301	20
Average		121	120	8

Source : Operator, AMC Parking

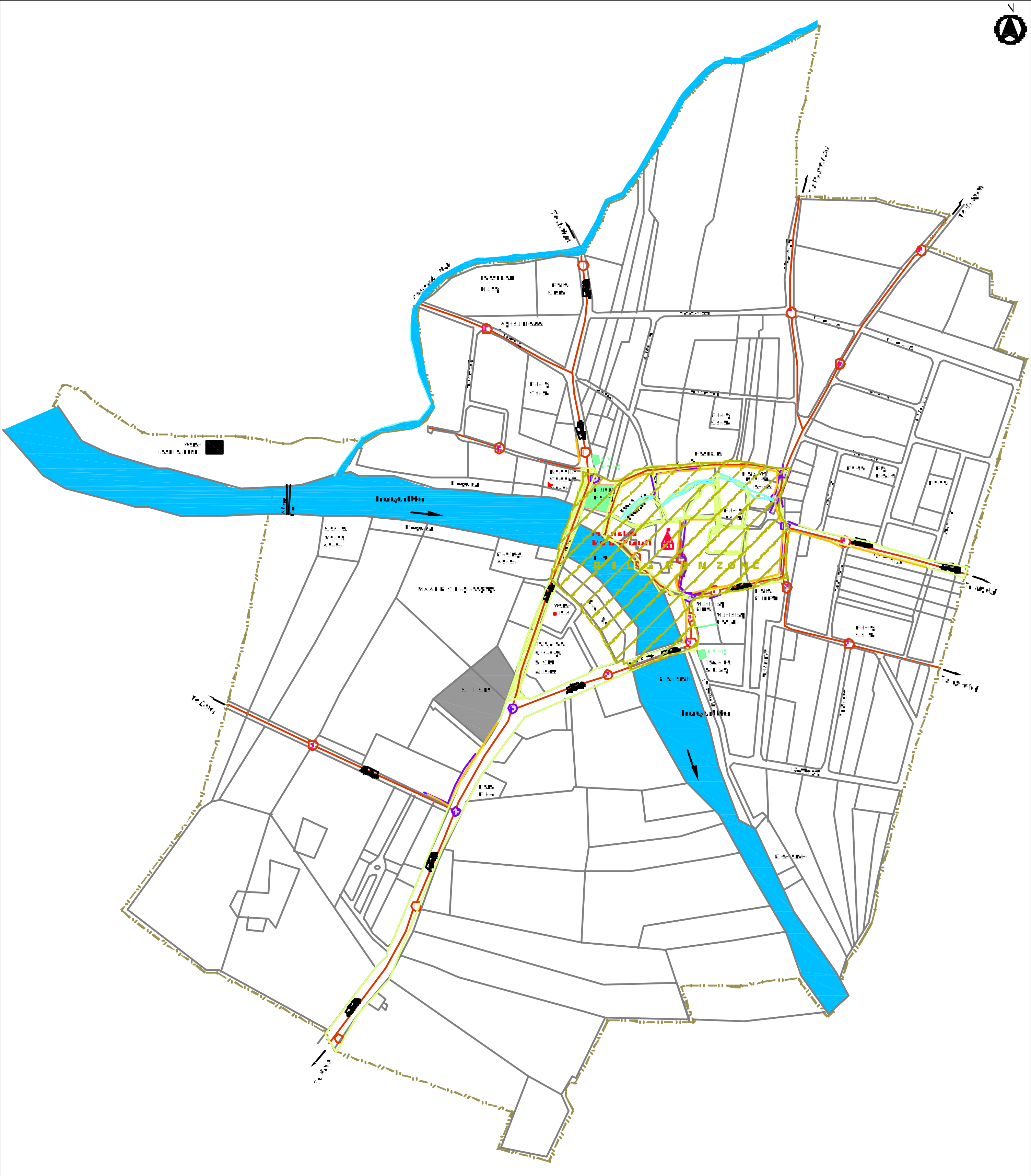
7.5 STREET LIGHTING

Provision and maintenance of streetlights is an obligatory function of Alandi Municipality. There are 968 streetlights in the city, spaced at an average distance of 18.5m. Conventional fluorescent tube lights account for 85% of the total lights, and the Mercury and Sodium Vapour Lamps accounts for 15% of the total number of streetlights. High mast lighting and High-powered fixtures are absent in the town.

Table 7.6 : Street Lights

Luminary Type	Units
	Nos
Halogen Lamps	-
Mercury and Sodium Vapour Lamps	143
Tube Lights	825
Others	-
Total	**968**
Total road length, km	18
Spacing of street lights, m	18.5
Desired spacing	

Source: Alandi Municipality Annual Report 2002-03



Major Roads in Alandi

Important Traffic Junctions in Alandi

Roads maintained by PWD

Roads maintained by Zilla Parishad

Roads maintained by AMC

Legend

Heavy traffic movement

Pedestrian Movement

CONSULTANT: Wilbur Smith Associates Pvt. Ltd.	TITLE: Figure No 7.1 Existing Traffic Scenario in Alandi	SCALE: Not to Scale DATE:
CLIENT: Maharashtra Pollution Control Board	PROJECT: Action Plan for Environmental Improvement for Alandi	DWG. NO:

7.6 SERVICE INADEQUACY AND KEY ISSUES

Traffic management in Alandi are mainly governed by the flow and movement of pilgrims in the town. However, there are essential issues associated with the town development and in particular, the circulation pattern and road networks. The broad issues comprise poor surface condition of roads, inadequate width, and poor maintenance of roads, footpath and drains, and improper parking facilities. The road surface condition exhibits distress such as cracks, potholes, and undulations.

The issues of traffic and transportation comprise the available road network and its adequacy, condition of the road surface, availability of footpaths, road width and traffic congestion, local transport system, maintenance of the roads etc.

The key issues and conclusions based on field visits and data analysis are presented below.

Table 7.7 : Essential Road Network Indicators

Indicator	Current Situation
Road Density	2.63 km/sq. km
Per capita Road Length (Municipal Roads)	1.02
Percent of surfaced roads (BT and concrete roads) to total road length	66.67
Percent of un-surfaced (WBM and kutcha) roads	33.33

Source: Analysis.

(i) High density and congested lanes - Central areas of the town, namely AMC office to Vadgaon Chowk, are narrow, of awkward shape, and surrounded by heavily built-up areas. These roads also carry large volumes of traffic. These factors make the area susceptible to formation of bottlenecks, traffic jams, accidents, air and noise pollution and delayed travel times.

(ii) Informal activities along roadside - The margins of roads are encroached upon in several sections of the roads within the Gaothan area by small street vendors, illegal parking and other informal activities. With no margins left on the roads, the effective carriageway of the road is reduced drastically leading to congestion.

(iii) Absence of street furniture/signage - The roads lack signals, signage, and footpaths.

(iv) Inadequate surfaced roads - Only 67 percent of municipal roads are surfaced. The road surface condition for most of the roads is very bad due to removal of the bitumen from the surface, resulting in wear and tear of vehicle tyres, slow traffic movement and dust pollution. It is imperative to undertake road improvements on a priority.

(v) Inadequate parking facilities –

- Lack of authorized on-street or off-street parking lots in the town. Only one designated parking area in the town.
- Reduced road capacity due to parking of number of autos and jeeps.
- Parking of PMT buses and alighting & boarding of passengers along the Pradakshina Marg.
- Parking of 2-wheelers, cars, jeeps and tempos in the bylanes near the temple and infront of temple.
- Parking at junctions and roundabouts. Haphazard parking on roads, bylanes causes reduction in effective road width and creates traffic hazards.

(vi) Thorough traffic of heavy commercial vehicles - The Pune-Chakan and Pune-Markal MDRs pass through the centre of the town. The vehicles carrying heavy machinery and industrial goods for the industries in the Chakan and Markal MIDC areas, ply on these roads. These roads are narrow and there are many acute angles to it. This can result in creating accident spots and traffic jam. The bypass road proposed in the 1988-98 DP has not been constructed yet.

(vii) Junction improvement – Major junctions in the town namely Dehu road junction, Y Junction (New MSRTC Bus Stand) on Pune road, Chakan chowk, Nagar Parishad chowk, Vadgaon chowk and Chakan chowk, lack traffic management facilities such as signage, traffic island, dividers, high mast lights etc. causing blockage to regular traffic, air and noise pollution, grimy aesthetics. These junctions can also be improved with some beautification measures such as fountains, green islands etc.

(viii) Inadequate street lighting - The new residential development is not sufficiently covered by streetlights. Poor lighting quality of road junctions. Inadequate lighting on the river banks. There is only one person in the AMC responsible for maintenance of the street lights.

Photographs

7.7 PROJECT IDENTIFICATION AND COSTING

Improvement of road network provides a conspicuous improvement in the urban fabric and act as major catalyst in stimulating the development of the region. The following proposals are based on road surface conditions, deficiency in the road network, connectivity evaluation, parking and pedestrian requirements, and are based on discussions with the AMC staff and site inspections. The locations of the proposed improvement areas are shown in Figure 7.2.

7.7.1 Road Improvements

The strategic objectives of road network improvements are (a) To improve the connectivity and accessibility within the town, (b) To improve the efficiency of road space, and (c) To reduce delays at the junctions and remove bottlenecks if any.

