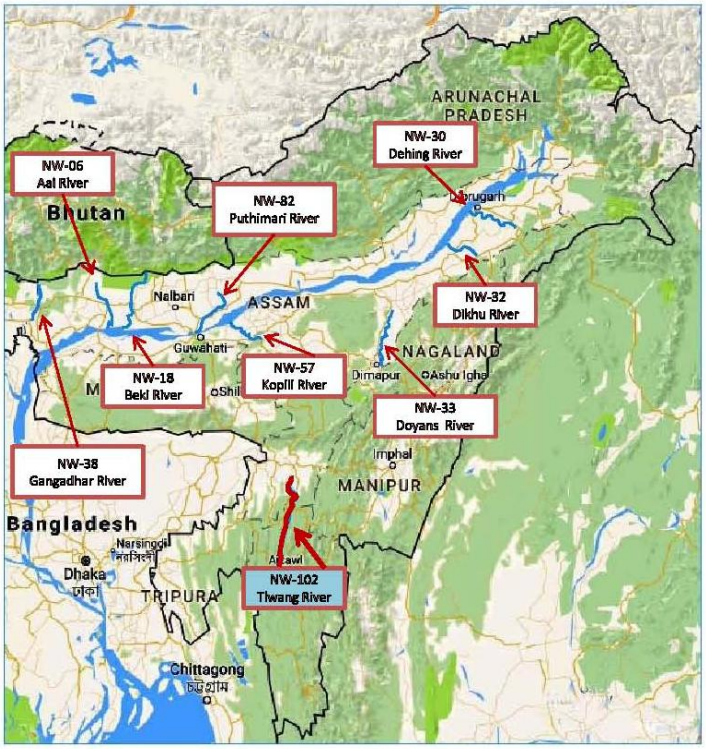
INLAND WATERWAYS AUTHORITY OF INDIA, A-13, SECTOR-1, NOIDA
DIST-GAUTAM BUDHA NAGAR, UTTAR PRADESH, PIN- 201 301(UP)

"FINAL FEASIBILITY REPORT ON HYDROGRAPHIC SURVEY

TLWANG (DHALESWARI) RIVER (NW-102) (87.136 km)

FROM "KHAMRANG NEAR NH-54 TO BRIDGE ON NH-154 AT GHARMURA"

Survey Period from 17.12.15 to 21.04.16



FINAL REPORT ON HYDROGRAPHICAL SURVEY OF TLWANG RIVER, ASSAM

REPORT SUBMISSION DATE- 05.11.2018

SUBMITTED BY:

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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 (Tlwang or Dhaleswari River) from Khamrang near NH-54 to Bridge on NH-154 at Gharmura (87.136 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 Puthimari 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).**

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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

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Salient Features of Tlwang 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….. , length.. km) d) Survey Period (… to ...)	a) Tlwang or Dhaleswari River b) NW- 102 c) From Khamrang near NH-54 (Chainage-0.00 km) to Gharmura RCC Bridge (NH-154) (Chainage-87.136 km) (87.136 Km). d) 17th December, 2015 to 21st April, 2016.
4.	Tidal & non tidal portions (from…..to….. , length.., tidal variation at every 10km)	There are no Tidal influences or portions found in this zone of River.
5.	LAD (Least available depth) status	**Observed Depth**

Sub Stretch-1 (0-10 km)	Sub Stretch-2 (10-20 km)	Sub Stretch-3 (20-30 km)	Sub Stretch-4 (30-40 km)
0.85	0.85	1.05	1.05
1.15	1.15	0.95	0.95
1.5	1.5	1.15	1.15
1.5	1.5	0.85	0.85
5	5	6	6
Total=10.00	Total=10.00	Total=10.00	Total=10.00

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

Sub Stretch-5 (40-50 km)	Sub Stretch-6 (50-60 km)	Sub Stretch-7 (60-70 km)	Sub Stretch-8 (70-80 km)
10.00	10.00	10.00	10.00
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
Total=10.00	Total=10.00	Total=10.00	Total=10.00

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

	Sub Stretch-9 (80-87.136 km)	Total
i) < 1.2 m	7.136	50.938
ii) 1.2 m to 1.4 m	0	4.2
iii) 1.5 m to 1.7 m	0	5.3
iv) 1.8 m to 2.0 m	0	4.7
v) > 2.0 m	0	22
	Total = 7.136	Total = 87.136 km

Reduced Depth

	Sub Stretch-1 (0-10 km)	Sub Stretch-2 (10-20 km)	Sub Stretch-3 (20-30 km)	Sub Stretch-4 (30-40 km)
i) < 1.2 m	1.15	1.15	0.6	0.6
ii) 1.2 m to 1.4 m	1.55	1.55	1.15	1.15
iii) 1.5 m to 1.7 m	2.15	2.15	1.75	1.75
iv) 1.8 m to 2.0 m	1.65	1.65	2.0	2.0
v) > 2.0 m	3.5	3.5	4.5	4.5
	Total=10.00	Total=10.00	Total=10.00	Total=10.00

	Sub Stretch-5 (40-50 km)	Sub Stretch-6 (50-60 km)	Sub Stretch-7 (60-70 km)	Sub Stretch-8 (70-80 km)
	10.00	10.00	10.00	10.00
i) < 1.2 m	0	0	0	0
ii) 1.2 m to 1.4 m	0	0	0	0
iii) 1.5 m to 1.7 m	0	0	0	0
iv) 1.8 m to 2.0 m	0	0	0	0
v) > 2.0 m	Total=10.00	Total=10.00	Total=10.00	Total=10.00

	Sub Stretch-9 (80-87.136 km)	Total (Km)
	7.136	50.636
i) < 1.2 m	00	6.2
ii) 1.2 m to 1.4 m	0	16.4
iii) 1.5 m to 1.7 m	0	7.3
iv) 1.8 m to 2.0 m	0	16
v) > 2.0 m	Total=7.136	Total=87.136

6. 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]

i) There is no dam, barrage found in this zone of river.

ii) RCC Bridge-2 (Two), Bamboo Bridge- 2 (Two)

Clearance w.r.t H.F.L	Min (m)	Max (m)
Horizontal Clearance (m)	35.00	42.55
Vertical Clearance w.r.t. H.F.L (m)	5.015	6.900

iii) Electric Line- 1 (one)

Clearance w.r.t H.F.L	
Horizontal Clearance (m)	225.92
Vertical Clearance w.r.t. H.F.L (m)	7.500

7. Slope

Reach		River / Canal Bed Level Change (m)	Distance (km)	Slope (m/km)	Slope (cm/km)
From	To				
0.011	13.959	4.419	13.948	0.317	31.682
13.960	24.226	3.253	10.266	0.317	31.687
24.227	40.619	5.193	16.392	0.317	31.680
40.620	55.123	4.595	14.503	0.317	31.683
55.124	69.525	4.563	14.401	0.317	31.685
69.526	76.382	2.172	6.856	0.317	31.680
76.383	87.136	3.407	10.753	0.317	31.684
Total			87.119	Avg-0.317	Avg-31.683

8. Discharge Report

Sl. No	Chainage (km)	Discharge (Cu.m/s)	
1	0.011	86.266	**Dated 17.12.15 to 21.04.16**
2	24.226	60.951	
3	30.150	53.289	
Avg. Discharge		66.83 Cubic meter/sec	

9. i)Present IWT Operations
ii) Ferry services, tourism, cargo, if any

i) As follows

ii) The Passenger Ferry Services are partly navigable at Chainage of 14 km, 24.200 km (Bhairabi Ferry ghat) in this zone of river. The light Cargo like vegetables, goods are temporarily available at Bhairabi Ferry ghat (Chainage-24.200 km).

10. Approx distance of Rail & Road from waterway

Nearest Railway station- Ramnathpur Railway Station (1.35 km approx)
Details of NH- NH-150, NH-154, NH-44A, NH-54, NH-151 and NH-131
Details of SH- , SH- 6, SH- 38, SH- 3

11. Any other information System

Section-1: Introductory Considerations

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

The River Tlwang originates in the Mizo hills, southern part of Mizoram and runs to Dapchhhuah. From Dapchhhuah it flows about 55 km to meet river Tlawng at Tlangkhang. From the confluence the river Tlwang flows about 25 km upto Bhairabi and enters Assam. In Assam the river is renamed as Dhaleswari. It flows about 126 km in Assam. Therefore, Tut- Tlwang - Dhaleswari River system will serve the interstate trade between Mizoram and Assam. Potential waterway for navigation in this river system is considered from Dapchhhuah to confluence of river Tlwang near Tlangkhang of about 55 km. The river Tlwang is navigable only during monsoon season for about 6 months in a year. The capacity of the vessel can play on this waterway is about 2 to 3 tons.

Local products such as oil seeds, ginger, tea, chilies, vegetables, cane etc., can be transported by boats on river Tut. The intra state traffic across Mizoram and Assam border can also be moved by boats. The local agricultural products are transported during the season to local market using this waterway. The development of this waterway is helpful for local remotely located tribal people.

The border of Assam and Mizoram hill area is very amazing for the tourists. NH-150, NH-154, NH-44A, NH-54, NH-151 and NH-131 are the main ways which connected with the other states with the rest portion of the North eastern part of the India. National Highway 154 via Gharmura RCC Bridge from Silchar in Assam to Kolashib traverses the entire length of Assam and connects Aizal with almost all the major cities of Mizoram and including the cities of Lunglei and the Siaha and the other communication by Railways by North Frontier Railways.

Figure 1- Tlwang River site Map

1.2 Tributaries / Network of River/ Basin :-

The three streams creates a river basin in this zone of river

i) Tut

ii) Teirei

iii) Ngashih

1.3State / District through which river passes :-

The river passes through the district of Tullo Hailakandi of Assam, Kolashib and Aizal of Mizoram.

1.4 Project Site Map :-

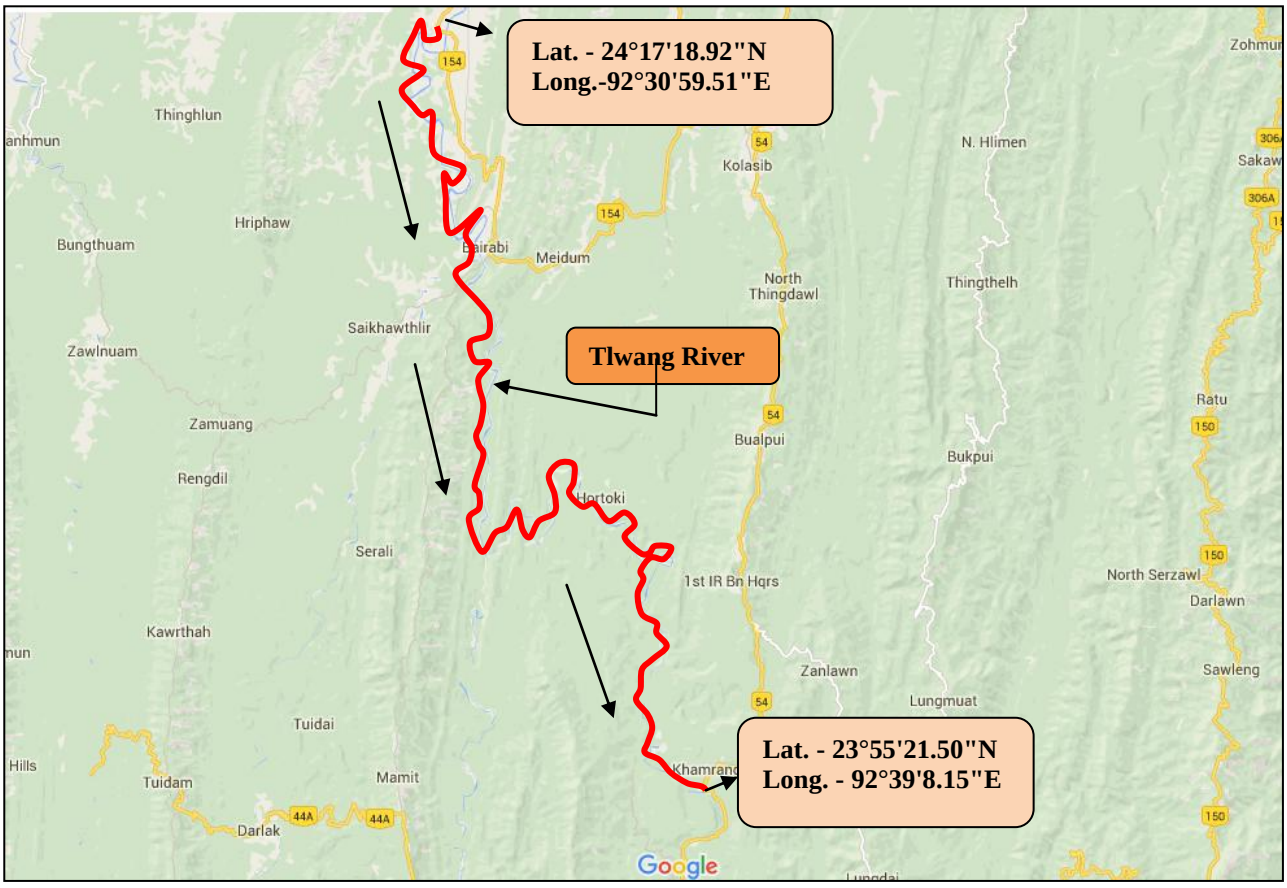


Figure 2 Project Site Location Map

1.5 River Key Map

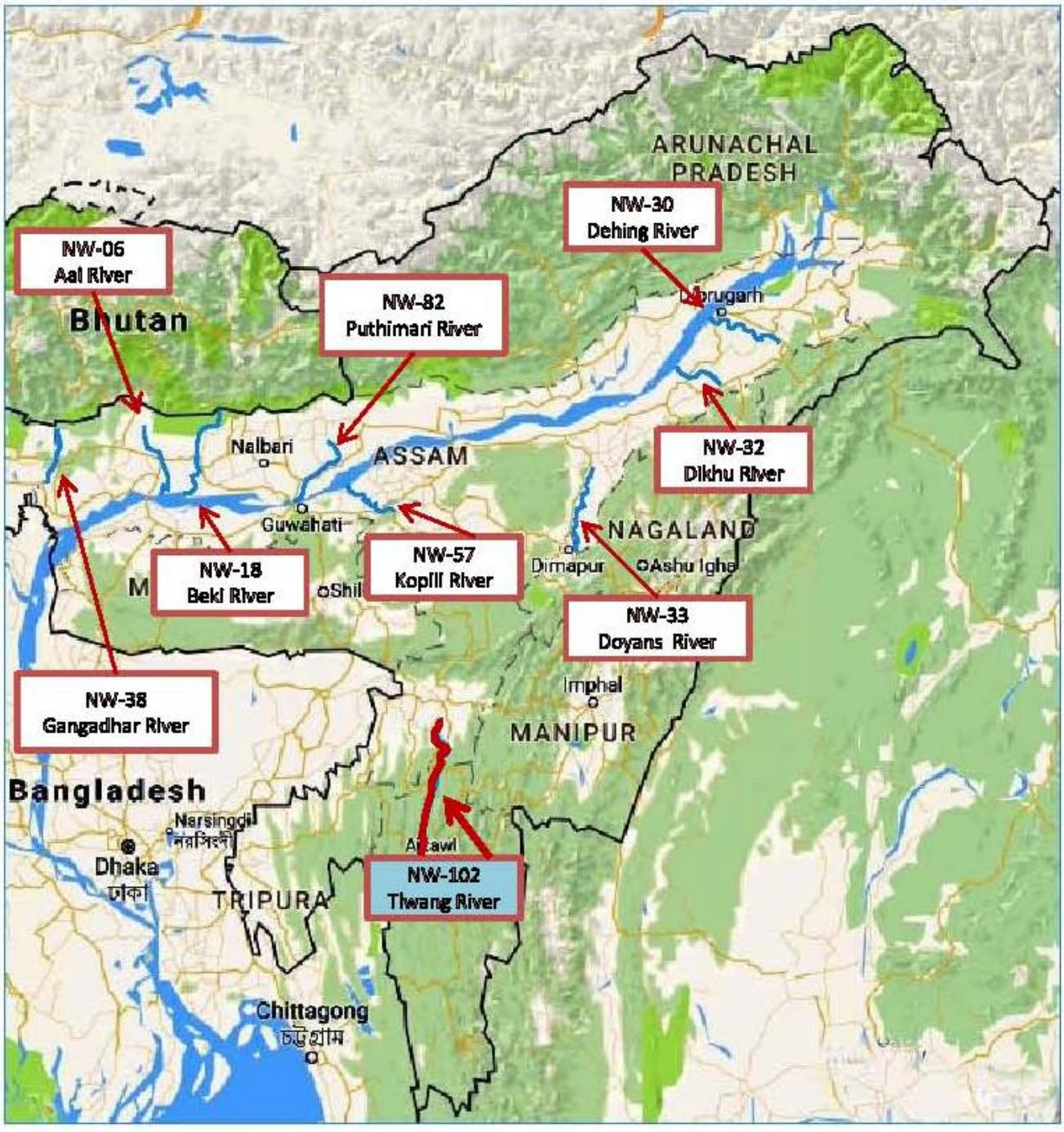


Figure 3- River Key Map

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 with 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 Tlwang River waterway and to provide an appropriate economic and organizational framework for restoring trade and navigation (cargo and passengers) on the Tlwang River with an aim to do as follows:
- Improve public and private investments into transport on the Tlwang 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 Tlwang 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

Following equipments were 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 Rover SPS 361	-	1
Software	HYPACK data acquisition	Version 14	1
Software	AUTOCAD	2013	1
Software	Microsoft Office	2013	1

Table 1-Details of Equipment list

- **Conduct of survey work**

Topographic Survey

The Topography survey of Tlwang River has been carried out from "Khamrang near NH-54 (Lat- 23°55'21.50"N, Long- 92°39'08.15"E) to Bridge on NH-154 at Gharmura (Lat 24°17'18.92"N, Long 92°30'59.51"E)." The length of the topography survey is from chainage 0.00 km to chainage 87.136 km.
The Topographic survey was 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 length of the Bathymetry survey is from Chainage 0.00 km to Chainage 35.00 km.

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 Tlwang 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 Tlwang River. The DGPS position along with water depths was recorded simultaneously and the tidal reduction was applied to the obtained depths.

Figure 4- During Bathymetry survey

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

For the Topographic Survey, the Horizontal control has been carried out from the CWC Gauge, located from the Gharmura RCC Bridge (NH-154). The value of Guage Level at Gharmura is-

Location Name	Geographic position		UTM position		Elevation (m)
	Latitude (N)	Longitude (E)	Northing	Easting	
Gharmura village.	24°17'7.96"	92°31'0.59"	2685926.205	450965.053	50.00 m w.r.t. MSL

Figure 5- CWC Gauge at Gharmura RCC Bridge

Figure 6-C.W.C Office near at Gharmura Site

Figure 7-G.T.S Bench Mark location Near at Gharmura RCC Bridge (NH-154)

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

There is no tidal Influence found in this part of the region of Assam.

2.4 Methodology to fix Chart Datum / Sounding Datum-

IWAI has provided the Sounding Datum at Sairong and Gharmura at the confluence Point of Dhaleswari River. The same was used to arrive the sounding datum values at BM pillars and tide gauges.

Sl. No	Place	Sounding Datum w.r.t MSL (Provided by IWAI)
1	Sairong (Chainage-108.737 km)	56.783 meter
2	Gharmura at confluence of Dhaleswarii River (Chainage-0.046 km)	22.348 meter

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

The CD levels of the Tlwang River are -

Sairong (Chainage-108.737 km) – 56.783 meter

Gharmura at confluence of Dhaleswarii River (Chainage-0.046 km) – 22.348 meter

2.6 Transfer of Sounding Datum table for tidal rivers / canals

There is no Tidal influence or Tidal effects found in this zone of river.

2.7 Table Indicating tidal variation at different observation points (say at every 10 Km)

There is no Tidal influence or Tidal effects found in this zone of river.

2.8 Salient Features of Dam, Barrages, Weirs, Anicut, Locks, Aqueducts etc

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	Height above MSL (m)	Height above SD (m)
BM 1	Gharmura	0.011	24°17'20.66"	92°30'56.75"	450858.74	2686317.132	40.289	17.939
BM 2	Ramnathpur	13.959	24°13'38.72"	92°31'27.05"	451689.01	2679488.441	42.171	15.414
BM 3	Bhairabi	24.226	24°10'44.48"	92°32'10.80"	452905.74	2674125.869	47.457	17.448
BM 4	Hnahthialtlang	40.619	24° 3'18.09"	92°32'14.17"	452955.71	2660396.629	54.526	19.317
BM 5	Hortiki	55.123	24° 4'5.33"	92°34'26.38"	456693.28	2661837.606	58.837	19.034
BM 6	Lelhchhun	69.544	24° 1'55.12"	92°37'41.66"	462197.98	2657817.059	63.672	19.306
BM 7	N. Mualvum	76.382	23°58'56.59"	92°37'43.98"	462248.62	2652326.291	68.931	22.393
BM 8	Khamrang	87.136	23°55'21.60"	92°39'11.75"	464712.92	2645708.588	73.373	23.447

Table 2 Bench Mark Details

2.10 Details of collected Water level at different gauge stations:-

Tide Gauge No	Location	Chainage	Easting	Northing	Latitude (N)	Longitude (E)	W.L M.S.L (m)	Period of Observation
Gauge Station-1	Gharmura village	0.052	450906.46	2686263.64	24°17'18.91"	92°30'58.46"	23.216	24 Hrs
Gauge Station-2	Ramnathpur village	13.964	451469.49	2678986.30	24°13'22.37"	92°31'19.31"	27.371	24 Hrs
Gauge Station-3	Bairabi village	24.278	452868.27	2674059.73	24°10'42.33"	92°32'9.49"	30.910	24 Hrs
Gauge Station-4	Vawngawn village	40.642	453018.56	2660336.46	24° 3'16.14"	92°32'16.41"	35.859	24 Hrs
Gauge Station-5	Hortoki village	55.140	456756.91	2661838.33	24° 4'5.37"	92°34'28.61"	40.093	24 Hrs
Gauge Station-6	Lelhchhun village	69.544	462257.68	2657815.67	24° 1'55.06"	92°37'43.79"	44.917	24 Hrs
Gauge Station-7	Saitlaw village	76.400	462206.61	2652357.51	23°58'57.59"	92°37'42.49"	46.768	24 Hrs
Gauge Station-8	Khamrang village	87.092	464610.81	2645692.6	23°55'21.07"	92°39'8.15"	50.088	24 Hrs

Table 3 Water level data of different Gauge stations

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	Sairong	108.737		56.783			Topo Reduced Data of Tlwang River
2	Gauge Station 8	87.092	81.746-87.136		49.926	-0.162	Submitted in Soft Copy
3	Gauge Station 7	76.400	72.972-81.746		46.538	-0.230	
4	Gauge Station 6	69.544	62.342-72.972		44.366	-0.551	
5	Gauge Station 5	55.140	47.891-62.342		39.803	-0.290	
6	Gauge Station 4	40.642	32.460-47.891		35.209	-0.560	
7	Gauge Station 3	24.278	19.121-32.460		30.025	-0.885	
8	Gauge Station 2	13.964	7.008-19.121		26.757	-0.614	
9	Gauge Station 1	0.052	0.000-7.008		22.350	-0.866	
10	Gharmura	0.046		22.348			

Table 4-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	Sairong		108.737	69.970	
2	Gharmura at Dhaleswari Confluence		0.000	36.300	
3		Gharmura RCC Bridge	0.041		36.30

Table 5 HFL Details

2.13 Graph: Sounding Datum and HFL vs Chainage:-

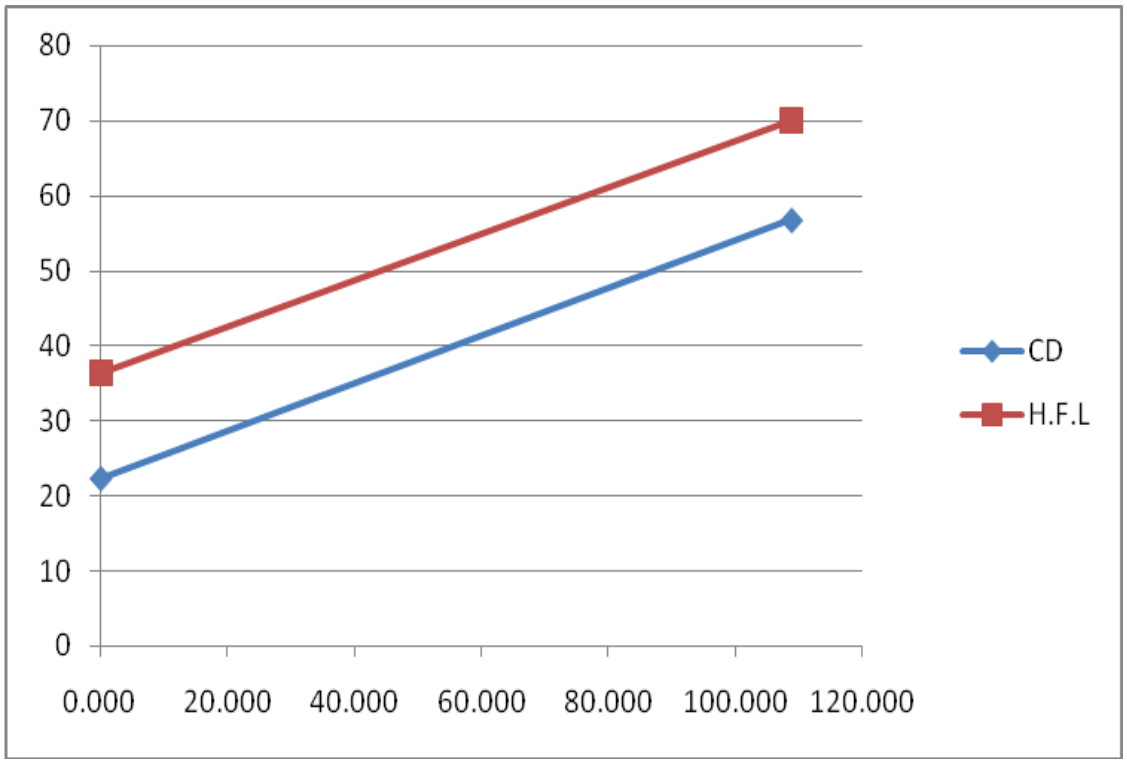


Table 6 Graph- Sounding Datum and H.F.L vs. Chainage

2.14 Average Bed Slope:-

Reach		River / Canal Bed Level Change (m)	Distance (km)	Slope (m/km)	Slope (cm/km)
From	To				
0.011	13.959	4.419	13.948	0.317	31.682
13.960	24.226	3.253	10.266	0.317	31.687
24.227	40.619	5.193	16.392	0.317	31.680
40.620	55.123	4.595	14.503	0.317	31.683
55.124	69.525	4.563	14.401	0.317	31.685
69.526	76.382	2.172	6.856	0.317	31.680
76.383	87.136	3.407	10.753	0.317	31.684
Total			87.119	Avg-0.317	Avg-31.683

Table 7-Average Bed Slope

2.15 Details of Dam/Barrage/Weirs/Anicut etc. w.r.t MSL:-

There are no Dams, Barrage, weirs, anicut found in this river zone.

2.16 Details of Locks:-

There are no locks found in this river zone.

2.17 Details of Aqueducts:-

There are no aqueducts found in this river zone.

2.18 Details of existing Bridge and Crossing over waterway:-

There are two RCC Bridges and two bamboo bridges located in this zone of river which (Bamboo Bridges) are temporary build up. So these bridges have no clearances.

