Preface

India is the largest peninsula in the world with a coastline of about 7517 km with 12 major ports and 185 non major / intermediate ports with a very impressive water network consisting of rivers, lakes, creeks and canals.

An efficient transport sector is vital for development of the economy to stimulate optimum competitive business environment. Indian transport system comprises various modes, viz. Railways, Roadways, Inland Waterways, Coastal Shipping and Airways. Integrated development of waterways can generate waterway grid that may in future help shift cargo traffic from road transport to the cheaper and eco-friendly inland waterways.

The first national waterways were established in India in mid 1980s & 1993 with a combined length of 2,716 km:

NW 1 (1620 km):	Ganga - Bhagirathi - Hooghly river system between Haldia & Allahabad declared as National Waterway in 1986
NW 2 (891 Km):	Brahmaputra River between Bangladesh Border and Sadiya declared as National Waterway in 1988
NW 3 (205 km):	West coast canal (168 km) - Udyogmandal canal (23 km) - Champakara canal (14 km) declared as National Waterway in 1993.

The government also declared the following two inland waterways as national waterways during 2008:

NW 4 (1078 km):	Kakinada-Pondicherry canal - Godavari and Krishna rivers
NW 5 (588 km):	East Coast Canal - Brahmani River and Mahanadi delta

Given the untapped potential of India's inland waterways, the Govt. of India desires to explore the commercial navigation potential on year round basis. Ministry of Shipping (MoS), Govt. of India has directed Inland Waterways Authority of India (IWAI) to identify the viable waterways in India for their phased development.
Accordingly, to make provisions for existing national waterways and to provide for the declaration of certain inland waterways to be national waterways and also to provide for the regulation and development of the said waterways for the purposes of shipping and navigation,
National waterway act, 2016 has received the assent of the President on the 25th March, 2016 declaring a total of 111 National Waterways.

IWAI, a statutory body under MoS, Govt. of India, has entrusted WAPCOS with the responsibility for preparation of two stages DPR of four national waterways in the state of Gujarat and Maharashtra: **National waterway No's 66 (Mahi), 73 (Narmada), 87 (Sabarmati), 100 (Tapi)** for a total length of 1123 km.

This Draft Feasibility Report (Stage-I) covers the review of data and reconnaissance survey for Tapi River in Gujarat and Maharashtra. The WAPCOS team has physically visited the river stretches and gathered all requisite information.

Acknowledgement

This Draft Feasibility Report is the outcome of review of existing infrastructure along the Tapi River and present state of affairs. This vision is shared jointly by IWAI and WAPCOS Limited.

This report gives the present status of water-ways assets, topographic features, climatic variability, land use / land cover pattern, details of all cross structures along with socio-economic information of the waterway.

We, WAPCOS project team acknowledge Cdr. P. K. Srivastava, Hydrographic Chief, Inland Waterways Authority of India; Sh Rajiv Singhal, AHS for constant encouragement and guidance, technical discussions and for evincing keen interest in the project and this report.

WAPCOS Team

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Haryana- 122015

List of Abbreviations

BM	Bench Mark / Local Reference Level
CH	Chainage
CM	Central Meridian
CRZ	Coastal Regulation Zone
CWC	Central Water Commission
CVT	Calibration, Verification & Test
DF	Dual Frequency
DGPS	Differential Global Positioning System
DPR	Daily Progress Report
GPS	Global Positioning System
HFL	Highest Flood Level
HC	Horizontal Clearance
HSE	Health, Safety and Environment
kHz	kilohertz
km	kilometer
m	meter
mmtpa	Million metric tones per annum
MN	million
m/s	meter per second
ms	milliseconds
MSL	Mean Sea Level
PWD	Public Works Department
QA/QC	Quality Assurance / Quality Control
QMS	Quality Management System
Rev	Revision
Rep.	Representative
SBES	Single Beam Echo sounder
SD	Standard Deviation
Sr	Senior
UTM	Universal Transverse Mercator
VC	Vertical Clearance
WGS	World Geodetic System

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<tr><td>2.</td><td>Cluster number and State(s)</td><td>Cluster-8, Gujarat & Maharashtra</td></tr>
<tr><td>3.</td><td>Waterway stretch</td><td>436 km length of the Tapi river from Hatnur Dam near Mangalwadi Long to confluence with Gulf of Khambhat (Arabian Sea)
(National Waterway 100)</td></tr>
<tr><td>4.</td><td><u>Navigability status</u></td><td></td></tr>
<tr><td>a)</td><td>Tidal & non-tidal portions (from…to, length, average tidal variation)</td><td>As per Toposheets tidal reach was up to 48 km but during reconnaissance survey, it was found that the tidal reach of the river is 30.8 kms.
The Nearest Port is Hazira Port. The tidal variation is about 6 m.
Source data: Hazira Port(28/03/16 to 19/04/16)</td></tr>
<tr><td>b)</td><td>LAD status (w.r.t. CD)
i) Survey period: April-May-June 2016
ii) < 1.0 m (km)
iii) 1.0 m to 1.5 m (km)
iv) 1.5 m to 2.0 m (km)
v) > 2.0 m (km)</td><td>
<table>
<tr><th>LAD (m)</th><th>0-25</th><th>25-30.87</th><th>30.87-50</th><th>50-75</th><th>75-100</th><th>100-125</th><th>125-150</th><th>Total (km)</th></tr>
<tr><td><1</td><td>0.00</td><td>0.49</td><td>9.74</td><td>4.10</td><td>6.51</td><td>3.97</td><td>2.67</td><td>27.47</td></tr>
<tr><td>1-1.2</td><td>0.00</td><td>0.00</td><td>0.49</td><td>0.81</td><td>0.16</td><td>0.00</td><td>0.00</td><td>1.45</td></tr>
<tr><td>1.2-1.4</td><td>0.10</td><td>0.00</td><td>0.29</td><td>0.40</td><td>1.06</td><td>1.05</td><td>0.00</td><td>2.90</td></tr>
<tr><td>1.4-1.7</td><td>0.30</td><td>0.00</td><td>0.61</td><td>0.39</td><td>1.36</td><td>0.00</td><td>0.00</td><td>2.66</td></tr>
<tr><td>1.7-2.0</td><td>0.58</td><td>0.10</td><td>0.79</td><td>0.62</td><td>0.23</td><td>0.23</td><td>0.00</td><td>2.54</td></tr>
<tr><td>>2</td><td>24.12</td><td>5.20</td><td>7.26</td><td>18.71</td><td>15.84</td><td>20.48</td><td>21.53</td><td>113.15</td></tr>
<tr><td>Total (Km)</td><td>25.10</td><td>5.79</td><td>19.17</td><td>25.02</td><td>25.16</td><td>25.73</td><td>24.2</td><td>150.17</td></tr>
</table>
<table>
<tr><th>LAD (m)</th><th>150-175</th><th>175-200</th><th>200-225</th><th>225-250</th><th>250-275</th><th>275-300</th><th>Total (km)</th></tr>
<tr><td><1</td><td>7.44</td><td>18.93</td><td>1.81</td><td>4.71</td><td>1.69</td><td>14.26</td><td>48.84</td></tr>
<tr><td>1-1.2</td><td>0.49</td><td>0.50</td><td>0.80</td><td>0.19</td><td>3.03</td><td>1.07</td><td>6.08</td></tr>
<tr><td>1.2-1.4</td><td>0.82</td><td>0.00</td><td>0.91</td><td>0.21</td><td>2.27</td><td>1.08</td><td>5.29</td></tr>
<tr><td>1.4-1.7</td><td>0.30</td><td>0.00</td><td>0.87</td><td>1.94</td><td>3.13</td><td>1.03</td><td>7.27</td></tr>
<tr><td>1.7-2.0</td><td>0.60</td><td>1.33</td><td>0.00</td><td>1.20</td><td>2.45</td><td>2.16</td><td>7.74</td></tr>
<tr><td>>2</td><td>16.50</td><td>3.25</td><td>20.55</td><td>16.68</td><td>12.30</td><td>5.35</td><td>74.63</td></tr>
<tr><td>Total (Km)</td><td>26.15</td><td>24.01</td><td>24.94</td><td>24.93</td><td>24.87</td><td>24.95</td><td>149.85</td></tr>
</table>
</td></tr>
</table>

LAD (m)	300-325	325-350	350-375	375-400	400-425	425-436	Total (km)
<1	1.93	10.93	17.54	7.15	10.04	0.89	**48.48**
1-1.2	0.57	0.00	3.68	2.29	0.35	0.00	**6.89**
1.2-1.4	2.11	0.95	1.59	4.05	0.00	0.00	**8.70**
1.4-1.7	2.24	1.79	0.91	0.51	2.39	0.00	**7.84**
1.7-2.0	4.44	3.15	0.41	2.90	0.63	1.12	**12.65**
>2	13.90	8.77	0.77	8.52	11.80	7.72	**51.48**
Total (Km)	**25.19**	**25.59**	**24.9**	**25.42**	**25.21**	**9.73**	**136.04**

c)	Cross structures i) Dams, weirs, barrages etc. (total number; with navigation locks or not) ii) Bridges, Power Cables etc. (total number; range of horizontal and vertical clearances)	A total of seven Dams/Weir/Barrages are located in the present study stretch of Tapi River. One barrage Palsera (Piloda) is under construction. None of these are provided with Navigational locks. A total of 28 road bridges (and 2 under construction Bridges), two railway bridges, one broken bridge and one small wooden bridge are located across Tapi river. HC : 8m to 50m VC : 3m to 30m A total of 30 HT lines and 04 Electric lines are located across Tapi River. HC:200-900m VC:10-40 m
d)	Average discharge & no. of days	**Surat Gauge data analysis** Only water level gauge data for period June to October is available at this site. In pre-Ukai period Surat city experienced heaviest flood on 6 Aug 1968 when flood level of 12.04 m was reported at this gauge for highest observed flood discharge of about 44170 m^3/s (15.6 lakh cusecs). In Aug 2006 flood level of 12.50 m was reported at this gauge for much less flood discharge of 24770 m^3/s (9.1 lakh cusecs). Considering river bed levels of the order of – 2m MSL and the tidal range at Surat, Navigational depths of the order of 1.5 m to 2 m and more could be available even during non-monsoon period except during period of low water time. **Ghala Gauge data analysis** Depth of about 1 to 1.5 m will prevail at Ghala gauge even during non-Monsoon period. The results of analysis indicate range average 10 daily flows : June to September - From 120 to 500 m^3/s

October to December - From 400 to 100 m^3/s

January to May - 50 to 20 m^3/s

Maximum flood discharge & HFL (during period of data) at Ghala gauge were 22500 m^3/s and 20.96 m respectively in August 2006.

Kakrapar Gauge data analysis

Daily gauge data was only available. Minimum depth of about 6 m at Kakrapar weir and about 3 m at 30 km upstream at Ukai dam will normally prevail even with minimum water level due to regular releases from Ukai dam for irrigation from Kakrapar canals.

Ukai Gauge data analysis

Daily gauge data was only available. Depth of about 50 m will prevail at Ukai dam. With the average bed slope of 1/2130 the back water effect continues over about 100 km up to Prakasha Barrage. Analysis shows that during monsoon period water level will be fairly above CD.

Sarangkheda Gauge data analysis

Analysis of data indicate following.

- Depths of the order 1 m will prevail near Sarankheda for the period of about 150 days in year.
- Depths of the order of 1 m to 2.5 m will prevail near Sarangkheda for the period of about 120 days in year.

Analysis indicates range of average flows on the basis of 10 daily flows in different period of year as following.

Month	June	July	Aug	Sept	Oct	Nov	Dec	Jan-Feb	March -May
Discharge M^3/s	150	400	1200	700	100	30	15	12	<5

Gidhade Gauge data analysis

Analysis of data indicate following.

- Depths of the order of 0.5 m to 2 m will prevail near Gidhade for the period of about 130 days in year.
- Depths more than 2 m will prevail near Gidhade for the period of about 70 days in year.

Analysis indicates range of average flows on the basis of 10 daily flows in different period of year as following.

Month	June	July	Aug	Sept	Oct	Nov	Dec	Jan-Feb	March-May
Discharge M^3/s	150	400	1200	700	100	30	12	<10	<5

Savkheda Gauge data analysis

Depths of the order of 0.0 m to 1.5 m will prevail near Savkheda for the period of about 50 days in year. Depths more than 1.5 m will prevail near Savkheda for the period of about 270 days in year.

Analysis indicates range of average flows on the basis of 10 daily flows in different period of year as following.

Month	June	July	Aug	Sept	Oct	Nov	Dec	Jan-Feb	March-May
Discharge M^3/s	150	400	1200	700	100	35	20	10	<5

Bhusawal Gauge data analysis

Daily gauge data for period 1969 to 2015 was only available. Results of analysis of data indicate following.

1) Depths less than 0.50 m will prevail near Bhusawal for the period of about 150 days in year.

2) Depths more than 0.5 to 0.8 m will prevail for the period of about 50 days in year.

Hatnur dam gauge data analysis

It is located at upstream end of present study stretch. Daily water level data of dam was available. The Maximum water level of 214.0 m was observed for most of the year and the lowest observed water level in Hatnur reservoir was 203.51 m during period of data.

e)	Slope (1 in ….)	

From	To	Bed level change	distance	Slope
Hatnur dam RBL 200 m	Sarankheda RBL 109 m	91 m	193 km	**1/2120**
Sarankheda RBL 109 m	Kakrapar(d/s) RBL 41 m	68 m	145 km	**1/2132**
Kakrapar RBL 41 m	**Mouth RBL -3.0 m**	**44 m**	**93 km**	**1/2113**

f)	Consultant's inference	**Reach: 0-35 km (River Mouth to Shiganpur Weir)** Shiganpur weir is located at upstream end of this stretch. Tidal effect is predominant in this reach. The tidal variation is about 6 m. LAD of greater than 2 m exist in the entire reach. Hence this reach is suitable

		for upto Class V navigation. **Reach: 35-113 km (Shiganpur Weir to Kakrapara Dam)** Depths of the order of 1.5 m will prevail for at least 270 days in a year. LAD analysis also suggests depths greater than 2m for majority of the stretch. Hence this reach is also suitable for upto Class V navigation for about 270 days and upto class III navigation for 365 days in a year. **Reach: 113-137 km (Kakrapara Dam to Ukai Dam)** Minimum depth of about 6 m at Kakrapar weir and about 3 m at 30 km upstream at Ukai dam will normally prevail. Hence this stretch is suitable for Navigation upto class V 365 days in a year. **Reach: 137-232 km (Ukai Dam to Prakasha barrage)** Depth of about 50 m will prevail at Ukai dam. With the average bed slope of 1/2130 the back water continues over about 100 km up to Prakasha Barrage. LAD analysis also shows that in majority of this stretch, LAD of reduced depth > 2 m shall prevail round the year. Hence this stretch is suitable for Navigation for all class for 365 days in a year. **Reach: 232-256 km (Prakasha barrage to Sarangkheda barrage)** LAD of greater than 2m exists in most of this stretch. Hence this stretch is also suitable for upto class V navigation for round the year (365 days) with only marginal dredging. **Reach: 256-295 km (Sarangkheda barrage to Salvade barrage)** Depths of the order 1 m will prevail for minimum 150 days in year and least depths of the order of 1 m to 2.5 m will prevail for minimum 120 days in year. Maintaining the releases from dams and some dredging shall improve navigation period for class I waterway to whole year (365 days). **Reach: 295-323 km (Salvade barrage to Palsera barrage)** LAD analysis shows depth > 1.5 m exists for 22 km out of 28 km stretch. Since Salvade dam exist at downstream end and Palsera Barrage is presently under construction at upstream end, the depths will improve significantly once the Palsera barrage is operational. Hence this stretch is suitable for class I navigation all-round the year. **Reach: 323-407.6 km (Palsera barrage to Shelgaon barrage)** Depth of the order of 0.0 m to 1.5 m prevailing for about 50 days in year and depths more than 1.5 m prevailing for the period of about 270 days in year. Palsera Barrage is presently under construction at upstream end and the depths will improve significantly once the Palsera barrage is operational. Hence this stretch is suitable for navigation class I all-round the year.

		Reach: 407.6-436 km (Shelgaon barrage to Hathnur Dam) This is the steepest reach in the present study stretch. Six numbers check dams in series are also constructed in this reach from 414 to 426 km to arrest releases from Hathnur dam. Navigation is this reach may be developed by means of dredging. Bhusawal Gauge is located at 418 km. Results of analysis of data indicate depths less than 0.50 m will prevail for the period of about 150 days in year and depths more than 0.5 to 0.8 m will prevail for the period of about 50 days in year. Hence these additional measures have to be taken up to make this waterway suitable for Class I navigation.
5.	<u>Traffic Potential</u>	
a)	Present IWT operations, ferry services, tourism, cargo, if any	Small throughput quarries have been leased by auction mode in the bed of the Tapi River. About 100000 ton is expected to be flowing from Nagod to Surat (56 km). It is recommended that the Ro-Ro facility to be provided for the transit of sand. Presently the coal for Ukai power plant is sourced from the Chhatisgarh mines via Bhusawal-Surat route. The thermal capacity of Ukai power plant is 850 MW. The consumption of coal of Ukai plant is 4.5 million tons annually. On proposed river stretch it is viable to transport coal between Bhusawal and Ukai. Hence Bhusawal would be Ideal location for jetty. Fly ash is the essential commodity for cement manufacturing. With Ukai thermal power plant near the stretch it is suitable to transport the fly ash waste from power plants to the cement manufacturing plants. There is surplus of 1.537 mmtpa of fly ash which could be transported to cement plants in Maghdhalla by waterway movement. There are two major Cement plants in Maghdhalla. Hence Stretch from Maghdhalla to Ukai can be considered for Fly ash movement. Cement with volume of 9.1 MMTPA and fertilizer with 3.47 MMTPA from Maghdalla may be transported using waterway as there is growth in Infrastructure in nearby districts and the districts nearby have large area under cultivation. Quarry stones, sand and construction raw materials are some of the important commodities that could be plied on the identified stretches for domestic movement. The commodities have been categorized in to following categories

		1) Domestic movement- Sand, Flyash 2) EXIM Movement- Coal, Hazira beach, Ukai Dam, Surat Castle, Mughalsarai, Andrews Library, Sardar Vallabhbhai Patel Museum, Planetarium and the European tombs, Swaraj Ashram at Bardoli, Historical fort at Songadh, Water Fun Park on Hazira Road , Aquatic Water Park at Kamrej, and Joy n Joy Amusement Park at Dhonapadi are majot tourist destination in Surat. Prakash Temples, Asthambha (Tribal say he is also known as Ashvasthama, a male character and son of Dronacharya.), Toranmal Forest, Khadki Point, Sita Khai, Yashwant Lake, Lotus Lake, Gorakhnath Temple, Sarangkheda Horse Bazaar, Dattatreya Temple, Unapdev, Gaimukh temple, Thalner, Shirud, Laling, Bhamer, Bodgaon, Sri Padmalaya, Swinging Towers of Farkande (250 years old), Unapdeo (Hot-water springs as special mention in ancient holy 'Ramayana' and had auspicious touch of Lord Rama during his fourteen years expulsion from Ayodhya), Parola fort are major tourist destinations near Tapi river. A lot of mentioned temples are located alsong the River Bank. There is also passenger movement in Tapi River. Due to lack of across river bridges it requires people to transport on small boats. Also there are pilgrimage and devotional places on Tapi River where tourists are seen travelling on small boats over short stretches.
b)	Important Industries within 50 km	Large industrial units such as Reliance Industries, Kribhko, Larsen & Tubro, ONGC, Essar, NTPC, Reliance Petrochemicals Ltd., Gas Authority of India Ltd.,Shell India Ltd. are contributing into industrial growth of the Surat dist. Pharmaceutical, Chemicals and petrochemicals products are the most export oriented activities in the medium and large scale industrial sector of the district. Industries like textile, sugar mills and paper manufacturing are predominate in Nandurbar district. Pipe manufacturing, fruit processing, pulse milling, biofertilizer production, Green / Solar

Commodity	MMTPA
Ukai Power Plant Fly ash	1.537
Sand	0.1
Fertilizers	2
Coal	4.5

		Energy and mattress manufacturing are the types of industries located in Jalgaon.
c)	Distance of Rail & Road from industry	The entire industrial clusters are well connected by Road and Railways. Most of the trade occurs by Roadways.
6.	Consultant's recommendation for going ahead with Stage-II (DPR preparation)	From the gauge discharge data and LAD analysis, it was found that reduced depth feasible for Navigation 365 days in a year for the development of waterway exist right upto Sarangkheda Barrage where only marginal dredging and provision of locks has to be provided. From Sarangkheda Barrage to Shelgaon Barrage, Palsera (piloda) barrage is under construction. After its construction we feel that round the year navigation may be developed right upto Shelgaon Barrage. The details of under construction Barrage have to be studied in detail along with river cross-sections in Stage II. From Shelgaon Barrage to Hathnur Dam, a series of check dam exist in a very steep slope, hence we feel that through navigation may be feasible only by raising the heights of these check dams. **WAPCOS recommend carrying out stage II Detailed studies up to shelgaon barrage from River mouth for about 407 km stretch.**
7.	Any other information/ comment	____

1. Introduction:

M/s Inland Waterways Authority of India (IWAI), a statutory body under ministry of shipping, Govt. of India, has entrusted WAPCOS with the responsibility for preparation of two stages DPR for 4 inland waterways (Sabarmati, Mahi, Narmada and Tapi) in the states of Gujarat & Maharashtra. The lengths of all four river stretches under the present studies are given below:

Sl. No.	Name of the River	Description of National Waterway	From:	Up to:
1.	Mahi River, Gujarat	248 km length of the river from Kadana Dam to confluence with Gulf of Khambhat near Kavi railway station **(National Waterway 66)**	23°18'22.35"N 73°49'37.45"E	22°10'34.71"N 72°30'36.31"E
2.	Narmada River, Gujarat & Maharashtra	227 km length of the river from Pandhariya to confluence of Narmada with Arabian Sea at Gulf of Khambhat **(National Waterway 73)**	21°57'10.37"N 74° 8'27.46"E	21°38'26.81"N, 72°33'28.24"E
3.	Sabarmati River, Gujarat	212 km length of the river from Barrage near Sadoliya to confluence with Gulf of Khambhat near Khambhat **(National Waterway 87)**	23°26'49.66"N 72°48'34.85"E	22°9'17.99"N 72°27'27.81"E
4.	**Tapi River, Gujarat & Maharashtra**	**436 km length of the river from Hatnur Dam near Mangalwadi Long to confluence with Gulf of Khambhat (Arabian Sea) (National Waterway 100)**	**21°4'21.99"N 75°56'44.88"E**	**21°2'15.51"N, 72°39'29.63"E**

Table 1: National Waterways in Gujarat & Maharashtra

The Google Map showing all river stretches is enclosed as **Figure 1**.

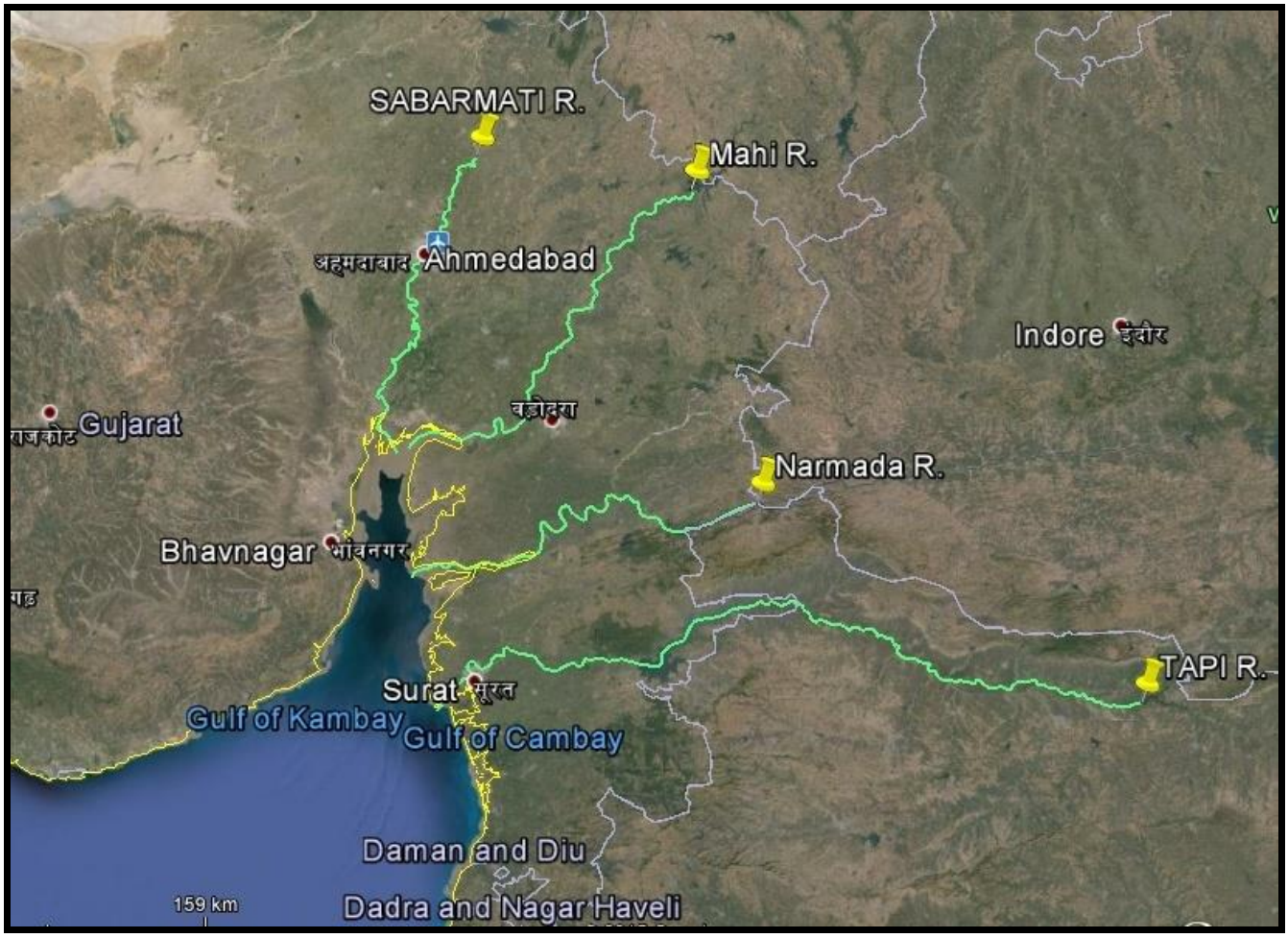


Figure 1: Google Map showing four rivers in Gujarat & Maharashtra

Accordingly, WAPCOS Ltd. undertakes the studies for 4 national waterways (Mahi, Narmada, Sabarmati and Tapi River) in Gujarat & Maharashtra. The brief scope of work is depicted as under:

Stage-1

A. Reconnaissance Survey
B. Collection and Review of available data
C. Feasibility Report

Stage-2

A. Hydrographic Survey & Hydro-morphological survey
B. Traffic Survey & Techno economic feasibility
C. Preparation of Detailed Project Report

The present studies are limited to establish the feasibility of national waterways for Inland navigation i.e. up to Stage 1 only**.** The studies are being carried out as detailed below:

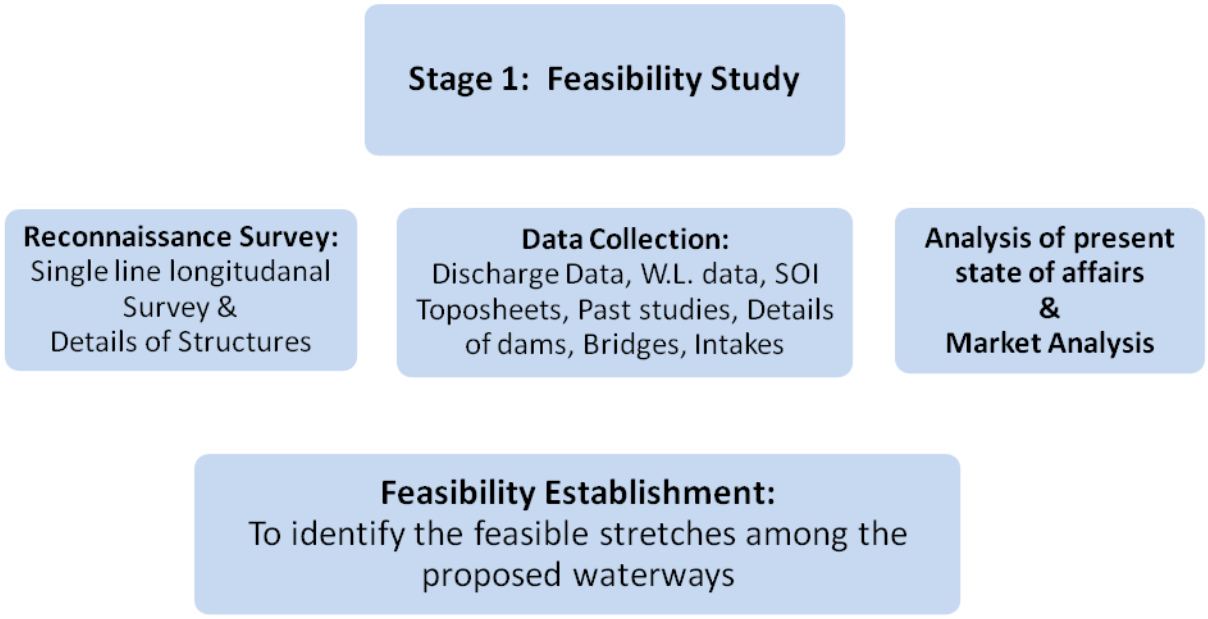


Figure 2: Feasibility Studies (Stage 1)

The present **Draft Feasibility Report** covers the review of data, reconnaissance survey and present state of affairs for Tapi River in Gujarat and Maharashtra as detailed below:

- ✓ **Introduction**
- ✓ **Classification of waterways**
- ✓ **River basin and hydrological details**
- ✓ **Details of existing structures**
- ✓ **Reconnaissance survey & Data collection**
- ✓ **Single line longitudinal survey**
- ✓ **Bed profile**
- ✓ **Soil texture**
- ✓ **Hydrological data collection and analysis**
- ✓ **Preliminary Traffic Studies and Market analysis**
- ✓ **Results and feasibility of waterway**

2. Introductory Considerations

As discussed in introduction, present studies consist of four rivers in the states of Gujarat & Maharashtra. This chapter covers origin, hydrological parameters like altitude, length, catchment area, Annual rainfall, major dams and barrages along the river, tributaries, and major cities along their bank, historical and religious places for Tapi River.

2.1 Tapi River

2.2 Length of River

The total length of the river from origin near Multai in Betul districts to its outfall in the Gulf of Khambhat is 724 km. The length under consideration for present studies is detailed below:

436 km length of the river from Hatnur Dam near Mangalwadi Long to confluence with Gulf of Khambhat (Arabian Sea) (National Waterway 100)	**From: 21°4'21.99"N 75°56'44.88"E**	**Up to: 21°2'15.51"N, 72°39'29.63"E**

2.3 State, District through which river passes

The Tapi River is the second largest westward draining interstate river of the Peninsula. It passes through Surat, Bardoli, Nandrbar, Dhule, Jalgaon, Raver, Buldana, Akola, and Amaravati districts in its course.

2.4 Maps

The map showing entire Tapi basin (Source: CWC) and Present study stretch is attached as **Figure 3** & **Figure 4** respectively

2.5 River Characteristics

2.5.1 River Course

Tapi originates near Multai reserve forest in Betul district of Madhya Pradesh. The total length of the river from origin to outfall into the Arabian Sea is 724 km For the first 282km the river flows in Madhya Pradesh, out of which 54 km forms the Common boundary with Maharashtra State. It flows for 228 km in Maharashtra before entering Gujarat. Traversing the length of 214 km in Gujarat, the Tapi River joins Arabian Sea in the Gulf of Cambay after flowing past the Surat city.

2.5.2 River Basin (Catchment Area)

It covers a large area in the State of Maharashtra besides areas in the states of Madhya Pradesh and Gujarat. The basin extends over states of Madhya Pradesh, Maharashtra and Gujarat having an area of 65,145 Sq.km out of which nearly 80 percent area lies in Maharashtra state. It lies between 72°33’ to 78°17’ east longitudes and 20°9’ to 21°50’ north latitudes. The entire Tapi basin can be divided in three sub-basins: Upper Tapi Basin up to Hatnur confluence of Purna with the main Tapi (29,430 sq. km)], Middle Tapi Basin from Hatnur up to the Gidhade gauging site (25,320 Sq. km), and Lower Tapi Basin from the Gidhade gauging site up

to the sea (10,395 Sq. km).

Table 2 : Tapi River Basin Area

State	Drainage area (sq. km.)
Madhya Pradesh	9804
Maharashtra	51504
Gujarat	3837
Total	65145

2.5.3 Tributaries

The Tapi River receives several tributaries on both the banks. There are 14 major tributaries having a length more than 50 km. On the right bank, 4 tributaries namely the Vaki, Gomai, Arunavati and Aner join the Tapi River. On the left bank, ten important tributaries namely the Nesu, Arunavati, Buray, Panjhra, Bori, Girna, Waghur, Purna, Mona and Sipna drain into the main channel. The drainage system on the left bank of the Tapi river is, therefore, more extensive as compared to the right bank area. The Purna and the Girna, the two important left bank tributaries together account for nearly 45 per cent of the total catchment area of the Tapi River. The Purna is the principal tributary of the Tapi River originating in Betul district in Gawilgarh hills of the Satpura range, mostly drains the three districts Amravati, Akola and Buldhana of Vidharbha Region. The Girna, another major tributary, rises in the Western Ghats and drains Nasik and Jalgaon districts of Maharashtra.

Sl. No	Tributaries	Length (Km)
1	**Purna**	**379**
2	**Girna**	**346**
3	**Bori**	**149**
4	**Panjhra**	**142**
5	**Aner**	**74**
6	**Arunavati**	**64**
7	**Gomai**	**58**

Table 3: Tributaries of Tapi River

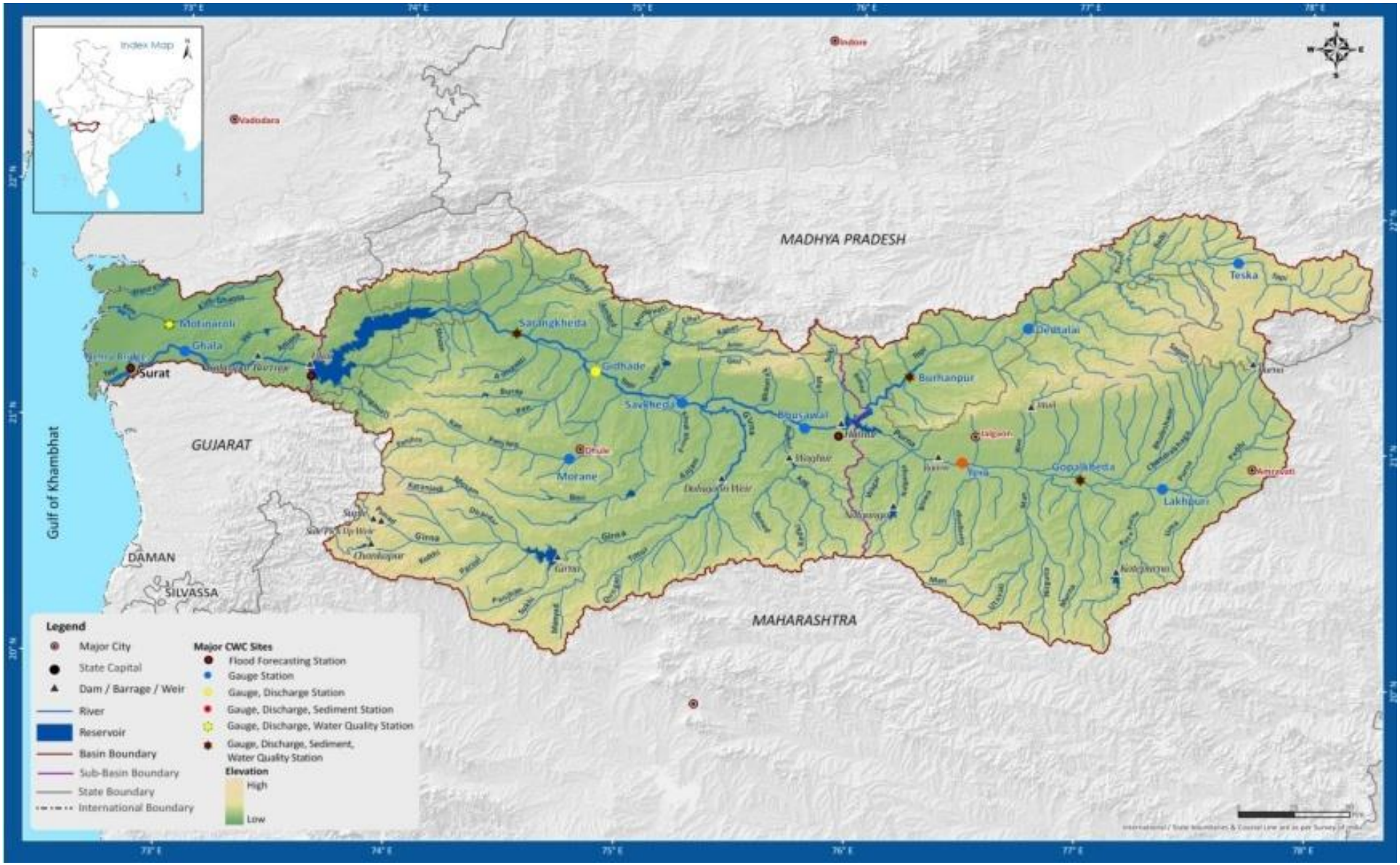


Figure 3: Tapi River Basin Area

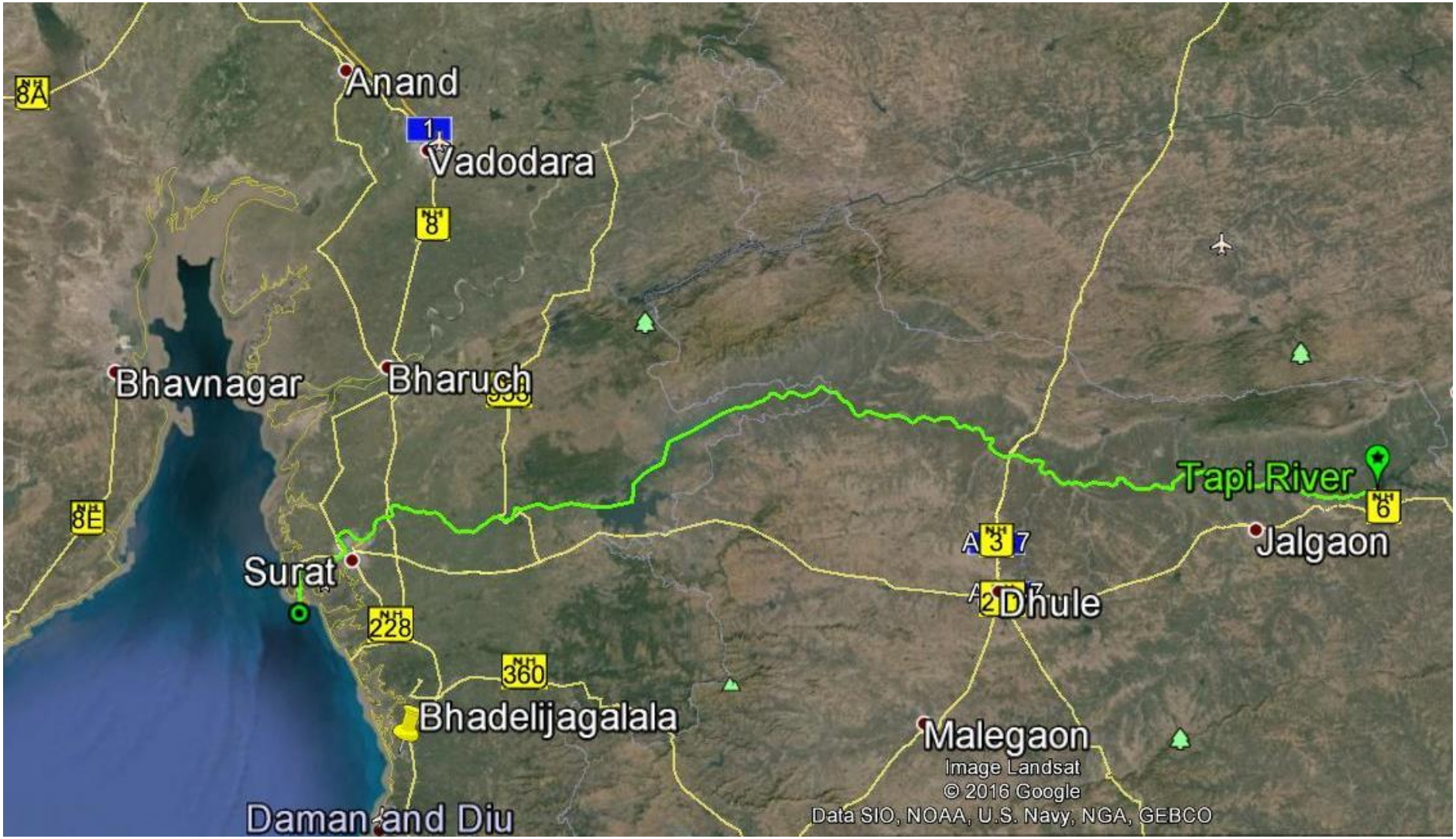


Figure 4: Google image showing Tapi River stretch (436 km) under present studies

2.5.4 Topography

The Tapi basin has two well-defined physical regions, viz. the hilly regions and the plains. The hilly regions cover the Satpura, the Satmala, the Mahadeo, the Ajanta and the Gawilgarh hills and are well forested. The agricultural area of the basin is considered as the total of the land under crops and trees, current fallows, other fallows, agricultural wasteland and net area sown. The basin in Madhya Pradesh is mostly covered with Deccan trap lava flows. The other formations found in the basin are alluvium, lower Gondwana, Cuddapah system, Bijawar series, and granites gneiss. Most of the area of Tapi basin falling within Maharashtra state is full of cuts & valleys.

2.5.5 Climate, Temperature & Humidity

There are four distinct seasons in the basin. They are

(i) Cold weather, (ii) hot weather, (iii) south-west monsoon and (iv) post- monsoon.

The cold weather season commences in December and continues till the end of February. December is the coldest month. The hot weather starts in March and continues up to the middle of June. May is usually hottest month of the season. The south-West of monsoon sets in by the middle of June and withdraws by the first week of October. June to September is the period of heaviest rain In the post-monsoon season, a few thunder-storms occur, especially in October. Thereafter, the weather clears up and it is dry and pleasant throughout the valley.

The temperature of the basin varies in a range of 5^0 to 48^0C. In the cold weather season mean minimum temperature varies between 11.1°C to 14.4°C. In May which is the hottest month of hot weather season. The mean max temperature ranges from 12°C to 40.11°C

2.5.6 Rainfall

The Tapi basin receives its maximum rainfall in the monsoon season. The normal rainfall near the coastal areas in the basin is highest going up to 1,000 mm. The normal annual rainfall in the Tapi basin up to is 820 mm, about 90% of which is received during the monsoon months only of which 50% is received during July and August In, the first week of October, 5.2% of the annual rainfall is received so rainfall is likely to produce a comparatively higher runoff so month of October has been included in the monsoon months.

2.5.7 Land Use

The major part of basin is covered with agriculture accounting to 66.19% of the total area. The important crops cultivated in this basin are wheat, sugarcane, rice, gram etc. Dry land farming is the common practice followed in the region. The kharif crops cultivated in the area are groundnut, soybean, maize and pulses, and the common Rabi crops are sorghum and gram. While the major part of basin is covered with forest accounting to 24.41% of the total area and the agricultural area constitutes 68.1%.The natural Vegetation comprises dry deciduous forest covers only 1.26% having built up land. About 2.99% of the basin is covered by water bodies.

2.5.8 Soil

The dominant soil-scapes, representing the region are gently to very gently sloping

deep, loamy to clayey and nearly level to gently sloping deep black soils. The basin covers consists of deep black soils and coastal alluvium. The soils in the Tapi basin classified into

- Coarse shallow soils
- Medium Black soil.
- Deep Black soil.

They are clayey, slightly alkaline, and calcareous.

2.5.9 Demography

There are 21 districts according census (2011) in the basin, 5 Districts in Gujarat, 6 in Madhya Pradesh and 10 in Maharashtra. Some of the important districts covers by this basin are Surat, Bardoli, Nandrbar, Dhule, Jalgaon, Raver, Buldana, Akola, and Amaravati. Basin nearly covers 94.37% of Surat district, while 24% of area in Betul Madhya Pradesh area is covered by the basin Jalgaon district in Maharashtra 99% of the area is covered by the basin.

2.5.10 Dams, Barrages/ Weirs/ Anicuts

This Basin consists of 356 Dams, 318 reservoirs 8 Barrages, 11 Weirs, 13 Lifts, and 2 Power Houses. Nearly 96% of Dams are used for irrigation purpose. The highest Dam in the basin is Ukai Dam having the height of 81m and Longest Dam is Lower Pedi dam having the length of 8610m. There are 8 Barrages out of which Shelgaon barrage is the highest and the longest barrage in the basin having the length 1134.65m and height the of 35.035 m. There are also 11 weirs and 13 lifts in Tapi basin. There is no navigational lock on any of existing Dams/ Barrage in the river stretch under present studies. The details of dams, weir and barrages in the present stretch are presented in chapter 3.

2.5.11 Tourism

There are eight important water tourism sites falling in this basin which are popular across the country some even around the world. Some of them are Ajanta Caves, Magalla Port, Saputara Lake, Asigardh Fort, Multai /Betul, and Salher Shikar. The details of major tourism places near the present stretch are presented in chapter 5.

2.6 Methodology and Data collection

2.6.1 Importance of Hydrological and Topographical data

Navigability of a natural river channel or tidal creek will primarily depend upon hydraulic parameters flow depth water discharge, velocity, sediment load and width of river channel. These parameters are function of topography/bathymetry of river bed and discharge in river during different seasons. Apart from these important parameters, there are other natural factors such as tidal range and length of tidal reach .type/nature of river bed (rocky, sandy, silty, clayey), bends in river course and stability of alignment of deep channel of river over long period. Apart from above natural factors, information on other factors such as various structures across (Dams/weirs/barrages/bridges) and along the river bank (river training and bank protection works) is also required.

2.6.2 Data Requirement

The following data was required for Stage-1 feasibility report:

1. Type of crops (in different seasons) and industries along the waterway
2. Availability of passenger ferry services. Prominent towns / City along the waterway.
3. Historical and tourist places.
4. Existing water sport and recreational activities and future probability.
5. Details of cross-structures (bridges, aqueducts, electric lines, telephone lines, pipe lines, cables) and their clearances. Salient features of Dams / Barrages / Weirs.
6. Availability of water in different seasons. Also to correlate this with CWC / Irrigation datum's.
7. Ponding level and limit of Dams / Barrages / Weirs.
8. Encroachment in the waterway, width of the waterway, sharp bends.
9. Environmental impacts. CRZ or wildlife clearances.
10. Local/pronounced name of the rivers in different stretches.
11. Any Border issue with other country.
12. Incorporation of topographical features (outside survey limits) from Google Earth imageries.
13. Obstructions to the navigation and un-approachable areas.
14. Photographs of all cross-structures, gauges, obstructions - annotated with location & chainage. In report with lat/long, easting/northing, chainage details
15. Permanent structures located within this corridor.
16. All prominent shore features (locks, bridges, aqueducts, survey pillars if available etc) and other conspicuous objects shall be fixed and indicated on the chart and included in the report.
17. Details of water intake/ structures shall be collected and shown on the charts and include in the report.
18. Availability of berthing place, existing jetty, ferry ghats, approach roads etc. in the area shall be indicated on the charts and include in the report.
19. During the survey, condition of the banks shall also be collected, whether that banks are pitched (protected) or not protected. The length of bank protection, where banks erosion is taking place shall also be estimated.
20. Positions and levels of corners of permanent structures within the corridor shall be physically surveyed and marked on survey charts.

2.6.3 Primary Data- Sources

A. Survey of India (SOI) Dehradun, during March & April 2016

Toposheets and satellite imageries are useful to obtain information such as extent of tidal reach, HTL & LTL, width of river and deep channel, important places, nature of river bed and bank along reach, channel bends, slope of river channel, and locations of various structures across and along river course and tendency of shifting of deep channel (general morphology of the deep channel of the river course).

As the coastal zone falls under restricted category, the restricted and non-restricted Toposheets of Survey of India /hydro-graphic charts and satellite imageries has been

collected after taking approval from **Ministry of Water Resources, River Development and Ganga Rejuvenation Govt. of India**.

A total of 14 toposheets of 1: 50000 scale were procured from SOI for Tapi river stretch and are being analysed to study various aspects mentioned above. The satellite imageries of different years from Google are also being analyzed.

The details of toposheets for Tapi River as collected from SOI are given as under:

1.	**Tapi**	46 C/12, 46 C/15, 46 C/16, 46 G/3, 46 G/4, 46 G/7, 46 G/8, 46 G/11, 46 G/11, 46 G/15, 46 K/2, 46 K/3, 46 K/6, 46 K/7

B. Data from Reconnaissance survey during April-May 2016

The reconnaissance survey was carried out in April- May 2016.

The details of existing cross-structures, Weirs, Barrages, Anicut, Dams, HT/ LT line, Type of Crops, Soils, shore protection along the waterway, Historical and tourist places, existing ferry services were collected. The collected data and photographs have been detailed in reconnaissance survey (Chapter 3).

2.5.4 Secondary Data- Sources

A. Central Water Commission (CWC), Govt of India and Water Resource Division (WRD), Gandhinagar during April-May 2016

These data give most vital information on water availability in river reach and sediment concentration in river water. The letters for gauge discharge data collection are sent to concerned chief engineers (attached as **Annexure 1**).

It was informed from the department that the data collection will take about 2-3 months and all the data have already been uploaded in WRIS website. Accordingly, the hydrological data viz. gauge, discharge, sediment and cross-section data at all G.D. sites have been downloaded from the website for all the gauge stations in Tapi river.

Hydrological analysis is being carried out based on this data.

Gauge discharge- sediment data collected

Gauge- discharge at 9 gauging sites on river Tapi were collected from CWC These gauging sites include Surat, Ghala, Kakrapar weir, Ukai Dam, Sarankheda, Gidhade, Savkheda, Bhusawal and Hatnur Dam. Out of these 9 gauging stations at four stations namely Ghala, Sarankheda, Gidhade and Savkheda water level gauge and discharge data was available and at remaining 5 sites only water level gauge data was available. These data were available for period all months in some cases and for about 5 to7 months extending from June to October/December for remaining stations.

Following Table gives details about location of gauging stations, zero level of gauge and type of data and duration of data availability.

Table 4: Gauge Discharge Sediment data collected from CWC

Gauging station	Data type	From	To	Frequency	Information on highest flood
Bhushawal, Dist.Jalgaon,MH 21⁰ 04′ 04” N 75⁰ 46′ 49” E Gauge zero/RBL-173.5	Gauge-discharge	1969	2012	Daily	HFL183.4m (1978) Est. CD 174.08m Min. WL173.578 m
	Sediment	-	-	-	
	Cross-section	-	-	-	
Ghala, Dist. Surat, Guj 21⁰ 17′ 29” N 73⁰ 02′ 10” E Gauge zero-3.033m River BL 3.00 m	Gauge-discharge	1977	2012	Daily	HFL20.96m (2006) Disc. 22500 m3/s Est. CD 3.03 m Minimum WL 2.74m
	Sediment	-	-	-	
	Cross-section	1979	2005	2 Days/year	
Gidhade, Dist. Dhule, MH 21⁰ 17′ 27” N 74⁰ 48′ 53” E Gauge zero/RBL-122m	Gauge-discharge	1970	2012	Daily	HFL141.65m (2006) Disc. 26384 m^3/s Est.CD 122.543 m Minimum WL121.0m
	Sediment	-	-	-	
	Cross-section	1989	2011	2 Days/year	
Hathnur, Dist.Jalgaon,MH 21⁰ 04′ 20” N 75⁰ 56′ 44” E Gauge zero -200 m	Gauge-discharge	1979	2012	Daily	HFL 214.01 m Est. CD 207.678 m Min. WL203.510 m
	Sediment	-	-	-	
	Cross-section	-	-	-	
Kakrapara, Dist. Surat, Guj 21⁰ 16′ 09” N 73⁰ 22′ 17” E Gauge zero-47.71 m River BL -39.20 m	Gauge-discharge	1969	2004	Daily	HFL54.53m(1998) Est. CD 47.71 m MinimumWL45.25m
	Sediment	-	-	-	
	Cross-section	-	-	-	
Sarangkheda, Dist.Nandurbar,MH 21⁰ 25′ 37” N 74⁰ 31′ 49” E Gauge zero/RBL-109m	Gauge-discharge	1974	2013	Daily	HFL126.7m(2006) Disc. 23044 m^3/s Est. CD 109.42 m MinimumWL108.9m
	Sediment	1984	2013	Daily	
	Cross-section	1978	2011	2 Days/year	
Savkheda,	Gauge-	1972	2012	Daily	HFL159.1m (1978)

Dist.Jalgaon,MH **21^0 08′ 57” N** **75^0 13′ 54” E** **Gauge zero/RBL-140m**	discharge				Disc. 24845 m3/s Est. CD 140.417m Min. WL140.05m
	Sediment	1972	2004	Daily	
	Cross-section	1998	2005	5 Days/year	
Surat(Seasonal), Dist. Surat, Guj **21^0 11′ 37” N** **72^0 48′ 49” E** **Gauge zero-0.460 m** **River BL - -2.0 m**	Gauge-discharge	1969	2011	Daily	HFL 12.5 (2006) Disc.-25770 m^3/s Est. CD 0.460 m
	Sediment	-	-	-	
	Cross-section	-	-		
Ukai Dam, Dist. Surat, Guj **21^0 14′ 53” N** **73^0 35′ 22” E** **Gauge zero-90.169 m** **River BL - 42.60 m**	Gauge-discharge	1969	2011	Daily	HFL105.479m(2006 Est. CD 90,169 m MinimumWL47.04m
	Sediment	-	-	-	
	Cross-section	-	-	-	

2.5.5 Methodology

The studies are being carried out as detailed below:

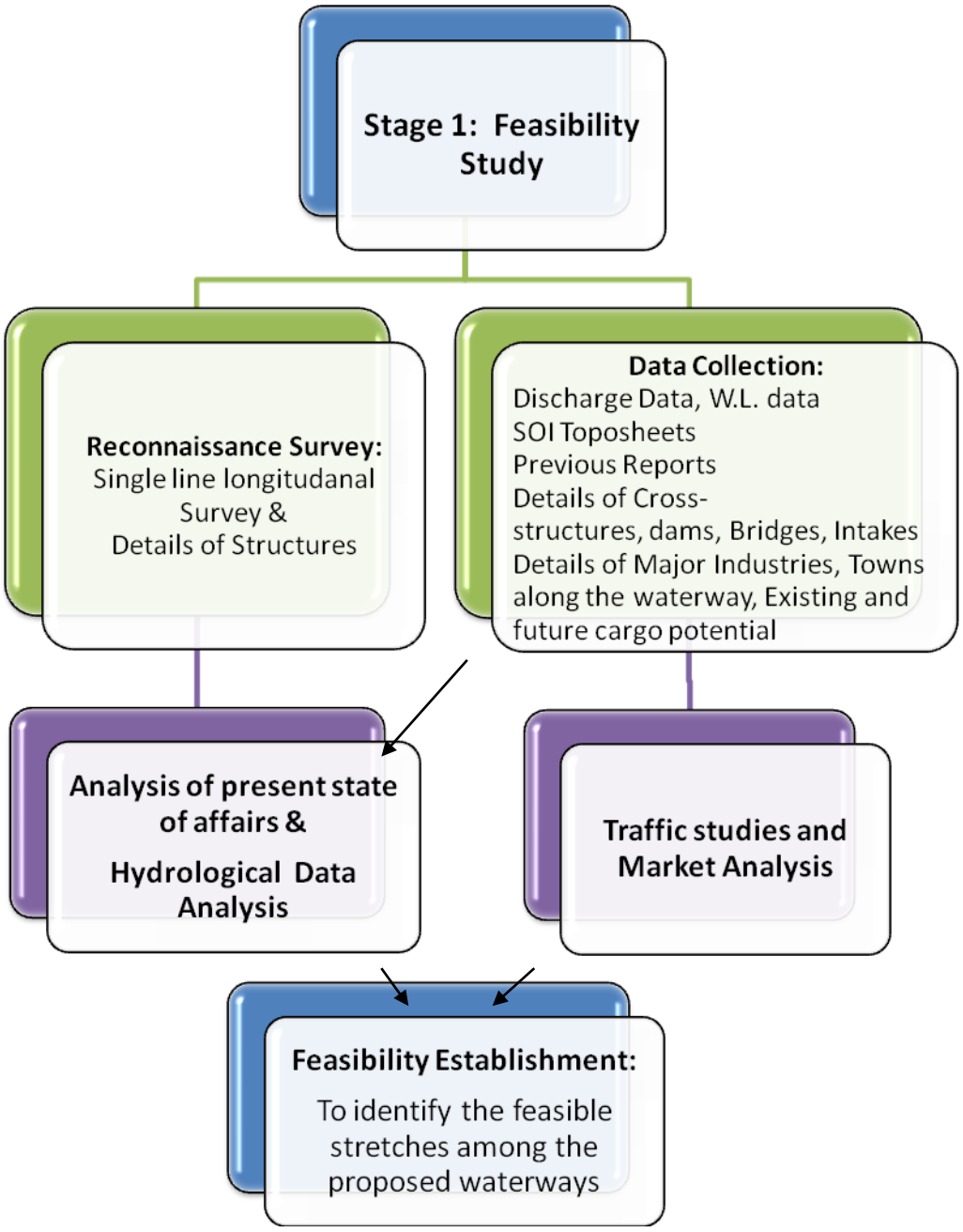


Figure 5: Feasibility Studies (Stage 1)

The detail methodology for reconnaissance survey, Hydrological data analysis and Traffic studies is given in their respective chapters. The feasibility of waterways is established after hydrological and traffic studies and analysis. Based on hydraulic conditions (depth, width, curvatures etc.) of the navigation channel, the class of the waterway are established in accordance with the classification notified by the Inland Waterways Authority of India (IWAI) vides Gazette Notification dated 26 January 2007. The same has been detailed below:

2.5.6 Classification of Waterways

In India, the inland waterways are classified into seven categories for rivers as well as canals by the Inland Waterways Authority of India (IWAI) vides Gazette Notification dated 26 January 2007 for safe passage of self-propelled vessels up to 2000 dead weight tonnage (DWT) and tug barge formation in push tow units of carrying capacity upto 8000 tonnes.

The classification of waterways is discussed below.

A. Classification of Inland waterways for Rivers

Table 5: Inland Waterway classification for Rivers

Class of Waterway	Rivers				
	Minimum Depth	Bottom Width	Bend Radius	Vertical Clearance	Horizontal Clearance
I.	1.2 m	30 m	300 m	4 m	30 m
II.	1.4 m	40 m	500 m	5 m	40 m
III.	1.7 m	50 m	700 m	7 m	50 m
IV.	2.0 m	50 m	800 m	10 m	50 m
V.	2.0 m	80 m	800 m	10 m	80 m
VI.	2.75 m	80 m	900 m	10 m	80 m
VII.	2.75 m	100 m	900 m	10 m	100 m

B. Classification of Inland waterways for Canals

Table 6: Inland Waterway classification for Canals

Class of Waterway	Canals				
	Minimum Depth	Bottom Width	Bend Radius	Vertical Clearance	Horizontal Clearance
I.	1.5 m	20 m	300 m	4 m	20 m
II.	1.8 m	30 m	500 m	5 m	30 m
III.	2.2 m	40 m	700 m	7 m	40 m
IV.	2.5 m	50 m	800 m	10 m	50 m
V.	-	-	-	-	-
VI.	3.50 m	60 m	900 m	10 m	60 m
VII.	-	-	-	-	-

The above classification for Rivers and Canals shall be effective if:

- Minimum depth of channel should be available for about 330 days in a year (about 90% days in a year).
- Vertical clearance at cross structures over the waterway should be available at least in central 75% portion of each of the spans in entire width of the waterway.

C. Vertical Clearance for Power Cables / Telephone Lines for all Classes

- Telephone lines and Low Voltage lines 16.5 m
- High Voltage Transmission lines not exceeding 110 KV – 19 m
- High Voltage Transmission lines exceeding 110 KV – 19 m + 1 cm per each KV

In case of underground pipe / power lines and other cables norms to be decided as per conditions and navigational requirement

D. Reference level for vertical clearance for different types of channels

- For rivers – over navigational HFL which is highest flood level at frequency of 5% in any year over a period of last 20 years
- HTL for tidal channels
- For channels design FSL

E. Type of vessels to be used in different class waterways

Table 7: Type of vessels to be used in different class of waterways

Class	Self-propelled vessel	Tug with barges
I.	Self-propelled, carrying capacity 100 DWT, Size (32m X 5m), Loaded draft 1m	1 Tug + 2 barges – 200 DWT, length 80m X breadth 5m , loaded draft 1m
II.	Self-propelled, carrying capacity 300 DWT, Size (45m X 8m), Loaded draft 1.2m	1 Tug + 2 barges – 600 DWT, length 110m X breadth 8m , loaded draft 1.2m
III.	Self-propelled, carrying capacity 500 DWT, Size (58m X 9m), Loaded draft 1.5m	1 Tug + 2 barges – 1000 DWT, length 141m X breadth 9m , loaded draft 1.5m
IV.	Self-propelled, carrying capacity 1000 DWT, Size (70m X 12m), Loaded draft 1.8m	1 Tug + 2 barges – 2000 DWT, length 170m X breadth 12m , loaded draft 1.8m
V.	Self-propelled, carrying capacity 1000 DWT, Size (70m X 12m), Loaded draft 1.8m	1 Tug + 2 barges – 2000 DWT, length 170m X breadth 24m , loaded draft 1.8m (moulded with 24 m)
VI.	Self-propelled, carrying capacity 2000 DWT, Size (86m X 14m), Loaded draft 2.5m	1 Tug + 2 barges – 4000 DWT, length 210m X breadth 14m , loaded draft 2.5m
VII.	Self-propelled, carrying capacity 4000 DWT, Size (86m X 14m), Loaded draft 2.9m	1 Tug + 4 barges – 8000 DWT, length 210m X breadth 28m , loaded draft 2.5m

All structures to be constructed across waterway classified should conform to respective requirement of vertical clearance and horizontal clearance. Before construction of any structure across the national waterway

WAPCOS has carried out hydrological studies to establish the feasibility of development of National Waterway 100 for Inland Navigation. In cases where minimum depth (of 1.2m as per Govt. of India notification) is not available round the year, the no. of days of availability and available depth is calculated and presented in chapter 4. The project authorities may review the waterway classification for navigation. The feasibility of these stretches may be established for some part of the year after detailed studies in stage 2 after the approval. Measures to improve the depth are also stressed upon.

3. Reconnaissance Survey and Analysis of present state of affairs

This chapter identifies the existing cross-structures viz. Dams, Weirs, Barrages, Locks, Bridges, Crossings, pipelines, cables, HT/LT line, in all the river stretches collected during the reconnaissance survey.

The reconnaissance survey of Tapi River was carried out in the months of April-May 2016. The reconnaissance survey report of Tapi River is attached as **Annexure 2**. The present status on river cross-structures is given below:

3.1 Existing Dams, Weir, Barrage, Anicuts and Locks

There is no navigational lock on any of existing Dams/ Barrage in the river stretch under present studies.

Table 8: Dam, Weir, Barrage, Anicut and Locks in Tapi River

Sl No	Structure Name	Chainage (km)	Location	Position			
				Latitude (N)	Longitude (E)	Easting (m)	Northing (m)
1	SHINGANPUR WEIR	35 km	Ramnagar	21º 13' 8.07 "N	72º 48' 14.86"E		
2	KAKRAPAR DAM	112.4	Kanja	21º 16' 10.23"N	73º 21' 51.62"E	330298	2352854
3	UKAI DAM	136.7	Ukai	21º 14' 57.22"N	73º 35' 26.80"E	353775	2350383
4	PRAKASHA DAM (27 GATES)	231.2	PRAKASHA VILLAGE	21º 30' 47.12"N	74º 20' 45.30"E	432256	2379076
5	BEFORE SARANKHEDA DAM(BARRAGE) 26 GATES	256.0	SARANKHEDDA VILLAGE	21º 25' 37.20"N	74º 31' 53.92"E	451463	2369479
6	SULVADE BARRAGE (DAM) BEFORE 200M WITH 27 GATES	294.9	-	21º 18' 12.32"N	74º 47' 55.15"E	479116	2355742
7	UNDER CONSTRUCTED BARRAGE POINTS TAKEN 100M BEFORE BARRAGE	323.2	Padalsare(Lower Tapi),Piloda	21º 11' 19.02"N	75º 00' 00.06"E	500002	2343023
8	UNDER CONSTRUCTED BARRAGE , LOCALLY CALLED	323.4	-	21º 11' 14.68"N	75º 00' 03.65"E	500105	2342889

Sl No	Structure Name	Chainage (km)	Location	Position			
				Latitude (N)	Longitude (E)	Easting (m)	Northing (m)
	AS PALSERA DAM						
9	SHELGAON BARRAGE	407.6	BHUSAWAL, JALGAON	21º 05' 41.92"N	75º 41' 19.71"E	571543	2332814
10	SMALL CEMENTED (CHECK DAM)	413.6	BHUSAWAL	21º 04' 46.12"N	75º 44' 25.58"E	576914	2331123
11	SMALL CEMENTED (CHECK DAM)	416.1	-	21º 04' 28.23"N	75º 45' 40.99"E	579093	2330583
12	SMALL CEMENTED (CHECK DAM)	418.18	Aklud	21º 04' 06.62"N	75º 46' 45.73"E	580964	2329928
13	SMALL CEMENTED (CHECK DAM)	419.4	-	21º 03' 49.33"N	75º 47' 25.53"E	582115	2329401
14	SMALL CEMENTED (CHECK DAM)	420.1	-	21º 03' 42.81"N	75º 47' 49.69"E	582814	2329204
15	SMALL CEMENTED (CHECK DAM)	425.5	Sudgaon	21º 03' 41.65"N	75º 50' 48.40"E	587971	2329195
16	HATNUR DAM WITH 41 GATES	436.2	HATNUR, VARANGAON	21º 04' 12.55"N	75º 56' 46.58"E	598302	2330203

3.2 Existing Bridges and Crossing Over River

Table 9: Existing Bridges and Crossing Over Tapi River

Sl No	Structure Name	Chainage (km)	Location	Position				Vertical clearance above H.F.L.* (m)	Horizontal Clearance (m)	Span No
				Latitude (N)	Longitude (E)	Easting (m)	Northing (m)			
1	MAGDALLA HAZIRA BRIDGE (SH-168)	21.8	Magdalla	21º 08' 42.86"N	72º 44' 45.24"E	265916	2339884	0	40	18
2	KEBAL BRIDGE, UNDER CONSTRUCTION	28.6	Ambika Niketan	21º 10' 54.27"N	72º 47' 45.54"E	271175	2343852	-	-	-
3	SARDAR BRIDGE(NH-6)	30.1	Navdi Bandar	21º 11' 18.47"N	72º 48' 29.78"E	272462	2344579	0	40	11
4	VIVEKANAND BRIDGE	30.9	Navdi Bandar	21º 11' 37.27"N	72º 48' 51.47"E	273096	2345149	0	40	17
5	NEHRU BRIDGE	31.4	Navdi Bandar	21º 11' 48.95"N	72º 48' 59.05"E	273319	2345505	0	35	13
6	FULWARI BRIDGE UNDER	32.4	Variyavi Bhagol	21º 12' 23.57"N	72º 49' 03.79"E	273471	2346568	-	-	-
7	JAHANGIRPURA-DABHOLI BRIDGE	36.4	Salimabad Society	21º 13' 55.81"N	72º 47' 35.30"E	270958	2349441	7	15	29
8	AMROLI BRIDGE	44.6	GIDC	21º 14' 04.50"N	72º 50' 35.78"E	276166	2349636	0	10	11
10	RAILWAY BRIDGE	45.6	GIDC	21º 13' 39.04"N	72º 50' 00.12"E	275128	2348867	1	40	8

Sl No	Structure Name	Chainage (km)	Location	Position		Easting (m)	Northing (m)	Vertical clearance above H.F.L.* (m)	Horizontal Clearance (m)	Span No
				Latitude (N)	Longitude (E)					
11	KAPODARA- UTRAN BRIDGE	47.8	Krishna Estate	21º 13' 22.67"N	72º 51' 58.81"E	278544	2348317	2	50	9
12	WATER PIPE LINE BRIDGE : 2	48.9 to 50.5	Junu Salthana Gam	BRIDGE:1- 21º 14' 26.56"N, 72º 54' 00.60"E BRIDGE:2- 21º 14' 37.40"N, 72º 54' 13.18"E		282083 282449	2350235 2350564	0.5	25	10
13	KAMREJ BRIDGE (NH-8)	58.5	Kholvad	21º 16' 56.13"N	72º 57' 03.32"E	287411	2354767	5	25	10 / 7
14	BODHAN BRIDGE (SH-165)	78	Bodhan	21º 16' 57.37"N	73º 05' 02.49"E	301225	2354631	4.5	25	12
15	UMARSADI HARIPURA BRIDGE	91.9	-	21º 13' 10.74"N	73º 12' 16.95"E	313669	2347514	0	10	33
16	VARJAKHAN BRIDGE(SH-5)	102.0	Khedpur	21º 15' 11.28"N	73º 17' 20.77"E	322470	2351124	18	30	14
17	MANDAVI BRIDGE(U/C)	103.6	Mandvi	21º 14' 44.41"N	73º 18' 05.05"E	323738	2350284	14	25	-
18	UKAI LIMBI BRIDGE(SH-174)	134.1	Limbi	21º 15' 38.26"N	73º 33' 58.75"E	351248	2351668	16.5	25	6
19	KAVTHA BRIDGE (SH-198)	204.6	-	21º 30' 28.50"N	74º 07' 27.84"E	409309	2378616	2	30	8
20	HATODA BRIDGE UNDER CONSTRUCTION	215.3	Hatoda	21º 31' 35.92"N	74º 12' 33.10"E	418102	2380642	10	45	-

Sl No	Structure Name	Chainage (km)	Location	Position				Vertical clearance above H.F.L.* (m)	Horizontal Clearance (m)	Span No
				Latitude (N)	Longitude (E)	Easting (m)	Northing (m)			
21	PRAKASHA BRIDGE (SH-5)	230.8	PRAKASHA	21º 30' 42.12"N	74º 20' 30.17"E	431819	2378924	19	20	37
22	SARANKHEDA BRIDGE (SH-1)	255.9	Takarkheda	21º 25' 36.49"N	74º 31' 47.19"E	451270	2369457	2	30	9
23	GIDHADE BRIDGE (SH-11)	297.0	Gidhade	21º 17' 24.80"N	74º 48' 55.01"E	480840	2354279	1	8	26
24	MUMBAI-AGRA HIGHWAY BRIDGE (RIGHT -LEFT) (NH-3)	300.7	Babulde	21º 16' 48.97"N	74º 50' 51.50"E	484195	2353174	18	30	11
25	MUMBAI-AGRA HIGHWAY BRIDGE (LEFT - RIGHT) (NH-3)	300.7	Babulde	21º 16' 49.04"N	74º 50' 52.69"E	484229	2353176	10	15	24
26	BUDHGAON BRIDGE	339.7	Gangapuri	21º 10' 10.23"N,	75º 08' 43.69"E	515101	2340915	5	25	12
27	NIMGAVAN BRIDGE(SH-51)	351.5	NIMGAVAN VILLAGE	21º 08' 58.12"N	75º 13' 37.92"E	523589	2338708	11	25	7
28	WOODEN BRIDGE	370.1	JALGAON, CHOPDA	21º 10' 20.74"N	75º 22' 45.19"E	539367	2341278	0	2	12
29	Jalgaon BRIDGE (SH-186)	388.5	JALGAON, CHOPDA	21º 08' 39.46"N,	75º 32' 21.33"E	555991	2338212	11	75	2
30	UNDER CONSTRUCTION	407.6	NEAR SELGAON	21º 05' 41.92"N,	75º 41' 19.71"E	571543	2332814	-	20	18

Sl No	Structure Name	Chainage (km)	Location	Position				Vertical clearance above H.F.L.* (m)	Horizontal Clearance (m)	Span No
				Latitude (N)	Longitude (E)	Easting (m)	Northing (m)			
31	BHUSAWAL BRIDGE(SH-187)	418.5	BHUSAWAL	21º 04' 03.84"N	75º 46' 58.50"E	581333	2329843	11	20	27
32	RAILWAY BRIDGE (THIN & THICK PILLARS MIXED)	423.9	BHUSAWAL	21º 03' 38.51"N	75º 49' 55.46"E	586443	2329091	9	10/20	29
33	HATNUR BRIDGE	435.4	HATNUR, VARANGAON	21º 04' 22.16"N,	75º 56' 18.46"E	597489	2330494	2	15	18
34	SMALL BROKEN BRIDGE	435.6	HATNUR , VARANGAON	21º 04' 19.32"N,	75º 56' 23.33"E	597630	2330407	0	4	22

Note: Unless specified, consider all bridges as road bridges.

* H.F.L. for tidal reach is adopted as MHWS from ATT- Vol 3 and for non- tidal reach; HFL is computed using the last twenty year CWC data for the various gauge site. The value of H.F.L. is computed in table no 39 para 4.19. Vertical clearance is measured visually.

3.3 Details of High Tension and Electric Lines

Table 10: HT and Electric Lines over Tapi River

Sl No	Structure Name	Chainage (km)	Location	Position (Above survey track)				Vertical clearance above H.F.L.*	Horizontal Clearance (m)
				Latitude (N)	Longitude (E)	Easting (m)	Northing (m)		
1	HT LINE	12.7	GSEG Colony	21º 09' 01.94"N	72º 39' 55.19"E	257555	2340591	41	900
2	HT LINE	47.8	Krishna Estate	21º 13' 20.96"N	72 º 52' 09.8"E	278860	2348260	13.5	250
3	HT LINE	79.8	Kudashi	21º 16' 13.67"N	73º 07' 07.45"E	304811	2353243	11	250

Sl No	Structure Name	Chainage (km)	Location	Position (Above survey track)				Vertical clearance above H.F.L.*	Horizontal Clearance (m)
				Latitude (N)	Longitude (E)	Easting (m)	Northing (m)		
4	HT LINE	79.8	Kudashi	21º 16' 17.68"N	73º 07' 00.55"E	304613	2353370	11	500
5	HT LINE	80.0	Kudashi	21º 16' 11.28"N	73º 07' 03.97"E	304710	2353172	13.5	500
6	HT LINE	101.9	-	21º 15' 06.69"N	73º 17' 16.76"E	322353	2350984	8	350
7	HT LINE	108.3	-	21º 15' 24.46"N	73º 20' 25.53"E	327802	2351472	12	500
8	HT LINE	114.6	-	21º 16' 20.35"N	73º 23' 04.44"E	332400	2353144	18	500
9	HT LINE	115.0	-	21º 16' 24.51"N	73º 23' 17.82"E	332787	2353268	22	500
10	HT LINE	123.5	Junai	21º 15' 58.98"N	73º 27' 58.67"E	340875	2352402	17	500
11	HT LINE	129.0	Bori Savar	21º 16' 21.24"N	73º 31' 06.59"E	346298	2353035	17	400
12	HT LINE	127.9	-	21º 16' 19.01"N	73º 30' 27.06"E	345158	2352977	16	400
13	HT LINE	134.3	-	21º 15' 36.18"N	73º 34' 07.53"E	351501	2351601	17	450
14	HT LINE	204.1	-	21º 30' 23.78"N	74º 07' 10.63"E	408813	2378474	10	400
15	HT LINE	204.3	-	21º 30' 24.91"N	74º 07' 17.11"E	408999	2378507	12	400
16	HT LINE	204.4	-	21º 30' 26.25"N	74º 07' 23.48."E	409183	2378547	12	400
17	HT LINE	210.7	-	21º 30' 29.23"N	74º 07' 33.83"E	409481	2378637	16	400
18	HT LINE	220.9	Kothli Budrak	21º 31' 04.69"N	74º 10' 25.86"E	414437	2379701	5	450
19	HT LINE	233.1	Korit	21º 30' 05.73"N	74º 21' 33.59"E	433640	2377798	22	900
20	HT LINE	244.3	Shelty	21º 26' 31.30"N	74º 25' 34.11"E	440536	2371178	14	900
21	HT LINE	256.0	Takarkheda	21º 25' 36.29"N	74º 31' 52.06"E	451410	2369451	8	650
22	BASKET CABLE CROSSING OVER	256.2	Takarkheda	21º 25' 33.86"N	74º 32' 00.76"E	451660	2369375	13	600

Sl No	Structure Name	Chainage (km)	Location	Position (Above survey track)				Vertical clearance above H.F.L.*	Horizontal Clearance (m)
				Latitude (N)	Longitude (E)	Easting (m)	Northing (m)		
23	HT LINE	257.1	-	21º 25' 21.46"N	74º 32' 22.62"E	452289	2368992	10	600
24	HT LINE	277.0	Ranjane	21º 22' 59.82"N	74º 42' 10.59"E	469206	2364596	3	500
25	BASKET CABLE CROSSING OVER	296.7	Gidhade	21º 17' 31.75"N	74º 48' 47.48"E	480623	2354493	6	600
26	HT LINE	298.3	Patharde	21º 17' 01.01"N	74º 49' 29.41"E	481830	2353546	0.5	600
27	HT LINE CROSSING ON NORTH	300.7	-	21º 16' 48.83"N	74º 50' 53.75"E	484259	2353170	5	600
28	HT LINE CROSSING ON NORTH	303.0	Kurkhedi	21º 16' 50.28"N	74º 52' 13.36"E	486554	2353212	9	700
29	HT LINE CROSSING ABOVE RIVER	329.6	Vadhoda	21º 10' 50.10"N	75º 03' 23.76"E	505875	2342134	3	600
30	ELECTRIC LINE / NO POLE IN RIVER	339.7	Chopda	21º 10' 12.07"N	75º 08' 42.35"E	515063	2340971	0	200
31	HT LINE	350.6	-	21º 09' 00.64"N	75º 13' 24.45"E	523201	2338785	23	400
32	HT LINE	350.7	-	21º 08' 59.67"N	75º 13' 29.46"E	523345	2338755	13	300

Sl No	Structure Name	Chainage (km)	Location	Position (Above survey track)				Vertical clearance above H.F.L.*	Horizontal Clearance (m)
				Latitude (N)	Longitude (E)	Easting (m)	Northing (m)		
33	ELECTRIC LINE / NO POLE IN RIVER	369.7	Jalgaon, chopda	21º 10' 22.47"N	75º 22' 32.51"E	539001	2341330	0.5	200
34	HT LINE , NO POLES IN RIVER	390.3	Jalgaon	21º 08' 13.05"N	75º 33' 14.25"E	557520	2337406	4	200

* H.F.L. for tidal reach is adopted as MHWS from ATT- Vol 3 and for non- tidal reach; HFL is computed using the last twenty year CWC data for the various gauge site. The value of H.F.L. is computed in table no 39 para 4.19. Vertical clearance is measured visually.

3.4 Pipelines and cables

Table 11: Existing Bridges and Crossing Over Tapi River

Sl No	Structure Name	Chainage (km)	Location	Position (Along survey track) WGS84 Datum; UTM Projection: Zone 43 N Latitude [N] Longitude [E]	Easting (m)	Northing (m)	Vertical clearance above H.F.L.*	Horizontal Clearance (m)	Span Nos.
1	WATER PIPE LINE BRIDGE : 2	48.9 to 50.5	Junu Salthana Gam	BRIDGE:1- 21º 14' 26.56"N, 72º 54' 00.60"E BRIDGE:2- 21º 14' 37.40"N, 72º 54' 13.18"E	282083 282449	2350235 2350564	0	25	10

* H.F.L. is computed using the last twenty year CWC data (collected 1972-2015) for the various gauge site. The value of H.F.L. is computed in table no 39 para 4.19. Vertical clearance is measured visually.

3.5 Hindrances during conducting the reconnaissance survey

Not approachable due to weeds in river for river stretch at chainage 46km to 50km. Rocky strata was observed at CH-70 to CH-100, CH-130 to CH-140, CH-230 to CH-240, CH-340 to CH-350, CH-400 to CH-420 and CH-430 to CH-436 while carrying out the reconnaissance survey.

3.6 Encroachment to the waterway

There is no encroachment in the waterway in the reach under consideration in this study.

3.7 Details of Protected Area, Wildlife, Defence

There are two Wildlife Sanctuaries namely Melghat Tiger Reserve and Yaval in Amravati and Jalgaon districts respectively in the river basin.

3.8 NH/SH/MDR along and/or in Vicinity

Thirty Four (34) road and rail bridges cross Tapi River in its 436 km long stretch. The national highway NH 8, NH 6, and NH 3 crosses Tapi River in this stretch. The state highways crossing over Tapi in 436 km stretch are SH 6, SH 168, SH 5, SH 174, SH 1, SH 11, SH 14, SH 14, SH 186,SH 187 and SH-198.

3.9 Railway Line and stations in the vicinity

The main railway stations present along the river are Surat, Bhusaval, Utran, and Kosad Railway station.

3.10 Geologically Sensitive Areas

During reconnaissance survey, Rocky strata was observed while carrying out the reconnaissance survey for CH-70 to CH-100, CH-130 to CH-140, CH-230 to CH-240, CH-340 to CH-350, CH-400 to CH-420 and CH-430 to CH-436. However this will be critically identified in stage 2.

3.11 Critical Areas requiring detail investigations

Detailed investigations shall be required at proposed ferry locations nearby temples, existing boating points and ghats.

4 Reconnaissance Survey

This chapter gives the stretch wise description of entire river stretches and presents the observed water level during survey. This chapter also covers the Hydrological analysis of the collected data viz. Minimum and maximum water levels, discharges, average 10 daily discharges, change in cross-section over the years and establishment of sounding datum in river. The route map of Tapi River is given below:

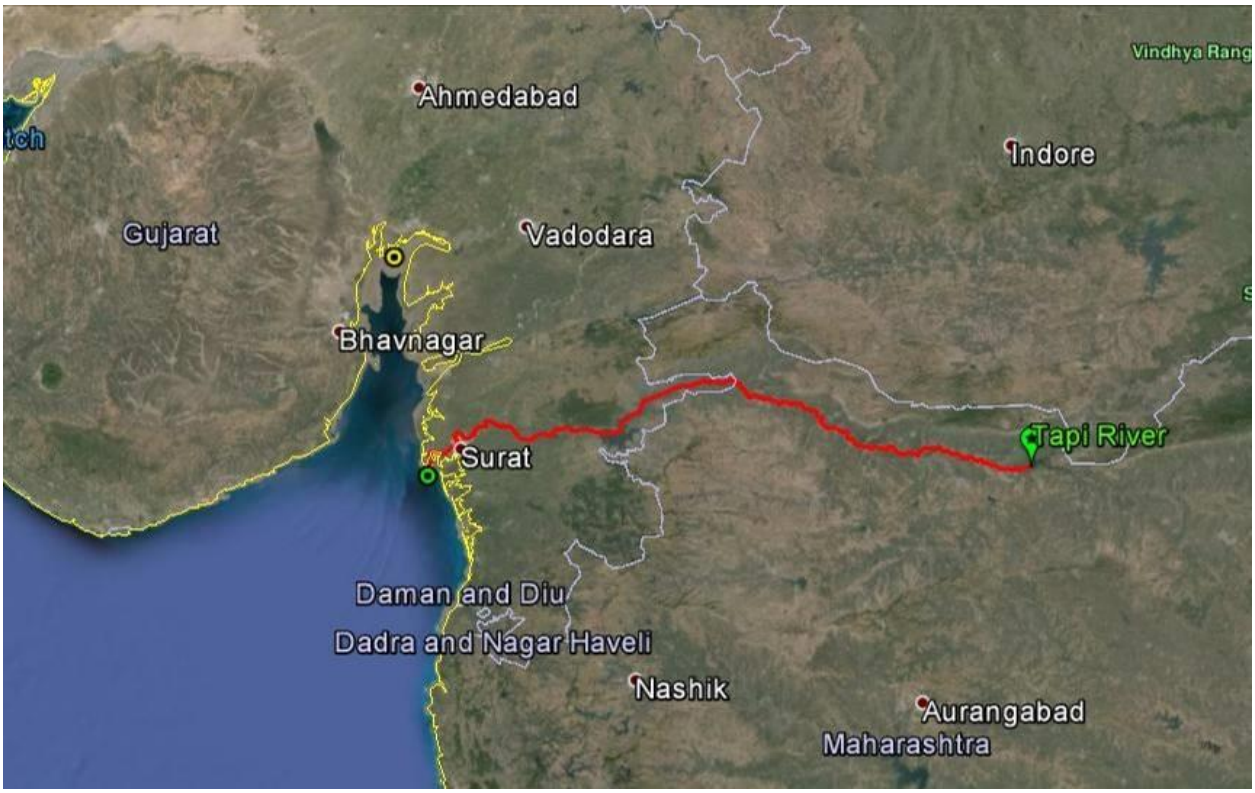


Figure 6 Route map of Tapi River

4.1 Resources, Equipment used and Methodology adopted

4.1.1 Resources & Equipment used

Table 12: Survey Personnel

Personnel Name	Function
Santosh Upadhay	Surveyor , Fugro Limited
Santosh Nag	Surveyor , Fugro Limited
Chetan Lohabare	Engineer, Fugro Limited

Following equipment and systems were mobilised for the data acquisition.

Table 13: Equipments for data acquisition

Equipment / System	Description / Make / Model/Resolution /Accuracy
Software / Navigation	Starfix.Seis V. 10.1 PC based data acquisition and survey vessel navigation package and accessories
Positioning	12 Channel Single frequency (L1 & L2) DGPS System and accessories
Echo Sounder	ODOM Hydrotrac single Frequency Echo sounder, 210KHz Transducer and accessories
Soil sample collection	Grab Sampler with accessories
Laser Distometer	

Survey Vessel

Locally hired boat 'Tapi Darshan', 'Sawarda', and 'Turkhedda were used for carrying out the bathymetry survey.

4.1.2 Detailed Methodology adopted for survey

a) Specifications for survey: Survey Geodesy

The survey was conducted in WGS84 datum; UTM Projection (Zone 43 N, CM 075°). The geodetic parameters used during the survey are as follows:

Table 14: Global Positioning System Geodetic Parameters

Global Positioning System Geodetic Parameters	
Datum:	World Geodetic System 1984
Spheroid:	World Geodetic System 1984
Semi major axis:	a = 6 378 137.000 m
Inverse Flattening:	1/f = 298.257 223 563
Map Projection:	Universal Transverse Mercator
Grid System:	UTM Zone 43 N;
Central Meridian:	075° 00' 00" East
Latitude of Origin:	0° 00' 00" North
False Easting:	500 000 m
False Northing:	0 m
Scale factor on Central Meridian:	0.9996
Units:	Meter

b) Field Calibrations & Verifications

All survey equipment's used for the survey were calibrated and bench tested prior to their mobilization for this task. After installation on the survey vessel, field verification and tests were carried out as per standard survey methods. On completion of successful

Mobilization, Calibration, Verification and Testing of all equipment as per the relevant work practices, the survey task was commenced.

c) *DGPS Calibrations*

In order to ensure the integrity of the horizontal control of survey the DGPS system was bench checked against a known point, prior to mobilization to site, at workshop and found to be satisfactory.

d) *Single Beam Echo Sounder (SBES)*

Odom Hydrotrac single frequency (210 kHz) echo sounder was used for measuring water depths. The echo sounder system was bench calibrated at FSINPVT workshop prior to mobilization for the survey. The echo sounder transducer was side mounted on the survey vessel and its draft below the water-line was measured and recorded. Thereafter, the echo-sounder was calibrated by the standard bar-check method at site, prior to deployment on the survey job. The echo sounder system was interfaced with the Starfix.Seis navigation and survey system for navigation and data logging.

e) *Data Acquisition & Survey Run-Line Logs*

The Navigation and depth data from the Starfix.HP DGPS was logged continuously and monitored using the Starfix.Seis navigation suite. A survey run-line log book was maintained where the quality of data was noted. Details such as horizontal and vertical clearances above high flood level of bridges, aqueducts, electric lines, telephone lines, pipe lines, cables enroute were assessed on the spot and recorded, and their coordinates and location were plotted on the chart and included in the report. Photographs of important structures along the route are included as part of this report.

f) *Soil Sampling and Visual Analysis*

Soil samples were collected from the river bed along the surveyed route at about 10 km intervals, and the nature and texture of the samples collected were visually analyzed and reported.

g) *On-line QC of Data Logged*

Real Time Graphs and QC Plots as provided by the Starfix survey software suite were used by experienced surveyors to monitor and control the quality of sensor data on-line, before they are logged. Time stamping on all the data was done by means of Starfix Timing Module through Navigation network synchronized with the GPS (high precision) 1PPS time signal. The data / record obtained from each survey sensor such as Navigation, Heading, SBES and Motion Sensor etc. were quality checked and an extract of the same were made available for verification and confirmation to proceed further.

h) *Survey of Data Processing and interpretation methods*

The survey data was logged in Binary Format (BF), and proc essed using the Starfix.Proc software. Heading, motion and position data were processed and checked to ensure good data quality.

The measured offsets for all survey sensors was entered into the navigation system and processed using Starfix.Proc to enable track charts was plotted and 'corrected' navigation files was integrated with other sensor data at a later stage. These included:

- GPS position absolute of the primary & secondary positioning systems.

- Common Reference Point.
- Single beam echo sounder.

i) Bathymetry Data Analysis and Presentation

Starfix Proc and Starfix Workbench were used to import and process the navigation, bathymetry, tides and sound velocity data. The data was filtered, cleaned, and combined to create geographically positioned bathymetric data set that has been corrected for tides and sound speed.

j) Equipment Layout Diagram

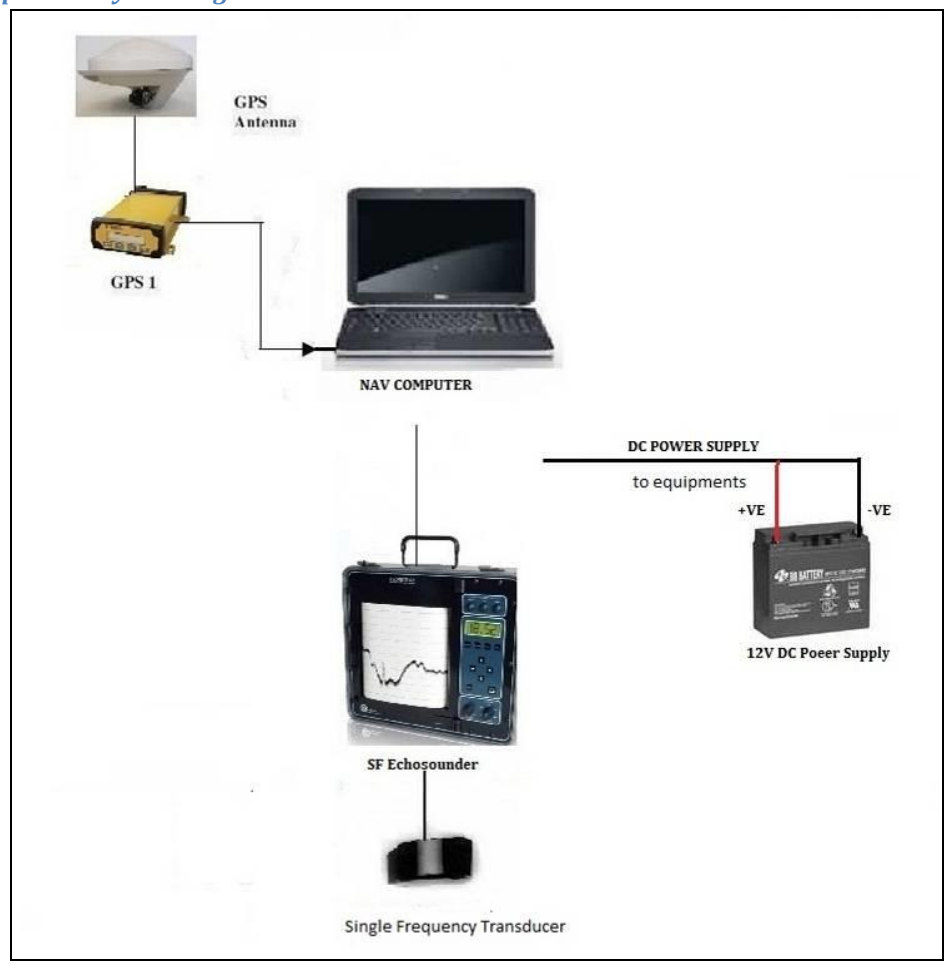


Figure 7: Equipment layout diagram

4.2 Description of bench marks (B.M.)/ authentic reference level used

One GTS bench mark and two CWC Musto type bench marks were successfully recovered, and two TBMs were established along the river stretch at the below mentioned locations. All the heights of the riverbed in this report are referenced to these GTS BM/MTBM/TBMs for obtaining their height above the MSL.

Table 15: Details of Bench Marks used for obtaining the height of riverbed above the MSL

Sr. No.	Location	Type of BM	Latitude (N)	Longitude (E)	Height above MSL (m)	Used for River stretch Chainage
1	Ukai	GTSBM	21° 14' 12.19''	73° 35' 27.71''	114.022	**76.82 to 197.91**
2	Sanrangkheda	TBM	21° 25' 42.97''	74° 31' 58.61''	128.37	**198.51 to 312.85**
3	Palsod	MTBM	21° 08' 36.04''	75° 20' 04.87''	165.9448	**313.05 to 390.39**
4	Bhusawal	MTBM	21° 03' 54.35''	75° 46' 55.31''	189.521	**391.40 to 427.74**
5	Hatnur	TBM	21° 04' 02.99''	75° 56' 50.12''	215.71	**428.17 to 436.04**

Fugro Survey (India) Pvt. Ltd. D-222/30, TTC Industrial Area, MIDC, Nerul, Navi Mumbai Pin - 400 075 (India)	Reccee report on Geodetic Station/Bench Mark		
	Job No. :	J-MAR-16-029	Station Name/ID:
	Client :	WAPCOS	
	Location :	Ukai Dam,Ukai , Gujrat	GTS BM
	Recovered By:	Santosh Upadhyay (FSINPVT Surveyor)	
	Date of Reccee:	16 April 2016	

Brief Narrative on the Recovery of the Station

Source of Station Description Data	:-	Ukai Dam Engineer
Describe the Approach to the Station	:-	The BM is situated on South East of Ukai Dam about 3.5KM from Ukai Dam.BM is 15 m away from Water Tank towards East.The BM can be accessed from Gate No.1 & 2.MB has cement base with a cemented piller of height of 49cm.
Was the station recovered successfully?	:-	Yes
How were the Coordinates verified?	:-	Not Verified

Final Coordinates in WGS84 Datum

GEOGRAPHICAL COORDINATES:			UTM COORDINATES:	Zone No: 43	CM: 75° E	
LATITUDE :	21.23672	N	EASTING:	353788.6	m	σ = +/- 0.xx m
LONGITUDE :	73.59103	E	NORTHING:	2348997.732	m	σ = +/- 0.xx m
ELLIPSOIDAL HEIGHT :	50.682	m	CONVERGENCE :	NA	Degrees	
			Ht above Local MSL:	114.022m	m	

LOCATION & ACCESS :	The BM is situated on the cement floor with emanted Piller of Height 49cm.The BM can be access from gate no.1 & 2 .
STATION MARKING :	The letters BM are etched on the cemented flooring and emanted Piller of Height 49cm.(see photographs below).

Expected durability of the Station (in Years) : 20 years

DETAILED DIAGRAM :

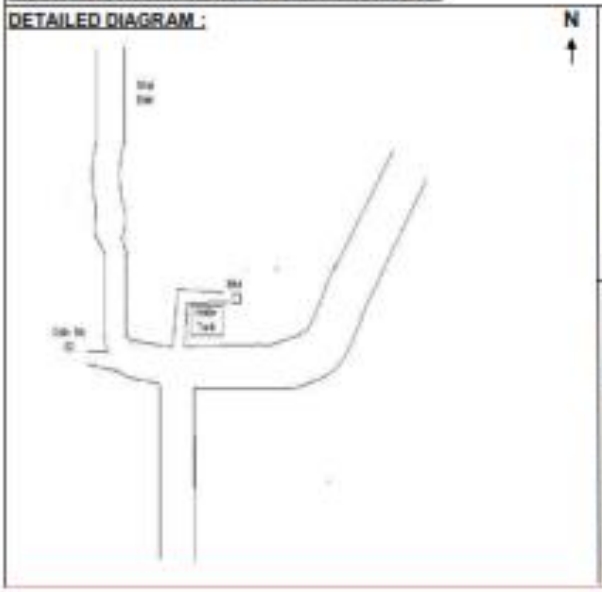


Figure 8 Benchmark details GTS BM at Ukai Dam

Fugro Survey (India) Pvt. Ltd. D-222/30, TTC Industrial Area, MIDC, Nerul, Navi Mumbai Pin - 400 075 (India)	Reccee report on Geodetic Station/Bench Mark		
	Job No. :	J-MAR-16-029	Station Name/ID:
	Client :	WAPCOS	
	Location :	Sarangkheda Barrage, Maharashtra	TBM
	Recovered By:	Chetan K Lohabare (FSINPVT Engineer)	
	Date of Reccee:	28 May 2016	

Brief Narrative on the Recovery of the Station

Source of Station Description Data	:-	CWC Bhusawal Office
Describe the Approach to the Station	:-	
Was the station recovered successfully?	:-	Yes
How were the Coordinates verified?	:-	

Final Coordinates in WGS84 Datum

GEOGRAPHICAL COORDINATES:			UTM COORDINATES:	Zone No: 43	CM: 75° E
LATITUDE :	21.42860318	N	EASTING:		m ± +/- 0.xx m
LONGITUDE :	74.53294767	E	NORTHING:		m ± +/- 0.xx m
ELLIPSOIDAL HEIGHT :	69.876	m	CONVERGENCE :	NA	Degrees
			Ht above Local MSL:	131.9844	m

LOCATION & ACCESS :	
STATION MARKING :	

Expected durability of the Station (in Years) : 20 years

DETAILED DIAGRAM :

Figure 9 Benchmark details TBM at Sarangkheda Barrage

Fugro Survey (India) Pvt. Ltd. D-222/30, TTC Industrial Area, MIDC, Nerul, Navi Mumbai Pin - 400 075 (India)	Reccee report on Geodetic Station/Bench Mark		
	Job No. :	J-MAR-16-029	Station Name/ID:
	Client :	WAPCOS	
	Location :	Palsod, Maharashtra	CWC MTBM
	Recovered By:	Santosh Kumar Nag (FSINPVT Surveyor)	
	Date of Reccee:	14 May 2016	

Brief Narrative on the Recovery of the Station

Source of Station Description Data	:-	CWC Bhusawal Office
Describe the Approach to the Station	:-	The MTBM is situated on the South bank of the Tapi river approx 1 km North of Palsod village. It can be approached from the Kathore village (on North bank) and then after crossing the river to reach South bank, 1 Km South East of Kathore village. It is situated exactly on the South bank on a hilly bank.
Was the station recovered successfully?	:-	Yes
How were the Coordinates verified?	:-	Verified with that of provided by CWC Bhusawal office.

Final Coordinates in WGS84 Datum

GEOGRAPHICAL COORDINATES:			UTM COORDINATES:	Zone No: 43	CM: 75° E	
LATITUDE :	21°08'36"03992	N	EASTING:	534750.397	m	± +/- 0.xx m
LONGITUDE :	75°20'04.87130	E	NORTHING:	2338048.702	m	± +/- 0.xx m
ELLIPSOIDAL HEIGHT :	102.6628	m	CONVERGENCE :	NA	Degrees	
			Ht above Local MSL:	165.9438	m	

LOCATION & ACCESS :	The BM is situated on the stone, surrounded by a cementry structure of square shape on the South bank of the Tapi river, near Palsod village.
STATION MARKING :	The BM is engraved 'MTBM, 4/3/11' on the cementry wall.

Expected durability of the Station (in Years) : 20 years

DETAILED DIAGRAM :

Figure 10 Benchmark details CWC MTBM at Palsod

Fugro Survey (India) Pvt. Ltd. D-222/30, TTC Industrial Area, MIDC, Nerul, Navi Mumbai Pin - 400 075 (India)	Reccee report on Geodetic Station/Bench Mark		
	Job No. :	J-MAR-16-029	Station Name/ID:
	Client :	WAPCOS	
	Location :	Bhusaval Junction, Maharashtra	CWC MTBM
	Recovered By:	Chetan K Loahabare (FSINPVT Engineer)	
	Date of Reccee:	12 May 2016	

Brief Narrative on the Recovery of the Station

Source of Station Description Data	:-	CWC Bhusawal Office
Describe the Approach to the Station	:-	The MTBM is situated on the South bank of the Tapi river approx 20M West of Bhusaval Bridge (Raver road).
Was the station recovered successfully?	:-	Yes
How were the Coordinates verified?	:-	Verified with that of provided by CWC Bhusawal office.

Final Coordinates in WGS84 Datum

GEOGRAPHICAL COORDINATES:			UTM COORDINATES:	Zone No: 43	CM: 75° E	
LATITUDE :	21.06510791	N	EASTING:	581241.96	m	σ = +/- 0.xx m
LONGITUDE :	75.78202931	E	NORTHING:	2329552.62	m	σ = +/- 0.xx m
ELLIPSOIDAL HEIGHT :	127.018	m	CONVERGENCE :	NA	Degrees	
			Ht above Local MSL:	189.521	m	

LOCATION & ACCESS :	The BM is situated on the stone, surrounded by a cementry structure of square shape on the South bank of the Tapi river, near Bhusaval Bridge.
STATION MARKING :	The BM is engraved 'MTBM, 14/3/2011' on the cement wall.

Expected durability of the Station (in Years) : 20 years

DETAILED DIAGRAM :

Figure 11 Benchmark details CWC MTBM at Bhusaval Junction

Fugro Survey (India) Pvt. Ltd. D-222/30, TTC Industrial Area, MIDC, Nerul, Navi Mumbai Pin - 400 075 (India)	Reccee report on Geodetic Station/Bench Mark		
	Job No. :	J-MAR-16-029	Station Name/ID:
	Client :	WAPCOS	
	Location :	Hatnur DAM, Maharashtra	TBM
	Recovered By:	Chetan K Lohabare (FSI/PVT Engineer)	
	Date of Reccee:	11 May 2016	

Brief Narrative on the Recovery of the Station

Source of Station Description Data	:-	Flood Control wireless office Hatnur Dam
Describe the Approach to the Station	:-	The TBM is situated in the premises of irrigation department at 1.7m of South East corner of flood control office in the same premises, adjacent to wireless tower.
Was the station recovered successfully?	:-	Yes
How were the Coordinates verified?	:-	Coordinates is provided by flood control office.

Final Coordinates in WGS84 Datum

GEOGRAPHICAL COORDINATES:			UTM COORDINATES:	Zone No: 43	CM: 75° E	
LATITUDE :	21.06749763	N	EASTING:		m	σ = +/- 0.xx m
LONGITUDE :	75.94725662	E	NORTHING:		m	σ = +/- 0.xx m
ELLIPSOIDAL HEIGHT :	183.731	m	CONVERGENCE :	NA	Degrees	
			Ht above Local MSL:	215.71	m	

LOCATION & ACCESS :	The BM is situated on the stone with square metal sheet, surrounded by a cementry structure of square shape on the South bank of the Tapi river, near Bhusaval Bridge.
STATION MARKING :	The BM is engraved 'MTBM, 4/3/11' on the cementry wall.

Expected durability of the Station (in Years) : 20 years

DETAILED DIAGRAM :

Figure 12 Benchmark details TBM at Hatnur Dam

4.3 Tidal Influence Zone and Tidal Variation in different stretches

As per Toposheets tidal reach was up to 48 km but during reconnaissance survey, it was found that the tidal reach of the river is 30.8 kms.
The Nearest Port is Hazira Port. The tidal variation is about 6 m.
Source data: Tide data for Hazira Port (28/03/16 to 19/04/16)

4.4 Chart datum / Sounding datum and reduction details

4.4.1 Horizontal control

Satellite based worldwide Starfix.HP DGPS was used for positioning the survey vessel during this survey. The accuracy of the x, y, z position data obtained from the Starfix.HP DGPS system is +/- 10 cm at 95% assurance levels. Starfix software suite was used for navigation, data logging, and online quality control of the survey data logged.

4.4.2 Vertical Control

Chart Datum at the River Estuary:-

From CH 0.0 to CH 30.8 which have tidal influence, the soundings were reduced to Chart Datum using real time tidal observations and applying MSL~CD value of 2.25 m for the nearest Tapi River (Hazira), obtained from Admiralty Tide Table (ATT) Vol-3. The coordinates of the port and the value of Chart Datum (CD) used in this survey are given below:

Table 16: Details of Chart Datum Used for Reduction of Soundings

Sr. No	Location	Latitude (N)	Longitude (E)	Z0 (m)	Source
1	Tapi River (Hazira)	21° 08' 00''	72°40' 00''	2.25	ATT -3

Z0: The Value of Z0 is taken below M.S.L

Bench Mark on the upstream of the River:-

One GTS bench mark and two CWC Musto type bench marks were successfully recovered, and two TBMs were established along the river stretch at the below mentioned locations. All the heights of the riverbed in this report are referenced to these GTS BM/MTBM/TBMs for obtaining their height above the MSL.

Table 17: Details of Bench Marks used for obtaining the height of riverbed above the MSL

Sr. No.	Location	Type of BM	Latitude (N)	Longitude (E)	Height above MSL (m)	Used for River stretch
1	Ukai	GTSBM	21° 14' 12.19''	73° 35' 27.71''	114.022	76.82 to 197.91
2	Sanrangkheda	TBM	21° 25' 42.97''	74° 31' 58.61''	128.37	198.51 to 312.85

Sr. No.	Location	Type of BM	Latitude (N)	Longitude (E)	Height above MSL (m)	Used for River stretch
3	Palsod	MTBM	21° 08' 36.04''	75° 20' 04.87''	165.9438	313.05 to 390.39
4	Bhusawal	MTBM	21° 03' 54.35''	75° 46' 55.31''	189.521	391.40 to 427.74
5	Hatnur	TBM	21° 04' 02.99''	75° 56' 50.12''	215.71	428.17 to 436.04

The value of Zo is below M.S.L.

4.5 Hydrographic Survey

4.5.1 Hydrographic Survey

a) Length of stretch for which bathymetry survey has been carried out

The bathymetry survey has been carried out in the following stretches:

Tidal Reach

The tide effect was predominant up to chainage 35km from river mouth. Bathymetry Survey has been carried out in this reach. Source data for Tide has been taken from Hazira Port for the period of 28/03/16 to 19/04/16.

Non-Tidal Reach

From (km)	To (km)
30.869	173.576
185.639	221.236
224.198	226.444
231.290	252.026
256.171	280.303
286.728	288.548
295.135	318.504
323.451	327.157
327.873	334.17
336.849	338.541
353.505	355.421
360.369	363.166
376.761	378.725
395.716	399.190
401.54	409.245
411.058	412.640
416.126	418.418
419.438	420.856
424.355	435.068

b) *Minimum and Maximum Depths*

As per IWAI suggestion, following sign convention is adopted

(+): Riverbed below CD

(-): Riverbed above CD

(+): Water Depth below CD

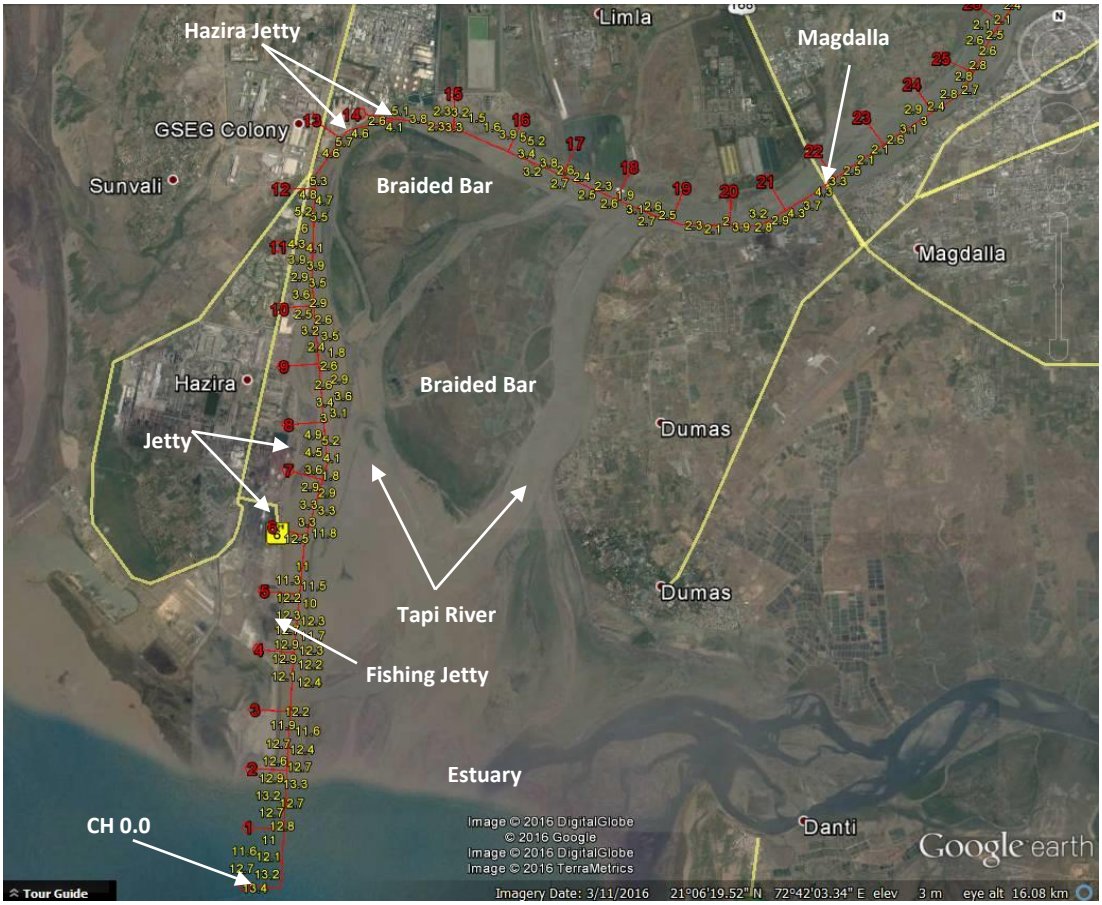
(-): Water Depth above CD.

c) *Minimum and Maximum Depths*

River Stretch (From CH 0.0 to CH 25.0)

Hazira jetty can be seen on the west bank of the river near CH 6 to 7.0. Agricultural fields are found on both banks of the river. Patches of vegetation are also seen along the river banks. Braided bar is also seen near the CH 8.0. A fishing jetty is also seen at CH.4.5. The Magdalla (ONGC) Bridge crosses the river at CH 21.8. Hazira jetty is seen at north bank of river at CH 14.2.

