

PROJECT MANAGEMENT CONSULTANCY FOR IMPLEMENTATION OF SMART CITY MISSION PROJECTS FOR MANGALURU CITY

DETAILED PROJECT REPORT IMPROVEMENT OF GUJJAR LAKE

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1 Introduction

1.1 Project Background

Gujjar kere is one of the significant lakes in the city of Mangalore. The geographic location is towards the south of the city and is accessed through the Bolar / Jeppu Market road. The total extent of the lake is 2.72 Acres. This can be considered as one of the very few lakes still existing in the city. It presently comes under the jurisdiction of Mangalore City Corporation.

Historically Gujjar kere used to be one of the most prominent water body in the area, although over the years encroachment and neglect has led to it being dry, filled with silt and being converted into a marsh due to the lack of facilities to hold back the rainwater.

Figure 1-1 View of Gujjar kere



Source: Louis Berger

1.2 Project Purpose

The objective(s) of the project is towards:

1. Improvement and upgradation of the lake as a part of Rain water Harvesting initiative to store rainwater.
2. Rejuvenating the lake to improve the socio-cultural value of the surrounding area and redevelopment it as a recreational area.

1.3 Project Brief

The Mangaluru Smart City Limited (MSCL, the Client), under the Government of Karnataka (GoK), has proposed the Improvement of Gujjar kere (the Project) with the allocation of INR 2 Crore from the Smart City Mission Fund.

The available areas of improvement are:

1. Areas falling within the boundary of the lake.
2. Immediate areas and access routes around the lake.

The salient features of the proposed improvement project are:

1. Self-sustainable, rainwater harvesting development, with the aim of storing the rain water and ground water rising through capillary action.
2. Exploring and analyzing the possibility of inclusion of following features/ conveniences as part of the improvement:
 - Public Plaza
 - Pedestrian friendly design (walking track)
 - Public facilities
 - Recreational and leisure areas

Work Order to take on the project of 'Improvement of Gujjar kere' was issued to the PMC on 20th June 2019. This report is an amalgamation of the data collected and analyzed, the concepts developed for the proposed project, comments & suggestions received from the Client, in submission for the first deliverable of the 'Concept Report'.

2 Existing Condition Study

2.1 City Context and Existing Connectivity

Gujjar kere, which is located towards the southern end of Mangalore city is approximately 4.81 Acres in designated Design area. It is surrounded by residential built up structures and sparse green, providing a suitable opportunity in terms of rejuvenating and redeveloping it as a means of significantly improving the recreation and water harvesting options for the residents of the city and beyond.

The site is in close proximity to the Netravati River. The Railway Station, Mangalore Central, which is the nerve center of the city’s transportation, is within 3 kilometers from the site, while the airport is around 17 kilometers. The extents of the ABD and most of the important infrastructure facilities fall within a radius of 1 to 2 kilometers towards the southwest direction.

Figure 2-1 City context



Source: Louis Berger

Several proposed redevelopment sites falling within the Smart city Mission in the form of proposed Redeveloped Market Complex and the Redevelopment of the Waterfront is also within a radius of 2.0 and 0.5 kilometer respectively. Other projects namely the Multi-Level Car Parking is located at 2.0 kilometers, while projects like redevelopment of the Car Street and the redevelopment of

Old bus stand are located at a distance of 3.0 and 2.2 kilometers respectively. A comparable project falling outside the boundaries of the ABD area in the form of a New Integrated Bus Terminus at Padil is situated at 5.0 Kilometers.

2.2 Site Connectivity

The Gujjar kere road (around 5 meters wide), which encompasses the Gujjar kere on the Western and Southern side, connects onto the Bolar road (around 10 meters wide). This is the major arterial road that connects the lake to the rest of the city. Local roads bound the lake towards the north and east side.

Figure 2-2 Site connectivity to the city

Source: Louis Berger

Figure 2-3 Main vehicular approach



Source: Louis Berger

2.3 Site Access

The lake is accessed through the Gujjar kere road along the western and southern edges. Vehicular accessibility is possible along this stretch as well as along the northern end. The entire stretch of road towards the northern edge, eastern edge and partly along the southern edge is unpaved. The road widths all around varies from 5 meters to around 9 meters.

2.4 Historical development of the lake

The lake used to be an organic water body till the year 2011-2012, following which steps were constructed all around giving it the rectangular form that is seen today. The years of development are seen through the following time-lapse.

Figure 2-4 Gujjar kere: Time lapse





Source: Google Earth

2.5 Present Site Situation

The site of the lake shows neglect as most of it is dry with no prospects of rejuvenating it at the present moment. Presently the lake has no inlets, while there are two outlets along the southwestern and western sides, through which the water flows out. Drains are present towards the western side of the lake to which these outlets are connected. A series of concrete steps in the form of an embankment binds it on all sides. The area around the site has a limited amount of greenery with a few native plant species being scattered around.

There are several issues present in and around the site, as noted below:

- No dedicated inlets. The collection of water in the lake depends upon the ground water table and surface run offs.
- No gates or any mechanical system at outlet to stop the outflow of water.
- No filtration system.
- Approach area around the lake is not properly developed and has become a garbage collection area due to neglect.
- The purpose for which the steps around the lake was built is not served.

- Flora and fauna species are scarce around the lake and whatever present is being completely neglected.

Figure 2-5 Context of present site situation



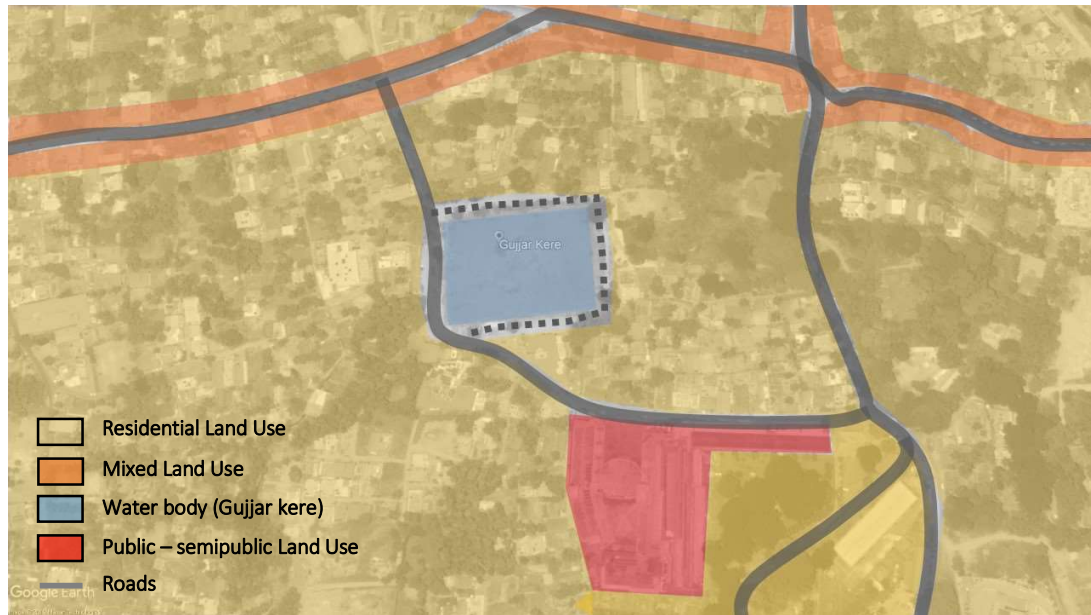
Source: Louis Berger

2.6 Surrounding Land use

The existing land use shows the principal land use around the lake to be residential. In close proximity, along the main road, mixed land use is seen, with patches of commercial. With half kilometer radius, industrial land use is seen all along the Netravathi waterfront.

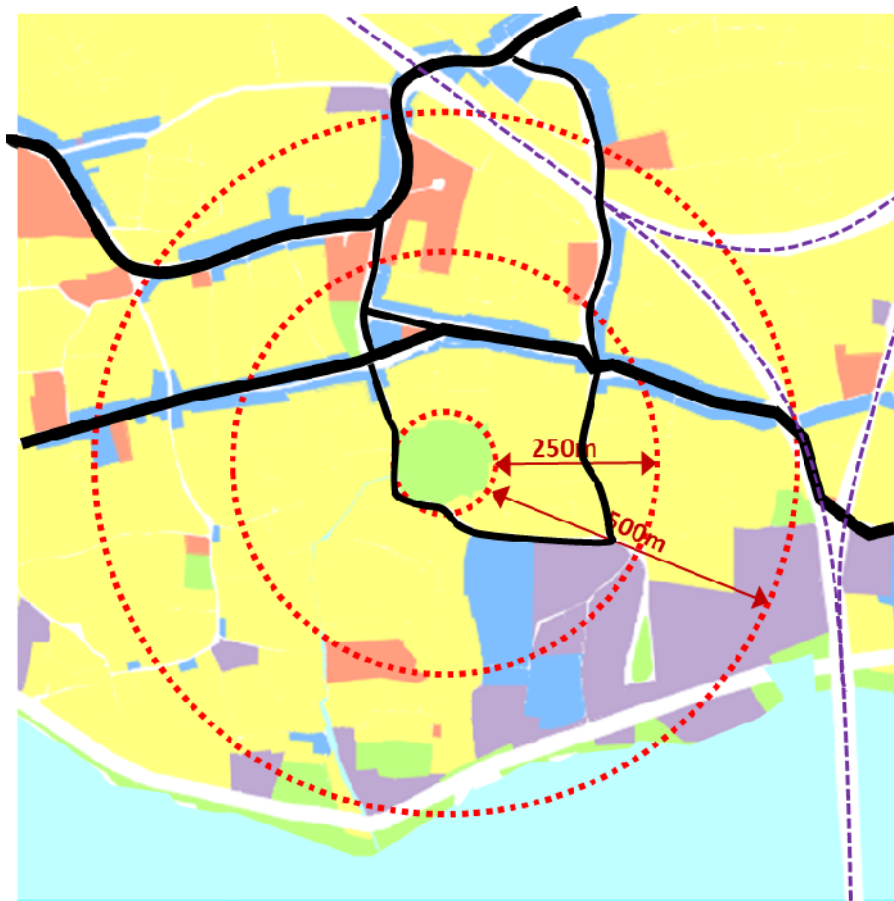
On the other hand, as per the proposed land use prescribed in the master plan of 2021, the predominant land use around the lake is residential, with a stretch of commercial along the main approach road. It is to be noted that the land use of the lake has been changed to green, in place of water body, which is the major deviation from the present land use.

Figure 2-6 Existing land use



Source: Louis Berger

Figure 2-7 Proposed land use with proximity range



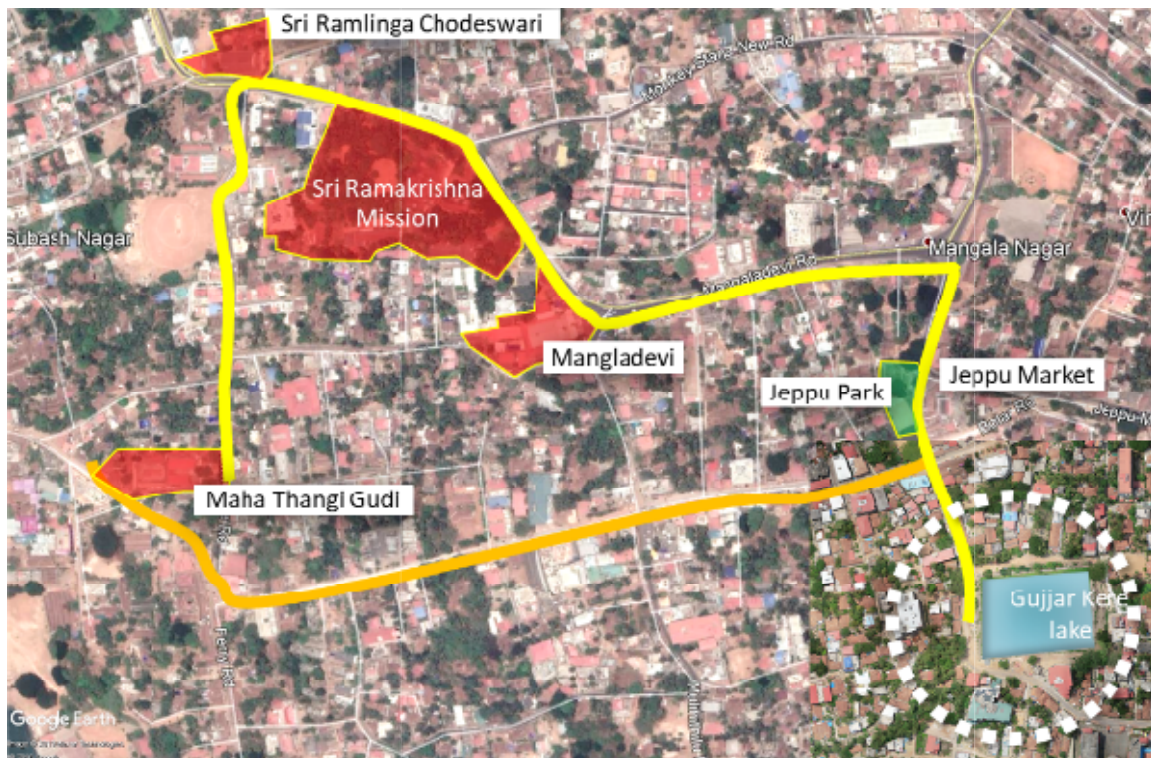
Source: Mangalore Master Plan 2021

The Site is majorly residential in 500 m radius. Also, mixed land use is observed within 250m. Market Places are in the convenient range of 500m which will certainly make the site a favourable spot to and from the lake. With half kilometer radius, industrial land use is seen all along the Netravathi waterfront. The existing and proposed land use highlights the importance of the Gujjar Kere Lake in the area. Redeveloping it would serve as a recreational area for the people. With increased percentage allocated for residential land use in the area, the value of the rejuvenated lake in terms of socio-cultural interaction space and as a rain water harvesting reservoir, would substantially increase.

2.7 Cultural significance

The Lake is connected to other social infrastructures nodes in the form of temples and places of worship through the Bolar road. Some important temples fall within a 2-kilometer radius from the lake. The lake is also used for immersion of idols and a particular route is followed as per the image below.

Figure 2-8 Connectivity to social infrastructure nodes & route for idol immersion



Source: Louis Berger

2.8 Rainfall Analysis

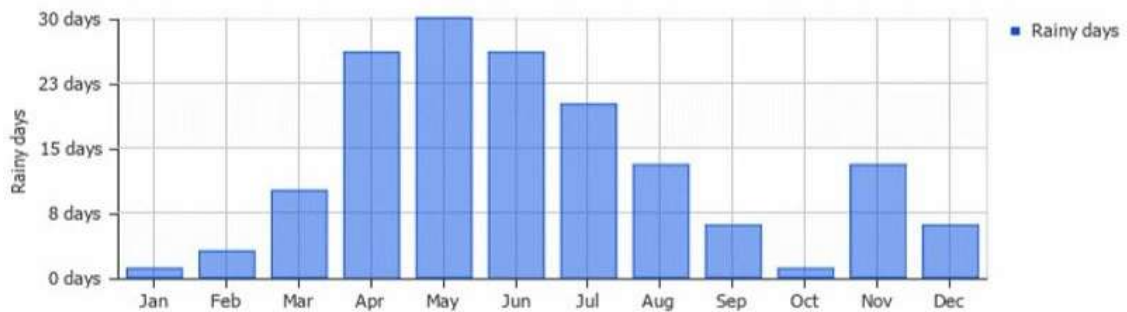
Regions in and around Mangalore witness heavy rainfall in the monsoons (June, July and August), while peak rainfall intensity is maximum in the month of October. The average yearly rainfall over a period of last 36 years come to 3395.2 mm, which is quite high as compared to the neighboring regions.