The recommendations include:

i. Rehabilitation of existing roads, involving resurfacing of roads and in some cases, reconstruction; and undertaking periodic maintenance of the same.

ii. Upgrading of existing roads, by widening some main roads (to possible extent) and black-topping important kutcha / earthen roads

iii. Conversion of internal roads to pedestrian roads only.

Table 7.8 : Improvement of Major Roads

Sl No.	Road	Proposed Improvements	Length (km)	Cost (Rs. Lakh)	Priority
1	Mahadwar road and all internal roads around the Samadhi Temple	Concreting (blocks) of Mahadwar road and surrounding internal roads upto Samadhi temple. Removal of obstacles. (Steel barricades to be provided at the entrance of the Mahadwar road from the Nagar Parishad chowk to prohibit entry of vehicles)	0.25	8.0	High
2	Stretch from Vadgaon chowk to Chakan chowk	Strengthening & widening of the road. Construction of 1.5 m wide footpath on one of the road. Construction of concrete drains for rainwater along the route. No entry for heavy vehicles on from Vadgaon chowk to Chakan chowk.	0.35	16.0	High
3	Old bridge to Markal chowk	Strengthening & Widening of road. Shifting vegetable shops to old MSRTC bus stand area. Widening of Nagar Parishad (AMC) office junction. Plantation of trees from old bridge to Nagar Parishad junction.	0.35	7.0	High
4	Pune road from AMC limit upto old and new bridge and Dehu road	Resurfacing (black topping) of Dehu Road upto municipal boundary.	1.5	21.0	High
5	Padmavati Road	Black topping of Padmavati Road (carriageway) upto municipal boundary.	0.35	7.0	Medium
6	Chakan chowk to Water treatment plant	Strengthening and black topping of existing kutcha road upto water treatment plant.	0.3	5.0	Medium
7	Charholi road	Strengthening & Widening of Charholi road. Black topping of Charholi Road upto municipal boundary.	0.35	7.0	Medium
8	Sopan Bridge	Access roads from New & Old bridge and resurfacing of Sopan Bridge with steel guard railings	0.5	2.0	High
9	Old Bridge	Widening of bridge by providing steel girders on either sides for pedestrians and cyclists, with guard rails	0.2	2.0	High
	Total			**75.0**	

Source: Analysis

7.7.2 Construction of Bypass Road to avoid Heavy Vehicle Traffic through the Town.

The field survey showed that majority of the commercial traffic plying on Pune-Chakan and Pune-Markal road, which is not destined to Alandi, also passes through the town causing traffic and pollution problems.

To avoid this, a bypass road along the municipal boundary of Alandi was proposed in the 1988-98 DP of Alandi. This bypass road was expected to reroute the present thorough traffic of heavy vehicles through the town, around the periphery of the town, which would relieve the town of its current menace. However, the bypass road has not been constructed yet. As a result all the heavy vehicle traffic still continues to pass through the centre of the town.

Hence, it is recommended that the construction of the Bypass road as per the alignment shown in the DP should be taken-up at the earliest and shall be maintained properly to encourage its usage by commercial traffic.

Cost estimate

The following specifications are considered for estimating the cost of the proposed bypass road.
Carriageway – 7m
Hard shoulder – 1.5 m both sides
Total length – 2 km.

It is suggested that the right of way for this road may be fixed at 15.2 m instead of the 12.2 m suggested in the 1988-98 DP for future widening. The construction cost of the entire 2 km long bypass road from Dehu road junction to Chakan road is estimated to be Rs. 80 Lakh.

Future Development – Medium Priority
It is also recommended that the Bypass road alignment may be changed in future as below. The proposed bypass road can start from the Dehu road junction and will pass through survey no. 927, 928 and 930. This road will join the alignment at the junction near the proposed site of the crematorium. A new bridge is required to be constructed over the Indrayani river in this stretch.

Other Recommendations

The other recommendations include:

i. Formulation of a road development and maintenance plan with prioritization of roads.
ii. Rehabilitation of hawkers and vendors who have encroached the Mahadwar road, Pradakshina road and other roads in the town.
iii. Conversion of Mahadwar road (from Nagar Parishad chowk to Samadhi temple) and from Samadhi chowk to existing post office to pedestrian.
iv. Shifting of the vegetable market on the Cosmos Bank- Markal chowk road to the site of the old MSRTC bus stand opposite AMC office.
v. Extension of the existing road system proposed in the Development Plan (DP), to improve linkages to town expansion areas;
vi. Notwithstanding any option listed above, strengthening and upgrading of existing roads shall be taken up as a priority due to dilapidated road condition.

7.7.3 Junction Improvements

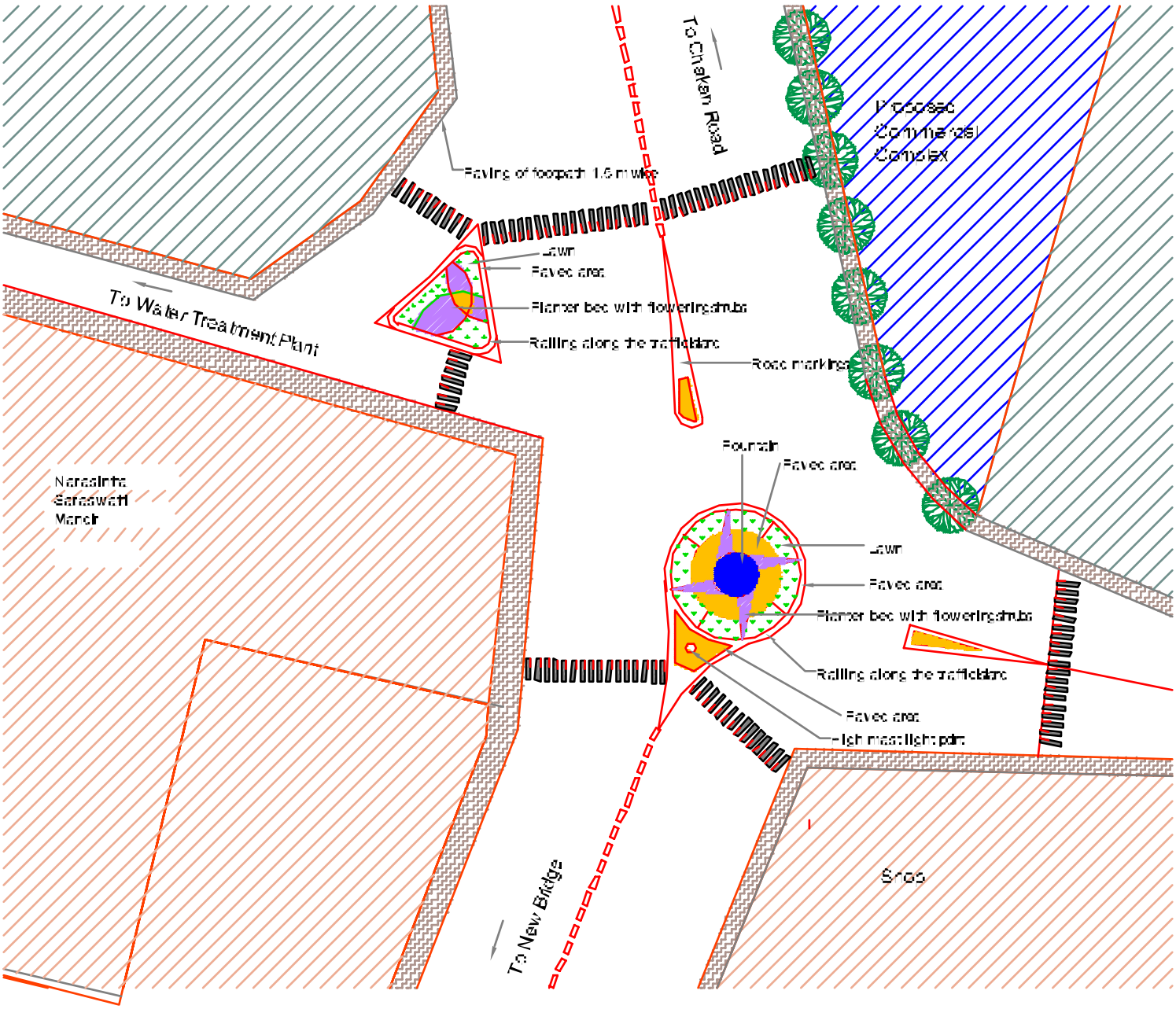
The following major intersections in the town are recommended for improvements for better traffic management and beautification of the town. Proposed improvements at each of the junction are described below.

The summary of the same is presented in **Table 7.9**.