Sl. No	Structure Name	Chainage (km)	Location	Position		Position		Length (m)	Width (m)	Nos of piers	Horizontal Clearance(m)	Vertical Clearance w.r.t H.F.L (m)	Present Condition
				Latitude (N)	Longitude (E)	Easting	Northing						
1	Gharmura RCC Bridge	0.041	Gharmura Village	24°17'19.14"	92°30'59.38"	450932.608	2686270.801	207.909	8.222	4	42.55	5.015	Complete
2	Bamboo Bridge	6.706	Jakebpur F.V	24°15'56.79"	92°30'29.90"	450092.81	2683740.98	92.760	0.857	-	-	-	Temporary
3	Bamboo Bridge	12.121	Ramnathpur Village	24°14'2.47"	92°30'50.62"	450664.106	2680222.436	89.63	1.218	-	-	-	Temporary
4	Bairabi RCC Bridge	24.218	Bairabi Village	24°10'39.47"	92°32'9.57"	452870.808	2673971.00	161.287	11.04	3	35.00	6.900	Complete

Table 8- Bridge Details

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

No other Cross structures, pipe lines and cables have been seen during the period of survey.

2.20 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.	HighTension Line	24.100	Bhairabi	24°10'39.42"	86°32'5.96"	452768.359	2673970.175	4	225.92	7.500	Complete

Table 9 - Electrical line

2.21 Current Meter and Discharge Details:-

Since water depth was too low between Chainage 0.011 km and 87.136 km, no bathymetry survey, current or discharge measurements have been conducted. The data recorded for Ch.-0.011 km, Ch.-24.226 km and Ch.-30.150 km are given 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/sec)
		Latitude (N)	Longitude (E)	Easting (m)	Northing (m)		0.5 D			
1	0.011	24°17'19.336"	92°30'59.843"	450945.1350	2686275.8700	1.740	0.512	0.512	168.49	86.266
2	24.226	24°10'43.683"	92°32'07.677"	452816.9075	2674100.8570	1.500	0.501	0.501	121.66	60.951
3	30.150	24°08'13.913"	92°32'31.443"	453472.3726	2669492.4413	0.8	0.402	0.402	132.56	53.289

Table 10- Details Current Meter List

2.22-a. Soil Sample Locations:-

Sample No.	Chainage (km)	Easting (m)	Northing (m)	Latitude (N)	Longitude (E)	Depth
1	0.011	450951.95	2686309.46	24°17'20.429"	92°31'00.081"	1.740
2	13.959	451471.65	2678946.7	24°13'21.095"	92°31'19.411"	0.800
3	24.226	452829.405	2674088.29	24°10'43.276"	92°32'08.122"	1.500
4	40.619	453041.305	2660352.465	24°03'16.683"	92°32'17.236"	0.400
5	55.123	456757.87	2661800.075	24°04'04.133"	92°34'28.678"	0.400
6	69.544	462240.87	2657767.215	24°01'53.509"	92°37'43.22"	0.500
7	76.382	462218.14	2652375.13	23°58'58.181"	92°37'42.918"	0.300
8	87.136	464615.61	2645676.43	23°55'20.566"	92°39'08.346"	0.400

Table 11-Soil Sample Location

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	0.011	450951.95	2686309.46	24°17'20.429"	92°31'00.081"	1.740	0.87
2	13.959	451471.65	2678946.7	24°13'21.095"	92°31'19.411"	0.800	0.4
3	24.226	452829.405	2674088.29	24°10'43.276"	92°32'08.122"	1.500	0.75
4	40.619	453041.305	2660352.465	24°03'16.683"	92°32'17.236"	0.400	0.2
5	55.123	456757.87	2661800.075	24°04'04.133"	92°34'28.678"	0.400	0.2
6	69.544	462240.87	2657767.215	24°01'53.509"	92°37'43.22"	0.500	0.25
7	76.382	462218.14	2652375.13	23°58'58.181"	92°37'42.918"	0.300	0.15
8	87.136	464615.61	2645676.43	23°55'20.566"	92°39'08.346"	0.400	0.2

Table 12- Water Sample Location

Section-3: Description of Waterways- Stretch Wise

3.1 From Chainage 0.00 Km to Chainage. 10.00 Km. (Gharmura village to Duttapur village)

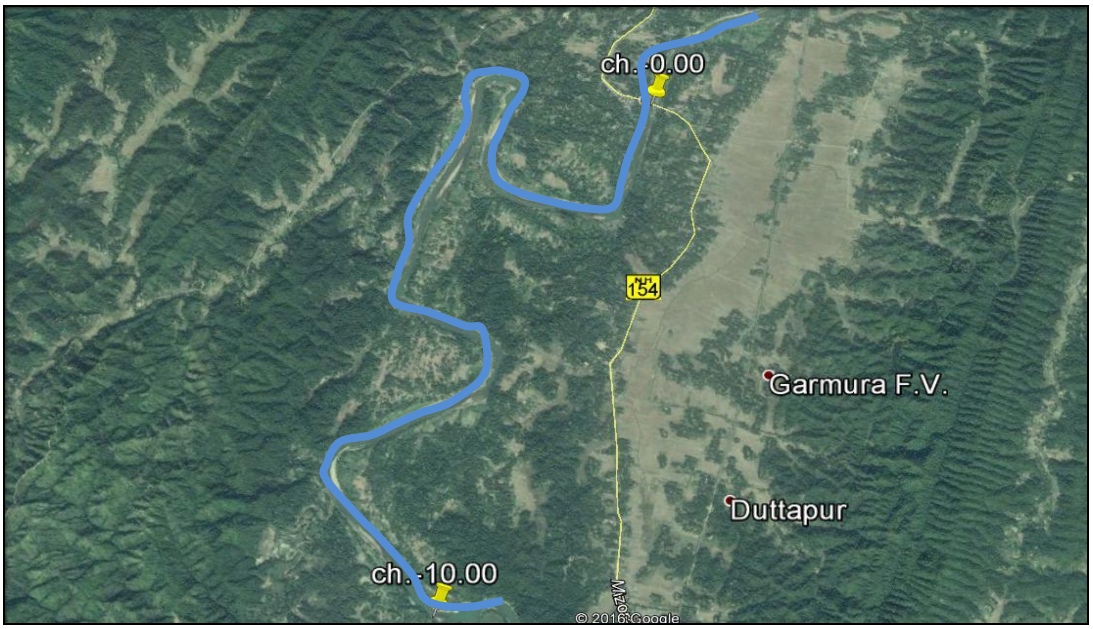


Figure 8 Chainage 0.00 km to Chainage 10.00 km

The River width of Tlwang (Dhaleswari) from Chainage 0.00 Km. to Chainag 10.00 Km is 57m to 100m approximate width. The average width portion of the river is 72m.
It is a basically a hilly area river the villages are the Gharmura , Jalnacherra Grant, Sahabmara, Bathcherra, Bagcherra and the Damcherra are situated on the left portion of the river at an avg. distance of 2km (approx) and the villages Jamira, Nandagram, Baruatilla and Rongpur are situated on the right portion of the river at an avg. distance of 3km.(approx). BM-1 has been situated near at chainage of 0.011km right bank side of the river.

The Gharmura RCC Bridge (Lat. - 24°17'19.14"N, Long. - 92°30'59.38"E) is situated near the chainage 0.011km and which is connected with the NH154 and the North Frontier Railway is also available in this part of the river. The Jamira Railway Station is situated at a distance of 4km towards North and the other NH-44A, NH-54, NH-150 are also available for communication in this part.

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	1.0	16.0	6750	14064.76	0.3	14.5	10000	58279.1
II	0.00	10.00	0.7	16.3	10000	56211.23	0.2	14.8	10000	151265.1
III	0.00	10.00	0.4	16.6	10000	186406.77	0.1	15.1	10000	367225
IV	0.00	10.00	0.1	16.9	10000	290655.51	0.1	15.4	10000	526922.84

Figure 9- Gharmura RCC Bridge (Chainage-0.410 km)

Figure 10- Bamboo Bridge (Chainage- 6.706 km)

3.2 From Chainage. 10.00 Km to Chainage. 20.00 Km (Duttapur village to Bairabi village)

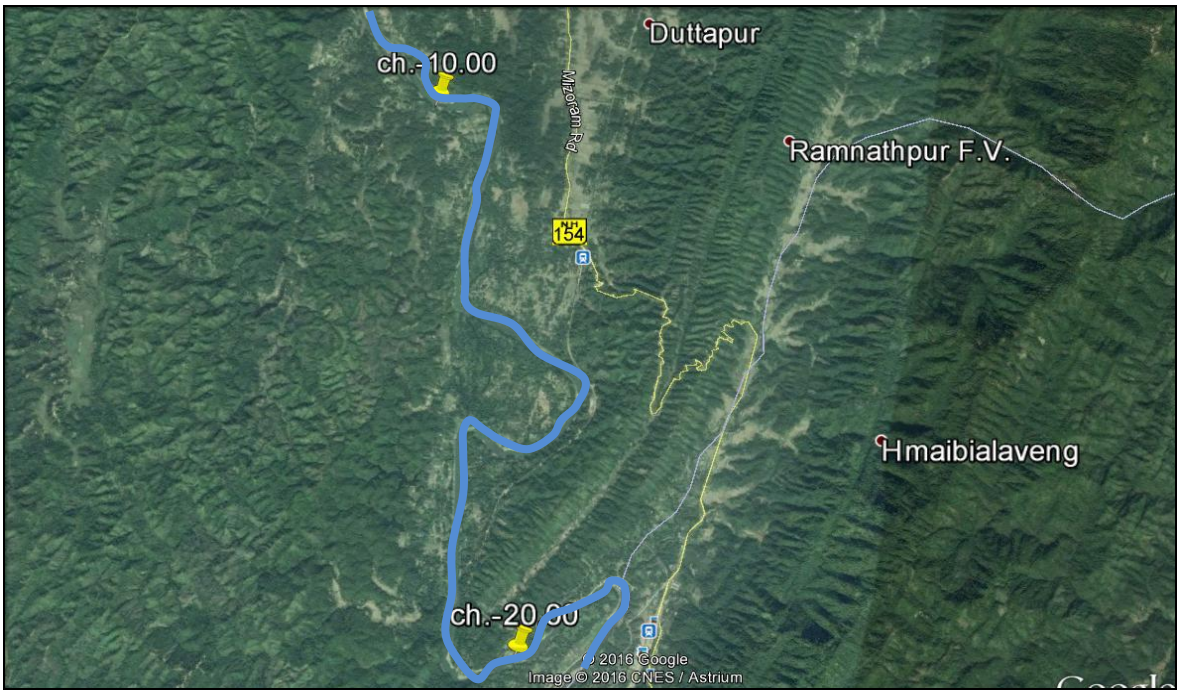


Figure 11 Chainage 10.00 km to Chainage 20.00 km

The River width of Tlwang River (Dhaleswari) from Chainage10.00 Km. to Chainage 20.00 Km is 42m to 74m approximate width. The average width portion of the river is 48m.

The villages Ramnathpura , Duttapur, Hmaibialaveng, Southchhimluang are the villages are situated on the left portion of the river at an avg. distance of 2 km(approx) and the villages Kolalian, Hriphaw and Bajirangpaveng are situated on the right bank of the river at an avg. distance of 3km (approx). BM-2 has been situated near at chainage of 13.959 km left bank side of the river. A Bamboo Bridge has been located near at chainage of 12.121km. A temporary ferry ghat is located near at chainage of 14 km.

The NH154, NH54 and the other roads are connected with this villages and the North Frontier Railway is also available for communication in this place. The Ramnathpur railway Station is situated at a distance of 300m. on the left bank 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	10.00	20.00	1.0	13.9	5300	49938.53	0.3	12.7	9550	35308.9
II	10.00	20.00	0.9	14.0	10000	42568.11	0.3	12.8	10000	106403.69
III	10.00	20.00	0.7	14.1	10000	148418.45	0.3	12.9	10000	284886.98
IV	10.00	20.00	0.5	14.2	10000	238023.78	0.2	13.0	10000	426985.95

Figure 12- Bamboo Bridge (Chainage- 12.121km)

3.3 From Chainage 20.00 Km to Chainage 30.00 Km (Bairabi village to Rajtali village)

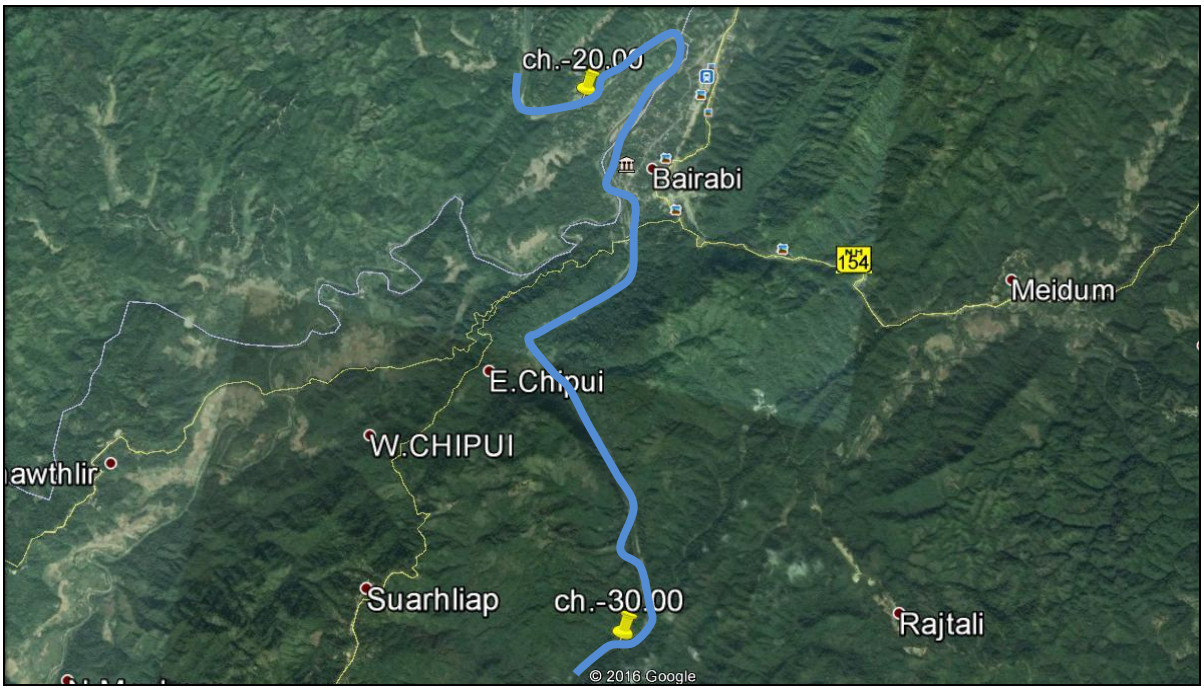


Figure 14 Chainage 20.00 km to Chainage 30.00 km

The River width Tlwang (Dhaleswari) from Chainage 20.00 Km. to Chainage 30.00 Km is 34m to 44m approximate width .The average width portion of the river is 30 m.

The river from the chainage-20.00 km to chainage-30.00 km is situated in basically in the valley of the hills of the Mizoram. The Bairabi, Asproveng, S. Chimmluang, Pangbalkawn and the Meidum are the villages are situated on the left portion of the river at an avg. distance of 2.5 km (approx) and the villages E. Chipui, Saikhawthlir, Suarhliap, N. Muabang are the villages situated on the right portion of the river at an avg. distance of 2 km (approx). Bhairabi RCC Bridge and Bhairbi Ferry ghat (Lat. - 24°10'39.47"N, Long. - 92°32'9.57"E) has been situated near at chainage of 24.218 km. BM-3 has been situated near at chainage of 24.226 km left bank side of the river.

The NH-154, Zamuang Road, Suarhliap Roads are the main ways for communication and the North Frontier Railway is also available in this place the nearest Railway Station Bairabi is situated at a distance of 300m on the left bank 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	20.00	30.00	0.9	6.7	7300	12002.6	0.5	5.7	10000	49958.62
II	20.00	30.00	0.8	6.9	10000	50582.96	0.3	5.9	10000	137246.67
III	20.00	30.00	0.6	7.1	10000	166549.87	0.1	6.1	10000	342733.94
IV	20.00	30.00	0.4	7.3	10000	256772.99	0.1	6.3	10000	488842.91

Figure 13- Bhairabi RCC Bridge (Chainage- 24.218 km)

Figure 14-Bhairabi ferry ghat (Chainage- 24.218 km)

3.4 From Chainage 30.00 Km to Chainage. 40.00 Km (Rajtali village to Vawn gaon village)

Figure 15 Chainage 30.00km to Chainage 40.00km

The River width of Tlwang (Dhaleswari) River from Chainage 30.00 Km. to Chainage 40.00 Km is 30m to 54m approximate width. The average water portion of the river is 38m.

The villages Rajtali and the Dilzua H are the only villages situated on the left bank of the river at an avg. distance of 2.5 km (approx) and the villages Kananthar, Dammancherra and the Vawngawn are situated at an avg. distance of 3km (approx) on the right bank of the river. The NH-54 and the Suarhliap Road and the Rajtali Roads are the main communication roads for this place the North Frontier Railway is not available in this place.

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	0.1	6.5	8000	71393.2	-0.3	4.7	8200	89710.64
II	30.00	40.00	0.09	6.6	10000	171906.3	-0.3	4.8	10000	221960.55
III	30.00	40.00	0.09	6.7	10000	382971.39	-0.3	4.9	10000	495990.28
IV	30.00	40.00	0.09	6.8	10000	527619.36	-0.3	5.0	10000	673382.1

3.5 From Chainage. 40.00 Km to Chainage. 50.00 Km (Vawngaon village to North Tlangkhang village)

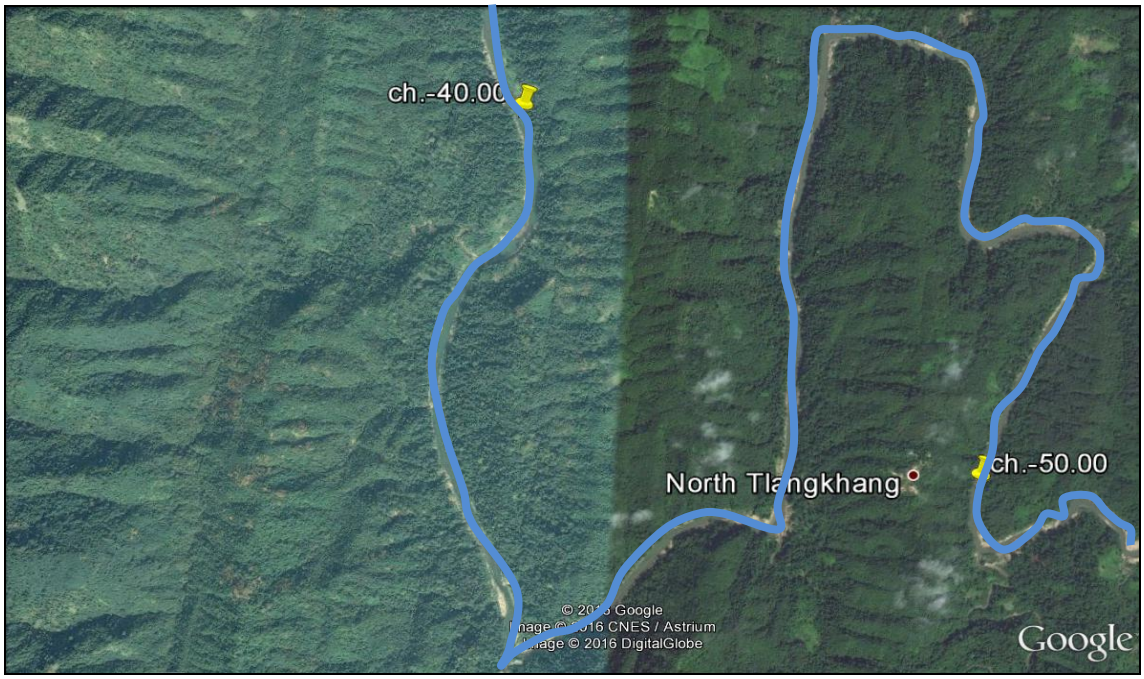


Figure 16 Chainage 40.00km to 50.00km

The River width of River Tlwang (Dhaleswari) from Chainage 40.00 Km. to Chainage 50.00 Km is 34m to 74m approximate width. The average width portion of the river is 40m.

Between the chainage of 40.00 km to 50.00 km, the river is totally surrounded by full of jungle or dense forest. Two villages named North Tlang khang and Vawngawnzo are situated on the right bank of the river at a distance of 400 m and 600 m approx from the river. Only the villages inter- connected roads are located in this portion. BM-4 has been situated near at chainage of 40.619km right bank side 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	40.00	50.00	0.1	1.7	9000	333520.3	-0.3	1.3	8250	424221.54
II	40.00	50.00	0.09	1.7	10000	519663.1	-0.3	0	10000	639571.29
III	40.00	50.00	0.09	1.7	10000	822098.02	-0.3	0	10000	976521.3
IV	40.00	50.00	0.09	1.7	10000	1020558.69	-0.3	0	10000	1180890.7

3.6 From Chainage. 50.00 Km to Chainage. 60.00 Km (North Tlangkhang village to Hortoki village)

Figure 17 Chainage 50.00 km to 60.00 km

The River width of South Buckingham Canal from Chainage 50.00 Km. to Chainage 60.00 Km is 25m to 40m approximate width. The average water portion of the river is 31m.
Between the chainage 50.00 km to Chainage 60.00 km only a single village Horitoki is situated near the chainage 60.00 km on the left portion of the river and the rest portion between the chainage is full of deep forest and only the village's mud road is locate for communication in this portion of the river. BM-5 has been Situated near at chainage of 55.123km left bank side 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	50.00	60.00	0.1	0.7	10000	710075.21	-0.3	0	9800	332216.77
II	50.00	60.00	0.09	0.7	10000	472848.3	-0.3	0	10000	564838.8
III	50.00	60.00	0.09	0.7	10000	793155.9	-0.3	0	10000	922082.6
IV	50.00	60.00	0.09	0.7	10000	990835.96	-0.3	0	10000	1130816.8

3.7 From Chainage. 60.00 Km to Chainage. 70.00 Km (Hortoki Village to Lelhchhun village)

Figure 18 Chainage 60.00km to 70.00km

The Rriver width of River Tlwang (Dhaleswari) from Chainage 60.00 Km. to Chainage 70.00 Km is 25m to 40m approximate width. The average water portion of the river is 30m.

Between the chainage 60.00 km to 70.00 km of the river is full of deep forest area and the lacking of roads for communication only the NH-54 is situated at an distance of 4km approx on top of the hill and other village mud roads are located. The Kwanpui Town is situated on the left portion of the river at a distance of 4.5 km on the top of the hill. BM-6 has been situated near at chainage of 69.544 km right bank side 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	70.00	0.1	0.6	9100	216392.7	-0.3	0	9100	264120.13
II	60.00	70.00	0.09	0.6	10000	389316	-0.3	0	10000	462433.7
III	60.00	70.00	0.09	0.6	10000	691501.4	-0.3	0	10000	798347.4
IV	60.00	70.00	0.09	0.6	10000	892022.24	-0.3	0	10000	1007010.1

3.8 From Chainage 70.00 Km to Chainage 80.00 Km (Lelhchhuton village to Saitlaw village)

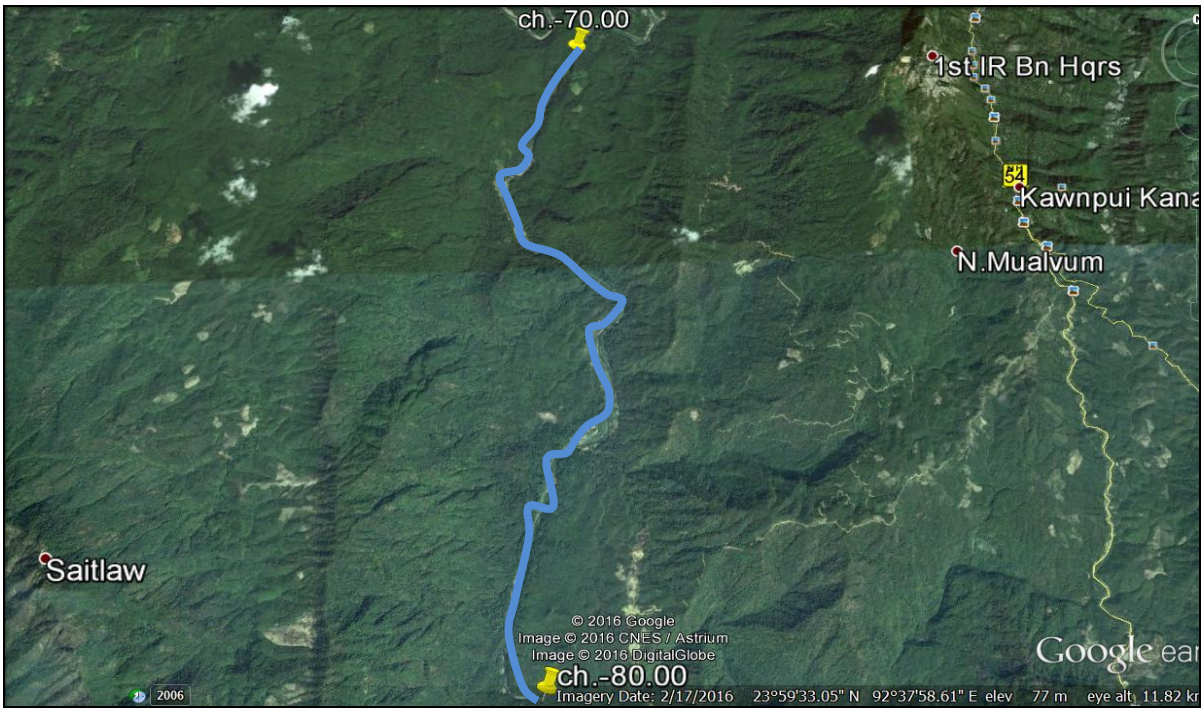


Figure 19 Chainage 70.00 km to 80.00 km

The width of River Tlwang (Dhaleswari) from Chainage70.00 Km. to Chainage 80.00 Km is 20m to 33m approximate width. The average water portion of the river is 25m.

Between the Chainage of 70 km to 80 km the portion is basically covered by forest. The Villages and the towns are 1st IR Bn Hqrs, Kawnpui Kanan Vegn, N. Mualvum, Zanlawn are situated on the left portion of the river at an avg. distance of 4km and the only a single village Saitlaw is situated on the right portion of the river at a distance of 3km approx from the river. BM-7 has been situated near at chainage of 76.382 km left bank side 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	70.00	80.00	0.1	0.6	10000	348270	-0.3	0	10000	429716.7
II	70.00	80.00	0.09	0.6	10000	568626	-0.3	0	10000	683295.8
III	70.00	80.00	0.09	0.6	10000	900090.8	-0.3	0	10000	1051948.3
IV	70.00	80.00	0.09	0.6	10000	1102584.27	-0.3	0	10000	1263144.1

3.9 From Chainage. 80.00 Km to Chainage 87.136 Km (Saitlaw village to Khamrang village)

Figure 20 Chainage 80.00 km to 87.136km

The River width of River Tlwang (Dhaleswari) from Chainage 80.00 Km. to Chainage 87.136 Km is 21 m to 46 m approximate width. The average width portion of the river is 30m.