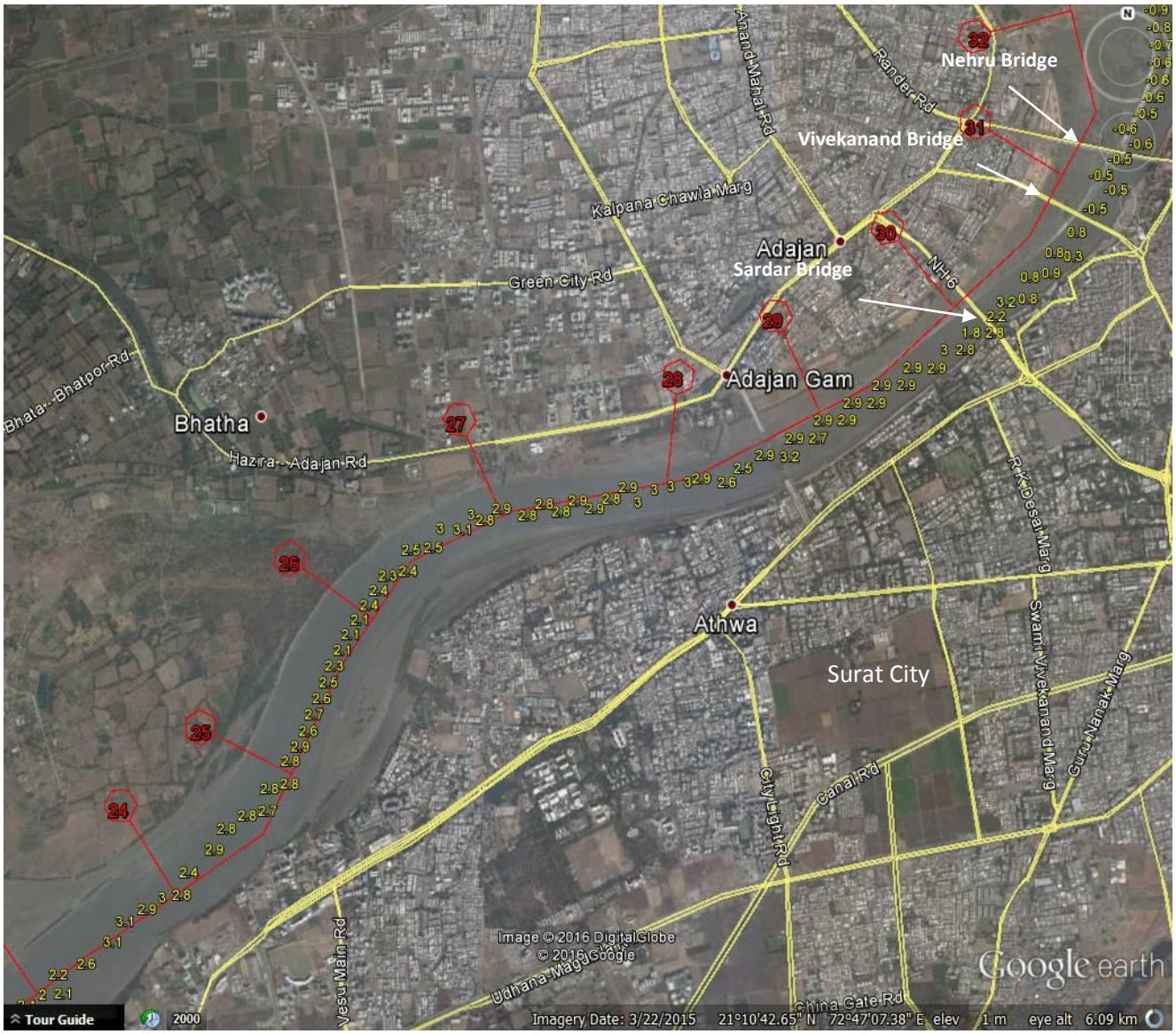
The minimum water depth recorded in this section is 1.37 m (CH 15.60) and the maximum water depth is 13.47 m (CH 1.60)



River Stretch (From CH 25.0 to CH 30.8)

Industrial city of Surat is located alongside side of Tapi River. Agricultural fields are found on both banks of the river. Patches of vegetation are also seen along the river banks. Sardar Bridge is crossing the river at CH 30.1 and CH 30.8 and connecting to Surat City.

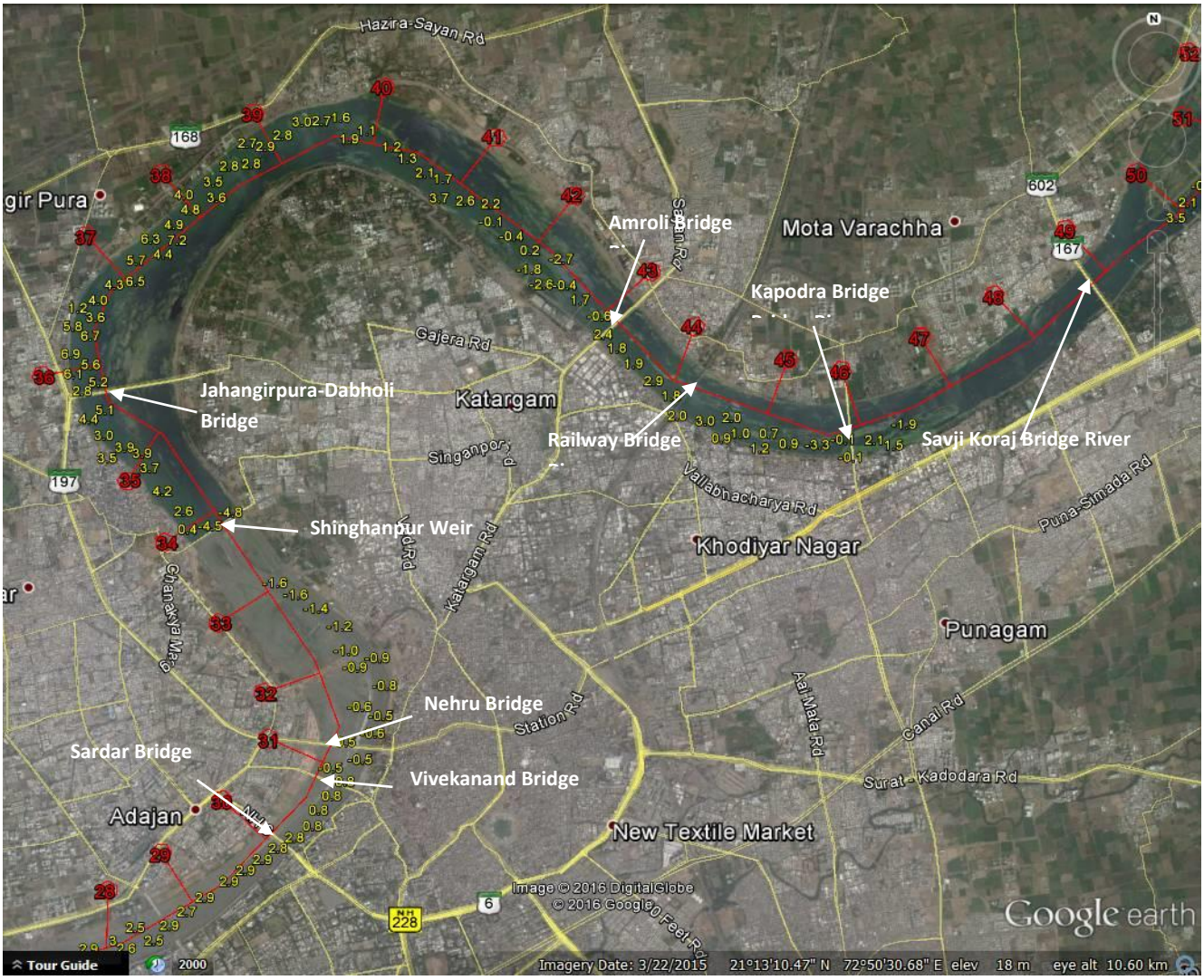
The minimum water depth recorded in this section is 0.27 m (CH 30.67) and the maximum water depth is 3.21 m (CH 28.73).



River Stretch (From CH 30.8 to CH 50.0)

Shinghanpur Weir which arrests the current tide is located at CH 31 Km. Agricultural fields are found on north banks of the river. Patches of vegetation are also seen along the river banks. Seven bridge crossing the river at 31.1, 33.9, 35.9, 43.1, 44.1, 45.9, and 48.9.

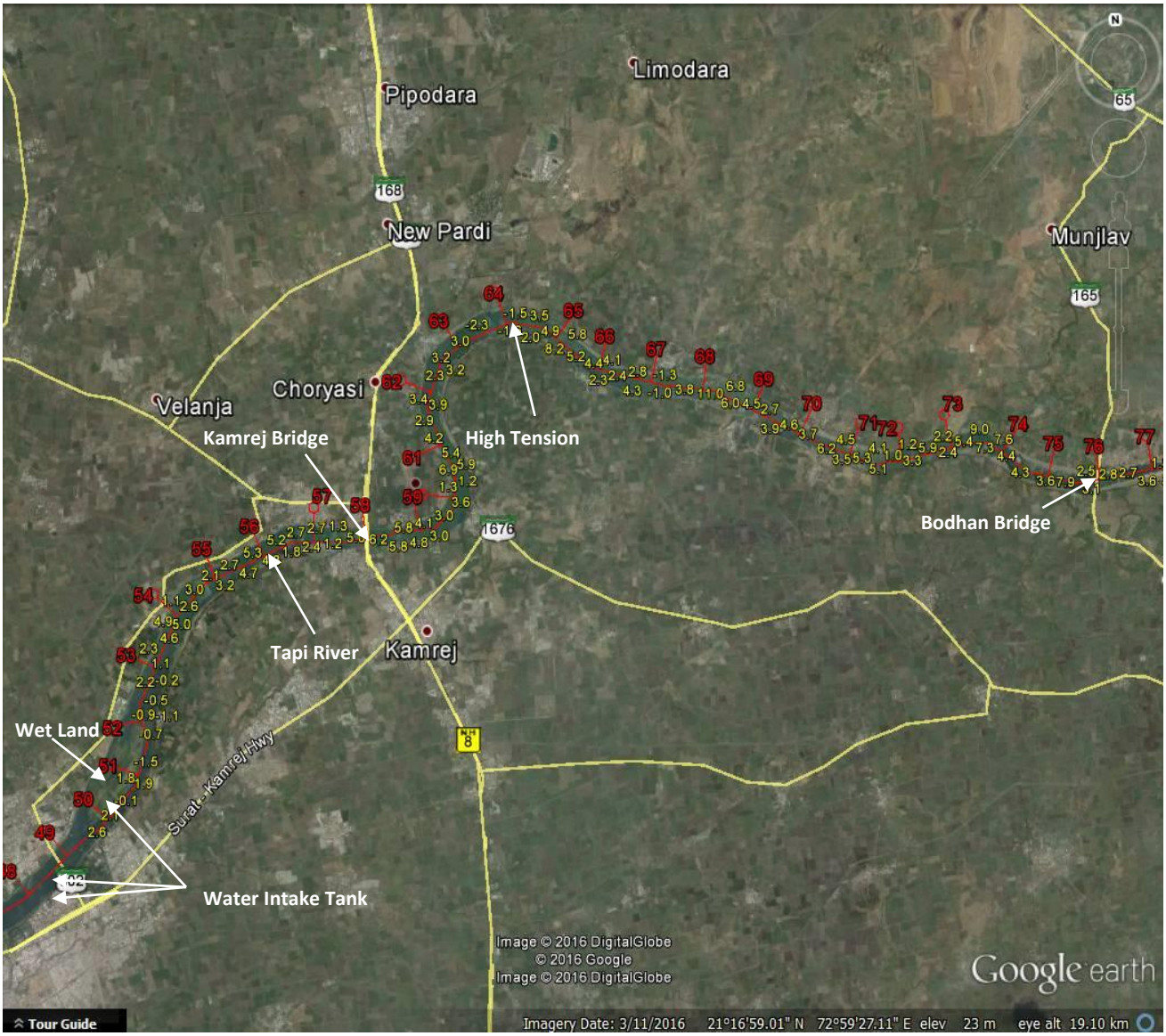
The minimum water depth recorded in this section is 0 m (CH 33.895) and the maximum water depth is 9.232 m (CH 44.525).



River Stretch (From CH 50.0 to CH 75.0)

Agricultural fields are found on both banks of the river. Patches of vegetation are also seen along the river banks. Kamrej (Kholvad) Road Bridge crosses the river at CH 58.0.

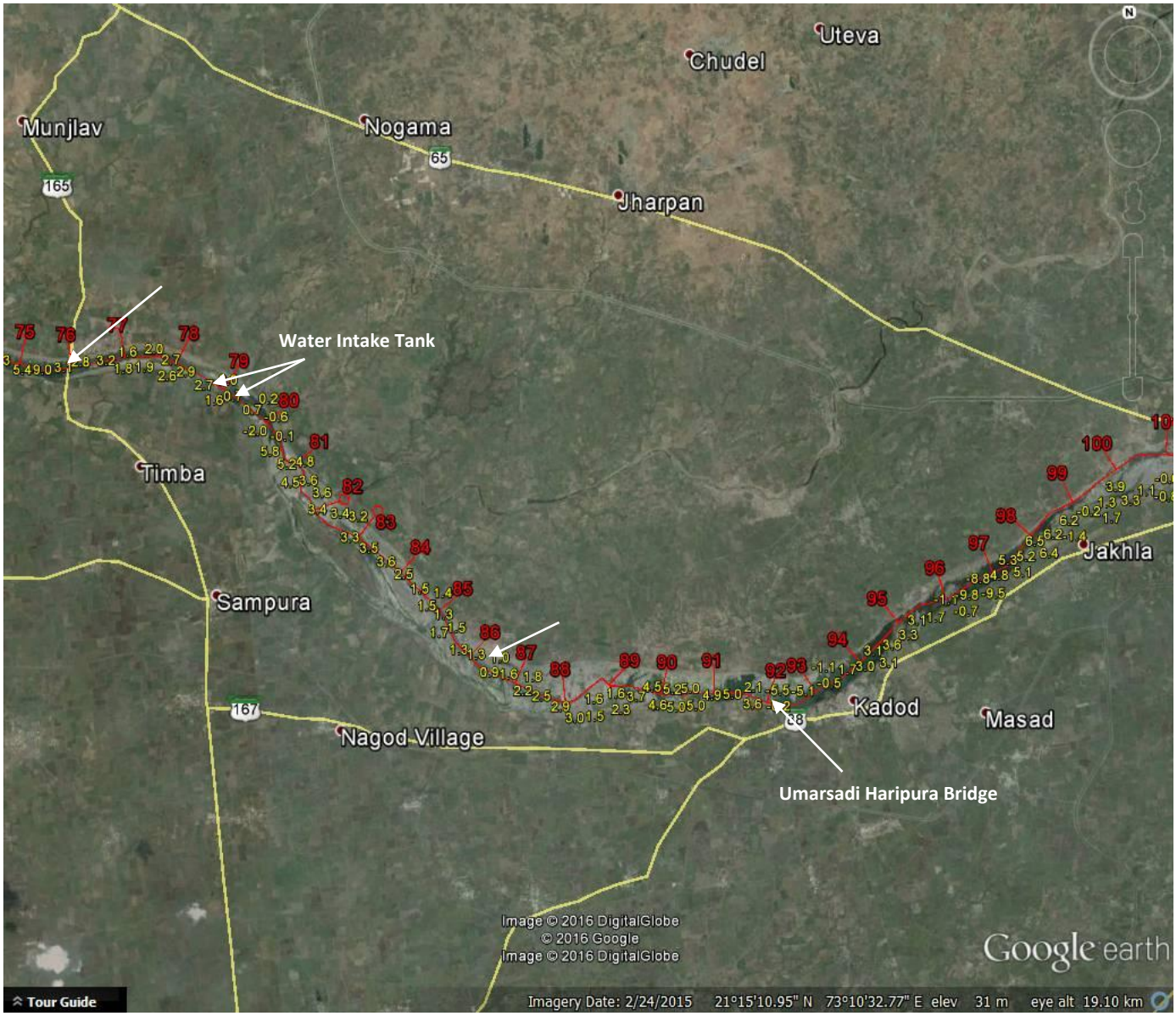
The minimum water depth recorded in this section is 0 m (CH 64.063) and the maximum water depth is 11.566 m (CH 68.060).



River Stretch (From CH 75.0 to CH 100.0)

Agricultural fields are found on both banks of the river. Patches of vegetation are also seen along the river banks. Bodhan Bridge crosses the river at CH 78.0. Umarsadi-Haripura Road Bridge crosses the river at CH 92.0.

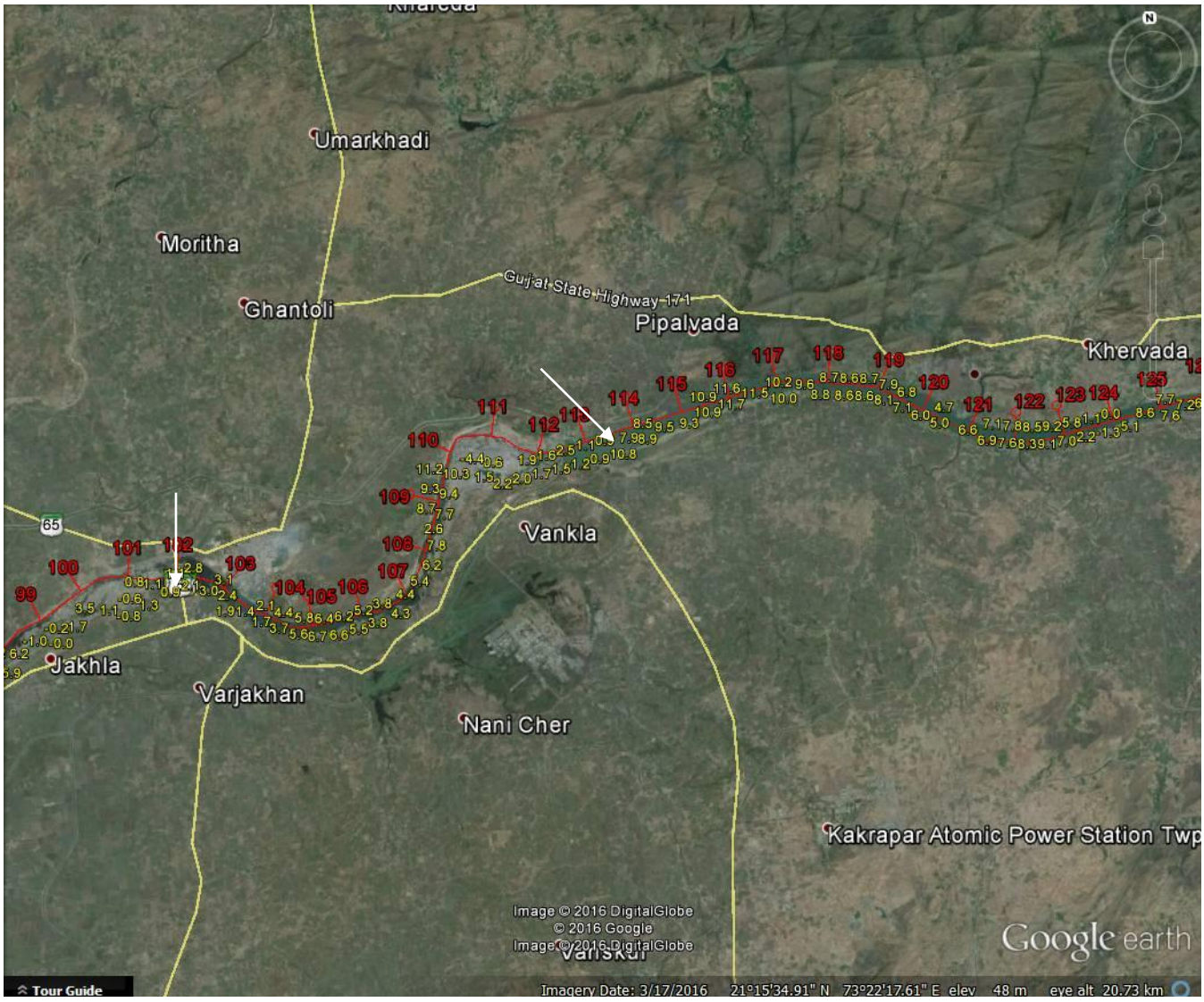
The minimum water depth recorded in this section is 0 m (CH 96.671) and the maximum water depth is 8.958 m (CH 74.452).



River Stretch (From CH 100.0 to CH 125.0)

Moritha, Umarkhadi, Ghantoli, Pipalvada, Magatra and Khervad villages are present at the North of the Tapi River and Vankla, Varjakhan, Nani Cher villages are present at the south of the Tapi River. Vegetations are seen on both sides of the river. Tapi River is flowing from West to East direction. Varjakhan Bridge crosses the river at CH 102.

The minimum water depth recorded in this section is 0 m (CH 109.988) and the maximum water depth is 11.864 m (CH 116.404).



River Stretch (From CH 125.0 to CH 150.0)

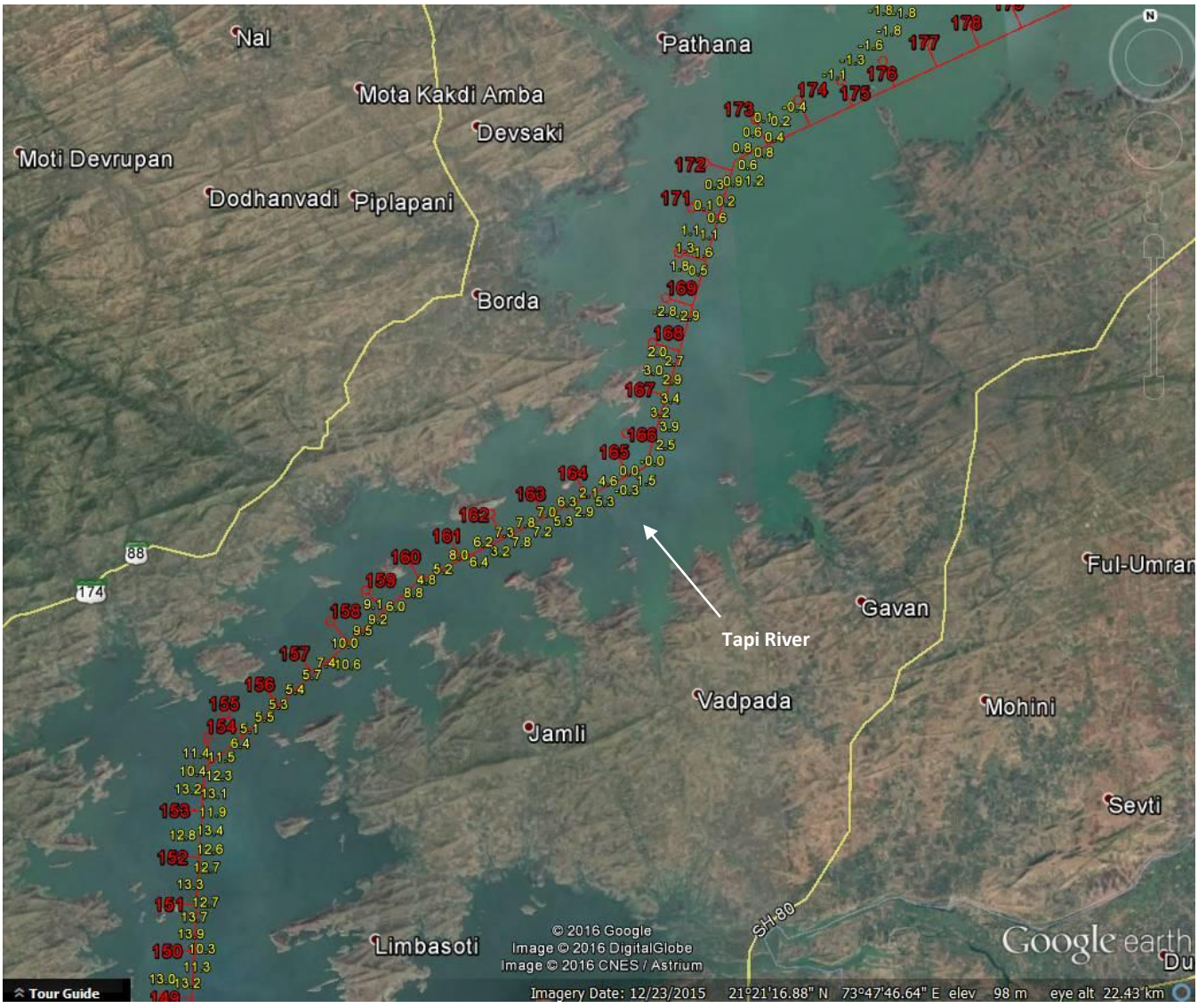
Ajvar, Khervada, Sara Jamli, Limbi and Serula villages are present at the North of the Tapi River and Ukai, Pipalkuva and Moti Khervan villages are present at the south of the Tapi River. Vegetations are seen on both sides of the river. Tapi River is flowing from East to West direction. Ukai-Limbi Bridge crosses the river at CH 134.17. Ukai Dam has been located at 136.7 Km Chainage.

The minimum water depth recorded in this section is 0 m (CH 137.083) and the maximum water depth is 19.747 m (CH 139.849.0).

River Stretch (From CH 150.0 to CH 175.0)

Limbasoti, Jamli, vadpada and Gavan villages are present at the East of the Tapi River and Borda, Piplapani, pathana, Devsaki villages are present at the West of the Tapi River. Vegetations are seen on both sides of the river. Tapi River is flowing from South West to North East direction.

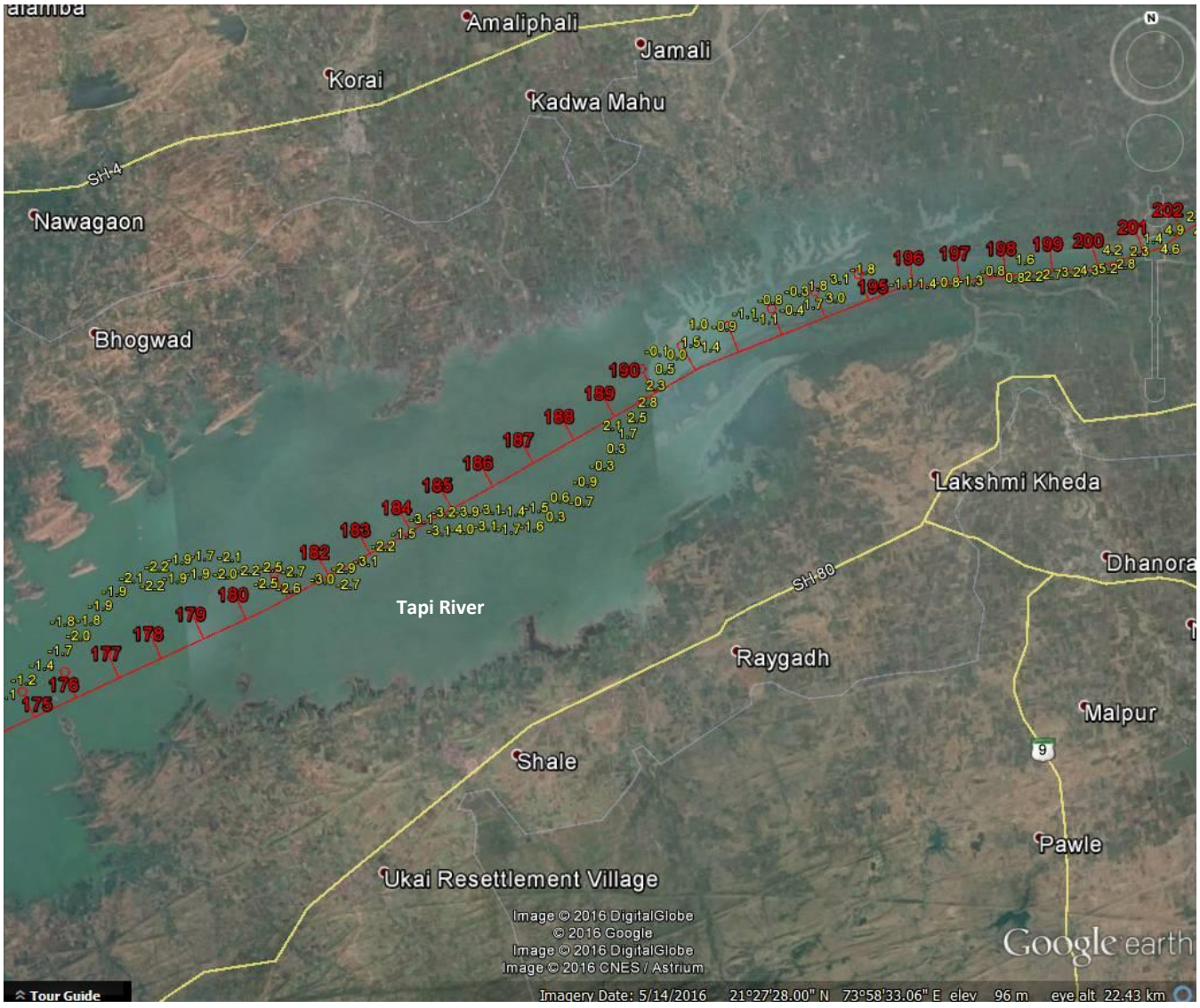
The minimum water depth recorded in this section is 0 m (CH 168.529) and the maximum water depth is 14.584 m (CH 150.062).



River Stretch (From CH 175.0 to CH 200.0)

Raygadh, Mogran, Shale villages are present at the South of the Tapi River and Nawagaon, Bhogwad,Selamba, Nawpada, Korai villages are present at the North of the Tapi River. Vegetation are seen on both sides of the river. Tapi River is flowing from West to East direction.

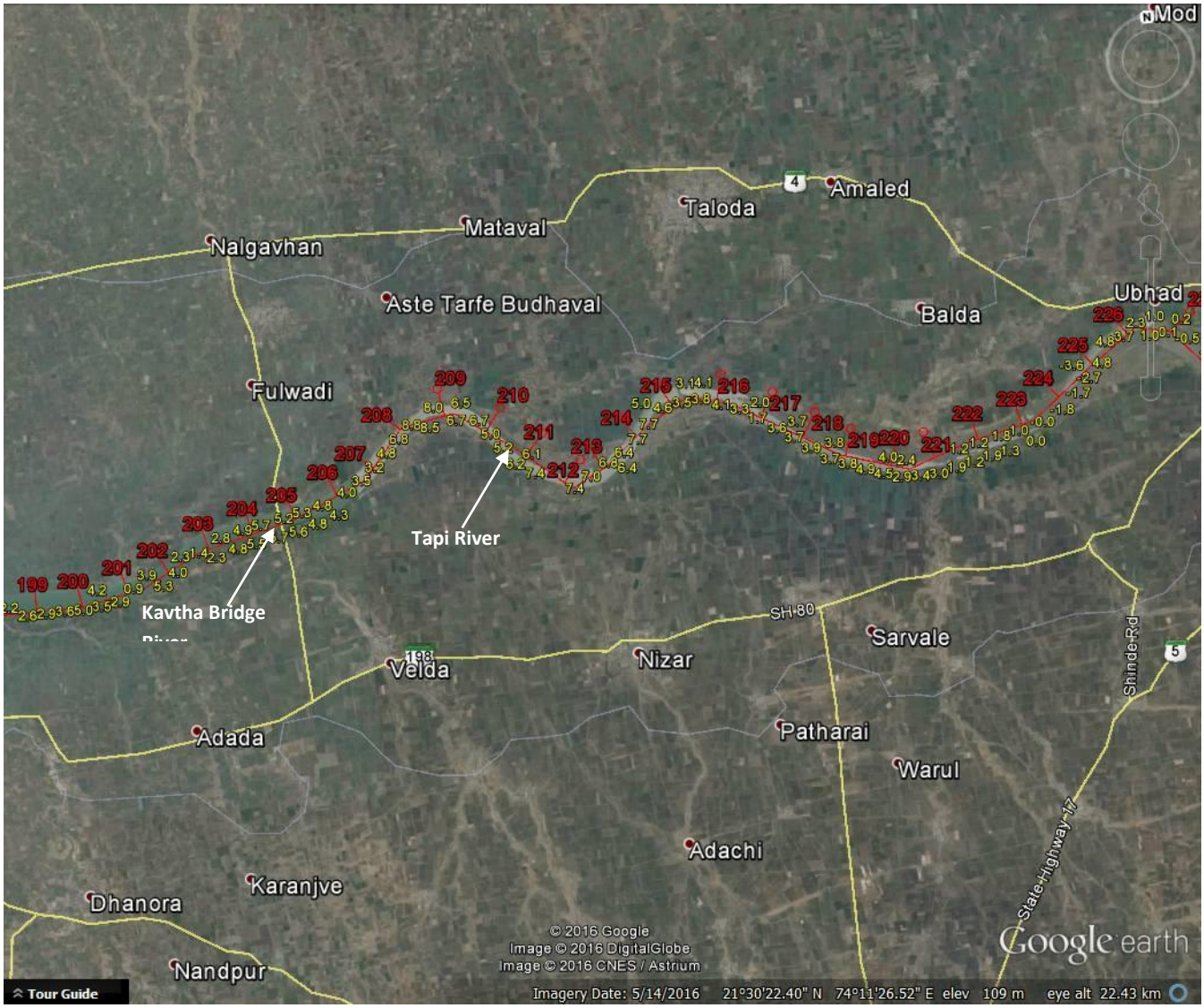
The minimum water depth recorded in this section is 0 m (CH 184.707) and the maximum water depth is 5.770 m (CH 199.984).



River Stretch (From CH 200.0 to CH 225.0)

Mataval, Nalgavhan, Fulwadi, Taloda villages are present at the North of the Tapi River and Laxmi kheda, Velda, Adada and Nizar villages are present at the South of the Tapi River. Vegetation are seen on both sides of the river. Tapi River is flowing from West to East direction. Kavatha Road Bridge crosses the river at CH 204.6. Tapi River is flowing from West to East direction (From CH 217.0 to CH 231.0).

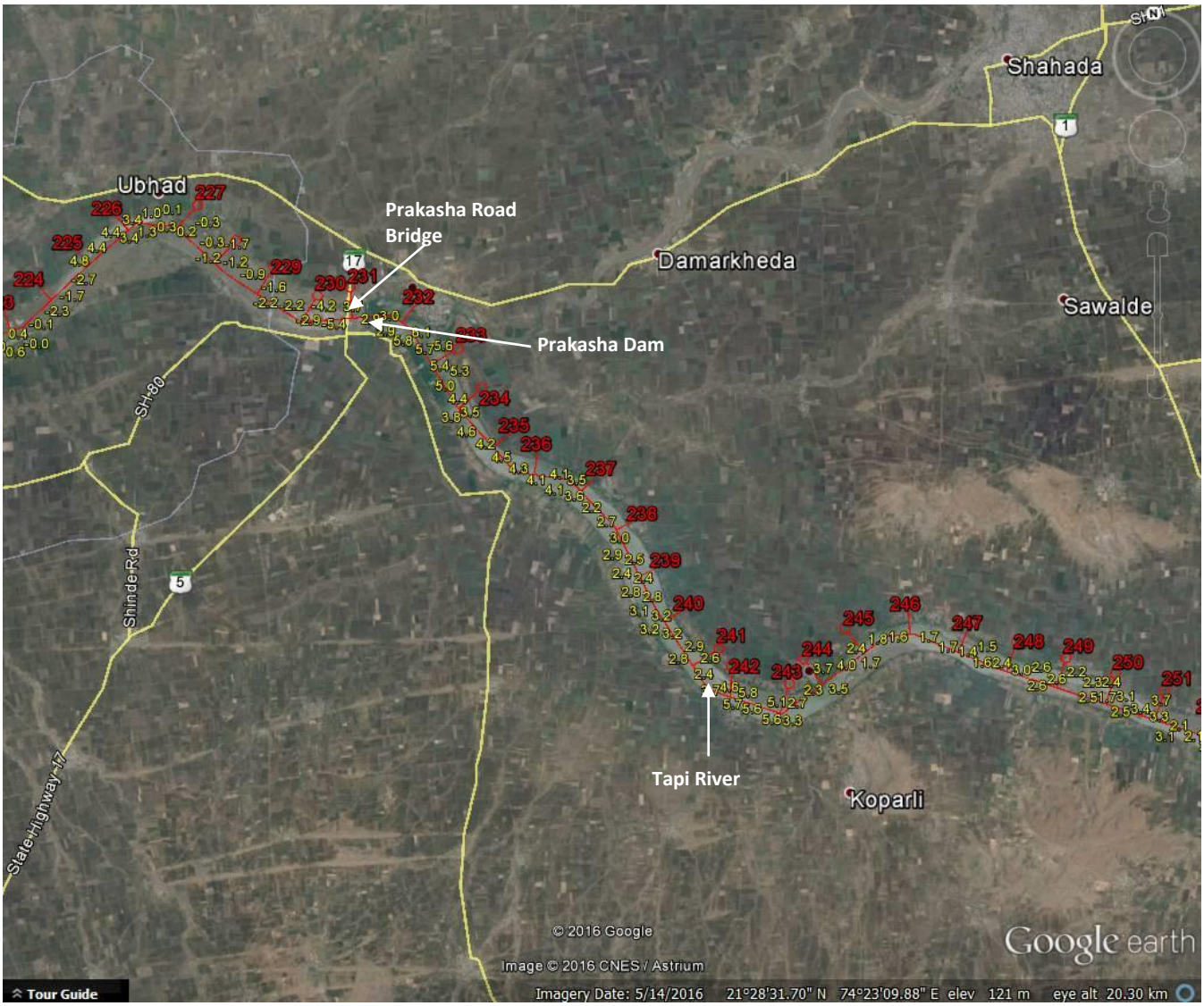
The minimum water depth recorded in this section is 0 m (CH 224.619) and the maximum water depth is 9.864 m (CH 208.135).



River Stretch (From CH 225.0 to CH 250.0)

Ubhad village is present at the North of the Tapi River and Devala, shahade, Bamdod, Borale, Nashinde villages are present at the South of the Tapi River. Vegetation are seen on both sides of the river. Tapi River is flowing from West to East direction (From CH 217.0 to CH 231.0) and North West to South East (from CH 231.0 to CH244.0). Prakasha dam built on the river at CH231.3. High Tension electric line is crossing the river at CH 244.6

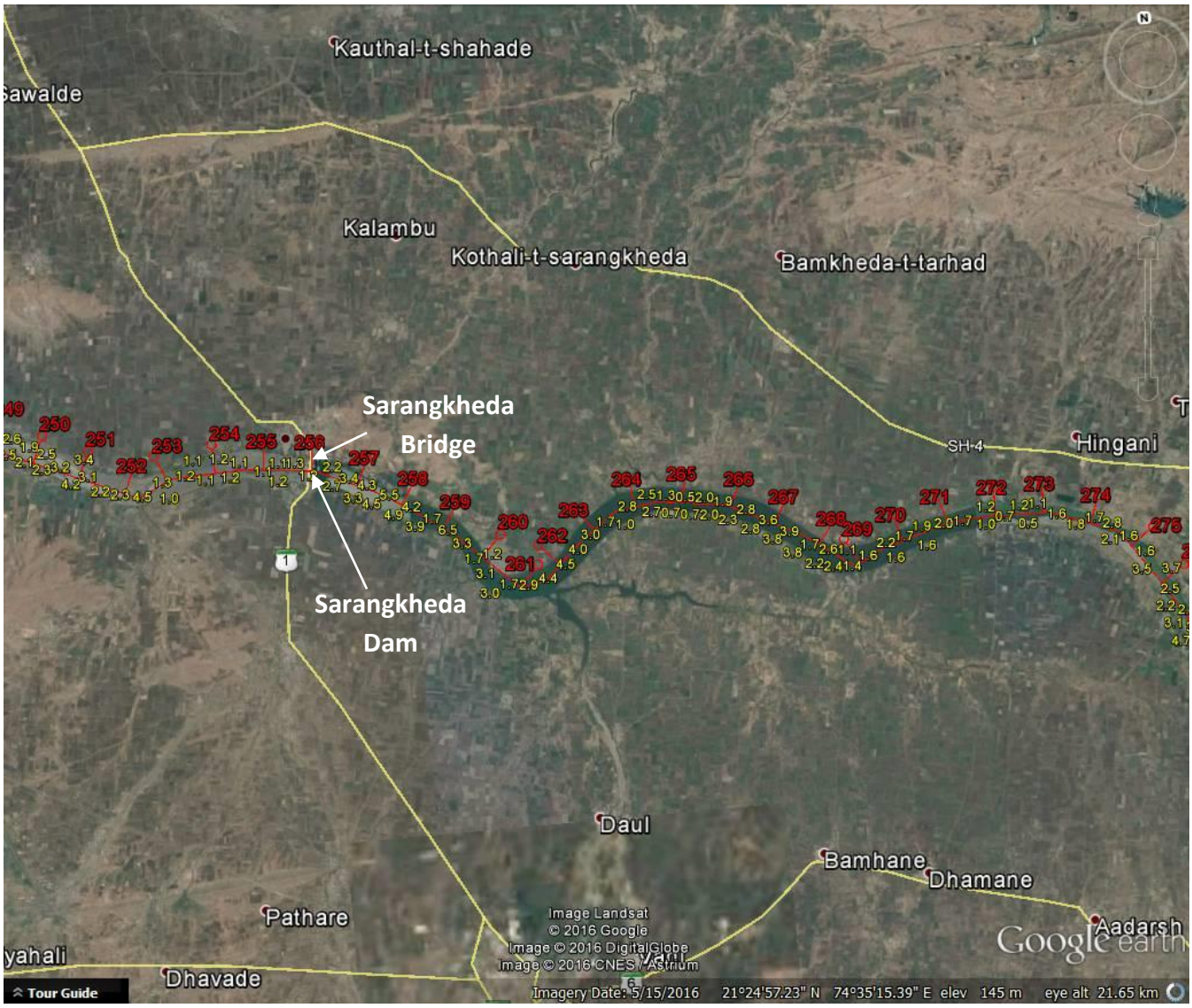
The minimum water depth recorded in this section is 0 m (CH 230.894) and the maximum water depth is 6.359 m (CH 232.512).



River Stretch (From CH 250.0 to CH 275.0)

Settlements are seen on both sides of the river. Agricultural fields and Vegetation are also seen in this region on both sides of the river. Sarangkheda Bridge is located at CH 255.9. Sarangkheda Dam is located at CH 256.03 and 256.15. High Tension electric line is crossing the river at CH 244.6, CH 255.96, CH 256.15 and CH 256.9.

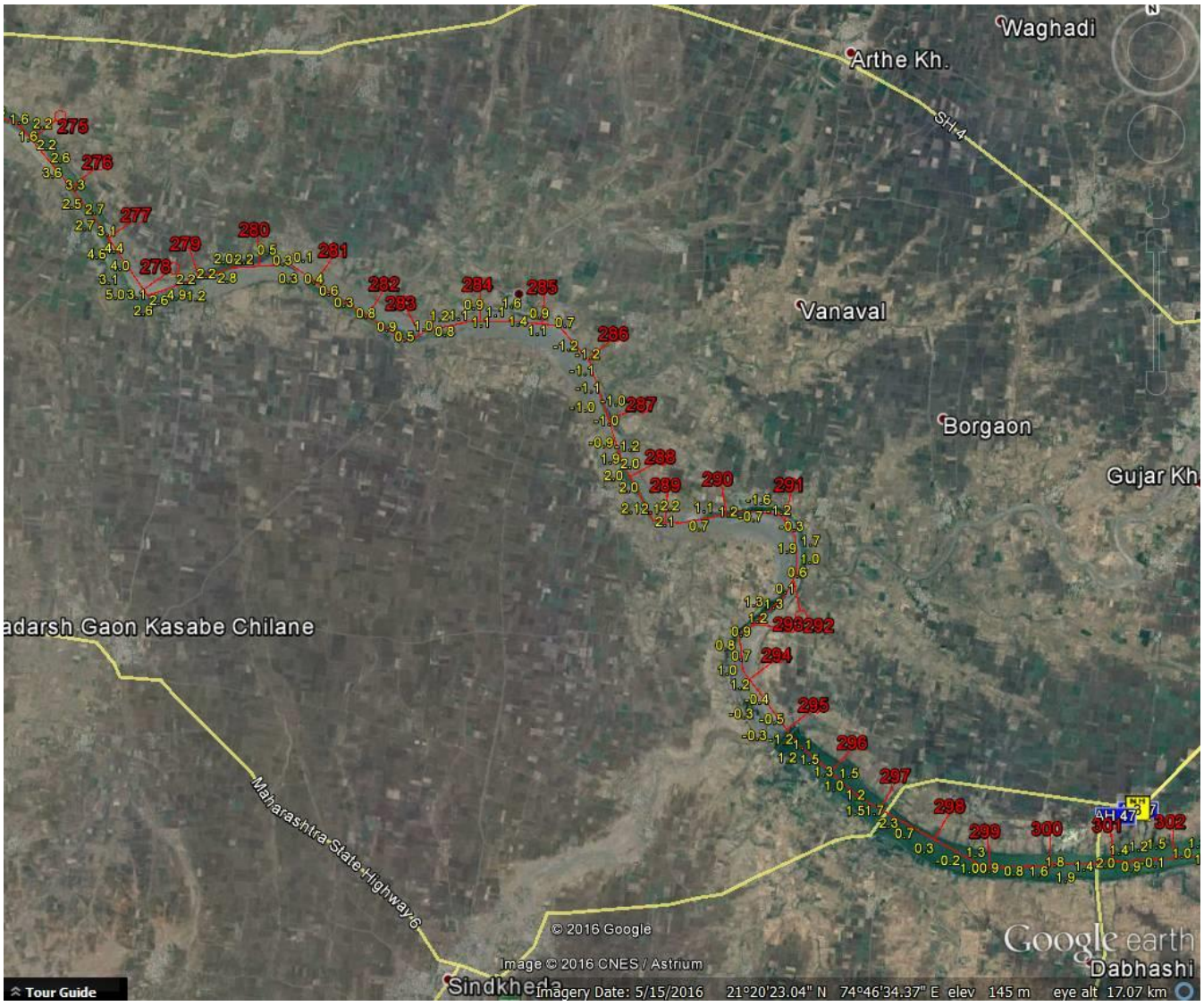
The minimum water depth recorded in this section is 0 m (CH 256.087) and the maximum water depth is 6.990 m (CH 259.471).



River Stretch (From CH 275.0 to CH 300.0)

Settlements are seen on both sides of the river. Agricultural fields and Vegetation are also seen in this region on both sides of the river. Sulwade Barrage is located at CH 294.8. High Tension electric line is crossing the river at CH 276.8. Gidhade Bridge is located at CH 297.1

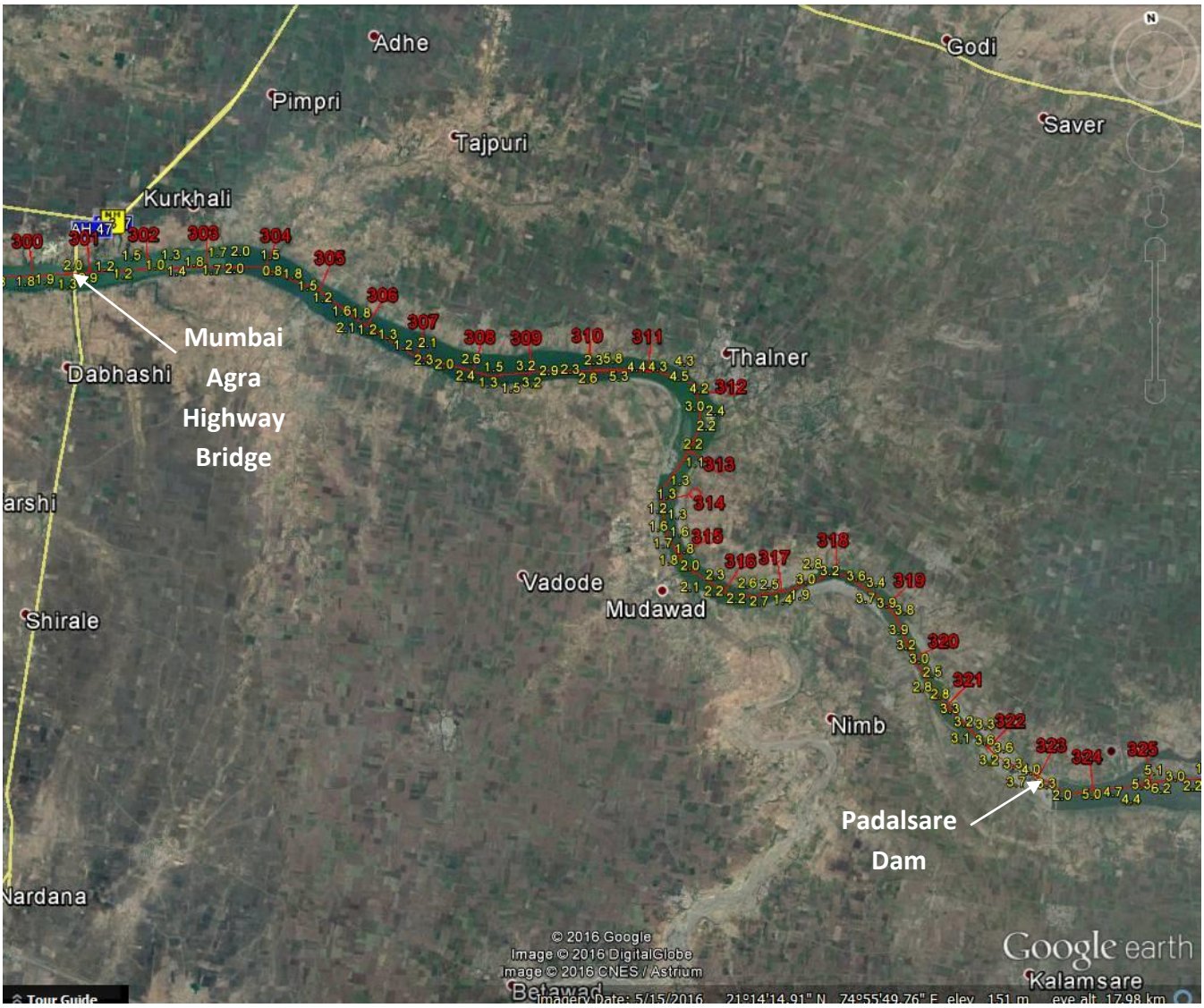
The minimum water depth recorded in this section is 0 m (CH 290.371) and the maximum water depth is 5.041 m (CH 277.909).



River Stretch (From CH 300.0 to CH 325.0)

Settlements are seen on both sides of the river. Agricultural fields and Vegetation are also seen in this region on both sides of the river. Mumbai Agra Highway Bridge is located at CH 300.75. Padalsare Dam is located at CH 323.4. High Tension electric line is crossing the river at CH 296.7, CH 298.2, CH 300.8, and CH 303.08.

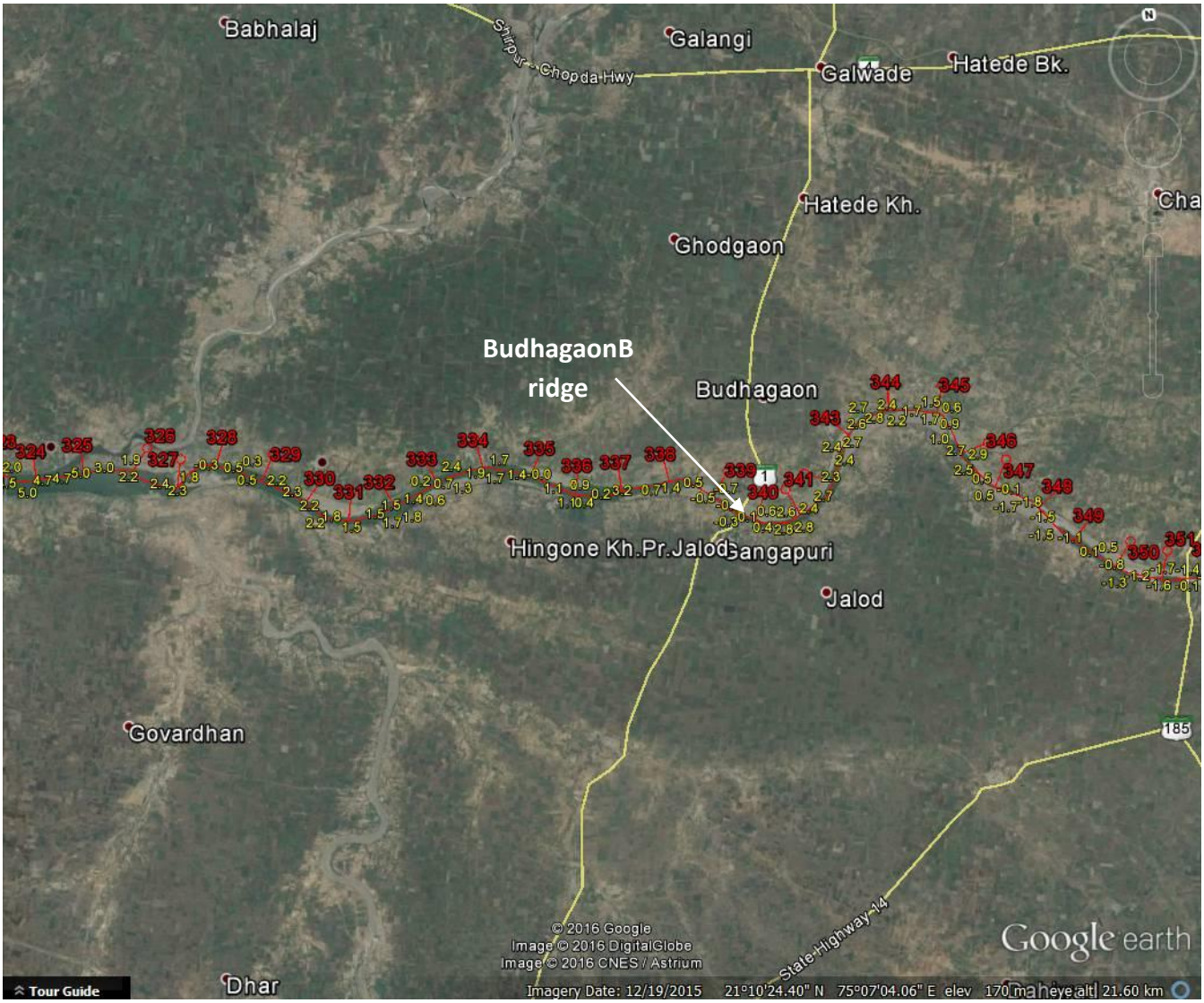
The minimum water depth recorded in this section is 0 m (CH 316.889) and the maximum water depth is 5.831 m (CH 310.576).



River Stretch (From CH 325.0 to CH 350.0)

Settlements are seen on both sides of the river. Agricultural fields and Vegetation are also seen in this region on both sides of the river. Budhagaon Bridge is located at CH 339.7. High Tension electric line is crossing the river at CH 329.54 and CH 339.54.

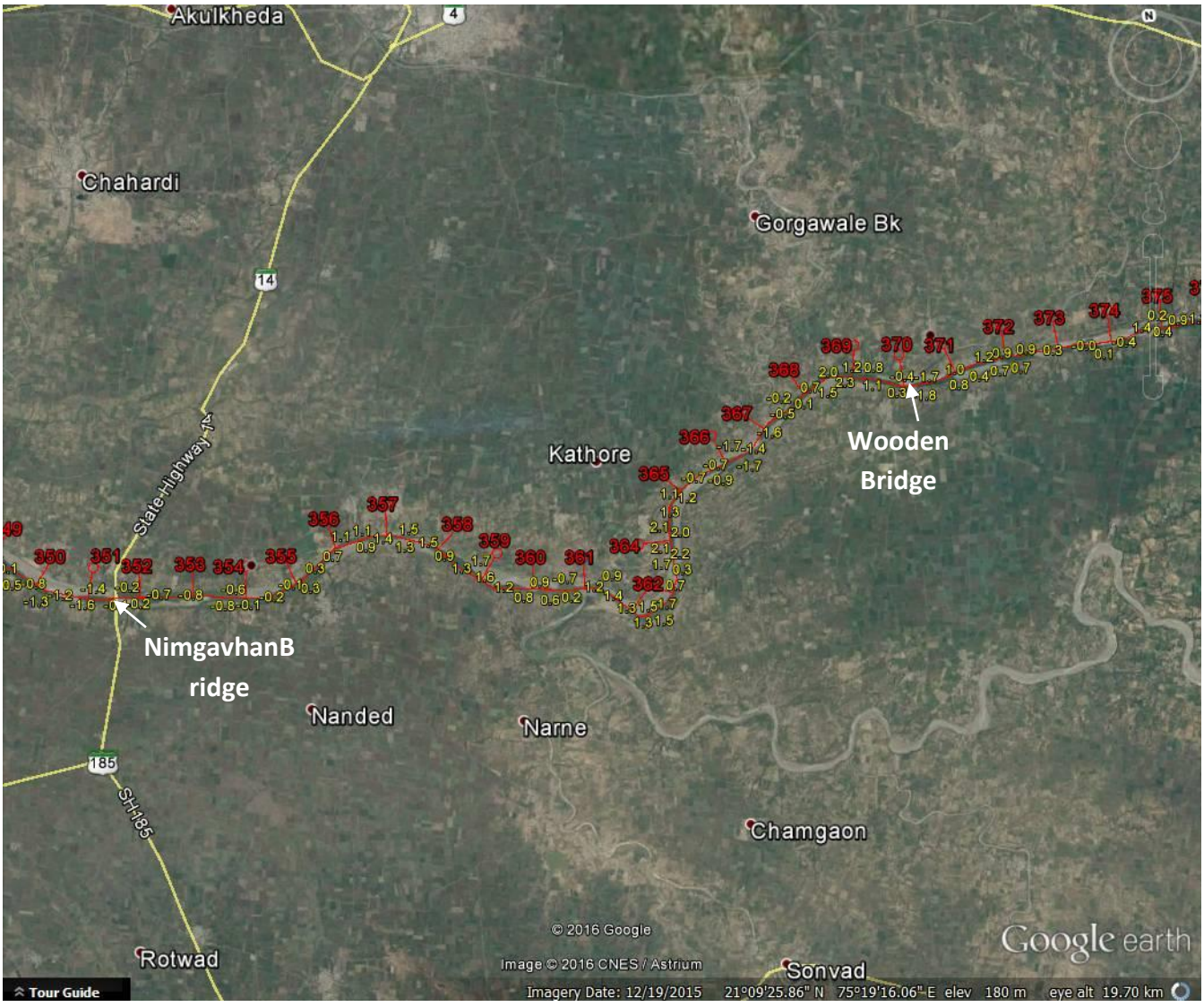
The minimum water depth recorded in this section is 0 m (CH 344.772) and the maximum water depth is 6.234 m (CH 325.194).



River Stretch (From CH 350.0 to CH 375.0)

Settlements are seen on both sides of the river. Agricultural fields and Vegetation are also seen in this region on both sides of the river. Nimgavhan Bridge is located at CH 351.5; Wooden Bridge is located at CH 370.2. High Tension electric line is crossing the river at CH 350.6, CH 350.75 and CH 369.8.

The minimum water depth recorded in this section is 0 m (CH 370.185) and the maximum water depth is 2.320 m (CH 368.708).



River Stretch (From CH 375.0 to CH 400.0)

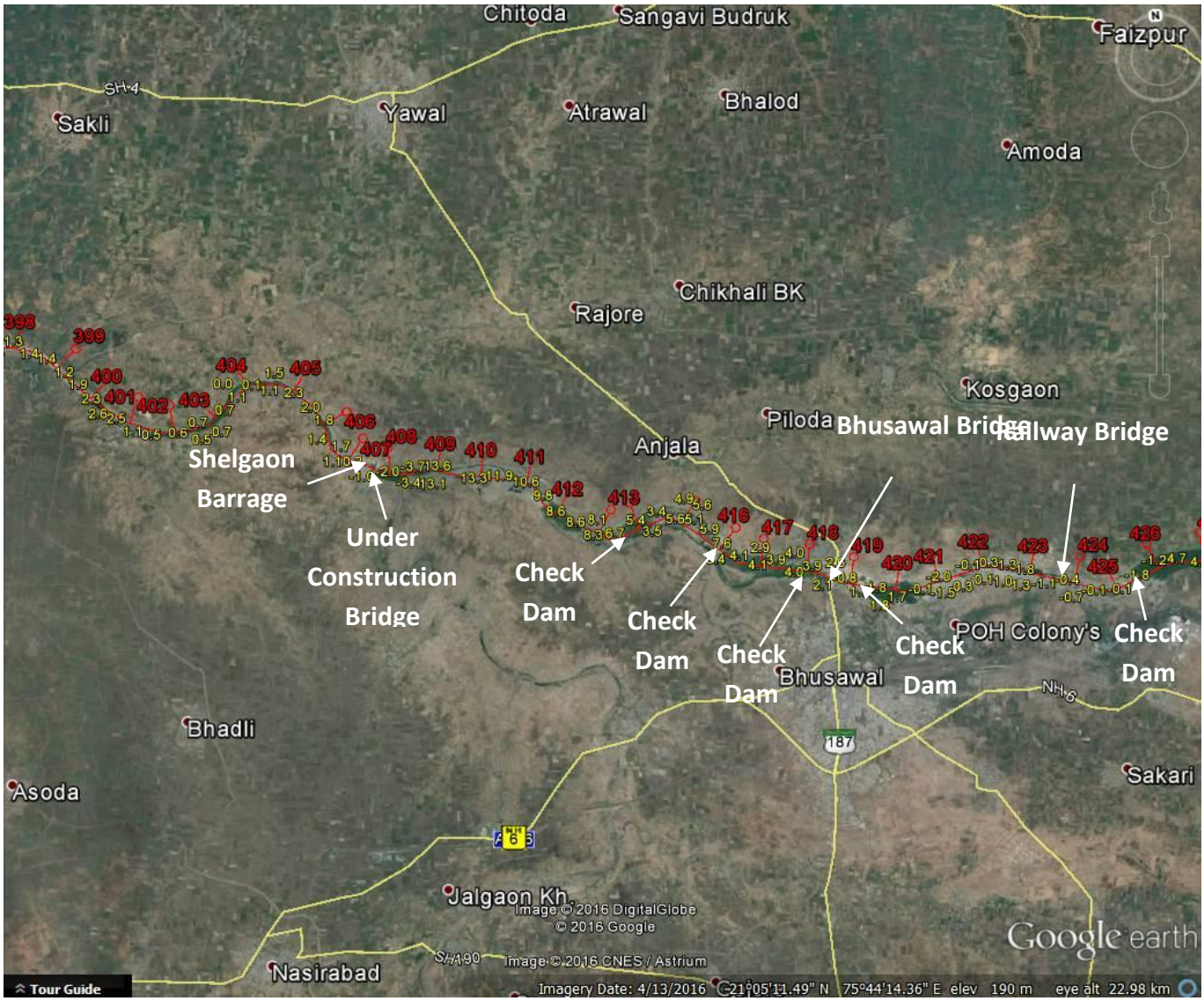
Settlements are seen on both sides of the river. Agricultural fields and Vegetation are also seen in this region on both sides of the river. Jalgaon Bridge is located at CH 388.62. High Tension electric line is crossing the river at CH 390.2 and CH 391.26.

The minimum water depth recorded in this section is 0 m (CH 392.189) and the maximum water depth is 3.494 m (CH 382.768).

River Stretch (From CH 400.0 to CH 425.0)

Settlements are seen on both sides of the river. Agricultural fields and Vegetation are also seen in this region on both sides of the river. Under Construction Bridge is located at CH 407.64. Shelgaon Barrage is located at CH 407.56; Check Dam is located at CH 413.73 and CH 415.98. Bhusawal Bridge is located at CH 418.56; Railway Bridge is located at CH 423.9. Check Dam is located at CH 418.2, CH 419.4, CH 420.15 and CH 425.64. High Tension electric line is crossing the river at CH 424.18, CH 424.38 and CH 424.58.

The minimum water depth recorded in this section is 0 m (CH 408.349) and the maximum water depth is 13.855 m (CH 410.043).



River Stretch (From CH 425.0 to CH 436.0)

Settlements are seen on both sides of the river. Agricultural fields and Vegetation are also seen in this region on both sides of the river. Check Dam is located at CH 425.64. High Tension electric line is crossing the river at CH 427.27. Hatnur Bridge is located at CH 435.45; Small broken Bridge is located at CH 435.63. Hatnur Dam is located at CH 436.269.

The minimum water depth recorded in this section is 0 m (CH 435.620) and the maximum water depth is 5.960 m (CH 431.617).

d) Water levels Bathymetric survey

Table 18: Water levels Bathymetric survey

Chainage (Km) A	Type of Survey B	Observed Water Depth (m) C	Tide (m) D	Reduced Depth (m) E=C-D
-0.02	Bathy	15.38	1.96	13.42
0.08	Bathy	15.10	1.93	13.17
0.18	Bathy	14.57	1.90	12.67
0.28	Bathy	14.05	1.87	12.18
0.38	Bathy	13.92	1.84	12.08
0.48	Bathy	13.40	1.82	11.58
0.58	Bathy	12.50	1.79	10.71
0.67	Bathy	12.77	1.77	11.00
1.04	Bathy	14.75	2.00	12.75
1.14	Bathy	14.65	2.00	12.65
1.24	Bathy	14.80	2.00	12.80
1.31	Bathy	14.36	1.62	12.74
1.40	Bathy	14.22	1.60	12.62
1.50	Bathy	15.00	1.58	13.42
1.60	Bathy	15.03	1.56	13.47
1.70	Bathy	14.68	1.53	13.15
1.80	Bathy	14.39	1.51	12.88
1.90	Bathy	14.83	1.48	13.35
2.00	Bathy	14.41	1.46	12.95
2.09	Bathy	14.27	1.43	12.84
2.19	Bathy	14.15	1.42	12.73
2.29	Bathy	13.97	1.39	12.58
2.39	Bathy	13.95	1.36	12.59
2.49	Bathy	13.74	1.34	12.40
2.59	Bathy	14.01	1.31	12.70
2.69	Bathy	13.43	1.28	12.15
2.78	Bathy	13.10	1.26	11.84
2.81	Bathy	12.88	1.25	11.63
2.91	Bathy	13.14	1.23	11.91
3.01	Bathy	13.45	1.20	12.25
3.54	Bathy	13.59	1.07	12.52
3.64	Bathy	13.48	1.04	12.44
3.74	Bathy	13.12	1.01	12.11
3.84	Bathy	14.21	0.98	13.23
3.94	Bathy	13.14	0.96	12.18
3.99	Bathy	14.24	2.03	12.21

Chainage (Km) A	Type of Survey B	Observed Water Depth (m) C	Tide (m) D	Reduced Depth (m) E=C-D
4.04	Bathy	13.86	0.93	12.93
4.09	Bathy	14.72	2.03	12.69
4.19	Bathy	14.34	2.03	12.31
4.29	Bathy	14.88	2.02	12.86
4.34	Bathy	13.89	0.87	13.02
4.39	Bathy	14.67	2.02	12.65
4.44	Bathy	12.51	0.84	11.67
4.49	Bathy	14.93	2.02	12.91
4.54	Bathy	13.53	0.82	12.71
4.59	Bathy	14.88	2.02	12.86
4.69	Bathy	14.29	2.03	12.26
4.79	Bathy	14.29	2.03	12.26
4.89	Bathy	13.81	2.03	11.78
4.99	Bathy	12.05	2.03	10.02
5.08	Bathy	14.28	2.03	12.25
5.18	Bathy	13.98	2.03	11.95
5.28	Bathy	13.58	2.03	11.55
5.38	Bathy	13.37	2.03	11.34
5.48	Bathy	13.05	2.03	11.02
6.00	Bathy	13.30	0.54	12.76
6.11	Bathy	13.01	0.52	12.49
6.21	Bathy	12.30	0.50	11.80
6.31	Bathy	5.73	0.48	5.25
6.41	Bathy	3.78	0.46	3.32
6.51	Bathy	3.84	0.46	3.38
6.61	Bathy	3.75	0.44	3.31
6.71	Bathy	3.75	0.42	3.33
6.80	Bathy	3.63	0.41	3.22
6.90	Bathy	3.27	0.39	2.88
7.00	Bathy	3.30	0.37	2.93
7.10	Bathy	3.41	0.35	3.06
7.20	Bathy	2.15	0.33	1.82
7.32	Bathy	3.93	0.32	3.61
7.42	Bathy	3.90	0.31	3.59
7.52	Bathy	4.38	0.29	4.09
7.62	Bathy	4.81	0.28	4.53
7.72	Bathy	5.36	0.26	5.10
7.82	Bathy	5.47	0.25	5.22
7.92	Bathy	5.15	0.23	4.92

Chainage (Km) A	Type of Survey B	Observed Water Depth (m) C	Tide (m) D	Reduced Depth (m) E=C-D
8.02	Bathy	4.92	0.21	4.71
8.11	Bathy	5.39	2.04	3.35
8.19	Bathy	5.06	2.04	3.02
8.28	Bathy	5.18	2.04	3.14
8.36	Bathy	5.31	2.04	3.27
8.46	Bathy	5.45	2.04	3.41
8.55	Bathy	5.66	2.05	3.61
8.65	Bathy	5.06	2.05	3.01
8.75	Bathy	4.66	2.05	2.61
8.85	Bathy	4.94	2.05	2.89
8.95	Bathy	4.61	2.04	2.57
9.05	Bathy	3.87	2.04	1.83
9.14	Bathy	4.46	2.04	2.42
9.24	Bathy	5.52	2.05	3.47
9.34	Bathy	5.54	2.05	3.49
9.43	Bathy	5.23	2.05	3.18
9.53	Bathy	4.97	2.05	2.92
9.62	Bathy	4.70	2.05	2.65
9.72	Bathy	4.51	2.05	2.46
9.82	Bathy	4.71	2.05	2.66
9.92	Bathy	5.00	2.06	2.94
10.06	Bathy	4.05	0.45	3.60
10.16	Bathy	4.44	0.45	3.99
10.26	Bathy	4.00	0.46	3.54
10.36	Bathy	3.40	0.46	2.94
10.46	Bathy	3.53	0.46	3.07
10.56	Bathy	4.35	0.47	3.88
10.65	Bathy	4.38	0.47	3.91
10.76	Bathy	4.22	0.47	3.75
10.86	Bathy	4.53	0.47	4.06
10.96	Bathy	4.47	0.47	4.00
11.06	Bathy	4.80	0.48	4.32
11.16	Bathy	4.66	0.48	4.18
11.26	Bathy	5.38	0.48	4.90
11.36	Bathy	6.12	0.48	5.64
11.46	Bathy	6.43	0.48	5.95
11.55	Bathy	7.51	2.12	5.39
11.66	Bathy	5.99	0.48	5.51
11.75	Bathy	5.73	0.48	5.25

Chainage (Km) A	Type of Survey B	Observed Water Depth (m) C	Tide (m) D	Reduced Depth (m) E=C-D
11.85	Bathy	5.55	0.49	5.06
11.95	Bathy	5.18	0.49	4.69
12.05	Bathy	5.30	0.49	4.81
12.14	Bathy	5.74	0.49	5.25
12.91	Bathy	4.44	-0.16	4.60
13.01	Bathy	3.64	-0.17	3.81
13.10	Bathy	3.55	-0.17	3.72
13.28	Bathy	5.52	-0.18	5.70
13.38	Bathy	5.66	-0.19	5.85
13.47	Bathy	6.18	-0.20	6.38
13.57	Bathy	4.41	-0.20	4.61
13.67	Bathy	3.20	-0.20	3.40
13.77	Bathy	2.26	-0.21	2.47
13.87	Bathy	2.35	-0.21	2.56
13.97	Bathy	3.79	-0.22	4.01
14.07	Bathy	2.66	-0.23	2.89
14.17	Bathy	3.86	-0.24	4.10
14.27	Bathy	4.89	-0.24	5.13
14.37	Bathy	4.71	-0.25	4.96
14.47	Bathy	4.11	-0.25	4.36
14.56	Bathy	3.51	-0.25	3.76
14.66	Bathy	2.75	-0.26	3.01
14.76	Bathy	2.28	-0.27	2.55
14.86	Bathy	2.01	-0.27	2.28
14.96	Bathy	2.06	-0.28	2.34
15.03	Bathy	2.86	-0.28	3.14
15.11	Bathy	2.99	-0.28	3.27
15.20	Bathy	2.90	-0.29	3.19
15.30	Bathy	1.56	-0.30	1.86
15.40	Bathy	1.71	-0.31	2.02
15.50	Bathy	1.23	-0.30	1.53
15.60	Bathy	1.06	-0.31	1.37
15.69	Bathy	1.12	-0.32	1.44
15.79	Bathy	1.25	-0.32	1.57
15.89	Bathy	1.75	-0.33	2.08
15.99	Bathy	3.01	-0.33	3.34
16.09	Bathy	3.59	-0.34	3.93
16.19	Bathy	4.62	-0.34	4.96
16.29	Bathy	4.94	-0.34	5.28

Chainage (Km) A	Type of Survey B	Observed Water Depth (m) C	Tide (m) D	Reduced Depth (m) E=C-D
16.30	Bathy	4.92	-0.33	5.25
16.34	Bathy	3.42	-0.32	3.74
16.42	Bathy	2.61	-0.33	2.94
16.52	Bathy	3.05	-0.32	3.37
16.62	Bathy	2.84	-0.33	3.17
16.72	Bathy	4.01	-0.33	4.34
16.82	Bathy	4.62	-0.34	4.96
16.92	Bathy	3.46	-0.35	3.81
17.02	Bathy	2.52	-0.35	2.87
17.12	Bathy	2.31	-0.36	2.67
17.22	Bathy	2.24	-0.36	2.60
17.32	Bathy	2.52	-0.37	2.89
17.42	Bathy	2.15	-0.36	2.51
17.52	Bathy	2.04	-0.37	2.41
17.62	Bathy	2.10	-0.38	2.48
17.72	Bathy	1.99	-0.38	2.37
17.82	Bathy	1.97	-0.39	2.36
17.92	Bathy	1.87	-0.40	2.27
18.02	Bathy	2.25	-0.40	2.65
18.12	Bathy	2.06	-0.41	2.47
18.22	Bathy	1.91	-0.40	2.31
18.32	Bathy	1.49	-0.41	1.90
18.42	Bathy	3.30	-0.42	3.72
18.52	Bathy	2.70	-0.42	3.12
18.62	Bathy	2.39	-0.43	2.82
18.73	Bathy	2.25	-0.43	2.68
18.83	Bathy	2.18	-0.44	2.62
18.92	Bathy	2.11	-0.44	2.55
19.37	Bathy	1.95	-0.46	2.41
19.47	Bathy	1.87	-0.46	2.33
19.56	Bathy	1.82	-0.47	2.29
19.66	Bathy	1.70	-0.47	2.17
19.76	Bathy	1.67	-0.48	2.15
19.89	Bathy	1.61	-0.48	2.09
19.99	Bathy	1.54	-0.48	2.02
20.10	Bathy	1.50	-0.49	1.99
20.26	Bathy	3.99	-0.48	4.47
20.36	Bathy	3.41	-0.48	3.89
20.45	Bathy	3.52	-0.49	4.01

Chainage (Km) A	Type of Survey B	Observed Water Depth (m) C	Tide (m) D	Reduced Depth (m) E=C-D
20.56	Bathy	3.16	-0.49	3.65
20.66	Bathy	2.74	-0.50	3.24
20.76	Bathy	2.30	-0.50	2.80
20.86	Bathy	2.15	-0.51	2.66
20.96	Bathy	2.24	-0.51	2.75
21.05	Bathy	2.34	-0.51	2.85
21.15	Bathy	2.60	-0.52	3.12
21.25	Bathy	3.12	-0.52	3.64
21.35	Bathy	3.73	-0.53	4.26
21.45	Bathy	4.00	-0.53	4.53
21.54	Bathy	3.66	-0.54	4.20
21.64	Bathy	3.13	-0.54	3.67
21.72	Bathy	3.41	-0.49	3.90
21.94	Bathy	3.79	-0.50	4.29
22.04	Bathy	3.31	-0.50	3.81
22.14	Bathy	3.02	-0.51	3.53
22.24	Bathy	2.75	-0.51	3.26
22.34	Bathy	2.30	-0.51	2.81
22.44	Bathy	2.13	-0.52	2.65
22.54	Bathy	1.94	-0.51	2.45
22.64	Bathy	1.74	-0.51	2.25
22.74	Bathy	1.61	-0.52	2.13
22.84	Bathy	1.58	-0.52	2.10
22.94	Bathy	1.62	-0.53	2.15
23.04	Bathy	1.50	-0.53	2.03
23.14	Bathy	1.55	-0.53	2.08
23.24	Bathy	1.65	-0.53	2.18
23.34	Bathy	1.89	-0.53	2.42
23.44	Bathy	2.08	-0.53	2.61
23.54	Bathy	2.31	-0.53	2.84
23.64	Bathy	2.53	-0.54	3.07
23.74	Bathy	2.57	-0.54	3.11
23.83	Bathy	2.39	-0.54	2.93
23.93	Bathy	2.42	-0.55	2.97
24.03	Bathy	2.22	-0.55	2.77
24.13	Bathy	2.12	-0.54	2.66
24.23	Bathy	1.82	-0.54	2.36
24.33	Bathy	1.81	-0.55	2.36
24.43	Bathy	2.37	-0.55	2.92

Chainage (Km) A	Type of Survey B	Observed Water Depth (m) C	Tide (m) D	Reduced Depth (m) E=C-D
24.53	Bathy	2.21	-0.56	2.77
24.69	Bathy	2.19	-0.56	2.75
24.79	Bathy	2.14	-0.56	2.70
24.88	Bathy	2.27	-0.56	2.83
24.98	Bathy	2.20	-0.57	2.77
25.08	Bathy	2.22	-0.57	2.79
25.18	Bathy	2.29	-0.57	2.86
25.28	Bathy	2.02	-0.57	2.59
25.38	Bathy	2.10	-0.57	2.67
25.48	Bathy	2.07	-0.57	2.64
25.58	Bathy	1.97	-0.57	2.54
25.68	Bathy	1.69	-0.57	2.26
25.77	Bathy	1.50	-0.57	2.07
25.87	Bathy	1.50	-0.57	2.07
25.97	Bathy	1.58	-0.57	2.15
26.07	Bathy	1.79	-0.58	2.37
26.17	Bathy	1.80	-0.57	2.37
26.27	Bathy	1.72	-0.57	2.29
26.37	Bathy	1.83	-0.57	2.40
26.45	Bathy	1.91	-0.57	2.48
26.55	Bathy	1.91	-0.57	2.48
26.65	Bathy	2.43	-0.58	3.01
26.75	Bathy	2.52	-0.57	3.09
26.85	Bathy	2.43	-0.57	3.00
26.95	Bathy	2.25	-0.57	2.82
27.04	Bathy	2.29	-0.57	2.86
27.13	Bathy	2.23	-0.58	2.81
27.23	Bathy	2.25	-0.58	2.83
27.33	Bathy	2.27	-0.58	2.85
27.43	Bathy	2.32	-0.57	2.89
27.53	Bathy	2.29	-0.57	2.86
27.63	Bathy	2.19	-0.58	2.77
27.73	Bathy	2.35	-0.58	2.93
27.83	Bathy	2.37	-0.58	2.95
27.93	Bathy	2.38	-0.58	2.96
28.03	Bathy	2.41	-0.59	3.00
28.14	Bathy	2.39	-0.59	2.98
28.23	Bathy	2.31	-0.58	2.89
28.33	Bathy	1.99	-0.58	2.57

Chainage (Km) A	Type of Survey B	Observed Water Depth (m) C	Tide (m) D	Reduced Depth (m) E=C-D
28.43	Bathy	1.95	-0.58	2.53
28.53	Bathy	1.92	-0.59	2.51
28.63	Bathy	2.31	-0.59	2.90
28.73	Bathy	2.62	-0.59	3.21
28.83	Bathy	2.36	-0.59	2.95
28.93	Bathy	2.12	-0.59	2.71
29.03	Bathy	2.28	-0.58	2.86
29.12	Bathy	2.33	-0.59	2.92
29.22	Bathy	2.33	-0.59	2.92
29.33	Bathy	2.35	-0.59	2.94
29.41	Bathy	2.32	-0.59	2.91
29.51	Bathy	2.32	-0.59	2.91
29.62	Bathy	2.33	-0.59	2.92
29.71	Bathy	2.34	-0.59	2.93
29.81	Bathy	2.38	-0.58	2.96
29.91	Bathy	2.25	-0.58	2.83
30.01	Bathy	1.20	-0.58	1.78
30.11	Bathy	2.25	-0.56	2.81
30.18	Bathy	1.96	-0.21	2.17
30.28	Bathy	2.97	-0.21	3.18
30.38	Bathy	0.64	-0.20	0.84
30.48	Bathy	0.64	-0.20	0.84
30.58	Bathy	0.64	-0.21	0.85
30.62	Bathy	0.64	-0.20	0.84
30.67	Bathy	0.66	0.39	0.27
30.71	Bathy	0.64	-0.20	0.84
30.77	Bathy	0.65	0.37	0.28
30.81	Bathy	0.64	-0.20	0.84

4.5.2 Topographic Survey

a) Length of stretch for which topographic survey has been carried out

Since the water depth is shallow in the following reaches and bathymetry survey was not possible, therefore water depth & river bed levels are taken by topography survey manually.

From(Km)	To(Km)
173.647	185.574
221.296	224.171
226.517	231.216
252.09	256.087
280.397	286.672
288.605	295.083
318.615	323.383
327.286	327.822
334.263	336.746
338.573	353.405
355.491	360.270
363.220	376.627
378.825	395.616
399.290	401.440
409.337	410.996
412.737	416.061
418.491	419.335
420.925	424.256
435.147	436.044

All the above stretches are already shown in google images in Para 4.5.1 (b). However, where the topographic survey has been perform continuously for more than 5 km are given below for more clarity.

b) Minimum and Maximum Depths

As per IWAI suggestion, following sign convention is adopted

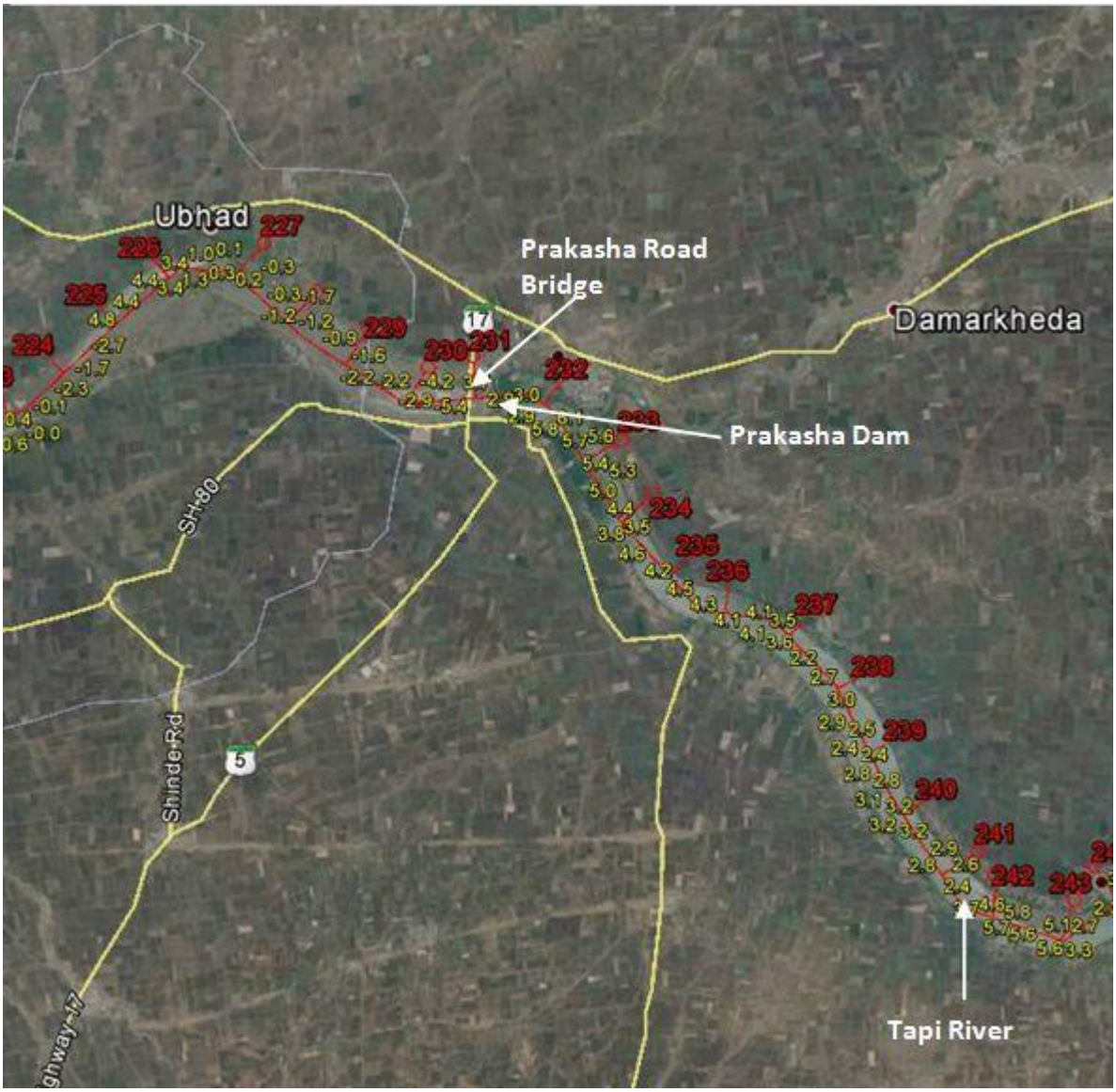
(+) : Riverbed below CD
(-) : Riverbed above CD
(+) : Water Depth below CD
(-) : Water Depth above CD

River Stretch (From CH 173.647 to CH 185.5)

Limbasoti, Jamli, vadpada and Gavan villages are present at the East of the Tapi River and Borda, Piplapani, pathana, Devsaki villages are present at the West of the Tapi River. Vegetation are seen on both sides of the river. Tapi River is flowing from South West to North East direction.

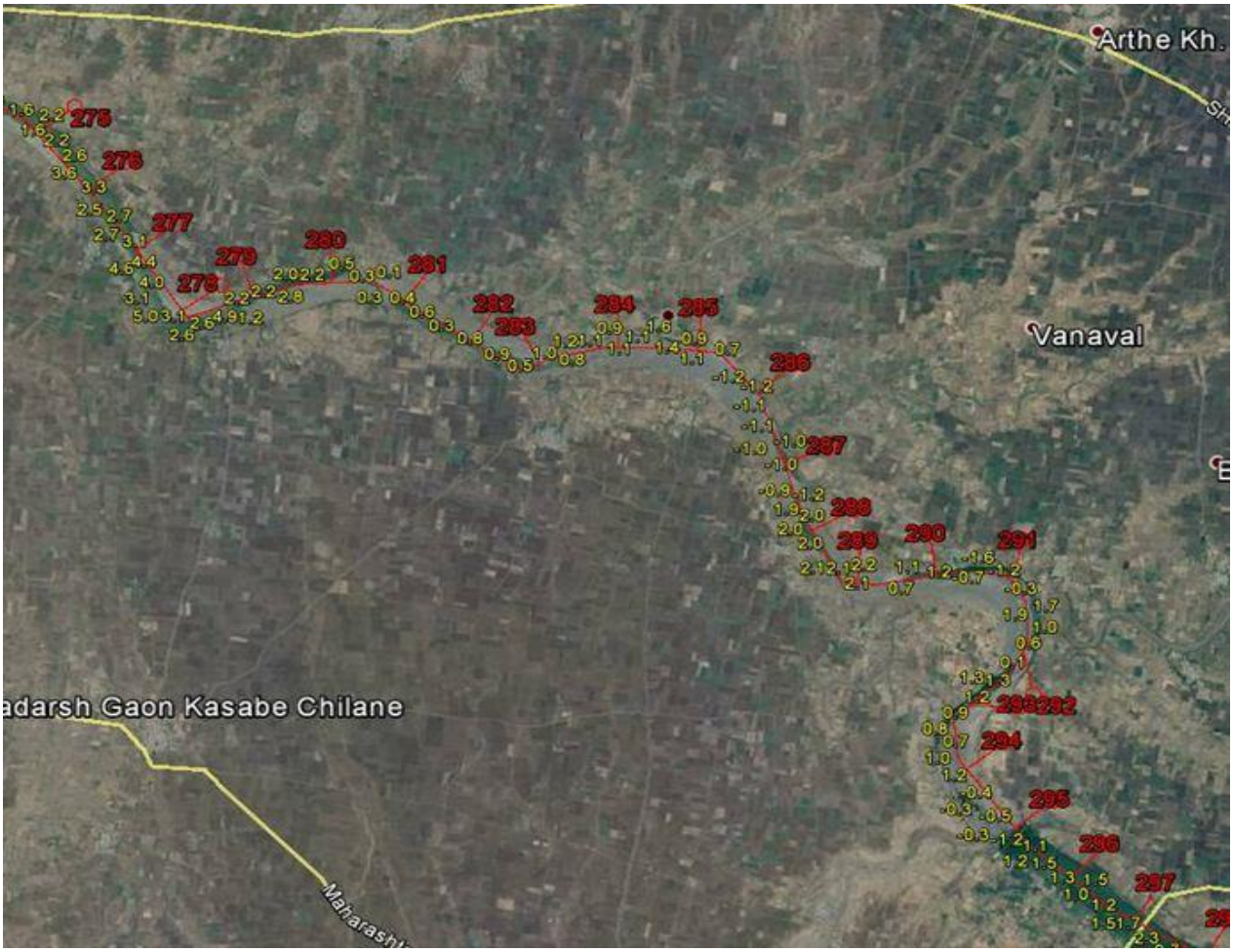
River Stretch (From CH 226.517 to CH 231.216)

Ubhad village is present at the North of the Tapi River and Devala, shahade, Bamdod, Borale, Nashinde villages are present at the South of the Tapi River. Vegetation are seen on both sides of the river. Tapi River is flowing from West to East direction (From CH 217.0 to CH 231.0)



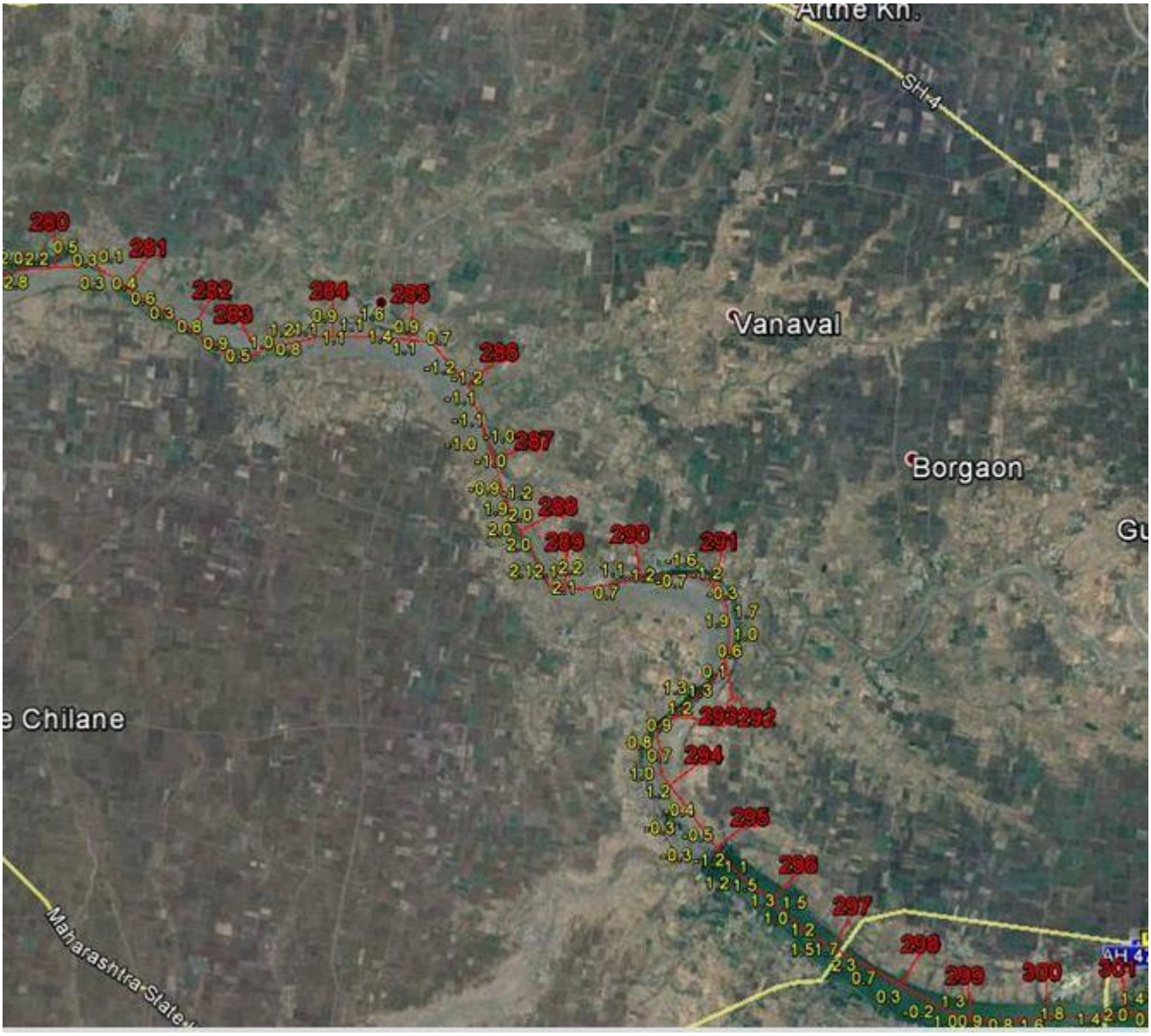
River Stretch (From CH 280.39 to CH 286.672)

Settlements are seen on both sides of the river. Agricultural fields and Vegetation are also seen in this region on both sides of the river.



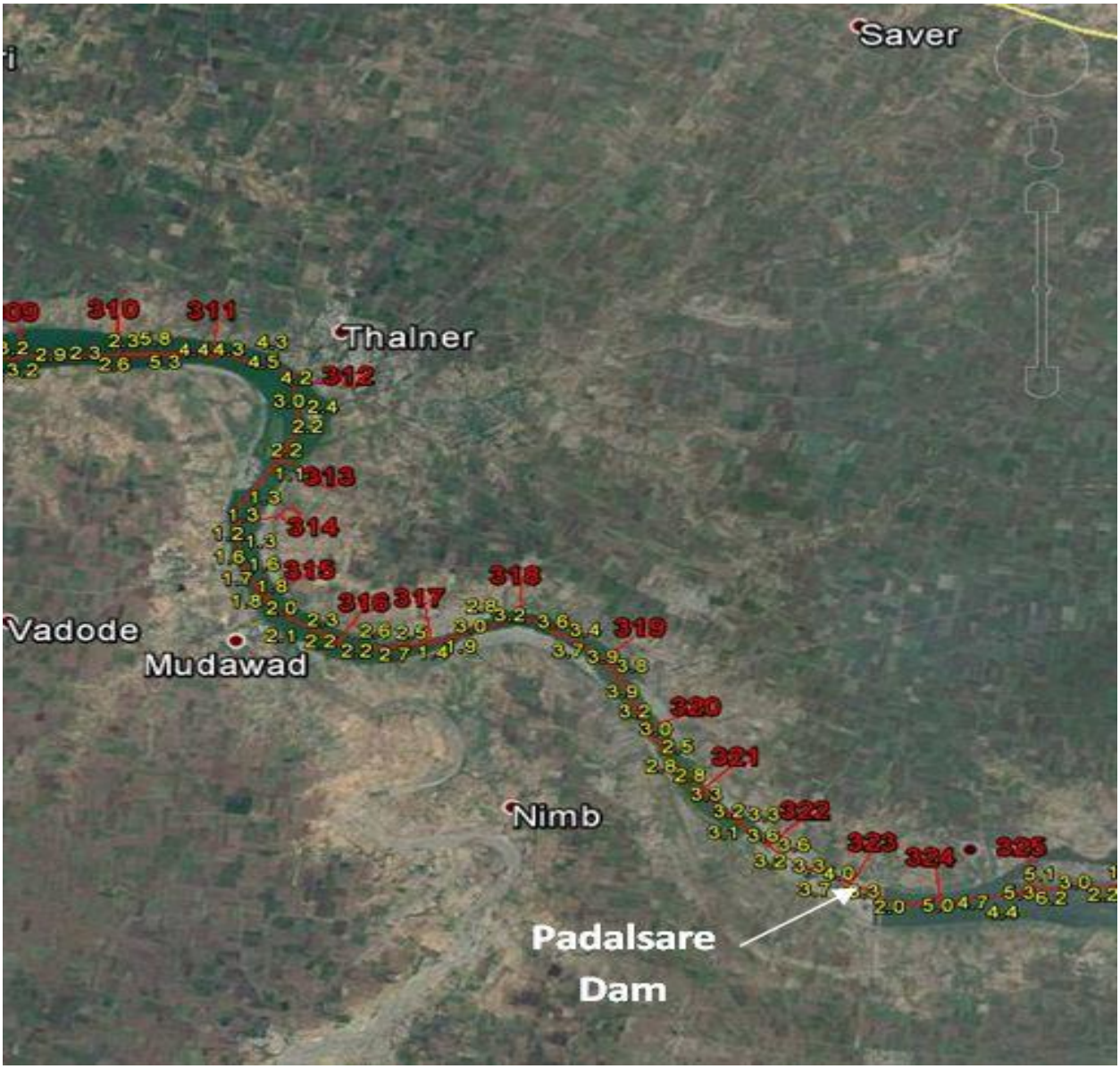
River Stretch (From CH 288.650 to CH 295.083)

Settlements are seen on both sides of the river. Agricultural fields and Vegetation are also seen in this region on both sides of the river. Sulwade Barrage is located at CH 294.8.



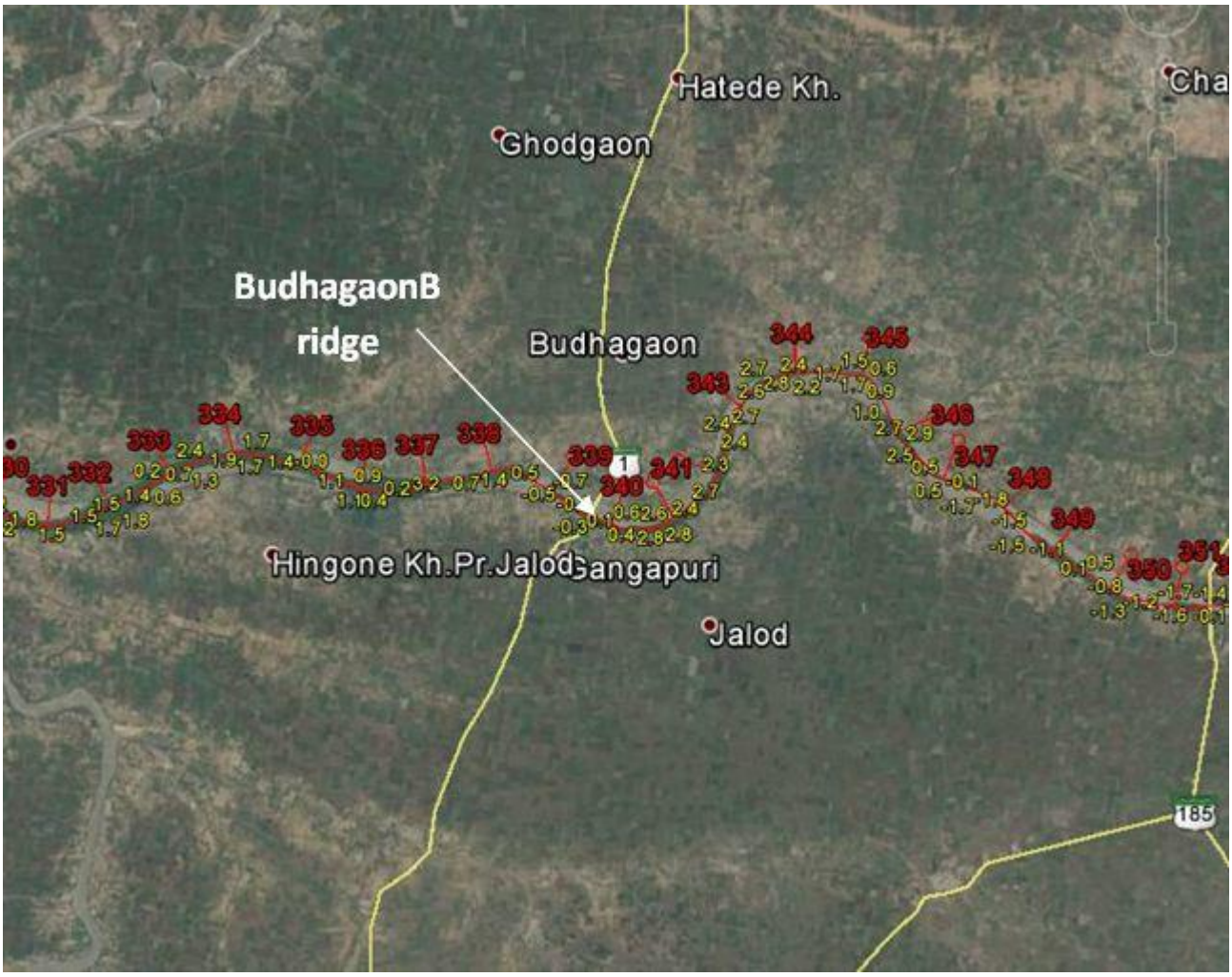
River Stretch (From CH 318.615 to CH 323.383)

Settlements are seen on both sides of the river. Agricultural fields and Vegetation are also seen in this region on both sides of the river. Padalsare Dam is located at CH 323.4.



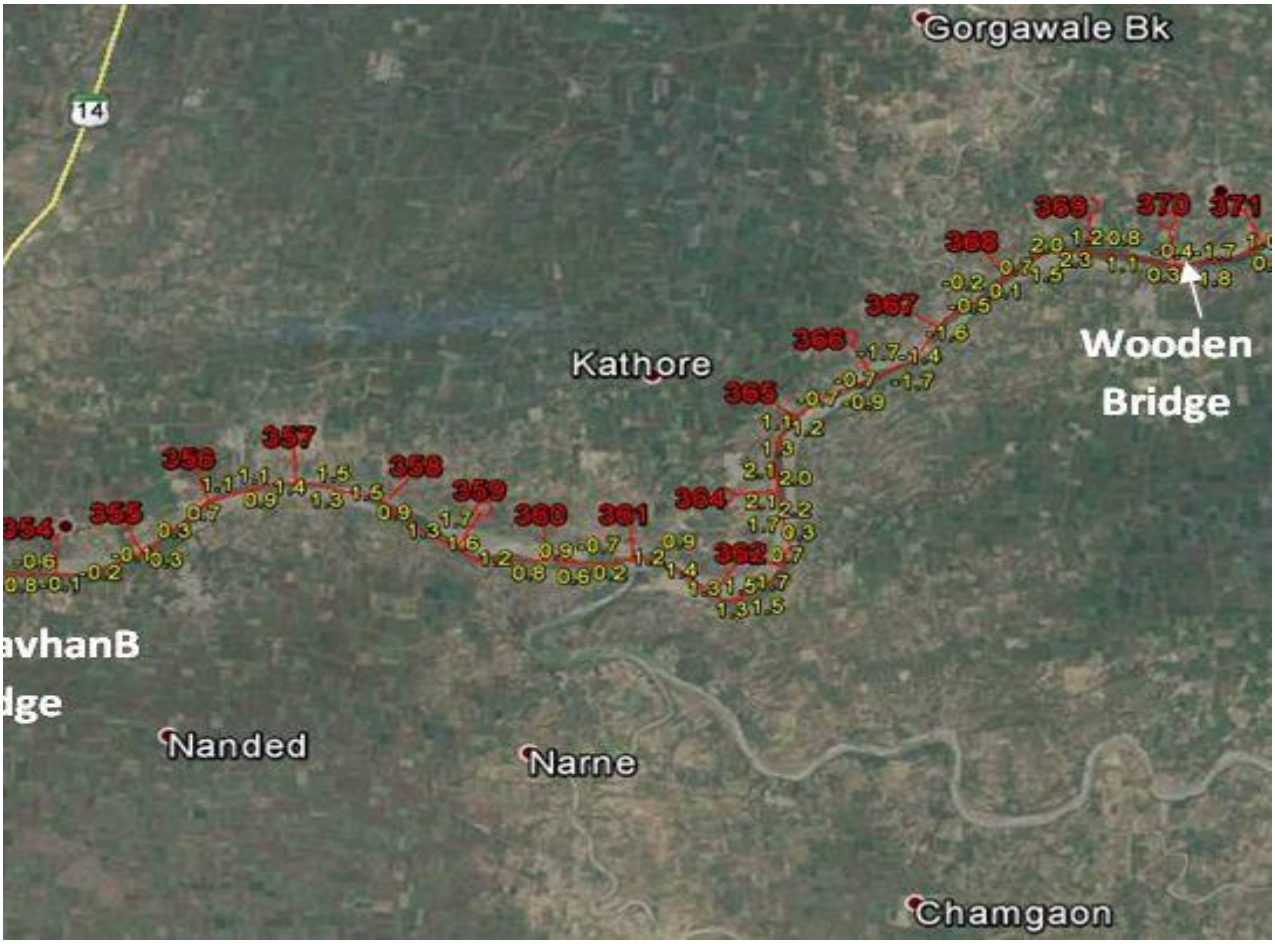
River Stretch (From CH 338.573 to CH 353.405)

Settlements are seen on both sides of the river. Agricultural fields and Vegetation are also seen in this region on both sides of the river. Budhagaon Bridge is located at CH 339.7. High Tension electric line is crossing the river at CH 339.54.