Table 2-1 Average monthly rainfall from the past 36 years

Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Total
3.2	1.9	12.0	34.3	179.4	943.6	916.8	698.9	291.3	215.6	89.6	8.5	3395.2
Average rainy days in a year (as per above figure)												
2	4	11	26	30	26	20	13	7	2	13	7	161
Average daily rainfall												
1.6	0.5	1.1	1.3	6.0	36.3	45.8	53.8	41.6	107.8	6.9	1.2	21.1
Average number of hours of rain occurred in a day												
2	2	2	2	3	3	3	3	3	3	2	2	
average peak rainfall intensity per hour												
0.79	0.24	0.55	0.66	1.99	12.10	15.28	17.92	13.87	35.93	3.45	0.61	

Source: weatherandclimate.com

Figure 2-9 Average number of rainy days per month



Source: weatherandclimate.com

2.9 Catchment Area Analysis

For the calculation of the catchment area, an estimated water volume entering through capillary action and flowing out through the outlet have been considered along with the cross section and numbers of the same.

The total catchment area of the Gujjar kere is around 23.94 Ha.

The catchment area has been divided into four distinct zones and the following calculation has been done based on these zones.

Figure 2-10 Catchment Area demarcation



Source: Louis Berger

The details present on the site are as follows:

Table 2-2 Outlet details and calculated hydraulic levels

OUTLET		Note: Outlet at the southwest corner to be blocked due to its low height and only the outlet located on	HYDRAULIC LEVELS OF LAKE	
IL	4.75		Average Bed Level, m	3.10
Type	Open Drain		Outlet IL, m	4.75
Size	1.0 m wide		Storage Depth, m (avg.)	1.0

No	1	western end to be considered.	Max. Storage Level, m	4.75
			Freeboard, m	0.0
			Bund level, m	6.50

Source: Louis Berger

Table 2-3 Catchment area cumulative data

Catchment No.	Area, ha	Landuse, ha			Impermeability factor		
		Green	Road	Resi/Comm	Green	Road	Resi/Comm
1	2.36	0.30	0.20	1.86	0.2	0.9	0.65
2	3.62	2.00	0.20	1.42	0.2	0.9	0.65
3	13.72	3.50	1.15	9.07	0.2	0.9	0.65
4	4.24	1.00	0.65	2.59	0.2	0.9	0.65

Catchment No.	Weighted Average, C	Rainfall Intensity, mm/hr.	Discharge, Cumecs	Inlet location
1	0.614	36	0.14	Surface Flow
2	0.415	36	0.15	Surface Flow
3	0.556	36	0.76	Surface Flow
4	0.582	36	0.25	Surface Flow

Source: Louis Berger

The observations noted are as follows:

- The contributing catchment area of the lake is approximately 24 Ha
- The catchment has a concave like shape with lake centrally located.
- The land use of the catchment area comprises of different types of developments such as residential, roads and green areas.
- The lake doesn't have any natural streams connected to it but exists with one outfall located on west side.
- An intercepting RCC Drain of 1m wide exists around the periphery of the lake intercepting sullage/sewage and drainage runoff entering the lake.
- The flows are further conveyed to the outfall drain on west side of the lake.
- The only source of water is through capillary action / artisan well. The pressure forces the water to come on the surface of the lake.
- The lake receives flows only during the monsoon season, or else it is empty throughout the remaining part of the year.
- The average storage depth available currently is about 1.0m.
- Grading of about 0.5m depth can be proposed on the periphery of the lake bed to allow additional storage.
- A measuring scale can be installed in the middle of the lake to monitor the storage depth in different seasons.
- Protection of the catchment area from excessive development would improve the life and sustainability of the lake.

- In the dry period, the lake area can be utilized for temporary events, sports, social gatherings etc.,
- The size of the intercepting drain is adequate to carry the runoff generated in the catchment.

2.10 Lake Elevation Analysis

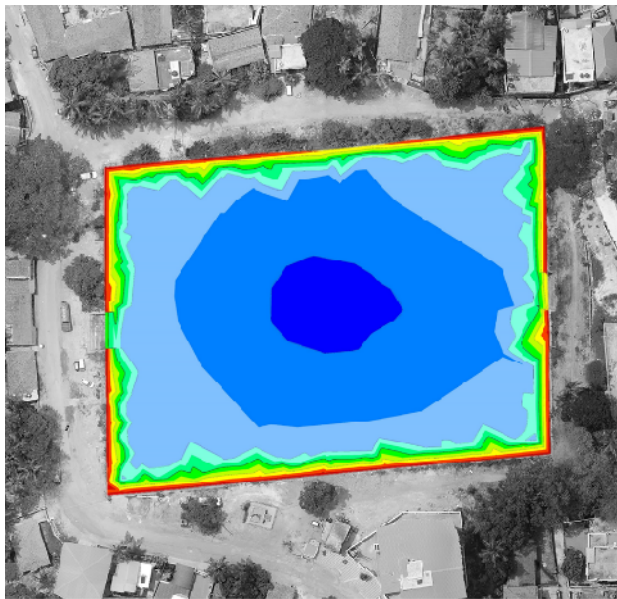
Based on the data collected from the catchment area analysis, total cumulative discharge into the lake is 1.31 cumecs. Considering the various contour levels, the storage value of the lake has been calculated.

Table 2-4 Lake Storage Capacity

Description	contour area		Cumulative. Area	Volume, cum
lake area @ 2.85	172.50	sqm	172.50	
lake area @ 3.00	592.50	sqm	765.00	70.31
lake area @ 3.50	4071.70	sqm	4836.70	1400.43
lake area @ 4.00	4325.70	sqm	9162.40	3499.78
lake area @ 4.75	399.20	sqm	9561.60	7021.50
Storage volume of the lake				11992.01

Source: Louis Berger

Figure 2-11 Lake Elevation with respect to contours



Source: Louis Berger

Elevations Table				
Number	Minimum Elevation	Maximum Elevation	Area	Color
1	2.67	3.00	691.28	Dark Blue
2	3.00	3.50	3985.93	Blue
3	3.50	4.00	3475.07	Light Blue
4	4.00	4.50	653.47	Cyan
5	4.50	5.00	484.16	Green
6	5.00	5.50	409.70	Light Green
7	5.50	6.00	356.60	Yellow-Green
8	6.00	6.50	315.28	Yellow
9	6.50	7.00	262.18	Orange
10	7.00	7.46	123.08	Red

2.11 Identified Problems & Issues

Depletion and extinction of source of Water:

1. **Anthropogenic Stress:** The Lake used to fill with water from a small water stream in its north east corner by capillary action. With the passage of time, the stream was encroached and covered with settlements. Presently, Lake is dry,

filled with silt and is being converted into a marsh. The unavailability of any infrastructure to hold water (rain water) is another reason for the drying lake.

Over time, the depth of the lake reduces, resulting in a reduced water storage volume. The lake which acts as a catchment for the region, now unable to hold runoff water due to reasons discussed above.

2. **Improper Management:** This Lake, though being a part of a residential locality is neglected upon. Local people and residents are oblivious to the fact that this lake if properly maintained would improve the social and cultural value of the area. Mismanagement of the premises has resulted in garbage dumping along the edges with uncontrolled inflow of drains.
3. **Lack of lake profiling:** There are several lakes around Mangalore which faces the same issues as the Gujjar Kere Lake faces. As different lakes have different characters, problems specific to Gujjar Kere Lake needs to be identified first and solutions to those specific issues need to be addressed. This can be achieved through physical and social surveys.
4. **Lack of Government Commitment:** Government institutions lack the knowledge about the importance of the lake in the area and essence of conservation and management, owing to constraints in finances and lack of adequate infrastructure. This is a direct impact of limited or no research on the impact of the lake on the surrounding areas.

3 Statutory and Legal Framework

The Indian Constitution provides, in clear terms, for the State's commitment to protect the environment. Article 51-A indicates the fundamental right of citizens to protect the natural environment while Article 48-A indicates the State's role to protect and safeguard the same. The Constitution also empowers urban local bodies with responsibilities to protect lake environments.

3.1 Initiatives by the Central Government

1. **National Lake Conservation Plan:** Ministry of Environment and Forests has been implementing the National Lake Conservation Plan for conservation and management of degraded lakes in urban and semi-urban areas. This has been in place since 2001. The main objectives of NLCP is to help State Governments sustainably manage and conserve lakes to prevent their degradation. The other objectives of NLCP is to restore the water quality and ecology of the lakes in different parts of the country, prevent point and non-point polluting sources, treating the Catchment area, desilting and weed control in and around the lake along with research & Development studies on floral and faunal activities and related ecological aspects.
2. **The Environment Protection Act, 1986 (EPA):** The Environment Protection Act, establishes an inter relationship between water, air and land, and human beings, other living creatures, plants, micro-organism and property; The purpose of the Act is to implement the decisions of the United Nations Conference on the Human Environment. They relate to the protection and improvement of the human environment and the prevention of hazards to human beings, other living creatures, plants and property. Chapter two of the Act describes general powers of Central Government, while section 3 gives the Central Government the power to take action to protect the environment. This Act also gives the government the power to give direction to closure, prohibition or regulation of industry, pollution.
3. **The water (prevention and control of pollution) act; Ministry of Environment and Forests (1974):** This Act provides for the prevention and control of water pollution and the maintenance/ restoration of the wholesomeness of water; and aids in the establishment of a board, which possesses the powers and functions of conducting activities and interventions in the context of prevention and control of water pollution. Sewage and industrial effluent discharges in the water bodies are approved or rejected by the PCBs established under the Water Act.
4. **The water (prevention and control of pollution) cess act; Ministry of Environment and Forests (1977):** The Water Cess Act provides the details

for the levy and collection of a cess on water consumed by persons owning certain industries and by local authorities, with a view to augment the resources of the central board and the state boards for the prevention and control of water pollution constituted under The water (prevention and control of pollution) act, 1974. This Act was amended in 2003 with minor modifications to the original act.

5. **National Water Mission - National Action Plan on Climate Change; Ministry of Water Resources (2009, 2008):** This comprehensive mission document by the Ministry of Water Resources (MoWR) highlights the objective of the National Water Mission, which is to conserve water through minimizing wastage and ensuring equitable distribution of water across and within states through integrated water resources development and management.
6. **Guidelines for repair, renovation and restoration of water bodies with external assistance and domestic support - Ministry of Water Resources (2009):** These two documents by the Government of India, Ministry of Water Resources (MoWR) provide information and details on the 'Repair, Renovation and Restoration (RRR) of Water Bodies' scheme that has been launched by the Ministry under the state sector, one with domestic budgetary support and the other with external assistance.

3.2 Initiatives by the Karnataka State Government

1. **Karnataka Lake Conservation and Development Authority Act 2014:** Guidelines has been constituted vide Gazette Notification No. SAMVYASHAE 07 SHASANA 2012, Bangalore dated 07.03.2015 for Lake Conservation and Development. The Karnataka Lake Conservation and Development Authority Rules has come into existence on 05.03.2016. As per the Karnataka Lake Conservation and Development Authority Act 2014, the jurisdiction of authority applies to all the lakes in the Karnataka State located within the limits of all Municipal Corporations and Bangalore Development Authority or any other water bodies or lakes notified by the Government from time to time.

The main aim of the act is to:

- Restore lakes and wetlands in quality and importance to their pristine status as reflected in the pages of history of the State.
- To establish a strong system of well linked lakes and tanks free from organic and chemical pollutants, and
- To intensify official concern and motivate community vigilance to the extent where pollution and encroachment of Lakelands would become impossible.

In Conclusion, there are several applicable policies from both the Central and State Governments which highlight the importance of conservation of lakes and

water bodies. These act, policies and laws would act as a guideline in the preparation of concept proposal.

4 Social, Economic & Environmental Impacts

To rejuvenate and conserve a lake, a detailed understanding of the environmental, economic and social impacts is necessary. Several aspects of a lake, in the form of its development over time, change of surrounding land use pattern, watershed area, estimated monetary investments among others must be considered at the time of planning. These can only be understood through a detailed socio-economic and environmental impact study.

4.1 Lake Rejuvenation: Social Impacts

1. **Creation of Social Interaction Spaces:** Rejuvenation of a lake, not only results in the improvement of stored water, but also results in the development and beautification of the adjoining land to the lake. Through this development a socially interactive space is created for the neighboring residential community, thereby increasing its social value.
2. **Creation of a Micro Climate:** Proper lake redevelopment results in creation of micro climate in the area. Water present in the lake throughout the year results in a considerable decrease in the temperature in the neighboring area along with creation of local winds, which creates a soothing atmosphere.
3. **Development of Recreational Facilities:** Added design elements in the form of jogging and cycling tracks, open gyms, play area create more value to the space and make it more attractive for the locals. Urban design in and around the lake results in improving the aesthetics and make it more appealing.

4.2 Lake Rejuvenation: Economic Impacts

1. **Better property value:** With the rejuvenation of a lake, value of surrounding properties increases, and a better property tax can be estimated on these buildings. This will improve the local tax base.
2. **Entry fee:** For visitors a small amount of money can be charged which goes towards the maintenance of the premises.

4.3 Lake Rejuvenation: Environmental Impacts

1. **Improved Flora and Fauna:** A water body attracts several species of birds and leads to the growth of different plant species. With the rejuvenation of a lake, one of the first visible effects seen is the spread of flora and fauna.
2. **Rain Water Harvesting:** In places like Karnataka where the summers are harsh with limited rainfall, there are instances of water shortages. To counter this problem, during months of monsoon with high rainfall, the water can be stored within the lake limits and used later. This should be done for all lakes in the region and should be a mandatory practice.

3. **Control of Water Quality:** As a part of redevelopment, all surrounding sewage lines are usually treated to control the flow of sewage into the lake. The water that enters the lake is a part of runoffs, which further gets purified through the soil on the lake bed, resulting in settling down of silt and better quality.

4.4 De-silting of a lake

1. There is a general feeling that the main reason for frequent drying up of lakes is their reduced storage capacity due to regular siltation over the years and therefore, desilting should be the major component of any Lake Conservation Project.
2. Lakes, which are in near vicinity of towns get polluted due to neglect on the part of society and when tested, the results show eutrophic conditions. This becomes another reason for advocating desilting of the lakes, for a certain depth, said to contain such polluted contents.
3. Silting is the process of slow accumulation of silt in the bottom of water bodies. Since, practically, there cannot be any reversal of this process, by which we can remove only the deposited silt through a slow process. We practically do 'digging' or 'excavation' of lake bed and while doing so, no one can claim that only deposited silt has been removed and the original lake bed has not been touched.
4. Particularly, when we use heavy excavation machinery, there are all chances that in addition to the deposited silt, the strata of original lake bed will also get removed in the desilting operations. There is no specified boundary or visible difference between the deposited silt above the original bed and the soil of original lake bed. Further to this, there is no provision to check the particle size of the excavated muck so as to see that only silt is removed. Thus, **by excessive excavation, the original lake bed is disturbed leading to increase in percolation rate resulting in heavy seepage losses through the lake bed.** The reason being this that by extra digging, the thin sealing layer of compacted silt deposited year after year of lake filling is disturbed and the joints of original strata get exposed. This has actually happened after massive desilting at *Pushkar* lake in 2009 (source: the Times of India, 24th October, 2009 issue).
5. If the situation is this that a lake seldom overflows, then, increasing storage capacity will not serve any purpose. On the contrary, the probability of overflow will decrease and water level with the same storage will go down which will result in a poor look. (source: 13th meeting of Regional Committee for Hard Rock Regional Centre of National Institute of Hydrology held on 10th, April, 2002, Hyderabad).
6. It is very necessary to frame a well thought policy for approving desilting work in lake beds so that, it does not have long term negative effects and wasteful expenditure considering scarcity of water and natural water resources.

