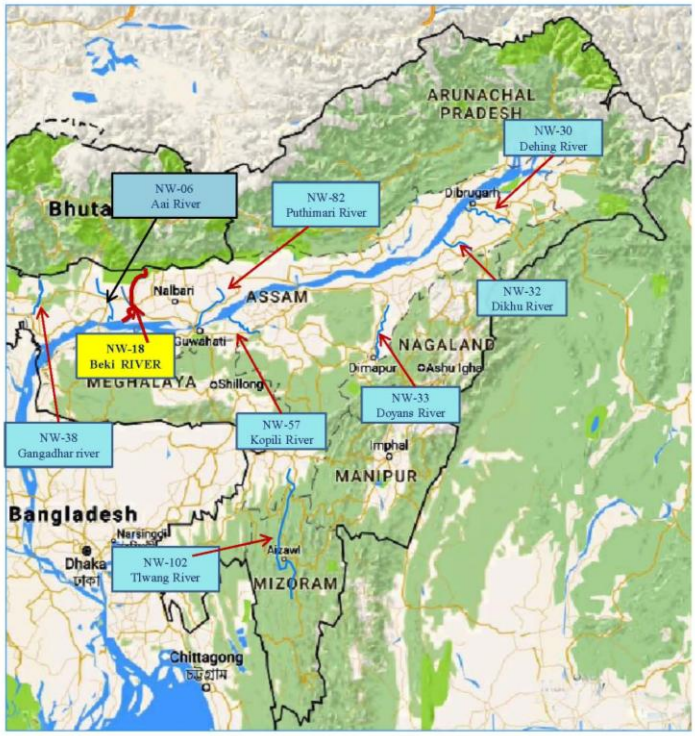
INLAND WATERWAYS AUTHORITY OF INDIA, A-13, SECTOR-1, NOIDA DIST-GAUTAM BUDHA NAGAR, UTTAR PRADESH, PIN- 201 301(UP)

"FINAL FEASIBILITY REPORT ON HYDROGRAPHIC SURVEY

BEKI RIVER (NW-18) (68.90 km)

FROM "CONFLUENCE WITH BRAHMAPUTRA RIVER TO ELENAGAMARI"

Survey Period from 09.10.15 to 06.11.15



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FINAL REPORT ON HYDROGRAPHICAL SURVEY OF BEKI RIVER, ASSAM

REPORT SUBMISSION DATE- 03.10.2018

SUBMITTED BY:

PRECISION SURVEY CONSULTANCY

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NH- 6, Howrah – 711 403
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Acknowledgement

Precision Survey Consultancy (PSC), Salap, Howrah express its sincere gratitude to **IWAI** for awarding the work and guidance for completing this Project of detailed Hydrographic Survey and the Feasibility Report in **Region-II (Beki River) from Confluence of Brahmaputra River to Elenagamari (68.90 km).**

We would like to use this opportunity to pen down our profound gratitude and appreciations to **Ms. Nutan Guha Biswas, IAS, Chairperson, IWAI** for spending their valuable time and guidance for compleing this project of " Detailed Hydrography and Topography survey in Beki River." PSC would also like to thanks **Shri Pravir Pandey, Vice Chairman, IA&AS., Shri Shashi Bhushan Shukla, Member (Traffic), Shri Alok Ranjan, Member (Finance) and Shri S.K.Gangwar, Member (Technical).**

PSC wishes to express their gratitude to **Cdr. Ashish Arya, Hydrographic Chief, IWAI, Cdr. P.K. Srivastava, Ex. Hydrographic Chief, Shri S.V.K. Reddy, Chief Engineer-I, IWAI** for his guidance and inspiration for this project. PSC would also like to thank **Shri Rajiv Singhal, A.H.S., IWAI** for invaluable support and suggestions provided throughout the survey period. PSC is pleased to place on record our sincere thanks to other staff and officers of **IWAI** for their excellent support and co-operation throughout the survey period.

List of Abbreviations

CD	Chart Datum
DGPS	Differential Global Positioning Systems
ETS	Electronic Total Station
GPS	Global Positioning Systems
LBM	Local Bench Mark
MSL	Mean Sea Level
RL	Reference Level
SD	Sounding Datum
SBAS	Satellite-Based Augmentation System
TBC	Trimble Business Centre
FRP	Fiber Reinforced Plastic

Table 1- List of Abbreviations

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Salient Features of Beki River

Sl.	Particulars	Details
1.	Name of Consultant	Precision Survey consultancy
2.	Region number & State(s)	Region II, Assam
3.	a) Waterway name b) NW # c) Total Stretch and length of declared NW (from…. To….; total length) d) Survey Period (… to …)	a) Beki River b) NW-18 c) From Confluence of Brahmaputra River (Chainage-0.000 km) to Elenagamari (Chainage-68.90 km). d) 09th October, 2015 to 6th November, 2015
4.	Tidal & non tidal portions (from… to, length, average tidal variation)	There is no Tidal influence found in this zone of River.
5.	LAD (Least available depth) status i) <1.2 m ii) 1.2 m to 1.4 m iii) 1.5 m to 1.7 m iv)1.8 m to 2.0 m v) >2.0 m	**Observed Depth**

Sub Stretch-1 (0.00-10.00 km)	Sub Stretch-2 (10.00-20.00 km)	Sub Stretch-3 (20.00 – 30.00 km)	Sub Stretch-4 (30.00-40.00 km)
5.0	5.3	5.3	5.2
2.75	2.75	2.8	2.7
0.85	0.85	0.9	0.8
0.5	0.5	0.6	0.5
0.9	0.6	0.4	0.8
Total-10.00	Total-10.00	Total- 10.00	Total- 10.00

Sub Stretch-5 (40.00-50.00 km)	Sub Stretch-6 (50.00-60.00 km)	Sub Stretch-7 (60.00-68.90 km)	Total (km)
5.2	5.1	8.90	40.00
2.1	2.3	0	15.40
1.6	1.6	0	6.6
0.6	0.6	0	3.3
0.5	0.4	0	3.6
Total- 10.00	Total- 10.00	Totai-8.90	Total- 68.90 km

i) < 1.2 m
ii) 1.2 m to 1.4 m
iii) 1.5 m to 1.7 m
iv) 1.8 m to 2.0 m
v) > 2.0 m

<table>
<tr><th>Sl.</th><th>Particulars</th><th>Details</th></tr>
<tr><td></td><td>LAD (Least available depth) status
i) <1.2 m
ii) 1.2 m to 1.4 m
iii) 1.5 m to 1.7 m
iv)1.8 m to 2.0 m
v) >2.0 m</td><td>
<u>Reduced Depth</u>
<table>
<tr><th>Sub Stretch-1 (0.00-10.00 km)</th><th>Sub Stretch-2 (10.00-20.00 km)</th><th>Sub Stretch-3 (20.00 – 30.00 km)</th><th>Sub Stretch-4 (30.00-40.00 km)</th></tr>
<tr><td>4.5</td><td>4.3</td><td>5.0</td><td>5.0</td></tr>
<tr><td>2.5</td><td>2.5</td><td>2.6</td><td>2.6</td></tr>
<tr><td>0.75</td><td>0.75</td><td>0.8</td><td>0.8</td></tr>
<tr><td>1.35</td><td>1.35</td><td>0.6</td><td>0.6</td></tr>
<tr><td>0.9</td><td>1.1</td><td>1.0</td><td>1.0</td></tr>
<tr><td>Total-10.0</td><td>Total-10.0</td><td>Total- 10.0</td><td>Total- 10.0</td></tr>
</table>
<table>
<tr><th>Sub Stretch-5 (40.00-50.00 km)</th><th>Sub Stretch-6 (50.00-60.00 km)</th><th>Sub Stretch-7 (60.00-68.90 km)</th><th>Total (km)</th></tr>
<tr><td>5.1</td><td>5.1</td><td>8.90</td><td>37.90</td></tr>
<tr><td>2.4</td><td>2.4</td><td>0</td><td>15.00</td></tr>
<tr><td>1.3</td><td>1.3</td><td>0</td><td>5.7</td></tr>
<tr><td>0.44</td><td>0.44</td><td>0</td><td>4.78</td></tr>
<tr><td>0.76</td><td>0.76</td><td>0</td><td>5.52</td></tr>
<tr><td>Total- 10.0</td><td>Total- 10.00</td><td>Total-8.9</td><td>Total- 68.90 km</td></tr>
</table>
i) <1.2 m
ii) 1.2 m to 1.4 m
iii) 1.5 m to 1.7 m
iv)1.8 m to 2.0 m
v) >2.0 m
</td></tr>
<tr><td>6.</td><td>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</td><td>
i) There are no Dams, Barrages found in this zone of river.

ii) Damage RCC Bridge-1 (one), Damage Rail Bridge-1(one)
iii) RCC Bridge- 3 (Three), Rail Bridge-1(one)
<table>
<tr><th>Clearance w.r.t H.F.L</th><th>Min (m)</th><th>Max (m)</th></tr>
<tr><td>Horizontal Clearance (m)</td><td>36.734</td><td>45.917</td></tr>
<tr><td>Vertical Clearance w.r.t. H.F.L (m)</td><td>1.338</td><td>2.465</td></tr>
</table>
iv) High Tension Line-5 (Five)
<table>
<tr><th>Clearance w.r.t H.F.L</th><th>Min (m)</th><th>Max (m)</th></tr>
<tr><td>Horizontal Clearance (m)</td><td>390.12</td><td>450.11</td></tr>
<tr><td>Vertical Clearance w.r.t. H.F.L (m)</td><td>1.329</td><td>1.471</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>Sl.</th><th>Particulars</th><th>Details</th></tr>
<tr><td>7.</td><td>Slope</td><td>
<table>
<tr><th colspan="2">Reach</th><th>River / Canal Bed Level Change (m)</th><th>Distance (km)</th><th>Slope (m/km)</th><th>Slope (cm/km)</th></tr>
<tr><th>From (km)</th><th>To (km)</th><th></th><th></th><th></th><th></th></tr>
<tr><td>0.00</td><td>8.831</td><td>1.617</td><td>8.831</td><td>0.183</td><td>18.310</td></tr>
<tr><td>8.832</td><td>13.000</td><td>0.606</td><td>4.168</td><td>0.145</td><td>14.539</td></tr>
<tr><td>13.000</td><td>30.000</td><td>3.569</td><td>17.000</td><td>0.210</td><td>20.994</td></tr>
<tr><td>30.001</td><td>38.470</td><td>2.247</td><td>8.469</td><td>0.265</td><td>26.532</td></tr>
<tr><td>38.471</td><td>48.178</td><td>3.125</td><td>9.707</td><td>0.322</td><td>32.193</td></tr>
<tr><td>48.179</td><td>56.333</td><td>2.943</td><td>8.154</td><td>0.361</td><td>36.093</td></tr>
<tr><td>56.334</td><td>62.000</td><td>3.894</td><td>5.666</td><td>0.687</td><td>68.726</td></tr>
<tr><td>62.001</td><td>68.364</td><td>4.092</td><td>6.363</td><td>0.643</td><td>64.309</td></tr>
<tr><td colspan="3">Total</td><td>68.358</td><td>Avg-0.352</td><td>Avg-35.212</td></tr>
</table>
</td></tr>
<tr><td>8.</td><td>Discharge Report</td><td>
<u>Discharge Report</u>
<table>
<tr><th>Sl. No</th><th>Chainage (km)</th><th>Discharge (Cubic meter/sec)</th><th>Dated</th></tr>
<tr><td>1</td><td>5.485</td><td>45.211</td><td rowspan="5">09.10.15 to 06.11.15</td></tr>
<tr><td>2</td><td>10.275</td><td>117.41</td></tr>
<tr><td>3</td><td>35.500</td><td>178.12</td></tr>
<tr><td>4</td><td>47.920</td><td>133.28</td></tr>
<tr><td colspan="2">Avg. Discharge</td><td>118.50</td></tr>
</table>
</td></tr>
<tr><td>9.</td><td>i) Present IWT operations
ii) Ferry services, tourism, cargo, if any</td><td>As follows
The Passenger ferry services named Morabaj ferry ghat and Swachar ferry ghat are available near Chainage of 11.00 km and 12.00 km respectively. But there is no cargo available in this region of river. Manas National park and wildlife sanctuary is located in this region of river which is the main tourist spot in this region of river.</td></tr>
<tr><td>10.</td><td>Approx Distance of Rail & Road from Industry</td><td>Nearest Railway station - i) Sarbhog Junction Railway Station (4.61 km from the waterway approximately) ii) Barpeta Rd. Railway Station (5.48 km approximately from the waterway)
Name of National Highway close to the River- NH- 31(crossed the waterway)
Name of SH - SH-6 (5.4 km approx. from the waterway)
SH-2 (1.08 km approx from the waterway)
SH- 7 (10.00 km approx from the waterway)
SH-8 (11.00 km approx from the waterway)
There is no major industry found in this region of river. But small kind of Scale industry, Jute industry, utensil industry is found in this zone of river.</td></tr>
<tr><td>11.</td><td>Any other information/ comment</td><td></td></tr>
</table>

Section-1: Introductory Considerations

1.1- River Course: Background information, Historical Information, Origin, End:-

Beki River is one of the right bank tributaries of Brahmaputra River, which flows down from the region. Tourists can have beautiful view of the river and its natural surroundings from the bridges situated on NH no-31. Discharging a huge amount of water every year, the river turns dangerous during monsoon .Beki River is also known as Kurissu River in Bhutan located in Barpeta district.

The River Beki originates from the Mountain Reserve Forest at Mathanguri and joins the river Manas after traversing a length of about 85 km. It drains an area of about 26,243 Sq.km in Barpeta district; Beki River flows from North to South direction. Manas National park, Barpeta Road, Howly are the important places situated in this zone of river. Aai and Beki are the two closed rivers which are merged in the Brahmaputra confluence.

Figure 1-Beki River site Location

1.2 - Tributaries / Network of River/ Basin:-

The three streams create a river basin in this zone of river:-

i) Aai

ii) Beki

iii) Manas

1.3 - State / District through which river passes:-

The River Beki passes through the village of Barpeta and Chairang in the state of Assam.

1.4 – Project Site Google Map:-

Figure 2 - Project Site Location Map

1.5 River Key Map:-

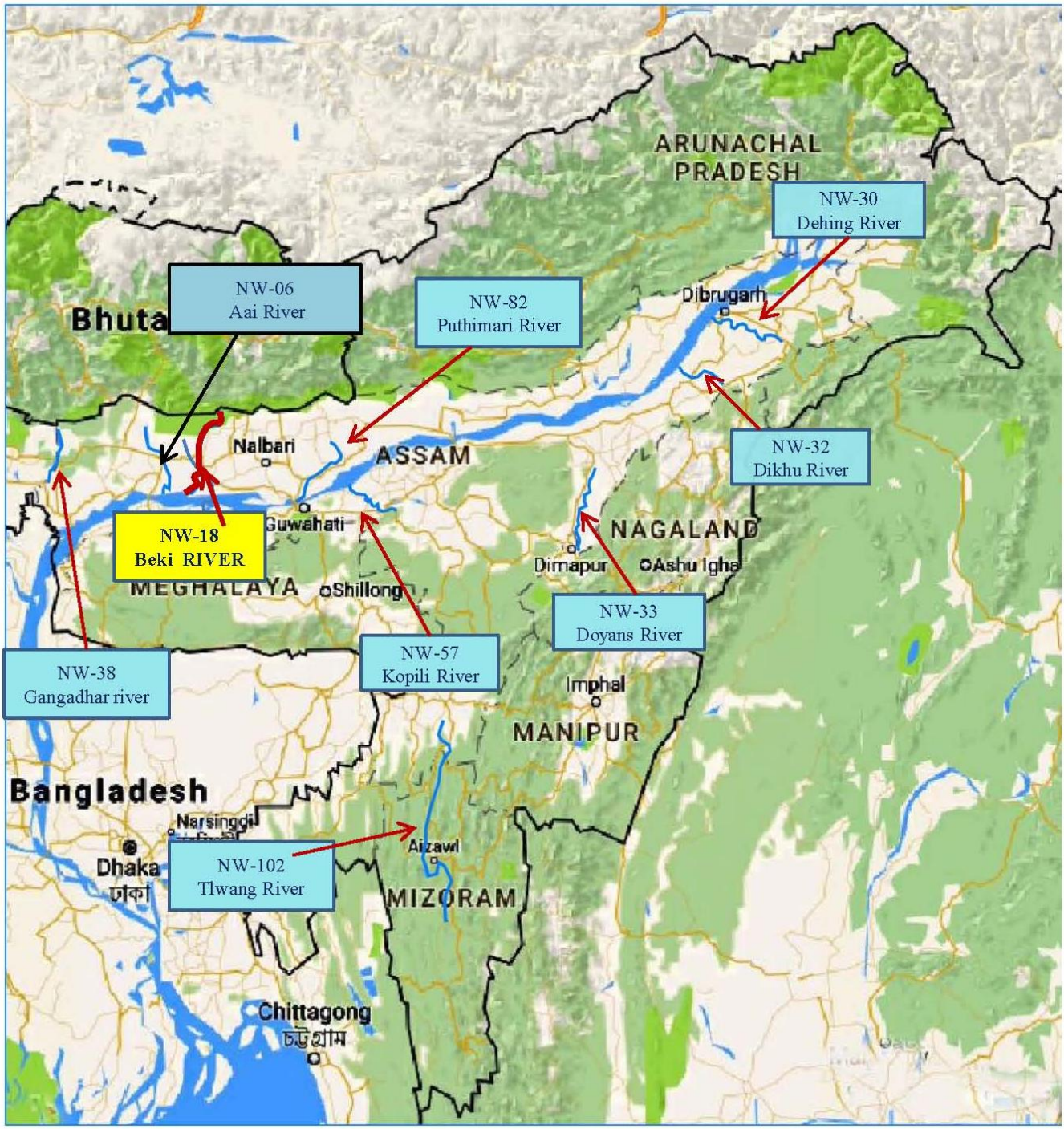


Figure 3- River Key Map

1.6- Scope of work:-

The Scope of work shall cover all technical aspects of hydrographic survey at par with International Standards including the following for development of the river/canal for inland navigation.

The detailed hydrographic survey is to be carried out by using Automated Hydrographic Survey System (using digital Echo sounder for depth measurement, DGPS Beacons Receivers for position fixing and Hypackmax or equivalent software for data logging). The survey is to be conducted in WGS‟84 datum.

- Detailed Hydrographic Survey to assess the navigability of the waterway.
- To collect Water and bottom samples, current meter observation and discharge from the deepest route at every 10 km interval.
- To identify cross structures which are obstructing navigation.
- To identify the length of bank protection required.
- The BM is denoted by a "." mark engraved on a plate. The plate is fixed on a 5cm diameter GI pipe. The GI pipe is cemented with construction pillar of 30cmX30cmX150cm.
- The pillar extends 60.cms above ground level. Inscription "IWAI", "PSC" and BM No. can be seen on the face of the pillar.
- The main objective of the Study was to recommend the strategy and programs for the development of the Beki River waterway and to provide an appropriate economic and organizational framework for restoring trade and navigation (cargo and passengers) on the Beki River with an aim to do as follows: Improve public and private investments into transport on the Beki River, in accordance with adequate economic and financial analysis;
- Propose enhancement of coordination of activities regarding inland navigation and to set up priorities of public interests;
- Obtain an integrated approach considering water management, energy production, flood control and environmental aspects in the Beki River basin and Propose improvement of the infrastructure.

Section-2: Methodology Adopted to undertake Study

2.1 - Methodology Adopted including Resources and equipment used and calibration: -

Equipment:-

Following equipments are employed for the Bathymetric and Topographic survey:-

Equipment	Make	Version	Qty Employed
Echo sounder	Bathy MF 500	……	1
Current Meter	AEM 213-D	……	1
Tide Gauge	Manual (Pole type)	----------	4
RTK	South S86T	----------	3
GPS Sets	Trimble –Becon Receiver SPS 361	----------	1
Software	HYPACK data acquisition	Version 14	1
Software	AUTOCAD	2013	1
Software	Microsoft Office	2013	1

Table 2 - Equipments

- **Conduct of survey work**

- **Topographic Survey:-**

The Topography survey of Beki river has been carried out from "Brahmaputra confluence (Lat 26°14'23.80"N, Long 90°47'20.86"E) to Elenagamari (Lat 26°38'37.19"N, Long 90°59'2.15"E)". The Length of the Topography survey is from Chainage 0.00 km to Chainage 68.90 km.

The Topographic survey has been conducted to ascertain following in the survey area:-

- Spot levels
- High bank Line
- Vegetation covered
- Bridges and permanent structures
- Road, culvert and other communication network

GPS RTK (Real Time Kinematic) satellite navigation is a technique used in land survey and in hydrographic survey based on the use of carrier phase measurements of the GPS, GLONASS and / or Galileo signals where a single reference station provides the real-time corrections, providing up to centimeter-level accuracy. When referring to GPS in particular, the system is also commonly referred to as Carrier-Phase Enhancement, CPGPS. RTK systems use a single base station receiver and a number of mobile units. The base station re-broadcasts the phase of the carrier that it measured, and the mobile units compare their own phase measurements with the ones received from the base station. There are several ways to transmit a correction signal from base station to mobile station. The most popular way to achieve real-time, low-cost signal transmission is to use a radio modem, typically in the UHF band. This allows the units to calculate their relative position to millimeters, although their absolute position is accurate only to the same accuracy as the position of the base station.

Bathymetry Survey:-

The Bathymetry survey has been carried out from Chainage 0.00 km to Chainage 53.500 km. The remaining stretches of the river has not been carried out the bathymetry survey due to insufficient layer of water.

Bathy 500 MF was used to obtain soundings onboard the survey boat. A working frequency of 210 KHz was used for sounding operations. The digital output from the echo sounder was automatically fed to the HYPACK data logging software on a real-time basis for the acquisition of survey data. No breakdown of equipment was reported and the performance of the equipment was found to be satisfactory during the entire duration of the survey.

The sound velocity was set to 1500 m/s on single beam echo sounder during acquisition. The Daily bar checks were done prior to the sounding operation and before the closing of the sounding operation for the day. Being very shallow depths, the echo sounder depths were also cross-checked in between by using demarcated sounding poles during the conduct of the survey. The sounding lines were run using Survey boat to identify the design line of the Beki River for the possible stretch. The cross lines were run perpendicular to the orientation of river flow (i.e. perpendicular to the orientation of depth contours) in respective stretches. The spot sounding was also carried out in the area where the survey boat cannot be operated due to low depth. The hemisphere DGPS and Sounding Pole were used for Spot sounding at shallow locations in the Beki River. The DGPS position along with water depths was recorded simultaneously and the tidal reduction was applied to the obtained depths.

Figure 4- Bathymetry survey work

2.2 - Description of Bench Marks (B.M) / authentic Reference Level used:-

For Topographic Survey, the Horizontal control has been carried out from the CP-B1 (G.T.S Level). The G.T.S Level position at Bandar Khowa Village was established by using the DGPS receiver in different mode. The value of G.T.S Level at Bandar Khowa Village is-

	Geographic position		UTM position		
Location Name	**Latitude (N)**	**Longitude (E)**	**Northing**	**Easting**	**Elevation (m)**
Bandar Khowa	26°29'42.60"	90°55'11.16"	2932201.90	292668.01	52.540 m. w.r.t. M.S.L

Figure 5-Bench Mark Location

2.3 - Tidal Influence Zone and tidal variation in different stretches:-

There are no Tidal influences or effects found in this zone of river.

2.4 - Methodology to fix Chart Datum/ Sounding Datum:-

IWAI had provided Sounding Datum at Mathanguri Beki, Beki Road Bridge and at confluence with Brahmaputra River. The same was used to arrive the Sounding Datum values at BM Pillars and at tide gauges.

Sl. No	Place	Sounding Datum w.r.t MSL (Provided by IWAI)
1	Mathanguri Beki (Chainage-84.724 km)	91.503 metre
2	Beki Road Bridge (Chainage-47.914 km)	42.110 metre
3	Brahmaputra Confluence (Chainage-0.00 km)	30.6771 metre

2.5 - Six years minimum Water Levels to arrive at Chart Datum (CD) / Sounding Datum (SD):-

The Minimum water level (CD level) of the Beki River is:-

i) Mathanguri Beki (Chainage-84.724 km) is 91.503m.

ii) Beki Road Bridge (Chainage-47.914 km) is 42.110m.

iii) Beki River Confluence (Chainage-0.00 km) is 30.6771m.

2.6 -Transfer of Sounding Datum table for Tidal Rivers:-

There is no tidal influence found in this region of river.

2.7 –Table indicating tidal variation at different observation points (say at every 10KM):-

There is no tidal influence found in this region of river.

2.8 - Salient features of Dam, Barrages, Weirs, Anicut, Locks and Aqueducts:-

There are no Dams, Barrage, weirs, Anicut, Locks, Aqueducts found in this zone of River.

2.9- Description of erected Bench mark Pillars:-

BM No	Location	Chainage (Km)	Latitude (N)	Longitude (E)	Easting	Northing	BM Height above MSL (m)	BM Height above SD (m)
BM 1	Deuldi	4.808	26°15'26.89"	90°46'31.82"	277831.933	2906106.829	38.060	6.06
BM 2	Sawrachor	13.703	26°16'40.87"	90°51'13.62"	285689.015	2908251.378	39.741	2.478
BM 3	Sawpur	24.863	26°19'57.84"	90°52'40.68"	288204.285	2914273.604	40.758	10.087
BM 4	Ghugubari	38.857	26°25'6.50"	90°53'54.53"	290407.862	2923739.863	43.210	10.431
BM 5	Bandar Khowa	47.920	26°29'42.78"	90°55'11.81"	292686.417	2932207.336	45.385	3.212
BM 6	Khudna Bari	58.987	26°33'58.75"	90°58'55.48"	299004.662	2939986.927	56.475	16.339
BM 7	Elenagamari	68.944	26°39'0.49"	90°59'19.18"	299806.662	2949262.358	61.117	21.262

Table 3 - Bench Mark Details

2.10- Description of erected Tide Gauges:-

Tide Gauge No	Location	Chainage (km)	Easting	Northing	W.L w.r.t M.S.L (m)	Period of observation
GS (TP)- 14	Elengamari village	68.364	299464.4	2948641.0	53.280	24 Hrs
GS (TP)- 13	Simulbari village	65.000	298437.5	2945340.6	51.178	24 Hrs
GS (TP)-12	Balipur village	62.000	298290.2	2942666.9	49.228	24 Hrs
GS (TP)-11	Safakamar village	59.000	298781.8	2940049.2	46.357	24 Hrs
GS (TP)-1	Domani Gaon Village	56.333	297336.4	2937613.8	45.414	24 Hrs
GS (TP)-2	Damage Rail Bridge area	48.369	292550.1	2932640.5	42.999	24 Hrs
GS (TP)-5	Rail Bridge area	48.178	292305.4	2923414.2	42.971	24 Hrs
GS (TP)-6	Ghugubari village	39.646	290190.4	2924507.8	40.115	24 Hrs
GS (TP)-7	Bhera village	38.470	290518.3	2923306.7	39.746	24 Hrs
GS (TP)-8	Balapathar village	30.172	291025.8	2916019.9	37.878	24 Hrs
GS (TP)-9	Udmari village	30.000	292022.8	2916127.9	37.799	24 Hrs
GS (TP)-10	Chandmama pathar village	13.000	284864.4	2907305.6	34.130	24 Hrs
GS (TP)-4	Sikartary Gaon village	8.831	281915.9	2905105.6	33.514	24 Hrs
GS (TP)-3	Kismat Moinbari village	-0.257	272835.8	2904126.2	31.397	24 Hrs

Table 4- Tide Gauge Details

2.11- Chart Datum / Sounding Datum and Reductions details:-

Sl no	CWC gauge / Dam / Barrage / Weir / Anicut / Bench Mark / tide gauges	Chainage (km)	Stretch for corrected soundings and topo levels (km)	Established Sounding Datum w.r.t. MSL (m) at col. A.	Sounding Datum of Tide Gauge w.r.t. MSL (m)	Correction in WL data for Bathymetric survey (m)	Topo level data to be converted as depth for volume calculation w.r.t. SD (m)
	A	B	C (50% stretch is to be selected on both side of tide gauge)	D +ve indicates above MSL -ve indicates below MSL	E	F = (E- WL data in MSL)	G = (E- Topo levels in MSL)
1	Mathanguri Beki	84.724		91.503			Beki Reduced Topo.xyz
2	GS-(TP)- 14	68.364	66.7-68.90		51.000	53.280	Submitted in Soft Copy
3	GS -(TP)- 13	65.000	63.5-66.7		49.000	51.178	
4	GS -(TP)- 12	62.000	60.5-63.5		48.000	49.228	
5	GS-(TP)- 11	59.000	57.7-60.5		45.500	46.357	
6	GS-(TP)- 1	56.333	52.4-57.7		44.120	45.414	
7	GS-(TP)- 2	48.369	48.3-52.4		42.219	42.999	
8	GS-(TP)- 5	48.178	43.9-48.3		42.173	42.971	
9	Beki Road bridge	47.914		42.110		42.960	
10	GS-(TP)- 6	39.646	39.0-43.9		40.136	40.115	
11	GS-(TP)- 7	38.470	34.3-39.0		39.855	39.746	
12	GS-(TP)- 8	30.172	30.0-34.3		37.874	37.878	
13	GS-(TP)- 9	30.000	21.5-30.0		37.833	37.799	
14	GS-(TP)- 10	13.000	10.9-21.5		33.775	34.130	
15	GS -(TP)- 4	8.831	4.3-10.9		32.779	33.514	
16	GS-(TP)- 3	-0.257	0.0-4.3		30.671	31.397	
17	Confluence	0.000				31.440	

Table 5 - Chart Datum / Sounding Datum & Reduction Details

2.12- High Flood Level (H.F.L.) at known gauge stations and cross-structures:-

MHWS (Mean High Water Springs) is to be taken in tidal stretches and HFL in non-tidal stretches.