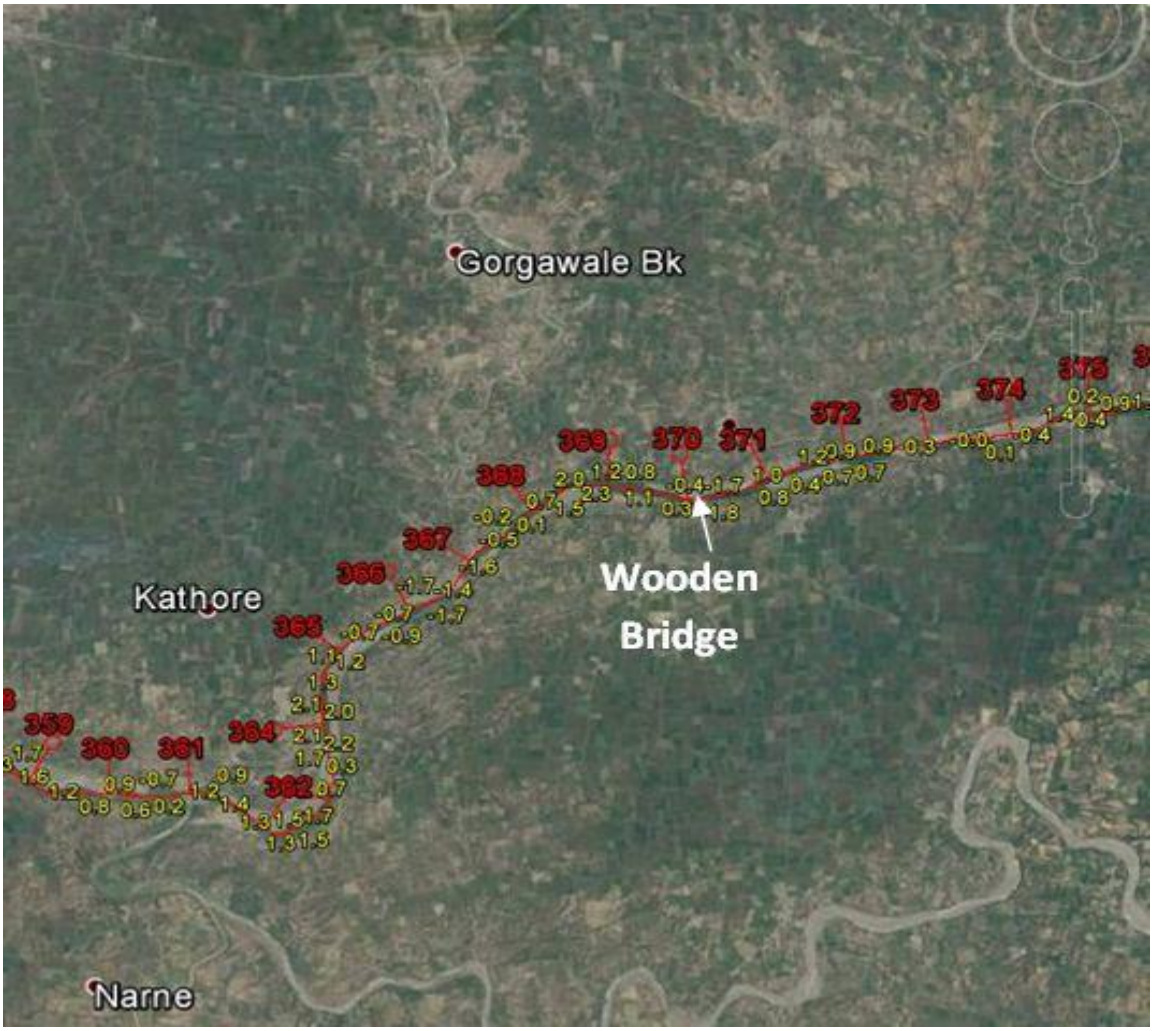
River Stretch (From CH 355.491 to CH 360.27)

Settlements are seen on both sides of the river. Agricultural fields and Vegetation are also seen in this region on both sides of the river



River Stretch (From CH 363.220 to CH 376.627)

Settlements are seen on both sides of the river. Agricultural fields and Vegetation are also seen in this region on both sides of the river



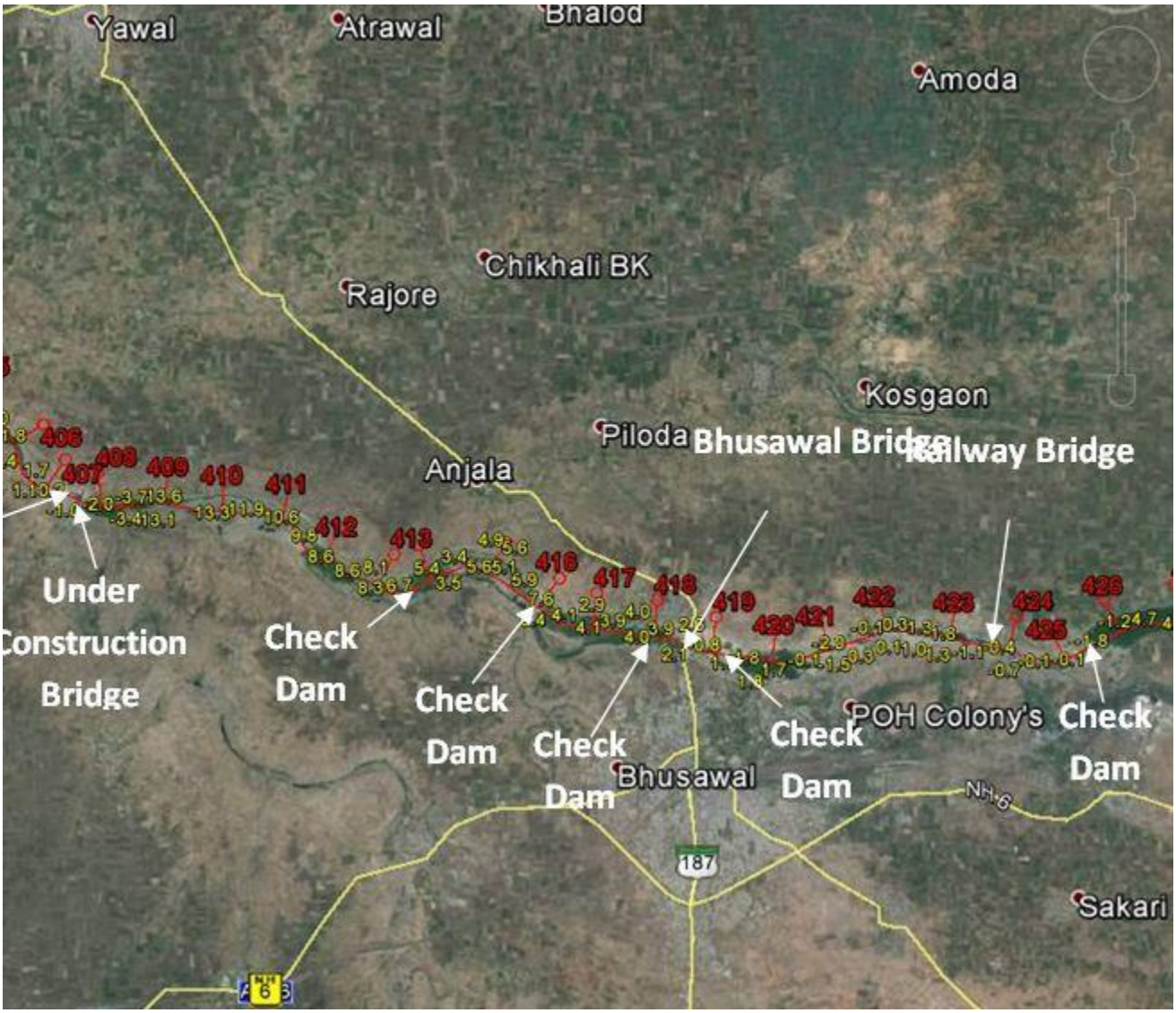
River Stretch (From CH 378.825 to CH 395.616)

Settlements are seen on both sides of the river. Agricultural fields and Vegetation are also seen in this region on both sides of the river. Jalgaon Bridge is located at CH 388.62. High Tension electric line is crossing the river at CH 390.2 and CH 391.26.

The minimum water depth recorded in this section is -0.505 m (CH 392.189) and the maximum water depth is 3.494 m (CH 382.768).

River Stretch (From CH 420.925 to CH 424.256)

Settlements are seen on both sides of the river. Agricultural fields and Vegetation are also seen in this region on both sides of the river. Railway Bridge is located at CH 423.9. High Tension electric line is crossing the river at CH 424.18,



c) Water levels during reconnaissance survey (bathymetry survey (non-tidal reach and topographic survey))

Table 19: Water levels reconnaissance survey

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
30.869	Bathy	0.967	0.650	0.467	0
30.967	Bathy	0.939	0.660	0.473	0
31.067	Bathy	0.934	0.650	0.479	0
31.166	Bathy	0.962	0.650	0.485	0
31.266	Bathy	0.971	0.650	0.491	0
31.366	Bathy	1.058	0.660	0.498	0
31.404	Bathy	1.052	0.650	0.500	0
31.404	Bathy	1.031	0.650	0.500	0
31.408	Bathy	1.053	0.660	0.500	0
31.493	Bathy	1.080	0.660	0.505	0
31.584	Bathy	1.154	0.650	0.511	0
31.679	Bathy	1.231	0.650	0.517	0
31.778	Bathy	1.295	0.650	0.523	0
31.878	Bathy	1.390	0.650	0.529	0
31.978	Bathy	1.409	0.660	0.535	0
32.077	Bathy	1.471	0.650	0.541	0
32.124	Bathy	1.577	0.650	0.544	0
32.253	Bathy	1.617	0.650	0.552	0
32.346	Bathy	1.691	0.650	0.558	0
32.441	Bathy	1.752	0.660	0.564	0
32.536	Bathy	1.791	0.660	0.570	0
32.631	Bathy	1.962	0.660	0.576	0
32.724	Bathy	2.016	0.660	0.581	0
32.817	Bathy	2.146	0.650	0.587	0
32.890	Bathy	2.229	0.660	0.592	0
33.893	Bathy	5.190	1.500	0.653	0
33.895	Bathy	5.431	1.370	0.653	0
33.914	Bathy	3.256	3.640	0.655	0
34.004	Bathy	0.292	6.690	0.660	0.368
34.100	Bathy	-0.368	7.280	0.666	1.034
34.194	Bathy	-1.229	8.050	0.672	1.901
34.290	Bathy	-1.962	8.700	0.678	2.64
34.387	Bathy	-1.832	8.470	0.684	2.516
34.485	Bathy	-2.856	9.400	0.690	3.546
34.583	Bathy	-3.460	10.000	0.696	4.156

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
34.682	Bathy	-3.341	9.830	0.702	4.043
34.781	Bathy	-2.955	9.970	0.708	3.663
34.875	Bathy	-3.017	9.750	0.714	3.731
34.961	Bathy	-3.153	9.670	0.720	3.873
35.053	Bathy	-3.175	9.570	0.725	3.9
35.152	Bathy	-3.159	9.500	0.731	3.89
35.251	Bathy	-2.728	8.940	0.737	3.465
35.347	Bathy	-1.652	7.650	0.743	2.395
35.443	Bathy	-2.223	8.090	0.749	2.972
35.535	Bathy	-3.670	9.380	0.755	4.425
35.609	Bathy	-4.323	9.970	0.759	5.082
35.659	Bathy	-2.005	8.600	0.762	2.767
35.758	Bathy	-4.382	10.930	0.768	5.15
35.852	Bathy	-5.304	11.820	0.774	6.078
35.952	Bathy	-4.818	11.270	0.780	5.598
36.051	Bathy	-5.579	10.960	0.786	6.365
36.149	Bathy	-6.148	11.490	0.792	6.94
36.247	Bathy	-5.885	11.190	0.798	6.683
36.340	Bathy	-4.949	10.200	0.804	5.753
36.386	Bathy	-2.826	10.060	0.807	3.633
36.483	Bathy	-0.354	7.570	0.813	1.167
36.582	Bathy	-2.230	7.430	0.819	3.049
36.680	Bathy	-3.162	8.140	0.825	3.987
36.776	Bathy	-3.493	8.350	0.831	4.324
36.861	Bathy	-3.185	7.970	0.836	4.021
36.961	Bathy	-4.159	8.760	0.842	5.001
37.061	Bathy	-5.662	10.010	0.849	6.511
37.160	Bathy	-5.518	9.900	0.855	6.373
37.260	Bathy	-5.225	9.530	0.861	6.086
37.359	Bathy	-4.842	9.130	0.867	5.709
37.459	Bathy	-3.562	7.800	0.873	4.435
37.559	Bathy	-5.394	9.570	0.879	6.273
37.658	Bathy	-6.280	10.620	0.885	7.165
37.757	Bathy	-4.046	8.500	0.892	4.938
37.857	Bathy	-3.872	8.600	0.898	4.77
37.956	Bathy	-3.871	8.810	0.904	4.775
38.054	Bathy	-3.102	8.150	0.910	4.012
38.154	Bathy	-2.348	7.420	0.916	3.264
38.253	Bathy	-2.708	7.860	0.922	3.63

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
38.351	Bathy	-2.556	7.300	0.928	3.484
38.450	Bathy	-1.860	7.060	0.934	2.794
38.505	Bathy	-1.900	7.100	0.938	2.838
38.601	Bathy	-1.759	6.940	0.944	2.703
38.698	Bathy	-1.823	6.900	0.950	2.773
38.795	Bathy	-1.809	6.820	0.956	2.765
38.894	Bathy	-1.750	6.650	0.962	2.712
38.994	Bathy	-1.890	6.730	0.968	2.858
39.094	Bathy	-1.749	6.530	0.974	2.723
39.194	Bathy	-1.740	6.660	0.980	2.72
39.293	Bathy	-1.806	6.790	0.986	2.792
39.391	Bathy	-1.509	6.650	0.992	2.501
39.488	Bathy	-1.975	7.210	0.998	2.973
39.582	Bathy	-1.601	6.870	1.004	2.605
39.608	Bathy	-1.738	7.080	1.006	2.744
39.656	Bathy	-1.129	6.630	1.009	2.138
39.755	Bathy	-0.571	6.230	1.015	1.586
39.851	Bathy	-0.868	6.740	1.021	1.889
39.949	Bathy	-1.315	7.150	1.027	2.342
40.045	Bathy	-0.028	5.810	1.033	1.061
40.138	Bathy	0.490	5.300	1.038	0.548
40.230	Bathy	0.457	5.370	1.044	0.587
40.321	Bathy	-0.152	6.030	1.050	1.202
40.412	Bathy	-0.408	6.740	1.055	1.463
40.560	Bathy	-0.279	7.220	1.064	1.343
40.660	Bathy	-1.079	7.980	1.070	2.149
40.760	Bathy	-0.576	7.420	1.077	1.653
40.859	Bathy	-0.766	7.570	1.083	1.849
40.959	Bathy	-2.632	9.370	1.089	3.721
41.059	Bathy	-2.916	9.590	1.095	4.011
41.159	Bathy	-1.509	8.260	1.101	2.61
41.259	Bathy	-1.926	8.780	1.107	3.033
41.359	Bathy	-1.094	8.030	1.114	2.208
41.459	Bathy	0.664	6.460	1.120	0.456
41.559	Bathy	0.744	6.520	1.126	0.382
41.659	Bathy	1.260	5.980	1.132	0
41.759	Bathy	1.512	5.720	1.138	0
41.859	Bathy	0.912	6.260	1.144	0.232
41.959	Bathy	1.271	5.870	1.151	0

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
42.059	Bathy	0.821	6.290	1.157	0.336
42.180	Bathy	2.942	4.010	1.164	0
42.279	Bathy	3.851	3.050	1.170	0
42.376	Bathy	3.811	2.990	1.176	0
42.474	Bathy	2.559	4.100	1.182	0
42.573	Bathy	1.500	5.100	1.188	0
42.672	Bathy	1.628	5.160	1.194	0
42.772	Bathy	1.289	5.670	1.201	0
42.872	Bathy	-0.452	7.680	1.207	1.659
42.937	Bathy	-1.052	8.400	1.211	2.263
43.063	Bathy	1.810	5.790	1.219	0
43.157	Bathy	-0.852	8.210	1.224	2.076
43.230	Bathy	-1.509	8.790	1.229	2.738
43.293	Bathy	-1.143	8.340	1.233	2.376
43.393	Bathy	-0.188	7.200	1.239	1.427
43.493	Bathy	-0.534	7.180	1.245	1.779
43.593	Bathy	-0.660	7.300	1.251	1.911
43.693	Bathy	-2.072	8.680	1.257	3.329
43.793	Bathy	-4.171	10.770	1.264	5.435
43.895	Bathy	-2.239	8.780	1.270	3.509
43.979	Bathy	-1.633	8.190	1.275	2.908
44.032	Bathy	-0.540	7.120	1.278	1.818
44.129	Bathy	2.391	4.180	1.284	0
44.225	Bathy	-0.671	7.240	1.290	1.961
44.323	Bathy	-1.718	8.290	1.296	3.014
44.424	Bathy	-0.838	7.450	1.302	2.14
44.525	Bathy	-7.923	14.490	1.309	9.232
44.625	Bathy	-0.681	7.400	1.315	1.996
44.725	Bathy	0.432	6.490	1.321	0.889
44.825	Bathy	0.307	6.810	1.327	1.02
44.925	Bathy	0.757	6.580	1.333	0.576
45.025	Bathy	0.311	7.230	1.339	1.028
45.123	Bathy	0.138	7.170	1.346	1.208
45.222	Bathy	0.671	6.530	1.352	0.681
45.319	Bathy	0.372	6.610	1.358	0.986
45.415	Bathy	0.468	6.190	1.364	0.896
45.513	Bathy	0.469	6.030	1.370	0.901
45.606	Bathy	4.691	1.750	1.375	0
45.660	Bathy	5.012	1.330	1.379	0

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
45.729	Bathy	1.531	4.880	1.383	0
45.897	Bathy	1.478	4.830	1.393	0
46.097	Bathy	-0.705	7.250	1.406	2.111
46.196	Bathy	-0.061	6.180	1.412	1.473
46.296	Bathy	3.325	2.270	1.418	0
49.942	Bathy	-0.951	5.840	1.643	2.594
50.040	Bathy	-1.857	6.550	1.649	3.506
50.140	Bathy	-1.295	6.080	1.655	2.95
50.240	Bathy	-0.478	5.250	1.661	2.139
50.340	Bathy	-0.458	5.280	1.667	2.125
50.401	Bathy	3.174	1.660	1.671	0
50.498	Bathy	1.815	3.100	1.677	0
50.597	Bathy	1.154	3.690	1.683	0.529
50.697	Bathy	-0.181	4.970	1.689	1.87
50.789	Bathy	-0.118	5.350	1.695	1.813
50.875	Bathy	0.749	4.730	1.700	0.951
50.971	Bathy	2.425	3.560	1.706	0
51.070	Bathy	1.692	3.920	1.712	0.02
51.169	Bathy	3.155	2.420	1.718	0
51.170	Bathy	3.145	2.480	1.718	0
51.270	Bathy	3.211	2.770	1.724	0
51.467	Bathy	1.962	3.950	1.737	0
51.550	Bathy	2.394	3.160	1.742	0
51.630	Bathy	2.771	2.570	1.747	0
51.723	Bathy	2.416	2.530	1.752	0
51.810	Bathy	2.652	2.120	1.758	0
51.901	Bathy	3.878	0.750	1.763	0
51.997	Bathy	3.500	0.770	1.769	0
52.106	Bathy	3.416	0.530	1.776	0
52.201	Bathy	3.112	0.790	1.782	0
52.302	Bathy	2.897	1.025	1.788	0
52.400	Bathy	2.670	1.370	1.794	0
52.495	Bathy	2.331	1.720	1.800	0
52.585	Bathy	2.212	1.730	1.806	0
52.665	Bathy	1.997	2.230	1.810	0
52.704	Bathy	-0.395	4.700	1.813	2.208
52.804	Bathy	-0.508	4.820	1.819	2.327
52.902	Bathy	0.689	3.620	1.825	1.136
53.002	Bathy	1.384	2.920	1.831	0.447

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
53.102	Bathy	0.180	3.780	1.837	1.657
53.200	Bathy	-0.494	4.720	1.843	2.337
53.299	Bathy	-0.979	5.220	1.849	2.828
53.399	Bathy	-2.998	6.590	1.856	4.854
53.498	Bathy	-3.383	7.670	1.862	5.245
53.597	Bathy	-2.750	6.990	1.868	4.618
53.696	Bathy	-3.078	7.280	1.874	4.952
53.751	Bathy	-3.042	7.220	1.877	4.919
53.796	Bathy	-3.047	7.170	1.880	4.927
53.850	Bathy	-3.398	7.510	1.883	5.281
53.894	Bathy	-2.968	7.010	1.886	4.854
53.950	Bathy	-2.171	6.260	1.890	4.061
54.063	Bathy	-0.728	4.850	1.897	2.625
54.148	Bathy	0.851	3.370	1.902	1.051
54.231	Bathy	-0.778	5.080	1.907	2.685
54.352	Bathy	-1.107	5.470	1.914	3.021
54.450	Bathy	-0.680	5.120	1.920	2.6
54.550	Bathy	-0.911	5.440	1.927	2.838
54.648	Bathy	0.409	4.000	1.933	1.524
54.747	Bathy	-0.134	4.450	1.939	2.073
54.834	Bathy	-0.313	4.590	1.944	2.257
54.934	Bathy	-0.420	4.660	1.950	2.37
55.034	Bathy	-1.213	5.410	1.956	3.169
55.134	Bathy	-0.739	4.920	1.963	2.702
55.234	Bathy	-1.819	5.800	1.969	3.788
55.334	Bathy	-2.748	6.660	1.975	4.723
55.434	Bathy	-2.733	6.640	1.981	4.714
55.533	Bathy	-2.757	6.620	1.987	4.744
55.620	Bathy	-3.332	7.190	1.993	5.325
55.733	Bathy	-3.872	7.730	2.000	5.872
55.833	Bathy	-2.458	6.380	2.006	4.464
55.933	Bathy	-1.790	5.630	2.012	3.802
56.020	Bathy	-2.283	6.190	2.017	4.3
56.120	Bathy	-3.198	7.040	2.023	5.221
56.220	Bathy	-2.668	6.440	2.030	4.698
56.320	Bathy	-1.712	5.440	2.036	3.748
56.420	Bathy	0.221	3.480	2.042	1.821
56.518	Bathy	-0.605	4.270	2.048	2.653
56.616	Bathy	1.209	2.510	2.054	0.845

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
56.701	Bathy	0.612	3.130	2.059	1.447
56.798	Bathy	-0.333	4.230	2.065	2.398
56.897	Bathy	-0.581	4.510	2.071	2.652
56.996	Bathy	-2.565	6.510	2.077	4.642
57.095	Bathy	-0.823	5.160	2.083	2.906
57.194	Bathy	0.851	3.770	2.090	1.239
57.293	Bathy	0.811	4.490	2.096	1.285
57.393	Bathy	0.612	5.210	2.102	1.49
57.491	Bathy	1.604	4.600	2.108	0.504
57.623	Bathy	-0.179	6.160	2.116	2.295
57.722	Bathy	-2.042	7.900	2.122	4.164
57.821	Bathy	-2.873	8.480	2.128	5.001
57.921	Bathy	-2.216	7.610	2.134	4.35
58.021	Bathy	-1.846	7.150	2.141	3.987
58.102	Bathy	-1.091	6.560	2.146	3.237
58.139	Bathy	-5.131	10.780	2.148	7.279
58.239	Bathy	-4.090	10.030	2.154	6.244
58.339	Bathy	-3.671	10.000	2.160	5.831
58.439	Bathy	-3.621	10.440	2.166	5.787
58.539	Bathy	-3.651	10.790	2.172	5.823
58.639	Bathy	-3.263	10.420	2.179	5.442
58.739	Bathy	-2.664	9.850	2.185	4.849
58.839	Bathy	-2.571	9.800	2.191	4.762
58.938	Bathy	-1.943	9.260	2.197	4.14
59.038	Bathy	-0.376	7.780	2.203	2.579
59.137	Bathy	-1.501	8.870	2.209	3.71
59.235	Bathy	-0.749	8.670	2.215	2.964
59.363	Bathy	-0.733	8.570	2.223	2.956
59.456	Bathy	-2.128	9.950	2.229	4.357
59.554	Bathy	-1.903	9.740	2.235	4.138
59.654	Bathy	-1.419	9.550	2.241	3.66
59.754	Bathy	-1.375	9.710	2.247	3.622
59.846	Bathy	-1.138	9.510	2.253	3.391
59.939	Bathy	-0.873	9.290	2.259	3.132
60.038	Bathy	0.940	7.560	2.265	1.325
60.137	Bathy	1.088	7.380	2.271	1.183
60.239	Bathy	0.045	7.970	2.277	2.232
60.339	Bathy	-4.628	12.310	2.283	6.911
60.434	Bathy	-3.597	11.090	2.289	5.886

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
60.525	Bathy	-3.256	10.912	2.295	5.551
60.617	Bathy	-3.123	10.397	2.301	5.424
60.719	Bathy	-2.516	9.721	2.307	4.823
60.820	Bathy	-2.167	8.689	2.313	4.48
60.937	Bathy	-1.862	8.210	2.319	4.181
61.012	Bathy	-1.137	7.915	2.325	3.462
61.111	Bathy	-0.829	7.421	2.330	3.159
61.200	Bathy	-0.319	7.280	2.336	2.655
61.299	Bathy	-0.588	7.580	2.343	2.931
61.398	Bathy	-2.618	9.740	2.349	4.967
61.498	Bathy	-0.403	7.530	2.355	2.758
61.597	Bathy	-1.496	8.480	2.361	3.857
61.694	Bathy	-1.031	8.030	2.367	3.398
61.818	Bathy	-1.611	8.570	2.375	3.986
61.913	Bathy	-2.087	9.060	2.380	4.467
62.011	Bathy	-1.824	8.610	2.386	4.21
62.116	Bathy	-1.379	7.990	2.392	3.771
62.209	Bathy	-0.513	7.230	2.398	2.911
62.310	Bathy	0.060	6.900	2.405	2.345
62.410	Bathy	-0.734	7.680	2.411	3.145
62.512	Bathy	-0.751	7.730	2.418	3.169
62.609	Bathy	-0.786	7.780	2.425	3.211
62.721	Bathy	-0.812	7.830	2.432	3.244
62.832	Bathy	-0.838	7.880	2.438	3.276
62.959	Bathy	-0.859	7.940	2.445	3.304
63.043	Bathy	-1.436	7.780	2.450	3.886
63.139	Bathy	-2.482	8.980	2.456	4.938
63.214	Bathy	-1.933	8.800	2.461	4.394
63.311	Bathy	-0.501	7.550	2.467	2.968
63.392	Bathy	4.748	2.600	2.472	0
63.492	Bathy	4.753	2.740	2.478	0
63.589	Bathy	5.881	1.770	2.484	0
63.687	Bathy	4.895	2.890	2.490	0
63.786	Bathy	5.402	2.510	2.496	0
63.880	Bathy	4.146	3.880	2.502	0
63.970	Bathy	4.019	4.110	2.507	0
64.063	Bathy	6.179	1.990	2.513	0
64.158	Bathy	2.838	5.140	2.519	0
64.258	Bathy	-1.059	8.980	2.525	3.584

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
64.357	Bathy	-0.689	8.490	2.531	3.22
64.457	Bathy	-0.920	8.550	2.537	3.457
64.556	Bathy	-3.985	11.470	2.543	6.528
64.654	Bathy	0.547	6.690	2.549	2.002
64.756	Bathy	-5.708	12.740	2.556	8.264
64.847	Bathy	-2.329	9.260	2.561	4.89
65.045	Bathy	-2.625	9.360	2.573	5.198
65.145	Bathy	-5.616	12.150	2.580	8.196
65.245	Bathy	-3.212	9.650	2.586	5.798
65.345	Bathy	-3.655	10.060	2.592	6.247
65.445	Bathy	-1.488	7.860	2.598	4.086
65.545	Bathy	-2.007	8.340	2.604	4.611
65.644	Bathy	-2.549	8.890	2.610	5.159
65.745	Bathy	0.753	5.620	2.617	1.864
65.886	Bathy	-1.808	8.220	2.625	4.433
65.981	Bathy	2.283	4.080	2.631	0.348
66.078	Bathy	-1.428	7.790	2.637	4.065
66.176	Bathy	0.341	6.410	2.643	2.302
66.274	Bathy	0.672	6.310	2.649	1.977
66.373	Bathy	0.282	6.770	2.655	2.373
66.477	Bathy	0.483	7.010	2.661	2.178
66.569	Bathy	-0.167	7.360	2.668	2.835
66.670	Bathy	-1.633	7.720	2.674	4.307
66.769	Bathy	4.708	1.410	2.680	0
66.869	Bathy	1.515	4.690	2.686	1.171
66.968	Bathy	3.711	2.530	2.692	0
67.065	Bathy	3.996	2.300	2.698	0
67.163	Bathy	3.281	2.880	2.704	0
67.265	Bathy	3.447	2.710	2.710	0
67.364	Bathy	-0.482	6.710	2.716	3.198
67.464	Bathy	1.700	4.530	2.723	1.023
67.564	Bathy	1.503	4.740	2.729	1.226
67.663	Bathy	-1.071	7.270	2.735	3.806
67.761	Bathy	4.920	1.210	2.741	0
67.860	Bathy	0.751	5.320	2.747	1.996
67.960	Bathy	-5.898	11.850	2.753	8.651
68.060	Bathy	-8.797	14.730	2.759	11.556
68.159	Bathy	-8.210	14.350	2.765	10.975
68.269	Bathy	-1.520	7.860	2.772	4.292

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
68.362	Bathy	-3.216	10.080	2.778	5.994
68.459	Bathy	-4.059	11.040	2.784	6.843
68.556	Bathy	-3.513	10.630	2.790	6.303
68.655	Bathy	-1.795	8.900	2.796	4.591
68.755	Bathy	-0.738	7.810	2.802	3.54
68.854	Bathy	-1.431	8.560	2.808	4.239
68.954	Bathy	-1.692	8.920	2.814	4.506
69.054	Bathy	-2.527	9.730	2.821	5.348
69.153	Bathy	0.145	6.870	2.827	2.682
69.353	Bathy	1.690	5.140	2.839	1.149
69.552	Bathy	-1.002	7.700	2.851	3.853
69.650	Bathy	-1.316	8.050	2.858	4.174
69.752	Bathy	-1.721	8.420	2.864	4.585
69.852	Bathy	-4.238	10.580	2.870	7.108
69.952	Bathy	-4.478	10.420	2.876	7.354
70.051	Bathy	-4.078	9.730	2.882	6.96
70.149	Bathy	-0.832	6.300	2.888	3.72
70.254	Bathy	-1.137	6.490	2.895	4.032
70.354	Bathy	-3.269	9.420	2.901	6.17
70.452	Bathy	-1.490	7.530	2.907	4.397
70.552	Bathy	-1.059	7.000	2.913	3.972
70.652	Bathy	-0.761	6.780	2.919	3.68
70.752	Bathy	-1.540	7.570	2.925	4.465
70.852	Bathy	-0.566	6.630	2.931	3.497
70.952	Bathy	-0.422	6.550	2.938	3.36
71.051	Bathy	0.625	5.560	2.944	2.319
71.151	Bathy	-2.488	8.560	2.950	5.438
71.245	Bathy	-2.316	8.720	2.956	5.272
71.347	Bathy	-2.301	8.610	2.963	5.264
71.453	Bathy	-2.259	8.590	2.969	5.228
71.579	Bathy	-2.171	8.370	2.976	5.147
71.682	Bathy	-2.118	8.110	2.983	5.101
71.779	Bathy	-1.099	7.020	2.989	4.088
71.877	Bathy	2.011	3.830	2.995	0.984
71.973	Bathy	1.838	3.960	3.001	1.163
72.098	Bathy	-0.283	5.950	3.008	3.291
72.198	Bathy	-2.172	7.700	3.014	5.186
72.298	Bathy	-2.172	7.690	3.021	5.193
72.398	Bathy	-2.841	7.410	3.027	5.868

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
72.500	Bathy	-2.841	8.160	3.033	5.874
72.596	Bathy	-0.168	5.370	3.153	3.321
72.696	Bathy	1.032	4.060	3.278	2.246
72.795	Bathy	1.032	5.970	3.402	2.37
72.895	Bathy	1.119	3.880	3.527	2.408
72.993	Bathy	1.252	3.700	3.650	2.398
73.092	Bathy	-1.651	6.520	3.773	5.424
73.192	Bathy	-2.289	6.910	3.898	6.187
73.277	Bathy	-4.898	9.310	4.004	8.902
73.377	Bathy	-4.897	8.340	4.129	9.026
73.475	Bathy	-3.094	6.740	4.252	7.346
73.654	Bathy	-5.362	8.990	4.475	9.837
73.764	Bathy	-1.948	5.320	4.612	6.56
73.863	Bathy	-2.821	6.900	4.737	7.558
73.959	Bathy	-1.588	5.300	4.857	6.445
74.059	Bathy	-2.374	5.840	4.982	7.356
74.158	Bathy	-1.452	5.660	5.106	6.558
74.257	Bathy	1.496	3.250	5.230	3.734
74.357	Bathy	0.954	4.830	5.354	4.4
74.455	Bathy	2.785	3.900	5.477	2.692
74.555	Bathy	2.484	5.340	5.602	3.118
74.659	Bathy	1.409	5.940	5.732	4.323
74.758	Bathy	-0.233	6.730	5.856	6.089
74.858	Bathy	0.412	6.000	5.981	5.569
74.958	Bathy	1.503	4.840	6.105	4.602
75.057	Bathy	-0.986	7.220	6.230	7.216
75.157	Bathy	2.793	3.540	6.354	3.561
75.257	Bathy	1.074	4.350	6.479	5.405
75.356	Bathy	-1.262	6.790	6.602	7.864
75.452	Bathy	-2.235	8.820	6.723	8.958
75.560	Bathy	-0.356	7.130	6.858	7.214
75.660	Bathy	4.258	2.400	6.984	2.726
75.760	Bathy	4.617	2.030	7.108	2.491
75.860	Bathy	4.091	2.690	7.233	3.142
75.960	Bathy	3.196	3.570	7.358	4.162
76.060	Bathy	5.328	2.470	7.483	2.155
76.160	Bathy	4.807	2.960	7.608	2.801
76.260	Bathy	4.576	2.870	7.733	3.157
76.359	Bathy	5.062	2.240	7.857	2.795

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
76.459	Bathy	5.221	1.860	7.982	2.761
76.558	Bathy	5.380	1.180	8.105	2.725
76.657	Bathy	5.041	0.830	8.229	3.188
76.729	Bathy	4.726	0.500	8.320	3.594
76.820	Bathy	6.806	1.000	8.433	1.627
76.975	Bathy	6.870	1.000	8.627	1.757
77.084	Bathy	6.960	1.000	8.763	1.803
77.192	Bathy	7.030	1.000	8.898	1.868
77.285	Bathy	7.080	1.000	9.015	1.935
77.384	Bathy	7.150	1.000	9.138	1.988
77.483	Bathy	7.200	1.000	9.262	2.062
77.541	Bathy	7.256	1.000	9.334	2.078
77.709	Bathy	7.290	1.000	9.544	2.254
77.802	Bathy	7.300	1.000	9.661	2.361
77.924	Bathy	7.310	1.000	9.813	2.503
78.036	Bathy	7.360	1.200	9.953	2.593
78.113	Bathy	7.330	1.500	10.049	2.719
78.226	Bathy	7.316	2.000	10.191	2.875
78.410	Bathy	7.680	2.000	10.420	2.74
78.510	Bathy	7.920	2.000	10.545	2.625
78.615	Bathy	8.020	2.000	10.676	2.656
78.714	Bathy	8.260	2.000	10.801	2.541
78.814	Bathy	8.586	2.000	10.926	2.34
78.914	Bathy	9.060	2.000	11.050	1.99
79.013	Bathy	9.540	2.000	11.175	1.635
79.113	Bathy	10.010	2.000	11.299	1.289
79.213	Bathy	10.680	2.000	11.424	0.744
79.311	Bathy	10.990	2.000	11.546	0.556
79.409	Bathy	11.000	2.000	11.669	0.669
79.506	Bathy	11.560	2.000	11.791	0.231
79.600	Bathy	12.076	3.000	11.908	0
79.714	Bathy	11.820	3.000	12.051	0.231
79.767	Bathy	11.466	3.000	12.117	0.651
79.903	Bathy	12.860	3.000	12.286	0
80.000	Bathy	14.406	2.000	12.408	0
80.109	Bathy	12.620	2.000	12.544	0
80.215	Bathy	10.310	2.000	12.677	2.367
80.307	Bathy	8.250	1.500	12.791	4.541
80.450	Bathy	6.966	1.500	12.971	6.005

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
80.599	Bathy	7.310	1.200	13.156	5.846
80.672	Bathy	7.960	1.200	13.249	5.289
80.756	Bathy	8.140	1.000	13.353	5.213
80.835	Bathy	8.286	1.000	13.452	5.166
80.916	Bathy	8.540	1.000	13.553	5.013
81.097	Bathy	8.970	0.800	13.779	4.809
81.192	Bathy	9.360	0.800	13.899	4.539
81.287	Bathy	9.840	0.500	14.017	4.177
81.381	Bathy	10.534	0.500	14.134	3.6
81.475	Bathy	10.679	0.500	14.251	3.572
81.571	Bathy	10.781	0.500	14.369	3.588
81.670	Bathy	10.834	0.500	14.485	3.651
81.769	Bathy	10.940	0.500	14.620	3.68
81.824	Bathy	11.110	0.500	14.688	3.578
81.915	Bathy	11.430	0.500	14.802	3.372
82.045	Bathy	11.490	0.500	14.921	3.431
82.186	Bathy	11.540	0.500	15.141	3.601
82.286	Bathy	11.680	0.500	15.265	3.585
82.387	Bathy	11.730	0.700	15.412	3.682
82.489	Bathy	11.780	0.800	15.520	3.74
82.579	Bathy	12.080	1.000	15.632	3.552
82.668	Bathy	12.614	1.000	15.743	3.129
82.758	Bathy	12.690	1.000	15.855	3.165
82.848	Bathy	12.780	1.000	15.968	3.188
82.938	Bathy	12.810	1.200	16.081	3.271
83.022	Bathy	12.890	1.200	16.185	3.295
83.120	Bathy	12.960	1.500	16.308	3.348
83.219	Bathy	13.060	2.000	16.431	3.371
83.317	Bathy	13.100	2.000	16.554	3.454
83.417	Bathy	13.134	2.500	16.679	3.545
83.517	Bathy	13.270	2.000	16.804	3.534
83.617	Bathy	13.410	2.000	16.929	3.519
83.717	Bathy	13.580	2.000	17.054	3.474
83.817	Bathy	13.670	2.000	17.179	3.509
83.919	Bathy	13.750	1.500	17.306	3.556
84.018	Bathy	13.854	0.500	17.431	3.577
84.117	Bathy	14.080	0.500	17.554	3.474
84.216	Bathy	14.890	0.500	17.678	2.788
84.314	Bathy	15.350	0.500	17.801	2.451

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
84.413	Bathy	15.880	0.500	17.924	2.044
84.511	Bathy	16.454	0.500	18.047	1.593
84.611	Bathy	16.590	0.500	18.171	1.581
84.710	Bathy	16.820	0.500	18.296	1.476
84.809	Bathy	16.980	0.500	18.420	1.44
84.905	Bathy	17.090	0.500	18.540	1.45
85.005	Bathy	17.230	1.000	18.665	1.435
85.097	Bathy	17.524	1.000	18.779	1.255
85.195	Bathy	17.430	1.000	18.902	1.472
85.295	Bathy	17.320	1.000	19.027	1.707
85.395	Bathy	17.260	1.000	19.152	1.892
85.495	Bathy	17.110	1.000	19.277	2.167
85.595	Bathy	17.014	1.000	19.402	2.388
85.715	Bathy	17.860	1.000	19.552	1.692
85.815	Bathy	18.604	1.000	19.676	1.072
85.915	Bathy	18.550	1.000	19.802	1.252
86.014	Bathy	18.514	1.000	19.926	1.412
86.113	Bathy	18.680	1.000	20.049	1.369
86.212	Bathy	18.840	1.000	20.173	1.333
86.363	Bathy	19.110	1.000	20.362	1.252
86.461	Bathy	19.460	1.000	20.484	1.024
86.558	Bathy	19.894	1.000	20.606	0.712
86.658	Bathy	19.830	1.000	20.730	0.9
86.757	Bathy	19.810	1.000	20.855	1.045
86.857	Bathy	19.740	1.000	20.979	1.239
86.957	Bathy	19.640	1.000	21.104	1.464
87.056	Bathy	19.580	1.000	21.229	1.649
87.156	Bathy	19.520	1.000	21.353	1.833
87.256	Bathy	19.480	1.000	21.478	1.998
87.356	Bathy	19.450	1.000	21.602	2.152
87.456	Bathy	19.420	1.000	21.727	2.307
87.554	Bathy	19.350	1.200	21.851	2.501
87.653	Bathy	19.360	1.500	21.974	2.614
87.752	Bathy	19.380	1.500	22.098	2.718
87.850	Bathy	19.560	1.500	22.221	2.661
87.945	Bathy	19.400	1.000	22.339	2.939
87.998	Bathy	19.430	1.000	22.406	2.976
88.081	Bathy	19.400	1.500	22.509	3.109
88.149	Bathy	19.351	5.000	22.595	3.244

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
88.262	Bathy	20.721	5.000	22.735	2.014
88.360	Bathy	20.500	5.000	22.858	2.358
88.441	Bathy	20.231	5.000	22.959	2.728
88.540	Bathy	20.459	5.000	23.109	2.65
88.642	Bathy	20.960	5.000	23.180	2.22
88.751	Bathy	21.218	5.000	23.270	2.052
88.849	Bathy	21.634	1.500	23.371	1.737
88.961	Bathy	21.836	1.500	23.467	1.631
89.031	Bathy	22.220	1.500	23.696	1.476
89.132	Bathy	23.841	1.500	23.823	0
89.245	Bathy	23.060	1.500	23.965	0.905
89.341	Bathy	22.510	1.500	24.085	1.575
89.497	Bathy	22.010	1.500	24.279	2.269
89.584	Bathy	21.560	1.500	24.388	2.828
89.671	Bathy	21.040	1.500	24.497	3.457
89.758	Bathy	20.880	1.500	24.605	3.725
89.845	Bathy	20.530	2.000	24.714	4.184
89.940	Bathy	20.500	5.000	24.833	4.333
90.035	Bathy	20.410	5.000	24.952	4.542
90.134	Bathy	20.450	5.000	25.076	4.626
90.177	Bathy	20.481	6.000	25.129	4.648
90.234	Bathy	20.380	5.000	25.200	4.82
90.328	Bathy	20.310	5.000	25.318	5.008
90.398	Bathy	20.290	5.000	25.406	5.116
90.404	Bathy	20.261	5.000	25.413	5.152
90.482	Bathy	20.520	5.000	25.511	4.991
90.578	Bathy	20.610	5.000	25.631	5.021
90.656	Bathy	20.740	5.000	25.728	4.988
90.741	Bathy	20.840	5.000	25.835	4.995
90.848	Bathy	21.010	4.000	25.968	4.958
90.867	Bathy	21.221	4.000	25.992	4.771
90.947	Bathy	21.320	4.000	26.092	4.772
91.047	Bathy	21.360	5.000	26.217	4.857
91.147	Bathy	21.480	5.000	26.342	4.862
91.247	Bathy	21.520	6.000	26.466	4.946
91.328	Bathy	21.581	7.000	26.568	4.987
91.346	Bathy	21.590	7.000	26.591	5.001
91.446	Bathy	22.380	5.000	26.715	4.335
91.556	Bathy	23.240	5.000	26.853	3.613

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
91.653	Bathy	24.190	4.000	26.974	2.784
91.750	Bathy	25.030	4.000	27.095	2.065
91.847	Bathy	25.940	3.000	27.216	1.276
91.944	Bathy	26.760	2.000	27.338	0.578
91.992	Bathy	27.561	1.500	27.398	0
92.033	Bathy	28.320	2.000	27.417	0
92.114	Bathy	29.430	3.000	27.453	0
92.195	Bathy	30.410	4.000	27.489	0
92.291	Bathy	30.960	4.000	27.526	0
92.380	Bathy	31.520	5.000	27.562	0
92.447	Bathy	32.010	5.000	27.603	0
92.547	Bathy	33.180	6.000	27.648	0
92.735	Bathy	34.330	7.000	27.733	0
92.829	Bathy	36.951	7.000	27.775	0
92.927	Bathy	35.030	7.000	27.819	0
93.022	Bathy	34.060	5.000	27.862	0
93.118	Bathy	33.010	5.000	27.905	0
93.197	Bathy	32.180	5.000	27.941	0
93.296	Bathy	31.290	5.000	27.985	0
93.395	Bathy	30.250	3.000	28.030	0
93.494	Bathy	29.180	2.000	28.074	0
93.604	Bathy	28.630	2.000	28.124	0
93.697	Bathy	27.870	3.000	28.165	0.295
93.790	Bathy	27.030	3.000	28.207	1.177
93.882	Bathy	26.550	3.000	28.249	1.699
93.972	Bathy	25.281	3.000	28.289	3.008
94.064	Bathy	25.200	2.000	28.331	3.131
94.164	Bathy	25.320	2.000	28.376	3.056
94.263	Bathy	25.410	2.000	28.420	3.01
94.363	Bathy	25.410	2.000	28.465	3.055
94.462	Bathy	25.390	2.000	28.510	3.12
94.562	Bathy	25.310	2.000	28.555	3.245
94.652	Bathy	25.240	2.000	28.595	3.355
94.739	Bathy	25.160	1.000	28.635	3.475
94.828	Bathy	25.110	1.000	28.675	3.565
94.875	Bathy	25.081	1.000	28.696	3.615
94.955	Bathy	25.100	1.000	28.731	3.631
95.054	Bathy	25.310	1.000	28.776	3.466
95.153	Bathy	25.410	2.000	28.820	3.41

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
95.267	Bathy	25.540	2.000	28.872	3.332
95.367	Bathy	25.690	5.000	28.917	3.227
95.442	Bathy	25.750	5.000	28.962	3.212
95.539	Bathy	25.810	5.000	29.007	3.197
95.608	Bathy	25.880	5.000	29.026	3.146
95.671	Bathy	25.911	5.000	29.054	3.143
95.794	Bathy	25.990	5.000	29.109	3.119
95.864	Bathy	26.650	5.000	29.141	2.491
95.961	Bathy	27.520	5.000	29.184	1.664
96.050	Bathy	28.840	5.000	29.224	0.384
96.125	Bathy	29.920	5.000	29.258	0
96.225	Bathy	30.360	5.000	29.303	0
96.325	Bathy	33.180	5.000	29.348	0
96.425	Bathy	35.270	5.000	29.393	0
96.525	Bathy	36.640	5.000	29.438	0
96.625	Bathy	37.890	5.000	29.483	0
96.671	Bathy	39.291	5.000	29.504	0
96.725	Bathy	39.000	5.000	29.528	0
96.839	Bathy	38.210	5.000	29.579	0
96.938	Bathy	38.411	5.000	29.624	0
97.037	Bathy	33.280	2.000	29.668	0
97.136	Bathy	28.310	2.000	29.713	1.403
97.234	Bathy	25.052	2.000	29.757	4.705
97.318	Bathy	24.990	2.000	29.795	4.805
97.414	Bathy	24.710	2.000	29.838	5.128
97.510	Bathy	24.590	2.000	29.881	5.291
97.606	Bathy	24.413	2.000	29.925	5.512
97.702	Bathy	24.280	2.500	29.968	5.688
97.799	Bathy	24.110	2.500	30.011	5.901
97.895	Bathy	24.870	2.500	30.055	5.185
97.991	Bathy	23.720	2.500	30.098	6.378
98.093	Bathy	23.642	2.500	30.144	6.502
98.195	Bathy	23.880	2.000	30.190	6.31
98.290	Bathy	23.990	2.000	30.232	6.242
98.364	Bathy	24.090	2.000	30.266	6.176
98.475	Bathy	24.134	2.000	30.315	6.181
98.585	Bathy	24.182	2.000	30.365	6.183
98.650	Bathy	31.832	2.000	30.394	0
98.747	Bathy	31.440	2.000	30.438	0

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
98.847	Bathy	31.080	2.000	30.483	0
98.947	Bathy	30.740	2.000	30.528	0
99.047	Bathy	30.620	1.000	30.573	0
99.177	Bathy	30.440	1.000	30.632	0.192
99.275	Bathy	29.410	0.500	30.675	1.265
99.372	Bathy	29.000	0.500	30.719	1.719
99.415	Bathy	28.582	0.500	30.739	2.157
99.470	Bathy	28.030	1.000	30.763	2.733
99.569	Bathy	27.810	1.000	30.808	2.998
99.669	Bathy	27.640	2.000	30.853	3.213
99.768	Bathy	27.350	2.000	30.897	3.547
99.894	Bathy	27.020	2.000	30.954	3.934
99.994	Bathy	26.870	3.000	30.999	4.129
100.042	Bathy	26.352	3.000	31.021	4.669
100.168	Bathy	27.810	2.000	31.077	3.267
100.222	Bathy	28.932	1.500	31.102	2.17
100.255	Bathy	29.970	1.500	31.117	1.147
100.351	Bathy	30.020	1.500	31.163	1.143
100.462	Bathy	30.410	1.500	31.201	0.791
100.573	Bathy	30.860	2.000	31.256	0.396
100.686	Bathy	31.020	2.000	31.310	0.29
100.763	Bathy	32.162	2.500	31.345	0
100.783	Bathy	31.950	2.000	31.354	0
100.881	Bathy	31.826	2.000	31.398	0
100.980	Bathy	31.710	2.000	31.443	0
101.076	Bathy	30.740	2.000	31.486	0.746
101.147	Bathy	29.782	1.000	31.518	1.736
101.163	Bathy	30.130	1.000	31.525	1.395
101.223	Bathy	30.240	1.000	31.552	1.312
101.284	Bathy	30.330	1.000	31.580	1.25
101.344	Bathy	30.520	1.500	31.607	1.087
101.378	Bathy	30.802	1.500	31.622	0.82
101.507	Bathy	30.730	1.500	31.680	0.95
101.565	Bathy	30.790	1.000	31.706	0.916
101.659	Bathy	30.820	1.000	31.749	0.929
101.760	Bathy	30.700	1.000	31.794	1.094
101.830	Bathy	31.612	1.000	31.825	0.213
101.894	Bathy	33.822	1.000	31.854	0
101.940	Bathy	32.310	1.000	31.875	0

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
102.004	Bathy	31.420	2.000	31.904	0.484
102.046	Bathy	30.552	3.000	31.922	1.37
102.113	Bathy	29.850	3.000	31.953	2.103
102.169	Bathy	29.220	3.000	31.978	2.758
102.234	Bathy	28.540	4.000	32.007	3.467
102.267	Bathy	28.122	4.000	32.022	3.9
102.327	Bathy	29.030	4.000	32.049	3.019
102.431	Bathy	28.840	4.000	32.096	3.256
102.530	Bathy	28.610	4.000	32.140	3.53
102.625	Bathy	28.432	4.000	32.183	3.751
102.726	Bathy	28.990	4.000	32.229	3.239
102.869	Bathy	29.160	4.000	32.293	3.133
102.967	Bathy	29.340	4.000	32.337	2.997
103.066	Bathy	29.680	4.500	32.381	2.701
103.163	Bathy	30.022	4.500	32.425	2.403
103.264	Bathy	30.290	4.500	32.471	2.181
103.364	Bathy	30.580	4.000	32.515	1.935
103.464	Bathy	30.810	4.000	32.560	1.75
103.563	Bathy	31.020	4.000	32.605	1.585
103.630	Bathy	31.262	4.000	32.635	1.373
103.741	Bathy	30.960	4.000	32.685	1.725
103.840	Bathy	30.580	4.000	32.730	2.15
103.940	Bathy	30.210	4.000	32.775	2.565
104.049	Bathy	30.000	4.000	32.824	2.824
104.121	Bathy	29.160	4.000	32.856	3.696
104.224	Bathy	28.540	5.000	32.902	4.362
104.309	Bathy	28.030	5.000	32.941	4.911
104.406	Bathy	27.660	5.000	32.984	5.324
104.527	Bathy	27.440	5.000	33.039	5.599
104.638	Bathy	27.310	5.000	33.089	5.779
104.751	Bathy	27.220	6.000	33.140	5.92
104.859	Bathy	26.910	6.000	33.188	6.278
104.920	Bathy	26.554	6.000	33.216	6.662
105.054	Bathy	26.830	6.000	33.276	6.446
105.153	Bathy	26.940	6.000	33.321	6.381
105.253	Bathy	26.960	6.000	33.366	6.406
105.352	Bathy	26.820	6.000	33.410	6.59
105.362	Bathy	26.994	6.000	33.415	6.421
105.447	Bathy	27.260	6.000	33.453	6.193

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
105.547	Bathy	27.810	6.000	33.498	5.688
105.647	Bathy	27.990	6.000	33.543	5.553
105.746	Bathy	28.130	6.000	33.588	5.458
105.846	Bathy	28.410	6.000	33.633	5.223
105.946	Bathy	28.730	6.000	33.678	4.948
106.039	Bathy	29.954	6.000	33.720	3.766
106.145	Bathy	30.010	6.000	33.767	3.757
106.244	Bathy	30.030	6.000	33.812	3.782
106.343	Bathy	30.060	6.000	33.856	3.796
106.447	Bathy	29.990	5.000	33.903	3.913
106.546	Bathy	29.840	5.000	33.948	4.108
106.646	Bathy	29.720	5.000	33.993	4.273
106.746	Bathy	29.680	5.000	34.037	4.357
106.846	Bathy	29.600	5.000	34.082	4.482
106.874	Bathy	29.554	5.000	34.095	4.541
106.938	Bathy	29.210	5.000	34.124	4.914
107.062	Bathy	29.020	5.000	34.180	5.16
107.158	Bathy	28.840	4.000	34.223	5.383
107.254	Bathy	28.610	4.000	34.266	5.656
107.350	Bathy	28.480	4.000	34.309	5.829
107.446	Bathy	28.320	4.000	34.352	6.032
107.542	Bathy	28.200	4.000	34.396	6.196
107.576	Bathy	28.134	4.000	34.411	6.277
107.639	Bathy	27.960	4.000	34.439	6.479
107.737	Bathy	27.640	5.000	34.484	6.844
107.836	Bathy	27.130	5.000	34.528	7.398
107.930	Bathy	26.820	6.000	34.570	7.75
108.025	Bathy	26.174	6.000	34.613	8.439
108.141	Bathy	27.430	6.000	34.665	7.235
108.221	Bathy	28.840	6.000	34.701	5.861
108.309	Bathy	29.980	5.000	34.741	4.761
108.392	Bathy	31.030	5.000	34.778	3.748
108.424	Bathy	32.174	5.000	34.793	2.619
108.510	Bathy	30.020	5.000	34.831	4.811
108.566	Bathy	27.174	5.000	34.857	7.683
108.684	Bathy	26.240	5.000	34.909	8.669
108.784	Bathy	26.520	6.000	34.954	8.434
108.856	Bathy	25.514	6.000	34.987	9.473
108.982	Bathy	25.680	6.000	35.044	9.364

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
109.082	Bathy	25.780	7.000	35.089	9.309
109.110	Bathy	25.994	7.000	35.101	9.107
109.182	Bathy	25.680	7.000	35.134	9.454
109.282	Bathy	25.240	8.000	35.179	9.939
109.381	Bathy	24.890	8.000	35.224	10.334
109.481	Bathy	24.060	8.000	35.268	11.208
109.583	Bathy	23.534	9.000	35.288	11.754
109.673	Bathy	25.650	5.000	35.341	9.691
109.788	Bathy	28.930	2.000	35.375	6.445
109.887	Bathy	34.620	1.000	35.406	0.786
109.988	Bathy	39.784	0.500	35.417	0
110.104	Bathy	35.940	0.500	35.436	0
110.218	Bathy	32.734	0.500	35.446	2.712
110.310	Bathy	33.157	0.500	35.461	2.304
110.411	Bathy	33.751	1.000	35.481	1.73
110.512	Bathy	33.912	1.000	35.502	1.59
110.618	Bathy	34.126	0.500	35.606	1.48
110.710	Bathy	34.236	1.500	35.710	1.474
110.801	Bathy	35.100	2.500	35.801	0.701
110.893	Bathy	35.734	4.000	35.904	0.17
110.950	Bathy	35.320	4.000	35.929	0.609
111.047	Bathy	35.000	4.000	35.973	0.973
111.140	Bathy	34.910	4.000	36.023	1.113
111.241	Bathy	34.725	4.000	36.085	1.36
111.362	Bathy	34.605	5.000	36.131	1.526
111.483	Bathy	34.510	5.000	36.169	1.659
111.493	Bathy	33.974	5.000	36.174	2.2
111.553	Bathy	34.090	5.000	36.201	2.111
111.648	Bathy	34.200	5.000	36.243	2.043
111.703	Bathy	34.322	4.000	36.268	1.946
111.790	Bathy	34.450	4.000	36.307	1.857
111.877	Bathy	34.554	4.000	36.346	1.792
111.964	Bathy	34.660	4.000	36.386	1.726
112.051	Bathy	34.786	2.000	36.425	1.638
112.164	Bathy	34.950	2.000	36.476	1.526
112.264	Bathy	35.018	2.000	36.521	1.502
112.364	Bathy	34.100	2.000	36.566	2.466
112.464	Bathy	35.251	2.000	36.611	1.36
112.546	Bathy	34.370	10.000	36.648	2.278

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
112.646	Bathy	35.483	10.000	36.692	1.21
112.745	Bathy	35.600	10.000	36.737	1.137
112.845	Bathy	35.715	10.000	36.782	1.067
112.945	Bathy	35.800	10.000	36.827	1.027
113.044	Bathy	35.947	10.000	36.872	0.925
113.144	Bathy	36.000	12.000	36.917	0.917
113.244	Bathy	36.179	12.000	36.962	0.783
113.338	Bathy	36.831	14.000	47.712	10.881
113.443	Bathy	36.900	14.000	47.733	10.833
113.542	Bathy	36.720	14.000	47.753	11.033
113.642	Bathy	36.810	14.000	47.773	10.963
113.684	Bathy	36.861	14.000	47.781	10.92
113.741	Bathy	37.890	14.000	47.793	9.903
113.852	Bathy	38.540	14.000	47.815	9.275
113.952	Bathy	39.420	14.000	47.835	8.415
114.052	Bathy	39.950	14.000	47.855	7.905
114.131	Bathy	40.471	14.000	47.871	7.4
114.251	Bathy	39.980	14.000	47.895	7.915
114.350	Bathy	39.440	14.000	47.914	8.474
114.449	Bathy	39.010	14.000	47.934	8.924
114.548	Bathy	38.850	14.000	47.954	9.104
114.603	Bathy	38.471	14.000	47.965	9.494
114.747	Bathy	38.940	14.000	47.994	9.054
114.846	Bathy	39.240	14.000	48.014	8.774
114.946	Bathy	39.760	14.000	48.033	8.273
114.988	Bathy	40.231	13.000	48.042	7.811
115.043	Bathy	40.010	13.000	48.053	8.043
115.140	Bathy	39.610	13.000	48.072	8.462
115.237	Bathy	39.030	13.000	48.092	9.062
115.334	Bathy	38.850	13.000	48.111	9.261
115.431	Bathy	38.440	13.000	48.131	9.691
115.477	Bathy	38.021	13.000	48.140	10.119
115.529	Bathy	37.840	13.000	48.150	10.31
115.628	Bathy	37.410	13.000	48.170	10.76
115.727	Bathy	37.320	13.000	48.190	10.87
115.827	Bathy	37.350	13.000	48.210	10.86
115.904	Bathy	37.371	13.000	48.225	10.854
116.026	Bathy	37.010	13.000	48.250	11.24
116.126	Bathy	36.940	13.000	48.270	11.33

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
116.226	Bathy	36.710	13.000	48.290	11.58
116.326	Bathy	36.620	13.000	48.310	11.69
116.404	Bathy	36.461	13.000	48.325	11.864
116.526	Bathy	36.880	13.000	48.350	11.47
116.626	Bathy	36.990	13.000	48.369	11.379
116.725	Bathy	38.210	13.000	48.389	10.179
116.825	Bathy	38.360	13.000	48.409	10.049
116.925	Bathy	38.470	13.000	48.429	9.959
117.024	Bathy	38.590	13.000	48.449	9.859
117.124	Bathy	38.680	13.000	48.469	9.789
117.224	Bathy	38.760	13.000	48.489	9.729
117.361	Bathy	38.840	13.000	48.517	9.677
117.373	Bathy	38.964	13.000	48.519	9.555
117.461	Bathy	39.060	13.000	48.537	9.477
117.561	Bathy	39.280	13.000	48.557	9.277
117.661	Bathy	39.540	13.000	48.577	9.037
117.683	Bathy	39.774	13.000	48.581	8.807
117.761	Bathy	39.820	13.000	48.596	8.776
117.860	Bathy	39.880	13.000	48.616	8.736
117.960	Bathy	39.960	12.000	48.636	8.676
118.060	Bathy	39.990	12.000	48.656	8.666
118.160	Bathy	40.030	12.000	48.676	8.646
118.260	Bathy	40.060	12.000	48.696	8.636
118.360	Bathy	40.110	12.000	48.716	8.606
118.459	Bathy	40.150	11.000	48.736	8.586
118.559	Bathy	40.160	11.000	48.756	8.596
118.659	Bathy	40.110	11.000	48.776	8.666
118.760	Bathy	40.134	11.000	48.796	8.662
118.855	Bathy	40.419	11.000	48.815	8.396
118.950	Bathy	40.720	11.000	48.834	8.114
119.083	Bathy	40.990	11.000	48.861	7.871
119.182	Bathy	41.250	11.000	48.881	7.631
119.282	Bathy	41.560	11.000	48.901	7.34
119.382	Bathy	41.800	11.000	48.921	7.121
119.482	Bathy	42.131	11.000	48.941	6.81
119.581	Bathy	42.410	11.000	48.961	6.551
119.681	Bathy	42.701	11.000	48.981	6.279
119.781	Bathy	42.980	11.000	49.001	6.021
119.881	Bathy	43.272	11.000	49.021	5.749

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
119.980	Bathy	43.580	11.000	49.040	5.46
120.080	Bathy	43.842	11.000	49.060	5.218
120.180	Bathy	44.110	11.000	49.080	4.97
120.280	Bathy	44.413	11.000	49.100	4.687
120.380	Bathy	44.720	11.000	49.120	4.4
120.479	Bathy	44.983	11.000	49.140	4.157
120.579	Bathy	45.290	11.000	49.160	3.87
120.604	Bathy	45.554	11.000	49.165	3.611
120.679	Bathy	44.820	11.000	49.180	4.36
120.779	Bathy	44.170	11.000	49.200	5.03
120.878	Bathy	43.440	11.000	49.220	5.78
120.886	Bathy	42.814	11.000	49.222	6.408
121.000	Bathy	42.659	11.000	49.244	6.586
121.087	Bathy	42.503	11.000	49.262	6.758
121.185	Bathy	42.348	11.000	49.281	6.933
121.283	Bathy	42.200	11.000	49.301	7.101
121.377	Bathy	42.038	11.000	49.320	7.282
121.556	Bathy	41.900	11.000	49.356	7.456
121.656	Bathy	41.727	11.000	49.376	7.649
121.755	Bathy	41.572	11.000	49.395	7.824
121.855	Bathy	41.400	11.000	49.415	8.015
121.955	Bathy	41.261	11.000	49.435	8.174
122.053	Bathy	41.106	11.000	49.455	8.349
122.153	Bathy	40.930	11.000	49.475	8.545
122.252	Bathy	40.795	11.000	49.495	8.7
122.350	Bathy	40.660	11.000	49.514	8.854
122.489	Bathy	40.485	11.000	49.542	9.058
122.583	Bathy	40.329	11.000	49.561	9.232
122.636	Bathy	40.174	11.000	49.572	9.398
122.780	Bathy	41.387	11.000	49.600	8.213
122.880	Bathy	42.600	11.000	49.620	7.02
122.979	Bathy	43.800	11.000	49.640	5.84
123.079	Bathy	45.026	11.000	49.660	4.634
123.179	Bathy	46.250	11.000	49.680	3.43
123.279	Bathy	47.452	11.000	49.700	2.248
123.379	Bathy	48.620	11.000	49.720	1.1
123.479	Bathy	49.878	11.000	49.740	0
123.579	Bathy	51.030	11.000	49.760	0
123.588	Bathy	52.304	11.000	49.762	0

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
123.679	Bathy	51.048	11.000	49.780	0
123.779	Bathy	49.800	11.000	49.800	0
123.879	Bathy	48.537	11.000	49.820	1.283
123.978	Bathy	47.250	11.000	49.840	2.59
124.078	Bathy	46.026	11.000	49.860	3.834
124.178	Bathy	44.770	11.000	49.880	5.11
124.278	Bathy	43.515	11.000	49.900	6.385
124.378	Bathy	42.250	11.000	49.920	7.67
124.441	Bathy	41.004	11.000	49.933	8.929
124.577	Bathy	41.177	11.000	49.960	8.783
124.677	Bathy	41.349	10.000	49.980	8.63
124.776	Bathy	41.500	10.000	50.000	8.5
124.875	Bathy	41.695	10.000	50.019	8.325
124.975	Bathy	41.880	10.000	50.039	8.159
125.074	Bathy	42.040	10.000	50.059	8.019
125.174	Bathy	42.230	10.000	50.079	7.849
125.273	Bathy	42.385	10.000	50.099	7.714
125.372	Bathy	42.500	10.000	50.119	7.619
125.472	Bathy	42.731	10.000	50.139	7.408
125.571	Bathy	42.903	9.000	50.159	7.255
125.670	Bathy	43.020	9.000	50.178	7.158
125.770	Bathy	43.249	9.000	50.198	6.95
125.869	Bathy	43.400	9.000	50.218	6.818
125.947	Bathy	43.594	9.000	50.234	6.64
125.947	Bathy	43.490	9.000	50.234	6.744
126.068	Bathy	43.340	9.000	50.258	6.918
126.168	Bathy	43.010	9.000	50.278	7.268
126.267	Bathy	42.880	9.000	50.298	7.418
126.384	Bathy	42.680	9.000	50.321	7.641
126.484	Bathy	42.610	9.000	50.341	7.731
126.584	Bathy	42.480	9.000	50.361	7.881
126.662	Bathy	42.325	9.000	50.377	8.052
126.780	Bathy	42.540	9.000	50.400	7.86
126.876	Bathy	42.940	9.000	50.420	7.48
126.973	Bathy	43.060	9.000	50.439	7.379
127.046	Bathy	43.265	9.000	50.454	7.189
127.169	Bathy	43.000	9.000	50.478	7.478
127.269	Bathy	42.830	9.000	50.498	7.668
127.369	Bathy	42.640	9.000	50.518	7.878

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
127.468	Bathy	42.410	9.000	50.538	8.128
127.568	Bathy	42.230	9.000	50.558	8.328
127.667	Bathy	42.110	9.000	50.578	8.468
127.767	Bathy	42.060	9.000	50.598	8.538
127.867	Bathy	42.000	9.000	50.618	8.618
127.912	Bathy	41.965	9.000	50.627	8.662
127.966	Bathy	41.990	9.000	50.638	8.648
128.066	Bathy	42.050	9.000	50.658	8.608
128.166	Bathy	42.200	9.000	50.678	8.478
128.266	Bathy	42.340	9.000	50.698	8.358
128.366	Bathy	42.520	9.000	50.718	8.198
128.466	Bathy	42.690	9.000	50.738	8.048
128.576	Bathy	42.840	9.000	50.759	7.919
128.673	Bathy	42.910	9.000	50.779	7.869
128.771	Bathy	43.000	9.000	50.799	7.799
128.869	Bathy	43.030	8.000	50.818	7.788
128.967	Bathy	43.190	8.000	50.838	7.648
129.053	Bathy	43.355	8.000	50.855	7.5
129.164	Bathy	43.360	8.000	50.877	7.517
129.263	Bathy	43.260	8.000	50.897	7.637
129.362	Bathy	43.160	8.000	50.917	7.757
129.461	Bathy	43.590	8.000	50.937	7.347
129.559	Bathy	43.290	8.000	50.956	7.666
129.661	Bathy	43.510	8.000	50.977	7.467
129.761	Bathy	43.350	8.000	50.997	7.647
129.861	Bathy	43.690	8.000	51.017	7.327
129.961	Bathy	43.870	8.000	51.037	7.167
130.061	Bathy	43.640	8.000	51.057	7.417
130.161	Bathy	43.520	8.000	51.077	7.557
130.261	Bathy	43.480	8.000	51.097	7.617
130.361	Bathy	43.290	8.000	51.117	7.827
130.461	Bathy	43.100	8.000	51.137	8.037
130.561	Bathy	43.160	8.000	51.157	7.997
130.661	Bathy	43.180	8.000	51.177	7.997
130.761	Bathy	43.380	8.000	51.197	7.817
130.861	Bathy	43.260	8.000	51.217	7.957
130.961	Bathy	43.290	8.000	51.237	7.947
131.061	Bathy	43.280	8.000	51.257	7.977
131.161	Bathy	43.670	8.000	51.277	7.607

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
131.261	Bathy	43.650	8.000	51.297	7.647
131.361	Bathy	43.590	8.000	51.317	7.727
131.461	Bathy	43.480	8.000	51.337	7.857
131.561	Bathy	43.680	8.000	51.357	7.677
131.661	Bathy	43.290	8.000	51.376	8.086
131.761	Bathy	43.650	8.000	51.396	7.746
131.773	Bathy	43.745	8.000	51.399	7.654
131.856	Bathy	43.510	8.000	51.416	7.906
131.955	Bathy	43.260	8.000	51.435	8.175
132.054	Bathy	43.000	8.000	51.455	8.455
132.062	Bathy	42.735	8.000	51.457	8.722
132.153	Bathy	42.990	8.000	51.475	8.485
132.253	Bathy	43.260	7.000	51.495	8.235
132.306	Bathy	43.545	7.000	51.506	7.961
132.452	Bathy	44.321	7.000	51.535	7.214
132.552	Bathy	45.097	7.000	51.555	6.457
132.652	Bathy	45.880	7.000	51.575	5.695
132.752	Bathy	46.650	7.000	51.595	4.945
132.852	Bathy	47.440	7.000	51.615	4.175
132.952	Bathy	48.202	7.000	51.635	3.433
133.052	Bathy	48.990	7.000	51.655	2.665
133.152	Bathy	49.755	7.000	51.675	1.92
133.252	Bathy	50.500	7.000	51.695	1.195
133.351	Bathy	51.307	7.000	51.715	0.408
133.451	Bathy	52.083	7.000	51.735	0
133.551	Bathy	52.850	7.000	51.755	0
133.651	Bathy	53.635	7.000	51.775	0
133.751	Bathy	54.412	7.000	51.795	0
133.851	Bathy	55.200	7.000	51.815	0
133.951	Bathy	55.964	7.000	51.835	0
134.051	Bathy	56.740	7.000	51.855	0
134.151	Bathy	57.500	7.000	51.875	0
134.251	Bathy	58.293	7.000	51.895	0
134.351	Bathy	59.050	7.000	51.915	0
134.445	Bathy	59.845	7.000	51.933	0
134.551	Bathy	60.660	6.000	51.954	0
134.651	Bathy	61.280	6.000	51.974	0
134.751	Bathy	62.350	6.000	51.994	0
134.851	Bathy	63.460	6.000	52.014	0

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
134.945	Bathy	63.755	5.000	52.033	0
135.051	Bathy	63.710	5.000	52.054	0
135.139	Bathy	63.705	5.000	52.072	0
135.240	Bathy	64.260	5.000	52.092	0
135.328	Bathy	64.815	5.000	52.110	0
135.423	Bathy	65.370	5.000	52.129	0
135.586	Bathy	65.925	5.000	52.161	0
135.750	Bathy	66.480	5.000	52.194	0
135.922	Bathy	67.035	5.000	52.229	0
136.085	Bathy	67.590	5.000	52.261	0
136.229	Bathy	68.145	5.000	52.290	0
136.285	Bathy	68.700	5.000	52.301	0
136.373	Bathy	69.255	5.000	52.319	0
136.464	Bathy	69.810	5.000	52.337	0
136.613	Bathy	70.365	5.000	52.367	0
136.709	Bathy	70.920	5.000	52.386	0
136.890	Bathy	71.475	5.000	52.422	0
136.984	Bathy	72.030	5.000	52.441	0
137.083	Bathy	72.585	5.000	52.461	0
137.120	Bathy	73.370	22.840	90.169	16.799
137.225	Bathy	73.290	22.630	90.177	16.887
137.393	Bathy	73.130	22.580	90.191	17.061
137.486	Bathy	72.770	22.650	90.198	17.428
137.580	Bathy	72.750	22.720	90.206	17.456
137.672	Bathy	72.350	22.990	90.213	17.863
137.764	Bathy	72.380	23.010	90.221	17.841
137.858	Bathy	72.450	22.830	90.228	17.778
137.955	Bathy	72.620	22.740	90.236	17.616
138.054	Bathy	72.300	22.990	90.244	17.944
138.152	Bathy	72.160	23.030	90.252	18.092
138.252	Bathy	72.410	22.640	90.260	17.85
138.351	Bathy	71.760	22.850	90.267	18.507
138.451	Bathy	71.840	22.450	90.275	18.435
138.551	Bathy	71.580	22.390	90.283	18.703
138.651	Bathy	71.630	22.090	90.291	18.661
138.750	Bathy	71.260	22.310	90.299	19.039
138.850	Bathy	71.310	21.980	90.307	18.997
138.950	Bathy	71.350	22.110	90.315	18.965
139.050	Bathy	71.240	22.230	90.323	19.083

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
139.150	Bathy	71.270	22.190	90.331	19.061
139.250	Bathy	70.800	22.560	90.339	19.539
139.350	Bathy	70.960	22.230	90.347	19.387
139.449	Bathy	70.790	22.260	90.355	19.565
139.549	Bathy	70.880	22.250	90.363	19.483
139.649	Bathy	71.080	22.280	90.371	19.291
139.749	Bathy	71.040	22.250	90.379	19.339
139.849	Bathy	70.640	22.480	90.387	19.747
139.949	Bathy	72.540	22.080	90.395	17.855
140.049	Bathy	72.400	22.140	90.403	18.003
140.149	Bathy	73.250	21.920	90.411	17.161
140.249	Bathy	73.090	21.880	90.419	17.329
140.349	Bathy	72.880	22.010	90.427	17.547
140.449	Bathy	72.980	21.790	90.435	17.455
140.549	Bathy	73.370	21.540	90.443	17.073
140.649	Bathy	73.250	21.580	90.451	17.201
140.749	Bathy	73.390	21.800	90.459	17.069
140.848	Bathy	73.270	21.870	90.467	17.197
140.897	Bathy	73.410	21.960	90.471	17.061
140.970	Bathy	73.770	21.700	90.477	16.707
141.068	Bathy	74.420	21.070	90.485	16.065
141.167	Bathy	74.730	20.730	90.493	15.763
141.265	Bathy	74.050	21.280	90.501	16.451
141.364	Bathy	75.120	21.450	90.508	15.388
141.462	Bathy	74.560	21.440	90.516	15.956
141.561	Bathy	74.220	21.770	90.524	16.304
141.660	Bathy	74.400	21.560	90.532	16.132
141.760	Bathy	74.100	21.830	90.540	16.44
141.859	Bathy	73.510	21.950	90.548	17.038
141.959	Bathy	73.730	21.760	90.556	16.826
142.057	Bathy	73.580	21.810	90.564	16.984
142.155	Bathy	73.770	21.800	90.572	16.802
142.251	Bathy	73.830	21.910	90.580	16.75
142.349	Bathy	73.790	21.870	90.587	16.797
142.446	Bathy	74.390	21.400	90.595	16.205
142.543	Bathy	74.990	20.480	90.603	15.613
142.639	Bathy	75.140	20.250	90.611	15.471
142.736	Bathy	75.310	19.800	90.618	15.308
142.832	Bathy	75.800	19.450	90.626	14.826

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
142.928	Bathy	76.300	18.980	90.634	14.334
143.021	Bathy	74.950	20.420	90.641	15.691
143.113	Bathy	74.360	20.960	90.648	16.288
143.206	Bathy	74.300	21.100	90.656	16.356
143.300	Bathy	74.010	21.330	90.663	16.653
143.393	Bathy	74.720	20.710	90.671	15.951
143.487	Bathy	74.250	21.180	90.678	16.428
143.583	Bathy	74.270	21.110	90.686	16.416
143.680	Bathy	76.910	18.550	90.694	13.784
143.776	Bathy	73.580	20.710	90.701	17.121
143.873	Bathy	74.780	19.470	90.709	15.929
143.971	Bathy	73.740	20.750	90.717	16.977
144.069	Bathy	73.960	20.590	90.725	16.765
144.168	Bathy	74.250	20.350	90.733	16.483
144.267	Bathy	75.990	18.590	90.741	14.751
144.367	Bathy	75.310	19.100	90.749	15.439
144.467	Bathy	74.150	20.330	90.757	16.607
144.566	Bathy	74.050	20.440	90.765	16.715
144.666	Bathy	74.430	20.050	90.773	16.343
144.766	Bathy	76.300	18.220	90.781	14.481
144.865	Bathy	77.310	17.240	90.789	13.479
144.964	Bathy	76.220	18.470	90.797	14.577
145.060	Bathy	78.730	16.050	90.804	12.074
145.157	Bathy	79.680	15.140	90.812	11.132
145.251	Bathy	81.980	12.760	90.819	8.839
145.344	Bathy	81.310	13.450	90.827	9.517
145.440	Bathy	79.140	15.540	90.835	11.695
145.536	Bathy	79.770	15.310	90.842	11.072
145.627	Bathy	80.650	14.530	90.850	10.2
145.716	Bathy	80.590	14.510	90.857	10.267
145.804	Bathy	82.560	12.450	90.864	8.304
145.890	Bathy	81.690	13.000	90.871	9.181
145.977	Bathy	81.690	13.120	90.878	9.188
146.066	Bathy	81.270	13.620	90.885	9.615
146.153	Bathy	80.950	13.990	90.892	9.942
146.241	Bathy	80.290	14.630	90.899	10.609
146.326	Bathy	79.710	14.990	90.905	11.195
146.414	Bathy	79.100	15.460	90.912	11.812
146.496	Bathy	79.130	15.530	90.919	11.789

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
146.580	Bathy	78.370	16.340	90.926	12.556
146.667	Bathy	75.020	19.760	90.933	15.913
146.750	Bathy	78.690	15.880	90.939	12.249
146.832	Bathy	79.110	15.370	90.946	11.836
146.912	Bathy	79.150	15.540	90.952	11.802
146.989	Bathy	79.160	15.550	90.959	11.799
147.071	Bathy	78.940	15.860	90.965	12.025
147.152	Bathy	78.120	16.580	90.972	12.852
147.233	Bathy	78.040	16.540	90.978	12.938
147.310	Bathy	78.260	16.250	90.984	12.724
147.386	Bathy	77.800	16.530	90.990	13.19
147.474	Bathy	77.810	16.590	90.997	13.187
147.565	Bathy	78.130	16.360	91.005	12.875
147.650	Bathy	77.800	16.460	91.011	13.211
147.732	Bathy	77.700	16.450	91.018	13.318
147.811	Bathy	76.520	17.320	91.024	14.504
147.895	Bathy	76.380	17.620	91.031	14.651
147.981	Bathy	76.420	17.410	91.038	14.618
148.091	Bathy	76.460	17.360	91.045	14.585
148.186	Bathy	76.510	17.250	91.051	14.541
148.285	Bathy	76.550	17.310	91.058	14.508
148.391	Bathy	76.595	17.230	91.065	14.47
148.486	Bathy	76.650	17.420	91.072	14.422
148.567	Bathy	76.690	17.290	91.078	14.388
148.686	Bathy	76.740	17.360	91.085	14.345
148.781	Bathy	76.830	17.300	91.092	14.262
148.882	Bathy	76.810	17.280	91.110	14.3
148.959	Bathy	77.340	16.590	91.116	13.776
149.039	Bathy	77.580	16.310	91.122	13.542
149.119	Bathy	77.940	15.930	91.129	13.189
149.205	Bathy	78.170	15.670	91.136	12.966
149.294	Bathy	79.340	15.350	91.143	11.803
149.383	Bathy	79.540	15.050	91.150	11.61
149.475	Bathy	79.900	14.650	91.157	11.257
149.571	Bathy	80.310	14.260	91.165	10.855
149.667	Bathy	80.010	14.380	91.173	11.163
149.765	Bathy	80.440	14.070	91.181	10.741
149.863	Bathy	80.880	13.560	91.188	10.308
149.962	Bathy	75.890	18.470	91.196	15.306

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
150.062	Bathy	76.620	18.330	91.204	14.584
150.153	Bathy	78.830	15.860	91.212	12.382
150.186	Bathy	77.350	16.940	91.214	13.864
150.234	Bathy	77.192	18.900	91.218	14.026
150.288	Bathy	80.570	13.850	91.222	10.652
150.331	Bathy	77.743	18.290	91.226	13.482
150.380	Bathy	77.710	18.430	91.230	13.52
150.453	Bathy	77.697	18.540	91.236	13.539
150.548	Bathy	77.588	18.580	91.243	13.655
150.644	Bathy	77.360	18.690	91.251	13.891
150.744	Bathy	77.610	18.530	91.259	13.649
150.842	Bathy	77.712	18.410	91.267	13.554
150.939	Bathy	77.855	18.260	91.275	13.419
151.036	Bathy	77.509	18.580	91.282	13.773
151.133	Bathy	77.960	18.300	91.290	13.33
151.231	Bathy	78.581	17.840	91.298	12.717
151.329	Bathy	78.516	17.940	91.306	12.79
151.424	Bathy	78.053	18.390	91.313	13.26
151.513	Bathy	78.509	17.840	91.320	12.812
151.603	Bathy	78.670	17.640	91.328	12.657
151.699	Bathy	78.678	17.730	91.335	12.657
151.796	Bathy	78.336	17.980	91.343	13.007
151.895	Bathy	78.188	17.880	91.351	13.163
151.995	Bathy	78.773	17.300	91.359	12.586
152.095	Bathy	78.906	17.400	91.367	12.461
152.194	Bathy	78.758	17.530	91.375	12.617
152.293	Bathy	78.582	17.490	91.383	12.8
152.393	Bathy	77.991	17.440	91.391	13.4
152.490	Bathy	78.589	16.860	91.399	12.81
152.587	Bathy	77.835	17.630	91.406	13.571
152.687	Bathy	78.523	17.430	91.414	12.892
152.785	Bathy	79.508	16.540	91.422	11.914
152.884	Bathy	79.807	16.160	91.430	11.623
152.983	Bathy	78.329	17.700	91.438	13.109
153.083	Bathy	78.574	17.750	91.446	12.872
153.183	Bathy	78.324	17.860	91.454	13.13
153.281	Bathy	78.288	17.980	91.462	13.174
153.380	Bathy	78.520	17.780	91.470	12.949
153.477	Bathy	78.401	17.990	91.478	13.076

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
153.572	Bathy	79.162	17.230	91.485	12.323
153.670	Bathy	81.046	15.350	91.493	10.447
153.770	Bathy	83.694	12.800	91.501	7.807
153.924	Bathy	81.506	15.030	91.513	10.008
154.000	Bathy	80.026	16.500	91.519	11.494
154.095	Bathy	80.147	16.370	91.527	11.38
154.195	Bathy	83.623	12.790	91.535	7.912
154.294	Bathy	83.457	12.960	91.543	8.086
154.394	Bathy	84.668	11.730	91.551	6.883
154.494	Bathy	84.707	11.780	91.559	6.852
154.593	Bathy	84.961	11.630	91.567	6.606
154.693	Bathy	85.195	11.630	91.575	6.38
154.792	Bathy	85.510	11.230	91.583	6.072
154.892	Bathy	84.111	12.490	91.591	7.479
154.991	Bathy	84.279	12.300	91.599	7.32
155.091	Bathy	84.340	12.290	91.607	7.267
155.191	Bathy	84.936	11.540	91.615	6.679
155.290	Bathy	85.938	10.520	91.623	5.684
155.390	Bathy	86.293	10.370	91.631	5.338
155.490	Bathy	86.554	10.170	91.639	5.085
155.589	Bathy	86.899	9.960	91.647	4.748
155.689	Bathy	86.823	10.130	91.655	4.832
155.789	Bathy	86.154	10.620	91.663	5.509
155.889	Bathy	86.169	10.600	91.670	5.501
155.989	Bathy	86.506	10.200	91.678	5.173
156.089	Bathy	86.757	9.910	91.686	4.929
156.189	Bathy	86.194	10.320	91.694	5.5
156.289	Bathy	86.429	10.140	91.702	5.274
156.389	Bathy	86.341	10.330	91.710	5.369
156.489	Bathy	86.330	10.270	91.718	5.389
156.589	Bathy	86.180	10.260	91.726	5.546
156.688	Bathy	86.008	10.510	91.734	5.727
156.788	Bathy	86.416	10.160	91.742	5.326
156.887	Bathy	86.376	10.500	91.750	5.374
156.987	Bathy	86.011	10.760	91.758	5.747
157.087	Bathy	84.347	12.270	91.766	7.42
157.187	Bathy	81.130	15.490	91.774	10.645
157.287	Bathy	84.804	12.090	91.782	6.979
157.387	Bathy	81.238	15.790	91.790	10.553

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
157.487	Bathy	81.104	15.790	91.798	10.695
157.587	Bathy	81.173	15.740	91.806	10.634
157.687	Bathy	81.405	15.520	91.814	10.409
157.787	Bathy	81.223	15.690	91.822	10.599
157.887	Bathy	81.376	15.630	91.830	10.455
157.986	Bathy	81.622	15.570	91.838	10.216
158.086	Bathy	81.925	15.290	91.846	9.921
158.186	Bathy	81.748	15.500	91.854	10.106
158.286	Bathy	81.855	15.170	91.862	10.007
158.386	Bathy	81.839	15.050	91.870	10.031
158.486	Bathy	81.959	15.060	91.878	9.919
158.586	Bathy	82.311	14.750	91.886	9.575
158.686	Bathy	82.404	14.800	91.894	9.49
158.786	Bathy	86.132	11.230	91.902	5.771
158.886	Bathy	84.751	12.580	91.910	7.16
158.985	Bathy	82.771	14.580	91.918	9.147
159.083	Bathy	82.739	14.420	91.926	9.187
159.179	Bathy	86.522	10.710	91.934	5.412
159.276	Bathy	85.911	11.280	91.941	6.031
159.374	Bathy	85.983	11.130	91.949	5.967
159.473	Bathy	83.115	14.000	91.957	8.842
159.573	Bathy	82.440	14.440	91.965	9.525
159.673	Bathy	84.353	12.630	91.973	7.62
159.772	Bathy	86.081	10.600	91.981	5.901
159.871	Bathy	87.219	9.930	91.989	4.77
159.971	Bathy	82.693	14.020	91.997	9.304
160.090	Bathy	86.061	11.290	92.007	5.946
160.156	Bathy	82.867	13.930	92.012	9.145
160.206	Bathy	86.303	11.130	92.016	5.713
160.256	Bathy	85.947	10.870	92.020	6.073
160.310	Bathy	86.788	10.660	92.024	5.236
160.382	Bathy	87.500	9.860	92.030	4.53
160.463	Bathy	88.930	8.530	92.036	3.107
160.557	Bathy	88.543	8.860	92.044	3.501
160.654	Bathy	84.063	13.320	92.052	7.988
160.752	Bathy	84.076	13.510	92.060	7.983
160.851	Bathy	84.120	13.450	92.067	7.947
160.950	Bathy	84.259	13.300	92.075	7.816
161.049	Bathy	85.037	12.510	92.083	7.047

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
161.146	Bathy	85.433	11.980	92.091	6.658
161.246	Bathy	85.704	11.500	92.099	6.395
161.346	Bathy	85.931	11.390	92.107	6.176
161.445	Bathy	87.033	10.120	92.115	5.082
161.545	Bathy	87.020	10.100	92.123	5.103
161.645	Bathy	88.131	9.290	92.131	4
161.745	Bathy	88.916	8.420	92.139	3.223
161.844	Bathy	84.858	12.550	92.147	7.289
161.940	Bathy	84.322	13.100	92.155	7.832
162.040	Bathy	84.513	13.000	92.163	7.65
162.140	Bathy	84.132	13.200	92.171	8.039
162.240	Bathy	84.420	12.930	92.179	7.759
162.340	Bathy	84.374	13.010	92.187	7.813
162.439	Bathy	84.562	12.860	92.195	7.633
162.539	Bathy	84.898	12.680	92.203	7.305
162.639	Bathy	84.798	12.720	92.211	7.412
162.739	Bathy	85.013	12.500	92.219	7.205
162.839	Bathy	85.202	12.170	92.227	7.025
162.939	Bathy	88.765	8.680	92.234	3.47
163.038	Bathy	89.909	7.380	92.242	2.334
163.138	Bathy	86.160	11.200	92.250	6.09
163.238	Bathy	86.964	10.390	92.258	5.294
163.338	Bathy	86.015	11.570	92.266	6.252
163.438	Bathy	86.346	11.240	92.274	5.928
163.538	Bathy	90.583	7.200	92.282	1.699
163.637	Bathy	86.916	10.630	92.290	5.375
163.736	Bathy	89.363	8.120	92.298	2.935
163.835	Bathy	90.156	7.210	92.306	2.15
163.934	Bathy	89.211	8.080	92.314	3.103
164.031	Bathy	88.995	8.600	92.322	3.326
164.130	Bathy	88.169	9.310	92.330	4.161
164.224	Bathy	87.017	10.570	92.337	5.32
164.320	Bathy	87.759	9.800	92.345	4.586
164.417	Bathy	91.709	5.820	92.353	0.644
164.516	Bathy	92.562	4.920	92.361	0
164.616	Bathy	92.587	4.700	92.369	0
164.715	Bathy	92.709	4.390	92.377	0
164.815	Bathy	92.380	4.500	92.385	0.004
164.915	Bathy	91.934	4.750	92.393	0.458

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
165.015	Bathy	91.910	4.780	92.401	0.491
165.115	Bathy	91.429	5.270	92.409	0.98
165.215	Bathy	90.884	5.980	92.417	1.533
165.315	Bathy	92.464	4.640	92.425	0
165.420	Bathy	91.199	5.870	92.433	1.234
165.493	Bathy	88.859	8.150	92.439	3.58
165.572	Bathy	89.545	7.460	92.445	2.9
165.670	Bathy	90.502	6.260	92.453	1.951
165.769	Bathy	89.916	6.530	92.461	2.545
165.869	Bathy	88.048	8.170	92.469	4.421
165.969	Bathy	88.477	7.820	92.477	4
166.068	Bathy	88.596	7.770	92.485	3.889
166.166	Bathy	88.589	7.740	92.493	3.904
166.263	Bathy	88.681	7.560	92.500	3.82
166.359	Bathy	89.192	7.360	92.508	3.316
166.454	Bathy	89.311	7.380	92.516	3.205
166.552	Bathy	89.304	7.250	92.524	3.219
166.723	Bathy	89.210	7.180	92.537	3.327
166.748	Bathy	89.126	7.060	92.539	3.414
166.847	Bathy	89.344	7.010	92.547	3.204
166.945	Bathy	89.353	6.970	92.555	3.202
167.042	Bathy	89.452	7.060	92.563	3.111
167.140	Bathy	89.659	7.000	92.571	2.912
167.237	Bathy	89.583	6.890	92.578	2.996
167.335	Bathy	89.613	6.780	92.586	2.973
167.435	Bathy	89.741	6.700	92.594	2.854
167.534	Bathy	89.950	6.500	92.602	2.652
167.633	Bathy	90.341	6.210	92.610	2.269
167.733	Bathy	90.663	6.040	92.618	1.955
167.833	Bathy	90.630	5.870	92.626	1.997
167.932	Bathy	91.417	5.730	92.634	1.217
168.031	Bathy	91.560	5.520	92.642	1.082
168.130	Bathy	92.132	5.260	92.650	0.517
168.230	Bathy	95.098	4.960	92.658	0
168.330	Bathy	95.199	4.790	92.666	0
168.430	Bathy	95.560	4.740	92.674	0
168.529	Bathy	95.615	4.580	92.682	0
168.629	Bathy	95.522	4.440	92.690	0
168.729	Bathy	92.648	4.300	92.698	0.05

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
168.829	Bathy	92.602	4.130	92.706	0.104
168.928	Bathy	92.739	4.050	92.714	0
169.028	Bathy	92.553	4.100	92.722	0.169
169.128	Bathy	92.961	3.930	92.730	0
169.228	Bathy	92.698	3.950	92.738	0.039
169.328	Bathy	92.851	3.780	92.746	0
169.427	Bathy	92.576	3.680	92.754	0.177
169.527	Bathy	92.244	3.590	92.762	0.518
169.627	Bathy	91.015	3.490	92.770	1.754
169.727	Bathy	90.888	3.570	92.778	1.89
169.827	Bathy	90.979	3.470	92.786	1.807
169.927	Bathy	91.224	3.360	92.794	1.569
170.027	Bathy	91.466	3.190	92.802	1.336
170.127	Bathy	91.727	3.190	92.810	1.083
170.227	Bathy	91.186	3.140	92.818	1.632
170.327	Bathy	91.718	3.040	92.826	1.108
170.426	Bathy	91.728	3.030	92.833	1.105
170.525	Bathy	92.224	2.950	92.841	0.617
170.622	Bathy	91.777	2.840	92.849	1.072
170.718	Bathy	92.222	2.940	92.857	0.634
170.814	Bathy	92.285	2.930	92.864	0.58
170.913	Bathy	92.715	2.660	92.872	0.158
171.012	Bathy	92.782	2.640	92.880	0.099
171.110	Bathy	92.678	2.610	92.888	0.21
171.208	Bathy	92.957	2.430	92.896	0
171.307	Bathy	92.956	2.360	92.904	0
171.405	Bathy	92.620	2.320	92.912	0.291
171.503	Bathy	92.642	2.340	92.920	0.277
171.601	Bathy	92.649	2.280	92.927	0.278
171.698	Bathy	92.720	2.290	92.935	0.215
171.789	Bathy	92.856	2.220	92.943	0.087
171.877	Bathy	92.760	1.500	92.950	0.19
171.954	Bathy	92.220	2.000	92.956	0.736
172.032	Bathy	92.030	2.000	92.962	0.932
172.061	Bathy	91.724	2.000	92.964	1.24
172.175	Bathy	91.812	2.000	92.972	1.16
172.271	Bathy	91.871	2.000	92.981	1.11
172.374	Bathy	91.970	2.000	92.989	1.019
172.453	Bathy	92.350	2.000	92.996	0.646

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
172.531	Bathy	93.320	2.000	93.002	0
172.609	Bathy	92.210	2.000	93.008	0.798
172.610	Bathy	92.254	1.500	93.008	0.754
172.692	Bathy	92.200	1.500	93.015	0.815
172.775	Bathy	92.210	1.500	93.021	0.811
172.858	Bathy	92.230	1.500	93.028	0.798
172.885	Bathy	92.204	1.500	93.030	0.826
172.946	Bathy	92.400	1.500	93.035	0.635
173.036	Bathy	92.600	1.000	93.042	0.442
173.125	Bathy	92.740	1.000	93.049	0.309
173.215	Bathy	92.840	1.000	93.057	0.217
173.305	Bathy	92.960	1.000	93.064	0.104
173.394	Bathy	93.100	0.500	93.071	0
173.420	Bathy	93.304	0.500	93.073	0
173.485	Bathy	93.360	0.500	93.078	0
173.576	Bathy	93.440	0.500	93.085	0
173.647	Topo	93.494	0.300	93.091	0
173.668	Topo	93.560	0.300	93.093	0
173.767	Topo	93.670	0.200	93.101	0
173.775	Topo	93.714	0.100	93.101	0
173.864	Topo	93.773	0.100	93.108	0
173.961	Topo	93.832	0.100	93.116	0
174.058	Topo	93.892		93.124	0
174.155	Topo	93.951		93.132	0
174.252	Topo	94.010		93.140	0
174.349	Topo	94.069		93.147	0
174.446	Topo	94.128		93.155	0
174.543	Topo	94.187		93.163	0
174.640	Topo	94.247		93.171	0
174.737	Topo	94.306		93.178	0
174.834	Topo	94.365		93.186	0
174.931	Topo	94.424		93.194	0
175.029	Topo	94.483		93.202	0
175.126	Topo	94.543		93.209	0
175.223	Topo	94.602		93.217	0
175.320	Topo	94.661		93.225	0
175.417	Topo	94.720		93.233	0
175.514	Topo	94.779		93.241	0
175.611	Topo	94.839		93.248	0

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
175.708	Topo	94.898		93.256	0
175.805	Topo	94.957		93.264	0
175.902	Topo	95.016		93.272	0
175.999	Topo	95.075		93.279	0
176.096	Topo	95.134		93.287	0
176.193	Topo	95.194		93.295	0
176.290	Topo	95.253		93.303	0
176.297	Topo	95.312		93.303	0
176.375	Topo	95.300		93.309	0
176.458	Topo	95.200		93.316	0
176.541	Topo	95.120		93.323	0
176.596	Topo	95.082		93.327	0
176.627	Topo	95.090		93.330	0
176.716	Topo	95.130		93.337	0
176.806	Topo	95.170		93.344	0
176.896	Topo	95.280		93.351	0
176.986	Topo	95.210		93.358	0
177.076	Topo	95.222		93.365	0
177.171	Topo	95.200		93.373	0
177.265	Topo	95.310		93.381	0
177.360	Topo	95.340		93.388	0
177.386	Topo	95.302		93.390	0
177.456	Topo	95.320		93.396	0
177.554	Topo	95.310		93.404	0
177.652	Topo	95.410		93.412	0
177.749	Topo	95.420		93.419	0
177.847	Topo	95.510		93.427	0
177.945	Topo	95.422		93.435	0
178.044	Topo	95.522		93.443	0
178.143	Topo	95.590		93.451	0
178.243	Topo	95.620		93.459	0
178.342	Topo	95.672		93.467	0
178.442	Topo	95.630		93.475	0
178.542	Topo	95.610		93.483	0
178.641	Topo	95.592		93.491	0
178.740	Topo	95.500		93.499	0
178.839	Topo	95.410		93.507	0
178.938	Topo	95.400		93.514	0
179.037	Topo	95.360		93.522	0

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
179.082	Topo	95.392		93.526	0
179.133	Topo	95.410		93.530	0
179.228	Topo	95.460		93.538	0
179.323	Topo	95.410		93.545	0
179.418	Topo	95.280		93.553	0
179.512	Topo	95.392		93.560	0
179.605	Topo	95.500		93.568	0
179.696	Topo	95.622		93.575	0
179.780	Topo	95.600		93.582	0
179.864	Topo	95.630		93.589	0
179.948	Topo	95.670		93.595	0
180.026	Topo	95.682		93.602	0
180.103	Topo	95.710		93.608	0
180.180	Topo	95.790		93.614	0
180.257	Topo	95.860		93.620	0
180.334	Topo	95.950		93.626	0
180.411	Topo	96.032		93.632	0
180.545	Topo	96.090		93.643	0
180.621	Topo	96.150		93.649	0
180.697	Topo	96.180		93.655	0
180.773	Topo	96.170		93.661	0
180.849	Topo	96.182		93.667	0
180.924	Topo	96.240		93.673	0
181.005	Topo	96.282		93.680	0
181.087	Topo	96.420		93.686	0
181.170	Topo	96.620		93.693	0
181.250	Topo	96.862		93.699	0
181.330	Topo	96.880		93.706	0
181.409	Topo	96.900		93.712	0
181.489	Topo	96.930		93.719	0
181.579	Topo	96.912		93.726	0
181.677	Topo	96.880		93.734	0
181.774	Topo	96.760		93.741	0
181.871	Topo	96.740		93.749	0
181.969	Topo	96.762		93.757	0
182.066	Topo	96.710		93.765	0
182.163	Topo	96.460		93.772	0
182.260	Topo	96.842		93.780	0
182.359	Topo	96.730		93.788	0

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
182.457	Topo	96.840		93.796	0
182.556	Topo	96.880		93.804	0
182.652	Topo	96.792	0.100	93.812	0
182.748	Topo	96.550	0.200	93.819	0
182.844	Topo	96.310	0.300	93.827	0
182.941	Topo	96.162	0.500	93.835	0
183.041	Topo	96.000	0.500	93.843	0
183.141	Topo	95.840	0.500	93.851	0
183.241	Topo	95.500	1.000	93.859	0
183.340	Topo	95.262	1.000	93.867	0
183.440	Topo	95.330	1.000	93.875	0
183.539	Topo	95.400	1.000	93.883	0
183.573	Topo	95.452	1.500	93.885	0
183.637	Topo	95.690	1.500	93.890	0
183.735	Topo	95.920	1.500	93.898	0
183.833	Topo	96.290	1.000	93.906	0
183.930	Topo	96.740	1.000	93.914	0
183.974	Topo	97.062	1.000	93.917	0
184.029	Topo	96.990	0.500	93.922	0
184.128	Topo	96.970	0.500	93.930	0
184.228	Topo	96.550	0.200	93.938	0
184.235	Topo	96.982		93.938	0
184.324	Topo	97.030		93.945	0
184.420	Topo	97.090		93.953	0
184.516	Topo	97.150		93.961	0
184.607	Topo	97.590		93.968	0
184.697	Topo	97.890		93.975	0
184.707	Topo	98.062		93.976	0
184.785	Topo	97.960		93.982	0
184.874	Topo	97.950		93.989	0
184.963	Topo	97.920		93.996	0
185.005	Topo	97.932		94.000	0
185.055	Topo	97.720		94.004	0
185.150	Topo	97.460		94.011	0
185.245	Topo	97.320	0.100	94.019	0
185.332	Topo	97.175	0.200	94.026	0
185.339	Topo	97.160	0.200	94.027	0
185.417	Topo	97.150	0.200	94.033	0
185.437	Topo	97.115	0.300	94.034	0

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
185.495	Topo	97.350	0.500	94.039	0
185.574	Topo	97.470	0.500	94.045	0
185.639	Bathy	96.475	1.000	94.050	0
185.655	Bathy	96.030	1.000	94.052	0
185.731	Bathy	95.710	1.000	94.058	0
185.821	Bathy	95.430	1.500	94.065	0
185.910	Bathy	95.160	1.500	94.072	0
186.000	Bathy	95.040	2.000	94.079	0
186.083	Bathy	94.935	2.500	94.086	0
186.090	Bathy	94.860	2.500	94.087	0
186.188	Bathy	95.710	2.500	94.094	0
186.285	Bathy	95.640	3.000	94.102	0
186.382	Bathy	95.590	3.000	94.110	0
186.435	Bathy	94.535	3.000	94.114	0
186.480	Bathy	94.410	3.000	94.118	0
186.579	Bathy	94.300	3.000	94.126	0
186.678	Bathy	94.080	3.000	94.134	0.054
186.778	Bathy	93.820	4.000	94.142	0.322
186.855	Bathy	93.505	4.000	94.148	0.643
186.877	Bathy	93.590	4.000	94.150	0.56
186.977	Bathy	93.730	4.000	94.158	0.428
187.077	Bathy	93.770	3.000	94.166	0.396
187.131	Bathy	94.675	3.000	94.170	0
187.176	Bathy	94.860	3.000	94.174	0
187.276	Bathy	94.710	2.500	94.181	0
187.375	Bathy	94.880	2.500	94.189	0
187.474	Bathy	95.120	2.000	94.197	0
187.553	Bathy	95.485	2.000	94.204	0
187.573	Bathy	95.410	2.000	94.205	0
187.670	Bathy	95.430	2.000	94.213	0
187.767	Bathy	95.460	2.000	94.221	0
187.864	Bathy	95.470	2.000	94.229	0
187.961	Bathy	94.530	2.000	94.236	0
188.016	Bathy	95.555	2.000	94.241	0
188.057	Bathy	95.010	2.500	94.244	0
188.153	Bathy	94.880	2.500	94.252	0
188.248	Bathy	94.610	3.000	94.259	0
188.344	Bathy	94.230	3.000	94.267	0.037
188.439	Bathy	94.020	4.000	94.275	0.255

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
188.535	Bathy	93.860	4.000	94.282	0.422
188.566	Bathy	93.595	4.000	94.285	0.69
188.626	Bathy	93.320	5.000	94.289	0.969
188.714	Bathy	92.980	5.000	94.297	1.317
188.802	Bathy	92.575	5.000	94.304	1.729
188.892	Bathy	92.310	5.000	94.311	2.001
188.981	Bathy	92.180	5.000	94.318	2.138
189.069	Bathy	92.080	6.000	94.325	2.245
189.158	Bathy	91.870	6.000	94.332	2.462
189.247	Bathy	91.750	6.000	94.339	2.589
189.301	Bathy	91.655	6.000	94.344	2.689
189.339	Bathy	91.630	6.000	94.347	2.717
189.416	Bathy	91.595	6.000	94.353	2.758
189.433	Bathy	91.590	6.000	94.354	2.764
189.517	Bathy	91.540	6.000	94.361	2.821
189.601	Bathy	91.580	6.000	94.367	2.787
189.685	Bathy	91.520	6.000	94.374	2.854
189.698	Bathy	91.860	6.000	94.375	2.515
189.765	Bathy	91.950	6.000	94.381	2.431
189.844	Bathy	92.060	6.000	94.387	2.327
189.924	Bathy	92.090	5.000	94.393	2.303
190.003	Bathy	92.440	5.000	94.400	1.96
190.019	Bathy	92.615	5.000	94.401	1.786
190.092	Bathy	93.040	5.000	94.407	1.367
190.183	Bathy	93.910	5.000	94.414	0.504
190.275	Bathy	94.120	3.000	94.421	0.301
190.366	Bathy	95.645	2.000	94.429	0
190.367	Bathy	95.100	3.000	94.429	0
190.461	Bathy	94.860	3.000	94.436	0
190.556	Bathy	94.440	3.000	94.444	0.004
190.651	Bathy	94.510	3.000	94.451	0
190.736	Bathy	93.615	4.000	94.458	0.843
190.746	Bathy	93.330	4.000	94.459	1.129
190.845	Bathy	93.010	4.000	94.467	1.457
190.944	Bathy	92.940	5.000	94.475	1.535
191.044	Bathy	92.710	5.000	94.483	1.773
191.088	Bathy	92.595	5.000	94.486	1.891
191.121	Bathy	92.840	5.000	94.489	1.649
191.167	Bathy	92.990	5.000	94.493	1.503

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
191.266	Bathy	93.060	4.000	94.501	1.441
191.364	Bathy	93.130	4.000	94.509	1.379
191.463	Bathy	93.270	4.000	94.516	1.246
191.561	Bathy	93.480	4.000	94.524	1.044
191.571	Bathy	93.605	4.000	94.525	0.92
191.661	Bathy	93.860	3.000	94.532	0.672
191.760	Bathy	94.180	3.000	94.540	0.36
191.859	Bathy	94.680	3.000	94.548	0
191.958	Bathy	95.060	2.000	94.556	0
192.051	Bathy	95.565	2.000	94.563	0
192.057	Bathy	95.510	2.000	94.564	0
192.157	Bathy	95.430	2.000	94.572	0
192.256	Bathy	95.500	2.000	94.580	0
192.356	Bathy	95.610	2.000	94.588	0
192.440	Bathy	95.685	2.000	94.595	0
192.456	Bathy	95.730	2.000	94.596	0
192.555	Bathy	95.810	2.000	94.604	0
192.655	Bathy	95.730	2.000	94.612	0
192.755	Bathy	95.460	2.000	94.620	0
192.855	Bathy	95.210	2.000	94.628	0
192.955	Bathy	95.380	2.000	94.636	0
193.055	Bathy	95.590	2.000	94.644	0
193.085	Bathy	95.695	2.000	94.646	0
193.155	Bathy	95.140	2.000	94.652	0
193.254	Bathy	95.020	2.500	94.660	0
193.353	Bathy	94.920	2.500	94.668	0
193.453	Bathy	94.860	3.000	94.676	0
193.552	Bathy	94.710	3.000	94.684	0
193.569	Bathy	94.655	3.000	94.685	0.03
193.651	Bathy	94.130	4.000	94.691	0.561
193.750	Bathy	93.010	4.000	94.699	1.689
193.849	Bathy	92.880	4.000	94.707	1.827
193.948	Bathy	92.730	5.000	94.715	1.985
194.046	Bathy	92.690	5.000	94.723	2.033
194.081	Bathy	92.605	5.000	94.726	2.121
194.146	Bathy	91.890	5.000	94.731	2.841
194.246	Bathy	91.730	6.000	94.739	3.009
194.346	Bathy	91.640	6.000	94.747	3.107
194.437	Bathy	91.625	6.000	94.754	3.129

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
194.446	Bathy	92.000	5.000	94.755	2.755
194.543	Bathy	92.460	5.000	94.763	2.303
194.641	Bathy	92.910	5.000	94.771	1.861
194.739	Bathy	93.260	4.000	94.778	1.518
194.812	Bathy	93.595	4.000	94.784	1.189
194.837	Bathy	94.010	3.000	94.786	0.776
194.936	Bathy	94.290	3.000	94.794	0.504
195.034	Bathy	94.930	2.000	94.802	0
195.133	Bathy	95.480	2.000	94.810	0
195.232	Bathy	95.550	1.000	94.818	0
195.306	Bathy	96.645	1.000	94.824	0
195.331	Bathy	96.590	1.000	94.826	0
195.429	Bathy	96.320	1.000	94.834	0
195.527	Bathy	96.020	1.000	94.842	0
195.625	Bathy	95.970	2.000	94.849	0
195.724	Bathy	95.860	2.000	94.857	0
195.815	Bathy	95.715	2.000	94.865	0
195.839	Bathy	95.830	2.000	94.867	0
195.937	Bathy	95.990	2.000	94.874	0
196.035	Bathy	96.260	1.000	94.882	0
196.133	Bathy	96.510	1.000	94.890	0
196.171	Bathy	96.745	1.000	94.893	0
196.232	Bathy	96.510	1.000	94.898	0
196.332	Bathy	96.190	1.000	94.906	0
196.432	Bathy	95.990	2.000	94.914	0
196.532	Bathy	95.740	2.000	94.922	0
196.609	Bathy	95.675	2.000	94.928	0
196.632	Bathy	95.870	2.000	94.930	0
196.732	Bathy	95.930	2.000	94.938	0
196.832	Bathy	95.990	1.000	94.946	0
196.932	Bathy	96.130	1.000	94.954	0
197.032	Bathy	96.290	1.000	94.962	0
197.132	Bathy	96.540	1.000	94.970	0
197.142	Bathy	96.825	1.000	94.971	0
197.232	Bathy	96.260	1.000	94.978	0
197.332	Bathy	95.980	2.000	94.986	0
197.432	Bathy	95.910	2.000	94.994	0
197.507	Bathy	95.840	2.000	95.000	0
197.532	Bathy	95.860	2.000	95.002	0

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
197.631	Bathy	95.740	2.000	95.010	0
197.731	Bathy	95.720	2.000	95.018	0
197.831	Bathy	95.780	2.000	95.026	0
197.915	Bathy	95.805	2.000	95.033	0
197.931	Bathy	95.140	2.000	95.034	0
198.031	Bathy	94.280	2.000	95.042	0.762
198.131	Bathy	93.590	3.000	95.050	1.46
198.231	Bathy	93.480	3.000	95.058	1.578
198.331	Bathy	93.110	3.000	95.066	1.956
198.431	Bathy	92.860	3.000	95.074	2.214
198.509	Bathy	92.415	3.000	95.080	2.665
198.531	Bathy	92.410	3.000	95.082	2.672
198.631	Bathy	92.450	3.000	95.090	2.64
198.731	Bathy	92.560	3.000	95.098	2.538
198.831	Bathy	92.420	3.000	95.106	2.686
198.927	Bathy	92.395	3.000	95.114	2.719
199.031	Bathy	92.260	3.000	95.122	2.862
199.131	Bathy	92.010	3.000	95.130	3.12
199.231	Bathy	91.930	3.000	95.138	3.208
199.331	Bathy	91.640	4.000	95.146	3.506
199.431	Bathy	91.580	4.000	95.154	3.574
199.446	Bathy	91.425	4.000	95.155	3.73
199.531	Bathy	91.030	5.000	95.162	4.132
199.631	Bathy	90.860	5.000	95.170	4.31
199.731	Bathy	90.640	5.000	95.178	4.538
199.831	Bathy	90.220	5.000	95.186	4.966
199.931	Bathy	89.940	6.000	95.194	5.254
199.948	Bathy	89.425	6.000	95.195	5.77
200.058	Bathy	90.030	6.000	95.204	5.174
200.158	Bathy	90.990	5.000	95.212	4.222
200.258	Bathy	91.760	4.000	95.220	3.46
200.306	Bathy	92.425	3.000	95.224	2.799
200.358	Bathy	92.400	3.000	95.228	2.828
200.458	Bathy	92.460	3.000	95.236	2.776
200.558	Bathy	92.350	3.000	95.244	2.894
200.658	Bathy	92.490	3.000	95.252	2.762
200.670	Bathy	92.395	3.000	95.253	2.858
200.758	Bathy	92.970	3.000	95.260	2.29
200.858	Bathy	93.340	2.000	95.268	1.928