Table 7.9 : Cost of Junction Improvements in Alandi

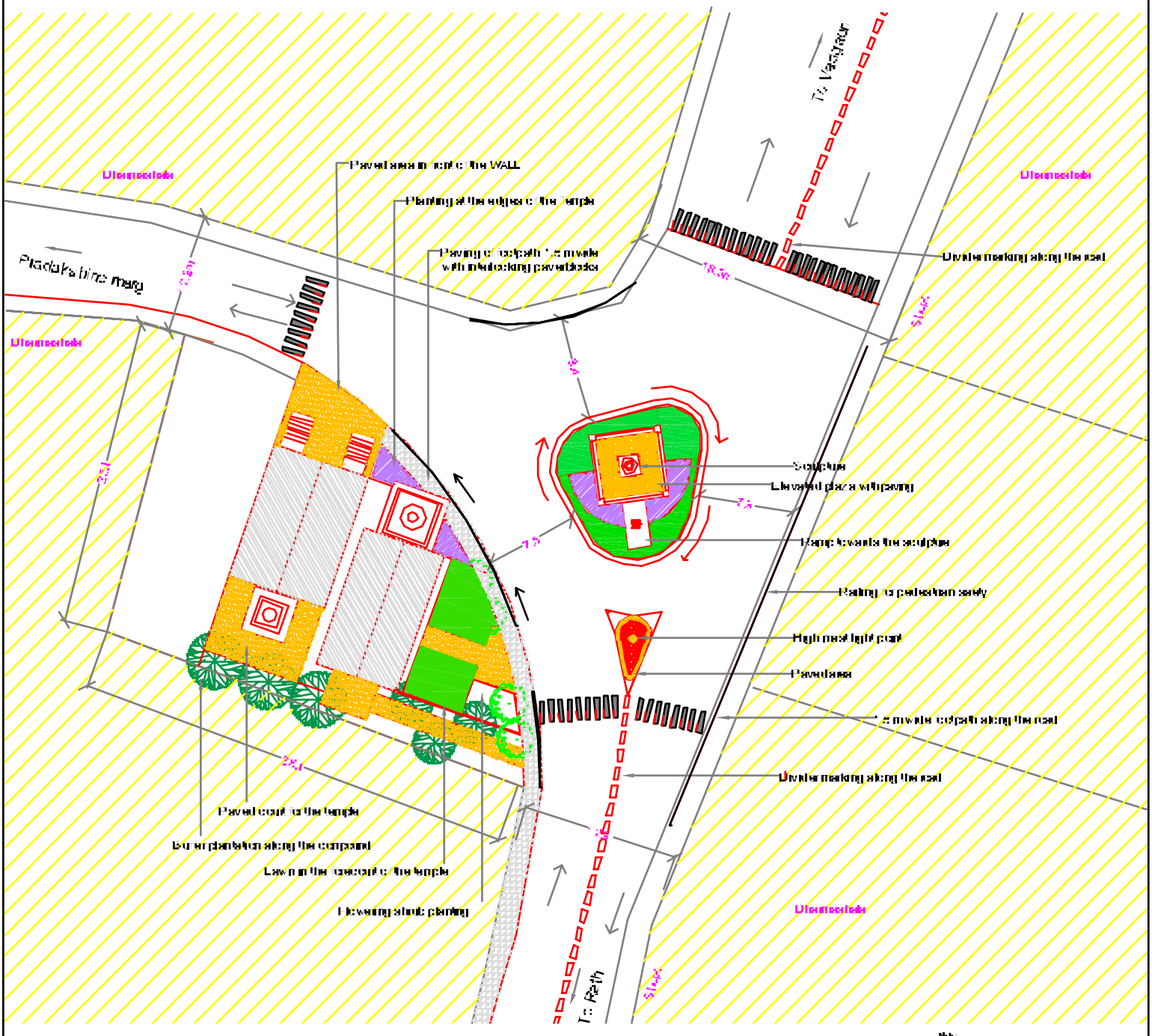
Sl No.	Name of the Junction	Proposed Improvements	Cost (Rs. Lakh)
1	Vadgaon chowk	Traffic island, signages, green belt alongside Bhairoba temple and the Holy wall, high mast lamp	3.0
2	Chakan chowk	Traffic island, widening of the square by partial acquisition of the PMT bus stand area, signages, green belt, high mast lamp	3.0
3	Y Junction (New MSRTC Bus Stand) on Pune road	Welcome arch, signages, Tourist map of Alandi, green belt, high mast lamp	3.5
4.	All the above	Landscaping	0.5
	Total		**10.0**

Source: Analysis



Note-
Indicative Drawing , to be followed DPR

CONSULTANT: Wilbur Smith Associates Pvt. Ltd.	TITLE: Figure No. 7.4 Proposed Improvement of Chalan Crowle	SCALE: Not to Scale
		DATE:
CLIENT: Maharashtra Pollution Control Board	PROJECT: Action Plan for Environmental Improvement of Ulhas	DWG. NO:



CONSULTANT: Wilbur Smith Associates Pvt. Ltd.	TITLE: Figure No. 7.2 Proposed Improvements of Vadgaon Chowk	SCALE: Not to Scale
		DATE:
CLIENT: Maharashtra Pollution Control Board	PROJECT: Action Plan for Environmental Improvement in Karad	DWG. NO:

Improvement of Major roads

Junction improvement in Alandi

Legend

- Proposed Parking
- Proposed Improvement of Roads
- Proposed Improvement for Junction

CONSULTANT: Wilbur Smith Associates Pvt. Ltd.

TITLE: Proposed Locations for Roads, Junctions & Parking Improvements in Alandi

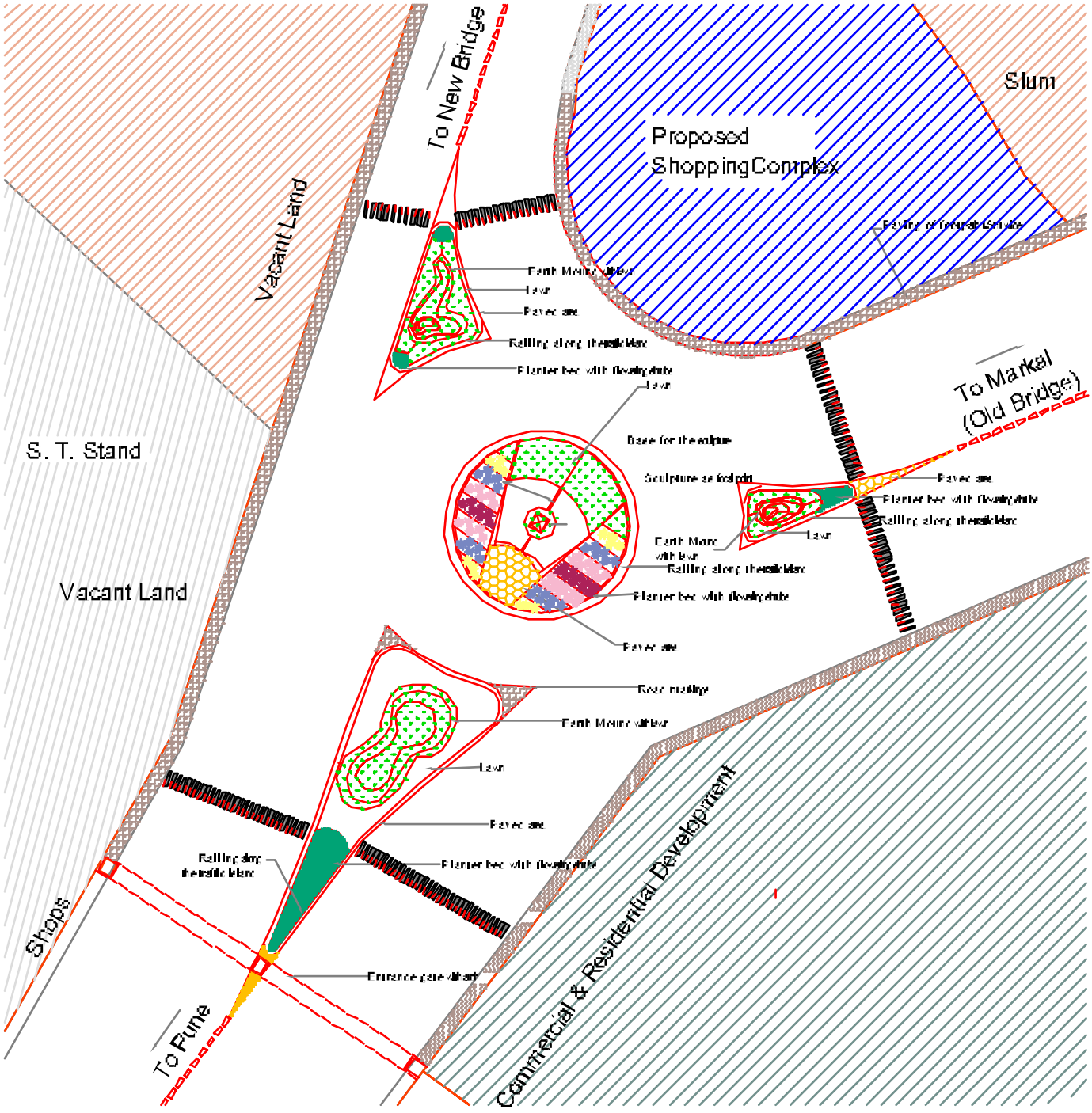
SCALE: Not to Scale

DATE:

CLIENT: Maharashtra Pollution Control Board

PROJECT: Integrated Environmental Improvement of Religious Places in Maharashtra - Alandi

DWG. NO:



CONSULTANT: Wilbur Smith Associates Pvt. Ltd.	Proposed Improvements for Y Junction on Pune Road	SCALE:
		DATE:
CLIENT: Maharashtra Pollution Control Board	Action Plan for Environmental Improvement in Alandi	DWG. NO:

7.7.4 Pedestrian Facilities

Pedestrians movement is the most important component of the traffic in Alandi. The movement of pilgrims in groups, "Dindi"s and "Palakhi"s, form the major pedestrian traffic. During normal period, about Based on the pedestrian demand assessment during normal and festival (Ekadashi) periods, following recommendations are formulated with an objective to make walking easier on the streets of Alandi.