Sl no	Location and description of CWC gauge / Dam / Barrages / Weirs / Anicut / Locks / Aqueducts / BM	Cross-structure details	Chainage (km)	Established HFL / MHWS / FSL / MWL / FRL w.r.t. MSL (m)	Computed HFL at Cross-Structures w.r.t. MSL (m)
1	Mathanguri Beki		84.724	102.280	
2		Beki NH-31 Road Bridge (RCC Bridge) near BM-5	47.914		46.200

Table 6 - HFL Details

2.13 - Average Bed Slope:-

Reach		River / Canal Bed Level Change (m)	Distance (km)	Slope (m/km)	Slope (cm/km)
From (km)	To (km)				
0.00	8.831	1.617	8.831	0.183	18.310
8.832	13.000	0.606	4.168	0.145	14.539
13.000	30.000	3.569	17.000	0.210	20.994
30.001	38.470	2.247	8.469	0.265	26.532
38.471	48.178	3.125	9.707	0.322	32.193
48.179	56.333	2.943	8.154	0.361	36.093
56.334	62.000	3.894	5.666	0.687	68.726
62.001	68.364	4.092	6.363	0.643	64.309
Total			68.358	Avg - 0.352	Avg - 35.212

Table 7 - Average Bed slope

2.14 - Details of Dam, Barrages, Weirs, Anicut, etc. w.r.t. MSL:-

There are no Dams, Barrages, weirs, Anicut found in this zone of River.

2.15 - Details of Locks:-

There are no locks found in this zone of river.

2.16 - Details of Aqueducts:-

There are no aqueducts found in this zone of River.

2.17- Details of existing Bridges and Crossings over waterway:-

Sl. No	Chainage (km)	Location	Cross-Structure details	Latitude (N)	Longitude (E)	Northing	Easting	Length (m)	Width (m)	No of Piers	Horizontal Clearance (m)	Vertical Clearance (m)w.r.t H.F.L	Present Condition
1	25.506	Khudrakuchi village	Damage RCC Bridge	26°19'54.86"	90°53'14.59"	2914166.138	289143.961	806.92	11.676	17	44.56	1.445	Damaged
2	47.893	Bandorkhada Village	RCC Bridge	26°29'41.55"	90°55'10.10"	2932170.147	292638.618	401.38	10.35	8	40.78	1.338	Complete
3	47.926	Bandorkhada Village	RCC Bridge	26°29'41.80"	90°54'58.28"	2932183.411	292311.628	403.09	8.12	8	41.02	1.467	Complete
4	48.266	Puthimarii Village	Rail Bridge	26°29'53.83"	90°55'2.34"	2932525.465	292425.274	339.49	5.56	6	45.917	1.506	Complete
5	48.318	Puthimari Village	Damage Rail Bridge	26°29'54.67"	90°55'2.85"	2932577.009	292444.537	336.65	4.97	16	48.04	1.469	Damaged
6	55.774	Uttar Sabakamar Village	RCC Bridge	26°32'44.90"	90°57'35.81"	2937748.731	296763.269	395.47	6.84	8	36.734	2.465	Complete

Table 8 - Bridge Details

2.18 - Details of other Cross structures, pipe-lines, under water cables:-

There are no other cross structures, pipe lines or underwater cables found in this zone of river.

2.19 - High Tension Lines / Electric lines / Tele-communication lines:-

Sl. no	Line	Chainage (km)	Location	Position				No of piers	Horizontal clearance (m)	Vertical clearance w.r.t H.F.L (m)	Remarks
				Latitude (N)	Longitude (E)	Easting	Northing				
1.	High Tension Line	47.995	Bandorkhada Village	26°29'44.12"	90°55'3.84"	292617.00	2941584.00	8	412.48	1.460	Complete
2.	High Tension Line	48.017	Bandorkhada Village	26°29'44.87"	90°55'3.86"	292466.99	2932275.04	8	408.97	1.470	Complete
3.	High Tension Line	48.095	Bandorkhada Village	26°29'47.40"	90°55'3.71"	292463.82	2932352.98	8	390.12	1.470	Complete
4.	High Tension Line	48.151	Bandorkhada Village	26°29'49.11"	90°55'2.52"	292432.00	2932406.13	8	450.11	1.329	Complete
5.	High Tension Line	48.224	Bandorkhada Village	26°29'52.21"	90°55'10.41"	292652.04	2932498.00	8	428.68	1.471	Complete

Table 9 - High Tension Lines

2.20 - Current Meter and Discharge details:-

The water level was too low after the chainage 47.920 km, no bathymetry survey, current or discharge measurements have been conducted. The details are tabulated below:-

Stretch No.	Chainage (km)	Position				Observed Depth (m) (D)	Velocity (m/sec.)	Average Velocity (m/sec.)	X-Sectional area (sq. m.)	Discharge (Cu.m/s)
		Latitude (N)	Longitude (E)	Easting (m)	Northing (m)		0.5 D			
1	5.485	26°14'17.124"	90°46'58.261"	278528.1193	2903946.3022	0.6	0.135	0.135	334.90	45.211
2	10.275	26°15'4.001"	90°49'52.366"	283384.6416	2905307.2264	0.9	0.313	0.313	375.12	117.41
3	35.500	26°24'17.815"	90°54'38.165"	291591.8482	2922221.0058	1.3	0.423	0.423	421.10	178.12
4	47.920	26°29'42.889"	90°54'59.46"	292344.161	2932216.055	1.2	0.419	0.419	318.11	133.28

Table 10 - Current Meter Details

2.21 - (a) Soil Sample Locations:-

Sample No.	Chainage (km)	Easting (m)	Northing (m)	Latitude (N)	Longitude (E)	Depth (m)
1	4.808	277352.63	2904865	26°14'46.308"	90°46'15.353"	2.6
2	13.703	286743.13	2906780	26°15'53.662"	90°51'52.475"	1.3
3	24.863	288485.115	2913933	26°19'46.957"	90°52'51.011"	2.6
4	38.857	290695.6	2923888	26°25'11.487"	90°54'04.855"	2.3
5	47.920	292480.67	2932198	26°29'42.376"	90°55'04.399"	1.2
6	53.500	298471.852	2940087	26°34'01.747"	90°58'36.197"	1.2
7	65.70	298691.7771	2948622.5227	26°38'39.142"	90°58'39.265"	0.4

Table 11 - Soil Sample Locations

(b) Water Sample Locations:-

Sample No.	Chainage (km)	Easting (m)	Northing (m)	Latitude (N)	Longitude (E)	Total Depth (d) (m)	Mid-Depth (0.5d) (m)
1	4.808	277352.63	2904865	26°14'46.308"	90°46'15.353"	2.6	1.3
2	13.703	286743.13	2906780	26°15'53.662"	90°51'52.475"	1.3	0.65
3	24.863	288485.115	2913933	26°19'46.957"	90°52'51.011"	2.6	1.3
4	38.857	290695.6	2923888	26°25'11.487"	90°54'04.855"	2.3	1.15
5	47.920	292480.67	2932198	26°29'42.376"	90°55'04.399"	1.2	0.6
6	53.500	298471.852	2940087	26°34'01.747"	90°58'36.197"	1.2	0.60
7	65.70	298691.7771	2948622.5227	26°38'39.142"	90°58'39.265"	0.4	0.2

Table 12 - Water Sample Locations

Section-3: Description of waterway

3.1- From Chainage 0.00 Km to Chainage 10.00 Km. (Joypur Pathar village to Balkuri village):-

Figure 6- Chainage 0.00 km to Chainage 10.00 km

The River width of Beki River from Chainage 0.00 Km. to chainage 10.00 Km is 589 m to 549 m approximate width. The average water portion of the river is 600m.

During the survey, it was noticed that Pathar Chali village is located near at chainage of 0.00 km. The BM pillar is located at a distance of 850m approximately from the Deuldi village. The left side of the bank is covered with agricultural land. Joypur Gaon Village is located at a distance of approximately 1.08km from the river bank. During the survey it was noticed that Joypur gaon village, Kismatmoinbari village are located on the left side of the river. Both side dense forests have been also found near at the bank sides of the river. An irrigation canal has been found near at chainage of 9.200 km.

Class	Chainage (km)		Observed				Reduced w.r.t. Sounding Datum			
	From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)
I	0.00	10.00	0.4	4.4	4000	44296.15	-0.3	4.0	10000	283362.98
II	0.00	10.00	0.2	4.4	10000	189408.88	-0.3	4.1	10000	449659.05
III	0.00	10.00	0.1	4.4	10000	360159.92	-0.3	4.1	10000	717826.21
IV	0.00	10.00	0.1	4.4	10000	320884.7	-0.3	4.1	10000	614644.22

3.2 - From Chainage 10.00 Km to Chainage 20.00 Km (Shewrar Bhitha village to Tapajuli Patha village):-

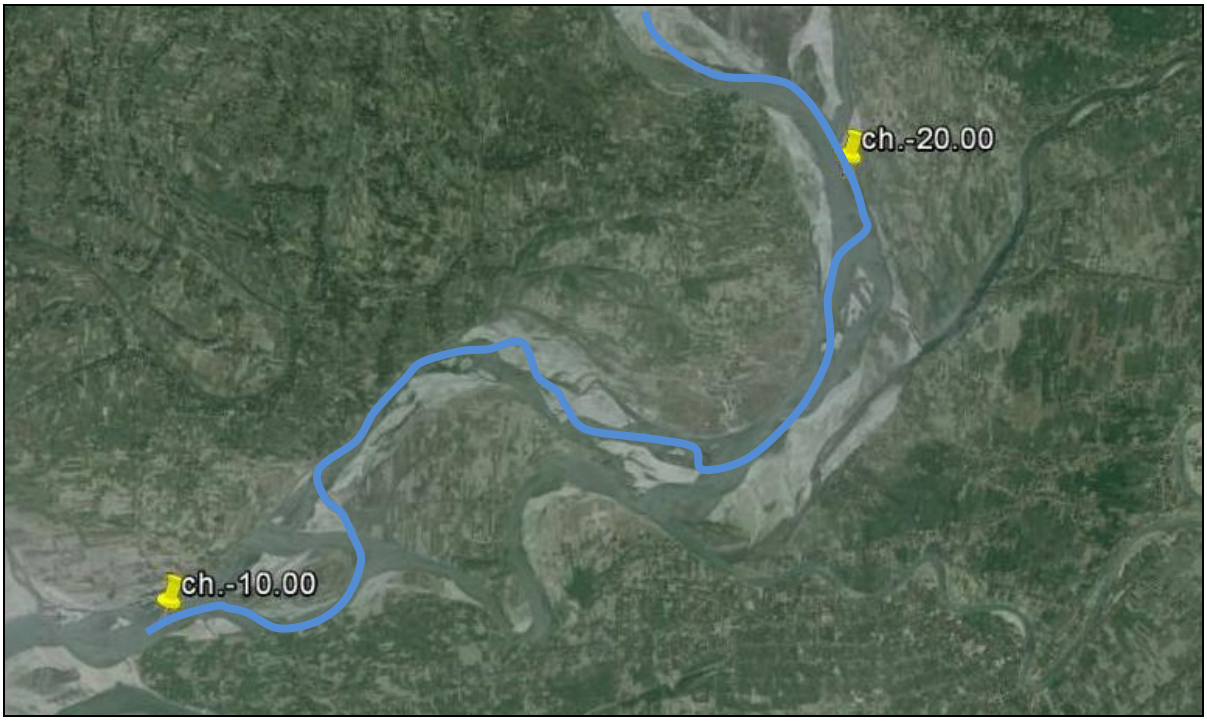


Figure 7 – Chaimage 10.00 km to Chainage 20.00 km

The River width of Beki River from Chainage 10.00 Km. to chainage 20.00 Km is 549 m to 895 m approximate width. The average width portion of the river is 750m.

During the survey, it was noticed that Solmari, Chandmama Pathar village are located at a distance of 1.084m from the left side of the river and Sat mukhi, Siknir par, Mohia village are located in the right side at a distance of 799m approximately from the river. During the survey it was also noticed that Balikuri village, Chandmam village, Sawrachar gaon village are situated on the left side of the river and Shewrar Bhitha village, Tapajuli Pather village are situated on the right side of the river bank. BM 2 is also located near at chainage of 13.703 km. Two irrigation canals have been also found near at the chainage of 16.395 km and 18.750 km on the right side of the river bank respectively. Morabaz ferry ghat and Swachar ferry ghat are available in this stretches of river near at chainage of 11.00 km and 12.00 km respectively.

Class	Chainage (km)		Observed				Reduced w.r.t. Sounding Datum			
	From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)
I	10.00	20.00	0.1	9.2	7700	71128.35	-0.3	8.1	10000	139675.19
II	10.00	20.00	0.1	9.2	9100	138087.99	-0.4	8.1	10000	728147.65
III	10.00	20.00	0.1	9.2	10000	264753.15	-0.3	8.1	10000	437905.09
IV	10.00	20.00	0.1	9.2	10000	219994.45	-0.3	8.1	10000	311724.96

Figure 8- Morabaz ferry ghat (Chainage-11.00 km)

Figure 9- Swachar ferry ghat (Chainage-12.00 km)

3.3- From Chainage 20.00 Km to Chainage 30.00 Km (Rampur Village to Gunial guri village):-

Figure 10 - Chainage 20.00 to chainage 30.00 km

The River width of Beki River from chainage 20.00 Km. to chainage 30.00 Km is 469m to 1803m approximately. The average width portion of the river is 500 metre.

During the survey, it was noticed that from chainage 20.00 km to chainage 30.00 km is covered with paddy land area. Khelli, Titapani, Rampur etc. villages are located at a distance of 2.18m approximately from the river side. During the survey it was noticed that Khudrakuchi village, Gunialguri village are situated in the left bank side of the river and Chanpur village, Sawpur village, Rubhi village, Udmari village and Barpeta town are situated in the right bank side of the river. Dakumarie ghat is situated in this stretches of river. A damage RCC Bridge is situated near at chainage of 25.506 km near at BM-3 at Khudrakachi village. An irrigation canal is also found near at chainage of 30.420 km.

Class	Chainage (km)		Observed				Reduced w.r.t. Sounding Datum			
	From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)
I	20.00	30.00	0.2	7.7	6650	67913.02	-0.3	7.4	8100	95476.09
II	20.00	30.00	0.2	7.7	9050	120463.55	-0.3	7.4	9100	153878.6
III	20.00	30.00	0.1	7.7	10000	240540.15	-0.3	7.4	10000	314838.34
IV	20.00	30.00	0.1	7.7	10000	178721.75	-0.3	7.4	10000	205865.32

3.4- From Chainage 30.00 Km to Chainage 40.00 Km (Gunialguri village to Khatakuchi village):-

Figure 11 - Chainage 30.00 km to chainage 40.00 km

The river width of Beki River from Chainage 30.00 Km. to Chainage 40.00 Km is 958m to 1480m approximate width. The average width portion of the river is 1000 m.

Khudrakhuchi, Chariatpur, Balapathar, Ghilajari etc. Villages are located at a distance of 750m approx from right side bank of the river and Saru Harid, Khata Kuchi, Lachanga, Guileza etc. villages are located at a distance of 757.31m approximately left side from the river side. During the survey it was also noticed that Monakocha village, Dimapur village, Khatakuchi village, Guileza village, Jamerkur village, Bagula Mari village are located in the left side and Balai village, Kathlijar village, Kurobaha village are located in the right side of the river bank. An irrigation canal has been found at the chainage of 32.312km. BM- 4 is situated at the chainage of 36.950 km.

Class	Chainage (km)		Observed				Reduced w.r.t. Sounding Datum			
	From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)
I	30.00	40.00	0.5	5.1	10000	162930.82	-0.3	4.2	10000	191834.62
II	30.00	40.00	0.2	5.1	10000	277256.88	-0.3	4.2	10000	320874.5
III	30.00	40.00	0.1	5.1	10000	482768.39	-0.3	4.2	10000	527619.38
IV	30.00	40.00	0.1	5.1	10000	329020.7	-0.3	4.2	10000	306354.2

3.5- From Chainage 40.00 Km to Chainage 50.00 Km. (Katokibari village to Kayasta village):-

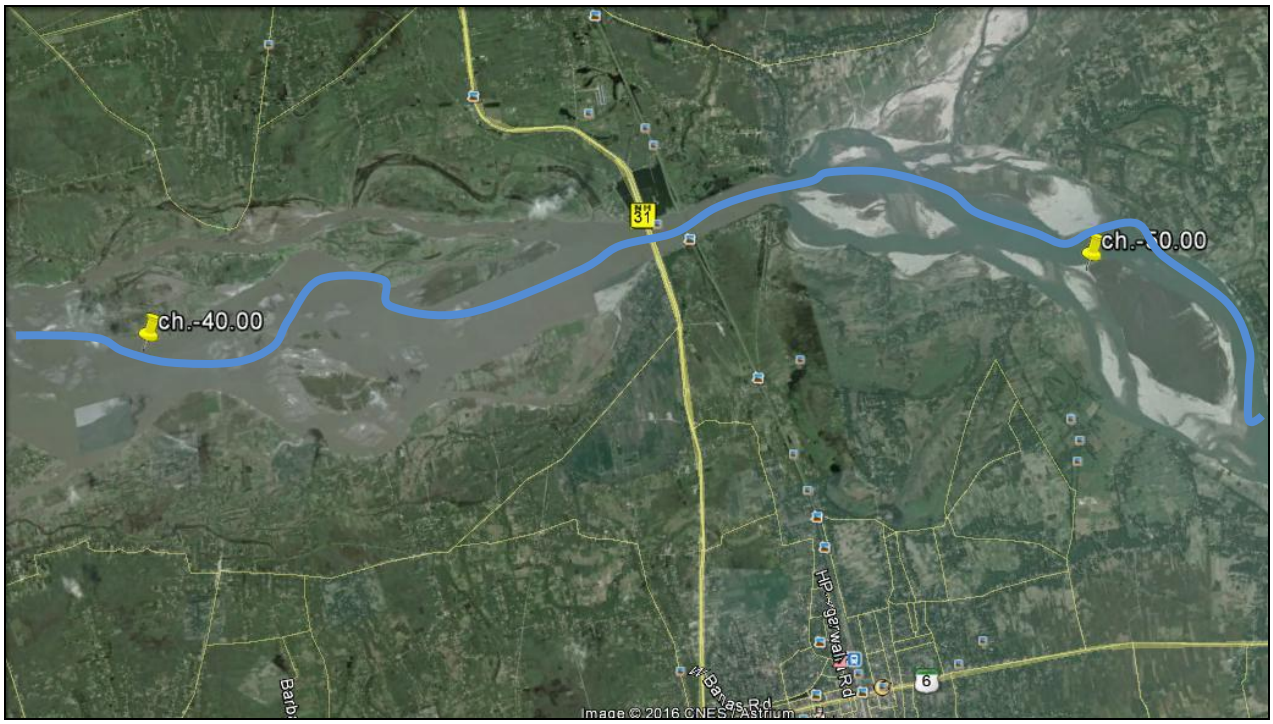


Figure 12- Chainage 40.000 Km. to Chainage 50.000 Km

The River width of Beki River from Chainage 40.000 Km. to Chainage 50.00 Km. is 425m to 1080m approximate width. The average width portion of the river is 525m.

Jakuapara Madulijhar, Dakshin oanakgari village are located at a distance of approx 300m from the river. It was noticed that two RCC Bridges are passed over the River; these bridges are communicated between Kolkata to Guwahati. During the survey it was noticed that Chalchalia village, Sapana village, Phulkipara town, Barbijhar village, Benni village, Sapana village, Ghilajari village, Chantaberi village, Milan Nagar, Raypur village, Bandorkhowa village, Sahapur village are located in the right bank side of the river and Medagaon village, Katokibari village, Puthimari village, Kayasta village are located in left bank side of the river. Kolkata to Ghy Railway Bridge is situated near at chainage of 48.266km. Two Kolkata to Guwahati RCC Bridge are also located near at chainage of 47.893km and 47.926km. Another damage Rail Bridge is found near at chainage of 48.318km. Five high tension lines are also found near at chainage of 47.995 km, 48.017 km, 48.095 km, 48.151 km and 48.224 km respectively. An Irrigation canal is found near at chainage of 51.090 km. BM 5 is situated near at the chainage of 47.920 km.

Class	Chainage (km)		Observed				Reduced w.r.t. Sounding Datum			
	From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)
I	40.00	50.00	0.2	5.6	10000	157307.28	-0.3	3.9	10000	212042.57
II	40.00	50.00	0.1	5.8	10000	274474.8	-0.3	3.9	10000	344619.5
III	40.00	50.00	0.1	5.8	10000	468875.86	-0.3	3.9	10000	603724.43
IV	40.00	50.00	0.1	5.8	10000	357563.8	-0.3	3.9	10000	373601.1

Figure 13- RCC Bridge (Chainage- 47.893 km)

Figure 14- R.C.C. Bridge (Chainage- 47.926 km) (Kolkata to Guwahati)

Figure 15- Railway Bridge (Chainage- 48.266km and 48.318 km) (Kolkata – Guwahati)

3.6- From Chainage 50.00 Km to Chainage 60.00 Km (Bhetomare Tup village to Udalguri Gaon village:-

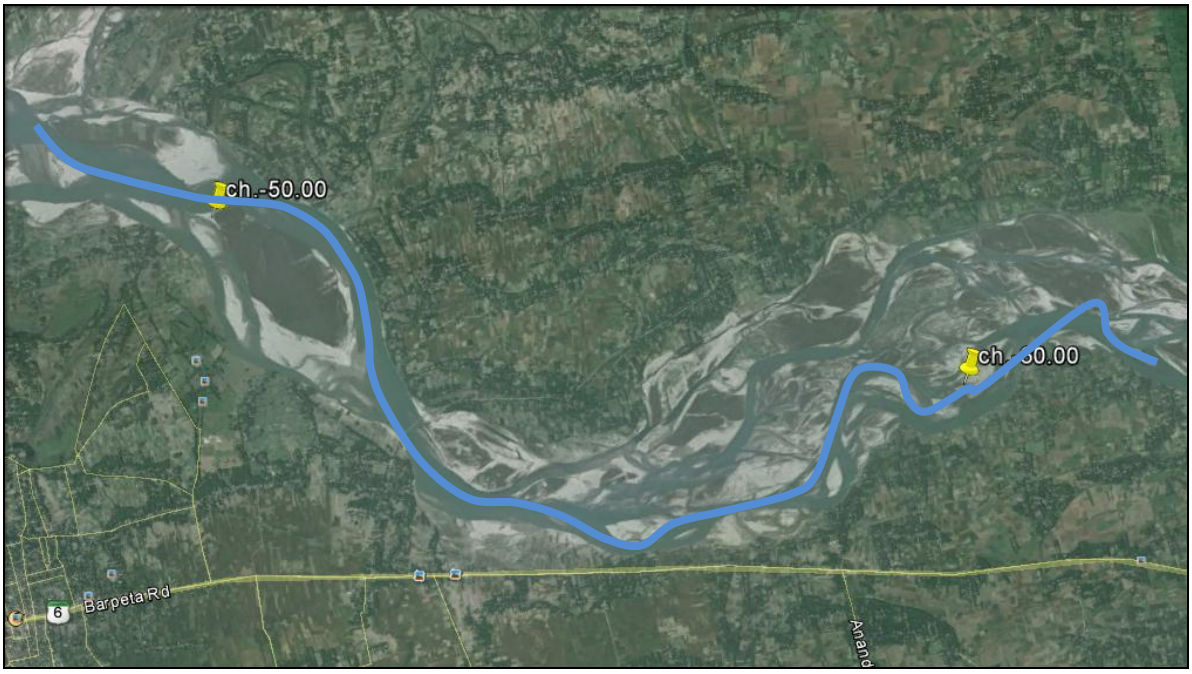


Figure 16- Chainage 50.000 Km. to Chainage 60.00 Km

The River width of Beki River from chainage 50.00 Km. to chainage 60.00 Km is 335 m to 767 m approximate width. The average water portion of the river is 500m.

During the survey, it was noticed that the RCC Bridge is located near at chainage of 55.774 km which is crossed over the river. The RCC Bridge is communicated Jamerkur village to Katatar Village. The bridge's location is (Lat- 26°32'45.99"N, Long- 90°57'34.89"E). The maximum place is covered with paddy land area both sides of the river bank. Bhetomare Tup village, Khudnabari village, Udalgiri Gaon village are located in left side of the river bank and Uttarsabakamar village, Raypur village, Shilbari village, Balipur village are located in the right side bank of the river. An irrigation canal is found near at chainage of 57.100 km. BM- 6 is situated at the chainage of 56.475 km.

Class	Chainage (km)		Observed				Reduced w.r.t. Sounding Datum			
	From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)
I	50.00	60.00	0.01	3.7	9750	72360.76	-0.3	3.0	10000	317711.55
II	50.00	60.00	0.01	3.7	9600	155275.3	-0.3	3.0	10000	506675.7
III	50.00	60.00	0.01	3.7	10000	301856.93	-0.3	3.0	10000	776265.84
IV	50.00	60.00	0.01	3.7	10000	222065.5	-0.3	3.0	10000	503218.9

Figure 17- RCC Bridge (Chainage- 55.774 km)

3.7- From Chainage 60.00 Km to Chainage 68.9Km (Mainamata to Labdanguri village):-

Figure 18- Chainage 60.00 km to Chainage 68.9 km

The river width of Beki River from chainage 60.00 Km. to chainage 68.90 Km is 736 m to 1004 m. approximate width. The average width portion of the river is 1000m.

During the survey, it was noticed that oxiguri Gaon village, Kahitama Pathar, Bhalaguri Gaon, Bhalaguri Pathar NC village are located at a distance of 5.00 km in the left side bank of the river and khagra Bari, Chinbari Gaon, Elangamari village are located at a distance of approximately 1km in the right bank side of the river. During the survey it was noticed that Mainamata gaon village, Labdanguri village are situated in the left side of the river and Simulbari village, Khagrabari village, Chunbari village are situated in the right side of the river. BM -7 is situated at the chainage of 68.944 km. Both sides paddy land are also found near the bank sides of the river.

Class	Chainage (km)		Observed				Reduced w.r.t. Sounding Datum			
	From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)
I	60.00	68.90	0.01	0.3	9000	317377.29	-0.3	0	9000	456606.5
II	60.00	68.90	0.01	0.5	9000	472144.2	-0.3	0	9000	663368.6
III	60.00	68.90	0.01	0.5	9000	808950.04	-0.3	0	9000	1044102.24
IV	60.00	68.90	0.01	0.5	9000	2252789.64	-0.3	0	9000	3117670.75

- **Bathymetry Survey:-**

a) Length of the stretch for which the Bathymetric survey has been carried out:-

The Bathymetry survey of the Beki River has been carried out from the chainage of 0.00 km to chainage 2.700 km; 9.260 km to 17.500 km; 17.624 km to 29.200 km; 29.400 km to 37.500 km; 37.500 km to 45.525 km; 45.700 km to 53.500 km. The Bathymetry survey was not possible after the chainage of 53.500 km due to insufficient water.