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
200.958	Bathy	93.960	2.000	95.276	1.316
200.969	Bathy	94.345	1.000	95.277	0.932
201.058	Bathy	93.870	2.000	95.284	1.414
201.158	Bathy	93.160	2.000	95.292	2.132
201.257	Bathy	92.550	3.000	95.300	2.75
201.270	Bathy	91.365	4.000	95.301	3.936
201.398	Bathy	91.020	4.000	95.311	4.291
201.496	Bathy	90.680	5.000	95.319	4.639
201.594	Bathy	90.440	5.000	95.327	4.887
201.692	Bathy	90.040	5.000	95.335	5.295
201.790	Bathy	89.730	5.000	95.343	5.613
201.851	Bathy	89.335	6.000	95.347	6.012
201.889	Bathy	89.860	6.000	95.351	5.491
201.989	Bathy	90.140	6.000	95.359	5.219
202.089	Bathy	90.570	6.000	95.367	4.797
202.189	Bathy	90.920	5.000	95.375	4.455
202.289	Bathy	91.380	5.000	95.383	4.003
202.389	Bathy	91.890	3.000	95.391	3.501
202.468	Bathy	92.285	3.000	95.397	3.112
202.489	Bathy	92.850	3.000	95.398	2.548
202.588	Bathy	93.080	3.000	95.406	2.326
202.687	Bathy	93.760	1.000	95.414	1.654
202.786	Bathy	94.010	1.000	95.422	1.412
202.852	Bathy	94.395	1.000	95.428	1.033
202.886	Bathy	93.880	1.000	95.430	1.55
202.985	Bathy	93.130	2.000	95.438	2.308
203.085	Bathy	92.690	2.000	95.446	2.756
203.184	Bathy	92.440	3.000	95.454	3.014
203.284	Bathy	91.880	3.000	95.462	3.582
203.351	Bathy	91.355	4.000	95.468	4.113
203.384	Bathy	91.000	4.000	95.470	4.47
203.483	Bathy	90.650	4.000	95.478	4.828
203.583	Bathy	90.590	5.000	95.486	4.896
203.683	Bathy	90.240	5.000	95.494	5.254
203.783	Bathy	90.260	5.000	95.502	5.242
203.883	Bathy	90.030	5.000	95.510	5.48
203.982	Bathy	89.770	6.000	95.518	5.748
204.082	Bathy	89.510	6.000	95.526	6.016
204.118	Bathy	89.385	6.000	95.529	6.144

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
204.182	Bathy	89.430	6.000	95.534	6.104
204.282	Bathy	89.410	6.000	95.542	6.132
204.307	Bathy	89.385	6.000	95.544	6.159
204.382	Bathy	89.810	6.000	95.550	5.74
204.482	Bathy	90.000	5.000	95.558	5.558
204.495	Bathy	90.395	5.000	95.559	5.164
204.545	Bathy	89.930	6.000	95.563	5.633
204.577	Bathy	89.216	6.000	95.566	6.35
204.603	Bathy	89.450	6.000	95.568	6.118
204.671	Bathy	89.870	6.000	95.573	5.703
204.746	Bathy	89.930	6.000	95.579	5.649
204.822	Bathy	90.030	5.000	95.585	5.555
204.900	Bathy	90.280	5.000	95.591	5.311
204.982	Bathy	90.410	5.000	95.598	5.188
205.036	Bathy	90.666	5.000	95.602	4.936
205.077	Bathy	90.710	5.000	95.606	4.896
205.172	Bathy	90.770	5.000	95.613	4.843
205.267	Bathy	90.780	5.000	95.621	4.841
205.362	Bathy	90.830	5.000	95.628	4.798
205.458	Bathy	90.870	5.000	95.636	4.766
205.499	Bathy	90.906	5.000	95.639	4.733
205.555	Bathy	90.990	5.000	95.644	4.654
205.655	Bathy	91.190	5.000	95.652	4.462
205.755	Bathy	91.380	4.000	95.660	4.28
205.855	Bathy	91.450	4.000	95.668	4.218
205.954	Bathy	91.640	4.000	95.676	4.036
206.054	Bathy	91.730	4.000	95.684	3.954
206.148	Bathy	91.956	4.000	95.691	3.735
206.154	Bathy	92.020	4.000	95.692	3.672
206.250	Bathy	92.060	4.000	95.699	3.639
206.347	Bathy	92.210	4.000	95.707	3.497
206.443	Bathy	92.380	3.000	95.715	3.335
206.540	Bathy	92.510	3.000	95.723	3.213
206.636	Bathy	92.770	3.000	95.730	2.96
206.639	Bathy	92.976	3.000	95.730	2.754
206.759	Bathy	92.500	3.000	95.740	3.24
206.858	Bathy	92.100	4.000	95.748	3.648
206.957	Bathy	91.870	5.000	95.756	3.886
207.057	Bathy	91.220	5.000	95.764	4.544

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
207.156	Bathy	90.980	5.000	95.772	4.792
207.256	Bathy	90.610	6.000	95.780	5.17
207.355	Bathy	90.140	6.000	95.788	5.648
207.433	Bathy	89.956	6.000	95.794	5.838
207.454	Bathy	89.320	6.000	95.796	6.476
207.554	Bathy	89.000	6.000	95.804	6.804
207.653	Bathy	88.410	8.000	95.812	7.402
207.753	Bathy	88.010	8.000	95.820	7.81
207.852	Bathy	87.560	8.000	95.828	8.268
207.951	Bathy	87.020	10.000	95.835	8.815
208.111	Bathy	86.530	10.000	95.848	9.318
208.135	Bathy	85.986	10.000	95.850	9.864
208.204	Bathy	86.080	10.000	95.856	9.776
208.301	Bathy	86.490	8.000	95.864	9.374
208.389	Bathy	86.990	8.000	95.870	8.88
208.493	Bathy	87.390	8.000	95.879	8.489
208.581	Bathy	87.850	8.000	95.886	8.036
208.667	Bathy	87.990	7.000	95.893	7.903
208.795	Bathy	88.540	7.000	95.903	7.363
208.855	Bathy	88.936	7.000	95.908	6.972
208.887	Bathy	89.020	7.000	95.910	6.89
208.987	Bathy	89.060	7.000	95.918	6.858
209.085	Bathy	89.210	6.000	95.926	6.716
209.179	Bathy	89.480	6.000	95.934	6.454
209.242	Bathy	89.690	6.000	95.939	6.249
209.255	Bathy	89.986	6.000	95.940	5.954
209.340	Bathy	89.650	6.000	95.947	6.297
209.439	Bathy	89.410	6.000	95.955	6.545
209.539	Bathy	89.380	7.000	95.963	6.583
209.639	Bathy	89.160	7.000	95.970	6.81
209.738	Bathy	89.090	7.000	95.978	6.888
209.838	Bathy	88.990	7.000	95.986	6.996
209.894	Bathy	88.906	7.000	95.991	7.085
209.937	Bathy	88.990	7.000	95.994	7.004
210.035	Bathy	89.260	7.000	96.002	6.742
210.134	Bathy	89.650	7.000	96.010	6.36
210.228	Bathy	89.890	5.000	96.018	6.128
210.308	Bathy	90.290	5.000	96.024	5.734
210.391	Bathy	90.990	5.000	96.031	5.041

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
210.414	Bathy	91.956	4.000	96.033	4.077
210.476	Bathy	91.860	4.000	96.038	4.178
210.552	Bathy	91.890	4.000	96.044	4.154
210.663	Bathy	91.800	4.000	96.052	4.252
210.709	Bathy	91.836	4.000	96.056	4.22
210.766	Bathy	90.890	5.000	96.061	5.171
210.898	Bathy	90.350	5.000	96.071	5.721
211.027	Bathy	90.010	5.000	96.082	6.072
211.088	Bathy	89.866	6.000	96.086	6.22
211.115	Bathy	89.490	6.000	96.089	6.599
211.214	Bathy	89.030	6.000	96.097	7.067
211.312	Bathy	89.010	7.000	96.104	7.094
211.411	Bathy	88.990	7.000	96.112	7.122
211.510	Bathy	88.810	7.000	96.120	7.31
211.549	Bathy	88.726	7.000	96.123	7.397
211.606	Bathy	88.730	7.000	96.128	7.398
211.702	Bathy	88.760	7.000	96.136	7.376
211.797	Bathy	88.810	7.000	96.143	7.333
211.893	Bathy	88.880	7.000	96.151	7.271
211.988	Bathy	88.730	7.000	96.158	7.428
212.084	Bathy	88.720	7.000	96.166	7.446
212.098	Bathy	88.816	7.000	96.167	7.351
212.102	Bathy	88.841	7.000	96.174	7.333
212.232	Bathy	88.875	7.000	96.179	7.304
212.337	Bathy	88.910	7.000	96.186	7.276
212.417	Bathy	88.760	7.000	96.193	7.433
212.476	Bathy	88.806	7.000	96.197	7.391
212.503	Bathy	88.980	7.000	96.200	7.22
212.603	Bathy	89.030	7.000	96.208	7.178
212.703	Bathy	89.250	7.000	96.216	6.966
212.803	Bathy	89.210	7.000	96.224	7.014
212.903	Bathy	89.420	6.000	96.232	6.812
213.003	Bathy	89.650	6.000	96.240	6.59
213.101	Bathy	89.730	6.000	96.247	6.517
213.199	Bathy	89.810	6.000	96.255	6.445
213.297	Bathy	89.840	6.000	96.263	6.423
213.374	Bathy	89.856	6.000	96.269	6.413
213.395	Bathy	89.640	6.000	96.271	6.631
213.495	Bathy	89.460	6.000	96.279	6.819

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
213.594	Bathy	89.030	7.000	96.287	7.257
213.694	Bathy	88.550	7.000	96.295	7.745
213.773	Bathy	87.896	7.000	96.301	8.405
213.794	Bathy	87.890	7.000	96.303	8.413
213.892	Bathy	88.030	6.000	96.311	8.281
213.991	Bathy	88.280	6.000	96.319	8.039
214.089	Bathy	88.620	6.000	96.327	7.707
214.188	Bathy	88.710	6.000	96.334	7.624
214.196	Bathy	89.956	6.000	96.335	6.379
214.286	Bathy	90.260	6.000	96.342	6.082
214.372	Bathy	90.520	6.000	96.349	5.829
214.471	Bathy	90.990	5.000	96.357	5.367
214.555	Bathy	91.380	5.000	96.364	4.984
214.653	Bathy	91.820	5.000	96.372	4.552
214.750	Bathy	92.390	3.000	96.379	3.989
214.784	Bathy	92.926	3.000	96.382	3.456
214.849	Bathy	92.900	3.000	96.387	3.487
214.949	Bathy	92.860	3.000	96.395	3.535
215.055	Bathy	92.880	3.000	96.404	3.524
215.155	Bathy	92.886	3.000	96.412	3.526
215.247	Bathy	93.340	2.000	96.419	3.079
215.307	Bathy	93.936	2.000	96.424	2.488
215.316	Bathy	95.886	1.000	96.425	0.539
215.331	Bathy	96.376	1.000	96.426	0.05
215.398	Bathy	94.220	3.000	96.431	2.211
215.433	Bathy	92.626	3.500	96.434	3.808
215.498	Bathy	92.310	3.000	96.439	4.129
215.598	Bathy	92.650	3.000	96.447	3.797
215.698	Bathy	92.460	3.000	96.455	3.995
215.798	Bathy	92.530	3.000	96.463	3.933
215.898	Bathy	92.660	3.000	96.471	3.811
215.998	Bathy	92.620	3.000	96.479	3.859
216.097	Bathy	92.420	3.000	96.487	4.067
216.121	Bathy	92.876	3.000	96.489	3.613
216.193	Bathy	92.990	3.000	96.495	3.505
216.287	Bathy	93.190	2.000	96.502	3.312
216.363	Bathy	93.380	2.000	96.508	3.128
216.463	Bathy	93.460	2.000	96.516	3.056
216.563	Bathy	93.810	1.000	96.524	2.714

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
216.662	Bathy	94.290	1.000	96.532	2.242
216.681	Bathy	94.836	1.000	96.534	1.698
216.762	Bathy	94.490	1.000	96.540	2.05
216.862	Bathy	94.300	2.000	96.548	2.248
216.962	Bathy	93.950	2.000	96.556	2.606
217.062	Bathy	93.620	2.000	96.564	2.944
217.070	Bathy	93.366	2.500	96.565	3.199
217.162	Bathy	93.000	2.000	96.572	3.572
217.262	Bathy	92.930	2.000	96.580	3.65
217.362	Bathy	92.860	2.000	96.588	3.728
217.463	Bathy	92.640	3.000	96.596	3.956
217.547	Bathy	92.880	3.000	96.603	3.723
217.568	Bathy	92.916	3.000	96.605	3.689
217.651	Bathy	92.900	3.000	96.611	3.711
217.737	Bathy	92.840	3.000	96.618	3.778
217.805	Bathy	92.900	3.000	96.624	3.724
217.867	Bathy	92.990	3.000	96.629	3.639
217.937	Bathy	92.860	3.000	96.634	3.774
218.002	Bathy	92.710	3.000	96.640	3.93
218.077	Bathy	92.840	3.000	96.646	3.806
218.160	Bathy	92.900	3.000	96.652	3.752
218.280	Bathy	92.936	3.000	96.662	3.726
218.311	Bathy	92.940	3.000	96.664	3.724
218.375	Bathy	92.976	3.000	96.669	3.693
218.466	Bathy	92.990	3.000	96.677	3.687
218.563	Bathy	92.910	3.000	96.684	3.774
218.661	Bathy	92.960	3.000	96.692	3.732
218.753	Bathy	92.946	3.000	96.700	3.754
218.759	Bathy	92.840	3.000	96.700	3.86
218.858	Bathy	92.910	3.000	96.708	3.798
218.957	Bathy	92.660	3.000	96.716	4.056
219.054	Bathy	92.426	3.500	96.724	4.298
219.155	Bathy	92.060	3.500	96.732	4.672
219.255	Bathy	91.880	3.500	96.740	4.86
219.355	Bathy	91.410	4.000	96.748	5.338
219.454	Bathy	91.300	4.000	96.756	5.456
219.476	Bathy	91.276	4.500	96.757	5.481
219.554	Bathy	91.900	5.000	96.764	4.864
219.654	Bathy	92.320	5.000	96.772	4.452

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
219.754	Bathy	92.770	3.000	96.780	4.01
219.854	Bathy	93.000	3.000	96.788	3.788
219.954	Bathy	93.220	2.000	96.796	3.576
220.054	Bathy	93.910	2.000	96.804	2.894
220.153	Bathy	94.446	1.500	96.812	2.366
220.248	Bathy	93.990	1.500	96.819	2.829
220.342	Bathy	93.840	2.000	96.827	2.987
220.466	Bathy	93.480	2.000	96.837	3.357
220.562	Bathy	93.660	2.000	96.844	3.184
220.658	Bathy	93.790	2.000	96.852	3.062
220.703	Bathy	93.956	2.000	96.856	2.9
220.752	Bathy	93.900	2.000	96.860	2.96
220.845	Bathy	93.890	2.000	96.867	2.977
220.940	Bathy	93.910	2.000	96.875	2.965
220.959	Bathy	93.936	2.000	96.876	2.94
221.036	Bathy	94.060	1.000	96.882	2.822
221.136	Bathy	94.690	0.500	96.890	2.2
221.236	Bathy	95.020	0.500	96.898	1.878
221.296	Topo	95.666	0.300	96.903	1.237
221.336	Topo	95.800	0.300	96.906	1.106
221.434	Topo	95.630	0.300	96.914	1.284
221.480	Topo	95.586	0.300	96.918	1.332
221.533	Topo	95.800	0.200	96.922	1.122
221.564	Topo	95.846	0.100	96.925	1.079
221.632	Topo	95.710	0.100	96.930	1.22
221.753	Topo	95.700	0.200	96.940	1.24
221.853	Topo	95.690	0.200	96.948	1.258
221.863	Topo	95.676	0.300	96.948	1.272
221.953	Topo	95.730	0.600	96.956	1.226
222.053	Topo	95.110	0.800	96.964	1.854
222.077	Topo	94.876	1.000	96.966	2.09
222.153	Topo	95.020	0.800	96.972	1.952
222.253	Topo	95.210	0.600	96.980	1.77
222.353	Topo	95.440	0.400	96.988	1.548
222.452	Topo	95.650	0.300	96.996	1.346
222.472	Topo	95.696	0.200	96.997	1.301
222.552	Topo	95.940		97.004	1.064
222.652	Topo	96.030		97.012	0.982
222.752	Topo	96.210		97.020	0.81

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
222.852	Topo	96.420		97.028	0.608
222.903	Topo	96.676		97.032	0.356
222.952	Topo	96.940		97.036	0.096
223.051	Topo	97.000		97.044	0.044
223.151	Topo	97.060		97.051	0
223.245	Topo	97.080		97.059	0
223.276	Topo	97.120		97.061	0
223.342	Topo	97.166		97.067	0
223.372	Topo	97.880		97.069	0
223.472	Topo	98.390		97.077	0
223.572	Topo	98.890		97.085	0
223.672	Topo	99.430		97.093	0
223.737	Topo	100.136		97.098	0
223.772	Topo	100.000		97.101	0
223.872	Topo	99.210		97.109	0
223.972	Topo	98.850		97.117	0
224.072	Topo	98.800		97.125	0
224.104	Topo	96.866		97.128	0.262
224.171	Topo	97.630		97.133	0
224.198	Bathy	98.356	1.300	97.135	0
224.269	Bathy	98.010	1.400	97.141	0
224.301	Bathy	98.700	1.500	97.144	0
224.366	Bathy	99.340	1.500	97.149	0
224.463	Bathy	99.860	1.400	97.156	0
224.557	Bathy	100.690	1.500	97.164	0
224.619	Bathy	101.506	1.900	97.169	0
224.655	Bathy	101.230	2.300	97.172	0
224.747	Bathy	100.760	2.800	97.179	0
224.776	Bathy	100.210	3.000	97.181	0
224.839	Bathy	99.350	3.100	97.187	0
224.928	Bathy	98.570	3.200	97.194	0
224.961	Bathy	97.440	3.300	97.196	0
225.000	Bathy	96.770	3.400	97.199	0.429
225.026	Bathy	93.316	3.500	97.202	3.886
225.090	Bathy	92.770	3.700	97.207	4.437
225.168	Bathy	92.390	4.100	97.213	4.823
225.251	Bathy	92.456	4.500	97.219	4.763
225.267	Bathy	92.380	4.400	97.221	4.841
225.367	Bathy	92.210	4.300	97.229	5.019

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
225.467	Bathy	92.550	4.200	97.237	4.687
225.484	Bathy	92.836	4.000	97.238	4.402
225.566	Bathy	93.020	3.700	97.245	4.225
225.657	Bathy	93.336	3.500	97.252	3.916
225.666	Bathy	93.410	3.400	97.253	3.843
225.764	Bathy	93.610	3.300	97.261	3.651
225.862	Bathy	93.740	3.200	97.268	3.528
225.902	Bathy	93.856	3.000	97.272	3.416
225.954	Bathy	93.830	2.500	97.276	3.446
226.028	Bathy	94.956	2.000	97.282	2.326
226.044	Bathy	94.820	1.500	97.283	2.463
226.139	Bathy	94.800	1.200	97.291	2.491
226.178	Bathy	95.826	1.000	97.294	1.468
226.237	Bathy	96.020	0.700	97.298	1.278
226.317	Bathy	96.346	0.500	97.305	0.959
226.329	Bathy	96.300	0.500	97.306	1.006
226.421	Bathy	96.280	0.500	97.313	1.033
226.444	Bathy	96.296	0.500	97.315	1.019
226.517	Topo	96.960		97.321	0.361
226.614	Topo	97.020		97.329	0.309
226.631	Topo	97.146		97.330	0.184
226.714	Topo	97.210		97.337	0.127
226.797	Topo	97.290		97.343	0.053
226.821	Topo	97.360		97.345	0
226.907	Topo	97.210		97.352	0.142
226.952	Topo	97.170		97.356	0.186
226.974	Topo	97.106		97.357	0.251
227.038	Topo	97.880		97.362	0
227.133	Topo	97.620		97.370	0
227.161	Topo	97.546		97.372	0
227.226	Topo	97.590		97.377	0
227.319	Topo	97.690		97.385	0
227.416	Topo	97.730		97.393	0
227.503	Topo	97.990		97.400	0
227.611	Topo	98.010		97.408	0
227.711	Topo	98.150		97.416	0
227.810	Topo	98.330		97.424	0
227.910	Topo	98.680		97.432	0
227.917	Topo	99.026		97.433	0

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
228.010	Topo	99.110		97.440	0
228.110	Topo	99.280		97.448	0
228.119	Topo	99.426		97.449	0
228.209	Topo	98.990		97.456	0
228.282	Topo	98.646		97.462	0
228.363	Topo	98.600		97.468	0
228.463	Topo	98.330		97.476	0
228.563	Topo	98.450		97.484	0
228.648	Topo	98.386		97.491	0
228.663	Topo	98.880		97.492	0
228.763	Topo	99.010		97.500	0
228.863	Topo	99.070		97.508	0
228.931	Topo	99.136		97.514	0
228.963	Topo	99.220		97.516	0
229.062	Topo	99.310		97.524	0
229.161	Topo	99.430		97.532	0
229.170	Topo	99.536		97.533	0
229.256	Topo	99.660		97.540	0
229.352	Topo	99.720		97.548	0
229.414	Topo	99.796		97.553	0
229.448	Topo	99.990		97.555	0
229.545	Topo	100.060		97.563	0
229.642	Topo	100.240		97.571	0
229.739	Topo	100.330		97.579	0
229.763	Topo	100.456		97.580	0
229.836	Topo	100.530		97.586	0
229.933	Topo	100.550		97.594	0
230.095	Topo	101.576		97.607	0
230.141	Topo	101.720		97.611	0
230.240	Topo	101.810		97.619	0
230.253	Topo	101.896		97.620	0
230.337	Topo	102.340		97.626	0
230.355	Topo	102.716		97.628	0
230.436	Topo	103.020		97.634	0
230.536	Topo	103.350		97.642	0
230.636	Topo	103.620		97.650	0
230.735	Topo	103.960		97.658	0
230.835	Topo	104.220		97.666	0
230.894	Topo	104.546		97.671	0

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
230.935	Topo	103.310		97.674	0
231.033	Topo	102.906		97.682	0
231.134	Topo	102.620		97.690	0
231.216	Topo	102.336		106.000	3.664
231.290	Bathy	102.850	4.780	106.010	3.16
231.297	Bathy	103.096	4.850	106.011	2.915
231.341	Bathy	103.065	5.000	106.017	2.952
231.366	Bathy	103.090	5.120	106.021	2.931
231.444	Bathy	103.100	5.070	106.032	2.932
231.460	Bathy	103.102	5.040	106.034	2.932
231.528	Bathy	103.010	5.210	106.043	3.033
231.545	Bathy	102.925	5.420	106.046	3.121
231.610	Bathy	102.230	5.960	106.055	3.825
231.628	Bathy	101.930	6.400	106.057	4.127
231.713	Bathy	100.405	7.900	106.069	5.664
231.894	Bathy	100.350	7.920	106.094	5.744
231.993	Bathy	100.327	7.940	106.108	5.781
232.093	Bathy	100.297	8.040	106.122	5.825
232.260	Bathy	100.039	8.200	106.145	6.106
232.341	Bathy	100.173	8.150	106.156	5.983
232.424	Bathy	100.084	8.110	106.168	6.084
232.512	Bathy	99.821	8.300	106.180	6.359
232.600	Bathy	100.133	8.040	106.192	6.059
232.690	Bathy	100.492	7.620	106.204	5.712
232.773	Bathy	100.607	7.500	106.216	5.609
232.866	Bathy	100.607	7.540	106.229	5.622
232.960	Bathy	100.785	7.380	106.242	5.457
233.056	Bathy	101.993	6.200	106.255	4.262
233.153	Bathy	101.641	6.500	106.269	4.628
233.251	Bathy	100.589	7.500	106.282	5.693
233.349	Bathy	100.868	7.230	106.296	5.428
233.441	Bathy	100.991	7.020	106.309	5.318
233.537	Bathy	101.266	6.770	106.322	5.056
233.634	Bathy	101.211	6.840	106.335	5.124
233.733	Bathy	101.381	6.570	106.349	4.968
233.832	Bathy	102.004	6.110	106.363	4.359
233.932	Bathy	102.869	5.200	106.377	3.508
234.034	Bathy	102.629	5.440	106.391	3.762
234.119	Bathy	102.250	5.780	106.403	4.153

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
234.214	Bathy	102.082	5.940	106.416	4.334
234.310	Bathy	101.785	6.200	106.429	4.644
234.408	Bathy	101.964	6.110	106.443	4.479
234.508	Bathy	102.047	5.960	106.457	4.41
234.607	Bathy	102.320	5.710	106.470	4.15
234.705	Bathy	102.081	5.910	106.484	4.403
234.803	Bathy	102.011	6.000	106.498	4.487
234.903	Bathy	101.877	6.200	106.511	4.634
235.002	Bathy	101.989	6.110	106.525	4.536
235.097	Bathy	101.739	6.270	106.538	4.799
235.191	Bathy	102.013	6.050	106.551	4.538
235.288	Bathy	102.263	5.800	106.565	4.302
235.387	Bathy	102.300	5.740	106.579	4.279
235.484	Bathy	102.296	5.800	106.592	4.296
235.619	Bathy	102.494	5.640	106.611	4.117
235.675	Bathy	102.600	5.570	106.618	4.018
235.767	Bathy	102.691	5.500	106.631	3.94
235.858	Bathy	102.551	5.600	106.644	4.093
235.949	Bathy	102.490	5.700	106.656	4.166
236.041	Bathy	102.598	5.550	106.669	4.071
236.136	Bathy	102.826	5.340	106.682	3.856
236.232	Bathy	102.632	5.500	106.696	4.064
236.331	Bathy	102.574	5.560	106.709	4.135
236.430	Bathy	102.776	5.470	106.723	3.947
236.530	Bathy	103.016	5.200	106.737	3.721
236.625	Bathy	103.131	5.000	106.750	3.619
236.726	Bathy	103.250	4.900	106.764	3.514
236.830	Bathy	103.380	4.770	106.779	3.399
236.928	Bathy	103.414	4.730	106.792	3.378
237.026	Bathy	103.849	4.210	106.806	2.957
237.123	Bathy	104.617	3.500	106.819	2.202
237.220	Bathy	104.526	3.570	106.833	2.307
237.319	Bathy	104.516	3.560	106.846	2.33
237.419	Bathy	104.482	3.600	106.860	2.378
237.519	Bathy	104.173	3.850	106.874	2.701
237.619	Bathy	104.145	3.880	106.888	2.743
237.718	Bathy	104.172	3.900	106.902	2.73
237.817	Bathy	104.057	4.040	106.916	2.859
237.917	Bathy	103.901	4.110	106.929	3.028

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
238.040	Bathy	103.937	4.040	106.946	3.009
238.138	Bathy	104.017	4.000	106.960	2.943
238.237	Bathy	103.907	4.070	106.974	3.067
238.335	Bathy	104.047	3.980	106.987	2.94
238.435	Bathy	104.518	3.510	107.001	2.483
238.535	Bathy	104.995	3.000	107.015	2.02
238.635	Bathy	104.805	3.200	107.029	2.224
238.735	Bathy	104.635	3.400	107.043	2.408
238.835	Bathy	104.647	3.330	107.057	2.41
238.935	Bathy	104.553	3.470	107.071	2.518
239.035	Bathy	104.446	3.650	107.084	2.638
239.135	Bathy	104.326	3.680	107.098	2.772
239.234	Bathy	104.285	3.700	107.112	2.827
239.334	Bathy	104.235	3.750	107.126	2.891
239.434	Bathy	104.108	3.880	107.140	3.032
239.534	Bathy	104.067	3.900	107.154	3.087
239.634	Bathy	103.947	4.040	107.167	3.22
239.729	Bathy	103.837	4.120	107.181	3.344
239.828	Bathy	103.940	4.000	107.194	3.254
239.928	Bathy	104.045	3.880	107.208	3.163
240.028	Bathy	103.997	3.920	107.222	3.225
240.126	Bathy	104.020	3.900	107.236	3.216
240.222	Bathy	104.093	3.870	107.249	3.156
240.321	Bathy	104.291	3.640	107.263	2.972
240.416	Bathy	104.375	3.580	107.276	2.901
240.510	Bathy	104.416	3.470	107.289	2.873
240.608	Bathy	104.447	3.500	107.303	2.856
240.707	Bathy	104.525	3.470	107.316	2.791
240.806	Bathy	104.366	3.580	107.330	2.964
240.905	Bathy	104.325	3.620	107.344	3.019
241.005	Bathy	104.479	3.410	107.358	2.879
241.105	Bathy	104.794	3.140	107.371	2.577
241.204	Bathy	105.522	2.470	107.385	1.863
241.303	Bathy	105.778	2.200	107.399	1.621
241.398	Bathy	105.563	2.370	107.412	1.849
241.512	Bathy	105.217	2.520	107.428	2.211
241.618	Bathy	105.082	2.890	107.443	2.361
241.702	Bathy	104.415	3.500	107.454	3.039
241.792	Bathy	103.802	4.100	107.467	3.665

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
241.887	Bathy	103.545	4.380	107.480	3.935
241.985	Bathy	102.923	4.950	107.494	4.571
242.082	Bathy	102.047	5.870	107.507	5.46
242.180	Bathy	101.768	6.200	107.521	5.753
242.277	Bathy	101.868	6.070	107.534	5.666
242.375	Bathy	102.010	5.880	107.548	5.538
242.474	Bathy	101.976	5.970	107.561	5.585
242.574	Bathy	101.890	6.020	107.575	5.685
242.671	Bathy	101.984	6.000	107.589	5.605
242.767	Bathy	102.466	5.500	107.602	5.136
242.864	Bathy	103.159	4.800	107.615	4.456
242.960	Bathy	103.769	4.200	107.629	3.86
243.088	Bathy	104.397	3.500	107.647	3.25
243.170	Bathy	105.006	2.900	107.658	2.652
243.269	Bathy	105.951	2.000	107.672	1.721
243.369	Bathy	106.064	1.900	107.685	1.621
243.469	Bathy	105.784	2.100	107.699	1.915
243.569	Bathy	105.378	2.600	107.713	2.335
243.668	Bathy	104.781	3.200	107.727	2.946
243.768	Bathy	105.575	2.500	107.741	2.166
243.865	Bathy	105.086	3.000	107.754	2.668
243.965	Bathy	104.699	3.300	107.768	3.069
244.063	Bathy	104.626	3.500	107.782	3.156
244.163	Bathy	104.278	3.800	107.796	3.518
244.263	Bathy	104.090	4.000	107.809	3.719
244.362	Bathy	103.864	4.200	107.823	3.959
244.460	Bathy	103.378	4.700	107.837	4.459
244.558	Bathy	103.546	4.500	107.850	4.304
244.658	Bathy	104.208	3.900	107.864	3.656
244.758	Bathy	104.595	3.500	107.878	3.283
244.858	Bathy	105.505	2.700	107.892	2.387
244.957	Bathy	106.167	2.000	107.906	1.739
245.057	Bathy	105.681	2.500	107.920	2.239
245.157	Bathy	105.948	2.200	107.933	1.985
245.243	Bathy	105.880	2.200	107.945	2.065
245.254	Bathy	105.900	2.100	107.947	2.047
245.343	Bathy	105.920	2.100	107.959	2.039
245.354	Bathy	105.930	2.100	107.961	2.031
245.444	Bathy	105.935	2.100	107.973	2.038

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
245.453	Bathy	106.040	2.000	107.975	1.935
245.581	Bathy	106.165	1.900	107.992	1.827
245.679	Bathy	106.416	1.700	108.006	1.59
245.779	Bathy	106.426	1.500	108.020	1.594
245.879	Bathy	106.452	1.600	108.034	1.582
245.978	Bathy	106.253	1.700	108.047	1.794
246.094	Bathy	106.558	1.400	108.063	1.505
246.184	Bathy	106.274	1.700	108.076	1.802
246.276	Bathy	106.429	1.600	108.089	1.66
246.375	Bathy	106.446	1.500	108.102	1.656
246.473	Bathy	106.445	1.500	108.116	1.671
246.570	Bathy	106.443	1.540	108.129	1.686
246.668	Bathy	106.483	1.470	108.143	1.66
246.766	Bathy	106.580	1.400	108.157	1.577
246.865	Bathy	106.782	1.200	108.170	1.388
246.965	Bathy	106.499	1.500	108.184	1.685
247.065	Bathy	106.987	1.000	108.198	1.211
247.165	Bathy	106.799	1.200	108.212	1.413
247.265	Bathy	106.641	1.300	108.226	1.585
247.365	Bathy	106.769	1.100	108.240	1.471
247.465	Bathy	106.633	1.200	108.254	1.621
247.564	Bathy	106.614	1.300	108.267	1.653
247.663	Bathy	106.490	1.400	108.281	1.791
247.762	Bathy	106.148	1.800	108.295	2.147
247.871	Bathy	105.957	2.000	108.310	2.353
247.971	Bathy	105.769	2.200	108.324	2.555
248.071	Bathy	105.881	2.100	108.338	2.457
248.171	Bathy	105.653	2.300	108.351	2.698
248.270	Bathy	105.411	2.500	108.365	2.954
248.370	Bathy	105.523	2.400	108.379	2.856
248.470	Bathy	105.668	2.300	108.393	2.725
248.570	Bathy	106.007	2.000	108.407	2.4
248.670	Bathy	105.777	2.200	108.421	2.644
248.769	Bathy	105.810	2.150	108.434	2.624
248.869	Bathy	105.713	2.300	108.448	2.735
248.968	Bathy	105.847	2.100	108.462	2.615
249.067	Bathy	106.126	1.900	108.476	2.35
249.166	Bathy	106.252	1.800	108.489	2.237
249.265	Bathy	106.300	1.800	108.503	2.203

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
249.276	Bathy	106.358	1.700	108.505	2.147
249.363	Bathy	106.300	1.700	108.517	2.217
249.376	Bathy	106.279	1.750	108.519	2.24
249.463	Bathy	106.320	1.700	108.531	2.211
249.476	Bathy	106.291	1.800	108.533	2.242
249.563	Bathy	106.180	1.700	108.545	2.365
249.577	Bathy	106.086	1.900	108.547	2.461
249.663	Bathy	106.000	1.900	108.558	2.558
249.678	Bathy	105.930	2.000	108.561	2.631
249.762	Bathy	105.510	1.900	108.572	3.062
249.778	Bathy	106.115	1.800	108.574	2.459
249.861	Bathy	106.200	1.750	108.586	2.386
249.878	Bathy	106.303	1.700	108.588	2.285
249.961	Bathy	106.350	1.500	108.600	2.25
249.978	Bathy	106.489	1.400	108.602	2.113
250.060	Bathy	106.520	1.300	108.613	2.093
250.078	Bathy	106.674	1.200	108.616	1.942
250.160	Bathy	106.730	1.100	108.627	1.897
250.178	Bathy	106.931	1.000	108.630	1.699
250.259	Bathy	106.590	1.200	108.641	2.051
250.278	Bathy	106.475	1.400	108.644	2.169
250.358	Bathy	106.320	1.400	108.655	2.335
250.379	Bathy	106.237	1.600	108.658	2.421
250.458	Bathy	106.200	1.700	108.669	2.469
250.479	Bathy	106.158	1.800	108.672	2.514
250.558	Bathy	105.990	2.000	108.683	2.693
250.580	Bathy	105.590	2.200	108.686	3.096
250.658	Bathy	105.500	2.200	108.696	3.196
250.680	Bathy	105.438	2.400	108.699	3.261
250.756	Bathy	105.520	2.200	108.710	3.19
250.778	Bathy	105.565	2.300	108.713	3.148
250.856	Bathy	105.310	2.500	108.724	3.414
250.879	Bathy	105.031	2.900	108.727	3.696
250.940	Bathy	104.960	3.300	108.736	3.776
250.959	Bathy	104.530	3.500	108.738	4.208
251.019	Bathy	104.530	3.300	108.747	4.217
251.038	Bathy	104.559	3.300	108.749	4.19
251.108	Bathy	104.940	3.000	108.759	3.819
251.131	Bathy	105.080	2.900	108.762	3.682

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
251.206	Bathy	105.200	2.800	108.772	3.572
251.230	Bathy	105.299	2.600	108.776	3.477
251.304	Bathy	105.440	2.500	108.786	3.346
251.329	Bathy	105.535	2.400	108.789	3.254
251.404	Bathy	105.620	2.300	108.800	3.18
251.430	Bathy	105.750	2.200	108.803	3.053
251.504	Bathy	106.030	2.000	108.814	2.784
251.530	Bathy	106.390	1.500	108.817	2.427
251.603	Bathy	106.430	1.400	108.827	2.397
251.628	Bathy	106.550	1.300	108.831	2.281
251.702	Bathy	106.630	1.200	108.841	2.211
251.728	Bathy	106.763	1.100	108.845	2.082
251.801	Bathy	106.750	1.200	108.855	2.105
251.828	Bathy	106.736	1.200	108.859	2.123
251.901	Bathy	106.610	1.200	108.869	2.259
251.928	Bathy	106.525	1.300	108.873	2.348
252.000	Bathy	106.870	1.000	108.882	2.012
252.026	Bathy	107.098	0.700	108.886	1.788
252.090	Topo	107.260	0.500	108.895	1.635
252.114	Topo	107.429	0.400	108.898	1.469
252.183	Topo	107.000	0.300	108.908	1.908
252.211	Topo	107.555	0.300	108.912	1.357
252.339	Topo	107.500	0.500	108.930	1.43
252.362	Topo	107.437	0.500	108.933	1.496
252.395	Topo	104.400	0.300	108.937	4.537
252.411	Topo	107.481	0.200	108.940	1.459
252.477	Topo	107.410	0.200	108.949	1.539
252.576	Topo	107.560	0.200	108.963	1.403
252.676	Topo	107.820	0.200	108.976	1.156
252.771	Topo	107.971	0.200	108.989	1.018
252.776	Topo	107.900	0.200	108.990	1.09
252.876	Topo	107.840	0.200	109.004	1.164
252.976	Topo	107.830	0.200	109.018	1.188
253.076	Topo	107.730	0.300	109.032	1.302
253.197	Topo	107.900	0.300	109.049	1.149
253.275	Topo	107.971	0.300	109.059	1.088
253.290	Topo	107.880	0.300	109.061	1.181
253.386	Topo	107.920	0.300	109.075	1.155
253.482	Topo	108.020	0.200	109.088	1.068

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
253.578	Topo	108.000	0.200	109.101	1.101
253.614	Topo	107.971	0.200	109.106	1.135
253.676	Topo	107.900	0.200	109.115	1.215
253.775	Topo	108.030	0.200	109.129	1.099
253.874	Topo	108.110	0.200	109.142	1.032
253.896	Topo	107.971	0.200	109.146	1.175
253.972	Topo	107.940	0.200	109.156	1.216
254.071	Topo	107.930	0.100	109.170	1.24
254.152	Topo	107.971	0.100	109.181	1.21
254.165	Topo	107.980	0.100	109.183	1.203
254.244	Topo	107.990	0.100	109.194	1.204
254.295	Topo	107.971	0.100	109.201	1.23
254.328	Topo	108.020	0.100	109.205	1.185
254.421	Topo	108.120	0.200	109.218	1.098
254.515	Topo	108.160	0.200	109.231	1.071
254.566	Topo	108.167	0.300	109.238	1.071
254.616	Topo	108.110	0.300	109.245	1.135
254.716	Topo	108.050	0.200	109.259	1.209
254.816	Topo	108.140	0.200	109.273	1.133
254.890	Topo	108.167	0.100	109.283	1.116
254.915	Topo	108.240	0.100	109.287	1.047
255.015	Topo	108.210		109.301	1.091
255.115	Topo	108.230		109.315	1.085
255.136	Topo	108.167		109.317	1.15
255.215	Topo	108.210		109.328	1.118
255.314	Topo	108.130		109.342	1.212
255.414	Topo	108.040		109.356	1.316
255.514	Topo	108.020		109.370	1.35
255.544	Topo	108.167		109.374	1.207
255.613	Topo	107.990		109.384	1.394
255.713	Topo	107.970		109.397	1.427
255.812	Topo	107.820		109.411	1.591
255.876	Topo	108.167	0.200	109.420	1.253
255.911	Topo	108.860	0.100	109.425	0.565
255.972	Topo	109.204	0.100	109.433	0.229
256.011	Topo	109.250	0.100	109.439	0.189
256.015	Topo	109.294	0.100	109.439	0.145
256.048	Topo	109.230		109.444	0.214
256.064	Topo	109.294	1.500	109.446	0.152

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
256.080	Topo	109.300		109.448	0.148
256.087	Topo	112.460		109.449	0
256.171	Bathy	113.199	7.870	114.445	1.246
256.268	Bathy	112.230	8.110	114.455	2.225
256.354	Bathy	111.460	7.500	114.463	3.003
256.371	Bathy	109.946	7.470	114.465	4.519
256.455	Bathy	111.291	6.210	114.473	3.182
256.535	Bathy	111.660	6.100	114.481	2.821
256.557	Bathy	111.729	6.110	114.483	2.754
256.657	Bathy	111.801	6.110	114.493	2.692
256.732	Bathy	112.160	6.120	114.500	2.34
256.756	Bathy	112.062	6.010	114.502	2.44
256.853	Bathy	111.373	6.630	114.512	3.139
256.948	Bathy	111.444	6.550	114.521	3.077
257.049	Bathy	111.090	6.980	114.531	3.441
257.149	Bathy	111.221	6.800	114.541	3.32
257.250	Bathy	111.008	6.980	114.551	3.543
257.351	Bathy	110.620	7.340	114.561	3.941
257.448	Bathy	110.269	7.690	114.571	4.302
257.549	Bathy	110.059	7.880	114.581	4.522
257.652	Bathy	109.917	8.140	114.591	4.674
257.753	Bathy	109.761	8.130	114.601	4.84
257.854	Bathy	109.111	8.650	114.611	5.5
257.956	Bathy	109.143	8.490	114.620	5.477
258.058	Bathy	109.685	7.870	114.630	4.945
258.159	Bathy	110.191	7.260	114.641	4.45
258.261	Bathy	110.526	6.850	114.651	4.125
258.319	Bathy	110.760	6.650	114.656	3.896
258.362	Bathy	110.524	6.750	114.660	4.136
258.464	Bathy	110.459	6.800	114.670	4.211
258.566	Bathy	110.771	6.420	114.680	3.909
258.666	Bathy	112.325	4.770	114.690	2.365
258.766	Bathy	113.270	3.810	114.700	1.43
258.868	Bathy	113.396	3.520	114.710	1.314
258.968	Bathy	113.062	3.880	114.720	1.658
259.068	Bathy	111.720	5.120	114.730	3.01
259.167	Bathy	111.314	5.540	114.740	3.426
259.272	Bathy	109.856	6.820	114.750	4.894
259.372	Bathy	108.303	8.320	114.760	6.457

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
259.471	Bathy	107.779	8.730	114.769	6.99
259.573	Bathy	107.977	8.490	114.779	6.802
259.674	Bathy	109.257	7.200	114.789	5.532
259.774	Bathy	111.450	4.980	114.799	3.349
259.875	Bathy	113.280	3.100	114.809	1.529
259.975	Bathy	113.838	2.510	114.819	0.981
260.071	Bathy	113.663	2.690	114.828	1.165
260.160	Bathy	113.157	3.090	114.837	1.68
260.343	Bathy	112.954	3.300	114.855	1.901
260.443	Bathy	112.456	3.750	114.865	2.409
260.545	Bathy	111.808	4.460	114.875	3.067
260.643	Bathy	111.890	4.330	114.885	2.995
260.735	Bathy	112.606	3.600	114.894	2.288
260.807	Bathy	113.314	2.870	114.901	1.587
260.868	Bathy	113.570	2.640	114.907	1.337
260.947	Bathy	113.214	3.030	114.915	1.701
261.113	Bathy	112.136	4.020	114.931	2.795
261.209	Bathy	112.075	4.220	114.940	2.865
261.310	Bathy	111.922	4.290	114.950	3.028
261.410	Bathy	111.281	4.870	114.960	3.679
261.511	Bathy	110.769	5.510	114.970	4.201
261.619	Bathy	110.632	5.560	114.981	4.349
261.642	Bathy	110.630	5.550	114.983	4.353
261.732	Bathy	110.605	5.590	114.992	4.387
261.831	Bathy	110.532	5.690	115.002	4.47
261.931	Bathy	110.690	5.500	115.011	4.321
262.031	Bathy	110.531	5.640	115.021	4.49
262.131	Bathy	111.006	5.240	115.031	4.025
262.231	Bathy	110.992	5.170	115.041	4.049
262.331	Bathy	111.187	5.040	115.051	3.864
262.431	Bathy	111.526	4.690	115.060	3.534
262.532	Bathy	111.806	4.470	115.070	3.264
262.632	Bathy	112.112	4.090	115.080	2.968
262.732	Bathy	112.091	4.100	115.090	2.999
262.832	Bathy	112.029	4.140	115.100	3.071
262.932	Bathy	113.148	2.990	115.110	1.962
263.032	Bathy	113.460	2.800	115.120	1.66
263.132	Bathy	113.310	2.850	115.129	1.819
263.232	Bathy	113.610	2.560	115.139	1.529

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
263.332	Bathy	113.600	2.400	115.149	1.549
263.443	Bathy	113.839	2.330	115.160	1.321
263.538	Bathy	114.149	2.020	115.169	1.02
263.672	Bathy	113.744	2.450	115.182	1.438
263.763	Bathy	113.121	3.040	115.191	2.07
263.863	Bathy	113.260	2.900	115.201	1.941
263.963	Bathy	112.824	3.320	115.211	2.387
264.064	Bathy	112.407	3.720	115.221	2.814
264.162	Bathy	111.997	4.140	115.231	3.234
264.264	Bathy	111.792	4.320	115.241	3.449
264.365	Bathy	113.093	3.040	115.251	2.158
264.466	Bathy	112.761	3.360	115.260	2.499
264.574	Bathy	112.594	3.540	115.271	2.677
264.674	Bathy	113.121	3.020	115.281	2.16
264.775	Bathy	112.912	3.260	115.291	2.379
264.876	Bathy	114.032	2.090	115.301	1.269
264.978	Bathy	114.602	1.510	115.311	0.709
265.076	Bathy	114.820	1.280	115.321	0.501
265.177	Bathy	114.953	1.180	115.330	0.377
265.277	Bathy	114.813	1.280	115.340	0.527
265.378	Bathy	114.612	1.500	115.350	0.738
265.479	Bathy	114.009	2.090	115.360	1.351
265.578	Bathy	113.414	2.660	115.370	1.956
265.676	Bathy	113.349	2.750	115.379	2.03
265.775	Bathy	113.365	2.750	115.389	2.024
265.876	Bathy	112.653	3.430	115.399	2.746
265.988	Bathy	112.718	3.440	115.410	2.692
266.087	Bathy	113.499	2.620	115.420	1.921
266.186	Bathy	113.103	3.050	115.430	2.327
266.287	Bathy	113.211	2.890	115.440	2.229
266.387	Bathy	113.147	2.980	115.449	2.302
266.487	Bathy	112.946	3.200	115.459	2.513
266.589	Bathy	112.640	3.520	115.469	2.829
266.690	Bathy	112.661	3.520	115.479	2.818
266.792	Bathy	112.400	3.740	115.489	3.089
266.892	Bathy	111.918	4.230	115.499	3.581
266.993	Bathy	111.998	4.110	115.509	3.511
267.092	Bathy	111.919	4.180	115.519	3.6
267.193	Bathy	111.683	4.430	115.529	3.846

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
267.294	Bathy	111.780	4.330	115.539	3.759
267.392	Bathy	111.767	4.360	115.548	3.781
267.493	Bathy	112.170	3.980	115.558	3.388
267.591	Bathy	111.636	4.490	115.568	3.932
267.705	Bathy	111.793	4.260	115.579	3.786
267.805	Bathy	112.704	3.380	115.589	2.885
267.906	Bathy	113.975	2.170	115.599	1.624
268.008	Bathy	113.692	2.380	115.609	1.917
268.107	Bathy	113.905	2.170	115.618	1.713
268.207	Bathy	113.472	2.610	115.628	2.156
268.307	Bathy	113.267	2.830	115.638	2.371
268.407	Bathy	113.305	2.830	115.648	2.343
268.486	Bathy	113.060	3.070	115.656	2.596
268.570	Bathy	113.303	2.810	115.664	2.361
268.655	Bathy	114.126	1.990	115.672	1.546
268.753	Bathy	114.671	1.440	115.682	1.011
268.839	Bathy	114.603	1.500	115.690	1.087
268.941	Bathy	114.426	1.600	115.698	1.272
269.012	Bathy	114.317	1.700	115.708	1.391
269.111	Bathy	114.273	1.850	115.717	1.444
269.234	Bathy	114.104	2.020	115.729	1.625
269.333	Bathy	113.819	2.290	115.739	1.92
269.429	Bathy	113.521	2.580	115.748	2.227
269.527	Bathy	114.080	2.050	115.758	1.678
269.624	Bathy	114.142	1.940	115.768	1.626
269.724	Bathy	114.237	1.900	115.777	1.54
269.823	Bathy	114.114	2.000	115.787	1.673
269.923	Bathy	114.101	2.000	115.797	1.696
270.023	Bathy	114.408	1.690	115.807	1.399
270.123	Bathy	114.371	1.740	115.817	1.446
270.222	Bathy	114.406	1.700	115.826	1.42
270.322	Bathy	114.202	1.880	115.836	1.634
270.422	Bathy	113.974	2.110	115.846	1.872
270.522	Bathy	114.094	2.060	115.856	1.762
270.621	Bathy	114.095	2.020	115.866	1.771
270.721	Bathy	113.592	2.530	115.875	2.283
270.820	Bathy	113.687	2.400	115.885	2.198
270.920	Bathy	113.830	2.320	115.895	2.065
271.019	Bathy	113.656	2.480	115.905	2.249

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
271.128	Bathy	113.960	2.160	115.915	1.955
271.228	Bathy	113.960	2.170	115.925	1.965
271.326	Bathy	114.278	1.890	115.935	1.657
271.421	Bathy	114.563	1.610	115.944	1.381
271.512	Bathy	114.560	1.620	115.953	1.393
271.519	Bathy	114.420	1.740	115.954	1.534
271.608	Bathy	114.810	1.850	115.963	1.153
271.613	Bathy	114.999	1.200	115.963	0.964
271.715	Bathy	115.015	1.100	115.974	0.959
271.813	Bathy	115.214	0.950	115.983	0.769
271.925	Bathy	115.267	0.850	115.992	0.725
272.005	Bathy	115.321	0.790	116.002	0.681
272.105	Bathy	115.529	0.590	116.011	0.482
272.201	Bathy	115.678	1.100	116.021	0.343
272.302	Bathy	114.822	1.340	116.031	1.209
272.391	Bathy	114.682	1.440	116.040	1.358
272.490	Bathy	115.512	0.620	116.049	0.537
272.584	Bathy	115.427	0.680	116.059	0.632
272.684	Bathy	115.017	1.100	116.068	1.051
272.783	Bathy	115.476	0.590	116.078	0.602
272.882	Bathy	114.526	1.600	116.088	1.562
272.981	Bathy	114.777	1.360	116.098	1.321
273.077	Bathy	114.363	1.800	116.107	1.744
273.174	Bathy	114.877	1.260	116.117	1.24
273.274	Bathy	114.467	1.660	116.126	1.659
273.286	Bathy	114.533	1.610	116.128	1.595
273.374	Bathy	114.515	1.630	116.136	1.621
273.473	Bathy	114.301	1.820	116.146	1.845
273.573	Bathy	114.785	1.340	116.156	1.371
273.672	Bathy	114.426	1.740	116.166	1.74
273.771	Bathy	114.416	1.710	116.175	1.759
273.867	Bathy	114.515	1.600	116.185	1.67
273.963	Bathy	114.291	1.900	116.194	1.903
274.062	Bathy	114.155	1.980	116.204	2.049
274.162	Bathy	113.640	2.470	116.214	2.574
274.260	Bathy	113.441	2.690	116.223	2.782
274.358	Bathy	113.476	2.640	116.233	2.757
274.458	Bathy	113.592	2.520	116.243	2.651
274.557	Bathy	112.741	3.360	116.253	3.512

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
274.632	Bathy	114.130	1.970	116.260	2.13
274.722	Bathy	113.099	2.970	116.269	3.17
274.819	Bathy	114.726	1.410	116.278	1.552
274.918	Bathy	114.052	2.040	116.288	2.236
275.017	Bathy	114.672	1.410	116.298	1.626
275.116	Bathy	114.460	1.500	116.308	1.848
275.215	Bathy	114.145	1.860	116.317	2.172
275.315	Bathy	113.677	2.390	116.327	2.65
275.414	Bathy	112.967	3.070	116.337	3.37
275.514	Bathy	112.866	3.210	116.347	3.481
275.614	Bathy	112.740	3.300	116.356	3.616
275.713	Bathy	112.756	3.300	116.366	3.61
275.810	Bathy	113.003	3.150	116.376	3.373
275.909	Bathy	112.697	3.380	116.385	3.688
276.009	Bathy	113.120	2.870	116.395	3.275
276.103	Bathy	114.155	1.870	116.405	2.25
276.202	Bathy	113.952	2.120	116.414	2.462
276.302	Bathy	113.740	2.200	116.424	2.684
276.401	Bathy	114.198	1.940	116.434	2.236
276.501	Bathy	113.656	2.330	116.444	2.788
276.599	Bathy	113.787	2.290	116.453	2.666
276.696	Bathy	113.325	2.750	116.463	3.138
276.793	Bathy	113.391	2.740	116.472	3.081
276.893	Bathy	112.550	3.480	116.482	3.932
276.989	Bathy	112.072	3.960	116.492	4.42
277.084	Bathy	111.897	4.060	116.501	4.604
277.182	Bathy	111.836	4.150	116.511	4.675
277.277	Bathy	112.549	3.490	116.520	3.971
277.361	Bathy	114.611	1.330	116.528	1.917
277.445	Bathy	113.617	2.400	116.537	2.92
277.536	Bathy	113.426	2.570	116.545	3.119
277.627	Bathy	112.907	3.080	116.554	3.647
277.720	Bathy	113.296	2.680	116.564	3.268
277.813	Bathy	112.960	3.100	116.573	3.613
277.909	Bathy	111.541	4.370	116.582	5.041
278.006	Bathy	112.696	3.330	116.592	3.896
278.117	Bathy	113.537	2.500	116.603	3.066
278.184	Bathy	114.018	2.010	116.609	2.591
278.284	Bathy	114.038	2.010	116.619	2.581

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
278.383	Bathy	113.244	2.770	116.629	3.385
278.483	Bathy	112.743	3.290	116.639	3.896
278.583	Bathy	111.713	4.280	116.648	4.935
278.679	Bathy	115.362	0.590	116.658	1.296
278.765	Bathy	115.449	0.540	116.666	1.217
278.854	Bathy	114.773	1.230	116.675	1.902
278.951	Bathy	114.471	1.480	116.685	2.214
279.049	Bathy	114.833	1.070	116.694	1.861
279.148	Bathy	114.506	1.450	116.704	2.198
279.247	Bathy	114.895	1.030	116.714	1.819
279.347	Bathy	113.966	1.960	116.723	2.757
279.447	Bathy	114.778	1.140	116.733	1.955
279.545	Bathy	114.613	1.330	116.743	2.13
279.635	Bathy	115.429	0.510	116.752	1.323
279.733	Bathy	115.238	0.710	116.761	1.523
279.830	Bathy	114.420	1.490	116.771	2.351
279.928	Bathy	114.594	1.320	116.781	2.187
280.010	Bathy	114.670	1.350	116.789	2.119
280.109	Bathy	117.040	1.200	116.808	0
280.209	Bathy	116.760	1.100	116.828	0.068
280.303	Bathy	116.360	0.500	116.847	0.487
280.397	Topo	116.560	0.300	116.866	0.306
280.480	Topo	116.752	0.100	116.883	0.131
280.570	Topo	116.760	0.100	116.901	0.141
280.670	Topo	116.610	0.100	116.921	0.311
280.770	Topo	116.590	0.100	116.941	0.351
280.870	Topo	116.810	0.100	116.961	0.151
280.991	Topo	116.707	0.100	116.985	0.278
281.070	Topo	116.520	0.100	117.001	0.481
281.169	Topo	116.610	0.100	117.021	0.411
281.269	Topo	116.410	0.200	117.040	0.63
281.370	Topo	116.760	0.200	117.061	0.301
281.470	Topo	116.810	0.200	117.081	0.271
281.570	Topo	116.720	0.200	117.101	0.381
281.653	Topo	116.705	0.200	117.117	0.412
281.670	Topo	116.610	0.200	117.121	0.511
281.770	Topo	116.410	0.200	117.141	0.731
281.870	Topo	116.210	0.200	117.161	0.951
281.970	Topo	116.410	0.200	117.181	0.771

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
282.070	Topo	116.310	0.200	117.201	0.891
282.170	Topo	116.610	0.200	117.221	0.611
282.270	Topo	116.410	0.200	117.241	0.831
282.370	Topo	116.410	0.200	117.261	0.851
282.447	Topo	116.705	0.200	117.276	0.571
282.465	Topo	116.410	0.200	117.280	0.87
282.543	Topo	116.610	0.200	117.295	0.685
282.622	Topo	116.810	0.200	117.311	0.501
282.721	Topo	116.720	0.200	117.331	0.611
282.831	Topo	116.660	0.100	117.352	0.692
282.939	Topo	116.610	0.100	117.374	0.764
283.032	Topo	116.810	0.100	117.393	0.583
283.125	Topo	116.410	0.100	117.412	1.002
283.137	Topo	116.705	0.100	117.414	0.709
283.199	Topo	116.220	0.100	117.426	1.206
283.299	Topo	116.610	0.100	117.446	0.836
283.398	Topo	116.610	0.100	117.466	0.856
283.498	Topo	116.510	0.200	117.486	0.976
283.597	Topo	116.560	0.200	117.506	0.946
283.632	Topo	116.579	0.200	117.513	0.934
283.697	Topo	116.460	0.200	117.526	1.066
283.786	Topo	116.563	0.200	117.544	0.981
283.796	Topo	116.610	0.200	117.546	0.936
283.868	Topo	116.410	0.100	117.560	1.15
283.967	Topo	116.310	0.200	117.580	1.27
284.067	Topo	116.320	0.200	117.600	1.28
284.167	Topo	116.560	0.000	117.620	1.06
284.267	Topo	116.580	0.000	117.640	1.06
284.314	Topo	116.652	0.000	117.649	0.997
284.367	Topo	116.080	0.000	117.660	1.58
284.466	Topo	116.280	0.000	117.680	1.4
284.566	Topo	116.280	0.100	117.700	1.42
284.619	Topo	116.077	0.100	117.710	1.633
284.681	Topo	116.410	0.100	117.723	1.313
284.779	Topo	116.610	0.100	117.742	1.132
284.815	Topo	116.892	0.000	117.750	0.858
284.878	Topo	116.890	0.000	117.762	0.872
284.965	Topo	116.892	0.000	117.780	0.888
284.978	Topo	116.910	0.000	117.782	0.872

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
285.076	Topo	116.920	0.000	117.802	0.882
285.173	Topo	116.930	0.000	117.821	0.891
285.209	Topo	116.892	0.000	117.828	0.936
285.315	Topo	117.160	0.000	117.850	0.69
285.411	Topo	117.960	0.000	117.869	0
285.452	Topo	119.147	0.000	117.877	0
285.509	Topo	119.160	0.000	117.888	0
285.608	Topo	119.150	0.000	117.908	0
285.707	Topo	119.320	0.000	117.928	0
285.806	Topo	119.160	0.000	117.948	0
285.900	Topo	119.147	0.000	117.967	0
285.993	Topo	119.160	0.000	117.985	0
286.139	Topo	119.160	0.000	118.014	0
286.239	Topo	119.150	0.000	118.034	0
286.351	Topo	119.147	0.000	118.057	0
286.436	Topo	119.160	0.100	118.074	0
286.533	Topo	119.160	0.100	118.093	0
286.630	Topo	119.140	0.300	118.113	0
286.672	Topo	119.147	0.500	118.121	0
286.728	Bathy	119.150	0.600	118.132	0
286.827	Bathy	119.160	0.800	118.152	0
286.894	Bathy	119.147	1.000	118.165	0
287.024	Bathy	119.160	0.800	118.192	0
287.123	Bathy	119.560	0.700	118.211	0
287.263	Bathy	119.147	0.200	118.239	0
287.320	Bathy	119.410	0.300	118.251	0
287.420	Bathy	119.510	0.500	118.271	0
287.520	Bathy	118.960	0.600	118.291	0
287.541	Bathy	116.441	0.600	118.295	1.854
287.618	Bathy	116.360	0.800	118.310	1.95
287.674	Bathy	116.441	1.000	118.321	1.88
287.716	Bathy	116.320	1.100	118.330	2.01
287.816	Bathy	116.300	1.100	118.350	2.05
287.848	Bathy	116.441	1.200	118.356	1.915
287.916	Bathy	116.560	1.500	118.370	1.81
288.023	Bathy	116.400	2.000	118.391	1.991
288.116	Bathy	116.380	2.000	118.410	2.03
288.217	Bathy	116.400	2.000	118.430	2.03
288.316	Bathy	116.410	1.200	118.450	2.04

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
288.411	Bathy	116.400	0.800	118.469	2.069
288.415	Bathy	116.410	0.600	118.470	2.06
288.513	Bathy	116.410	0.700	118.489	2.079
288.548	Bathy	116.400	0.500	118.496	2.096
288.605	Topo	116.390	0.200	118.508	2.118
288.708	Topo	116.400		118.528	2.128
288.815	Topo	116.400		118.556	2.156
288.923	Topo	116.380		118.571	2.191
289.019	Topo	116.380		118.590	2.21
289.075	Topo	116.420		118.602	2.182
289.116	Topo	116.400		118.610	2.21
289.216	Topo	116.420		118.630	2.21
289.266	Topo	116.400		118.640	2.24
289.330	Topo	117.360		118.653	1.293
289.429	Topo	118.160		118.672	0.512
289.469	Topo	118.061	0.100	118.680	0.619
289.527	Topo	118.160	0.200	118.692	0.532
289.625	Topo	118.160	0.300	118.712	0.552
289.724	Topo	118.060	0.300	118.731	0.671
289.755	Topo	118.061	0.500	118.738	0.677
289.810	Topo	117.660	0.600	118.749	1.089
289.907	Topo	117.760	0.600	118.768	1.008
290.016	Topo	117.860	0.700	118.790	0.93
290.115	Topo	117.360	0.800	118.810	1.45
290.200	Topo	117.660	1.000	118.827	1.167
290.259	Topo	117.737	1.000	118.838	1.101
290.334	Topo	117.960	0.500	118.854	0.894
290.439	Topo	118.160	0.300	118.874	0.714
290.519	Topo	118.960	0.200	118.890	0
290.609	Topo	119.560	0.100	118.908	0
290.731	Topo	120.500	0.100	118.933	0
290.861	Topo	120.160	0.400	118.959	0
291.000	Topo	119.560	0.500	118.987	0
291.137	Topo	119.360	0.600	119.014	0
291.228	Topo	118.160	0.800	119.032	0.872
291.344	Topo	117.116	1.000	119.055	1.939
291.388	Topo	117.260	0.900	119.064	1.804
291.510	Topo	117.360	0.800	119.089	1.729
291.604	Topo	117.160	0.600	119.108	1.948

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
291.705	Topo	117.760	0.500	119.128	1.368
291.757	Topo	117.864	0.700	119.138	1.274
291.798	Topo	118.160	0.600	119.146	0.986
291.870	Topo	118.560	0.200	119.161	0.601
291.971	Topo	118.960		119.181	0.221
292.071	Topo	119.399		119.201	0
292.182	Topo	119.160		119.223	0.063
292.307	Topo	119.260		119.248	0
292.329	Topo	119.399		119.252	0
292.391	Topo	117.960	0.200	119.265	1.305
292.505	Topo	117.960	0.400	119.288	1.328
292.562	Topo	118.666	0.800	119.299	0.633
292.634	Topo	118.160	0.300	119.313	1.153
292.699	Topo	118.060	0.200	119.327	1.267
292.790	Topo	118.560	0.300	119.345	0.785
292.830	Topo	118.666	0.400	119.353	0.687
292.885	Topo	118.210	0.300	119.364	1.154
292.975	Topo	118.190	0.200	119.382	1.192
293.065	Topo	118.240	0.100	119.400	1.16
293.119	Topo	118.841		119.410	0.569
293.194	Topo	118.510		119.426	0.916
293.280	Topo	118.620		119.443	0.823
293.415	Topo	118.850		119.470	0.62
293.450	Topo	118.841		119.477	0.636
293.482	Topo	118.520		119.483	0.963
293.572	Topo	118.410		119.501	1.091
293.665	Topo	118.220	0.200	119.520	1.3
293.711	Topo	118.841	0.300	119.529	0.688
293.759	Topo	118.480	0.200	119.538	1.058
293.830	Topo	118.220	0.200	119.553	1.333
293.837	Topo	118.841	0.100	119.554	0.713
293.886	Topo	118.520		119.564	1.044
293.984	Topo	118.410		119.584	1.174
294.053	Topo	118.841		119.597	0.756
294.077	Topo	118.960		119.602	0.642
294.157	Topo	119.460		119.618	0.158
294.235	Topo	120.028	0.200	119.634	0
294.336	Topo	120.060		119.654	0
294.436	Topo	120.160		119.674	0

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
294.536	Topo	119.660		119.694	0.034
294.606	Topo	120.058		119.708	0
294.734	Topo	120.260		119.733	0
294.832	Topo	120.260		119.753	0
294.906	Topo	120.058		119.768	0
294.925	Topo	120.560		119.772	0
295.004	Topo	120.760		119.787	0
295.083	Topo	120.960		119.803	0
295.135	Bathy	121.456	6.980	122.543	1.087
295.166	Bathy	121.060	7.100	122.554	1.494
295.226	Bathy	120.793	7.330	122.575	1.782
295.260	Bathy	121.460	7.300	122.587	1.127
295.313	Bathy	122.130	7.320	122.605	0.475
295.347	Bathy	121.460	7.100	122.617	1.157
295.413	Bathy	120.916	7.170	122.641	1.725
295.447	Bathy	120.760	7.000	122.652	1.892
295.514	Bathy	121.136	7.040	122.676	1.54
295.546	Bathy	121.060	7.000	122.687	1.627
295.614	Bathy	121.210	7.030	122.711	1.501
295.646	Bathy	120.960	7.100	122.722	1.762
295.714	Bathy	120.923	7.400	122.746	1.823
295.746	Bathy	120.760	7.100	122.757	1.997
295.815	Bathy	121.291	7.030	122.781	1.49
295.846	Bathy	121.060	6.900	122.792	1.732
295.916	Bathy	121.483	6.890	122.816	1.333
295.946	Bathy	121.450	6.900	122.827	1.377
296.015	Bathy	121.458	6.960	122.851	1.393
296.045	Bathy	121.310	7.000	122.862	1.552
296.115	Bathy	121.309	7.090	122.886	1.577
296.144	Bathy	121.400	7.100	122.896	1.496
296.216	Bathy	121.397	7.010	122.921	1.524
296.244	Bathy	121.510	6.800	122.931	1.421
296.316	Bathy	121.948	6.430	122.956	1.008
296.344	Bathy	121.220	6.500	122.966	1.746
296.444	Bathy	121.774	6.560	123.001	1.227
296.544	Bathy	121.802	6.530	123.036	1.234
296.643	Bathy	121.890	6.510	123.071	1.181
296.743	Bathy	121.617	6.740	123.106	1.489
296.840	Bathy	121.389	6.980	123.140	1.751

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
296.937	Bathy	121.469	6.880	123.174	1.705
297.035	Bathy	120.915	7.430	123.208	2.293
297.135	Bathy	122.775	7.020	123.243	0.468
297.235	Bathy	122.120	6.790	123.278	1.158
297.334	Bathy	122.649	6.200	123.313	0.664
297.433	Bathy	122.902	6.030	123.348	0.446
297.532	Bathy	122.934	6.120	123.382	0.448
297.631	Bathy	122.853	6.050	123.417	0.564
297.730	Bathy	123.109	6.160	123.451	0.342
297.830	Bathy	123.018	5.800	123.486	0.468
297.930	Bathy	123.616	5.420	123.521	0
298.030	Bathy	123.838	5.050	123.556	0
298.130	Bathy	123.790	5.060	123.591	0
298.229	Bathy	123.350	4.890	123.626	0.276
298.327	Bathy	123.424	4.780	123.660	0.236
298.425	Bathy	123.590	4.730	123.695	0.105
298.522	Bathy	122.770	5.610	123.729	0.959
298.618	Bathy	122.432	5.890	123.762	1.33
298.716	Bathy	122.932	5.410	123.796	0.864
298.813	Bathy	122.935	5.460	123.830	0.895
298.911	Bathy	122.993	5.390	123.865	0.872
299.019	Bathy	122.973	5.310	123.902	0.929
299.114	Bathy	122.917	5.300	123.936	1.019
299.213	Bathy	123.254	4.940	123.970	0.716
299.312	Bathy	123.105	5.170	124.005	0.9
299.411	Bathy	123.201	5.100	124.040	0.839
299.511	Bathy	123.315	4.990	124.075	0.76
299.610	Bathy	123.384	4.950	124.109	0.725
299.709	Bathy	123.054	5.280	124.144	1.09
299.809	Bathy	122.568	5.340	124.179	1.611
299.909	Bathy	122.408	5.640	124.214	1.806
300.008	Bathy	122.175	5.730	124.249	2.074
300.108	Bathy	122.126	5.550	124.284	2.158
300.208	Bathy	122.173	5.690	124.319	2.146
300.308	Bathy	122.611	5.250	124.354	1.743
300.408	Bathy	122.506	5.470	124.389	1.883
300.507	Bathy	122.788	5.300	124.423	1.635
300.607	Bathy	123.118	5.060	124.458	1.34
300.705	Bathy	123.060	5.120	124.493	1.433

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
300.802	Bathy	123.243	5.080	124.526	1.283
300.901	Bathy	122.568	5.320	124.528	1.96
300.998	Bathy	123.127	4.880	124.577	1.45
301.094	Bathy	123.107	4.760	124.624	1.517
301.188	Bathy	123.260	4.750	124.672	1.412
301.189	Bathy	123.730	4.710	124.672	0.942
301.277	Bathy	123.560	4.690	124.716	1.156
301.364	Bathy	123.415	4.820	124.759	1.344
301.461	Bathy	123.610	4.500	124.808	1.198
301.473	Bathy	124.882	3.260	124.814	0
301.559	Bathy	124.460	3.600	124.857	0.397
301.567	Bathy	123.337	4.760	124.861	1.524
301.652	Bathy	123.460	4.600	124.904	1.444
301.657	Bathy	123.048	5.010	124.907	1.859
301.746	Bathy	122.934	5.130	124.951	2.017
301.843	Bathy	123.414	4.610	125.000	1.586
301.941	Bathy	123.745	4.280	125.049	1.304
302.039	Bathy	124.094	3.890	125.098	1.004
302.136	Bathy	124.191	3.790	125.147	0.956
302.234	Bathy	123.877	4.050	125.196	1.319
302.332	Bathy	123.838	4.130	125.245	1.407
302.431	Bathy	123.418	4.530	125.294	1.876
302.531	Bathy	123.546	4.440	125.344	1.798
302.631	Bathy	123.628	4.370	125.394	1.766
302.731	Bathy	123.601	4.340	125.444	1.843
302.830	Bathy	123.632	4.350	125.495	1.863
302.930	Bathy	123.878	4.040	125.545	1.667
303.030	Bathy	123.892	4.040	125.595	1.703
303.130	Bathy	123.747	4.220	125.645	1.898
303.230	Bathy	123.702	4.250	125.695	1.993
303.329	Bathy	123.708	4.220	125.745	2.037
303.429	Bathy	123.827	4.100	125.795	1.968
303.529	Bathy	124.456	3.470	125.844	1.388
303.628	Bathy	125.008	2.940	125.894	0.886
303.727	Bathy	124.848	3.120	125.944	1.096
303.826	Bathy	124.516	3.420	125.994	1.478
303.915	Bathy	124.500	3.400	126.038	1.538
303.999	Bathy	124.717	3.280	126.080	1.363
304.098	Bathy	125.342	2.640	126.130	0.788

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
304.198	Bathy	125.273	2.650	126.180	0.907
304.297	Bathy	125.435	2.550	126.230	0.795
304.397	Bathy	125.290	2.670	126.280	0.99
304.497	Bathy	125.263	2.750	126.330	1.067
304.596	Bathy	125.150	2.870	126.379	1.229
304.694	Bathy	124.672	3.360	126.428	1.756
304.792	Bathy	124.979	3.060	126.478	1.499
304.891	Bathy	125.294	2.740	126.527	1.233
304.991	Bathy	125.269	2.770	126.577	1.308
305.093	Bathy	125.102	2.930	126.628	1.526
305.192	Bathy	125.001	3.070	126.678	1.677
305.292	Bathy	125.113	2.930	126.728	1.615
305.392	Bathy	124.967	3.060	126.778	1.811
305.492	Bathy	124.912	3.140	126.828	1.916
305.592	Bathy	124.793	3.270	126.878	2.085
305.692	Bathy	125.102	3.010	126.928	1.826
305.791	Bathy	124.919	3.180	126.978	2.059
305.892	Bathy	125.194	2.910	127.029	1.835
305.992	Bathy	125.212	2.890	127.079	1.867
306.091	Bathy	125.845	2.330	127.129	1.284
306.190	Bathy	125.947	2.200	127.178	1.231
306.288	Bathy	125.949	2.200	127.227	1.278
306.387	Bathy	125.993	2.140	127.277	1.284
306.486	Bathy	126.082	2.100	127.326	1.244
306.584	Bathy	126.370	1.760	127.375	1.005
306.683	Bathy	126.206	1.910	127.425	1.219
306.783	Bathy	125.767	2.330	127.475	1.708
306.883	Bathy	125.560	2.570	127.525	1.965
307.011	Bathy	125.480	2.660	127.589	2.109
307.043	Bathy	125.382	2.750	127.606	2.224
307.109	Bathy	125.326	2.840	127.639	2.313
307.206	Bathy	125.245	2.880	127.687	2.442
307.304	Bathy	125.406	2.690	127.736	2.33
307.403	Bathy	125.796	2.410	127.786	1.99
307.503	Bathy	125.867	2.250	127.836	1.969
307.602	Bathy	125.523	2.580	127.886	2.363
307.702	Bathy	125.535	2.600	127.936	2.401
307.801	Bathy	125.433	2.650	127.986	2.553
307.901	Bathy	126.414	1.770	128.035	1.621

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
308.000	Bathy	126.495	1.580	128.085	1.59
308.099	Bathy	126.885	1.260	128.135	1.25
308.199	Bathy	126.710	1.390	128.185	1.475
308.292	Bathy	126.383	1.740	128.231	1.848
308.389	Bathy	126.410	2.000	128.280	1.87
308.487	Bathy	126.871	2.940	128.329	1.458
308.563	Bathy	126.360	2.300	128.367	2.007
308.584	Bathy	125.363	1.920	128.378	3.015
308.684	Bathy	125.416	2.050	128.428	3.012
308.763	Bathy	125.416	2.050	128.467	3.051
308.783	Bathy	125.416	2.050	128.478	3.062
308.883	Bathy	125.604	1.950	128.528	2.924
308.983	Bathy	125.377	2.320	128.577	3.2
309.082	Bathy	125.403	2.380	128.627	3.224
309.182	Bathy	125.501	2.370	128.677	3.176
309.282	Bathy	125.584	2.390	128.727	3.143
309.381	Bathy	125.674	2.300	128.777	3.103
309.481	Bathy	125.880	2.140	128.827	2.947
309.580	Bathy	126.194	1.900	128.877	2.683
309.679	Bathy	126.636	1.460	128.926	2.29
309.779	Bathy	126.679	1.560	128.976	2.297
309.878	Bathy	126.821	1.370	129.026	2.205
309.978	Bathy	126.475	1.680	129.076	2.601
310.078	Bathy	126.873	1.300	129.127	2.253
310.178	Bathy	125.645	2.520	129.176	3.531
310.276	Bathy	125.783	2.370	129.226	3.443
310.376	Bathy	125.476	2.620	129.276	3.8
310.476	Bathy	124.326	3.800	129.326	5
310.576	Bathy	123.545	4.540	129.376	5.831
310.671	Bathy	124.102	3.980	129.424	5.322
310.771	Bathy	124.792	3.280	129.474	4.682
310.870	Bathy	125.597	2.440	129.523	3.926
310.969	Bathy	125.155	2.870	129.573	4.418
311.069	Bathy	125.429	2.650	129.623	4.194
311.168	Bathy	125.370	2.680	129.673	4.303
311.235	Bathy	125.214	2.850	129.706	4.492
311.334	Bathy	125.257	2.840	129.756	4.499
311.433	Bathy	125.475	2.640	129.805	4.33
311.530	Bathy	126.309	1.800	129.854	3.545

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
311.627	Bathy	125.997	2.070	129.902	3.905
311.723	Bathy	125.765	2.270	129.951	4.186
311.820	Bathy	125.826	2.230	130.000	4.174
311.881	Bathy	126.861	1.240	130.030	3.169
311.971	Bathy	126.860	1.200	130.075	3.215
312.072	Bathy	127.160	1.100	130.126	2.966
312.148	Bathy	127.760	0.900	130.164	2.404
312.167	Bathy	128.341	0.700	130.173	1.832
312.185	Bathy	128.341	0.800	130.182	1.841
312.239	Bathy	128.160	0.800	130.209	2.049
312.327	Bathy	128.160	0.850	130.253	2.093
312.394	Bathy	128.460	0.900	130.287	1.827
312.492	Bathy	128.460	0.900	130.336	1.876
312.589	Bathy	128.560	0.950	130.385	1.825
312.687	Bathy	128.260	0.950	130.434	2.174
312.782	Bathy	128.360	1.000	130.481	2.121
312.854	Bathy	128.341	1.000	130.518	2.177
312.954	Bathy	128.260	1.100	130.568	2.308
313.048	Bathy	129.621	1.200	130.614	0.993
313.127	Bathy	129.440	1.000	130.654	1.214
313.173	Bathy	129.798	1.000	130.677	0.879
313.218	Bathy	129.890	1.000	130.700	0.81
313.306	Bathy	129.690	1.000	130.744	1.054
313.405	Bathy	129.690	1.100	130.794	1.104
313.505	Bathy	129.740	1.100	130.844	1.104
313.605	Bathy	129.740	1.150	130.894	1.154
313.705	Bathy	129.690	1.150	130.944	1.254
313.802	Bathy	129.740	1.180	130.992	1.252
313.896	Bathy	129.798	1.200	131.040	1.242
314.007	Bathy	129.890	1.200	131.095	1.205
314.106	Bathy	129.890	1.100	131.145	1.255
314.206	Bathy	129.690	1.100	131.195	1.505
314.305	Bathy	129.690	1.000	131.245	1.555
314.326	Bathy	129.798	1.000	131.255	1.457
314.404	Bathy	129.740	1.000	131.294	1.554
314.504	Bathy	129.640	0.900	131.344	1.704
314.638	Bathy	129.740	0.900	131.412	1.672
314.736	Bathy	129.690	0.800	131.461	1.771
314.834	Bathy	129.729	0.800	131.510	1.781

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
314.933	Bathy	129.740	0.700	131.559	1.819
315.032	Bathy	129.640	0.600	131.609	1.969
315.125	Bathy	129.729	0.500	131.656	1.927
315.244	Bathy	129.740	0.500	131.715	1.975
315.343	Bathy	129.690	0.500	131.765	2.075
315.442	Bathy	129.729	0.500	131.814	2.085
315.540	Bathy	129.800	0.500	131.864	2.064
315.638	Bathy	129.690	0.500	131.913	2.223
315.669	Bathy	129.603	0.500	131.928	2.325
315.735	Bathy	129.690	0.500	131.961	2.271
315.830	Bathy	129.240	0.500	132.009	2.769
315.926	Bathy	129.690	0.500	132.057	2.367
316.021	Bathy	129.900	0.500	132.105	2.205
316.150	Bathy	129.740	0.400	132.169	2.429
316.177	Bathy	129.603	0.400	132.183	2.58
316.249	Bathy	129.580	0.500	132.219	2.639
316.349	Bathy	129.640	1.000	132.269	2.629
316.467	Bathy	129.640	1.500	132.328	2.688
316.565	Bathy	129.580	1.600	132.377	2.797
316.640	Bathy	129.883	1.800	132.415	2.532
316.763	Bathy	130.740	1.800	132.477	1.737
316.863	Bathy	131.140	1.900	132.527	1.387
316.889	Bathy	133.223	2.000	132.540	0
316.963	Bathy	131.740	2.000	132.576	0.836
317.062	Bathy	130.440	2.000	132.626	2.186
317.175	Bathy	130.740	2.000	132.683	1.943
317.275	Bathy	129.740	2.000	132.733	2.993
317.374	Bathy	129.640	1.600	132.783	3.143
317.474	Bathy	129.840	1.200	132.832	2.992
317.573	Bathy	129.740	0.800	132.882	3.142
317.657	Bathy	129.595	0.500	132.924	3.329
317.673	Bathy	129.740	0.600	132.932	3.192
317.772	Bathy	130.140	0.900	132.982	2.842
317.852	Bathy	129.740	1.000	133.022	3.282
317.884	Bathy	129.816	1.200	133.038	3.222
317.951	Bathy	130.040	1.100	133.072	3.032
318.050	Bathy	129.740	0.800	133.121	3.381
318.115	Bathy	129.640	0.600	133.154	3.514
318.198	Bathy	129.640	0.500	133.195	3.555

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
318.304	Bathy	129.640	0.600	133.249	3.609
318.404	Bathy	129.740	0.800	133.299	3.559
318.504	Bathy	129.900	0.900	133.349	3.449
318.615	Topo	130.018	0.100	133.404	3.386
318.703	Topo	129.740	0.150	133.448	3.708
318.781	Topo	129.740	0.200	133.488	3.748
318.863	Topo	130.018	0.200	133.529	3.511
318.880	Topo	130.020	0.100	133.537	3.517
318.978	Topo	129.690	0.100	133.586	3.896
319.075	Topo	129.820	0.200	133.635	3.815
319.172	Topo	129.820	0.200	133.684	3.864
319.192	Topo	130.018	0.200	133.694	3.676
319.271	Topo	129.900	0.100	133.733	3.833
319.371	Topo	130.120	0.100	133.783	3.663
319.471	Topo	129.920	0.100	133.833	3.913
319.513	Topo	129.881	0.100	133.854	3.973
319.569	Topo	130.690	0.200	133.883	3.193
319.666	Topo	130.130	0.200	133.931	3.801
319.764	Topo	129.690	0.200	133.980	4.29
319.838	Topo	129.761	0.200	134.017	4.256
319.861	Topo	130.240	0.200	134.029	3.789
319.959	Topo	130.840	0.200	134.078	3.238
320.072	Topo	131.140	0.200	134.135	2.995
320.172	Topo	131.640	0.200	134.185	2.545
320.272	Topo	132.240	0.200	134.235	1.995
320.353	Topo	132.387	0.200	134.275	1.888
320.471	Topo	131.540	0.200	134.334	2.794
320.570	Topo	131.440	0.200	134.384	2.944
320.670	Topo	131.740	0.200	134.434	2.694
320.769	Topo	131.640	0.200	134.484	2.844
320.881	Topo	131.540	0.200	134.540	3
320.951	Topo	131.629	0.200	134.575	2.946
320.977	Topo	131.440	0.200	134.588	3.148
321.077	Topo	131.340	0.200	134.638	3.298
321.177	Topo	131.440	0.200	134.689	3.249
321.277	Topo	131.740	0.200	134.739	2.999
321.377	Topo	131.640	0.200	134.789	3.149
321.442	Topo	131.629	0.200	134.821	3.192
321.477	Topo	131.440	0.100	134.839	3.399

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
321.576	Topo	131.740	0.100	134.888	3.148
321.676	Topo	131.640	0.100	134.938	3.298
321.775	Topo	131.740	0.100	134.988	3.248
321.875	Topo	131.440	0.100	135.038	3.598
321.975	Topo	131.640	0.100	135.088	3.448
322.074	Topo	131.540		135.138	3.598
322.174	Topo	131.940		135.188	3.248
322.302	Topo	131.940		135.252	3.312
322.400	Topo	132.040		135.301	3.261
322.498	Topo	131.740		135.350	3.61
322.596	Topo	131.640		135.399	3.759
322.694	Topo	131.440		135.448	4.008
322.792	Topo	131.840		135.497	3.657
322.890	Topo	131.740		135.547	3.807
322.896	Topo	132.108		135.550	3.442
322.989	Topo	132.240		135.596	3.356
323.089	Topo	132.340		135.646	3.306
323.178	Topo	132.440		135.691	3.251
323.289	Topo	133.140		135.747	2.607
323.293	Topo	133.787		135.749	1.962
323.383	Topo	135.440		135.794	0.354
323.451	Bathy	136.348	1.500	139.828	3.48
323.477	Bathy	136.340	1.800	139.828	3.488
323.572	Bathy	135.440	2.200	139.830	4.39
323.613	Bathy	135.348	2.500	139.831	4.483
323.658	Bathy	135.040	2.800	139.832	4.792
323.756	Bathy	134.740	2.900	139.834	5.094
323.831	Bathy	134.848	3.000	139.836	4.988
323.855	Bathy	134.740	3.000	139.836	5.096
323.946	Bathy	134.732	3.000	139.838	5.106
324.054	Bathy	134.740	2.900	139.841	5.101
324.153	Bathy	134.840	2.800	139.843	5.003
324.253	Bathy	135.140	2.700	139.845	4.705
324.353	Bathy	135.140	2.600	139.847	4.707
324.453	Bathy	135.240	2.400	139.849	4.609
324.504	Bathy	135.431	2.200	139.850	4.419
324.550	Bathy	135.140	2.300	139.851	4.711
324.649	Bathy	135.040	2.500	139.853	4.813
324.748	Bathy	134.640	2.600	139.855	5.215

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
324.847	Bathy	134.540	2.800	139.858	5.318
324.881	Bathy	134.631	3.000	139.858	5.227
324.947	Bathy	134.840	2.900	139.860	5.02
325.047	Bathy	134.340	3.200	139.862	5.522
325.147	Bathy	134.140	3.600	139.864	5.724
325.194	Bathy	133.631	4.000	139.865	6.234
325.242	Bathy	134.740	3.500	139.866	5.126
325.340	Bathy	134.840	3.000	139.868	5.028
325.438	Bathy	136.840	2.500	139.870	3.03
325.515	Bathy	137.970	1.200	139.872	1.902
325.636	Bathy	137.840	1.100	139.874	2.034
325.735	Bathy	137.640	1.100	139.876	2.236
325.771	Bathy	137.970	1.200	139.877	1.907
325.828	Bathy	137.840	1.100	139.878	2.038
325.927	Bathy	138.140	1.000	139.881	1.741
326.026	Bathy	138.040	0.900	139.883	1.843
326.125	Bathy	137.440	0.800	139.885	2.445
326.224	Bathy	137.940	0.600	139.887	1.947
326.239	Bathy	137.970	0.500	139.887	1.917
326.334	Bathy	137.840	0.600	139.889	2.049
326.434	Bathy	137.840	0.600	139.891	2.051
326.534	Bathy	137.440	0.800	139.894	2.454
326.634	Bathy	137.540	0.900	139.896	2.356
326.736	Bathy	138.040	0.900	139.898	1.858
326.752	Bathy	138.123	1.000	139.898	1.775
326.828	Bathy	137.540	0.800	139.900	2.36
327.004	Bathy	137.640	0.700	139.904	2.264
327.157	Bathy	137.840	0.600	139.907	2.067
327.286	Topo	138.090	0.500	139.910	1.82
327.312	Topo	138.123	0.400	139.910	1.787
327.421	Topo	139.240	0.300	139.913	0.673
327.486	Topo	139.740	0.300	139.914	0.174
327.515	Topo	141.063	0.400	139.915	0
327.595	Topo	140.340	0.400	139.916	0
327.632	Topo	140.251	0.500	139.917	0
327.674	Topo	140.440	0.400	139.918	0
327.773	Topo	140.340	0.200	139.920	0
327.822	Topo	140.251	0.200	139.921	0
327.873	Bathy	139.930	0.800	139.922	0

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
327.971	Bathy	140.090	1.500	139.924	0
328.067	Bathy	139.690	2.100	139.926	0.236
328.163	Bathy	139.800	2.800	139.928	0.128
328.268	Bathy	139.800	3.500	139.931	0.131
328.288	Bathy	139.489	4.000	139.931	0.442
328.370	Bathy	139.440	4.000	139.933	0.493
328.465	Bathy	139.540	4.000	139.935	0.395
328.554	Bathy	139.640	4.000	139.937	0.297
328.597	Bathy	139.489	4.000	139.938	0.449
328.653	Bathy	139.440	3.900	139.939	0.499
328.752	Bathy	138.740	3.500	139.941	1.201
328.856	Bathy	138.740	3.400	139.943	1.203
328.945	Bathy	138.340	3.200	139.945	1.605
329.059	Bathy	138.140	2.800	139.947	1.807
329.147	Bathy	137.778	2.000	139.949	2.171
329.247	Bathy	137.440	2.300	139.952	2.512
329.340	Bathy	137.840	2.500	139.954	2.114
329.438	Bathy	138.040	2.600	139.956	1.916
329.536	Bathy	137.740	2.800	139.958	2.218
329.640	Bathy	137.778	3.000	139.960	2.182
329.728	Bathy	137.440	3.000	139.962	2.522
329.827	Bathy	137.840	3.000	139.964	2.124
329.927	Bathy	137.640	3.000	139.966	2.326
330.027	Bathy	137.840	3.000	139.968	2.128
330.108	Bathy	137.778	3.000	139.970	2.192
330.127	Bathy	137.540	2.900	139.970	2.43
330.226	Bathy	137.440	2.800	139.972	2.532
330.326	Bathy	137.540	2.700	139.975	2.435
330.425	Bathy	137.640	2.400	139.977	2.337
330.473	Bathy	137.778	2.000	139.978	2.2
330.562	Bathy	138.040	1.900	139.980	1.94
330.655	Bathy	138.140	1.900	139.982	1.842
330.759	Bathy	137.440	1.600	139.984	2.544
330.864	Bathy	138.440	1.500	139.986	1.546
330.923	Bathy	138.529	1.500	139.987	1.458
330.960	Bathy	138.540	1.400	139.988	1.448
331.059	Bathy	138.340	1.300	139.990	1.65
331.184	Bathy	138.440	1.200	139.993	1.553
331.283	Bathy	138.540	1.100	139.995	1.455

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
331.382	Bathy	138.340	1.000	139.997	1.657
331.413	Bathy	138.529	1.000	139.998	1.469
331.481	Bathy	138.740	1.000	139.999	1.259
331.581	Bathy	138.540	0.900	140.001	1.461
331.660	Bathy	138.640	0.800	140.003	1.363
331.671	Bathy	139.007	0.800	140.003	0.996
331.721	Bathy	138.529	1.000	140.004	1.475
331.726	Bathy	138.340	0.900	140.004	1.664
331.754	Bathy	138.240	0.800	140.005	1.765
331.782	Bathy	138.040	0.800	140.006	1.966
331.874	Bathy	137.540	0.600	140.008	2.468
331.905	Bathy	137.672	0.400	140.008	2.336
331.961	Bathy	137.540	0.500	140.010	2.47
332.051	Bathy	138.140	0.600	140.011	1.871
332.138	Bathy	138.240	0.600	140.013	1.773
332.220	Bathy	138.610	0.700	140.015	1.405
332.236	Bathy	138.740	0.750	140.015	1.275
332.334	Bathy	139.040	0.770	140.017	0.977
332.433	Bathy	138.640	0.780	140.020	1.38
332.531	Bathy	139.040	0.800	140.022	0.982
332.567	Bathy	139.115	0.800	140.022	0.907
332.630	Bathy	139.340	0.750	140.024	0.684
332.730	Bathy	139.440	0.710	140.026	0.586
332.829	Bathy	139.840	0.690	140.028	0.188
332.929	Bathy	139.740	0.650	140.030	0.29
332.970	Bathy	140.058	0.600	140.031	0
333.029	Bathy	139.440	0.550	140.032	0.592
333.129	Bathy	139.340	0.560	140.034	0.694
333.229	Bathy	139.040	0.520	140.037	0.997
333.343	Bathy	138.740	0.530	140.039	1.299
333.441	Bathy	138.440	0.510	140.041	1.601
333.520	Bathy	137.871	0.600	140.043	2.172
333.540	Bathy	137.640	0.610	140.043	2.403
333.639	Bathy	137.440	0.620	140.045	2.605
333.738	Bathy	138.040	0.680	140.047	2.007
333.837	Bathy	138.140	0.700	140.050	1.91
333.937	Bathy	138.240	0.720	140.052	1.812
333.985	Bathy	138.283	0.800	140.053	1.77
334.077	Bathy	138.340	0.750	140.055	1.715

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
334.170	Bathy	138.440	0.720	140.057	1.617
334.263	Topo	138.340	0.550	140.059	1.719
334.357	Topo	138.340	0.250	140.061	1.721
334.450	Topo	138.240	0.200	140.063	1.823
334.542	Topo	138.332	0.200	140.065	1.733
334.639	Topo	138.640	0.200	140.067	1.427
334.735	Topo	138.340	0.200	140.069	1.729
334.792	Topo	138.581	0.200	140.070	1.489
334.832	Topo	138.540	0.190	140.071	1.531
334.932	Topo	138.640	1.800	140.073	1.433
335.029	Topo	139.040	1.500	140.075	1.035
335.127	Topo	139.340	0.180	140.077	0.737
335.226	Topo	139.440	0.200	140.079	0.639
335.322	Topo	139.840	0.250	140.081	0.241
335.428	Topo	139.740	0.270	140.084	0.344
335.483	Topo	140.113	0.300	140.085	0
335.517	Topo	139.440	0.270	140.085	0.645
335.621	Topo	139.340	0.280	140.088	0.748
335.737	Topo	139.040	0.250	140.090	1.05
335.841	Topo	138.740	0.220	140.092	1.352
335.963	Topo	138.440	0.200	140.095	1.655
336.051	Topo	139.040	0.200	140.097	1.057
336.067	Topo	139.202	0.200	140.097	0.895
336.166	Topo	139.340	0.150	140.099	0.759
336.284	Topo	139.440	0.150	140.102	0.662
336.392	Topo	139.740	0.200	140.104	0.364
336.476	Topo	139.800	0.160	140.106	0.306
336.526	Topo	139.945	0.200	140.107	0.162
336.586	Topo	138.740	0.300	140.108	1.368
336.746	Topo	138.640	0.500	140.112	1.472
336.849	Bathy	138.040	0.600	140.114	2.074
336.927	Bathy	137.840	0.700	140.116	2.276
337.026	Bathy	137.340	0.800	140.118	2.778
337.125	Bathy	137.140	0.800	140.120	2.98
337.217	Bathy	136.924	0.800	140.122	3.198
337.323	Bathy	137.340	0.750	140.124	2.784
337.423	Bathy	137.740	0.780	140.126	2.386
337.522	Bathy	138.040	0.650	140.128	2.088
337.613	Bathy	138.340	0.640	140.130	1.79

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
337.711	Bathy	138.740	0.600	140.132	1.392
337.808	Bathy	139.440	0.650	140.134	0.694
337.866	Bathy	139.651	0.700	140.136	0.485
337.906	Bathy	139.640	0.650	140.137	0.497
338.006	Bathy	139.660	0.630	140.139	0.479
338.105	Bathy	139.470	0.620	140.141	0.671
338.298	Bathy	138.740	0.600	140.145	1.405
338.387	Bathy	138.340	0.550	140.147	1.807
338.487	Bathy	138.040	0.600	140.149	2.109
338.541	Bathy	137.379	0.600	140.150	2.771
338.573	Topo	138.340	0.400	140.151	1.811
338.673	Topo	138.740	0.200	140.153	1.413
338.773	Topo	139.640		140.155	0.515
338.873	Topo	140.140		140.157	0.017
338.973	Topo	140.240		140.159	0
339.033	Topo	140.900		140.161	0
339.073	Topo	140.690	0.200	140.161	0
339.261	Topo	140.800	0.150	140.165	0
339.407	Topo	140.470	0.160	140.169	0
339.470	Topo	140.690	0.100	140.170	0
339.630	Topo	140.923	0.120	140.173	0
339.653	Topo	140.440	0.150	140.174	0
339.690	Topo	140.485	0.190	140.175	0
339.734	Topo	140.130	0.200	140.176	0.046
339.848	Topo	140.090	0.200	140.178	0.088
339.963	Topo	139.800	0.200	140.181	0.381
340.050	Topo	139.600	0.160	140.182	0.582
340.083	Topo	138.875	0.200	140.183	1.308
340.175	Topo	137.840	0.170	140.185	2.345
340.321	Topo	137.640	0.200	140.188	2.548
340.428	Topo	137.440	0.160	140.190	2.75
340.481	Topo	137.640	0.150	140.192	2.552
340.575	Topo	137.840	0.120	140.194	2.354
340.643	Topo	138.065	0.200	140.195	2.13
340.768	Topo	137.840	0.150	140.198	2.358
340.865	Topo	137.440	0.100	140.200	2.76
340.961	Topo	137.840	0.200	140.202	2.362
341.001	Topo	137.825	0.200	140.203	2.378
341.058	Topo	137.640	0.200	140.204	2.564

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
341.156	Topo	137.540	0.150	140.206	2.666
341.254	Topo	137.440	0.160	140.208	2.768
341.354	Topo	137.540	0.100	140.210	2.67
341.412	Topo	137.855	0.100	140.211	2.356
341.453	Topo	137.540	0.130	140.212	2.672
341.551	Topo	137.640	0.100	140.214	2.574
341.650	Topo	137.840	0.180	140.217	2.377
341.788	Topo	138.040	0.200	140.219	2.179
341.872	Topo	138.115	0.200	140.221	2.106
341.972	Topo	137.940	0.160	140.223	2.283
341.999	Topo	138.115	0.200	140.224	2.109
342.068	Topo	137.840	0.150	140.225	2.385
342.084	Topo	137.945	0.100	140.226	2.281
342.163	Topo	137.440	1.200	140.228	2.788
342.262	Topo	137.840	0.100	140.230	2.39
342.361	Topo	137.440	0.180	140.232	2.792
342.459	Topo	137.540	0.100	140.234	2.694
342.484	Topo	138.015	0.100	140.234	2.219
342.559	Topo	137.840	0.150	140.236	2.396
342.659	Topo	137.540	0.120	140.238	2.698
342.762	Topo	138.035	0.200	140.240	2.205
342.857	Topo	137.840	0.200	140.242	2.402
342.905	Topo	138.015	0.200	140.243	2.228
342.966	Topo	138.095	0.100	140.245	2.15
343.052	Topo	137.840	0.100	140.247	2.407
343.144	Topo	138.305	0.100	140.248	1.943
343.145	Topo	138.440	0.100	140.248	1.808
343.157	Topo	138.115	0.100	140.249	2.134
343.170	Topo	137.940	0.100	140.249	2.309
343.184	Topo	137.940	0.100	140.249	2.309
343.209	Topo	137.840	0.100	140.250	2.41
343.296	Topo	137.640	0.100	140.252	2.612
343.398	Topo	137.540	0.100	140.254	2.714
343.502	Topo	137.440	0.100	140.256	2.816
343.579	Topo	137.540	0.100	140.258	2.718
343.668	Topo	138.085	0.100	140.260	2.175
343.779	Topo	137.890	0.100	140.262	2.372
343.865	Topo	138.085	0.100	140.264	2.179
343.888	Topo	137.840	0.120	140.264	2.424

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
343.988	Topo	138.040	0.100	140.266	2.226
344.087	Topo	138.240	0.100	140.269	2.029
344.175	Topo	138.255	0.130	140.271	2.016
344.187	Topo	138.440	0.100	140.271	1.831
344.287	Topo	138.540	0.100	140.273	1.733
344.387	Topo	138.440	0.120	140.275	1.835
344.487	Topo	138.340	0.100	140.277	1.937
344.587	Topo	138.740	0.100	140.279	1.539
344.664	Topo	138.535	0.100	140.281	1.746
344.685	Topo	138.740	0.100	140.281	1.541
344.785	Topo	138.640	0.100	140.284	1.644
344.885	Topo	138.740	0.100	140.286	1.546
344.977	Topo	139.055	0.100	140.288	1.233
344.985	Topo	139.140	0.100	140.288	1.148
345.083	Topo	139.340	0.100	140.290	0.95
345.145	Topo	139.705		140.291	0.586
345.189	Topo	139.740		140.292	0.552
345.238	Topo	139.405		140.293	0.888
345.279	Topo	139.360		140.294	0.934
345.367	Topo	139.040		140.296	1.256
345.408	Topo	138.915		140.297	1.382
345.460	Topo	139.040		140.298	1.258
345.557	Topo	139.140		140.300	1.16
345.637	Topo	139.345		140.302	0.957
345.666	Topo	138.740		140.302	1.562
345.761	Topo	138.540		140.304	1.764
345.855	Topo	138.040		140.306	2.266
345.946	Topo	137.745		140.308	2.563
345.950	Topo	137.840		140.308	2.468
346.047	Topo	137.840		140.310	2.47
346.165	Topo	137.640		140.313	2.673
346.264	Topo	137.440		140.315	2.875
346.362	Topo	137.540		140.317	2.777
346.439	Topo	137.795		140.319	2.524
346.461	Topo	138.440		140.319	1.879
346.561	Topo	138.640		140.321	1.681
346.661	Topo	139.240		140.324	1.084
346.687	Topo	139.775		140.324	0.549
346.760	Topo	139.440		140.326	0.886

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
346.859	Topo	139.490		140.328	0.838
346.963	Topo	139.690		140.330	0.64
346.991	Topo	139.805		140.331	0.526
347.060	Topo	140.440		140.332	0
347.163	Topo	140.740		140.334	0
347.258	Topo	141.240		140.336	0
347.328	Topo	141.740		140.338	0
347.343	Topo	141.725		140.338	0
347.446	Topo	141.840		140.340	0
347.546	Topo	142.040		140.343	0
347.637	Topo	142.340		140.344	0
347.772	Topo	142.745		140.347	0
347.785	Topo	142.140		140.348	0
347.918	Topo	141.740		140.350	0
348.008	Topo	141.840		140.352	0
348.109	Topo	141.440		140.355	0
348.209	Topo	141.840		140.357	0
348.241	Topo	142.015		140.357	0
348.305	Topo	141.740		140.359	0
348.403	Topo	141.840		140.361	0
348.504	Topo	141.845		140.363	0
348.598	Topo	141.440		140.365	0
348.701	Topo	141.540		140.367	0
348.814	Topo	141.865		140.370	0
348.901	Topo	141.440		140.371	0
349.001	Topo	141.840		140.374	0
349.100	Topo	141.285		140.376	0
349.201	Topo	141.140		140.378	0
349.301	Topo	140.840		140.380	0
349.401	Topo	140.240		140.382	0.142
349.427	Topo	140.325		140.383	0.058
349.500	Topo	139.740		140.384	0.644
349.600	Topo	139.840		140.386	0.546
349.632	Topo	139.995		140.387	0.392
349.700	Topo	139.840		140.389	0.549
349.799	Topo	139.440		140.391	0.951
349.804	Topo	140.095		140.391	0.296
349.899	Topo	140.140		140.393	0.253
349.992	Topo	140.655		140.395	0

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
349.999	Topo	140.840		140.395	0
350.102	Topo	140.935		140.397	0
350.207	Topo	141.140		140.399	0
350.242	Topo	141.240		140.400	0
350.296	Topo	141.740		140.401	0
350.416	Topo	141.840		140.404	0
350.513	Topo	141.640		140.406	0
350.604	Topo	141.540		140.408	0
350.636	Topo	141.955		140.409	0
350.704	Topo	142.040		140.410	0
350.783	Topo	142.115		140.412	0
350.804	Topo	141.840		140.412	0
350.903	Topo	141.840		140.414	0
351.002	Topo	141.640		140.416	0
351.030	Topo	141.885		140.417	0
351.110	Topo	142.040		140.436	0
351.210	Topo	142.040		140.460	0
351.310	Topo	141.840		140.484	0
351.410	Topo	142.040		140.508	0
351.525	Topo	140.285		140.536	0.251
351.610	Topo	140.340		140.556	0.216
351.710	Topo	140.440		140.580	0.14
351.810	Topo	140.740		140.604	0
351.910	Topo	140.640		140.628	0
352.010	Topo	140.840		140.652	0
352.110	Topo	140.840	0.200	140.676	0
352.210	Topo	140.940	0.200	140.700	0
352.309	Topo	140.740	0.300	140.724	0
352.378	Topo	141.203	0.400	140.740	0
352.409	Topo	141.340	0.300	140.748	0
352.509	Topo	141.440	0.350	140.772	0
352.609	Topo	141.540	0.350	140.796	0
352.709	Topo	141.490	0.380	140.820	0
352.808	Topo	141.590	0.370	140.844	0
352.908	Topo	141.690	0.400	140.868	0
353.008	Topo	141.790	0.400	140.892	0
353.108	Topo	141.890	0.400	140.916	0
353.208	Topo	141.690	0.400	140.940	0
353.305	Topo	141.440	0.400	140.963	0

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
353.333	Topo	141.723	0.400	140.970	0
353.405	Topo	141.440	0.450	140.987	0
353.505	Bathy	141.740	0.500	141.011	0
353.605	Bathy	141.840	0.560	141.035	0
353.710	Bathy	141.440	0.620	141.060	0
353.810	Bathy	141.840	0.820	141.084	0
353.909	Bathy	141.640	0.950	141.108	0
354.009	Bathy	141.740	1.050	141.132	0
354.108	Bathy	141.840	1.100	141.156	0
354.164	Bathy	141.481	1.200	141.169	0
354.206	Bathy	141.740	1.150	141.179	0
354.301	Bathy	141.340	1.150	141.202	0
354.426	Bathy	141.840	1.120	141.232	0
354.525	Bathy	141.540	1.100	141.256	0
354.625	Bathy	141.340	1.100	141.280	0
354.724	Bathy	141.540	1.150	141.304	0
354.774	Bathy	141.492	1.200	141.316	0
354.824	Bathy	141.340	1.150	141.328	0
354.924	Bathy	141.440	1.200	141.351	0
355.024	Bathy	141.540	1.100	141.375	0
355.135	Bathy	141.140	1.000	141.402	0.262
355.230	Bathy	141.140	0.800	141.425	0.285
355.326	Bathy	140.840	0.700	141.448	0.608
355.421	Bathy	140.740	0.600	141.471	0.731
355.491	Topo	140.944	0.400	141.488	0.544
355.518	Topo	140.740	0.350	141.494	0.754
355.618	Topo	140.840	0.350	141.518	0.678
355.717	Topo	140.440	0.400	141.542	1.102
355.817	Topo	140.540	0.400	141.566	1.026
355.917	Topo	140.840	0.420	141.590	0.75
356.036	Topo	140.640	0.400	141.618	0.978
356.122	Topo	140.580	0.400	141.639	1.059
356.122	Topo	140.440	0.350	141.639	1.199
356.221	Topo	140.540	0.320	141.663	1.123
356.320	Topo	140.840	0.300	141.687	0.847
356.419	Topo	140.740	0.350	141.710	0.97
356.519	Topo	140.740	0.400	141.734	0.994
356.618	Topo	141.040	0.400	141.758	0.718
356.730	Topo	140.640	0.400	141.785	1.145

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
356.797	Topo	140.947	0.400	141.801	0.854
356.829	Topo	140.640	0.360	141.809	1.169
356.929	Topo	140.440	0.350	141.833	1.393
357.029	Topo	140.740	0.340	141.857	1.117
357.142	Topo	140.840	0.380	141.884	1.044
357.239	Topo	140.440	0.400	141.907	1.467
357.335	Topo	140.640	0.400	141.930	1.29
357.431	Topo	140.840	0.400	141.953	1.113
357.498	Topo	140.470	0.400	141.969	1.499
357.528	Topo	140.690	0.350	141.976	1.286
357.645	Topo	140.840	0.350	142.005	1.165
357.725	Topo	140.640	0.400	142.024	1.384
357.856	Topo	140.440	0.400	142.055	1.615
357.945	Topo	140.540	0.400	142.077	1.537
358.038	Topo	140.640	0.400	142.099	1.459
358.135	Topo	140.740	0.300	142.122	1.382
358.185	Topo	141.203	0.300	142.134	0.931
358.232	Topo	140.690	0.400	142.145	1.455
358.328	Topo	140.840	0.500	142.169	1.329
358.424	Topo	140.640	0.600	142.192	1.552
358.540	Topo	140.740	0.600	142.219	1.479
358.639	Topo	140.440	0.700	142.243	1.803
358.739	Topo	140.540	0.700	142.267	1.727
358.834	Topo	140.995	0.700	142.290	1.295
358.939	Topo	140.840	0.700	142.315	1.475
359.039	Topo	140.740	0.600	142.339	1.599
359.139	Topo	141.140	0.600	142.363	1.223
359.239	Topo	140.740	0.500	142.387	1.647
359.386	Topo	141.200	0.500	142.422	1.222
359.451	Topo	141.199	0.600	142.438	1.239
359.476	Topo	141.240	0.600	142.444	1.204
359.576	Topo	141.340	0.500	142.468	1.128
359.675	Topo	141.740	0.500	142.492	0.752
359.774	Topo	141.540	0.400	142.516	0.976
359.874	Topo	141.740	0.300	142.540	0.8
359.973	Topo	141.640	0.300	142.563	0.923
360.073	Topo	141.740	0.200	142.587	0.847
360.102	Topo	141.741	0.200	142.594	0.853
360.172	Topo	142.040	0.300	142.611	0.571