(i) To provide for adequate pedestrian infrastructure such as footpath.
(ii) To improve pedestrian safety by providing facilities such as pedestrian guardrails at major intersections.

Project 1 - Provision of 1.5m wide footpath on the following sections

Road Section	Length	Estimated Cost Rs. Lakh
1. From old bridge - Nagar Parishad chowk – Markal chowk – Vadgaon chowk. Footpath from Vadgaon chowk to Chakan chowk considered in improvement of roads in Table 8.	0.9 km	4.0
2. Pune road (from Dehu road junction upto Chakan chowk.)	0.75 km	3.5
3. Y Junction (New MSRTC Bus Stand) on Pune road upto old bridge	0.4 km	2.0
Total		**9.5**

Project 2 - Converting Mahadwar road to pedestrian road only - No entry to vehicles to Mahadwar road from Nagar Parishad chowk side, providing steel barricades at the entrance at Nagar Parishad chowk.. The residents can use the road at the police station junction to enter the internal area. The cost of providing steel barricades is estimated to be Rs. Twenty Thousand only.

Project 3 - Converting road from Goroba Kaka Mandir on Pradakshina Marg to Samadhi temple as pedestrian road only - No entry to vehicles from the Goroba Kaka Mandir by providing steel barricades at the entrance at the Pradakshina Marg junction. The cost of providing steel barricades is estimated to be Rs Twenty Thousand only.

Project 4 - Providing pedestrian guardrails at the following locations to enhance safety.

Road Section	Estimated Cost, Rs. Lakh
i. Foot bridge over Indrayani river (Sopan Bridge)	3.3
ii. Nagar Parishad chowk	1.65
iii. Vadgaon chowk to Chakan chowk	1.1
iv. From New bridge to Chakan chowk	1.1
Total	**7.15**

7.7.5 Parking Facilities.

The key objectives are;

i. To prevent unauthorised parking of private vehicles, trucks and auto rickshaws on streets and

ii. To plan and provide for on-street and off-street parking facilities.

Based on the parking demand and availability of space at respective locations the parking supply is categorised in to on-street and off-street parking. The following projects are formulated to cater to the parking demand in the town. They are,

i. **Shifting of PMT bus stand** – The present bus stand of PMT at Chakan chowk may be shifted to the PCMT bus stand near old bridge to control entry of buses into the Pilgrim Zone. However, in order to facilitate boarding of bus by the users on the Chakan chowk side, certain services of PMT and PCMT may be routed through the Chakan chowk-Vadgaon chowk route.

   Alternatively, the PMT Chakan bus stop may be shifted further down on the Chakan road and the buses may take a ring route i.e. New bridge – Chakan chowk – Vadgaon chowk – Markal – AMC – Old bridge or the other way round.

ii. **Development of integrated MSRTC, PMT & PCMT bus terminus -** The above arrangement is proposed keeping in view the present concentration of all religious, commercial and institutional activities in the Gaothan area and hence the need of the access till this area. However, in the long term, the non-conforming activities to Pilrgim zone, such as commercial and institutional activities, are proposed to be shifted on the right side of the river (Haveli Taluk). Consequently, the new MSRTC bus stand can be developed into an integrated bus terminus for MSRTC, PMT and PCMT services.

iii. **Provision of off-street pay & park facilities –** The existing pay & park facility of the Alandi Municipality at Chakan chowk (area 3300 sq. m) can be improved as suggested separately in this section. Also, an additional pay & park facility of about 3000 sq. m may be created on the area behind the AMC office. Additional land may be acquired along the river bank for the parking purpose. Henceforth roadside parking of vehicles in these areas should be completely prohibited.

iv. **Provision of on-street parking facilities -** On-street parking facilities may be provided along the Pune road, Chakan chowk-Vadgaon chowk stretch of Pradakshina Marg, Cosmos Bank and Vadgaon chowk by properly earmarking space along one side of the roads. However, parking along the Bypass road should not be permitted.

v. **Provision of auto and jeep stands –** Parking spaces for auto rikshaw and jeeps may be provided near the PCMT bus stand, Chakan chowk, Vadgaon chowk and Y Junction near new bus stand of MSRTC.

vi. **LPG/CNG based auto rickshaw –** Only LPG/CNG fuel based auto rikshaws should be permitted in future, with the availability of the said fuel. Similarly, after the development of the new integrated bus terminus, feeder services by LPG/CNG based vehicles can be provided to the town.

vii. **Basement parking for 2 wheelers at the proposed vegetable market at old bus stand –** The 1988-98 DP proposes construction of a vegetable market at the land of the Old MSRTC bus stand near the AMC office. The vegetable market should be constructed such that additional space for 2-wheeler parking is created at the location.

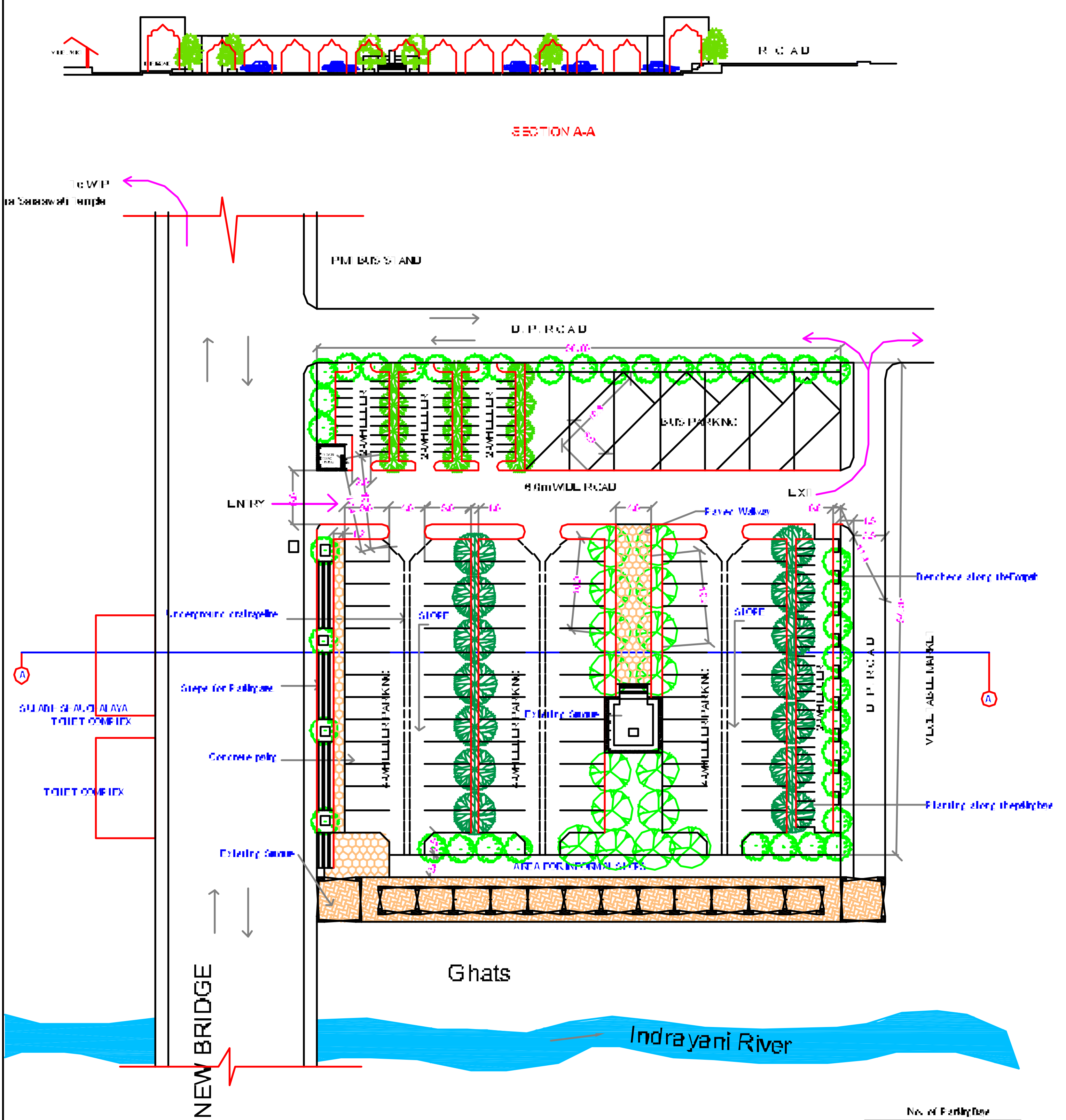
However, this cost will be part of the construction of the vegetable market.

The estimated block cost for implementation of the parking is summarised below.

Table 7.10 : Cost of Providing Parking Facilities

Description	Cost
	Rs.lakh
1. On Street Parking facilities along the Pune road, Chakan chowk-Vadgaon chowk stretch of Pradakshina marg, Cosmos Bank and Vadgaon chowk	0.20
2. Improvement of existing parking facility of AMC at Chakan chowk	15.5
3. New parking facility behind AMC office	15.5
4. Integrated bus terminus at New MSRTC bus stand	60.0
5. Earmarking area for auto and jeep stand at PCMT bus stand, Chakan chowk, Vadgaon chowk and Y Junction (New MSRTC Bus Stand) near new bus stand of MSRTC.	0.20
Total	**91.4**

Source: Analysis.