Date of Survey	Type of survey	Chainage	
		From (km)	To (km)
01.12.15	Bathymetry Survey	9.260	17.500
28.11.15	Bathymetry Survey	37.500	45.525
29.11.15	Bathymetry Survey	29.400	37.500
30.11.15	Bathymetry Survey	17.650	29.216
02.12.15	Bathymetry Survey	17.624	29.200
16.01.16	Bathymetry Survey	45.700	53.500
20.01.16	Bathymetry Survey	0.00	2.700

- **Topographic Survey:-**

a) Length of the stretch for which the Topographic survey has been carried out:-

The Topographic survey has been carried out from Brahmaputra Confluence to Elenagamari. The Stretches of the Topographic survey has been carried out from the chainage 0.00 km to chainage 68.9 km.

a) Prominent Dams / Barrage:-

There are no Dams, Barrages found in this zone of River.

b) Tidal stretch, tidal range. Pondage stretch / length of Dam, Barrages, Weirs, Anicut, Locks:-

There are no Dams, Barrages, weirs, Anicut; Locks are found in this zone of river.

c) Conditions of banks (protected, un-protected):-

The bank of the river includes villages, Forest, Roads, Jetty etc are situated in this zone of river.The Bank of the River Beki has been affected by floods, sometimes it become dangerous. As a result, short as well as long embankments are needed in the both bank side of the river. Sometimes Bolder Pitching is also used for protecting the both bankside of the river. Bolder pitching has been found near the village Uttarsabakamar village, Bandar Khowa village. Besides, the Roadside are also helpful for the protection of the both side of the river bank.

d) Hindrances - Hyacinth, rocks, rapid waterfalls, steep gradient, forest, wild-life sanctuary, security issues. Obstruction (if any) for navigation, e.g. fishing stakes:-

Manas National Park and forest is situated in the north east portion of the river and the Forest is sharing the land with India and Bhutan area. It is almost covered near about 2837 sq.km. area. Kaziranga National park (wildlife sanctuary) is situated in this zone of river.

e) Details of Protected Area- Wildlife, Defence, Atomic Power Plants and any other issue attached to it:-

The river Beki is too close with the border of India and Bhutan. As a Border area, the security clearance must be needed for the water ways development and also the vicinity of the Manas National Park.

f) NH/SH/MDR along and/or within 5 km from the waterways:-

The NH-31, NH-31C, NH-31B and the NH-37 are too close with the river Beki. The Barpeta-Howly roadway communication is a very crucial way for the native villagers and also for the Trans porting services.

g) Railway Line and Stations in the vicinity:-

The North Frontier Railway service is the main railway network in this region. The Barpeta Road Railway Station, Sorbhog Railway stations are crossing over this river. Kolkata to Ghy Railway service is really helpful for the native villagers and also for the tourist. The Nearest Railway Station is Barpeta Road which is situated on the left bank side of the river near at chainage of 48.266 km.

h) Land Use Pattern along Waterway on visual assessment:-

During the period of the survey it was noticed that the maximum land on the both bank of the river is used as an agricultural land and the rest portion of the land is covered with forests.

i) Crops / Agriculture in the region on visual assessment:-

In the north eastern part of India, Assam is the major state for all aspect in agriculture. The major crops Paddy, jute, Tea, Rice, Wheat, Maize, Sorghum, gram, Millets, Sugarcane and Spices are cultivated in this region.

j) Availability of Bulk / Construction Material:-

The availability of the construction materials is too easy for construction & any kind of structure. There are many cementing factories and brick fields are located and the sand is also available from the river.

k) Existing Industries along Waterway with their types and details:-

There are some scale industries, jute and utensil industries located in this region of river. But there is no major industry found in this stretches of river.

l) Existing Ghats, Jetties and Terminals (with conditions and facilities). Existing navigation facilities (if any):-

The Temporary Jetty Services are available near chainage of 11km, 12 km respectively. The passengers are mainly from the villages situated on the both bank sides of the river. The ferry services are really very helpful for growing the local businesses with supplying their goods. The Ferry services are also become helpful for the daily communication system for the local public and also for the tourist. Transporting system is become easier through ferry services.

Sl.no	Name of Ferry ghat	Chainage (km)	Easting	Northing	Latitude (N)	Longitude (E)	Remarks
1	Morabaz Ferry ghat	11.00	283648.66	2906253.18	26°15'34.87"	90°50'1.28"	Temporary Jetty
2	Swachar Ferry ghat	12.00	284374.03	2906668.27	26°15'48.74"	90°50'27.19"	

m) Existing Cargo Movement:-

The cargo movement is processed through waterways system. Two passenger ferry services are available in this river near at chainage of 11.00 km and 12.00 km respectively. But the cargo is not available in this region of river.

n) Prominent City / Town / Places of Worship / Historical places for Tourism:-

Kaziranga National Park, Manas National Park, Kamakhya temple, Chinpara vithi, Pari Hareswar Debalaya (Temple) are the important tourist places in this region. The Historical places like Barpeta Satra, Darga of Syed Shahnur Dewan and Sorbhog are located here. Many tourists come here to see the natural beauty every year.

o) Village / colonies along the sub-stretch and approx. Population:-

Beki River mainly includes with many villages like Solmari, Chandmama Pathar, Sat Mukhi, Siknirpar, Mohia, Balikuri, Kheli, Rampur, Barpeta, Sawpur, Bagulamari, Dimapur, Puthimari, Bandorkhoda etc are situated near the bank side of the River. The villager can easily access with the surrounding villages by the Railways and road services.

p) Availability of Passenger Ferry Services with facilities and Annual movement data:-

The Passenger Ferry Services are available near at chainage of 11 km and 12 km respectively. The passengers are mainly from the villages situated on the both bank of the river and the ferry services are really very helpful for growing the local businesses and transportation with the both bank of the river. The Ferry services are also helpful for the daily communication system**.** Ferry services are also important for pollution less service in this region. If more Ferry services may develop in this region of the states, pollution less states is made easily.

Sl. no	Name of Ferry ghat	Chainage (km)	Easting	Northing	Latitude (N)	Longitude (E)	Remarks
1	Morabaz Ferry ghat	11.00	283648.66	2906253.18	26°15'34.87"	90°50'1.28"	Temporary Ferry
2	Swachar Ferry ghat	12.00	284374.03	2906668.27	26°15'48.74"	90°50'27.19"	

q) Available and probable Water Sport Recreational Facilities:-

There are no water sport recreational facilities available in this zone of river.

r) Fishing activities:-

Fish and fishing business are an important sector in this region. Cast nets, Scoop nets, Gill nets, Fishing lines and Traditional Bamboo Trap used for catching the fishes here. Fishing plays an important role in supporting livelihood for the inhabitants of this Region. Fishes are one of the main occupations in this region of people where so many people are engaged with this profession for the demand of fish.

s) Sand mining:-

The bank of the River Beki is also used for the sand mines. The Sand Mining helps the people for collection sand which is the major component for Building purposes. The Motor vehicles can easily collect the sand and move for transportation. Sand Mines is an important sector where so many people are engaged and these activities help them to get their daily livelihood. Besides this, sand is also exported to other states as it becomes demandful for making Building or Industries.

t) Tributaries:-

Aai, Beki and Manas, the three streams create a river basin in this zone of river.

u) Details of Irrigation Canals and Outlets:-

The Irrigation Canal and outlets have been found near at chainage of 9.200 km, 16.395 km, 18.750 km, 30.420 km, 32.312 km, 51.090 km and 57.100 km. The Canal supplies the valuable water for the cultivation which is the main occupation of the surrounding Farmers. But the Canals become dangerous in the Rainy season. As a result, the bank of the river sometimes is flooded.

v) Details of Nalas. Polluted water discharge in to the rivers and treatment plants (if any):-

There are no Nalas found in this zone of river.

w) Usage of water (drinking, irrigation, industries, navigation etc.) Water quality:-

In Recent time's man avoid drinking the water of the river but the water is essential for cultivation which is the main occupation for the villagers of this region. The water is also used in the industrial hubs. Ferry services are also navigable in this region of river. The water is used as irrigation purposes. With the help of the irrigation system, the cultivation can easily accessible.

x) Photographs of cross-structures in each stretch with description, location, Chainage, clearance and condition:-

The Two Kolkata-Guwahati RCC bridges are situated near at chainage of 47.893km and 47.926km. The Bridges are located near at Bandar Khowa village. The Bridge's location is (Lat. - 26°29'41.55"N, long. - 90°55'10.10"E), (Lat. - 26°29'41.80"N, Long. - 90°54'58.28"E). The Bridges have a good horizontal and vertical clearance. The Bridges can help the native passengers for a good communication and also good for the tourist's destination. The Bridges can help the transportation system easily.

The Rail Bridge is situated near at chainage of 48.266 km. The Bridge's location is Lat. - 26°29'53.83"N, Long. - 90°55'2.34"E. The Kolkata - Ghy Railway terminal is one of the important communication way for the inhabitants of Assam and also good for the Tourist. The Rail Bridge is located near at Shorbhog village. The Bridge has a good horizontal and vertical height. The Damage Rail Bridge is also situated near at chainage of 48.318km.

The RCC Bridge is situated near at chainage of 55.774km. The Bridge's location is Lat.-26°29'52.21" N, Long.-90°55'10.41"E. The Bridge is located at Bhetomare Tup village. The Bridge has a good horizontal and vertical height.

Section 4: Terminals

There is no existing terminal found in this region of river.

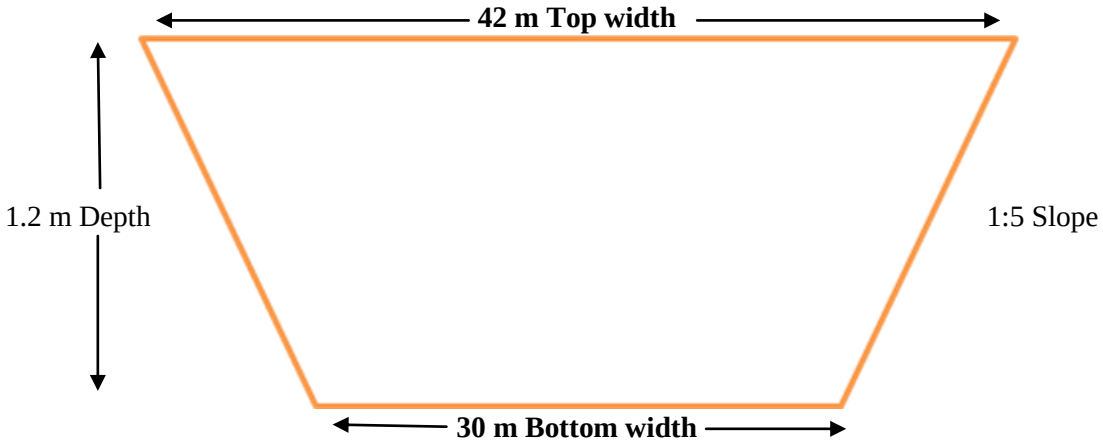
4.1 Details of Land use, owner etc.:-

The both sides bank of the River Beki used for cultivation. The Farmers are cultivated their crops with using this fertile land and grows a huge amount of crops every year. Besides, some portions of the land are surrounded by small industries and Forests. Though bolder pitching is found in some places, But in Recent times, the bank of the river has been worn away in some places for lack of trees. Sometimes, the land of the river has been changed into a heap of garbage. As a result, the river side becomes polluted land. In the Monsoon period, Flood and erosion has been affected both side of the river bank.

Section 5: Fairway development:-

Dredging sections, summary of depths and dredging quantity for different classification of waterways (stretch-wise)

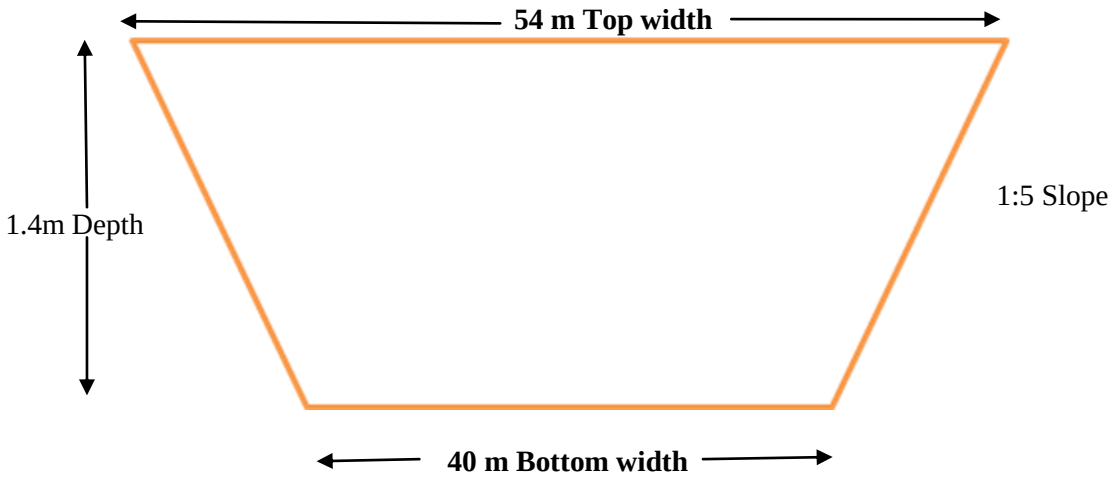
Class-I: - (Channel design: - Bottom width- 30 meter, Top width- 42 meter)



Location		Chainage (km)		Depth (m)		As per Observed Soundings				As per Reduced Soundings					
From	To	From	To	Min. depth (m)	Max.depth (m)	Length of Shoal (m)	Avg. Depth of Cut (m)	Dredging Qty. (Cubic meter)	Cumulative Dredging Qty. (Cubic meter)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Avg. Depth of Cut (m)	Dredging Qty. (Cubic meter)	Cumulative Dredging Qty. (Cubic meter)
Joypur pathar Village	Balkuri Village	0.00	10.00	0.4	4.4	4000	0.34	44296.15	44296.15	-0.3	4.0	10000	0.86	283362.98	283362.98
Shewrar Bhita Village	Tapajuli patha Village	10.00	20.00	0.1	9.2	7700	0.28	71128.35	115424.50	-0.3	8.1	10000	0.42	139675.19	423038.17
Rampur Village	Gunialguri Village	20.00	30.00	0.2	7.7	6650	0.31	67913.02	183337.52	-0.3	7.4	8100	0.35	95476.09	518514.26
Gunialguri Village	Khatakuchi Village	30.00	40.00	0.5	5.1	10000	0.49	162930.82	346268.34	-0.3	4.2	10000	0.58	191834.62	710348.88
Katokibari Village	Kayasta Village	40.00	50.00	0.2	5.6	10000	0.47	157307.28	503575.62	-0.3	3.9	10000	0.64	212042.57	922391.45
Bhetomare Tup Village	Udalguri Village	50.00	60.00	0.01	3.7	9750	0.23	72360.76	575936.38	-0.3	3.0	10000	0.96	317711.55	1240103.00
Udalguri Village	Jyoti Gaon Village	60.00	68.90	0.01	0.3	9000	1.06	317377.29	893313.67	-0.3	0	9000	1.53	456606.50	1696709.50
Total						57100		893313.67		Total		67100		1696709.50	

Table 13- Dredging quantity in class-I

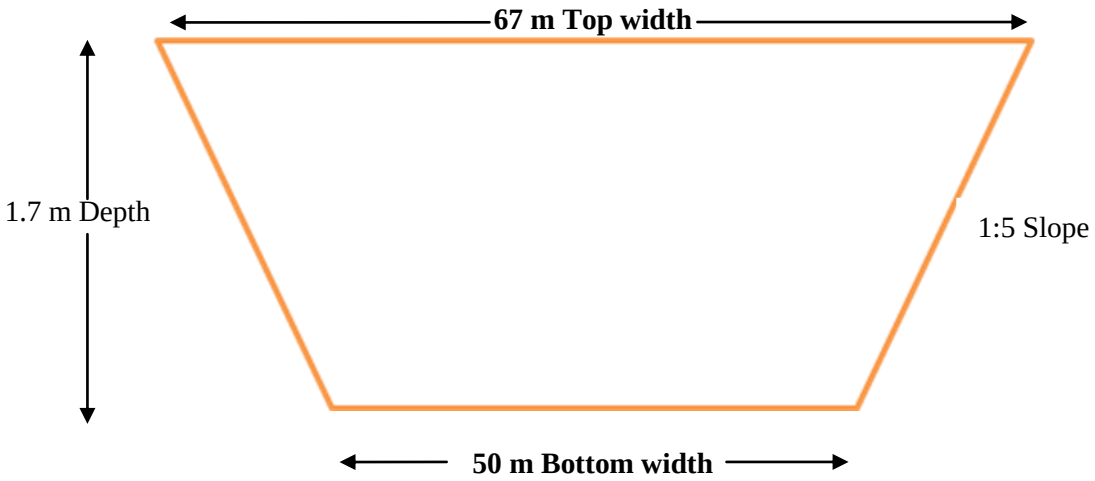
Class-II: - (Channel design: - Bottom width- 40 meter, Top width- 54 meter)



Location		Chainage (km)		As per Observed Soundings						As per Reduced Soundings					
From	To	From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Avg. Depth of Cut (m)	Dredging Qty. (Cubic meter)	Cumulative Dredging Qty. (Cubic meter)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Avg. Depth of Cut (m)	Dredging Qty. (Cubic meter)	Cumulative Dredging Qty. (Cubic meter)
Joypur pathar Village	Balkuri Village	0.00	10.00	0.2	4.4	10000	0.43	189408.88	189408.88	-0.3	4.1	10000	1.02	449659.05	449659.05
Shewrar Bhita Village	Tapajuli patha Village	10.00	20.00	0.1	9.2	9100	0.34	138087.99	327496.87	-0.4	8.1	10000	1.65	728147.65	1177806.70
Rampur Village	Gunialguri Village	20.00	30.00	0.2	7.7	9050	0.30	120463.55	447960.42	-0.3	7.4	9100	0.38	153878.60	1331685.30
Gunialguri Village	Khatakuchi Village	30.00	40.00	0.2	5.1	10000	0.63	277256.88	725217.30	-0.3	4.2	10000	0.72	320874.50	1652559.80
Katokibari Village	Kayasta Village	40.00	50.00	0.1	5.8	10000	0.62	274474.80	999692.10	-0.3	3.9	10000	0.78	344619.50	1997179.30
Bhetomare Tup Village	Udalguri Village	50.00	60.00	0.01	3.7	9600	0.36	155275.30	1154967.40	-0.3	3.0	10000	1.15	506675.70	2503855.00
Udalguri Village	Jyoti Gaon Village	60.00	68.90	0.01	0.5	9000	1.12	472144.20	1627111.60	-0.3	0	9000	1.67	663368.60	3167223.60
Total						66750		1627111.60		Total		68100		3167223.60	

Table 14- Dredging quantity in class-II

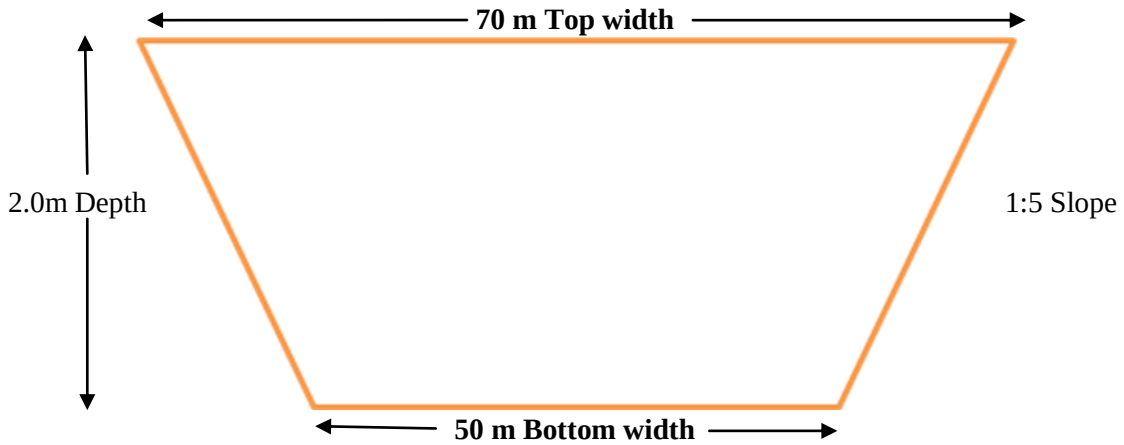
Class-III: - (Channel design: - Bottom width- 50 meter, Top width- 67 meter)



Location		Chainage (km)		As per Observed Soundings						As per Reduced Soundings					
From	To	From	To	Min. depth (m)	Max depth (m)	Length of Shoal (m)	Avg. Depth of Cut (m)	Dredging Qty. (Cubic meter)	Cumulative Dredging Qty. (Cubic meter)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Avg. Depth of Cut (m)	Dredging Qty. (Cubic meter)	Cumulative Dredging Qty. (Cubic meter)
Joypur pathar Village	Balkuri Village	0.00	10.00	0.1	4.4	10000	0.65	360159.92	360159.92	-0.3	4.1	10000	1.30	717826.21	717826.21
Shewrar Bhita Village	Tapajulipatha Village	10.00	20.00	0.1	9.2	10000	0.48	264753.15	624913.07	-0.3	8.1	10000	0.79	437905.09	1155731.3
Rampur Village	Gunialguri Village	20.00	30.00	0.1	7.7	10000	0.43	240540.15	865453.22	-0.3	7.4	10000	0.57	314838.34	1470569.64
Gunialguri Village	Khatakuchi Village	30.00	40.00	0.1	5.1	10000	0.87	482768.39	1348221.6	-0.3	4.2	10000	0.95	527619.38	1998189.02
Katokibari Village	Kayasta Village	40.00	50.00	0.1	5.8	10000	0.85	468875.86	1817097.5	-0.3	3.9	10000	1.09	603724.43	2601913.45
Bhetomare Tup Village	Udalguri Village	50.00	60.00	0.01	3.7	10000	0.54	301856.93	2118954.4	-0.3	3.0	10000	1.41	776265.84	3378179.29
Udalguri Village	Jyoti Gaon Village	60.00	68.9	0.01	0.5	9000	1.63	808950.04	2927904.44	-0.3	0	9000	2.10	1044102.24	4422281.53
Total						69000		2927904.44		Total		69000		4422281.53	

Table 15- Dredging quantity in class-III

Class-IV: - - (Channel design: - Bottom width- 50 meter, Top width- 70 meter)



Location		Chainage (km)		As per Observed Soundings						As per Reduced Soundings					
From	To	From	To	Min. depth (m)	Max depth (m)	Length of Shoal (m)	Avg. Depth of Cut (m)	Dredging Qty. (Cubic meter)	Cumulative Dredging Qty. (Cubic meter)	Min. Depth (m)	Max.Depth (m)	Length of Shoal (m)	Avg. Depth of Cut (m)	Dredging Qty. (Cubic meter)	Cumulative Dredging Qty. (Cubic meter)
Joypur pathar Village	Balkuri Village	0.00	10.00	0.1	4.4	10000	0.58	320884.7	320884.7	-0.3	4.1	10000	1.12	614644.22	614644.22
Shewrar Bhita Village	Tapajuli patha Village	10.00	20.00	0.1	9.2	10000	0.40	219994.45	540879.15	-0.3	8.1	10000	0.57	311724.96	926369.18
Rampur Village	Gunialguri Village	20.00	30.00	0.1	7.7	10000	0.32	178721.75	719600.9	-0.3	7.4	10000	0.37	205865.32	1132234.5
Gunialguri Village	Khatakuchi Village	30.00	40.00	0.1	5.1	10000	0.60	329020.7	1048621.6	-0.3	4.2	10000	0.56	306354.2	1438588.7
Katokibari Village	Kayasta Village	40.00	50.00	0.1	5.8	10000	0.65	357563.8	1406185.4	-0.3	3.9	10000	0.68	373601.1	1812189.8
Bhetomare Tup Village	Udalguri Village	50.00	60.00	0.01	3.7	10000	0.40	222065.5	1628250.9	-0.3	3.0	10000	0.91	503218.9	2315408.7
Udalguri Village	Jyoti Gaon Village	60.00	68.9	0.01	0.5	9000	4.55	2252789.64	3881040.54	-0.3	0	9000	6.29	3117670.75	5433079.45
Total						69000		3881040.54		Total		69000		5433079.45	

Table 16- Dredging quantity in class- IV

Section 6: Conclusion

The Survey stretch of Beki River is 68.9 km, originates from Himalayan glacier. Beki River is also known as Kurissu River in Bhutan. As much as two major ferry services are available in this zone of river. The waterway of the Beki River includes with many villages, Rail and Road, Ferry Ghat, Jetty etc. Railway Bridge (Kolkata- Guwahati) is crossing over the river which is very communicative for the native villagers and the foreigners. Three RCC bridges are situated in this zone of river. During the period of the survey we found the water level of the river is average range for the Hydro graphic survey. For this reason the river is affected by the sand char in the way of the river and flown by some channels and get narrower in some places. Tourists can have beautiful view of the river and its natural surroundings from the bridges situated on NH no- 31. Barpeta, Sorbhog, Bander khowa etc. places are situated in this zone. NH-31 is the major communicative way in Assam and other states for communication system and good transportation.

There are six bridges including RCC Bridge, Rail Bridge, Damage Bridges situated in this zone of river. Three RCC Bridges have been situated near at chainage of 47.893km, 47.926km and 55.774km. The Kolkata-Guwahati Rail Bridge is situated near at chainage of 48.266km. The bridges have a good Vertical and Horizontal clearance for development of the water ways. One damage RCC Bridge is also found near at chainage of 25.506km. Five High Tension Lines are also located near at chainage of 47.995km, 48.017km, 48.095km, 48.151km and 48.224km. RCC Bridges and Rail Bridge are really helpful to the local people and also for the tourists for a smart communication. As a result, the region becomes developed which is the major impact in recent times.

6.1 Dredging Summary:-

Class Details	As per Observed soundings (Cubic meter)	As per Reduced soundings (Cubic meter)
Class I	893313.67	1696709.50
Class II	1627111.60	3167223.60
Class III	2927904.44	4422281.53
Class IV	3881040.54	5433079.45

Annexure:-

Annexure-1:-Source and type of data collected from various agencies:-

The Chart Datum value and HFL values of Mathanguri Beki, Beki Road Bridge and Confluence of Brahmaputra have been provided by IWAI office.