Between the chainage.-80.00 km to Chainage 86.00 km , the river channel is covered with full of deep forest but the village Khamrang is the only village, situated on the left bank of the river at a distance of 1.2km and the NH54 and the Sairang Road is the main roads of this portion for communication. BM-8 has been situated near at chainage of 87.136 km left bank side 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	80.00	87.136	0.1	0.6	7000	137806.6	-0.3	0	7000	169629
II	80.00	87.136	0.1	0.6	7000	262694	-0.3	0	7000	311988.8
III	80.00	87.136	0.1	0.6	7000	475983.5	-0.3	0	7000	546879.4
IV	80.00	87.136	0.1	0.6	7000	616534.38	-0.3	0	7000	692827.5

•**Bathymetry Survey**

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

The layer of water in the river Tlwang is not sufficient for carrying out the Bathymetric survey. The Length of the Bathymetric survey of the river is 0.00km to 35.00km.

Date of Bathymetry Survey	From (km)	To (km)
25.12.15	0.00	11.745
26.12.15	11.745	21.560
04.04.16	21.560	30.00
12.04.16	30.00	35.00

- **Topographic Survey**

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

The Topographic survey has been carried out from "Khamrang near NH54 (Lat 23°55'21.50"N, Long 92°39'8.15"E) to Gharmura RCC Bridge (NH154) (Lat 24°17'18.92"N, Long 92°30'59.51"E). The length of the Topography Survey of the river is 0.00km to 87.136km

b) Navigational Hazards - Rocks, rapid waterfalls, steep gradient: -

There are many Rocks found in this zone of river.

c) Details of Protected Area- Wildlife Defence: -

The river Tlwang is too close with the border of Assam and Mizoram state so there were some security clearance will need for the water ways development and as well as the security or other clearance will need for the vicinity of the Lengteng wildlife Sanctuary .

d) NH/SH/MDR along and/or in vicinity:-

The Roads are linked with NH-44A, NH-54, NH-150, NH-150 and SH-6 which are very communicative way for the local inhabitants and for the tourist. The North Frontier Railway link is also help for communication and transportation.

e) Railway Line and Stations in the vicinity:-

There is no Railway line or stations found between Khamrang near NH-54 and Gharmura village. But Ramnathpur Railway station has been located near BM-2.

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

The major portion of the right bank of the river is occupied by agriculture. Major crops are rice, tea, mustard, sugarcane, black dhal, vegetables like, radish, cabbage, cauliflower, etc. The left bank mostly occupied with scattered forest area and agriculture. The most important forest products are timber, bamboo and firewood.

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

As a Hill area, the local Farmer is well known for Jhum cultivation. In recent times, Paddy cultivation are also available in this places. Beside this, Horticultute is growing here- Anthurium, Roses, Banana, Ginger, Turmeric, Passion Fruit and orange are also being cultivated.

h) Availability of Bulk / Construction Material: -

The availability of the construction materials is not easy for construction or any kind of structure. Many rocks, outcrops etc. are available near the river side.

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

There is much kind of Industries situated on the bank of the river the Industries like cement, wood and the other small industries like small foundries are available.

j) Existing Jetties and Terminals (with conditions and facilities): -

The Temporary Jetty Service is available at near the chainage of of 14.00km, 24.200km for communication with the both banks of the river.

Sl no	Chainage (km)	Name of ferry Ghat	Easting	Northing	Latitude (N)	Longitude (E)	Remarks
1	14.000	Kanchiwala Ghat	451422	2678929	24°10'41.78"	92°32'9.67"	Temporary Jetty
2	24.218	Bairabi	452873	2674042	24°13'20.51"	92°31'17.65"	

k) Existing Cargo Movement: -

Two temporary ferry services are available in this zone of river near at chainage of 14.00 km and 24.218 km. The light cargo like vegetables, fishes, light goods etc. are available near at Bhairabi ferry ghat (Chainage-24.218 km).

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

The places situated beside the bank of the river are basically a Hill station and the famous places are the Kolashib, Hailakandi, Bhairabi, Aizwal etc. The State Museum at Babu Tlang, The Cultural Sub-Center, Zoological Garden, Bung Picnic Spot, MAHCO Showroom, Treasury Square, Vengthlang, Bethlehem, Bara Bazar, Luangmual Handicrafts Center. Beside this, the Durtlang Hills, Berawtlang Tourist Complex, Pukzing caves, Tamdil Lake and Rungdil Lake are also tourist spot in this zone of river.

m) Availability of Passenger Ferry Services: -

The Ferry Service is available at near the chainage of of 14.00km, 24.200km for communication with the both banks of the river.

Sl no	Chainage (km)	Name of ferry Ghat	Easting	Northing	Latitude (N)	Longitude (E)	Remarks
1	14.000	Kanchiwala Ghat	451422	2678929	24°10'41.78"	92°32'9.67"	Temporary Ferry
2	24.218	Bairabi	452873	2674042	24°13'20.51"	92°31'17.65"	

n) Available and probable Water Sport Recreational Facilities: -

No water sports and other facilities available in this zone of river.

o) Fishing activities:-

As a hill area the people are well connected the profession like hunting and Fishing. Though the cultivation has been set up recently in the hill area, the local people are gathered in the river site and catch fish daily basis. Fishing is one of the major occupations in this zone of river.

p) Sand mining:-

Illegal river sand mining across the country is on the rise for past many years in Indian, which results in adverse impact on river system and dependent communities. In Tlwang gravel mining was noticed during the survey period. Besides this, sand is also exported to other states as it becomes demandful for making Building or Industries.

q) Tributaries:-

The Three streams create a river basin in this zone of river

i) Tut

i) Teirei

ii) Ngashih

r) Details of Irrigation Canals and Outlets:-

The irrigation canals and outlets habe been located near at chainage of 5.400km, 8.600km, 8.800km, 23.900km , 42.700km, 50.500km, 60.700km right bank side of the river and 12.500km, 57.200km, 68.250km, 80.00km left bank side of the river.

s) Details of Nalas, polluted water discharge in to the rivers and treatment plants:-

There are no nalas found in this zone of river.

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

In Recent time's man avoid to 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. Irrigation Canals supply the sufficient water for the cultivation.

Section 4: Terminals

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

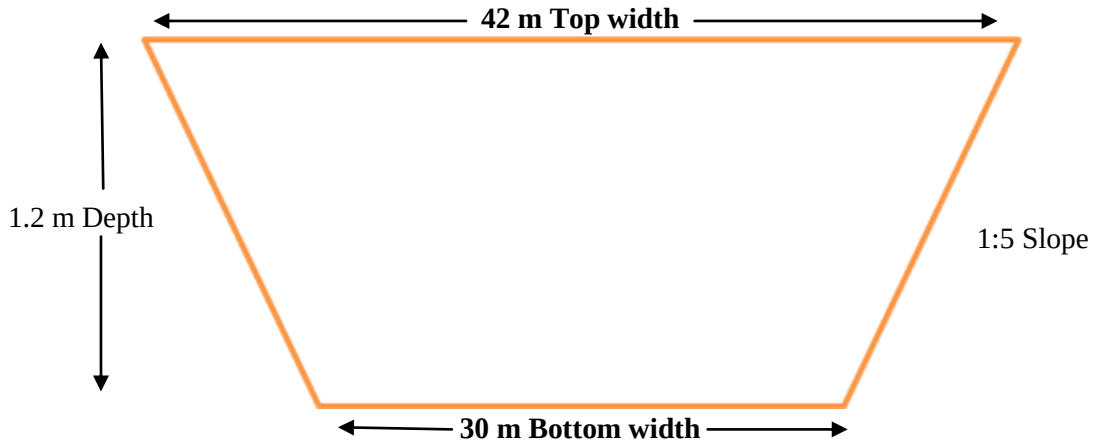
4.1 Details of Land use, owner etc.:-

The both side bank of the River Tlwang connect with dense forests. Besides, some portions of the land are surrounded by small industries and Agricultural land. 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)

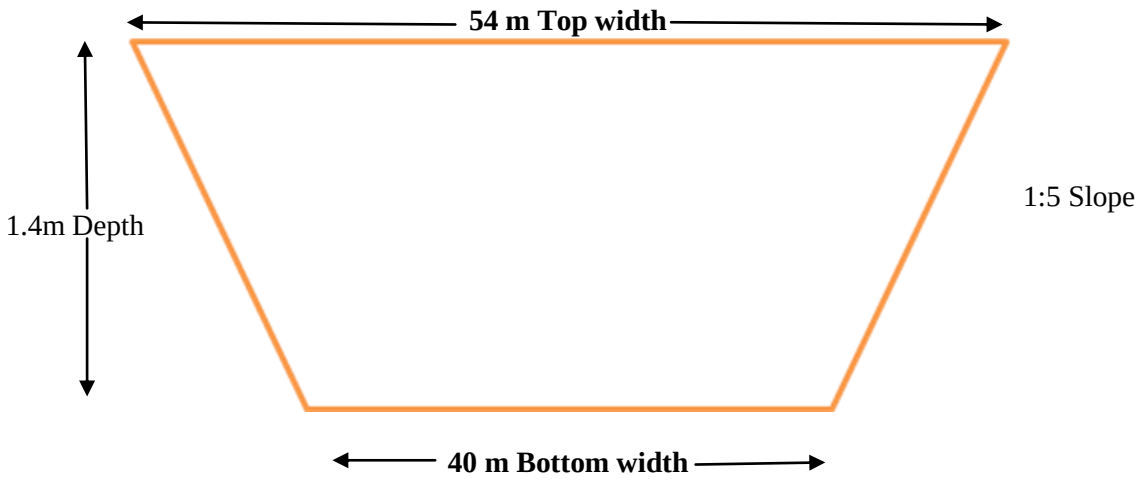
Class-I: - (Channel design: - Bottom width- 30 meter, Top width- 42 meter)



Location		Chainage (km)		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 Quantity (cubic meter)	Min Depth (m)	Max Depth (m)	Length of Shoal (m)	Avg Depth of Cut (m)	Dredging Qty. (cubic meter)	Cumulative Dredging Quantity (cubic meter)
Gharmura	Duttapur	0	10	1.0	16.0	6750	0.063	14064.76	14064.76	0.3	14.5	10000	0.176	58279.10	58279.10
Duttapur	Bhairabi	10	20	1.0	13.9	5300	0.030	49938.53	64003.29	0.3	12.7	9550	0.111	35308.90	93588.00
Bhairabi	Rajtali	20	30	0.9	6.7	7300	0.030	12002.60	76005.89	0.5	5.7	10000	0.151	49958.62	143546.62
Rajtali	Vawngawn	30	40	0.1	6.5	8000	0.270	71393.20	147399.09	-0.3	4.7	8200	0.331	89710.64	233257.26
Vawngawn	North Tlangkhang	40	50	0.1	1.7	9000	1.12	333520.30	480919.39	-0.3	1.3	8250	1.55	424221.54	657478.80
North Tlangkhang	Hortoki	50	60	0.1	0.7	10000	2.14	710075.21	1190994.60	-0.3	0	9800	1.026	332216.77	989695.57
Hortoki	Lelhchhuton	60	70	0.1	0.6	9100	0.719	216392.70	1407387.30	-0.3	0	9100	0.878	264120.13	1253815.70
Lelhchhuton	Saitlaw	70	80	0.1	0.6	10000	1.05	348270.00	1755657.30	-0.3	0	10000	1.30	429716.70	1683532.40
Saitlaw	Khamrang	80	87.136	0.1	0.6	7000	0.596	137806.60	1893463.90	-0.3	0	7000	0.733	169629.00	1853161.40
Total						72450		1893463.90		Total		81900		1853161.40	

Table 13-Dredging Calculation for Class-I

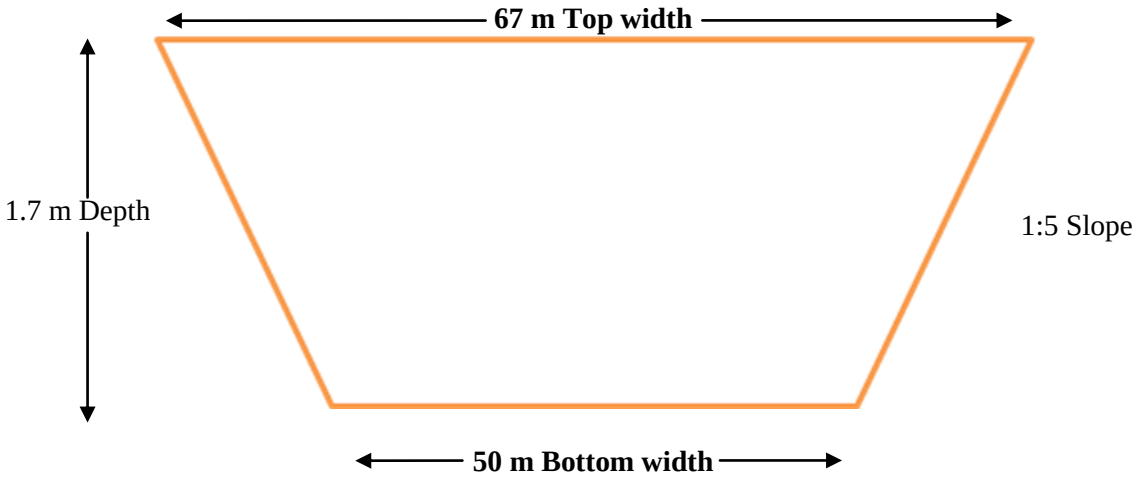
Class-II: - (Channel design: - Bottom width- 40 meter, Top width- 54 meter)



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 Quantity (cubic meter)	Min Depth (m)	Max Depth (m)	Length of Shoal (m)	Avg depth of cut (m)	Dredging Qty. (cubic meter)	Cumulative Dredging Quantity (cubic meter)
Gharmura	Duttapur	0	10	0.7	16.3	10000	0.128	56211.23	56211.23	0.2	14.8	10000	0.344	151265.10	151265.10
Duttapur	Bhairabi	10	20	0.9	14.0	10000	0.097	42568.11	98779.34	0.3	12.8	10000	0.242	106403.69	257668.79
Bhairabi	Rajtali	20	30	0.8	6.9	10000	0.115	50582.96	149362.30	0.3	5.9	10000	0.312	137246.67	394915.46
Rajtali	Vawngawn	30	40	0.09	6.6	10000	0.390	171906.30	321268.60	-0.3	4.8	10000	0.504	221960.55	616876.01
Vawngawn	North Tlangkhang	40	50	0.09	1.7	10000	1.180	519663.10	840931.70	-0.3	0	10000	1.453	639571.29	1256447.30
North Tlangkhang	Hortoki	50	60	0.09	0.7	10000	1.074	472848.30	1313780.00	-0.3	0	10000	1.283	564838.80	1821286.10
Hortoki	Lelhchhuton	60	70	0.09	0.6	10000	0.884	389316.00	1703096.00	-0.3	0	10000	1.050	462433.70	2283719.80
Lelhchhuton	Saitlaw	70	80	0.09	0.6	10000	1.292	568626.00	2271722.00	-0.3	0	10000	1.552	683295.80	2967015.60
Saitlaw	Khamrang	80	87.136	0.1	0.6	7000	0.852	262694.00	2534416.00	-0.3	0	7000	1.01	311988.80	3279004.40
Total						87000		2534416.00		Total		87000		3279004.40	

Table 14- Dredging Calculation for Class-II

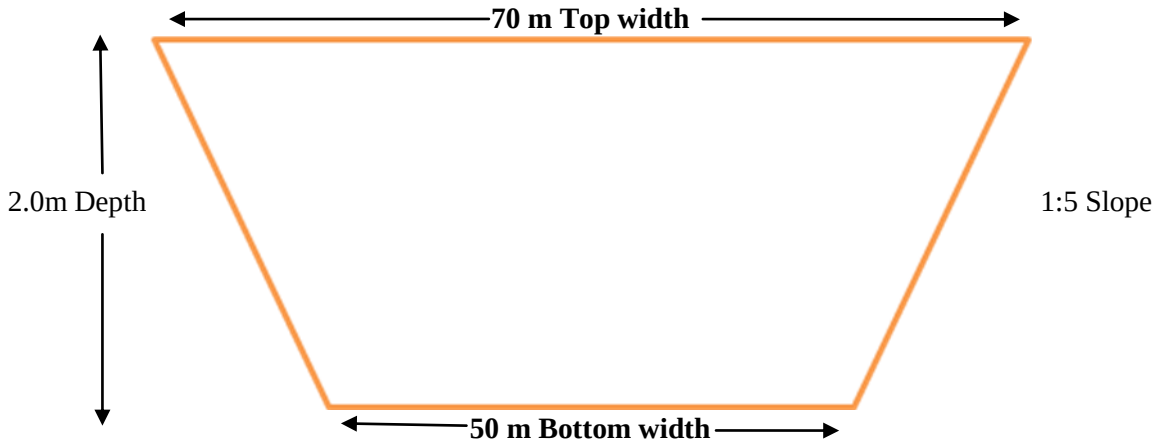
Class-III: - (Channel design: - Bottom width- 50 meter, Top width- 67 meter)



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 Quantity (cubic meter)	Min. Depth (m)	Max Depth (m)	Length of Shoal (m)	Avg depth of cut (m)	Dredging Qty. (cubic meter)	Cumulative Dredging Quantity (cubic meter)
Gharmura	Duttapur	0	10	0.4	16.6	10000	0.339	186406.77	186406.77	0.1	15.1	10000	0.667	367225.00	367225.00
Duttapur	Bhairabi	10	20	0.7	14.1	10000	0.270	148418.45	334825.22	0.3	12.9	10000	0.518	284886.98	652111.98
Bhairabi	Rajtali	20	30	0.6	7.1	10000	0.303	166549.87	501375.09	0.1	6.1	10000	0.623	342733.94	994845.92
Rajtali	Vawngawn	30	40	0.09	6.7	10000	0.696	382971.39	884346.48	-0.3	4.9	10000	0.902	495990.28	1490836.20
Vawngawn	North Tlangkhang	40	50	0.09	1.7	10000	1.494	822098.02	1706444.50	-0.3	0	10000	1.775	976521.30	2467357.50
North Tlangkhang	Hortoki	50	60	0.09	0.7	10000	1.442	793155.90	2499600.40	-0.3	0	10000	1.676	922082.60	3389440.10
Hortoki	Lelhchhuton	60	70	0.09	0.6	10000	1.257	691501.40	3191101.80	-0.3	0	10000	1.451	798347.40	4187787.50
Lelhchhuton	Saitlaw	70	80	0.09	0.6	10000	1.636	900090.80	4091192.60	-0.3	0	10000	1.912	1051948.30	5239735.80
Saitlaw	Khamrang	80	87.136	0.1	0.6	7000	1.23	475983.50	4567176.10	-0.3	0	7000	1.42	546879.40	5786615.20
Total						87000		4567176.10		Total		87000		5786615.20	

Table 15- Dredging Calculation for 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 Quantity (cubic meter)	Min. Depth (m)	Max Depth (m)	Length of Shoal (m)	Avg depth of cut (m)	Dredging Qty. (cubic meter)	Cumulative Dredging Quantity (cubic meter)
Gharmura	Duttapur	0	10	0.1	16.9	10000	0.528	290655.51	290655.51	0.1	15.4	10000	0.958	526922.84	526922.84
Duttapur	Bhairabi	10	20	0.5	14.2	10000	0.433	238023.78	528679.29	0.2	13.0	10000	0.776	426985.95	953908.79
Bhairabi	Rajtali	20	30	0.4	7.3	10000	0.467	256772.99	785452.28	0.1	6.3	10000	0.889	488842.91	1442751.70
Rajtali	Vawngawn	30	40	0.09	6.8	10000	0.959	527619.36	1313071.64	-0.3	5	10000	1.224	673382.10	2116133.80
Vawngawn	North Tlangkhang	40	50	0.09	1.7	10000	1.855	1020558.69	2333630.33	-0.3	0	10000	2.147	1180890.70	3297024.50
North Tlangkhang	Hortoki	50	60	0.09	0.7	10000	1.801	990835.96	3324466.29	-0.3	0	10000	2.056	1130816.80	4427841.30
Hortoki	Lelhchhuton	60	70	0.09	0.6	10000	1.622	892022.24	4216488.53	-0.3	0	10000	1.831	1007010.10	5434851.40
Lelhchhuton	Saitlaw	70	80	0.09	0.6	10000	2.004	1102584.27	5319072.80	-0.3	0	10000	2.296	1263144.10	6697995.50
Saitlaw	Khamrang	80	87.136	0.1	0.6	7000	1.60	616534.38	5935607.18	-0.3	0	7000	1.79	692827.50	7390823.00
Total						87000		5935607.18		Total		87000		7390823.00	

Table 16- Dredging Calculation for Class-IV

Section 6: Conclusion:

The waterways of the river Tlwang are originated from the Mijo Hills situated in southern part of Mijoram, the length of the river is 87.136km, Stretch from Gharmura RCC Bridge (NH-154) to Khamrang (NH-54). During the period of the survey we found the water level of the river is not sufficient for the Hydrographic survey. The waterway of the river includes RCC Bridges, Electrical Line, Villages, Irrigation Canals and outlets, Dense Forest etc. Total 8 nos of Bench Mark have been established during the survey period. The light ferry services have been found in this zone of river.

The River has Two RCC Bridges situated near at chainage of 0.011km and another RCC Bridge is situated near at change of 24.2km. The first one is Gharmura RCC Bridge which is connect with NH 154 and another is Bairabi RCC Bridge which is also connects with NH 154.Besides, two Bamboo Bridges are also situated near at chainage of 6.7km and 12.1km respectively. The Bridges have a good Vertical and Horizontal clearance for the development of the water ways. The Cargo transportation is well connected by the roads. The Gharmura RCC Bridge is well connected to 154 towards Aizal. But there were lots of possibility to improve the cargo transportation by waterway and if the waterways will develop then the transportation system will take a major role to communicate with Assam and the other States of India in very low and chip rate.

The State Museum at Babu Tlang, The Cultural Sub-Center, Zoological Garden, Bung Picnic Spot, MAHCO Showroom, Treasury Square, Vengthlang, Bethlehem, Bara Bazar, Luangmual Handicrafts Center. If you are looking for scenic outdoor charms then must visit the Durtlang Hills, Berawtlang Tourist Complex, Pukzing caves, Tamdil Lake and Rungdil Lake are the tourist spot in this zone of river.

6.1 Dredging Quantity:

Class Details	As per Observed Soundings (cubic meter)	As per Reduced Soundings (cubic meter)
Class I	1893463.90	1853161.40
Class II	2534416.00	3279004.40
Class III	4567176.10	5786615.20
Class IV	5935607.18	7390823.00

Annexure:-

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

The Chart Datum value of Sairang , Gharmura and Confluence with Dhaleswari River 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 Quantity (cubic meter)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cubic meter)	Cumulative Dredging Quantity (cubic meter)
0	1	1.1	10	200	291.40	291.40	1	8.9	1000	4090.42	4090.42
1	2	1	10	100	70.02	361.42	0.8	8.9	1000	1879.49	5969.91
2	3	1.1	16	1000	1197.81	1559.23	1.1	14.5	1000	5251.41	11221.32
3	4	1	16	1000	1736.78	3296.01	0.8	14.5	1000	8502.66	19723.98
4	5	1	3.5	1000	6378.75	9674.76	0.6	2.4	1000	18527.59	38251.57
5	6	1.1	8.3	1000	2500.84	12175.60	1.1	6	1000	9631.72	47883.29
6	7	1.1	8.7	450	562.93	12738.53	1.1	7.4	1000	4656.64	52539.93
7	8	1	3.5	500	692.85	13431.38	0.6	2.2	1000	3483.25	56023.18
8	9	1	5.3	500	486.70	13918.08	1.1	4.6	1000	1244.05	57267.23
9	10	1	9.6	1000	146.68	14064.76	0.3	7.9	1000	1011.87	58279.10
10	11	1.1	13.9	100	67.36	14132.12	1	12.7	550	640.57	58919.67
11	12	1.1	4.9	250	359.10	14491.22	1	3.3	1000	2325.71	61245.38
12	13	1	7	500	86.79	14578.01	0.9	6.4	1000	1444.65	62690.03
13	14	1.1	7.1	500	630.70	15208.71	1	5.4	1000	2904.25	65594.28
14	15	1.1	7.4	1000	1373.54	16582.25	1.6	6.6	1000	4565.95	70160.23
15	16	1	5.8	1000	2781.32	19363.57	0.6	4.9	1000	8098.14	78258.37
16	17	1	10.6	350	384.57	19748.14	1	8.9	1000	2368.96	80627.33
17	18	1	3.1	500	691.63	20439.77	0.3	2.5	1000	3555.93	84183.26
18	19	1	4.6	1000	43365.68	63805.45	1	3.9	1000	7293.29	91476.55
19	20	1	7.6	100	197.84	64003.29	0.5	6.5	1000	2111.45	93588.00
20	21	1	6.4	1000	2093.89	66097.18	0.9	5.6	1000	7303.78	100891.78
21	22	1.1	5	750	839.15	66936.33	1	4.2	1000	2599.54	103491.32
22	23	1	3.1	1000	2011.26	68947.59	0.5	2.3	1000	10658.18	114149.50

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 Quantity (cubic meter)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cubic meter)	Cumulative Dredging Quantity (cubic meter)
23	24	1	6	1000	1623.08	70570.67	0.9	5.2	1000	7885.16	122034.66
24	25	1.1	6.4	550	553.03	71123.70	0.5	5.4	1000	4037.85	126072.51
25	26	1.1	6	500	745.92	71869.62	0.6	5.6	1000	2629.81	128702.32
26	27	1	6.7	150	280.42	72150.04	1	5.7	1000	2553.31	131255.63
27	28	1	6.2	1000	2388.63	74538.67	1	5.7	1000	4421.90	135677.53
28	29	1	4.6	750	853.10	75391.77	0.9	3.6	1000	3485.83	139163.36
29	30	0.9	5	600	614.12	76005.89	0.8	3.7	1000	4383.26	143546.62
30	31	1	5.7	1000	1156.85	77162.74	1	4.7	1000	3756.51	147303.13
31	32	1	5.2	1000	1190.59	78353.33	0.6	4.6	1000	5479.13	152782.26
32	33	1	3.7	1000	1484.84	79838.17	1	2.6	1000	5219.46	158001.72
33	34	1.2	4.1	0	0.00	79838.17	1	3.2	100	84.03	158085.75
34	35	1.3	6.5	0	0.00	79838.17	-0.3	0	100	56.39	158142.14
35	36	0.1	3.7	1000	1214.62	81052.79	-0.3	0	1000	1462.41	159604.55
36	37	0.1	0.6	1000	3266.75	84319.54	-0.3	0	1000	3395.77	163000.32
37	38	0.1	0.4	1000	11061.61	95381.15	-0.3	0	1000	12025.46	175025.78
38	39	0.1	0.5	1000	21557.55	116938.70	-0.3	0	1000	23647.86	198673.64
39	40	0.1	0.6	1000	30460.39	147399.09	-0.3	0	1000	34583.62	233257.26
40	41	0.1	0.4	1000	37378.05	184777.14	-0.3	0	1000	43623.22	276880.48
41	42	0.1	0.6	1000	42137.68	226914.82	-0.3	0	1000	52410.62	329291.10
42	43	0.1	0.4	1000	42572.11	269486.93	-0.3	0	1000	54988.82	384279.92
43	44	0.1	0.4	1000	42954.24	312441.17	-0.3	0	1000	55482.49	439762.41
44	45	0.1	0.6	1000	42349.79	354790.96	-0.3	0	1000	54701.70	494464.11
45	46	0.1	0.4	1000	42998.44	397789.40	-0.3	0	1000	55539.34	550003.45
46	47	0.1	0.5	1000	42635.23	440424.63	-0.3	0	1000	55069.66	605073.11
47	48	0.1	1.3	1000	40242.39	480667.02	-0.3	0	1000	52059.97	657133.08
48	49	1.2	1.7	0	0.00	480667.02	1.2	1.3	0	0.00	657133.08
49	50	0.1	1.4	1000	252.37	480919.39	-0.3	0	250	345.72	657478.80
50	51	0.1	0.7	1000	440039.90	920959.24	-0.3	0	800	936.56	658415.36
51	52	0.1	0.4	1000	6310.40	927269.64	-0.3	0	1000	7190.62	665605.98
52	53	0.1	0.4	1000	11988.26	939257.90	-0.3	0	1000	13303.72	678909.70
53	54	0.1	0.6	1000	22498.76	961756.66	-0.3	0	1000	25651.16	704560.86
54	55	0.1	0.4	1000	28495.17	990251.83	-0.3	0	1000	32742.00	737302.86
55	56	0.1	0.5	1000	32687.78	1022939.60	-0.3	0	1000	38316.27	775619.13
56	57	0.1	0.4	1000	40044.94	1062984.60	-0.3	0	1000	48732.08	824351.21
57	58	0.1	0.5	1000	42629.89	1105614.40	-0.3	0	1000	55062.38	879413.59
58	59	0.1	0.6	1000	42883.06	1148497.50	-0.3	0	1000	55389.88	934803.47