No. of Parking Bays

Type	Nos
Bus/Heavy Vehicle	4
4 - Wheels	[illegible]
2 -Wheels	[illegible]
TOTAL	[illegible]

CONSULTANT: Wilbur Smith Associates Pvt. Ltd.	TITLE: Proposed Improvements to Parking Facility at Chakan Chowk	SCALE: Not to Scale DATE:
CLIENT: Maharashtra Pollution Control Board	PROJECT: Action Plan for Environmental Improvement for Alandi	DWG. NO:

7.7.6 Street Lighting

The present illumination along the roads in the Pilgrim zone is adequate. However, the street lights are mainly in the form of tube lights (85%). The road stretch from old bridge to new bridge via Nagar Parishad chowk, Cosmos bank chowk, Markal chowk, Vadgaon chowk, and Chakan chowk is recommended for illumination by sodium vapour lamps due to the heavy vehicular pedestrian movement. Similarly, high mast lamps with 4 sodium vapour lamps are proposed at the major junctions, existing and proposed parking areas, and on the section between the old and new bridge on both the banks of the river.

Table 7.11 : Cost Estimates for the Proposed Streetlights

Description	Requirement	Unit Cost	Cost
	Nos.	*Rs. Lakh*	*Rs. Lakh*
Single arm pole with Sodium Vapour Lamps along the stretch from old bridge to new bridge via Pradakshina marg at 30 m spacing	40	0.17	6.8
High Mast Lamps with 4 sodium vapour lamps each at Y Junction (New MSRTC Bus Stand), Nagar Parishad chowk, Vadgaon chowk and Chakan chowk	4	2.5	2.5 (3 locations included in costing of junction improvement)
High Mast Lamps with 4 sodium vapour lamps each at existing parking at Chakan chowk, PCMT parking.	2	2.5	(Both locations included in of parking parking improvement)
High mast lamps on river banks between old and new bridge at 50 m spacing for a length of 350 m.	8	0.17	1.36
Total			**10.66**

7.7.7 Road Safety Improvements.

In Alandi, pedestrians and cyclists constitute a significant share in the road users and commercial traffic is also high. It is therefore imperative that the issue of traffic safety needs to be adequately addressed.

The key objectives are

- To prevent the growth of road accidents in the town and
- To enforce the traffic safety norms and make commuting in town more safe and healthy.

The recommendations are:

a. Physically segregating the slow moving and fast moving traffic
b. Provision of adequate pedestrian sidewalks and guardrails wherever necessitated
c. Avoiding entry of commercial vehicles destined other than Alandi by providing a Bypass road.
d. Strictly enforcing the traffic rules by providing adequate manpower to Traffic Police.
e. Provision of adequate signages wherever necessary.

Table 7.12 : Summary of Road and Traffic Improvement Project Costs in Alandi

Improvement Schemes	Amount
	Rs. Lakh
1. Road Improvements	75.00
2. Construction of Bypass Road	80.00
3. Junction Improvements	10.00
4. Pedestrian Facilities	17.05
5. Parking Facilities	91.40
6. Street Lighting	10.66
7. Road Safety Improvements	0.50
A. Sub-total	**284.61**
B. Contingencies (5% of A)	14.23
C. Supervision & quality control (2% of A)	5.70
D. DPR cost (2% of A)	5.70
Total	**308.24** **Say 310.00**

Table 7.13: Criteria for Selection of Roads and Junctions for Improvement

Sl No	Road Details	Criteria for Selection
Roads within Pilgrim zone		
1	Mahadwar Road	Nearest entry road to temple from PCMT bus stand, connecting to municipality office (Nagar Parishad chowk), market area, and the main artery (Pune-Markal road). Significant pedestrian movement of pilgrims.
2	Vadgaon chowk to Chakan chowk	Major road with many Dharmashala (Guest Houses), important religious places/temples and commercial areas along. Significant pedestrian movement of pilgrims.
3	Old bridge to Markal chowk	An arterial road for entry to the town and thorough traffic of heavy vehicles to Markal industrial area.
Roads in the Alandi Town		
4	Padmavati Road	A sub arterial road connecting residential areas and major road (Vadgaon road).
5	Chakan chowk to Water treatment plant	A sub arterial road connecting the residential area and major public utility facility to major junction.
6	Charholi road	An arterial road connecting to the neighbouring village
7	Dehu road	An arterial road connecting to the neighbouring major religious place and also route for heavy commercial vehicles to Pimpari –Chinchwad Municipal Corporation.
8	Pune Chakan road over new bridge	An arterial road, main entry to Alandi from Pune via NH-50. Pedestrian movement of pilgrims.
Bypass Road		
9	Proposed Bypass Road	New formation road, to cater the needs of the commercial traffic and reducing the congestion in the town limits
Junctions in Pilgrim Zone		
1	Nagar Parishad chowk	Busy junction of two important roads namely Mahadwar road and the Pune-Markal road, at town municipal office with roads leading to the main temple and the road with heavy vehicle traffic to Markal industrial area.
2	Vadgaon chowk	Major junction in the centre of the town with roads leading to temple and town centre as well as those out of the town. Busy commercial and residential area.
3	Chakan chowk	Major junction in the centre of the town with a city bus station and roads leading to temple and town centre as well as those out of the town. Busy commercial area.
Junctions in Alandi Town		
4	Y Junction (New MSRTC Bus Stand) at bifurcation of Pune road to new and old bridge	Wide junction bifurcating the entry to the town via old and new bridge over the Indrayani river.
5	Dehu road junction	Important junction for traffic moving to Dehu and Pimpari Chinchwad city/industrial area.

8.0 ECO- PILGRIMAGE DEVELOPMENT

8.1 NEED FOR DEVELOPING ECO - PILGRIMAGE

Alandi is a famous pilgrim town in Maharashtra near Pune. The town is known for the Samadhi of Saint Dyaneshwar a saint revered all through Maharashtra. The place attracts lakhs of people every year. At present major chunk of the people visiting Alandi are from the rural areas falling in the low to middle income category. On the occasion of the two annual festivals of Ashadhi Ekadashi and Kartiki Ekadashi large number of pilgrims congregate in the town. These festivals are a unique showcase of the socio cultural tradition of Maharashtra. It is an event that has been taking place for the last 700 years started by the people of the "Warkari Sampradaya". The tenets of this sect preach universal peace, equality & brotherhood. It's a living tradition of a movement started 700 years ago by saints belonging to different castes and communities that believes in resolving the differences between caste, creed, rich, poor and attain peace and moksha through 'Bhakti' (devotion). The centre of this devotion is Lord Vithala of Pandharpur. Due to the Bhakti Movement started by the saints, Maharashtra is rightfully called "Sant Bhoomi" (Land of saints). The saints have preached their teachings in the form of porms knows as "Abhangs". These are treasure trove for those interested in spiritualism and literature. But very little information is known to people outside Maharashtra about these saints and their teachings which are apt even in today's times. Even the urban youth and younger generation from Maharashtra are not aware of this rich legacy. It is important to preserve and promote this tradition and one way of doing it is by developing the places associated with the saints as eco-pilgrim destinations. Most of these places are rural areas or small towns, promoting pilgrim activities will also help boost the local economy of these places. The towns and villages are located in and around Alandi and Pandharpur and hence a pilgrim circuit can be developed on the theme of 'Land of Saints'. The important aspects to be covered in the tourism development plan are described briefly in the following sections. There are two aspects to it,

- Developing Alandi as eco-pilgrimage destination
- Developing eco-pilgrimage circuit around Alandi on the theme of "Land of Saints".

8.2 TOURISM ASSET INVENTORY

The tourism assets for any destination can be broadly grouped into two categories Natural attractions – these include scenic features such as mountains, forests, waterbodies, sea face etc and cultural attractions- these include indigenous tribal culture, temples, museums, forts palaces etc. In order to promote religious tourism the focus is mainly on the cultural assets. In case of Alandi and near by areas the assets can be listed as below

Table 8.1: Religious Tourism Attractions in Maharashtra

Sr. No.	Place	Religious Tourism Attractions
1	Alandi	Temple of Dyaneshwar Maharaj, Indrayani River
2	Dehu	Temple of Tukaram Maharaj, Indrayani River
3	Pandharpur	Temple of Lord Vithoba, Chandrabhaga River
4	Mangal Vedha	Birth Place of Saint Chokha mela
5	Paithan	Place associated with Saint Eknath
6	Nevasa (Nagar)	Samadhi of Nivruttinath (Dyaneshwar's brother)
7	Hingoli	Birth place of Saint Namdev
8	Ter (Osmanabad)	Birth place of Saint Gora Kumbhar

The above list is indicative and detailed survey will have to be carried out to make a comprehensive list. While place like Pandharpur, Alandi, Dehu are well known those such as Mangalvedha, Hingoli are not known and their significance has not been highlighted. The history and significance of the place – historical, religious, architectural, spiritual etc will have to be documented and made available to the tourists. These would include the places like Samadhi's of the saints, their ancestral houses, temples, places where they frequently visited and natural aesthetic features such as rivers, lakes etc if any.