Annexure-2:-Min. / max. Depth, length of shoal per km-wise for different classification in the designed dredged channel:-

Class-I:-

Chainage (km)		As per Observed Soundings					As per Reduced Soundings				
From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (Cubic meter)	Cumulative Dredging Qty (Cubic meter)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Cumulative Dredging Qty (Cubic meter)
0	1	0.5	3	1000	8407.34	8407.34	-0.3	1.5	1000	44100.34	44100.34
1	2	0.5	3	1000	20496.87	28904.21	-0.3	1.5	1000	53452.74	97553.08
2	3	0.4	3.2	1000	12934.19	41838.4	-0.3	2.7	1000	11861.56	109414.64
3	4	1.2	3.2	0	0	41838.4	-0.3	2.7	1000	44016.9	153431.54
4	5	1.2	4.2	0	0	41838.4	-0.3	3.9	1000	15710.62	169142.16
5	6	0.5	4.2	1000	2457.75	44296.15	-0.3	3.2	1000	24319.94	193462.1
6	7	1.3	2.4	0	0	44296.15	-0.3	2.2	1000	27905.48	221367.58
7	8	1.3	3.2	0	0	44296.15	-0.5	3.2	1000	29270.54	250638.12
8	9	1.3	3.3	0	0	44296.15	-0.5	3.3	1000	17692.6	268330.72
9	10	1.2	4.4	0	0	44296.15	0.5	4	1000	15032.26	283362.98
10	11	0.3	6.9	1000	1818.28	46114.43	0.3	4.2	1000	15156.46	298519.44
11	12	0.1	3.6	1000	1931.14	48045.57	-0.2	2.7	1000	11483.47	310002.91
12	13	0.2	9.2	200	219.08	48264.65	-0.2	8.1	1000	7761.81	317764.72
13	14	0.1	3.2	1000	4922.4	53187.05	0.2	3	1000	3531.89	321296.61
14	15	0.3	4.9	1000	7414.65	60601.7	0.7	2.5	1000	21088.06	342384.67
15	16	0.3	8.1	1000	23489.78	84091.48	-0.3	4.7	1000	42677.36	385062.03
16	17	0.4	4	1000	18188.87	102280.35	0.5	3.2	1000	17610.94	402672.97
17	18	0.2	3.1	1000	12638.63	114918.98	0.1	2.9	1000	18573.13	421246.1
18	19	1.1	3.7	500	505.52	115424.5	0.7	3.7	1000	1614.64	422860.74
19	20	1.2	3.5	0	0	115424.5	0.5	3.5	1000	177.43	423038.17
20	21	0.5	4.2	1000	15979.59	131404.09	0.5	4.2	1000	29634.29	452672.46

Chainage (km)		As per Observed Soundings					As per Reduced Soundings				
From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (Cubic meter)	Cumulative Dredging Qty (Cubic meter)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Cumulative Dredging Qty (Cubic meter)
21	22	0.2	3.4	1000	9918.58	141322.67	-0.2	3.2	1000	12137.86	464810.32
22	23	1.2	6.1	0	0	141322.67	0.9	3.3	1000	1637.36	466447.68
23	24	0.5	6.1	100	5.2	141327.87	0.3	3.5	100	9.17	466456.85
24	25	0.35	5.4	1000	12581.56	153909.43	0.3	4.1	1000	19831.99	486288.84
25	26	0.6	3.6	1000	10702.79	164612.22	0.3	3.2	1000	6566.52	492855.36
26	27	1.2	7.7	0	0	164612.22	1.2	7.4	0	0	492855.36
27	28	0.6	7.7	1000	8625.18	173237.4	0.2	7.4	1000	18132.31	510987.67
28	29	0.5	4.1	1000	9478.15	182715.55	0.2	3.8	1000	1968.35	512956.02
29	30	0.5	2.9	550	621.97	183337.52	-0.3	2.7	1000	5558.24	518514.26
30	31	0.5	3.5	1000	27011.93	210349.45	-0.3	2.9	1000	43337.08	561851.34
31	32	0.5	5.1	1000	17110.38	227459.83	0.3	2.5	1000	12130.83	573982.17
32	33	0.5	5.1	1000	12072.46	239532.29	0.3	2.5	1000	31119.12	605101.29
33	34	0.5	2.9	1000	37538.69	277070.98	0.3	1.8	1000	27577.53	632678.82
34	35	0.5	4.2	1000	2563.66	279634.64	0.3	4.2	1000	3117.67	635796.49
35	36	0.5	4.6	1000	8041.65	287676.29	0.2	3.3	1000	16142.5	651938.99
36	37	0.5	4.9	1000	23925.22	311601.51	0.3	3.5	1000	22669.07	674608.06
37	38	0.5	5	1000	6145.31	317746.82	0.3	3.1	1000	9265.36	683873.42
38	39	0.5	4.1	1000	23257.99	341004.81	0.3	2.9	1000	20825.54	704698.96
39	40	0.5	4.3	1000	5263.53	346268.34	0.3	4	1000	5649.92	710348.88
40	41	0.5	5.6	1000	9453.98	355722.32	0.3	3.9	1000	10358.13	720707.01
41	42	0.5	5.6	1000	17387.5	373109.82	0.3	3.5	1000	15512.8	736219.81
42	43	0.5	5.6	1000	14086.81	387196.63	0.3	3.5	1000	22032.48	758252.29
43	44	0.5	3.4	1000	7896.48	395093.11	0.3	3.2	1000	4198.43	762450.72
44	45	0.3	2.4	1000	16674.18	411767.29	-0.3	2.3	1000	21269.25	783719.97
45	46	0.5	2.7	1000	11424.84	423192.13	-0.3	2.2	1000	26544.25	810264.22
46	47	0.5	4.1	1000	18305.07	441497.2	-0.3	2.2	1000	21486.09	831750.31
47	48	0.5	3.6	1000	16044.31	457541.51	-0.3	2.5	1000	13427.71	845178.02
48	49	0.2	4.7	1000	23283.15	480824.66	-0.3	3	1000	39890.57	885068.59
49	50	0.5	4.6	1000	22750.96	503575.62	-0.3	2.5	1000	37322.86	922391.45
50	51	0.5	3.1	1000	8439.1	512014.72	-0.3	3	1000	37618.61	960010.06
51	52	0.5	3	1000	5281.98	517296.7	-0.3	2.9	1000	24895.07	984905.13
52	53	0.7	3.7	1000	3138.69	520435.39	-0.3	2.9	1000	12060.17	996965.3

Chainage (km)		As per Observed Soundings					As per Reduced Soundings				
From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (Cubic meter)	Cumulative Dredging Qty (Cubic meter)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Cumulative Dredging Qty (Cubic meter)
53	54	0.01	0.3	1000	1695.06	522130.45	-0.3	0	1000	21141.11	1018106.4
54	55	0.01	0.3	1000	8160.21	530290.66	-0.3	0	1000	30180.14	1048286.6
55	56	0.01	0.3	1000	8727.05	539017.71	-0.3	0	1000	41115.5	1089402.1
56	57	0.02	0.3	1000	11127.14	550144.85	-0.3	0	1000	34693.88	1124095.9
57	58	0.01	0.3	1000	19009.13	569153.98	-0.3	0	1000	57582.9	1181678.8
58	59	0.01	0.2	1000	5944.2	575098.18	-0.3	0	1000	42986.94	1224665.8
59	60	0.02	0.3	750	838.2	575936.38	-0.3	0	1000	15437.19	1240103
60	61	0.01	0.3	1000	1549.64	577486.02	-0.3	0	1000	20560.31	1260663.3
61	62	0.02	0.3	1000	17305.61	594791.63	-0.3	0	1000	50920.67	1311583.9
62	63	0.01	0.3	1000	42906.95	637698.58	-0.3	0	1000	55071.9	1366655.8
63	64	0.02	0.2	1000	42126.64	679825.22	-0.3	0	1000	54959.58	1421615.4
64	65	0.01	0.3	1000	43063.67	722888.89	-0.3	0	1000	55798.38	1477413.8
65	66	0.01	0.3	1000	42465.05	765353.94	-0.3	0	1000	54838.56	1532252.4
66	67	0.01	0.3	1000	42914.06	808268	-0.3	0	1000	54310.98	1586563.3
67	68	0.01	0.3	1000	42228.93	850496.93	-0.3	0	1000	55288.12	1641851.5
68	68.9	0.02	0.3	1000	42816.74	893313.67	-0.3	0	1000	54858.05	1696709.5
Total				57100	893313.67				67100	1696709.5	

Table 17- Minimum & Maximum depth per km wise (Class-I)

Class-II:-

Chainage (km)		As per Observed Soundings					As per Reduced Soundings				
From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (Cubic meter)	Cumulative Dredging Qty (Cubic meter)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Cumulative Dredging Qty (Cubic meter)
0	1	0.3	3.1	1000	15503.34	15503.34	-0.3	1.5	1000	64806.33	64806.33
1	2	0.2	3.1	1000	35412.48	50915.82	-0.3	1.5	1000	78941.75	143748.08
2	3	0.2	3.2	1000	28125.6	79041.42	-0.3	2.7	1000	21444.02	165192.1
3	4	0.4	3.2	1000	17522.26	96563.68	-0.3	2.7	1000	66577.72	231769.82
4	5	0.7	4.2	1000	27153.94	123717.62	-0.3	4.1	1000	27631.54	259401.36
5	6	0.5	4.2	1000	16537.76	140255.38	-0.3	3.2	1000	40429.47	299830.83
6	7	0.5	2.4	1000	4846.04	145101.42	-0.3	2.4	1000	44728.46	344559.29
7	8	0.9	3.2	1000	31459.42	176560.84	-0.3	3.2	1000	46669.58	391228.87
8	9	0.5	3.4	1000	5882.6	182443.44	-0.3	3.3	1000	31783.52	423012.39
9	10	0.5	4.4	1000	6965.44	189408.88	-0.3	4	1000	26646.66	449659.05
10	11	0.3	6.9	1000	11895.33	201304.21	0.2	4.2	1000	26274.15	475933.2
11	12	0.1	3.7	1000	4600.92	205905.13	-0.2	2.8	1000	22764.25	498697.45
12	13	0.2	9.2	1000	2118.99	208024.12	-0.2	8.1	1000	15160.48	513857.93
13	14	0.1	3.2	1000	10195.85	218219.97	0.1	3.2	1000	7764.58	521622.51
14	15	0.28	5.1	1000	12045.8	230265.77	0.2	2.5	1000	33339.59	554962.1
15	16	0.1	8.2	1000	39213.35	269479.12	-0.4	4.7	1000	64655.87	619617.97
16	17	0.3	4	1000	30251.82	299730.94	0.3	3.2	1000	30515.22	650133.19
17	18	0.1	3.2	1000	24670.65	324401.59	0.1	3.1	1000	32440.74	682573.93
18	19	0.9	3.7	1000	3087.08	327488.67	0.5	3.7	1000	7404.49	689978.42
19	20	1.1	3.6	100	8.2	327496.87	0.5	3.7	1000	487828.24	1177806.7
20	21	0.4	4.3	1000	26235.99	353732.86	-0.2	4.2	1000	23571.79	1201378.5
21	22	0.2	3.5	1000	19403.27	373136.13	-0.2	3.2	1000	23571.79	1224950.2
22	23	0.4	6.1	500	574.92	373711.05	0.3	3.4	1000	6249.24	1231199.5
23	24	0.4	6.1	1000	1110.38	374821.43	0.3	3.5	1000	24757.13	1255956.6
24	25	0.2	5.4	1000	12652.44	387473.87	0.2	4.1	1000	17190.98	1273147.6
25	26	0.5	3.6	1000	23756.18	411230.05	0.3	3.3	1000	17190.98	1290338.6
26	27	1	7.7	1000	1884.91	413114.96	1	7.4	100	2.31	1290340.9
27	28	0.5	7.7	1000	7987.76	421102.72	0.2	7.4	1000	26229.36	1316570.2
28	29	0.3	4.1	1000	26190.36	447293.08	0.2	3.8	1000	10875.99	1327446.2
29	30	0.3	2.9	550	667.34	447960.42	-0.3	2.7	1000	4239.07	1331685.3
30	31	0.4	3.5	1000	32698.44	480658.86	-0.3	3.1	1000	63895.15	1395580.5
31	32	0.3	5.1	1000	38334.36	518993.22	0.3	2.7	1000	26715.16	1422295.6
32	33	0.3	5.1	1000	16675.71	535668.93	0.3	2.5	1000	36053.24	1458348.9
33	34	0.3	2.9	1000	59028.15	594697.08	0.3	1.8	1000	58829.31	1517178.2
34	35	0.2	4.2	1000	13874.96	608572.04	0.3	4.2	1000	4976.87	1522155
35	36	0.48	4.6	1000	14262.98	622835.02	0.2	3.3	1000	24413.85	1546568.9

Chainage (km)		As per Observed Soundings					As per Reduced Soundings				
From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (Cubic meter)	Cumulative Dredging Qty (Cubic meter)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Cumulative Dredging Qty (Cubic meter)
36	37	0.3	5.1	1000	37881.76	660716.78	0.3	3.5	1000	44503.32	1591072.2
37	38	0.3	5.1	1000	19228.28	679945.06	0.3	3.1	1000	8923.98	1599996.2
38	39	0.3	4.2	1000	33602.91	713547.97	0.3	2.9	1000	41614.56	1641610.7
39	40	0.2	4.4	1000	11669.33	725217.3	0.2	4	1000	10949.02	1652559.8
40	41	0.4	5.8	1000	22890.85	748108.15	0.2	3.9	1000	17453.19	1670013
41	42	0.4	5.8	1000	27737.98	775846.13	0.3	3.5	1000	30763.88	1700776.8
42	43	0.3	5.6	1000	15935.23	791781.36	0.3	3.5	1000	34405.5	1735182.3
43	44	0.3	3.6	1000	26215.31	817996.67	0.3	3.2	1000	11969.92	1747152.3
44	45	0.2	2.4	1000	22503.63	840500.3	-0.3	2.4	1000	35575.59	1782727.8
45	46	0.58	2.8	1000	21228.39	861728.69	-0.3	2.2	1000	35748.83	1818476.7
46	47	0.3	4.3	1000	32556.69	894285.38	-0.3	2.2	1000	33244.55	1851721.2
47	48	0.3	3.6	1000	31054.55	925339.93	-0.3	2.5	1000	27611.65	1879332.9
48	49	0.1	5.1	1000	29112.57	954452.5	-0.3	3	1000	51528.28	1930861.2
49	50	0.3	4.7	1000	45239.6	999692.1	-0.3	2.5	1000	66318.19	1997179.3
50	51	0.4	3.1	1000	17981.54	1017673.6	-0.3	3	1000	55130.92	2052310.3
51	52	0.48	3	1000	15316.6	1032990.2	-0.3	2.9	1000	40539.16	2092849.4
52	53	0.6	3.7	1000	11039.32	1044029.6	-0.3	2.9	1000	29663.44	2122512.9
53	54	0.01	0.3	600	545.43	1044575	-0.3	0	1000	36894.62	2159407.5
54	55	0.01	0.3	1000	15136.33	1059711.3	-0.3	0	1000	45557.73	2204965.2
55	56	0.01	0.3	1000	19374.06	1079085.4	-0.3	0	1000	56330.39	2261295.6
56	57	0.01	0.3	1000	24429.03	1103514.4	-0.3	0	1000	51763.73	2313059.3
57	58	0.01	0.3	1000	28060.73	1131575.1	-0.3	0	1000	83756.44	2396815.8
58	59	0.01	0.2	1000	19102.42	1150677.6	-0.3	0	1000	68415.99	2465231.8
59	60	0.01	0.3	1000	4289.79	1154967.4	-0.3	0	1000	38623.23	2503855
60	61	0.01	0.3	1000	3457.91	1158425.3	-0.3	0	1000	36153.46	2540008.5
61	62	0.01	0.3	1000	13867.57	1172292.8	-0.3	0	1000	61124.08	2601132.5
62	63	0.01	0.3	1000	65353.37	1237646.2	-0.3	0	1000	81958.72	2683091.3
63	64	0.01	0.2	1000	64165.34	1301811.5	-0.3	0	1000	79725.22	2762816.5
64	65	0.01	0.3	1000	65592.83	1367404.4	-0.3	0	1000	81997.42	2844813.9
65	66	0.01	0.3	1000	65510.71	1432915.1	-0.3	0	1000	80605.73	2925419.6
66	67	0.01	0.3	1000	64955.69	1497870.8	-0.3	0	1000	79793.48	3005213.1
67	68	0.01	0.3	1000	63956.31	1561827.1	-0.3	0	1000	81254.97	3086468.1
68	68.9	0.01	0.5	1000	65284.51	1627111.6	-0.3	0	1000	80755.56	3167223.6
Total				66750	1627111.6				68100	3167223.6	

Table 18 - Minimum & Maximum depth per km wise (Class II)

Class-III:-

Chainage (km)		As per Observed Soundings					As per Reduced Soundings				
From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (Cubic meter)	Cumulative Dredging Qty (Cubic meter)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Cumulative Dredging Qty (Cubic meter)
0	1	0.1	3.1	1000	31015.42	31015.42	-0.3	1.5	1000	94483.44	94483.44
1	2	0.1	3.1	1000	61030.97	92046.39	-0.3	1.5	1000	115693.6	210177.04
2	3	0.2	3.2	1000	48368.55	140414.94	-0.3	2.7	1000	38800.21	248977.25
3	4	0.2	3.2	1000	32251.1	172666.04	-0.3	2.7	1000	99825.07	348802.32
4	5	0.6	4.2	1000	48962.89	221628.93	-0.3	4.1	1000	50269.59	399071.91
5	6	0.3	4.2	1000	30731.38	252360.31	-0.3	3.2	1000	67134.84	466206.75
6	7	0.3	2.4	1000	15825.96	268186.27	-0.3	2.4	1000	72285.53	538492.28
7	8	0.7	3.2	1000	56158.6	324344.87	-0.3	3.2	1000	74222	612714.28
8	9	0.49	3.4	1000	15304.98	339649.85	-0.3	3.3	1000	55909.04	668623.32
9	10	0.4	4.4	1000	20510.07	360159.92	0.2	4	1000	49202.89	717826.21
10	11	0.1	6.9	1000	24306.66	384466.58	0.2	4.2	1000	47389.43	765215.64
11	12	0.1	3.7	1000	11320.98	395787.56	-0.2	2.8	1000	43306.25	808521.89
12	13	0.1	9.2	1000	8968.42	404755.98	-0.2	8.1	1000	31751.09	840272.98
13	14	0.1	3.2	1000	21049.55	425805.53	0.1	3.2	1000	21951.69	862224.67
14	15	0.26	5.1	1000	20647.06	446452.59	0.2	2.5	1000	53734.44	915959.11
15	16	0.1	8.2	1000	65199.13	511651.72	-0.3	4.7	1000	97389.48	1013348.59
16	17	0.2	4	1000	50566.53	562218.25	0.2	3.2	1000	53954.76	1067303.35
17	18	0.1	3.2	1000	47249.06	609467.31	0.1	3.1	1000	56125.42	1123428.77
18	19	0.7	3.7	1000	11891.12	621358.43	0.5	3.7	1000	22005.12	1145433.89
19	20	0.9	3.6	1000	3554.64	624913.07	0.5	3.7	1000	10297.41	1155731.3
20	21	0.1	4.3	1000	43851.58	668764.65	-0.2	4.2	1000	76481.67	1232212.97
21	22	0.2	3.5	1000	39928.45	708693.1	-0.2	3.2	1000	44800.82	1277013.79
22	23	0.39	6.1	1000	6618.61	715311.71	0.3	3.4	1000	18486.4	1295500.19
23	24	0.39	6.1	1000	7976.25	723287.96	0.2	3.5	1000	6799.56	1302299.75
24	25	0.29	5.4	1000	22995.04	746283	0.2	4.1	1000	42993.54	1345293.29
25	26	0.4	3.6	1000	45618.72	791901.72	0.3	3.3	1000	32141.2	1377434.49
26	27	0.8	7.7	1000	4680.68	796582.4	0.5	7.4	1000	4194.22	1381628.71
27	28	0.4	7.7	1000	19530.04	816112.44	0.2	7.4	1000	45688.9	1427317.61
28	29	0.1	4.1	1000	47600.84	863713.28	0.1	3.8	1000	21721.82	1449039.43
29	30	0.1	2.9	1000	1739.94	865453.22	-0.3	2.7	1000	21530.21	1470569.64
30	31	0.2	3.5	1000	54814.08	920267.3	-0.3	3.1	1000	85307.04	1555876.68
31	32	0.1	5.1	1000	63643.72	983911.02	0.3	2.7	1000	47511.81	1603388.49
32	33	0.1	5.1	1000	33362.02	1017273.04	0.3	2.5	1000	59361.84	1662750.33
33	34	0.1	2.9	1000	90930.85	1108203.89	0.1	1.8	1000	90153.84	1752904.17
34	35	0.1	4.2	1000	29933.52	1138137.41	0.1	4.2	1000	17956.48	1770860.65

Chainage (km)		As per Observed Soundings					As per Reduced Soundings				
From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (Cubic meter)	Cumulative Dredging Qty (Cubic meter)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Cumulative Dredging Qty (Cubic meter)
35	36	0.46	4.6	1000	31607.82	1169745.23	0.2	3.3	1000	45738.73	1816599.38
36	37	0.1	5.1	1000	64314.54	1234059.77	0.1	3.5	1000	72823.43	1889422.81
37	38	0.1	5.1	1000	36761.8	1270821.57	0.1	3.1	1000	18679.48	1908102.29
38	39	0.1	4.2	1000	53347.57	1324169.14	0.1	2.9	1000	63865.68	1971967.97
39	40	0.1	4.4	1000	24052.47	1348221.61	0.1	4	1000	26221.05	1998189.02
40	41	0.3	5.8	1000	44531.64	1392753.25	0.1	3.9	1000	37290.65	2035479.67
41	42	0.3	5.8	1000	50324.49	1443077.74	0.3	3.5	1000	49952.21	2085431.88
42	43	0.1	5.6	1000	27641.95	1470719.69	0.1	3.5	1000	54722.66	2140154.54
43	44	0.1	3.6	1000	48832.09	1519551.78	0.1	3.2	1000	28865.58	2169020.12
44	45	0.2	2.4	1000	41101.68	1560653.46	-0.3	2.4	1000	59591.62	2228611.74
45	46	0.5	2.8	1000	42237.33	1602890.79	-0.3	2.2	1000	59800.63	2288412.37
46	47	0.1	4.3	1000	53419.12	1656309.91	-0.3	2.2	1000	48582.27	2336994.64
47	48	0.1	3.6	1000	51030.29	1707340.2	-0.3	2.5	1000	79706.7	2416701.34
48	49	0.1	5.1	1000	73626.82	1780967.02	-0.3	3	1000	99563.94	2516265.28
49	50	0.1	4.7	1000	36130.45	1817097.47	-0.3	2.5	1000	85648.17	2601913.45
50	51	0.3	3.1	1000	36130.45	1853227.92	-0.3	3	1000	68198.49	2670111.94
51	52	0.4	3	1000	28111.5	1881339.42	-0.3	2.9	1000	51412.68	2721524.62
52	53	0.5	3.7	1000	8165.99	1889505.41	-0.3	2.9	1000	62747.93	2784272.55
53	54	0.01	0.3	1000	31458.96	1920964.37	-0.3	0	1000	73877.81	2858150.36
54	55	0.01	0.3	1000	40036.97	1961001.34	-0.3	0	1000	87602.3	2945752.66
55	56	0.01	0.3	1000	45519.2	2006520.54	-0.3	0	1000	80680.4	3026433.06
56	57	0.01	0.3	1000	49267.37	2055787.91	-0.3	0	1000	121081.8	3147514.86
57	58	0.01	0.3	1000	39801.63	2095589.54	-0.3	0	1000	102126.6	3249641.46
58	59	0.01	0.2	1000	15374.93	2110964.47	-0.3	0	1000	65673.86	3315315.32
59	60	0.01	0.3	1000	7989.93	2118954.4	-0.3	0	1000	62863.97	3378179.29
60	61	0.01	0.3	1000	22995.67	2141950.07	-0.3	0	1000	92999.34	3471178.63
61	62	0.01	0.3	1000	98775.61	2240725.68	-0.3	0	1000	119490.4	3590669.03
62	63	0.01	0.3	1000	96978.7	2337704.38	-0.3	0	1000	116234.8	3706903.83
63	64	0.01	0.2	1000	99137.2	2436841.58	-0.3	0	1000	119545.1	3826448.93
64	65	0.01	0.3	1000	99012.84	2535854.42	-0.3	0	1000	117516.7	3943965.63
65	66	0.01	0.3	1000	98174.28	2634028.7	-0.3	0	1000	116333.1	4060298.73
66	67	0.01	0.3	1000	96663.42	2730692.12	-0.3	0	1000	118464.2	4178762.93
67	68	0.01	0.3	1000	98671.13	2829363.25	-0.3	0	1000	117735.4	4296498.33
68	68.9	0.01	0.5	1000	98541.19	2927904.44	-0.3	0	1000	125783.2	4422281.53
Total				68000	2927904.44				68000	4422281.53	

Table 19 - Minimum & Maximum depth per km wise (Class III)

Class - IV:-

Chainage (km)		As per Observed Soundings					As per Reduced Soundings				
From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (Cubic meter)	Cumulative Dredging Qty (Cubic meter)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Cumulative Dredging Qty (Cubic meter)
0	1	0.1	3.1	1000	44920.96	44920.96	-0.3	1.5	1000	111437.04	111437.04
1	2	0.1	3.1	1000	79820.81	124741.77	-0.3	1.5	1000	136873.64	248310.68
2	3	0.2	3.2	1000	63965.16	63965.16	-0.3	2.7	1000	52289.1	52289.1
3	4	0.2	3.2	1000	43950.41	168692.18	-0.3	2.7	1000	120237.06	368547.74
4	5	0.5	4.2	1000	65290.73	129255.89	-0.3	4.1	1000	67972.94	120262.04
5	6	0.1	4.2	1000	43941.04	212633.22	-0.3	3.2	1000	85783.29	454331.03
6	7	0.1	2.4	1000	28892.86	158148.75	-0.3	2.4	1000	91025.24	211287.28
7	8	0.5	3.2	1000	74452.09	287085.31	-0.3	3.2	1000	93368.53	547699.56
8	9	0.3	3.4	1000	26927.04	185075.79	-0.3	3.3	1000	74071.96	285359.24
9	10	0.3	4.4	1000	33799.39	320884.7	0.2	4	1000	66944.66	614644.22
10	11	0.1	6.9	1000	34977.07	220052.86	0.1	4.2	1000	64948.29	350307.53
11	12	0.1	3.7	1000	22754.13	343638.83	-0.2	2.8	1000	60149.68	674793.9
12	13	0.1	9.2	1000	19884.88	239937.74	-0.2	8.1	1000	48041.62	398349.15
13	14	0.1	3.2	1000	33941.54	377580.37	0.1	3.2	1000	37284.34	712078.24
14	15	0.24	5.1	1000	31390.12	271327.86	0.2	2.5	1000	68208.84	466557.99
15	16	0.1	8.2	1000	83617.79	461198.16	-0.3	4.7	1000	117725.5	829803.74
16	17	0.1	4	1000	67222.62	338550.48	0.1	3.2	1000	71909.86	538467.85
17	18	0.1	3.2	1000	65282.64	526480.8	0.1	3.1	1000	73392.27	903196.01
18	19	0.5	3.7	1000	23268.14	361818.62	0.5	3.7	1000	36993.27	575461.12
19	20	0.7	3.6	1000	14398.35	540879.15	0.5	3.7	1000	23173.17	926369.18
20	21	0.1	4.3	1000	57132.45	418951.07	-0.2	4.2	1000	95399.32	670860.44
21	22	0.1	3.5	1000	57469.12	598348.27	-0.2	3.2	1000	62071.02	988440.2
22	23	0.38	6.1	1000	16557.34	435508.41	0.3	3.4	1000	31421.74	702282.18
23	24	0.3	6.1	1000	20677.1	619025.37	0.2	3.5	1000	18603.4	1007043.6
24	25	0.1	5.4	1000	33321.65	468830.06	0.2	4.1	1000	57004.56	759286.74
25	26	0.3	3.6	1000	63036.52	682061.89	0.3	3.3	1000	45558.37	1052602
26	27	0.6	7.7	1000	12364	481194.06	0.5	7.4	1000	14566.73	773853.47
27	28	0.3	7.7	1000	33440.59	715502.48	0.2	7.4	1000	61311.78	1113913.8
28	29	0.1	4.1	1000	64670.46	545864.52	0.1	3.8	1000	31874.51	805727.98
29	30	0.1	2.9	1000	4098.42	719600.9	-0.3	2.7	1000	18320.78	1132234.5
30	31	0.2	3.5	1000	72231.74	618096.26	-0.3	3.1	1000	116112.37	921840.35
31	32	0.1	5.1	1000	81480.07	801080.97	0.1	2.7	1000	63767.03	1196001.6
32	33	0.1	5.1	1000	49376.64	667472.9	0.1	2.5	1000	77250.27	999090.62
33	34	0.1	2.9	1000	111090.8	912171.77	0.1	1.8	1000	110075.58	1306077.1
34	35	0.1	4.2	1000	45210.22	712683.12	0.1	4.2	1000	32597.67	1031688.3
35	36	0.44	4.6	1000	47532.33	959704.1	0.2	3.3	1000	62256.92	1368334.1
36	37	0.1	5.1	1000	83075.72	795758.84	0.1	3.5	1000	92050.18	1123738.5

Chainage (km)		As per Observed Soundings					As per Reduced Soundings				
From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (Cubic meter)	Cumulative Dredging Qty (Cubic meter)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Cumulative Dredging Qty (Cubic meter)
37	38	0.2	5.1	1000	51743.13	1011447.2	0.1	3.1	1000	27992.36	1396326.4
38	39	0.1	4.2	1000	67015.98	862774.82	0.1	2.9	1000	78705.12	1202443.6
39	40	0.1	4.4	1000	37174.34	1048621.6	0.1	4	1000	42262.29	1438588.7
40	41	0.2	5.8	1000	62002.2	924777.02	0.1	3.9	1000	54383.03	1256826.6
41	42	0.2	5.8	1000	67885.9	1116507.5	0.3	3.5	1000	66416.31	1505005
42	43	0.1	5.6	1000	41389.57	966166.59	0.3	3.5	1000	70015.93	1326842.6
43	44	0.1	3.6	1000	66232.95	1182740.4	0.1	3.2	1000	44181.06	1549186.1
44	45	0.2	2.4	1000	56279.79	1022446.4	-0.3	2.4	1000	76837.38	1403679.9
45	46	0.4	2.8	1000	59442.01	1242182.4	-0.3	2.2	1000	77229.37	1626415.5
46	47	0.1	4.3	1000	67570.13	1090016.5	-0.3	2.2	1000	69394.43	1473074.4
47	48	0.1	3.6	1000	71105.07	1313287.5	-0.3	2.5	1000	65882.88	1692298.3
48	49	0.1	5.1	1000	68315.66	1158332.2	-0.3	3	1000	98763.28	1571837.6
49	50	0.1	4.7	1000	92897.91	1406185.4	-0.3	2.5	1000	119891.49	1812189.8
50	51	0.2	3.1	1000	52901.69	1211233.9	-0.3	3	1000	105432.16	1677269.8
51	52	0.3	3	1000	49451.77	1455637.2	-0.3	2.9	1000	87377.82	1899567.6
52	53	0.4	3.7	1000	43805.8	1255039.7	-0.3	2.9	1000	68399.28	1745669.1
53	54	0.01	0.3	1000	19068.71	1474705.9	-0.3	0	1000	81193.36	1980761
54	55	0.01	0.3	1000	47425.56	1302465.2	-0.3	0	1000	92957.69	1838626.8
55	56	0.01	0.3	1000	56314.62	1531020.5	-0.3	0	1000	107735.59	2088496.6
56	57	0.01	0.3	1000	63071.44	1365536.7	-0.3	0	1000	99696.72	1938323.5
57	58	0.01	0.3	1000	67120.4	1598140.9	-0.3	0	1000	142319.15	2230815.7
58	59	0.01	0.2	1000	57241.57	1422778.2	-0.3	0	1000	122555.31	2060878.8
59	60	0.01	0.5	1000	30110.01	1628250.9	-0.3	0	1000	84592.99	2315408.7
60	61	0.01	0.3	1000	13514.21	1436292.4	-0.3	0	1000	81873.07	2142751.9
61	62	0.01	0.3	1000	31960.64	1660211.6	-0.3	0	1000	112965.73	2428374.5
62	63	0.01	0.3	1000	119186.2	1555478.6	-0.3	0	1000	140930.41	2283682.3
63	64	0.01	0.2	1000	117019.4	1777231	-0.3	0	1000	137085.34	2565459.8
64	65	0.01	0.3	1000	119622.8	1675101.4	-0.3	0	1000	140996.37	2424678.7
65	66	0.01	0.3	1000	119472.8	1896703.8	-0.3	0	1000	138597.99	2704057.8
66	67	0.01	0.3	1000	118460.9	1793562.3	-0.3	0	1000	137194.93	2561873.6
67	68	0.01	0.3	1000	116635.2	2013339	-0.3	0	1000	139718.81	2843776.6
68	68.9	0.01	0.5	1000	119060.2	3881040.54	-0.3	0	1000	138866.31	5433079.45
Total				68000	3881040.54				68000	5433079.45	