5 Benchmarking

5.1 Kankaria Lake, Ahmedabad, Gujarat

The historical Kankaria Lake is situated nearly at the centre of Ahmedabad city. It is having a periphery of about 2.5 Km and has been the symbol of Ahmedabad's identity since almost 500 years. The historic lake around an island garden called Naginawadi has been an evergreen outing place for the people of Ahmedabad. Along with the adjoining Zoo, Aquarium and surrounding hill gardens, it offers a complete entertainment centre. With an expanse of around 4 sq. km of water body, it has acted as the lungs for the south-eastern part of the city.

Figure 5-1 Panoramic View of Kankaria Lake



Source: Ahmedabad Municipal Corporation

BEFORE THE INITIATIVE

Kankaria was visited by hundreds of visitors and was an urban chaos characterized by unclean Ghats, traffic chaos on the 2.4 miles periphery road, unorganized street life including a congested eating area on one corner thriving with street food vendors. The periphery wall was in a dilapidated state, and lake precincts presented somewhat unclean and disorganized environment. Vehicle parking along the periphery walls often blocked the view, and visiting children had a hard time amidst the noise, traffic and resultant chaos. Kankaria had also gained notoriety as a suicide point. The water in the lake was unhygienic due to drainage run offs and dumping of waste.

Figure 5-2 Informal functions & Development before initiative



Source: Re-Envisioning the Indian City: Informality and Temporality

AIM OF THE PROJECT

Initiated by the Ahmedabad Municipal Corporation, the primary objective of the Kankaria Lakefront Development was to transform this city-scale public space with efficient and robust infrastructure. The strategies to implement this transformation included creating complete pedestrian zones encircling the lake's edge, developing an outer ring road by strengthening the existing road network, creating approximately 6 km of access streets as well as new access points to the lakefront, enhancing recreational potential by improving public facilities, preserving historic buildings and encouraging development within the precinct.

Figure 5-3 Master Plan



Lake & Development over time

Source: HCP and Google Earth

MAIN PROJECT COMPONENTS

- The development of the lakefront was planned with facilities like food courts, walkways, linear gardens and landscapes and musical fountains.
- The entire lakefront areas have been pedestrianized with access to lakefront area through three entrance plazas and two other entrances.
- A 2.25 km long continuous pedestrian promenade made of grey granite was constructed around the periphery of the lake.
- A 2 m wide bicycle track along the periphery was also added.
- The highlight of the development was provision of a 42 m long mini toy train. The train operates around the periphery giving a joyride.
- Provision was made for creation of a handicrafts market to provide experience of shopping for traditional items of Gujarat to visitors.
- Green space was enhanced by creation of two linear parks 200 m wide one on each side. This provided the open space for recreational activities.
- The project also included construction of new public toilets supported by overhead tanks. Clean water treated by an in-house reverse osmosis plant supplied drinking water to visitors free of cost.

Figure 5-4 Developed Kankaria Lakefront after implementation



envisioning the Indian City: Informality and Temporality

PROJECT DURATION & COST

- Project Initiated in: 2006 & Completed in: 2009
- Total Project Cost: Rs. 360 Million

POST REDEVELOPMENT

The lake was transformed into a Complete Entertainment Centre. The response from the citizens was overwhelming. During last one year more than 1.18 crore visitors have enjoyed the ambience of the transformed Kankaria Lake Front. Festivals, small gatherings, educational tours, jogging, informal meetings, picnics etc. have become new face of Kankaria to attract young generation in a meaningful way. Further, the Lake is emerging as a platform for creative expressions of different communities of artists. As a result of the project, a chaotic spot has been converted into a well-organized recreational zone through a planned and think through approach despite many challenges. Further the project demonstrated a useful model for incorporation of project affected people like the food vendors into the project. Moreover, because of the clean environment, the ecology of the place has attracted many new species of birds.

5.2 Kaikondrahalli Lake, Karnataka

Kaikondrahalli Lake is located in the south east of Bangalore, on Sarjapur road. The area surrounding the lake has experienced a multifold increase in real estate value in the past decade. Sarjapur road, which runs past one edge of the lake, is congested with traffic, while the lake itself is surrounded by all the dystopic elements of modern Indian cities - malls, apartments, and IT companies along with shanties and tented slums. The lake is around 48 Acres in area.

Figure 5-5 View of Kaikondrahalli Lake



Source: India Water Portal

BEFORE THE REDEVELOPMENT

Older residents around the lake describe a much different landscape. As recently as 2000, the lake was filled with fresh water, surrounded by groves of fruiting trees, and frequented by birds, foxes, and snakes. By 2003 the lake had begun to dry up, with the incoming channels to the lake blocked by

construction and the dumping of debris and garbage. By 2007, the lake bed was a slushy malarial bed of sewage and waste. Over the years the lake started to be used for an eclectic mix of undesirable activities and misuse of the ecology and environment around.

Figure 5-6 View of dried up Kaikondrahalli Lake



Source: Lake Restoration: Two successful Models, NITI Aayog

Various problems faced by this lake over the years are:

- Severe Inflow of sewage
- Silting and settled deposits
- Dumping of debris
- Land formation owing to eutrophication
- Encroachments

REDEVELOPMENT PROCESS

The BBMP used a phased approach for lake restoration, primarily because it did not have access to adequate funds to begin with.

Phase I, which lasted from December 2009 to March 2011, underwent the following steps:

- The process began with demarcation of the lake's boundaries to stop any encroachment. The mapping was done in coordination with the revenue department, which is the custodian of land records.
- Lake encroachers were then served notice and ultimately evicted.
- With the lake administratively secured and cleared of encroachments, the next step was to stop pollution. As the inflow of sewage was a major reason for the lake's degradation, the inflow was diverted through a pipeline.
- The next step was aimed at de-silting of the lake. The unruly vegetation growth in the lake was cleared before de-weeding and de-silting of the lakebed. These efforts increased the lake's depth by an additional meter and increased its storage capacity from 1, 85,000 Cum. to 2, 85,000 cum and increased tank depth from 1.5m to 2.5m.

In Phase II, which lasted from September 2011 to March 2012, the following steps were followed:

- a fence was constructed around the lake to demarcate the boundary.
- Thereafter, the lake periphery was afforested to improve water quality and prevent soil erosion.
- As the dumping of items such as flowers and idols during religious festivals was also a major source of pollution in the lake, separate ponds were constructed for these activities, enabling citizens to continue with their cultural and religious practices without harming the lake.

Kaikondrahalli was then developed into an aesthetic and recreational urban space, with facilities like walking/ jogging pathway around the lake perimeter, a 2.5-km cycling track, an amphitheater for cultural performances, and pergolas and toilets.

Figure 5-7 Developed Kaikondrahalli Lakefront after implementation



Source: Lake Restoration: Two successful Models, NITI Aayog

PROJECT DURATION & COST

- Project Initiated in: 2009 & Completed in: 2012
- Total Project Cost: Rs. 7.5 Crores

POST REDEVELOPMENT

Post redevelopment, the lake has become an urban recreational space which is frequented by people. In the case of Kaikondrahalli, the local community is enjoying the new facilities, evident from the approximately 1,200 visitors the lake site receives every day. Also, the local ecology has been revived and this attract a large variety of birds including pelicans, ducks, black cormorants and many others. Moreover, to maintain the lake in the present form, there is constant coordination between PWD, Pollution Control Board and the local government to control the incoming of pollutants into the lake.

6 Concept Plan for Gujjar kere

6.1 Vision and Goal

The vision of the development is to revitalize Gujjar kere and give the city of Mangalore an open public space along a water body that is cherished by the community. Objective of the Project are:

- Improvement and upgradation of the lake as a part of Rain water Harvesting.
- Rejuvenating the lake to improve the socio-cultural value of the surrounding area and redevelop the same as a recreational area.

6.2 Existing Layout

On site, the reservoir part of the lake is surrounded by concrete stairs on all sides, each with a 0.5 m high riser. Smaller steps on the western and eastern sides are present to approach the water. With two outlets being always open, a thin layer of water is seen at the bottom. The existing layout of the lake is as per the following sections.

Figure 6-1 Gujjar Kere lake Survey Plan

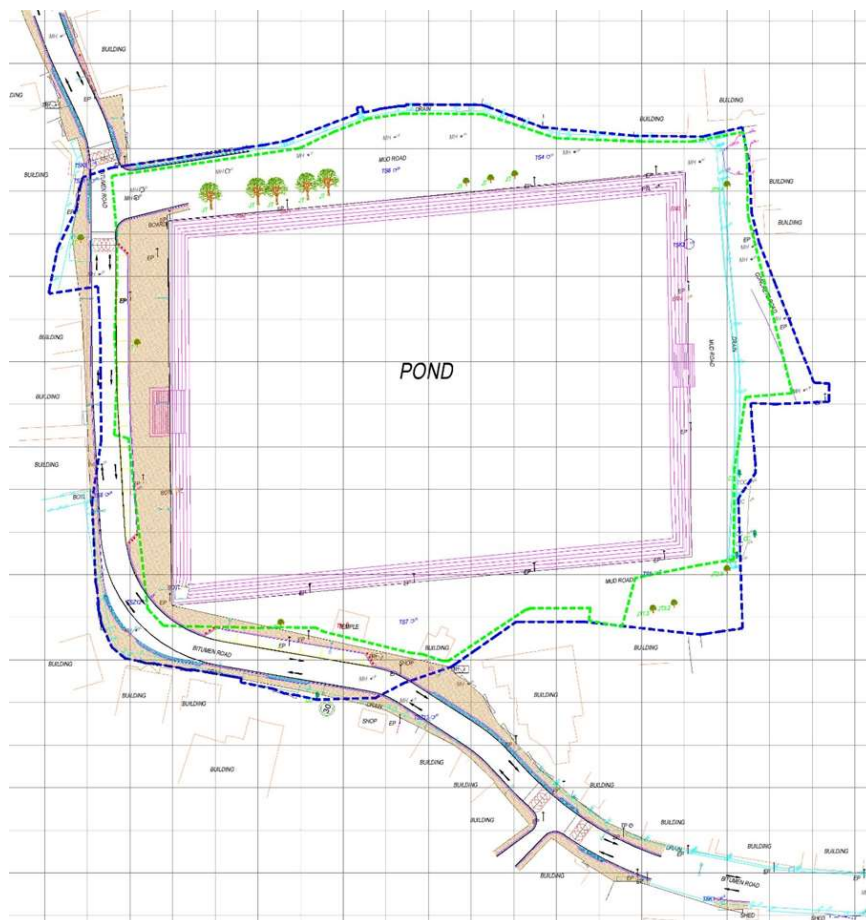
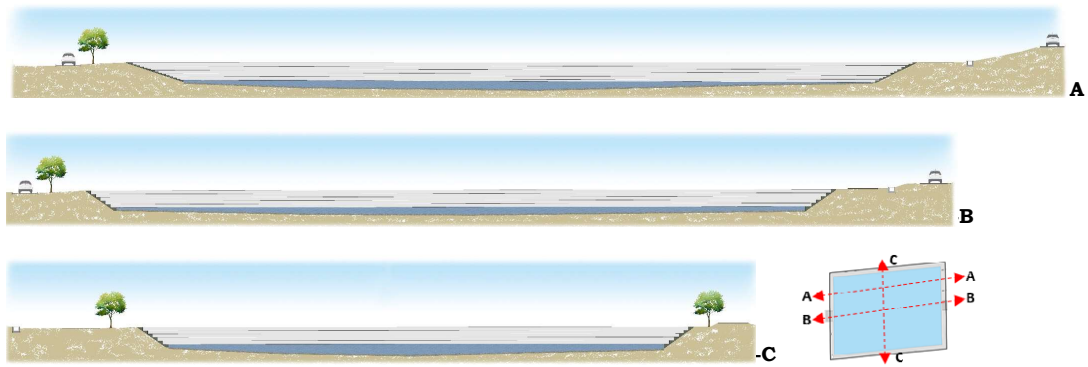


Figure 6-2 Existing lake sections



Source: Louis Berger

6.3 Design Basis: Potential spaces

The site is approached through road running along the western side of the Site. While through secondary kuccha roads along the east and south. The areas with high potential for integration with the concept design include the areas around the temple structure, vacant areas towards the northern, southern and eastern fronts, the existing steps and plantations along with the residential community around the lake.

The concept design proposes a landscaped plaza to give an experience of arrival to visitors, provides a defined access around the lakefront. The development will include addition of public facilities for an enhanced visitor experience. Due to proper vehicular connectivity, parking spaces are to be provided to accommodate a limited number of vehicles near the existing temple. The improved road design as proposed as a part of Smart City Mission is to be integrated with the urban design and all existing greens are to be retained.

The proposed landscaped plaza is designed to enhance a portion of the lake. A continuous walking and jogging track will outline the entire perimeter of the lake for improved access. As part of the concept to draw in the community and inculcate the sense of ownership of the area, we aim to add a program that includes area for yoga, open gymnasium and a small play area that can be used by demographics of all ages. These designed spaces shall be flexible in nature, wherein the type of use can vary with times of the day as well as with varying seasons of the year.

The overall design concept is focused on to improve accessibility and reinvigorate this space that can draw the community towards it and focusses towards motivating the community to care and take onus of maintaining the lake. The addition of a variety of programs around the water body will aim to make the lake an integral part of the community's routine. Moreover, the aim is to tap the unused potential of the lake and it's once a year usage is to be converted to be a perennial one. Consequently, Gujjar kere will have the

potential to become a model community project that catalyzes similar open public spaces in all communities around the city of Mangalore.

6.4 Design Components for Layout Plan

The major components of the design incorporated in the layout plan may be summarized as follows:

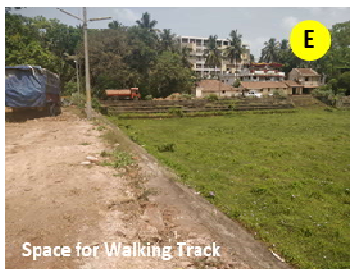
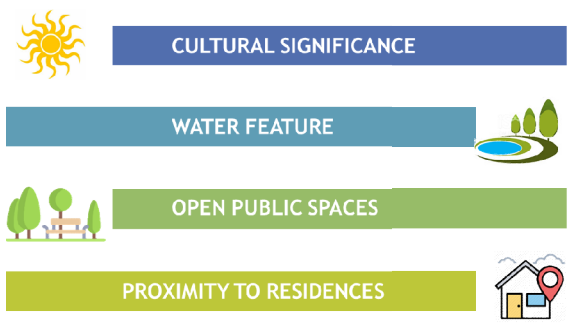
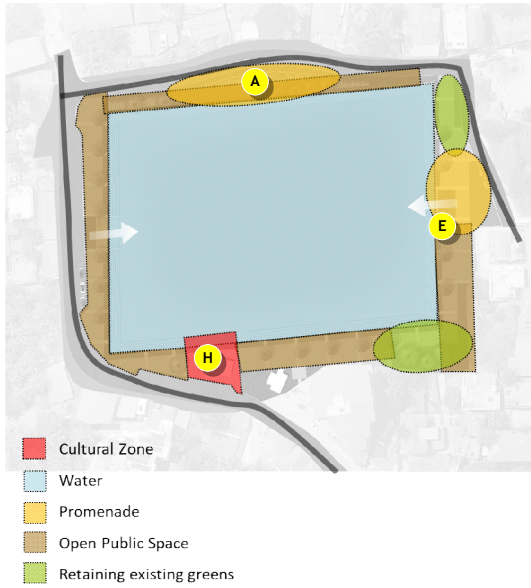
- Urban Landscaped plaza: A space created for public interaction.
- Supporting utilities: In the form of open gym, play area, toilets etc.
- Walking and Jogging track: To reduce vehicular movement around the lake.
- Enhanced cultural space: Around the existing temple.
- Face-lifting of the existing steps.
- Parking: Limited number of parking spaces designed.