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
360.270	Topo	142.340	0.400	142.635	0.295
360.369	Bathy	142.440	0.500	142.658	0.218
360.468	Bathy	142.540	0.800	142.682	0.142
360.566	Bathy	142.540	0.900	142.706	0.166
360.665	Bathy	142.580	0.900	142.729	0.149
360.771	Bathy	143.140	1.100	142.755	0
360.870	Bathy	143.440	1.200	142.779	0
360.911	Bathy	143.506	1.200	142.788	0
360.970	Bathy	143.140	1.200	142.803	0
361.070	Bathy	142.740	1.200	142.827	0.087
361.170	Bathy	142.440	1.200	142.851	0.411
361.245	Bathy	142.040	1.200	142.869	0.829
361.288	Bathy	142.024	1.200	142.879	0.855
361.331	Bathy	141.640	1.100	142.889	1.249
361.418	Bathy	141.540	1.000	142.910	1.37
361.509	Bathy	141.740	0.900	142.932	1.192
361.608	Bathy	141.740	0.800	142.956	1.216
361.707	Bathy	141.640	0.700	142.980	1.34
361.806	Bathy	141.640	0.700	143.003	1.363
361.906	Bathy	141.740	0.600	143.027	1.287
361.935	Bathy	142.133	0.600	143.034	0.901
362.065	Bathy	141.740	0.600	143.065	1.325
362.206	Bathy	141.840	0.700	143.099	1.259
362.368	Bathy	141.640	0.800	143.138	1.498
362.493	Bathy	141.640	0.700	143.168	1.528
362.554	Bathy	142.120	0.700	143.183	1.063
362.626	Bathy	141.740	0.600	143.200	1.46
362.776	Bathy	141.540	0.500	143.236	1.696
362.871	Bathy	141.590	0.500	143.255	1.665
362.942	Bathy	141.640	0.500	143.276	1.636
363.057	Bathy	141.740	0.400	143.304	1.564
363.131	Bathy	141.440	0.400	143.321	1.881
363.166	Bathy	142.088	0.400	143.330	1.242
363.220	Topo	142.340	0.200	143.343	1.003
363.318	Topo	142.640		143.366	0.726
363.417	Topo	143.040		143.390	0.35
363.491	Topo	143.508		143.408	0
363.517	Topo	143.140		143.414	0.274
363.617	Topo	143.140		143.438	0.298

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
363.718	Topo	141.740		143.462	1.722
363.809	Topo	141.191	0.100	143.484	2.293
363.916	Topo	141.340	0.100	143.510	2.17
364.015	Topo	141.440	0.200	143.533	2.093
364.114	Topo	141.740	0.200	143.557	1.817
364.213	Topo	141.740	0.300	143.581	1.841
364.322	Topo	141.640	0.300	143.607	1.967
364.419	Topo	141.540	0.300	143.630	2.09
364.539	Topo	142.340	0.400	143.659	1.319
364.582	Topo	142.959	0.400	143.670	0.711
364.656	Topo	142.440	0.400	143.687	1.247
364.764	Topo	142.540	0.300	143.713	1.173
364.861	Topo	142.540	0.300	143.736	1.196
364.955	Topo	142.640	0.200	143.759	1.119
365.065	Topo	142.540	0.200	143.785	1.245
365.169	Topo	143.440	0.200	143.810	0.37
365.264	Topo	144.540	0.200	143.833	0
365.334	Topo	145.061	0.200	143.850	0
365.360	Topo	144.540	0.200	143.856	0
365.457	Topo	144.840	0.200	143.880	0
365.559	Topo	144.640	0.200	143.904	0
365.659	Topo	144.840	0.200	143.928	0
365.758	Topo	145.340	0.100	143.952	0
365.858	Topo	145.640	0.100	143.976	0
365.903	Topo	145.749	0.100	143.986	0
365.958	Topo	145.640	0.100	144.000	0
366.059	Topo	145.440	0.200	144.024	0
366.159	Topo	145.340	0.200	144.048	0
366.259	Topo	145.740	0.200	144.072	0
366.359	Topo	145.840	0.200	144.096	0
366.459	Topo	145.740	0.200	144.120	0
366.557	Topo	145.540	0.200	144.143	0
366.598	Topo	145.545	0.200	144.153	0
366.662	Topo	145.340	0.100	144.169	0
366.749	Topo	145.740		144.190	0
366.856	Topo	145.840		144.215	0
366.945	Topo	145.440		144.237	0
367.054	Topo	145.340		144.263	0
367.178	Topo	145.140		144.292	0

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
367.286	Topo	144.540		144.318	0
367.381	Topo	144.840		144.341	0
367.387	Topo	144.432		144.343	0
367.480	Topo	144.840		144.365	0
367.578	Topo	144.540		144.389	0
367.680	Topo	144.640	0.100	144.413	0
367.758	Topo	144.358	0.200	144.432	0.074
367.780	Topo	144.340	0.200	144.437	0.097
367.879	Topo	144.140	0.200	144.461	0.321
367.983	Topo	143.740	0.300	144.486	0.746
368.072	Topo	143.840	0.300	144.507	0.667
368.177	Topo	143.840	0.300	144.532	0.692
368.297	Topo	143.140	0.300	144.561	1.421
368.332	Topo	143.038	0.300	144.569	1.531
368.379	Topo	142.540	0.300	144.581	2.041
368.480	Topo	142.840	0.300	144.605	1.765
368.589	Topo	142.540	0.300	144.631	2.091
368.708	Topo	142.340	0.200	144.660	2.32
368.808	Topo	143.340	0.200	144.684	1.344
368.911	Topo	143.440	0.200	144.708	1.268
369.013	Topo	143.540	0.200	144.733	1.193
369.114	Topo	143.540	0.200	144.757	1.217
369.215	Topo	143.640	0.200	144.781	1.141
369.240	Topo	144.029	0.200	144.788	0.759
369.319	Topo	144.240		144.806	0.566
369.411	Topo	144.840		144.828	0
369.517	Topo	144.540		144.854	0.314
369.600	Topo	144.840		144.874	0.034
369.698	Topo	144.640		144.897	0.257
369.785	Topo	145.282		144.918	0
369.818	Topo	145.740		144.926	0
369.912	Topo	145.840		144.949	0
370.037	Topo	146.440		144.979	0
370.110	Topo	146.340		144.996	0
370.167	Topo	146.840		145.010	0
370.185	Topo	147.212		145.014	0
370.219	Topo	146.740		145.022	0
370.300	Topo	146.340		145.042	0
370.396	Topo	146.140		145.065	0

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
370.492	Topo	145.740		145.088	0
370.603	Topo	144.840		145.115	0.275
370.707	Topo	144.640		145.139	0.499
370.797	Topo	144.140		145.161	1.021
370.862	Topo	144.140		145.177	1.037
370.887	Topo	144.340		145.183	0.843
370.995	Topo	144.540		145.209	0.669
371.093	Topo	144.540		145.232	0.692
371.199	Topo	144.840		145.257	0.417
371.301	Topo	144.840		145.282	0.442
371.389	Topo	144.140		145.303	1.163
371.509	Topo	144.640		145.332	0.692
371.608	Topo	144.840		145.356	0.516
371.707	Topo	144.640		145.380	0.74
371.739	Topo	144.488		145.387	0.899
371.807	Topo	144.340		145.404	1.064
371.908	Topo	144.540		145.428	0.888
372.008	Topo	144.840		145.452	0.612
372.106	Topo	144.740		145.475	0.735
372.206	Topo	144.640		145.499	0.859
372.306	Topo	144.840		145.523	0.683
372.406	Topo	144.640		145.547	0.907
372.506	Topo	144.340		145.571	1.231
372.605	Topo	144.399		145.595	1.196
372.706	Topo	144.340		145.619	1.279
372.805	Topo	144.540		145.643	1.103
372.905	Topo	145.340		145.667	0.327
373.005	Topo	145.840		145.691	0
373.105	Topo	145.340		145.715	0.375
373.205	Topo	145.640		145.739	0.099
373.306	Topo	145.640		145.763	0.123
373.422	Topo	145.340		145.791	0.451
373.429	Topo	145.330		145.793	0.463
373.505	Topo	145.840		145.811	0
373.621	Topo	145.440		145.839	0.399
373.689	Topo	145.740		145.855	0.115
373.786	Topo	146.440		145.879	0
373.886	Topo	146.840		145.902	0
373.997	Topo	146.540		145.929	0

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
374.126	Topo	147.240		145.960	0
374.143	Topo	147.490		145.964	0
374.247	Topo	147.340		145.989	0
374.338	Topo	147.440		146.011	0
374.429	Topo	147.140		146.033	0
374.520	Topo	146.440		146.055	0
374.626	Topo	145.840		146.080	0.24
374.709	Topo	144.400		146.100	1.7
374.724	Topo	144.840		146.104	1.264
374.823	Topo	144.740		146.127	1.387
374.922	Topo	145.240		146.151	0.911
375.020	Topo	145.340		146.175	0.835
375.118	Topo	145.977		146.198	0.221
375.218	Topo	145.840		146.222	0.382
375.330	Topo	145.640		146.249	0.609
375.430	Topo	145.240		146.273	1.033
375.529	Topo	145.440		146.297	0.857
375.629	Topo	145.440		146.321	0.881
375.680	Topo	145.251		146.333	1.082
375.729	Topo	145.140		146.345	1.205
375.828	Topo	144.840		146.369	1.529
375.927	Topo	144.640		146.392	1.752
376.027	Topo	144.540		146.416	1.876
376.126	Topo	144.840		146.440	1.6
376.225	Topo	144.740		146.464	1.724
376.343	Topo	144.840		146.492	1.652
376.429	Topo	144.940		146.513	1.573
376.500	Topo	145.184	0.400	146.530	1.346
376.519	Topo	144.540	0.400	146.534	1.994
376.627	Topo	144.840	0.400	146.560	1.72
376.761	Bathy	144.840	0.500	146.592	1.752
376.845	Bathy	144.740	0.600	146.613	1.873
376.969	Bathy	144.640	0.600	146.642	2.002
377.080	Bathy	144.840	0.600	146.669	1.829
377.174	Bathy	144.540	0.600	146.692	2.152
377.263	Bathy	144.640	0.600	146.713	2.073
377.298	Bathy	144.676	0.600	146.721	2.045
377.383	Bathy	144.540	0.600	146.742	2.202
377.482	Bathy	144.740	0.600	146.765	2.025

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
377.587	Bathy	144.740	0.600	146.791	2.051
377.685	Bathy	144.640	0.600	146.814	2.174
377.775	Bathy	144.850	0.600	146.835	1.985
377.861	Bathy	145.140	0.600	146.857	1.717
377.968	Bathy	144.840	0.600	146.882	2.042
378.042	Bathy	144.840	0.600	146.900	2.06
378.118	Bathy	144.740	0.600	146.918	2.178
378.187	Bathy	144.981	0.600	146.935	1.954
378.212	Bathy	144.840	0.600	146.941	2.101
378.304	Bathy	144.540	0.500	146.963	2.423
378.404	Bathy	144.640	0.400	146.987	2.347
378.532	Bathy	144.840	0.400	147.018	2.178
378.627	Bathy	144.740	0.500	147.040	2.3
378.725	Bathy	145.140	0.400	147.064	1.924
378.825	Topo	145.140	0.300	147.088	1.948
378.931	Topo	145.040	0.300	147.113	2.073
379.045	Topo	144.740	0.200	147.141	2.401
379.159	Topo	144.540	0.200	147.168	2.628
379.249	Topo	144.654	0.200	147.190	2.536
379.261	Topo	144.640	0.200	147.192	2.552
379.360	Topo	144.540	0.200	147.216	2.676
379.459	Topo	144.840	0.200	147.240	2.4
379.559	Topo	144.740	0.200	147.264	2.524
379.658	Topo	144.840	0.200	147.288	2.448
379.758	Topo	144.640	0.200	147.312	2.672
379.895	Topo	144.740	0.200	147.345	2.605
379.984	Topo	144.840	0.200	147.366	2.526
380.037	Topo	144.762	0.200	147.379	2.617
380.077	Topo	144.840	0.100	147.388	2.548
380.176	Topo	145.140		147.412	2.272
380.274	Topo	145.740		147.436	1.696
380.374	Topo	145.640		147.460	1.82
380.474	Topo	146.140		147.484	1.344
380.574	Topo	146.340		147.508	1.168
380.674	Topo	146.740		147.532	0.792
380.773	Topo	146.856		147.555	0.699
380.874	Topo	146.540		147.580	1.04
380.974	Topo	146.740		147.604	0.864
381.074	Topo	146.840		147.628	0.788

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
381.174	Topo	147.140		147.652	0.512
381.274	Topo	147.140		147.676	0.536
381.374	Topo	147.040		147.700	0.66
381.474	Topo	147.340		147.724	0.384
381.574	Topo	147.440		147.748	0.308
381.609	Topo	147.301		147.756	0.455
381.674	Topo	147.140		147.772	0.632
381.774	Topo	146.740		147.796	1.056
381.874	Topo	146.140	0.100	147.820	1.68
381.969	Topo	145.358	0.200	147.842	2.484
382.073	Topo	145.340	0.200	147.867	2.527
382.173	Topo	145.840	0.300	147.891	2.051
382.273	Topo	145.640	0.500	147.915	2.275
382.373	Topo	145.140	0.410	147.939	2.799
382.472	Topo	144.840	0.500	147.963	3.123
382.572	Topo	144.540	0.500	147.987	3.447
382.672	Topo	144.840	0.600	148.011	3.171
382.750	Topo	145.229	0.600	148.030	2.801
382.768	Topo	144.540	0.600	148.034	3.494
382.896	Topo	144.840	0.500	148.065	3.225
382.996	Topo	144.740	0.500	148.089	3.349
383.096	Topo	144.640	0.400	148.113	3.473
383.196	Topo	145.240	0.500	148.137	2.897
383.294	Topo	145.640	0.500	148.160	2.52
383.394	Topo	145.440	0.500	148.184	2.744
383.464	Topo	145.458	0.500	148.201	2.743
383.494	Topo	145.840	0.400	148.208	2.368
383.593	Topo	145.740	0.300	148.232	2.492
383.693	Topo	145.440	0.200	148.256	2.816
383.792	Topo	146.340		148.280	1.94
383.892	Topo	146.840		148.304	1.464
383.991	Topo	146.840		148.328	1.488
384.090	Topo	147.140		148.352	1.212
384.190	Topo	147.040		148.375	1.335
384.261	Topo	147.175		148.393	1.218
384.297	Topo	147.340		148.401	1.061
384.397	Topo	147.240		148.425	1.185
384.497	Topo	147.540		148.449	0.909
384.597	Topo	147.440		148.473	1.033

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
384.697	Topo	147.840		148.497	0.657
384.796	Topo	147.640		148.521	0.881
384.896	Topo	147.840		148.545	0.705
384.959	Topo	147.846		148.560	0.714
384.996	Topo	147.840		148.569	0.729
385.096	Topo	147.440		148.593	1.153
385.196	Topo	147.640		148.617	0.977
385.299	Topo	148.340		148.642	0.302
385.399	Topo	148.840		148.666	0
385.448	Topo	148.939		148.677	0
385.496	Topo	148.440		148.689	0.249
385.593	Topo	148.540		148.712	0.172
385.689	Topo	148.740		148.735	0
385.747	Topo	149.126		148.749	0
385.829	Topo	148.740		148.769	0.029
385.928	Topo	148.440		148.793	0.353
386.027	Topo	148.640		148.816	0.176
386.127	Topo	148.440		148.840	0.4
386.175	Topo	148.912		148.852	0
386.226	Topo	148.540		148.864	0.324
386.325	Topo	148.640		148.888	0.248
386.424	Topo	148.440		148.912	0.472
386.524	Topo	148.640	0.200	148.935	0.295
386.623	Topo	148.140	0.300	148.959	0.819
386.639	Topo	147.768	0.400	148.963	1.195
386.722	Topo	147.840	0.400	148.983	1.143
386.821	Topo	147.640	0.400	149.007	1.367
386.921	Topo	147.840	0.400	149.031	1.191
387.020	Topo	147.840	0.400	149.055	1.215
387.128	Topo	147.440	0.400	149.080	1.64
387.184	Topo	148.292	0.400	149.094	0.802
387.228	Topo	147.840	0.400	149.104	1.264
387.328	Topo	148.140	0.400	149.128	0.988
387.428	Topo	147.540	0.300	149.152	1.612
387.540	Topo	147.140	0.300	149.179	2.039
387.638	Topo	146.840	0.300	149.203	2.363
387.736	Topo	146.440	0.300	149.226	2.786
387.798	Topo	146.647	0.300	149.241	2.594
387.834	Topo	146.440	0.200	149.250	2.81

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
387.933	Topo	146.840	0.200	149.274	2.434
388.032	Topo	146.740		149.297	2.557
388.130	Topo	146.440		149.321	2.881
388.244	Topo	146.440		149.348	2.908
388.343	Topo	146.340		149.372	3.032
388.442	Topo	146.840		149.396	2.556
388.541	Topo	146.440		149.420	2.98
388.570	Topo	146.279		149.427	3.148
388.640	Topo	146.340		149.443	3.103
388.740	Topo	146.440		149.467	3.027
388.840	Topo	146.540		149.491	2.951
388.940	Topo	146.740		149.515	2.775
389.040	Topo	146.840		149.539	2.699
389.140	Topo	146.940		149.563	2.623
389.240	Topo	147.040		149.587	2.547
389.345	Topo	147.140		149.613	2.473
389.429	Topo	147.182		149.633	2.451
389.535	Topo	146.840		149.658	2.818
389.666	Topo	146.540		149.690	3.15
389.765	Topo	146.740		149.714	2.974
389.865	Topo	146.840		149.737	2.897
389.964	Topo	146.440	0.200	149.761	3.321
389.999	Topo	146.724	0.300	149.770	3.046
390.078	Topo	146.640	0.300	149.789	3.149
390.178	Topo	146.740	0.200	149.812	3.072
390.277	Topo	147.440	0.200	149.836	2.396
390.376	Topo	147.640	0.200	149.860	2.22
390.392	Topo	148.568	0.200	149.864	1.296
390.475	Topo	148.440		149.884	1.444
390.574	Topo	148.740		149.908	1.168
390.676	Topo	148.540		149.932	1.392
390.775	Topo	148.640		149.956	1.316
390.875	Topo	148.940		149.980	1.04
390.974	Topo	148.340		150.004	1.664
391.074	Topo	148.700		150.028	1.328
391.204	Topo	148.900		150.059	1.159
391.300	Topo	148.900		150.082	1.182
391.395	Topo	149.000		150.105	1.105
391.398	Topo	149.271		150.105	0.834

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
391.495	Topo	149.700		150.129	0.429
391.595	Topo	149.800		150.153	0.353
391.695	Topo	149.900		150.177	0.277
391.794	Topo	150.100		150.200	0.1
391.894	Topo	150.500		150.224	0
391.992	Topo	150.600		150.248	0
392.091	Topo	150.520		150.272	0
392.189	Topo	150.800		150.295	0
392.241	Topo	150.647		150.308	0
392.289	Topo	150.400		150.319	0
392.389	Topo	150.100		150.343	0.243
392.492	Topo	149.700		150.368	0.668
392.591	Topo	149.300		150.392	1.092
392.690	Topo	149.000		150.415	1.415
392.728	Topo	149.161		150.425	1.264
392.789	Topo	149.000		150.439	1.439
392.886	Topo	149.600		150.463	0.863
392.993	Topo	150.000		150.488	0.488
393.092	Topo	150.100		150.512	0.412
393.192	Topo	150.400		150.536	0.136
393.292	Topo	150.500		150.560	0.06
393.372	Topo	150.703		150.579	0
393.392	Topo	150.500		150.584	0.084
393.492	Topo	150.400		150.608	0.208
393.591	Topo	150.000		150.632	0.632
393.690	Topo	150.100		150.655	0.555
393.819	Topo	149.700		150.686	0.986
393.917	Topo	149.700		150.710	1.01
393.997	Topo	149.845		150.729	0.884
394.016	Topo	149.900		150.734	0.834
394.116	Topo	150.000		150.758	0.758
394.216	Topo	150.500		150.782	0.282
394.323	Topo	150.600		150.807	0.207
394.421	Topo	150.700		150.831	0.131
394.495	Topo	150.641		150.849	0.208
394.520	Topo	150.400		150.855	0.455
394.620	Topo	150.000		150.879	0.879
394.720	Topo	149.900		150.903	1.003
394.821	Topo	149.000		150.927	1.927

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
394.844	Topo	149.099	0.200	150.932	1.833
394.919	Topo	149.000	0.200	150.950	1.95
395.017	Topo	148.700	0.200	150.974	2.274
395.115	Topo	148.800	0.200	150.997	2.197
395.213	Topo	149.500	0.200	151.021	1.521
395.311	Topo	149.700	0.200	151.044	1.344
395.409	Topo	149.900	0.200	151.068	1.168
395.488	Topo	150.023	0.200	151.087	1.064
395.516	Topo	149.700	0.200	151.094	1.394
395.616	Topo	149.800	0.300	151.118	1.318
395.716	Bathy	149.600	0.500	151.142	1.542
395.816	Bathy	149.800	0.600	151.166	1.366
395.915	Bathy	149.800	0.800	151.190	1.39
396.015	Bathy	149.900	1.200	151.213	1.313
396.068	Bathy	150.060	1.600	151.226	1.166
396.106	Bathy	150.100	1.500	151.235	1.135
396.181	Bathy	150.000	1.800	151.253	1.253
396.280	Bathy	150.400	1.900	151.277	0.877
396.379	Bathy	151.000	1.900	151.301	0.301
396.418	Bathy	151.459	1.900	151.310	0
396.477	Bathy	151.000	1.900	151.324	0.324
396.574	Bathy	150.600	1.800	151.348	0.748
396.661	Bathy	150.000	1.800	151.368	1.368
396.681	Bathy	149.641	1.800	151.373	1.732
396.761	Bathy	149.600	1.700	151.392	1.792
396.860	Bathy	150.000	1.600	151.416	1.416
396.960	Bathy	149.800	1.400	151.440	1.64
397.082	Bathy	149.700	0.900	151.469	1.769
397.179	Bathy	149.600	0.800	151.493	1.893
397.266	Bathy	149.634	0.400	151.514	1.88
397.277	Bathy	149.900	0.350	151.516	1.616
397.372	Bathy	150.000	0.360	151.539	1.539
397.506	Bathy	150.100	0.400	151.571	1.471
397.605	Bathy	150.400	0.400	151.595	1.195
397.703	Bathy	150.300	0.400	151.619	1.319
397.802	Bathy	150.500	0.360	151.642	1.142
397.870	Bathy	150.741	0.400	151.659	0.918
397.902	Bathy	150.600	0.400	151.666	1.066
398.002	Bathy	150.400	0.500	151.690	1.29

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
398.102	Bathy	150.300	0.520	151.714	1.414
398.202	Bathy	150.000	0.600	151.738	1.738
398.302	Bathy	149.900	0.600	151.762	1.862
398.402	Bathy	149.700	0.600	151.786	2.086
398.456	Bathy	150.194	0.600	151.799	1.605
398.497	Bathy	150.400	0.600	151.809	1.409
398.597	Bathy	150.100	0.500	151.833	1.733
398.696	Bathy	150.500	0.500	151.857	1.357
398.796	Bathy	150.600	0.500	151.881	1.281
398.895	Bathy	150.700	0.500	151.905	1.205
398.975	Bathy	150.656	0.500	151.924	1.268
398.990	Bathy	150.400	0.500	151.927	1.527
399.090	Bathy	150.000	0.400	151.951	1.951
399.190	Bathy	149.900	0.400	151.975	2.075
399.290	Topo	150.100	0.300	151.999	1.899
399.390	Topo	150.400	0.300	152.023	1.623
399.495	Topo	150.100	0.300	152.049	1.949
399.594	Topo	149.700	0.300	152.073	2.373
399.694	Topo	149.900	0.200	152.096	2.196
399.794	Topo	150.100	0.200	152.120	2.02
399.871	Topo	150.121	0.200	152.139	2.018
399.894	Topo	149.600	0.200	152.144	2.544
399.993	Topo	149.900	0.300	152.168	2.268
400.093	Topo	149.800	0.300	152.192	2.392
400.192	Topo	149.800	0.300	152.216	2.416
400.292	Topo	149.900	0.400	152.240	2.34
400.388	Topo	149.600	0.500	152.263	2.663
400.475	Topo	149.570	0.600	152.284	2.714
400.486	Topo	149.700	0.600	152.286	2.586
400.585	Topo	149.800	0.500	152.310	2.51
400.685	Topo	149.900	0.400	152.334	2.434
400.784	Topo	150.000	0.400	152.358	2.358
400.883	Topo	150.100	0.300	152.382	2.282
400.962	Topo	149.900	0.200	152.401	2.501
401.057	Topo	150.500	0.200	152.424	1.924
401.101	Topo	150.800	0.200	152.434	1.634
401.152	Topo	151.000	0.300	152.446	1.446
401.248	Topo	151.100	0.300	152.469	1.369
401.344	Topo	151.400	0.300	152.492	1.092

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
401.440	Topo	151.500	0.400	152.515	1.015
401.540	Bathy	151.600	0.500	152.539	0.939
401.548	Bathy	151.865	0.500	152.541	0.676
401.639	Bathy	152.200	0.500	152.563	0.363
401.741	Bathy	152.100	0.500	152.588	0.488
401.824	Bathy	151.900	0.500	152.607	0.707
401.935	Bathy	151.700	0.500	152.634	0.934
402.027	Bathy	151.800	0.500	152.656	0.856
402.102	Bathy	152.100	0.600	152.674	0.574
402.220	Bathy	152.000	0.600	152.703	0.703
402.328	Bathy	152.000	0.600	152.729	0.729
402.406	Bathy	152.200	0.600	152.747	0.547
402.515	Bathy	152.100	0.600	152.773	0.673
402.626	Bathy	152.000	0.600	152.800	0.8
402.758	Bathy	152.100	0.600	152.832	0.732
402.861	Bathy	152.150	0.600	152.854	0.704
402.981	Bathy	152.200	0.600	152.885	0.685
403.085	Bathy	151.900	0.600	152.910	1.01
403.203	Bathy	151.700	0.600	152.939	1.239
403.282	Bathy	151.800	0.700	152.958	1.158
403.376	Bathy	151.900	0.700	152.980	1.08
403.422	Bathy	152.500	0.700	152.991	0.491
403.592	Bathy	152.800	0.700	153.032	0.232
403.673	Bathy	153.022	0.700	153.051	0.029
403.707	Bathy	152.700	0.700	153.059	0.359
403.805	Bathy	152.800	0.700	153.083	0.283
403.904	Bathy	153.000	0.700	153.107	0.107
404.003	Bathy	153.100	0.700	153.131	0.031
404.026	Bathy	153.032	0.700	153.136	0.104
404.055	Bathy	152.600	0.600	153.143	0.543
404.155	Bathy	152.400	0.500	153.167	0.767
404.255	Bathy	152.100	0.500	153.191	1.091
404.355	Bathy	151.760	0.400	153.215	1.455
404.410	Bathy	151.758	0.400	153.228	1.47
404.450	Bathy	151.600	0.400	153.238	1.638
404.539	Bathy	151.400	0.500	153.259	1.859
404.635	Bathy	151.100	0.500	153.282	2.182
404.732	Bathy	151.000	0.600	153.305	2.305
404.852	Bathy	150.900	0.600	153.334	2.434

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
404.950	Bathy	151.100	0.600	153.358	2.258
405.048	Bathy	151.100	0.500	153.381	2.281
405.104	Bathy	151.058	0.600	153.395	2.337
405.146	Bathy	151.100	0.600	153.405	2.305
405.244	Bathy	151.400	0.700	153.428	2.028
405.343	Bathy	151.200	0.700	153.452	2.252
405.442	Bathy	151.500	0.800	153.476	1.976
405.557	Bathy	151.600	0.800	153.504	1.904
405.654	Bathy	151.700	0.900	153.527	1.827
405.745	Bathy	151.737	1.000	153.549	1.812
405.750	Bathy	151.600	0.900	153.550	1.95
405.850	Bathy	151.900	0.900	153.574	1.674
405.950	Bathy	152.100	0.800	153.598	1.498
406.050	Bathy	151.700	0.700	153.622	1.922
406.142	Bathy	152.200	0.700	153.644	1.444
406.239	Bathy	152.100	0.600	153.667	1.567
406.314	Bathy	152.007	0.600	153.685	1.678
406.429	Bathy	152.200	0.600	153.713	1.513
406.525	Bathy	151.900	0.600	153.738	1.838
406.636	Bathy	151.700	0.500	153.763	2.063
406.731	Bathy	152.500	0.500	153.785	1.285
406.826	Bathy	152.700	0.400	153.808	1.108
406.921	Bathy	152.800	0.400	153.831	1.031
407.016	Bathy	153.100	0.400	153.854	0.754
407.031	Bathy	153.447	0.400	153.857	0.41
407.129	Bathy	153.700	0.400	153.881	0.181
407.229	Bathy	153.800	0.400	153.905	0.105
407.329	Bathy	154.100	0.450	153.929	0
407.428	Bathy	154.500	0.450	153.953	0
407.525	Bathy	155.100	0.450	153.976	0
407.622	Bathy	155.000	0.500	153.999	0
407.719	Bathy	155.600	0.500	154.022	0
407.816	Bathy	156.000	0.500	154.046	0
407.973	Bathy	156.100	0.500	154.083	0
408.067	Bathy	156.600	0.500	154.106	0
408.161	Bathy	157.500	0.500	154.128	0
408.255	Bathy	157.900	0.500	154.151	0
408.349	Bathy	158.400	0.500	154.174	0
408.383	Bathy	158.609	0.500	172.000	13.391

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
408.441	Bathy	158.700	0.500	172.012	13.312
408.541	Bathy	158.800	0.500	172.034	13.234
408.641	Bathy	159.000	0.600	172.055	13.055
408.741	Bathy	158.500	0.600	172.077	13.577
408.841	Bathy	158.900	0.600	172.098	13.198
408.880	Bathy	158.876	0.600	172.106	13.23
408.967	Bathy	158.800	0.600	172.125	13.325
409.060	Bathy	159.000	0.500	172.145	13.145
409.152	Bathy	158.700	0.400	172.164	13.464
409.245	Bathy	158.900	0.400	172.184	13.284
409.337	Topo	158.700	0.300	172.204	13.504
409.450	Topo	159.000	0.300	172.228	13.228
409.548	Topo	158.900	0.200	172.249	13.349
409.646	Topo	158.800	0.100	172.270	13.47
409.716	Topo	159.010	0.100	172.285	13.275
409.744	Topo	158.600	0.100	172.291	13.691
409.844	Topo	158.800	0.100	172.312	13.512
409.943	Topo	158.900	0.100	172.333	13.433
410.043	Topo	158.500	0.100	172.355	13.855
410.142	Topo	159.000	0.100	172.376	13.376
410.242	Topo	158.800	0.200	172.397	13.597
410.342	Topo	158.900	0.200	172.418	13.518
410.375	Topo	158.883	0.200	172.425	13.542
410.437	Topo	159.700	0.200	172.439	12.739
410.531	Topo	160.300	0.200	172.459	12.159
410.625	Topo	160.500	0.200	172.479	11.979
410.702	Topo	160.600	0.300	172.495	11.895
410.800	Topo	160.800	0.300	172.516	11.716
410.898	Topo	161.100	0.300	172.537	11.437
410.996	Topo	162.000	0.400	172.558	10.558
411.058	Bathy	162.603	0.400	172.571	9.968
411.091	Bathy	162.700	0.600	172.578	9.878
411.181	Bathy	162.800	0.800	172.598	9.798
411.275	Bathy	163.000	1.100	172.618	9.618
411.368	Bathy	163.800	1.200	172.638	8.838
411.507	Bathy	163.700	1.200	172.667	8.967
411.621	Bathy	164.100	1.200	172.692	8.592
411.780	Bathy	164.000	1.200	172.726	8.726
411.805	Bathy	164.432	1.200	172.731	8.299

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
411.854	Bathy	163.700	1.000	172.741	9.041
411.953	Bathy	163.800	1.000	172.762	8.962
412.058	Bathy	164.000	1.000	172.785	8.785
412.181	Bathy	164.100	0.800	172.811	8.711
412.244	Bathy	163.800	0.900	172.825	9.025
412.349	Bathy	164.200	0.700	172.847	8.647
412.446	Bathy	164.300	0.600	172.868	8.568
412.542	Bathy	164.400	0.500	172.888	8.488
412.550	Bathy	164.469	0.400	172.890	8.421
412.640	Bathy	164.600	0.400	172.909	8.309
412.737	Topo	164.800	0.300	172.930	8.13
412.873	Topo	165.000	0.300	172.959	7.959
412.948	Topo	164.800	0.200	172.975	8.175
413.023	Topo	164.773	0.200	172.991	8.218
413.059	Topo	166.000	0.200	172.999	6.999
413.133	Topo	166.000	0.300	173.014	7.014
413.245	Topo	166.100	0.300	173.038	6.938
413.367	Topo	166.200	0.300	173.059	6.859
413.491	Topo	166.400	0.400	173.091	6.691
413.616	Topo	167.000	0.400	173.118	6.118
413.745	Topo	167.700	0.500	173.145	5.445
413.846	Topo	168.600	0.500	173.167	4.567
413.937	Topo	169.300	0.500	173.186	3.886
414.022	Topo	169.800	0.500	173.204	3.404
414.117	Topo	169.700	0.500	173.225	3.525
414.225	Topo	169.800	0.400	173.248	3.448
414.320	Topo	169.000	0.400	173.268	4.268
414.408	Topo	168.700	0.400	173.287	4.587
414.519	Topo	168.100	0.300	173.311	5.211
414.619	Topo	167.600	0.300	173.332	5.732
414.685	Topo	167.706	0.300	173.346	5.64
414.701	Topo	168.428		173.349	4.921
414.730	Topo	168.300		173.355	5.055
414.828	Topo	168.100		173.376	5.276
414.926	Topo	168.300	0.300	173.397	5.097
415.024	Topo	167.900	0.400	173.418	5.518
415.103	Topo	167.866	0.500	173.435	5.569
415.122	Topo	167.700	0.500	173.439	5.739
415.219	Topo	167.900	0.600	173.460	5.56

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
415.282	Topo	167.600	0.700	173.473	5.873
415.381	Topo	167.300	0.800	173.495	6.195
415.424	Topo	167.431	0.800	173.504	6.073
415.478	Topo	167.300	0.500	173.515	6.215
415.575	Topo	167.400	0.400	173.536	6.136
415.671	Topo	167.700		173.557	5.857
415.754	Topo	168.231		173.574	5.343
415.866	Topo	167.600		173.598	5.998
415.963	Topo	166.000		173.619	7.619
416.061	Topo	165.600		173.640	8.04
416.126	Bathy	165.231	5.000	173.654	8.423
416.157	Bathy	166.000	5.000	173.660	7.66
416.251	Bathy	166.100	5.000	173.680	7.58
416.344	Bathy	167.300	4.800	173.700	6.4
416.441	Bathy	167.700	4.400	173.722	6.022
416.542	Bathy	168.100	4.000	173.743	5.643
416.571	Bathy	169.432	3.000	173.749	4.317
416.642	Bathy	169.500	2.800	173.764	4.264
416.741	Bathy	169.700	2.700	173.785	4.085
416.841	Bathy	170.100	2.500	173.806	3.706
416.941	Bathy	170.400	2.400	173.828	3.428
416.984	Bathy	170.232	2.200	173.837	3.605
417.041	Bathy	169.700	2.100	173.849	4.149
417.140	Bathy	169.800	1.800	173.870	4.07
417.189	Bathy	170.940	1.500	173.881	2.941
417.240	Bathy	170.700	1.500	173.892	3.192
417.340	Bathy	170.600	1.600	173.913	3.313
417.440	Bathy	170.400	1.700	173.934	3.534
417.539	Bathy	170.100	1.800	173.955	3.855
417.639	Bathy	169.700	1.900	173.977	4.277
417.738	Bathy	170.000	1.900	173.998	3.998
417.838	Bathy	170.100	2.000	174.019	3.919
417.938	Bathy	170.000	2.000	174.041	4.041
418.037	Bathy	170.300	2.000	174.062	3.762
418.126	Bathy	170.215	2.000	174.081	3.866
418.179	Bathy	170.700	1.800	174.092	3.392
418.180	Bathy	171.000	1.500	174.092	3.092
418.228	Bathy	171.100	1.200	174.103	3.003
418.303	Bathy	171.400	1.000	174.118	2.718

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
418.418	Bathy	171.500	0.800	174.143	2.643
418.491	Topo	171.700		174.159	2.459
418.551	Topo	172.000		174.171	2.171
418.592	Topo	172.100		174.180	2.08
418.593	Topo	174.392		174.180	0
418.611	Topo	174.600		174.184	0
418.637	Topo	174.800		174.190	0
418.643	Topo	175.100		174.191	0
418.700	Topo	175.100		174.203	0
418.800	Topo	175.000		174.225	0
418.899	Topo	174.900		174.246	0
419.017	Topo	174.821		174.271	0
419.022	Topo	174.800		174.272	0
419.098	Topo	175.000		174.288	0
419.174	Topo	175.100		174.305	0
419.250	Topo	175.200		174.321	0
419.293	Topo	175.313	0.200	177.330	2.017
419.335	Topo	175.500	0.300	177.368	1.868
419.438	Bathy	175.767	2.000	177.460	1.693
419.494	Bathy	175.400	2.200	177.511	2.111
419.578	Bathy	175.000	2.400	177.587	2.587
419.635	Bathy	174.764	2.500	177.638	2.874
419.682	Bathy	175.600	2.200	177.680	2.08
419.770	Bathy	175.824	2.000	177.759	1.935
419.783	Bathy	175.700	2.500	177.771	2.071
419.827	Bathy	176.175	3.000	177.810	1.635
419.839	Bathy	176.000	3.200	177.821	1.821
419.893	Bathy	176.100	3.400	177.870	1.77
419.987	Bathy	175.700	3.600	177.954	2.254
420.082	Bathy	175.900	3.800	178.040	2.14
420.161	Bathy	175.680	4.000	178.111	2.431
420.179	Bathy	176.000	3.500	178.127	2.127
420.274	Bathy	176.500	3.000	178.213	1.713
420.328	Bathy	176.800	2.500	178.261	1.461
420.427	Bathy	177.400	2.000	178.350	0.95
420.517	Bathy	178.097	1.500	178.431	0.334
420.526	Bathy	178.300	1.400	178.439	0.139
420.626	Bathy	178.400	1.300	178.529	0.129
420.726	Bathy	178.500	1.200	178.619	0.119

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
420.825	Bathy	178.800	1.000	178.709	0
420.856	Bathy	178.897	0.700	178.737	0
420.925	Topo	179.000		178.798	0
421.024	Topo	180.500		178.887	0
421.121	Topo	181.152		178.975	0
421.222	Topo	181.100		179.066	0
421.322	Topo	180.700		179.156	0
421.422	Topo	180.900		179.246	0
421.522	Topo	181.000		179.336	0
421.539	Topo	180.652	0.500	181.000	0.348
421.621	Topo	180.800		181.074	0.274
421.720	Topo	180.900		181.163	0.263
421.819	Topo	181.000		181.252	0.252
421.918	Topo	181.400		181.341	0
422.065	Topo	181.500		181.474	0
422.116	Topo	181.986		181.519	0
422.157	Topo	181.700		181.556	0
422.257	Topo	181.500		181.646	0.146
422.357	Topo	181.400		181.736	0.336
422.456	Topo	181.000		181.826	0.826
422.556	Topo	180.800		181.916	1.116
422.562	Topo	181.235		181.921	0.686
422.656	Topo	181.000		182.005	1.005
422.756	Topo	180.800		182.095	1.295
422.864	Topo	180.700		182.193	1.493
422.964	Topo	180.900		182.282	1.382
423.001	Topo	181.204		182.316	1.112
423.064	Topo	181.100		182.372	1.272
423.163	Topo	180.700		182.462	1.762
423.263	Topo	180.400		182.551	2.151
423.347	Topo	180.347		182.627	2.28
423.362	Topo	180.700		182.641	1.941
423.462	Topo	180.800		182.731	1.931
423.562	Topo	182.800		182.821	0.021
423.657	Topo	184.036		182.906	0
423.761	Topo	183.800		183.000	0
423.861	Topo	184.000		183.089	0
423.944	Topo	183.654		183.165	0
423.960	Topo	183.900		183.179	0

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
424.059	Topo	184.000		183.268	0
424.158	Topo	183.800		183.357	0
424.256	Topo	184.100		183.446	0
424.355	Bathy	184.000	0.500	183.535	0
424.454	Bathy	183.800	0.600	183.624	0
424.553	Bathy	183.900	0.700	183.713	0
424.652	Bathy	184.100	0.900	183.802	0
424.751	Bathy	184.000	1.200	183.891	0
424.827	Bathy	183.957	1.500	183.959	0.002
424.848	Bathy	184.000	1.800	183.978	0
424.973	Bathy	184.100	1.900	184.091	0
425.062	Bathy	184.238	2.000	184.171	0
425.068	Bathy	184.800	0.200	184.176	0
425.163	Bathy	185.000	0.100	184.262	0
425.209	Bathy	186.138	0.100	184.303	0
425.260	Bathy	185.900	0.400	184.349	0
425.359	Bathy	185.600	0.500	184.438	0
425.385	Bathy	185.538	0.700	184.461	0
425.455	Bathy	186.000	0.500	184.525	0
425.530	Bathy	186.238	0.100	184.592	0
425.547	Bathy	186.100	0.200	184.607	0
425.603	Bathy	186.000	0.300	184.657	0
425.686	Bathy	185.900	0.400	184.732	0
425.745	Bathy	185.738	0.500	184.785	0
425.767	Bathy	186.100	0.800	184.805	0
425.857	Bathy	186.300	1.100	184.886	0
425.938	Bathy	186.500	1.300	184.959	0
426.048	Bathy	187.000	1.600	185.058	0
426.146	Bathy	187.100	1.900	185.146	0
426.186	Bathy	187.300	2.100	185.182	0
426.286	Bathy	188.500	1.200	185.272	0
426.305	Bathy	188.780	2.500	191.000	2.22
426.381	Bathy	187.800	3.000	191.001	3.201
426.475	Bathy	187.900	3.500	191.001	3.101
426.569	Bathy	186.100	4.200	191.002	4.902
426.655	Bathy	186.280	5.000	191.003	4.723
426.759	Bathy	186.000	4.800	191.003	5.003
426.855	Bathy	186.600	4.500	191.004	4.404
426.951	Bathy	186.800	4.200	191.005	4.205

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
427.019	Bathy	187.030	4.250	191.005	3.975
427.047	Bathy	186.800	4.200	191.006	4.206
427.143	Bathy	187.000	4.100	191.006	4.006
427.240	Bathy	187.100	4.100	191.007	3.907
427.372	Bathy	187.300	4.000	191.008	3.708
427.439	Bathy	187.280	4.000	191.009	3.729
427.471	Bathy	187.400	3.800	191.009	3.609
427.568	Bathy	187.500	3.500	191.009	3.509
427.665	Bathy	187.700	3.200	191.010	3.31
427.739	Bathy	188.227	3.000	191.011	2.784
427.761	Bathy	188.300	3.000	191.011	2.711
427.858	Bathy	188.100	3.000	191.012	2.912
427.955	Bathy	187.900	3.000	191.012	3.112
428.051	Bathy	187.280	3.000	191.013	3.733
428.148	Bathy	187.780	3.000	191.014	3.234
428.172	Bathy	187.820	3.000	191.014	3.194
428.246	Bathy	187.680	3.000	191.015	3.335
428.345	Bathy	187.580	3.100	191.015	3.435
428.444	Bathy	187.380	3.100	191.016	3.636
428.543	Bathy	187.580	3.200	191.017	3.437
428.589	Bathy	187.620	3.200	191.017	3.397
428.643	Bathy	187.580	3.300	191.018	3.438
428.742	Bathy	187.280	3.500	191.018	3.738
428.841	Bathy	187.180	3.500	191.019	3.839
428.941	Bathy	186.680	3.800	191.020	4.34
428.963	Bathy	186.820	4.000	191.020	4.2
429.032	Bathy	187.580	3.500	191.020	3.44
429.133	Bathy	188.320	2.500	191.021	2.701
429.226	Bathy	188.280	2.800	191.022	2.742
429.324	Bathy	187.980	3.000	191.023	3.043
429.423	Bathy	187.780	3.100	191.023	3.243
429.521	Bathy	187.880	3.000	191.024	3.144
429.620	Bathy	187.680	3.000	191.025	3.345
429.719	Bathy	187.480	3.000	191.026	3.546
429.818	Bathy	187.580	3.000	191.026	3.446
429.917	Bathy	187.380	3.000	191.027	3.647
430.015	Bathy	187.280	3.000	191.028	3.748
430.114	Bathy	187.780	3.000	191.029	3.249
430.214	Bathy	187.580	3.000	191.029	3.449

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
430.226	Bathy	187.820	3.000	191.029	3.209
430.314	Bathy	187.180	3.100	191.030	3.85
430.414	Bathy	187.580	3.000	191.031	3.451
430.514	Bathy	187.380	3.100	191.032	3.652
430.614	Bathy	187.280	3.200	191.032	3.752
430.714	Bathy	187.380	3.300	191.033	3.653
430.814	Bathy	187.280	3.300	191.034	3.754
430.914	Bathy	187.180	3.400	191.035	3.855
431.014	Bathy	187.780	3.500	191.035	3.255
431.114	Bathy	187.380	3.500	191.036	3.656
431.130	Bathy	187.320	3.500	191.036	3.716
431.213	Bathy	187.280	4.000	191.037	3.757
431.312	Bathy	187.380	4.500	191.038	3.658
431.411	Bathy	187.680	5.000	191.038	3.358
431.518	Bathy	185.780	5.200	191.039	5.259
431.527	Bathy	185.120	5.700	191.039	5.919
431.617	Bathy	185.080	5.600	191.040	5.96
431.717	Bathy	185.480	5.600	191.041	5.561
431.816	Bathy	185.380	5.700	191.041	5.661
431.889	Bathy	185.320	5.500	191.042	5.722
431.915	Bathy	185.480	5.200	191.042	5.562
432.014	Bathy	185.580	5.100	191.043	5.463
432.114	Bathy	185.880	4.500	191.044	5.164
432.213	Bathy	186.480	4.100	191.044	4.564
432.291	Bathy	187.820	3.000	191.045	3.225
432.312	Bathy	187.280	3.200	191.045	3.765
432.412	Bathy	187.580	3.100	191.046	3.466
432.511	Bathy	187.580	3.200	191.047	3.467
432.611	Bathy	187.380	3.400	191.047	3.667
432.624	Bathy	187.320	3.500	191.047	3.727
432.709	Bathy	187.580	3.400	191.048	3.468
432.806	Bathy	187.880	3.000	191.049	3.169
432.947	Bathy	187.980	2.700	191.050	3.07
433.018	Bathy	188.320	2.500	191.050	2.73
433.045	Bathy	188.780	2.400	191.051	2.271
433.143	Bathy	188.380	2.200	191.051	2.671
433.242	Bathy	188.980	2.000	191.052	2.072
433.341	Bathy	189.080	1.600	191.053	1.973
433.371	Bathy	189.320	1.500	191.053	1.733

Chainage (km) A	Type of Survey B	River Bed wrt MSL (m) C	Observed Depth (m) D	Chart Datum w.r.t. MSL (m) E	Reduced Depth(m) F=E-C
433.441	Bathy	189.480	1.600	191.054	1.574
433.540	Bathy	189.880	1.800	191.054	1.174
433.639	Bathy	187.980	1.900	191.055	3.075
433.678	Bathy	188.820	2.000	191.055	2.235
433.737	Bathy	188.380	1.900	191.056	2.676
433.836	Bathy	188.780	1.800	191.056	2.276
433.903	Bathy	189.020	1.800	191.057	2.037
433.934	Bathy	189.180	1.900	191.057	1.877
434.031	Bathy	189.280	1.600	191.058	1.778
434.055	Bathy	189.320	1.500	191.058	1.738
434.128	Bathy	189.180	1.600	191.059	1.879
434.282	Bathy	189.480	1.600	191.060	1.58
434.381	Bathy	189.080	1.700	191.061	1.981
434.458	Bathy	189.020	1.800	191.061	2.041
434.479	Bathy	189.180	1.700	191.061	1.881
434.578	Bathy	189.380	1.600	191.062	1.682
434.677	Bathy	189.480	1.500	191.063	1.583
434.739	Bathy	189.320	1.500	191.063	1.743
434.777	Bathy	189.580	1.400	191.064	1.484
434.877	Bathy	189.780	1.300	191.064	1.284
434.977	Bathy	189.880	1.000	191.065	1.185
435.068	Bathy	189.980	0.500	191.066	1.086
435.147	Topo	190.600	0.300	191.066	0.466
435.155	Topo	191.080	0.200	191.066	0
435.252	Topo	191.380	0.100	191.067	0
435.372	Topo	191.780	0.100	191.068	0
435.462	Topo	191.994	0.100	191.069	0
435.465	Topo	192.080	0.100	191.069	0
435.497	Topo	191.265	0.100	191.069	0
435.550	Topo	192.480		191.069	0
435.620	Topo	194.852		191.070	0
435.628	Topo	193.480		191.070	0
435.693	Topo	192.980		191.070	0
435.762	Topo	192.441	0.100	191.071	0
435.851	Topo	192.580	0.200	191.072	0
435.893	Topo	192.204	0.300	191.072	0
435.946	Topo	193.480	0.200	191.072	0
436.044	Topo	193.038	0.100	191.073	0

4.6 Observed and reduced bed profile along the river

4.6.1 Observed bed profile along the river

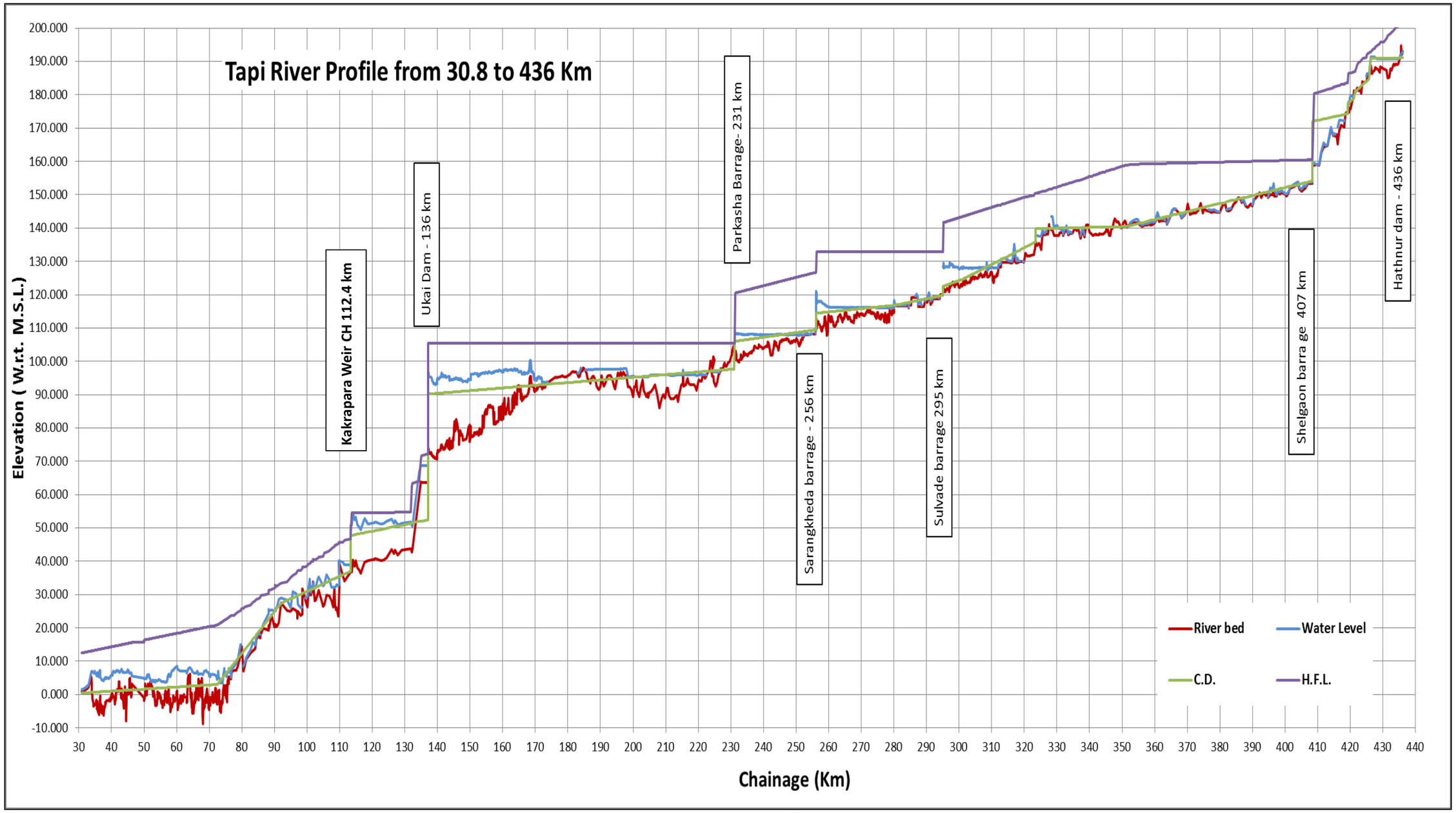


Figure 13: Tapi River Bed Profile

(Source: Actual single line longitudinal survey carried out at site during April and May 2016, CWC Gauge discharge data)

4.6.2 Reduced bed profile along the river

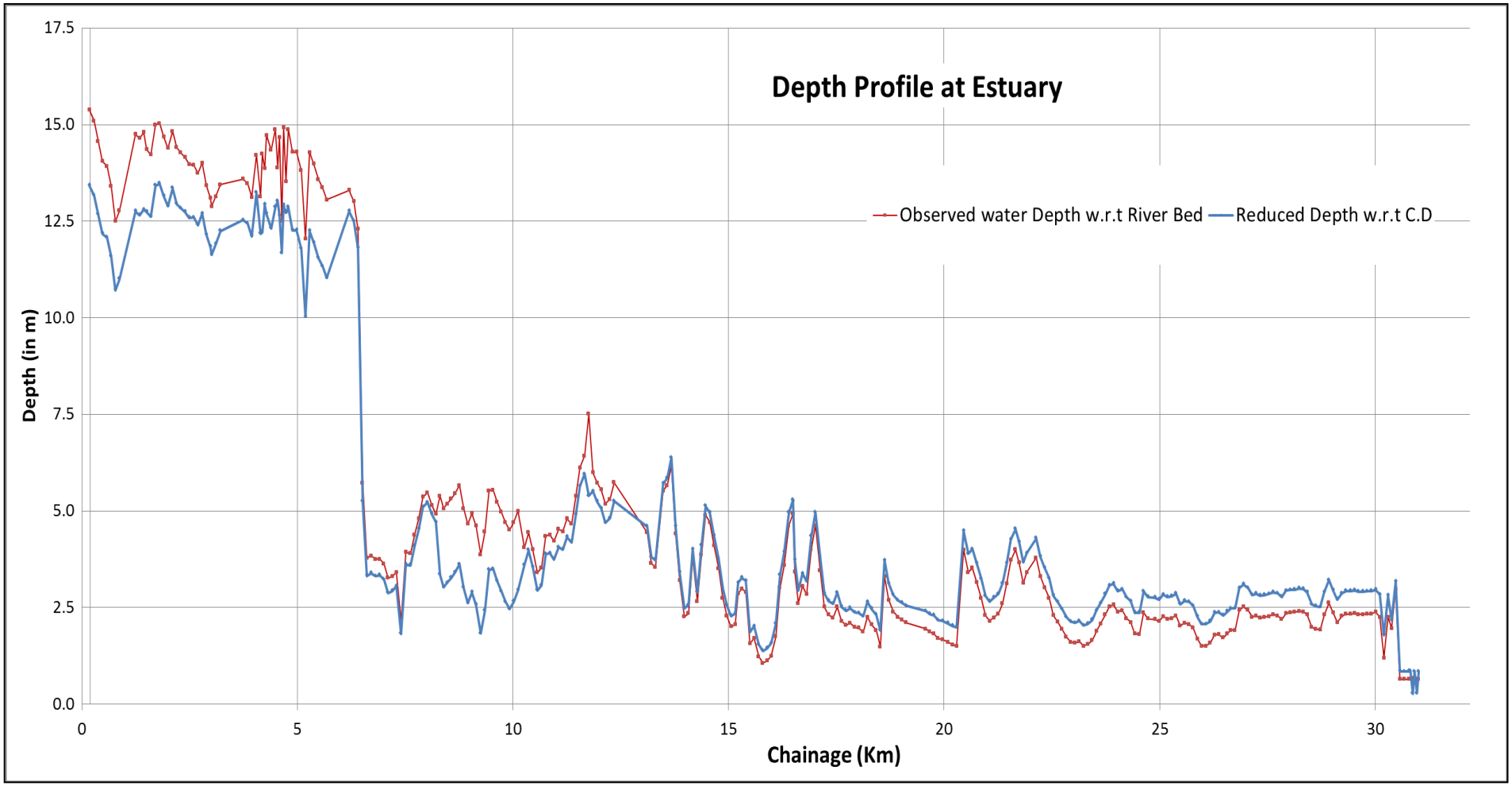


Figure 14: Depth profile from River mouth (CH 0.0) to the end of tidal influence (CH 30.8)

(Source: Actual single line longitudinal survey carried out at site during April and May 2016 and Admiralty Tide Table (ATT- Vol 3))

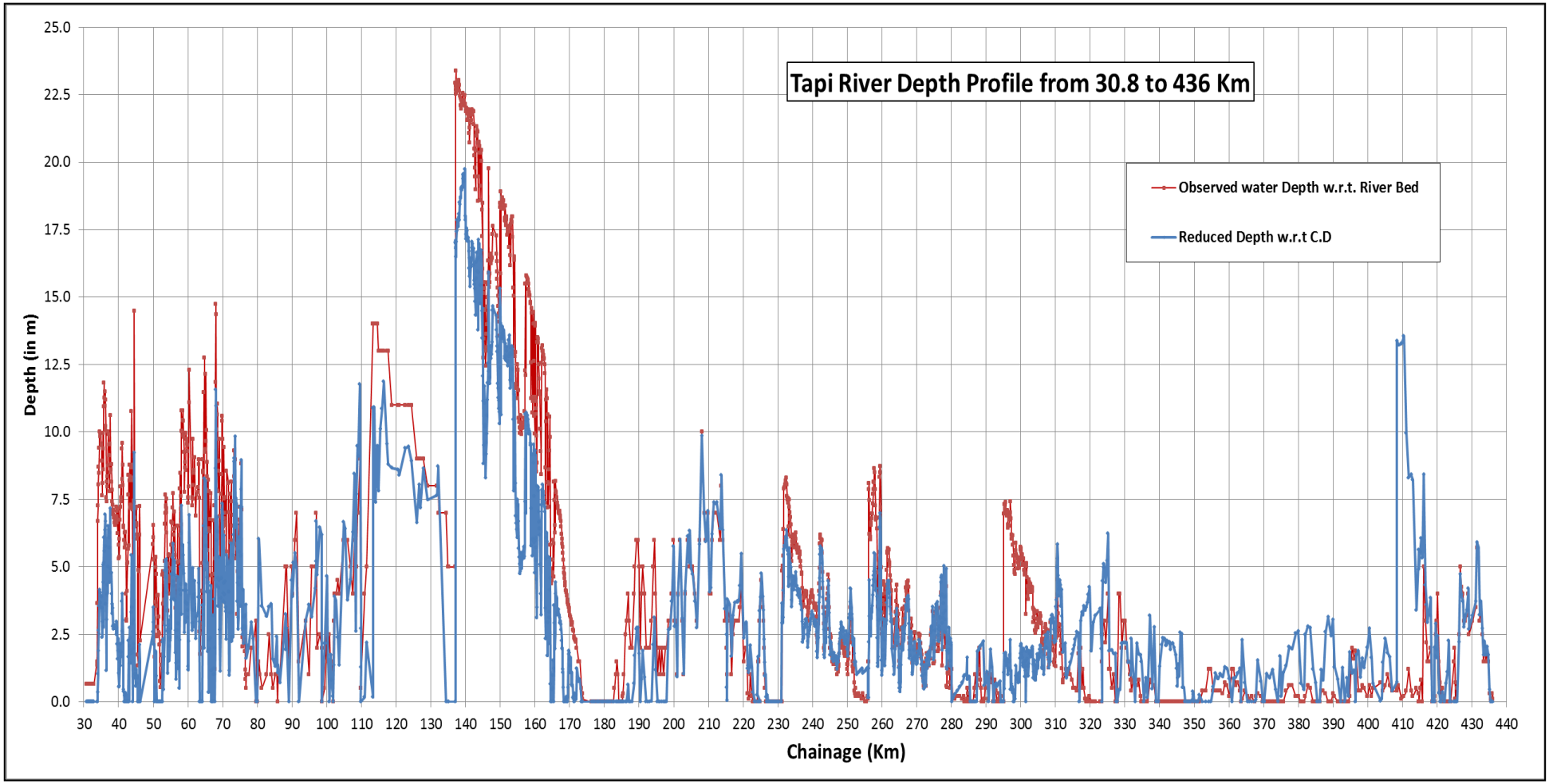


Figure 15: Depth profile from the end of tidal influence (CH 30.8) to CH 436.0

(Source: Actual single line longitudinal survey carried out at site during April and May 2016, CWC Gauge discharge data)

4.7 Results from Hydrographic/Topographic Survey

The bathymetry survey has been carried out in the following stretches:

Tidal Reach

The tide effect was predominant up to chainage 35km from river mouth. Bathymetry Survey has been carried out in this reach. Source data for Tide has been taken from Hazira Port for the period of 28/03/16 to 19/04/16.

Non-Tidal Reach

From (km)	To (km)
30.869	173.576
185.639	221.236
224.198	226.444
231.290	252.026
256.171	280.303
286.728	288.548
295.135	318.504
323.451	327.157
327.873	334.17
336.849	338.541
353.505	355.421
360.369	363.166
376.761	378.725
395.716	399.190
401.54	409.245
411.058	412.640
416.126	418.418
419.438	420.856
424.355	435.068

Topographic survey has been carried out in the following reaches:

From(Km)	To(Km)
173.647	185.574
221.296	224.171
226.517	231.216
252.09	256.087
280.397	286.672
288.605	295.083
318.615	323.383
327.286	327.822
334.263	336.746
338.573	353.405

355.491	360.270
363.220	376.627
378.825	395.616
399.290	401.440
409.337	410.996
412.737	416.061
418.491	419.335
420.925	424.256
435.147	436.044

4.8 Soil characteristics

At forty five (45) locations soil samples were collected and the details of CH vs soil textures are tabulated at Annexure 3. There are Rocky strata present at CH-70 to CH-100, CH-130 to CH-140, CH-230 to CH-240, CH-340 to CH-350, CH-400 to CH-420 and CH-430 to CH-436.

Table 20: Soil Characteristics

Chainage (km)	Texture
0 -30	Sandy
30-40	Sandy, clay
40-70	sandy
70-100	Rocky
100-130	Sandy
130-140	Rocky
140-220	Clay
220-230	sandy
230-240	Rocky
240-250	Clay
250-260	Sandy
260-280	Sandy Clay
280-300	Sandy
300-320	Sandy & Clay
320-340	Sandy
340-350	Sandy/Rocky
350-400	Sandy
400-420	Rocky
420-430	Clay
430-436	Rocky

4.9 Water characteristics

From visual observation, water mixed with sand was observed in the tidal reach. Clear water was observed at most of the river reach.

4.10 Condition of banks

The condition of banks was found to be good. The banks are natural. The photographs showing condition of banks along the river during Stage-1 survey are also attached at along with reconnaissance survey report.

4.11 Details of collected water level and Discharge data

The details of collected data as detailed in chapter 2 (refer 2.2.3 and 2.2.4):

Table 21: Location details of gauging stations

Name	**Location**		
	Chainage km	Lat.	Long.
Surat(Seasonal), Dist. Surat, Guj	30.87	21^0 11′ 37” N	72^0 48′ 49” E
Ghala, Dist. Surat, Guj	72.5	21^0 17′ 29” N	73^0 02′ 10” E
Kakrapar, Dist. Surat, Guj	113.34	21^0 16′ 09” N	73^0 22′ 17” E
Ukai Dam, Dist. Surat, Guj	137.12	21^0 14′ 53” N	73^0 35′ 22” E
Sarangkheda, Dist.Nandurbar,MH	255.88	21^0 25′ 37” N	74^0 31′ 49” E
Gidhade, Dist. Dhule, MH	295	21^0 17′ 27” N	74^0 48′ 53” E
Savkheda, Dist.Jalgaon,MH	351.5	21^0 08′ 57” N	75^0 13′ 54” E
Bhushawal, Dist.Jalgaon, MH	418	21^0 04′ 04” N	75^0 46′ 49” E
Hathnur, Dist.Jalgaon, MH	436.2	21^0 04′ 20” N	75^0 56′ 44” E

The details of Gauge station, jurisdiction, establishment and data availability (Source: CWC WRIS Site) are presented in the figures below:

Figure 16: Surat Gauge Site

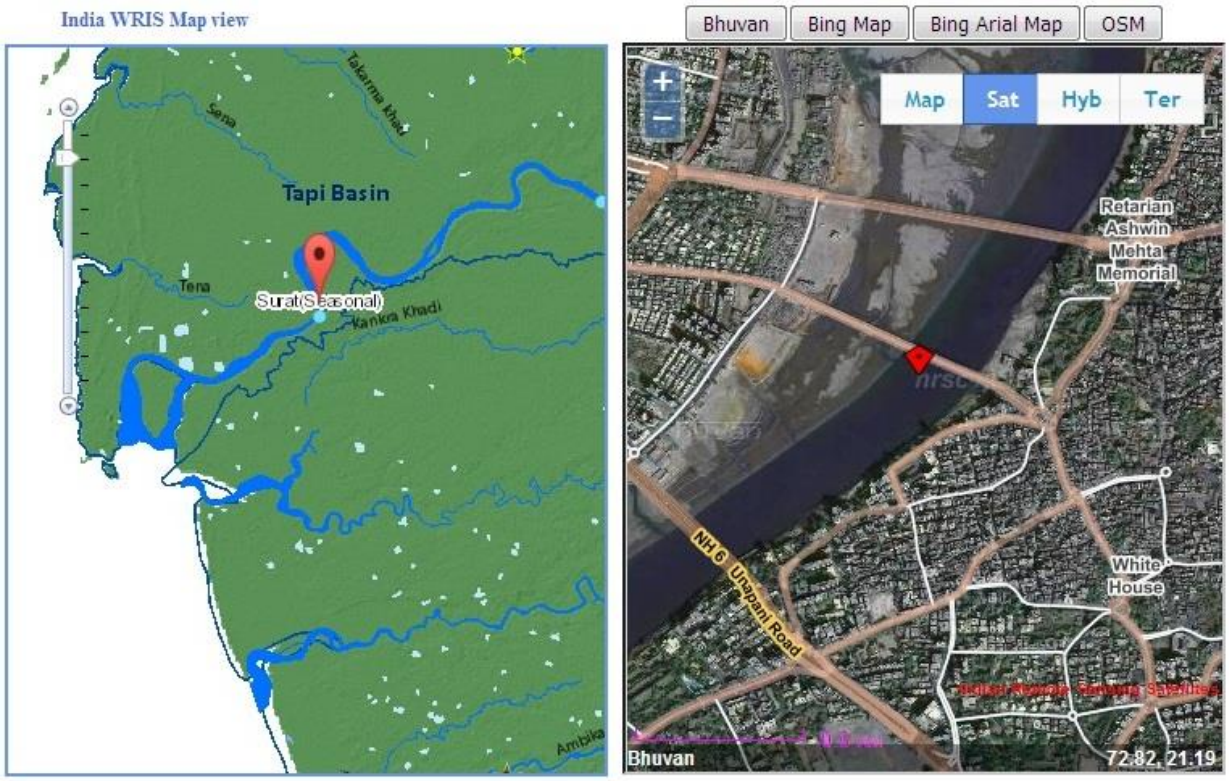


Figure 17: Remote Station and Location map of Surat Gauge Site

General Station Characteristics | Water Level | Discharge | X-Section | Sediment

Station Characteristics | Establishment Details | Series Characteristics | Data Availability | FF/WaterQuality/AWS Details

General Details

Station Name	Surat(Seasonal)	
Station Code	01 02 17 019	
Operational Status	Existing	
Activity	HO/FF	
Station Type (Current)	G	
Tehsil/Taluk	Chorasi	
District	Surat	
State	Gujarat	
Latitude (DMS)	21°11'37"	N
Longitude (DMS)	72°48'49"	E
Altitude (m)	-5.00	
Distance to Outlet (km)	0	
Topo Sheet No.	--	
Catchment Area (sq km)	63973.00	

Basin Details

Basin	Tapi
Independent River	Tapi
Tributary	--
Sub Tributary	--
Sub Sub Tributary	--
Local River	Tapi

Jurisdication Details

Owner Agency	CWC
State/Regional Office	N & T BO, Gandhinagar
Circle Office	S.E., Vadodara
Divisional Office	Surat
Sub Divisional Office	LTSD, Surat
Section Office	Surat
Nearest Airport	--
Town	--
Railway Station	--
Bus Stand	--

Nearest GTS B.M	--
Musto Type B.M	--
Musto Type B.M Value(m)	--
Type of Bed	--
River Width(m)	--
Type of River	--
Station Bank	--
Method of Discharge Obs.	--
Zero of Gauge(m)	--
U/S GaugeLine Dist.(m)	--
D/S GaugeLine Dist.(m)	--
River Origin Location	--
Station History	--
Location Details	--
Accessibility	--
Station Setup	--
Address	--
Other Information	--

Figure 18: Surat GD site- General, basin and jurisdiction details

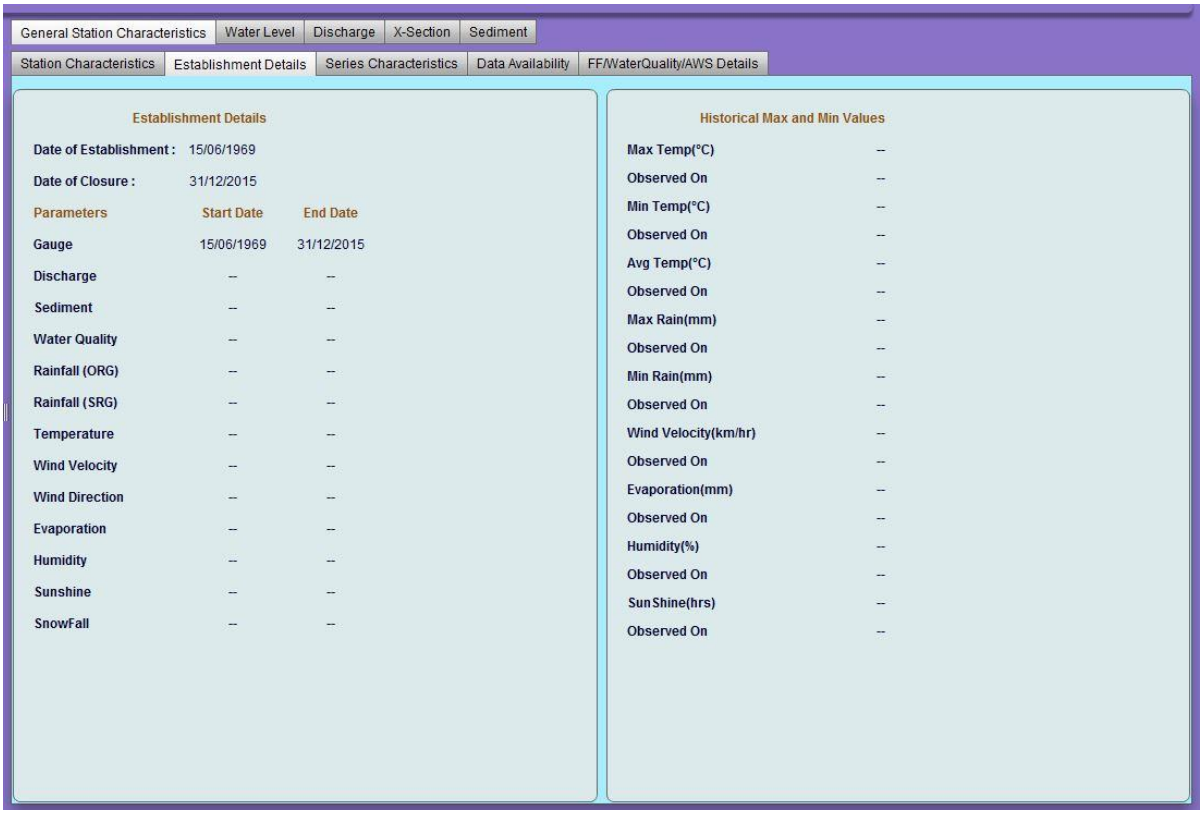


Figure 19: Surat GD site- Establishment details

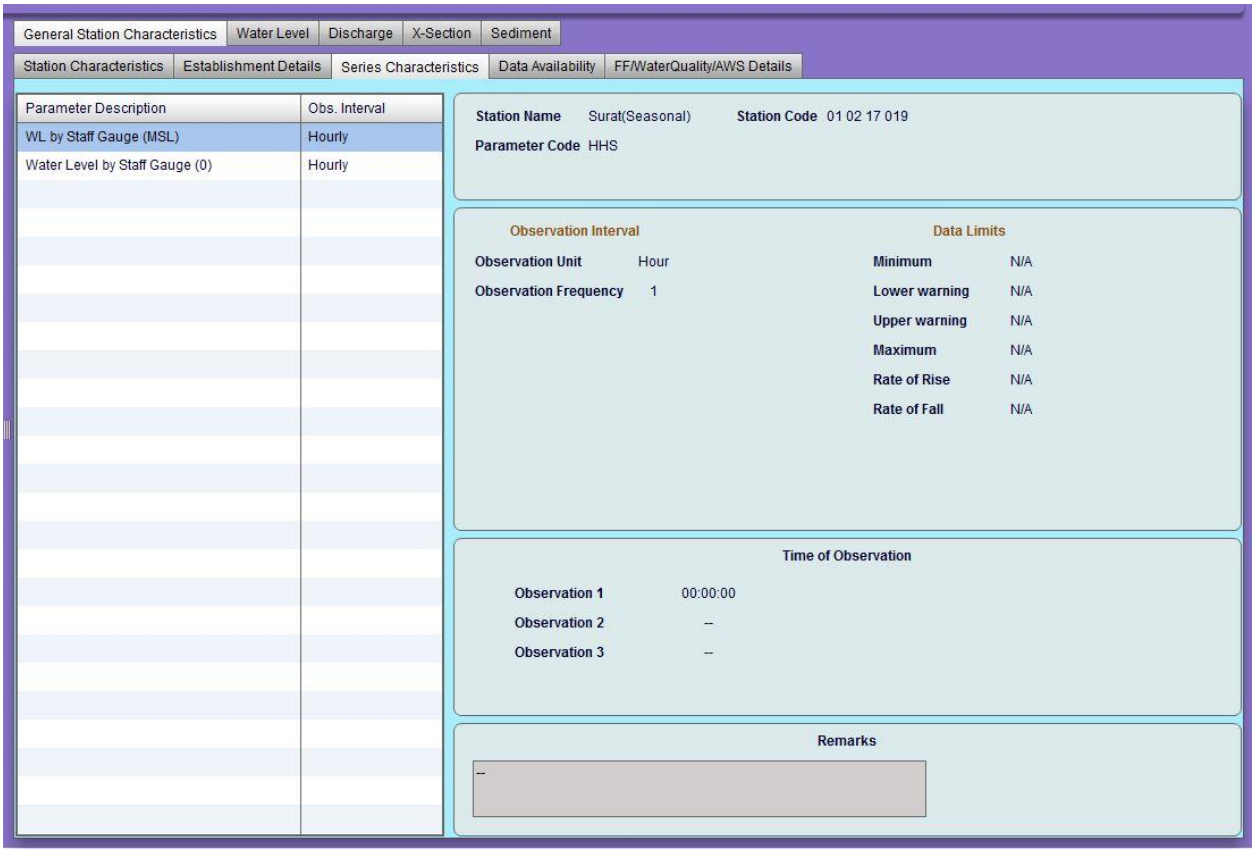


Figure 20: Surat G.D. Site- series characteristics

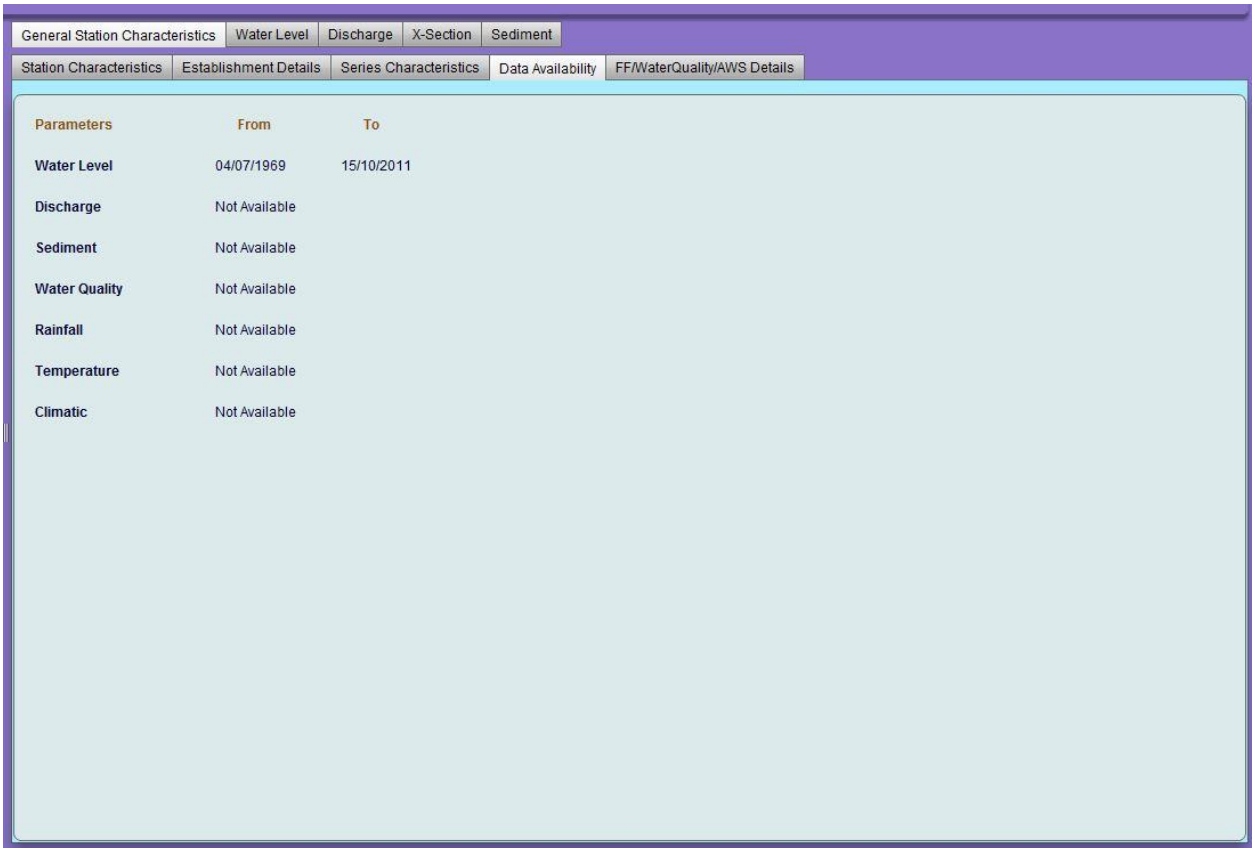


Figure 21: Surat G.D. site: Data availability

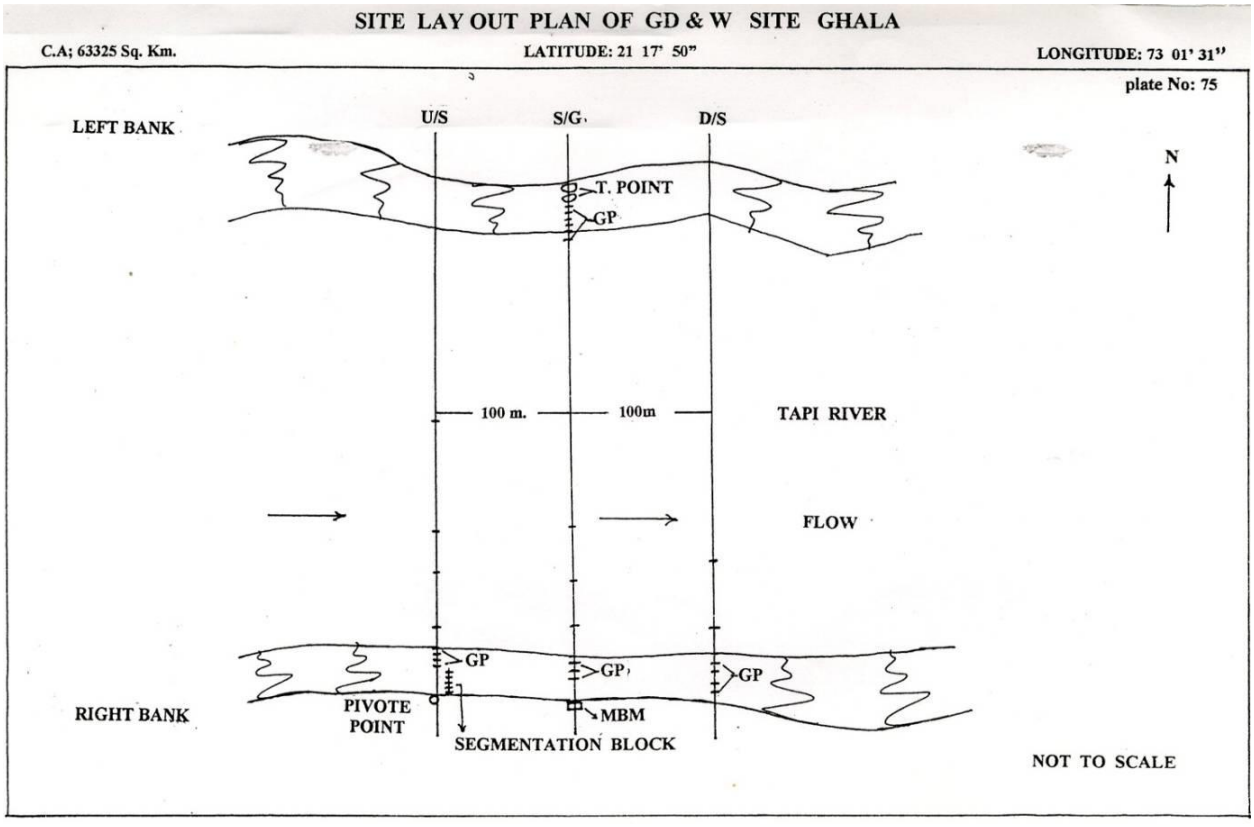


Figure 22: Site layout Plan Ghala

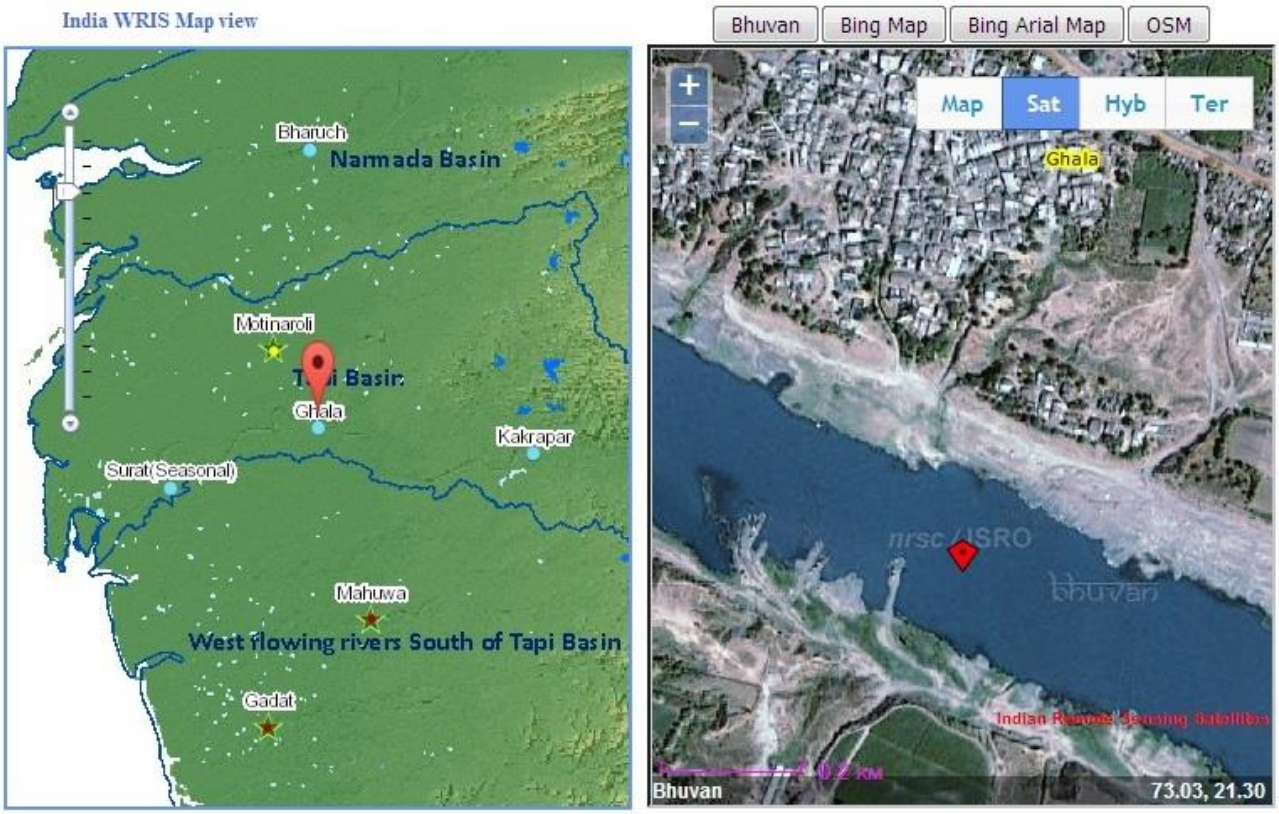


Figure 23: Site Layout Plan and Location map of Ghala Gauge Site

General Station Characteristics | Water Level | Discharge | X-Section | Sediment

Station Characteristics | Establishment Details | Series Characteristics | Data Availability | FF/WaterQuality/AWS Details

General Details

Station Name	Ghala	
Station Code	01 02 17 018	
Operational Status	Existing	
Activity	HO	
Station Type (Current)	G	
Tehsil/Taluk	Kamrej	
District	Surat	
State	Gujarat	
Latitude (DMS)	21°17'29"	N
Longitude (DMS)	73°02'10"	E
Altitude (m)	1.87	
Distance to Outlet (km)	--	
Topo Sheet No.	--	
Catchment Area (sq km)	63325.00	

Basin Details

Basin	Tapi
Independent River	Tapi
Tributary	--
Sub Tributary	--
Sub Sub Tributary	--
Local River	Tapi

Jurisdication Details

Owner Agency	CWC
State/Regional Office	N & T BO, Gandhinagar
Circle Office	S.E. (C), Gandhinagar
Divisional Office	Tapi Div., Surat
Sub Divisional Office	LTSD, Surat
Section Office	Ghala
Nearest Airport	--
Town	--
Railway Station	--
Bus Stand	--

Nearest GTS B.M	--
Musto Type B.M	--
Musto Type B.M Value(m)	--
Type of Bed	--
River Width(m)	--
Type of River	--
Station Bank	Right
Method of Discharge Obs.	--
Zero of Gauge(m)	--
U/S GaugeLine Dist.(m)	--
D/S GaugeLine Dist.(m)	--
River Origin Location	--
Station History	--
Location Details	--
Accessibility	--
Station Setup	--
Address	--
Other Information	--

Figure 24: Ghala GD site- General, basin and jurisdiction details

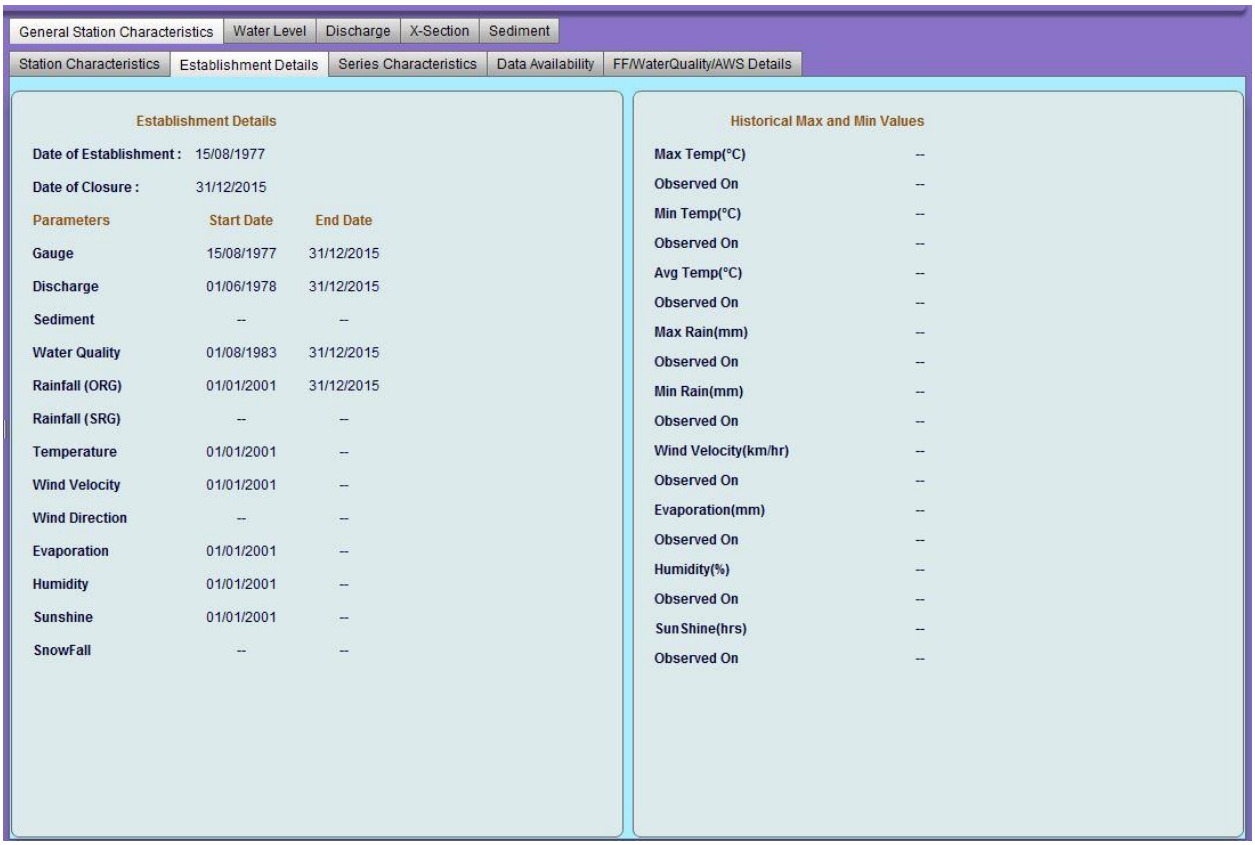


Figure 25: Ghala GD site- Establishment details

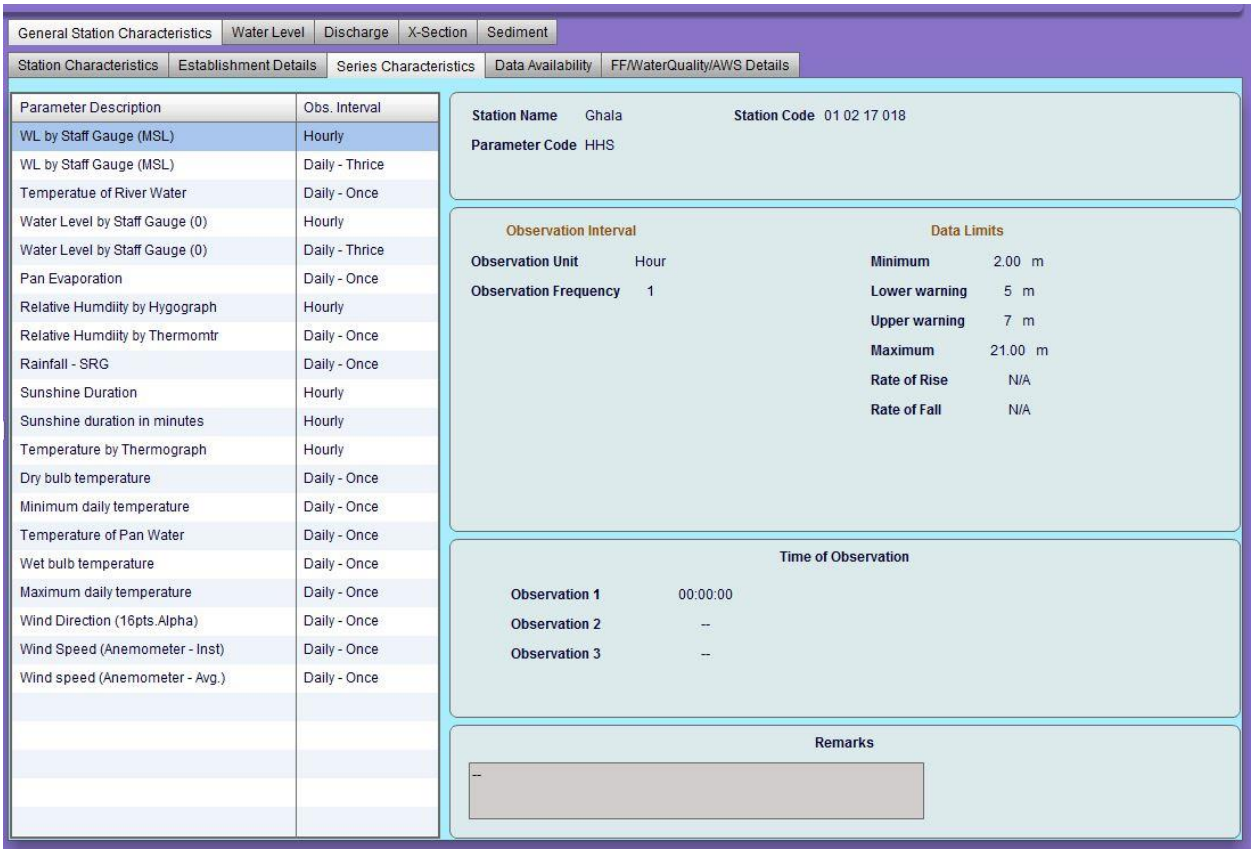


Figure 26: Ghala G.D. Site- series characteristics

General Station Characteristics | Water Level | Discharge | X-Section | Sediment

Station Characteristics | Establishment Details | Series Characteristics | Data Availability | FF/WaterQuality/AWS Details

Parameters	From	To
Water Level	15/08/1977	31/05/2012
Discharge	01/06/1978	31/05/2005
Sediment	Not Available	
Water Quality	Not Available	
Rainfall	Not Available	
Temperature	Not Available	
Climatic	Not Available	

Figure 27: Ghala G.D. site: Data availability

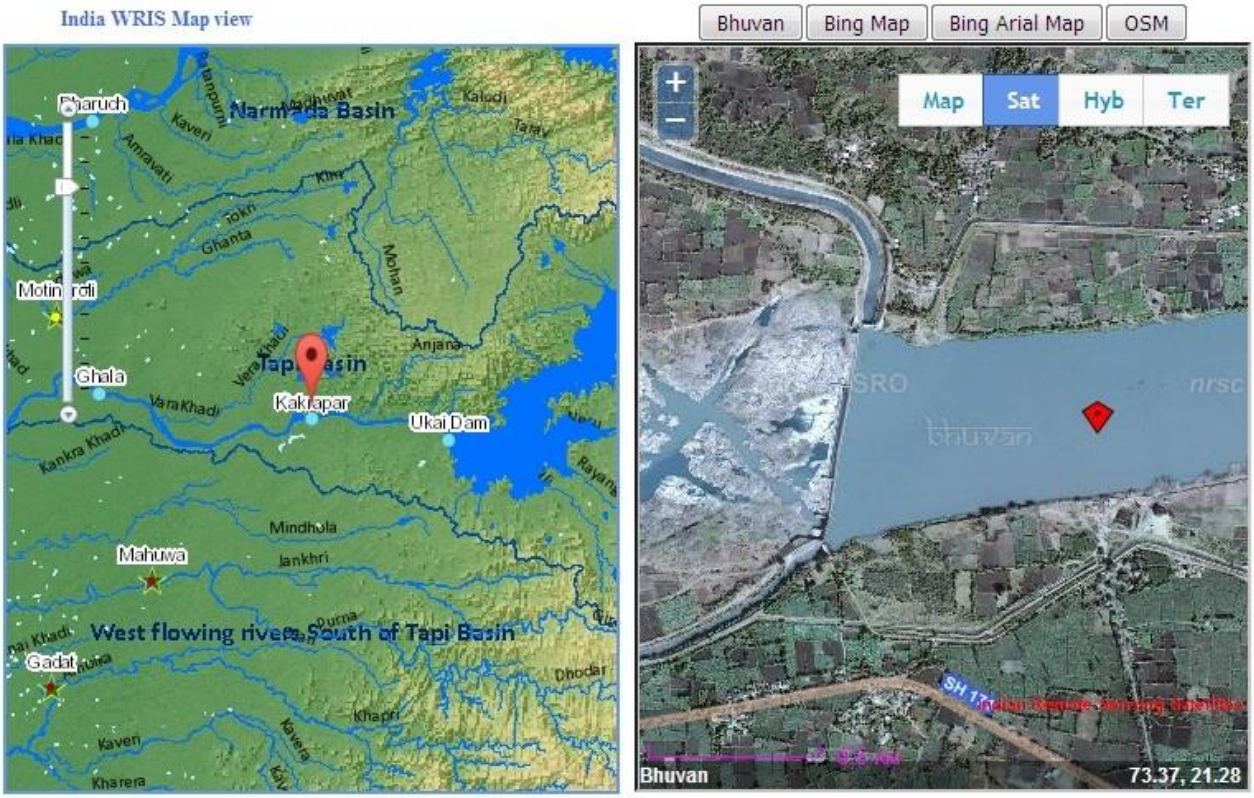


Figure 28: Location map of Kakrapar Gauge Site

General Station Characteristics | Water Level | Discharge | X-Section | Sediment

Station Characteristics | Establishment Details | Series Characteristics | Data Availability | FF/WaterQuality/AWS Details

General Details

Station Name	Kakrapar	
Station Code	01 02 17 017	
Operational Status	Closed	
Activity	HO	
Station Type (Current)	G	
Tehsil/Taluk	Mandvi	
District	Surat	
State	Gujarat	
Latitude (DMS)	21°16'09"	N
Longitude (DMS)	73°22'17"	E
Altitude (m)	37.79	
Distance to Outlet (km)	0	
Topo Sheet No.	46G07	
Catchment Area (sq km)	62826.00	

Basin Details

Basin	Tapi
Independent River	Tapi
Tributary	--
Sub Tributary	--
Sub Sub Tributary	--
Local River	Tapi

Jurisdication Details

Owner Agency	CWC
State/Regional Office	N & T BO, Gandhinagar
Circle Office	S.E. (C), Gandhinagar
Divisional Office	Tapi Div., Surat
Sub Divisional Office	LTSD, Surat
Section Office	Kakrapar
Nearest Airport	--
Town	--
Railway Station	--
Bus Stand	--

Nearest GTS B.M	--
Musto Type B.M	--
Musto Type B.M Value(m)	--
Type of Bed	--
River Width(m)	--
Type of River	--
Station Bank	--
Method of Discharge Obs.	--
Zero of Gauge(m)	--
U/S GaugeLine Dist.(m)	--
D/S GaugeLine Dist.(m)	--
River Origin Location	--
Station History	--
Location Details	--
Accessibility	--
Station Setup	--
Address	--
Other Information	--

Figure 29: Kakrapar GD site- General, basin and jurisdiction details

General Station Characteristics | Water Level | Discharge | X-Section | Sediment

Station Characteristics | Establishment Details | Series Characteristics | Data Availability | FF/WaterQuality/AWS Details

Establishment Details

Date of Establishment : 15/06/1969

Date of Closure : 31/05/2005

Parameters	Start Date	End Date
Gauge	15/06/1969	31/05/2005
Discharge	--	--
Sediment	--	--
Water Quality	--	--
Rainfall (ORG)	15/06/1969	31/05/2005
Rainfall (SRG)	--	--
Temperature	--	--
Wind Velocity	--	--
Wind Direction	--	--
Evaporation	--	--
Humidity	--	--
Sunshine	--	--
SnowFall	--	--

Historical Max and Min Values

Max Temp(°C)	--
Observed On	--
Min Temp(°C)	--
Observed On	--
Avg Temp(°C)	--
Observed On	--
Max Rain(mm)	--
Observed On	--
Min Rain(mm)	--
Observed On	--
Wind Velocity(km/hr)	--
Observed On	--
Evaporation(mm)	--
Observed On	--
Humidity(%)	--
Observed On	--
Sun Shine(hrs)	--
Observed On	--

Figure 30: Kakrapar GD site- Establishment details

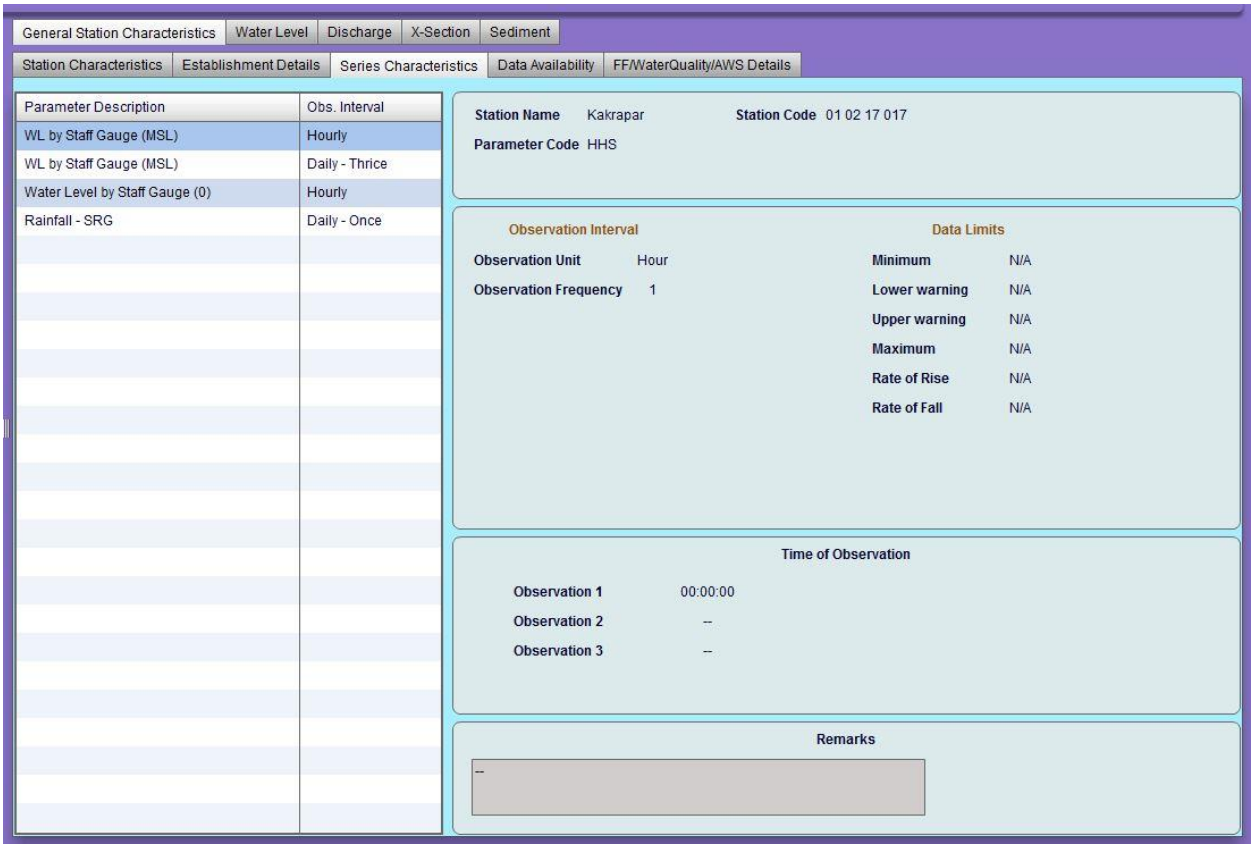


Figure 31: Kakrapar G.D. Site- series characteristics

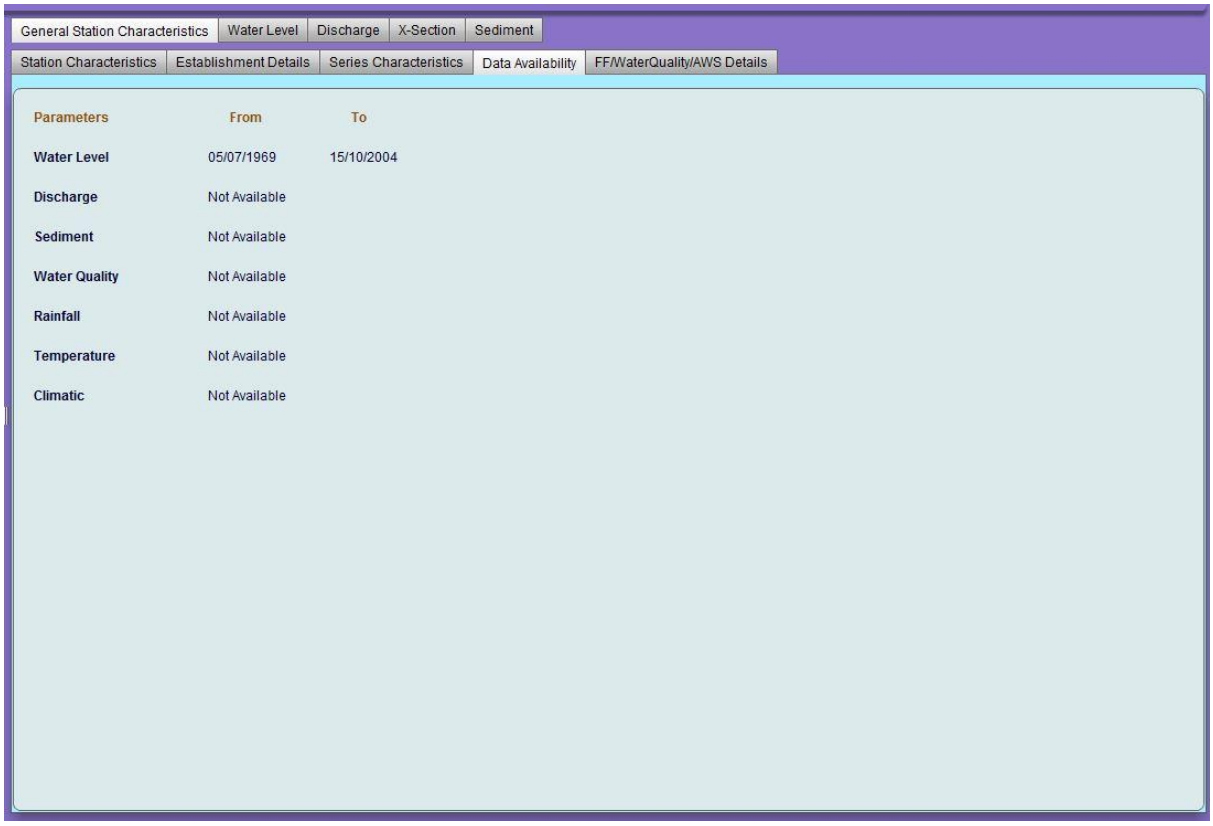


Figure 32: Kakrapar G.D. site: Data availability

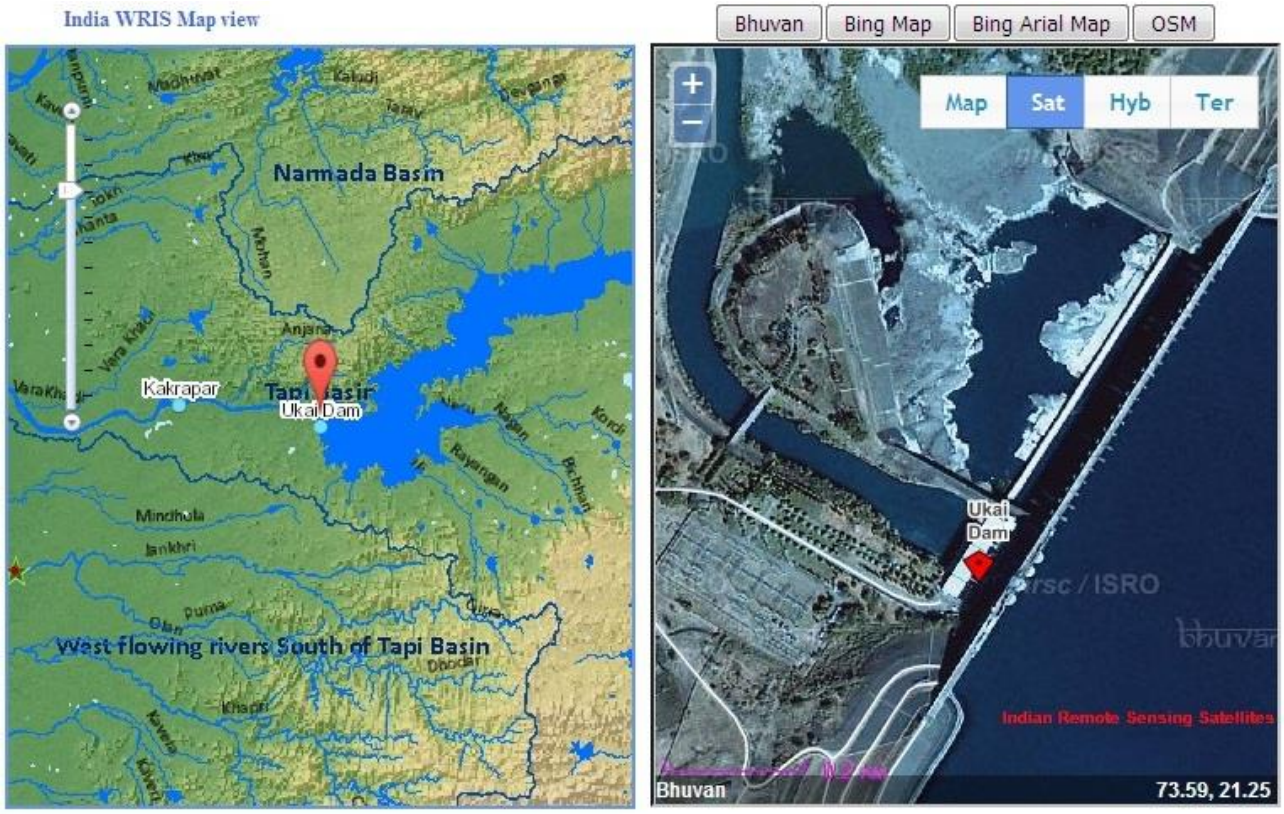


Figure 33: Location map of Ukai Gauge Site

General Station Characteristics | Water Level | Discharge | X-Section | Sediment

Station Characteristics | Establishment Details | Series Characteristics | Data Availability | FF/WaterQuality/AWS Details

