

### Nallas in Godvari Stretch

#### 5.1 Nallas Across Study Area

The study of Godavari River involved assessment of pollution sources from nallas joining at various points on both banks. The impact of sewage disposal in the river has been apparent, especially where the nallas join the river. Large numbers of natural streams are joining the river due to natural slope of the water shed towards Godavari. With the developmental activities, these streams have become nallas carrying significant volume of pollutants. The nallas directly joining Godavari and Nasardi rivers only have been considered for assessment of water quality. The fresh water flow reduces during the non-monsoon months. Most of the nallas carry sewage, wash water, storm water and in few cases, industrial wastewater.

The right bank of river Godavari has seventeen nallas; some of them directly flow into the river while others have very low insignificant flow. These nallas are Gangapur nalla/ Bardand phata, Someshwar 1/2, Chikhali, Anandvalli, Forest Nursery, Asaram Babu Ashram, Chopda, Joshiwada, Malharkhan, Bhoi, Saraswati, Kashimale karyalay, Jadhav Farm, Panchak, Pimpalpatti and Pawar wadi. However, for the assessment of water quality only nallas having flow were considered. Some of the nallas like Someshwar nalla, Chikhali nalla, Forest Nursery nalla and Chopda nalla were repeatedly analysed of their quality since they were meeting the river directly with significant pollution load.

The left bank of river Godavari has eight nallas; namely Gandharwadi, Kusumagraj udyan, Ramwadi (Lendi), Waghadi, Aruna, Kevadiban, Kapila and Manur. Many of these nallas carry sewage have been intercepted and diverted by NMC to protect the river from pollutants.

The nallas on the Nasardi River were also analysed since it is a tributary to river Godavari. The right bank nallas meeting river Nasardi are: Chunchale nalla, Kutwat Nagar nalla, kamath wada nalla, Torna nalla, Bhujbal Farms, Indira nagar nalla and Bajarangwadi while the left bank has MSEB nalla meeting the river.

The following observations were made about nallas during the visit of NEERI team. The information of the nallas on left and right bank is presented in **Table 5.1** The Nalla Map shows only the evaluated list of nallas on banks of Godavari and Nasardi **Figure 5.1** and area wise assessment is presented in **Figure 5.2 (a to d)** respectively.

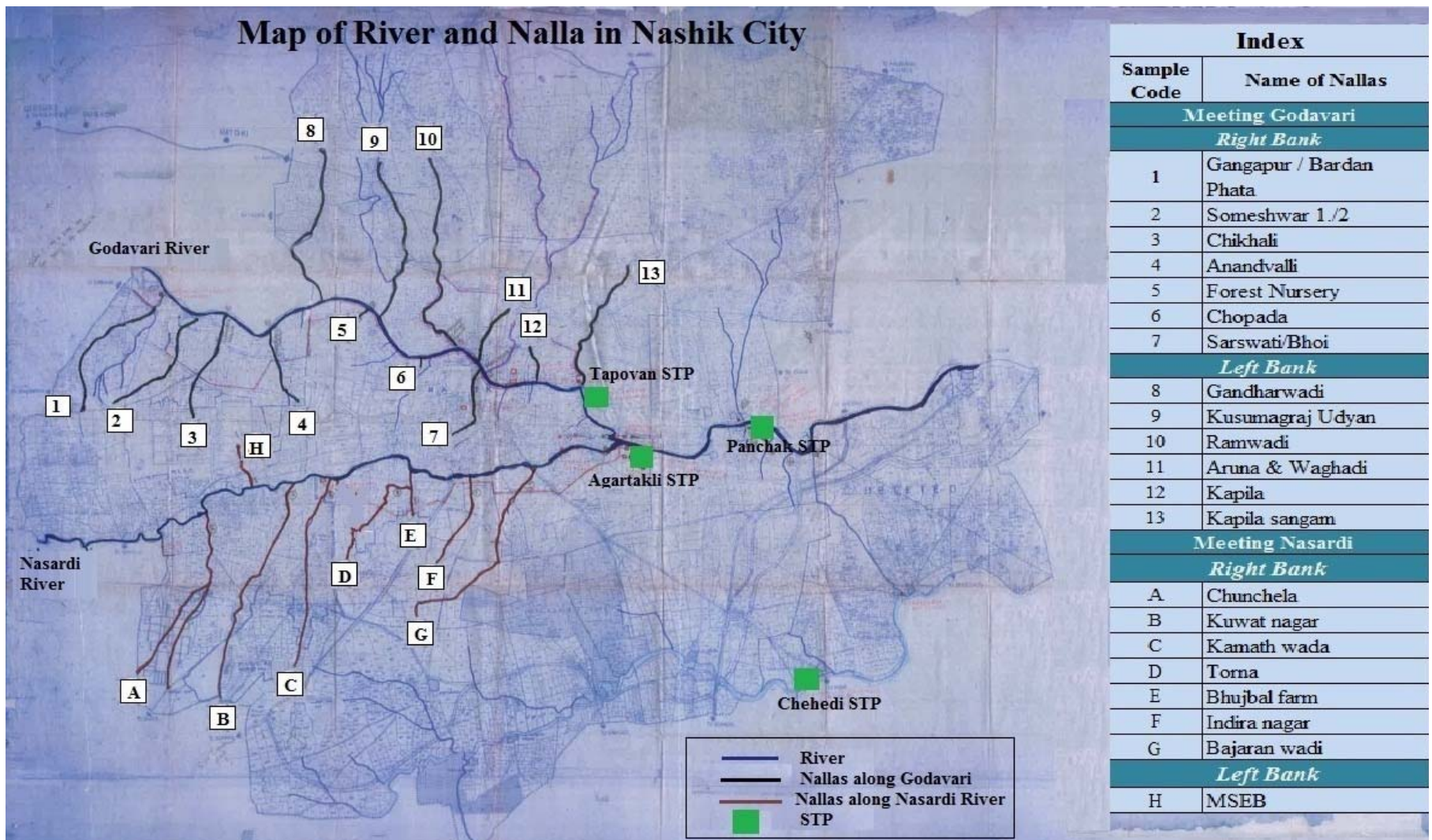


Figure 5.1: Nallas Joining River Godavari and Nasardi along with Locations of STPs at Nashik