6.5 Master Plan

The main focus of the masterplan will be on the following:

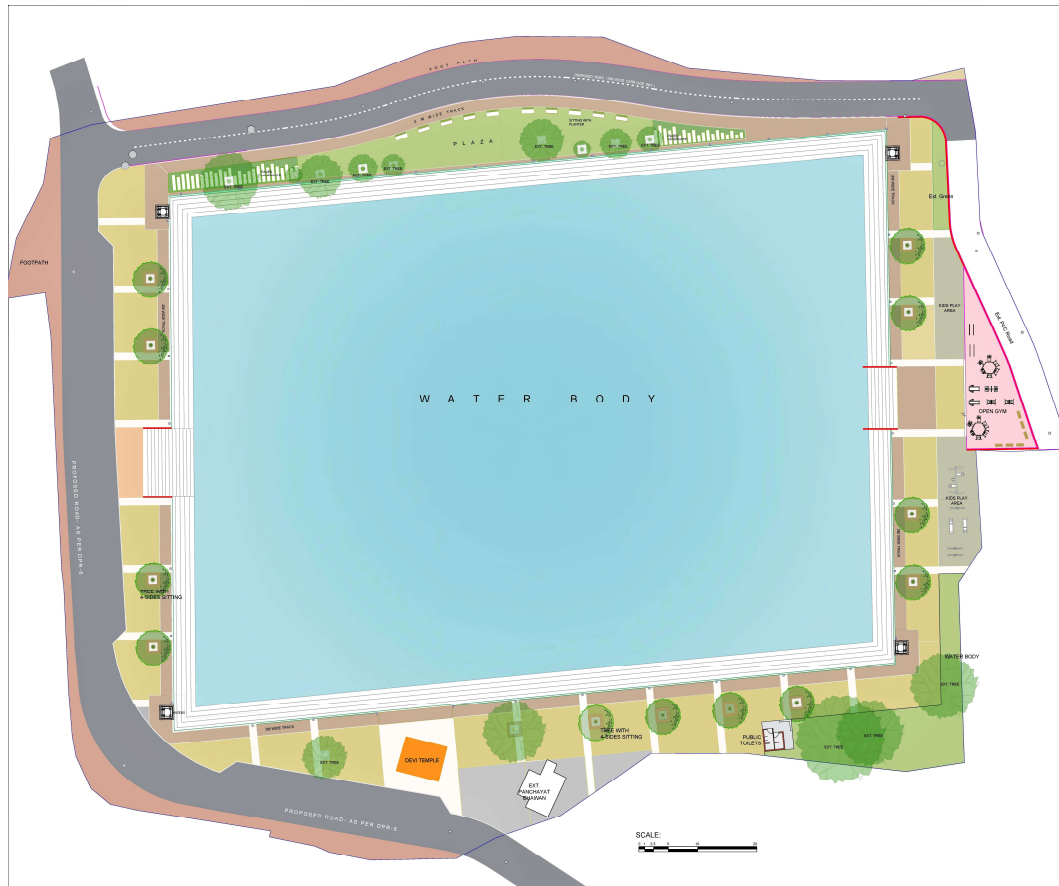
- Improving the condition of the vehicular & pedestrian approach roads.
- Introduction of an urban landscaped plaza with defined green and spaces for sitting towards the northern side of the lake
- Integration of the existing green in to the proposed urban design.
- Creation of a defined space around the existing temple, which becomes a part of the cultural zone within the vicinity of the lake.
- Generating socially viable spaces in the form of open gym etc.
- Continuous pedestrian track along the perimeter of the lake for walking.
- Improving the conditions of the existing steps with better access & finishes.

Figure 6-3 Concept zoning



Source: Louis Berger

Figure 6-4 Proposed Master plan



A. Urban Landscaped Plaza:

- Softscape with grass
- Combination of hardscape and softscape
- Existing Trees
- Benches for sitting

B. Existing vehicular roads developed as per Smart City DPR 6.

C. Secondary kutcha road developed & extended for future connectivity.

D. Space for open gym.

E. Continuous walking track.

F. Enhanced steps separated with a cover wall.

G. Space for Lake Edge development

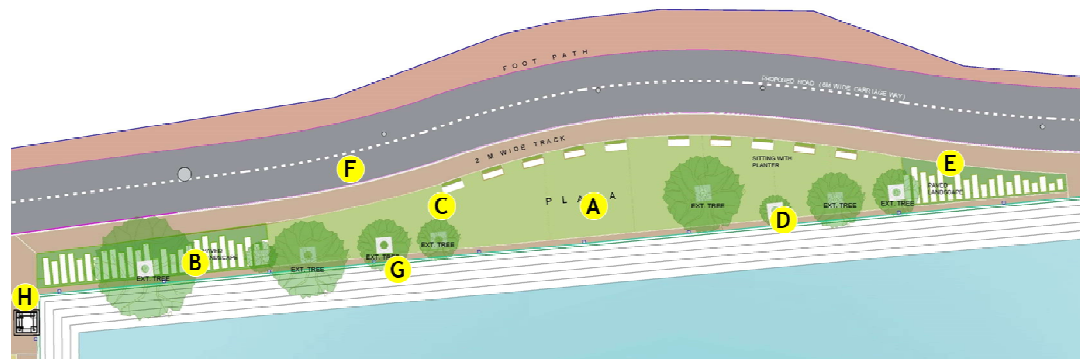
H. Cultural space

I. Space for Parking

J. Toilet Block

With the introduction of various landscaping and urban design options, the aim is to create an outdoor area for cultural and social interaction among the nearby residents, so as to improve the conditions of living.

Figure 6-5 Detailed Part Plan of Landscaped Urban Plaza (Northern Side)



Source: Louis Berger

- A. GREEN GRASS COVER
- B. HARDSCAPE PAVERS
- C. BENCHES
- D. EXISTING TREES

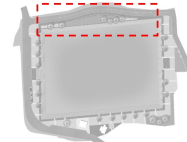
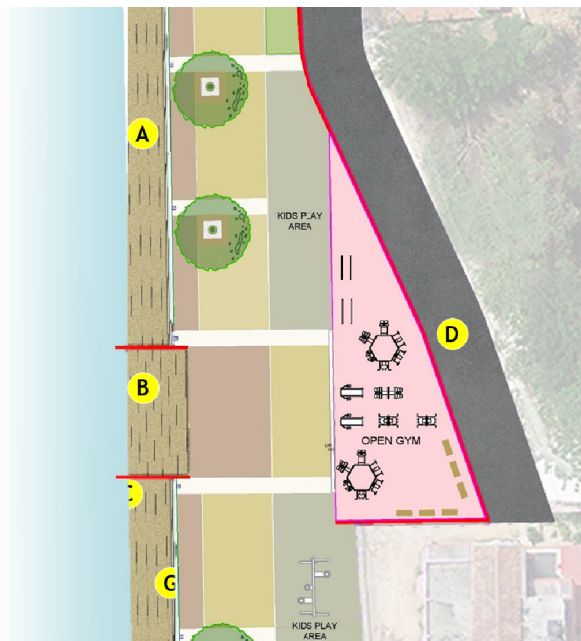


Figure 6-6 Detailed Part Plan of Eastern Side steps and Open gym



Source: Louis Berger

- A. STAIRS WITH LARGE RISERS
- B. STEPS TO APPROACH WATER
- C. DESIGNER WALL
- D. EXISTING ROAD
- E. OPEN GYM
- F. PROPOSED PLANTATION
- G. RAILING

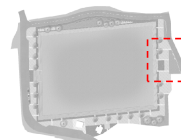
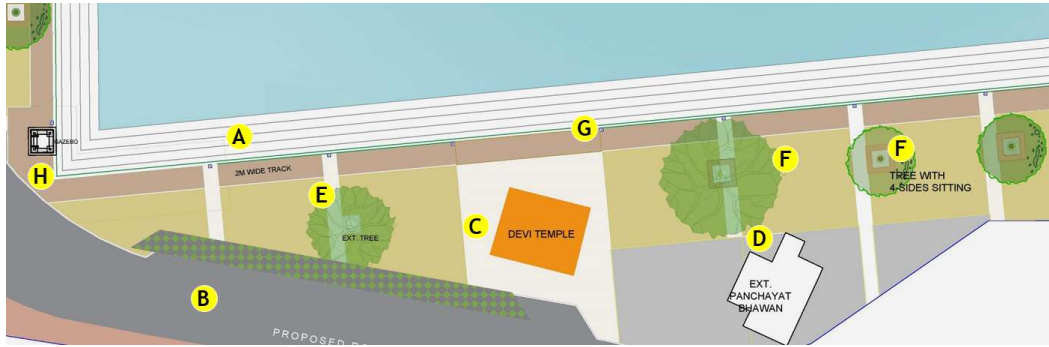


Figure 6-7 Detailed Part Plan of Cultural area and Service Block (Southern Side)



Source: Louis Berger

- A. STAIRS WITH LARGE RISERS B. PROPOSED PAVED ROAD C. EXISTING TEMPLE
 D. PROPOSED TOILET BLOCK E. EXISTING TREE F. PROPOSED PLANTATION G. RAILING H. GAZEBO

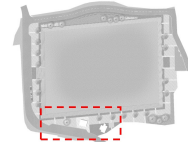
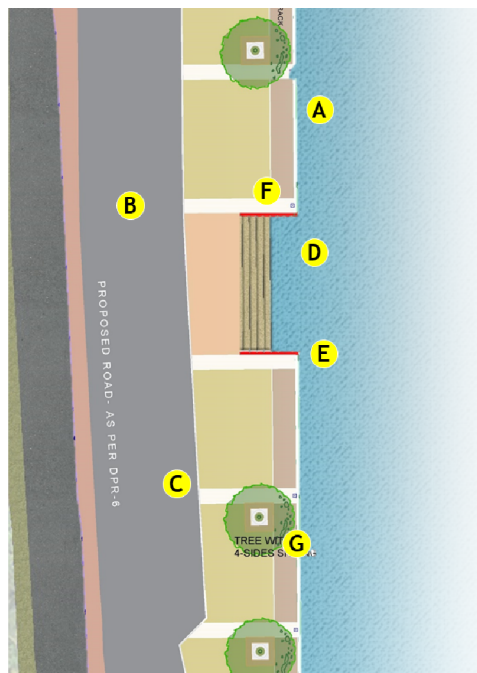
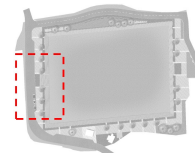


Figure 6-8 Detailed Part Plan of Western Side steps and Parking



- A. STAIRS WITH LARGE RISERS
 B. PROPOSED PAVED ROAD
 C. PARKING
 D. WATER APPROACH STEPS
 E. DESIGNER WALL
 F. PROPOSED PLANTATION
 G. RAILING



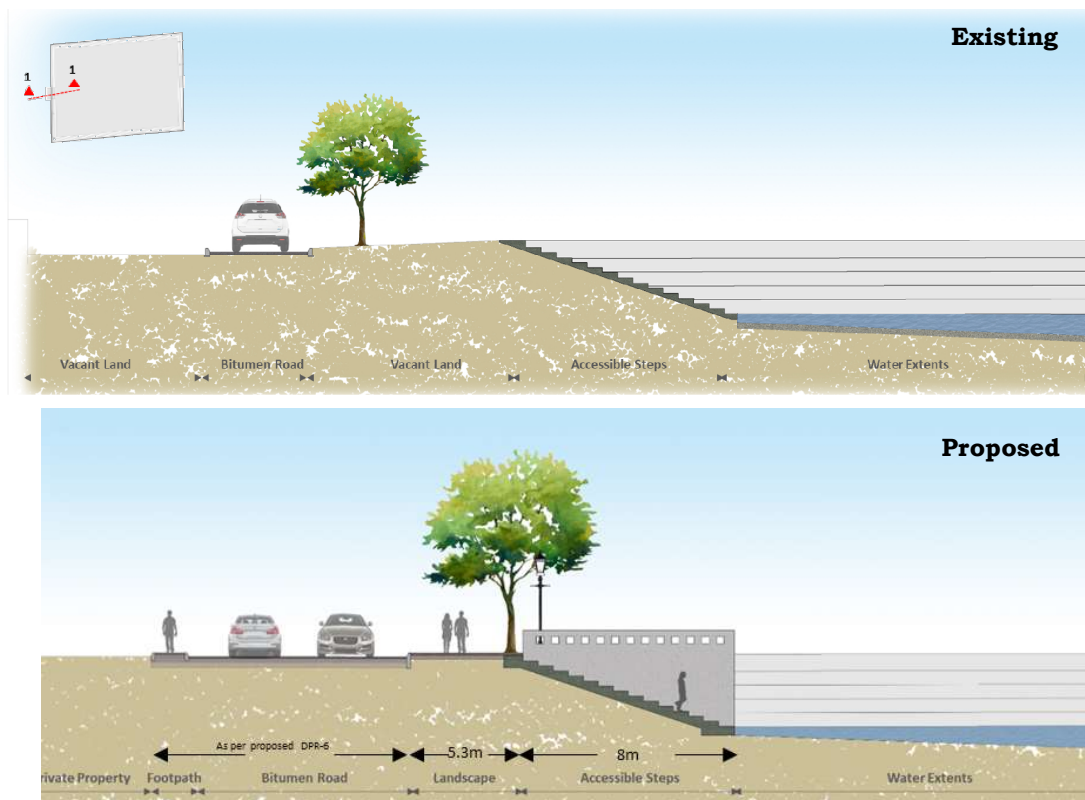
Source: Louis Berger

The existing surfaces around the lake are mostly softscape with overgrown weeds and vegetation during the monsoons and barren during rest of the year. The plan proposes transition of these surfaces into creation of an interesting space, with an optimum balance of hardscape and softscape, which in turn converts an unused space into a functional one. The existing stairs would create a perfect opportunity for creation of social interaction spaces all around

the waterbody, with specified areas through which the water can be accessed. This would blend with the proposed landscape.

For instance, in section 1-1, the interventions are limited to creation of a designed wall along the stairs approaching the water level. Also, the area of land between the stairs and the existing road has been landscaped so as to provide a smooth transition from the paved road to the steps.

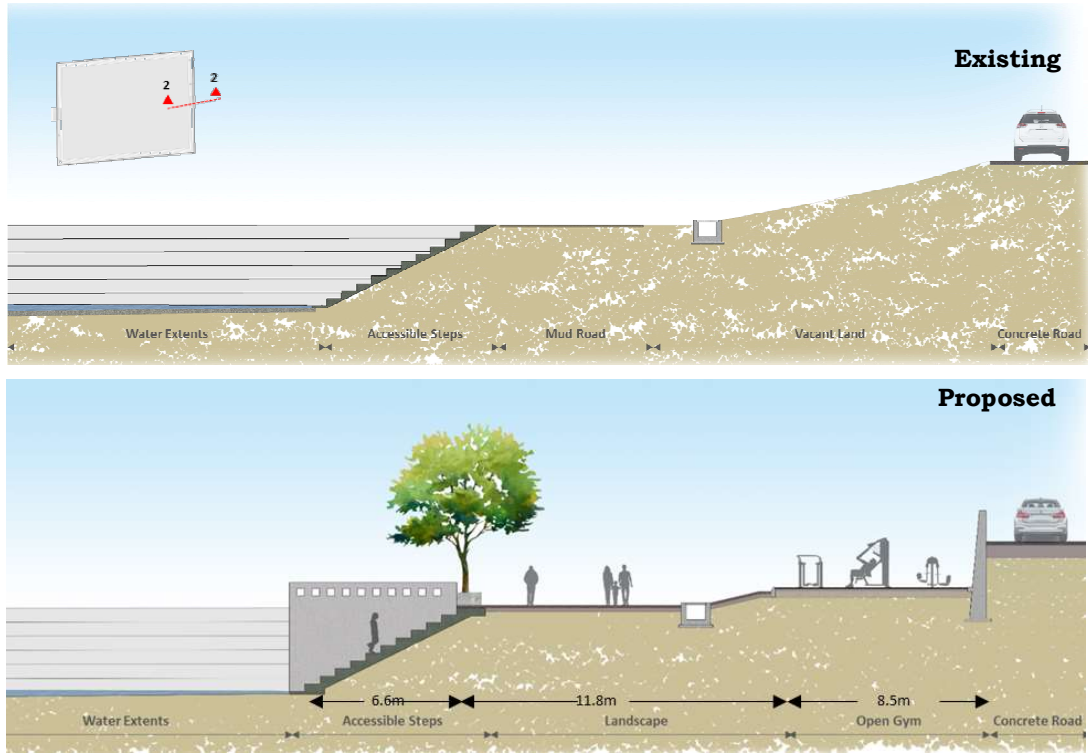
Figure 6-9 Existing and Proposed Sections along Section Line 1-1



Source: Louis Berger

Section 2-2 is quite similar to the former section, the only noted difference being the transition onto the open gym area. The steps from the lake leads to the ground surface paving which terminates onto the rubber flooring as provided in the open gym. A retaining wall towards the back of the gym to be constructed to support the rising concrete road.