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 Quantity (cubic meter)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cubic meter)	Cumulative Dredging Quantity (cubic meter)
59	60	0.1	0.5	1000	42497.05	1190994.60	-0.3	0	1000	54892.10	989695.57
60	61	0.1	0.5	1000	42788.99	1233783.50	-0.3	0	1000	55268.47	1044964.00
61	62	0.1	0.5	1000	43025.57	1276809.10	-0.3	0	1000	55574.29	1100538.30
62	63	0.1	0.4	1000	15076.01	1291885.10	-0.3	0	1000	19519.14	1120057.50
63	64	0.1	0.6	100	26.49	1291911.60	-0.3	0	100	26.89	1120084.40
64	65	0.1	0.6	1000	1505.55	1293417.20	-0.3	0	1000	1721.69	1121806.10
65	66	0.1	0.6	1000	5820.44	1299237.60	-0.3	0	1000	6440.40	1128246.50
66	67	0.1	0.6	1000	13191.96	1312429.60	-0.3	0	1000	14565.59	1142812.00
67	68	0.1	0.4	1000	25168.64	1337598.20	-0.3	0	1000	29092.86	1171904.90
68	69	0.1	0.6	1000	30523.26	1368121.50	-0.3	0	1000	34919.03	1206823.90
69	70	0.1	0.6	1000	39265.85	1407387.30	-0.3	0	1000	46991.79	1253815.70
70	71	0.1	0.4	1000	42430.85	1449818.20	-0.3	0	1000	52799.05	1306614.80
71	72	0.1	0.6	1000	41943.39	1491761.60	-0.3	0	1000	54176.21	1360791.00
72	73	0.1	0.5	1000	42602.63	1534364.20	-0.3	0	1000	55017.52	1415808.50
73	74	0.1	0.5	1000	11633.80	1545998.00	-0.3	0	1000	12850.26	1428658.80
74	75	0.1	0.6	1000	19160.90	1565158.90	-0.3	0	1000	20994.28	1449653.00
75	76	0.1	0.4	1000	29382.93	1594541.80	-0.3	0	1000	33572.61	1483225.70
76	77	0.1	0.6	1000	35703.93	1630245.70	-0.3	0	1000	42252.05	1525477.70
77	78	0.1	0.4	1000	39935.41	1670181.20	-0.3	0	1000	48324.96	1573802.70
78	79	0.1	0.4	1000	42710.02	1712891.20	-0.3	0	1000	54490.35	1628293.00
79	80	0.1	0.6	1000	42766.11	1755657.30	-0.3	0	1000	55239.43	1683532.40
80	81	0.1	0.4	1000	42899.86	1798557.10	-0.3	0	1000	55411.80	1738944.20
81	82	0.1	0.6	1000	33991.63	1832548.80	-0.3	0	1000	43918.63	1782862.90
82	83	0.1	0.6	1000	1864.56	1834413.30	-0.3	0	1000	2239.46	1785102.30
83	84	0.1	0.5	1000	3438.88	1837852.20	-0.3	0	1000	3915.55	1789017.90
84	85	0.1	0.5	1000	6943.38	1844795.60	-0.3	0	1000	7526.26	1796544.10
85	86	0.1	0.4	1000	18953.89	1863749.50	-0.3	0	1000	21646.31	1818190.50
86	87.136	0.1	0.4	1000	29714.39	1893463.90	-0.3	0	1000	34970.90	1853161.40
Total				72450	1893463.90		Total		81900	1853161.40	

Table 17- Minimum & Maximum Depth for 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 Quantity (cubic meter)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cubic meter)	Cumulative Dredging Quantity (cubic meter)
0	1	1.09	10.2	1000	3131.48	3131.48	0.99	9.1	1000	13026.02	13026.02
1	2	0.9	10.2	1000	1517.97	4649.45	0.7	9.1	1000	7935.21	20961.23
2	3	0.8	16.3	1000	5164.77	9814.22	0.8	14.8	1000	13802.38	34763.61
3	4	0.8	16.3	1000	7167.26	16981.48	0.7	14.8	1000	20325.61	55089.22
4	5	0.99	3.6	1000	16485.33	33466.81	0.59	2.5	1000	37100.83	92190.05
5	6	1.09	8.4	1000	9193.78	42660.59	1.09	6.1	1000	21953.66	114143.71
6	7	1	8.9	1000	5165.62	47826.21	0.9	7.6	1000	15961.70	130105.41
7	8	0.8	3.7	1000	4088.88	51915.09	0.5	2.4	1000	10900.62	141006.03
8	9	0.7	5.31	1000	1962.04	53877.13	0.8	4.61	1000	4445.30	145451.33
9	10	0.9	9.7	1000	2334.10	56211.23	0.2	8	1000	5813.77	151265.10
10	11	0.9	14	1000	1772.53	57983.76	0.8	12.8	1000	4687.52	155952.62
11	12	1	4.91	1000	2869.40	60853.16	0.9	3.31	1000	8363.27	164315.89
12	13	0.9	7.1	1000	1626.82	62479.98	0.8	6.5	1000	7160.84	171476.73
13	14	1	7.3	1000	2987.54	65467.52	0.8	6.5	1000	8068.34	179545.07
14	15	1	7.6	1000	4878.51	70346.03	0.9	6.8	1000	12636.95	192182.02
15	16	0.99	5.81	1000	10301.92	80647.95	0.59	4.91	1000	20456.13	212638.15
16	17	0.9	10.8	1000	2508.01	83155.96	0.9	9.1	1000	7511.76	220149.91
17	18	0.9	3.3	1000	4835.95	87991.91	1.2	2.7	1000	11295.64	231445.55
18	19	0.9	4.8	1000	8023.03	96014.94	0.9	4.1	1000	17673.82	249119.37
19	20	0.9	7.7	1000	2764.40	98779.34	0.4	6.6	1000	8549.42	257668.79
20	21	0.9	6.41	1000	8874.58	107653.90	0.8	5.61	1000	19176.31	276845.10
21	22	0.9	5.1	1000	3921.65	111575.60	0.8	4.3	1000	8610.27	285455.37
22	23	0.9	3.2	1000	7159.18	118734.80	0.4	2.4	1000	23652.95	309108.32
23	24	0.9	6.01	1000	5375.52	124110.30	0.8	5.21	1000	16487.48	325595.80
24	25	1	6.6	1000	2222.18	126332.50	0.3	5.6	1000	9724.81	335320.61
25	26	1	6.51	1000	3311.90	129644.40	0.5	5.61	1000	8339.17	343659.78
26	27	0.99	6.9	1000	2630.85	132275.20	0.8	5.9	1000	9527.05	353186.83
27	28	0.8	6.9	1000	7144.08	139419.30	0.8	5.9	1000	12565.75	365752.58
28	29	0.9	6.3	1000	4675.72	144095.00	0.8	5.4	1000	13240.17	378992.75
29	30	0.8	5.2	1000	5267.26	149362.30	0.7	3.9	1000	15922.71	394915.46
30	31	0.9	5.8	1000	4463.43	153825.70	0.9	4.8	1000	12633.50	407548.96
31	32	0.9	5.7	1000	5810.90	159636.60	0.5	4.7	1000	16533.56	424082.52
32	33	0.9	5.3	1000	4729.89	164366.50	0.8	4.7	1000	11454.93	435537.45

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 Quantity (cubic meter)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cubic meter)	Cumulative Dredging Quantity (cubic meter)
33	34	1	4.3	1000	418.94	164785.40	0.8	3.4	1000	1926.88	437464.33
34	35	1.2	6.6	1000	1204.04	165989.50	0.99	3.4	1000	3595.72	441060.05
35	36	0.1	3.7	1000	8052.07	174041.50	-0.3	0	1000	10012.03	451072.08
36	37	0.1	0.6	1000	18499.22	192540.80	-0.3	0	1000	20257.02	471329.10
37	38	0.1	0.4	1000	31769.56	224310.30	-0.3	0	1000	35435.47	506764.57
38	39	0.09	0.5	1000	43948.88	268259.20	-0.3	0	1000	49435.66	556200.23
39	40	0.09	0.6	1000	53009.43	321268.60	-0.3	0	1000	60675.78	616876.01
40	41	0.09	0.4	1000	59759.70	381028.30	-0.3	0	1000	69392.78	686268.79
41	42	0.09	0.6	1000	64544.15	445572.50	-0.3	0	1000	78342.33	764611.12
42	43	0.09	0.4	1000	64843.58	510416.10	-0.3	0	1000	80807.82	845418.94
43	44	0.09	0.4	1000	65426.15	575842.20	-0.3	0	1000	81533.76	926952.70
44	45	0.1	0.6	1000	64505.29	640347.50	-0.3	0	1000	80385.97	1007338.70
45	46	0.09	0.4	1000	65493.09	705840.60	-0.3	0	1000	81617.05	1088955.70
46	47	0.1	0.5	1000	64938.96	770779.50	-0.3	0	1000	80926.20	1169881.90
47	48	0.09	1.3	1000	61736.33	832515.90	-0.3	0	1000	76978.65	1246860.60
48	49	0.1	1.7	1000	1408.59	833924.50	-0.3	0	1000	1609.55	1248470.10
49	50	0.09	1.4	1000	7007.22	840931.70	-0.3	0	1000	7977.16	1256447.30
50	51	0.09	0.7	1000	10175.67	851107.40	-0.3	0	1000	11330.80	1267778.10
51	52	0.1	0.4	1000	23223.40	874330.80	-0.3	0	1000	26474.78	1294252.90
52	53	0.1	0.4	1000	32882.26	907213.00	-0.3	0	1000	37173.49	1331426.40
53	54	0.09	0.6	1000	44866.45	952079.50	-0.3	0	1000	51416.59	1382842.90
54	55	0.1	0.4	1000	50559.03	1002638.00	-0.3	0	1000	58306.78	1441149.70
55	56	0.1	0.5	1000	54154.47	1056793.00	-0.3	0	1000	63025.95	1504175.70
56	57	0.1	0.4	1000	62009.36	1118802.00	-0.3	0	1000	74129.80	1578305.50
57	58	0.1	0.5	1000	64931.36	1183734.00	-0.3	0	1000	80916.83	1659222.30
58	59	0.09	0.6	1000	65317.18	1249051.00	-0.3	0	1000	81398.00	1740620.30
59	60	0.09	0.5	1000	64729.57	1313780.00	-0.3	0	1000	80665.82	1821286.10
60	61	0.1	0.5	1000	65173.47	1378954.00	-0.3	0	1000	81218.55	1902504.70
61	62	0.1	0.5	1000	65535.39	1444489.00	-0.3	0	1000	81669.93	1984174.60
62	63	0.1	0.4	1000	24357.62	1468847.00	-0.3	0	1000	30215.90	2014390.50
63	64	0.09	0.6	1000	3839.16	1472686.00	-0.3	0	1000	4258.54	2018649.00
64	65	0.09	0.6	1000	12917.87	1485604.00	-0.3	0	1000	14502.13	2033151.20
65	66	0.09	0.6	1000	22978.83	1508583.00	-0.3	0	1000	25904.12	2059055.30
66	67	0.1	0.6	1000	33153.93	1541737.00	-0.3	0	1000	37023.37	2096078.70
67	68	0.1	0.4	1000	47462.03	1589199.00	-0.3	0	1000	54781.49	2150860.20
68	69	0.1	0.6	1000	52197.00	1641396.00	-0.3	0	1000	59890.80	2210751.00
69	70	0.1	0.6	1000	61700.60	1703096.00	-0.3	0	1000	72968.81	2283719.80
70	71	0.1	0.4	1000	64953.19	1768050.00	-0.3	0	1000	78876.71	2362596.50
71	72	0.1	0.6	1000	63885.75	1831935.00	-0.3	0	1000	79614.12	2442210.60

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 Quantity (cubic meter)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cubic meter)	Cumulative Dredging Quantity (cubic meter)
72	73	0.1	0.5	1000	65001.77	1896937.00	-0.3	0	1000	80984.30	2523194.90
73	74	0.1	0.5	1000	31137.57	1928075.00	-0.3	0	1000	34359.63	2557554.50
74	75	0.09	0.6	1000	41054.33	1969129.00	-0.3	0	1000	45791.01	2603345.50
75	76	0.1	0.4	1000	51749.20	2020878.00	-0.3	0	1000	59404.81	2662750.30
76	77	0.1	0.6	1000	58067.46	2078946.00	-0.3	0	1000	68110.39	2730860.70
77	78	0.1	0.4	1000	62483.25	2141429.00	-0.3	0	1000	74459.25	2805320.00
78	79	0.1	0.4	1000	65152.85	2206582.00	-0.3	0	1000	80518.03	2885838.00
79	80	0.1	0.6	1000	65140.33	2271722.00	-0.3	0	1000	81177.60	2967015.60
80	81	0.1	0.4	1000	65343.01	2337065.00	-0.3	0	1000	81430.09	3048445.70
81	82	0.1	0.6	1000	53518.84	2390584.00	-0.3	0	1000	66489.25	3114935.00
82	83	0.1	0.6	1000	10554.19	2401138.00	-0.3	0	1000	11885.43	3126820.40
83	84	0.1	0.5	1000	15869.58	2417008.00	-0.3	0	1000	17826.21	3144646.60
84	85	0.1	0.5	1000	23289.72	2440297.00	-0.3	0	1000	25298.59	3169945.20
85	86	0.1	0.4	1000	40966.28	2481264.00	-0.3	0	1000	46913.67	3216858.90
86	87.136	0.1	0.4	1000	53152.55	2534416.00	-0.3	0	1000	62145.55	3279004.40
Total				87000	2534416.00		Total		87000	3279004.40	

Table 18- Minimum & Maximum Depth for 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 Quantity (cubic meter)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cubic meter)	Cumulative Dredging Quantity (cubic meter)
0	1	1.08	10.4	1000	14457.60	14457.60	0.98	9.3	1000	34498.64	34498.64
1	2	0.8	10.4	1000	9046.66	23504.26	0.6	9.3	1000	24391.14	58889.78
2	3	0.5	16.6	1000	15636.58	39140.84	0.5	15.1	1000	32669.00	91558.78
3	4	0.5	16.6	1000	22000.18	61141.02	0.5	15.1	1000	42937.65	134496.43
4	5	0.98	3.7	1000	38854.63	99995.65	0.58	2.6	1000	69143.19	203639.62
5	6	1.08	8.5	1000	25550.22	125545.87	0.9	6.2	1000	47623.98	251263.60
6	7	0.9	9.1	1000	21237.91	146783.78	0.7	7.8	1000	41675.26	292938.86
7	8	0.6	3.9	1000	16753.94	163537.72	0.4	2.6	1000	31798.67	324737.53
8	9	0.4	5.32	1000	10983.78	174521.50	0.4	4.62	1000	20285.18	345022.71
9	10	0.8	9.8	1000	11885.27	186406.77	0.1	8.1	1000	22202.29	367225.00
10	11	0.7	14.1	1000	10350.47	196757.24	0.6	12.9	1000	18128.56	385353.56
11	12	0.9	4.92	1000	13183.64	209940.88	0.8	3.32	1000	26304.86	411658.42
12	13	0.8	7.2	1000	9970.35	219911.23	0.7	6.6	1000	24062.80	435721.22
13	14	0.9	7.5	1000	11020.91	230932.14	0.6	6.6	1000	22455.75	458176.97
14	15	0.9	7.8	1000	16423.50	247355.64	0.8	7	1000	32302.44	490479.41
15	16	0.98	5.82	1000	27908.08	275263.72	0.58	4.92	1000	44680.55	535159.96
16	17	0.8	11	1000	10728.76	285992.48	0.8	9.3	1000	21669.63	556829.59
17	18	0.8	3.5	1000	15372.60	301365.08	0.8	2.9	1000	30040.61	586870.20
18	19	0.8	5	1000	21118.58	322483.66	0.8	4.3	1000	39424.35	626294.55
19	20	0.8	7.8	1000	12341.56	334825.22	0.3	6.7	1000	25817.43	652111.98
20	21	0.8	6.42	1000	25346.27	360171.49	0.7	5.62	1000	45079.34	697191.32
21	22	0.8	5.2	1000	13683.62	373855.11	0.7	4.4	1000	25703.03	722894.35
22	23	0.8	3.3	1000	21731.05	395586.16	0.3	2.5	1000	50651.84	773546.19
23	24	0.8	6.02	1000	14370.72	409956.88	0.6	5.22	1000	35720.33	809266.52
24	25	0.9	6.8	1000	10221.27	420178.15	0.1	5.8	1000	25268.76	834535.28
25	26	0.9	6.52	1000	11249.02	431427.17	0.4	5.62	1000	22732.50	857267.78
26	27	0.98	7.1	1000	11767.71	443194.88	0.6	6.1	1000	28219.53	885487.31
27	28	0.6	7.1	1000	19814.29	463009.17	0.6	6.1	1000	32086.96	917574.27

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 Quantity (cubic meter)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cubic meter)	Cumulative Dredging Quantity (cubic meter)
28	29	0.8	6.4	1000	19230.82	482239.99	0.7	5.5	1000	36723.25	954297.52
29	30	0.7	5.4	1000	19135.10	501375.09	0.6	4.1	1000	40548.40	994845.92
30	31	0.8	5.9	1000	16808.68	518183.77	0.8	4.9	1000	35776.65	1030622.60
31	32	0.8	6	1000	20436.96	538620.73	0.4	4.8	1000	42321.38	1072944.00
32	33	0.8	5.4	1000	14414.72	553035.45	0.6	4.8	1000	26567.81	1099511.80
33	34	0.8	4.5	1000	8346.23	561381.68	0.6	3.6	1000	17123.87	1116635.60
34	35	1.1	6.7	1000	12071.24	573452.92	0.9	3.6	1000	23480.64	1140116.30
35	36	0.1	3.7	1000	30849.63	604302.55	-0.3	0	1000	37312.48	1177428.80
36	37	0.1	0.6	1000	50651.41	654953.96	-0.3	0	1000	55716.16	1233144.90
37	38	0.1	0.4	1000	65427.72	720381.68	-0.3	0	1000	72920.12	1306065.00
38	39	0.09	0.5	1000	77481.77	797863.45	-0.3	0	1000	86791.12	1392856.20
39	40	0.09	0.6	1000	86483.03	884346.48	-0.3	0	1000	97980.09	1490836.20
40	41	0.09	0.4	1000	93036.44	977382.92	-0.3	0	1000	106426.37	1597262.60
41	42	0.09	0.6	1000	97953.44	1075336.40	-0.3	0	1000	115576.76	1712839.40
42	43	0.09	0.4	1000	97867.61	1173204.00	-0.3	0	1000	117592.55	1830431.90
43	44	0.09	0.4	1000	98885.36	1272089.30	-0.3	0	1000	118870.37	1949302.30
44	45	0.1	0.6	1000	97494.06	1369583.40	-0.3	0	1000	117198.31	2066500.60
45	46	0.09	0.4	1000	98986.38	1468569.80	-0.3	0	1000	118992.02	2185492.60
46	47	0.1	0.5	1000	98148.00	1566717.80	-0.3	0	1000	117984.28	2303476.90
47	48	0.09	1.3	1000	94357.48	1661075.30	-0.3	0	1000	113337.58	2416814.50
48	49	0.1	1.7	1000	14685.53	1675760.80	-0.3	0	1000	16165.51	2432980.00
49	50	0.09	1.4	1000	30683.73	1706444.50	-0.3	0	1000	34377.47	2467357.50
50	51	0.09	0.7	1000	35587.76	1742032.30	-0.3	0	1000	39710.83	2507068.30
51	52	0.1	0.4	1000	53340.88	1795373.20	-0.3	0	1000	60060.30	2567128.60
52	53	0.1	0.4	1000	66345.80	1861719.00	-0.3	0	1000	74452.90	2641581.50
53	54	0.09	0.6	1000	78224.45	1939943.40	-0.3	0	1000	88673.73	2730255.20
54	55	0.1	0.4	1000	83544.00	2023487.40	-0.3	0	1000	95062.60	2825317.80
55	56	0.1	0.5	1000	86700.26	2110187.70	-0.3	0	1000	99285.42	2924603.20
56	57	0.1	0.4	1000	94723.32	2204911.00	-0.3	0	1000	110588.94	3035192.20
57	58	0.1	0.5	1000	98135.28	2303046.30	-0.3	0	1000	117968.86	3153161.00
58	59	0.09	0.6	1000	98720.49	2401766.80	-0.3	0	1000	118672.36	3271833.40

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 Quantity (cubic meter)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cubic meter)	Cumulative Dredging Quantity (cubic meter)
59	60	0.09	0.5	1000	97833.67	2499600.40	-0.3	0	1000	117606.65	3389440.10
60	61	0.1	0.5	1000	98502.97	2598103.40	-0.3	0	1000	118411.03	3507851.10
61	62	0.1	0.5	1000	99050.36	2697153.80	-0.3	0	1000	119068.79	3626919.90
62	63	0.1	0.4	1000	48565.10	2745718.90	-0.3	0	1000	56882.52	3683802.40
63	64	0.09	0.6	1000	23894.96	2769613.80	-0.3	0	1000	26000.48	3709802.90
64	65	0.09	0.6	1000	40555.16	2810169.00	-0.3	0	1000	45164.10	3754967.00
65	66	0.09	0.6	1000	54255.45	2864424.40	-0.3	0	1000	60682.91	3815649.90
66	67	0.1	0.6	1000	65949.84	2930374.30	-0.3	0	1000	73466.47	3889116.40
67	68	0.1	0.4	1000	80944.37	3011318.60	-0.3	0	1000	92243.93	3981360.30
68	69	0.1	0.6	1000	84641.90	3095960.50	-0.3	0	1000	96123.49	4077483.80
69	70	0.1	0.6	1000	95141.25	3191101.80	-0.3	0	1000	110303.80	4187787.50
70	71	0.1	0.4	1000	98523.22	3289625.00	-0.3	0	1000	116327.00	4304114.60
71	72	0.1	0.6	1000	96556.97	3386182.00	-0.3	0	1000	116071.70	4420186.20
72	73	0.1	0.5	1000	98302.84	3484484.80	-0.3	0	1000	118146.10	4538332.30
73	74	0.1	0.5	1000	63638.37	3548123.20	-0.3	0	1000	69819.89	4608152.20
74	75	0.09	0.6	1000	74020.34	3622143.50	-0.3	0	1000	82446.84	4690599.00
75	76	0.1	0.4	1000	84914.90	3707058.40	-0.3	0	1000	96360.05	4786959.00
76	77	0.1	0.6	1000	91463.32	3798521.70	-0.3	0	1000	105345.70	4892304.80
77	78	0.1	0.4	1000	95941.02	3894462.80	-0.3	0	1000	111737.60	5004042.40
78	79	0.1	0.4	1000	98577.53	3993040.30	-0.3	0	1000	117793.90	5121836.30
79	80	0.1	0.6	1000	98152.32	4091192.60	-0.3	0	1000	117899.40	5239735.80
80	81	0.1	0.4	1000	98758.77	4189951.40	-0.3	0	1000	118718.70	5358454.50
81	82	0.1	0.6	1000	84490.16	4274441.50	-0.3	0	1000	100945.40	5459399.90
82	83	0.1	0.6	1000	33900.69	4308342.20	-0.3	0	1000	37134.20	5496534.10
83	84	0.1	0.5	1000	42173.15	4350515.40	-0.3	0	1000	46277.28	5542811.40
84	85	0.1	0.5	1000	54051.24	4404566.60	-0.3	0	1000	58464.04	5601275.40
85	86	0.1	0.4	1000	74453.68	4479020.30	-0.3	0	1000	84184.04	5685459.50
86	87.136	0.1	0.4	1000	88155.78	4567176.10	-0.3	0	1000	101155.80	5786615.20
Total				87000	4567176.10		Total		87000	5786615.20	

Table 19- Minimum & Maximum Depth for 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 Quantity (cubic meter)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cubic meter)	Cumulative Dredging Quantity (cubic meter)
0	1	1.07	10.6	1000	23855.87	23855.87	0.7	9.5	1000	51048.93	51048.93
1	2	0.7	10.6	1000	16146.66	40002.53	0.5	9.5	1000	38281.30	89330.23
2	3	0.2	16.9	1000	23978.88	63981.41	0.2	15.4	1000	47413.44	136743.67
3	4	0.2	16.9	1000	32899.91	96881.32	0.2	15.4	1000	57924.27	194667.94
4	5	0.97	3.8	1000	54951.46	151832.78	0.57	2.7	1000	89422.01	284089.95
5	6	1.07	8.6	1000	37410.24	189243.02	0.7	6.3	1000	65092.99	349182.94
6	7	0.8	9.3	1000	32585.60	221828.62	0.5	8	1000	57971.65	407154.59
7	8	0.4	4.1	1000	29050.92	250879.54	0.3	2.8	1000	49005.41	456160.00
8	9	0.1	5.33	1000	19496.81	270376.35	0.1	4.63	1000	35033.55	491193.55
9	10	0.7	9.9	1000	20279.16	290655.51	0.1	8.2	1000	35729.29	526922.84
10	11	0.5	14.2	1000	17251.53	307907.04	0.4	13	1000	28035.36	554958.20
11	12	0.8	4.93	1000	22428.43	330335.47	0.7	3.3	1000	41665.87	596624.07
12	13	0.7	7.3	1000	18334.34	348669.81	0.6	6.7	1000	39459.61	636083.68
13	14	0.8	7.7	1000	18636.17	367305.98	0.4	6.7	1000	35111.05	671194.73
14	15	0.8	8	1000	26608.08	393914.06	0.7	7.2	1000	47437.44	718632.17
15	16	0.97	5.83	1000	40162.52	434076.58	0.57	4.93	1000	60476.57	779108.74
16	17	0.7	11.2	1000	17842.25	451918.83	0.7	9.5	1000	32794.63	811903.37
17	18	0.7	3.7	1000	24520.09	476438.92	0.7	3.1	1000	46408.85	858312.22
18	19	0.7	5.2	1000	32390.19	508829.11	0.7	4.5	1000	56872.15	915184.37
19	20	0.7	7.9	1000	19850.18	528679.29	0.2	6.8	1000	38724.42	953908.79
20	21	0.7	6.43	1000	37370.89	566050.18	0.6	5.63	1000	63123.71	1017032.50
21	22	0.7	5.3	1000	20893.87	586944.05	0.6	4.5	1000	38741.02	1055773.50
22	23	0.7	3.4	1000	34271.24	621215.29	0.2	2.6	1000	69712.27	1125485.80
23	24	0.7	6.03	1000	23455.71	644671.00	0.4	5.23	1000	51030.76	1176516.60
24	25	0.8	7	1000	17197.93	661868.93	0.1	6	1000	35759.25	1212275.80
25	26	0.8	6.6	1000	17299.30	679168.23	0.3	5.63	1000	33836.39	1246112.20
26	27	0.97	7.3	1000	18891.67	698059.90	0.4	6.3	1000	42400.75	1288512.90
27	28	0.4	7.3	1000	28509.82	726569.72	0.4	6.3	1000	44639.97	1333152.90
28	29	0.7	6.5	1000	29504.38	756074.10	0.6	5.6	1000	51843.91	1384996.80