**Table 5.1: Information on Nallas Joining River Godavari**

	<b>Observations along with information provided by NMC</b>
<b>Nallas meeting the Right Bank of River Godavari</b>	
Bardan Phata / Gangapur	<p>This nalla carries sewage along with storm water from Gangapur village. NMC has not provided complete sewerage network or STP for the residential area of Gangapur along the banks. Sewer lines have only been constructed in some parts. No pumping station is present in this zone. STP of 18 MLD is proposed in this area and currently in the process of land acquisition.</p> <p>Recently as a part of implementation of the Action Plan suggested by NEERI and as per the Hon'ble High court's directive, NMC has made an arrangement of intercepting this nalla and diverted to Tapovan STP via New Ganeshwadi pumping station.</p>
Someshwar	<p>There are two nallas in the Someshwar area. Nalla 1 receives only sewage from Someshwar area and has flow in all the seasons.</p> <p>The Nalla 2 carries domestic solid waste along with sewage. This nalla at present has been diverted by NMC.</p>
Chikhali	<p>It starts from Satpur industrial zone and hence is likely to carry the industrial wastewater either through illegal direct discharges or through seepage of the industrial waste applied on land. The existence of industrial waste was confirmed by the change of colour of rocks to brown red in the nalla. Without proper treatment metal pollutants from small scale electroplating industries through wastewater are likely to get discharged into the river. This nalla present has been also diverted to at New Ganeshwadi pumping station.</p>
Anandvalli	<p>This nalla receives wastewater from Anandvalli village. NMC has made temporary arrangement comprising of cemented collection tank (Bandhara) for sewage collection and is pumping this to New Ganeshwadi Pumping station.</p>
Forest Nursery	<p>This nalla Carries sewage from Suyojit Garden Society. Sewer line on the backside of this society is not functional. The sewer chambers sewage flows into the river via forest nursery nalla. During multiple visits of the NEERI team, it was observed that the sewage flows directly into the river. SPS of 25 MLD capacity has been proposed near old Gangapur Pumping station, will pump the sewage from the main sewer line to Tapovan STP via Makhamalabad trunk sewer after commissioning.</p>
Chopda	<p>This nalla receives filter backwash water from the Bara bungalow water treatment plant. The samples of water falling in the river Godavari are being analyzed by MPCB. The nalla has been intercepted and diverted.</p>
Malharkhan	<p>This nalla receives sewage from Malharkhan slum area. NMC has diverted the nalla into the sewer line by intercepting it.</p>

**Table 5.1 (Contd..) : Information on Nallas Joining River Godavari**

<b>Observations along with information provided by NMC</b>	
<b>Nallas meeting the Right Bank of River Godavari</b>	
Bhoi	Joining after Talkuteshwar bridge, it receives overflow of sewage chamber which is diverted to New Ganeshwadi SPS.
Saraswati nalla	This nalla is intercepted by NMC and diverted to the New Ganeshwadi pumping station but overflow goes into the Bhoi nalla. This overflow directly meets the river. The Bhadrakali SPS will divert the sewage to Agartakli 40 STP once commissioned as proposed by NMC.
Kashimale karyalay	It receives the over flow of the sewage chamber. The nalla is intercepted and diverted to the sewer lines.
Jadhav Farm	This nalla is located on the downstream of Tapovan STP. Small quantity of sewage flow from few houses was observed. NMC has diverted the nalla to the sewer line.
Panchak	Receives sewage from Panchak area. It is diverted and intercepted into the sewer line and hence no flow was observed.
Pawar Wadi	Located at Panchak area and because of diversion no flow was observed
<b>Nallas meeting the Left bank of River Godavari</b>	
Gandharwadi	Some water flow was observed in this nalla. No sewage was observed flowing in this nalla during the visit.
Kusumagraj Udyan	It has some water flow however the same is not highly contaminated, and is diverted into the sewer line by NMC.
Ramwadi (Lendi)	Receives sewage from the slums in Ramwadi area. NMC has been taken action by diverting into the trunk sewer line, which is directly connected to the New Ganeshwadi pumping station.
Waghadi	Receives sludge and sewage from overflow of chamber below Talkuteshwar pool, which overflows and joins the river. NMC has taken up periodic cleaning of chamber to prevent the overflow and intercepted this nalla.
Kevadiban	No flow observed during the visit. NMC has intercepted and diverted.
Kapila	Receives sewage overflow from Kapila pumping station and directly meets Godavari river in the upstream of the Tapovan STP. The diversion of this nalla is in progress.
Manur	Main sewer line is placed in this nalla, crosses river Godavari and joins Panchak SPS. The main sewer line placed along the right bank of river Godavari carries sewage from Dasak, Panchak and Janardhan Nagar which is diverted to Panchak SPS. This nalla was observed to be dry as NMC had intercepted and diverted it.



a) Someshwar Nalla at Gangapur Road



b) Chikhali Nalla at Gangapur Road



c) Forest Nursery Nalla Near Suyojit Society



d) Chopda Nalla Near Jogging Track

**Figure 5.2: Photographs of Nallas Taken During November-December 2013 Visits at Nashik**

The Nallas were evaluated for pre monsoon and post monsoon seasons. The frequency of sampling varied depending on the significance of discharges. The details of samples collected from nallas joining at right and left bank of river Godavari during the study period is presented along with sample code used in the **Table 5.2**.

The abridged analytical results of water samples collected from nalla are presented through **Table 5.3 to 5.8**. While evaluating nallas it was observed that the chambers constructed on sewer lines near Gangapur road were damaged and broken. The samples from such leakages and flows joining river Godavari are presented in **Table 5.9**.