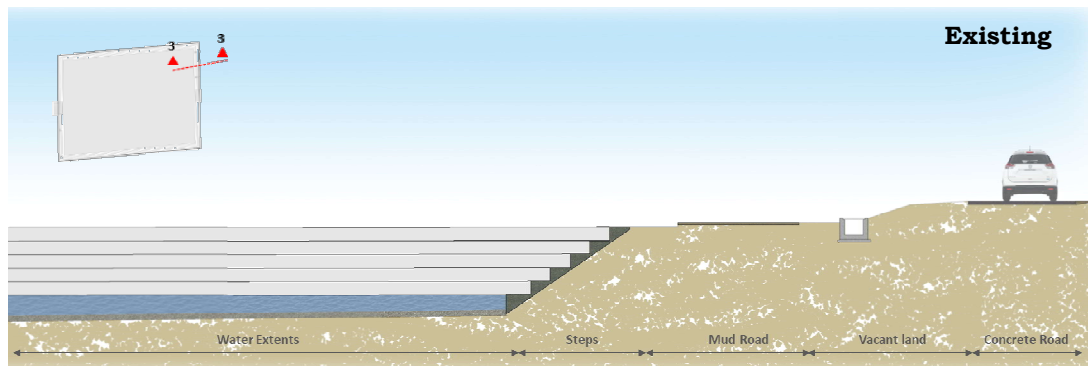
Figure 6-10 Existing and Proposed Sections along Section Line 2-2

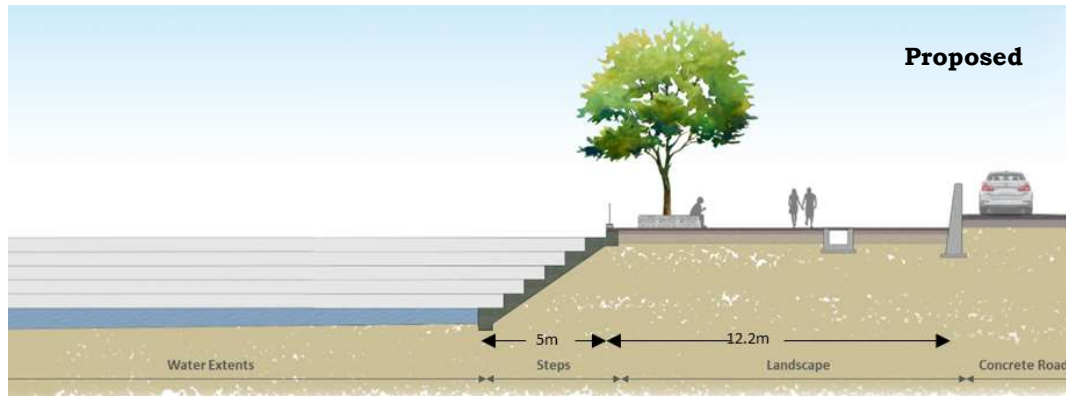


Source: Louis Berger

With reference to section 3-3, the last of the steps with large risers terminate at the walking track, which leads onto the pavers. As a part of landscaping, new plantations have been proposed whose base is supported by circular sitting benches. The surface is flat and there is only a marginal level difference.

Figure 6-11 Existing and Proposed Sections along Section Line 3-3

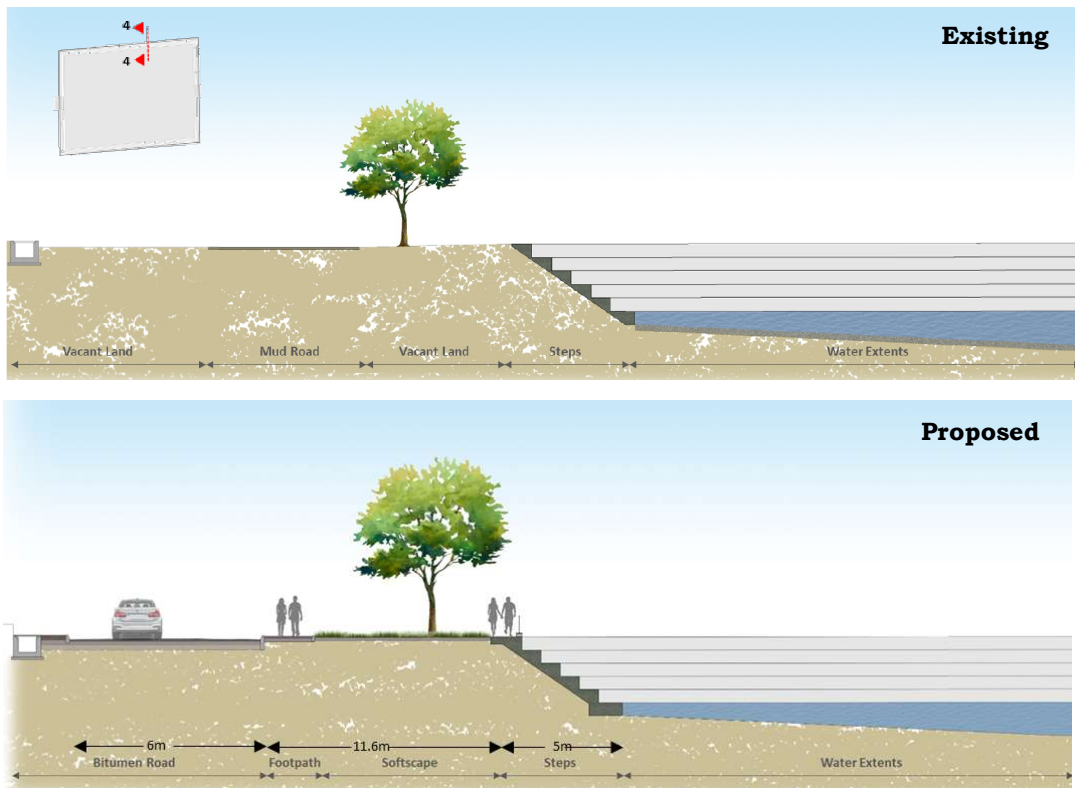




Source: Louis Berger

Section 4-4 runs through the landscaped area towards the north of the lake. A similar set of stairs with large risers terminate onto a green surface. Majority of the area towards the north is softscape lined with native grass, beyond which the walking track continues. The former kutchra road is proposed to be made into a paved one and would be connecting to the road coming down on the east.

Figure 6-12 Existing and Proposed Sections along Section Line 4-4



Source: Louis Berger

6.6 Materiality and Streetscape

Mangalore city in its history boasts of a thriving tile industry. The 'Mangalore tiles' earlier in time were used throughout the country by the building

construction industry. Locally sourced laterite stone block was another popular construction material in the city and adjoining areas because of the strength, hardness and resistance to moisture.

Figure 6-13 Mangalore and Materiality



Source: Louis Berger

But with the passage of time, the usability of these local materials has reduced, and it is important for us to remind the community of the rich architectural language native to Mangalore.

Material selection for the Gujjar lake urbanscape that includes but is not limited to seating areas, paved areas, pathways, plant enclosures, railing, lighting, bollards, signage, garbage bins will be done in a responsible manner that respects the context of the city and our climate. The design materials besides playing a key role in the aesthetics, also significantly participate in the socio-cultural and climatic impact of the design.

As designers, we will choose all materials based on:





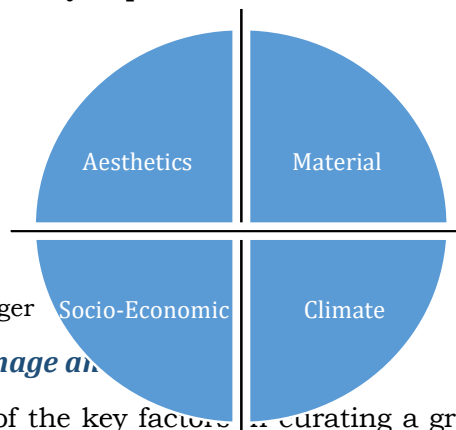
-  Availability
-  Durability
-  Economic Value
-  Sustainability

Figure 6-14 Materiality Impact



Source: Louis Berger

6.7 Wayfinding, Signage and

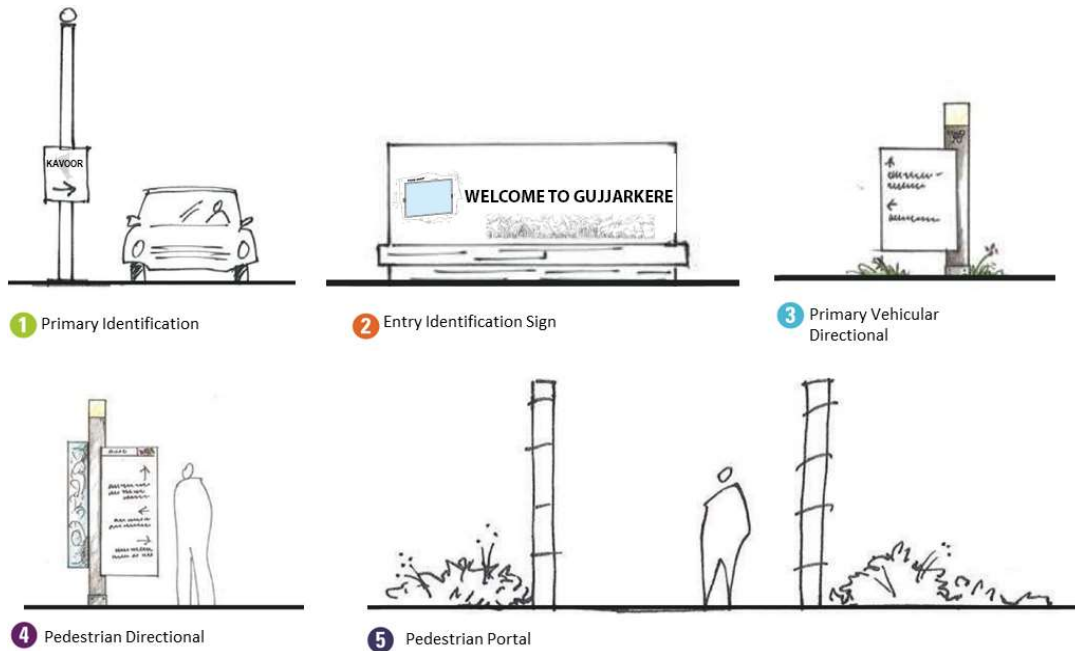
Signage is one of the key factors in curating a great experience for all visitors. Besides the inherent use of providing necessary orienting and wayfinding

information, Signage in Gujjar lake redevelopment will also be employed towards:

- Building a strong vision for the community
- Attracting more visitors
- Inculcating pride and responsibility within the community
- Increasing the visibility of development

There are primarily four categories of signage – Signage for Identification, Signage for Direction, Signage for Information and Signage for Regulation. Signage for Identification will exist on the approach road in the northwestern side of the lake. An entry identification sign will be right at the entrance of the plaza zone of the lakefront. Vehicular and pedestrian directional signages (indicating suggested movement path, direction and various visitor facilities) will be required throughout the perimeter walking track along the lake. Informational signage will be designed and provided at specific points of interest created along the lake. Regulatory signage guiding visitor behavior and points of prohibition/safety will be at critical locations along the lakefront.

Figure 6-15 Forms of Wayfinding & Signage



Source: Louis Berger

Figure 6-16 Signage Instances



Source: Louis Berger

6.8 Views





7 Cost Estimation

The approved list of Smart City proposals for Mangaluru includes the following project cost estimation for Gujjarkere Lake.

Sr. No.	Description	Cost In INR
1	Civil Work including SWD,Lake Improvement and Horticulture	4,80,42,466
2	Electrical Work	14,79,922
3	Plumbing Work	3,84,016
4	HVAC Work	14,000
	Construction Cost Sub Total	4,99,20,404
	GST @ 12% on Civil	51,99,849
	GST @ 18% on Market Rate	6,27,191
	Escalation and Tender Premium @5%	24,96,020
	Add 3% Contengency	14,97,612
	Miscellaneous and Rounding off	58,923
	Grand Total	5,98,00,000

8 General Instructions

8.1 Contractor's Superintendence

- 1) The Contractor shall submit a Staff Organisation Plan in accordance with the Client.
- 2) This plan shall be updated and resubmitted whenever there are changes to the staff. The plan shall show the management structure and state clearly the duties, responsibilities and authority of each staff member.
- 3) The site agent and his associates/supervisors shall have experience and qualification appropriate to the type and magnitude of the Works. Full details shall be submitted of the qualifications and experience of all proposed staff to the Engineer for his approval.

8.2 Checking of the Contractor's Temporary Works Design

The Contractor shall, prior to commencing the construction of the Temporary Works, submit a certificate to the Engineer signed by him certifying that the Temporary Works have been properly and safely designed and checked and that the Contractor has checked the effect of the Temporary Works on the Permanent Works and has found this to be satisfactory.

8.2.1 The Site

- 1) Works Areas are those areas identified are to these Employer's Requirements and on the Drawings.

8.2.2 Use of the Site

- 1) The Site or Contractor's Equipment shall not be used by the Contractor for any purpose other than for carrying out the Works in the scope of this contract, except that, with the consent in writing of the Engineer, the Site or Contractor's Equipment such as batching/mixing plants for concrete and bituminous materials may be used for the work in connection with other contracts under the Employer.
- 2) Rockcrushing plant shall not be used on the Site.
- 3) The location and size of each stockpile of materials, including excavated materials, within the Site shall be as permitted by the Engineer. Stockpiles shall be maintained at all times in a stable condition.
- 4) Entry to and exit from the Site shall be controlled and shall be only available at the locations for which the Engineer has given his consent.

8.2.3 Access to the Site

- 1) The Contractor shall make its own arrangements, subject to the consent of the Engineer, for any further access required to the Site.
- 2) In addition, the Contractor shall ensure that access to every portion of the Site is continually available to the Employer and Engineer.

8.2.4 Access to Outside the Site

- 1) The Contractor shall be responsible for ensuring that any access or egress through the Site boundaries are controlled such that no disturbance to residents or damage to public or private property occur as a result of the use of such access or egress by its employees and sub-contractors.

8.2.5 Survey of the Site

- 1) A survey shall be carried out of the Site to establish its precise boundaries and the existing ground levels within it. This survey shall include a photographic survey sufficient to provide a full record of the state of the Site before commencing the work with particular attention paid to those areas where reinstatement will be carried out later on. The survey shall be carried out before the site clearance wherever possible and in any case prior to the commencement of work in any Works Area. The survey shall be carried out by the Contractor and agreed with the Engineer.