Table 20- Minimum & Maximum depth per km wise (Class IV)

Annexure-3:-Observed depth at 200 meter interval:-

Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Observed		Observed		Observed		Observed	
	Min	Max	Min	Max	Min	Max	Min	Max
0	0.5	2.4	0.4	2.5	0.3	2.5	0.2	2.5
200	0.5	2.1	0.3	2.2	0.1	2.2	0.1	2.2
400	0.7	2.2	0.4	2.3	0.1	2.3	0.1	2.3
600	0.6	1.2	0.59	1.2	0.58	1.2	0.57	1.2
800	0.5	2.7	0.4	2.7	0.3	2.7	0.2	2.7
1000	0.5	3	0.3	3.1	0.1	3.1	0.1	3.1
1200	0.5	1.5	0.48	1.6	0.46	1.6	0.44	1.6
1400	0.5	1	0.4	1.2	0.3	1.2	0.2	1.2
1600	0.5	0.9	0.2	0.9	0.1	0.9	0.1	0.9
1800	0.5	1.7	0.4	1.8	0.3	1.8	0.2	1.8
2000	0.6	1.1	0.58	1.2	0.56	1.2	0.54	1.2
2200	0.7	1.5	0.6	1.5	0.5	1.5	0.4	1.5
2400	0.4	0.5	0.2	0.7	0.2	0.7	0.2	0.7
2600	0.6	1.6	0.5	1.6	0.4	1.6	0.3	1.6
2800	1.6	3	1.4	3.2	1.2	3.2	1	3.2
3000	1.7	3.2	1.4	3.2	1.1	3.2	0.8	3.2
3200	1.2	3.2	0.6	3.2	0.59	3.2	0.58	3.2
3400	1.3	1.9	0.4	2.1	0.38	2.1	0.36	2.1
3600	1.5	1.9	0.7	1.9	0.6	1.9	0.5	1.9
3800	2	2.8	0.4	2.8	0.2	2.8	0.2	2.8
4000	1.5	1.9	1	2.1	0.9	2.1	0.8	2.1
4200	1.6	1.7	1.4	1.8	1.39	1.8	1.38	1.8
4400	1.2	1.8	1	1.8	0.98	1.8	0.96	1.8
4600	1.3	3.6	0.7	3.6	0.6	3.6	0.5	3.6
4800	2.1	3.6	0.9	3.6	0.7	3.6	0.5	3.6
5000	1.3	4.2	0.9	4.2	0.8	4.2	0.7	4.2
5200	0.7	3.2	0.5	3.3	0.3	3.3	0.1	3.3
5400	1.1	1.1	1	1.2	0.9	1.2	0.8	1.2
5600	1.3	2.5	1.1	2.6	0.9	2.6	0.7	2.6
5800	0.5	2.6	0.5	3.1	0.49	3.1	0.48	3.1
6000	1.3	2.2	1.1	2.3	1.08	2.3	1.06	2.3
6200	2.1	1.6	0.6	1.7	0.5	1.7	0.4	1.7
6400	1.5	1.5	1.3	1.6	1.1	1.6	0.9	1.6
6600	1.7	1.7	0.9	1.8	0.8	1.8	0.7	1.8
6800	1.4	1.7	0.5	1.7	0.3	1.7	0.1	1.7
7000	2.1	2.4	1.4	2.4	1.3	2.4	1.2	2.4
7200	2	2.6	1.7	2.6	1.5	2.6	1.3	2.6
7400	2.2	2.4	2.1	2.5	2	2.5	1.9	2.5
7600	1.5	3.2	1.1	3.2	1.08	3.2	1.06	3.2

Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Observed		Observed		Observed		Observed	
	Min	Max	Min	Max	Min	Max	Min	Max
7800	1.8	2.5	1.2	2.6	1.1	2.6	1	2.6
8000	1.3	1.8	0.9	1.8	0.7	1.8	0.5	1.8
8200	2	2.3	0.5	2.3	0.49	2.3	0.48	2.3
8400	2.1	2.7	0.7	2.7	0.5	2.7	0.3	2.7
8600	2.2	2.6	1	2.7	0.9	2.7	0.8	2.7
8800	1.5	3.3	0.9	3.4	0.7	3.4	0.5	3.4
9000	1.8	3.2	1.2	3.3	0.9	3.3	0.6	3.3
9200	1.2	2.6	1	2.7	0.99	2.7	0.98	2.7
9400	1.2	4.4	1	4.4	0.9	4.4	0.8	4.4
9600	1.3	1.4	1.1	1.6	0.9	1.6	0.7	1.6
9800	1.5	3.7	1.1	3.8	1.08	3.8	1.06	3.8
10000	1.3	3.2	0.5	3.3	0.4	3.3	0.3	3.3
10200	0.5	3.2	0.3	3.3	0.2	3.3	0.2	3.3
10400	0.3	2.2	0.3	2.3	0.2	2.3	0.1	2.3
10600	1.2	3.6	1	3.8	0.98	3.8	0.96	3.8
10800	1.3	6.9	1.2	6.9	1.1	6.9	1	6.9
11000	1	2.4	0.3	2.5	0.1	2.5	0.1	2.5
11200	1	2.5	0.2	2.6	0.1	2.6	0.1	2.6
11400	0.2	1.5	0.2	1.7	0.2	1.7	0.1	1.7
11600	0.1	2.4	0.1	2.5	0.1	2.5	0.1	2.5
11800	0.1	2.8	0.1	2.8	0.09	2.8	0.08	2.8
12000	0.6	3.6	0.4	3.7	0.38	3.7	0.36	3.7
12200	1.1	4.1	1	4.2	0.9	4.2	0.8	4.2
12400	0.3	8.2	0.3	8.2	0.1	8.2	0.1	8.2
12600	1.3	9.2	1.2	9.2	1.1	9.2	1	9.2
12800	0.2	2	0.2	2.1	0.19	2.1	0.18	2.1
13000	1.2	2.2	1	2.3	0.98	2.3	0.96	2.3
13200	0.9	1.2	0.6	1.3	0.5	1.3	0.4	1.3
13400	0.1	1.1	0.1	1.2	0.1	1.2	0.1	1.2
13600	0.1	1.3	0.1	1.3	0.1	1.3	0.1	1.3
13800	1	3.2	1	3.2	0.8	3.2	0.6	3.2
14000	1.3	2.2	1.2	2.2	1.1	2.2	1	2.2
14200	1.6	2.4	1.3	2.4	1.1	2.4	0.9	2.4
14400	0.5	2.3	0.49	2.4	0.48	2.4	0.47	2.4
14600	0.3	4.9	0.28	5.1	0.26	5.1	0.24	5.1
14800	0.6	4.3	0.5	4.5	0.4	4.5	0.3	4.5
15000	1.4	4.5	1.2	4.7	1	4.7	0.8	4.7
15200	1	8.1	0.9	8.2	0.8	8.2	0.7	8.2
15400	2.5	4.3	2.3	4.5	2.1	4.5	1.9	4.5
15600	1	3.7	0.9	3.8	0.8	3.8	0.7	3.8
15800	0.3	7.4	0.1	7.5	0.1	7.5	0.1	7.5
16000	2.2	4	2.1	4	2	4	1.9	4

Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Observed		Observed		Observed		Observed	
	Min	Max	Min	Max	Min	Max	Min	Max
16200	1.1	3.7	1	3.7	0.9	3.7	0.8	3.7
16400	1.4	2.6	1.2	2.6	1	2.6	0.8	2.6
16600	1.4	3.5	1.3	3.6	1.2	3.6	1.1	3.6
16800	2.1	3.3	1.9	3.4	1.7	3.4	1.5	3.4
17000	0.4	2.5	0.3	2.6	0.2	2.6	0.1	2.6
17200	0.3	2.6	0.1	2.8	0.1	2.8	0.1	2.8
17400	0.7	2.5	0.69	2.6	0.68	2.6	0.67	2.6
17600	0.2	2.6	0.18	2.8	0.16	2.8	0.14	2.8
17800	0.6	3.1	0.5	3.2	0.4	3.2	0.3	3.2
18000	1.3	3.1	1.1	3.2	0.9	3.2	0.7	3.2
18200	1.9	2.5	1.8	2.5	1.7	2.5	1.6	2.5
18400	1.1	2.7	0.9	2.8	0.7	2.8	0.5	2.8
18600	2	3.7	1.9	3.7	1.8	3.7	1.7	3.7
18800	1.1	2.5	0.9	2.6	0.7	2.6	0.5	2.6
19000	1.2	3.4	1.1	3.5	1	3.5	0.9	3.5
19200	1.4	3.5	1.2	3.6	1.18	3.6	1.16	3.6
19400	1.5	2.6	1.4	2.7	1.3	2.7	1.2	2.7
19600	1.3	3.2	1.1	3.3	0.9	3.3	0.7	3.3
19800	1.4	2.9	1.39	3.1	1.38	3.1	1.37	3.1
20000	1.3	3.4	1.1	3.4	0.9	3.4	0.7	3.4
20200	1.7	2.7	1.6	2.8	1.5	2.8	1.4	2.8
20400	2.1	3.6	1.9	3.7	1.7	3.7	1.5	3.7
20600	0.7	4.2	0.4	4.3	0.1	4.3	0.1	4.3
20800	0.5	4.2	0.49	4.3	0.48	4.3	0.47	4.3
21000	0.5	1.9	0.4	2.1	0.3	2.1	0.2	2.1
21200	0.5	1.9	0.4	2.1	0.3	2.1	0.2	2.1
21400	0.2	3.4	0.2	3.5	0.2	3.5	0.1	3.5
21600	0.9	2.2	0.89	2.2	0.88	2.2	0.87	2.2
21800	1.2	2.2	1.18	2.2	1.16	2.2	1.14	2.2
22000	1.36	2.6	1.34	2.7	1.32	2.7	1.3	2.7
22200	1.9	2.9	1.8	2.9	1.7	2.9	1.6	2.9
22400	3.2	4.7	2.1	4.8	2	4.8	1.9	4.8
22600	1.3	6.1	1.18	6.1	0.98	6.1	0.78	6.1
22800	1.2	1.7	1.29	1.7	1.27	1.7	1.25	1.7
23000	1.3	1.5	0.4	1.6	0.39	1.6	0.38	1.6
23200	0.5	2.6	0.5	2.6	0.4	2.6	0.3	2.6
23400	1.1	6.1	1	6.1	0.9	6.1	0.8	6.1
23600	1.5	2	1.2	2	1.18	2	1.16	2
23800	1.4	1.7	1.2	1.7	1	1.7	0.8	1.7
24000	1.3	2.7	0.8	2.7	0.7	2.7	0.6	2.7
24200	1	3.2.	0.2	3.2.	0.1	3.2.	0.1	3.2.
24400	0.5	3.7	0.34	3.7	0.3	3.7	0.3	3.7

Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Observed		Observed		Observed		Observed	
	Min	Max	Min	Max	Min	Max	Min	Max
24600	0.35	3.5	0.3	3.5	0.29	3.5	0.28	3.5
24800	0.5	5.4	0.5	5.4	0.4	5.4	0.3	5.4
25000	0.6	3.5	0.5	3.5	0.4	3.5	0.3	3.5
25200	1.4	3.6	1.2	3.6	1	3.6	0.8	3.6
25400	1.4	3.5	0.58	3.5	0.57	3.5	0.56	3.5
25600	0.6	2.6	0.5	2.6	0.48	2.6	0.46	2.6
25800	1.7	2.7	1.3	2.7	1.28	2.7	1.26	2.7
26000	1.4	3.1	1.3	3.1	1.2	3.1	1.1	3.1
26200	1.5	3.2	1.4	3.2	1.3	3.2	1.2	3.2
26400	1.2	6.9	1	6.9	0.8	6.9	0.6	6.9
26600	1.7	5.6	1.68	5.6	1.66	5.6	1.64	5.6
26800	1.7	1.9	1.69	1.9	1.68	1.9	1.67	1.9
27000	2.7	7.7	2.6	7.7	2.5	7.7	2.4	7.7
27200	0.6	2.9	0.5	2.9	0.4	2.9	0.3	2.9
27400	0.6	2.2.	0.58	2.2.	0.56	2.2.	0.54	2.2.
27600	0.6	4.5	0.5	4.5	0.4	4.5	0.3	4.5
27800	1.6	4.2	1.4	4.2	1.2	4.2	1	4.2
28000	1.3	3.5	1.29	3.5	1.28	3.5	1.27	3.5
28200	0.5	4.1	0.48	4.1	0.46	4.1	0.44	4.1
28400	0.5	3.2	0.4	3.2	0.3	3.2	0.2	3.2
28600	0.5	4.1	0.3	4.1	0.1	4.1	0.1	4.1
28800	0.5	2.5	0.4	2.5	0.3	2.5	0.2	2.5
29000	0.5	2.7	0.3	2.7	0.1	2.7	0.1	2.7
29200	0.5	2.2	0.4	2.2	0.3	2.2	0.2	2.2
29400	1.1	2.9	0.9	2.9	0.7	2.9	0.5	2.9
29600	0.5	2.7	0.4	2.7	0.3	2.7	0.2	2.7
29800	1.6	2.3	1.5	2.3	1.4	2.3	1.3	2.3
30000	1.2	2.7	1	2.7	0.8	2.7	0.6	2.7
30200	1.5	3.5	1.4	3.5	1.3	3.5	1.2	3.5
30400	0.7	2.7	0.5	2.7	0.3	2.7	0.1	2.7
30600	0.5	3.5	0.4	3.5	0.3	3.5	0.2	3.5
30800	0.6	3	0.4	3	0.2	3	0.2	3
31000	0.6	3.1	0.59	3.1	0.58	3.1	0.57	3.1
31200	0.6	3	0.58	3	0.56	3	0.54	3
31400	0.7	3.2	0.6	3.2	0.5	3.2	0.4	3.2
31600	0.5	2..2	0.3	2..2	0.1	2..2	0.1	2..2
31800	0.7	5.1	0.6	5.1	0.5	5.1	0.4	5.1
32000	0.5	3.7	0.3	3.7	0.1	3.7	0.1	3.7
32200	0.5	2.1	0.4	2.1	0.3	2.1	0.2	2.1
32400	0.5	5.1	0.3	5.1	0.1	5.1	0.1	5.1
32600	0.5	1.4	0.4	1.4	0.3	1.4	0.2	1.4
32800	0.5	2.4	0.48	2.4	0.46	2.4	0.44	2.4

Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Observed		Observed		Observed		Observed	
	Min	Max	Min	Max	Min	Max	Min	Max
33000	0.5	1.2	0.4	1.2	0.3	1.2	0.2	1.2
33200	0.5	0.7	0.3	0.7	0.1	0.7	0.1	0.7
33400	0.5	2.4	0.49	2.4	0.48	2.4	0.47	2.4
33600	0.5	1.4	0.3	1.4	0.1	1.4	0.1	1.4
33800	0.5	2.2	0.4	2.2	0.3	2.2	0.2	2.2
34000	0.5	2.9	0.3	2.9	0.1	2.9	0.1	2.9
34200	0.5	3.7	0.2	3.7	0.1	3.7	0.1	3.7
34400	1	3.5	0.99	3.5	0.98	3.5	0.97	3.5
34600	1.6	2.1	1.5	2.1	1.4	2.1	1.3	2.1
34800	2	4.2	1.9	4.2	1.8	4.2	1.7	4.2
35000	1.5	3.6	1.3	3.6	1.1	3.6	0.9	3.6
35200	1.7	2.2	1.69	2.2	1.68	2.2	1.67	2.2
35400	2.1	4.6	2.08	4.6	2.06	4.6	2.04	4.6
35600	0.5	2.7	0.48	2.7	0.46	2.7	0.44	2.7
35800	2.1	4.6	2	4.6	1.9	4.6	1.8	4.6
36000	0.9	2.6	0.8	2.6	0.7	2.6	0.6	2.6
36200	0.5	3	0.3	3	0.1	3	0.1	3
36400	0.5	2.7	0.48	2.8	0.46	2.8	0.44	2.8
36600	0.9	2.6	0.89	2.7	0.88	2.7	0.87	2.7
36800	0.5	3.7	0.4	3.8	0.3	3.8	0.2	3.8
37000	0.5	4.9	0.4	5.1	0.3	5.1	0.2	5.1
37200	1.4	4.4	1.38	4.5	1.36	4.5	1.34	4.5
37400	0.5	3.7	0.3	3.7	0.1	3.7	0.1	3.7
37600	0.6	5	0.5	5.1	0.4	5.1	0.3	5.1
37800	1.5	4.5	1.3	4.7	1.1	4.7	0.9	4.7
38000	0.9	4.1	0.6	4.2	0.3	4.2	0.2	4.2
38200	0.5	3.2	0.4	3.3	0.3	3.3	0.2	3.3
38400	0.5	3.7	0.3	3.9	0.1	3.9	0.1	3.9
38600	1	3.3	0.99	3.4	0.98	3.4	0.97	3.4
38800	0.5	1.7	0.3	1.8	0.1	1.8	0.1	1.8
39000	0.6	2.3	0.5	2.4	0.4	2.4	0.3	2.4
39200	0.5	3.3	0.3	3.4	0.1	3.4	0.1	3.4
39400	0.5	3.7	0.2	3.7	0.1	3.7	0.1	3.7
39600	1.1	4.3	0.8	4.4	0.79	4.4	0.78	4.4
39800	0.9	2.6	0.4	2.7	0.3	2.7	0.2	2.7
40000	0.5	3.7	0.4	3.8	0.3	3.8	0.2	3.8
40200	1.9	3.6	1.7	3.6	1.5	3.6	1.3	3.6
40400	1.2	3.3	1.19	3.4	1.18	3.4	1.17	3.4
40600	0.5	2.6	0.48	2.8	0.46	2.8	0.44	2.8
40800	0.5	3.6	0.48	3.8	0.46	3.8	0.44	3.8
41000	0.6	5.6	0.5	5.8	0.4	5.8	0.3	5.8
41200	1	3.5	0.9	3.5	0.8	3.5	0.7	3.5

Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Observed		Observed		Observed		Observed	
	Min	Max	Min	Max	Min	Max	Min	Max
41400	1	2.3	0.8	2.5	0.6	2.5	0.4	2.5
41600	0.5	1.7	0.48	1.9	0.46	1.9	0.44	1.9
41800	1.5	3.9	1.49	3.9	1.48	3.9	1.47	3.9
42000	0.5	3.6	0.4	3.7	0.3	3.7	0.2	3.7
42200	1	1.6	0.9	1.8	0.8	1.8	0.7	1.8
42400	0.9	3.6	0.88	3.8	0.86	3.8	0.84	3.8
42600	0.5	5.6	0.3	5.6	0.1	5.6	0.1	5.6
42800	1	3.6	0.9	3.7	0.8	3.7	0.7	3.7
43000	0.5	3.4	0.3	3.6	0.1	3.6	0.1	3.6
43200	1	3.2	0.7	3.3	0.4	3.3	0.1	3.3
43400	0.6	2.6	0.59	2.6	0.58	2.6	0.57	2.6
43600	0.5	3.1	0.48	3.2	0.46	3.2	0.44	3.2
43800	0.9	2.1	0.8	2.2	0.7	2.2	0.6	2.2
44000	0.9	2.4	0.7	2.4	0.5	2.4	0.3	2.4
44200	0.7	2.3	0.6	2.4	0.5	2.4	0.4	2.4
44400	0.3	0.5	0.2	0.5	0.2	0.5	0.2	0.5
44600	0.5	2.4	0.4	2.4	0.3	2.4	0.2	2.4
44800	0.5	2.4	0.49	2.4	0.48	2.4	0.47	2.4
45000	0.6	1.7	0.58	1.7	0.56	1.7	0.54	1.7
45200	0.9	1.4	0.89	1.4	0.88	1.4	0.87	1.4
45600	0.7	1.6	0.6	1.6	0.5	1.6	0.4	1.6
45800	1.8	0.5	1.6	0.8	1.4	0.8	1.2	0.8
46000	0.9	2.7	0.89	2.8	0.88	2.8	0.87	2.8
46200	1.4	3.7	1.39	3.8	1.38	3.8	1.37	3.8
46400	0.5	4	0.48	4.2	0.46	4.2	0.44	4.2
46600	0.5	4.1	0.4	4.3	0.3	4.3	0.2	4.3
46800	0.5	2.7	0.3	2.7	0.1	2.7	0.1	2.7
47000	1	2.6	0.9	2.8	0.8	2.8	0.7	2.8
47200	0.5	2.6	0.3	2.6	0.1	2.6	0.1	2.6
47400	0.5	2.5	0.4	2.7	0.3	2.7	0.2	2.7
47600	0.6	3.6	0.59	3.6	0.58	3.6	0.57	3.6
47800	0.5	2.2	0.48	2.3	0.46	2.3	0.44	2.3
48000	1	3.2	0.99	3.2	0.98	3.2	0.97	3.2
48200	0.9	3.6	0.8	3.8	0.7	3.8	0.6	3.8
48400	0.5	1.7	0.3	2.1	0.1	2.1	0.1	2.1
48600	0.5	4.7	0.49	5.1	0.48	5.1	0.47	5.1
48800	0.2	1.47	0.1	2.3	0.1	2.3	0.1	2.3
49000	0.5	2	0.3	2	0.1	2	0.1	2
49200	1	3.3	0.99	3.4	0.98	3.4	0.97	3.4
49400	1	4.6	0.98	4.7	0.96	4.7	0.94	4.7
49600	0.5	2	0.48	2	0.46	2	0.44	2
49800	0.6	2.3	0.5	2.3	0.4	2.3	0.3	2.3

Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Observed		Observed		Observed		Observed	
	Min	Max	Min	Max	Min	Max	Min	Max
50000	0.5	2.6	0.4	2.6	0.3	2.6	0.2	2.6
50200	1.6	2.6	1.4	2.6	1.2	2.6	1	2.6
50400	0.5	3.1	0.48	3.1	0.46	3.1	0.44	3.1
50600	1	3	0.99	3	0.98	3	0.97	3
50800	0.5	1.7	0.4	1.7	0.3	1.7	0.2	1.7
51000	1	3	0.9	3	0.8	3	0.7	3
51200	0.5	2.3	0.48	2.3	0.46	2.3	0.44	2.3
51400	0.6	2.6	0.5	2.6	0.4	2.6	0.3	2.6
51600	1.4	2	1.2	2	1	2	0.8	2
51800	1.3	2.6	1.29	2.6	1.28	2.6	1.27	2.6
52000	1.1	2.7	1.08	2.7	1.06	2.7	1.04	2.7
52200	0.7	3.7	0.6	3.7	0.5	3.7	0.4	3.7
52400	1.4	2.4	1.2	2.4	1	2.4	0.8	2.4
52600	0.9	2.3	0.8	2.3	0.7	2.3	0.6	2.3
52800	1.6	2.5	1.4	2.5	1.2	2.5	1	2.5
53000	1.6	3	1.5	3	1.4	3	1.3	3
53200	2	2.4	1.8	2.4	1.6	2.4	1.4	2.4
53400	1	3	0.9	3	0.8	3	0.7	3
53600	0.9	1.7	0.8	1.7	0.7	1.7	0.6	1.7
53800	1.2	2.6	1	2.6	0.8	2.6	0.6	2.6
54000	0.01	0.1	0.01	0.1	0.01	0.1	0.01	0.1
54200	0.03	0.2	0.03	0.2	0.02	0.2	0.01	0.2
54400	0.05	0.1	0.05	0.1	0.03	0.1	0.02	0.1
54600	0.02	0.1	0.02	0.1	0.01	0.1	0.01	0.1
54800	0.03	0.2	0.03	0.2	0.02	0.2	0.01	0.2
55000	0.1	0.3	0.02	0.3	0.01	0.3	0.01	0.3
55200	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3
55400	0.2	0.3	0.2	0.3	0.1	0.3	0.1	0.3
55600	0.01	0.2	0.01	0.2	0.01	0.2	0.01	0.2
55800	0.02	0.2	0.02	0.2	0.01	0.2	0.01	0.2
56000	0.03	0.1	0.03	0.1	0.02	0.1	0.01	0.1
56200	0.02	0.2	0.02	0.2	0.01	0.2	0.01	0.2
56400	0.1	0.3	0.1	0.3	0.01	0.3	0.01	0.3
56600	0.03	0.2	0.02	0.2	0.02	0.2	0.01	0.2
56800	0.1	0.3	0.1	0.3	0.01	0.3	0.01	0.3
57000	0.02	0.3	0.01	0.3	0.01	0.3	0.01	0.3
57200	0.01	0.2	0.01	0.2	0.01	0.2	0.01	0.2
57400	0.02	0.2	0.01	0.2	0.01	0.2	0.01	0.2
57600	0.01	0.3	0.01	0.3	0.01	0.3	0.01	0.3
57800	0.02	0.2	0.01	0.2	0.01	0.2	0.01	0.2
58000	0.03	0.1	0.02	0.1	0.02	0.1	0.01	0.1
58200	0.05	0.1	0.02	0.1	0.01	0.1	0.01	0.1

Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Observed		Observed		Observed		Observed	
	Min	Max	Min	Max	Min	Max	Min	Max
58400	0.03	0.2	0.01	0.2	0.01	0.2	0.01	0.2
58600	0.02	0.2	0.01	0.2	0.01	0.2	0.01	0.2
58800	0.01	0.1	0.01	0.1	0.01	0.1	0.01	0.1
59000	0.1	0.2	0.1	0.2	0.01	0.2	0.01	0.2
59200	0.1	0.3	0.1	0.3	0.01	0.3	0.01	0.3
59400	0.03	0.1	0.01	0.1	0.01	0.1	0.01	0.1
59600	0.04	0.2	0.02	0.2	0.01	0.2	0.01	0.2
59800	0.02	0.1	0.01	0.1	0.01	0.1	0.01	0.1
60000	0.03	0.2	0.02	0.2	0.01	0.2	0.01	0.2
60200	0.1	0.2	0.1	0.2	0.02	0.2	0.01	0.2
60400	0.1	0.3	0.1	0.3	0.01	0.3	0.01	0.3
60600	0.03	0.01	0.01	0.01	0.01	0.01	0.01	0.01
60800	0.1	0.2	0.1	0.2	0.1	0.2	0.1	0.2
61000	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3
61200	0.02	0.1	0.01	0.1	0.01	0.1	0.01	0.1
61400	0.05	0.02	0.03	0.02	0.03	0.02	0.01	0.02
61600	0.03	0.1	0.01	0.1	0.01	0.1	0.01	0.1
61800	0.05	0.2	0.03	0.2	0.03	0.2	0.01	0.2
62000	0.1	0.2	0.1	0.2	0.1	0.2	0.1	0.2
62200	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3
62400	0.03	0.01	0.01	0.01	0.01	0.01	0.01	0.01
62600	0.02	0.1	0.01	0.1	0.01	0.1	0.01	0.1
62800	0.03	0.2	0.02	0.2	0.02	0.2	0.01	0.2
63000	0.05	0.1	0.01	0.1	0.01	0.1	0.01	0.1
63200	0.1	0.2	0.1	0.2	0.1	0.2	0.1	0.2
63400	0.02	0.1	0.01	0.1	0.01	0.1	0.01	0.1
63600	0.03	0.1	0.01	0.1	0.01	0.1	0.01	0.1
63800	0.03	0.1	0.01	0.1	0.01	0.1	0.01	0.1
64000	0.04	0.2	0.01	0.2	0.01	0.2	0.01	0.2
64200	0.05	0.1	0.01	0.1	0.01	0.1	0.01	0.1
64400	0.03	0.2	0.01	0.2	0.01	0.2	0.01	0.2
64600	0.1	0.3	0.1	0.3	0.01	0.3	0.01	0.3
64800	0.02	0.2	0.01	0.2	0.01	0.2	0.01	0.2
65000	0.01	0.3	0.01	0.3	0.01	0.3	0.01	0.3
65200	0.02	0.2	0.01	0.2	0.01	0.2	0.01	0.2
65400	0.03	0.1	0.01	0.1	0.01	0.1	0.01	0.1
65600	0.05	0.2	0.03	0.2	0.01	0.2	0.01	0.2
65800	0.02	0.1	0.01	0.1	0.01	0.1	0.01	0.1
66000	0.1	0.2	0.1	0.2	0.01	0.2	0.01	0.2
66200	0.1	0.3	0.1	0.3	0.01	0.3	0.01	0.3
66400	0.02	0.1	0.01	0.1	0.01	0.1	0.01	0.1
66600	0.03	0.2	0.01	0.2	0.01	0.2	0.01	0.2

Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Observed		Observed		Observed		Observed	
	Min	Max	Min	Max	Min	Max	Min	Max
66800	0.05	0.3	0.03	0.3	0.01	0.3	0.01	0.3
67000	0.01	0.1	0.01	0.1	0.01	0.1	0.01	0.1
67200	0.1	0.3	0.1	0.3	0.01	0.3	0.01	0.3
67400	0.2	0.3	0.2	0.3	0.01	0.3	0.01	0.3
67600	0.02	0.1	0.01	0.1	0.01	0.1	0.01	0.1
67800	0.03	0.1	0.01	0.1	0.01	0.1	0.01	0.1
68000	0.02	0.2	0.01	0.2	0.01	0.2	0.01	0.2
68200	0.03	0.1	0.02	0.1	0.01	0.1	0.01	0.1
68400	0.1	0.2	0.1	0.3	0.01	0.3	0.01	0.3
68600	0.1	0.3	0.1	0.5	0.01	0.5	0.01	0.5
68900	0.1	0.2	0.1	0.2	0.01	0.2	0.01	0.2

Table 21-Observed depth at 200 meter interval

Annexure-4:-Reduced Depth at 200 meter interval:-

Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Reduced		Reduced		Reduced		Reduced	
	Min	Max	Min	Max	Min	Max	Min	Max
0	0.7	1.4	0.4	1.5	0.4	1.5	0.4	1.5
200	-0.3	1.4	-0.3	1.5	-0.3	1.5	-0.3	1.5
400	0.8	1.5	0.6	1.5	0.6	1.5	0.6	1.5
600	-0.3	1	-0.3	1.2	-0.3	1.2	-0.3	1.2
800	-0.1	1	-0.1	1	-0.1	1	-0.1	1
1000	0.4	1	0.3	1.2	0.3	1.2	0.3	1.2
1200	0.7	1.4	0.5	1.4	0.5	1.4	0.5	1.4
1400	1	1.5	0.7	1.5	0.7	1.5	0.7	1.5
1600	1.2	1.4	1	1.4	1	1.4	1	1.4
1800	-0.3	0.9	-0.3	1.2	-0.3	1.2	-0.3	1.2
2000	0.5	1	0.3	1	0.3	1	0.3	1
2200	0.7	1	0.5	1.1	0.5	1.1	0.5	1.1
2400	-0.3	1	-0.3	1	-0.3	1	-0.3	1
2600	0.9	1.2	0.7	1.3	0.7	1.3	0.7	1.3
2800	1.4	1.7	1.2	1.7	1.2	1.7	1.2	1.7
3000	1.5	2.7	1.3	2.7	1.3	2.7	1.3	2.7
3200	0.5	2.3	0.3	2.4	0.3	2.4	0.3	2.4
3400	0.7	1.5	0.5	1.6	0.5	1.6	0.5	1.6
3600	0.9	1.9	0.7	2.1	0.7	2.1	0.7	2.1
3800	1	1.9	0.6	2.1	0.6	2.1	0.6	2.1
4000	-0.3	0.7	-0.3	0.9	-0.3	0.9	-0.3	0.9
4200	-0.3	1.1	-0.3	1.2	-0.3	1.2	-0.3	1.2
4400	0.4	1.5	0.3	1.6	0.3	1.6	0.3	1.6
4600	0.7	3.9	0.7	4.1	0.7	4.1	0.7	4.1
4800	0.4	2.3	0.4	2.5	0.4	2.5	0.4	2.5
5000	-0.3	3.2	-0.3	3.2	-0.3	3.2	-0.3	3.2
5200	0.5	2.7	0.3	2.7	0.3	2.7	0.3	2.7
5400	0.7	0.9	0.6	1.2	0.6	1.2	0.6	1.2
5600	0.5	1.9	0.5	2.1	0.5	2.1	0.5	2.1
5800	0.5	2.5	0.3	2.5	0.3	2.5	0.3	2.5
6000	0.4	2.1	0.4	2.1	0.4	2.1	0.4	2.1
6200	-0.3	1	-0.3	1.2	-0.3	1.2	-0.3	1.2
6400	-0.1	0.7	-0.1	0.9	-0.1	0.9	-0.1	0.9
6600	0.4	0.9	0.4	1.2	0.4	1.2	0.4	1.2
6800	0.4	2.3	0.4	2.4	0.4	2.4	0.4	2.4
7000	-0.3	2.2	-0.3	2.2	-0.3	2.2	-0.3	2.2
7200	-0.3	3.2	-0.3	3.2	-0.3	3.2	-0.3	3.2
7400	-0.2	2.2	-0.2	2.3	-0.2	2.3	-0.2	2.3
7600	0.4	3.2	0.3	3.2	0.3	3.2	0.3	3.2

Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Reduced		Reduced		Reduced		Reduced	
	Min	Max	Min	Max	Min	Max	Min	Max
7800	0.5	2.9	0.3	2.9	0.3	2.9	0.3	2.9
8000	0.7	2.1	0.5	2.2	0.5	2.2	0.5	2.2
8200	0.5	2.5	0.5	2.6	0.5	2.6	0.5	2.6
8400	0.9	2.9	0.6	3.1	0.6	3.1	0.6	3.1
8600	-0.3	3.2	-0.3	3.3	-0.3	3.3	-0.3	3.3
8800	-0.3	3.3	-0.3	3.3	-0.3	3.3	-0.3	3.3
9000	0.5	3.3	0.3	3.3	0.3	3.3	0.3	3.3
9200	0.5	2.9	0.3	3.1	0.3	3.1	0.3	3.1
9400	0.5	4	0.3	4	0.3	4	0.3	4
9600	0.6	1.7	0.5	1.8	0.5	1.8	0.5	1.8
9800	0.5	3.7	0.4	3.7	0.4	3.7	0.4	3.7
10000	0.3	3.2	0.2	3.2	0.2	3.2	0.1	3.2
10200	0.4	3.3	0.4	3.3	0.4	3.3	0.4	3.3
10400	0.7	2.5	0.5	2.5	0.5	2.5	0.5	2.5
10600	0.5	3.4	0.5	3.5	0.5	3.5	0.5	3.5
10800	0.7	4.2	0.5	4.2	0.5	4.2	0.5	4.2
11000	1.4	2.5	1.3	2.5	1.3	2.5	1.3	2.5
11200	-0.2	2.4	-0.2	2.4	-0.2	2.4	-0.2	2.4
11400	0.5	1.7	0.3	1.8	0.3	1.8	0.3	1.8
11600	0.4	2.5	0.4	2.5	0.4	2.5	0.4	2.5
11800	0.4	2.7	0.3	2.7	0.3	2.7	0.3	2.7
12000	0.4	2.7	0.4	2.8	0.4	2.8	0.4	2.8
12200	0.3	4	0.3	4.2	0.3	4.2	0.3	4.2
12400	0.3	4	0.3	4.1	0.3	4.1	0.3	4.1
12600	-0.2	8.1	-0.2	8.1	-0.2	8.1	-0.2	8.1
12800	0.2	1.7	0.2	1.8	0.2	1.8	0.2	1.8
13000	0.4	2.5	0.3	2.5	0.3	2.5	0.3	2.5
13200	0.7	1.5	0.5	1.5	0.5	1.5	0.5	1.5
13400	0.1	1.5	0.1	1.5	0.1	1.5	0.1	1.5
13600	0.5	1.5	0.3	1.5	0.3	1.5	0.3	1.5
13800	0.5	3	0.4	3.2	0.4	3.2	0.4	3.2
14000	1.1	2.3	1	2.3	1	2.3	1	2.3
14200	0.7	2.5	0.2	2.5	0.2	2.5	0.2	2.5
14400	1.2	2	1	2	1	2	1	2
14600	0.7	2.3	0.5	2.3	0.5	2.3	0.5	2.3
14800	1.1	2.5	1	2.5	1	2.5	1	2.5
15000	1.3	2.5	1.1	2.5	1.1	2.5	1.1	2.5
15200	-0.3	4.7	-0.3	4.7	-0.3	4.7	-0.3	4.7
15400	0.4	2.3	0.3	2.3	0.3	2.3	0.3	2.3
15600	0.5	2.9	0.4	2.9	0.4	2.9	0.4	2.9
15800	0.5	3.5	0.3	3.5	0.3	3.5	0.3	3.5
16000	0.9	2.5	0.7	2.5	0.7	2.5	0.7	2.5

Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Reduced		Reduced		Reduced		Reduced	
	Min	Max	Min	Max	Min	Max	Min	Max
16200	0.5	3	0.3	3	0.2	3	0.1	3
16400	1	3	0.7	3.1	0.7	3.1	0.7	3.1
16600	0.5	3.2	0.3	3.2	0.3	3.2	0.3	3.2
16800	0.9	2.1	0.7	2.3	0.7	2.3	0.7	2.3
17000	0.5	2.3	0.3	2.5	0.3	2.5	0.3	2.5
17200	0.1	2.7	0.1	2.7	0.1	2.7	0.1	2.7
17400	0.4	2	0.3	2.2	0.3	2.2	0.3	2.2
17600	0.5	2.1	0.3	2.2	0.3	2.2	0.3	2.2
17800	1.9	2.5	1.6	2.7	1.6	2.7	1.6	2.7
18000	1.1	2.9	1.1	3.1	1.1	3.1	1.1	3.1
18200	0.7	2.1	0.5	2.2	0.5	2.2	0.5	2.2
18400	0.9	2.1	0.7	2.3	0.7	2.3	0.7	2.3
18600	0.9	3.7	0.9	3.7	0.9	3.7	0.9	3.7
18800	0.7	1.7	0.5	1.9	0.5	1.9	0.5	1.9
19000	0.7	1.2	0.5	1.3	0.5	1.3	0.5	1.3
19200	0.5	3.1	0.5	3.2	0.5	3.2	0.5	3.2
19400	0.5	3.5	0.5	3.7	0.5	3.7	0.5	3.7
19600	0.5	2.7	0.5	2.8	0.5	2.8	0.5	2.8
19800	0.8	3	0.6	3.2	0.6	3.2	0.6	3.2
20000	0.5	3.1	0.5	3.1	0.5	3.1	0.5	3.1
20200	1.1	2.2	1.1	2.3	1.1	2.3	1.1	2.3
20400	1.5	3	1.3	3.1	1.3	3.1	1.3	3.1
20600	1.1	3.9	1.1	4.1	1.1	4.1	1.1	4.1
20800	1	4.2	1	4.2	1	4.2	1	4.2
21000	-0.2	3.2	-0.2	3.2	-0.2	3.2	-0.2	3.2
21200	1	2.2	0.7	2.3	0.7	2.3	0.7	2.3
21400	1.2	2	1	2.1	1	2.1	1	2.1
21600	1.3	2.7	1.1	2.9	1.1	2.9	1.1	2.9
21800	1.5	2.7	1.3	2.8	1.3	2.8	1.3	2.8
22000	1.2	2.7	1.2	2.8	1.2	2.8	1.2	2.8
22200	1.3	3	1.3	3.2	1.3	3.2	1.3	3.2
22400	1.2	2.7	1.2	2.8	1.2	2.8	1.2	2.8
22600	2	3.3	1.5	3.4	1.5	3.4	1.5	3.4
22800	0.9	2.1	0.3	2.3	0.3	2.3	0.3	2.3
23000	1.4	2.2	1.2	2.3	1.2	2.3	1.2	2.3
23200	1.4	2.2	1.3	2.3	1.3	2.3	1.3	2.3
23400	1.1	3.5	1.1	3.5	1.1	3.5	1.1	3.5
23600	1	2.3	1	2.3	1	2.3	1	2.3
23800	1	2.7	1	2.7	1	2.7	1	2.7
24000	0.3	2.5	0.2	2.5	0.2	2.5	0.2	2.5
24200	0.9	2.2	0.7	2.3	0.7	2.3	0.7	2.3
24400	0.9	2.2	0.7	2.3	0.7	2.3	0.7	2.3

Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Reduced		Reduced		Reduced		Reduced	
	Min	Max	Min	Max	Min	Max	Min	Max
24600	1	3.5	1	3.5	1	3.5	1	3.5
24800	1	4.1	1	4.1	1	4.1	1	4.1
25000	0.8	3.1	0.6	3.2	0.6	3.2	0.6	3.2
25200	0.3	3.2	0.3	3.3	0.3	3.3	0.3	3.3
25400	0.8	3.2	0.8	3.2	0.8	3.2	0.8	3.2
25600	0.8	3.2	0.6	3.3	0.6	3.3	0.6	3.3
25800	1.8	3.2	1.6	3.3	1.6	3.3	1.6	3.3
26000	1.8	2.3	1.8	2.3	1.8	2.3	1.8	2.3
26200	1.9	3.2	1.7	3.2	1.7	3.2	1.7	3.2
26400	1.2	3.5	1.2	3.5	1.2	3.5	1.2	3.5
26600	1.2	3.7	1	3.7	0.5	3.7	0.5	3.7
26800	1.2	3	1.2	3	1.2	3	1.2	3
27000	1.3	7.4	1.3	7.4	1.3	7.4	1.3	7.4
27200	1.2	2.5	1.1	2.5	1.1	2.5	1.1	2.5
27400	0.2	3.2	0.2	3.2	0.2	3.2	0.2	3.2
27600	1.1	4	1.1	4	1.1	4	1.1	4
27800	1.2	3.9	1.1	3.9	1.1	3.9	1.1	3.9
28000	1.2	3.8	1.2	3.8	1.2	3.8	1.2	3.8
28200	0.9	3.7	0.9	3.7	0.9	3.7	0.9	3.7
28400	0.2	3.2	0.2	3.2	0.1	3.2	0.1	3.2
28600	1.2	3.1	1.2	3.1	1.2	3.1	1.2	3.1
28800	1	1.9	1	1.9	1	1.9	1	1.9
29000	1	2.4	1	2.4	1	2.4	1	2.4
29200	0.9	2	0.7	2	0.7	2	0.7	2
29400	1	2	1	2.1	1	2.1	1	2.1
29600	0.9	1.7	0.7	1.8	0.7	1.8	0.7	1.8
29800	0.9	2.7	0.8	2.7	0.8	2.7	0.8	2.7
30000	-0.3	1.7	-0.3	1.8	-0.3	1.8	-0.3	1.8
30200	-0.3	1.8	-0.3	2.1	-0.3	2.1	-0.3	2.1
30400	0.7	2.9	0.7	3.1	0.7	3.1	0.7	3.1
30600	0.9	2.5	0.7	2.7	0.7	2.7	0.7	2.7
30800	1	2.9	1	3.1	1	3.1	1	3.1
31000	0.9	2.5	0.7	2.7	0.7	2.7	0.7	2.7
31200	0.9	1.7	0.7	1.9	0.7	1.9	0.7	1.9
31400	0.9	2.2	0.7	2.3	0.7	2.3	0.7	2.3
31600	0.3	1.7	0.3	1.7	0.3	1.7	0.1	1.7
31800	1.2	2.2	1	2.3	1	2.3	1	2.3
32000	1	2.5	1	2.5	1	2.5	1	2.5
32200	1	2.1	1	2.2	1	2.2	1	2.2
32400	1.2	1.7	1.1	1.9	1.1	1.9	1.1	1.9
32600	1	1.2	1	1.3	1	1.3	1	1.3
32800	1	2.5	1	2.5	1	2.5	1	2.5

Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Reduced		Reduced		Reduced		Reduced	
	Min	Max	Min	Max	Min	Max	Min	Max
33000	0.3	1.2	0.3	1.3	0.1	1.3	0.1	1.3
33200	0.9	1.4	0.7	1.4	0.7	1.4	0.7	1.4
33400	1.2	1.4	1	1.4	1	1.4	1	1.4
33600	1.2	1.5	1.1	1.5	1.1	1.5	1.1	1.5
33800	1.1	1.5	1.1	1.5	1.1	1.5	1.1	1.5
34000	1.1	1.8	1.1	1.8	1.1	1.8	1.1	1.8
34200	1.2	3	1.2	3.1	1.2	3.1	1.2	3.1
34400	1.2	3.7	1.2	3.7	1.2	3.7	1.2	3.7
34600	1.1	3.7	1.1	3.7	1.1	3.7	1.1	3.7
34800	0.3	4.2	0.3	4.2	0.1	4.2	0.1	4.2
35000	1.4	2.5	1.2	2.6	1.2	2.6	1.2	2.6
35200	1.5	2.7	1.3	2.8	1.3	2.8	1.3	2.8
35400	1	2.7	1	2.7	1	2.7	1	2.7
35600	0.2	2.9	0.2	2.9	0.2	2.9	0.2	2.9
35800	1	3.1	1	3.1	1	3.1	1	3.1
36000	1.4	3.3	1.2	3.3	1.2	3.3	1.2	3.3
36200	1.3	3.3	1.1	3.3	1.1	3.3	1.1	3.3
36400	0.9	2.3	0.7	2.3	0.7	2.3	0.7	2.3
36600	1	2.4	1	2.4	1	2.4	1	2.4
36800	0.3	3.5	0.3	3.5	0.1	3.5	0.1	3.5
37000	1	3.1	1	3.1	1	3.1	1	3.1
37200	1.5	2.9	1.3	2.9	1.3	2.9	1.3	2.9
37400	1	2.9	1	2.9	1	2.9	1	2.9
37600	0.3	2.3	0.3	2.3	0.1	2.3	0.1	2.3
37800	1.3	1.5	1.2	1.5	1.2	1.5	1.2	1.5
38000	0.8	2.7	0.5	2.7	0.5	2.7	0.5	2.7
38200	0.7	2.9	0.7	2.9	0.7	2.9	0.7	2.9
38400	0.3	2.5	0.3	2.5	0.1	2.5	0.1	2.5
38600	1.2	2	1.1	2	1.1	2	1.1	2
38800	1	2.1	1	2.1	1	2.1	1	2.1
39000	0.3	1.7	0.3	1.7	0.3	1.7	0.3	1.7
39200	0.8	2	0.6	2	0.6	2	0.6	2
39400	1	4	1	4	1	4	1	4
39600	1.1	2.9	1.1	2.9	1.1	2.9	1.1	2.9
39800	1.2	2.5	1.1	2.5	1.1	2.5	1.1	2.5
40000	0.3	2.7	0.2	2.7	0.1	2.7	0.1	2.7
40200	1	2.9	1	2.9	1	2.9	1	2.9
40400	2	3.9	1.7	3.9	1.7	3.9	1.7	3.9
40600	1.2	2.3	1.2	2.3	1.2	2.3	1.2	2.3
40800	1	2.3	1	2.3	1	2.3	1	2.3
41000	1.2	2	1.2	2	1.2	2	1.2	2
41200	1.3	3.5	1.2	3.5	1.2	3.5	1.2	3.5

Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Reduced		Reduced		Reduced		Reduced	
	Min	Max	Min	Max	Min	Max	Min	Max
41400	1	2.5	1	2.5	1	2.5	1	2.5
41600	0.3	2.1	0.3	2.1	0.3	2.1	0.3	2.1
41800	1	3.5	1	3.5	1	3.5	1	3.5
42000	1	3.5	1	3.5	1	3.5	1	3.5
42200	0.3	3	0.3	3	0.3	3	0.3	3
42400	1.4	3.5	1.2	3.5	1.2	3.5	1.2	3.5
42600	1.2	3.2	1.1	3.2	1.1	3.2	1.1	3.2
42800	1.2	3.5	1.1	3.5	1.1	3.5	1.1	3.5
43000	1	2.7	1	2.7	1	2.7	1	2.7
43200	1	3.2	1	3.2	1	3.2	1	3.2
43400	0.3	2.1	0.3	2.1	0.1	2.1	0.1	2.1
43600	1	1.5	1	1.5	1	1.5	1	1.5
43800	1	2.2	1	2.2	1	2.2	1	2.2
44000	1	2.3	1	2.3	0.2	2.3	0.2	2.3
44200	1.1	2.3	1	2.4	1	2.4	1	2.4
44400	1	1.9	1	1.9	1	1.9	1	1.9
44600	1	2.3	1	2.3	1	2.3	1	2.3
44800	-0.3	2.3	-0.3	2.3	-0.3	2.3	-0.3	2.3
45000	-0.3	1.4	-0.3	1.4	-0.3	1.4	-0.3	1.4
45200	-0.3	0.8	-0.3	0.8	-0.3	0.8	-0.3	0.8
45400	-0.3	1.8	-0.3	1.8	-0.3	1.8	-0.3	1.8
45600	-0.3	1.8	-0.3	1.8	-0.3	1.8	-0.3	1.8
45800	-0.3	2.1	-0.3	2.1	-0.3	2.1	-0.3	2.1
46000	-0.3	2.2	-0.3	2.2	-0.3	2.2	-0.3	2.2
46200	-0.3	1.1	-0.3	1.1	-0.3	1.1	-0.3	1.1
46400	-0.3	1.4	-0.3	1.4	-0.3	1.4	-0.3	1.4
46600	-0.3	1.4	-0.3	1.4	-0.3	1.4	-0.3	1.4
46800	-0.3	1.5	-0.3	1.5	-0.3	1.5	-0.3	1.5
47000	-0.3	1.2	-0.3	1.2	-0.3	1.2	-0.3	1.2
47200	-0.3	1.3	-0.3	1.3	-0.3	1.3	-0.3	1.3
47400	-0.3	1.5	-0.3	1.5	-0.3	1.5	-0.3	1.5
47600	-0.3	1.4	-0.3	1.4	-0.3	1.4	-0.3	1.4
47800	-0.3	2.2	-0.3	2.2	-0.3	2.2	-0.3	2.2
48000	-0.3	2.5	-0.3	2.5	-0.3	2.5	-0.3	2.5
48200	-0.3	3	-0.3	3	-0.3	3	-0.3	3
48400	-0.3	2.2	-0.3	2.2	-0.3	2.2	-0.3	2.2
48600	-0.3	2.3	-0.3	2.3	-0.3	2.3	-0.3	2.3
48800	-0.3	1.8	-0.3	1.8	-0.3	1.8	-0.3	1.8
49000	-0.3	1.9	-0.3	1.9	-0.3	1.9	-0.3	1.9
49200	-0.3	2.1	-0.3	2.1	-0.3	2.1	-0.3	2.1
49400	-0.3	2.5	-0.3	2.5	-0.3	2.5	-0.3	2.5
49600	-0.3	1.8	-0.3	1.8	-0.3	1.8	-0.3	1.8

Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Reduced		Reduced		Reduced		Reduced	
	Min	Max	Min	Max	Min	Max	Min	Max
49800	-0.3	1.4	-0.3	1.4	-0.3	1.4	-0.3	1.4
50000	-0.3	1.9	-0.3	1.9	-0.3	1.9	-0.3	1.9
50200	-0.3	1.4	-0.3	1.4	-0.3	1.4	-0.3	1.4
50400	-0.3	3	-0.3	3	-0.3	3	-0.3	3
50600	-0.3	1.2	-0.3	1.2	-0.3	1.2	-0.3	1.2
50800	-0.3	1.2	-0.3	1.2	-0.3	1.2	-0.3	1.2
51000	-0.3	2.9	-0.3	2.9	-0.3	2.9	-0.3	2.9
51200	-0.3	1.8	-0.3	1.8	-0.3	1.8	-0.3	1.8
51400	-0.3	1.7	-0.3	1.7	-0.3	1.7	-0.3	1.7
51600	-0.3	2.1	-0.3	2.1	-0.3	2.1	-0.3	2.1
51800	-0.3	2.1	-0.3	2.1	-0.3	2.1	-0.3	2.1
52000	-0.3	2.2	-0.3	2.2	-0.3	2.2	-0.3	2.2
52200	-0.3	2.5	-0.3	2.5	-0.3	2.5	-0.3	2.5
52400	-0.3	2.7	-0.3	2.7	-0.3	2.7	-0.3	2.7
52600	-0.3	2.9	-0.3	2.9	-0.3	2.9	-0.3	2.9
52800	-0.3	2.9	-0.3	2.9	-0.3	2.9	-0.3	2.9
53000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
53200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
53400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
53600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
53800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
54000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
54200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
54400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
54600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
54800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
55000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
55200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
55400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
55600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
55800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
56000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
56200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
56400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
56600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
56800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
57000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
57200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
57400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
57600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
57800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
58000	-0.3	0	-0.3	0	-0.3	0	-0.3	0

Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Reduced		Reduced		Reduced		Reduced	
	Min	Max	Min	Max	Min	Max	Min	Max
58200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
58400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
58600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
58800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
59000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
59200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
59400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
59600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
59800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
60000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
60200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
60400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
60600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
60800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
61000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
61200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
61400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
61600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
61800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
62000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
62200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
62400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
62600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
62800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
63000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
63200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
63400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
63600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
63800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
64000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
64200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
64400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
64600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
64800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
65000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
65200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
65400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
65600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
65800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
66000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
66200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
66400	-0.3	0	-0.3	0	-0.3	0	-0.3	0

Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Reduced		Reduced		Reduced		Reduced	
	Min	Max	Min	Max	Min	Max	Min	Max
66600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
66800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
67000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
67200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
67400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
67600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
67800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
68000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
68200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
68400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
68600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
68900	-0.3	0	-0.3	0	-0.3	0	-0.3	0

Table 22- Beki reduced depth at 200 meter intervals

Annexure-5:- Details of collected Water level of different gauge stations w.r.t. MSL (CWC, Irrigation, Ports, Maritime Boards, Observed stations during survey etc.) – Table indicating Chainage (zero at downstream):-

Date	Tide Pole name	Chainage (km)	Time	T. Reading (m)	Zero of TP w.r.t. MSL (m)	W.L w.r.t. MSL (m)	SD value w.r.t. MSL (m)	Corrected Tide (m)
				A	B	C = A+B	D	E = D-C
18.01.16	GS-(TP)- 14	68.364	24 hrs	0.28	53	53.280	51.000	-2.280
18.01.16	GS-(TP)- 13	65.000	24 hrs	0.3	50.878	51.178	49.000	-2.178
17.01.16	GS -(TP)- 12	62.000	24 hrs	0.32	48.908	49.228	48.000	-1.228
17.01.16	GS-(TP)- 11	59.000	24 hrs	0.32	46.037	46.357	45.500	-0.857
16.01.16	GS-(TP)- 1	56.333	24 hrs	0.4	45.014	45.414	44.120	-1.294
16.01.16	GS-(TP)- 2	48.369	24 hrs	0.5	42.499	42.999	42.219	-0.780
28.11.15	GS-(TP)- 5	48.178	24 hrs	0.9	42.071	42.971	42.173	-0.798
28.11.15	GS-(TP)- 6	39.646	24 hrs	1.2	38.915	40.115	40.136	0.021
29.11.15	GS-(TP)- 7	38.470	24 hrs	0.8	38.946	39.746	39.855	0.109
29.11.15	GS-(TP)- 8	30.172	24 hrs	0.4	37.478	37.878	37.874	-0.004
30.11.15	GS-(TP)- 9	30.000	24 hrs	1.1	36.699	37.799	37.833	0.034
30.11.15	GS-(TP)- 10	13.000	24 hrs	1.0	33.13	34.130	33.775	-0.355
20.01.16	GS-(TP)- 4	8.831	24 hrs	1.0	32.514	33.514	32.779	-0.735
20.01.16	GS-(TP)- 3	-0.257	24 hrs	0.5	30.897	31.397	30.671	-0.726

Table 23- Details of Collected water level at different gauge stations

Annexure-6:-Details of Bathymetric surveys carried out:-

Date of Survey	Type of survey	Chainage	
		From (km)	To (km)
01.12.15	Bathymetry Survey	9.260	17.500
28.11.15	Bathymetry Survey	37.500	45.525
29.11.15	Bathymetry Survey	29.400	37.500
30.11.15	Bathymetry Survey	17.650	29.216
02.12.15	Bathymetry Survey	2.700	9.260
16.01.16	Bathymetry Survey	45.700	53.500
20.01.16	Bathymetry Survey	0.00	2.700

Table 24- Details of Bathymetry survey

Annexure-7:- Bank Protection along the Bank:-

The River had a tendency to break its boundary. So for this reason some short and as well as long embankments are needed in the both banks of the river. The river at the edge of its end it gets wider. The Boulder pitching is noticed near Rameswarpur village to Gantla village ch.-63.100km to 67.280km, Sankor ghat village ch.- 79.120km to 80.340 and ch.-80.780km to 80.910km the Embankment and the boulder pitching are also located for protecting the banks of the river and also prevent for soil erosion.

Annexure-8:-Details of Features across the Bank:-

The bank of the river includes villages, Ferry ghat, Irrigation canals and outlets, Rail Bridges, RCC Bridges and Forest etc. The both side river bank are highly protected by embankment and bolder pitching due to flood, erosion etc. The villagers are also situated near the bank side of the river. Recently different kinds of industries are also located near the bank side of the river.

Annexure-9:-Detailed methodology adopted for carrying out survey. Horizontal Control and Vertical Control:-

- **Establishment of Horizontal Control:-**

  The Horizontal control for Topography survey: - High precision RTK DGPS in fix mode is using UHF Radio Modem with IHO accuracy standards, with minimum 24 hours observations at some permanent platform/base.