**Table 5.2 : List of Nallas Joining Right and Left Bank along with Sample Code at River Godavari & River Nasardi**

Sample Code	Name of nallas	Period of Sampling					
		May-13	Oct-13	Nov-13	Dec 13**	Jan-14	May-14
<b>Right Bank of Godavari</b>							
GA	Gangapur / Bardand Phata	-	Y	Y	-	-	-
SOM	Someshwar 1/2.	-	Y	Y	Y	Y	Y
CHI	Chikhali	Y	Y	Y	Y	Y	Y
AN	Anandvalli	-	Y	Y	Y		
FOR	Forest Nursery	-	-	-	-	Y	-
CHO	Chopada	-	Y	Y	Y	-	-
SAR	Saraswati	-	Y	Y	-	-	-
<b>Left Bank of Godavari</b>							
GAN	Gandharwadi	-	-	Y	-	-	-
KUS	Kusumagraj	-	-	Y	-	-	-
	Udyan	-	-		-	-	-
RAM	Ramwadi	-	Y	Y	-	-	-
ARU	Aruna	-		Y	-	-	-
WAG	Waghadi	-	Y	Y	-	-	-
KAP	Kapila	-	-	Y	-	-	-
KAP-1	Kapila Sangam	-	-	Y	-	-	-
<b>Right Bank of Nasardi</b>							
IND	Indira nagar	-	-	Y	-	-	-
KUW	Kutwat nagar	-	-	Y	-	-	-
KAM	Kamath wada	-	-	Y	-	-	-
CHU	Chunchale	-	-	Y	-	-	-
TOR	Torna	-	-	Y	-	-	-
BHU	Bhujbal Farms	-	-	Y	-	-	-
BHW	Bजारंगवadi	-	-	Y	-	-	-
<b>Left Bank of Nasardi</b>							
MSC	MSEB	-	-	Y	-	-	-

Y: Sample Collected,

\*\* River Sampling Upstream and Downstream of Nallas Joining River Godavari

**Table 5.3 : Analytical Results of Chikhali Nalla Sample on Right Bank of River Godavari (May-2013)**

Nalla →	CHI-1	CHI-2	CPCB*Eff.	MPCB A-III
Parameter ↓				
<b>Physical Parameters</b>				
pH	8.5	7.2	5.5-9.0	-
<b>Nutrient and Organic Parameters</b>				
BOD	12.5	21	30.0	10.0 mg/L
NH <sub>3</sub> -N	1.5	1.8	50.0	-
PO <sub>4</sub> -P	BDL	BDL	5.0	-

Note: Minimum Detectable Limits For parameters tested are (PO<sub>4</sub>-0.05, BOD-1.0, NH<sub>3</sub>-N -0.2),

All values except for pH are expressed as mg/L

\*- CPCB Effluent Discharge Standards for Inland Surface water

**Table 5.4 : Analytical Results for Nallas on Right and Left Bank of River Godavari In Nashik (October-2013)**

Nalla→	GA	SOM	CHI	AN	CHO	SAR	RAM	WAG	CPCB* Eff Dis. Std.	MPCB A-III
Parameter↓										
<b>Physical &amp; Inorganic Parameters</b>										
pH	7.9	8.2	7.6	8	8.2	7.6	7.7	7.6	5.5-9.0	
EC	461	416	607	489	426	458	531	265		
TDS	277	250	364	293	256	275	319	159		
<b>Nutrient and Organic Parameters</b>										
BOD	11.0	6.0	8.0	3.0	8.0	83.0	28.0	8.0	30.0	10.0 mg/L
COD	40.0	24.0	28.0	16.0	16.0	128.0	60.0	36.0	250.0	
NH <sub>3</sub> -N	2.4	3.3	3.3	1.5	0.9	6.2	4.2	0.8	50.0	
PO <sub>4</sub> -P	0.1	0.1	0.4	0.1	0.1	0.1	0.2	0.1	5.0	

Note: Minimum Detectable Limits For parameters tested are (PO<sub>4</sub>-0.05, BOD-1.0, NH<sub>3</sub>-N-0.2),

All values except for pH & EC are expressed as mg/L

\*- CPCB Effluent Discharge Standards for Inland Surface water

\* Table 5.5 is on next page

**Table 5.6 : Analytical results for Nallas on River Nasardi in Nashik (November-2013)**

Nalla→	IND	MSC	KUW	BHU	CHU	TOR	KAM	BHW	CPCB*Eff Dis. Std.	MPCB A-III
Parameter↓										
<b>Physical &amp; Inorganic Parameters</b>										
pH	7.7	7.4	7.4	7.4	7.3	7.4	7	7.6	5.5-9.0	
EC	557	352	855	532	539	752	568	716		
TDS	334	211	513	319	323	451	341	430		
Total Alkalinity	238	180	274	224	270	310	256	275		
<b>Nutrient and Organic Parameters</b>										
DO	3.7	3.7	2.4	2.7	1.5	2.0	1.5	BDL		≥ 3.0 mg/L
BOD	6.0	5.5	14.0	13.0	21.6	14.1	19.2	49.2	30.0	10.0 mg/L
COD	38.0	46.0	23.0	43.0	53.0	31.0	58.0	230.0	250.0	
NH <sub>3</sub> -N	BDL	BDL	0.4	0.9	1.6	0.6	1.6	2.1	50.0	
PO <sub>4</sub> -P	0.2	0.4	0.2	1.4	0.7	1.2	1.3	1.1	5.0	

Note: Minimum Detectable Limits For parameters tested are (PO<sub>4</sub>-0.05, BOD-1.0, NH<sub>3</sub>-N: 0.2),