8.2.6 Barricades and Signboards

- 1) The Contractor shall erect barricades as per Tender Drawing and gates around its areas of operations to prevent entry by unauthorised persons to his Works Areas and necessary identity cards /permits should be issued to workers and staff by the contractor. The Contractor shall submit proposal for barricades of the complete perimeter of all works areas to the Engineer. Painting of the barricades shall be carried out to the design and colours as directed by the Engineer and the Contractor shall carry out re-painting of the entire barricades on a regular basis. No work shall be commenced in any Works Area until the Engineer has been satisfied that the barricades installed by the Contractor are sufficient to prevent, within reason, unauthorised entry. The cost of all this barricade is included in quoted price.
- 2) The types, sizes and locations of project signboards shall be agreed with the Engineer before manufacture and erection. Other advertising signs shall not be erected on the Site.
- 3) The consent of the Engineer shall be obtained before hoardings, fences, gates or signs are removed. Hoardings, fences, gates and signs which are to be left in positions after the completion of the Works shall be repaired and repainted as instructed by the Engineer.
- 4) Hoardings, barricades, gates and signs shall be maintained in clean and good order by the Contractor until the completion of the Works, whether such hoardings, fences, gates and signs have been installed by the Contractor or by others and transferred to the Contractor during the period of the Works. All the fencing, hoardings, gates and signs etc. shall be mopped minimum one in a week and washed monthly.
- 5) All hoardings, barricades, gates and signs installed by the Contractor shall be

removed by the Contractor upon the completion of the Works, unless otherwise directed by the Engineer.

8.3 Clearance of the Site

All Temporary Works which are not to remain on the Site after the completion of the Works shall be removed prior to completion of the Works or at other times instructed by the Engineer. The Site shall be cleared and reinstated to the lines and levels and to the same condition as existed before the Works started except as otherwise stated in the Contract.

8.3.1 Survey

- 1) The Contractor shall relate the construction of the Works to the Site Grid. To facilitate this, survey reference points have been established and the Engineer will provide benchmarks in the vicinity of the Site. .
- 2) Before the Contractor commences the setting out of the Works, the Engineer will provide a drawing showing the position of each survey reference point and bench mark, together with the co-ordinates and/or level assigned to each point. The Contractor shall satisfy itself that there are no conflicts between the data given and shall establish and provide all subsidiary setting out points which may be necessary for the proper and accurate setting out and checking of the Works.
- 3) The Contractor shall carefully protect all the survey reference points, bench marks, setting out points, monuments, towers and the like from any damages and shall maintain them and promptly repair or replace any points damaged from any causes whatsoever. The Contractor shall regularly recheck the position of all setting out points, bench marks and the like to the satisfaction of the Engineer.
- 4) Upon handover to the Contractor, the survey reference points will become the responsibility of the Contractor. The Contractor shall frequently review, ensure that these survey points continue to remain consistent with the bench marks.

8.3.2 Safety, Health and Environmental Requirements

The Contractor shall comply with in the conditions stipulated in the Conditions of contracts on Safety, Health & Environment (SHE).

Training of Contractor's Employees/Staff/Workers:-

Contractor shall provide a training/workshop on safety, Health & Environment (SHE) to all its workers/staff/employees/subcontractors of at least at the time of induction .Before postings of any his workers / staff / employees / subcontractors, the contractor shall give a certificate that the said person had undergone the requisite SHE training. Non-compliance of the above will invoke penalties as per condition of contract.

In case of any mishap/ accident causing death/injury to public or damage to public/private property or damage to public/private vehicles or damage to

railway property, the employer, will impose a penalty to the contractor as deemed fit and appropriate in addition to the cost of damage caused due to the mishap/accident.

8.3.3 Other Safety Measures

Site Safety, Health & Environment Plan

- 1) The Contractor shall, within 7 days of the date of Notice to Proceed, prepare and submit to the Engineer for review his proposed safety, Health and Environment plan which shall contain as a minimum those items set out in Conditions of Contract on Safety, Health & Environment Plan.

Fire Regulations and Safety

- 2) The Contractor shall provide and maintain all necessary temporary fire protection and firefighting facilities on the Site during the construction of the Works, and shall comply with all requirements of the Mangalore Fire Services Department. These facilities may include, without limitation, sprinkler systems and fire hose reels in temporary site buildings, raw water storage tanks and portable fire extinguishers suitable for the conditions on the Site and potential hazards.
- 3) The Contractor shall submit details of these facilities to the Engineer for review prior to commencement of work on the Site.
- 4) If, in the Engineer's opinion, the use of naked lights may cause a fire hazard, the Contractor shall take such additional precautions and provide such additional firefighting equipment (including breathing apparatus) as the Engineer considers necessary. The term "naked light" shall be deemed to include electric arcs and oxyacetylene or other flames used in welding or cutting metals.
- 5) Oxyacetylene burning equipment will not be permitted in any confined space. Burning equipment of the oxy propane type shall be used.

8.3.4 Hazard and Risk Assessments

- 1) The Contractor shall, prior to the commencement of any operation carry out a detailed hazard and risk assessment. The results of such assessments shall be recorded and the records kept for inspection by the Engineer.
- 2) The Contractor shall produce detailed method statements for all medium and high risk operations and shall submit them to the Engineer for his consent prior to commencement of any task to which they relate.
- 3) The Contractor shall produce and implement a Permit to Work system for all high risk operations. The Permit to Work system shall be submitted to the Engineer for consent before application.

8.3.5 Roofing work

- (1) The Contractor shall prepare a detailed specification for the operation, installation, removal of staging and submit it to the Engineer for review in advance before start of work.
- (2) Always ensure that you are inspecting scaffolding thoroughly before using it. Check to make sure the base is secured, and that it is level and adjusted for any lean in the building. Make sure that every single guardrail and plank is installed safely and securely, and also look out for elevation changes, obstructions (such as wires), and weather conditions.
- (3) During the design stages of scaffolding, one of the main mistakes that is made is failing to consider all of the different types of load that the material will be under during construction and setup. In order to maximize the safety of everyone involved, do not attempt to overload the scaffolding with more workers than it is rated for in order to save time. Also take care to ensure that it is not overloaded by equipment, and that nothing is pushing against any guardrails.
- (4) Everyone working on height should be trained and experienced in such kind of job and always work in good mental and health condition.
- (5) Scaffolding is designed to be braced by or entirely attached to a building. If bracing isn't properly secured, scaffold movement may dislodge an end, which will reduce the stability of the scaffold. There are a few types of brace retention or locking systems on scaffolds. These systems need to operate freely during assembly and dismantling, and also be able to lock in order to prevent the brace from dislodging. You shouldn't try and replace the proper parts supplied by the manufacturer with nails or other miscellaneous substitutions.
- (6) When taking the design of a scaffold into consideration, a construction company must ensure that any scaffolding over 10 feet high has guardrails on the three sides facing away from the building, at the very least. The side facing the building is still a danger, so it is recommended to have them there as well. Guardrails should not be viewed as a replacement for true fall protection gear, which should be worn at all times while on the scaffolding.
- (7) Scaffolding structures need to be constantly maintained and inspected in order to retain their structural integrity and safety. Someone knowledgeable about the construction of the scaffolds themselves needs to inspect the structure to ensure that it is still functional and safe, making sure that boards are all still intact and that all of the components are still in good shape. Failure to keep these crucial components regularly maintained could lead to extremely hazardous conditions
- (8) Use protection, or PPE This can include things like head protection, fall prevention gear, and non-slip footwear. It is essential to wear these measures at all times in order to maximize your safety, and the safety of all who are around you.

8.3.6 Dismantling Works

Precautions before and during demolition shall be as follows:

- (1) Precautions must be taken before and during demolition in accordance with AS2601-2001, 'The Demolition of Structures'.
- (2) The demolition shall not be commenced until precautionary measures have been inspected and approved. It is advisable to inform adjoining neighbours prior to the demolition so that they may close windows or take other measures.
- (3) Before demolition is commenced and also during the progress of such work, all electric cables or apparatus which are liable to be a source of danger, other than a cable or apparatus used for the demolition works shall be disconnected.
- (4) During the progress of demolition, the work shall be under the continuous supervision of the demolisher or of an experienced foreman.
- (5) Unless otherwise expressly approved, demolition shall be executed storey by storey commencing at the roof and working downward.
- (6) All practicable precautions shall be taken to avoid danger from collapse of a building when any part of a framed or partly framed building is removed.
- (7) Any asbestos present on the site should be removed in accordance with the Occupational Health and Safety (Asbestos) Regulations 2003 by an approved asbestos removal list registered by the Victorian Work Cover Authority.
- (8) When the demolition site adjoins a street or public walkway, a 2.4 metre high solid hoarding shall be erected on the street boundary unless the building is setback at least twice its height from the street boundary, in which case a security fence having a minimum height of 1.5 metres may be utilised. Notices lettered in accordance with AS1319, displaying the words "WARNING DEMOLITION IN PROGRESS" to be fixed to the hoarding or security fence.
- (9) When the site adjoins a footpath or public thoroughfare in addition to hoarding required by Clause 1.5.1.5 of AS2601-2001, the footpath shall be covered by an overhead protective structure unless the vertical height above the footpath is less than four metres or the least horizontal distance between footpath and the nearest part of the structure is greater than half the height of the structure. (It should be noted that Regulation 604(4) requires the consent and report of the Relevant Council be obtained before a building permit is issued which requires the erection of safety precautions over the road reserve). Demolished material shall not be allowed to remain on any floor or structure if the weight of the material exceeds the safe carrying capacity of the floor or structure and such material shall be so piled or stacked that it will not endanger workmen or other persons, and shall be removed as soon as practicable from the site unless otherwise authorised by the Building Surveyor.

- (10) Dust creating material, unless thoroughly dampened shall not be thrown or dropped from the building but shall be lowered by hoisting apparatus or removed by material chutes.
- (11) Inspect personal protective equipment (PPE) before use.
- (12) Select, wear and use appropriate PPE for the task.
- (13) Inspect all stairs, passageways, and ladders; illuminate all stairways.
- (14) Shut off or cap all electric, gas, water, steam, sewer, and other service lines; notify appropriate utility companies.
- (15) Demolition of exterior walls and floors must begin at the top of the structure and proceed downward.
- (16) Structural or load-supporting members on any floor must not be cut or removed until all stories above that floor have been removed.
- (17) Employees must not be permitted to work where structural collapse hazards exist until they are corrected by shoring, bracing, or other effective means.
- (18) Upon completion of the work, notification shall be given to the Building Surveyor that the work has been completed satisfactorily.
- (19) No bulk excavation or levelling of the site forms part of this demolition permit

8.3.7 Standby Equipment

- 1) The Contractor shall provide adequate stand-by equipment to ensure the safety of personnel, the Works and the public. These measures shall include as a minimum the following:-
- 2) stand-by pumping and generating equipment for the control of water;
- 3) stand-by equipment and spares for illumination of the Works; and
- 4) Stand-by generating equipment and equipment for the lighting for the works.

8.3.8 Co-operation

- 1) The Contractor shall provide full co-operation and assistance in all safety surveillance carried out by the Engineer or the Employer. Any breaches of the Site Safety Plan or the statutory regulations or others disregard for the safety of any persons may be the reason for the Engineer to exercise his authority to require the site agent's removal from the Site.

8.3.9 Care of the Works

- 1) Unless otherwise permitted by the Engineer all work shall be carried out in dry conditions.
- 2) The Works, including materials for use in the Works, shall be protected from damage due to water. Water on the Site and water entering the Site shall be promptly removed by temporary drainage or pumping systems or by other

methods capable of keeping the Works free of water. Silt and debris shall be removed by traps before the water is discharged and shall be disposed of at a location or locations to which the Engineer has given his consent.

- 3) The discharge points of the temporary systems shall be as per the consent of the Engineer. The Contractor shall make all arrangements with and obtain the necessary approval from the relevant authorities for discharging water to drains, watercourses etc. The relevant work shall not be commenced until the approved arrangements for disposal of the water have been implemented.
- 4) The methods used for keeping the Works free of water shall be such that settlement of, or damage to, new and existing structures do not occur.
- 5) Measures shall be taken to prevent flotation of new and existing structures.

8.3.10 Protection of the Works from Weather

- 1) Work shall not be carried out in weather conditions that may adversely affect the Works unless proper protection is provided to the satisfaction of the Engineer.
- 2) Permanent Works, including materials for such Works, shall be protected from exposures of weather conditions that may adversely affect such Permanent Works or materials.
- 3) During construction of the Works storm restraint systems shall be provided where appropriate. These systems shall ensure the security of the partially completed and ongoing stages of construction and in all weather conditions. Such storm restraint systems shall be installed as soon as practicable and shall be compatible with the right of way, or other access around or through- out the Site.
- 4) The Contractor shall at all times programme and order progress of the work and make all protective arrangements such that the Works can be made safe in the event of storms.

8.3.11 Protection of the Work

- 1) The finished works shall be protected from any damage that could arise from any activities on the adjacent site/ works.

8.3.12 Damage and Interference

- 1) Work shall be carried out in such a manner that there is no damage to or interference with:
 - 2) watercourses or drainage systems;
 - 3) utilities;
 - 4) structures (including foundations), roads, including street furniture, or other properties;
 - 5) public or private vehicular or pedestrian access;

- 6) Monuments trees, graves or burial grounds other than to the extent that is necessary for them to be removed or diverted to permit the execution of the Works. Heritage structures shall not be damaged or disfigured on any account.

The Contractor shall inform the Engineer as soon as practicable of any items which are not stated in the Contract to be removed or diverted but which the Contractor considers need to be removed or diverted to enable the Works to be carried out. Such items shall not be removed or diverted until the consent of the Engineer to such removal or diversion has been obtained.

- 7) Items which are damaged or interfered with as a result of the Works and items which are removed to enable work to be carried out shall be reinstated to the satisfaction of the Engineer and to at least the same condition as existed before the work started. Any claims by Utility Agencies due to damage of utilities by the Contractor shall be borne by the Contractor.

8.3.13 Utilities

Please refer Employer's Requirement - Functional

Structures, Roads and other Properties : The Contractor shall immediately inform the Engineer of any damage to structures, roads or other properties.

Access : Alternative access shall be provided to all premises if interference with the existing access, public or private, is necessary to enable the Works to be carried out. The arrangements for the alternative access shall be as agreed by the Engineer and the concerned agency. Unless agreed otherwise, the permanent access shall be reinstated as soon as practicable after the work is complete and the alternative access shall be removed immediately as it is no longer required, and the ground surfaces reinstated to the satisfaction of the Engineer. Proper signage and guidance shall be provided for the traffic / users regarding diversions.

Removal of Graves and other Obstructions : If any graves and other obstructions are required to be removed in order to execute the Works and such removal has not already been arranged for, the Contractor shall draw the Engineer's attention to them in good time to allow all necessary arrangements and authorisations for such removal, and it shall not itself remove them unless the Engineer has given consent.

Protection of the Adjacent Structures and Works : The Contractor shall take all necessary precautions to protect the structures or works being carried out by others adjacent to and, for the time being, within the Site from the effects of vibrations, undermining and any other earth movements or the diversion of water flow arising from its work.

8.3.14 Work on Roads

Traffic Management Plan

The Contractor shall develop a detailed Traffic Management Plan for the work under the contract. The purpose is to develop a Traffic Management Plan to cope with the traffic disruption as a result of construction activities by identifying strategies for traffic

management on the roads and neighbourhoods impacted by the construction activities. The Contractor shall implement the Traffic Management Plan throughout the whole period of the Contract.

Principles for Traffic Management

The basis for the Plan shall take into consideration four principles:

- 1) to minimise the inconvenience of road users and the interruption to surface traffic through the area impacted by the construction activities;
- 2) to ensure the safety of road users in the impacted area;
- 3) to facilitate access to the construction site, and to maintain reasonable construction progress.
- 4) to ensure traffic safety at each construction site.