8.3 TOURISM INFRASTRUCTURE ASSESSMENT

The development of any place for tourism is based on the 4 A principle. These 4 A's are Attraction, Access, Accommodation and Amenities. The tourism attractions have already been discussed in the above section and these are the places associated with the Saints of Maharashtra and other pilgrim places. The next step would be to assess the infrastructure level with priority to the other 3 A's. While planning for the same the background of the people targeted should be kept in mind. At present the most of the people visiting these places are from rural areas and come from a lower to middle income group. People from the higher income group are very few. Some dip stick surveys on the inflow and pattern of pilgrims will be needed to consolidate the number's and pattern.

Access: The linkage of the place with respect to road, rail and air connection will have to be studied. Availability of public transport road conditions, frequency of public transport, local transport to move around the place, hiring of vehicles, parking areas etc will have to be considered.

Accommodation: The level accommodation facilities available in these towns, their number cleanliness, service etc needs to be assessed. While planning and providing accommodation for the higher income group the focus should be n provide clean and hygienic places rather than luxurious places. The feasibility of converting old "wadas" into guest houses could be explored. This will help in conserving the traditional/ vernacular architecture which in itself is a tourist attraction. It has also to be kept in mind the accommodation is available and affordable for all sections of the society.

Amenities: The tourist amenities include communication facilities such as national and international trunk calling systems, internet kiosks, emergency health care services, authorized guides, information centres, wayside eating places and public conveniences, tourist map of the place, etc. In keeping with the spiritual and religious theme of the circuit these could also include meditation centres, yoga training centres, naturopathy clinics, etc. The feasibility of providing such amenities at some of the places along the circuit should be studied.

Alandi Town

Access: Alandi town is well connected by road to Pune City and Pimpri Chinchwad. There is no direct rail connection to Alandi however Pune, which is 25 km from Alandi, has good rail connections to all parts of Maharshtra and India. The nearest airport is also at Pune.

Accommodation: At present the Alandi has about 10 hotels and 350 Dharmashalas. These cater to the needs of the lower income group. There are very few clean and hygienic hotels in Alandi. Pilgrims have to depend on accommodation in Pune for their needs. This reduces their stay and in turn Alandi loses on the economic returns.

Amenities: Alandi has basic health and medical facilities but it cannot handle critical emergency cases. Most people come to Alandi in the morning and leave by evening. Other

than the temple, there are no attractions for pilgrims/ tourists to increase the duration of their stay. Alandi also lacks effective information for tourists such as maps, signs and signage, history and legends of the temple, informed guides etc.

8.4 ASSET DEVELOPMENT AND MANAGEMENT

The tourism assets are the attractions, which in this case would include temples, Samadhi's etc in most cases temples are managed by trusts. However in small towns and villages they do not have the requisite funds and technical know how to manage these assets. A mechanism has to be developed by which some portion of the revenue generated from the tourism is ploughed back to the respective places for their maintenance and upkeep. The State of Kerala has a separate Government Department called the "Devasom" the department gets a part of the revenue generated from all the big temples such as Guravayoor, Sabarimalai as well as other lesser known temples across the state. The department then gives money to the needy temples in remote villages for their maintenance and upkeep.

The local community can also play a vital role in the upkeep of the sites. A portion of revenue generated from the village guesthouses, fees charged by guides etc can be used for the development of the place.

8.5 GUIDELINES FOR SUSTAINABLE TOURISM

The development of tourism can have negative impacts if it is uncontrolled and unmanaged. The impacts are detrimental to the natural and socio-cultural environment of the host area. In this particular case the cultural environment and social fabric is more at threat than the natural environment. However depending on the place and presence of natural feature such as forests, rivers, mountains etc it would assume equal significance. Hence these places will have to be developed on the principles of eco- tourism. The two important aspects of eco-tourism are

- Minimum adverse impacts to the social and natural environment and
- Direct benefit to the local (host) community

The above two objectives are achieved by targeting the high paying tourists but restricting their inflow (number). However it may not be possible to do in each and every case. The strategy to be adopted for promoting eco - pilgrimage in Maharashtra will depend on the socio-cultural assessment of the host community and the environmental sensitivity of the area.

The International Eco tourism Society has laid guidelines for developing sustainable tourism along with a code of conduct for the tourists as well as the community and other stakeholders such as hotel owners, tourist guides and tour operators. It is essential to identify the stakeholders and sensitize them about the concept of sustainable tourism. Some of the guidelines are given below.

<u>Guidelines for Project Implementing/ Initiating Agencies (PIA)</u>

- Educate local stakeholders to create awareness of the social, economic, and environmental costs and benefits to come from this project and brief them on principles of sustainable tourism
- Employ local people throughout all levels of the project
- Support local businesses through direct business transactions and a fund to encourage use and development of sustainable energy systems (e.g., solar light panels)

- Maintain availability of natural resources to locals;
- Capacity-building of local communities to facilitate their active participation at all levels of the process
- Ensure the development and enforcement of legislation/measures against any illegal, abusive, or exploitative tourist activity
- Support cultural and environmental programs of community groups and organizations;
- Promote information exchange on transportation, accommodation, public awareness raising programs and education, and ways to minimize negative effects of tourism, with other groups practicing ecotourism;
- Use plenty of signs to educate visitors about the problems of traveling off paths, and taking home souvenirs from the area.
- Ensure accuracy of information disseminated to tourists - ensure high quality interpretive skills;
- Deliver information about tourists to locals; and,
- Inform tourists about cultural and ecological values (give examples of how tourists can help conserve energy, water, and assist with waste recycling).
- Social, Environmental and Economic impact assessments to be completed prior to project initiation;
- "Design with nature" in collaboration with planning authorities by using low-impact designs, materials, and technologies;
- Minimize infrastructure impacts to vegetation and animals. Develop a transportation plan with minimum impact infrastructure planned (e.g., low compaction roads);
- Non-indigenous flora and fauna should never be introduced to the area;
- Utilize integrate land-use planning and coastal zone management techniques;
- Effectively take steps to decrease the volume of waste associated with travel and tourism;
- Practice energy conservation in all areas (heating, air conditioning, lighting). Use solar systems wherever possible;
- Practice water conservation and install water conserving fixtures;
- Encourage the use of public transportation and ride-sharing. Facilitate walking, jogging, cycling, and alternative transportation methods;
- Seek out options for diversion of waste to other products (i.e., animal feed and compost);
- Improve access to researchers;
- Determine the type of tourist to be interested. Promote and develop strategies accordingly
- Determine maximum numbers of visitors permitted within an area (carrying capacity);
- Offer tours and activities which are consistent with host community values, reinforce community identity, and provide commensurate benefits to the host community;
- Distance itself publicly from illegal, abusive, or exploitative forms of tourism.
- Conduct energy and water audits;

- Monitoring of impact of tourism on the local culture and environment and make plans to stop negative impacts and increase positive impacts;
- Conduct an ecosystem, social, and geologic inventory of the area affected before and after the project begins - use the analysis of differences for future policy development and make this information available to other ecotourism projects
- Use percent of returns to promote research on environment and social issues.

Guidelines for Tourists

- Where possible, purchase reusable, recycled, and unbleached paper products for guest rooms, dining facilities, and office use;
- Purchase supplies in bulk to decrease packaging waste.
- Practice the Principle "Take only Photographs and leave no tracks" to the fullest. Pack out everything that you bring in including plastic water bottles (or use purification tablets or a filter).
- Encourage and support host community environmental and cultural initiatives and efforts toward sustainable tourism.
- Learn about local history, customs and culture as well as vital ecosystems. Learn at least the basics of the local language. A simple hello please or thank you goes a long way.
- Respect local traditions and etiquette: Wear clothing that is accepted by the local culture. Be aware of People's sensitivity to being photographed; always ask first. Observe local customs.
- Avoid ostentatious display of wealth

The above guidelines are generic in nature and specific guidelines will have to be developed for the study area. Also the theme for development is important it could be on the principles of "Saints of Mahrashtra" where all places associated with the saints are developed in a tourist circuit. In Maharashtra these would essentially comprise of the five districts of Pune, Solapur, Satara, Ahmednagar and Aurangabad. All these districts have other established pilgrim & tourism places such as Shirdi in Ahmednagar, Ajanata Elora in Aurangabad etc. These could also be linked and packages could be developed accordingly.

8.6 COST ESTIMATE

Alandi Town

The cost for developing amenities for eco-pilgrimmage in Alandi are covered under the other projects such as Road Development (signs signage etc) and Riverfront Development (gardens, toilets etc). The cost of other items is mentioned below.

Table 8.2 : Cost for Eco Pilgrimage Development Projects

Sl. No	Item	Approx. Cost in Rs. Lakhs
1	Preparing a tourist map & information Brochure of Alandi showing important places within the town, their distances, history, legends, surrounding places, information on hotels, their pricing etc.	1.5
2	Compiling information related to disaster management such as availability of health facilities, risk prone areas of town emergency Numbers etc.	0.5
3	Training of various stakeholders such as tour operators, hotel owners, tourist guides' etc for promoting environment friendly and socially acceptable tourism in Alandi	5.0
4	Preparing an environment & social code of conduct for pilgrims and tourism stakeholders and displaying it prominent locations	1.0
5	Identification of heritage structures/ site based on their architectural and socio-cultural importance for conservation and restoration.	5.0
	Total	13.0

Cost of developing meditation centers, nature cure centers etc will vary from project to project. It would also need some market research studies for their viability. Hence this cost is not included above.