All values except for pH, EC, are expressed as mg/L

\*-CPCB Effluent Discharge Standard for Inland Surface water

**Table 5.5 : Analytical Results of Nallas on Right and Left Bank of River Godavari in Nashik (November-2013)**

Nalla→	GA	SOM	CHI	AN	CHO	SAR	GAN	KUS	RAM	ARU	WAG	KAP	KAP-1	CPCB* Eff Dis. Std.	MPCB A-III
Parameter↓															
<b>Physical &amp; Inorganic Parameters</b>															
pH	7.9	8.2	7.6	8	8.2	7.6	8	7.9	7.7	7.3	7.6	7.9	7.8	5.5-9.0	
EC	461	416	607	489	426	458	667	739	531	785	265	779	720		
TDS	277	250	364	293	256	275	400	443	319	471	159	467	432		
Total Alkalinity	250	224	122	194	124	146	308	334	130	320	108	322	364		
<b>Nutrient and Organic Parameters</b>															
DO	4.2	5.8	5.2	5.4	5.6	BDL	6.0	6.0	BDL	BDL	3.0	1.5	6.0	-	≥ 3.0 mg/L
BOD	13.0	8.4	10.0	5.2	6.4	45.0	5.0	15.0	32.0	54.0	15.0	18.0	8.0	30.0	10.0 mg/L
COD	40.0	24.0	28.0	16.0	19.0	128.0	15.0	23.0	56.0	100.0	56.0	100.0	31.0	250.0	
NH <sub>3</sub> -N	1.1	3.0	2.8	4.9	0.9	5.8	BDL	BDL	4.2	1.7	0.8	1.2	BDL	50.0	
PO <sub>4</sub> -P	0.1	0.1	0.4	0.1	0.1	0.2	0.2	0.1	0.1	1.4	0.1	1.2	0.1	5.0	

Note: Minimum Detectable Limits For parameters tested are (PO<sub>4</sub>-0.05, BOD-1.0, NH<sub>3</sub>-N -0.2)

All values except for pH, EC, are expressed as mg/L

\*-CPCB Effluent Discharge Standard for Inland Surface water



**Table 5.7: Analytical Results for Nallas on Right Bank of River Godavari in Nashik: (January-2014)**

Nalla→	SOM	CHI	FOR	CPCB* Eff. Dis. Std.	MPCB A-III
Parameter↓					
<b>Physical Parameters &amp; Inorganic Parameters</b>					
pH	7.3	7	7.2	5.5-9.0	
EC	711	824	704		
TDS	427	494	422		
<b>Organic &amp; Nutrient Parameters</b>					
DO	4.5	1.0	BDL	30.0	≥ 3.0 mg/L
BOD	10.0	12.0	60.0	30.0	10.0 mg/L
COD	24.0	36.0	140.0	250.0	
NH <sub>3</sub> -N	3.0	3.1	4.1	50.0	
PO <sub>4</sub> <sup>-</sup>	0.8	1.5	1.8	5.0	

Note: Minimum Detectable Limits For parameters tested are (PO<sub>4</sub>-0.05, BOD-1.0, NH<sub>3</sub>-N -0.2)

All values except for pH, EC, are expressed as mg/L

\*-CPCB Effluent Discharge Standard for Inland Surface water

The composite sampling programme was conducted for Someshwar and Chikhali nalla in the non monsoon months which indicated 3 to 4 times higher BOD values and acidic pH confirming unauthorized releases of waste discharges either domestic or industrial. Three hourly grab composite samples were collected during critical month of May. The nalla had very less flow which could be either due to summer or partial diversion of nalla to STP.

**Table 5.8 : Analytical Results for Composite Sampling of Nallas on Right Bank of River Godavari in Nashik (May-2014)**

Nalla→	SOM	CHI	CPCB* Eff Dis. Std.	MPCB A-III
Parameter↓				
<b>Physical &amp; Inorganic parameters</b>				
pH	6.3	5.8	5.5-9.0	
EC	1290	720		
TDS	774	432		
<b>Organic &amp; Nutrient Parameters</b>				
BOD	45.0	23.0	30.0	10.0 mg/L
COD	140.0	60.0	250.0	
NH <sub>3</sub> -N	5.8	4.4	50.0	
PO <sub>4</sub> -P	1.8	0.5	5.0	

Note: Minimum Detectable Limits For parameters tested are (PO<sub>4</sub>-0.05, BOD-1.0, NH<sub>3</sub>-N -0.2)

All values except for pH are expressed as mg/L

\*-CPCB Effluent Discharge Standard for Inland Surface water

**Table 5.9 : Additional Samples Collected from Deliberate or Otherwise Broken Chambers of Sewer Lines at Nashik Entering River Godavari**

Chamber→	Chamber at Gangapur Nalla	Chamber No. 189	Broken Chamber Near Ganesh Wadi	Sewage Flowing Near Ganesh Wadi P.S.	Chamber No. 213	CPCB* Eff Disch. Stand.	MPCB A-III
Parameter↓							
<b>Physical &amp; Inorganic parameters</b>							
pH	7.8	7.8	7.2	7.2	7.4	5.5-9.0	
EC	535	469	1034	684	768		
TDS	321	281	620	410	461		
<b>Nutrient and organic parameters</b>							
DO	4.3	3.4	2.8	BDL	1.2		≥ 3.0 mg/L
BOD	6.0	27.0	26.0	132.0	100.0	30.0	10.0 mg/L
COD	24.0	88.0	80.0	220.0	200.0	250.0	
NH <sub>3</sub> -N	2.2	6.2	3.1	6.0	7.5	50.0	
PO <sub>4</sub> -P	0.1	0.3	0.3	1.1	0.9	5.0	

Note: Minimum Detectable Limits For parameters tested are (PO<sub>4</sub>-0.05, BOD-1.0, NH<sub>3</sub>-N -0.2),

All values except for pH, EC, are expressed as mg/L

\*-CPCB Effluent Discharge Standard for Inland Surface water

### 5.1.1 Observations and Interpretation for Nalla Water Quality at Nashik

#### i) Physical & Inorganic Parameters

The pH of all nalla samples during the study period was observed to be in the range of 7-8.2. Electrical conductivity ranges between 265- 1290 micro Siemens/cm. Higher EC can be attributed to presence of untreated wastewater.