General Details

Station Name	Ukai Dam	
Station Code	01 02 17 016	
Operational Status	Existing	
Activity	HO/FF	
Station Type (Current)	G	
Tehsil/Taluk	Songadh	
District	Surat	
State	Gujarat	
Latitude (DMS)	21°14'53"	N
Longitude (DMS)	73°35'22"	E
Altitude (m)	47.85	
Distance to Outlet (km)	0	
Topo Sheet No.	46G11	
Catchment Area (sq km)	62225.00	

Basin Details

Basin	Tapi
Independent River	Tapi
Tributary	--
Sub Tributary	--
Sub Sub Tributary	--
Local River	Tapi

Jurisdication Details

Owner Agency	CWC
State/Regional Office	N & T BO, Gandhinagar
Circle Office	S.E. (C), Gandhinagar
Divisional Office	Tapi Div., Surat
Sub Divisional Office	LTSD, Surat
Section Office	Ukai
Nearest Airport	Vadodara (180 Km.)
Town	Surat (100Km.)
Railway Station	Songadh (15 Km.)
Bus Stand	Ukai

Nearest GTS B.M	--
Musto Type B.M	--
Musto Type B.M Value(m)	--
Type of Bed	--
River Width(m)	--
Type of River	--
Station Bank	--
Method of Discharge Obs.	--
Zero of Gauge(m)	--
U/S GaugeLine Dist.(m)	--
D/S GaugeLine Dist.(m)	--
River Origin Location	--
Station History	--
Location Details	--
Accessibility	--
Station Setup	--
Address	--
Other Information	--

Figure 34: Ukai Dam GD site- General, basin and jurisdiction details

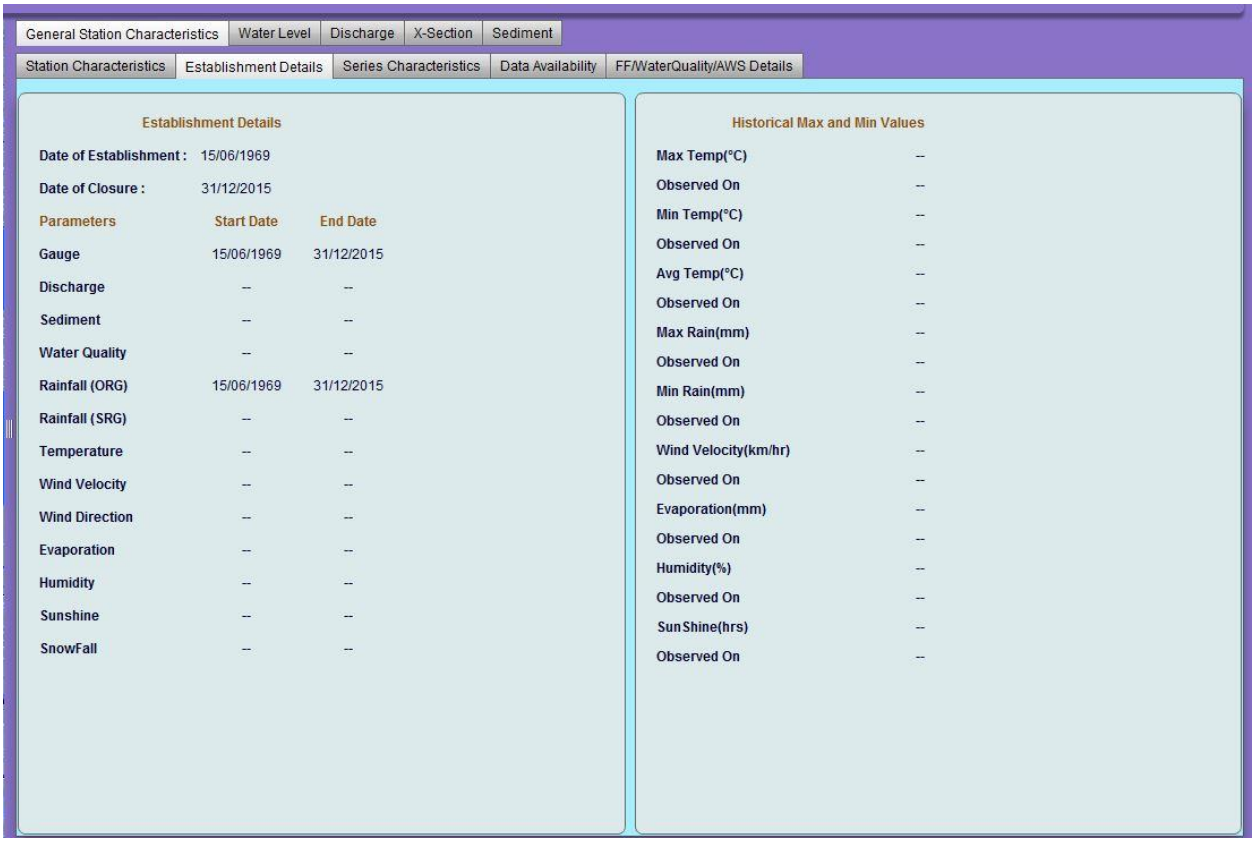


Figure 35: Ukai Dam GD site- Establishment details

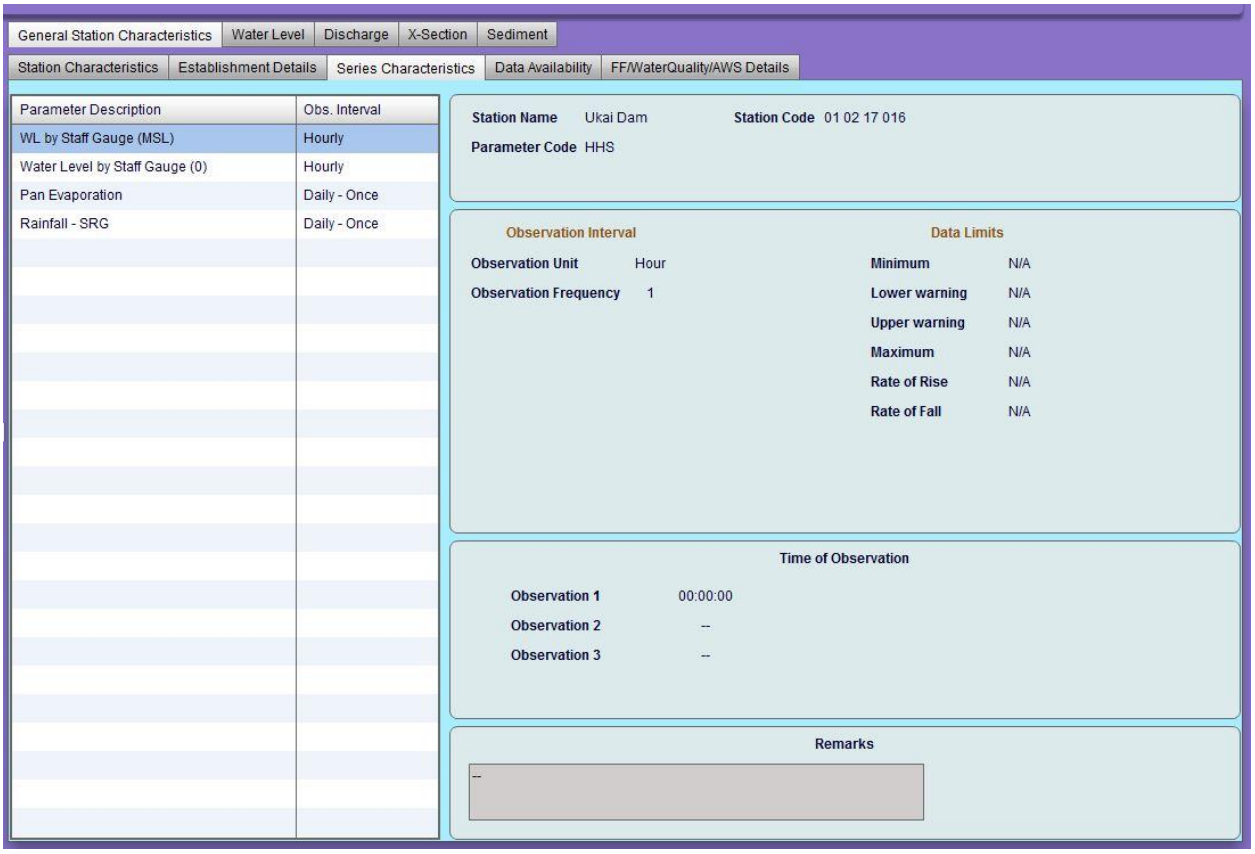


Figure 36: Ukai Dam G.D. Site- series characteristics

General Station Characteristics | Water Level | Discharge | X-Section | Sediment

Station Characteristics | Establishment Details | Series Characteristics | Data Availability | FF/WaterQuality/AWS Details

Parameters	From	To
Water Level	02/07/1969	14/10/2011
Discharge	Not Available	
Sediment	Not Available	
Water Quality	Not Available	
Rainfall	Not Available	
Temperature	Not Available	
Climatic	Not Available	

Figure 37: Ukai Dam G.D. site: Data availability

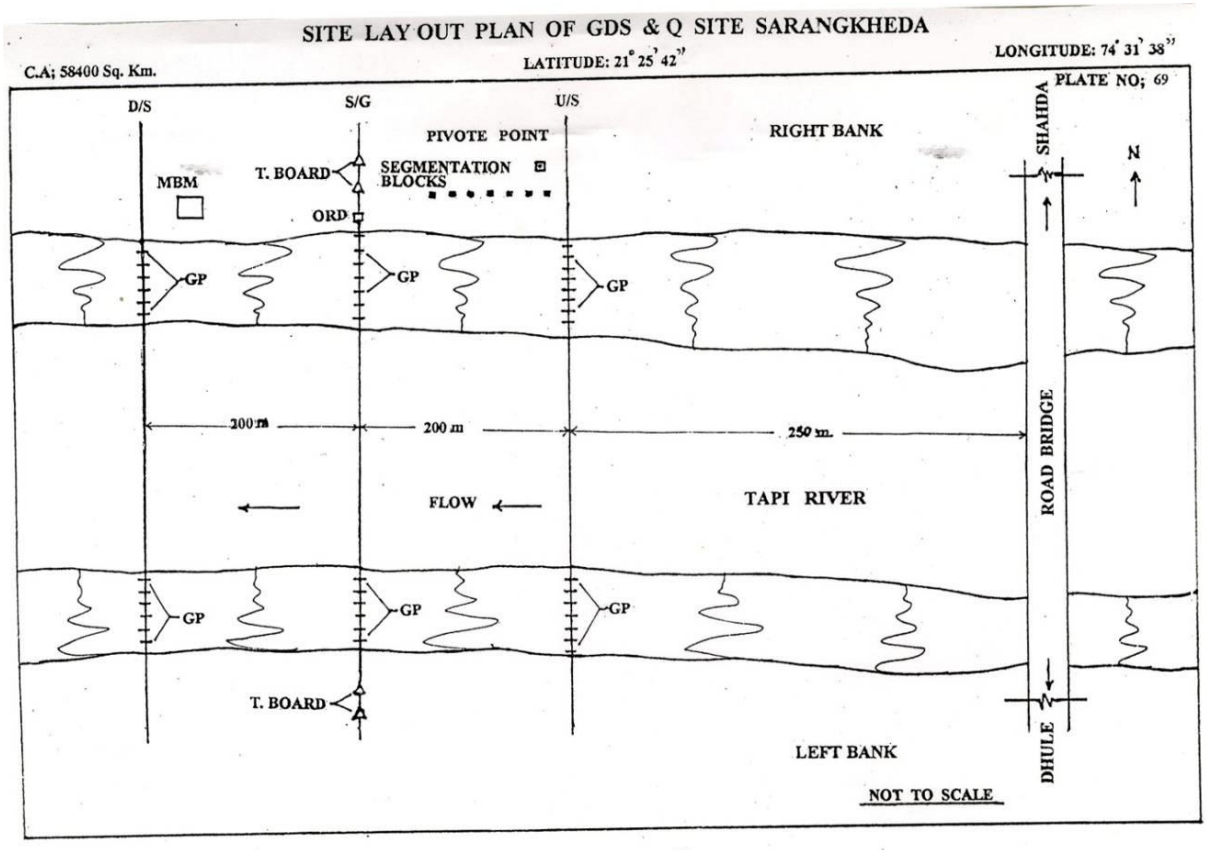


Figure 38: Figure 15: Site Layout Plan of Sarangkheda Gauge Site

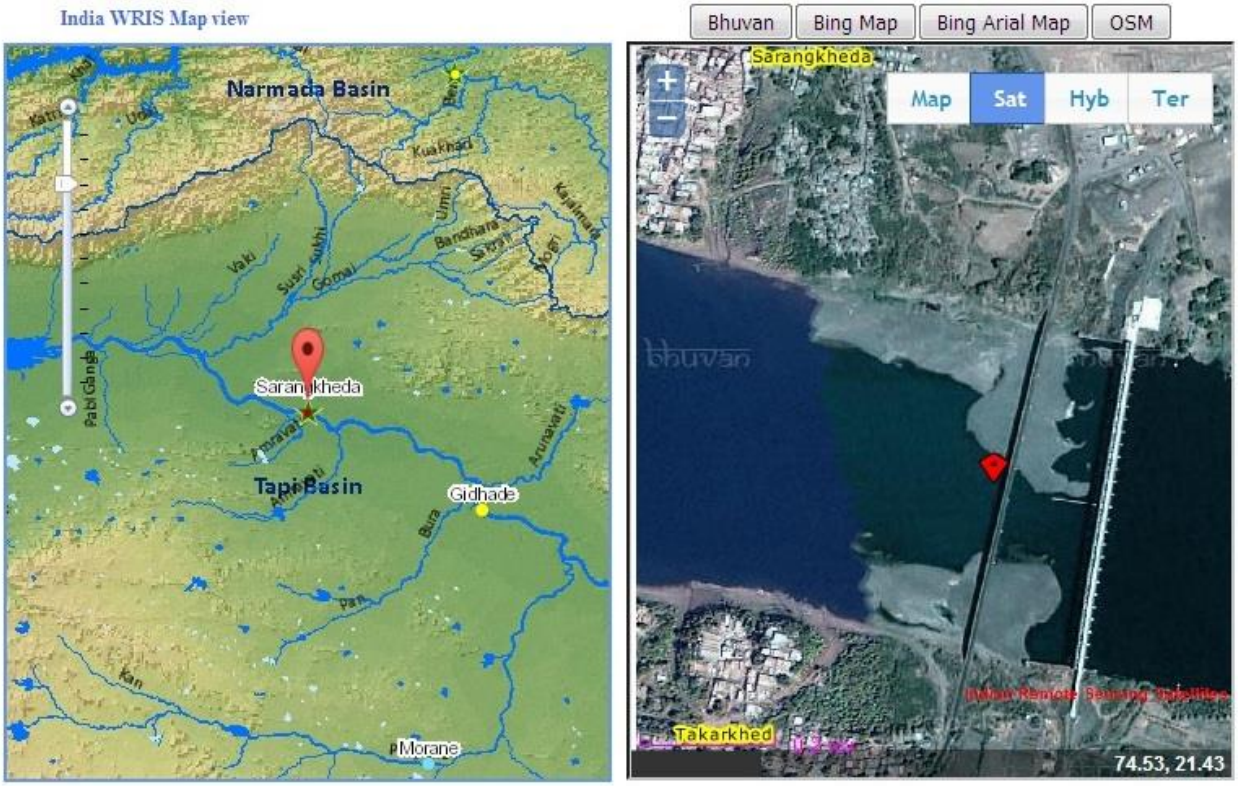


Figure 39: Site Layout Plan and Location map of Sarangkheda Gauge Site

General Station Characteristics | Water Level | Discharge | X-Section | Sediment

Station Characteristics | Establishment Details | Series Characteristics | Data Availability | FF/WaterQuality/AWS Details

General Details

Station Name	Sarangkheda	
Station Code	01 02 17 015	
Operational Status	Existing	
Activity	HO	
Station Type (Current)	GDSQ	
Tehsil/Taluk	Shahade	
District	Nandurbar	
State	Maharashtra	
Latitude (DMS)	21°25'37"	N
Longitude (DMS)	74°31'49"	E
Altitude (m)	108.00	
Distance to Outlet (km)	--	
Topo Sheet No.	--	
Catchment Area (sq km)	58400.00	

Basin Details

Basin	Tapi
Independent River	Tapi
Tributary	--
Sub Tributary	--
Sub Sub Tributary	--
Local River	Tapi

Jurisdication Details

Owner Agency	CWC
State/Regional Office	N & T BO, Gandhinagar
Circle Office	S.E., Vadodara
Divisional Office	Surat
Sub Divisional Office	MTSD, Dhule
Section Office	Sarangkheda
Nearest Airport	INDORE
Town	SHAHADA
Railway Station	DONDAICHA
Bus Stand	SARANGKHEDA

Nearest GTS B.M	--
Musto Type B.M	--
Musto Type B.M Value(m)	--
Type of Bed	--
River Width(m)	--
Type of River	--
Station Bank	Right
Method of Discharge Obs.	--
Zero of Gauge(m)	--
U/S GaugeLine Dist.(m)	--
D/S GaugeLine Dist.(m)	--
River Origin Location	--
Station History	--
Location Details	--
Accessibility	--
Station Setup	--
Address	--
Other Information	--

Figure 40: Sarangkheda GD site- General, basin and jurisdiction details

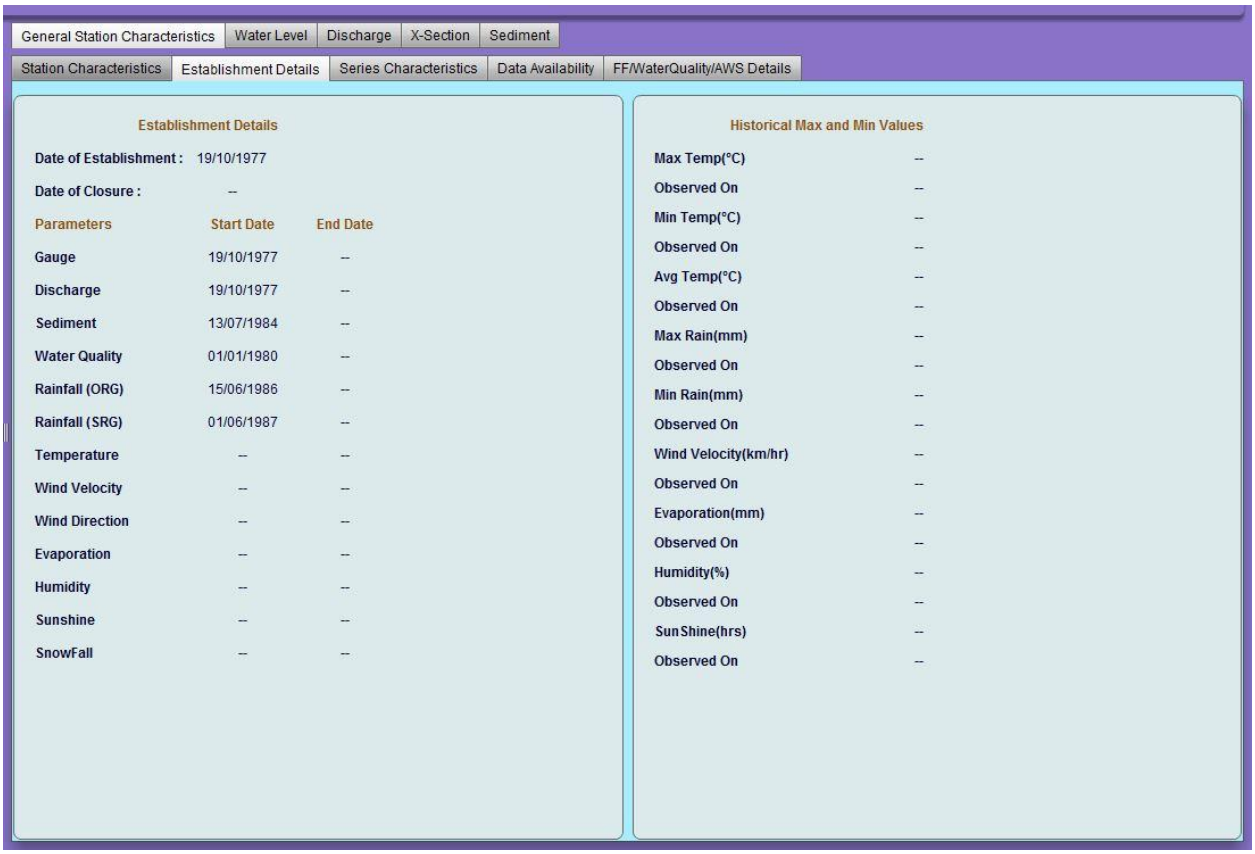


Figure 41: Sarangkheda GD site- Establishment details

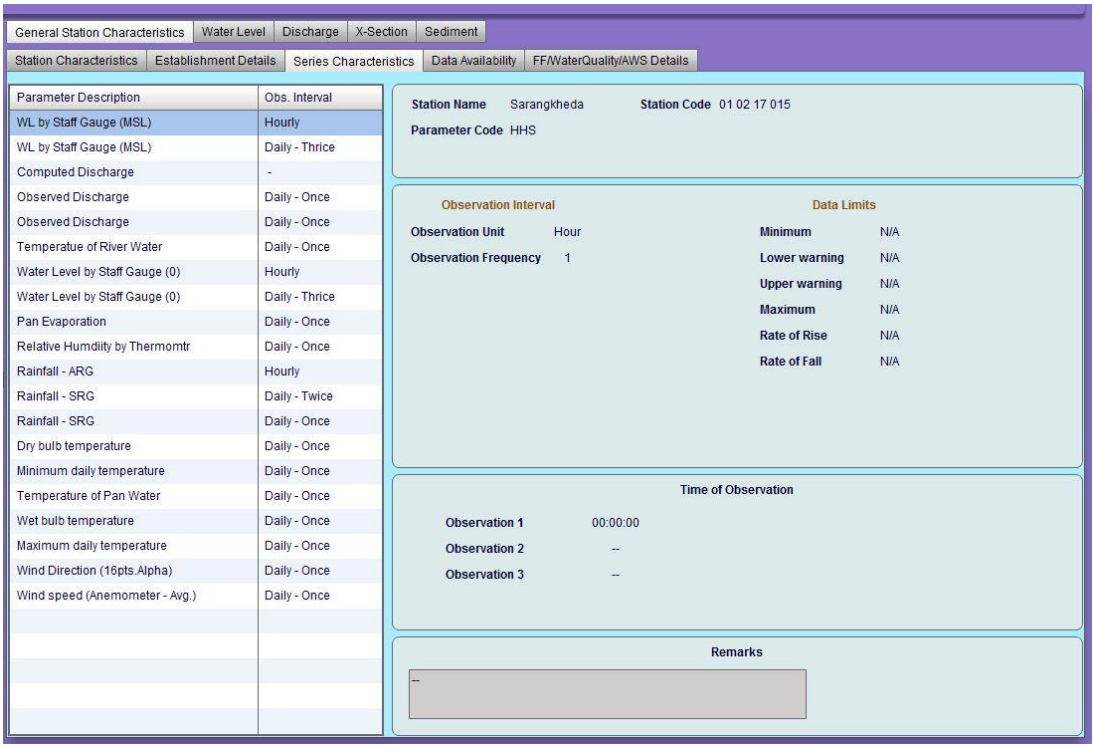


Figure 42: Sarangkheda G.D. Site- series characteristics

General Station Characteristics | Water Level | Discharge | X-Section | Sediment

Station Characteristics | Establishment Details | Series Characteristics | Data Availability | FF/WaterQuality/AWS Details

Parameters	From	To
Water Level	19/10/1977	31/05/2013
Discharge	01/06/1974	31/05/2013
Sediment	01/06/1984	31/05/2013
Water Quality	01/07/2003	01/05/2013
Rainfall	Not Available	
Temperature	Not Available	
Climatic	Not Available	

Figure 43: Sarangkheda G.D. site: Data availability

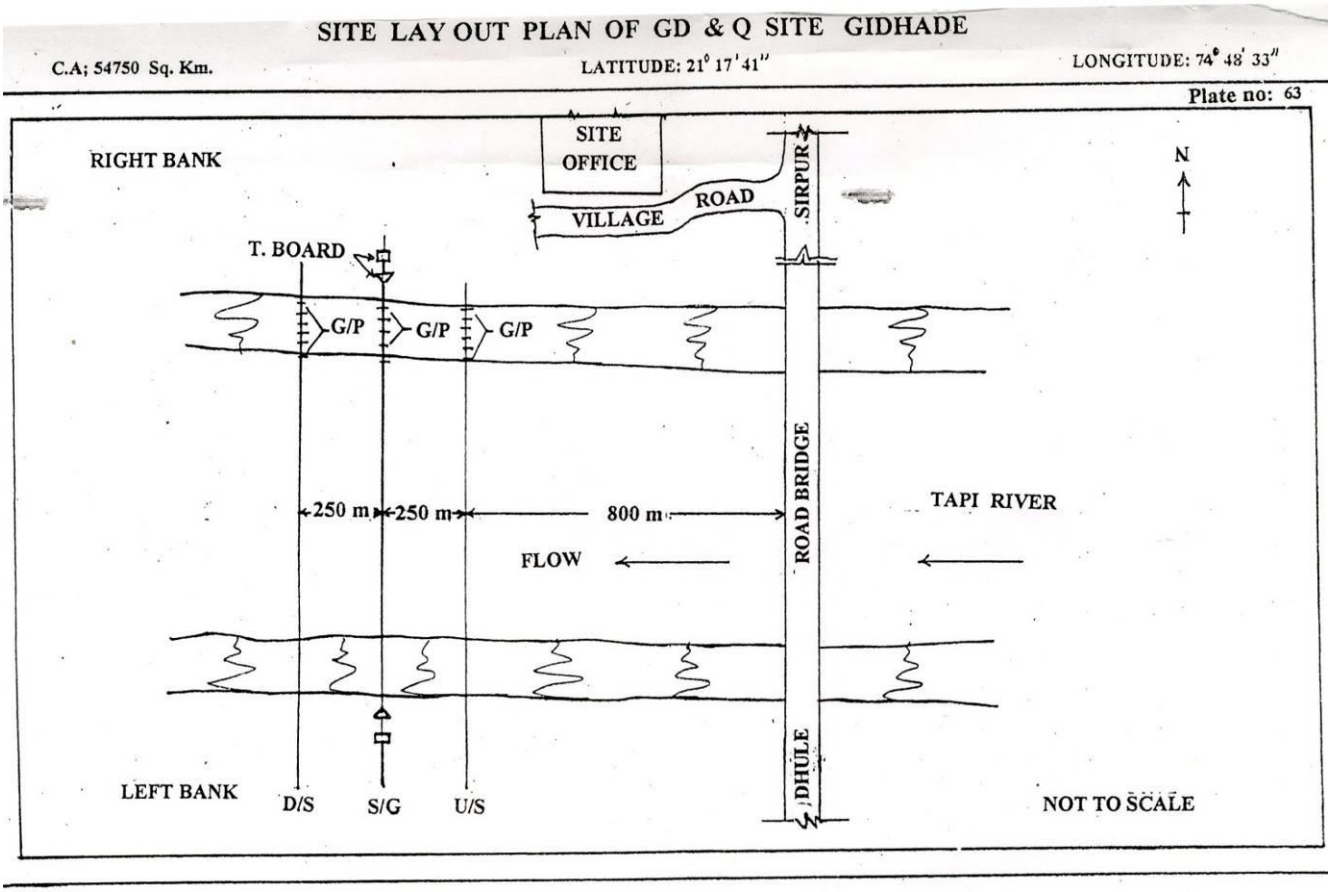


Figure 44: Site layout Gidhade

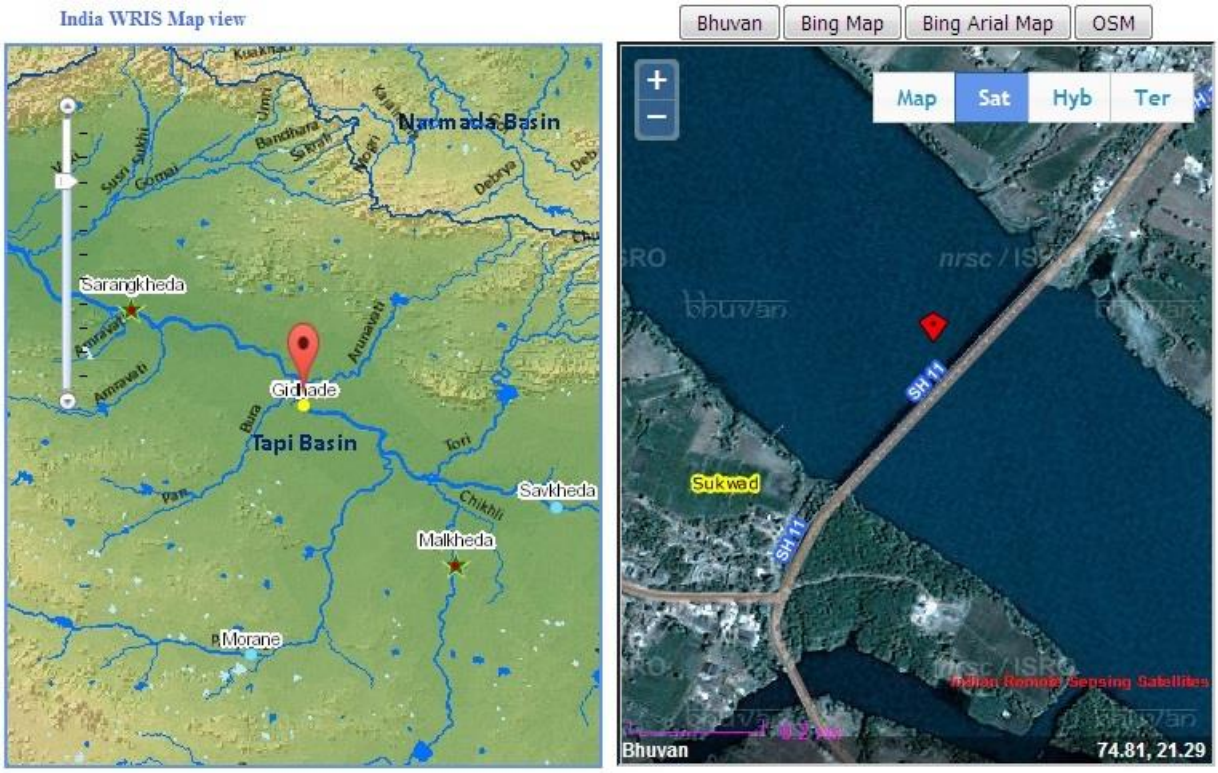


Figure 45: Site Layout Plan and Location map of Gidhade Gauge Site

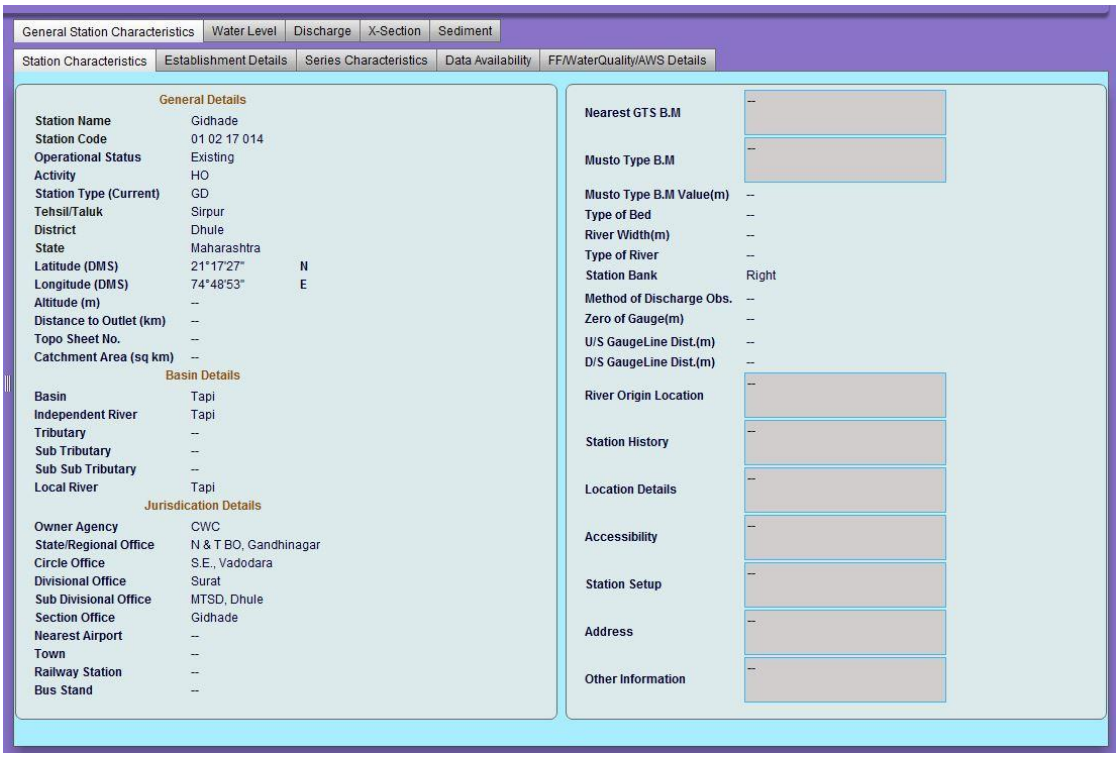


Figure 46: Gidhade GD site- General, basin and jurisdiction details

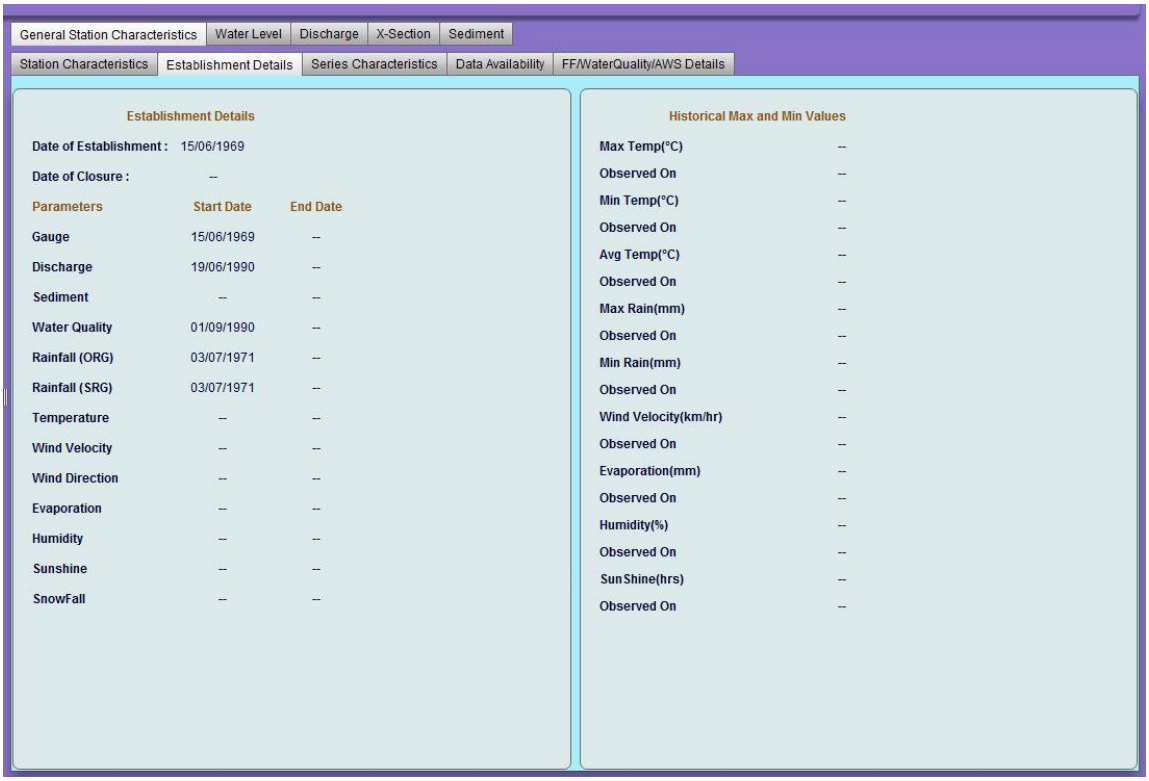


Figure 47: Gidhade GD site- Establishment details

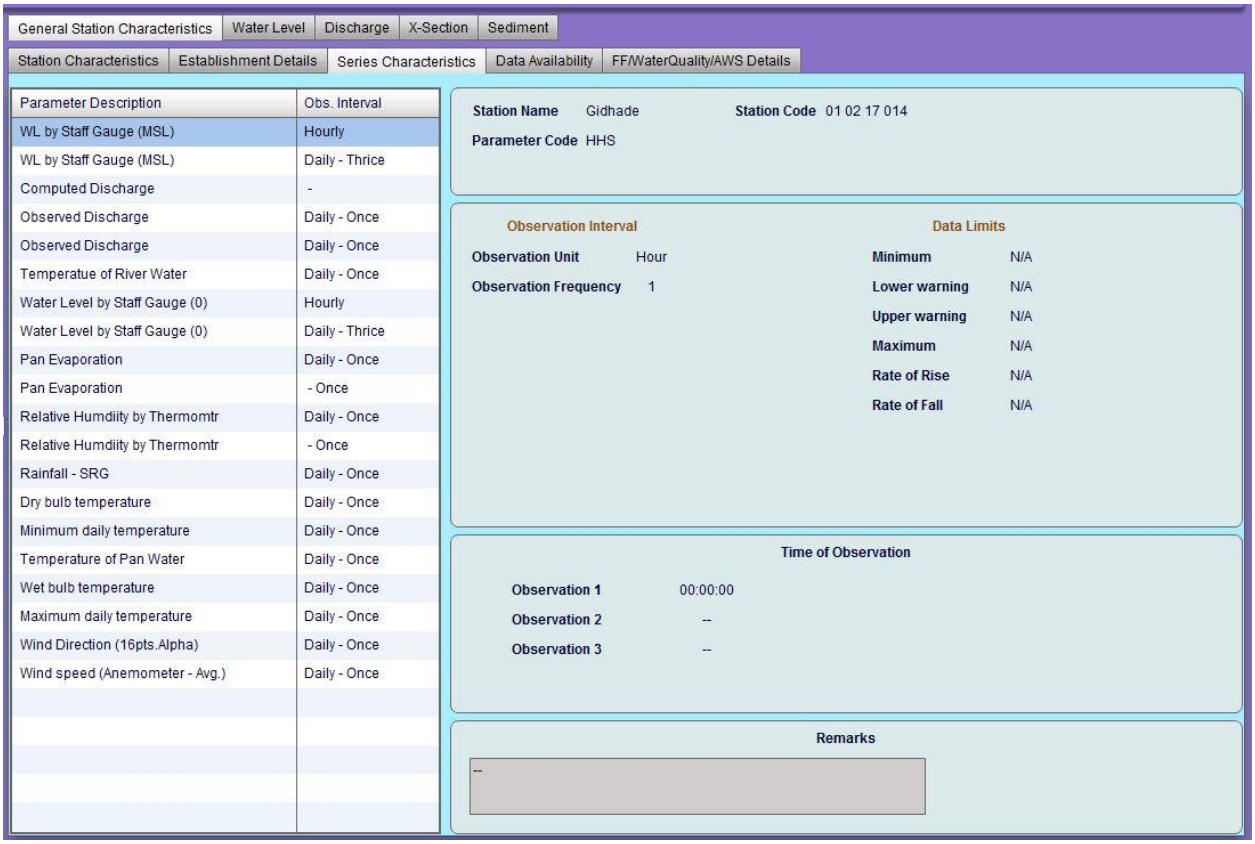


Figure 48: Gidhade G.D. Site- series characteristics

General Station Characteristics | Water Level | Discharge | X-Section | Sediment

Station Characteristics | Establishment Details | Series Characteristics | Data Availability | FF/WaterQuality/AWS Details

Parameters	From	To
Water Level	05/07/1970	31/05/2012
Discharge	01/06/1973	31/05/2012
Sediment	Not Available	
Water Quality	Not Available	
Rainfall	Not Available	
Temperature	Not Available	
Climatic	Not Available	

Figure 49: Gidhade G.D. site: Data availability

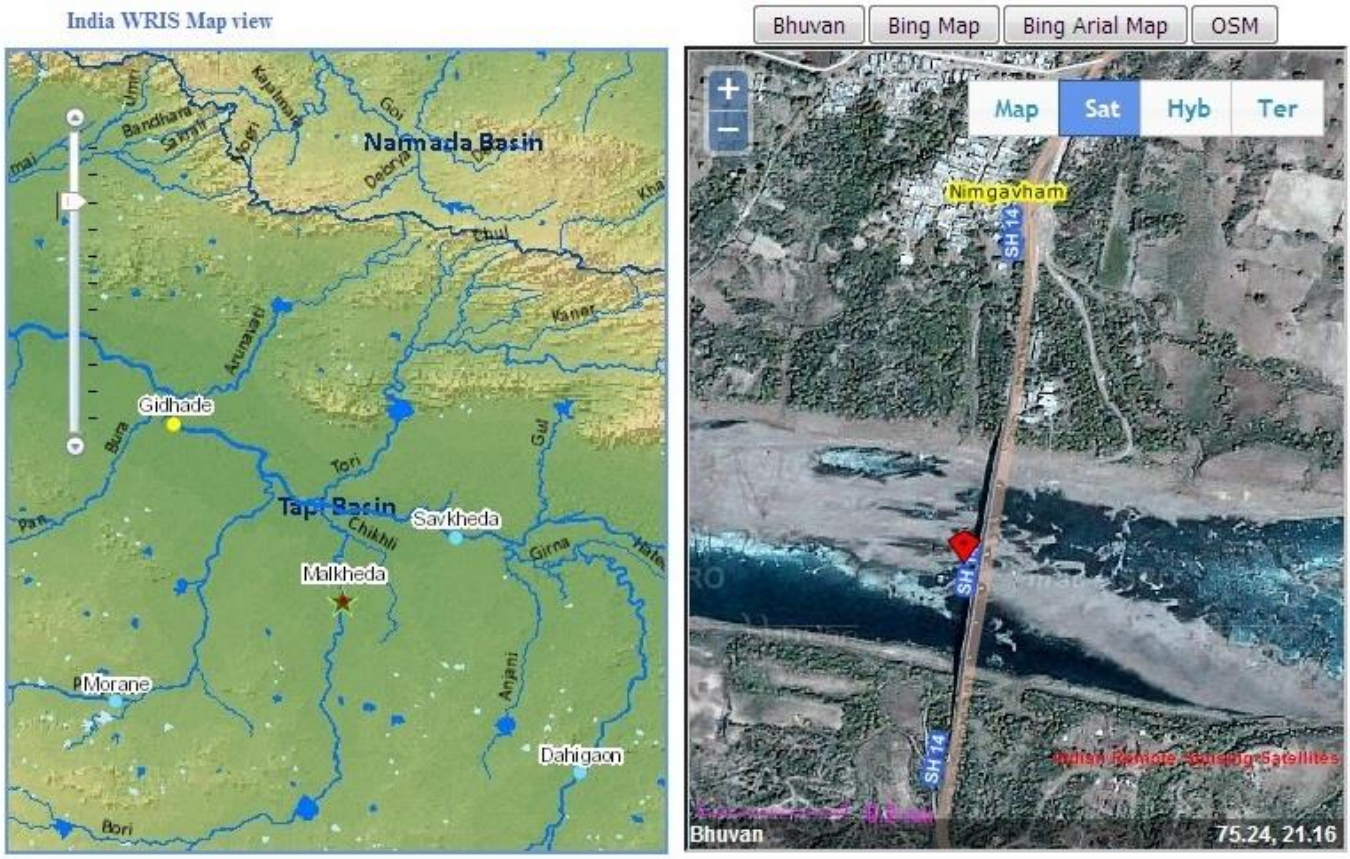


Figure 50: Site Layout Plan and Location map of Savkheda Gauge Site

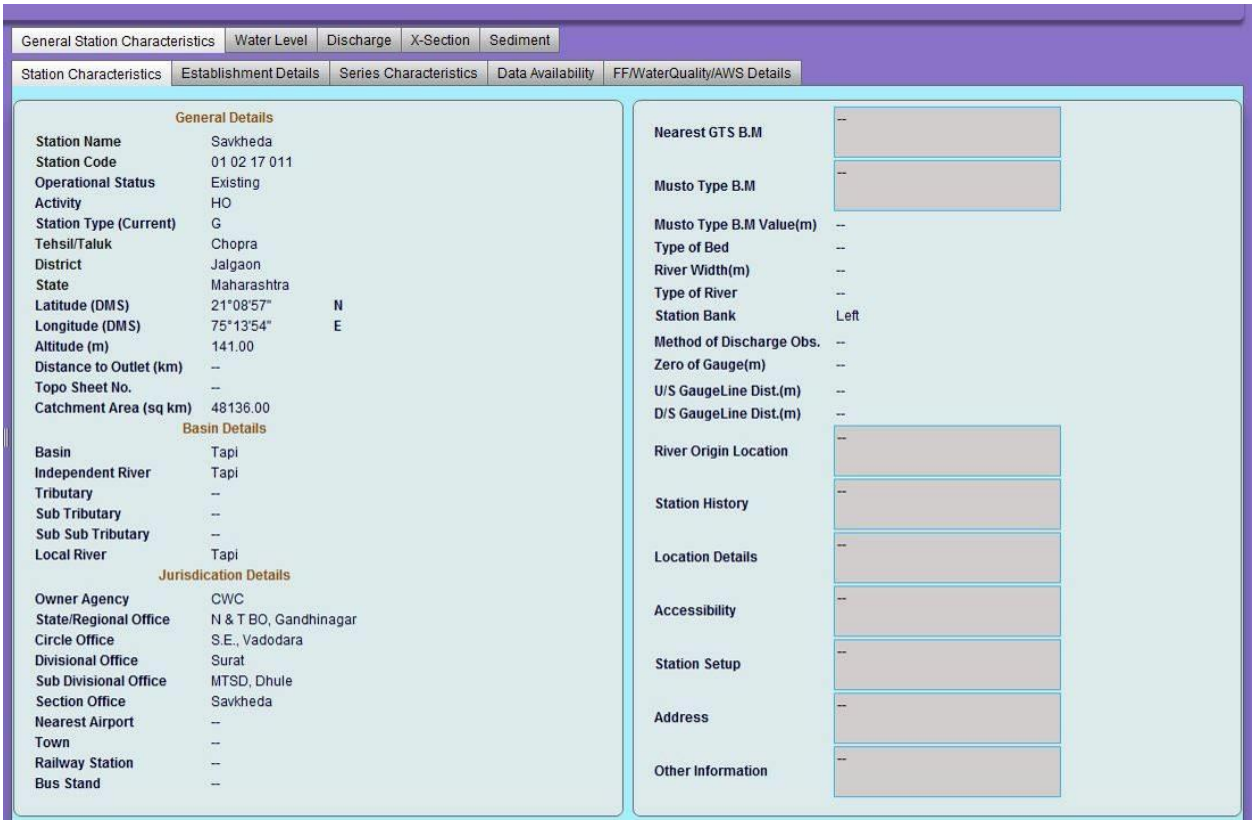


Figure 51: Savkheda GD site- General, basin and jurisdiction details

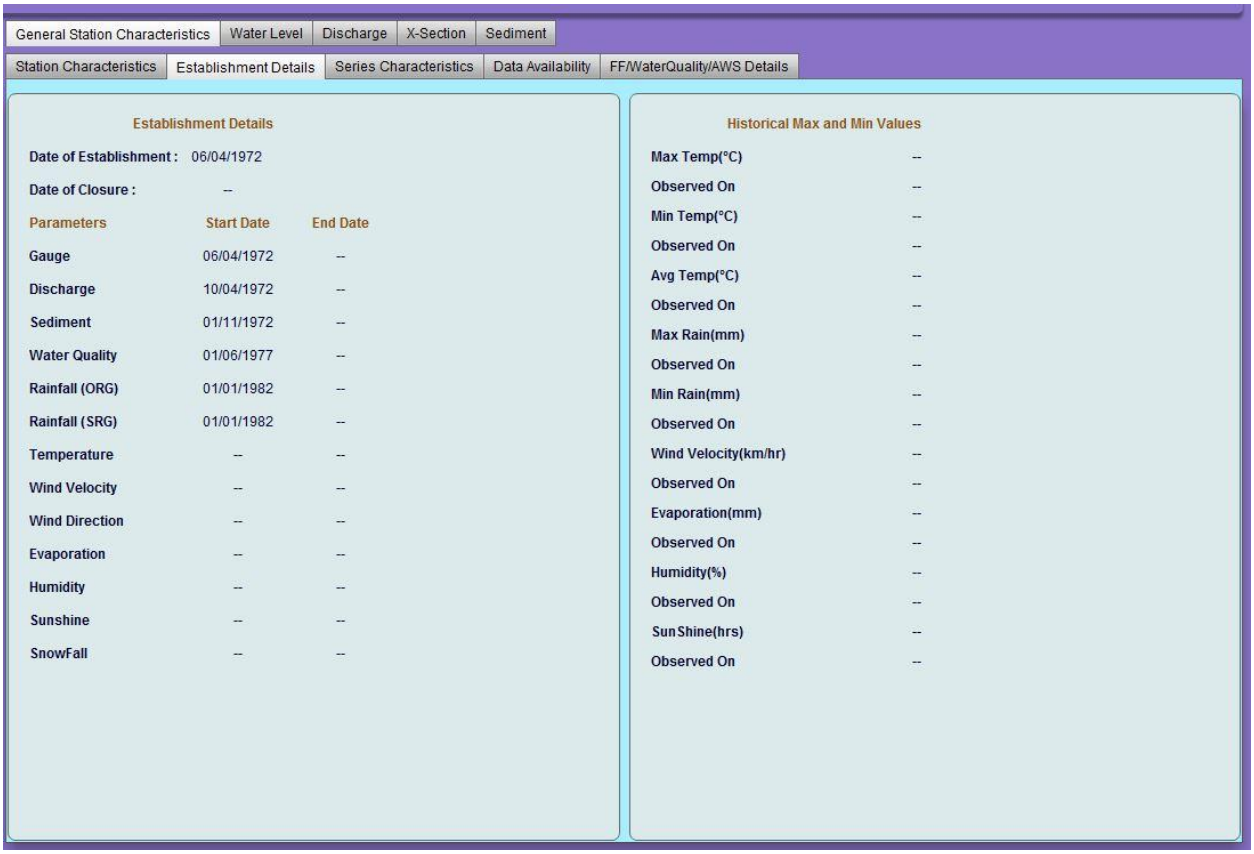


Figure 52: Savkheda GD site- Establishment details

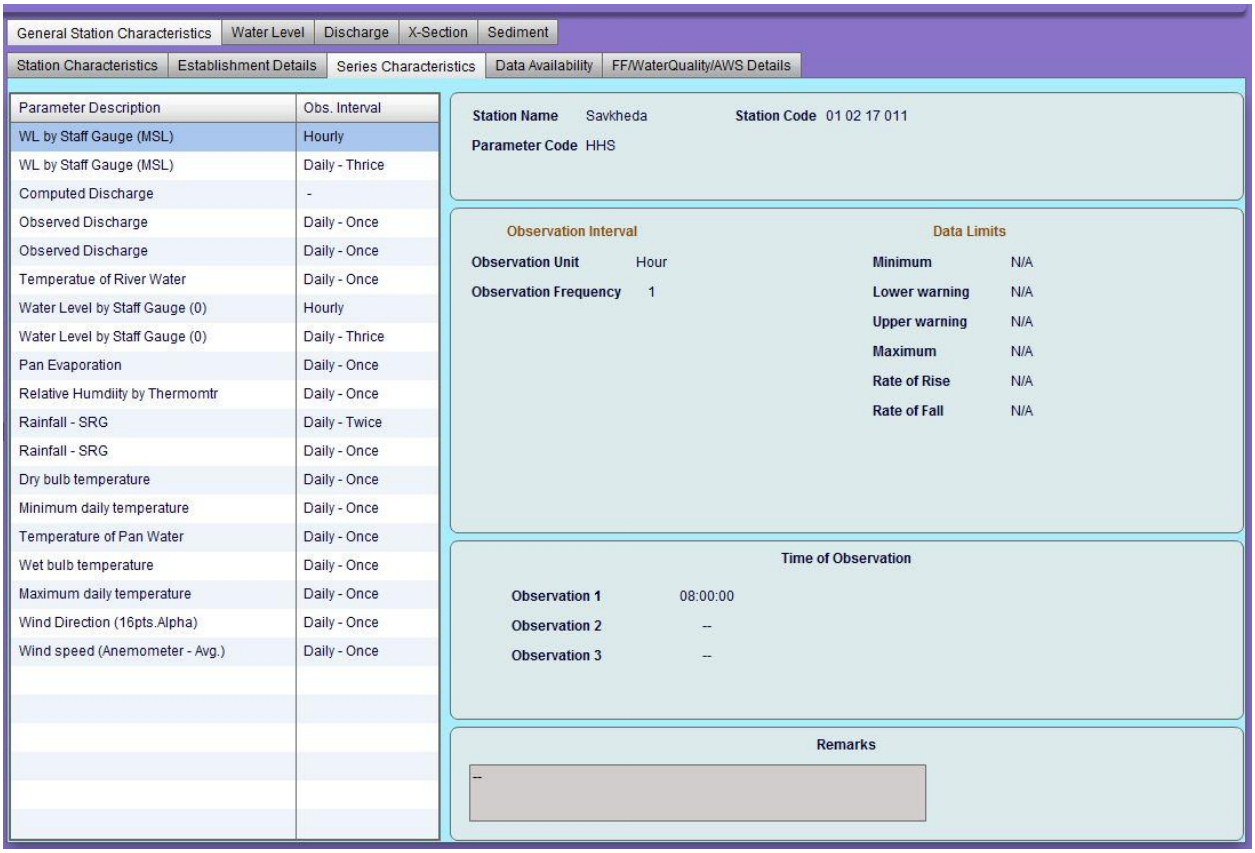


Figure 53: Savkheda G.D. Site- series characteristics

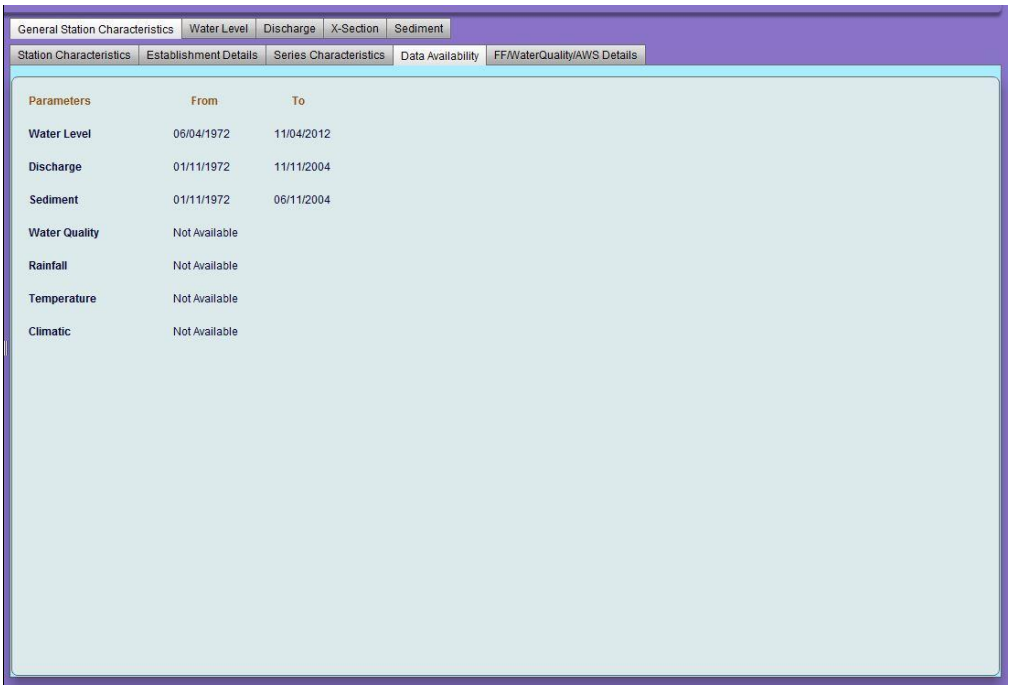


Figure 54: Savkheda G.D. site: Data availability

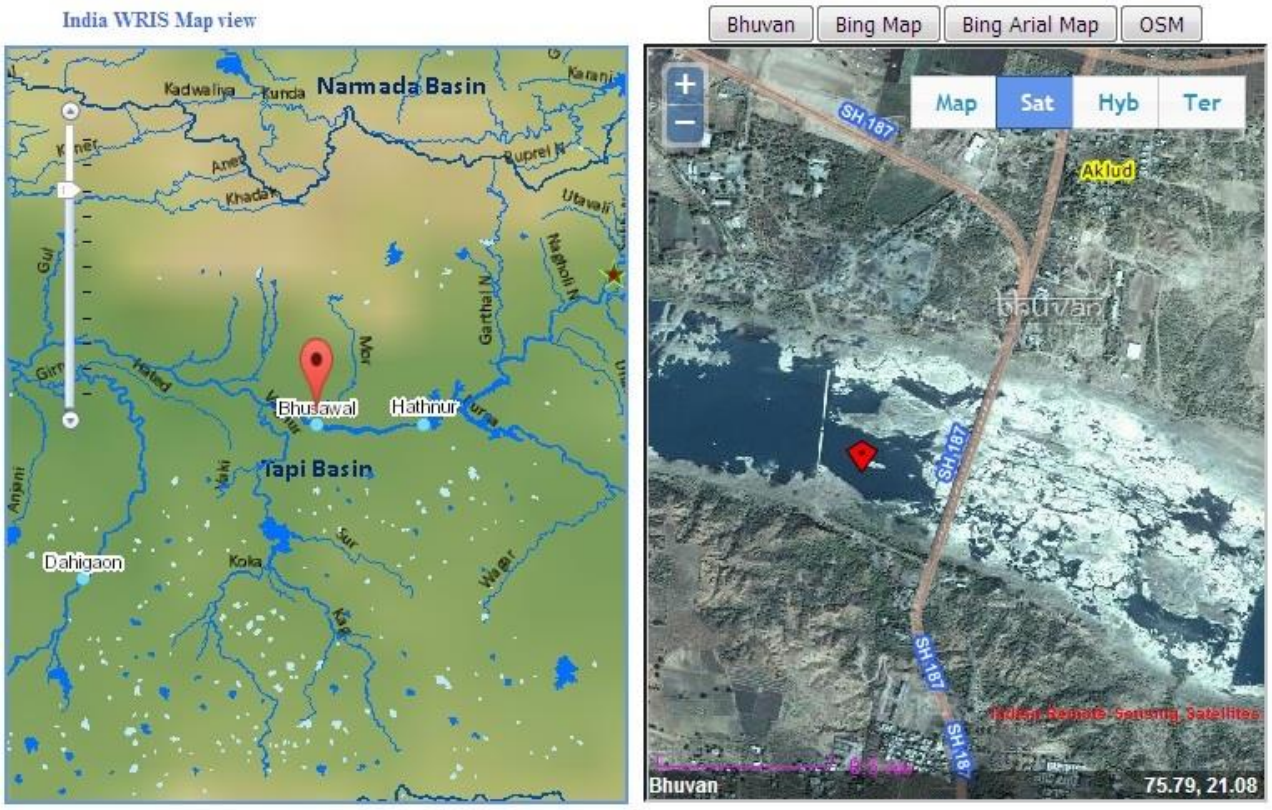


Figure 55: Location map of Bhusawal Gauge Site

General Station Characteristics | Water Level | Discharge | X-Section | Sediment

Station Characteristics | Establishment Details | Series Characteristics | Data Availability | FF/WaterQuality/AWS Details

General Details

Station Name	Bhusawal	
Station Code	01 02 17 007	
Operational Status	Existing	
Activity	HO	
Station Type (Current)	G	
Tehsil/Taluk	Bhusawal	
District	Jalgaon	
State	Maharashtra	
Latitude (DMS)	21°04'04"	N
Longitude (DMS)	75°46'49"	E
Altitude (m)	185.00	
Distance to Outlet (km)	418	
Topo Sheet No.	46O16	
Catchment Area (sq km)	32478.00	

Basin Details

Basin	Tapi
Independent River	Tapi
Tributary	--
Sub Tributary	--
Sub Sub Tributary	--
Local River	Tapi

Jurisdication Details

Owner Agency	CWC
State/Regional Office	N & T BO, Gandhinagar
Circle Office	S.E., Vadodara
Divisional Office	Surat
Sub Divisional Office	Bhusawal
Section Office	Bhusawal
Nearest Airport	Aurangabad
Town	Bhusawal
Railway Station	Bhuswal
Bus Stand	Bhusawal

Nearest GTS B.M	--
Musto Type B.M	--
Musto Type B.M Value(m)	--
Type of Bed	--
River Width(m)	--
Type of River	--
Station Bank	Left
Method of Discharge Obs.	--
Zero of Gauge(m)	--
U/S GaugeLine Dist.(m)	--
D/S GaugeLine Dist.(m)	--
River Origin Location	--
Station History	--
Location Details	--
Accessibility	--
Station Setup	--
Address	--
Other Information	--

Figure 56: Bhusawal GD site- General, basin and jurisdiction details

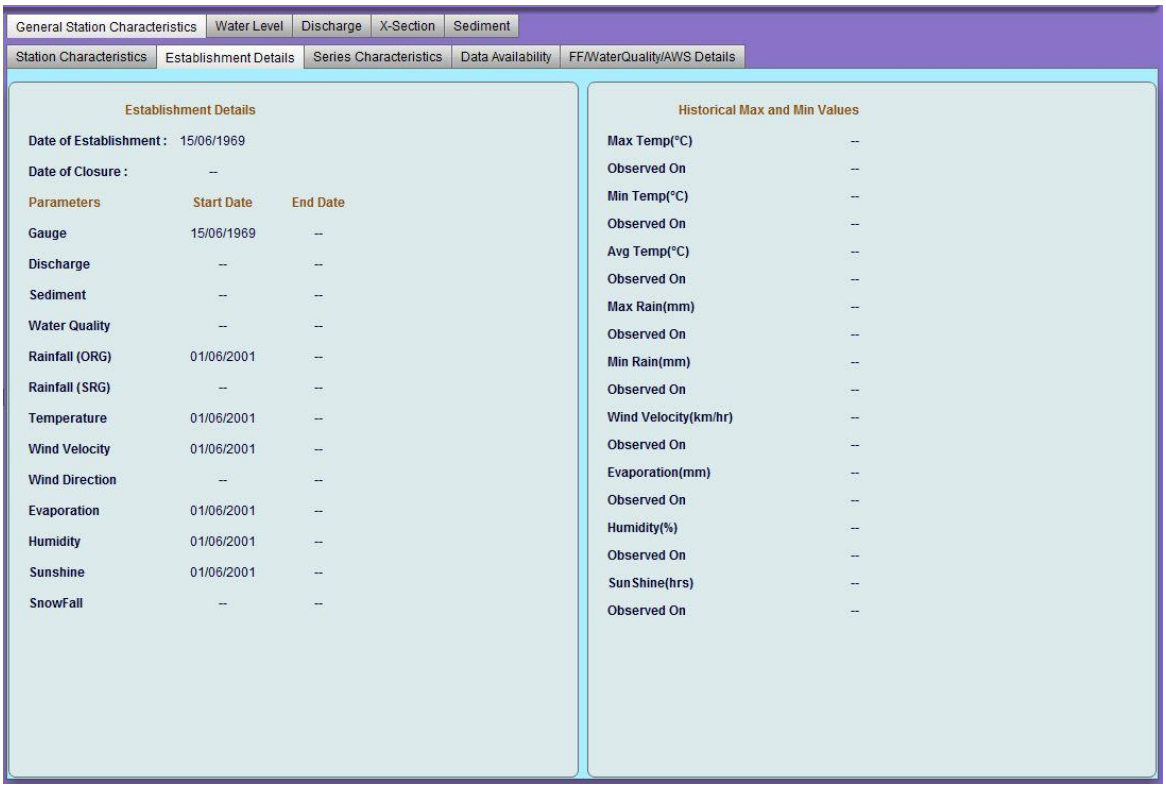


Figure 57: Bhusawal GD site- Establishment details

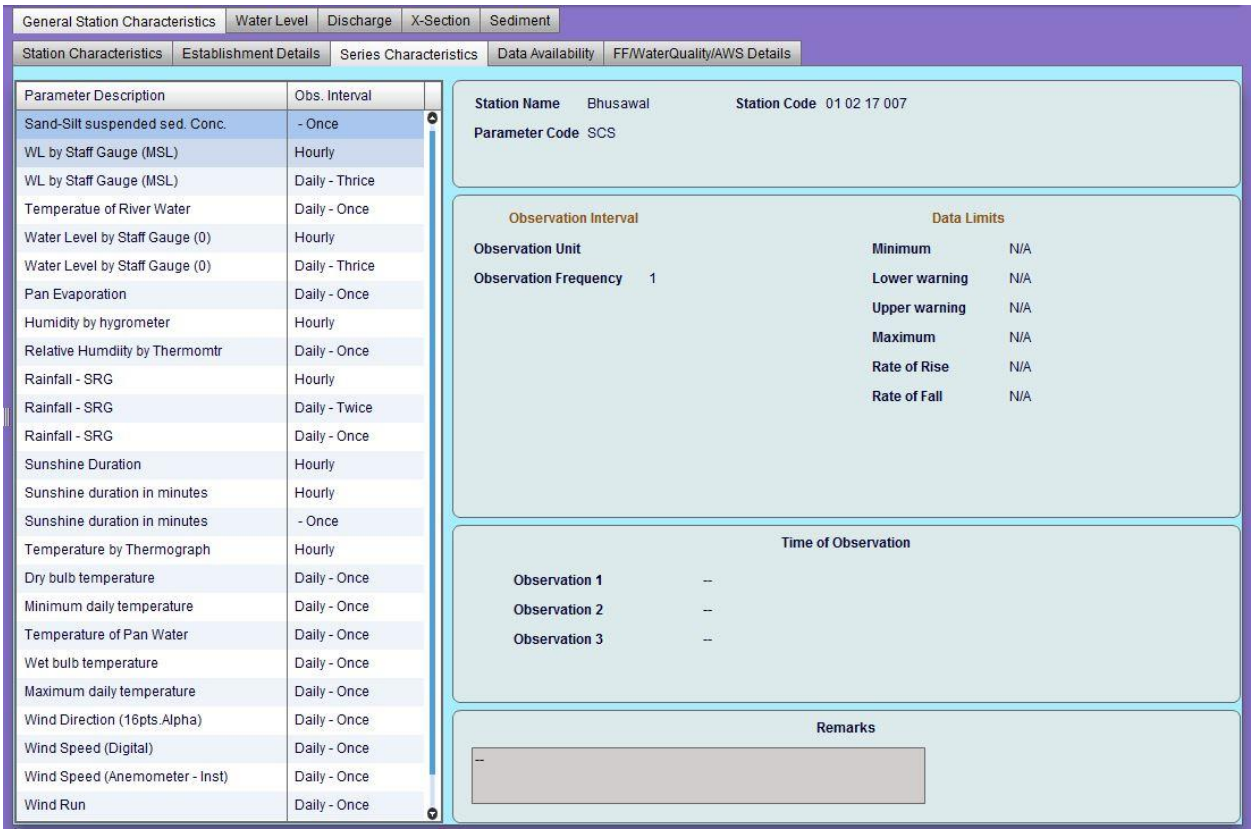


Figure 58: Bhusawal G.D. Site- series characteristics

General Station Characteristics | Water Level | Discharge | X-Section | Sediment

Station Characteristics | Establishment Details | Series Characteristics | Data Availability | FF/WaterQuality/AWS Details

Parameters	From	To
Water Level	05/07/1969	31/05/2012
Discharge	Not Available	
Sediment	Not Available	
Water Quality	Not Available	
Rainfall	Not Available	
Temperature	Not Available	
Climatic	Not Available	

Figure 59: Bhusawal G.D. site: Data availability

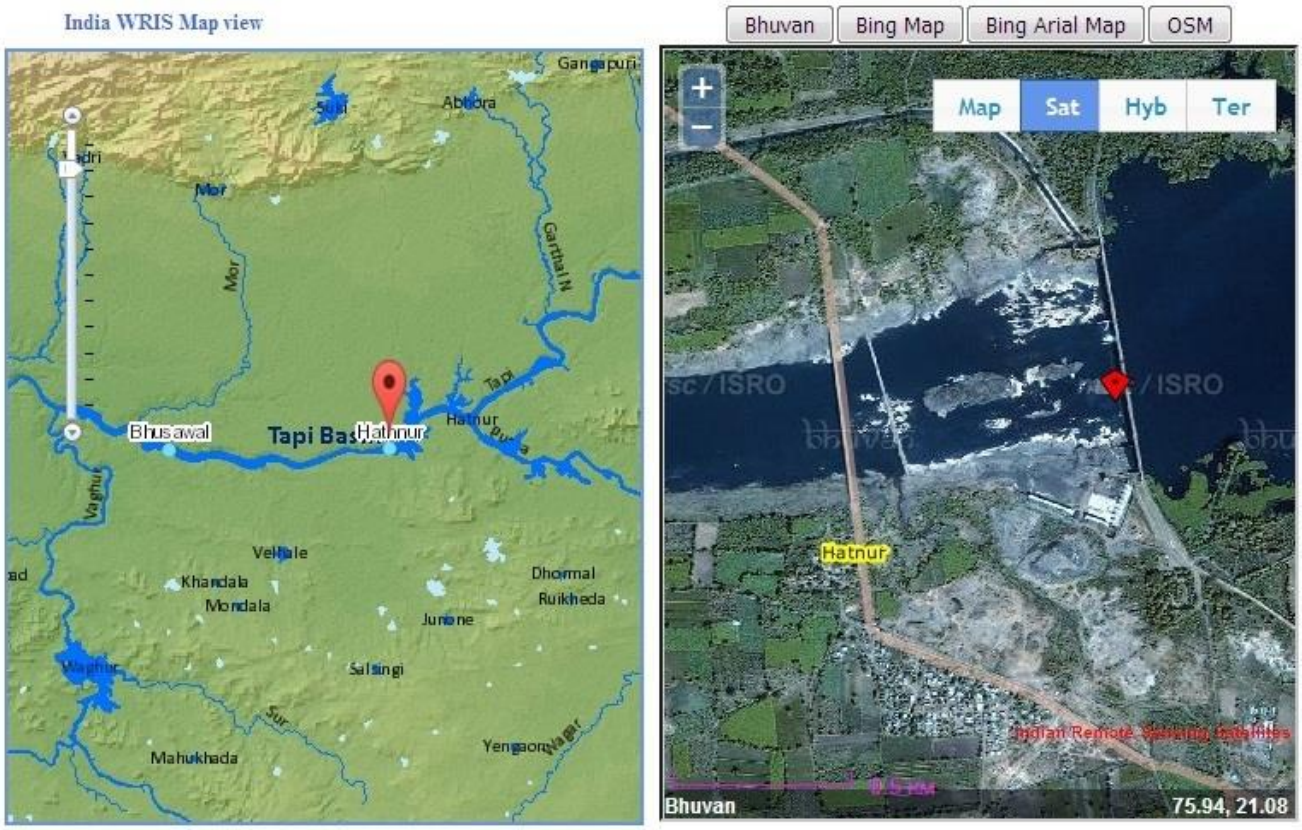


Figure 60: Location map of Hatnur Gauge Site

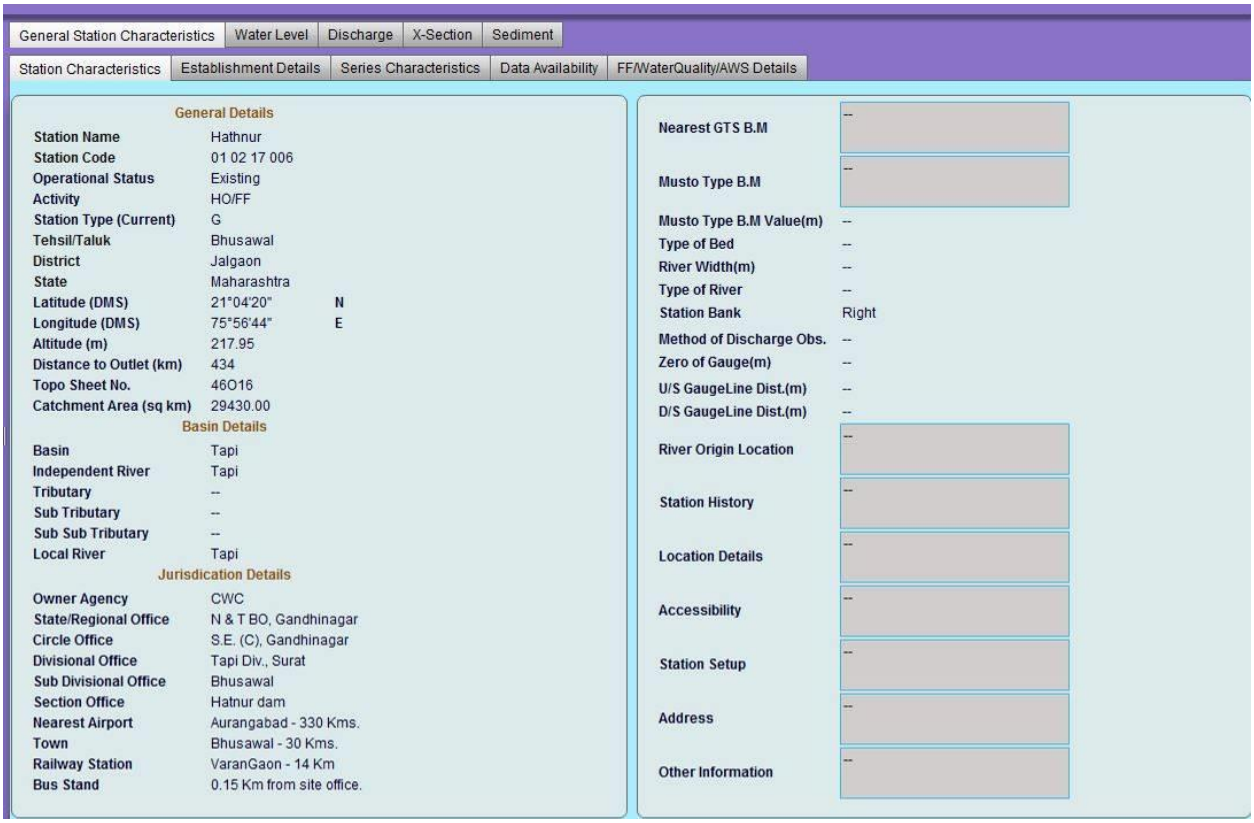


Figure 61: Hathnur GD site- General, basin and jurisdiction details

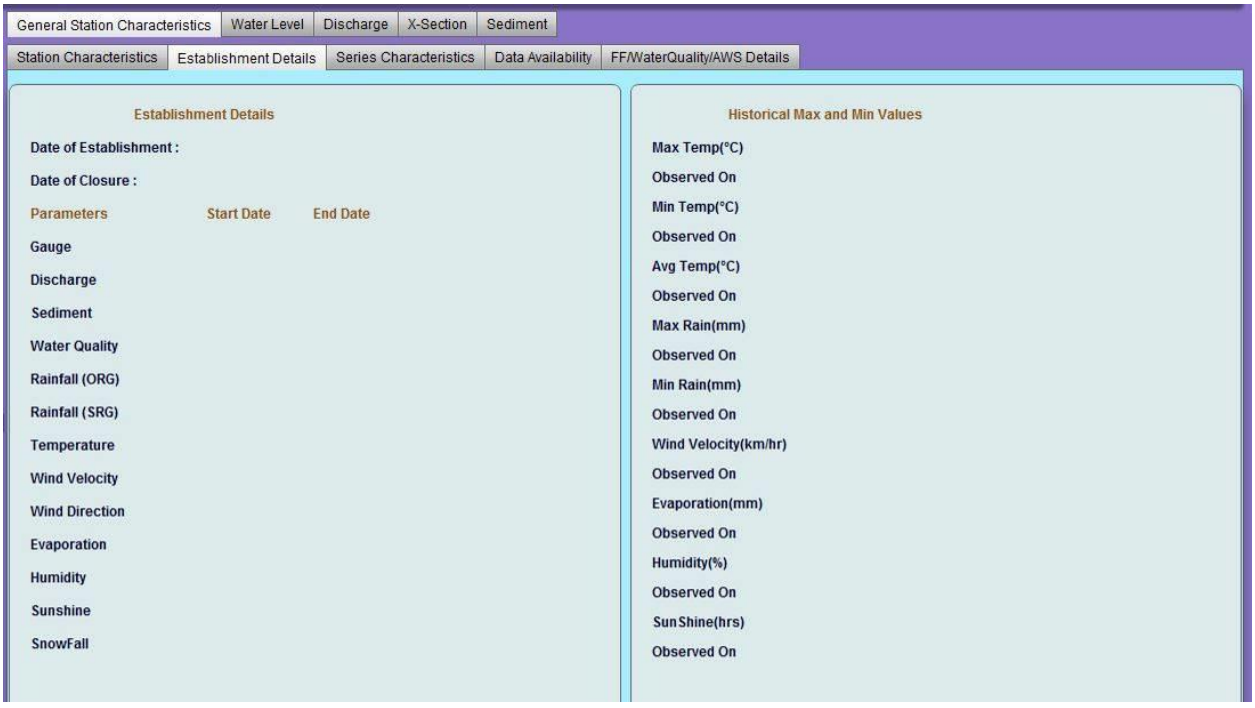


Figure 62: Hathnur GD site- Establishment details

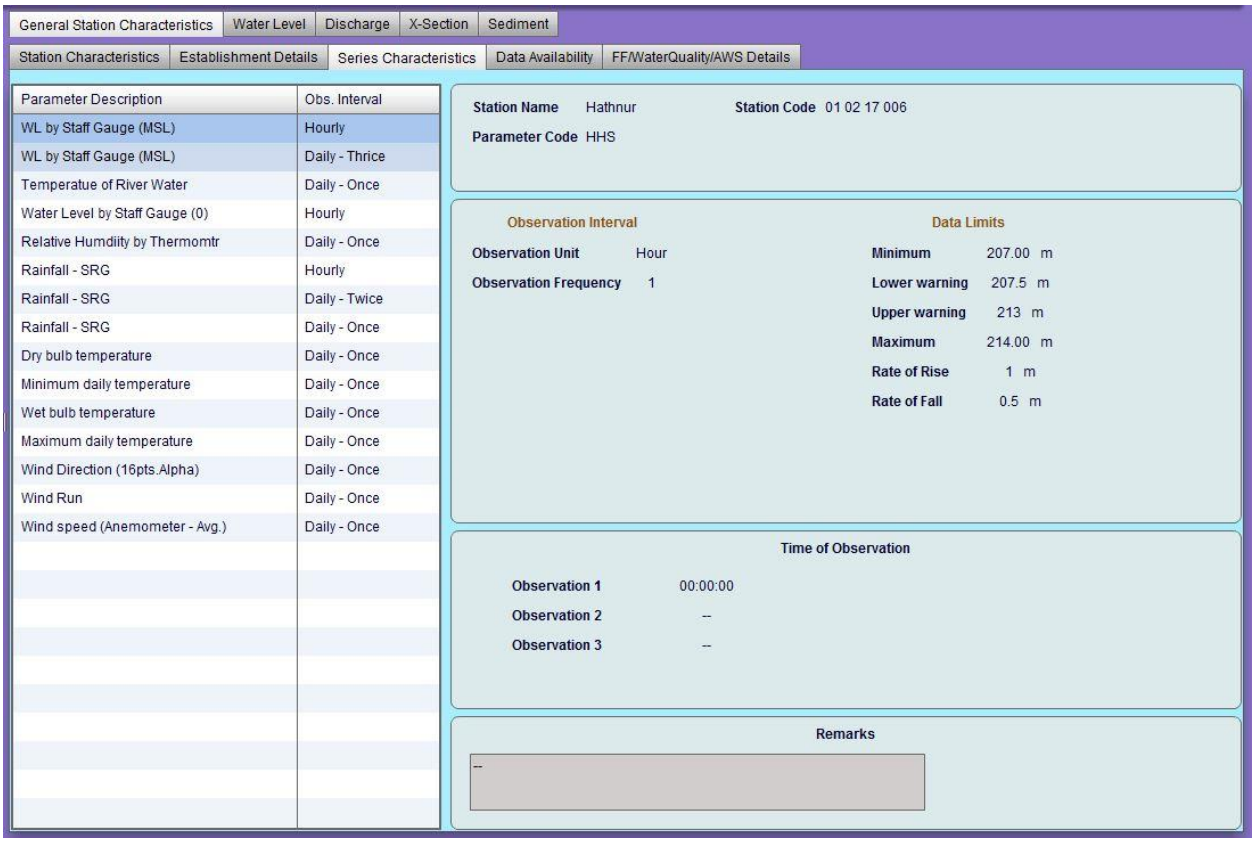


Figure 63: Hathnur G.D. Site- series characteristics

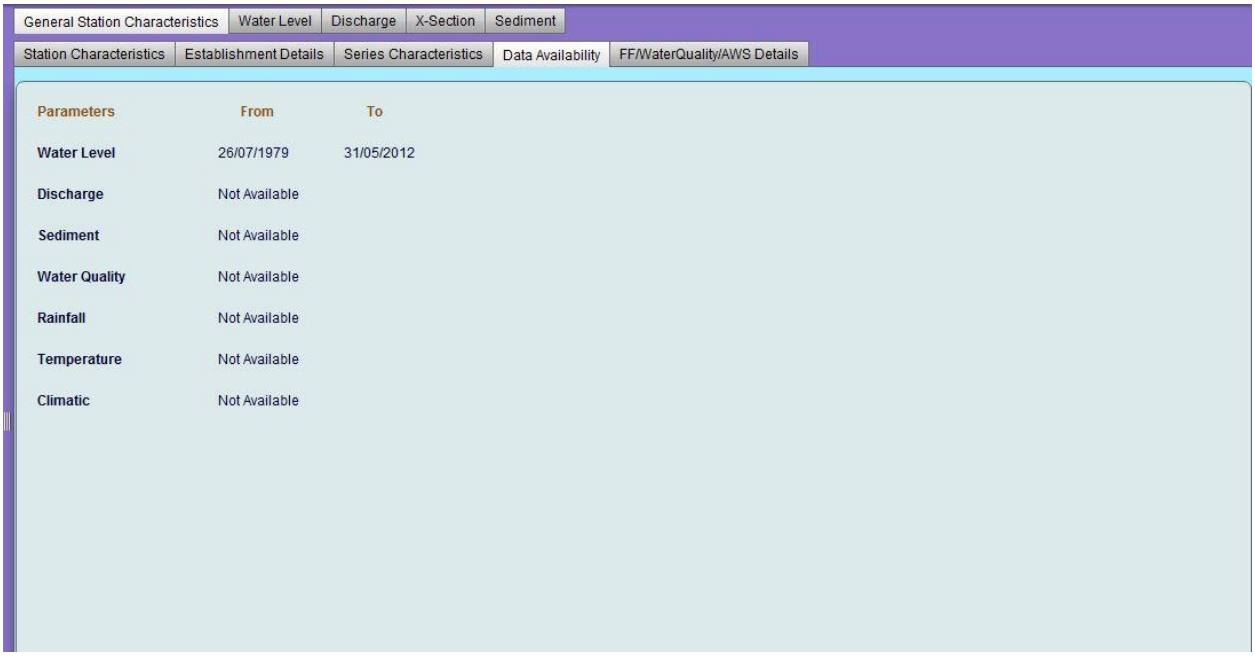


Figure 64: Hathnur G.D. site: Data availability

4.12 Methodology for analysis of Gauge- Discharge Data

The gauge-discharge data available for number of years for these gauging stations was analyzed in different ways as given below:

10 Daily average discharges

The ten daily average flows in each month for each year were worked out and then the average of average 10 daily flows over the entire period of data were worked out to get idea about availability of 10 daily average discharge during different months of the year. Based on these average 10 daily flows it will be possible to work out available depth of flow for natural or design cross section of river. These data analysis will be helpful for navigation feasibility in given stretch of river. The output from this analysis will also be useful for mathematical model studies(to be carried out in stage II) to predict longitudinal water surface profiles for different discharges along given reach of river and also to design section of navigation channel on river bed.

Maximum / minimum discharges and water levels

The yearly maximum discharge and water level for the entire period of data were extracted and then these data were statistically analysed using Gumbel extreme value distribution to estimate flood discharges for different return periods such as 2,5, 10, 25 ,50 and 100 years. Similarly high flood levels were analysed. The minimum flow and minimum water level data was also analysed. The estimated HFLs and Minimum water levels will be useful for planning navigation as well as for design of terminals for cargo and passenger traffic.

Gauge discharge curves

Using available gauge discharge data G-Q curves were developed for each gauge station. These will be helpful to compute water level for any discharge. Also for calibration and validation of mathematical model (studies required in stage II) this data will be very useful.

Comparison of River Cross Section Data:

The Tapi river cross sections at gauging stations on different sites were not available for different years. For a given gauging station the cross sections for different years including the latest cross section could be superimposed to study changes in river bed levels and shifting of the deep channel if any over the period of data.

Period of availability for range of water depths above CD

For a navigation channel to be feasible it is necessary that adequate discharge is available to maintain required depth/draft for fairly longer duration during the year. The water level data for each gauge station was analysed to find out period of availability for the different range of water depths. Based on past 20 to 30 years of data, average number of days in a year for availability of different range of depths were worked out. These data will be very useful to estimate number of days for which minimum depth required to facilitate navigation will be available in different rivers.

Discharge- sediment flow data

These data can be analysed to prepare discharge v/s sediment concentration plot for each gauging station. This analysis will be useful to understand sediment concentration in reach for range of discharges. These sediment data were not available for Tapi river.

4.13 Bed Slope

The average bed slopes of the Tapi River for the reach under consideration is about 1/2130. Details are given in Table below.

Table 22: Bed Slope of Tapii River

River	Reach & River bed level (RBL)		River Bed Level Change	Distance	Slope
	From	To			
Tapi	Hatnur dam RBL 200 m	Sarankheda RBL 109 m	91 m	193 km	**1/2120**
	Sarankheda RBL 109 m	Kakrapar(d/s) RBL 41 m	68 m	145 km	**1/2132**
	Kakrapar RBL 41 m	**Mouth RBL -3.0 m**	**44 m**	**93 km**	**1/2113**

4.14 River Cross sections

The data of river cross sections at gauging 9 sites was not available. However, the river widths, bank levels, nature of river bed and deep channel was studied on the basis of topo-sheets and google images. In general the river width varied between 200 to 400 m in the reach under consideration from Hatnur dam to Surat city. On downstream of Surat city width gradually increase in lower reach. The bank levels are about 10 to 15 higher than the river bed levels in most of reach. The deep channel meanders within the defined high level banks and there is no history of river course changes.

The river bed material is mostly coarse to fine mixed sand in upper reaches and medium and fine sand in lower reaches. In tidal reach clay is also present in bed material.

4.15 Ten- Daily average Discharges

Ghala

Analysis of 10 daily average flows at Ghala is presented in *Table 26*. The results of this analysis indicate range average 10 daily flows in different period of year as following.

- June to September - From 120 to 500 m^3/s
- October to December - From 400 to 100 m^3/s
- January to May - 50 to 20 m^3/s

Sarangkheda

Analysis of 10 daily average flows is presented in *Table 28*. The results of this analysis indicate range of average flows on the basis of 10 daily flows in different period of year as following.

Table 23: Water flow at Sarangkheda

Month	June	July	Aug	Sept	Oct	Nov	Dec	Jan-Feb	March-May
Discharge M^3/s	150	400	1200	700	100	30	15	12	<5

Gidhade

Analysis of 10 daily average flows is presented in *Table 27*. The results of this analysis indicate range of average flows on the basis of 10 daily flows in different period of year as following.

Table 24: Water flow at Gidhade

Month	June	July	Aug	Sept	Oct	Nov	Dec	Jan-Feb	March-May
Discharge M^3/s	150	400	1200	700	100	30	12	<10	<5

Savkheda

Analysis of 10 daily average flows is presented in *Table 29*. The results of this analysis indicate range of average flows on the basis of 10 daily flows in different period of year as following.

Table 25:Water flow at Savkheda

Month	June	July	Aug	Sept	Oct	Nov	Dec	Jan-Feb	March-May
Discharge M^3/s	150	400	1200	700	100	35	20	10	<5

Table 26: Average 10 daily discharges in cumecs at Ghala Gauge on Tapi River

YEAR	JUNE			JULY			AUGUST			SEPTEMBER			OCTOBER			NOVEMBER			DECEMBER			JANUARY			FEBRUARY			MARCH			APRIL			MAY		
	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III
1978-1979	225.56	135.24	464.06	516.98	511.22	324.01	288.22	430.83	2062.98	3962.46	496.83	349.10	285.29	219.07	279.04	343.00	202.52	281.73	359.49	365.88	257.64	226.05	268.48	210.34	214.16	282.17	188.15	195.35	221.53	348.49	454.19	278.50	358.14	298.76	299.37	97.59
1979-1980	49.39	21.53	172.29	520.92	403.50	285.51	866.69	4139.80	614.86	379.99	358.43	312.68	251.50	334.55	347.04	338.41	394.06	120.78	246.73	332.98	327.69	300.42	330.90	291.22	387.95	332.55	378.01	204.99	245.42	278.82	271.12	199.12	37.41	47.86	52.26	63.00
1980-1981	106.65	170.68	357.09	573.06	552.15	561.70	759.93	559.31	445.17	175.98	129.69	162.72	284.52	311.87	231.81	151.74	217.20	279.40	190.35	23.93	89.71	44.00	74.20	82.93	190.00	101.50	59.15	38.30	158.12	29.27	64.13	64.60	49.60	28.72	12.04	22.43
1981-1982	29.85	18.81	28.02	304.44	341.67	195.01	402.98	648.45	677.99	350.05	335.01	882.36	719.14	443.02	424.41	377.25	328.35	424.10	368.80	314.80	272.09	273.45	344.15	318.36	72.80	126.20	157.31	145.90	83.45	319.36	291.95	257.95	193.30	121.95	29.90	37.50
1982-1983	39.00	50.50	338.00	264.39	72.07	432.96	266.12	642.72	651.63	74.54	20.92	20.55	9.44	7.90	7.75	13.37	9.60	6.56	6.82	5.76	7.91	7.30	5.07	4.60	5.34	5.66	4.94	5.16	4.99	4.68	5.14	4.95	5.26	4.91	5.59	4.82
1983-1984	4.56	5.14	57.48	15.49	116.25	143.10	332.03	574.00	346.85	712.83	1280.55	1424.08	1195.84	682.53	396.00	170.10	149.46	206.25	416.79	539.64	372.22	290.69	347.15	413.89	382.62	419.59	421.12	420.63	255.73	342.54	453.46	19.36	13.66	12.65	33.48	11.07
1984-1985	14.66	116.81	30.49	78.17	76.41	41.42	68.24	160.49	254.38	329.69	275.21	247.41	332.98	386.61	232.11	25.51	211.84	175.43	186.80	113.31	110.79	117.45	153.60	152.64	131.53	125.85	202.47	136.10	71.30	26.27	16.15	44.07	14.49	11.58	11.16	11.36
1985-1986	9.59	12.41	7.98	9.01	14.70	22.13	407.87	62.41	20.11	18.59	17.87	23.84	21.00	13.78	14.58	14.56	17.00	12.53	12.22	14.82	11.82	8.13	9.85	7.44	4.67	5.65	6.12	4.63	5.62	5.52	4.81	5.36	4.53	6.03	6.48	4.92
1986-1987	8.25	9.69	98.41	13.66	11.91	22.39	103.95	290.80	326.65	258.81	217.86	176.78	23.54	38.96	45.13	32.86	20.61	37.18	19.18	19.22	16.15	14.20	14.71	15.70	15.25	16.97	17.79	19.56	15.91	18.15	23.82	13.11	22.13	19.34	53.32	111.70
1987-1988	154.93	126.94	172.52	99.09	118.75	21.10	21.26	14.52	24.25	15.35	19.47	18.19	18.96	18.60	13.02	16.18	16.09	10.99	11.23	12.85	14.85	7.84	7.80	10.52	11.90	7.49	7.75	12.58	12.85	6.89	11.74	12.68	7.04	13.12	16.54	8.25
1988-1989	14.59	106.63	48.49	89.47	327.43	623.40	449.74	389.50	722.54	586.19	876.00	3315.40	3041.22	559.22	268.96	119.27	288.57	108.27	161.61	190.30	104.45	257.94	235.59	239.79	236.38	27.46	41.01	154.51	314.57	58.90	25.76	27.03	44.50	190.06	235.59	285.75
1989-1990	343.64	197.55	136.20	255.94	36.77	328.83	99.55	128.73	601.98	601.49	448.46	414.17	407.79	198.86	80.89	77.44	185.61	65.49	42.45	54.24	77.74	58.44	85.19	58.51	43.11	18.02	49.59	93.41	100.92	211.22	118.19	63.45	201.50	168.25	160.81	240.02
1990-1991	331.18	281.58	323.13	183.24	125.58	151.71	173.91	331.03	3924.27	2405.00	678.34	679.15	744.61	633.93	269.85	205.30	284.04	325.54	275.74	274.94	388.98	283.93	257.04	328.93	57.33	21.34	13.15	27.14	39.47	55.76	29.69	19.64	23.33	21.27	21.92	47.45
1991-1992	57.16	34.63	18.58	32.70	51.73	103.25	396.40	383.50	213.68	88.09	28.08	20.96	22.64	22.05	27.20	25.76	22.04	17.34	18.88	18.92	15.50	14.25	12.39	10.89	15.00	12.74	11.29	13.04	11.51	6.83	6.56	7.65	7.63	6.76	11.11	8.59
1992-1993	10.25	10.55	233.27	12.88	15.69	58.07	88.99	201.89	75.36	406.12	149.97	100.54	112.93	46.24	32.50	26.56	40.52	18.98	19.44	15.58	18.83	16.12	15.85	77.22	16.89	17.66	19.85	16.10	16.96	14.52	44.55	60.57	104.58	78.37	99.52	140.34
1993-1994	98.21	107.99	152.86	92.82	433.61	287.53	250.75	230.77	46.76	34.51	150.21	230.61	389.66	252.61	228.85	45.49	218.31	184.18	178.98	183.03	152.16	137.28	43.63	82.54	60.71	33.50	22.12	60.64	38.66	22.16	42.57	44.03	16.30	17.71	16.44	27.25
1994-1995	52.02	1319.49	576.87	423.20	711.61	565.36	150.82	274.67	1672.38	9334.00	1809.09	462.87	335.63	219.44	212.22	60.58	22.70	28.86	28.66	25.01	27.94	128.79	205.42	39.61	226.83	260.30	233.40	143.39	284.57	189.39	28.62	33.86	170.66	184.00	22.67	20.32
1995-1996	20.33	25.55	28.00	16.79	159.00	300.25	64.48	34.11	48.57	41.06	30.49	27.57	32.14	28.16	19.60	15.98	16.98	14.90	11.54	12.53	12.13	9.89	12.25	13.23	8.72	9.27	10.48	7.27	8.78	7.41	6.71	8.11	10.14	9.66	10.47	11.92
1996-1997	10.22	39.31	41.79	28.25	26.25	164.63	49.22	28.16	94.01	106.64	135.31	324.38	279.26	261.33	142.72	60.41	113.79	50.81	42.74	32.19	28.05	29.48	30.94	25.88	25.70	21.95	23.07	18.89	17.28	16.29	22.82	101.72	124.70	106.36	358.45	301.26
1997-1998	61.62	27.58	342.25	29.46	39.33	102.76	69.12	41.46	671.37	459.53	230.95	285.03	197.13	135.87	106.81	35.75	31.30	32.86	40.81	42.43	281.19	247.87	249.17	72.02	81.01	109.17	118.16	185.92	122.76	190.60	321.72	201.17	129.80	90.07	50.18	88.21
1998-1999	73.59	54.97	29.43	279.86	55.08	46.56	83.22	128.80	72.16	76.22	5431.41	2055.50	772.16	422.62	294.33	146.78	84.34	88.18	51.72	96.88	118.49	65.80	68.78	66.96	22.85	48.81	52.64	194.49	155.02	54.45	59.57	67.52	107.04	49.08	12.06	24.95
1999-2000	82.57	46.71	43.88	19.33	128.15	77.13	38.16	144.34	124.58	38.88	44.39	127.41	216.54	387.16	338.84	171.93	138.53	102.73	111.94	107.95	44.01	36.08	66.53	44.42	83.09	32.00	30.75	30.47	61.48	20.97	81.47	40.21	32.14	30.39	40.86	68.73
2000-2001	37.89	39.83	41.17	68.78	249.46	42.81	49.72	55.43	57.43	49.04	41.84	26.02	18.25	17.21	17.22	15.58	18.15	19.96	19.69	21.07	19.96	19.67	15.48	18.81	20.77	18.74	16.76	15.30	14.50	12.90	12.27	13.92	14.95	15.22	15.81	15.92
2001-2002	17.09	150.77	37.62	86.31	101.44	81.49	146.82	177.11	43.45	34.22	41.48	52.08	47.33	37.80	32.93	33.50	35.64	38.65	40.18	36.81	39.97	35.33	32.26	25.48	21.05	19.51	27.34	18.18	15.89	14.31	19.13	24.57	26.00	26.93	26.81	32.14
2002-2003	27.74	27.22	52.81	62.35	39.01	36.45	47.59	61.80	96.66	1826.24	334.69	130.45	153.36	102.86	38.77	18.95	14.66	14.98	14.78	29.50	18.49	16.70	14.85	23.13	23.21	23.09	25.76	24.37	23.79	19.86	18.88	15.06	21.09	20.73	21.24	24.69
2003-2004	25.43	47.36	156.95	35.99	55.52	139.59	80.73	50.79	576.91	557.69	390.41	460.69	594.28	451.32	232.58	39.17	32.05	30.44	31.57	34.42	31.23	29.89	28.57	29.89	28.95	28.61	32.28	34.74	25.89	20.78	20.04	29.65	103.94	54.12	27.63	34.68
2004-2005	36.77	46.13	26.76	35.73	38.51	84.41	1341.40	253.89	64.74	43.54	38.95	115.44	39.82	29.24	27.01	26.56	19.67	17.99	18.93	19.23	19.13	18.65	19.75	21.80	23.23	22.60	22.79	22.73	19.89	17.92	24.00	22.85	19.22	19.08	18.33	22.11
MAXIMUM	**343.64**	**1319.49**	**576.87**	**573.06**	**711.61**	**623.40**	**1341.40**	**4139.80**	**3924.27**	**9334.00**	**5431.41**	**3315.40**	**3041.22**	**682.53**	**424.41**	**377.25**	**394.06**	**424.10**	**416.79**	**539.64**	**388.98**	**300.42**	**347.15**	**413.89**	**387.95**	**419.59**	**421.12**	**420.63**	**314.57**	**348.49**	**454.19**	**278.50**	**358.14**	**298.76**	**358.45**	**301.26**
MINIMUM	**4.56**	**5.14**	**7.98**	**9.01**	**11.91**	**21.10**	**21.26**	**14.52**	**20.11**	**15.35**	**17.87**	**18.19**	**9.44**	**7.90**	**7.75**	**13.37**	**9.60**	**6.56**	**6.82**	**5.76**	**7.91**	**7.30**	**5.07**	**4.60**	**4.67**	**5.65**	**4.94**	**4.63**	**4.99**	**4.68**	**4.81**	**4.95**	**4.53**	**4.91**	**5.59**	**4.82**
AVERAGE	**71.95**	**119.69**	**148.75**	**153.64**	**178.25**	**194.21**	**262.89**	**386.64**	**538.21**	**850.62**	**518.96**	**460.96**	**390.63**	**231.96**	**161.56**	**96.59**	**116.06**	**100.56**	**108.45**	**108.82**	**106.63**	**99.84**	**109.24**	**99.51**	**89.30**	**79.57**	**81.23**	**83.10**	**86.92**	**85.71**	**91.82**	**62.25**	**69.00**	**61.22**	**61.85**	**65.44**

All values are in m^3/s

Table 27: Average 10 daily discharges in cumecs at Gidhade Gauge on Tapi River

YEAR	JUNE			JULY			AUGUST			SEPTEMBER			OCTOBER			NOVEMBER			DECEMBER			JANUARY			FEBRUARY			MARCH			APRIL			MAY		
	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III
1970-1971	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1971-1972	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1972-1973	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1973-1974	0	32.3537	12.1436	855.614	3355.176	1682.595	707.5176	976.6445	5104.282	2430.895	787.611	2652.231	922.76	269.59	296.9636	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1974-1975	NA	NA	NA	14.16	573.72	280.8364	1142.26	1787.7	616.7455	163.1	104.17	273.32	244.07	321.42	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1975-1976	NA	NA	56.52	376.44	436.32	443.1	1370.9	2283.86	1314.836	2965.26	2456.08	602.78	616.56	280.44	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1976-1977	NA	NA	50.85	219.04	558.62	845.8273	2907.7	550.17	955.8	3874.3	1332.42	430.33	174.89	53.89	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1977-1978	0	266.02	847.61	193.99	113.6	1028.782	628.83	720.19	1225.355	3219.05	1598.27	331.63	466.89	62.21	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1978-1979	0.00	414.00	636.66	860.84	1157.05	2174.11	259.16	1194.63	6639.67	2206.35	258.40	157.86	138.41	32.36	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1979-1980	NA	NA	NA	84.04	543.58	821.88	5721.50	5619.93	636.62	405.68	564.83	1405.30	282.72	66.14	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1980-1981	NA	761.39	1128.13	688.09	174.63	243.83	3349.55	1581.13	1682.66	839.88	364.46	191.81	118.70	28.96	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1981-1982	NA	NA	NA	640.42	574.41	348.00	1643.20	4321.95	828.41	478.29	585.38	1773.89	623.49	104.32	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1982-1983	NA	NA	975.32	NA	558.20	1185.04	392.95	670.54	1268.68	376.83	809.15	592.38	91.11	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1983-1984	NA	NA	411.57	143.31	1195.94	643.79	1734.23	3977.95	1202.63	3173.27	2130.58	2655.25	1894.47	572.85	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1984-1985	NA	NA	NA	500.84	1475.08	491.62	972.86	2885.11	1107.49	262.61	207.33	NA	22.25	579.60	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1985-1986	NA	NA	491.89	22.47	NA	244.40	1223.82	968.06	154.33	NA	NA	440.19	77.68	87.49	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1986-1987	NA	101.42	263.84	NA	2715.72	1587.75	1966.87	2542.83	413.33	NA	NA	24.96	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1987-1988	NA	510.36	244.82	590.41	214.58	25.71	182.74	333.13	890.54	307.56	9.99	7.32	8.42	4.65	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1988-1989	NA	8.32	550.72	441.60	1400.63	2668.85	1243.34	271.00	2413.64	1439.94	1257.88	3202.20	3724.33	334.40	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1989-1990	NA	NA	534.24	605.01	76.72	749.32	201.11	1713.92	2476.99	1273.59	348.48	811.07	129.76	18.69	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1990-1991	NA	NA	11.18	771.60	54.38	2983.44	798.09	4202.70	3795.75	2372.97	490.87	1069.51	910.77	782.14	366.68	181.90	101.30	58.14	36.83	38.09	15.55	8.67	5.23	5.24	6.70	3.70	1.48	1.51	1.23	1.03	10.38	7.17	3.54	3.40	1.78	1.74
1991-1992	16.05	392.17	135.98	244.87	897.39	889.50	1571.27	367.99	610.30	226.54	17.94	10.15	7.86	3.99	3.28	2.93	2.60	2.49	2.06	1.90	1.60	2.12	2.96	1.11	0.07	0.39	0.23	NA	NA	NA	NA	NA	NA	NA	NA	NA
1992-1993	NA	58.97	306.67	8.27	34.43	66.91	475.06	1688.05	923.20	1203.68	256.84	87.78	81.78	303.92	56.51	16.47	8.66	5.93	3.59	2.01	1.43	1.24	0.80	0.09	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1993-1994	NA	NA	82.46	205.47	1921.47	474.61	928.37	247.87	287.61	677.77	217.80	565.18	318.28	352.96	164.24	52.21	34.07	17.46	16.64	22.67	8.83	2.23	1.68	0.85	0.53	0.16	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1994-1995	NA	170.36	80.76	319.24	708.15	906.49	537.11	608.63	1831.36	6768.80	987.28	283.36	113.70	46.78	46.72	40.28	29.50	10.84	5.04	5.38	5.46	6.18	18.83	5.18	2.28	1.41	0.94	0.95	0.87	2.15	1.26	0.99	0.63	0.10	0.01	0.13
1995-1996	0.08	0.00	187.29	91.36	321.38	773.51	173.45	54.19	81.99	1446.31	249.47	98.05	46.25	93.42	32.60	4.53	2.21	0.81	0.22	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1996-1997	NA	12.93	0.22	9.74	108.88	673.03	614.97	270.10	632.64	905.17	1168.22	268.41	151.73	50.97	473.63	80.07	40.15	14.61	5.74	1.75	0.80	0.39	0.19	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1997-1998	NA	NA	19.00	153.28	60.58	674.81	671.30	55.03	1385.10	559.69	299.28	317.03	94.74	37.57	50.78	54.88	14.99	93.55	701.26	185.99	74.45	38.42	24.11	9.15	2.31	1.04	0.34	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1998-1999	NA	96.99	36.50	203.62	113.61	357.63	982.86	1010.31	505.03	601.15	5251.42	1970.47	647.19	435.82	210.12	133.14	188.57	58.98	33.33	9.73	11.63	3.54	1.88	1.61	1.37	2.46	1.22	0.19	NA	NA	NA	NA	NA	NA	NA	NA	NA
1999-2000	NA	296.54	843.20	93.83	271.25	414.36	902.11	1660.67	160.19	116.25	778.32	664.45	893.44	765.67	156.07	95.04	66.30	17.60	6.66	3.81	1.72	1.25	1.17	1.02	0.39	0.01	NA	NA	NA	NA	NA	NA	NA	NA	766.90	26.54	
2000-2001	411.95	107.83	22.92	366.45	938.86	481.01	41.56	15.27	332.48	105.93	84.05	16.61	1.67	0.77	0.07	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

YEAR	JUNE			JULY			AUGUST			SEPTEMBER			OCTOBER			NOVEMBER			DECEMBER			JANUARY			FEBRUARY			MARCH			APRIL			MAY		
	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III
2001-2002	NA	427.35	122.30	10.38	87.39	122.71	431.63	1434.01	231.28	89.54	18.29	34.05	442.94	223.40	30.40	12.47	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2002-2003	NA	NA	2526.20	70.16	5.61	41.14	73.20	209.28	1688.43	4371.70	495.04	154.59	78.82	41.40	42.38	10.17	0.57	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2003-2004	NA	NA	223.65	242.70	257.67	681.66	327.66	308.93	842.76	601.32	164.53	1284.24	463.62	135.18	55.50	21.97	3.13	1.53	0.25	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2004-2005	NA	34.53	10.52	1.02	20.90	80.83	801.72	524.15	616.65	138.66	21.71	158.68	159.56	116.17	7.86	1.06	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2005-2006	NA	NA	NA	99.8056	31.8748	559.4487	1923.88	312.03	116.7718	82.962	1002.81	521.81	135.0505	38.7812	37.18482	5.7174	0.2358	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2006-2007	NA	NA	NA	2106.921	132.68	299.7265	7750.675	2724.1	465.7436	1071.264	1155.512	1052.32	1007.128	120.143	78.96091	80.278	29.2281	8.7938	2.5005	1.0555	0.106727	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2007-2008	NA	NA	3.73825	3738.293	1218.346	303.2195	1676.146	706.0917	365.1058	941.1549	429.6779	679.4933	209.3516	98.7042	40.56082	35.2824	26.8688	18.9781	40.752	49.26	17.47182	28.932	25.081	15.72091	7.212	0.812	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2008-2009	NA	NA	NA	NA	NA	239.6428	645.3632	442.8113	90.56409	1772.6	736.4174	316.954	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2009-2010	NA	NA	NA	163.9089	220.0899	688.5182	78.2229	4.6302	378.7	2532.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2010-2011	NA	NA	NA	524.105	189.5165	624.6607	1209.943	871.8673	841.7001	1678.671	661.9949	89.9474	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2011-2012	NA	NA	NA	9.7356	246.6721	440.7335	353.1185	320.1271	1587.84	1542.027	417.7042	159.7373	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MAXIMUM	**411.95**	**761.39**	**2526.20**	**3738.29**	**3355.18**	**2983.44**	**7750.67**	**5619.93**	**6639.67**	**6768.80**	**5251.42**	**3202.20**	**3724.33**	**782.14**	**473.63**	**181.90**	**188.57**	**93.55**	**701.26**	**185.99**	**74.45**	**38.42**	**25.08**	**15.72**	**7.21**	**3.70**	**1.48**	**1.51**	**1.23**	**2.15**	**10.38**	**7.17**	**3.54**	**3.40**	**766.90**	**26.54**
MINIMUM	**0.00**	**0.00**	**0.22**	**1.02**	**5.61**	**25.71**	**41.56**	**4.63**	**81.99**	**82.96**	**9.99**	**7.32**	**1.67**	**0.77**	**0.00**	**1.06**	**0.24**	**0.81**	**0.22**	**1.06**	**0.11**	**0.39**	**0.19**	**0.09**	**0.07**	**0.01**	**0.23**	**0.19**	**0.87**	**1.03**	**1.26**	**0.99**	**0.63**	**0.10**	**0.01**	**0.13**
AVERAGE	**71.35**	**217.15**	**373.00**	**435.31**	**620.68**	**724.18**	**1246.57**	**1293.27**	**1197.52**	**1438.46**	**770.01**	**685.28**	**450.01**	**195.90**	**97.75**	**48.73**	**36.56**	**23.82**	**65.76**	**29.24**	**12.64**	**9.29**	**8.19**	**4.44**	**2.61**	**1.25**	**0.85**	**0.88**	**1.05**	**1.59**	**5.82**	**4.08**	**2.09**	**1.75**	**256.23**	**9.47**