Eco-pilgrim Circuit Development

The first step towards the developing this project would be preparing a Religious Tourism Master Plan for the five districts namely Pune, Solapur, Auangabad, Ahmednagar and Satara along the identified theme of Saints of Maharashtra. The Master plan would assess the pilgrim attractions, heritage value, the level of tourist infrastructure, available human resources, institutional mechanism and role of local community in implementing the project, marketing strategy, investment and return plan and detailed estimates for taking up specific projects. The approximate cost will be **Rs. 25 lakhs.**

9.0 OTHER PROJECTS

The following table presents other miscellaneous projects identified by different agencies/departments of the Government of Maharashtra and other stakeholders. These projects are still in the pipeline and more details were not available. The projects have included as they were found to be in line with the objectives this study.

Table 9.1: Details of Projects Identified by Other Agencies

Sl No.	Project Description	Cost, Rs. Crores	Proposed by	Remarks
1	Road side plantation (5 km on both sides)			
	Alandi – Markal Road	0.27	Dept. of Social Forestry, GoM	For the pilgrims (Varkari) walking down to Alandi during the fairs.
	Alandi – Chakan – Road			
	Alandi – Chakan – Road			
	Alandi – Moshi Road			
	Alandi – Pune Road			
	Alandi – Vadgoan Road			
2	Developing forest nursery, Plantation around Police station and playground - 1700 sq. m area	0.20		
3	Developing a medicinal plants and herbal garden	0.50		Rest areas or open spaces
4	Decongestion and beautification of area around the temple	3.00	AMC	
5	Construction of a Meditation Centre, Kirtan Mandap and a Community Hall for pilgrims	1.00	Temple Trust	
6	Setting up a new electric/diesel crematorium at proposed crematorium site in DP 1988-98 and rehabilitation of existing crematorium site	0.18	Temple Trust	The present cremation ground near the old bridge has become a major solid waste dumping ground and is not a welcome sight as an important entry point to the town. The Gas crematorium is economic, conserves wood and is pollution free
7	Construction of 8 seats public toilets at Indrayani Nagar slum – 1 block Padmavati Road slum – 1 block Chakan Road slum – 1 block Sathe Nagar slum – 1 block New MSRTC Bus Stand – 1 block	0.15	AMC	To prevent open defecation by slum dwellers on riverbank and around the town. Improve hygienic condition in the town
8	Providing 5 seats Mobile Toilets – 10 blocks	0.20	Temple Trust	To be procured phase wise and made available to the surrounding villages during non-festival period
	Total	5.50		

10. ENVIRONMENTAL BENEFITS

The potential benefits of implementation of the various environmental improvement projects suggested in this report are listed below.

AMBIENT AIR

- Improvement in ambient air quality due to smooth movement of vehicles avoiding traffic congestion, idling due to availability of wider roads with resurfacing of roads
- Reduction in vehicular pollution due to diversion of traffic via proposed Bypass road
- Improvement in air quality, less dust pollution due to development of greenbelt along roads
- Reduction in air pollution due to decongestion of temple area and pilgrim zone
- Reduction in odour nuisance due to proper collection and disposal of municipal solid waste and sewage

NOISE

- Less noise pollution due to smooth movement of vehicles and green belt development along roads
- Reduction in noise pollution due to decongestion of temple area and pilgrim zone

WATER RESOURCES

- Improvement in Indrayani river water quality due to diversion of untreated sewage and sullage entering into the river.
- Improvement in Indrayani river water quality due to removal of abandoned structures, dredging and removing stagnation of water
- Less surface and ground water pollution due to diversion of open sewage flow through a proper sewerage system and treatment of sewage as well as safe disposal of solid waste.
- Improved hygienic conditions along river banks due to prevention of untreated sewage flow entering the river, clearing the solid waste dumps
- Reduction in water borne diseases due to improvement in river water quality and availability of adequate treated water from augmented WTP.
- Conservation of water due to availability of treated wastewater for greenbelt development in the town
- Improvement in Indrayani river water quality due to shifting of existing crematorium and solid waste disposal site

LAND

- Improvement in soil quality due to scientific disposal of municipal solid waste, and green belt development

AESTHETICS

- Pleasing aesthetics in the town due to development of green belt, landscaping & beautification of major junctions, appropriate street lighting, removal of solid waste dumps, efficient collection and disposal of daily solid waste
- Better aesthetics along the riverfront due to improved water quality, soft landscaping and greenbelt development, walkway and boating facilities, maintenance of cleanliness due to additional collection waste facilities like Nirmalya Kalash.

PUBLIC HEALTH

- Improved hygienic conditions in the town due to efficient collection and disposal of solid waste and domestic sewage, provision of public toilets in slums and mobile toilets for pilgrims, and development of green and open spaces.
- Reduction in water borne diseases due to improvement in Indrayani river water quality
- Improvement in public health due to better air and noise quality
- Improved water quality and aesthetics along Indrayani river banks
- Better hygienic conditions at the eateries and food joints

IMPROVEMENTS IN TOWN INFRASTRUCTURE AND OTHER BENEFITS

- Wider and better quality roads
- Smooth traffic flow. No conflict of slow moving and fast moving vehicles
- Less traffic congestion
- Adequate and better parking facilities
- Improved pedestrian safety due to wider footpaths, guard rails, proper signages etc.
- Hazard free movement of pilgrims and tourists
- Improved sewerage and drainage system
- Availability of adequate water supply and safe drinking water.
- Clean roads & surroundings due to efficient collection and disposal of solid waste
- Overall clean environment
- Land availability (due to rehabilitation of existing SW disposal sites) for better use.
- Conservation of heritage structures.
- Strengthening of local ecosystem due to development of greenbelt and forest nursery
- Conservation of trees due to switching over to electric/diesel crematorium
- More comfort to pilgrims due to better pilgrim facilities such as maps & appropriate signages, accommodation, water supply, public toilets and rest areas, safe and clean river banks with bathing ghats, religious rites and recreation areas.
- Safe and pleasant tourism experience for the pilgrims
- Overall socio-economic development of the town.

11. SUMMARY OF PROJECTS

A summary of the projects costs discussed in this report is given below in Table 11.1 Details of the projects namely, likely beneficiaries of the projects, potential partners in development and investment, cost recovery and management options, and the resulting environmental benefits are discussed in Table 11.2.

Table 11.1 : Summary of Project Costs

Sl. No	Name of the Project	Phase I	Phase II	Cost In Rs. Lakhs
1	Construction of underground sewerage network and STP	343.00	289.00	632.00
2	Solid waste management system	50.00	75.00	125.00
3	Indrayani Riverfront Development	70.00	-	70.00
4	Water supply	221.00	329.00	550.00
5	Roads and traffic improvement in Alandi	170.00	140.00	310.00
6	Tourism (Eco pilgrimage) development projects	38.00	-	38.00
7	Other projects	100.00	450.00	550.00
	Total	**992.00**	**1283.00**	**2275.00**

Note : The figures are rounded off appropriately.

Table 11.2 : Summary of Proposed Environmental Improvement Projects

Project	Total Cost	Phases of Implementation and Estimated Cost				Likely Beneficiaries	Potential Partners in Development and Investment	Cost Recovery & Management Options	Likely Environmental Benefits
	(Rs. Lakh)	Phase 1- 2005- 2011(Focus: Pilgrim Zone)	Cost (Rs. Lakh)	Phase II- 2011-2031 (Focus: Alandi Town)	Cost (Rs. Lakh)				
1. Construction of Underground Sewerage Network and STP	632.00	▪ Development of an underground sewerage scheme covering the Pilgrim Zone and adjoining area on the left bank of the river such ▪ Construction of an STP of 4 MLD capacity and a 2 MLD Holding Pond on the left bank of the river	343.00	▪ Development of underground sewerage network covering the area on the right bank of the river. ▪ Construction of an STP of 4 MLD capacity and a 2 MLD Holding Pond on the right bank of the river	289.00	▪ Residents of Alandi due to improved sewerage and drainage facilities. ▪ Residents and pilgrims due to improved public health ▪ AMC due to better maintenance of sewerage and sewage treatment in the town, availability of treated wastewater for green belt development.	▪ Construction of Sewerage Network by AMC ▪ Construction & Operation of STP by private operator ▪ Technical assistance by Maharashtra Jeevan Pradhikaran	▪ Aid from State and Central Govt. ▪ Municipal tax from residents, commercial organisations, dharmashalas and hotels & restaurants ▪ Construction and operation of STP by private sector	➢ Improved sewerage and drainage system ➢ Improvement in Indrayani river water quality ➢ Less surface and ground water pollution ➢ Improved hygienic conditions, reduction in water borne diseases ➢ Overall clean environment ➢ Improvement in public health ➢ Pleasing aesthetics ➢ Water reuse for greenbelt development
2. Solid Waste Management	125.00	▪ Implementation of waste segregation and collection system in Pilgrim Zone ▪ Development of the Compost Plant site proposed in the DP. ▪ Landfilling of non-degradable waste in abandoned stone quarries. ▪ Rehabilitation of existing SW disposal sites ▪ Community awareness programmes, IEC campaigns by NGOs on waste segregation	50.00	▪ Implementation of waste segregation and collection system in entire town ▪ Identification and commissioning of new site for composting and landfill.	75.00	▪ Residents of Alandi due to improved SWM facilities. ▪ Residents and pilgrims due to improved public health ▪ AMC due to better maintenance of solid waste in the town. ▪ Temple trust due improved hygienic conditions and aesthetics in the temple area and along river bank.	▪ Collection & transportation by AMC ▪ Development & Operation of disposal facility by private operator ▪ Project development assistance by MPCB ▪ Financial/equipment sponsorship of private sector for collection of waste, operation & maintenance of the Compost plant. ▪ NGOs', Social groups' participation in awareness programmes ▪ Participation from local religious education institutes in maintaining cleanliness of Temple area and river front ▪ Technical assistance by local engineering college	▪ Aid from State and Central government agencies ▪ Partial recovery through sale of compost ▪ Contribution from households towards door to door collection.	➢ Clean roads & surroundings ➢ Improved water quality and aesthetics along Indrayani river banks ➢ Reduction in odour nuisance ➢ Improved hygienic conditions ➢ Improvement in public health ➢ Better hygienic conditions at the eateries and food joints. ➢ Land availability (due to rehabilitation of existing SW disposal sites) for better use.