#### ii) Organic & Nutrient

The dissolved oxygen (DO) levels observed during all months ranged between BDL to 7.4 mg/L. Higher DO levels were observed at Chikhali nalla in December when low temperatures were recorded. However, in January - 1.0 mg/L DO was recorded indicating inflow of pollutants. DO less than 0.5 mg/L was observed at Forest Nursery, Ramwadi, Bajarang wadi and Saraswati nalla samples. Low value of dissolved oxygen is an indicator of biodegradable organic pollution which could be due to inflow of domestic sewage. Wastewater from various nearby slums, villages and society is released in nalla which is responsible for pollution.

Release of nutrients like ammonical nitrogen and phosphates was also observed at many places which can lead to eutrophication and further deterioration in river water quality. Ammonical nitrogen ranged from BDL to 7.5 mg/L. Higher values were recorded in Forest Nursery and Saraswati nalla which receive untreated domestic wastewater.

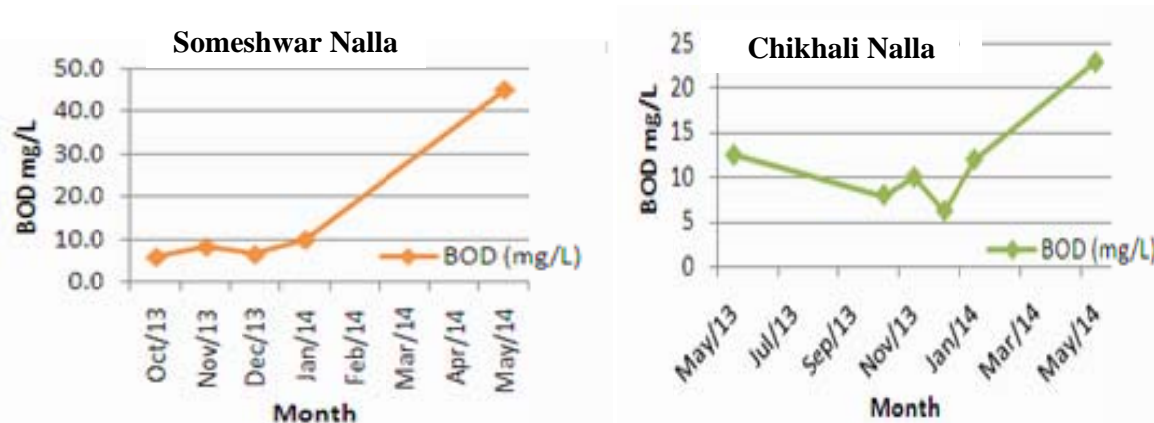
Organic pollution is indicated by Biochemical Demand Oxygen (BOD). The BOD values of major nallas varied from 3.0 to 94 mg/L. Maximum value of 94 mg/L was observed at Forest Nursery nalla in December which actually carries domestic waste water from Suyojit Society area. Saraswati nalla also exhibited higher BOD values (83 mg/L) exceeding the permissible value of 30 mg/L. Higher BOD levels were also observed at Ramwadi nalla which receives sewage from Ramwadi area.

The Chemical Oxygen Demand of the nalla samples was within the stipulated standards mentioned by CPCB for Inland Surface water during all months. Hence based on the multiple sampling of the nallas, the overall water quality of nallas is summarised in **Table 5.10**.

**Table 5.10: Ranges of Pollutant Parameters in Major Nallas Evaluated During October -2013 to January 2014**

Parameters	Codes of Nallas								
	GA	SOM	CHI	AN	CHO	SAR	RAM	WAG	FOR
DO	BDL-4.2	4.5-6.2	1.0-7.4	BDL-5.4	5.6-6.2	BDL	BDL	BDL-3.0	BDL-2.6
BOD	11-13	6-10	6.2-12	3-5.2	6.4-11	45-83	28-32	8-15	60-94
NH <sub>3</sub> -N	1.1-2.4	0.3-3.3	1.2-3.3	1.5-4.9	0.9-1.8	6.2-5.8	4.0-4.2	BDL-0.8	4.1-7.5

Variation of BOD values especially for Someshwar and Chikhali Nalla is given in the **Figure 5.3**



**Figure 5.3 : Results Showing Variation in BOD Values for Different Nallas**

During the study period, variations in BOD values were observed at both nallas- Someshwar and Chikhali. BOD values for Someshwar nalla show reduced values in post-monsoon months which could be due to availability of sufficient water for dilution from river. While during the non-monsoon months, the BOD of the nalla is seen to be increasing upto 45 mg/L. Similar trend is observed for BOD values of Chikhali nalla. One of the reasons for such a trend is the availability of fresh water for dilution of pollutants. Post-monsoon months show higher flow in the river due to

rains, thus diluting the pollutants released while in the summer period, the water gets evaporated thus lesser quantity of water is available for sufficient dilution.

## 5.2 Impact Analysis of Nallas on River Water Quality

In order to study the impact of input of pollutants through nallas, specific sampling was carried out for four major nallas on right bank of river Godavari which carry significant load of contaminants. These exercises were limited to the locations wherein, it was feasible to collect the sample from bridges (**Figure 5.4**). The information on sampling locations and analytical results is presented in **Table 5.11 and 5.12**.