  The Horizontal control for Bathymetry survey: - DGPS is receiving corrections from Beacons.

- **Establishment of Vertical Control:-**

  Vertical control from CP-B1 is used for the entire survey work. Its value is 52.540 meter w.r.t. MSL has been considered for calculating the vertical levels. Total 7 no. BM was established along the 68.90 km Beki River with the reference of CP-B1 which is situated near Bander Khowa Village.

Topography Survey:-

The survey was commenced on 09th October, 2015 and completed on 06th November, 2015. Then the days were autumn season and arrival of winter season. The climate become normal which reached about 20◦ C. Mostly day weather was sunny and was very favorable for the conduct of survey and the weather condition remains same for the entire duration of the survey.

The survey was undertaken as per the line plan provided and the spot level points in the cross line were spaced at 40 m interval. The plotting of the chart was done on UTM Projection at Zone 46R as directed in the contract specifications. The spot levels along the river were obtained by using Trimble DGPS. The data was post processed using Trimble Business Center to get the precise position and MSL height values of the rover locations. The topographic survey for the entire survey stretch was conducted to collect the following data:-

- Spot levels
-Delineation of Islands
-Fixing of bridges and marks
-Assess the type of river bank
-Extending the vertical and horizontal control throughout the survey area
-Collection of local information along the river Banks

Topographic survey Equipments: South (S86T) GNSS RTK, Total Station was used for conducting the topographic survey.

South RTK (S86T) satellite navigation is a technique used in land survey and in hydrographic survey based on the use of carrier phase measurements of the GPS, GLONASS and / or Galileo signals where a single reference station provides the real-time corrections, providing up to centimeter-level accuracy. When referring to GPS in particular, the system is also commonly referred to as Carrier-Phase Enhancement, CPGPS. RTK systems use a single base station receiver and a number of mobile units. The base station re-broadcasts the phase of the carrier that it measured, and the mobile units compare their own phase measurements with the ones received from the base station. There are several ways to transmit a correction signal from base station to mobile station. The most popular way to achieve real-time, low-cost signal transmission is to use a radio modem, typically in the UHF band. This allows the units to calculate their relative position to millimeters, although their absolute position is accurate only to the same accuracy as the position of the base station.

RTK systems are available in dual-frequency and single-frequency versions. Dual-frequency systems deliver greater precision, faster and over longer baselines than single-frequency systems. Leica GS09 & GS12 GNSS RTK that used for the survey contains dual-frequency requires antenna and controller to suit any surveying task with a wide range of functionality. Leica GS09 & GS12 GNSS RTK Rover is extremely light-weight and cable free rover is comfortable to use and withstand even for rough use and topple over. It uses a single base station receiver and a number of mobile units. The base station re-broadcasts the phase of the carrier that it measured, and the mobile units compare their own phase measurements with the ones received from the base station. So, that centimeter level accuracy can be achieved from latitude, longitude and altitude. RTK technique in terms of general navigation, it is perfectly suited to roles like surveying. In this case, the base station is located at a known surveyed location, often a benchmark, and the mobile units can then produce a highly accurate map by taking fixes relative to that point. RTK has also found uses in auto drive/autopilot systems, precision farming and similar roles.

Figure 19- Topography Survey Instruments

- **Bathymetry Survey:-**

The bathymetry survey was carried out using Bathy 500 portable shallow water Echosounder supported by DGPS Beacon Receiver and HYPACK Data collection and processing software. The survey equipment was installed as per the standard procedure the survey vessel equipped with safety gears.

Bathy- 500MF Echosounder: The Bathy- 500MF echosounder is an electronic hydrographic survey instrument used for measuring depths with precision chart recordings and digital data output manufactured by Syqwest Incorporated, USA. The Bathy-500 echo sounding systems are based on the principle that when a sound signal is sent into the water it will be reflected back when it strikes an object. The Bathy-500 is technologically sophisticated, utilizing modern, micro processor based electronics and a thermal chart recorder mechanism. Digital processing enables the instrument to offer fully automatic digitizing capabilities. When interfaced to a NMEA 0183 compatible position sensor, it provides user with a complete, integrated hydrographic survey environment. The instrument front panel consists of a high contrast, backlit four line LCD displays and a fully sealed input keypad. The front panel encompassing system data, status and setup parameters with RS232/RS422 output format. All operating functions are set via the front panel interface. Setup selections are stored within internal, non-volatile memory for instant availability upon power-up. The instrument decodes and processes the NMEA 0183 formatted sentence GGA or GLL from GPS/DGPS using variable Baud rates for communication.

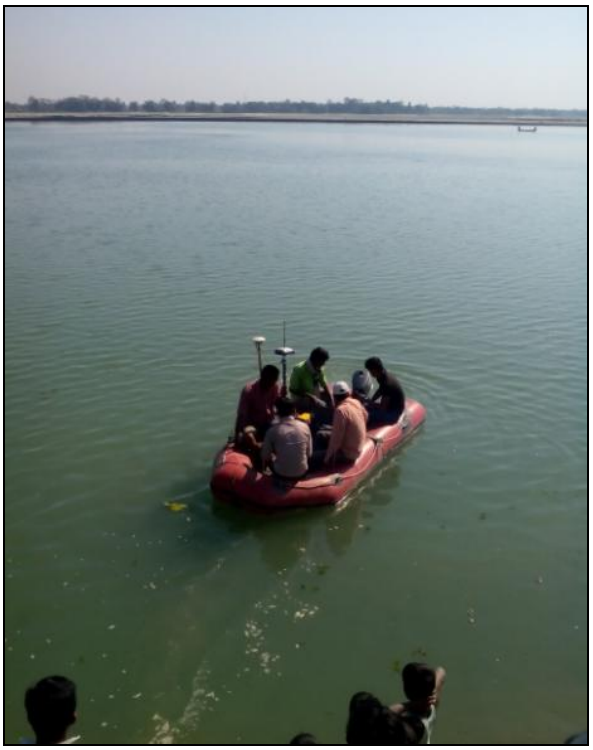


Figure 20- Bathymetry Survey Instruments

Annexure-10:-Photographs of Equipment:-

Following equipment was employed for the Bathymetry and Topography survey:-

Equipment	Make	Version	Qty Employed
Echo sounder	Bathy MF 500	……	1
Current Meter	AEM 213-D	……	1
Tide Gauge	Manual (Pole type)	-	4
RTK	South S86T		3
GPS Sets	Trimble –Becon Rover SPS 361		1
Software	HYPACK data acquisition	Version 14	1
Software	AUTOCAD	2013	1
Software	Microsoft Office	2013	1

- **Positioning System:-**

- 1 no Trimble DGPS system (SPS361)

Figure 21- DGPS Survey Instrument

- **Navigation & Data Logging System:-**

- To provide on-line route guidance, log navigation data, provide QC of navigation data, etc. The system comprises the following equipment:
- 1 no. DELL Laptop
- 1 no. Hypack version 2014 Navigation & Data Logging Software
- 1 no. Positioning & sensor interfaces
- Sufficient Paper Rolls

- **Single Beam Echo Sounder System:-**

  - 1 no. Bathy 500MF multi frequency Echo sounder
  - 1 no. transducer 210 kHz + mounting bracket & base plate

Figure 22- Echo Sounder Instrument

- **Current Meter:-**

  - 1 no. current meter (AEM 213-D) was used during water velocity
  - observation

Figure 23- Current Meter

Annexure-11:-Bench Mark Forms:-

BM Name	Northing (m)	Easting (m)	RL(m)	Latitude (N)	Longitude (E)
BM 1	2906106.933	277831.829	38.060	26°15'26.89"	90°46'31.82"
Pillar Established by: - Precision Survey Consultancy. Surveyor – Mr. Debasis Mondal; Date of establishment: -16.10.2015					
Station Description :-					
Benchmark is located near Deuldi village beside Sikartari pathar. The Bench mark is situated in the south Portion from the Barpeta Railway Station. The BM is denoted by a "." mark engraved on a plate. The plate is fixed on a 5cm diameter GI pipe. The GI pipe is cemented with construction pillar of 30cmX30cmX150cm. The pillar extends 60.cms above ground level. Inscription "IWAI", "PSC" and BM No. can be seen on the face of the pillar. The measurements of the bench mark pillar from notable locations / edges as follows: South from village mud Road–740m					
Life of Station : 15Yrs	**Datum: - WGS 84**		**ZONE : 46 N**		

Table 25- Bench Mark Form & Google image view of BM 1

BM Name	Northing (m)	Easting (m)	RL (m)	Latitude (N)	Longitude (E)
BM 2	2908251.37	285689.015	39.741	26°16'40.87"	90°51'13.62"
Pillar Established by: - Precision Survey Consultancy. Surveyor – Mr. Debasis Mondal; Date of establishment: -16.10.2015					
Station Description :-					
Benchmark is located near Chandmama Pathar village, beside Moram Road. The BM is denoted by a "." mark engraved on a plate. The plate is fixed on a 5cm diameter GI pipe. The GI pipe is cemented with construction pillar of 30cmX30cmX150cm. The pillar extends 60.cms above ground level. Inscription "IWAI", "PSC" and BM No.can be seen on the face of the pillar. The measurements of the bench mark pillar from notable locations / edges as follows: South from Village mud road - 504m.					
Life of Station : 15Yrs	**Datum: - WGS 84**		**ZONE :46 N**		

Table 26- Bench Mark Form & Google image view of BM 2

BM Name	Northing (m)	Easting (m)	RL (m)	Latitude (N)	Longitude (E)
BM 3	2914273.604	288204.285	40.758	26°19'57.84"	90°52'40.68"
Pillar Established by: - Precision Survey Consultancy. Surveyor – Mr.Debasis Mondal; Date of Establishment – 18/10/2015					
Station Description :-					
Benchmark is located near at Khudrakuchi village. The BM is denoted by a "." mark engraved on a plate. The plate is fixed on a 5cm diameter GI pipe. The GI pipe is cemented with construction pillar of 30cmX30cmX150cm. The pillar extends 60.cms above ground level. Inscription "IWAI", "PSC" and BM No.can be seen on the face of the pillar. The measurements of the bench mark pillar from notable locations / edges as follows: South East From Village Road – 676km.					
Life of Station : 15Yrs	**Datum: - WGS 84**		**ZONE :46 N**		

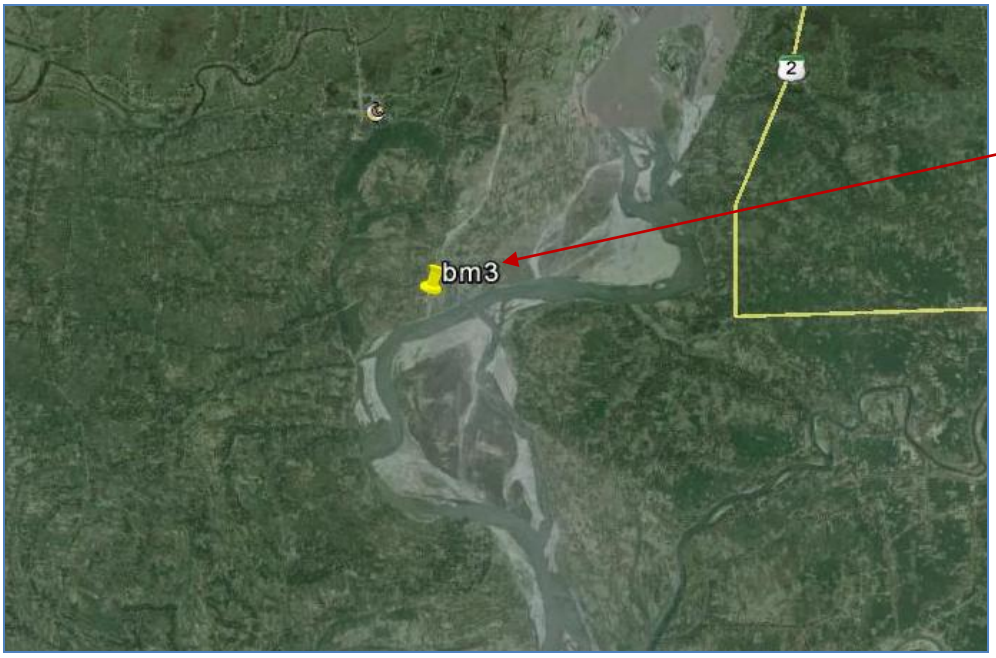


Table 27- Bench Mark Form & Google image view of BM 3

BM Name	Northing (m)	Easting (m)	RL (m)	Latitude (N)	Longitude (E)
BM 4	2923739.863	290407.862	43.210	26°25'6.53"	90°53'54.53"
Pillar Established by: - Precision Survey Consultancy. Surveyor – Mr. Debasis Mondal; Date of Establishment –19.10.2015					
Station Description :-					
Benchmark is located near GhuguBari Village, beside Kalgachia Road. The BM is denoted by a "." mark engraved on a plate. The plate is fixed on a 5cm diameter GI pipe. The GI pipe is cemented with construction pillar of 30cmX30cmX150cm. The pillar extends 60.cms above ground level. Inscription "IWAI", "PSC" and BM No. can be seen on the face of the pillar. The measurements of the bench mark pillar from notable locations / edges as follows: South Westside from Road - 3.0m West from Village Road –20 m.					
Life of Station : 15Yrs	**Datum: - WGS 84**		**ZONE : 46 N**		

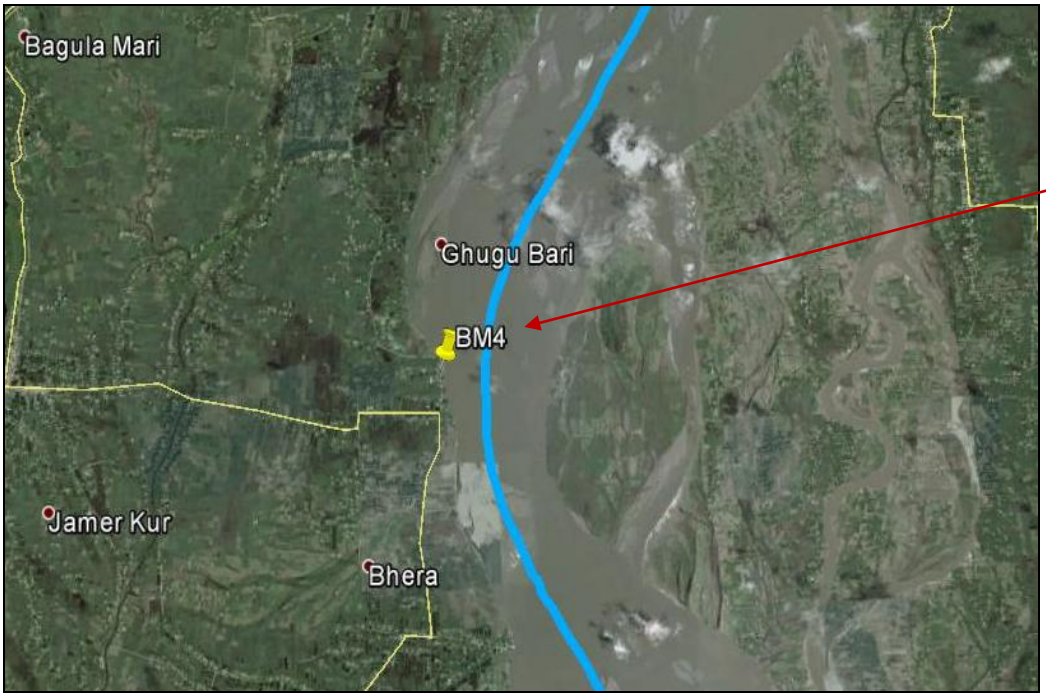


Table 28- Bench Mark Form & Google image view of BM 4

BM Name	Northing (m)	Easting (m)	RL (m)	Latitude (N)	Longitude (E)
BM 5	2932207.336	292686.417	45.385	26°29'42.78"	90°55'11.81"
Pillar Established by: - Precision Survey Consultancy. Surveyor – Mr.Debasis Mondal; Date of Establishment – 22.10.2015					
Station Description :-					
Benchmark is located near Bandar Khowa village, nearby NH-31 Road; The BM is denoted by a "." mark engraved on a plate. The plate is fixed on a 5cm diameter GI pipe. The GI pipe is cemented with construction pillar of 30cmX30cmX150cm. The pillar extends 60.cms above ground level. Inscription "IWAI", "PSC" and BM No.can is seen on the face of the pillar. The measurements of the bench mark pillar from notable locations / edges as follows: North from NH-31 road –17.40 m.					
Life of Station : 15Yrs	**Datum: - WGS 84**		**ZONE : 46 N**		

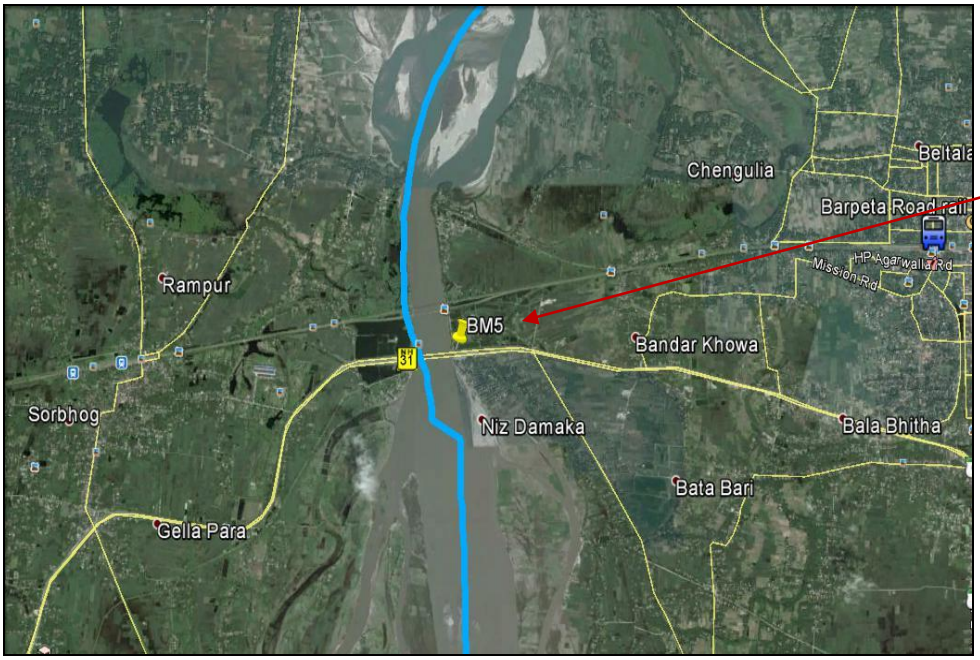


Table 29- Bench Mark Form & Google image view of BM 5

BM Name	Northing (m)	Easting (m)	RL (m)	Latitude (N)	Longitude (E)
BM 6	2939986.927	299004.662	56.475	26°33'58.75"	90°58'55.48"
Pillar Established by: - Precision Survey Consultancy. Surveyor – Mr.Debasis Mondal; Date of Establishment – 22.10.2015					
Station Description :-					
Benchmark is located beside EC road near Naravakkom village. The BM is denoted by a "." mark engraved on a plate. The plate is fixed on a 5cm diameter GI pipe. The GI pipe is cemented with construction pillar of 30cmX30cmX150cm. The pillar extends 60.cms above ground level. Inscription "IWAI", "PSC" and BM No.can be seen on the face of the pillar. The measurements of the bench mark pillar from notable locations / edges as follows: West from EC road –43.8 m.					
Life of Station : 15Yrs	**Datum: - WGS 84**		**ZONE : 46 N**		

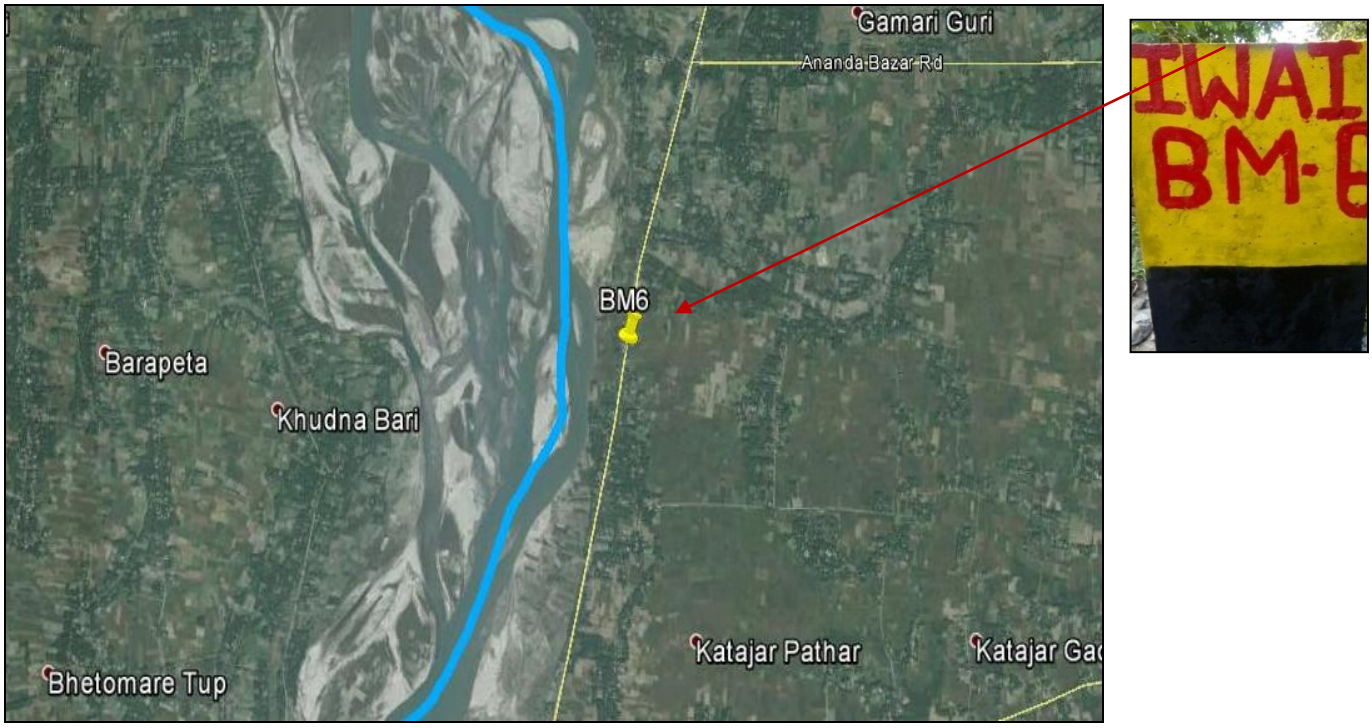


Table 30- Bench Mark Form & Google image view of BM 6

BM Name	Northing (m)	Easting (m)	RL (m)	Latitude (N)	Longitude (E)
BM 7	2949262.358	299806.662	61.117	26°39'0.49"	90°59'19.18"

Pillar Established by: - Precision Survey Consultancy. Surveyor – Mr. Debasis Mondal;

Date of Establishment –24.10.2015

Station Description :-

Benchmark is located beside EC road near Chunbari Gaon village.
The BM is denoted by a "." mark engraved on a plate. The plate is fixed on a 5cm diameter GI pipe. The GI pipe is cemented with construction pillar of 30cmX30cmX150cm.
The pillar extends 60.cms above ground level. Inscription "IWAI", "PSC" and BM No.can be seen on the face of the pillar.
The measurements of the bench mark pillar from notable locations / edges as follows:
West from EC road – 43.8 m.

Life of Station : 15Yrs	Datum: - WGS 84	ZONE : 46 N

Table 31- Bench Mark Form & Google image view of BM 7

Annexure-12:- Levelling calculations:-

BM - 1 and BM - 3, both stations are not used the digital level machine, RTK has been used in this two stations.

Levelling from BM-2 to GS-10

BS	IS	FS	RISE(+)	FALL(-)	RL(m)	REMARKS
0.965					39.741	BM -2
	1.935			0.97	38.771	
0.73				0.485	38.286	
	2.5	2.42		1.77	36.516	
0.435		3.955		1.455	35.061	
		1.366		0.931	34.13	GS-10 water level

Levelling from BM-4 to GS-7

BS	IS	FS	RISE(+)	FALL(-)	RL(m)	REMARKS
1.210					43.210	BM-4
	2.190			0.980	42.230	
0.480		2.490		0.280	41.950	
	2.175			1.695	40.255	
		2.684		0.509	39.746	Water Level (GS-7)

Levelling from BM-5 to GS-5

BS	IS	FS	RISE(+)	FALL(-)	RL(m)	REMARKS
1.345					45.385	BM-5
	2.955			1.61	43.775	
0.12		3.1		0.145	43.63	
		0.779		0.659	42.971	
						GS-5 water level

Levelling from BM-6 to GS-11

BS	IS	FS	RISE (+)	FALL (-)	RL	REMARKS
0.659					56.475	BM-6
	1.563			0.904	55.571	
	2.465			0.902	54.669	
	2.935			0.47	54.199	
0.955		3.85		0.915	53.284	
	2.465			1.51	51.774	
0.35		2.98		0.515	51.259	
	3.1			2.75	48.509	
0.25		3.85		0.75	47.759	
		1.652		1.402	46.357	GS-11 water Level

Levelling from BM-7 to GS-14

BS	IS	FS	RISE(+)	FALL(-)	RL	REMARKS
1.2					61.117	BM-7
	2.65			1.45	59.667	
0.55		3.15		0.5	59.167	CP-1
	1.78			1.23	57.937	
	2.65			0.87	57.067	
0.325		3.12		0.47	56.597	CP-2
	2.6			2.275	54.322	
0.345		2.98		0.38	53.942	CP-3
		1.007		0.662	53.28	GS-14 water Level

Table 32- Leveling Calculation of Beki River

Annexure-13:-Soil Sample:-

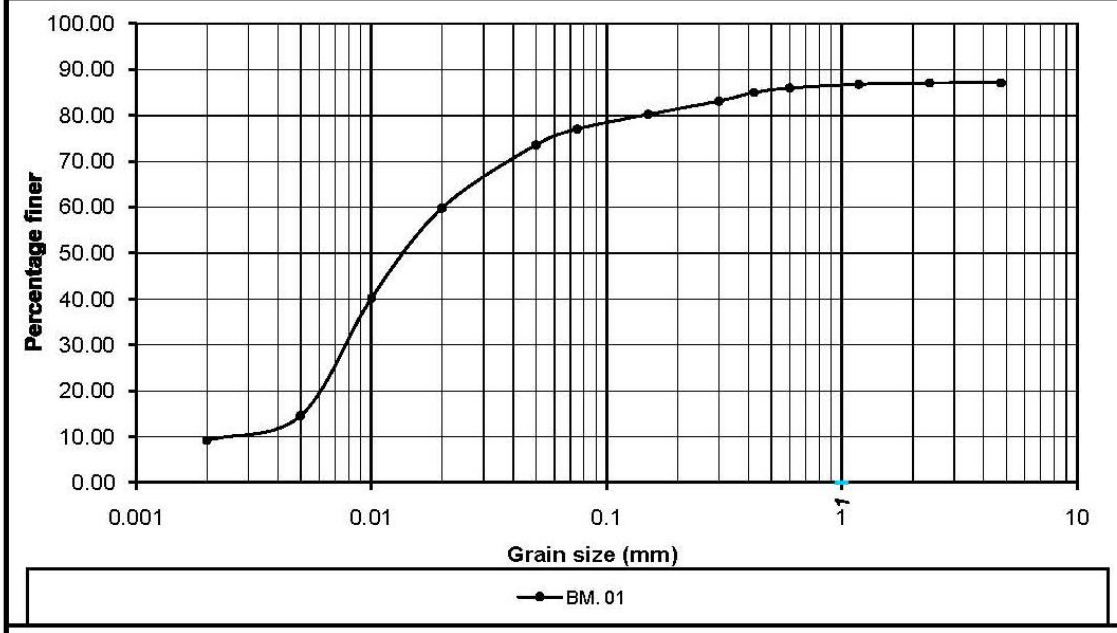
RESULTS OF TEST OF SOIL SAMPLES

SITE – BAKI RIVER

PHYSICAL ANALYSIS OF SOIL

Sl.No.	BM.	GRAVEL (%)	SAND (%)	SILT+CLAY (%)	SPECIFIC GRAVITY	pH VALUE	SILT (%)	CLAY (%)	Cu	Cc
1	1.00	12.89	35.62	51.49	2.62	7.25	42.30	9.19	6.25	0.98
2	2.00	20.45	27.98	51.57	2.62	7.40	43.98	7.59	6.81	1.00
3	3.00	16.74	32.86	50.40	2.61	7.30	40.89	9.51	8.74	1.08
4	4.00	19.70	14.25	66.05	2.63	7.20	57.86	8.19	7.19	1.36
5	5.00	14.89	26.50	58.61	2.64	7.35	51.87	6.74	3.72	0.85
6	6.00	8.96	47.25	43.79	2.65	7.30	35.62	8.17	5.88	2.00
7	7.00	11.58	48.60	39.82	2.65	7.50	29.86	9.96	8.95	1.74