All values are in m^3/s

Table 28: Average 10 daily discharges in cumecs at Sarangkheda Gauge on Tapi River

YEAR	JUNE			JULY			AUGUST			SEPTEMBER			OCTOBER			NOVEMBER			DECEMBER			JANUARY			FEBRUARY			MARCH			APRIL			MAY		
	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III
1977-1978	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	128.70	88.63	83.71	52.70	235.89	229.30	85.10	51.99	40.49	37.44	36.11	49.60	47.70	47.05	32.72	34.56	23.14	18.65	13.89	11.55	10.56	9.46	8.39
1978-1979	11.08	358.84	378.23	545.56	800.70	1374.50	307.84	885.48	3884.80	1638.29	382.23	228.24	176.93	101.85	100.05	60.97	86.99	46.06	62.78	47.12	38.27	31.63	28.79	55.92	50.39	79.43	57.74	40.08	28.98	19.73	16.92	13.32	10.07	9.61	8.09	7.33
1979-1980	6.99	7.18	1087.83	129.32	486.53	644.75	3912.72	4258.34	442.35	302.49	353.11	848.38	251.83	146.08	141.32	65.55	38.21	87.56	209.79	48.63	50.39	37.27	41.06	31.90	27.27	24.17	22.10	17.91	17.73	15.57	9.49	10.49	9.09	9.14	8.75	8.78
1980-1981	139.65	800.02	733.09	667.22	196.44	229.87	2655.26	1259.33	1507.68	756.24	339.61	194.33	111.87	56.89	38.15	33.50	24.17	22.90	22.30	26.35	34.51	53.18	30.74	25.26	13.67	14.11	16.18	14.57	14.34	14.26	9.39	9.68	7.99	7.67	7.54	7.38
1981-1982	6.87	6.19	10.63	369.71	546.37	386.11	1180.26	3869.77	758.71	431.42	527.55	1471.16	687.00	217.01	132.14	137.38	73.89	54.87	39.74	35.05	58.92	45.46	35.57	30.24	77.38	50.73	33.03	20.65	17.50	13.71	12.98	9.78	7.60	9.07	7.67	7.72
1982-1983	6.86	10.07	547.17	35.39	273.42	582.75	173.64	248.48	540.88	176.69	466.23	308.09	103.34	47.50	27.79	28.21	22.59	11.01	9.32	11.46	15.71	26.14	25.77	15.99	9.86	7.96	6.74	6.52	5.86	5.48	4.44	3.91	3.79	3.25	2.99	2.85
1983-1984	3.00	3.96	149.25	114.13	608.50	348.85	975.50	3679.06	781.57	2916.81	1705.51	2270.70	1543.81	605.17	229.73	76.43	50.93	47.76	39.64	29.57	23.53	21.65	33.36	18.45	13.60	14.34	14.68	11.80	8.33	6.08	9.26	8.89	9.16	7.75	7.50	5.36
1984-1985	16.03	132.68	38.48	111.70	749.46	153.14	547.00	3099.20	1196.47	243.48	169.39	74.48	34.84	520.82	53.05	27.51	12.39	8.94	7.54	6.69	8.00	8.02	7.43	8.10	6.38	6.28	6.16	4.66	3.96	3.21	4.63	2.80	2.30	2.21	2.61	2.60
1985-1986	13.95	27.09	428.54	74.13	21.71	304.50	971.50	869.32	203.35	82.91	20.59	163.85	138.33	139.97	54.96	19.48	14.82	7.72	4.98	4.36	5.08	5.10	4.94	4.53	4.83	5.71	4.41	8.02	3.70	3.30	2.64	2.41	2.26	2.08	1.94	1.98
1986-1987	2.70	115.96	202.73	56.13	565.77	1521.09	1711.20	2568.05	586.47	182.21	94.63	62.89	12.48	6.83	4.90	4.33	3.00	3.09	3.04	2.47	2.58	2.86	2.59	2.65	1.90	1.47	2.34	1.64	1.08	0.53	0.35	NA	NA	NA	NA	0.36
1987-1988	0.25	417.59	248.41	509.31	205.55	24.97	186.70	301.01	796.68	274.01	17.31	6.30	8.32	6.58	3.31	1.26	32.63	36.76	3.13	6.08	1.75	0.53	0.64	0.50	0.53	0.40	0.18	1.51	2.14	1.12	0.01	0.53	0.45	0.02	0.00	4.08
1988-1989	0.60	67.90	396.42	294.74	1190.32	2693.91	1262.55	267.26	2147.69	1427.59	1181.84	3129.51	3803.97	542.12	235.91	115.87	71.66	28.50	15.71	13.85	7.67	5.32	4.77	3.84	2.87	2.02	0.94	0.67	0.43	11.84	8.19	1.26	0.02	6.73	5.63	2.10
1989-1990	1.71	17.61	446.86	663.61	149.28	922.40	241.48	1611.57	2661.82	1452.10	336.55	723.05	155.66	51.25	28.54	13.53	8.18	7.06	5.19	3.32	2.30	2.38	2.49	1.34	0.44	0.12	0.00	0.00	0.00	0.00	7.01	5.82	0.42	0.00	NA	8.67
1990-1991	77.28	389.61	559.93	462.89	24.47	2444.98	843.71	3871.11	3628.27	2213.90	515.43	849.16	783.93	726.26	387.09	207.01	98.25	55.53	28.34	25.11	10.49	4.84	2.77	2.47	2.19	0.57	2.65	1.99	0.92	0.00	11.38	12.54	6.57	7.79	5.86	1.31

YEAR	JUNE			JULY			AUGUST			SEPTEMBER			OCTOBER			NOVEMBER			DECEMBER			JANUARY			FEBRUARY			MARCH			APRIL			MAY		
	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III
1991-1992	12.34	348.54	167.35	244.71	769.01	647.64	1539.51	317.61	511.16	209.09	8.32	7.46	3.99	2.32	0.39	0.00	NA	0.40	0.26	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1992-1993	NA	110.70	374.38	10.17	31.34	57.98	527.30	1931.49	1069.31	1373.48	322.64	109.34	96.20	372.82	64.17	17.16	5.90	3.23	1.52	0.41	0.06	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1993-1994	NA	NA	153.71	273.18	2358.43	691.86	1336.35	365.51	461.11	879.50	335.17	787.16	494.55	450.63	222.10	73.52	30.38	15.96	18.05	27.21	9.27	1.38	1.61	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1994-1995	NA	194.42	122.39	445.72	871.48	1107.15	707.39	719.55	2177.16	8128.60	1241.96	445.08	179.08	97.94	102.82	40.14	19.46	10.64	4.64	2.96	2.84	3.11	8.90	3.51	1.49	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1995-1996	0.00	0.00	189.85	148.31	494.67	969.34	283.63	79.24	131.20	1822.31	344.83	130.87	54.19	91.07	31.55	5.30	2.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1996-1997	NA	20.57	0.40	5.10	156.94	1050.85	793.03	390.07	744.81	1152.40	1542.61	328.79	183.80	65.72	571.40	107.83	43.30	15.23	6.46	0.95	0.00	NA	NA	16.27	149.05	89.52	1091.97	865.62	75.70	1601.95	745.96	359.00	461.24	131.89	39.41	44.63
1997-1998	NA	NA	16.27	149.05	89.52	1091.97	865.62	75.70	1601.95	745.96	359.00	461.24	131.89	39.41	44.63	70.73	16.30	119.98	978.11	239.03	86.32	40.86	23.73	13.50	2.05	0.60	0.05	NA	NA	NA	NA	NA	NA	NA	NA	NA
1998-1999	NA	132.52	48.33	299.03	144.55	449.97	1285.42	1304.42	686.79	816.26	6239.20	2608.20	994.60	721.68	321.76	180.93	278.11	72.61	38.26	12.17	11.92	3.62	1.70	1.10	1.15	1.40	0.80	0.10	NA	NA	NA	NA	NA	NA	NA	NA
1999-2000	NA	212.98	870.79	88.12	313.36	540.40	840.67	1857.71	197.96	125.98	910.27	862.86	1011.59	1018.92	193.55	74.22	60.26	18.73	8.26	2.95	2.36	0.51	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1174.00	39.54
2000-2001	383.04	186.68	21.14	403.31	1072.52	705.95	68.44	19.83	388.37	183.89	93.54	13.05	1.03	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2001-2002	0.00	546.70	180.93	8.79	17.63	120.71	526.32	1533.77	316.65	88.16	13.73	11.45	517.02	323.54	28.95	10.59	3.76	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2002-2003	0.00	NA	2352.00	122.52	4.06	40.91	41.28	269.23	2053.02	4956.50	706.73	228.77	79.24	36.74	27.60	14.87	6.31	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2003-2004	NA	NA	405.78	406.20	296.76	948.36	353.29	426.02	1534.66	765.44	178.28	1711.54	657.63	162.01	55.68	14.98	2.47	3.06	0.18	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2004-2005	NA	31.75	8.11	0.00	14.93	48.20	1062.55	719.36	981.15	154.18	33.11	222.38	155.87	111.83	28.49	1.74	0.00	NA	NA	NA	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NA	NA	NA
2005-2006	0.00	0.00	0.00	115.04	19.97	697.44	2338.93	433.21	148.46	100.41	900.58	767.60	170.75	32.48	20.12	4.93	0.24	0.00	0.00	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2006-2007	NA	NA	NA	1985.86	173.16	416.30	7874.04	3059.32	815.71	1675.87	1673.11	1441.42	1360.39	408.09	100.90	56.24	32.81	11.12	6.49	3.47	1.98	1.06	0.41	0.28	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2007-2008	NA	NA	23.04	3998.20	1562.39	606.70	2104.61	1012.73	514.96	1220.33	598.53	1015.49	256.17	78.09	41.85	28.44	25.23	8.34	3.77	2.24	0.02	0.00	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2008-2009	NA	NA	NA	NA	NA	640.62	757.53	761.62	229.15	481.43	981.07	511.86	218.29	241.81	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2009-2010	0.00	0.00	0.00	161.53	322.01	1002.72	84.72	0.00	0.00	1335.83	266.05	37.86	242.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2010-2011	0.00	0.00	0.00	506.66	273.67	393.23	1372.18	1144.18	1033.76	1925.49	1192.83	118.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2011-2012	0.00	61.19	3.32	126.51	443.25	552.90	492.23	485.98	1971.72	2078.13	567.92	143.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2012-2013	0.00	0.00	0.00	139.44	171.21	1502.60	1435.43	930.96	622.18	3159.45	1060.75	369.95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MAXIMUM	383.04	800.02	2352.00	3998.20	2358.43	2693.91	7874.04	4258.34	3884.80	8128.60	6239.20	3129.51	3803.97	1018.92	571.40	207.01	278.11	235.89	978.11	239.03	86.32	53.18	41.06	55.92	149.05	89.52	1091.97	865.62	75.70	1601.95	745.96	359.00	461.24	131.89	1174.00	44.63
MINIMUM	0.00	0.00	0.00	0.00	4.06	24.97	41.28	0.00	0.00	82.91	8.32	6.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVERAGE	29.67	150.03	308.04	402.10	453.51	740.45	1190.28	1275.01	1066.51	1299.34	733.72	647.56	417.76	209.78	96.61	46.36	33.85	30.09	56.35	21.95	14.69	12.42	11.33	10.07	16.59	13.87	52.28	42.85	9.36	74.78	37.45	20.65	24.21	9.89	61.02	6.66

Table 29: Average 10 daily discharges in cumecs at Savkheda Gauge on Tapi River

YEAR	JUNE			JULY			AUGUST			SEPTEMBER			OCTOBER			NOVEMBER			DECEMBER			JANUARY			FEBRUARY			MARCH			APRIL			MAY		
	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III
1972-1973	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	36.72 35	25.95 78	28.1	20.82 22	17.86 27	18.40 155	18.37 02	14.7 37	13.27 273	14.70 44	13.0 31	18	13.6	9.1	6.727 273	6.7	5.5 88	5	3.1 08	2.9	2.090 909
1973-1974	8.32	114.7	15.02	789.96	3141.14	1275.391	644.53	667.8	4441.091	1835.34	690.02	1560.666	624.85	261.63	300.6 727	158.31	91.94	82.03	46.17	38.98	37.42 727	32.87	31.64	26.26 364	23.7	21.89	18.95	19.99	21.85	20.5	16.29	15.79	13.39	10.68	9.43	32.43 636
1974-1975	23.33	8.81	17.7	161.05	452.85	207.3 182	834.4	1773.72	481.8 182	127.56	79.34	192.2	245.84	414.29	169.1 455	60.2	32.3	25	19.8	17.45	15.36 364	12.83	12.09	10.63 636	10.9	9.47	13.06 25	10.72	7.14	5.663 636	4.9	3.7	3.74	2.57	2.47	2.8
1975-1976	9.43	164.62	219.99	435.77	412.68	461.6 545	1208.82	2216.83	929.4 818	2501.87	2216.61	609.69	562.16	218.31	208.4	182	78.5	59.39	49.43	40.67	31.93 636	21.38	20.88	17.53 364	15.403	13.011	11.76	9.546	7.65	6.674 545	7.763	6.44	3.99	3.186	2.668	2.490 909
1976-	42.4	19.2	65.32	161.3	239.5	625.9	1922.	372.1	760.2	3169.	1429.	392.8	181.6	97.3	59.15	54.98	108.7	230.	57.9	48.36	37.75	24.74	20.7	17.06	14.88	15.5	15.27	16.	12.	8.218	7.9	5.5	5.3	4.6	5.17	6.827

YEAR	JUNE			JULY			AUGUST			SEPTEMBER			OCTOBER			NOVEMBER			DECEMBER			JANUARY			FEBRUARY			MARCH			APRIL			MAY		
	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III
1977	88	4	9	72	6	518	8	7	273	72	26	8	6	98	364	9	6	75	6		455		9			3	5	03	96	182	7	6	7	1		273
1977-1978	4.91	290.74	724.48	138.53	92.78	762.3	595.43	624.13	1045.536	2101.89	998.89	288.73	429.27	116.07	70.21818	49.44	35.52	261.65	173.5	70.61	46.66364	38.29	32.79	29.1	39.56	34.3	32.475	20.17	24.79	17.26364	12.37	8.8	12.69	10.48	5.41	3.681818
1978-1979	7.74	358.83	379.33	651.74	837.25	1417.72	311.19	862.72	5350.16	1621.26	352.49	176.75	148.39	90.34	59.88	51.87	56.89	35.56	55.24	40.71	29.11	25.52	24.59	54.68	49.79	67.42	42.13	28.28	16.61	11.40	11.03	8.61	6.69	5.08	4.74	3.68
1979-1980	2.86	3.22	977.83	81.42	538.68	482.64	3803.84	3504.54	350.60	214.87	288.57	660.71	151.48	71.98	92.47	50.18	36.23	112.83	152.28	47.41	43.23	33.50	35.01	23.95	17.24	14.63	12.36	10.04	10.11	7.83	5.59	6.83	5.33	5.95	9.60	6.04
1980-1981	66.70	472.96	512.08	413.37	120.45	216.24	2366.35	1184.21	1093.77	630.09	244.56	129.68	77.47	44.40	28.16	17.85	19.97	14.47	14.56	22.11	32.75	37.97	21.35	17.47	5.86	11.54	12.77	10.58	9.94	8.81	5.82	6.15	4.97	3.86	5.51	4.34
1981-1982	4.13	3.27	9.45	457.38	451.28	270.43	1926.23	2882.55	567.92	374.55	435.20	1375.97	432.09	160.25	89.27	91.31	52.24	42.20	34.28	29.99	45.15	36.26	30.87	27.20	62.12	36.26	18.35	15.16	11.68	9.24	8.82	4.65	3.65	4.00	4.26	3.99
1982-1983	3.77	179.93	271.62	16.66	217.93	500.28	131.28	270.80	500.75	126.66	341.05	231.79	77.20	33.95	17.74	11.68	9.27	5.36	6.30	7.05	15.98	24.08	20.11	8.66	6.70	4.08	4.01	3.76	3.33	2.30	2.00	1.68	1.70	1.56	1.84	1.55
1983-1984	1.36	2.08	204.39	93.10	464.58	267.03	700.97	2543.81	592.16	2207.37	1222.61	1560.46	981.89	394.99	168.75	42.85	46.05	46.88	41.62	27.01	17.06	21.33	24.21	12.63	10.83	12.53	8.76	8.21	4.87	3.23	10.62	7.95	8.47	6.49	6.51	6.89
1984-1985	22.82	124.36	34.98	93.54	517.96	119.56	874.91	3373.01	878.45	210.45	135.38	63.56	48.32	476.79	37.06	21.51	7.35	6.27	4.52	4.68	5.09	5.21	5.00	6.16	4.30	5.14	4.49	3.16	3.37	2.82	3.13	2.26	2.02	2.39	2.50	2.10
1985-1986	1.94	50.51	367.09	54.51	16.03	375.73	970.04	822.98	167.92	76.13	9.58	219.51	128.92	128.73	49.02	14.42	11.37	4.80	2.81	3.24	3.05	3.01	2.42	2.60	3.07	3.61	3.04	2.99	1.51	1.20	1.22	1.45	1.22	1.26	1.17	0.96
1986-1987	1.94	172.09	234.66	41.98	887.96	1470.39	1978.49	2713.30	533.53	172.72	107.13	43.09	7.11	3.37	2.51	2.13	2.25	2.99	2.40	2.31	2.13	2.60	2.43	2.55	2.09	1.67	2.04	1.66	1.24	1.25	1.14	1.33	1.10	0.80	0.96	1.71
1987-1988	1.73	366.35	269.08	458.45	103.90	17.07	89.45	253.98	606.96	181.61	11.71	3.49	8.14	4.26	2.90	1.47	12.42	18.89	2.05	2.29	1.57	1.51	1.82	1.66	1.43	1.44	2.11	5.04	4.09	1.78	2.94	3.88	1.36	1.18	5.97	6.53
1988-1989	0.88	12.08	445.71	395.56	1350.43	2320.82	1266.20	196.13	2352.51	1341.14	1115.01	2230.53	3311.06	343.77	161.44	81.90	53.46	22.39	11.77	10.62	4.90	3.80	2.94	2.44	2.24	1.74	1.78	1.60	1.85	10.85	4.80	1.47	1.29	10.26	10.47	4.50
1989-1990	5.12	22.40	441.12	473.80	115.68	824.88	239.65	1296.60	2295.00	1288.56	255.16	677.44	97.10	42.78	14.62	6.82	4.45	6.72	3.47	1.64	1.27	2.87	1.79	1.08	0.94	0.99	0.80	0.49	0.44	0.49	13.91	7.87	0.28	0.33	4.24	5.97
1990-1991	117.94	618.98	467.34	594.24	26.60	2201.99	913.52	3454.39	3144.36	1887.16	425.46	666.70	555.86	575.54	344.21	134.16	69.22	33.39	17.47	24.14	12.80	7.54	6.10	4.06	5.19	1.84	1.24	2.33	1.96	1.58	14.76	13.40	6.70	6.74	2.79	1.99
1991-1992	82.79	287.09	102.05	163.27	562.91	1147.56	1104.07	298.33	513.22	172.59	13.78	9.18	6.90	3.85	3.63	3.21	2.98	3.03	2.93	2.72	2.30	1.95	2.12	1.29	1.14	1.60	1.12	0.90	0.76	0.85	0.64	0.33	0.37	0.30	0.25	0.15
1992-1993	0.12	199.40	355.88	8.52	21.53	72.33	476.96	1781.34	1024.67	1313.69	253.05	64.64	54.03	286.44	33.61	12.29	5.09	4.51	1.84	1.77	1.47	1.29	1.01	0.92	0.77	0.67	0.98	0.65	0.78	0.58	0.68	0.50	0.17	0.06	0.00	0.00
1993-1994	0.00	15.19	172.82	302.64	2172.84	563.17	1093.70	324.39	381.94	855.94	217.51	646.44	328.91	405.38	172.45	61.28	24.18	11.36	20.16	30.12	9.10	2.64	1.53	1.37	1.03	0.91	0.70	0.60	0.44	0.30	0.29	1.29	0.52	0.14	0.00	0.00
1994-1995	0.00	165.20	92.53	414.50	859.24	1006.09	698.33	906.86	2220.11	7915.90	1157.84	334.78	129.84	76.45	82.99	35.11	16.93	5.56	3.77	4.33	3.80	5.41	8.39	3.34	2.12	1.48	1.33	1.29	1.89	2.14	1.80	1.57	1.17	1.27	1.62	0.95
1995-1996	1.11	0.99	325.73	89.38	477.23	1073.83	292.59	71.74	158.71	1879.65	346.43	111.98	46.13	100.04	24.77	3.49	2.96	2.23	1.25	0.86	0.79	0.78	0.75	0.49	0.55	0.43	0.37	0.29	0.19	0.12	0.00	0.00	NA	0.00	NA	NA
1996-1997	NA	4.59	0.21	8.24	184.89	1161.00	727.48	280.46	994.27	1056.84	1364.66	261.07	171.66	46.12	439.26	70.81	45.33	14.59	4.82	1.94	1.57	1.06	0.97	0.99	0.71	0.49	0.15	0.00	0.00	0.00	0.00	NA	NA	0.00	0.00	0.00
1997-1998	NA	164.80	32.16	169.34	38.34	701.70	640.22	43.21	1456.38	584.79	236.87	405.39	77.30	31.57	75.48	43.70	12.50	249.42	782.63	152.91	59.00	26.22	17.17	6.30	3.40	2.65	1.14	1.03	0.92	1.56	0.47	0.18	0.00	0.00	0.00	0.00
1998-1999	NA	161.10	33.60	278.48	119.63	282.99	1042.34	1085.96	506.52	668.23	5317.48	2026.71	680.24	473.23	239.96	168.03	217.94	107.28	59.37	12.11	12.46	37.31	15.69	11.02	5.20	9.74	4.09	1.39	1.53	1.10	0.77	1.17	0.98	NA	NA	NA
1999-2000	NA	441.85	800.41	87.23	243.33	448.17	1341.74	1702.11	177.90	177.05	1025.33	830.53	993.33	861.93	170.32	114.19	59.50	17.82	8.07	6.74	3.26	2.68	2.09	1.64	1.08	1.31	1.19	1.16	NA	NA	NA	NA	NA	NA	503.55	1.63
2000-2001	515.20	126.58	29.04	259.67	1149.01	503.64	44.00	10.09	298.21	152.23	105.35	7.49	6.32	1.89	1.19	0.59	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1613.17
2001-2002	NA	302.96	80.10	19.55	68.96	82.27	441.18	1651.05	198.15	77.33	13.83	22.73	598.19	170.67	25.56	12.65	7.45	2.12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	240.68
2002-2003	NA	NA	2517.09	57.07	6.25	11.21	81.52	243.01	1981.22	5130.14	387.31	161.64	81.90	33.74	25.00	7.11	3.43	3.05	2.36	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2003-2004	NA	NA	245.00	239.03	8.16	965.51	0.00	54.30	1176.76	413.52	194.47	1563.65	327.88	129.18	27.67	6.88	3.91	0.73	1.27	0.75	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2004-2005	NA	68.06	15.21	18.15	43.82	170.50	742.06	520.14	1157.88	79.09	8.09	169.01	121.26	96.79	5.84	2.08	0.17	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MAXIMUM	**515.20**	**618.98**	**2517.09**	**789.96**	**3141.14**	**2320.82**	**3803.84**	**3504.54**	**5350.16**	**7915.90**	**5317.48**	**2230.53**	**3311.06**	**861.93**	**439.26**	**182.00**	**217.94**	**261.65**	**782.63**	**152.91**	**59.00**	**38.29**	**35.01**	**54.68**	**62.12**	**67.42**	**42.13**	**28.28**	**24.79**	**20.50**	**16.29**	**15.79**	**13.39**	**10.68**	**503.55**	**1613.17**
MINIMUM	**0.00**	**0.99**	**0.21**	**8.24**	**6.25**	**11.21**	**0.00**	**10.09**	**158.71**	**76.13**	**8.09**	**3.49**	**6.32**	**1.89**	**1.19**	**0.59**	**0.17**	**0.73**	**1.25**	**0.75**	**0.79**	**0.78**	**0.75**	**0.49**	**0.55**	**0.43**	**0.15**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
AVERAGE	38.61	164.10	326.85	238.36	498.25	687.73	922.01	1187.08	1198.07	1267.06	656.25	553.10	365.40	193.63	100.11	48.83	36.14	47.14	53.50	23.15	17.69	15.46	12.90	10.94	10.96	10.34	8.37	6.81	5.96	4.98	5.42	4.55	3.69	3.32	22.85	69.90

All values are in m^3/s

4.16 Monthly minimum and maximum Water levels

Table 30: Monthly minimum and maximum Water levels at Ghala

Year	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP		OCT		NOV		DEC	
	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max
1977	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.93	6.16	5.73	10.64	4.90	5.91	4.87	6.12	5.46	6.04
1978	5.72	5.73	5.89	6.52	5.34	5.98	5.33	5.85	4.67	5.86	4.53	6.34	4.96	6.44	5.13	16.57	5.80	16.83	4.87	5.83	3.88	5.87	5.24	5.87
1979	5.02	5.78	4.81	5.84	4.44	6.14	5.25	6.30	4.26	5.99	4.10	6.67	5.41	6.50	5.70	16.18	5.43	6.13	5.43	5.96	4.52	6.36	5.24	5.99
1980	5.08	6.08	5.26	6.21	4.24	6.15	3.97	5.81	4.19	5.24	4.52	6.47	6.31	6.82	5.62	7.35	4.28	5.74	4.50	6.07	4.27	5.99	4.22	5.97
1981	4.17	5.33	4.04	5.73	4.07	5.47	4.25	4.85	4.00	4.51	3.93	5.22	4.15	8.19	5.49	7.44	5.71	9.14	5.86	8.57	5.70	6.29	4.95	6.13
1982	4.92	6.14	4.37	5.83	4.32	6.03	4.56	5.84	4.32	5.60	4.31	6.20	4.27	8.35	4.95	7.25	4.23	6.08	4.12	4.20	4.14	4.54	4.10	4.24
1983	4.03	4.21	3.97	4.13	3.96	3.98	3.97	3.99	3.96	4.03	3.97	5.77	4.16	6.45	5.08	8.35	5.68	11.27	5.83	10.76	4.50	6.00	5.70	6.55
1984	5.37	6.34	5.02	6.41	4.21	6.30	4.25	6.41	4.16	5.28	4.19	6.00	4.19	5.78	4.31	5.95	4.85	6.00	4.33	6.11	4.27	6.19	4.18	6.11
1985	4.30	5.69	4.18	5.91	4.17	5.74	4.22	5.47	4.12	4.28	4.16	4.32	4.17	4.71	4.20	7.20	4.31	4.88	4.26	4.59	4.27	4.54	4.18	4.50
1986	4.20	4.37	4.16	4.23	4.15	4.22	4.15	4.23	4.16	4.25	4.22	6.01	4.37	4.96	4.72	6.99	4.41	5.97	4.43	5.32	4.53	5.12	4.50	4.70
1987	4.50	4.69	4.52	4.74	4.51	4.82	4.50	4.88	4.52	5.72	4.78	6.23	4.10	6.00	4.61	5.06	4.72	4.83	4.53	4.78	4.62	4.74	4.62	4.74
1988	4.57	4.67	4.46	4.63	4.44	4.68	4.44	4.62	4.47	4.73	4.48	6.90	4.63	8.81	5.18	8.38	6.00	14.34	4.82	13.31	4.66	6.12	4.67	5.95
1989	5.26	6.00	4.51	5.85	4.48	6.44	4.47	5.32	4.59	6.15	4.46	6.32	4.50	6.52	4.54	6.80	5.99	8.24	4.72	6.25	4.43	6.08	4.45	5.59
1990	4.45	5.32	4.39	5.18	4.44	5.53	4.45	5.56	4.76	5.87	5.12	6.20	4.48	6.15	4.57	16.69	5.92	12.73	5.37	9.56	5.16	5.97	5.53	6.25
1991	5.22	6.18	4.21	5.07	4.25	5.21	4.20	4.69	4.21	5.01	4.23	5.06	4.30	5.23	4.93	6.27	4.34	5.32	4.37	4.45	4.33	4.45	4.29	4.46
1992	4.24	4.34	4.24	4.40	4.14	4.42	4.14	4.26	4.15	4.26	4.19	7.48	4.22	5.07	4.55	6.45	4.80	8.44	4.48	5.12	4.52	4.95	4.52	4.83
1993	4.61	5.32	4.62	4.70	4.63	4.84	4.63	5.30	4.87	5.58	5.02	6.38	4.97	7.80	4.71	6.05	4.70	6.28	5.20	6.52	4.69	6.02	5.02	5.82
1994	4.75	5.80	4.70	5.47	4.73	5.59	4.71	5.41	4.70	4.93	4.83	13.57	5.17	9.04	4.81	11.60	5.82	17.48	4.88	5.99	4.64	4.84	4.66	4.75
1995	4.60	5.70	4.59	5.82	4.52	5.85	4.41	5.97	4.31	5.95	4.29	4.67	4.30	7.80	4.51	5.16	4.40	4.89	4.35	4.76	4.25	4.40	4.20	4.32
1996	4.19	4.31	4.10	4.27	4.10	4.23	4.07	4.26	4.20	4.34	4.09	5.59	4.51	6.35	4.65	6.40	4.73	6.17	4.99	6.21	4.80	5.52	5.03	5.17
1997	4.96	5.12	4.89	4.99	4.80	4.91	4.81	5.82	5.09	6.45	5.04	8.37	4.92	6.59	5.10	8.97	5.90	7.43	5.17	6.06	4.93	5.29	4.91	6.53
1998	4.88	6.53	4.99	5.83	5.47	6.27	5.27	6.49	5.07	5.77	5.03	6.07	4.95	9.02	5.22	5.97	5.22	19.57	5.37	7.89	4.76	6.04	4.78	6.08
1999	4.65	5.91	4.63	5.49	4.68	6.36	4.64	6.04	4.54	6.04	4.75	5.82	4.38	7.86	4.75	6.19	4.88	6.47	5.32	6.75	4.87	6.29	4.77	5.82
2000	4.72	5.85	4.79	5.66	4.62	5.45	4.71	5.84	4.70	5.75	4.75	5.11	4.87	8.66	4.99	5.48	5.09	5.37	4.96	5.07	4.96	5.04	4.87	4.99
2001	4.76	4.91	4.75	4.91	4.58	4.77	4.55	4.59	4.55	4.57	4.57	7.16	4.90	6.12	4.84	6.63	4.96	5.34	4.92	5.16	4.93	5.05	4.93	5.05

Year	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP		OCT		NOV		DEC	
	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max
2002	4.91	5.04	4.82	4.91	4.67	4.84	4.70	4.84	4.80	4.93	4.84	5.24	4.96	5.34	4.95	6.79	4.64	12.13	4.52	6.18	4.40	4.57	4.37	4.92
2003	4.33	4.57	4.45	4.52	4.36	4.51	4.34	4.42	4.40	4.46	4.37	6.95	4.50	7.51	4.61	7.39	5.70	6.73	4.39	7.54	4.33	4.82	4.37	4.46
2004	4.39	4.42	4.39	4.54	4.37	4.58	4.41	7.16	4.51	5.83	4.50	5.00	4.73	6.09	4.81	11.96	4.64	6.02	4.60	4.79	4.46	4.76	4.36	4.50
2005	4.36	4.50	4.41	4.57	4.31	4.55	4.31	4.58	4.36	4.54	4.39	8.72	4.51	8.02	4.35	6.42	4.35	7.95	4.44	6.05	4.30	4.41	4.15	4.47
2006	4.36	4.61	4.40	4.59	4.47	4.70	4.51	4.62	4.47	4.57	4.44	4.79	4.57	8.07	5.09	20.93	5.01	9.98	5.06	6.80	4.34	5.48	4.27	4.39
2007	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.30	6.09	4.07	11.97	4.87	10.39	5.24	8.07	2.98	5.78	3.50	4.75	3.45	3.95
2008	3.39	4.55	3.13	3.65	3.17	4.57	3.12	3.43	3.10	3.43	3.99	6.40	4.39	5.68	4.12	7.60	3.82	6.56	3.02	3.86	3.05	4.23	3.00	3.43
2009	2.77	2.97	2.92	3.04	2.92	4.07	3.16	3.51	3.16	3.46	3.05	3.62	3.10	6.20	3.67	5.15	3.55	6.07	3.40	4.19	3.41	3.63	2.98	3.50
2010	3.01	3.43	2.74	3.35	2.93	3.22	3.05	3.97	3.12	3.35	3.11	3.79	3.08	4.60	3.41	8.77	3.29	9.90	3.02	3.61	3.65	3.97	3.37	3.80
2011	3.37	4.27	3.35	3.52	3.22	3.46	2.92	3.45	3.26	3.57	3.23	3.80	3.30	4.39	3.34	10.59	3.76	8.91	3.50	3.91	3.52	3.57	3.31	3.53
2012	3.26	3.45	3.40	3.70	3.35	3.47	3.56	3.73	3.40	3.75	3.47	3.55	3.42	4.20	3.60	7.21	5.03	12.75	4.76	5.11	4.65	4.83	4.53	4.65
2013	4.35	4.81	4.05	4.30	3.93	4.17	3.54	4.08	3.51	4.10	3.57	4.35	3.93	10.24	5.88	11.95	4.28	14.22	4.95	8.15	4.50	4.92	4.28	4.49
2014	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.43	4.17	3.32	9.04	3.39	9.60	4.03	11.89	3.86	4.80	3.08	3.85	3.03	3.38
2015	3.17	3.95	2.98	3.19	2.97	3.50	3.17	3.85	2.95	3.47	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Max	**5.72**	**6.53**	**5.89**	**6.52**	**5.47**	**6.44**	**5.33**	**7.16**	**5.09**	**6.45**	**5.12**	**13.57**	**6.31**	**11.97**	**5.88**	**20.93**	**6.00**	**19.57**	**5.86**	**13.31**	**5.70**	**6.36**	**5.70**	**6.55**
Min	**2.77**	**2.97**	**2.74**	**3.04**	**2.92**	**3.22**	**2.92**	**3.43**	**2.95**	**3.35**	**3.05**	**3.55**	**3.08**	**4.20**	**3.34**	**5.06**	**3.29**	**4.83**	**2.98**	**3.61**	**3.05**	**3.57**	**2.98**	**3.38**

Table 31: Monthly minimum and maximum Water levels at Gidhade

Year	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP		OCT		NOV		DEC	
	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max
1970	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	123.60	125.40	123.65	133.65	124.25	134.15	123.55	124.55	NA	NA	NA	NA
1971	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	122.50	123.08	122.53	124.40	122.73	123.18	123.05	128.00	123.05	125.50	NA	NA	NA	NA
1972	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	122.21	125.45	122.55	127.60	122.48	135.50	122.95	125.18	122.48	122.93	NA	NA	NA	NA
1973	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	122.23	122.98	122.40	129.05	123.33	133.75	123.75	127.95	123.10	125.55	NA	NA	NA	NA
1974	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	122.60	125.30	123.25	128.05	122.75	123.70	122.80	124.75	NA	NA	NA	NA

Year	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP		OCT		NOV		DEC	
	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max
1975	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	122.50	124.40	122.85	124.70	123.75	128.60	123.90	130.00	123.30	124.85	NA	NA	NA	NA
1976	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	122.68	123.60	122.75	126.35	123.70	129.20	123.55	129.70	123.05	123.55	NA	NA	NA	NA
1977	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	122.90	126.50	123.05	126.85	123.30	127.13	123.45	129.00	123.20	125.40	NA	NA	NA	NA
1978	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	122.90	125.73	122.80	131.15	123.40	136.75	123.20	130.30	123.00	123.35	NA	NA	NA	NA
1979	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	122.73	127.20	123.58	137.65	123.10	125.28	122.80	123.68	NA	NA	NA	NA
1980	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	123.60	125.50	122.65	126.55	123.95	130.75	123.05	125.02	122.70	123.05	NA	NA	NA	NA
1981	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	123.26	125.75	123.10	134.00	123.50	127.20	123.20	125.58	NA	NA	NA	NA
1982	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	122.85	127.98	122.55	125.85	122.90	124.90	122.95	124.80	123.00	123.10	NA	NA	NA	NA
1983	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	123.20	127.05	123.00	124.55	123.20	131.00	124.31	128.22	124.00	127.45	NA	NA	NA	NA
1984	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	122.72	128.45	123.63	131.55	122.78	123.60	123.26	125.85	NA	NA	NA	NA
1985	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	123.78	126.11	123.00	124.23	123.05	126.00	122.50	127.00	123.24	124.33	NA	NA	NA	NA
1986	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	122.90	126.60	122.59	128.60	122.90	130.43	123.00	126.00	NA	NA	NA	NA	NA	NA
1987	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	122.75	125.45	122.50	124.73	122.43	126.30	121.82	124.00	121.78	122.02	NA	NA	NA	NA
1988	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	122.54	124.80	123.05	128.65	122.90	129.09	123.25	128.88	123.72	131.62	NA	NA	NA	NA
1989	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	123.07	127.10	122.85	126.52	122.97	130.87	123.30	127.09	122.80	123.45	NA	NA	NA	NA
1990	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	122.82	127.65	122.80	131.80	123.20	134.55	123.30	130.87	123.34	125.53	122.86	123.63	122.75	122.90
1991	122.68	122.76	122.64	122.69	125.05	125.11	125.10	125.33	125.05	125.20	125.16	127.35	122.73	129.70	123.30	131.80	122.50	123.60	122.04	122.54	122.36	122.40	122.33	122.37
1992	122.26	122.40	122.27	122.39	122.11	122.31	122.01	122.10	122.01	122.01	122.64	126.60	122.36	123.49	122.95	129.25	122.80	127.85	122.70	126.50	122.51	122.68	122.39	122.51
1993	122.12	122.42	122.00	122.12	NA	NA	NA	NA	NA	NA	121.22	124.14	122.80	132.15	122.82	126.93	122.83	126.70	122.95	125.45	122.41	122.95	122.23	122.74
1994	122.06	122.21	121.81	122.05	NA	NA	NA	NA	NA	NA	122.67	124.15	122.85	127.00	123.50	129.90	122.95	137.60	122.36	123.30	122.07	122.46	122.02	122.11
1995	122.02	122.35	121.88	122.02	121.88	122.01	121.86	121.94	121.81	121.86	121.72	124.90	122.43	128.70	122.06	123.40	122.28	130.83	122.21	123.13	121.96	122.20	121.70	121.92

Year	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP		OCT		NOV		DEC	
	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max
1996	NA	NA	121.70	121.73	NA	NA	121.70	121.73	NA	NA	121.70	122.60	122.19	127.68	122.52	127.20	122.80	127.30	122.32	125.20	122.16	123.00	121.87	122.18
1997	121.70	121.91	NA	NA	121.74	121.74	NA	NA	NA	NA	122.11	122.56	122.03	131.30	122.14	130.20	122.45	125.68	122.04	123.02	122.02	123.32	122.40	125.80
1998	121.96	122.41	121.75	121.93	121.71	121.74	NA	NA	NA	NA	122.09	123.00	122.23	128.03	122.92	126.89	123.51	137.73	123.08	125.55	122.52	123.74	122.08	122.52
1999	121.90	124.60	121.84	122.02	121.72	121.88	121.71	121.73	121.71	121.72	122.28	127.40	122.25	124.74	122.49	131.05	122.50	125.20	122.78	126.18	122.34	122.80	121.95	122.34
2000	121.88	121.99	121.71	121.87	NA	NA	NA	NA	122.00	124.65	121.75	126.62	122.65	126.96	122.23	124.42	122.04	123.04	121.76	122.02	NA	NA	NA	NA
2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	121.76	125.59	122.16	123.32	122.25	130.25	122.23	122.82	122.39	125.18	122.00	122.39	122.03	122.06
2002	122.03	122.08	122.01	122.06	121.83	122.07	NA	NA	NA	NA	123.80	131.00	122.07	123.22	122.06	131.85	122.98	132.90	122.28	122.98	122.11	122.26	NA	NA
2003	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	123.18	123.84	122.20	128.15	122.57	129.40	122.64	127.25	122.60	124.96	121.90	122.67	121.80	121.90
2004	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	121.70	122.82	121.88	123.24	122.94	129.15	122.21	123.88	122.16	123.50	121.96	122.15	NA	NA
2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	122.06	126.40	122.40	128.80	122.29	127.80	122.17	123.16	121.95	122.18	121.95	122.03
2006	121.94	121.95	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	122.36	131.00	123.24	141.65	123.59	127.33	122.68	127.80	122.41	122.85	122.06	122.41
2007	121.76	122.04	121.70	121.76	NA	NA	NA	NA	NA	NA	121.56	122.27	122.85	135.50	122.95	133.58	122.87	126.57	122.34	123.75	122.15	122.36	122.15	122.47
2008	122.12	122.29	121.69	122.11	121.64	121.68	NA	NA	NA	NA	NA	NA	121.90	124.30	122.32	129.35	123.02	129.32	127.20	132.72	130.80	132.48	130.54	131.02
2009	130.06	130.48	129.61	130.04	129.04	129.59	128.61	129.02	128.01	128.60	127.29	128.00	122.73	127.50	122.25	131.00	127.80	132.70	131.00	132.74	131.86	132.70	132.66	132.80
2010	132.33	132.74	131.93	132.30	131.52	131.92	130.75	131.50	130.26	130.74	123.96	130.23	122.32	125.80	123.44	128.65	123.22	131.86	131.20	132.72	132.16	132.76	132.56	132.74
2011	132.33	132.72	131.78	132.30	130.38	131.74	130.02	130.36	129.46	129.98	126.70	129.45	122.60	128.72	123.00	128.48	122.99	128.30	129.30	132.94	132.40	132.84	131.88	132.40
2012	131.64	131.88	130.88	131.62	130.32	130.86	129.80	130.30	129.12	129.76	128.12	128.32	123.08	129.25	123.36	129.95	123.04	133.35	128.40	132.80	132.50	132.80	131.88	132.48
2013	131.56	131.86	130.94	131.54	130.30	130.92	129.68	130.26	128.84	129.67	122.40	128.96	122.90	127.90	123.85	134.43	122.70	130.10	123.00	126.95	127.50	132.90	132.62	132.87
2014	132.16	132.60	131.65	132.16	131.00	131.65	130.50	131.00	129.90	130.50	129.30	129.90	124.26	136.00	122.65	130.45	123.28	130.85	128.45	132.95	132.62	132.95	132.70	133.00
2015	132.15	133.35	132.00	132.58	131.45	132.00	130.45	131.45	129.50	130.45	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Max	132.33	133.35	132.00	132.58	131.52	132.00	130.75	131.50	130.26	130.74	129.30	131.00	124.26	136.00	123.95	141.65	127.80	137.73	131.20	132.95	132.62	132.95	132.70	133.00

Year	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP		OCT		NOV		DEC	
	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max
Min	121.70	121.91	121.69	121.73	121.64	121.68	121.70	121.73	121.71	121.72	121.22	122.27	121.88	123.22	122.06	123.18	121.82	122.82	121.76	122.02	121.90	122.15	121.70	121.90

Table 32: Monthly minimum and maximum Water levels at Sarangkheda

Year	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP		OCT		NOV		DEC	
	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max
1977	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	110.12	110.44	109.98	111.61	109.90	111.14
1978	109.78	109.88	109.81	110.12	109.67	109.98	109.49	109.70	109.45	109.54	109.45	113.24	110.05	117.10	111.23	121.50	111.23	117.25	110.65	111.42	110.46	110.78	110.30	110.63
1979	110.29	110.66	110.27	110.68	109.97	110.48	109.86	110.07	109.81	109.93	109.78	115.33	110.62	113.88	111.62	122.73	111.27	112.92	110.70	111.71	110.38	111.66	110.23	111.70
1980	110.12	110.29	110.03	110.12	109.95	110.02	109.87	109.95	109.87	109.96	109.90	114.11	110.52	113.90	111.89	116.70	110.92	112.52	110.20	110.87	109.99	110.22	109.98	110.35
1981	109.95	110.35	109.79	109.95	109.84	109.93	109.77	109.87	109.73	109.93	109.75	109.91	109.88	114.08	110.90	119.95	111.41	114.54	110.60	113.59	110.27	111.00	110.12	110.46
1982	110.03	110.22	110.01	110.50	109.89	110.01	109.80	109.92	109.77	109.92	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1983	109.74	109.90	NA	NA	109.62	109.70	109.60	109.62	109.57	109.61	NA	NA	110.11	112.08	110.65	116.80	111.90	114.70	110.36	114.28	109.97	110.34	109.84	110.06
1984	109.80	110.04	109.79	109.90	109.73	109.86	109.71	109.90	109.83	109.90	109.88	111.05	110.14	115.88	110.07	118.75	110.12	111.34	109.55	113.13	109.72	110.01	109.71	109.80
1985	109.78	109.83	109.74	109.79	109.67	109.74	109.65	109.75	109.66	109.73	109.71	113.49	109.82	112.21	110.35	113.57	109.70	112.00	109.76	111.40	109.55	109.88	109.54	109.61
1986	109.59	109.65	109.62	109.69	109.57	109.81	109.57	109.60	109.57	109.62	109.60	112.00	109.73	115.90	110.98	117.00	109.85	110.98	109.62	109.92	109.65	109.71	109.61	109.70
1987	109.66	109.72	109.63	109.72	109.50	109.67	109.35	109.51	109.42	109.50	109.44	112.87	109.73	112.30	109.61	113.13	109.47	111.61	109.40	109.72	109.33	110.78	109.42	109.73
1988	109.35	109.47	109.28	109.44	109.27	109.52	109.22	109.44	109.23	109.61	109.28	111.99	110.28	115.50	110.58	115.84	111.00	116.00	110.74	118.15	110.01	110.87	109.77	110.00
1989	109.72	109.77	109.61	109.73	109.60	110.19	109.39	110.03	109.38	109.87	109.52	114.31	110.54	113.95	110.66	118.25	110.91	114.30	110.20	111.18	110.10	110.22	109.86	110.13
1990	109.83	109.97	109.73	109.88	NA	NA	109.74	110.13	109.72	110.40	NA	NA	110.01	118.55	110.79	119.60	111.13	115.21	111.12	113.09	110.48	111.30	109.98	110.53
1991	109.89	110.06	109.79	110.06	109.68	109.94	109.95	110.24	109.84	110.13	109.91	112.05	110.46	112.99	111.10	118.82	109.84	111.37	109.81	110.05	109.70	109.92	109.74	109.90
1992	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	110.04	113.95	109.96	111.25	110.40	116.02	110.59	115.10	110.25	112.98	109.90	110.20	109.71	109.91
19	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	110.	111.	110.	117.	110.	114.	110.	113.	110.	113.	109.	110.	109.	110.

Year	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP		OCT		NOV		DEC	
	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max
93											31	47	58	97	44	20	52	74	57	20	86	64	79	40
1994	109.47	109.78	109.10	109.41	NA	NA	NA	NA	NA	NA	109.57	111.62	110.53	114.14	111.06	115.20	111.13	123.25	110.39	111.36	109.96	110.49	109.85	109.97
1995	109.86	110.12	109.48	109.89	109.31	109.47	NA	NA	NA	NA	110.75	113.65	110.33	116.13	109.98	111.56	NA	NA	109.96	111.45	109.66	109.92	NA	NA
1996	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	109.74	110.60	109.77	114.74	110.29	114.22	110.42	114.85	110.14	113.00	109.87	110.79	109.48	109.93
1997	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	109.90	110.05	109.73	118.05	109.88	115.95	110.22	113.21	109.75	111.29	109.72	111.45	110.19	113.56
1998	109.67	110.16	109.43	109.62	NA	NA	NA	NA	NA	NA	109.70	110.84	109.97	115.36	110.69	114.90	111.49	122.96	110.95	113.21	110.11	111.80	109.62	110.10
1999	109.42	109.95	109.37	109.53	109.25	109.35	NA	NA	NA	NA	109.88	113.62	109.90	112.54	110.21	118.10	110.23	113.38	110.19	113.80	109.63	110.35	109.37	109.68
2000	109.21	109.30	NA	NA	NA	NA	NA	NA	109.48	112.98	109.36	113.75	109.91	114.90	109.60	112.05	109.44	111.43	109.04	109.38	NA	NA	NA	NA
2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	109.12	112.87	109.90	110.54	109.93	115.80	109.45	110.40	109.57	112.82	109.41	109.80	NA	NA
2002	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	110.98	115.60	109.04	110.98	109.46	119.00	110.60	118.70	109.98	110.55	109.68	109.98	NA	NA
2003	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	109.86	112.10	110.05	115.80	110.30	117.60	110.27	115.30	110.32	112.95	110.05	110.25	109.91	110.03
2004	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	109.12	109.80	109.11	110.35	110.40	116.00	109.38	111.30	109.39	110.60	109.09	109.37	NA	NA
2005	109.47	109.47	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	109.16	114.10	109.91	116.10	109.70	115.20	109.53	110.77	109.26	109.53	109.21	109.25
2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	110.18	117.65	111.43	126.70	111.50	114.70	110.65	114.94	109.82	110.64	109.48	109.80
2007	109.33	109.47	NA	NA	NA	NA	NA	NA	NA	NA	108.90	109.95	110.35	120.90	111.08	119.50	110.96	114.08	110.26	111.56	109.92	110.28	109.69	110.00
2008	109.42	109.68	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	109.80	109.80	109.84	114.60	109.70	113.80	109.70	110.65	109.45	109.70	109.20	109.45
2009	109.25	109.32	109.25	109.25	NA	NA	NA	NA	NA	NA	109.00	109.48	109.00	114.95	109.55	113.10	109.60	115.40	109.60	112.00	111.10	111.60	111.10	111.30
2010	110.60	111.10	109.40	110.60	109.30	109.40	109.30	109.30	109.30	109.30	109.20	110.70	109.30	112.60	111.43	114.55	111.40	116.45	111.95	112.40	112.20	112.50	112.20	112.20
2011	111.60	112.20	111.25	111.60	110.70	111.25	110.40	110.65	110.15	110.30	110.15	111.00	110.15	113.10	110.85	116.10	110.95	115.10	111.80	112.20	111.30	111.80	110.80	113.30
2012	110.35	110.80	110.00	110.30	110.00	110.00	110.00	110.00	110.00	110.00	110.00	110.00	109.00	116.45	110.50	116.00	110.70	120.35	112.15	112.40	111.95	112.30	111.50	111.95
2013	111.20	111.50	110.85	111.15	110.30	110.80	110.00	110.30	109.40	110.00	109.30	113.20	110.10	114.91	111.20	119.75	110.15	117.30	110.45	113.35	112.20	112.40	111.95	112.30
2014	111.65	111.95	111.10	111.65	110.50	111.10	110.20	110.45	109.70	110.20	109.55	109.70	109.50	120.25	109.45	112.23	109.90	118.40	110.00	113.10	112.00	112.40	112.10	112.30

Year	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP		OCT		NOV		DEC	
	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max
2015	111.90	112.10	111.60	111.90	111.30	111.50	110.90	111.30	110.40	110.90	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Max	111.90	112.20	111.60	111.90	111.30	111.50	110.90	111.30	110.40	112.98	110.98	115.60	110.62	120.90	111.89	126.70	111.90	123.25	112.15	118.15	112.20	112.50	112.20	113.56
Min	109.21	109.30	109.10	109.25	109.25	109.35	109.22	109.30	109.23	109.30	108.90	109.48	109.00	109.80	109.45	111.56	109.38	110.40	109.04	109.38	109.09	109.37	109.20	109.25

Table 33: Monthly minimum and maximum Water levels at Savkheda

Year	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP		OCT		NOV		DEC	
	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max
1972	NA	NA	NA	NA	NA	NA	143.95	144.08	143.94	144.09	143.95	147.32	144.21	149.41	144.12	158.61	144.71	146.72	144.46	144.71	144.38	144.51	144.31	144.41
1973	144.27	144.33	144.24	144.35	144.17	144.30	144.09	144.20	144.04	144.08	144.08	145.02	145.09	151.14	145.09	156.04	145.47	149.83	144.67	147.31	144.37	144.98	144.31	144.38
1974	144.25	144.31	144.21	144.26	144.21	144.25	144.16	144.22	144.09	144.46	144.11	144.43	144.33	146.77	144.76	150.17	144.31	145.16	144.34	146.72	144.14	144.33	144.12	144.15
1975	142.06	142.11	142.04	142.17	142.03	142.11	141.99	142.04	141.96	142.03	142.01	144.29	142.50	144.85	143.41	149.78	143.46	150.22	142.59	144.72	142.31	143.32	142.20	142.31
1976	142.16	142.20	142.12	142.16	142.07	142.11	142.05	142.14	142.02	142.06	142.02	142.78	142.25	145.94	142.85	147.62	143.05	149.85	142.32	142.96	142.28	144.37	142.24	142.35
1977	142.17	142.34	142.15	142.18	142.12	142.21	142.11	142.15	142.11	142.15	142.17	146.25	142.31	146.40	142.65	146.90	142.88	149.19	142.32	145.14	142.16	144.62	142.20	143.13
1978	142.11	142.20	142.09	142.36	142.04	142.14	142.03	142.09	141.97	142.08	141.99	145.65	142.20	150.73	143.01	159.02	142.88	150.26	142.53	143.13	142.44	142.67	142.40	142.61
1979	142.37	142.68	142.39	142.82	142.24	142.44	142.10	142.27	142.05	142.12	142.05	148.77	142.40	147.14	142.08	157.55	142.87	144.89	142.57	143.36	142.42	143.66	142.41	143.64
1980	142.30	142.43	142.22	142.30	142.19	142.25	142.19	142.23	142.21	142.27	142.22	144.82	142.39	146.02	143.65	151.69	142.61	144.74	142.22	142.71	142.11	142.23	142.08	142.44
1981	142.14	142.39	142.08	142.20	142.09	142.15	142.06	142.11	142.06	142.14	142.04	142.28	142.21	146.70	142.77	154.22	143.00	147.68	142.45	144.89	142.28	142.69	142.19	142.37
1982	142.18	142.30	142.13	142.51	142.01	142.12	141.92	142.07	141.92	141.96	141.94	146.01	141.96	145.98	142.40	144.52	142.39	144.80	141.88	142.52	141.89	142.05	141.85	142.07
1983	141.89	142.10	141.84	141.91	141.80	141.87	141.79	141.81	141.79	141.81	141.80	144.51	142.22	144.03	142.82	151.70	143.80	148.64	142.29	146.75	142.22	142.37	142.10	142.28
1984	142.09	142.25	142.03	142.16	141.96	142.10	142.03	142.13	142.01	142.09	142.02	143.01	142.20	146.20	142.24	152.54	142.23	143.19	142.20	146.15	142.11	142.28	142.10	142.15
1985	142.11	142.17	142.08	142.15	142.06	142.10	142.03	142.14	142.03	142.08	142.03	147.01	142.15	144.65	142.49	146.75	142.01	145.17	142.09	143.45	141.95	142.16	141.93	141.96

Year	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP		OCT		NOV		DEC	
	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max
1986	141.91	141.95	141.91	142.20	141.85	142.00	141.86	141.89	141.85	141.87	141.86	144.78	142.05	149.13	142.88	151.78	142.13	142.98	142.02	142.17	142.01	142.07	142.00	142.02
1987	142.00	142.07	141.98	142.02	141.95	141.99	141.94	141.97	141.92	142.07	141.93	145.04	142.03	144.60	141.98	147.27	141.93	143.46	141.91	142.22	141.88	142.57	141.90	141.95
1988	141.91	141.94	141.90	142.01	141.83	142.07	141.85	142.08	141.86	142.21	141.88	144.83	142.86	149.14	142.50	150.58	142.92	148.71	142.49	151.76	142.24	142.67	142.08	142.28
1989	142.02	142.11	142.00	142.03	141.98	142.21	141.96	142.14	142.00	142.22	141.97	146.88	142.35	147.98	142.39	150.32	142.65	147.22	142.07	142.75	142.00	142.13	141.93	142.06
1990	141.90	142.02	141.88	141.91	141.86	141.88	141.86	142.15	141.85	142.11	142.08	148.00	141.90	152.49	142.23	156.10	142.52	150.43	142.71	145.65	142.29	142.96	141.95	142.35
1991	141.90	142.06	141.90	142.07	141.92	141.96	142.02	142.11	141.95	142.06	141.96	144.14	142.29	152.38	142.79	150.50	141.97	143.09	141.92	142.01	141.91	141.93	141.88	141.91
1992	141.85	141.90	141.84	141.90	141.83	141.86	141.79	141.85	141.78	141.80	141.75	146.08	141.87	143.04	142.28	149.85	142.22	149.20	142.01	145.32	141.78	142.03	141.72	141.77
1993	141.71	141.73	141.70	141.76	141.70	141.77	141.65	141.80	141.58	141.68	141.56	143.60	142.41	153.51	142.23	147.73	142.15	146.25	142.26	144.60	141.91	142.37	141.80	142.35
1994	141.73	141.80	141.70	141.74	141.69	141.71	141.68	141.79	141.51	141.70	141.47	143.88	142.41	147.38	142.60	150.89	142.78	158.71	142.46	143.15	142.20	142.63	142.21	142.25
1995	142.18	142.36	142.15	142.18	142.15	142.22	142.14	142.18	142.07	142.18	142.03	146.25	142.28	148.40	142.14	143.40	142.16	151.62	142.07	143.18	141.97	142.05	141.91	141.96
1996	141.87	141.92	141.85	141.88	141.81	141.85	141.76	141.80	141.00	141.00	141.78	142.22	141.89	148.10	142.16	148.24	142.25	147.20	142.03	144.86	142.07	142.53	141.92	142.10
1997	141.91	141.95	141.84	141.92	141.83	141.84	141.83	141.83	141.00	141.00	141.00	142.76	141.88	150.00	142.02	150.80	142.12	146.48	142.10	143.27	142.06	145.20	142.22	145.80
1998	141.92	142.23	141.90	141.98	141.90	142.00	141.00	141.90	141.00	141.00	142.05	142.83	142.12	147.19	142.56	147.20	143.12	159.00	142.80	145.44	142.42	143.51	142.13	142.42
1999	142.02	142.13	141.94	142.13	141.87	141.98	141.87	142.02	NA	NA	142.08	147.09	142.05	144.41	142.42	150.87	142.40	146.95	142.60	146.64	142.18	142.60	142.00	142.18
2000	141.82	142.06	141.80	141.95	141.78	141.89	NA	NA	141.75	144.25	141.98	146.54	142.24	147.60	141.85	143.84	142.00	142.59	141.88	142.09	141.82	141.86	NA	NA
2001	NA	NA	NA	NA	NA	NA	NA	NA	142.48	142.48	141.85	145.44	141.80	142.80	141.94	151.78	141.90	142.50	142.00	145.55	141.78	142.01	NA	NA
2002	NA	NA	NA	NA	NA	NA	NA	NA	142.48	142.48	143.13	151.55	141.72	142.52	141.76	150.00	142.59	153.61	141.95	142.49	141.83	142.01	141.74	141.85
2003	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	142.38	144.02	142.00	148.40	142.27	147.90	142.26	146.20	141.89	144.10	141.78	141.92	141.72	141.84
2004	141.40	141.70	141.28	141.40	NA	NA	NA	NA	NA	NA	141.48	142.50	141.50	142.87	142.40	148.30	141.66	143.45	141.70	142.64	141.39	141.69	141.01	141.39
2005	141.00	141.01	141.00	141.00	141.08	141.80	141.00	141.05	NA	NA	141.00	141.00	141.00	145.50	141.50	148.50	141.40	148.90	141.35	142.30	141.05	141.35	141.05	141.05
2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	141.00	141.40	141.25	151.50	142.45	159.10	143.05	146.20	142.00	147.80	141.40	142.10	141.35	141.40

Year	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP		OCT		NOV		DEC	
	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max
2007	141.35	141.35	141.20	141.35	141.20	141.20	141.00	141.00	141.00	141.00	141.00	141.60	142.10	156.50	142.55	153.30	142.45	146.50	141.80	143.40	141.35	141.85	141.30	141.35
2008	141.20	141.30	141.05	141.20	141.00	141.50	NA	NA	NA	NA	141.00	141.00	141.00	142.90	141.45	149.20	141.75	146.20	141.20	142.20	141.05	141.20	141.00	141.05
2009	141.00	141.00	141.00	141.00	141.00	141.00	141.00	141.00	141.00	141.00	141.05	141.20	141.05	147.30	141.20	145.30	141.30	145.30	141.20	143.00	141.10	143.50	141.20	141.60
2010	141.10	141.20	141.05	141.10	141.00	141.00	NA	NA	NA	NA	140.30	140.85	140.50	149.20	142.60	148.90	141.90	148.75	141.30	142.15	141.40	142.40	141.35	141.85
2011	141.25	141.35	140.95	141.90	140.50	140.85	140.50	141.40	140.50	140.95	140.10	142.00	141.40	145.40	142.50	148.10	142.15	148.05	141.30	142.20	141.20	141.35	141.10	141.20
2012	140.95	141.10	140.55	140.90	140.15	140.50	140.05	140.10	NA	NA	141.25	142.25	141.25	149.80	142.75	150.60	142.50	155.40	141.70	142.45	140.75	141.65	140.40	140.70
2013	140.35	140.40	140.30	140.30	140.05	140.30	NA	NA	NA	NA	141.85	146.80	142.10	147.50	143.25	156.20	141.90	149.10	142.15	145.75	141.65	142.00	141.40	141.65
2014	141.40	141.45	141.35	141.45	141.35	141.40	141.00	141.30	141.00	141.40	NA	NA	141.20	157.00	141.85	144.60	141.90	150.50	141.65	142.00	141.55	141.70	141.35	141.90
2015	141.25	142.30	141.20	141.25	141.10	141.20	141.00	141.30	141.00	141.25	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Max	144.27	144.33	144.24	144.35	144.21	144.30	144.16	144.22	144.09	144.46	144.11	151.55	145.09	157.00	145.09	159.10	145.47	159.00	144.67	151.76	144.38	145.20	144.31	145.80
Min	140.35	140.40	140.30	140.30	140.05	140.30	140.05	140.10	140.50	140.95	140.10	140.85	140.50	142.52	141.20	143.40	141.30	142.50	141.20	142.00	140.75	141.20	140.40	140.70

4.17 Yearly minimum and maximum Water levels

Ghala

Table 34: Yearly minimum and maximum Water levels at Ghala

YEAR	MAXIMUM WATER LEVEL (m)	MINIMUM WATER LEVEL (m)
1978	10.64	4.87
1979	16.83	3.88
1979	16.18	4.10
1980	7.35	3.97
1981	9.14	3.93
1982	8.35	4.10
1983	11.27	3.96
1984	6.41	4.16
1985	7.20	4.12
1986	6.99	4.15
1987	6.23	4.10
1988	14.34	4.44
1989	8.24	4.43
1990	16.69	4.39
1991	6.27	4.20
1992	8.44	4.14
1993	7.80	4.61
1994	17.48	4.64
1995	7.80	4.20
1996	6.40	4.07
1997	8.97	4.80
1998	19.57	4.76
1999	7.86	4.38
2000	8.66	4.62
2001	7.16	4.55
2002	12.13	4.37
2003	7.54	4.33
2004	11.96	4.36
2005	8.72	4.15
2006	20.93	4.27
2007	11.97	2.98

YEAR	MAXIMUM WATER LEVEL (m)	MINIMUM WATER LEVEL (m)
2008	7.60	3.00
2009	6.20	2.77
2010	9.90	2.74
2011	10.59	2.92
2012	12.75	3.26
2013	14.22	3.51
2014	11.89	3.03
2015	3.95	2.95
MAXIMUM	20.93	4.87
MINIMUM	3.95	2.74

Gidhade

Table 35: Yearly minimum and maximum Water levels at Gidhade

YEAR	MAXIMUM WATER LEVEL (m)	MINIMUM WATER LEVEL (m)
1970	134.15	123.55
1971	128.00	122.50
1972	135.50	122.21
1973	133.75	122.23
1974	128.05	122.60
1975	130.00	122.50
1976	129.70	122.68
1977	129.00	122.90
1978	136.75	122.80
1979	137.65	122.73
1980	130.75	122.65
1981	134.00	123.10
1982	127.98	122.55
1983	131.00	123.00
1984	131.55	122.72
1985	127.00	122.50
1986	130.43	122.59
1987	126.30	121.78
1988	131.62	122.54
1989	130.87	122.80
1990	134.55	122.75
1991	131.80	122.04
1992	129.25	122.01

YEAR	MAXIMUM WATER LEVEL (m)	MINIMUM WATER LEVEL (m)
1993	132.15	121.22
1994	137.60	121.81
1995	130.83	121.70
1996	127.68	121.70
1997	131.30	121.70
1998	137.73	121.71
1999	131.05	121.71
2000	126.96	121.71
2001	130.25	121.76
2002	132.90	121.83
2003	129.40	121.80
2004	129.15	121.70
2005	128.80	121.95
2006	141.65	121.94
2007	135.50	121.56
2008	132.72	121.64
2009	132.80	122.25
2010	132.76	122.32
2011	132.94	122.60
2012	133.35	123.04
2013	134.43	122.40
2014	136.00	122.65
2015	133.35	129.50
MAXIMUM	141.65	129.50
MINIMUM	126.30	121.22

Sarangkheda

Table 36: Yearly minimum and maximum Water levels at Sarangkheda

YEAR	MAXIMUM WATER LEVEL (m)	MINIMUM WATER LEVEL (m)
1977	111.61	109.90
1978	121.50	109.45
1979	122.73	109.78
1979	116.70	109.87
1980	119.95	109.73
1981	110.50	109.77
1982	116.80	109.57
1983	118.75	109.55

YEAR	MAXIMUM WATER LEVEL (m)	MINIMUM WATER LEVEL (m)
1984	113.57	109.54
1985	117.00	109.57
1986	113.13	109.33
1987	118.15	109.22
1988	118.25	109.38
1989	119.60	109.72
1990	118.82	109.68
1991	116.02	109.71
1992	117.97	109.79
1993	123.25	109.10
1994	116.13	109.31
1995	114.85	109.48
1996	118.05	109.72
1997	122.96	109.43
1998	118.10	109.25
1999	114.90	109.04
2000	115.80	109.12
2001	119.00	109.04
2002	117.60	109.86
2003	116.00	109.09
2004	116.10	109.16
2005	126.70	109.48
2006	120.90	108.90
2007	114.60	109.20
2008	115.40	109.00
2009	116.45	109.20
2010	116.10	110.15
2011	120.35	109.00
2012	119.75	109.30
2013	120.25	109.45
2014	112.10	110.40
2015	126.70	110.40
MAXIMUM	110.50	108.90
MINIMUM	111.61	109.90

Savkheda

Table 37: Yearly minimum and maximum Water levels at Savkheda

YEAR	MAXIMUM WATER LEVEL (m)	MINIMUM WATER LEVEL (m)
1972	158.61	143.94
1973	156.04	144.04
1974	150.17	144.09
1975	150.22	141.96
1976	149.85	142.02
1977	149.19	142.11
1978	159.02	141.97
1979	157.55	142.05
1980	151.69	142.08
1981	154.22	142.04
1982	146.01	141.85
1983	151.70	141.79
1984	152.54	141.96
1985	147.01	141.93
1986	151.78	141.85
1987	147.27	141.88
1988	151.76	141.83
1989	150.32	141.93
1990	156.10	141.85
1991	152.38	141.88
1992	149.85	141.72
1993	153.51	141.56
1994	158.71	141.47
1995	151.62	141.91
1996	148.24	141.00
1997	150.80	141.00
1998	159.00	141.00
1999	150.87	141.87
2000	147.60	141.75
2001	151.78	141.78
2002	153.61	141.72
2003	148.40	141.72
2004	148.30	141.01
2005	148.90	141.00
2006	159.10	141.00
2007	156.50	141.00

YEAR	MAXIMUM WATER LEVEL (m)	MINIMUM WATER LEVEL (m)
2008	149.20	141.00
2009	147.30	141.00
2010	149.20	140.30
2011	148.10	140.10
2012	155.40	140.05
2013	156.20	140.05
2014	157.00	141.00
2015	142.30	141.00
MAXIMUM	**159.10**	**144.09**
MINIMUM	**142.30**	**140.05**

4.18 Chart Datum/ Sounding Datum

As per discussion with IWAI, Chart Datum has been taken as following for different reaches

Tidal Reach:

C.D. is taken as C.D. of nearest port from Admiralty Tide Table (ATT) or Navigational charts

Non Tidal Reach:

As per discussion with IWAI, Sounding datum in rivers is taken as Average of minimum yearly water level for Last six years at all gauging sites. The gauge-discharge data of Bhusawal, Ghala, Gidhade, Hathnur, Kakrapar, Sarangkheda, Savkheda and Ukai Dam site was collected from CWC. Accordingly, the C.D. at these G.D. Sites has been arrived as below:

C.D. at Ghala G.D. Site

(Although CWC data from 1978-2015 was available for Ghala, Data for the recent years 2009-2014 was used for computing C.D. since the data for above years only was available for the maximum period in a year)

= [3.030 + 3.510 + 3.260 + 2.920 + 2.740 + 2.770] / 6

= **3.038 m**

C.D. at Kakrapar G.D. Site

= [47.975 + 48.010 + 47.305 + 47.700 + 47.640 + 47.640] / 6

= **47.712 m**

C.D. at Ukai Dam G.D. Site

= [91.836 + 91.485 + 93.561 + 86.914 + 87.935 + 89.282 / 6

= **90.169 m**

C.D. at Sarangkheda G.D. Site

(Although CWC data from 1977-2015 was available for Sarangkheda, Data for the recent years 2008-2013 was used for computing C.D. since the data for above years only was available for the maximum period in a year)

= [109.450 + 109.300 + 109.000 + 110.150 + 109.200 + 109.000] / 6

= **109.35 m**

C.D. at Gidhade G.D. Site

(Although CWC data from 1970-2015 was available for Gidhade, Data for the recent years 2009-2014 was used for computing C.D. since the data for above years only was available for the maximum period in a year)

= [122.650 + 122.400 + 123.040 + 122.600 + 122.320 + 122.250] / 6

= **122.543 m**

C.D. at Savkheda G.D. Site

(Although CWC data from 1972-2015 was available for Savkheda, Data for the recent years 2009-2014 was used for computing C.D. since the data for above years only was available for the maximum period in a year)

= [141.000 + 140.050 + 140.050 + 140.100 + 140.300 + 141.100] / 6

= **140.433 m**

C.D. at Bhusawal G.D. Site

= [174.100 + 174.100 + 174.100 + 174.100 + 174.050 + 174.050] / 6

= **174.083 m**

C.D. at Hathnur G.D. Site

= [208.200+ 207.750 + 207.200 + 207.690 + 208.900 + 20.060] / 6

= **207.678 m**

In case of Dams/ Bridges/ Barrages/ Check Dam, the C.D. has been taken as Ponding level or MDDL.

4.19 High Flood Levels

Tidal Reach

In Tidal reach, MHWS at Hazira Port as per ATT Vol -3 has been adopted as High Flood Level.
MHWS: 4.1 (w.r.t. C.D.)
MSL : 2.25 (W.r.t. C.D.)
MHWS (w.r.t. M.S.L.) : 4.1-2.24 = 1.85 m (w.r.t. M.S.L.)

At Gauge discharge sites

High flood levels are computed from last twenty years Gauge discharge data collected from CWC for Surat, Ghala, Kakrapara, Ukai Dam, Sarangkheda, Gidhade, Savkheda, Bhusaval and Hathnur. The maximum water level in last twenty years from the collected data has been adopted as H.F.L. The values for various G.D. Sites are adopted as under:

S.No.	NAME of GD Site	H.F.L.
1	Surat	12.50
2	Ghala	20.930
3	Kakrapara	54.53
4	Ukai dam	105.442
5	Sarangkheda	126.7
6	Gidhade	141.65

7	Savkheda	159.1
8	Bhusaval	183.4
9	Hathnur	214.010

Table 38: HFL at GD sites

At Dams/weir/Barrages

In case of dams, weir and barrages, maximum observed water level of last twenty years or Maximum Water level as mentioned in CWC data has been adopted as H.F.L.

4.20 Monthly minimum and maximum Discharges

Ghala

YEAR	JUNE		JULY		AUGUST		SEPTEMBER		OCTOBER		NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH		APRIL		MAY		ANNUAL	
	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q
1978-1979	889.6	27.4	942	100	13626	172.9	14307.9	262.6	435	89.1	435	74.5	404.9	190	380	115.9	390	78.9	500.3	42	560	200	447.9	15.5	14307.9	15.5
1979-1980	734.6	6.6	627.4	206.1	12022.5	296	440	213.2	398	204.8	564.2	40	431.8	172	462	137	525	186	497	1	341	0	172	0	12022.5	0
1980-1981	518	54	690	472	981.6	262.4	304	24.7	764	50	366	22.2	395	19.3	223	12	340	9	270	4	120	18	60	6	981.6	4
1981-1982	78.5	10	1652.5	26.5	1076.4	192.5	3400	209	1820	332	479	287	453.5	128	453.5	117	357	29	419	23	357.5	49.5	288.5	23	3400	10
1982-1983	515	30	1131.7	23.3	1125.9	115	306.2	14.1	12.1	5.2	61.6	5	11.1	3.9	11.3	3.8	6.93	4.6	6.2	4.1	6.1	4.4	6.1	3.1	1131.7	3.1
1983-1984	281.5	4.4	495	6.8	1382.98	96.5	2905	265.89	2635	302	360.02	32.5	690	268	578	170	567.225	86	549	10.71	624	13	182.5	9.5	2905	4.4
1984-1985	460	12	342.7	10.332	440	16.881	476	107.59	526	18.5	511.7	11.9	460	13.5	322	18.652	372	15.126	306	10.7	220	11.117	19.6	6.932	526	6.932
1985-1986	20.25	6.8	51.2	7.4	916.26	16.01	66.36	14.97	33.87	9.86	26.27	9.36	28.71	5.83	11.93	4.96	7.31	3.55	8.05	3.71	6.21	3.41	14	3.592	916.26	3.41
1986-1987	349.782	4.783	38	9.14	610	16.7	321.4	17.21	127.2	12.8	108.5	14	24.1	11.9	21.6	11.2	22.4	11.6	30.1	11.4	56.2	11.8	215	10	610	4.783
1987-1988	340.8	24.8	270	13.4	86.72	10	22.5	14.67	23.2	8.98	18.96	7.27	16.09	8.91	12.5	5.98	14.13	6.23	17.3	5.7	15.59	4.62	20.65	7.34	340.8	4.62
1988-1989	435	8.91	1973	14	1625	116.1	7592	439.3	6360	28.1	402.1	21.6	288.2	21.53	410.9	109.8	343.6	19.63	605	16.2	150	16	378	29.66	7592	8.91
1989-1990	475	23.71	573.4	20	684.1	28.04	1265	304.4	490	39.24	420	17.78	259	17.29	200	20.4	150	16	257.7	18	277.7	22.46	325.2	50.15	1265	16
1990-1991	472.3	132.2	419.1	28.85	14225	34.92	6241	305.3	2323	126.1	368.4	100.8	455.9	196.5	421.5	120.1	98.4	10.91	123.9	13.86	71.27	14	111.9	13.87	14225	10.91
1991-1992	110	12.02	150	21.82	609.2	111.9	151.2	16.72	30.05	18	28.31	15	25.55	12.54	16.11	9.96	20	9.19	24.27	5.29	11.2	5.04	12.52	6	609.2	5.04
1992-1993	1050	6.81	119.9	9.027	506.6	28	1536	73.5	145.2	17.07	93.65	12.35	36.67	12.4	185	11.6	22.31	14.36	27.22	11.32	182.96	11.88	185	30	1536	6.81
1993-1994	263.2	41.75	1419	25.47	299	21.31	449.8	20.25	520	61.38	255	19.07	242.4	57.78	220.9	20	133.7	15	175.8	17.19	134.6	14.32	37.14	13.86	1419	13.86
1994-1995	8121	24.99	2458	150	5628	76	16887	324.2	378.5	120	89.41	19.7	35.74	22.5	274.6	28.79	340	28.39	345.5	23	415	15.47	392	14.92	16887	14.92
1995-1996	40.93	14	1247	14	149.1	27.46	89	21.19	73.79	16.98	18.72	12.5	14.69	9.066	15.3	8.17	12.43	6.64	11.3	5.63	11.04	4.935	14.41	7.85	1247	4.935
1996-1997	247	5.502	515.5	14.73	619.9	26	440	29	460	75.24	178.2	28.1	50.19	23.81	38.56	23.71	34	19.2	22.52	14.61	288.2	16.48	558.7	39.54	619.9	5.502
1997-1998	1700	20.89	470.5	13.7	1900	23.18	906.1	186.8	280	32.05	45.44	25	446.2	24.49	500	30.87	227.7	30	375	85.09	470	85.42	270	33.7	1900	13.7
1998-1999	290	20	1800	20	263.9	38.99	22500	37.91	1650	77.26	225	27.97	246.6	20	186.5	13	97.87	13.178	388.8	16	230	13	247.3	10	22500	10
1999-2000	190	17	881.2	10	263.7	16	396.4	17	469.9	65	381.2	32.25	196.5	25.31	193.4	20.184	145.8	22.622	127.87	16.02	178.9	19.968	153.9	20.976	881.2	10
2000-2001	70	25.401	1108	33.646	84.638	34.742	61.272	18.821	24	14.922	23.131	14.04	25.102	15	24.754	11	25.019	14	16.705	12.334	15.62	11.827	17.03	13.568	1108	11
2001-2002	584.562	16.648	244.388	37.614	360.619	26.284	105.565	31.021	52.315	30.804	44	30.194	47.922	28.945	44	20.277	31.686	16.272	25.739	12.717	30.077	13.588	33.692	25.112	584.562	12.717
2002-2003	71.135	22	83.831	34.039	369.635	34.409	4735.332	20	236.827	20.08	24.344	12.588	42.086	12.2	29.015	10	26.736	15	27.393	10	22.373	10	26.448	14.5	4735.332	10
2003-2004	522.915	23.235	284.633	29.694	1014.25	32.912	787.59	271.879	1286.28	33.292	86.039	29.338	38	28	32.489	27.883	35.302	25	36.535	18.625	547.765	17.826	223.908	22.794	1286.28	17.826
2004-2005	55.656	23.191	278.702	28.534	5223.756	45.695	280.197	33.585	51.189	25.584	31.041	17.593	21.758	17.198	22.758	18.319	30.066	20.438	27.557	16.113	34.406	16.546	29.729	16.725	5223.756	16.113
MAXIMUN	8121	132.2	2458	472	14225	296	22500	439.3	6360	332	564.2	287	690	268	578	170	567.225	186	605	85.09	624	200	558.7	50.15	**22500**	17.826
MINIMUM	20.25	4.4	38	6.8	84.638	10	22.5	14.1	12.1	5.2	18.72	5	11.1	3.9	11.3	3.8	6.93	3.55	6.2	1	6.1	0	6.1	0	340.8	**0**

Gidhade

YEAR	JUNE		JULY		AUGUST		SEPTEMBER		OCTOBER		NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH		APRIL		MAY	
	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
1973-1974	101.585	0	5853.058	68.02	15212.54	273.43	4771.995	438.08	1833	140.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1974-1975	0	0	1705	0	4467	249.6	433.3	62.8	1255	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1975-1976	204.4	0	1153	74.8	5549	410.7	8710	430.7	1128	154.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1976-1977	276.2	0	2729	32.3	6256	319.9	7148	260.6	257.4	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1977-1978	2850	0	3355	57.1	3564.4	170.4	7208	182.9	2001.3	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1978-1979	2808	0	11429.56	25.6	22489.8	172.4	8461	135.8	167.6	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1979-1980	0	0	4813.49	34.7	26384.76	431.35	2006.61	175.75	485.9	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1980-1981	2359.48	0	2904.08	45.5	7570.54	487.41	1330	159.63	158.67	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1981-1982	0	0	1833.12	205	13545.51	148.32	3671.92	285.57	1738.83	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1982-1983	2195.37	0	3537.65	0	2011.24	261.78	2283.63	289.95	356.08	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1983-1984	1727.18	0	2037.98	0	9135.07	489.77	4696.4	1321.28	3977.9	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1984-1985	0	0	4933.53	328.37	8671.88	0	359.49	133.73	2376.09	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1985-1986	3072.4	0	749.9	0	2568.57	0	1403.14	72.09	874.93	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1986-1987	708.65	0	5028.42	423.25	6961.43	175.23	137.1	0	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1987-1988	1637.47	0	1187.95	17.81	2446.04	10.61	649.88	5.67	18.76	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1988-1989	1283.21	0	5213.03	167.01	6745.33	72.15	6016.04	160.04	10767.19	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1989-1990	3338.28	0	2382.95	19.73	7315.26	58.37	2905.86	213.97	300	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1990-1991	62.91	0	10695.85	35.784	13030.8	100.4	7461.1	149.5	2282	165.1	244.9	40.77	56.87	5	13.01	3.716	10.44	1.4	1.958	0.529	13.84	1.791	4.6	0.816
1991-1992	760.7	0.245	7312	42.8	7680	262.8	399	7.539	10.59	3.02	3.393	2.06	2.54	1.38	3.34	0.424	0.745	0	0	0	0	0	0	0
1992-1993	1574	0	214.1	2	4224	76.04	3027	55	1407	35	21.2	4.973	4.73	1.12	1.62	0	0	0	NA	NA	NA	NA	0	0
1993-1994	343.6	0	8018	66.09	2232	66.43	1551	68.77	965	94.19	79.53	8.36	43.4	3.25	2.75	0.7	0.625	0	NA	NA	NA	NA	NA	NA
1994-1995	408.7	29.4	2059	68.52	3855	261.1	15068	115.7	166.2	11.5	86.1	5.3	7.3	3.3	43.08	3.3	3.3	0.6	2.9	0.6	1.6	0.4	0.2	0
1995-1996	846.3	0	3211	42.72	207.2	6.533	4981	24.87	194.2	19.32	12.25	0.567	0.43	0	0	0	0	0	0	0	0	0	0	0
1996-1997	63.91	0	2681	0	2366	49.49	2137	78.81	1119	30.36	128.2	10	10.42	0.488	0.589	0	0	0	0	0	0	0	0	0
1997-1998	56.1	8.17	4516	3.191	4268	11.39	1632	49.54	143	10.41	245	6	1418	47.65	51.84	3.637	3.25	0	0	0	0	0	0	0
1998-1999	174.109	0	3136	28.05	2414	134.52	17578	351.5	1201	152.4	401.51	42	49.24	5.16	4.98	1.4	3.656	0.7	0.512	0	0	0	0	0
1999-2000	3318	0	652.2	19.43	6267	73.17	1193	78.94	1945.386	92.45	123.7	13.1	13	0.5	1.38	0.736	0.623	0	NA	NA	NA	NA	766.9	0.293
2000-2001	1911	0	2541	77	712.9	6.84	160.8	2.33	3	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2001-2002	1202	0	244.6	5.95	5063	11.92	98.07	15.3	1198	18	17.53	0	0	0	0	0	0	0	0	0	NA	NA	NA	NA
2002-2003	5221	385	175	2.859	6516	5	7361	100	113	12.85	13.06	0	0	0	0	0	0	0	0	0	0	0	0	0
2003-2004	400	0	3036	5.6	4180	59.32	2674	97.88	1124	21.57	40	0.4	0.772	0	0	0	0	0	0	0	0	0	0	0
2004-2005	164.8	0	294.2	0	3218	112.1	400	3.702	259.8	3.44	2.671	0	0	0	0	0	0	0	0	0	0	0	0	0
2005-2006	0	0	2072	0	3697	27.55	2996	10	197.6	11.84	12.06	0	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2006-2007	NA	NA	5901	22.18	20898	152.9	2451	281.135	3198.815	43.3	122.467	2.46	2.8	0.002	0	0	NA	NA	NA	NA	NA	NA	NA	NA
2007-2008	29.33	0	10683.76	149.085	7712.529	152.325	1782.54	154.769	415.135	35.383	39.4	5.93	60.86	14.89	32.09	11.88	10.94	0	NA	NA	NA	NA	NA	NA
2008-2009	NA	NA	655.339	65.307	3669.627	0	2818	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2009-2010	0	0	2315.8	0	3787	0	5735	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2010-2011	0	0	2270.735	0	3441.203	310.101	4133.72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2011-2012	0	0	948.599	0	3638.515	151.247	3306.875	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MAXIMUN	5221	385	11429.56	423.25	26384.76	489.77	17578	1321.28	10767.19	165.1	401.51	42	1418	47.65	51.84	11.88	10.94	1.4	2.9	0.6	13.84	1.791	766.9	0.816
MINIMUN	0	0	175	0	207.2	0	98.07	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Sarangkheda

YEAR	JUNE		JULY		AUGUST		SEPTEMBER		OCTOBER		NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH		APRIL		MAY	
	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
1977-1978	NA	NA	NA	NA	NA	NA	NA	NA	132.5	63.1	600	40.4	342.1	41.4	43.4	33	81.116	35.497	43.9	19.5	22.5	10	12.1	7
1978-1979	1237.7	6.4	5142.6	49.8	13819.2	210.7	5008.6	157.6	298	71.1	135	33.7	96	34.2	88	23.5	130	38.5	61.5	16.2	19.7	8.5	11.4	6.8
1979-1980	3780.1	5	2801.7	57.9	15000	328.8	1243.8	151.4	421.3	70.2	461.3	31.4	390	40.1	49	29.2	30.7	20.7	20.63	14	11.6	8.9	11	7.5
1980-1981	2400	8.4	2320	68	5402.6	600	1138.9	135.5	140	35	37.6	17	72.7	19.279	76.3	22	19.016	10.6	18	10.7	12	7.32	9.5	5.5
1981-1982	14.9	5.4	2355.8	13.6	11375	191.8	2980	299.5	2008.2	108.2	207.5	49	84.1	31.7	49.2	27	102.1	28.6	26.5	12.2	15.5	7.1	16.8	5.7
1982-1983	1713.5	5	1522.4	17.6	938.9	106.9	1146.5	130.8	153.6	13.6	39.5	9.4	22	8.2	29.6	10.2	10.5	6.5	7.1	4.9	4.9	3.2	3.5	2.5
1983-1984	631.1	2.7	902.8	47.2	9492.6	179.1	4465.8	706.8	3925.8	99	100.6	35.9	43.8	16	46.9	15.2	19.8	10.7	14.1	5	11.9	4.5	10.3	3.9
1984-1985	201.3	6.8	4680.2	51	13750	40.1	369.9	42	1920.9	0.7	32.5	7	9.1	4.5	10.4	6.6	7.2	5.8	5.8	2.3	6.2	1.3	5	1.8
1985-1986	1710.9	11.5	910	16	1820	108.5	745.3	9.2	396.6	19.5	35	5.5	5.5	4	5.4	4.3	7.7	1.4	13.4	2.8	3	2	2.8	1.8
1986-1987	664.3	2	4994.9	11	7025.5	254.7	261.1	18.4	22.6	3.8	6.5	2.2	3.5	2.3	3.1	2.1	4	1.3	2.2	0.3	0.5	0.3	0.427	0.3
1987-1988	1573	0.123	1009	11.97	1604	5	520	4.806	21.4	2.142	206.3	0.258	17.06	1.166	1.252	0.2	1.138	0.068	3.67	0.014	1.039	0	7.182	0
1988-1989	976.6	0	5090	65	5610	115	5472	212.8	10521.1	114.7	171.3	20	22.3	6.5	6.6	3.3	4.1	0.5	39.9	0	18.45	0	11.2	0
1989-1990	2681	0.155	2550	70.7	9300	109	2896.3	183.1	306.4	21.1	22.4	6.2	6.9	1.46	4.06	1	1.1	0	0	0	8.249	0	36.56	0
1990-1991	3055	9.7	8418	4.933	11838	98.88	6382	232.3	1482	212.2	293.8	40.25	47.2	3.8	7.666	1.188	7.083	0	2.75	0	18.5	0	10.97	0
1991-1992	614.5	0.58	4831	59.6	7986	216.1	344.1	0	5.05	0	0.76	0	0.62	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1992-1993	1910	12.2	248.6	4.326	5244	82.5	3495	79.25	1546	35.2	29.2	2.23	2.49	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1993-1994	382.1	37.3	8462	83.25	2851	75.25	1830	73.92	1444	93.5	154	7.575	71	3.5	3.4	0	0	0	0	0	0	0	0	0
1994-1995	562.6	0	2419	108.8	4574	491.8	15626	210.2	278.1	50.45	61.8	5.7	6	1.867	17.6	1.967	2.734	0	0	0	0	0	0	0
1995-1996	1438	0	3867	60.07	365.1	13.83	6156	22.94	250.2	10.43	8.2	0	0	0	0	0	0	0	0	0	0	0	0	0
1996-1997	108	0	3510	1.77	2529	60.93	3505	92.33	1384	31.5	166.1	9	12	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1997-1998	20.78	10.3	7174	5.419	3960	17.67	1554	49.85	387.5	10.65	460	7	1988	57.39	52.18	3.76	2.69	0	NA	NA	NA	NA	NA	NA
1998-1999	203.7	8.468	4145	33.69	3145	201.9	21292	480	1834	257.3	630.4	53.89	50.22	5.699	4.94	0.86	2.405	0.49	0.325	0	NA	NA	NA	NA
1999-2000	1854	0	908.8	21.51	6300	91.63	2224	75	2207	85	115.1	12.69	16.79	1.306	0.616	0.384	NA	NA	NA	NA	NA	NA	1174	3.506
2000-2001	1874	0	3435	90	913.8	8.804	404	7.302	6.337	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2001-2002	1500	0	241.6	6.609	4076	25	329.9	8.165	1440	11.83	17.36	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2002-2003	4245	0	375.9	0	9000	5	8047	157.5	151.6	18.77	18.11	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2003-2004	745.7	41.134	4460	38.107	7564	76.57	3981	30	1539	39.28	20	1.05	0.552	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2004-2005	69.6	0	100.7	0	5909	169.4	468.5	10.5	276.1	6	5.74	0	NA	NA	0	0	0	0	0	0	0	0	NA	NA
2005-2006	0	0	2468	0	4458	40.17	2968	9.702	282.956	7.304	7	0	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2006-2007	NA	NA	9.65	13.6	23044	66.56	3854.049	391.756	3582.127	57.859	61.698	8.9	8.2	1.31	1.411	0.16	NA	NA	NA	NA	NA	NA	NA	NA
2007-2008	51.6	0.67	11827.37	150.3	8776.059	253.488	2154	206.192	453.9	31.115	31.233	0.23	6.19	0	0	0	NA	NA	NA	NA	NA	NA	NA	NA
2008-2009	NA	NA	1187.53	93.7	3406.376	82.33	2241	47.3	296.468	83.34	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2009-2010	0	0	3942.216	0	186.855	0	3513.922	0	991.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2010-2011	0	0	1211.9	0	2658	459.381	4875.994	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2011-2012	304.37	0	1408.835	0	4404.18	278.856	3342.001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2012-2013	0	0	4416	0	4332.383	284.4	10481	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MAXIMUN	4245	41.134	11827.37	150.3	23044	600	21292	706.8	10521.1	257.3	630.4	53.89	1988	57.39	88	33	130	38.5	61.5	19.5	22.5	10	1174	7.5
MINIMUM	0	0	9.65	0	186.855	0	261.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Savkheda

YEAR	JUNE		JULY		AUGUST		SEPTEMBER		OCTOBER		NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH		APRIL		MAY	
	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
1972-1973	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	41.177	21.655	28.358	16.442	20.105	11.075	25	12	16	5	7	5	4	2
1973-1974	290.4	2.3	5310	220.9	11820	226.9	3205	440.2	1144.8	145.3	270.1	60	48.8	34.8	36.5	21.9	27.1	16.6	23.9	16	18.8	11.2	70	7.1
1974-1975	60	6.7	1140	25.8	5337	125	343	45	1120	87.4	79	21	22	14	14.3	9.8	21.2	8.4	14.8	4.3	5.5	3	5.2	2.1
1975-1976	693.8	3.6	1199.2	88.3	6554.5	398.1	7548.8	402.7	1058.8	137	387.4	54.1	54.2	21.9	26	16.41	18.6	10.4	10.7	6.04	12.9	3.1	4.8	2.27
1976-1977	160.5	2.36	2218	36.2	3444.9	218.1	6018.5	230.2	230.7	51.2	862.1	42.37	73.6	25.5	26.6	15.3	17.2	12.5	19.6	6.8	10.8	4	9.8	3
1977-1978	2148.5	3.4	1913.3	51	2520.8	118.9	4408.7	176.7	1223.3	63.6	896.8	30.4	286.5	41.3	40.9	26.7	77.5	24.4	31.5	14.5	19	7	14	3.1
1978-1979	1445.8	3.4	5330.4	40.6	24856.2	175	4745.4	125	214.9	50	75	33	72.6	25.4	88	23.5	115	24	36.6	9.3	12.5	4.9	6.6	3.2
1979-1980	3718	2.3	2093.3	30	20845.2	243.7	931.7	115.4	268	52.5	396.6	30	394.4	27	43.4	19.5	20.5	10.5	12.5	5.5	9.7	2	14	3.8
1980-1981	951.9	3.7	1396.3	52.7	6560.22	252.86	1066.3	101.7	115	20	23.2	10	70	7	56.96	10.97	22	5	11.33	5	7.3	3.78	11	2.84
1981-1982	14.3	2.5	2000	7	9713	174	3459	219	952.4	80	152.7	35	57.6	24	42.7	22.6	78	17	16.2	7.8	13	2.4	4.7	2.6
1982-1983	1765	3	1547.7	10.2	990.6	88	1074.8	77.5	123.1	3.5	17.5	3.5	20.7	4.4	26	5.8	8	3.2	4.5	1.8	2.2	1.4	2.3	1.1
1983-1984	973.1	1.2	640	36.5	6050	222.9	3363.7	536.4	2125	47.5	65	35.6	47.3	10.7	42.2	10.7	17.4	7	11	2.6	14.5	6.27	10.2	3.7
1984-1985	252.2	8	1856.4	18.73	8805	25.12	292.3	21	2593.2	10.5	28	4.9	6.8	4	6.865	4.03	6.83	3.65	4	2.45	5.8	1.8	2.68	1.9
1985-1986	2170.1	1.5	1290.9	11.68	2101.5	57.5	1296.6	6.8	410.9	11.35	17.4	2.7	3.3	2.4	3.2	2.1	5	2.1	4.4	0.9	1.9	1.1	1.4	0.6
1986-1987	1175	1.1	4250	6	6879.3	236.2	247.5	10.6	12.5	2.1	5.51	1.8	2.6	2	4.3	1.9	3	1.5	1.8	1	1.5	0.8	4.7	0.7
1987-1988	1232	0.9	1098	6.3	1254	4.1	432.4	2.43	20	1.623	98.4	1.3	4	1.39	2.003	1.466	4.5	1.215	8.283	1	5.57	0.9	13.26	0.794
1988-1989	1024	0.7	4793	180	6820	60	4400	135.9	8478	50	105.8	14.3	20	4	5	2.2	2.5	1.5	16	1.3	12.6	0.8	18	1.8
1989-1990	2265	1.7	2887	50.18	5800	74.9	3292	130.3	199.1	4.874	15.9	1.8	5.88	1.17	4.89	0.945	1.06	0.76	0.76	0.175	15	0.13	13.897	0.164
1990-1991	3459	10.52	7355	4.733	11917	22.84	5530	54.04	1599	88.65	199.2	24.8	37.7	6.286	9.99	1.036	10.44	1.009	2.881	1	15.9	6.4	7.621	1.9
1991-1992	753.3	1.969	11181	36.57	5194	182.5	295	7.1	8.638	3	3.33	2.711	2.979	1.95	2.336	0.9	1.92	0.9	1.009	0.639	0.783	0.24	0.345	0.116
1992-1993	2000	0.09	246.2	2.014	4678	47	4748	24	1250	18.78	20	3.087	2.131	1.311	1.422	0.822	1.18	0.609	1.219	0.359	1.705	0.107	0.122	0
1993-1994	670.8	0	9572	71.56	2909	40	1652	52.3	802.8	92.27	89.45	9	80	3.611	3.155	1.05	1.297	0.534	0.742	0.265	2.613	0.178	0.37	0
1994-1995	563.3	0	2871	110.9	6189	132.2	19411	99.41	230	25.03	67.2	3	5.52	3	15.68	2.267	2.413	1.125	4.087	1.021	2.075	1.11	2.584	0.649
1995-1996	2028	0.509	3649	19.38	444	6.041	7093	12.04	300	6.13	4.939	1.744	1.527	0.76	0.921	0.461	0.592	0.316	0.348	0.03	0	0	0	0
1996-1997	18.69	0.015	3300	0.8	3558	35.36	2462	53.39	1110	22.44	112.3	9.89	12	1.35	1.448	0.752	0.879	0	0	0	0	0	0	0
1997-1998	196.6	2	4620	1.78	5671	7.22	1960	20	348.5	11.645	1350	5.6	1696	33.96	34.13	3.5	13.554	1	9.314	0.54	0.55	0	0	0
1998-1999	270.9	4.51	2240	14.47	2572	136.5	18851	300	1480	195.7	421.52	100	97.11	8.86	149.654	5.442	21.052	1.147	1.844	0.536	1.444	0.53	NA	NA
1999-2000	2921	8.586	935.5	12.27	6888	104.4	2640	94.9	1971	135.9	130.9	14.52	13.26	2.192	2.969	1.281	1.782	0.969	1.54	0.978	NA	NA	813.2	1.105
2000-2001	1958.509	2.45	3861.119	37.215	558.521	2.449	189.409	2.861	8.658	0.752	0.627	0.53	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1613.172	1613.172
2001-2002	1374	0.807	259.005	2.5	8129.605	5.13	121.231	5.26	1870.843	9.676	14.549	0.762	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	240.681	240.681
2002-2003	6414.749	220	158.878	1.556	9453.223	2.593	10688.39	120	127	6.5	9.493	2.584	3	0.424	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2003-2004	678.965	95.149	4961.52	0	6105.492	0	3692.39	88.59	701.322	6.234	7.481	0.527	1.496	0.413	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2004-2005	160.094	1.663	1163.022	1.87	4600.007	143.995	512.208	2.041	247.143	3.153	3.426	0.167	0	0	0	0	0	0	NA	NA	NA	NA	NA	NA
MAXIMUN	6414.749	220	11181	220.9	24856.2	398.1	19411	536.4	8478	195.7	1350	100	1696	41.3	149.654	26.7	115	24.4	36.6	16	19	11.2	1613.172	1613.172
MINIMUM	14.3	0	158.878	0	444	0	121.231	2.041	8.638	0.752	0.627	0.167	0	0	0	0	0	0	0	0	0	0	0	0

4.21 Yearly minimum and maximum Discharges

Ghala

YEAR	MAXIMUM DISCHARGE (m^3/sec)	MINIMUM DISCHARGE (m^3/sec)
1978-1979	14307.9	15.5
1979-1980	12022.5	0
1980-1981	981.6	4
1981-1982	3400	10
1982-1983	1131.7	3.1
1983-1984	2905	4.4
1984-1985	526	6.932
1985-1986	916.26	3.41
1986-1987	610	4.783
1987-1988	340.8	4.62
1988-1989	7592	8.91
1989-1990	1265	16
1990-1991	14225	10.91
1991-1992	609.2	5.04
1992-1993	1536	6.81
1993-1994	1419	13.86
1994-1995	16887	14.92
1995-1996	1247	4.935
1996-1997	619.9	5.502
1997-1998	1900	13.7
1998-1999	22500	10
1999-2000	881.2	10
2000-2001	1108	11
2001-2002	584.562	12.717
2002-2003	4735.332	10
2003-2004	1286.28	17.826
2004-2005	5223.756	16.113
2005-2006	**22500**	17.826
2006-2007	340.8	**0**
2007-2008	14307.9	15.5
2008-2009	12022.5	0
2009-2010	981.6	4
2010-2011	3400	10
2011-2012	1131.7	3.1
2012-2013	2905	4.4
2013-2014	526	6.932
2014-2015	916.26	3.41
MAXIMUM	**610**	**4.783**
MINIMUM	**340.8**	**4.62**

YEAR	MAXIMUM DISCHARGE (m^3/sec)	MINIMUM DISCHARGE (m^3/sec)
1973-1974	15212.54	0
1974-1975	4467	0
1975-1976	8710	0
1976-1977	7148	0
1977-1978	7208	0
1978-1979	22489.801	0
1979-1980	26384.76	0
1980-1981	7570.54	0
1981-1982	13545.51	0
1982-1983	3537.65	0
1983-1984	9135.07	0
1984-1985	8671.88	0
1985-1986	3072.4	0
1986-1987	6961.43	0
1987-1988	2446.04	0
1988-1989	10767.19	0
1989-1990	7315.26	0
1990-1991	13030.8	0
1991-1992	7680	0
1992-1993	4224	0
1993-1994	8018	0
1994-1995	15068	0
1995-1996	4981	0
1996-1997	2681	0
1997-1998	4516	0
1998-1999	17578	0
1999-2000	6267	0
2000-2001	2541	0
2001-2002	5063	0
2002-2003	7361	0
2003-2004	4180	0
2004-2005	3218	0
2005-2006	3697	0
2006-2007	20898	0
2007-2008	10683.758	0
2008-2009	3669.627	0
2009-2010	5735	0
2010-2011	4133.72	0
2011-2012	3638.515	0
2012-2013	26384.76	0
2013-2014	2446.04	0
2014-2015	15212.54	0
MAXIMUM	4467	0
MINIMUM	8710	0

YEAR	MAXIMUM DISCHARGE (m^3/sec)	MINIMUM DISCHARGE (m^3/sec)
1977-1978	600	7
1978-1979	13819.2	6.4
1979-1980	15000	5
1980-1981	5402.6	5.5
1981-1982	11375	5.4
1982-1983	1713.5	2.5
1983-1984	9492.6	2.7
1984-1985	13750	0.7
1985-1986	1820	1.4
1986-1987	7025.5	0.3
1987-1988	1604	0
1988-1989	10521.1	0
1989-1990	9300	0
1990-1991	11838	0
1991-1992	7986	0
1992-1993	5244	0
1993-1994	8462	0
1994-1995	15626	0
1995-1996	6156	0
1996-1997	3510	0
1997-1998	7174	0
1998-1999	21292	0
1999-2000	6300	0
2000-2001	3435	0
2001-2002	4076	0
2002-2003	9000	0
2003-2004	7564	0
2004-2005	5909	0
2005-2006	4458	0
2006-2007	23044	0.16
2007-2008	11827.37	0
2008-2009	3406.376	0
2009-2010	3942.216	0
2010-2011	4875.994	0
2011-2012	4404.18	0
2012-2013	10481	0
2013-2014	600	7
2014-2015	13819.2	6.4
MAXIMUM	15000	5
MINIMUM	5402.6	5.5

YEAR	MAXIMUM DISCHARGE (m^3/sec)	MINIMUM DISCHARGE (m^3/sec)
1972-1973	41.177	2
1973-1974	11820	2.3
1974-1975	5337	2.1
1975-1976	7548.8	2.27
1976-1977	6018.5	2.36
1977-1978	4408.7	3.1
1978-1979	24856.199	3.2
1979-1980	20845.199	2
1980-1981	6560.22	2.84
1981-1982	9713	2.4
1982-1983	1765	1.1
1983-1984	6050	1.2
1984-1985	8805	1.8
1985-1986	2170.1	0.6
1986-1987	6879.3	0.7
1987-1988	1254	0.794
1988-1989	8478	0.7
1989-1990	5800	0.13
1990-1991	11917	1
1991-1992	11181	0.116
1992-1993	4748	0
1993-1994	9572	0
1994-1995	19411	0
1995-1996	7093	0
1996-1997	3558	0
1997-1998	5671	0
1998-1999	18851	0.53
1999-2000	6888	0.969
2000-2001	3861.119	0.53
2001-2002	8129.605	0.762
2002-2003	10688.389	0.424
2003-2004	6105.492	0
2004-2005	4600.007	0
2005-2006	41.177	2
2006-2007	11820	2.3
2007-2008	5337	2.1
2008-2009	7548.8	2.27
2009-2010	6018.5	2.36
2010-2011	4408.7	3.1
2011-2012	24856.199	3.2
2012-2013	20845.199	2
2013-2014	6560.22	2.84
2014-2015	9713	2.4
MAXIMUM	1765	1.1
MINIMUM	6050	1.2

5. Preliminary Traffic studies and Market Analysis

This chapter deals with the status of land use pattern, crops, agriculture, existing industries, cargo, jetties and terminals, passenger ferry services along the river route.

5.1 Land use pattern along waterway

5.1.1 Land Utilization Pattern

Of the total area in Surat district, a vast portion or 65% comes under the net sown category area. This is followed by non –agriculture area and fallow lands, each at 14% and 10%.Forest area takes up less than 5% of total land in the Surat district. There are total 1,016 farmers in the district. Out of these, more than 43% of farmers have less than 1 hectare land each. The combined area held by 43% of farmers is only 11% of the total sown area. In contrast, over 66% of land is held by 29% of farmers who have an area of more than 2 hectares each.

Table 39: Land use pattern of the districts along the Tapi river stretch

District	Forest	Non-Agriculture	Net Sown Area	Uncultivable Barren Land	Fallow lands	Cultivable Waste	Others	Total Area
Surat	26	73	331	0	50.8	31	10	524
Tapi	74	48.5	164.1	46	0.5	3.4	9	345
Nandurbar	103	12	313	17	26	4	29	503
Dhule	209	16	397	27	0	0.331	84	733
Jalgaon	155.9	14.5	852.5	80.4	12.8	6.4	41	1163.9

In Tapi district, more than 48% of area is net sown area. This is followed by Forest area and non-agriculture area 21% and 14% each. The district also has 13% of barren land highest in percentage –wise amongst the districts along the Tapi River. Tapi district is known for dense forests with a major production of bamboos. There are total 73075 farmers in the district. Out of these, more than 40% of farmers have less than 1 hectare land each. The combined area held by 40% of farmers is only 8% of the total sown area. In contrast, over 71% of land is held by 32% (23,346) of farmers who have an area of more than 2 hectares each.

In Nandurbar district, majority of farmers have land holdings above 1 hectare. Out of total farmers in the district about 41% of farmers hold area between 1-2 hectares each. About 35% of total farmers own more than 63% of total cultivable land. In Nandurbar district, more than 62% of area is net sown area. This is followed by Forest area 20%. The maximum forest area is in the Akkulkwa tehsil i.e.42.34%. The forest produce includes Custard apple, fuel wood, grass, gum, tendu leaves, bamboo, etc. The district also has 3% of barren land.

In Dhule district, more than 54% of area is net sown area. This is followed by Forest area 29%. The district also has 4% of barren land. Dhule district is known for

dense forests with a major production of bamboos. There are total 4, 22,295 farmers in the district. Out of these, only 33% of farmers have less than 1 hectare land each. The combined area held by 33% of farmers is only 12% of the total sown area. In contrast, over 58% of land is held by 29% (2, 46,025) of farmers who have an area of more than 2 hectares each.

Jalgaon is the largest district in terms of land area, among all the districts around Tapi River. It has 73% of net sown area highest among all the districts along Tapi river stretch. It has 13% of its total area covered by forest. There are total 7, 77,177 farmers in the district. Out of these, only 34% of farmers have less than 1 hectare land each. The combined area held by 34% of farmers is only 12% of the total sown area. In contrast, over 58% of land is held by 28% (4, 50,546) of farmers who have an area of more than 2 hectares each

5.1.2 Districts along the river:

Surat:

Surat is a district in the state of Gujarat India with Surat city as the administrative headquarters of this district. It is surrounded by Bharuch; Narmada (North), Navsari (South) districts and east Tapi district to the west is the Gulf of Cambay. It is the second-most advanced district in Gujarat. It had a population of 6,079,231 of which 79.68% were urban as of 2011. It is one of the major Industrial districts in Gujarat. It has good connectivity and proximity to Maghdhalla and Hazira ports.

Tapi:

Tapi District was formed out of some Talukas separated from erstwhile Surat District. Vyara is head quarter of Tapi District, which comprises five Talukas – Vyara, Songadh, Valod, Uchhal and Nizar. It has it's headquarter in Vyara. It is on the Southern eastern fringe of Gujarat. On its west is Surat district and on its east is Maharashtra State border.Tapi is known for its bamboo products. It is Industrial backward area.

Nandurbar:

The Nandurbar district is one of the smallest districts of Maharashtra, located at the edge of Maharashtra's northern boundary enveloped by Madhya Pradesh on the north and the east and Gujarat on the west. The district is recognized for its tribal population and undulating landscapes of the Satpura ranges on the northern end of the district. The district enjoys water supply from two major sources, Tapi running across the district and Narmada in the north. Nandurbar city is the district headquarters and is the only town in the district connected by a railway line. The district is divided into 6 tehsils, namely, Dhadgaon (Akrani), Nandurbar, Akkulkwa, Taloda, Shahada and Navapur.