**Table 5.11: River Sample List along with Sample Codes**

Sample Codes of Nallas	Sample Description
SOM 1	River upstream Someshwar nalla meeting-river point
SOM 2	River at Someshwar nalla meeting-river point
SOM 3	River downstream Someshwar Nalla meeting- river point
CHI 1	River upstream Chikhali nalla meeting-river point
CHI 2	River at Chikhali nalla meeting-river point
CHI 3	River downstream Chikhali Nalla meeting- river point
FOR 1	River upstream Forest nursery nalla meeting-river point
FOR 2	River at Forest nursery nalla meeting-river point
FOR 3	River downstream Forest nursery Nalla meeting- river point
CHO 1	River upstream Chopda nalla meeting-river point
CHO 2	River at Chopda nalla meeting-river point
CHO 3	River downstream Chopda Nalla meeting- river point





**b) River Downstream Chopda Meeting River Point**



**c) Chopda Nalla Meeting River Point**



**d) Someshwar Nalla Meeting River**

### **5.2.1 Observation for Impact Analysis of Nalla Discharges on River**

Many nallas join river Godavari on left and right bank which carry small amount of storm water and unaccounted and uncollected wastewater. Out of these nallas, seven nallas are small with less than 1 km length and have practically insignificant flow. The scope of work included the study on ‘Impact Study of Nalla Discharges on the receiving river water quality at Godavari’ will indicate the extent of pollutant release and also the dilution and assimilative capacity of receiving waters. This type of evaluation is planned for the nallas where the bridges are available at the upstream and downstream of the discharge location of the nallas. The bridges joining right and left bank of the river are available at Someshwar, Chikhali, and Forest Nursery and Chopda nallas. Hence the water samples from Godavari River in the upstream and downstream part were collected from bridges in the middle part of river flow.

**Table 5.12: Impact Analysis of Nallas Discharges in Godavari River at Nashik (December 2013)**

Nalla→	SOM 1	SOM 2	SOM 3	CHI 1	CHI 2	CHI 3	FOR 1	FOR 2	FOR 3	CHO 1	CHO 2	CHO 3	CPCB* Eff Dis. Std	MPCB A-III
Parameter↓														
<b>Physical Parameters &amp; Inorganic Parameters</b>														
pH	7.3	7.3	7.6	7.6	7.7	7.8	7.5	7.5	7.3	7.2	7.4	7.4	5.5-9.0	
EC	259	305	283	290	383	320	518	701	545	595	546	595		
TDS	155	183	170	174	230	192	311	421	327	357	328	357		
Total alkalinity	128	142	134	132	146	142	196	248	200	227	222	232		
<b>Organic &amp; Nutrient Parameters</b>														
DO	7.7	6.2	7.4	7.4	7.4	7.2	8.4	2.6	6.3	7.5	6.2	9.8		≥ 3.0 mg/L
BOD	4.2	6.6	3.0	4.0	6.2	6.0	9.0	94.0	9.0	10.0	11.0	6.0	30.0	10.0 mg/L
COD	10.0	16.0	32.0	16.0	40.0	24.0	22.0	120.0	24.0	16.0	32.0	24.0	250.0	
NH <sub>3</sub> -N	0.3	0.2	0.3	0.3	1.2	0.4	0.5	7.5	3.1	1.1	1.8	1.3	50.0	
PO <sub>4</sub> -P	BDL	BDL	BDL	BDL	0.9	BDL	0.1	1.2	0.2	0.1	0.2	0.2	5.0	

*Note: Minimum Detectable Limits for parameters tested are (PO<sub>4</sub>-0.05, BOD-1.0, NH<sub>3</sub>-N -0.2),*

*All values except for pH, EC, are expressed as mg/L*

*\*-CPCB Effluent Discharge Standard for Inland Surface water*

The nalla samples from the nearest respective places for four nallas were also collected. The samples were collected at three points: before meeting river i.e. upstream, meeting river, and downstream of the meeting point. The pollution levels indicating impact of nallas on river water quality is given in **(Figure 5.5)**. The analytical results for important pollution parameters are presented in **Table 5.12**.

The results are compared with the Discharge Standards as mentioned by CPCB for discharges of effluents to Inland Surface Water. In the light of the receiving water body condition, i.e. river Godavari with practically no dilution with fresh water, the A-III class limits stipulated by MPCB for 'Not fit for human consumption, fish & wildlife propagation' were also considered during evaluation. The consent value for BOD, the conventional (30 mg/L) and recent altered value (10 mg/L) for the treated effluents from domestic wastewater treatment scheme is comparable with above mentioned standards.