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 Quantity (cubic meter)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cubic meter)	Cumulative Dredging Quantity (cubic meter)
29	30	0.5	5.6	1000	29378.18	785452.28	0.4	4.3	1000	57754.88	1442751.70
30	31	0.7	6	1000	26516.33	811968.61	0.7	5	1000	51200.52	1493952.20
31	32	0.7	6.3	1000	30946.66	842915.27	0.3	4.9	1000	58932.69	1552884.90
32	33	0.6	5.5	1000	22585.39	865500.66	0.4	4.9	1000	38960.71	1591845.60
33	34	0.6	4.7	1000	16476.15	881976.81	0.4	3.8	1000	30752.06	1622597.70
34	35	1	6.8	1000	21944.79	903921.60	0.7	3.8	1000	38624.01	1661221.70
35	36	0.1	3.7	1000	47468.44	951390.04	-0.3	0	1000	56194.81	1717416.50
36	37	0.1	0.6	1000	71045.55	1022435.59	-0.3	0	1000	77058.35	1794474.90
37	38	0.1	0.4	1000	85836.97	1108272.56	-0.3	0	1000	94268.88	1888743.70
38	39	0.09	0.5	1000	97856.58	1206129.14	-0.3	0	1000	108056.00	1996799.80
39	40	0.09	0.6	1000	106942.50	1313071.64	-0.3	0	1000	119334.10	2116133.80
40	41	0.09	0.4	1000	113376.77	1426448.41	-0.3	0	1000	127667.60	2243801.40
41	42	0.09	0.6	1000	118375.25	1544823.66	-0.3	0	1000	136978.20	2380779.70
42	43	0.09	0.4	1000	118118.34	1662942.00	-0.3	0	1000	138729.70	2519509.40
43	44	0.09	0.4	1000	119318.08	1782260.08	-0.3	0	1000	140198.60	2659707.90
44	45	0.1	0.6	1000	117471.30	1899731.38	-0.3	0	1000	137955.70	2797663.60
45	46	0.09	0.4	1000	119439.76	2019171.14	-0.3	0	1000	140341.00	2938004.60
46	47	0.1	0.5	1000	118427.61	2137598.75	-0.3	0	1000	139152.20	3077156.80
47	48	0.09	1.3	1000	114490.43	2252089.18	-0.3	0	1000	134342.20	3211499.00
48	49	0.1	1.7	1000	30075.56	2282164.74	-0.3	0	1000	31999.80	3243498.80
49	50	0.09	1.4	1000	51465.59	2333630.33	-0.3	0	1000	53525.79	3297024.50
50	51	0.09	0.7	1000	51667.41	2385297.74	-0.3	0	1000	58937.62	3355962.20
51	52	0.1	0.4	1000	73111.59	2458409.33	-0.3	0	1000	80602.62	3436564.80
52	53	0.1	0.4	1000	86693.62	2545102.95	-0.3	0	1000	95649.91	3532214.70
53	54	0.09	0.6	1000	98660.16	2643763.11	-0.3	0	1000	109968.80	3642183.50
54	55	0.1	0.4	1000	103743.33	2747506.44	-0.3	0	1000	116171.00	3758354.50
55	56	0.1	0.5	1000	106656.38	2854162.82	-0.3	0	1000	120125.60	3878480.10
56	57	0.1	0.4	1000	114721.13	2968883.95	-0.3	0	1000	131553.30	4010033.40
57	58	0.1	0.5	1000	118412.71	3087296.66	-0.3	0	1000	139134.40	4149167.80
58	59	0.09	0.6	1000	119119.94	3206416.60	-0.3	0	1000	139965.40	4289133.20
59	60	0.09	0.5	1000	118049.69	3324466.29	-0.3	0	1000	138708.10	4427841.30
60	61	0.1	0.5	1000	118856.83	3443323.12	-0.3	0	1000	139656.50	4567497.80

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 Quantity (cubic meter)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cubic meter)	Cumulative Dredging Quantity (cubic meter)
61	62	0.1	0.5	1000	119519.14	3562842.26	-0.3	0	1000	140434.50	4707932.30
62	63	0.1	0.4	1000	68250.27	3631092.53	-0.3	0	1000	77284.04	4785216.40
63	64	0.09	0.6	1000	42856.97	3673949.50	-0.3	0	1000	45514.91	4830731.30
64	65	0.09	0.6	1000	60624.48	3734573.98	-0.3	0	1000	66043.09	4896774.40
65	66	0.09	0.6	1000	74277.04	3808851.02	-0.3	0	1000	81483.44	4978257.80
66	67	0.1	0.6	1000	86225.32	3895076.34	-0.3	0	1000	94612.21	5072870.00
67	68	0.1	0.4	1000	101447.72	3996524.06	-0.3	0	1000	113609.70	5186479.70
68	69	0.1	0.6	1000	104368.50	4100892.56	-0.3	0	1000	116690.40	5303170.20
69	70	0.1	0.6	1000	115595.97	4216488.53	-0.3	0	1000	131681.30	5434851.40
70	71	0.1	0.4	1000	119017.27	4335505.80	-0.3	0	1000	137752.70	5572604.20
71	72	0.1	0.6	1000	116360.17	4451865.97	-0.3	0	1000	136659.30	5709263.40
72	73	0.1	0.5	1000	118641.91	4570507.88	-0.3	0	1000	139368.60	5848632.00
73	74	0.1	0.5	1000	83811.76	4654319.64	-0.3	0	1000	90693.05	5939325.00
74	75	0.09	0.6	1000	94140.75	4748460.39	-0.3	0	1000	103433.40	6042758.50
75	76	0.1	0.4	1000	105196.09	4853656.48	-0.3	0	1000	117557.20	6160315.70
76	77	0.1	0.6	1000	111894.59	4965551.07	-0.3	0	1000	126805.70	6287121.40
77	78	0.1	0.4	1000	116414.67	5081965.74	-0.3	0	1000	133118.70	6420240.10
78	79	0.1	0.4	1000	119007.36	5200973.10	-0.3	0	1000	139115.60	6559355.70
79	80	0.1	0.6	1000	118099.70	5319072.80	-0.3	0	1000	138639.80	6697995.50
80	81	0.1	0.4	1000	119165.60	5438238.40	-0.3	0	1000	140019.20	6838014.70
81	82	0.1	0.6	1000	104527.43	5542765.83	-0.3	0	1000	121795.10	6959809.90
82	83	0.1	0.6	1000	52402.00	5595167.83	-0.3	0	1000	56222.38	7016032.20
83	84	0.1	0.5	1000	61915.56	5657083.39	-0.3	0	1000	66584.47	7082616.70
84	85	0.1	0.5	1000	74017.18	5731100.57	-0.3	0	1000	79093.07	7161709.80
85	86	0.1	0.4	1000	94792.77	5825893.34	-0.3	0	1000	105431.50	7267141.30
86	87.136	0.1	0.4	1000	109713.84	5935607.18	-0.3	0	1000	123681.80	7390823.00
Total				87000	5935607.18		Total		87000	7390823.00	

Table 20 -Minimum & Maximum Depth for Class- IV

Annexure-3 Observed depth in 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	2.9	3.7	2.8	3.8	2.7	3.9	2.6	4
200	2.5	2.7	2.3	2.9	2.1	3.1	1.9	3.3
400	2.6	3	2.3	3.3	2	3.6	1.7	3.9
600	2.1	3	2	3.1	1.9	3.2	1.8	3.3
800	1.1	3	1.09	3.01	1.08	3.02	1.07	3.03
1000	3.5	10	3.3	10.2	3.1	10.4	2.9	10.6
1200	2.6	3.4	2.5	3.5	2.4	3.6	2.3	3.7
1400	2	2.6	1.9	2.7	1.8	2.8	1.7	2.9
1600	1	3	0.9	3.1	0.8	3.2	0.7	3.3
1800	2.5	4.2	2.49	4.21	2.48	4.22	2.47	4.23
2000	2.4	4.7	2.2	4.9	2	5.1	1.8	5.3
2200	3.5	5.5	3.4	5.6	3.3	5.7	3.2	5.8
2400	2.1	2.9	2.09	2.91	2.08	2.92	2.07	2.93
2600	2.4	3	2.3	3.1	2.2	3.2	2.1	3.3
2800	2	3.6	1.8	3.8	1.6	4	1.4	4.2
3000	1.1	16	0.8	16.3	0.5	16.6	0.2	16.9
3200	1	2.2	0.9	2.3	0.8	2.4	0.7	2.5
3400	3.1	6.4	3	6.5	2.9	6.6	2.8	6.7
3600	2.5	3.3	2.3	3.5	2.1	3.7	1.9	3.9
3800	2.4	2.6	2.3	2.7	2.2	2.8	2.1	2.9
4000	2.6	3.5	2.5	3.6	2.4	3.7	2.3	3.8
4200	1.6	2.4	1.5	2.5	1.4	2.6	1.3	2.7
4400	2.2	2.7	2	2.9	1.8	3.1	1.6	3.3
4600	1	2.4	0.99	2.41	0.98	2.42	0.97	2.43
4800	1.9	2.6	1.8	2.7	1.7	2.8	1.6	2.9
5000	1.9	2.6	1.7	2.8	1.5	3	1.3	3.2
5200	2.2	2.9	2	3.1	1.8	3.3	1.6	3.5
5400	2.6	5	2.4	5.2	2.2	5.4	2	5.6
5600	2.6	8.3	2.5	8.4	2.4	8.5	2.3	8.6
5800	1.1	2.7	1.09	2.71	1.08	2.72	1.07	2.73
6000	1.6	3.1	1.5	3.2	1.4	3.3	1.3	3.4
6200	1.1	2.4	1	2.5	0.9	2.6	0.8	2.7
6400	3.3	4.9	3.29	4.91	3.28	4.92	3.27	4.93
6600	5.6	8.7	5.4	8.9	5.2	9.1	5	9.3
6800	3.4	4.1	3.3	4.2	3.2	4.3	3.1	4.4
7000	2	3.5	1.8	3.7	1.6	3.9	1.4	4.1
7200	1.3	2.5	1.2	2.6	1.1	2.7	1	2.8

Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Observed		Observed		Observed		Observed	
	Min	Max	Min	Max	Min	Max	Min	Max
7400	1	2	0.8	2.2	0.6	2.4	0.4	2.6
7600	2.5	3.2	2.49	3.21	2.48	3.22	2.47	3.23
7800	1.4	2.7	1.39	2.71	1.38	2.72	1.37	2.73
8000	2.2	2.7	2	2.9	1.8	3.1	1.6	3.3
8200	2.2	5.3	2.19	5.31	2.18	5.32	2.17	5.33
8400	2.6	4.7	2.4	4.9	2.2	5.1	2	5.3
8600	2.2	2.7	2.19	2.71	2.18	2.72	2.17	2.73
8800	1	2.2	0.7	2.5	0.4	2.8	0.1	3.1
9000	2.6	3.1	2.5	3.2	2.4	3.3	2.3	3.4
9200	1.4	2.7	1.2	2.9	1	3.1	0.8	3.3
9400	1	2.5	0.9	2.6	0.8	2.7	0.7	2.8
9600	2.5	3.2	2.3	3.4	2.1	3.6	1.9	3.8
9800	2	4.5	1.99	4.51	1.98	4.52	1.97	4.53
10000	6.6	9.6	6.5	9.7	6.4	9.8	6.3	9.9
10200	1.1	3.1	0.9	3.3	0.7	3.5	0.5	3.7
10400	7.4	13.9	7.3	14	7.2	14.1	7.1	14.2
10600	2.6	4	2.5	4.1	2.4	4.2	2.3	4.3
10800	3.6	5.3	3.5	5.4	3.4	5.5	3.3	5.6
11000	2.3	4.9	2.29	4.91	2.28	4.92	2.27	4.93
11200	2.4	2.6	2.2	2.8	2	3	1.8	3.2
11400	2.2	2.7	2.1	2.8	2	2.9	1.9	3
11600	2.4	3	2.39	3.01	2.38	3.02	2.37	3.03
11800	1.1	2.4	1	2.5	0.9	2.6	0.8	2.7
12000	2.3	2.5	2.1	2.7	1.9	2.9	1.7	3.1
12200	1.6	2.7	1.59	2.71	1.58	2.72	1.57	2.73
12400	1	2.5	0.9	2.6	0.8	2.7	0.7	2.8
12600	2.5	2.7	2.3	2.9	2.1	3.1	1.9	3.3
12800	2	2.7	1.9	2.8	1.8	2.9	1.7	3
13000	5.2	7	5.1	7.1	5	7.2	4.9	7.3
13200	1.5	7.1	1.3	7.3	1.1	7.5	0.9	7.7
13400	2.3	3	2.2	3.1	2.1	3.2	2	3.3
13600	2.6	3.4	2.4	3.6	2.2	3.8	2	4
13800	1.1	2.7	1	2.8	0.9	2.9	0.8	3
14000	2.3	2.7	2.1	2.9	1.9	3.1	1.7	3.3
14200	2	3.3	1.99	3.31	1.98	3.32	1.97	3.33
14400	2.3	2.6	2.2	2.7	2.1	2.8	2	2.9
14600	3.6	7.4	3.4	7.6	3.2	7.8	3	8
14800	1.1	7.2	1	7.3	0.9	7.4	0.8	7.5
15000	2.3	3.9	2.2	4	2.1	4.1	2	4.2
15200	2.3	2.7	2.2	2.8	2.1	2.9	2	3
15400	1	4	0.99	4.01	0.98	4.02	0.97	4.03

Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Observed		Observed		Observed		Observed	
	Min	Max	Min	Max	Min	Max	Min	Max
15600	3.7	4.7	3.5	4.9	3.3	5.1	3.1	5.3
15800	2.5	3.4	2.4	3.5	2.3	3.6	2.2	3.7
16000	2.6	5.8	2.59	5.81	2.58	5.82	2.57	5.83
16200	1	2.4	0.9	2.5	0.8	2.6	0.7	2.7
16400	4.4	10.6	4.2	10.8	4	11	3.8	11.2
16600	2.6	6.5	2.59	6.51	2.58	6.52	2.57	6.53
16800	2.3	2.7	2.2	2.8	2.1	2.9	2	3
17000	2.6	3.1	2.4	3.3	2.2	3.5	2	3.7
17200	2.5	2.7	2.4	2.8	2.3	2.9	2.2	3
17400	2.4	2.6	2.3	2.7	2.2	2.8	2.1	2.9
17600	2.3	2.6	2.1	2.8	1.9	3	1.7	3.2
17800	2.3	2.7	2.2	2.8	2.1	2.9	2	3
18000	1	2.7	0.9	2.8	0.8	2.9	0.7	3
18200	2.2	2.6	2	2.8	1.8	3	1.6	3.2
18400	2.6	3.7	2.3	4	2	4.3	1.7	4.6
18600	2	2.7	1.9	2.8	1.8	2.9	1.7	3
18800	1	2.6	0.9	2.7	0.8	2.8	0.7	2.9
19000	2.4	4.6	2.2	4.8	2	5	1.8	5.2
19200	3.2	4.4	3.1	4.5	3	4.6	2.9	4.7
19400	2.9	7.6	2.8	7.7	2.7	7.8	2.6	7.9
19600	1	2.3	0.9	2.4	0.8	2.5	0.7	2.6
19800	2	2.7	1.8	2.9	1.6	3.1	1.4	3.3
20000	3	6.4	2.99	6.41	2.98	6.42	2.97	6.43
20200	1.9	2.3	1.8	2.4	1.7	2.5	1.6	2.6
20400	2.2	2.6	2	2.8	1.8	3	1.6	3.2
20600	2.4	2.7	2.2	2.9	2	3.1	1.8	3.3
20800	2.6	3	2.4	3.2	2.2	3.4	2	3.6
21000	1	2.7	0.9	2.8	0.8	2.9	0.7	3
21200	3.1	4.7	3.09	4.71	3.08	4.72	3.07	4.73
21400	2.5	5	2.4	5.1	2.3	5.2	2.2	5.3
21600	2	3.2	1.9	3.3	1.8	3.4	1.7	3.5
21800	1.1	2.7	1.09	2.71	1.08	2.72	1.07	2.73
22000	2.3	2.7	2.1	2.9	1.9	3.1	1.7	3.3
22200	2.4	3.1	2.3	3.2	2.2	3.3	2.1	3.4
22400	2.2	2.7	2	2.9	1.8	3.1	1.6	3.3
22600	1	1.7	0.9	1.8	0.8	1.9	0.7	2
22800	1.9	2.1	1.7	2.3	1.5	2.5	1.3	2.7
23000	2.2	2.6	2.19	2.61	2.18	2.62	2.17	2.63
23200	4.6	6	4.59	6.01	4.58	6.02	4.57	6.03
23400	2.6	3.1	2.4	3.3	2.2	3.5	2	3.7
23600	2.2	2.3	2.19	2.31	2.18	2.32	2.17	2.33

Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Observed		Observed		Observed		Observed	
	Min	Max	Min	Max	Min	Max	Min	Max
23800	1	3.3	0.9	3.4	0.8	3.5	0.7	3.6
24000	2	2.7	1.8	2.9	1.6	3.1	1.4	3.3
24200	2.7	4.1	2.5	4.3	2.3	4.5	2.1	4.7
24400	1.5	6.4	1.3	6.6	1.1	6.8	0.9	7
24600	1.1	3	1	3.1	0.9	3.2	0.8	3.3
24800	4.6	5.3	4.59	5.31	4.58	5.32	4.57	5.33
25000	2.1	3.5	2	3.6	1.9	3.7	1.8	3.8
25200	1.1	4.2	1	4.3	0.9	4.4	0.8	4.5
25400	2.5	6.5	2.49	6.51	2.48	6.52	2.47	6.53
25600	2.9	3.5	2.7	3.7	2.5	3.9	2.3	4.1
25800	3.5	4.9	3.4	5	3.3	5.1	3.2	5.2
26000	2.4	6	2.2	6.2	2	6.4	1.8	6.6
26200	2.6	2.9	2.5	3	2.4	3.1	2.3	3.2
26400	1.9	2.2	1.7	2.4	1.5	2.6	1.3	2.8
26600	1	3	0.99	3.01	0.98	3.02	0.97	3.03
26800	2.3	4.4	2.29	4.41	2.28	4.42	2.27	4.43
27000	3.7	6.7	3.5	6.9	3.3	7.1	3.1	7.3
27200	1	2.7	0.8	2.9	0.6	3.1	0.4	3.3
27400	2.6	4.7	2.59	4.71	2.58	4.72	2.57	4.73
27600	2.4	4.1	2.3	4.2	2.2	4.3	2.1	4.4
27800	4.3	6	4.1	6.2	3.9	6.4	3.7	6.6
28000	3.6	6.2	3.5	6.3	3.4	6.4	3.3	6.5
28200	2.3	4.6	2.2	4.7	2.1	4.8	2	4.9
28400	2.6	4	2.5	4.1	2.4	4.2	2.3	4.3
28600	3.6	4.5	3.59	4.51	3.58	4.52	3.57	4.53
28800	2.4	2.7	2.2	2.9	2	3.1	1.8	3.3
29000	1	2.7	0.9	2.8	0.8	2.9	0.7	3
29200	2.3	3.4	2.29	3.41	2.28	3.42	2.27	3.43
29400	0.9	3.9	0.8	4	0.7	4.1	0.6	4.2
29600	1.1	5	0.9	5.2	0.7	5.4	0.5	5.6
29800	2.1	3.2	2.09	3.21	2.08	3.22	2.07	3.23
30000	2.2	3	2.1	3.1	2	3.2	1.9	3.3
30200	3.5	4.3	3.3	4.5	3.1	4.7	2.9	4.9
30400	2.4	3	2.3	3.1	2.2	3.2	2.1	3.3
30600	3.4	5.7	3.3	5.8	3.2	5.9	3.1	6
30800	2.5	3.1	2.3	3.3	2.1	3.5	1.9	3.7
31000	1	3.9	0.9	4	0.8	4.1	0.7	4.2
31200	1.6	2.3	1.5	2.4	1.4	2.5	1.3	2.6
31400	2.2	3.3	2	3.5	1.8	3.7	1.6	3.9
31600	1.9	5.4	1.6	5.7	1.3	6	1	6.3
31800	1.1	2.7	1	2.8	0.9	2.9	0.8	3

Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Observed		Observed		Observed		Observed	
	Min	Max	Min	Max	Min	Max	Min	Max
32000	2.6	5.2	2.5	5.3	2.4	5.4	2.3	5.5
32200	1.9	3.7	1.7	3.9	1.5	4.1	1.3	4.3
32400	1	3.1	0.9	3.2	0.8	3.3	0.7	3.4
32600	2.9	3.5	2.8	3.6	2.7	3.7	2.6	3.8
32800	2.6	3	2.5	3.1	2.4	3.2	2.3	3.3
33000	1.2	3.2	1	3.4	0.8	3.6	0.6	3.8
33200	1.5	2.9	1.49	2.91	1.48	2.92	1.47	2.93
33400	1.7	2.7	1.6	2.8	1.5	2.9	1.4	3
33600	1.2	3	1	3.2	0.8	3.4	0.6	3.6
33800	1.3	4.1	1.1	4.3	0.9	4.5	0.7	4.7
34000	1.6	4	1.4	4.2	1.2	4.4	1	4.6
34200	1.3	6.5	1.2	6.6	1.1	6.7	1	6.8
34400	1.4	2.3	1.39	2.31	1.38	2.32	1.37	2.33
34600	1.5	2.4	1.4	2.5	1.3	2.6	1.2	2.7
34800	1.7	2.6	1.6	2.7	1.5	2.8	1.4	2.9
35000	1.6	3.7	1.59	3.71	1.58	3.72	1.57	3.73
35200	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3
35400	0.2	0.3	0.1	0.3	0.1	0.3	0.1	0.3
35600	0.1	0.2	0.1	0.2	0.1	0.2	0.1	0.2
35800	0.2	0.3	0.1	0.3	0.1	0.3	0.1	0.3
36000	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3
36200	0.2	0.4	0.19	0.4	0.19	0.4	0.19	0.4
36400	0.3	0.5	0.29	0.5	0.29	0.5	0.29	0.5
36600	0.4	0.6	0.2	0.6	0.2	0.6	0.2	0.6
36800	0.2	0.3	0.19	0.3	0.19	0.3	0.19	0.3
37000	0.1	0.2	0.1	0.2	0.1	0.2	0.1	0.2
37200	0.2	0.4	0.1	0.4	0.1	0.4	0.1	0.4
37400	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3
37600	0.2	0.3	0.1	0.3	0.1	0.3	0.1	0.3
37800	0.1	0.2	0.1	0.2	0.1	0.2	0.1	0.2
38000	0.2	0.3	0.19	0.3	0.19	0.3	0.19	0.3
38200	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3
38400	0.2	0.4	0.1	0.4	0.1	0.4	0.1	0.4
38600	0.1	0.3	0.09	0.3	0.09	0.3	0.09	0.3
38800	0.2	0.3	0.1	0.3	0.1	0.3	0.1	0.3
39000	0.3	0.5	0.2	0.5	0.2	0.5	0.2	0.5
39200	0.4	0.6	0.2	0.6	0.2	0.6	0.2	0.6
39400	0.2	0.3	0.1	0.3	0.1	0.3	0.1	0.3
39600	0.1	0.2	0.1	0.2	0.1	0.2	0.1	0.2
39800	0.2	0.4	0.19	0.4	0.19	0.4	0.19	0.4
40000	0.1	0.3	0.09	0.3	0.09	0.3	0.09	0.3

Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Observed		Observed		Observed		Observed	
	Min	Max	Min	Max	Min	Max	Min	Max
40200	0.2	0.3	0.1	0.3	0.1	0.3	0.1	0.3
40400	0.1	0.2	0.1	0.2	0.1	0.2	0.1	0.2
40600	0.2	0.3	0.2	0.3	0.2	0.3	0.2	0.3
40800	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3
41000	0.2	0.4	0.2	0.4	0.2	0.4	0.2	0.4
41200	0.1	0.3	0.09	0.3	0.09	0.3	0.09	0.3
41400	0.2	0.3	0.1	0.3	0.1	0.3	0.1	0.3
41600	0.3	0.5	0.1	0.5	0.1	0.5	0.1	0.5
41800	0.4	0.6	0.3	0.6	0.3	0.6	0.3	0.6
42000	0.2	0.3	0.1	0.3	0.1	0.3	0.1	0.3
42200	0.1	0.2	0.1	0.2	0.1	0.2	0.1	0.2
42400	0.2	0.4	0.19	0.4	0.19	0.4	0.19	0.4
42600	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3
42800	0.2	0.3	0.1	0.3	0.1	0.3	0.1	0.3
43000	0.1	0.2	0.09	0.2	0.09	0.2	0.09	0.2
43200	0.2	0.3	0.1	0.3	0.1	0.3	0.1	0.3
43400	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3
43600	0.2	0.4	0.19	0.4	0.19	0.4	0.19	0.4
43800	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3
44000	0.2	0.3	0.2	0.3	0.2	0.3	0.2	0.3
44200	0.3	0.5	0.2	0.5	0.2	0.5	0.2	0.5
44400	0.4	0.6	0.3	0.6	0.3	0.6	0.3	0.6
44600	0.2	0.3	0.2	0.3	0.2	0.3	0.2	0.3
44800	0.1	0.2	0.1	0.2	0.1	0.2	0.1	0.2
45000	0.2	0.4	0.19	0.4	0.19	0.4	0.19	0.4
45200	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3
45400	0.2	0.3	0.2	0.3	0.2	0.3	0.2	0.3
45600	0.2	0.3	0.1	0.3	0.1	0.3	0.1	0.3
45800	0.1	0.2	0.09	0.2	0.09	0.2	0.09	0.2
46000	0.2	0.3	0.1	0.3	0.1	0.3	0.1	0.3
46200	0.3	0.3	0.2	0.3	0.2	0.3	0.2	0.3
46400	0.4	0.4	0.2	0.4	0.2	0.4	0.2	0.4
46600	0.2	0.3	0.1	0.3	0.1	0.3	0.1	0.3
46800	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3
47000	0.2	0.5	0.19	0.5	0.19	0.5	0.19	0.5
47200	0.1	0.6	0.09	0.6	0.09	0.6	0.09	0.6
47400	0.2	0.3	0.1	0.3	0.1	0.3	0.1	0.3
47600	0.1	0.2	0.09	0.2	0.09	0.2	0.09	0.2
47800	0.2	0.4	0.1	0.4	0.1	0.4	0.1	0.4
48000	1.2	1.3	0.1	1.3	0.1	1.3	0.1	1.3
48200	1.3	1.4	0.1	1.4	0.1	1.4	0.1	1.4

Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Observed		Observed		Observed		Observed	
	Min	Max	Min	Max	Min	Max	Min	Max
48400	1.5	1.7	0.1	1.7	0.1	1.7	0.1	1.7
48600	1.4	1.5	1.3	1.5	1.3	1.5	1.3	1.5
48800	1.3	1.4	1.29	1.4	1.29	1.4	1.29	1.4
49000	1.2	1.4	1.1	1.4	1.1	1.4	1.1	1.4
49200	0.2	0.3	0.1	0.3	0.1	0.3	0.1	0.3
49400	0.1	0.3	0.09	0.3	0.09	0.3	0.09	0.3
49600	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3
49800	0.2	0.5	0.1	0.5	0.1	0.5	0.1	0.5
50000	0.3	0.5	0.1	0.5	0.1	0.5	0.1	0.5
50200	0.4	0.7	0.3	0.7	0.3	0.7	0.3	0.7
50400	0.2	0.5	0.1	0.5	0.1	0.5	0.1	0.5
50600	0.1	0.5	0.09	0.5	0.09	0.5	0.09	0.5
50800	0.2	0.6	0.19	0.6	0.19	0.6	0.19	0.6
51000	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3
51200	0.2	0.2	0.1	0.2	0.1	0.2	0.1	0.2
51400	0.1	0.4	0.1	0.4	0.1	0.4	0.1	0.4
51600	0.2	0.3	0.1	0.3	0.1	0.3	0.1	0.3
51800	0.3	0.3	0.1	0.3	0.1	0.3	0.1	0.3
52000	0.4	0.2	0.39	0.2	0.39	0.2	0.39	0.2
52200	0.2	0.3	0.1	0.3	0.1	0.3	0.1	0.3
52400	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3
52600	0.2	0.4	0.1	0.4	0.1	0.4	0.1	0.4
52800	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3
53000	0.2	0.3	0.1	0.3	0.1	0.3	0.1	0.3
53200	0.1	0.5	0.09	0.5	0.09	0.5	0.09	0.5
53400	0.2	0.6	0.2	0.6	0.2	0.6	0.2	0.6
53600	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3
53800	0.1	0.2	0.09	0.2	0.09	0.2	0.09	0.2
54000	0.2	0.4	0.1	0.4	0.1	0.4	0.1	0.4
54200	0.3	0.3	0.1	0.3	0.1	0.3	0.1	0.3
54400	0.4	0.3	0.39	0.3	0.39	0.3	0.39	0.3
54600	0.2	0.2	0.1	0.2	0.1	0.2	0.1	0.2
54800	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3
55000	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3
55200	0.2	0.4	0.1	0.4	0.1	0.4	0.1	0.4
55400	0.3	0.3	0.1	0.3	0.1	0.3	0.1	0.3
55600	0.4	0.5	0.3	0.5	0.3	0.5	0.3	0.5
55800	0.2	0.5	0.19	0.5	0.19	0.5	0.19	0.5
56000	0.1	0.4	0.1	0.4	0.1	0.4	0.1	0.4
56200	0.2	0.3	0.2	0.3	0.2	0.3	0.2	0.3
56400	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3

Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Observed		Observed		Observed		Observed	
	Min	Max	Min	Max	Min	Max	Min	Max
56600	0.2	0.4	0.2	0.4	0.2	0.4	0.2	0.4
56800	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3
57000	0.2	0.3	0.19	0.3	0.19	0.3	0.19	0.3
57200	0.3	0.4	0.2	0.4	0.2	0.4	0.2	0.4
57400	0.4	0.5	0.3	0.5	0.3	0.5	0.3	0.5
57600	0.2	0.3	0.19	0.3	0.19	0.3	0.19	0.3
57800	0.1	0.4	0.1	0.4	0.1	0.4	0.1	0.4
58000	0.2	0.3	0.1	0.3	0.1	0.3	0.1	0.3
58200	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3
58400	0.2	0.5	0.2	0.5	0.2	0.5	0.2	0.5
58600	0.1	0.6	0.1	0.6	0.1	0.6	0.1	0.6
58800	0.2	0.3	0.19	0.3	0.19	0.3	0.19	0.3
59000	0.1	0.2	0.09	0.2	0.09	0.2	0.09	0.2
59200	0.2	0.4	0.2	0.4	0.2	0.4	0.2	0.4
59400	0.3	0.3	0.1	0.3	0.1	0.3	0.1	0.3
59600	0.4	0.5	0.39	0.5	0.39	0.5	0.39	0.5
59800	0.2	0.2	0.1	0.2	0.1	0.2	0.1	0.2
60000	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3
60200	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3
60400	0.2	0.4	0.1	0.4	0.1	0.4	0.1	0.4
60600	0.3	0.3	0.2	0.3	0.2	0.3	0.2	0.3
60800	0.4	0.5	0.2	0.5	0.2	0.5	0.2	0.5
61000	0.2	0.5	0.19	0.5	0.19	0.5	0.19	0.5
61200	0.1	0.4	0.1	0.4	0.1	0.4	0.1	0.4
61400	0.2	0.3	0.1	0.3	0.1	0.3	0.1	0.3
61600	0.1	0.2	0.1	0.2	0.1	0.2	0.1	0.2
61800	0.2	0.4	0.1	0.4	0.1	0.4	0.1	0.4
62000	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3
62200	0.2	0.3	0.2	0.3	0.2	0.3	0.2	0.3
62400	0.3	0.4	0.2	0.4	0.2	0.4	0.2	0.4
62600	0.2	0.4	0.1	0.4	0.1	0.4	0.1	0.4
62800	0.2	0.3	0.1	0.3	0.1	0.3	0.1	0.3
63000	0.1	0.4	0.1	0.4	0.1	0.4	0.1	0.4
63200	0.2	0.3	0.19	0.3	0.19	0.3	0.19	0.3
63400	0.1	0.3	0.09	0.3	0.09	0.3	0.09	0.3
63600	0.2	0.5	0.1	0.5	0.1	0.5	0.1	0.5
63800	0.1	0.6	0.1	0.6	0.1	0.6	0.1	0.6
64000	0.2	0.3	0.19	0.3	0.19	0.3	0.19	0.3
64200	0.1	0.2	0.1	0.2	0.1	0.2	0.1	0.2
64400	0.1	0.4	0.1	0.4	0.1	0.4	0.1	0.4
64600	0.2	0.3	0.1	0.3	0.1	0.3	0.1	0.3

Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Observed		Observed		Observed		Observed	
	Min	Max	Min	Max	Min	Max	Min	Max
64800	0.3	0.3	0.2	0.3	0.2	0.3	0.2	0.3
65000	0.4	0.6	0.3	0.6	0.3	0.6	0.3	0.6
65200	0.2	0.3	0.1	0.3	0.1	0.3	0.1	0.3
65400	0.1	0.3	0.09	0.3	0.09	0.3	0.09	0.3
65600	0.2	0.4	0.2	0.4	0.2	0.4	0.2	0.4
65800	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3
66000	0.2	0.3	0.2	0.3	0.2	0.3	0.2	0.3
66200	0.1	0.5	0.1	0.5	0.1	0.5	0.1	0.5
66400	0.2	0.6	0.2	0.6	0.2	0.6	0.2	0.6
66600	0.3	0.3	0.2	0.3	0.2	0.3	0.2	0.3
66800	0.4	0.5	0.2	0.5	0.2	0.5	0.2	0.5
67000	0.2	0.4	0.1	0.4	0.1	0.4	0.1	0.4
67200	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3
67400	0.2	0.3	0.1	0.3	0.1	0.3	0.1	0.3
67600	0.1	0.2	0.1	0.2	0.1	0.2	0.1	0.2
67800	0.2	0.3	0.19	0.3	0.19	0.3	0.19	0.3
68000	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3
68200	0.2	0.4	0.1	0.4	0.1	0.4	0.1	0.4
68400	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3
68600	0.2	0.3	0.1	0.3	0.1	0.3	0.1	0.3
68800	0.3	0.5	0.1	0.5	0.1	0.5	0.1	0.5
69000	0.4	0.6	0.3	0.6	0.3	0.6	0.3	0.6
69200	0.2	0.3	0.1	0.3	0.1	0.3	0.1	0.3
69400	0.1	0.2	0.1	0.2	0.1	0.2	0.1	0.2
69600	0.1	0.4	0.1	0.4	0.1	0.4	0.1	0.4
69800	0.2	0.3	0.1	0.3	0.1	0.3	0.1	0.3
70000	0.3	0.3	0.1	0.3	0.1	0.3	0.1	0.3
70200	0.4	0.4	0.39	0.4	0.39	0.4	0.39	0.4
70400	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3
70600	0.2	0.3	0.1	0.3	0.1	0.3	0.1	0.3
70800	0.1	0.4	0.1	0.4	0.1	0.4	0.1	0.4
71000	0.2	0.3	0.1	0.3	0.1	0.3	0.1	0.3
71200	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3
71400	0.2	0.5	0.1	0.5	0.1	0.5	0.1	0.5
71600	0.1	0.6	0.1	0.6	0.1	0.6	0.1	0.6
71800	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3
72000	0.2	0.3	0.1	0.3	0.1	0.3	0.1	0.3
72200	0.3	0.4	0.2	0.4	0.2	0.4	0.2	0.4
72400	0.4	0.5	0.2	0.5	0.2	0.5	0.2	0.5
72600	0.2	0.3	0.19	0.3	0.19	0.3	0.19	0.3
72800	0.1	0.2	0.1	0.2	0.1	0.2	0.1	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
73000	0.2	0.3	0.1	0.3	0.1	0.3	0.1	0.3
73200	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3
73400	0.2	0.4	0.2	0.4	0.2	0.4	0.2	0.4
73600	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3
73800	0.2	0.3	0.1	0.3	0.1	0.3	0.1	0.3
74000	0.3	0.5	0.1	0.5	0.1	0.5	0.1	0.5
74200	0.4	0.6	0.3	0.6	0.3	0.6	0.3	0.6
74400	0.2	0.3	0.1	0.3	0.1	0.3	0.1	0.3
74600	0.1	0.2	0.1	0.2	0.1	0.2	0.1	0.2
74800	0.2	0.4	0.2	0.4	0.2	0.4	0.2	0.4
75000	0.1	0.3	0.09	0.3	0.09	0.3	0.09	0.3
75200	0.2	0.3	0.1	0.3	0.1	0.3	0.1	0.3
75400	0.1	0.2	0.1	0.2	0.1	0.2	0.1	0.2
75600	0.2	0.3	0.2	0.3	0.2	0.3	0.2	0.3
75800	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3
76000	0.2	0.4	0.2	0.4	0.2	0.4	0.2	0.4
76200	0.3	0.3	0.2	0.3	0.2	0.3	0.2	0.3
76400	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3
76600	0.2	0.5	0.1	0.5	0.1	0.5	0.1	0.5
76800	0.1	0.6	0.1	0.6	0.1	0.6	0.1	0.6
77000	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3
77200	0.2	0.2	0.1	0.2	0.1	0.2	0.1	0.2
77400	0.4	0.4	0.39	0.4	0.39	0.4	0.39	0.4
77600	0.2	0.3	0.1	0.3	0.1	0.3	0.1	0.3
77800	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3
78000	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
78200	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3
78400	0.2	0.3	0.2	0.3	0.2	0.3	0.2	0.3
78600	0.1	0.4	0.1	0.4	0.1	0.4	0.1	0.4
78800	0.2	0.3	0.2	0.3	0.2	0.3	0.2	0.3
79000	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
79200	0.4	0.5	0.3	0.5	0.3	0.5	0.3	0.5
79400	0.2	0.6	0.2	0.6	0.2	0.6	0.2	0.6
79600	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3
79800	0.2	0.2	0.19	0.2	0.19	0.2	0.19	0.2
80000	0.1	0.4	0.1	0.4	0.1	0.4	0.1	0.4
80200	0.2	0.3	0.1	0.3	0.1	0.3	0.1	0.3
80400	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3
80600	0.2	0.2	0.1	0.2	0.1	0.2	0.1	0.2
80800	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3
81000	0.2	0.3	0.2	0.3	0.2	0.3	0.2	0.3

Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Observed		Observed		Observed		Observed	
	Min	Max	Min	Max	Min	Max	Min	Max
81200	0.3	0.4	0.1	0.4	0.1	0.4	0.1	0.4
81400	0.4	0.5	0.3	0.5	0.3	0.5	0.3	0.5
81600	0.2	0.3	0.1	0.3	0.1	0.3	0.1	0.3
81800	0.1	0.5	0.1	0.5	0.1	0.5	0.1	0.5
82000	0.1	0.6	0.1	0.6	0.1	0.6	0.1	0.6
82200	0.2	0.3	0.19	0.3	0.19	0.3	0.19	0.3
82400	0.2	0.2	0.1	0.2	0.1	0.2	0.1	0.2
82600	0.1	0.4	0.1	0.4	0.1	0.4	0.1	0.4
82800	0.2	0.3	0.2	0.3	0.2	0.3	0.2	0.3
83000	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3
83200	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
83400	0.3	0.3	0.2	0.3	0.2	0.3	0.2	0.3
83600	0.4	0.5	0.3	0.5	0.3	0.5	0.3	0.5
83800	0.2	0.4	0.1	0.4	0.1	0.4	0.1	0.4
84000	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3
84200	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3
84400	0.2	0.3	0.2	0.3	0.2	0.3	0.2	0.3
84600	0.3	0.2	0.29	0.2	0.29	0.2	0.29	0.2
84800	0.4	0.5	0.3	0.5	0.3	0.5	0.3	0.5
85000	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3
85200	0.2	0.4	0.2	0.4	0.2	0.4	0.2	0.4
85400	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3
85600	0.2	0.3	0.2	0.3	0.2	0.3	0.2	0.3
85800	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3
86000	0.2	0.3	0.1	0.3	0.1	0.3	0.1	0.3
86200	0.1	0.2	0.1	0.2	0.1	0.2	0.1	0.2
86400	0.1	0.2	0.1	0.2	0.1	0.2	0.1	0.2
86600	0.2	0.3	0.2	0.3	0.2	0.3	0.2	0.3
86800	0.3	0.3	0.2	0.3	0.2	0.3	0.2	0.3
87136	0.4	0.4	0.3	0.4	0.3	0.4	0.3	0.4

Table 21-Observed depth at 200 m interval

Annexure-4 Reduced depth in 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	2.2	2.7	2.1	2.8	2	2.9	1.9	3
200	1.6	2	1.4	2.2	1.2	2.4	1	2.6
400	1.6	2.2	1.3	2.5	1	2.8	0.7	3.1
600	1.3	2	1.2	2.1	1.1	2.2	1	2.3
800	1	2	0.99	2.01	0.98	2.02	0.97	2.03
1000	3.1	8.9	2.9	9.1	2.7	9.3	2.5	9.5
1200	1.9	2.6	1.8	2.7	1.7	2.8	1.6	2.9
1400	1.1	1.7	1	1.8	0.9	1.9	0.8	2
1600	0.8	1.7	0.7	1.8	0.6	1.9	0.5	2
1800	1.7	2.9	1.69	2.91	1.68	2.92	1.67	2.93
2000	1.6	3.2	1.4	3.4	1.2	3.6	1	3.8
2200	2.7	4.1	2.6	4.2	2.5	4.3	2.4	4.4
2400	1.5	2	1.49	2.01	1.48	2.02	1.47	2.03
2600	1.6	2	1.5	2.1	1.4	2.2	1.3	2.3
2800	1.7	2.6	1.5	2.8	1.3	3	1.1	3.2
3000	1.1	14.5	0.8	14.8	0.5	15.1	0.2	15.4
3200	0.8	1.2	0.7	1.3	0.6	1.4	0.5	1.5
3400	2.2	4.4	2.1	4.5	2	4.6	1.9	4.7
3600	1.6	2.4	1.4	2.6	1.2	2.8	1	3
3800	1.5	1.9	1.4	2	1.3	2.1	1.2	2.2
4000	1.9	2.4	1.8	2.5	1.7	2.6	1.6	2.7
4200	0.9	1.4	0.8	1.5	0.7	1.6	0.6	1.7
4400	1.3	1.7	1.1	1.9	0.9	2.1	0.7	2.3
4600	0.6	1.3	0.59	1.31	0.58	1.32	0.57	1.33
4800	1.2	1.7	1.1	1.8	1	1.9	0.9	2
5000	1.3	1.7	1.1	1.9	0.9	2.1	0.7	2.3
5200	1.6	2	1.4	2.2	1.2	2.4	1	2.6
5400	1.9	3.7	1.7	3.9	1.5	4.1	1.3	4.3
5600	1.9	6	1.8	6.1	1.7	6.2	1.6	6.3
5800	1.1	1.9	1.09	1.91	1.08	1.92	1.07	1.93
6000	1.5	2.1	1.4	2.2	1.3	2.3	1.2	2.4
6200	1.1	1.5	1	1.6	0.9	1.7	0.8	1.8
6400	2.4	3.7	2.39	3.71	2.38	3.72	2.37	3.73
6600	4.6	7.4	4.4	7.6	4.2	7.8	4	8
6800	2.5	3.2	2.4	3.3	2.3	3.4	2.2	3.5
7000	1.1	1.9	0.9	2.1	0.7	2.3	0.5	2.5
7200	0.6	1.6	0.5	1.7	0.4	1.8	0.3	1.9

Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Reduced		Reduced		Reduced		Reduced	
	Min	Max	Min	Max	Min	Max	Min	Max
7400	1.1	1.4	0.9	1.6	0.7	1.8	0.5	2
7600	1.6	2.2	1.59	2.21	1.58	2.22	1.57	2.23
7800	1	1.7	0.99	1.71	0.98	1.72	0.97	1.73
8000	1.9	2.2	1.7	2.4	1.5	2.6	1.3	2.8
8200	1.6	4.6	1.59	4.61	1.58	4.62	1.57	4.63
8400	2.3	3.7	2.1	3.9	1.9	4.1	1.7	4.3
8600	1.6	2.1	1.59	2.11	1.58	2.12	1.57	2.13
8800	1.1	1.4	0.8	1.7	0.4	2	0.1	2.3
9000	2	2.5	1.9	2.6	1.8	2.7	1.7	2.8
9200	1.6	2	1.4	2.2	1.2	2.4	1	2.6
9400	0.3	1.7	0.2	1.8	0.1	1.9	0.1	2
9600	1.9	2.5	1.7	2.7	1.5	2.9	1.3	3.1
9800	1.4	3.5	1.39	3.51	1.38	3.52	1.37	3.53
10000	4.6	7.9	4.5	8	4.4	8.1	4.3	8.2
10200	1	2	0.8	2.2	0.6	2.4	0.4	2.6
10400	7	12.7	6.9	12.8	6.8	12.9	6.7	13
10600	2.1	3.1	2	3.2	1.9	3.3	1.8	3.4
10800	3.2	4.4	3.1	4.5	3	4.6	2.9	4.7
11000	1.6	3.3	1.59	3.31	1.58	3.32	1.57	3.33
11200	1.6	2	1.4	2.2	1.2	2.4	1	2.6
11400	1.5	2.2	1.4	2.3	1.3	2.4	1.2	2.5
11600	2	2.4	1.99	2.41	1.98	2.42	1.97	2.43
11800	1	1.7	0.9	1.8	0.8	1.9	0.7	2
12000	1.6	1.9	1.4	2.1	1.2	2.3	1	2.5
12200	1.2	1.99	1.19	2	1.18	2.01	1.17	2.02
12400	0.9	1.9	0.8	2	0.7	2.1	0.6	2.2
12600	2	2.1	1.8	2.3	1.6	2.5	1.4	2.7
12800	1.7	3.1	1.6	3.2	1.5	3.3	1.4	3.4
13000	5	6.4	4.9	6.5	4.8	6.6	4.7	6.7
13200	1	5.4	0.8	5.6	0.6	5.8	0.4	6
13400	1.6	2.2	1.5	2.3	1.4	2.4	1.3	2.5
13600	2.4	2.7	2.2	2.9	2	3.1	1.8	3.3
13800	1	2.1	0.9	2.2	0.8	2.3	0.7	2.4
14000	1.6	2	1.3	2.2	1.1	2.4	0.9	2.6
14200	1.6	2.6	1.59	2.61	1.58	2.62	1.57	2.63
14400	1.6	2	1.5	2.1	1.4	2.2	1.3	2.3
14600	3.3	6.6	3.1	6.8	2.9	7	2.7	7.2
14800	1	6.4	0.9	6.5	0.8	6.6	0.7	6.7
15000	2.2	3.3	2.1	3.4	2	3.5	1.9	3.6
15200	1.9	2.2	1.8	2.3	1.7	2.4	1.6	2.5
15400	0.6	3.1	0.59	3.11	0.58	3.12	0.57	3.13

Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Reduced		Reduced		Reduced		Reduced	
	Min	Max	Min	Max	Min	Max	Min	Max
15600	3	4.1	2.8	4.3	2.6	4.5	2.4	4.7
15800	1.9	2.7	1.8	2.8	1.7	2.9	1.6	3
16000	1.9	4.9	1.89	4.91	1.88	4.92	1.87	4.93
16200	1	2.1	0.9	2.2	0.8	2.3	0.7	2.4
16400	3.6	8.9	3.4	9.1	3.2	9.3	3	9.5
16600	2	5.6	1.99	5.61	1.98	5.62	1.97	5.63
16800	1.6	2	1.5	2.1	1.4	2.2	1.3	2.3
17000	1.9	2.5	1.7	2.7	1.5	2.9	1.3	3.1
17200	1.9	2.1	1.8	2.2	1.7	2.3	1.6	2.4
17400	1.6	2	1.5	2.1	1.4	2.2	1.3	2.3
17600	1.6	2	1.4	2.2	1.2	2.4	1	2.6
17800	1.6	2.1	1.5	2.2	1.4	2.3	1.3	2.4
18000	1.3	2.2	1.2	2.3	0.8	2.4	0.7	2.5
18200	1.6	1.9	1.4	2.1	1.2	2.3	1	2.5
18400	2	3.2	1.7	3.5	1.4	3.8	1.1	4.1
18600	1.6	2.3	1.5	2.4	1.4	2.5	1.3	2.6
18800	1	1.7	0.9	1.8	0.8	1.9	0.7	2
19000	2.9	3.9	2.7	4.1	2.5	4.3	2.3	4.5
19200	2.6	3.5	2.5	3.6	2.4	3.7	2.3	3.8
19400	2	6.5	1.9	6.6	1.8	6.7	1.7	6.8
19600	0.5	1.4	0.4	1.5	0.3	1.6	0.2	1.7
19800	1.2	1.6	1	1.8	0.8	2	0.6	2.2
20000	2.9	5.6	2.89	5.61	2.88	5.62	2.87	5.63
20200	0.9	1.3	0.8	1.4	0.7	1.5	0.6	1.6
20400	1.4	1.6	1.2	1.8	1	2	0.8	2.2
20600	1.6	1.9	1.4	2.1	1.2	2.3	1	2.5
20800	1.6	2	1.4	2.2	1.2	2.4	1	2.6
21000	0.9	1.9	0.8	2	0.7	2.1	0.6	2.2
21200	2.5	3.9	2.49	3.91	2.48	3.92	2.47	3.93
21400	1.6	4.2	1.5	4.3	1.4	4.4	1.3	4.5
21600	1.1	2.3	1	2.4	0.9	2.5	0.8	2.6
21800	1	1.7	0.99	1.71	0.98	1.72	0.97	1.73
22000	1.5	1.7	1.3	1.9	1.1	2.1	0.9	2.3
22200	1.7	2.3	1.6	2.4	1.5	2.5	1.4	2.6
22400	1.4	1.7	1.2	1.9	1	2.1	0.8	2.3
22600	0.5	0.7	0.4	0.8	0.3	0.9	0.2	1
22800	1	1.2	0.8	1.4	0.6	1.6	0.4	1.8
23000	1.4	1.7	1.39	1.71	1.38	1.72	1.37	1.73
23200	4.1	5.2	4.09	5.21	4.08	5.22	4.07	5.23
23400	1.3	1.4	1.1	1.6	0.9	1.8	0.7	2
23600	1.6	2.2	1.59	2.21	1.58	2.22	1.57	2.23

Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Reduced		Reduced		Reduced		Reduced	
	Min	Max	Min	Max	Min	Max	Min	Max
23800	0.9	2.4	0.8	2.5	0.7	2.6	0.6	2.7
24000	1	1.2	0.8	1.4	0.6	1.6	0.4	1.8
24200	1.6	3.2	1.4	3.4	1.2	3.6	1	3.8
24400	0.5	5.4	0.3	5.6	0.1	5.8	0.1	6
24600	1	2.1	0.9	2.2	0.8	2.3	0.7	2.4
24800	2.4	4.5	2.39	4.51	2.38	4.52	2.37	4.53
25000	1	2.6	0.9	2.7	0.8	2.8	0.7	2.9
25200	0.6	3.3	0.5	3.4	0.4	3.5	0.3	3.6
25400	1.6	5.6	1.59	5.61	1.58	5.62	1.57	5.63
25600	1.6	2.6	1.4	2.8	1.2	3	1	3.2
25800	2.1	4	2	4.1	1.9	4.2	1.8	4.3
26000	1.5	4.6	1.3	4.8	1.1	5	0.9	5.2
26200	1.6	1.9	1.5	2	1.4	2.1	1.3	2.2
26400	1	1.2	0.8	1.4	0.6	1.6	0.4	1.8
26600	1	2.1	0.99	2.11	0.98	2.12	0.97	2.13
26800	1.4	3.3	1.39	3.31	1.38	3.32	1.37	3.33
27000	2.7	5.7	2.5	5.9	2.3	6.1	2.1	6.3
27200	1	2.1	0.8	2.3	0.6	2.5	0.4	2.7
27400	1.9	3.7	1.89	3.71	1.88	3.72	1.87	3.73
27600	1.5	3.1	1.4	3.2	1.3	3.3	1.2	3.4
27800	3.3	5.1	3.1	5.3	2.9	5.5	2.7	5.7
28000	2.5	5.3	2.4	5.4	2.3	5.5	2.2	5.6
28200	1.4	3.7	1.3	3.8	1.2	3.9	1.1	4
28400	1.7	3.1	1.6	3.2	1.5	3.3	1.4	3.4
28600	2.6	3.6	2.59	3.61	2.58	3.62	2.57	3.63
28800	1.4	1.9	1.2	2.1	1	2.3	0.8	2.5
29000	0.9	2	0.8	2.1	0.7	2.2	0.6	2.3
29200	1.5	2.4	1.49	2.41	1.48	2.42	1.47	2.43
29400	0.8	3	0.7	3.1	0.6	3.2	0.5	3.3
29600	1	3.7	0.8	3.9	0.6	4.1	0.4	4.3
29800	2	2.3	1.99	2.31	1.98	2.32	1.97	2.33
30000	2.1	2.1	2	2.2	1.9	2.3	1.8	2.4
30200	2.6	3.5	2.4	3.7	2.2	3.9	2	4.1
30400	1.6	2.2	1.5	2.3	1.4	2.4	1.3	2.5
30600	2.5	4.7	2.4	4.8	2.3	4.9	2.2	5
30800	1.6	2.2	1.4	2.4	1.2	2.6	1	2.8
31000	1	3.2	0.9	3.3	0.8	3.4	0.7	3.5
31200	0.6	1.4	0.5	1.5	0.4	1.6	0.3	1.7
31400	1.3	1.9	1.1	2.1	0.9	2.3	0.7	2.5
31600	1.4	3.9	1.1	4.2	0.8	4.5	0.5	4.8
31800	1	1.9	0.9	2	0.8	2.1	0.7	2.2

Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Reduced		Reduced		Reduced		Reduced	
	Min	Max	Min	Max	Min	Max	Min	Max
32000	2.1	4.6	2	4.7	1.9	4.8	1.8	4.9
32200	1	2.2	0.8	2.4	0.6	2.6	0.4	2.8
32400	1.3	1.7	1.2	1.8	1.1	1.9	1	2
32600	3.1	2.3	3	2.4	2.9	2.5	2.8	2.6
32800	1.9	2.3	1.8	2.4	1.7	2.5	1.6	2.6
33000	2.1	2.6	1.9	2.8	1.7	3	1.5	3.2
33200	1.6	2.1	1.59	2.11	1.58	2.12	1.57	2.13
33400	1.3	1.7	1.2	1.8	1.1	1.9	1	2
33600	1	2.1	0.8	2.3	0.6	2.5	0.4	2.7
33800	2.4	3	2.2	3.2	2	3.4	1.8	3.6
34000	1.3	3.2	1.1	3.4	0.9	3.6	0.7	3.8
34200	1.2	2.1	1.1	2.2	1	2.3	0.9	2.4
34400	1	2.1	0.99	2.11	0.98	2.12	0.97	2.13
34600	1.1	2.3	1	2.4	0.9	2.5	0.8	2.6
34800	1.3	3.2	1.2	3.3	1.1	3.4	1	3.5
35000	1.2	2.4	1.19	2.41	1.18	2.42	1.17	2.43
35200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
35400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
35600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
35800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
36000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
36200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
36400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
36600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
36800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
37000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
37200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
37400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
37600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
37800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
38000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
38200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
38400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
38600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
38800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
39000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
39200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
39400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
39600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
39800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
40000	-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
40200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
40400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
40600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
40800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
41000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
41200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
41400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
41600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
41800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
42000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
42200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
42400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
42600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
42800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
43000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
43200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
43400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
43600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
43800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
44000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
44200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
44400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
44600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
44800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
45000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
45200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
45400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
45600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
45800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
46000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
46200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
46400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
46600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
46800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
47000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
47200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
47400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
47600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
47800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
48000	1.2	1.2	1	1.2	0.9	1.2	0.8	1.2
48200	1.2	1.3	1.1	1.3	1	1.3	1	1.3

Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Reduced		Reduced		Reduced		Reduced	
	Min	Max	Min	Max	Min	Max	Min	Max
48400	1.3	1.3	1.1	1.4	1	1.4	1	1.4
48600	1.2	1.3	1.2	1.3	1.1	1.3	1.1	1.3
48800	1.2	1.3	1.1	1.3	0.8	1.3	0.8	1.3
49000	1.2	1.3	1.1	1.3	1	1.3	1	1.3
49200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
49400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
49600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
49800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
50000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
50200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
50400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
50600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
50800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
51000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
51200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
51400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
51600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
51800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
52000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
52200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
52400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
52600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
52800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
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

Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Reduced		Reduced		Reduced		Reduced	
	Min	Max	Min	Max	Min	Max	Min	Max
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
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

Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Reduced		Reduced		Reduced		Reduced	
	Min	Max	Min	Max	Min	Max	Min	Max
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
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
68800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
69000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
69200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
69400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
69600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
69800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
70000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
70200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
70400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
70600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
70800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
71000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
71200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
71400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
71600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
71800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
72000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
72200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
72400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
72600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
72800	-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
73000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
73200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
73400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
73600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
73800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
74000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
74200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
74400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
74600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
74800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
75000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
75200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
75400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
75600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
75800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
76000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
76200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
76400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
76600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
76800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
77000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
77200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
77400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
77600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
77800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
78000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
78200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
78400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
78600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
78800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
79000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
79200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
79400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
79600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
79800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
80000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
80200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
80400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
80600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
80800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
81000	-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
81200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
81400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
81600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
81800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
82000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
82200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
82400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
82600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
82800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
83000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
83200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
83400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
83600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
83800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
84000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
84200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
84400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
84600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
84800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
85000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
85200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
85400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
85600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
85800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
86000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
86200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
86400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
86600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
86800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
87136	-0.3	0	-0.3	0	-0.3	0	-0.3	0

Table 22-Reduced depth at 200 m interval

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) and following:-

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
07.04.16	GS-(TP)-1	0.052	24 Hrs	0.27	23.216	23.486	22.350	-0.866
05.04.16	GS-(TP)-2	13.964	24 Hrs	0.29	27.371	27.661	26.757	-0.614
03.04.16	GS-(TP)-3	24.278	24 Hrs	0.35	30.910	31.26	30.025	-0.885
03.04.16	GS-(TP)-4	40.642	24 Hrs	0.46	35.859	36.319	35.209	-0.560
08.04.16	GS-(TP)-5	55.140	24 Hrs	0.51	40.093	40.603	39.803	-0.290
08.04.16	GS-(TP)-6	69.544	24 Hrs	0.59	44.917	45.507	44.366	-0.551
10.04.16	GS-(TP)-7	76.400	24 Hrs	0.65	46.768	47.418	46.538	-0.230
10.04.16	GS-(TP)-8	87.092	24 Hrs	0.75	50.088	50.838	49.926	-0.162

Table 23- Details of collected water level at different Gauge stations

Annexure-6 Details of Bathymetric surveys carried out:-

Date of Bathymetry Survey	From (km)	To (km)
25.12.15	0.00	11.745
26.12.15	11.745	21.560
04.04.16	21.560	30.00
12.04.16	30.00	35.00

Table 24- Details of Bathymetry survey

Annexure-7 Bank Protection along the Bank:-

The Bank of Tlwang River includes dense forest, outcrops etc. The total stretch between Gharmura to Khamrang are protected by dense forest, hill etc. Embankment and Boulder pitching are also protected the both side of the river bank. Both side dense forest and hill is the main features which protected the river side.

Annexure-8 Details of Features across the Bank:-

The bank of the river includes villages, Ferry Ghat, Irrigation canals and outlets, RCC Bridges, Electric Lines and Forest etc. The both side river bank are highly protected by embankment and bolder pitching. The villages like Gharmura, Bhairabi are also situated near the bank side of the river. Recently different kinds of industries like oil, Cement, Petro-Chemicals have been noticed in this zone of river.

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

- **Establishment of Horizontal Control:-**

  The Horizontal control for Topography surveys: - 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 surveys: - DGPS is receiving corrections from Beacons.

Establishment of Vertical Control:-

Vertical control from C.W.C Gauge Level, located near Gharmura RCC Bridge (NH-154) is used for the entire Survey work. Its value is 50.00m w.r.t. MSL has been considered for calculating the vertical levels. Total 8 no. of BM have been established along the 68.484kms stretch of the Tlwang River with the reference of G.T.S Level, which was fixed near at the Gharmura RCC Bridge (NH-154).

Topography Survey:-

The survey was commenced on 17th December, 2015 and completed on 21st April, 2016. Then the time was Summer season and the climate become sunny which reached approximately 31◦ 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 21 Topography survey Instrument

- **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 22 Bathymetry Survey Instrument

Annexure-10 Photograph of Equipment:-

Following equipment was 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 Rover SPS 361		1
Software	HYPACK data acquisition	Version 14	1
Software	AUTOCAD	2013	1
Software	Microsoft Office	2013	1

Survey Vessel:-

The bathymetric survey was conducted using one motorized boat. This boat was also used to collect water sample, current velocity, soil sample etc.

Figure 23 Survey Boat

- **Positioning System:-**

- **1 no Trimble DGPS system (SPS361)**

Figure 24 DGPS System 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 25 Echo Sounder

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

Figure 26 Current Meter

Topographic Survey Instruments:-

➢3 sets south RTK (Real Time Kinematic) were used during topographical/spot level survey.

Figure 27 - RTK Instrument for Topography survey

- **Calibration**

The equipments used for the survey were calibrated by the equipment supplier. The equipment calibration certificates are placed at Annexure to this report.

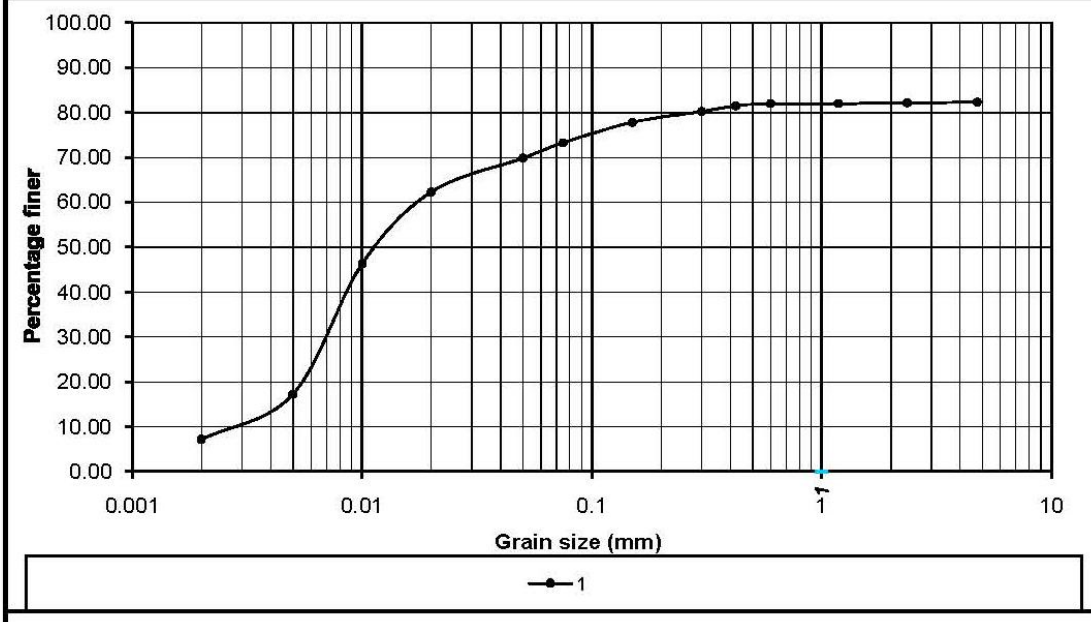
Annexure-11 Soil Samples Report:

RESULT OF TEST OF SOIL SAMPLES

SITE: TLWANG RIVER

SITE-TLWANG RIVER										
PHYSICAL ANALYSIS OF SOIL										
SL. NO	B.M	GRAVEL (%)	SAND (%)	SILT+CLAY (%)	SPECIFIC GRAVITY	PH VALUE	SILT	CLAY	Cu	Cc
1	1	17.68	15.60	66.72	2.66	7.40	59.50	7.22	6.23	0.97
2	2	9.96	26.12	63.92	2.65	7.30	55.00	8.92	9.58	1.16
3	3	18.90	20.84	60.26	2.67	7.40	50.50	9.76	4.81	0.76
4	4	23.07	19.20	57.73	2.66	7.30	48.50	9.23	7.31	0.71
5	5	19.78	24.15	56.07	2.68	7.40	48.10	7.97	7.91	1.02
6	6	16.84	27.10	56.06	2.66	7.50	47.60	8.46	8.82	1.19
7	7	19.93	24.21	55.86	2.66	7.30	46.70	9.16	10.28	0.93
8	8	18.60	27.40	54.00	2.67	7.40	45.20	8.80	15.37	1.88

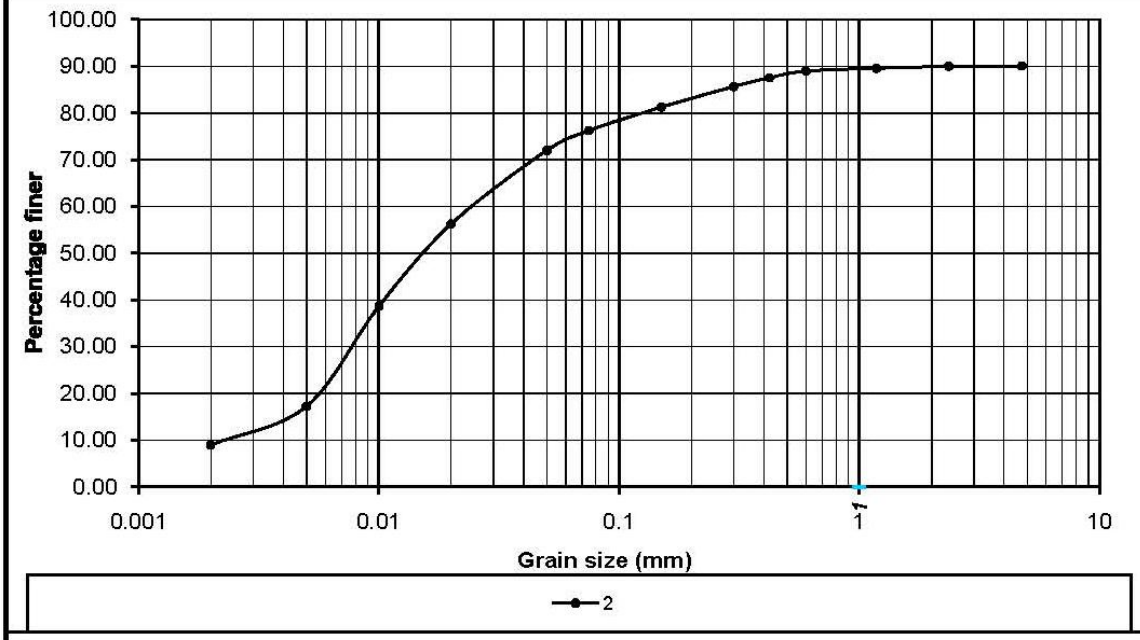
GRAIN SIZE DISTRIBUTION CURVES



Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Sand (%)**	**Gravel (%)**
1	7.22	59.50	15.60	17.68

*Silt & Clay

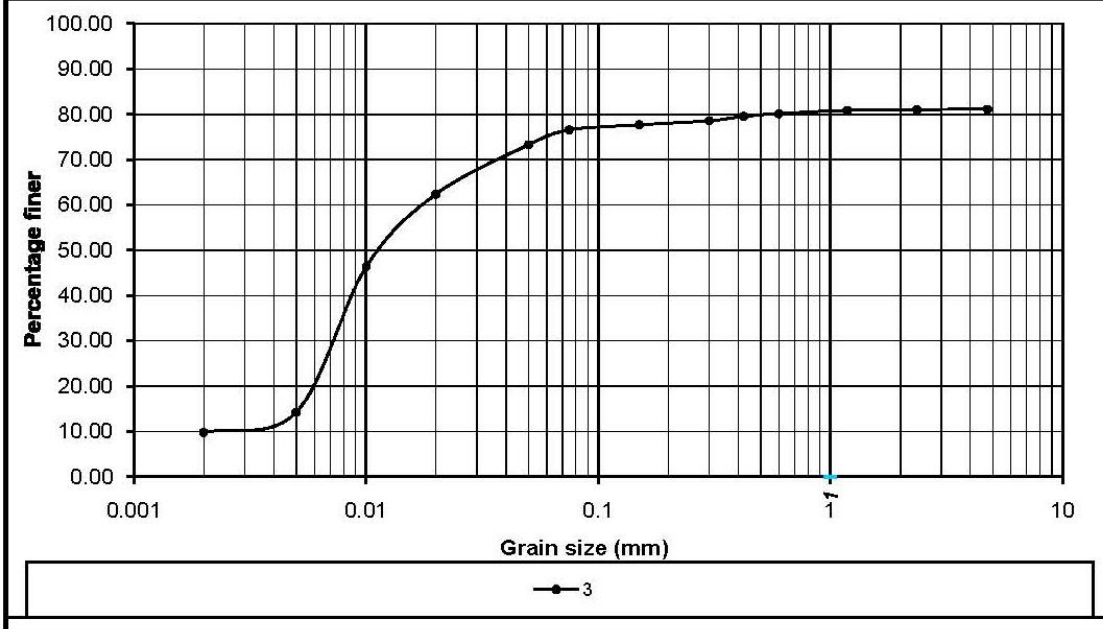
GRAIN SIZE DISTRIBUTION CURVES



Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Sand (%)**	**Gravel (%)**
2	8.92	55.00	26.12	9.96

*Silt & Clay

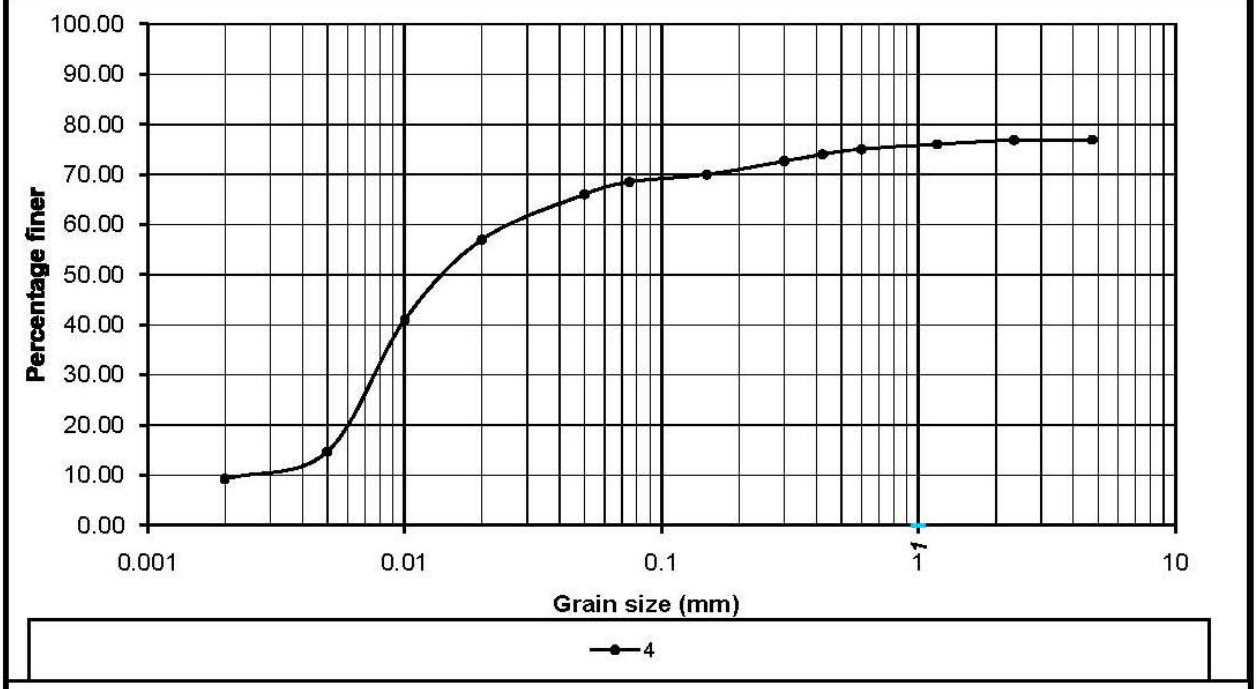
GRAIN SIZE DISTRIBUTION CURVES



Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Sand (%)**	**Gravel (%)**
3	9.76	50.50	20.84	18.90

*Silt & Clay

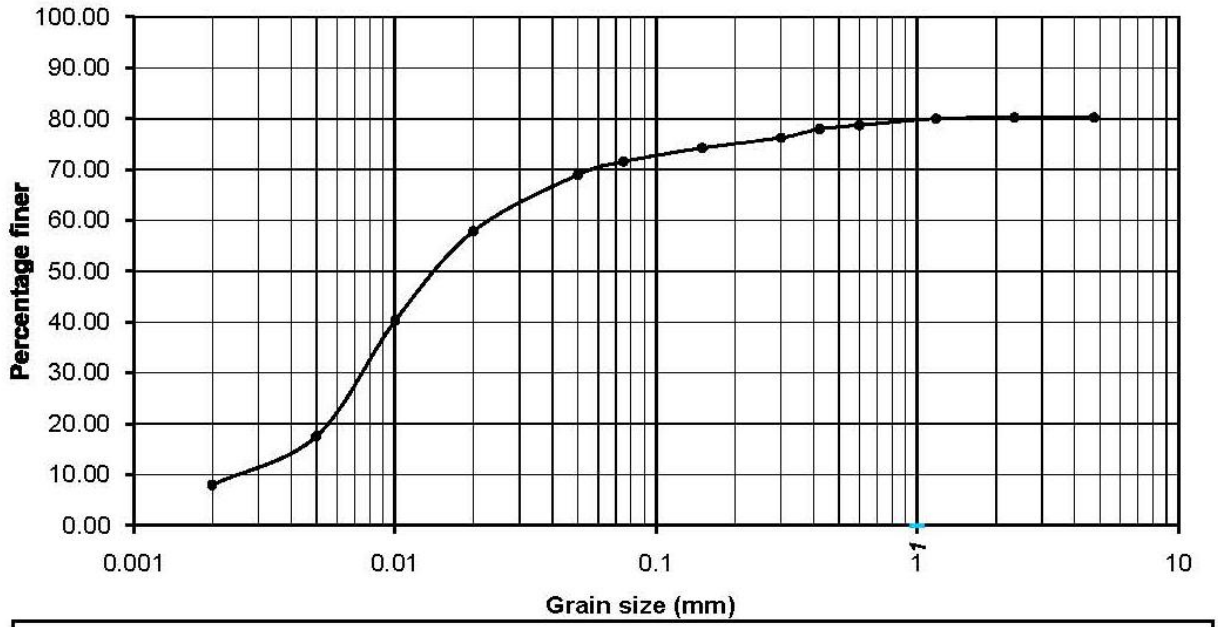
GRAIN SIZE DISTRIBUTION CURVES



Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Sand (%)**	**Gravel (%)**
4	9.23	48.50	19.20	23.07

*Silt & Clay

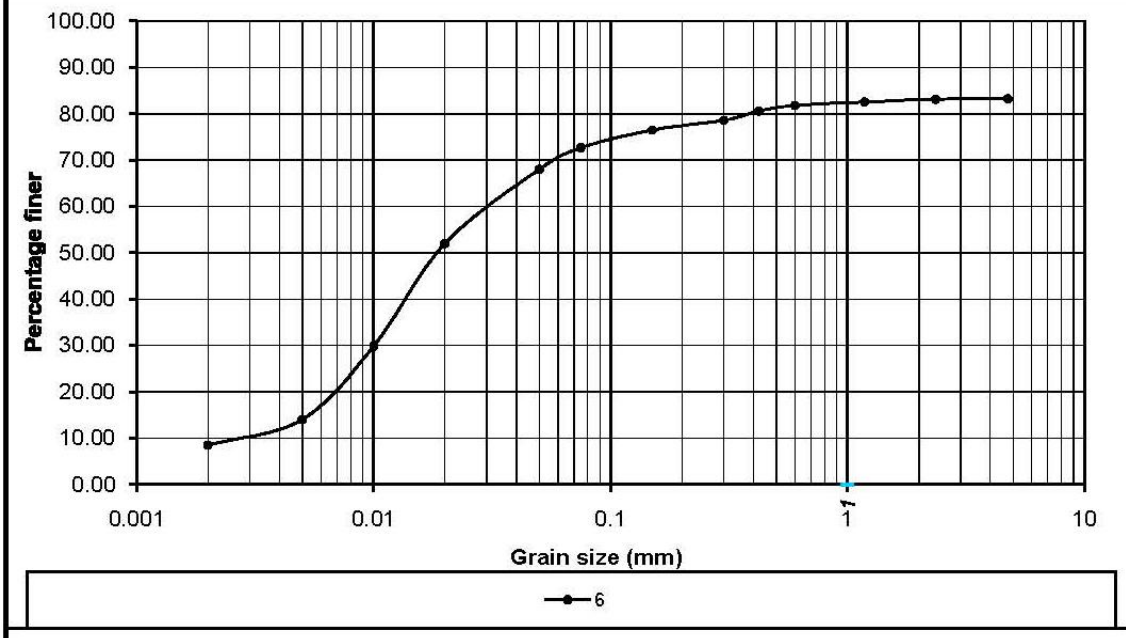
GRAIN SIZE DISTRIBUTION CURVES



Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Sand (%)**	**Gravel (%)**
5	7.97	48.10	24.15	19.78

*Silt & Clay

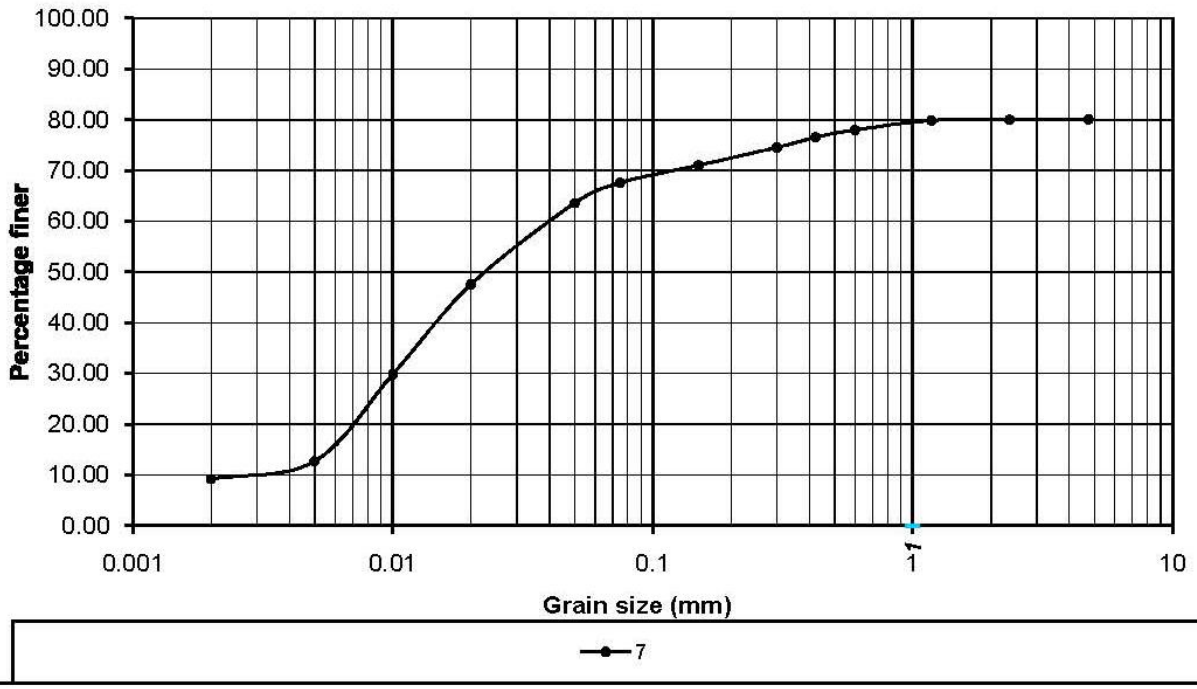
GRAIN SIZE DISTRIBUTION CURVES



Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Sand (%)**	**Gravel (%)**
6	8.46	47.60	27.10	16.84

*Silt & Clay

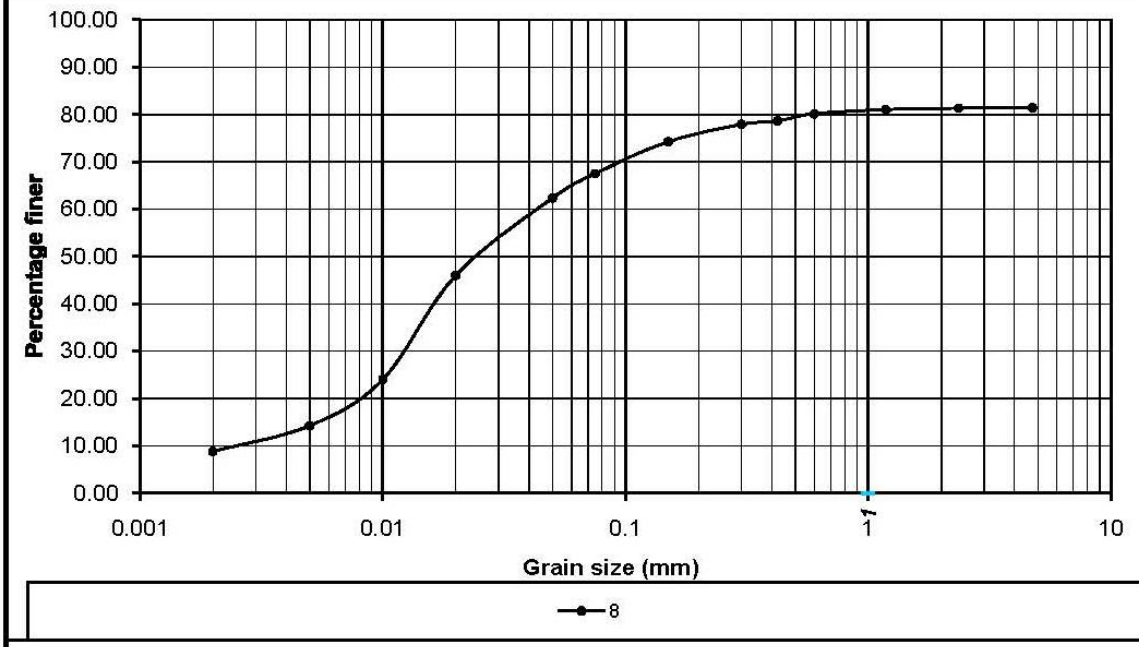
GRAIN SIZE DISTRIBUTION CURVES



Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Sand (%)**	**Gravel (%)**
7	9.16	46.70	24.21	19.93