8.4 Site Establishment

8.4.1 Site Laboratories:

The Contractor shall provide, erect and maintain in a clean, stable and secure condition a laboratory, equipped for the routine testing of concrete, soil and rock samples and for the storage and curing of concrete cubes or cylinders only. This laboratory shall be located at the Contractor's principal work site or at a location agreed to by the Engineer. Detailed requirements for this laboratory are set out in to Employer's Requirements.

8.4.2 Contractor's Site Accommodation

The Contractor shall provide and maintain its own site accommodation at locations consented to by the Engineer. Offices, sheds, stores, mess rooms, garages, workshops, toilet and other accommodation on the Site shall be maintained in a clean, stable and secure condition. Living accommodation shall not be provided on the Site. The Contractor shall comply with the requirements of Appendix 8 to the Employer's Requirement.

8.4.3 Toilet and Wash places

The Contractor shall provide toilet and wash places for the use of its personnel and all persons who will be on the Site. The size and disposition of toilet and wash places shall accord with the numbers and dispositions of persons entitled to be on the Site, which may necessitate their location on structures and, where necessary there shall be separate facilities for males and females. The capacities and layout shall be subject to approval of the Engineer. The Contractor shall arrange regular disposal of effluent and sludge in a manner that shall be in accordance with local laws/ regulations.

The Contractor shall be responsible for maintaining all toilets and wash places on the Site in a clean and sanitary condition and for ensuring that they do not pose a nuisance or a health threat. The Contractor shall also take such steps and make such provisions

as may be necessary or directed by the Engineer to ensure that vermin, mosquito breeding etc. are at all times controlled.

8.5 Site Utilities and Access

The Contractor shall be responsible for providing water, electricity, telephone, sewerage and drainage facilities for contractors site offices, structures and buildings and for all site laboratories in accordance to the Employer's Requirements and all such services that are necessary for satisfactory performance of the Works. The Contractor shall make all arrangements with and obtain the necessary approval from the relevant civil and utility authorities for the facilities. The contractor shall be responsible for provision of power supply for his works including for launching girder and the like .The Employer cannot guaranty provision of adequate, continuous power supply however assistance will be given in obtaining the necessary permissions for site generators and the like.

Access roads and parking areas shall be provided within the Site as required and shall be maintained in a clean, acceptable and stable condition. .

Submission of Particulars

- 1) The following particulars shall be submitted to the Engineer for his consent not more than ten days after the date of commencement of the Works:
- 2) drawings showing the formation works and the layout within earmarked area for the Contractor's offices, project signboards, principal access and other major facilities required early in the Contract, together with all service utilities;
- 3) drawings showing the details to be included on the project signboards and diversion boards.
- 4) Drawings showing location of stores, storage areas, concrete batching plants and other major facilities +and their access roads/paths shall be submitted to the Engineer for his consent as early as possible.

8.5.1 Security

The Contractor shall be responsible for the security of the Site for the full time the Site is in its possession, except for the specific case. The Contractor shall maintain all site boundary fences in first class condition, and shall so arrange site boundary fences at all access drainage points of work areas that it's use of such access points etc., are not restricted by the system or method of achieving the required security measures. Notices shall be displayed at intervals around the Site to warn the public of the dangers of entering the Site.

8.6 Testing

8.6.1 General

- 1) The Contractor shall provide and perform all forms of testing procedures applicable to the Works and various components and the interfacing of the Works with the other Contract works and shall conduct all necessary factory, site and acceptance tests.

- 2) All testing procedures shall be submitted at asap prior to conducting any Test. The Testing procedures shall show unambiguously the extent of testing covered by each submission, the method of testing, the Acceptance Criteria, the relevant drawing (or modification) status and the location.
- 3) The testing Procedures shall be submitted, as required, by the Contractor during the duration of the contract to reflect changes for the identification of additional testing requirements.
- 4) The Engineer shall have the facilities for monitoring all tests and have access to all testing records. Ample time shall be allowed within the testing programmes for necessary alterations to equipment, systems to be undertaken, together with re- testing prior to final commissioning.
- 5) The Contractor is reminded that at some point, the High Voltage Power Supply system will be energised and the additional precautions for the safety of staff and co-ordination of activities after power-on shall be anticipated in its testing and commissioning programmes.
- 6) All costs associated with the Testing shall be borne by the Contractor, unless otherwise specified, including the services of any specialised personnel or independent assessors. The Contractor shall also bear any expenses incurred due to resetting caused by defects or failure of equipment to meet the requirements of the Contract in the first instance.
- 7) Unless agreed in writing by the Engineer, the personnel engaged on testing shall be independent of those directly engaged for installation of the same equipment.
- 8) All testing equipment shall carry an appropriate and valid calibration labels.

8.6.2 Batches, Samples and Specimens

- 1) A batch of material is a specified quantity of the material that satisfies the specified conditions. If one of the specified conditions is that the material is delivered to the Site at the same time, then material delivered to the Site over a period of a few days may be considered as part of the same batch if in the opinion of the Engineer there is sufficient proof that the other specified conditions applying to the batch apply to all of the material delivered over the period.
- 2) A sample is a specified quantity of material that is taken from a batch for testing and which consists of a specified amount, or a specified number of pieces or units, of the material.
- 3) A specimen is the portion of a sample that is to be tested.

8.6.3 Samples for Testing

- 1) Samples shall be of sufficient size and in accordance with relevant Standards to carry out all specified tests.
- 2) Samples taken on the Site shall be selected by, and taken in the presence of,

the Engineer and shall be suitably marked for their identification. An identification marking system should be evolved at the start of works in consultation with the Engineer.

- 3) Samples shall be protected, handled and stored in such a manner that they are not damaged or contaminated and such that the properties of the sample do not change.
 - 4) Samples shall be delivered by the Contractor, under the supervision of the Engineer, to the specified place of testing. Samples on which non-destructive tests have been carried out shall be collected from the place of testing after testing and delivered to the Site or other locations instructed by the Engineer.
 - 5) Samples which have been tested may be incorporated in the Permanent Works provided that:
 - 6) the sample complies with the specified requirements;
 - 7) the sample is not damaged; and
 - 8) the sample is not required to be retained under any other provision of the Contract.
 - 9) Additional samples shall be provided for testing if in the opinion of the Engineer :
 - 10) material previously tested no longer complies with the specified requirements;
- or**
- 11) material has been handled or stored in such a manner that it may not comply with the specified requirements.
 - 12) Testing
 - 13) The Contractor shall be responsible for all on-site and off-site testing and for all in-situ testing. All appropriate laboratory tests shall be carried out in the Contractor's laboratory, unless otherwise permitted or required by the Engineer. Where the laboratory is not appropriately equipped and/or staffed for some tests, or if agreed to by the Engineer, tests may be carried out in other laboratories provided that:
 - 14) they are accredited for the relevant work to a standard acceptable to the Engineer ; and
 - 15) particulars of the proposed laboratory are submitted to the Engineer for his consent.
 - 16) In-situ tests shall be done in the presence of the Engineer.
 - 17) Equipment, apparatus and materials for in-situ tests and laboratory compliance tests carried out by the Contractor shall be provided by the Contractor. The equipment and apparatus shall be maintained by the Contractor and shall be calibrated before the testing starts and at regular intervals as permitted by the Engineer. The equipment, apparatus and materials for in-the situ tests shall be removed by the Contractor as soon as practicable after the testing is complete.

- 18) The Contractor shall be entitled in all cases to attend the testing carried out in the Employer's or other laboratories, to inspect the calibration certificates of the testing machines and to undertake the testing on counterpart samples.
- 19) Attendance on tests, including that by the Engineer, Contractor, shall be as laid down in the Quality Assurance procedures.

8.6.4 Records

Drawings Produced By the Contractor

Drawings produced by the Contractor including drawings of site layouts, Temporary Works, etc. for submission to the Engineer shall generally be to ISO A1 size. They shall display a title block with the information as detailed to these Employer's Requirements. The number of copies to be submitted to the Engineer shall be as stated in the Contract, or as required by Engineer.

Progress Photographs

The Contractor shall provide weekly progress photographs which have been properly recorded to show the progress of the works to the Engineer.

The Contractor shall ensure that no photography is permitted on the Site without the agreement of the Engineer. Contractor should be aware of the local regulations and conditions with regard to photography in some "RESTRICTED AREA" in Mangalore.

Records of Wage Rates

The Contractor shall keep monthly records of the average, high and low wage rates for each trade/tradesman employed on the Site and records shall be made available to the Engineer during inspection.

8.6.5 Provision and Disposal of Earthworks Material

The Contractor shall be responsible for the provision of all classes of earthworks material required for the Works, whether sourced from the excavations within the Contract or obtained from any other sources, which are located outside the Site, for which the Engineer has given the consent.

For fill or dumping sites, the Contractor shall prepare a land plan with details of surface drainage requirements, final formation levels, spreading and compaction of the fill during dumping acceptable to the Engineer. The Contractor shall also provide security for such sites. The dumping sites to be used by the Contractor shall be as directed by the Engineer.

All excavated material, excluding waste material, bentonite fluid and bentonite contaminated material shall be disposed of at the appointed site only. This material shall be placed and compacted in accordance with the Construction Specification for Earth Works or as otherwise directed by the Engineer's Representative. The disposal of waste material, bentonite fluid and material contaminated with bentonite shall be the full responsibility of the Contractor and these materials shall be disposed of by the Contractor at an approved location. The dumping sites provided by the Employer shall

not be used for disposal of waste material, bentonite fluid or material contaminated with bentonite.

Rock deposited as fill material at the dumpsites shall be capable of compaction with single pieces no larger than 300mm.

8.6.6 Restoration of Areas Disturbed By Construction.

Unless otherwise directed by the Engineer, any areas disturbed by the construction activity, either inside or outside the Project Right of Way, shall be reinstated as follows:

All areas affected by the construction work shall be reinstated to their original condition, with new materials, including but not necessarily limited to, sidewalks, parking lots, access roads, adjacent roads properties and landscaping. Grass cover shall be provided for any bare earth surface areas, along with proper provisions for surface drainage.

8.6.7 Landscaping

Landscaping must be submitted to the relevant authorities and match the remaining areas. In addition the Contractor shall carry out the construction of landscaping for all works areas and will submit his proposals to the relevant authorities for approval before commencement of landscaping works.

- 1) Conversion between metric units and imperial units shall be in accordance with the relevant Indian Standards.

8.7 Works Program

- 1) The Contractor shall prepare and submit its Works Programme and three month rolling programmes and the detailed requirements to these Work Requirements and the project calendar mentioned.
- 2) However successful bidder has to obtain all statutory permission NOC, clearance pertain to their plant, yards, other temporary works/structures, establishments, hutments and others allied work of their own use.

8.7.1 Monitoring of Progress

- 1) The Contractor shall submit to the Engineer three copies of a Weekly Progress Report (W P R), as described to these Employer's Requirements, describing the progress and current status of the Works. The WPR shall address the matters set out in the Works Programme.
- 2) The WPR shall be submitted by the end of each calendar month. It shall account for all works actually performed from sixth day of the last week and up to sixth day of the current week
- 3) The WPR shall be divided into two sections. The first section shall cover progress and current status relating to design (not applicable) and the second section shall

cover progress and current status relating to construction.

- 4) A weekly meeting to monitor & review the progress of the project shall be convened by the Engineer. Contractor's site Representative of Contractor and site agent of all interfacing contractor shall also attend the meeting. The Employer may also be present in the meeting.
- 5) The Engineer or Employer may also conduct progress review meetings on weekly/bi-weekly intervals depending upon the requirements or urgency of works. In these review meetings Engineer may call Contractor's Supplier/Sub-Contractor etc. as per the requirements.

8.7.2 Quality Assurance

The Contractor shall establish and maintain a Quality Assurance System in accordance with to these Employer's Requirements for construction procedures and the interfaces between them. This Quality Assurance system shall be applied without prejudice to, or without in any way limiting, any Quality Assurance Systems that the Contractor already maintains.

8.7.3 Co-Ordination with Designated and other Contractors

General

- 1) The Contractor is responsible for detailed co-ordination of his construction activities with those of the Designated Contractors, Civil Contractors, Utility Agencies, Statutory Authorities, Private Service Providers, Developers, Consultants and other Contractors whether or not specifically mentioned in the contract, that may be working on or adjacent to the site for the purpose of the Project. For the purpose of this Specification, all of the above parties shall be referred to as Interfacing Contractors. The Contractor shall note that there are other contractors, consultants, etc. which the Employer will engage from time to time with whom the Contractor shall have to similarly co-ordinate.
- 2) The Contractor, shall in carrying out his co-ordination responsibilities, raise in good time and provide sufficient information for the Engineer to decide on any disagreement between the Contractor and the Interfacing Contractors as to the extent of services or information required to pass between them. If such disagreement cannot be resolved by the Contractor despite having taken all reasonable efforts, then the decision of the Engineer shall be final and binding on the Contractor.
- 3) The Contractor shall co-ordinate with the Engineer on all matters relating to works that may affect the Operation & Maintenance of the already operational Section corridor of the Employer in general. Such work shall be subject to the rules and regulations imposed by the Employer.

8.7.4 Dedicated co-ordination team

- 1) The Contractor shall establish a dedicated co-ordination team, led by a Chief Co-

ordinator

- 2) The complexity of the Project and the importance of ensuring that work is executed within time limitations require detailed programming and monitoring of progress so that early programme adjustments can be made in order to minimise the effects of potential delays.
- 3) Auto CAD Operator :- The contractor shall provide one experienced Auto CAD operator exclusively for the Office of the Engineer till 3 months beyond the date of completion of project for As-build.

8.7.5 Contractor's Project Organization

- 1) The Contractor shall have a competent team of Managers, Engineers, Technical staff etc so as to complete the work satisfactory as per various requirements of the contract.
- 2) A office room with round the clock radio communication or telephone switch board links with all safety offices, works sites, site offices, batching plants, casting yards, workshops, fabrication yard, off site offices, Engineers site office, Resident Engineer's office, testing labs etc shall be maintained and manned round the clock. Residences of all senior project team members shall also be linked with the office room. Vehicles for emergency use should be on stand-by at the office room around the clock.
- 3) The designations of the various project organizations team members shall be got approved by the Engineer before adoption so as to avoid any duplication of the designations with those of the Employer or the Engineer.

8.7.6 Technology Transfer

- 1) The Contractor shall ensure that all local contractors and sub-contractors engaged in the works are given training, guidance and the necessary opportunity for transfer of technology in various areas of construction such as instrumentation, safety, quality assurance, etc.

8.7.7 Maintenance Report

- 1) The Maintenance Report shall be submitted as part of the long term inspection and maintenance operations for each major component of water supply, sewerage system, etc.
- 2) The Contractor shall provide inspection and maintenance manuals for the civil, structural and building works covering all areas.
- 3) For each area an inspection checklist shall be supplied giving inspection frequency, items to be inspected, criteria for acceptance, criteria for remedial works and details of the remedial works, including proposed materials and method statements. The recommended regular maintenance regime of each area shall also be given including cleaning methods and frequency for different surfaces; removal of leakage borne salts from concrete surfaces; cleaning of

drainage channels, sumps and pipes; repainting of metallic items;

- 4) A long term monitoring regime shall also be included covering items such as
- 5) Roofing & waterproofing work
- 6) All instruments necessary to carry out the inspections and monitoring that are identified in the report shall be provided by the Contractor.

8.8 Submission & Approval of Baseline & Project Monitoring Schedule

Planning is about breaking down the project into multiple activities and defining a logical sequence of events that will deliver the end product. Part of this is understanding and managing the dependencies between those events and resources.

So planning is effectively defining what is to be done and how.

Scheduling is less concerned with what is being done and why, and more with when and who. The schedule is typically represented in a calendar or as a timeline, in chronological order. It also includes assigning resources to each activity and ensuring that they will actually be available at the required date and time.