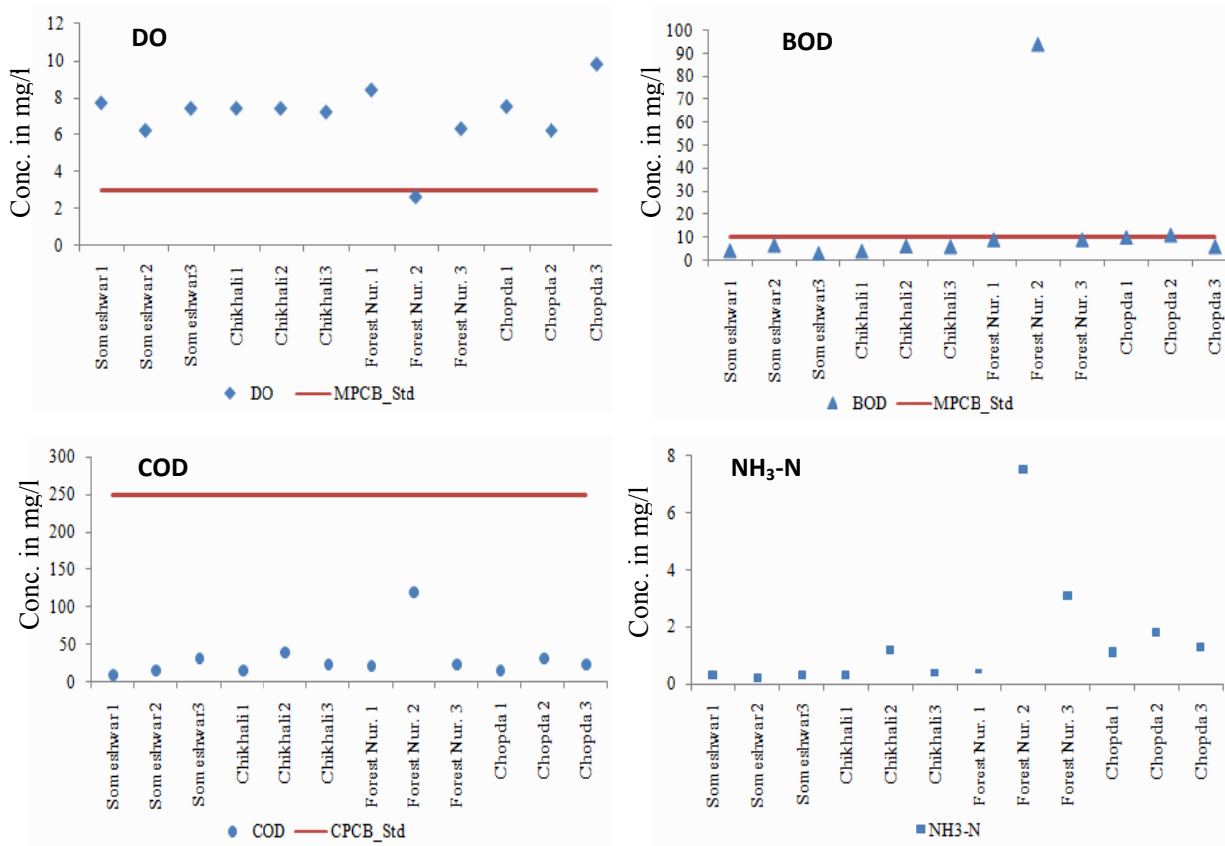
### **Findings**

- Chopda nalla joins the river near Chamber No.189. It was observed that wastewater was flowing through a broken chamber and directly joining river through a pipe during visits of NEERI team.
- Chikhli nalla and Someshwar nalla carries wastewater generated from upstream villages and joins river Godavari.
- Forest Nursery nalla carrying domestic wastewater from Suyojit society joins river Godavari near Chamber No. 213. The wastewater observed resembled domestic sewage.

#### **i) Physical & Inorganic**

The pH of the nalla water is observed to be slightly alkaline (i.e. above 7) but within the stipulated standard value. This observation indicates that no industrial discharges either acidic from electroplating or alkaline from chemical industries are getting discharged into any of the nallas. Certain small scale industries in Satpur MIDC Zone do not provide adequate treatment and release the industrial waste directly into nallas. These industries have a provision of a batch scale treatment. The variation in electrical conductivity was observed as an impact of nalla discharges. The electrical conductivity recorded in Someshwar nalla was high (1290  $\mu\text{S}/\text{cm}$ ) which confirms the release of electroplating waste water with higher concentrations of various salts.

The EC in the upstream river region before joining Forest nursery nalla was 518  $\mu\text{S}/\text{cm}$  which increased to 545  $\mu\text{S}/\text{cm}$  in the downstream region after meeting point. The EC of nalla water was 701  $\mu\text{S}/\text{cm}$ . The dilution of nalla water occurred due to river flow. This observation confirms the input of inorganic contaminants into the river.



**Figure 5.5 : Pollution indicating Impact of Nallas on River Water Quality**

**ii) Trace Metals**

Trace metals were analyzed in important nallas which were selected for impact analysis and the results are presented in **Table 5.13**.

**Table 5.13 : Trace Metal Analysis for Nallas Selected for Impact Evaluation**

Sample Description	Sample Code	Cu	Ni	Fe	Mn	Zn	Pb	Cd	Cr
River upstream Someshwar nalla meeting-river point	SOM1	0.06	BDL	0.16	0.02	0.08	BDL	0.03	BDL
River at Someshwar nalla meeting-river point	SOM2	0.03	BDL	0.20	0.03	0.1	0.24	0.04	BDL
River downstream Someshwar Nalla meeting- river point	SOM3	0.18	BDL	0.79	0.04	0.53	BDL	0.04	BDL
River upstream Chikhali nalla meeting-river point	CHI1	0.03	BDL	0.27	0.04	0.16	BDL	0.03	0.03
River at Chikhali nalla meeting-river point	CHI2	0.05	BDL	0.39	0.26	0.36	BDL	0.03	BDL
River downstream Chikhali Nalla meeting- river point	CHI3	0.09	BDL	0.28	BDL	0.27	0.28	0.03	BDL
River upstream Forest nursery nalla meeting-river point	FOR1	0.09	BDL	0.32	0.08	0.63	BDL	0.04	BDL



**Table 5.13 (Contd..) : Trace Metal Analysis for Nallas Selected for Impact Evaluation**

Sample Description	Sample Code	Cu	Ni	Fe	Mn	Zn	Pb	Cd	Cr
River at Forest nursery nalla meeting-river point	FOR2	0.06	BDL	1.32	0.18	0.44	BDL	0.04	BDL
River downstream Forest nursery Nalla meeting- river point	FOR3	0.09	0.03	0.57	0.03	0.56	0.22	0.04	BDL
River upstream Chopda nalla meeting-river point	CHO1	0.08	BDL	0.47	0.19	0.24	BDL	0.03	BDL
River at Chopda nalla meeting-river point	CHO2	0.07	BDL	4.42	0.27	0.48	BDL	0.03	BDL
River downstream Chopda Nalla meeting- river point	CHO3	0.077	BDL	0.59	0.62	0.10	BDL	0.03	BDL

### 5.2.2 Observations for Trace Metal Analysis

Upstream, meeting river point, and downstream of the nallas were assessed for heavy metal concentration and it was observed that concentration of lead was more than the permissible limits of 0.1 mg/L as prescribed by CPCB for Inland surface Water. Concentration of about 0.2 mg/L of Lead was observed in Chikhali nalla, Someshwar nalla indicating the presence of industrial discharge. River downstream Forest Nursery Nalla meeting- river point shows 0.2 mg/L levels of lead which could be due to mixing of other small stream. Since the nallas join the river Godavari, there is a possibility that such heavy metals are mixing with the river and may cause health problems if such water is consumed regularly.