*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 (%)**
8	8.80	45.20	27.40	18.60

*Silt & Clay

Annexure-12 Water Sample Report:

RESULTS OF EXAMINATION OF SAMPLES OF WATER

SITE- RIVER TIWANG (DHALESWARI)

PARAMETER – pH Value at 25° C

SL.NO;	B.M	LOCATION	PARAMETER	WATER SAMPLE RESULTS	PERMISSIBLE LIMIT IS:456-2000
1	1	UPPER	pH Value at 25° C	6.0	6.5 – 8.5
2		MIDDLE		5.9	
3		LOWER		6.0	
4	2	UPPER		6.0	
5		MIDDLE		5.9	
6		LOWER		6.0	
7	3	UPPER		5.8	
8		MIDDLE		5.9	
9		LOWER		6.0	
10	4	UPPER		6.0	
11		MIDDLE		6.2	
12		LOWER		6.1	
13	5	UPPER		6.0	
14		MIDDLE		6.0	
15		LOWER		6.2	
16	6	UPPER		5.9	
17		MIDDLE		5.9	
18		LOWER		6.0	
19	7	UPPER		5.9	
20		MIDDLE		6.0	
21		LOWER		6.1	
22	8	UPPER		5.8	
23		MIDDLE		5.9	
24		LOWER		6.1	

PARAMETER –Chloride as Cl (mg/l) SITE- RIVER TIWANG (DHALESWARI)					
SL.NO;	B.M	LOCATION	PARAMETER	WATER SAMPLE RESULTS	PERMISSIBLE LIMIT IS:456-2000
1	1	UPPER	Chloride as Cl (mg/l)	6.0	2000 mg/l for concrete not containing embedded steel and 500 mg/l for reinforced concrete work.
2		MIDDLE		4.0	
3		LOWER		5.0	
4	2	UPPER		5.0	
5		MIDDLE		4.0	
6		LOWER		6.0	
7	3	UPPER		6.2	
8		MIDDLE		5.9	
9		LOWER		6.0	
10	4	UPPER		6.0	
11		MIDDLE		5.7	
12		LOWER		4.5	
13	5	UPPER		6.0	
14		MIDDLE		5.5	
15		LOWER		4.0	
16	6	UPPER		6.0	
17		MIDDLE		5.0	
18		LOWER		7.0	
19	7	UPPER		6.0	
20		MIDDLE		5.5	
21		LOWER		6.0	
22	8	UPPER		6.5	
23		MIDDLE		4.0	
24		LOWER		5.0	

PARAMETER –Sulphates as SO_4 (mg/l)

SITE- RIVER TIWANG (DHALESWARI)

SL.NO;	B.M	LOCATION	PARAMETER	WATER SAMPLE RESULTS	PERMISSIBLE LIMIT IS:456-2000
1	1	UPPER	Sulphates as SO_4 (mg/l)	128	400 (mg/l)
2		MIDDLE		103	
3		LOWER		155	
4	2	UPPER		129	
5		MIDDLE		102	
6		LOWER		156	
7	3	UPPER		127	
8		MIDDLE		102	
9		LOWER		154	
10	4	UPPER		129	
11		MIDDLE		105	
12		LOWER		149	
13	5	UPPER		102	
14		MIDDLE		124	
15		LOWER		152	
16	6	UPPER		128	
17		MIDDLE		103	
18		LOWER		153	
19	7	UPPER		127	
20		MIDDLE		102	
21		LOWER		153	
22	8	UPPER		127	
23		MIDDLE		101	
24		LOWER		152	

PARAMETER –Sediment Concentration (mg/l)

SITE- RIVER TIWANG (DHALESWARI)

SL.NO;	B.M	LOCATION	PARAMETER	WATER SAMPLE RESULTS	PERMISSIBLE LIMIT IS:456-2000
1	1	UPPER	Sediment Concentration (mg/l)	186	2000 (mg/l)
2		MIDDLE		174	
3		LOWER		179	
4	2	UPPER		187	
5		MIDDLE		175	
6		LOWER		180	
7	3	UPPER		184	
8		MIDDLE		175	
9		LOWER		178	
10	4	UPPER		186	
11		MIDDLE		178	
12		LOWER		181	
13	5	UPPER		182	
14		MIDDLE		172	
15		LOWER		182	
16	6	UPPER		184	
17		MIDDLE		175	
18		LOWER		184	
19	7	UPPER		185	
20		MIDDLE		179	
21		LOWER		176	
22	8	UPPER		179	
23		MIDDLE		172	
24		LOWER		178	

Annexure-13 Bench Mark Forms:

BM Name	Easting	Northing	Latitude	Longitude	RL
BM 1	450858.742	2686317.132	24°17'20.66"	92°30'56.75"	40.289
Pillar Established by : - Precision Survey Consultancy. Surveyor – Mr. Debashis Mondal; Date of Establishment – 30.03.2016					
Station Description :-					
Benchmark is located near the Gharmura RCCBridge. 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 Nocan be seen on the face of the pillar.					
Life of Station : 15Yrs	Datum: - WGS 84		**ZONE :**46 R		

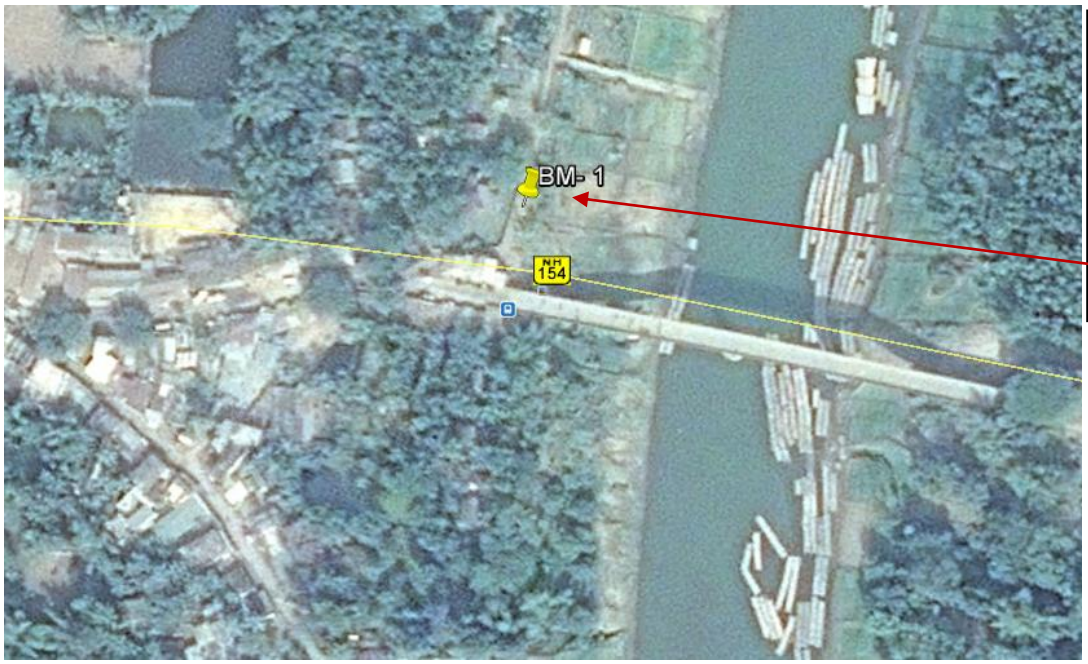


Figure 28 - BM Form & Google Image view of BM -1

BM Name	Easting	Northing	Latitude	Longitude	RL (m)
BM 2	451689.010	2679488.441	24°13'38.72"	92°31'27.05"	42.171
Pillar Established by : - Precision Survey Consultancy. Surveyor – Mr. Debashis Mondal ; Date of Establishment – 30.03.2016					
Station Description :- Benchmark is located near at Ramnathpur 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.					
Life of Station : 15Yrs	Datum: - WGS 84		**ZONE :**46 R		

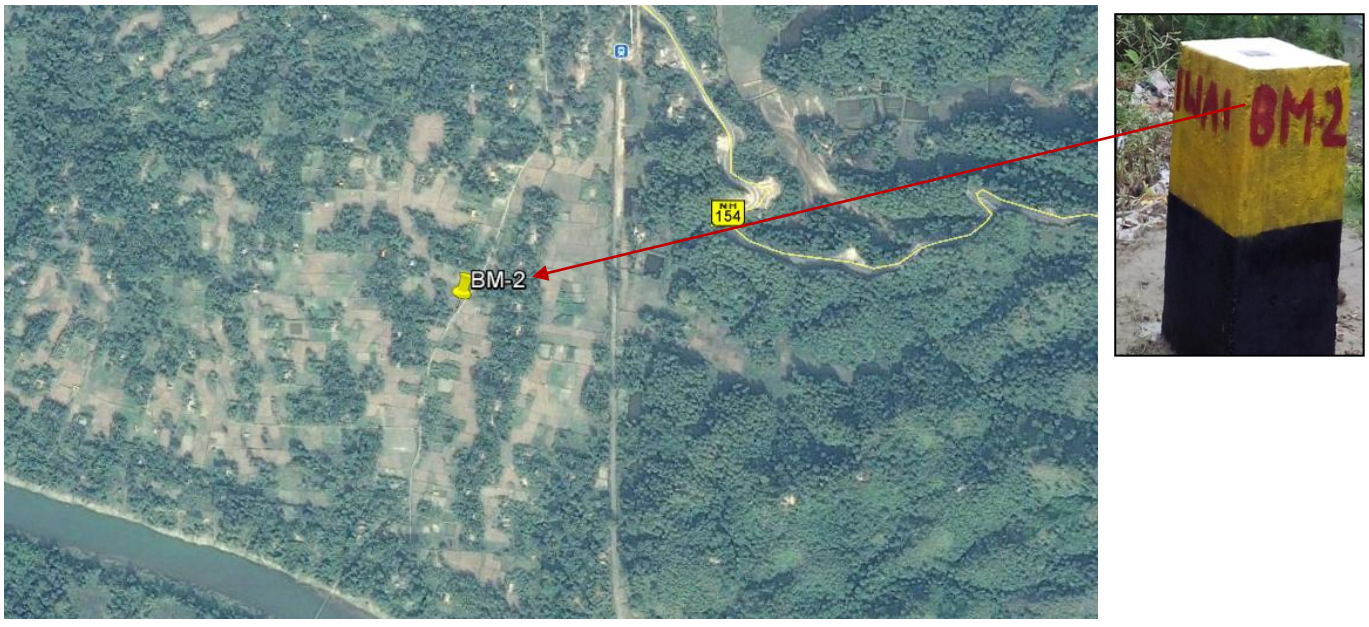


Figure 29 - BM Form & Google Image view of BM -2

BM Name	Easting	Northing	Latitude	Longitude	RL (m)
BM 3	452905.744	2674125.869	24°10'44.48"	92°32'10.80"	47.457

Pillar Established by : - Precision Survey Consultancy. Surveyor – Mr. Debashis Mondal ;
Date of Establishment –0 2.04.2016

Station Description :-

Benchmark is located at Bairabi 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.

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

Figure 30 - BM Form & Google Image view of BM –3

BM Name	Easting	Northing	Latitude	Longitude	RL (m)
BM 4	452955.709	2660396.629	24° 3'18.09"	92°32'14.17"	54.526
Pillar Established by : - Precision Survey Consultancy. Surveyor – Debashis Mondal Date of Establishment – 04.03.2016					
Station Description :-					
Benchmark is located near at Vawngawn 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.					
Life of Station : 15Yrs	Datum: - WGS 84		**ZONE :**46 R		

Figure 31 - BM Form & Google Image view of BM -4

BM Name	Easting	Northing	Latitude	Longitude	RL
BM 5	456693.278	2661837.606	24° 4'5.33"	92°34'26.38"	58.837
Pillar Established by: - Precision Survey Consultancy. Surveyor – Debashis Mondal; Date of Establishment –0 4.04.2016					
Station Description :-					
Benchmark is located near at Hortoki 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 is seen on the face of the pillar. The measurements of the bench mark pillar from notable locations / edges as follows: North from Light House Boundary –115.1 m.					
Life of Station : 15Yrs	Datum: - WGS 84		**ZONE :**46 R		

Figure 32 - BM Form & Google Image view of BM - V

BM Name	Easting	Northing	Latitude	Longitude	RL (m)
BM 6	462197.977	2657817.059	24° 1'55.12"	92°37'41.66"	63.672
Pillar Established by : - Precision Survey Consultancy. Surveyor – Debashis Mondal Date of Establishment – 06.04.2016					
Station Description :-					
Benchmark is located near at Lelhchhun 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.					
Life of Station : 15Yrs	Datum: - WGS 84			**ZONE :**46 R	

Figure 33- BM Form & Google Image view of BM – VI

BM Name	Easting	Northing	Latitude	Longitude	RL (m)
BM 7	462248.623	2652326.291	23°58'56.59"	92°37'43.98"	68.931

Pillar Established by: - Precision Survey Consultancy. Surveyor – Debashis Mondal;
Date of Establishment – 06.04.2016

Station Description :-

Benchmark is located beside Saitlaw 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.

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

Figure 34 - BM Form & Google Image view of BM - VII

BM Name	Easting	Northing	Latitude	Longitude	RL (m)
BM 8	464712.921	2645708.588	23°55'21.60"	92°39'11.75"	73.373
Pillar Established by : - Precision Survey Consultancy. Surveyor – Debashis Mondal; Date of Establishment – 09.04.2016					
Station Description :-					
Benchmark is located near at Khamrang 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.					
Life of Station : 15Yrs	Datum: - WGS 84	ZONE :46 R			

Figure 35 - BM Form & Google Image view of BM - VIII

Annexure-14 -Leveling Calculation and Leveling Diagram

Leveling from GS-1 to BM-1

BS	IS	FS	RISE(+)	FALL(-)	RL	REMARKS
0.645					40.289	BM-1
0.458		3.138		2.493	37.796	
0.658		2.198		1.740	36.056	
0.448		2.439		1.781	34.275	
0.383		2.279		1.831	32.444	
0.758		2.164		1.781	30.663	
0.988		2.417		1.659	29.004	
0.852		1.928		0.940	28.064	
0.766		3.005		2.153	25.911	
0.598		2.376		1.610	24.301	
		1.683		1.085	23.216	GS-1

Leveling from GS-2 to BM-2

BS	IS	FS	RISE(+)	FALL(-)	RL	REMARKS
0.642					42.171	BM-2
0.845		2.852		2.210	39.961	
0.525		2.288		1.443	38.518	
0.388		2.350		1.825	36.693	
0.591		2.952		2.564	34.129	
0.815		3.012		2.421	31.708	
0.475		2.685		1.870	29.838	
0.773		2.233		1.758	28.08	
		1.482		0.709	27.371	GS-2

Leveling from GS-3 to BM-3

BS	IS	FS	RISE(+)	FALL(-)	RL	REMARKS
0.550					47.457	BM-3
0.458		2.255		1.705	45.752	
0.695		3.088		2.630	43.122	
0.758		2.164		1.469	41.654	
0.920		2.417		1.659	39.995	
0.852		1.928		1.008	38.987	
0.762		2.502		1.650	37.337	
0.598		2.458		1.696	35.641	
0.328		2.683		2.085	33.556	
0.883		1.988		1.660	31.895	
		1.869		0.985	30.910	GS-3

Leveling from GS-4 to BM-4

BS	IS	FS	RISE(+)	FALL(-)	RL	REMARKS
0.642					54.526	BM-4
0.845		2.255		1.613	52.913	
0.525		2.688		1.843	51.070	
0.762		2.164		1.639	49.432	
0.598		2.417		1.655	47.777	
0.328		2.928		2.330	45.447	
0.883		2.439		2.111	43.336	
0.920		2.279		1.396	41.940	
0.852		2.164		1.244	40.696	
0.552		2.417		1.565	39.131	
0.355		2.528		1.976	37.155	
		1.651		1.296	35.859	GS-4

Leveling from GS-5 to BM-5

BS	IS	FS	RISE(+)	FALL(-)	RL	REMARKS
0.445					58.837	BM-5
0.385		2.198		1.753	57.084	
0.752		2.439		2.054	55.030	
0.950		2.279		1.527	53.503	
0.856		2.670		1.720	51.783	
0.445		2.417		1.561	50.222	
0.590		2.288		1.843	48.379	
0.855		2.350		1.760	46.619	
0.472		2.952		2.097	44.522	
0.455		2.840		2.368	42.154	
0.656		2.516		2.061	40.093	GS-5

Leveling from GS-6 to BM-6

BS	IS	FS	RISE(+)	FALL(-)	RL	REMARKS
0.625					63.672	BM-6
0.457		2.198		1.573	62.099	
0.764		2.439		1.982	60.117	
0.546		2.279		1.515	58.602	
0.358		2.164		1.618	56.985	
0.685		2.198		1.840	55.145	
0.422		2.439		1.754	53.391	
0.857		2.279		1.857	51.534	
0.381		2.670		1.813	49.721	
0.758		2.417		2.036	47.685	
0.554		2.164		1.406	46.279	
		1.916		1.362	44.917	GS-6

Leveling from GS-7 to BM-7

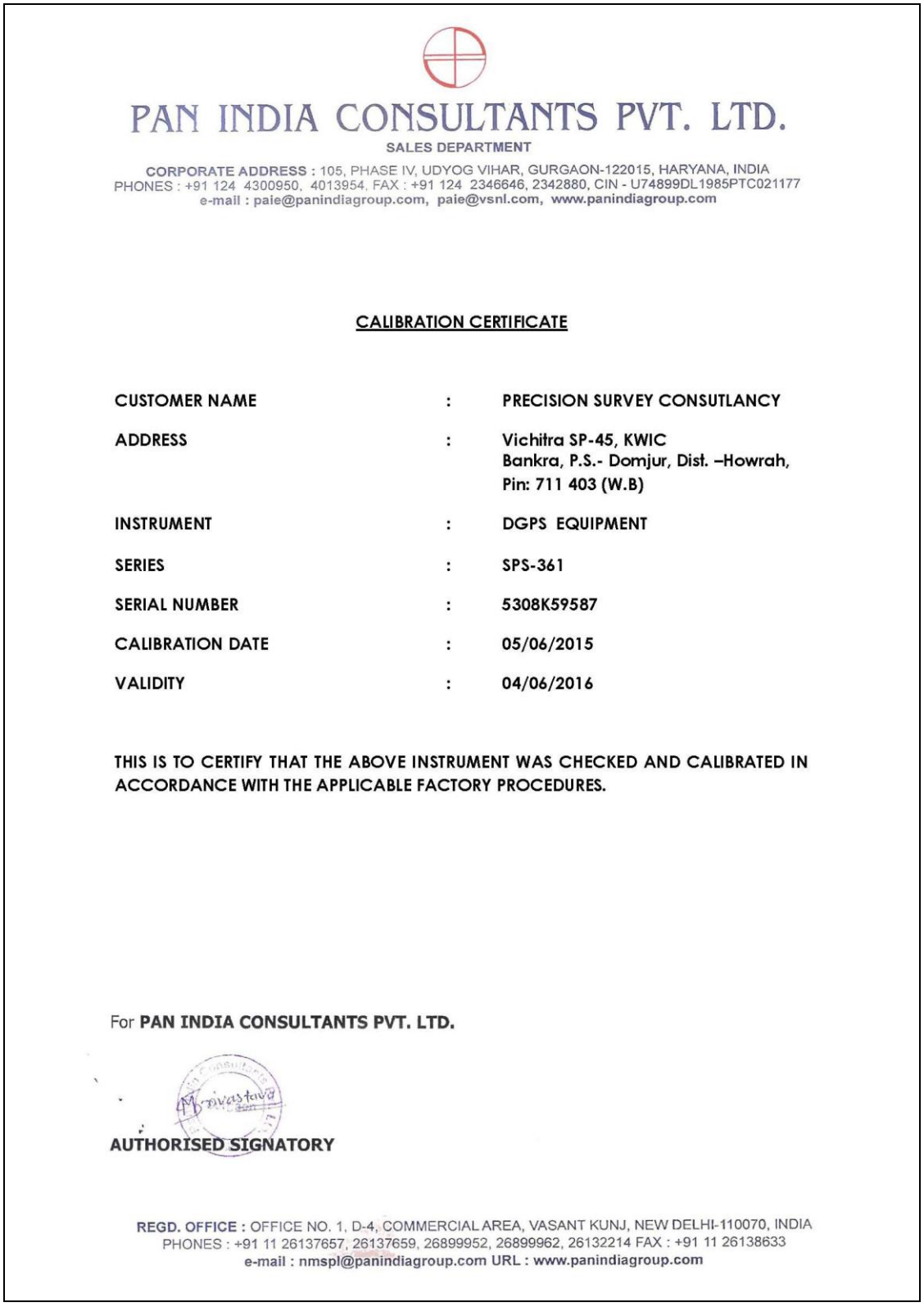
BS	IS	FS	RISE(+)	FALL(-)	RL	REMARKS
0.622					68.931	BM-7
0.488		2.598		1.976	66.955	
0.795		2.339		1.851	65.104	
0.551		2.679		1.884	63.220	
0.577		2.463		1.912	61.308	
0.460		2.842		2.265	59.043	
0.440		2.439		1.979	57.064	
0.858		2.479		2.039	55.025	
0.822		2.670		1.812	53.213	
0.750		2.417		1.595	51.618	
0.515		2.231		1.481	50.137	
0.422		2.556		2.041	48.096	
		1.750		1.328	46.768	GS-7

Leveling from GS-8 to BM-8

BS	IS	FS	RISE(+)	FALL(-)	RL	REMARKS
0.650					73.373	BM-8
0.440		2.879		2.229	71.144	
0.382		2.635		2.195	68.949	
0.754		2.417		2.035	66.914	
0.985		2.828		2.074	64.840	
0.455		2.940		1.955	62.885	
0.614		2.635		2.180	60.705	
0.747		2.417		1.803	58.902	
0.925		2.328		1.581	57.321	
0.850		2.502		1.577	55.744	
0.773		2.458		1.608	54.136	
0.487		2.683		1.910	52.226	
		2.625		2.138	50.088	GS-8

Table 25- Leveling Calculation of Tlwang River

Annexure-15 Calibration Certificate



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	:	Vichitra SP-45, KWIC Bankra, P.S.- Domjur, Dist. –Howrah, Pin: 711 403 (W.B)
INSTRUMENT	:	DGPS EQUIPMENT
SERIES	:	SPS-361
SERIAL NUMBER	:	5308K59587
CALIBRATION DATE	:	05/06/2015
VALIDITY	:	04/06/2016

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

Figure 36 - Calibration of DGPS Equipment

PAN INDIA CONSULTANTS PVT. LTD.

SALES DEPARTMENT

CORPORATE ADDRESS : 105, PHASE IV, UDYOG VIHAR, GURGAON-122015, HARYANA, INDIA
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e-mail : paie@panindiagroup.com, paie@vsnl.com, www.panindiagroup.com

CALIBRATION CERTIFICATE

CUSTOMER NAME	:	PRECISION SURVEY CONSUTLANCY
ADDRESS	:	P.O. –SALAP, P.S.-Vichitra SP-45,KWIC NH-6, Dist. –Howrah Pin: 711 403 W.B
INSTRUMENT	:	Echo Sounder
SERIES	:	Bathy 500 MF
SERIAL NO.	:	B5MF0560
CALIBRATION DATE	:	17/06/2015
VALIDITY	:	16/06/2016

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.

Pan India Consultants Pvt. Ltd. Gurgaon

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e-mail : nmspl@panindiagroup.com URL : www.panindiagroup.com

Figure 37 - Calibration of Echo Sounder

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-86
MAKE	:	SOUTH
INSTRUMENT SR. NO.	:	H0986214510 (Accuracy –RTK Mode-Horizontal = 10mm +: PPm RMS, Vertical = 20mm +: PPm RMS H0986214519 (Static Mode – Horizontal = 2.5 mm + 1 PPm Vertical = 5mm + PPm)
CALIBRATION DATE	:	11/06/2015
VALID UPTO	:	10/06/2016
ISSUED TO	:	PRECISION SURVEY CONSULTANCY

For SOUTH PRECISION INSTRUMENT PVT. LTD.

For SOUTH PRECISION INSTRUMENT PVT. LTD.

Authorised Signatory

Authorised Signatory

Figure 38 – Calibration Certificate of South

Annexure-16 Field Photographs

Figure 39 - Site Pictures of Topography Survey

Figure 40-River bank side pictures

Figure 41-Salient feature of Gharmura Site

Figure 42- Gauge at Gharmura Site

Figure 43-B.M pillar Establishment

Figure 44-Bathymetry instruments

Annexure-17 Survey Charts:-

LIST OF SURVEY CHARTS OF TLWANG RIVER FINAL DWG (NW-102)								
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	Jamira Ptlv to Dattapur	0.00 km to 8.313 km	0.052	22.350	23.216	-0.866	GS-1
2	P_02	Dattapur to Ramnathpur F.V	8.313 km to 13.631 km	13.964	26.757	27.371	-0.614	GS-2
3	P_03	Ramnathpur F.V to Bairabi	13.631 km to 22.287 km	13.964	26.757	27.371	-0.614	GS-2
4	P_04	Bairabi to E.Chipui	22.287 km to 26.950 km	24.278	30.025	30.910	-0.885	GS-3
5	P_05	E.Chipui to Lungmawi	26.950 km to 32.317 km	24.278	30.025	30.910	-0.885	GS-3
6	P_06	Lungmawi to Naththialang	32.317 km to 36.460 km	40.642	35.209	35.859	-0.650	GS-4
7	P_07	Naththialang to North Tlangkhang	36.460 km to 40.372 km	40.642	35.209	35.859	-0.650	GS-4
8	P_08	North Tlangkhang to North Tlangkhang	40.372 km to 47.260 km	40.642	35.209	35.859	-0.650	GS-4
9	P_09	North Tlangkhang to Hortoki	47.260 km to 55.814 km	55.140	39.803	40.093	-0.290	GS-5
10	P_10	Hortoki to Lelhchhun	55.814 km to 60.692 km	55.140	39.803	40.093	-0.290	GS-5
11	P_11	Lelhchhun to Kawnpui	60.692 km to 64.574 km	55.140	39.803	40.093	-0.290	GS-5
				69.544	44.366	44.917	-0.551	GS-6
12	P_12	kawnpui to N.Mualvum	64.574 km to 72.525 km	69.544	44.366	44.917	-0.551	GS-6
13	P_13	N.Mualvum to Saitlaw	72.525 km to 77.598 km	76.400	46.538	46.768	-0.230	GS-7
14	P_14	Saitlaw to W.serzawl	77.598 km to 82.538 km	76.400	46.538	46.768	-0.230	GS-7
				87.092	49.926	50.088	-0.162	GS-8
15	P_15	Saitlaw to W.serzawl to Khamrang	82.538 km to 87.136 km	87.092	49.926	50.088	-0.162	GS-8

Table 26- Survey Chart

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

Survey period: - 17st December, 2015 to 21st April, 2016

✧ **G.S:-** Gauge Station