Dhule:

It is Located at the crossing of Three National Highways namely NH-6 (Surat - Nagpur), NH-3 (Mumbai - Agra) and NH-211 (Dhule - Solapur).Dhule city is the Headquarter of District Dhule and is located about 340 Km NE of Mumbai while 350 Km North of Pune.

District is bounded by district Nandurbar in the North-West, District Nashik in south and District Jalgaon in East.

Jalgaon:

It is bounded on the north by the state of Madhya Pradesh, on the east by Buldhana district of Maharashtra, on the west by Nasik and Dhule district of Maharashtra and on the south by Aurangabad district of Maharashtra. Administratively, Jalgaon district is divided into four sub- divisions and 15 tehsil places. Agriculture is the predominant occupation in Jalgaon district.

5.2 Crops and Agriculture in the Region:

5.2.1 Agriculture:

Surat:

Rice and cereals dominate more than half of the net sown area. Sugarcane is another major crop having 30% of the net sown area in the district. The sugarcane production stood 7493 thousand tones. Rice, wheat, sorghum and Jowar are major food crops cultivated in the area. The major cash crops produced in the area are cotton and sugarcane.

Table 40: Major crops for Surat District

District Surat	Major Crops	Area in(000) Hectares	Production in('000 tonnes)	% to total area sown
	Rice	796	1805	24%
	Sorghum	187	221	6%
	Wheat	60	122	2%
	Sugarcane	989	7493	30%
	Cotton	34	86	1%
	Cereals	1075	2258	32%
	Jowar	187	221	6%

Surat has a tropical savanna climate , moderated strongly by the Sea to the Gulf of Cambay. The summer begins in early March and lasts till June. April and May are the hottest months, the average maximum temperature being 37 °C (99 °F). Monsoon begins in late June and the city receives about 1,200 millimeters (47 in) of rain by the end of September, with the average maximum being 32 °C (90 °F) during those months. October and November see the retreat of the monsoon and a return of high temperatures till late November. Winter starts in December and ends in late February, with average mean temperatures of around 23 °C (73 °F), and negligible rain.

Table 41: Soil Types in the Surat district

Type of soil	Area ('000 ha)
Hilly and highly undulating fine texture	87
Mid plains, fine texture, high rainfall	165

Mid plains, fine texture, medium rainfall	139
Coastal plain, deep fine texture, salt affected	42

Tapi:

Paddy and cereals dominate more than half of the net sown area. Sugarcane is another major crop having 6% of the net sown area in the district. The sugarcane production stood 516 thousand tones. Paddy, Sorghum, Groundnut and cereals are major food crops cultivated in the area. The major cash crops produced in the area are cotton and sugarcane.

Table 42: Major crops for Tapi District

District Tapi	Major Crops	Area in(00) Hectares	Production in('000 tonnes)	% to total area sown
	Paddy	380	798	23%
	Sorghum	37.6	50.1	2%
	Sugarcane	101	516	6%
	Groundnut	132	211	8%
	Cotton	43	76 Lint	3%
	Cereals	630	1221	38%

The South west monsoon brings rains to the district and rainy season extends from Middle June to the end of October. Average Annual rain fall from the district is 2000 mm.

Table 43: Soil Types in the Tapi district

	Major Soils (common names like red sandy loam deep soils	**Area ('000 ha)**	**Percent (%) of total**
	Plain Area- Heavy black soils	150.7	43.7
	Hilly Area- Light soil (lateritic and eroded shallow and Clay loam moderately deep shallow soil	89.7	26.0

Nandurbar:

Normal area under kharif crop is 252300.00 ha. Kharif season is the most predominant season. Kharif jawar, cotton, Bajara, kharif paddy are the main crops. Whereas tur, green gram, black gram, sunflower and groundnut are second important crops. Maize and Soyabean is fast emerging crop of the district. In rabbi season rabbi Jawar, wheat and gram are predominant crops. Groundnut, Bajara and sunflower are taken in summer season. In hilly area of the district vari and other hill millets are predominant crops. The productivity of hill millet is very negligible. Paddy is taken in both irrigated as well as rain fed condition. No other factor is as critical to paddy production as the moisture stress at the reproductive stage of the crop. Yield reduction from lack of water during reproductive stage can lead to serious losses in paddy productivity. Tur is mostly taken as inter crop in

paddy, jawar, cotton and maize crop. Horticulture crops like mango, Papaya, banana chilly, cauliflower, cabbage, brinjal, onion and beans are important crops. The agricultural production and productivity of principal crops is low and fluctuating as compare with state as well regional level. District as a whole only 20.50 % area is under cash crop/high valued crops and 5.21% area under horticulture crops, which is in an undeveloped stage with few exceptions requires additional inputs for reaching optimum level of productions.

Table 44: Major crops for Nandurbar District

MAJOR CROPS	AREA IN(000) HECTARES	PRODUCTION IN('000 TONNES)
Kh.Jowar	27.524	449.74216
Rice	18.2	238.602
Bajara	13.7	179.607
Tur	22.311	9.214443
Mung	14.819	6.120247
Udid	16.924	6.989612
Soybean	23.124	393.108
Cotton	49.645	7.8Lint
Wheat	16.38	433.7424
Gram	17.23	189.53

The soil type in the district is 63.43 % light 17.43 % medium and 19.13 % are heavy soils. The annual average rainfall of the district is 872.00 km.The district has dry climate in general. The temperature attained is of typical of tropical temperature zone. The summer is intolerably hot since March to June every year. The average rainfall in the district is about 888 mm and it is not uniform in all parts of the district. The temperature in the district ranges from 42.8 o in summer to 10.6o in winter.

Akarani block, Western part of Navapur block and Southern part of Nandurbar block. This zone consists of light shallow and sandy soil. It is good for Kharif crope i.e. for Bajra, Kharif Jawar, Groundnuts and Cotton, etc. Eastern part of Nandurbar, Shahada, Navapur Tahsil. These zones consist of medium quality soil, which is useful for minor irrigation. This zone consists of black cotton soil on the Basin of Tapi River. Its water holding capacity is quite good. Hence long duration crops are preferred. Part of Nandurbar & Shahada Tahsil is covered in this zone.

Dhule:

The crops are taken in three seasons in a year viz. Kharif, Rabi and summer. Main crops grown in the dirstrict are Bajara (29.8%), Jowar (15.8%), Groundnut (9.34%), Mung (4.1%), Paddy (1.25%), Among cash crops, Sugarcane (1.06%) , Chilli (.71%), Cotton are mostly grown in the district. Apart from this fruit crops like lemon, Orange, Mango, Papaya, Ber, and Awala are mainly grown in the district.

Table 45: Major crops for Dhule District

MAJOR CROPS	AREA IN(00) HECTARES	PRODUCTION IN('000 TONNES)
Cotton	1150	42.8 Lint
Pearl Millet	1047	119.1
Ground nut	358	29.4
Maize	347	86.4
Wheat	360	86.1

The soils are mostly formed from igneous rocks and are black, shallow and calcareous types having different depths. Agriculture in the district largely depends upon monsoon rainfall. The average normal preciptiation of district is 592 mm, Shirpur tahasil receives highest rainfall 1154 mm. Whereas Dhule 621 mm, and tahsil receives lowest rainfall 621mm. The highest temperature goes upto 45°c in summer where as minimum temperature is observed upto 8 °c in winter season

The major portion of the earth crust of the district has been synthesized from the igneous rocks and the Soil is black, medium black, Shallow and calcarious types having different depth and profiles. As regards the geographical area of the district there are light and shallow soils (60%) medium deep black soils (25%) and deep black soils (15%), Medium deep black soil spread over a Shinkdheda, Sakri and western part of Dhule tahsils. which is favorable irrigation purpose. The north part of district on the bank of Tapi River covered a Shirpur tahsil having a deep black soil.

The district is divided into two agro climatic zones, on is Scarcity zone consisting of 5 blocks & another one is Assured rainfall zone consisting of 10 blocks. In these zones the cropping pattern is different. Today Jalgaon district is known as Cotton & Banana bowl of the State, as 3.5 lakh ha area is under cotton & 46074 ha. Area is under Banana crop. These two crops are main cash crops generating major labour potential. These crops affect the economy of the district. Maize is emerging as another important crop in the district. In horticulture Pomegranate being the most value added crop, farmers are following it. Custard apple and lemon and another important crop of district. Brinjal and Ladies finger are main vegetable crops of district. Due to increase in irrigated areas rabbi area is increasing. In recent years there in increase in area of cotton, Maize, Soybean crops and reduction in the crop area of Cereals, Deshi cotton, Sunflower & Sesamum. There is increase in the area of Wheat & Gram crops due to availability of irrigation.

Table 46: Major crops for Jalgaon District

Major Crops	Area in(000) Hectares	Production in('000 tonnes)
Cotton	356.1	948.5
Sorghum	172.1	309.4
Maize	58.4	283.6
Black gram	35.8	26.6
Wheat	25	137.7

Sesamum	19.2	7.6
Groundnut	8.5	24

Jalgaon has got pretty diverse climate. It is exceptionally hot and dry during summer with temperature reaching as high as 45 degrees Celsius. Jalgaon receives about 700 mm rainfall during monsoons, which is followed by pleasant temperature in winter.

The soil pattern in the district differs widely due to marked variations in the topography of the region. Generally soil in Jalgaon is black fertile, medium fertile, forest oriented, Murum. Black and fertile soil is found .in Amerlner, Yerander, Jalgaon, Bhusawal and Muktainagar. Medium black fertile soil is found in Yaval, Raver, and Chopda towards the south and in limited quantity same soil is found in Chalisgaon and Bhadgaon. The soil is forest type towards the north of Chopda yawal and Raver Tehsil. Soil of Sandy type is found towards the foothills of Satpuda Mountains and also towards south of Pachora, Chalisgaon, Jamner and Bhadgaon.

5.3 Availability of Bulk/Construction Material:

5.3.1 Minerals

River transportation would be viable for the movement of bulk commodities like coal and minerals. Minerals can be broadly classified as major minerals like iron ore, lignite, gypsm, bauxite etc and minor minerals like sand, limestone, silica, blacktrap etc. The minor minerals can be extensively used in construction industry while major minerals in manufacturing industry. Gujarat is endowed with rich minerals like petroleum& natural gas, lignite, bauxite, limestone, bentonite, fire-clay, china-clay, fluorspar, marble, agate, chalk, gypsum and decorative &dimension stones with which, the state possesses a prominent place in mineral production in India.

Railway would be ideal mode of transport incase of the minor minerals and major minerals for lead distance of 100 km but the availability of rakes is the concern, so the present movement is done by road transport. The increasing restriction on load carrying capacity of trucks have made the road transport uneconomical for bulk materials like sand, gravel, limestone etc as these are low value commodities. Hence there is ample of scope movement of these mentioned bulk commodities by waterways.

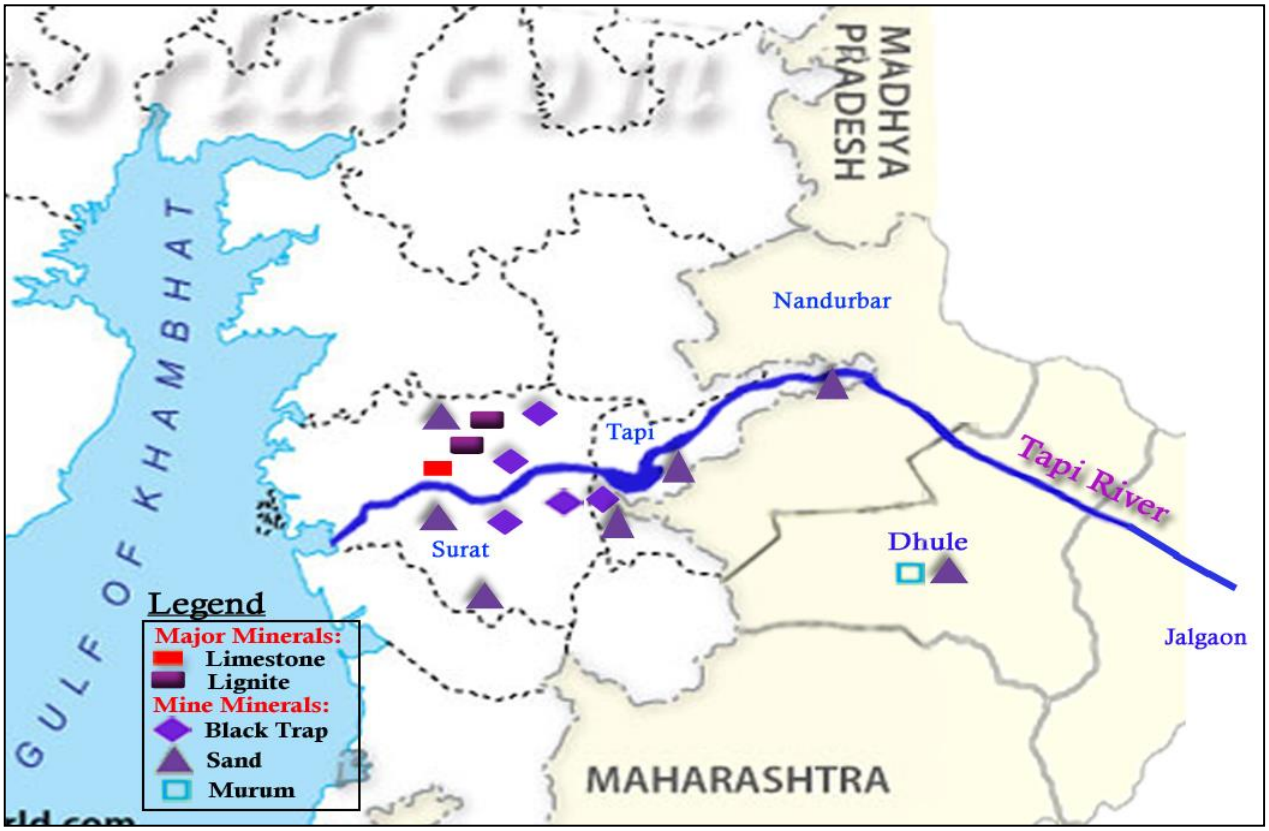


Figure 65: Minor minerals

Mineral Profile of the Surat District:

Surat is the second largest producer of lignite in Gujarat, which accounted for 19 % (17, 21,333 MT) of the total production (90, 96,438 MT) of lignite in the state during2005-06.

There are lignite based Thermal Power Stations producing and transmitting electric power, roofing tiles factories, stone ware pipes and drainage pipe factories and glass factories are functioning in mineral based industries on medium and large scale in the district.

PRODUCTION OF MINERALS 2010-11:

Table 47: Production of Minerals,

SL. No.	Name of Mineral	Production (Tones)
MAJOR MINERALS		
1.	Lignite	34,66,713
2.	Lime stone	1,67,940
MINOR MINERALS		
1.	Black Trap	31,56,726
2.	Sand	97,94,386
3.	Common Clay	14,83,000

Source: Department of Mines & Geology, Surat.

Mineral Profile of the Tapi District:

The Tapi district is very poor in mineral based products. There are minor mineral like, Black trap, ordinary sand, ordinary soil, Hard Muhrrum.

Produdction of Mineral 2010-2011

Table 48: Production of Mineral 2010-2011,

S.No.	Name Of Mineral	Production In Tones 2010- 2011
MINOR		
1	Black Trap	3291964
2	Ordinary Sand	817454
3	Ordinary Soil	118070
4	Hard Muhrrum	32000

Source: Dept of Mines & Geology, Tapi

The State of Maharashtra encompasses on area of 307713 sq.km. Out of which likely mineral bearing area is about 58465 sq.km. I.e. 19% of the total area of the State.

Table 49: Division wise distribution of mineral bearing area

Sl.No.	Division	Distribution
1	Nagpur	60%
2	Amravati	10%
3	Konkan	20%
4	Aurangabad	5%
5	Pune	3%
6	Nasik	2%

Mineral Profile of the Nandurbar District:

Minerals of economic value are not found in the district. Mud used for making bricks, sand and metal stone used for construction purpose are the only important minerals found in Nandurbar district.

Mineral Profile of the Dhule District:

No minerals of economic significance are found in Dhule district. The quality of the lime available in Dhule district is not suitable for cement manufacture. But many kiln lime units can come up to exploit this mineral resource. Also, Sand, Murum, Stone etc. are available in abundance, which can be suitably used for construction of roads and building.

Mineral Profile of the Jalgaon District:

There are no major mineral deposits in the district. However stand maron, stone, mica, and clay are available abundance, which can be suitably used for construction of roads

and buildings. Occurrences of agate stones are known in Aurangabad, Jalgaon, Buldhana and Ahmadnagar districts in the State. These stones are utilised for manufacture of fancy items like paperweights, ashtrays, pendants, necklace, buttons, etc. after slabbing, cutting, grinding, polishing and lapping.

5.3.2 Commodities of Opportunity:

Sand

Sand mining in small amount is carried in the bed of the Tapi River. Small throughput quarries have been leased by auction mode. The throughput of the quarry is as low as 10000 mt per annumn. But such quarries are present in large amount. Hence total 100000 ton is expected to be flowing from Nagod to Surat. The sand is mainly used in brick clay, conduction works. It is recommended that the Ro-Ro facility to be provided for the transit of sand.

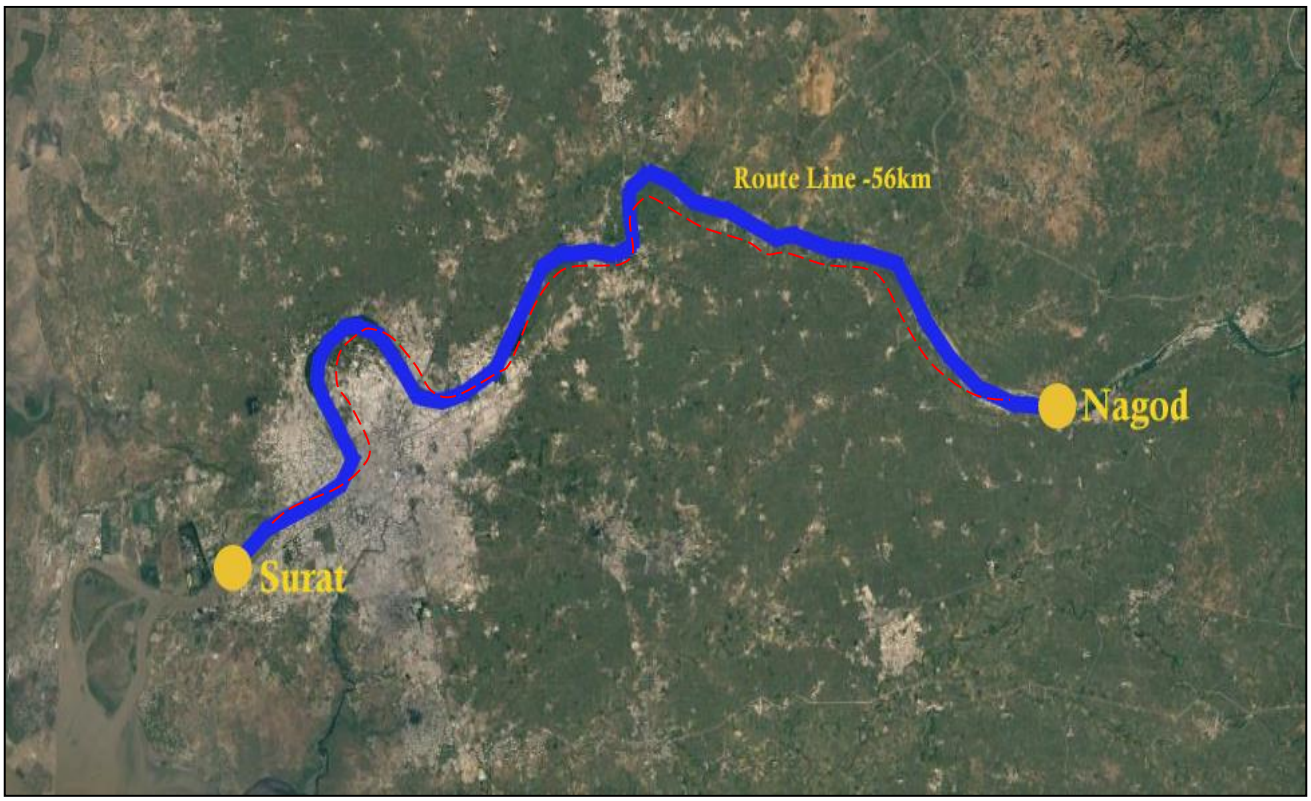


Figure 66: Sand

Figure 67: Sand extraction of Tapi River

Coal:

Coal is commodity used widely in industries like steel manufacturing, cement manufacturing and power generation. Along proposed Tapi river stretch there is situated Ukai power plant in Tapi district. On proposed river stretch it is viable to transport coal between Bhusawal and Ukai. Hence Bhusawal would be Ideal location for jetty.

Figure 68: Coal for Thermal power plant

Coal for Thermal power plant

The identified stretch has thermal power plant located at Ukai. Presently the coal is sourced from the Chhatisgarh mines.The thermal capcity of Ukai powerplant is 850 MW .The coal is moved from Chhatisgarh to power station via Bhusawal-Surat route. The nearby railway station is Sangadh which serves the powerplant. The annual consumption of coal of Ukai plant was 4.5 million tons annually.The stretch from Bhusawal to Sangadh can be utilized to meet the demand of the coal of Ukai thermal power plant.

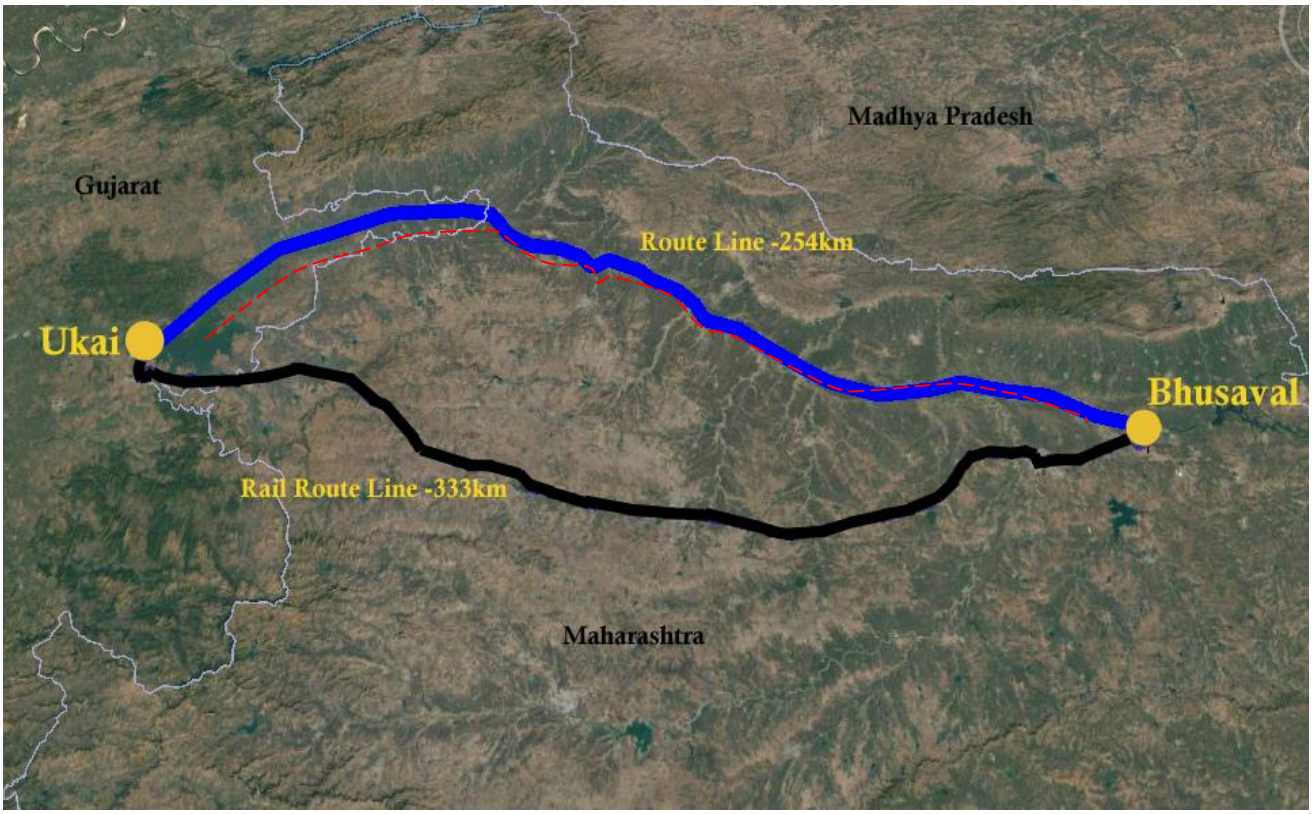


Figure 69: Coal

5.4 Existing Industries along Waterway:

The industrial area in Gujarat is located nearby to the ports .Many of the companies own captive jetties taking the advantage of the coastal movement of the raw materials for cost effective logistics. The ports nearest to the Tapi River proposed stretch are Hazira and Maghdhalla. In this section, we shall discuss the strategic location and infrastructural advantages of coastal movement of goods through identified river stretch to the nearby port. It assumed for sake of the study water depth of 2.5 m will be maintained in the stretch throughout the year.

Table 50: Existing Industries along Waterway

District	Industrial Area	Nearby Port	Distance from Industrial Area(km)			Opportunity
			To River	River-Market/Port	Direct to Market/Port	
Surat						
Source:GIDC Surat	Valod	Hazira/Maghdhalla	54	Na	54	NO
	Khatodara	Hazira/Maghdhalla	2	11	11	NO
	Bardoli	Hazira/Maghdhalla	43	Na	43	NO
	Olpad	Hazira/Maghdhalla	29	Na	29	
	Hazira(GSPCL)	Hazira/Maghdhalla	Na	Na	Na	NO
	Katargam	Hazira/Maghdhalla	2	18	18	maybe
	Ichhapor Bhatpor (IOC)	Hazira/Maghdhalla	1	0	2	NO
	Apparel park	Hazira/Maghdhalla	Na	Na	Na	NO
	Hazira	Hazira/Maghdhalla	Na	Na	Na	Hazira has its port nearby and no waterway movement
	Pandesara	Hazira/Maghdhalla	4	7	7	NO
	Hazira (Reliance)	Hazira/Maghdhalla	Na	Na	Na	Hazira has its port nearby and no waterway movement
	Sachin	Hazira/Maghdhalla	Na	0	11	no
	Ichhapor Bhatpor	Hazira/Maghdhalla	1	0	2	NO
	Sachin (DGDCL)	Hazira/Maghdhalla	Na	0	11	no
Surat						
Source:GIDC Surat	Nizer	Hazira/Maghdhalla	Na	Na	Na	NO
	Doswada	Hazira/Maghdhalla	13	140	90	NO
Jalgaon	Jalgaon	Hazira/Maghdhalla	16	355	377	May be
Source:MIDC Jalgaon	Chalisgaon	Hazira/Maghdhalla	108	355	322	May be
	Amalner	Hazira/Maghdhalla	18	322	292	no
	Pimprale	Hazira/Maghdhalla	14	355	377	no
	Varangaon	Hazira/Maghdhalla	8	389	388	May be
	Pachora	Hazira/Maghdhalla	60	355	326	no
	Bhusawal	Hazira/Maghdhalla	2	374	356	
Nandurbar	Navapur	Hazira/Maghdhalla	7	145	132	
Source: MIDC Nandurbar						
Dhule						
Source:MIDC Dhule	Dhule	Hazira/Maghdhalla	45	278	307	
	Nardana	Hazira/Maghdhalla	10	278	307	

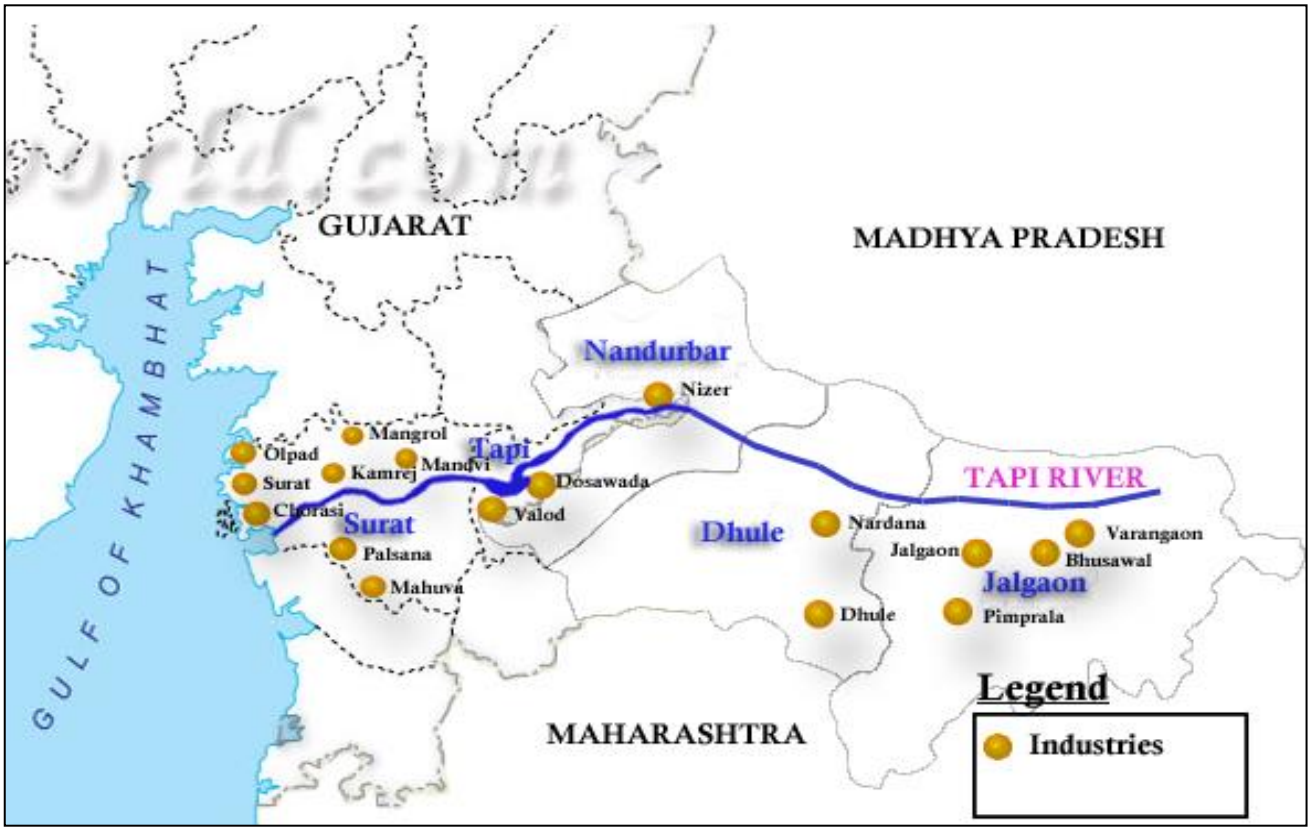


Figure 70: Industrial map of Tapi River Stretch

Figure 71: Road Map

Figure 72 : Rail Map

5.4.1 Industrial Profile of the Surat District:

Large industrial units such as Reliance Industries, Kribhko, Larsen & Tubro, ONGC, Essar, NTPC, Reliance Petrochemicals Ltd., Gas Authority of India Ltd.,Shell India Ltd. are contributing into industrial and economic growth of the district at present. There are nearly 500 texurising and 400 processing houses, 65,000 power looms and diamond units exist in the district. So, there is necessity of spare parts, machinery, and stores materials etc. on large scale for these industries. Hence, there is huge potentials for establishing new ancillary engineering and packaging industries on large scale to suffice the necessities of these industries.

Table 51: Industrial Profile of the Surat District

Sl. No.	Name of Indl. Area	Land acquired (Hec.)	Land Developed (Hec.)	Prevailing Rate per Sq. Mtr. (Rs.)	No. of Plots	No. Of Allotted Plots	No. of Vacant Plots	No. of Units in Production
1	Sachin	749.35	749.35	2990	1557	1553	4	2075
2	Pandesara	218.27	218.27	2990	547	545	2	782
3	Surat	54.96	54.96	1800	126	124	2	50

4	Bardoli	4.71	4.71	415	45	45	0	67
5	Ichhapore-Bhatpore	919.84	919.84	2990 &2160	323	298	25	337
6	Hazira-	428.04	428.04	2160	4	4	0	4
7	Khatodara	3.08	3.08	4005	43	43	0	142
8	Olpad	31.59	31.59	335	70	70	0	68
9	Katargam	38.33	38.33	3740	54	54	0	887

Large industrial units such as Reliance Industries, Kribhko, Larsen & Tubro, ONGC, Essar, NTPC, Reliance Petrochemicals Ltd., Gas Authority of India Ltd., and Shell India Ltd. are contributing into industrial and economic growth of the district at present. There are nearly 500 texurising and 400 processing houses, 65,000 power looms and diamond units exist in the district. So, there is necessity of spare parts, machinery, and stores materials etc. on large scale for these industries. Hence, there is huge potentials for establishing new ancillary engineering and packaging industries on large scale to suffice the necessities of these industries. There are 230 Medium Scale & Large Scale Industrial (MSI\LSI) units in Surat and Choryasi, 22 MS\LSI in Olpad, 131 MSI\LSI units in Mandrol, 2 MSI\LSI in Kamrej, 116 MSI\LSI in Madvi and Palsana, and 8 MSI\LSI units in Mahuva tehsil respectively are operating in the district.

Medium and Large Scale Players in Surat

Table 52: Medium and Large Scale Players in Surat

Company Name	Location	Product
Essar Power	Hazira	Naphtha
Indian Oil Corp. Limited	Choryas	Motor Spirit, Naphtha, Diesel
Indian Oil Corp. Limited	Bhatpor	LPG
Krishak Bharti Cooperative	Hazira	Ammonia, NGL
Larsen & Tubro	Hazira	LPG Equipment, Liquid Oxygen
Reliance Industries Limited	Bhatpor	Benzine, LPG, Naphtha, Chlorine,
Hindustan Petrochemical	Choryas	MS, HSP, Naphtha, SKO
Indo Burma Petroleum Limited	Choryas	SKO, High Speed Diesel, Motor Spirit
Essar Steel	Hazira	Liquid Oxygen, Aargon, C1.2

Major Exportable Items:

Pharmaceutical, Chemicals and petrochemicals products are the most export oriented activities in the medium and large scale industrial sector of the district.

Road Connectivity:

Magdalla & Hajira Ports in Surat have good rail and road connectivity. Magdalla port is only 2 km away from the state highway and 15 km away from NH-8. Hajira port in Surat has close proximity to the high speed dual carriageway which is under construction. Further augmentation of Surat-Hajira Linkage and connectivity to NH-6 and NH-8 by road.

Rail Connectivity:

Surat-Hajira Rail Link with DFC at Vapi\Vadodara stations along with residential, commercial, institutional, health and transportation infrastructure will definitely upsurge the industrial growth of the district. The nearby broad gauge railway line of Magdhala port and Surat railway station are 15 and 16 km respectively away from the port.

Population Demographics:

The geographical spread of district is 4327 sq.km. District has a total population of 60.79 lakhs. A significant portion of district population lives in urban areas accounting for nearly 79.68 percent of the total population. Population spread in the district is significantly higher than the state average with a density of 1376 persons per sq.km. The district has registered an overall literacy rate of 86.65 percent. Nearly one third of the total workforce is dependent on secondary sector activities. Further, total work force participation rate is higher than the state average unlike most of the urban regions in India. Higher participation rates are attributed to significant women employment in textile units.

5.4.2 Industrial Profile of the Tapi District:

Vyara and Songadh in Tapi district are known for dense forests with a major production of bamboos the unit of Central Pulp Mills is located in Songadh taluka. The industrial areas in Tapi district are Doswada, Nizer and Valod.

Table 53: Industrial Profile of the Tapi District

S.No.	Name of Ind. Area	Land acquired (In hectare)	Land developed (In hectare)	Prevailing Rate Per Sqm (In Rs.)	No. of Plots	No. of allotted Plots	No. of Vacant Plots	No. of Units in Production
1	Doswada	165.60	165.60	45	1	1	-	-
2	Nizer	5.60	5.60	100	1	1	-	-
3	Valod	1.16	0.3008	120	2	2	-	-

List of the units in Tapi & near by Area

- J.K.paper Mill Ltd., Ukai Tal.Songadh
- Hyderabad Industries Ltd., Golan, Tal.Valod.

Major Exportable Item: -

- Cotton Tower
- Papad

Table 54: Major Industries in Tapi district

Name of Company	Taluka	Product
Mozzaterra Tiles Pvt Ltd	Vyara	Cement Mosaic Tiles
Ukai Pradesh Sahkari Khand Udyog Mandli	Vyara	Sugar
Deeprekha Impex Pvt Ltd	Nizar	Textiles
Shri Govardhan Sugar Industries	Nizar	Sugar
Valod Pradesh Sahkari Khand Udyog Mandli Ltd	Valod	Sugar
Vini Textile	Valod	Textile
J K Paper Ltd	Songadh	Paper

There are about 27 MSMEs functioning in Tapi district. Of them, 8 are textile-based, 11 are sugar and forest-based, 6 are mineral-based and 2 units are other industries.

Taluka-wise distribution of these MSMEs is shown below:

- Vyara 11
- Valod 3
- Uchhal 1
- Songadh 8
- Nizar 4

Road

Tapi is well-connected with various locations within the state and outside through a network of national and state highways. ¬ Connectivity to metros: Surat at a distance of 62 km from Vyara, to be covered by NH 6, connects to Mumbai and Delhi. Surat to Mumbai (307 KM)/Delhi (1034 KM) via NH 8.

Rail

Almost all the Talukas of Tapi are well connected through rail network. Vyara is well-connected with Valsad, Vapi and Mumbai towards south and with Bharuch, Vadodara and Ahmedabad in the north.

5.4.3 Industrial Profile of the Nandurbar District:

Industries like textile, sugar mills and paper manufacturing are predominat in this district. There is a textile cluster located in Navapur tehsil.

Existing Status of Industrial Areas in Nandurbar district:

Table 55: Existing Status of Industrial Areas in Nandurbar district

Sl. No.	Name of Indl. Area	Land acquired (In Hect.)	No. of plots developed	No. of plots	No. of plots allotted	Industrial Rate per Sq. Mtr. (In Rs)	No. of Vacant plots.	No. of units in production
1.	Navapur	64.19	64.19	10	105	30	-	41

Major Exportable Items:

There are no major exportable items produced in these districts.

Road Connectivity:

The Navapur is very well connected through NH-6 to Gujarat and Madhya Pradesh. It is also connected to other parts of Maharashtra through state highways.

Rail Connectivity:

The Nandurbar and Navapur railway station fall in Surat – Jalgaon route

Large Scale Industries:

Table 56: Large Scale Industries

Sr. No.	Name of Industrial Enterprises	Taluka	Products
1	M/s.Shri Satpuda Tapi Parisar	Sahada	White Crystal Sugar
2	M/s. Shri Satpuda Tapi Parisar Sahakari Sakhar Karkhana	Sahada	Particle Board
3	M/s. Shri Satpuda Tapi Parisar Sahakari Sakhar Karkhana	Sahada	On-coated Paper & Paper Board
4	M/s. Shri Satpuda Tapi Parisar Sahakari Sakhar Karkhana	Sahada	Ethyl Alcohol
5	M/s. Maharashtra Oil Extraction Ltd.	Nandurbar	Salad Oil
6	M/s.AdivasiSahakari Sakhar Karkhana Navapur-Nandurbar Vibhag	Navapur	White Crystal Sugar
7	M/s. Loknayak Jay Prakash Narayan Sethkari Sahakari Soot Girni	Sahada	Cotton Ginning
8	M/s.PushpaDanteshwarSahakari Sakhar Karkhana Ltd.	Nandurbar	White Crystal Sugar d

9	M/s. Bholenath Paper Mill	Sahada	Paper Board

Population Demographics:

Nandurbar district has a total land area of 5,995 sq. km. and a population density of 276 people per sq. Km. Agriculture is the main occupation, employing 81.6 per cent of the labour force. Nandurbar district has a population of 16.46 lakh person. The district's literacy rate is 63.04 per cent, which is significantly lower than the State average of 82.91 per cent, and the All-India average of 74 per cent. The district has a total workforce of about 7.7 lakh persons. Of this, 33.7 per cent are cultivators, 47.9 per cent are agricultural labourers, 1.7 per cent are workers in household industry and 16.7 per cent are other workers.

5.4.4 Industrial Profile of the Dhule District:

The major industries in this district are oil mills, cotton grins, and textile. It is expected that the growth of MSMEs will boost up in and around Dhule district due to the connectivity of Dhule district (Nardana Taluka) to the Delhi-Mumbai Corridor Project.

Existing Status of Industrial Areas in Dhule district:

Table 57: Existing Status of Industrial Areas in Dhule district

	Name of Indl. Area	Land acq	No. of	No. o	Industrial	No.
	Dhule	5.2	2	2	120/	-
	Addl. Dhule	307	6	6	120/	7
	Nardana	224	0	0	75/	0
	Nardana	431	1	8	75/	4

Clusters in the District:

- Fiber to Fabrics Cluster, Shirpur, Dhule
- Edible Oil Cluster, Dhule
- Powerloom Cluster, Dhule

Major Exportable Items:

Major exportable item is Fatty Acids, Oil Cake, Edible oil etc.

Road Connectivity

Being located close to the intersection of NH-6, NH-3 and NH-211, this region enjoys advantage of excellent connectivity to ports and other cities like Surat. It is approximately 160 km from Nashik, 125 km from Shirdi, 146 km from Aurangabad, 261 km from Indore, 322 km from Pune and 324 km from Mumbai and 503 km from

Bhopal. It is well connected with all major cities of the state and country like Mumbai, Pune, Nagpur, Nashik, Aurangabad, Kolhapur, Amravati, Solapur, Ahmedabad, Surat,

Rail connectivity

It lies on broad gauge railway route of Mumbai-Bhusawal. Manmad-Dhule-Indore rail project has been sanctioned in Indian Railway Budget announced for the year 2016-17.

Population Demographics:

Dhule district has a total land area of 8,063 square kilometers (sq. km.). Agriculture is the main occupation, employing 70 per cent of the labour force. Dhule district has a population of 20.49 lakh persons. The district's literacy rate is 74.61 per cent, which is lower than the State average of 82.91 per cent, and equivalent to the All-India average of 74 per cent.

5.4.5 Industrial Profile of the Jalgaon District:

Pipe manufacturing, fruit processing, pulse milling, biofertilizer production, Green / Solar Energy and mattress manufacturing are the types of industries located in Jalgaon. Jalgaon is a significant collection and distribution center of agricultural goods and agriculture input industry (including biofertilizers). The leading products are Jawar and raw cotton and banana the region's rich volcanic soil is particularly well-suited to cotton production. Jalgaon is an important center for cotton-textile and vegetable-oil mills, particularly groundnut oil and h hydrogenation plants. Jalgaon is also well known for banana production. The Jalgaon city surrounded by various well-known and reputed industries like irrigation, pipe, forging, cloths. Jalgaon is nowadays becoming a w ell trading centre of Maharashtra and a leading producer of sugarcane.

Existing Status of Industrial Areas in the District Jalgaon:

Table 58: Existing Status of Industrial Areas in the District Jalgaon, Source: MIDC and DIC Jalgaon.

S.No	Name of Ind.Area	Land acquired (In hect)	Land developed (In hectare)	Prevailing Rate per Sqm.(In Rs.)	No of Plots	No of allotted Plots	No of Vacant Plots	No of Units in Production.
1	Co.Ind Est. Jal.	19.3	138 Plots	Rs.665 per Sq.mt for Industrial Rs.1330 Commercial per Sq.mt	138	138	--	133 5 Closed
2	MIDC Jalgaon	629.63	1710 Plots	-do-	1710	1654	46	1299 194 closed

3	MIDC Bhusaw al	325.84	171 plots	Rs.135 /sq.mt for Industrial Rs.270 sq.mt for Commercial	171	171	--	5
4	MIDC Chalis gaon	256.16	68 plots	Rs.130 / sq.mt Industrial Rs.260/ sq.mt commercial	68	60	8	1
	Total	1230.93	2087 plots					

List of the units in Jalgaon & Near By Area.

1. Jain Irrigation System Pvt Ltd.Bambhori Tal Dharangaon.

2. Supreme Industries, Gadegaon Tal Jamner

3) Raymond Ltd, MIDC Jalgaon.

4) Orient Cement Nashirabad Tal Jalgaon

Major Exportable Items:

Food Products, I.e. Mango, Banana, Gauva, PVC Pipes, PVC Mats etc Pulp and powder.

Road Connectivity:

State highways and roads link district headquarters at Jalgaon to all 15 tahsils and towns. National highway (No 6) passes through Jalgaon.

Rail Connectivity:

Connected by rail, with a station at Jalgaon (important broad gauge route and a narrow gauge line). Connected to Mumbai, Delhi, Chennai, Calcutta, and Surat too by rail.

Population Demographics:

Jalgaon district has an area of 11,765 square kilometers, and a population density of 359 persons per square kilometers. Cultivators and Agricultural labourers together are a major class of the workers in the district, employing 70.8 per cent of the labour force. Jalgaon district has a population of 42.24 lakh persons. The district's literacy rate is 79.73 per cent, which is marginally lower than the State average of 82.91 per cent but higher than the All-India average of 74 per cent. The district has a total workforce of about 15.6 lakh persons. Of this, 24.1 per cent are cultivators, 46.7 per cent are agricultural labourers, 2.4 per cent are workers in household industry and 26.8 per cent are other workers.

Fly ash:

It is the essential commodity for manufacturing of the cement. With Ukai thermal power plant near the stretch it is suitable to transport the fly ash waste from power plants to the cement manufacturing plants. Though the majority of fly ash is not being consumed locally in cement and brick manufacturing industries there is surplus of 1.537 mmtpa of fly ash which could be transported to cement plants in Maghdhalla by IWAIl movement. The same has been considered for IWAI movement and the growth will be in accordance with the demand of the cement plants at Maghdhalla. There is possibility of movement of fly ash from Ukai to Gulf of Maghdhalla. There are two major Cement plants in Maghdhalla. Hence Stretch from Maghdhalla to Ukai can be considered for Fly ash movement.

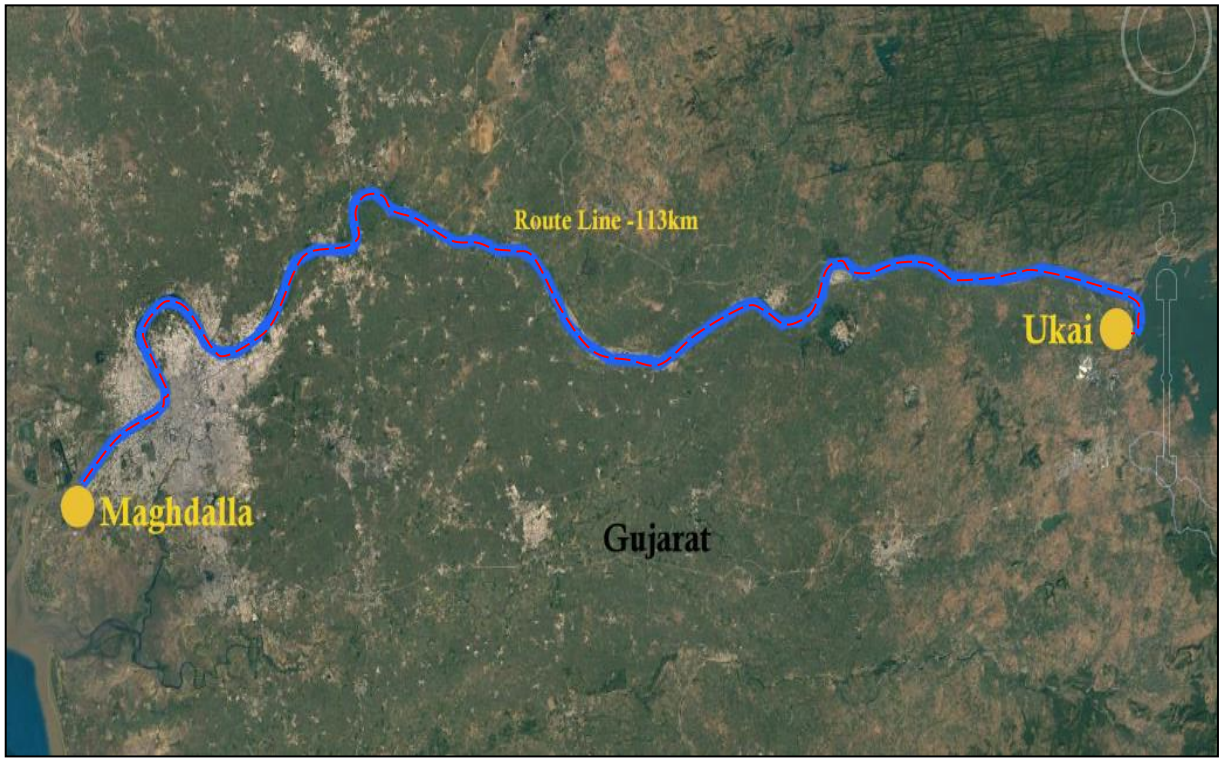


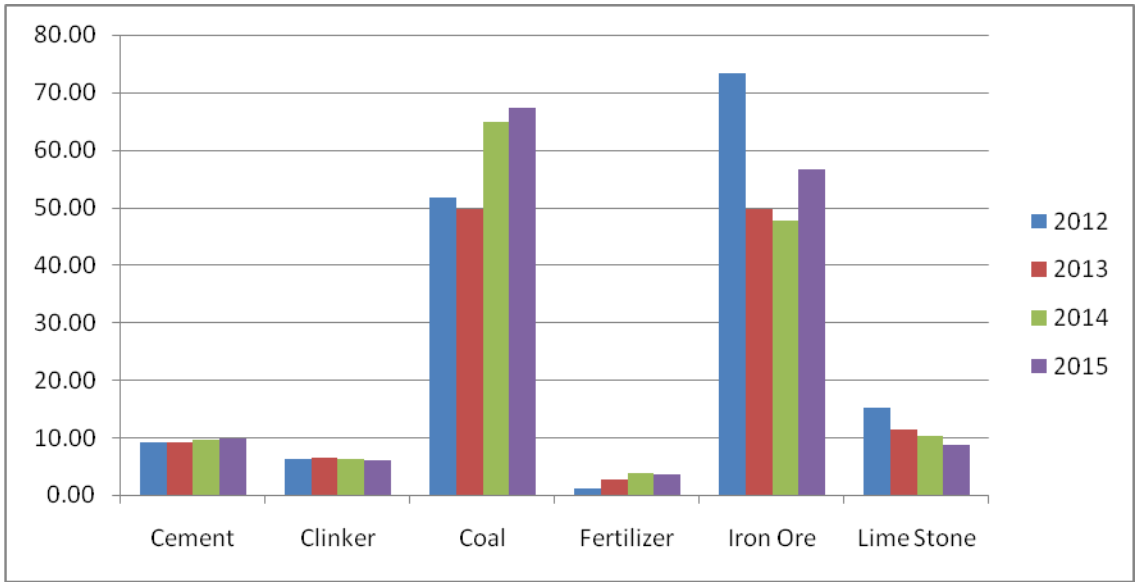
Figure 73: Fly Ash

5.5 Existing Terminals and Jetties:

5.5.1 Maghdhalla port:

Magdalla is a lighter age port. The port is situated on the western coast of India in southern Gujarat. It is on the southern bank of river Tapti about 16 Km upstream the river. The state highway is 2 Km and NH – 8 is 15 Km away from Magdalla Port. The nearest broad gauge railway line and Surat railway station are 15 and 16 km away from Magdalla Port respectively. The port is well connected by road with Rajasthan, Madhya Pradesh, and north Maharashtra which are hinterland areas to the port. The airport is 4 Km away from the port. The main cargo handled by Gujarat Maritime Board (GMB) jetty at Magdalla Port is coal. Essar Steel Ltd, Reliance Industries Ltd, Larsen & Toubro Ltd and

Gujarat Ambuja Cement Co. Ltd have constructed captive jetties at Magdalla for import and export of their products.GMB is planning to develop a common user berth towards south of Essar jetty at Hazira. The location is falling under the administrative control of Magdalla Port. Fertilisers, soybean, groundnut, coal, general cargo, etc. can be handled at this proposed location.



Year	Cement	Clinker	Coal	Fertilizer	Iron Ore	Lime Stone
2012	9.11	6.18	51.65	1.19	73.41	15.12
2013	9.14	6.38	49.78	2.58	49.68	11.40
2014	9.56	6.17	64.83	3.83	47.60	10.28
2015	9.81	6.08	67.31	3.49	56.68	8.59

Table 59: Movement of cargo from Port Maghdhalla

Commodity	Volume(MMTPA)	Attractive	Reasoning
Cement	9.11	May be	There is growth in Infrastructure in nearby districts.
Clinker	6.18	NO	NO Cement unit nearby the Stretch other than in Maghdhalla.
Coal	67.31	NO	As coal is sourced from Indian mines from East.
Fertilizer	3.49	Maybe	The districts nearby have large area under cultivation
Iron ore	56.39	NO	Main consumption centre Surat.
Limestone	8.59	NO	NO Cement unit nearby the Stretch other than in Maghdhalla.

5.6 Existing Cargo Movement:

Through primary survey and secondary research the Data of commodities presently being handled at ports of Dahej, Hazira and Magdalla have been gathered. Majority of commodities like coal, coke, fertilizers, cement, containers, steel coils are handled at this port. The large amount of coastal cargo like cement, containers and coal is also being handled at this port.

The O-D movement of commodities by rail has been studied and will be further analysed on cost basis to determine the modal shift. The data regarding freight railway shades nearby the identified stretches have been collected.

The proposed Tapi river stretch has been surveyed and present ferry or cargo movement has been observed. There no current boat movement in Tapi River, but some passenger movement and fishing activities are observed on the stretches of Tapi. The proximity of the Tapi River stretches to the ports like Maghdhalla and Hazira make them potential mode of transport to the hinterland. During site visit it was observed that quarry stones, sand and construction raw materials are some of the important commodities that could be plied on the identified stretches for domestic movement.

As per survey conducted the commodities have been categorized in to following categories

3) Domestic movement- Sand, Flyash
4) EXIM Movement- Coal,

Table 60 Traffic Assessment

Commodity	MMTPA
Ukai Power Plant Flyash	1.537
Sand	0.1
Fertilizers	2
Coal	4.5

SOURCE: As per Ukai power plant website and geological department website.

With reference to commodity identification, the ports may be proposed at Ukai for Coal and Flyash and at Surat for coal, Flyash.

5.7 Prominent city/Town/Places of Worship/Historical places for tourism:

5.7.1 Surat and Tapi:

Surat accounted for 4.29% of the total tourist flow in Gujarat .The district has various tourist destinations. It houses finely carved mosques, Parsi agiaris and Europian tombs. Famous Dumas beach is only 18 Km away from Surat City.

Hazira beach is situated 28 Km from Surat. The pleasant Hazira beach is fringed by feathery 'Casurina' trees and has a comfortable holiday home for visitors.

90 Km from Surat is Ukai Dam built over river Tapi is a place worth-visiting.

Some of the renowned tourist destinations in Surat City are Surat Castle, Mughalsarai, Andrews Library, Sardar Vallabhbhai Patel Museum, Planetarium and the European tombs

Swaraj Ashram at Bardoli, Historical fort at Songadh, Water Fun Park on Hazira Road , Aquatic Water Park at Kamrej, and Joy n Joy Amusement Park at Dhonapadi on NH-8 are some of the nearby tourist spots from the city

The district has around 95 hotels including high, medium and economy class accommodation with total bed capacity of 4,993. Some of the 5, 4 and 3 star hotels in Surat are Holiday Inn, Hotel Golden, Lords Park Inn International, Central Excellency, Hotel Embassy, and Hotel Yuvraj.

5.7.2 Nandurbar District:

Prakash Temples

The village located at the banks of the river Tapi in Shahada district, lies 25km from the district headquarter of Nandurbar. Also known as Dakshin Kashi, it is famous for its temples of Kedareshwar, Gomteshwar and Sangameshwar.

These are amongst the 108 temples of the village and witness more than 5 lakh tourists every year during the Shrawan months. The village faces accessibility issues during heavy monsoons as the river overflows and it becomes an island. It is also proposed to be the location for Mahakumbh Fair in 2015 which is generally home to Nasik.

Asthambha

Located in the Akrani Tehsil, and about 60 kms from Nandurbar, Asthambha is a historic religious place. It has one of the major religious temples for the tribal population of not only the Nandurbar district, but also for tribals from South Gujarat and Maharashtra. It is situated on a mountain top, accessible only by foot and holds a Diwali fair for 10-15

days. Asthambha is a mythological character from Hindu epic called Mahabharata. Tribals say he is also known as Ashvasthama, a male character and son of Dronacharya.

Toranmal Forest

Surrounded by the Satpura hills, Toranmal is a narrow piece of plateau showcasing varied flora and fauna varieties. The plants have medicinal and aromatic value. With beautiful and scenic views, the place ranks second to Mahabaleshwar as an important hill station in the state of Maharashtra. Toranmal is at a distance of 40kms from Shahada and about 90 kms from the district headquarter of Nandurbar.

Khadki Point

Located on top of the Toranmal plateau, Khadki point is one of the important viewing points in the Toranmal hill station. One can view the undulating landscape of the district at one end and river Narmada on the other.

Sita Khai

A beautiful gorge falling from the Toranmal plateau, Sita Khai is a beautiful picnic place. It is also very useful for the locals, who hang from ropes in the gorge to collect honey. The water in the gorge varies with monsoon and finds source at the Yashwant Lake.

Yashwant Lake

Yashwant Lake has a perimeter of 2.75 Km. and spreads in 39 hectares. It was constructed during British period by damming the dip gorge on Northern side of the gravel embankment of 400m by arresting the main flow of the stream. The littoral zone of Yashwant Lake is covered with various macrophysics. The west and northwest sides are surrounded by forested land. The Toranmal village is present on its eastern bank with its linear pattern settlement of tribal people across the road. The main drainage inflow of water enters the Lake from southern bank and minor drainages from Northwest. The outflow (spillway) of the Lake is located on Northern side near a temple.

Lotus Lake

It is a shallow perennial water body with 1.17km perimeter. It is fed by rains and during the rainy season. Water of the lake is utilized by local people for domestic purposes; however, it can be developed into a beautiful tourist spot, due to its excessive coverage with lotus flowers.

Gorakhnath Temple

The temple is one of the oldest temples on the Toranmal plateau and is visited by thousands of devotees during the grand fair of Mahashivratri in March and April. The temple is famous for producing a large sweet prasadam every year to offer the locals.

Nandurbar

Nandurbar is the district headquarters and is very well connected via railway and state highways to various major towns and cities in the vicinity. It has several places which can be developed further for tourism. The famous Imam Saheb's Dargah

and the Dandpaneshwar temple lie within the city limits. Also, locally famous temple of Shanimandal is also 10kms away from the city.

Sarangkheda Horse Bazaar

Sarangkheda is located on the other barrage of the river Tapi, downstream from Prakash. The village comes to life for 2-3 days in the winter, when local traders visit the horse grounds for the horse bazaar. An estimated daily visitation of about 1.5 lakh tourists from nearby villages and districts are seen enjoying the fair while trading their horses.

Dattatreya Temple

In close proximity to the Sarangkheda horse grounds, lies the Dattatreya temple. Every year a big fair is organized on the eve of Datta Jayanti. This Datt Mandir is almost 100 year old and renovated around 40 years ago. It is believed that idol of Datta has been brought from Mahur in Nanded district.

Unapdev

The temple in the hilly terrain of the Satpura ranges is famous for a hot spring. It has been developed as a picnic spot and around 500 – 1000 tourists visit the place each day on weekends. It is about 25kms from Shahada town.

Khekda

Gaimukh temple is famous for the huge crowds it gathers on Mahashivratri days. The temple is located deep in the hinterland of the Navapur Tehsil with beautiful views of the forests and the plains.

5.7.3 Dhule District:

Thalner

In Shirpur Taluka was farmer capital of Khandesh known for fort. Accordingly to the local grant in the being of the twelth century, while the country for 32.18 km. round was ‘without a light’ and twenty seven of its forts were deserted. Thalner prospered under Javaji and Govaji of the Tale subdivision of Gavalis or Ahirs.

Shirud

In Dhulia Taluka known for an antique shrine in hemadpanti style, dedicated to Kalika Goddess.

Laling

In Dhulia Taluka is known for an old and ruined fort occupying the top of the hill. It is a place of considerable antiquity and the fort is supposed to have been built during the region of Malik Raja Faruqui. Which subsequently granted to has eldest son. It was in this fort that, Nasir Khan and his son Miran Adil Khan were besieged in 1437 by the

Bhanrnani general till they were relieved by an army advancing from Gujrath. Laling has also two hemadpanti temples in a decoyed condition and a rained hemadpanti well.

Bhamer

In Sakri Taluka known for its fort and more so for the caves or rather monks dwelling that are in the escarpments of the hills above the village. A remarkable features in the fort is that its building are mostly underground, these escarpment being honey combed with caves, some of them plain and shapeless, but others regular building with pillar-supported roots. There caves are locally known as Gavali Raja's house.

Bodgaon

In Sakri Taluka formerly known as Bhojpur after the king Bhoj, who is supposed to have rules this region. It is known for several old and in some cased dilapidated temples mostly situated on the bank of the Utavalinala. There are four temples dedicated to Mahadev, one each to Maruti- Ganapati and Bhavani and a twelve pillared Samudhi of a unknown saint popularly known as 'Bara Khambi Mandir'.

5.7.4 Jalgaon District:

Sri Padmalaya

Among the two and a half Shree Ganapati Peeths in India, this is regarded as the half Peeth. It is called as Padmalaya Kshetra. This temple is located at the top of a hill. There are small temples on all sides of the main temple. The padukas of Shree Govind Maharaj are located in front of the temple. There is a huge bell next to the padukas. There are two self existent (Swayambhu) Ganesh idols in the sanctum. One idol has its trunk curving to the right and the other to the left. Padmalaya also known, as "Prabhakshetra" is a religious place located in Erandol Taluka about 4.8-km from Erandol. It is famous for the temples of Lord Ganapati and Hanuman.

Swinging Towers of Farkande

Swinging Towers located 16-km from Erandol on the bank of Utawadi River are a great example of old construction techniques. Both the towers are 15m long and when one of them is waved the other towers also starts waving automatically. It is believed that the construction is 250 years old.

Unapdeo

Hot-water springs are situated in the Satpudas at Unapdeo in Chopda tehsil. Like Unapdev, Sunapdev, Nijhardev are two other hot water breezes generated in Satpuda hills range. All these three places have special mention in ancient holy 'Ramayana' and had auspicious touch of Lord Rama during his fourteen years expulsion from Ayodhya.

Parola fort

Parola fort was built in 1727 and the size of the fort is 160 to 130-sq-meters. It is believed that the fort belongs to the father of the Great Rani of Jhansi, Laxmibai. Hence, Parola is believed to be the native of Rani Laxmibai.

Figure 74: Passenger vessel site Tapi River

There is also passenger movement in Tapi River. Due to lack of across river bridges it requires people to transport on small boats. Also there are pilgrimage and devotional places on Tapi River where tourists are seen travelling on small boats over short stretches.

6. Observations, Inferences and Conclusions

6.1 Waterway

The total length of the river under present studies is detailed below:

436 km length of the river from Hatnur Dam near Mangalwadi Long to confluence with Gulf of Khambhat (Arabian Sea)	**From: 21°4'21.99"N 75°56'44.88"E**	**Up to: 21°2'15.51"N, 72°39'29.63"E**

6.2 Length

The length of waterway under present studies under consideration is 436 km.

6.3 LAD

LAD (m)	0-25	25-30.87	30.87-50	50-75	75-100	100-125	125-150	Total (km)
<1	0.00	0.49	9.74	4.10	6.51	3.97	2.67	27.47
1-1.2	0.00	0.00	0.49	0.81	0.16	0.00	0.00	1.45
1.2-1.4	0.10	0.00	0.29	0.40	1.06	1.05	0.00	2.90
1.4-1.7	0.30	0.00	0.61	0.39	1.36	0.00	0.00	2.66
1.7-2.0	0.58	0.10	0.79	0.62	0.23	0.23	0.00	2.54
>2	24.12	5.20	7.26	18.71	15.84	20.48	21.53	113.15
Total (Km)	**25.10**	**5.79**	**19.17**	**25.02**	**25.16**	**25.73**	**24.2**	**150.17**

LAD (m)	150-175	175-200	200-225	225-250	250-275	275-300	Total (km)
<1	7.44	18.93	1.81	4.71	1.69	14.26	48.84
1-1.2	0.49	0.50	0.80	0.19	3.03	1.07	6.08
1.2-1.4	0.82	0.00	0.91	0.21	2.27	1.08	5.29
1.4-1.7	0.30	0.00	0.87	1.94	3.13	1.03	7.27
1.7-2.0	0.60	1.33	0.00	1.20	2.45	2.16	7.74
>2	16.50	3.25	20.55	16.68	12.30	5.35	74.63
Total (Km)	**26.15**	**24.01**	**24.94**	**24.93**	**24.87**	**24.95**	**149.85**

LAD (m)	300-325	325-350	350-375	375-400	400-425	425-436	Total (km)
<1	1.93	10.93	17.54	7.15	10.04	0.89	**48.48**
1-1.2	0.57	0.00	3.68	2.29	0.35	0.00	**6.89**
1.2-1.4	2.11	0.95	1.59	4.05	0.00	0.00	**8.70**
1.4-1.7	2.24	1.79	0.91	0.51	2.39	0.00	**7.84**
1.7-2.0	4.44	3.15	0.41	2.90	0.63	1.12	**12.65**
>2	13.90	8.77	0.77	8.52	11.80	7.72	**51.48**
Total (Km)	**25.19**	**25.59**	**24.9**	**25.42**	**25.21**	**9.73**	**136.04**

6.4 Cross-Structures

At present, there are three existing dams, three existing barrages, One under construction barrage (Palsera barrage) from 0 – 407.6 chainage. Six check dams are also located from 413-426 km Chainage.

There are 24 existing road bridges (including 13 state / National highways), five road bridges are under construction, two rail bridges, one water Pipeline Bridge, 34 high tension lines and 5 cables/electric line crossing Tapi river in the present study stretch.

6.5 Water availability

Surat Gauge data analysis

Daily gauge- data for period 1969 to 2004 was analysed in different ways as discussed in chapter 4. This Gauge is located on Nehru bridge in Surat City at about 24 km upstream of river mouth at Hazira. Only water level gauge data for period June to October is available at this site. In pre-Ukai period Surat city experienced heaviest flood on 6 Aug 1968 when flood level of 12.04 m was reported at this gauge for highest observed flood discharge of about 44170 m^3/s (15.6 lakh cusecs). In Aug 2006 flood level of 12.50 m was reported at this gauge for much less flood discharge of 24770 m^3/s (9.1 lakh cusecs). Tidal flow is experienced at this gauge. The tidal flow is arrested at Shinganpur weir located at about 2 km upstream of Nehru Bridge.

From analysis of water level data as well as the tidal range at Surat following conclusions could be drawn.

1) Considering river bed levels of the order of – 2m MSL and the tidal range at Surat, Navigational depths of the order of 1.5 m to 2 m and more could be available even during non-monsoon period except during period of low water time.
2) In Monsoon period depths of the order of 2 m and more will be possible in 26 km reach from river mouth to Shinganpur weir.
3) Estimated chart datum at Surat Gauge is 0.467 m w.r.t. MSL (As per IWAI criteria based on average of low water levels of past 6 years).

Ghala Gauge data analysis

Daily gauge- discharge data for period 1977 to 2017 was analysed as discussed in chapter 4. This gauge is located at about 72.5 km upstream of river mouth. The river bed level at this location is about 3 m MSL. At Shinganpur weir water level of 4.5 m is maintained for water supply to various intakes of SMC and Hazira industries. Therefore, depth of about 1 to 1.5 m will prevail at Ghala gauge even during non-Monsoon period.

From analysis of water level data following conclusions could be drawn.

1) The estimated chart datum of 3.03 m MSL is close to river bed level of about 3 m MSL

2) Depths of the order of 1.5 m will prevail near Ghala for the period of about 270 days in year. Between Ghala and Singanpur weir depths will be more than 1.5m.

3) From Ghala to Kakrapar the river bed slope becomes steeper and river bed is also rocky at many places.

The results of analysis indicate range average 10 daily flows in different period of year as following

- June to September - From 120 to 500 m^3/s
- October to December - From 400 to 100 m^3/s
- January to May - 50 to 20 m^3/s

Maximum flood discharge & HFL (during period of data) at Ghala gauge were 22500 m^3/s and 20.96 m respectively in August 2006.

Kakrapar Gauge data analysis

The Kakrapar weir is located at 113 km upstream from Tapi river mouth and about 30 km down of Ukai Dam. The crest level of weir is 48.78 m. Daily gauge data available for period 1969 to 2004 for months June to September was analysed in different ways as discussed in chapter 4.

The estimated CD as per IWAI criteria is 47.71 m at this gauge. The river bed levels on upstream and downstream of weir are 39.20 m and 37 m respectively. The river bed level on downstream of Ukai dam is about 42 m MSL. Thus, minimum depth of about 6 m at Kakrapar weir and about 3 m at 30 km upstream at Ukai dam will normally prevail even with minimum water level due to regular releases from Ukai dam for irrigation from Kakrapar canals. There will be need of navigation lock at Kakarapar and Ukai.

Ukai Gauge data analysis

The Ukai Dam is located at 137 km upstream from Tapi river mouth and about 30 km down of Kakrapar weir. The crest level of Ukai spillway is 91.135 m and FRL of the reservoir is 105.156 m MSL. Daily gauge data available for period 1969 to 2014 for months June to September was analysed in different ways as discussed in chapter 4.

Estimated CD at this gauge site is 90.169 m MSL. The river bed levels on upstream Ukai dam is somewhat above 42 m. Thus, with CD of about 90 m depth of about 50 m will

prevail at Ukai dam. With the average bed slope of 1/2130 the back water continues over about 100 km up to Prakasha Barrage. Analysis shows that during monsoon period water level will be fairly above CD. There will be need of navigation lock at Ukai dam and Prakasha Barrage. Thus, with depths of about 5 to 6 m at Prakash barrage another 10 to 12 reach will be navigable.

Sarangkheda Gauge data analysis

Daily gauge- discharge data at this CWC gauging station for period 1977 to 2015 was analysed in different ways as discussed above. This gauge is located at about 120 km upstream of Ukai dam and 25 km upstream of Prakasha Barrage. The river bed level at this location is about 109 m MSL. At about 40 upstream of Sarankheda gauging site another barrage- Sulawade barrage- is located near Sindkeda. The river bed slope in this reach becomes flatter as compared to the average bed slope of 1/2130. At about 4 km upstream of Sulawade barrage there is a bridge on river Tapi known as Gidhade bridge where another gauging site of CWC is located.

Analysis of data indicate following.

1) The highest flood level of 126.70 m MSL was observed at this site for the flood discharge of 23044 m^3/s during flood of August 2006.
2) Lowest observed water level during period of data was 108.9 m MSL.
3) The estimated chart datum of 109.42 m MSL is close to river bed level.
4) Depths of the order 1 m will prevail near Sarankheda for the period of about 150 days in year.
5) Depths of the order of 1 m to 2.5 m will prevail near Sarankheda for the period of about 120 days in year.
6) Depths near Sarankheda could be further improved by either marginal dredging and/or by constructing low level weir.

Analysis indicates range of average flows on the basis of 10 daily flows in different period of year as following.

Month	June	July	Aug	Sept	Oct	Nov	Dec	Jan-Feb	March-May
Discharge M^3/s	150	400	1200	700	100	30	15	12	<5

Gidhade Gauge data analysis

Daily gauge- discharge data at this gauging station for period 1970 to 2015 was analysed in different ways as discussed in chapter 4. This gauge is located at Gidhade bridge at about 164 km upstream of Ukai dama and about 40 km upstream of Sarankheda Barrage. The river bed level at this location is about 122 m MSL. At about 23 km upstream of Gidhade bridge gauging site, another barrage- Piloda barrage- is located. The river bed slope in this reach also becomes flatter (1/2800) as compared to the average bed slope of 1/2130. At about 50 km upstream of Gidhade bridge there is a bridge on river Tapi at Savkheda where another gauging site of CWC is located.

Analysis of data indicate following.

1) The highest flood level of 141.65 m MSL was observed at this site for the flood discharge of 26384 m^3/s during flood of August 2006.
2) Lowest observed water level during period of data was 121.22 m MSL.
3) The estimated chart datum of 122.54 m MSL is close to river bed level (122.0 m)
4) Depths of the order of 0.5 m to 2 m will prevail near Gidhade for the period of about 130 days in year.
5) Depths more than 2 m will prevail near Gidhade for the period of about 70 days in year.
6) Depths near Gidhade could be further improved by either marginal dredging and/or by constructing low level weirs/barrages.

Analysis indicates range of average flows on the basis of 10 daily flows in different period of year as following.

Month	June	July	Aug	Sept	Oct	Nov	Dec	Jan-Feb	March-May
Discharge M^3/s	150	400	1200	700	100	30	12	<10	<5

Savkheda Gauge data analysis

Daily gauge data at this gauging station for period 1972 to 2015 was analysed in different ways as discussed in chapter 4. This gauge is located at Savkheda bridge at about 214 km upstream of Ukai dam , about 50 km upstream of Gidhde bridge. The river bed level at this location is about 140 m MSL. At about 52 km upstream of Savkheda bridge gauging site, Bhusawal gauging site is located. The river bed slope in this reach from Bhusawal to Savkheda becomes steeper (1/1550) as compared to the average bed slope of 1/2130.

Results of analysis of data indicate following.

1) The highest flood level of 159.10 m MSL was observed at this site for the flood discharge of 24445 m^3/s during flood of August 1978.
2) Lowest observed water level during period of data was 140.05 m MSL.
3) The estimated chart datum of 140.417 m MSL is close to river bed level (140.0 m)
4) Depths of the order of 0.0 m to 1.5 m will prevail near Savkheda for the period of about 50 days in year.
5) Depths more than 1.5 m will prevail near Savkheda for the period of about 270 days in year.
6) Depths near Savkheda could be further improved by either marginal dredging and/or by constructing low level weirs.

Analysis indicates range of average flows on the basis of 10 daily flows in different period of year as following.

Month	June	July	Aug	Sept	Oct	Nov	Dec	Jan-Feb	March-May
Discharge M^3/s	150	400	1200	700	100	35	20	10	<5

Bhusawal Gauge data analysis

The Bhusawal gauge is located at about 266 km upstream of Ukai Dam and about 52 km upstream of Savkheda gauging station. The Hatnur dam on river is located about 20 km upstream of Bhusawal gauge. River bed is rocky at Bhusawal. Daily gauge data at this gauging station for period 1969 to 2015 was analysed in different ways as discussed in chapter 4.

Results of analysis of data indicate following.

3) The highest flood level of 183.40 m MSL was observed at this site during August 2006 high flood.
4) Lowest observed water level during period of data was 173.578 m MSL.
5) The estimated chart datum of 174.08 m m MSL is close to river bed level (173.0 m)
6) Depths less than 0.50 m will prevail near Bhusawal for the period of about 150 days in year.
7) Depths more than 0.5 to 0.8 m will prevail for the period of about 50 days in year.
8) Depths near Bhusawal could be further improved by either marginal dredging and/or by constructing low level weirs.

Hatnur dam gauge data analysis

The rivers reach under consideration for inland navigation ends at Hatnur dam. However, daily water level data of dam available for period 1979 to2015 was analysed. This analysis indicate following.

1) The Maximum water level of 214.0 m was observed for most of the year.
2) The lowest observed water level in Hatnur reservoir was 203.51 m during period of data.
3) Estimated chart datum as per IWAI criteria is 207.678 m. The river bed level at dam site is about 200 m.
4) Considering above facts navigation could be feasible in Ukai reservoir in Tapi as well as Purna rivers round the year for the reach of about 20 to 25 kms.

6.6 Cargo / Passenger / Tourism / Ro-Ro Facility

Surat is the second largest producer of lignite in Gujarat, which accounted for 19 % of the total production of lignite in the state during 2005-06. The Tapi district is very poor in mineral based products but there are minor mineral like, Black trap, ordinary sand, ordinary soil, Hard Muhrrum. Mud used for making bricks, sand and metal stone used for construction purpose are the only important minerals found in Nandurbar district. The quality of the lime available in Dhule district is not suitable for cement manufacture. But many kiln lime units can come up to exploit this mineral resource. Also, Sand, Murum, Stone etc. are available in abundance, which can be suitably used for construction of roads and building. Stand maron, stone, mica, and clay are available abundance, which can be suitably used for construction of roads and buildings in Jalgaon district. Occurrences of agate stones are known in Aurangabad, Jalgaon, Buldhana and Ahmadnagar districts in the State. These stones are utilised for manufacture of fancy items like paperweights, ashtrays, pendants, necklace, buttons, etc. after slabbing, cutting, grinding, polishing and lapping.

Large industrial units such as Reliance Industries, Kribhko, Larsen & Tubro, ONGC, Essar, NTPC, Reliance Petrochemicals Ltd., Gas Authority of India Ltd.,Shell India Ltd. are contributing into industrial growth of the Surat dist. at present. There are nearly 500 texurising and 400 processing houses, 65,000 power looms and diamond units. So, there is necessity of spare parts, machinery, and stores materials etc. on large scale for these industries.

Pharmaceutical, Chemicals and petrochemicals products are the most export oriented activities in the medium and large scale industrial sector of the district.

Vyara and Songadh in Tapi district are known for dense forests with a major production of bamboos the unit of Central Pulp Mills is located in Songadh taluka. About 27 MSMEs

operate in Tapi out of which 8 are textile-based, 11 are sugar and forest-based, 6 are mineral-based and 2 units are other industries.

Industries like textile, sugar mills and paper manufacturing are predominat in Nandurbar district. The major industries in Dhule are oil mills, cotton grins, and textile. The growth of MSMEs may boost due to Delhi-Mumbai Corridor Project. Major exportable item is Fatty Acids, Oil Cake, Edible oil etc.

Pipe manufacturing, fruit processing, pulse milling, biofertilizer production, Green / Solar Energy and mattress manufacturing are the types of industries located in Jalgaon. Jalgaon is a significant collection and distribution center of agricultural goods and agriculture input industry (including bio-fertilizers).

Sand mining in small amount is carried in the bed of the Tapi River. Small throughput quarries have been leased by auction mode. About 100000 ton is expected to be flowing from Nagod to Surat (56 km). It is recommended that the Ro-Ro facility to be provided for the transit of sand.

Coal is used in Ukai power plant situated in Tapi district. Presently the coal is sourced from the Chhatisgarh mines via Bhusawal-Surat route. The thermal capcity of Ukai powerplant is 850 MW The nearby railway station is Sangadh which serves the powerplant. The consumption of coal of Ukai plant is 4.5 million tons annually. On proposed river stretch it is viable to transport coal between Bhusawal and Ukai. Hence Bhusawal would be Ideal location for jetty.

Fly ash is the essential commodity for cement manufacturing. With Ukai thermal power plant near the stretch it is suitable to transport the fly ash waste from power plants to the cement manufacturing plants. There is surplus of 1.537 mmtpa of fly ash which could be transported to cement plants in Maghdhalla by waterway movement. There are two major Cement plants in Maghdhalla. Hence Stretch from Maghdhalla to Ukai can be considered for Fly ash movement.

Maghdhalla Port: The main cargo handled by Gujarat Maritime Board (GMB) jetty at Magdalla Port is coal. Essar Steel Ltd, Reliance Industries Ltd, Larsen & Toubro Ltd and Gujarat Ambuja Cement Co Ltd have constructed captive jetties at Magdalla for import and export of their products. GMB is planning to develop a common user berth at Hazira. Cement with volume of 9.1 MMTPA and fertilizer with 3.47 MMTPA may be transported using waterway as there is growth in Infrastructure in nearby districts and the districts nearby have large area under cultivation.

Quarry stones, sand and construction raw materials are some of the important commodities that could be plied on the identified stretches for domestic movement.

The commodities have been categorized in to following categories

5) Domestic movement- Sand, Flyash

6) EXIM Movement- Coal,

With reference to commodity identification, the ports may be proposed at Ukai for Coal and Flyash and at Surat for coal, Flyash.

Commodity	MMTPA
Ukai Power Plant Flyash	1.537
Sand	0.1
Fertilizers	2
Coal	4.5

The present study stretch of Tapi River has been surveyed and at present ferry or cargo movement has not been observed. There no current boat movement in Tapi River, but some passenger movement and fishing activities are observed on the stretches of Tapi. The proximity of the Tapi River stretches to the ports like Maghdhalla and Hazira make them potential mode of transport to the hinterland.

Hazira beach, Ukai Dam, Surat Castle, Mughalsarai, Andrews Library, Sardar Vallabhbhai Patel Museum, Planetarium and the European tombs, Swaraj Ashram at Bardoli, Historical fort at Songadh, Water Fun Park on Hazira Road , Aquatic Water Park at Kamrej, and Joy n Joy Amusement Park at Dhonapadi are majot tourist destination in Surat.

Prakash Temples, Asthambha (Tribals say he is also known as Ashvasthama, a male character and son of Dronacharya.), Toranmal Forest, Khadki Point, Sita Khai, Yashwant Lake, Lotus Lake, Gorakhnath Temple, Sarangkheda Horse Bazaar, Dattatreya Temple, Unapdev, Gaimukh temple, Thalner, Shirud, Laling, Bhamer, Bodgaon, Sri Padmalaya, Swinging Towers of Farkande (250 years old), Unapdeo (Hot-water springs as special mention in ancient holy 'Ramayana' and had auspicious touch of Lord Rama during his fourteen years expulsion from Ayodhya.), Parola fort are major tourist destinations near Tapi river. A lot of mentioned temples are located alsong the River Bank.

There is also passenger movement in Tapi River. Due to lack of across river bridges it requires people to transport on small boats. Also there are pilgrimage and devotional places on Tapi River where tourists are seen travelling on small boats over short stretches.

6.7 Classification of waterway: Suitable for Navigation

Reach: 0-35 km (River Mouth to Shiganpur Weir)

Shiganpur weir is located at upstream end of this stretch. It was constructed 14-15 years back to resist the Tidal flow for fresh water availability at upstream for Hazira and other industries located nearby. Tidal effect is predominant in this reach. The tidal variation is about 6 m. LAD of greater than 2 m exist in the entire reach. Hence this reach is suitable for upto Class V navigation.

Reach: 35-113 km (Shiganpur Weir to Kakrapara Dam)

Kakrapara Weir is located at upstream end of this study stretch. Gauge discharge data analysis of Ghala GD site shows that Depths of the order of 1.5 m will prevail for at least 270 days in a year. LAD analysis also suggests depths greater than 2m for majority of the stretch. Hence this reach is also suitable for upto Class V navigation for about 270 days and upto class III navigation for 365 days in a year.

Reach: 113-137 km (Kakrapara Dam to Ukai Dam)

As indicated in para 6.5, minimum depth of about 6 m at Kakrapar weir and about 3 m at 30 km upstream at Ukai dam will normally prevail even with minimum water level due to regular releases from Ukai dam for irrigation from Kakrapara canals. Hence this stretch is suitable for Navigation 365 days in a year though there will be need of navigation lock.

Reach: 137-232 km (Ukai Dam to Prakasha barrage)

The crest level of Ukai spillway is 91.135 m and FRL of the reservoir is 105.156 m MSL. Estimated CD at this gauge site is 90.169 m above MSL. The river bed levels on upstream Ukai dam is somewhat above 42 m. Thus, with CD of about 90 m depth of about 50 m will prevail at Ukai dam. With the average bed slope of 1/2130 the back water continues over about 100 km up to Prakasha Barrage. Analysis shows that during monsoon period water level will be fairly above CD. There will be need of navigation lock at Ukai dam and Prakasha Barrage. LAD analysis also shows that in majority of this stretch, LAD of reduced depth > 2 m shall prevail round the year. Hence this stretch is suitable for Navigation 365 days in a year though there will be need of navigation locks.

Reach: 232-256 km (Prakasha barrage to Sarangkheda barrage)

This stretch is bounded by Praksha barrage at downstream and Sarangkheda Barrage at upstream. LAD of greater than 2m exists in most of this stretch. Hence this stretch is also suitable for upto class V navigation for round the year (365 days) with only marginal dredging. Provision of locks have to be provided.

Reach: 256-295 km (Sarangkheda barrage to Salvade barrage)

Sarangkheda gauge is located at 257 km chianage. The river bed level at this location is about 109 m MSL. Its analysis shows that least depths of the order 1 m will prevail for minimum 150 days in year and least depths of the order of 1 m to 2.5 m will prevail for minimum 120 days in year. This stretch is bounded by sarangkheda barrage at downstream and Salvade Barrage at upstream. Maintaining the releases and some dredging shall make the waterway feasible for class I waterway and improve navigation period to whole year (365 days). These details may be studied in Stage II.

Reach: 295-323 km (Salvade barrage to Palsera barrage)

Gidhade gauge is located at upstream of salvade barrage and about 40 km upstream of Sarankheda Barrage. The river bed level at this location is about 122 m MSL. The river bed slope in this reach also becomes flatter (1/2800) as compared to the average bed slope of 1/2130. LAD analysis shows depth > 1.5 m exists for 22 km out of 28 km stretch. Since Salvade dam exist at downstream end and Palsera Barrage is presently under construction at upstream end, the depths will improve significantly once the Palsera barrage is operational. Hence this stretch is suitable for class I navigation all round the year.

Reach: 323-407.6 km (Palsera barrage to Shelgaon barrage)

Savkheda gauge is located at Savkheda bridge at 351.5 km. The river bed level at this location is about 140 m MSL. Results of analysis of data indicate depth of the order of 0.0 m to 1.5 m prevailing for about 50 days in year and depths more than 1.5 m prevailing for the period of about 270 days in year. Palsera Barrage is presently under construction at upstream end and the depths will improve significantly once the Palsera barrage is operational. Hence this stretch is suitable for navigation all round the year.

Reach: 407.6-436 km (Shelgaon barrage to Hathnur Dam)

This is the steepest reach in the present study stretch. Backwater of shelgaon reaches upto 423 km. Six numbers check dams in series are also constructed in this reach from 414 to 426 km to arrest releases from Hathnur dam. Navigation is this reach may be developed by means of dredging. Bhusawal Gauge is located at 418 km. Results of analysis of data indicate depths less than 0.50 m will prevail for the period of about 150 days in year and depths more than 0.5 to 0.8 m will prevail for the period of about 50 days in year. Hence these additional measures have to be taken up to make this waterway suitable for Class I navigation.

6.8 Proposed alternative methods for making waterway feasible

Only marginal dredging is required in 0-35 km.

Marginal dredging and raising height of Shiganpur weir will improve navigational depths in 35-113 km reach of Tapi River.

Some marginal dredging may be required in 113-232 km stretch. From kakra para weir, ukai dam upto Prakasha barrage.

For 232-256 km stretch from Prakasha barrage to sarangkheda barrage, Some marginal dredging only may be required in 113-232 km stretch.

For 256-295 km stretch from Sarangkheda barrage to Salvade barrage, for improving navigation period, dredging may be carried out and releases from sulvade and sarangkheda have to be maintained. Option of raising the height of sarangkheda barrage may not be economically viable but may be studied in Stage II studies.

Similarly, Since Salvade dam exist at downstream end and Palsera Barrage is presently under construction at upstream end of 295-323 km stretch, the depths will improve significantly once the Palsera barrage is operational. Hence may not arise any requirement of additional measures to make waterway feasible for navigation. Alternatively, raising of height of existing dam/barrages in the other option that can be studied in detail in stage II studies for improving the depth in river stretch.

For 323-407.6 stretch also from Palsera barrage to shelgaon barrage, the depths will improve significantly once the Palsera barrage is operational.

For 407.6 to 436 km river reach from Shelgaon barrage to Hathnur Dam, dredging, raising for height of existing check dams and navigational locks has to be provided for through navigation.

Provision of navigational locks has to be provided at each dam/weir/ barrage in the entire stretch of Tapi river (0-436 km) for through navigation.

6.9 SWOT Analysis

Strength:	Weakness
• ***Availability of depth for 400 km Reach (from >2 km 365 days in a year in tidal reach to about 1m for about 150 days in a year at shelgaon, which may changes to 330-360 days after construction of Sarangkheda and Pulsera Barrage.*** • ***Proximity to industrial clusters having big industries existing along Tapi river bank.*** • ***Ferry services are operational for about 50 km from mouth. (eg at shingpur weir)***	• ***Provisions of navigational lock have to be provided.*** • ***Two barrages are under construction***
Opportunities	**Threats**
• ***A lot of cargo potential for coal, flyash, sand and fertilizers.*** • ***A lot of religious and tourist places existing along the bank***	• *Natural calamities* • *No law and order and social problems are observed during reconnaissance survey*

6.10 Recommendation for going ahead with Stage II Studies

From the gauge discharge data and LAD analysis, it was found that reduced depth feasible for Navigation 365 days in a year for the development of waterway exist right upto Sarangkheda Barrage where only marginal dredging and provision of locks has to be provided. From Sarangkheda Barrage to Shelgaon Barrage, Palsera (piloda) barrage is under construction. After its construction we feel that round the year navigation may be developed right upto Shelgaon Barrage. The details of under construction Barrage have to be studied in detail along with river cross-sections in Stage II. From Shelgaon Barrage to Hathnur Dam, a series of check dam exist in a very steep slope, hence we feel that through navigation may be feasible only by raising the heights of these check dams. **WAPCOS recommend carrying out stage II Detailed studies upto shelgaon barrage from River mouth for about 407 km stretch.**

वाप्कोस लिमिटेड
WAPCOS LIMITED
(भारत सरकार का उपक्रम)
जल संसाधन, नदी विकास व गंगा संरक्षण मंत्रालय
(A Government of India Undertaking)
Ministry of Water Resources, River Development & Ganga Rejuvenation

NO: WAP/P&H/04 NW-IWAI/CWC/2016/05- 01 Date: 02.05.2016

To,
The Chief Engineer
Narmada & Tapi Basin Organization
Central Water Commission,
101, Narmada Tapi Bhavan, 1st Floor, Sector-10A,
Gandhinagar-382010
Phone:079-23245427
centbo-cwc@nic.in

Sub: Requirement of Gauge/Discharge Data and other hydrological data for Preparation of Two Stage DPR of Proposed 04 Inland Waterways (Mahi, Sabarmati, Tapi, Narmada) in the State of Gujarat & Maharashtra.

Sir,

Ministry of Shipping (MoS), Govt. of India had directed IWAI to identify the viable waterways In India for their phased development; accordingly, 106 new waterways were identified and intimated to MoS. These rivers are in the process of being declared as National Waterway and a bill to this effect has already been passed in the lok Sabha during this winter season. Inland Waterways Authority of India (IWAI) a statutory body under the Ministry of Shipping, Govt. of India has been entrusted with the responsibility for conducting preparation of Detailed Project Report of the proposed waterway. In order to assess the latest hydro-morphological condition of the rivers, IWAI has awarded the work of preparation of Detailed Projcet Reports of below mentioned rivers to M/s WAPCOS Limited.

Sl. No.	Name of the River / Canal	Name of the River / Canal Description of Inland Waterway
1.	MAHI RIVER	248 kms length of the river from Kadana Dam at Lat 23°18'22.35"N, Long 73°49'37.45"E to confluence with Gulf of Khambhat near Kavi railway station at Lat 22°10'34.71"N, Long 72°30'36.31"E
2.	NARMADA RIVER	227 km length of the river from Pandhariya at Lat 21°57'10.37"N, Lon 74° 8'27.46"E to confluence of Narmada with Arabian Sea at Gulf of Khambhat Lat 21°38'26.81"N, Lon 72°33'28.24"E
3.	SABARMATI RIVER	212 kms length of the river from Barrage near Sadoliya at Lat 23°26'49.66"N, Long 72°48'34.85"E to confluence with Gulf of Khambhat near Khambhat at Lat 22°9'17.99"N,

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CIN : U74899DL1969GOI005070

		Long 72°27'27.81"E
4.	TAPI RIVER	436 kms length of the river from Hatnur Dam near Mangalwadi at Lat 21° 4'21.99"N,Long 75°56'44.88"E to confluence with Gulf of Khambhat (Arabian Sea) at Lat 21°2'15.51"N, Long 72°39'29.63"E

M/s WAPCOS LIMITED is a "MINI RATNA-Category I" Public Sector Enterprise under the aegis of the Union Ministry of Water Resources, River Development & Ganga Rejuvenation has appointed M/s Fugro Survey (India) Pvt. Ltd., Fugro House, D-222/30, ITC. Indl Area, MIDC, Nerul, Navi Mumbai - 400706, Maharashtra as their survey agency for carrying out field work and data collection .

The following data is required to carry out the studiies:

1) Water Level, Discharge, Sediment, cross-section data, Salient features (Ponding Level HFL, Sill levels etc) at **Guage locations**

--- List of Guage stations attached as **Annex.1**

2) Details/ Salient features of **Dams/Weirs and Barrages** (Year of construction, capacity, ponding level, H.F.L., sill levels, Guage Discharge data, hydrological features etc.)

---- Dams/Weirs and Barrages attached as **Annex.2**

It is therefore requested to kindly provide the requisite data to M/s Fugro Survey (India) Pvt. Ltd. on behalf of WAPCOS.

An early action will be highly appreciated.

Thanking you and with best regards,

(Jatinder Kumar)
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(Ports & Harbours)
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जतिन्द्र कुमार /JATINDER KUMAR
मुख्य (सिविल) / Chief (Civil)
वाप्कोस लिमिटेड /WAPCOS LIMITED
(भारत सरकार का उपक्रम/A Govt. of India Undertaking)
76–सी, सैक्टर–18, गुड़गाँव–122015 (हरियाणा)
76-C, Sector-18, Gurgaon-122015 (Haryana)

Annexue-1

(a) Guage locations and data requirement

River	CWC GD Sites	Data requirement Period				Type of Data
		Water Level	Discharge	Sediment	Cross-section	
Mahi	Kadana Dam	2011- 2016	Last 30 Years	Last 30 Years	Last 30 Years	Guage, Discharge, Sediment, Water quality, Cross-section and Salient Features (Ponding level, HFL, Sill levels etc)
	Khanpur	2013- 2016	2013-2016	2013-2016	Last 30 Years	-do-
	Panam Dam	Last 30 Years	Last 30 Years	Last 30 Years	Last 30 Years	-do-
	Wanakbori	2011- 2016	Last 30 Years	Last 30 Years	Last 30 Years	-do-
Narmada	Bharuch	Last 30 Years	Last 30 Years	Last 30 Years	Last 30 Years	-do-
	Chandawad	2013- 2016	2013-2016	2013-2016	Last 30 Years	-do-
	Garudeshwar	2013- 2016	2013-2016	2013-2016	Last 30 Years	-do-
Tapi	Bhusawal	2012- 2016	Last 30 Years	Last 30 Years	Last 30 Years	-do-
	Ghala	2012- 2016	2005-2016	Last 30 Years	Last 30 Years	-do-
	Gidhade	2012- 2016	2012-2016	Last 30 Years	Last 30 Years	-do-
	Hathnur Dam	2012- 2016	Last 30 Years	Last 30 Years	Last 30 Years	-do-
	Kakrapar	2004- 2016	Last 30 Years	Last 30 Years	Last 30 Years	-do-
	Sarangkheda	2013- 2016	2013-2016	2013-2016	Last 30 Years	-do-
	Savkheda	2012- 2016	2004-2016	2004-2016	Last 30 Years	-do-
	Surat	2011- 2016	Last 30 Years	Last 30 Years	Last 30 Years	-do-
	Ukai dam	2011- 2016	Last 30 Years	Last 30 Years	Last 30 Years	-do-
Sabarmati	Kheda	2013- 2016	2013-2016	Last 30 Years	Last 30 Years	-do-
	Subhash Bridge	2010- 2016	Last 30 Years	Last 30 Years	Last 30 Years	
	Vautha	2013- 2016	2013-2016	Last 30 Years	Last 30 Years	

Annexue-2

(a) Dams/Weirs/Barrages locations for data requirement

Tapi River		
Sl. No.	Name	Location (Lat. Long)
1	Causeway cum Weir, Sultaniya Rander Surat, Gujarat 395005	21°13'09"N 72°48'17"E
2	Weir/Barrage (+Offtake Canal), Vill.-Kakrapar, Tal.-Mandvi, Dist.-Surat, Gujarat-394160	21°16'09"N 73°21'53"E
3	Ukai Dam, Tal.-songadh, Dist.-Surat, Gujarat-394680	21°15'02"N, 73°35'29"E
4	Prakasha Barrage Dam,Praksha, Dist-Nandurbar, Maharashtra	21°30'40"N 74°20'43"E
5	Sarangkheda Barrage, Shahada, Dist-Nandurbar, Maharashtra	21°25'37"N 74°31'55"E
6	Sulwade Barrage,Sindhkheda, Dist-Dhule, Maharashtra	21°18'12"N 74°48'07"E
7	Lower Tapi Dam (or Padalse Dam)near Amalner,Dist-Dhule, Maharashtra	21°11'18"N 75°00'02"E
8	Hathnur Dam near Bhusawal,Dist-Jalgaon, Maharashtra	21° 4'21.99"N 75°56'44.88"E
Narmada River		
1	Sardar Sarover Dam Navagam, Gujarat- 393155	21°49'49"N 73°44'50"E
Mahi River		
1	Sindhrot Check Dam Mahi River,Village- Sindhrot, District-Vadodara Gujarat 391330	22°19'49.93"N 73°03'22.76"E
2	Aquaduct near village Sangol, District Kheda, Gujarat 388235	22°50'56.68"N 73°22'55.87"E
3	Wanakbori Dam, Kheda, Wanakbori, Gujarat 388235	22°56'52.98"N 73°25'41.79"E
4	Dam/Barrage near Tantroli village ,Mahisagar district,Gujarat	23°15'54.16"N 73°43'57.75"E
5	Kadana Dam Mahisagar district, Gujarat,-389240	23°18'22.35"N 73°49'37.45"E
Sabarmati River		
1	Wasna Barrage, Ahemdabad	22°59'22.93"N 72°33'22.78"E
2	Barrage near Sadoliya Village/hamlet in Prantij Taluka in Sabar Kantha District of Gujarat State, India.	23°26'49.66"N 72°48'34.85"E

Kakrapar Barrage W00269

From

Salient Features	
Name of the Structure	Kakrapar Barrage
Nearest city	Mandvi
District	Surat
State	Gujarat
Name of River	Tapi
Basin	Tapi
Year of commencement	1952
Year of completion	1954
Mean annual rainfall (mm)	
Total annual yield of catchment (MCM)	
Design flood (Cumec)	38.232
Width of the river (m)	621.18
Length of Barrage and Anicut (m)	633.5
No. of bays (i.e. number of openings)	5
Type of spillway gate	Others
Crest Level (m)	160
Pond level (m)	48.86
Highest Flood Level (m)	185
Gates for under sluice - Number	6
Means for dissipating energy (Hydraulic)	D/s buckets
Status of BWA Construction	Completed

■ SALIENT FEATURES

Name of scheme	River	Village	Taluka	Dist.	Catchment Area (Sq.Kms)		Yield (MCM)		Maximum observed flood (Cumecs)
					Gujarat	Other	Maximum	Average	
Kakrapar	Tapi	Kakrapar	Mandvi	Surat	1875		-	-	42470

Date	Crest R.L. (M.)	F.R.L. (M)	H.F.L. (M)	Top of Dam R.L.(M)	Gross Capacity at F.R.L. (MCM)	Dead storage (MCM)	Live storage (MCM)	Lenth of Spillway (M)
06/08/1968	48.78	48.78	56.39	48.78	51.54	15.01	36.53	633.5

Salient Features of Kakrapar Barrage

Salient Features of Ukai Reservoir

Attribute	Value	Attribute	Value
Name of Reservoir	Ukai Reservoir	Status	-
State	Gujarat	Basin	Tapi
River	Tapi		
Maximum Water Level (m)	106.985	Live Storage Capacity(MCM)	7097
Full Reservoir Level (m)	105.16	Dead Storage Capacity(MCM)	684.39
Minimum Draw Down Level(m)	78.77	Submergence Area(Th.Ha.)	60.1
Gross Storage Capacity(MCM)	8510	Catchment Area(Sq.Km.)	62225

■ SALIENT FEATURES

Name of scheme	River	Village	Taluka	Dist.	Catchment Area (Sq.Kms)		Yield (MCM)		Maximum observed flood (Cumecs)
					Gujarat	Other	Maximum	Average	
Ukai	Tapi	Ukai	Songadha	Surat	917 KM ^{2}	61308.00	-	17220.00	42470.00

Date	Crest R.L. (M.)	F.R.L. (M)	H.F.L. (M)	Top of Dam R.L.(M)	Gross Capacity at F.R.L. (MCM)	Dead storage (MCM)	Live storage (MCM)	Lenth of Spillway (M)
06/08/1968	91.135	105.156	106.99	111.25	7414.29	684.394	6729.896	425.195

Salient Features of Ukai Dam

Prakasha Barrage B00497

Salient Features	
Name of the Structure	Prakasha Barrage
Nearest city	Shahada
District	Nandurbar
State	Maharashtra
Name of River	Tapi
Basin	Tapi
Year of commencement	1999
Mean annual rainfall (mm)	
Total annual yield of catchment (MCM)	
Design flood (Cumec)	50517
Length of Barrage and Anicut (m)	503
Height upto crest (m)	19.1
Type of spillway gate	Others
Spillway gates - Number	27
Crest Level (m)	102
Highest Flood Level (m)	120.5
Status of BWA Construction	Completed

Salient Features of Prakasha Barrage

Salient Features of Sarang Kheda Reservoir				
Attribute	Value		Attribute	Value
Name of Reservoir	Sarang Kheda Reservoir		Status	-
State	Maharashtra		Basin	Tapi
River	Tapi			
Maximum Water Level (m)	-		Live Storage Capacity(MCM)	-
Full Reservoir Level (m)	-		Dead Storage Capacity(MCM)	5.25
Minimum Draw Down Level(m)	-		Submergence Area(Th.Ha.)	1.823
Gross Storage Capacity(MCM)	-		Catchment Area(Sq.Km.)	56000
Water Allocation - Irrigation(MCM)	-		Water Allocation - Industrial(MCM)	-
Water Allocation - Hydroelectric (MCM)	-		Water Allocation - Ecology(MCM)	-
Water Allocation - Drinking(MCM)	-		Water Allocation - Thermal(MCM)	-
Land Affected - Total(Th.Ha.)	-		Towns and Villages Affected	-
Land Affected - Culturable(Th.Ha.)	-		Number of Families Affected - Total	-
Land Affected - Forest(Th.Ha.)	-		Number of Families Affected - SC	-
Land Affected - Others(Th.Ha.)	-		Number of Families Affected - ST	-
Reservoir Sedimentation Survey Done	-		Recreation activities at Reservoir	-
Aggrement on Sharing of Water	-			

The Sarangkheda Barrage Medium Irrigation Project is constructed in the Tapi basin in Nandurbar district of Maharashtra. The project comprises of 484.50 m long barrage with weir of the maximum height of 11 m having 26 vertical lift gates each of size 15 m x 11 m across river Tapi near village Sarangkheda, Taluka Shahada in district Nandurbar. The clear waterway provided in the barrage is 390 m to pass design flood of 50529 m3/s at u/s HFL of 132.93 m. The storage created by the construction of this barrage will provide water to irrigate the culturable command area (CCA) of 9742 ha in 5 villages of Shahada Taluka of Nandurbar district and 24 villages of Shindkheda Taluka in Dhule district. The lifting of water and its distribution will be done by the farmers through the co-operative and private lift irrigation schemes. 85.915% command area of this project lies in DPAP area. The ultimate irrigation potential of the project is 11519 ha. The project will also provide 3.57 Mm3 water for domestic use for Dondaicha and other nearby villages and 0.19 Mm3 of water for industrial requirements of the industries in Shahada Taluka.

The construction of civil works of the project was started in April 1999 and the mechanical works started in August 2002. The project was approved by the Planning Commission, Govt. of India for an estimated cost of Rs. 202.47 crore at 1999-2000 price level in December 2007.

The balance works of the main barrage; RCC deck bridge & approach road; mechanical work of gates; and other miscellaneous works of the project were included in AIBP during 2007-08. At the time of inclusion of the project under AIBP, 95% main barrage, 43% deck bridge & approach road, 80% mechanical works and 30% misc. works were complete. The balance works of the project to create the ultimate irrigation potential of 11519 ha were included under AIBP. The project is completed during 2009-10 and full potential is created.

Sarangkheda Barrage B00511

Salient Features	
Name of the Structure	Sarangkheda Barrage
Nearest city	Shahada
District	Nandurbar
State	Maharashtra
Name of River	Tapi
Basin	Tapi
Year of commencement	1999
Mean annual rainfall (mm)	
Total annual yield of catchment (MCM)	
Design flood (Cumec)	50529
Length of Barrage and Anicut (m)	484.5
Height upto crest (m)	11
Type of spillway gate	Others
Spillway gates - Number	26
Crest Level (m)	11
Status of BWA Construction	Completed

Salient Features of Sarangkheda Barrage

Salient Features of Sulwade Reservoir					
Attribute	Value		Attribute	Value
Name of Reservoir	Sulwade Reservoir		Status	-
State	Maharashtra		Basin	Tapi
River	Tapi			
Maximum Water Level (m)	-		Live Storage Capacity(MCM)	-
Full Reservoir Level (m)	-		Dead Storage Capacity(MCM)	0.118
Minimum Draw Down Level(m)	-		Submergence Area(Th.Ha.)	1.272
Gross Storage Capacity(MCM)	-		Catchment Area(Sq.Km.)	52000
Water Allocation - Irrigation(MCM)	-		Water Allocation - Industrial(MCM)	-
Water Allocation - Hydroelectric (MCM)	-		Water Allocation - Ecology(MCM)	-
Water Allocation - Drinking(MCM)	25.09		Water Allocation - Thermal(MCM)	-
Land Affected - Total(Th.Ha.)	-		Towns and Villages Affected	-
Land Affected - Culturable(Th.Ha.)	-		Number of Families Affected - Total	-
Land Affected - Forest(Th.Ha.)	-		Number of Families Affected - SC	-
Land Affected - Others(Th.Ha.)	-		Number of Families Affected - ST	-
Reservoir Sedimentation Survey Done	-		Recreation activities at Reservoir	-
Aggrement on Sharing of Water	-			

Sulwade Barrage B00498

Salient Features	
Name of the Structure	Sulwade Barrage
Nearest city	Sindkheda
District	Dhule
State	Maharashtra
Name of River	Tapi
Basin	Tapi
Year of commencement	1999
Mean annual rainfall (mm)	
Total annual yield of catchment (MCM)	
Design flood (Cumec)	49224
Length of Barrage and Anicut (m)	503
Height upto crest (m)	13
Type of spillway gate	Others
Spillway gates - Number	27
Crest Level (m)	122
Highest Flood Level (m)	145.4
Status of BWA Construction	Completed

Salient Features of Sulwade Barrage

Shelgaon Barrage B00512

Salient Features	
Name of the Structure	Shelgaon Barrage
Nearest city	Jalgaon
District	Jalgaon
State	Maharashtra
Name of River	Tapi
Basin	Tapi
Year of commencement	1999
Mean annual rainfall (mm)	
Total annual yield of catchment (MCM)	
Design flood (Cumec)	47413
Length of Barrage and Anicut (m)	1134.65
Height upto crest (m)	35.035
Type of spillway gate	Radial
Spillway gates - Number	18
Crest Level (m)	163.24
Pond level (m)	180.5
Status of BWA Construction	Completed

Salient Features of Shelgaon Barrage

Salient Features of Hatnur Reservoir					
Attribute	Value		Attribute	Value
Name of Reservoir	Hatnur Reservoir		Status	-
State	Maharashtra		Basin	Tapi
River	Tapi			
Maximum Water Level (m)	215.5		Live Storage Capacity(MCM)	255
Full Reservoir Level (m)	214		Dead Storage Capacity(MCM)	133
Minimum Draw Down Level(m)	209		Submergence Area(Th.Ha.)	4.816
Gross Storage Capacity(MCM)	388		Catchment Area(Sq.Km.)	29430
Water Allocation - Irrigation(MCM)	-		Water Allocation - Industrial(MCM)	-
Water Allocation - Hydroelectric (MCM)	-		Water Allocation - Ecology(MCM)	-
Water Allocation - Drinking(MCM)	-		Water Allocation - Thermal(MCM)	-
Land Affected - Total(Th.Ha.)	-		Towns and Villages Affected	18
Land Affected - Culturable(Th.Ha.)	-		Number of Families Affected - Total	-
Land Affected - Forest(Th.Ha.)	-		Number of Families Affected - SC	-
Land Affected - Others(Th.Ha.)	-		Number of Families Affected - ST	-
Reservoir Sedimentation Survey Done	-		Recreation activities at Reservoir	-
Aggrement on Sharing of Water	-			

Salient Features of Hatnur Reservoir

Salient Features of Upper Tapi Hatnur Dam			
Attribute	Value	Attribute	Value
Name of the Dam	Upper Tapi Hatnur Dam	Dam Status	Completed
River	Tapi	Purpose	Irrigation
Nearest City	Bhusawal	Commencement Year	-
District	Jalgaon	Completion Year	1982
State	Maharashtra	Operating and Maintainance Agency	-
Basin Name	Tapi		
Seismic Zone	Seismic Zone-III		
Dam Type	Earthen	Max Height above Foundation(m)	25.5
Length of Dam (m)	2580	Total Volume content of Dam (TCM)	3850
Type of Spillway	OG	Type of Spillway Gates	RD
Length of Spillway (m)	604.75	Number of Spillway Gates	41
Crest Level of Spillway	205	Size of Spillway Gates (m X m)	12 x 6.5
Spillway Capacity (cumec)	26415	Mode of Operation	-
Design Flood (cumec)	26415		
No. of River Sluice	-	Size of Sluice(M X M)	-
Sluice Purpose	-		

Salient Features of Hatnur Dam