The study of impact of nallas on River Godavari was carried out in the month of December 2013 i.e. in post monsoon months. The river does not show increased level of pollutants after meeting point of nallas due to presence of sufficient flow in the river for dilution. Based on NEERI's earlier observation, the status of river water quality could be poorer in summer months as the flow in river is further reduced.

### 5.3 Action Plan Implementation Impact after NEERI's Recommendation

The study undertaken by NEERI had covered all the nallas and points from where sewage discharges were observed. Based on multiple visits and assessment of conditions, NEERI had given recommendations. Nashik Municipal Corporation undertook various measures to improve the situation in last 6-8 months. It has also initiated activities which are likely to get completed by March 2015. Many of the action initiated need continuous monitoring and review.

In the light of implementation of action plan recommendations suggested by NEERI, the remedial measures undertaken recently by NMC is summarized till October 2014 in **Table 5.14**.

**Table 5.14: Action Under Taken by NMC on Various Nallas**

Sr. No.	Name	Length in km	Flow* (M <sup>3</sup> /d)	Sewer Zone	Observations made by NEERI scientists during field surveys (March 2014)	Action taken by NMC to join the Nallas intersecting line as a part of Implementation of NEERI's Action Plan
<b>Right Bank</b>						
1	Gangapur / Bardan Phata	3.96		Gangapur	It was observed that if the installed sewer lines overflow, the sewage joins the nalla.	Intercepted & Diverted (I & D) to the Ganeshwadi pumping station which goes to the Tapovan STP.
2	Someshwar 1	3.52	17		Nalla No. 1 receives only sewage from Someshwar area. It is observed that this nalla has flow in all seasons. The nalla No. 2 also carries sewage. Domestic solid waste is also dumped	Now at Canal road this nalla is intercepted by NMC. Intercepted & Diverted At present Someshwar nalla is diverted to Tapovan STP as this sewerage zone does not have STP. In future it will be sent to Gangapur STP.
3	Someshwar 2	2.8				
4	Chikhali	2.1	258		It starts from the industrial area of Satpur industrial zone and hence likely to carry the industrial wastewater either through illegal direct discharges or through seepage of the industrial waste applied on land. The existence of industrial waste was confirmed by the change of colour of rocks to brown red in the nalla.	Partly Intercepted & Diverted. At present Chikhali nalla is diverted to Tapovan STP as this sewerage zone does not have STP. In future, The proposed Chikhali nalla SPS and Gangapur STP will intercepted wastewater and treat it. However, most of the fair weather flow from Chikhali nalla and Someshwar nalla is diverted to Tapovan STP.

**Table 5.14 (Contd..) : Action Under Taken by NMC on Various Nallas**

Sr. No.	Name	Length in km	Flow* (M <sup>3</sup> /d)	Sewer Zone	Observations made by NEERI scientists during field surveys (March 2014)	Action taken by NMC to join the Nallas intersecting line as a part of Implementation of NEERI's Action Plan
5	Anandvalli	0.54	237	Tapovan	Receives Anandvalli village's wastewater. The NMC has made an temporary arrangement on this nalla. The NMC has made one cemented tank for sewage collection and pump into Ganeshwadi Pumping station.	Intercepted & Diverted to Ganeshwadi Pumping station.
6	Asarambapu Ashram	0.4			Insignificant flow	Intercepted & Diverted
7	Forest Nursery	0.3	3651		As it carries sewage from Suyojit Garden Society, it is characterized by high BOD and odour problem.	GRB Intercepting sewer over burdened/over loaded NMC has taken up SPS at old Gangapur Road to divert excess waste water via Makhmalabad Road to Tapovan.
8	Joshiwada	1.2			Dry during visit	Intercepted & Diverted
9	Chopada	2.08	1952	Tapovan	Receives filter back wash water from water treatment plant and sewage from Goda Park area	Intercepted & Diverted.
10	Malharkhan	1.84			Dry during visit	Intercepted & Diverted work in process
11	Sarswati	1.06			Dry during visit	Intercepted & Diverted
12	Bhoi	0.54			Overflow from sewage chamber observed	Intercepted & Diverted to New Ganeshwadi Pumping station
13	Kashimale Karyala	0.6		Tapovan	Very small flow	Intercepted & Diverted

**Table 5.14 (Contd..) : Action Under Taken by NMC on Various Nallas**

Sr. No.	Name	Length in km	Flow* (M <sup>3</sup> /d)	Sewer Zone	Observations made by NEERI scientists during field surveys (March 2014)	Action taken by NMC to join the Nallas intersecting line as a part of Implementation of NEERI's Action Plan
14	Jadhav Farm	0.52	12	Tapovan	Very small flow	Intercepted & Diverted work in process
15	Panchak Nalla	1.08		Panchak	Dry during visit	Intercepted & Diverted
16	Pimpalpatti	1.5			Not visited	Intercepted & Diverted
17	Pawarwadi				Not visited	
<b>Left Bank</b>						
18	Gandharwadi	4.3		Tapovan	Less contaminated water	No sewage flow
19	Kusumagraj Udyan	6.96			Less contaminated water	Intercepted & Diverted
20	Ramwadi	5.34	558		Constructed throughout its length, diverted to trunk sewer	Intercepted & Diverted work in process
21	Aruna	1.6			Not visited	Intercepted & Diverted
22	Waghadi	8.2			Significant sludge accumulated	Intercepted & Diverted
23	Kewadi ban	0.74			Dry during visit	Intercepted & Diverted
24	Kapila	3.66			Receives overflow of Kapila Pumping Station	Intercepted & Diverted work in process
25	Manur	4.9		Panchak	Not visited	Intercepted & Diverted

\* Flow measurement are carried out by NEERI

According to recent data provided by NMC (in March 2014), all the nallas are diverted to Pumping stations which eventually reach STPs. This can be a temporary solution to the manage wastewater flowing through nallas. Hence NMC should take steps for on-site treatment this wastewater in future. Regular monitoring and reviews are required every month.