Project	Total Cost	Phases of Implementation and Estimated Cost				Likely Beneficiaries	Potential Partners in Development and Investment	Cost Recovery & Management Options	Likely Environmental Benefits
	(Rs. Lakh)	Phase 1- 2005- 2011(Focus: Pilgrim Zone)	Cost (Rs. Lakh)	Phase II- 2011-2031 (Focus: Alandi Town)	Cost (Rs. Lakh)				
3. Riverfront Development	70.00	▪ Removal of mid-stream structures ▪ Strengthening of existing weir near old bridge. ▪ Construction of mid stream fountains ▪ Construction of ghats ▪ Construction of steps, boat landing facility, and walkway along right bank ▪ Gardens and soft landscaping: ▪ Construction of Toilet Blocks ▪ Lighting on river banks ▪ Drinking water fountains ▪ Provision of Nirmalya Kalash ▪ Removal of solid waste dumped along river bank and other miscellaneous works ▪ Boating ▪ Greenbelt and construction of steps from new bridge upto Alandi weir ▪ Relocation of existing crematorium ▪ Security guards	70.00	- (All development activities are proposed to be taken in Phase I itself.)	-	▪ Residents of Alandi due to improvement in hygienic conditions, better aesthetics and recreational facilities. ▪ Pilgrims due to better hygienic conditions, better facilities for taking bath and performing religious rites along river banks, and better aesthetics and recreational facilities. ▪ Temple trust and AMC due to improvement in river water quality and improved public health.	▪ Construction of Ghats and other facilities by Private sector / Irrigation Dept ▪ Maintenance of Old to New Bridge stretch by Temple Trust ▪ Maintenance of other stretch by AMC ▪ Security arrangements along Ghats by AMC	▪ Aid from State and Central Govt. ▪ Fixed annual fees to AMC from operator of recreational facilities.	➢ Improvement in Indrayani river water quality due to diversion of sewage ➢ Improved hygienic conditions along river bank ➢ Pleasing aesthetics along river banks ➢ Overall clean environment ➢ Unique tourism experience
4. Water Supply	550.00	**Rehabilitation of Existing Water Supply Scheme** ▪ Providing raw water intake pipe, raw water pumping main. ▪ Rehabilitation of treatment plant (2 MLD) ▪ It is advisable to retain the existing civil structures with some rehabilitation measures and modifications to suit new technologies and providing new electrical and mechanical components in water treatment plant. ▪ Construction of additional capacity of treatment plant (4MLD) ▪ Remodelling of the distribution system for equitable distribution of water and refurbishment of service reservoirs and cisterns.	221.00	**New Proposals for Additional Capacity** ▪ Providing raw water intake for additional capacity including the connecting pipe , raw water ▪ Clear water pumping main (Common for both schemes 1 & 2) ▪ Providing new raw water and clear water pumping machinery ▪ Construction of additional capacity of treatment plant (7 MLD) ▪ Construction of new service reservoirs to have sufficient storage. ▪ Laying new distribution lines in the uncovered area.	329.00	▪ Resident of Alandi and Pilgrims due better quality and adequate supply of drinking and domestic water.	▪ Construction of intake and distribution network by AMC ▪ Construction by private sector ▪ Operation & maintenance of WTP by AMC ▪ Technical assistance by Maharashtra Jeevan Pradhikaran	▪ Aid from State and Central Govt. ▪ Municipal Tax ▪ Revision of water charges	➢ Reduction in water borne diseases ➢ Improved public health

Project	Total Cost	Phases of Implementation and Estimated Cost				Likely Beneficiaries	Potential Partners in Development and Investment	Cost Recovery & Management Options	Likely Environmental Benefits
	(Rs. Lakh)	Phase 1- 2005- 2011(Focus: Pilgrim Zone)	Cost (Rs. Lakh)	Phase II- 2011-2031 (Focus: Alandi Town)	Cost (Rs. Lakh)				
5. Road and Traffic Improvements including Parking Facilities, Junction Improvement	310.00	▪ Road Improvements ▪ Junction Improvements at Chakan chowk, Vadgaon chowk, and New MSRTC junction ▪ Pedestrian Facilities ▪ Parking Facilities ▪ Street Lighting ▪ Road Safety Improvements	170.00	▪ Construction of Bypass Road ▪ Integrated bus terminus at New MSRTC Bus stand	140.00	▪ Residents of Alandi due to improved road conditions, road safety and air and noise quality. ▪ Pilgrims due to better road conditions, parking areas, and pedestrian safety. ▪ AMC due to better maintenance of roads in the town and. ▪ Traffic police due to less incidents of road accidents. ▪ Temple trust due to ease in pilgrim movement in the temple area and availability of area for improvement works.	▪ Construction of roads by PWD / AMC ▪ Junction improvement works by Temple Trust, private sector ▪ Construction of Parking area by Temple Trust, private sector ▪ Maintenance of Parking areas by private operator ▪ Development & maintenance of green belt along roads by Forest Dept, NGOs ▪ Private sector participation mainly through funding of project by local traders and industries.	▪ One time entry fee charged to the pilgrims and tourists entering the Pilgrim Zone ▪ Betterment charges from Temple Trust ▪ Toll tax for vehicles using Bypass road ▪ Municipal taxes	➢ Improved roads & traffic conditions ➢ Less traffic congestion ➢ No conflict of slow moving and fast moving vehicles ➢ Improved air quality ➢ Less noise pollution ➢ Hazard free movement of pilgrims and tourists ➢ Improved pedestrian safety
6. Tourism (Eco pilgrimage) Development Projects	38.00	▪ Preparation of a tourist map & information Brochure of Alandi ▪ Compiling information related to disaster management such as availability of health facilities, risk prone areas of the town, emergency services and agencies etc. ▪ Training of stake holders ▪ Preparing an environment & social code of conduct for pilgrims ▪ Identification of heritage structures/ sites based on architectural and socio-cultural importance for their conservation and restoration ▪ Pilgrim circuit development of religious places in neighbouring districts	38.00	-	-	▪ Pilgrims ▪ Temple trust	▪ Preparation of signages, training of stakeholders, development of environmental and social code of conduct by NGOs, educational institutes, temple trust ▪ Preparation of maps, brochures, identification of heritage structures, development of tourism circuit of neighboring religious places by Maharashtra Tourism Development Corporation (MTDC)	▪ Sponsorship of by private sector, temple trust ▪ Aid from MTDC	➢ Clean surrounding ➢ Conservation of natural resources ➢ Conservation of heritage structures

Project	Total Cost	Phases of Implementation and Estimated Cost				Likely Beneficiaries	Potential Partners in Development and Investment	Cost Recovery & Management Options	Likely Environmental Benefits
	(Rs. Lakh)	Phase 1- 2005- 2011(Focus: Pilgrim Zone)	Cost (Rs. Lakh)	Phase II- 2011-2031 (Focus: Alandi Town)	Cost (Rs. Lakh)				
7. Other Projects	550.00	Road side plantation (5 km on both sides) Developing forest nursery around police station Construction of 8 seat public toilet at slums in Indrayani Nagar, Padmavati Chakan Road, Sathe Nagar, New MSRTC Bus Stand Construction of 5 seat Mobile toilet New Electric/Diesel Crematorium	100.00	▪ Developing a medicinal plant and herbal garden ▪ Decongestion and beautification around the temple. ▪ Construction of Meditation Centre, Kirtan Mandap and Community Hall for pilgrims	450.00	▪ Residents of Alandi due to reduction in air and noise pollution, improvement in hygienic conditions and better aesthetics. ▪ Pilgrims due to better air quality, better hygienic conditions and aesthetics.	▪ Dept. of Social Forestry, GoM ▪ Temple Trust ▪ Alandi Municipal Council ▪ Private sector for funding of public toilet construction and mobile toilets	▪ Pay & use toilets ▪ User charges for community halls	➢ Improvement in air quality, reduction in dust pollution due to greenbelt development ➢ Reduction in noise pollution reduction in dust pollution due to greenbelt development and decongestion of temple area ➢ Better aesthetics ➢ Strengthening local ecosystem due to development of forest nursery and herbal garden ➢ Improvement in hygienic conditions due to provision of public toilets in slums and mobile toilets for pilgrims ➢ Improvement in river bank and water quality due to shifting of crematorium ➢ Conservation of trees due to switching over to electric/diesel crematorium
Total	**2275.00**		**992.00**		**1283.00**				➢