8.8.1 Contractor & sub-contractor should submit schedule for execution of work and get approval before the start of each work wherever required as per the instruction of Engineer-in-charge. The timeline schedule is the contractor's drawn version of information shown in the construction documents. Timeline should be prepared, submitted and approved by PMC & MSCL. Following are key aspect before preparation and finalization of project monitoring schedule and timeline

- 1) Dismantled and unused materials shall be handled properly during construction work progress and to be safely and securely handed over to the MSCL/MCC Authority after completion of the work.
- 2) The contractor shall keep the work site clean & free of all undesired debris to facilitate normal functioning of the running existing facility.
- 3) Project planning schedule to be prepared by the bidder without obstructing normal functioning of running of complex and the same schedules to be submitted to MSCL for approval. After approval, the schedule shall be adopted for undertaking the construction works.
- 4) The contractor shall arrange for all lighting, security & safety requirements if proposing to work in night shifts.
- 5) Project scheduling to include methodology for safety and security planning with respect to materials utilized by both, contractor's deployed items and the school owned materials.
- 6) The contractor shall submit method statement for rehabilitation of each building for the approval of the engineer before start of the work.

8.8.2 Project Activities


- 1) Project execution to break down in smallest building block.
- 2) Tasks to be performed to accomplish the goal.
- 3) An activity is defined as any function or decision in the project that: consumes time, resources, and cost.
- 4) Several types of user defined activities
- 5) Task or Resource Based – involve effort and produce a resulting product
- 6) Level of Effort (Hammock) – summarize a series of tasks - Client Meetings, Project Management tasks, Clerical work etc.
- 7) Milestone – represents a point in time

9 Annexure

9.1 Water Sample test Report

BOD and COD tested in the samples of water collected from the lake shows it to be well beyond the permissible limits.

Figure 9-1 Water Sample Test Report



सिविल अभियान्त्रिक विभाग
 राष्ट्रीय प्रौद्योगिकी संस्थान कर्नाटक, सुरत्कल
 पोस्ट श्रीनिवासनगर, मंगलूरु - 575 025
DEPARTMENT OF CIVIL ENGINEERING
NATIONAL INSTITUTE OF TECHNOLOGY KARNATAKA, SURATHKAL
 POST SRINIVASNAGAR, MANGALURU - 575 025


Date : 03.06.2019

TEST REPORT ON WATER SAMPLES


Ref : Letter no. WTESL / 2292 / MSCL / 462 Dated 18 - 05 - 2019 of
 Wadia Techno Engineering Services Ltd., Wing 'A', Raheja Pontl, Pt. Jawaharlal Nehru Road,
 Vakola, Santhacruz (E), Mumbai

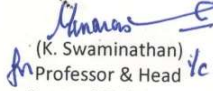
SAMPLES WERE SUPPLIED BY THE PARTY

Sl. No.	TEST PARAMETER	RESULT UNIT	RESULT			
			KAVO OR LAKE 1	KAVOOR LAKE 2	GUJJAR KERE 1	GUJJAR KERE 2
1	pH		6.55	6.44	6.05	6.12
2	Biochemical Oxygen Demand (5 day @ 20 °C)	mg / L	4.90	8.80	78.00	40.00
3	Chemical Oxygen Demand	mg / L	9.60	16.00	147.20	73.60
4	Total Suspended solids	mg / L	48.00	52.00	1662.00	776.00
5	Ammoniacal Nitrogen, as NH ₄ - N	mg / L	0.48	0.55	2.55	1.96
6	Total Nitrogen, as N	mg / L	0.93	1.08	3.51	2.84
7	Most Probable Number	MPN Index/100mL	Nil	4	70	63
8	Total Phosphate, as P	mg / L	N.D.	N.D.	N.D.	N.D.
9	Total Residual Chlorine	mg / L	N.D.	N.D.	N.D.	N.D.
10	Dissolved Oxygen	mg / L	6.8	6.9	5.0	5.2
11	Total Alkalinity, as CaCO ₃	mg / L	30.0	40.0	157.0	147.0
12	Turbidity	NTU	67.0	73.0	117.0	100.0
13	Total Hardness, as CaCO ₃	mg / L	37.0	37.0	157.0	136.0




(C.P. Devatha)
 Faculty Member
 Dept. of Civil Engg.






(K. Swaminathan)
 Professor & Head
 Dept. of Civil Engg.

9.2 Preparation of Concept note and draft DPR



Smart City
MISSION TRANSFORM NATION



ಮಂಗಳೂರು
ಸ್ಮಾರ್ಟ್ ಸಿಟಿ
MANGALURU
SMART CITY | *Way to go... Way to Grow...*

ಮಂಗಳೂರು ಸ್ಮಾರ್ಟ್ ಸಿಟಿ ಲಿಮಿಟೆಡ್

ಮಂಗಳೂರು ಮಹಾನಗರ ಪಾಲಿಕೆ ಕಟ್ಟಡ, 2ನೇ ಮಹಡಿ, ಎಮ್.ಜಿ. ರಸ್ತೆ, ಲಾಲ್‌ಬಾಗ್, ಮಂಗಳೂರು - 575 003, ಕೆ.ಕೆ.

Ref No: MSCL/TECH/CR/08/2019-20/227

Date: 20.06.2019

To,


Team Leader
Wadia Techno Engineering Services Ltd (WTESL)
Project Management Consultant
Mangaluru Smart City Limited

Subject: Preparation of Concept Note and Draft DPR – Rejuvenation & Rain Water Harvesting of Gujjare Kere

Dear Sir,

With reference to the above subject, PMC to study and submit the Concept Note with Draft DPR for taking up the Rejuvenation & Rain Water Harvesting of Gujjare Kere which has an allocation of Rs. 2Crores at the earliest. Since Gujjare Kere is at present under jurisdiction of Mangaluru City Corporation (MCC), MSCL instructs PMC to coordinate with MCC in prior to the preparation of concept report.

Yours faithfully



Managing Director 20/6/19.
Mangaluru Smart City Limited
Mangaluru

Ka Mub / Wskay

W

20/6

PR

20/6

Way to go... Way to Grow...

9.3 Review of Concept note



ಮಂಗಳೂರು ಸ್ಮಾರ್ಟ್ ಸಿಟಿ ಲಿಮಿಟೆಡ್

ಮಂಗಳೂರು ಮಹಾನಗರ ಪಾಲಿಕೆ ಕಟ್ಟಡ, 2ನೇ ಮಹಡಿ, ಎಮ್.ಸಿ. ರಸ್ತೆ, ಬಾರ್‌ಬಾಗ್, ಮಂಗಳೂರು - 575 003, ಕೆ.ಕೆ.

Ref No: MSCL/TECH/CR/08B/2019-20/574

Date: 28.08.2019

To,
Team Leader
Project Management Consultant
Mangaluru Smart City Limited

Dear Sir,

Subject: Review of Concept Note of the project - Improvement of Gujjara here

MSCL received the concept note for the project Improvement of Gujjara Lake on 26.08.2019. The primary objective of the project is to develop the lake as rain water harvesting tank. The lake is completely silted as of now. De-silting of the lake is one of the main aims of the project considering the tank as a rain harvesting system. The concept note is not having any details on the tests/survey for finding the volume of silt. The proper hydrological studies needs to done for the checking the availability of water throughout the year after development of lake. As per the site visit done by the technical team of MSCL, the broad scope of the works is as follows;

1. De silting and De weeding of the lake
2. Prevention of pollution from the point source and non-point sources entering the lake.
3. Diversion of entry of wastewater from the lake.
4. Development of recreational facilities around the lake including walkways, roads, Open gym etc.
5. Providing silt trap and screen barriers to avoid waste entry to the lake and prevention of Lake silting up.
6. Strengthening of the existing bund.
7. Catchment area improvement if required.
8. Improving the flora and fauna of the area.
9. Face-lifting the existing Anganawadi and premises.


Also the lake rejuvenation proposal should be according to the **NLCP guidelines**. The key issues considered in designs are,

- Estimation of storm water runoff by different methods after fixing the individual catchment areas of the inlets. Individual flood discharge for each inlet is arrived to estimate total inflow into the Lake each year.
- Based on the flood discharge arrived various levels of the Lake such as FTL, MWL, TBL are fixed.
- The desilting of the Lake is proposed considering the maximum water spread area with in Lake Boundary as key aspect. Further the zones are created based on engineering aspects to keep less depth towards the boundary, more depth towards the

Way to go... Way to Grow...

REGD.: MANGALURU SMART CITY LIMITED, MCC Building, 2nd Floor, M.G Road, Lalbaug, Mangaluru - 575 003, D.K
Ph: 0824-2986321, Email: smartcitymangaluru@gmail.com, Website: www.mangalurusmartcity.net
CIN: U7499KA2017PLC102010 GSTIN: 29AALCM0527G1ZF

9.4 Stakeholder consultation

 ॥ ಓಂ ಶ್ರೀ ಪರಾಶಕ್ತಿ ನಮಃ ॥ ಗುಜ್ಜರಕೆರೆ ತೀರ್ಥ ಸಂರಕ್ಷಣಾ ವೇದಿಕೆ (ಲ.) (ರ. ನಂ.: 141/2001-2002) ಲಲಿತಾರಾಜ್, ಮೋರ್ಗನ್‌ಗೇಟ್, ಜಪ್ಪು, ಮಂಗಳೂರು - 575 001.		
<p>ಅಧ್ಯಕ್ಷರು ಯೋಗೀಶ್ ಕುಮಾರ್ 9448146835</p> <p>ಉಪಾಧ್ಯಕ್ಷರುಗಳು ಜೆ. ಸುನಿಲ್ 9448503546 ರವೀಂದ್ರ ಪಿಲಾರ್ ವೇಣುಗೋಪಾಲ ಪುತ್ತನ್</p> <p>ಪ್ರಧಾನ ಕಾರ್ಯದರ್ಶಿ ಪಿ. ನೇಮು ಕೊಟ್ಟಾರಿ 9448389389 9762360699 ಜೊತೆ ಕಾರ್ಯದರ್ಶಿಗಳು ಜೆ. ಸುರೇಶ್ ಶ್ರೀಮತಿ ಭಾನುಮತಿ ಕರ್ಕೇರ</p> <p>ಕೋಶಾಧಿಕಾರಿ ಬಿ.ನಾರಾಯಣ ಶೆಟ್ಟಿ</p>	<p>ಕ್ರಮ ಸಂಖ್ಯೆ91/2019:2020</p> <p>ತಾ. 30/05/2019</p> <p>ರಿಗೆ, ಮ್ಯಾನೇಜಿಂಗ್ ಡೈರೆಕ್ಟರ್, ಎಮ್.ಎಸ್.ಸಿ.ಯಲ್. ಮಂಗಳೂರು.</p> <p style="text-align: center;">ವಿಷಯ : ಗುಜ್ಜರಕೆರೆ ಅಭಿವೃದ್ಧಿ ಬಗ್ಗೆ.</p> <p>ಮಂಗಳೂರು ಸ್ಮಾರ್ಟ್ ಸಿಟಿ ಕೆರೆ ಅಭಿವೃದ್ಧಿಗೊಳಿಸಲು ನಮ್ಮ ಗಮನಕ್ಕೆ ಬಂದಿದೆ. ಆದ್ದರಿಂದ ಈ ಕೆಳಗಿನ ಕಾಮಗಾರಿಗಳನ್ನು ವಿನಂತಿಸುತ್ತಿದ್ದೇವೆ.</p> <ol style="list-style-type: none"> 1. ಕೆರೆಯ ವ್ಯಾಪ್ತಿಯ ಬಗ್ಗೆ ಸರ್ವೆ ಮಾಡಿ ಅತಿಕ್ರಮಣ ಆದ ಬಗ್ಗೆ ಸರಿಯಾಗಿಸಿಕೊಳ್ಳಬೇಕು, ಸುತ್ತ ಬೇಲಿ ಹಾಕಬೇಕು. 2. ಕೆರೆಯ ಈಶಾನ್ಯ ಭಾಗದಲ್ಲಿ ಒಂದು ತೀರ್ಥ ಬರುತ್ತಾ ಇದೆ. ಇದರಿಂದ ಕೆರೆಗೆ ಶುದ್ಧ ನೀರು ಬರುವಂತೆ ವ್ಯವಸ್ಥೆ ಆಗಬೇಕು. 3. ಮಧ್ಯದಲ್ಲಿ ಶುದ್ಧ ನೀರಿನ ಕೆರೆ, ಅದರಲ್ಲಿ ಗ್ರಾಮ ತಾಯಿ ಮಂಗಳಾಂಬೆ ಮತ್ತು ಮಾರಿಯಮ್ಮ ತಾಯಿಯ ಅವವೃತ್ತ ಸ್ನಾನ ಆಗುವಂತೆ ವ್ಯವಸ್ಥೆ ಆಗಬೇಕು. 4. ಕೆರೆಯ ಸುತ್ತಲಿನ ಮಳೇನೀರು, ತ್ಯಾಜ್ಯ ನೀರು ಕೆರೆಗೆ ಬರದಂತೆ ಮಾಡಿ ಕುಡಿಯಲು ಶುದ್ಧವಾದ ನೀರು ಸಿಗುವಂತೆ ಮಾಡಬೇಕು. 5. ಈ ಕೂಡಲೇ ಪಾಚೆ ಕಳಚಿ ನೀರು ಖಾಲಿ ಮಾಡಬೇಕು. 6. ಸುತ್ತಲೂ ಹಸಿರಿನೊಂದಿಗೆ ವಾಕಿಂಗ್ ಟ್ರಾಕ್, ವಯೋ ವೃದ್ಧರಿಗೆ ಗಾಳಿ ಸೇವನೆಗೆ ಅವಕಾಶ. 7. ಸುತ್ತಲೂ ದಾರಿ ದೀಪದ ವ್ಯವಸ್ಥೆ. <p style="text-align: center;">ವಂದನೆಗಳೊಂದಿಗೆ, ಇತೀ ನಿಮ್ಮ ವಿಧೇಯ, ಕಾರ್ಯದರ್ಶಿ ಗುಜ್ಜರಕೆರೆ ತೀರ್ಥ ಸಂರಕ್ಷಣಾ ವೇದಿಕೆ ಗುಜ್ಜರಕೆರೆ, ಜಪ್ಪು, ಮಂಗಳೂರು</p>	<p>(0824) 2417235 (0824) 2416999</p>

9.5 Submission of compliance



Wadia Techno-Engineering Services Limited

ENGINEERS, ARCHITECTS & CONSULTANTS

A Wadia Group Enterprise

ISO: 9001-2015 Certified-CIN: U74220MH1960PLC011691

HEAD OFFICE: Wing-"A", Raheja Pond, Pt. Jawahar Lal Nehru Road, Vakola, Santacruz (E), Mumbai 400
Telephone: 91-22-67339400/ Fax: 91-22-26673193 E-mail: wtesl.wadiaengg.com WWW:wadiaengg.com

Ref. No. : WTESL/2292/MSCL/608

Date: 05.09.2019

o/c
The Managing Director,
Mangaluru Smart City Limited (MSCL)
Lalbagh, M.G. Road
Mangalore - 575003



Dear Sir,

Sub: Rejuvenation and Rainwater harvesting of Gujjare Kere Lake – Submission of Compliance to Comments on Concept Report

- Ref:-
1. MSCL Letter No. MSCL/TECH/CR/08/2018-20/226 dated 20.06.2019
 2. MSCL Letter No. MSCL/TECH/CR/08/2019-20/3227 dated 26.08.2019
 3. Our Letter No. WTESL/2292/MSCL/608 dated 26.08.2019
 4. MSCL Letter No. MSCL/TECH/CR/08B/2019-20/574 dated 30.08.2019

We hereby submit the Compliance to Comments on Concept Report of Gujjare Kere Lake and suggestion will be incorporated in DPR.

Looking forward to your approval for the same

Thanking You,

for WADIA TECHNO ENGINEERING SERVICES LTD.


Maniarayana K.T
TEAM LEADER

Attached: 4 Copies