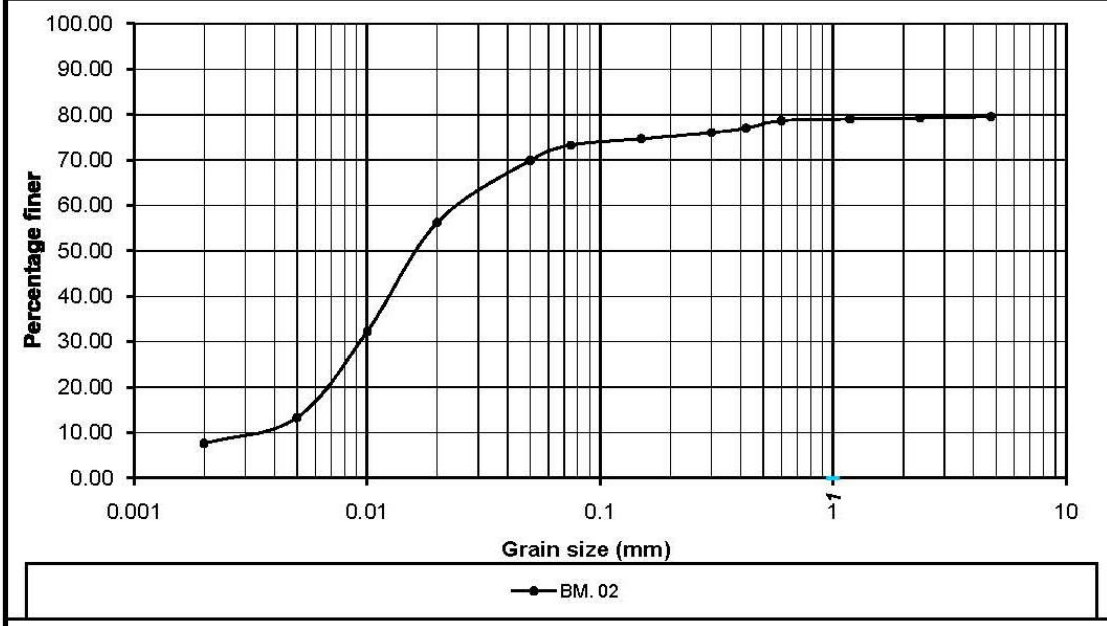
GRAIN SIZE DISTRIBUTION CURVES



Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Sand (%)**	**Gravel (%)**
BM. 01	9.19	42.30	35.62	12.89

*Silt & Clay

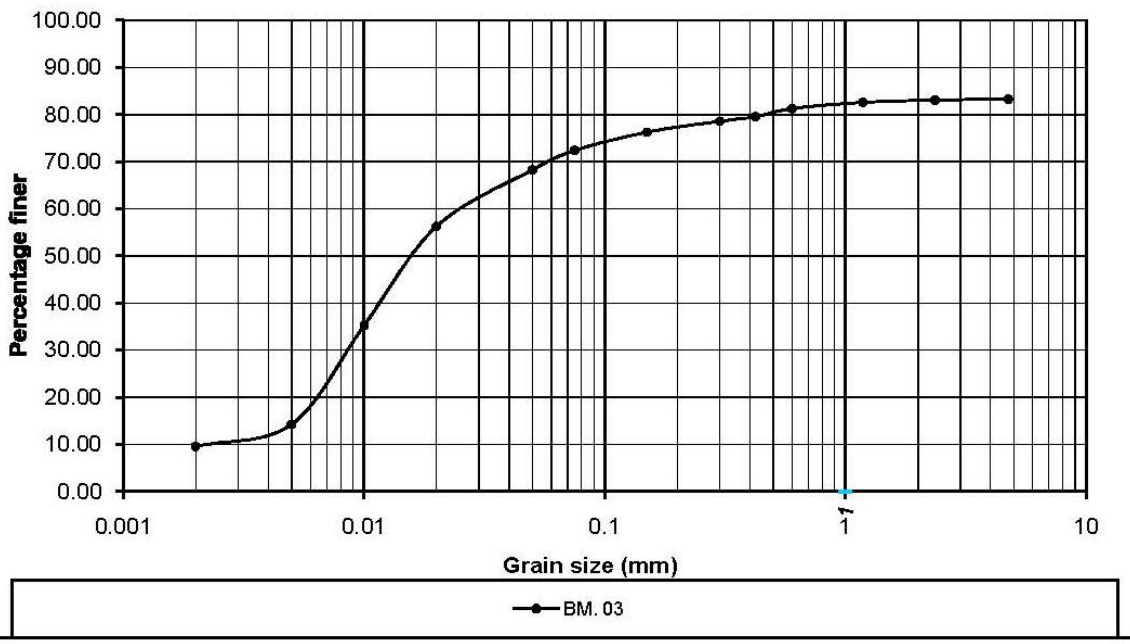
GRAIN SIZE DISTRIBUTION CURVES



Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Sand (%)**	**Gravel (%)**
BM. 02	7.59	43.98	27.98	20.45

*Silt & Clay

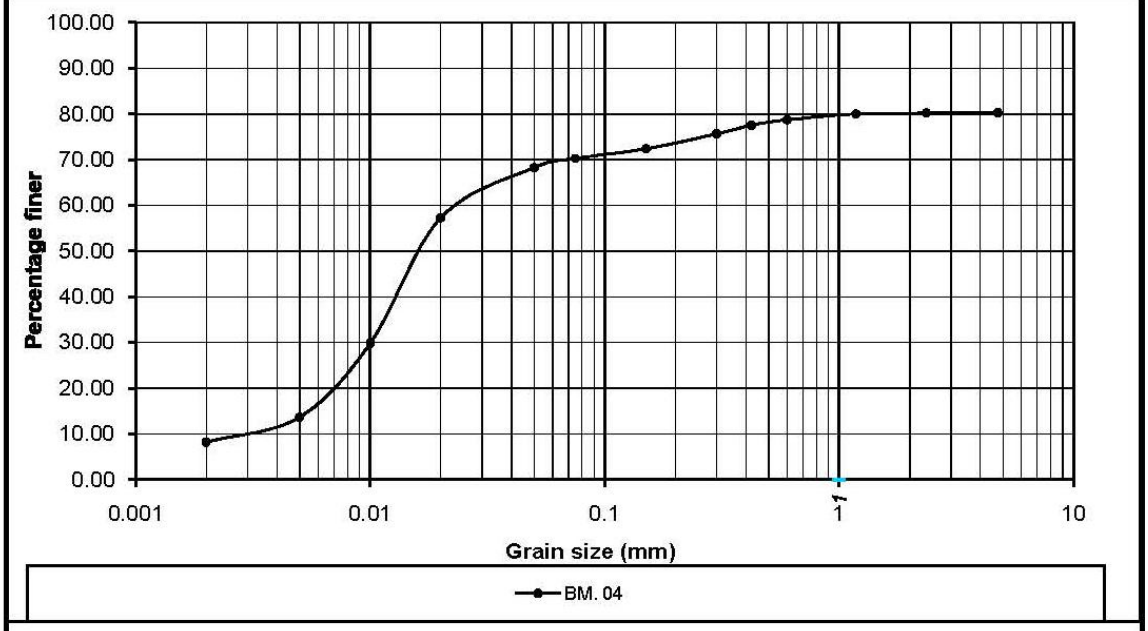
GRAIN SIZE DISTRIBUTION CURVES



Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Sand (%)**	**Gravel (%)**
BM. 03	9.51	40.89	32.86	16.74

*Silt & Clay

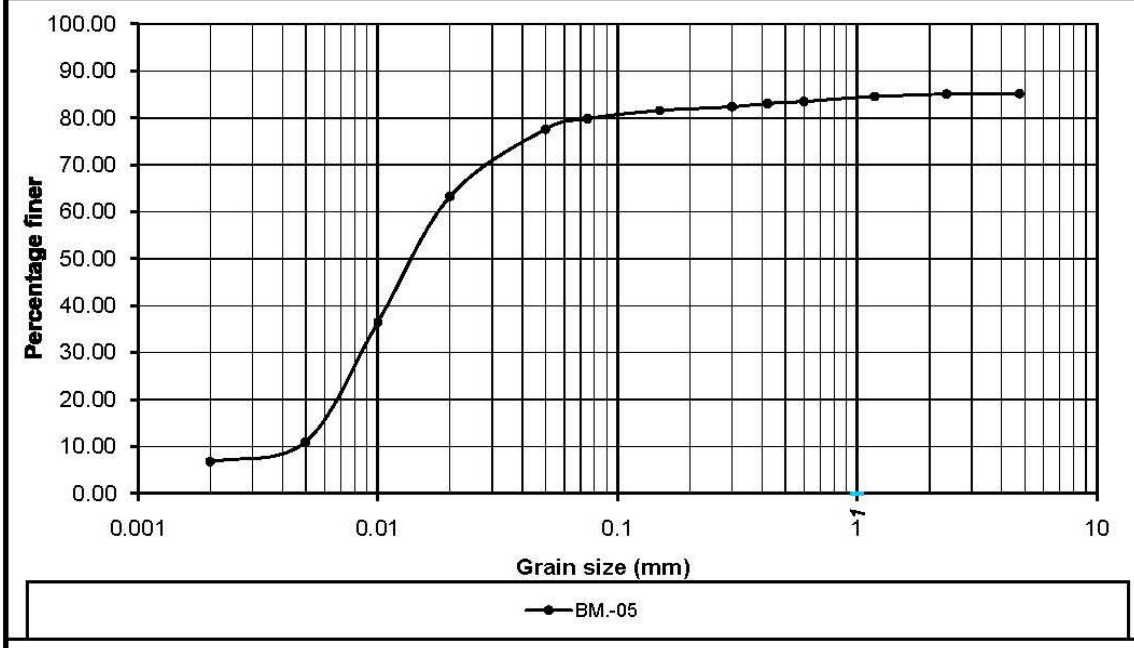
GRAIN SIZE DISTRIBUTION CURVES



Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Sand (%)**	**Gravel (%)**
BM. 04	8.19	57.86	14.25	19.70

*Silt & Clay

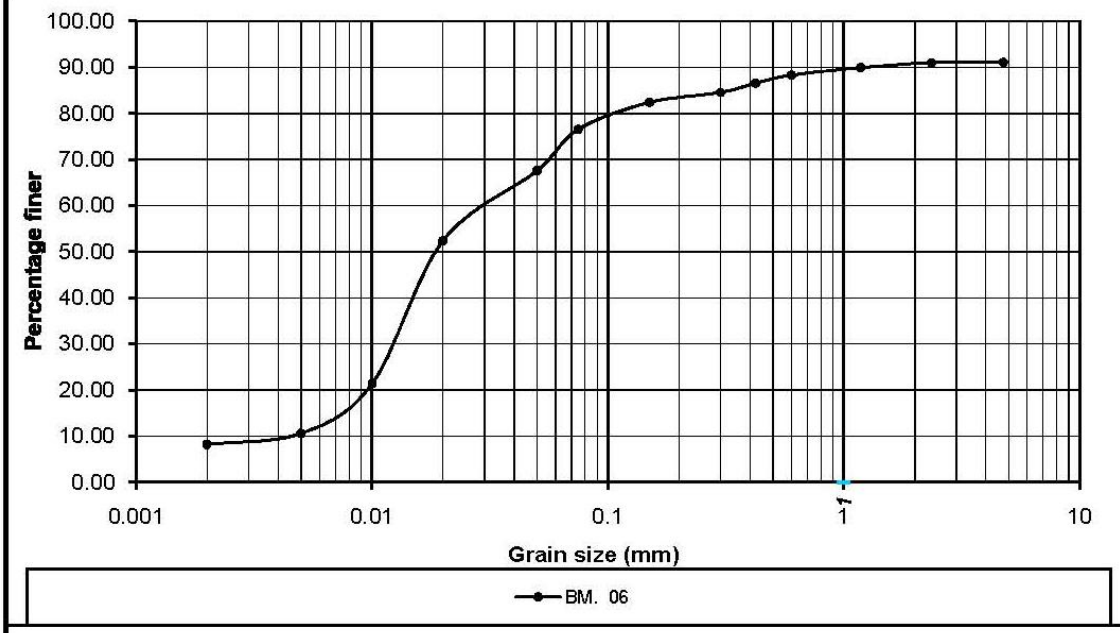
GRAIN SIZE DISTRIBUTION CURVES



Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Sand (%)**	**Gravel (%)**
BM.-05	6.74	51.87	26.50	14.89

*Silt & Clay

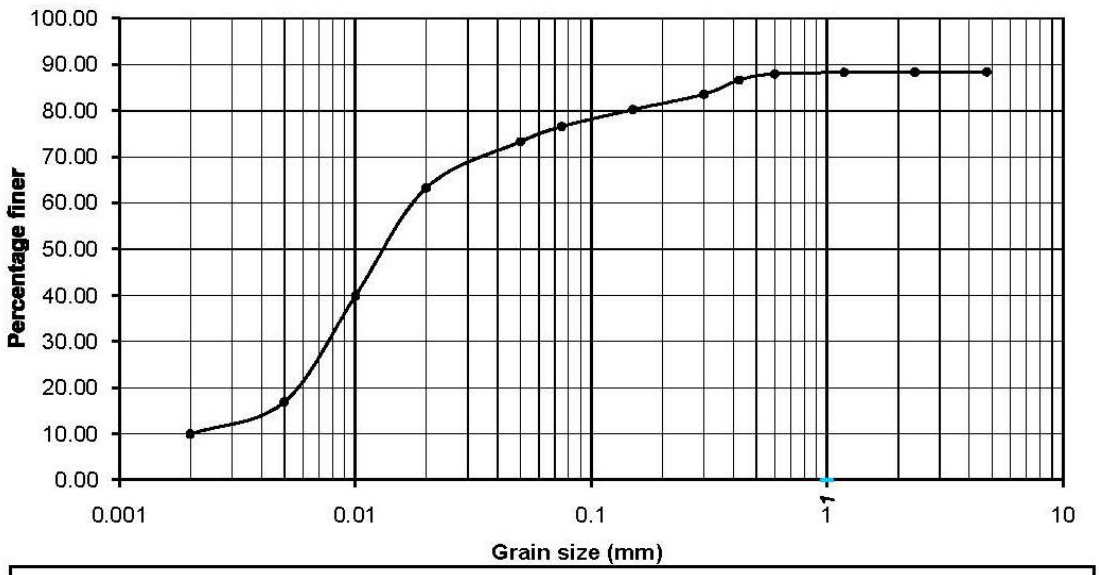
GRAIN SIZE DISTRIBUTION CURVES



Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Sand (%)**	**Gravel (%)**
BM. 06	8.17	35.62	47.25	8.96

*Silt & Clay

GRAIN SIZE DISTRIBUTION CURVES



Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Sand (%)**	**Gravel (%)**
BM. 07	9.96	29.86	48.60	11.58

*Silt & Clay

Annexure-14:- Water Samples:-

RESULTS OF EXAMINATION OF SAMPLES OF WATER

SITE- RIVER BEKI

PARAMETER – pH Value at 25° C

SL.NO;	B.M	LOCATION	PARAMETER	WATER SAMPLE RESULTS	PERMISSIBLE LIMIT IS:456-2000
1	1	1		7.0	
		2		7.2	
		3		7.1	
2	2	1		7.0	
		2		7.0	
		3		7.2	
3	3	1	pH Value at 25° C	7.1	6.5 – 8.5
		2		7.2	
		3		7.0	
4	4	1		7.2	
		2		7.1	
		3		7.1	
5	5	1		7.0	
		2		7.0	
		3		6.9	
6	6	1		6.9	
		2		7.0	
		3		6.8	
7	7	1		6.8	
		2		6.5	
		3		6.6	

RESULTS OF EXAMINATION OF SAMPLES OF WATER

SITE- RIVER BEKI

PARAMETER – pH Value at 25° C

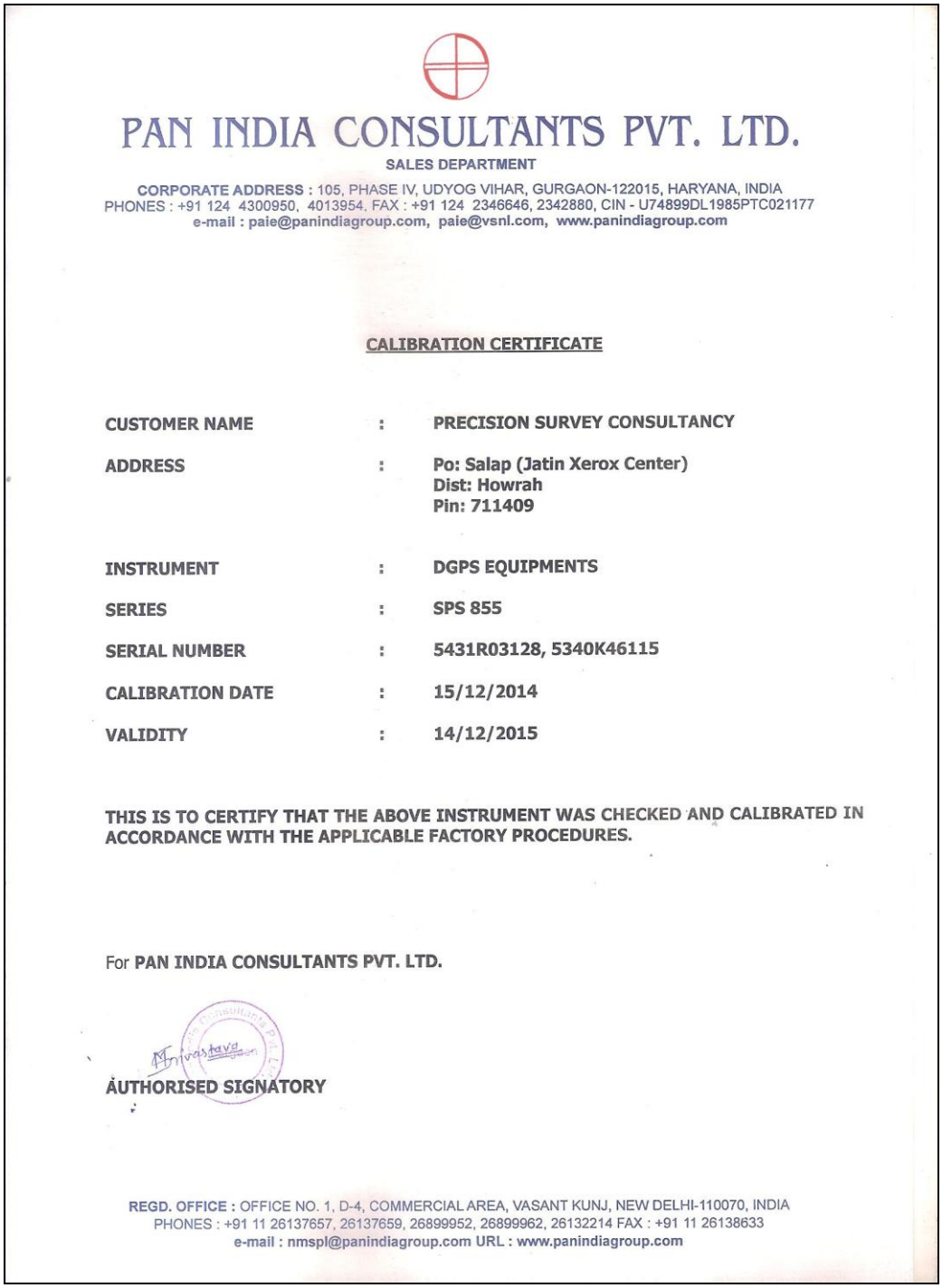
SL.NO;	B.M	LOCATION	PARAMETER	WATER SAMPLE RESULTS	PERMISSIBLE LIMIT IS:456-2000
1	1	1		7.0	
		2		7.2	
		3		7.1	
2	2	1		7.0	
		2		7.0	
		3		7.2	
3	3	1	pH Value at 25° C	7.1	6.5 – 8.5
		2		7.2	
		3		7.0	
4	4	1		7.2	
		2		7.1	
		3		7.1	
5	5	1		7.0	
		2		7.0	
		3		6.9	
6	6	1		6.9	
		2		7.0	
		3		6.8	
7	7	1		6.8	
		2		6.5	
		3		6.6	

PARAMETER –Chloride as Cl (mg/l)					
SL.NO;	B.M	LOCATION	PARAMETER	WATER SAMPLE RESULTS	PERMISSIBLE LIMIT IS:456-2000
1	1	1		7	
		2		6	
		3		8	
2	2	1		6	
		2		5	
		3		6	
3	3	1	Chloride as Cl (mg/l)	7	2000 mg/l for concrete not containing embedded steel and 500 mg/l for reinforced concrete work.
		2		5	
		3		8	
4	4	1		7	
		2		5	
		3		6	
5	5	1		6	
		2		5	
		3		5	
6	6	1		4	
		2		5	
		3		6	
7	7	1		6	
		2		5	
		3		7	

PARAMETER –Sulphates as SO_4 (mg/l)					
SL.NO;	B.M	LOCATION	PARAMETER	WATER SAMPLE RESULTS	PERMISSIBLE LIMIT IS:456-2000
1	1	1		66	
		2		76	
		3		68	
2	2	1		67	
		2		75	
		3		69	
3	3	1	Sulphates as SO_4 (mg/l)	68	400 (mg/l)
		2		72	
		3		66	
4	4	1		69	
		2		76	
		3		68	
5	5	1		71	
		2		69	
		3		78	
6	6	1		66	
		2		75	
		3		71	
7	7	1		78	
		2		82	
		3		69	

PARAMETER –Sediment Concentration (mg/l)					
SL.NO;	B.M	LOCATION	PARAMETER	WATER SAMPLE RESULTS	PERMISSIBLE LIMIT IS:456-2000
1	1	1		30	
		2		20	
		3		20	
2	2	1		30	
		2		20	
		3		30	
3	3	1	Sediment Concentration (mg/l)	20	2000 (mg/l)
		2		40	
		3		50	
4	4	1		30	
		2		20	
		3		40	
5	5	1		40	
		2		20	
		3		50	
6	6	1		30	
		2		20	
		3		20	
7	7	1		20	
		2		40	
		3		30	

Annexure-15:- Calibration Certificate:-



PAN INDIA CONSULTANTS PVT. LTD.

SALES DEPARTMENT

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PHONES : +91 124 4300950, 4013954, FAX : +91 124 2346646, 2342880, CIN - U74899DL1985PTC021177
e-mail : paie@panindiagroup.com, paie@vsnl.com, www.panindiagroup.com

CALIBRATION CERTIFICATE

CUSTOMER NAME	:	PRECISION SURVEY CONSULTANCY
ADDRESS	:	Po: Salap (Jatin Xerox Center) Dist: Howrah Pin: 711409
INSTRUMENT	:	DGPS EQUIPMENTS
SERIES	:	SPS 855
SERIAL NUMBER	:	5431R03128, 5340K46115
CALIBRATION DATE	:	15/12/2014
VALIDITY	:	14/12/2015

THIS IS TO CERTIFY THAT THE ABOVE INSTRUMENT WAS CHECKED AND CALIBRATED IN ACCORDANCE WITH THE APPLICABLE FACTORY PROCEDURES.

For PAN INDIA CONSULTANTS PVT. LTD.

AUTHORISED SIGNATORY

REGD. OFFICE : OFFICE NO. 1, D-4, COMMERCIAL AREA, VASANT KUNJ, NEW DELHI-110070, INDIA
PHONES : +91 11 26137657, 26137659, 26899952, 26899962, 26132214 FAX : +91 11 26138633
e-mail : nmspl@panindiagroup.com URL : www.panindiagroup.com

Table 33- Calibration Certificate of DGPS

PAN INDIA CONSULTANTS PVT. LTD.

SALES DEPARTMENT

CORPORATE ADDRESS : 105, PHASE IV, UDYOG VIHAR, GURGAON-122015, HARYANA, INDIA
PHONES : +91 124 4300950, 4013954, FAX : +91 124 2346646, 2342880, CIN - U74899DL1985PTC021177
e-mail : paie@panindiagroup.com, paie@vsnl.com, www.panindiagroup.com

CALIBRATION CERTIFICATE

CUSTOMER NAME	:	PRECISION SURVEY CONSUTLANCY
ADDRESS	:	P.O. –SALAP (Jatin Xerox Center) Dist. –Howrah Pin: 711 409
INSTRUMENT	:	ECHO –SOUNDER
SERIES	:	500MF
SERIAL NUMBER	:	B5MF0560
CALIBRATION DATE	:	28/04/2015
VALIDITY	:	27/04/2016

THIS IS TO CERTIFY THAT THE ABOVE INSTRUMENT WAS CHECKED AND CALIBRATED IN ACCORDANCE WITH THE APPLICABLE FACTORY PROCEDURES.

For **PAN INDIA CONSULTANTS PVT. LTD.**

AUTHORISED SIGNATORY

REGD. OFFICE : OFFICE NO. 1, D-4, COMMERCIAL AREA, VASANT KUNJ, NEW DELHI-110070, INDIA
PHONES : +91 11 26137657, 26137659, 26899952, 26899962, 26132214 FAX : +91 11 26138633
e-mail : nmspl@panindiagroup.com URL : www.panindiagroup.com

Table 34- Calibration Certificate of Eco Sounder

SOUTH

SOUTH PRECISION INSTRUMENT PVT. LTD.
FA - 229 B, Ground Floor, Mansarover Garden, New Delhi-110015
Ph. : 011- 45544114, 65568870 Fax: 011- 45530854 Mob.: 9999999255

Calibration Certificate

SOUTH Precision Instrument Pvt. Ltd. Calibration laboratory certifies that the instrument has been inspected, tested and calibrated in accordance with the documented procedures using measuring and test equipment, which are traceable to national standards and of the international accepted standard.

We hereby certify that the instrument mentioned below meet the specification and result of the traceability is carried out in accordance to our company's standard.

INSTRUMENT TYPE	:	GPS RTK
MODEL	:	S-86T
MAKE	:	SOUTH
INSTRUMENT SR. NO.	:	S86951117129438GEM W1286752342GM
CALIBRATION DATE	:	10/02/2015
VALID UPTO	:	09/02/2016
ISSUED TO	:	PRECISION SURVEY CONSULTANCY

For SOUTH PRECISION INSTRUMENT PVT. LTD.
For SOUTH PRECISION INSTRUMENT PVT. LTD.
Authorised Signatory

Authorised Signatory

Table 35- Calibration Certificate of GPS RTK

Annexure-16:- Site Picture:-

Figure 24-Bathymetry Instruments

Figure 16- Site pictures of Topography instruments

Figure 25- Current Meter reading

Figure 26-B.M pillar Establishment

Annexure-17:-Survey Charts:-

LIST OF SURVEY CHARTS OF BEKI RIVER (NW-18)								
Sl. No.	Chart No.	Location	Chainage (Form…….km. To…...km.)	Chart Datum And Water Level w.r.t. MSL			Value of Reduction	Remarks
				Chainage (km.)	CD (m.)	WL (m.)		
1	P_01	Joypur Pathar to Sikartary Gaon	0.000 km to 7.713 km	-0.257	30.671	31.397	-0.726	GS-3
				8.831	32.779	33.514	-0.735	GS-4
2	P_02	Sikartary Gaon to Sat Mukhi	7.713 km to 13.000 km	8.831	32.779	33.514	-0.735	GS-4
				13.000	33.775	34.130	-0.355	GS-10
3	P_03	Sat Mukhi to BankaBhanga	13.000 km to 22.000 km	13.000	33.775	34.130	-0.355	GS-10
				30.000	37.833	37.799	0.034	GS-9
4	P_04	Banka Bhanga to Kalgachia	22.000 km to 30.000 km	30.000	37.833	37.799	0.034	GS-9
5	P_05	Kalgachia to Ghugu Bari	30.000 km to 37.742 km	30.172	37.874	37.878	-0.004	GS-8
				38.470	39.855	39.746	0.109	GS-7
6	P_06	Ghugu Bari to Niz Dhamaka	37.742 km to 45.250 km	38.470	39.855	39.746	0.109	GS-7
				39.646	40.136	40.115	0.021	GS-6
7	P_07	Niz Dhamaka to Doomni Bridge	45.250 km to 53.000 km	48.178	42.173	42.971	-0.798	GS-5
				48.369	42.219	42.999	-0.780	GS-2
8	P_08	Doomni Bridge to Udaiguri Gaon	53.000 km to 60.456 km	56.333	44.120	45.414	-1.294	GS-1
				59.000	45.500	46.357	-0.857	GS-11
9	P_09	Udaiguri Gaon to Gaha Gaon N.C	60.456 km to 68.364 km	62.000	48.000	49.228	-1.228	GS-12
				65.000	49.000	51.178	-2.178	GS-13
				68.364	51.000	53.280	-2.280	GS-14

Figure 27- Survey Charts

Note: Scale: - 1:5000 in each survey Chart

Survey period: - 09th October, 2015 to 06th November, 2015

✧ **G.S:-** Gauge Station