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

JINJIRAM RIVER (NW- 50) (42.576 km)

FROM "FULERCHAR POINT III TO BRAHMAPUTRA RIVER AT TUMNI"

Survey Period from 10.12.15 to 12.01.16

FINAL REPORT ON HYDROGRAPHICAL SURVEY OF JINJIRAM RIVER, MEGHALAYA

REPORT SUBMISSION DATE- 13.09.2018

SUBMITTED BY:

PRECISION SURVEY CONSULTANCY

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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-IX (Jinjiram River) from Fulerchar Point III to Brahmaputra River at Tumni (42.576 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 Jinjiram River." PSC would also like to thanks **Shri Pravir Pandey, Vice Chairman, IA&AS., Shri Shashi Bhushan Shukla, Member (Traffic), Shri Alok Ranjan, Member (Finance) and Shri S.K.Gangwar, Member (Technical).**

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

List of Abbreviations

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

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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 w.r.t H.F.L /MHWS]

i) There are no Dams, weirs or Barrages found in this zone of river.

ii) Total number of Wooden Bridge- 1 (one),Under Construction RCC Bridge – 1(one), Bamboo Bridge-2 (Two)

Clearance w.r.t H.F.L	Clearance (m)
Horizontal Clearance (m)	10.15
Vertical Clearance w.r.t. H.F.L (m)	4.462

iii) H.T.Line-1(one), Electrical Line- 6 (six)

Clearance w.r.t H.F.L	Min (m)	Max (m)
Horizontal Clearance (m)	88.99	348.57
Vertical Clearance w.r.t. H.F.L (m)	4.765	9.00

7. Slope

Reach		River / Canal Bed Level Change (m)	Distance (km)	Slope (m/km)	Slope (cm/km)
From	To				
0.000	0.905	0.029	0.905	0.0320	3.204
0.906	13.095	0.386	12.189	0.0317	3.167
13.096	21.981	0.281	8.885	0.0316	3.163
21.982	30.762	0.279	8.78	0.0318	3.178
30.763	42.576	0.345	11.813	0.0292	2.921
Total			42.572	0.0321	3.126

8. Discharge Report

Sl. No	Chainage (km)	Discharge (Cubic Meter/sec)	
1	0.905	31.890	**Dated 10.12.15 to 12.01.16**
2	30.762	12.190	
3	41.675	24.896	
Avg. Discharge		22.992	

9.	i) Present IWT operations ii) Ferry services, tourism, cargo, if any	As follows The passenger Ferry services are available near chainage of 1.350 km (Sukchar Ferry), 2.10 km (Baparipara Ferry), 2.85 km (Mulakhaw Ferry), 3.529 km (Kasaripara Ferry), 13.00 km (Bottila Ferry), 27.900 km (Katdanga Ferry), 29.396 km (Ambari Ferry), 30.822 km (Gonabari Ferry) and Balebari ferry ghat (Ch.-31.800 km). The light cargo services like cycle and bicycles, vegetables, light goods are available in this zone of river.
10.	Approx. distance of Rail & Road from waterway	Nearest Railway station – Dhubri (Approx distance-21 km) near the Brahmaputra Bank side. Name of National highway close to the River - NH-51, NH-127B Name of SH- SH-2, SH-11, SH-46
11.	Any other information / comment	

Section-1: Introductory Considerations

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

Jinjiram River is one of the longest rivers in the Garo Hills district in Meghalaya. This river originates from the Derek village and its main tributary begins from Upot Lake. Jinjiram flows towards the east and then joins the Gagua River. Then it flows through the borders of Goalpara, towards Phulbari and enters the Goalpara District through Hallidayganj village. Upot Lake is the origin of its major tributary. Jinjiram is the longest river of the two districts of the Garo Hills. Jingiram, a tributary of the Brahmaputra, formed the natural boundary between Meghalaya's West Garo Hills and Assam's Dhubri districts. The river has drifted about 400 m southwards in to Meghalaya over a period of 40 years. This river has been suffering from lack of water throughout the season except rainy season.

Figure 1-Site Map of Jinjiram River

1.2 Tributaries / Network of River/ Basin

There are no tributaries found in this zone of river.

1.3 State / District through which river passes

The River passes through Goalpara and phulbari district.

1.4 Project Site Location Map

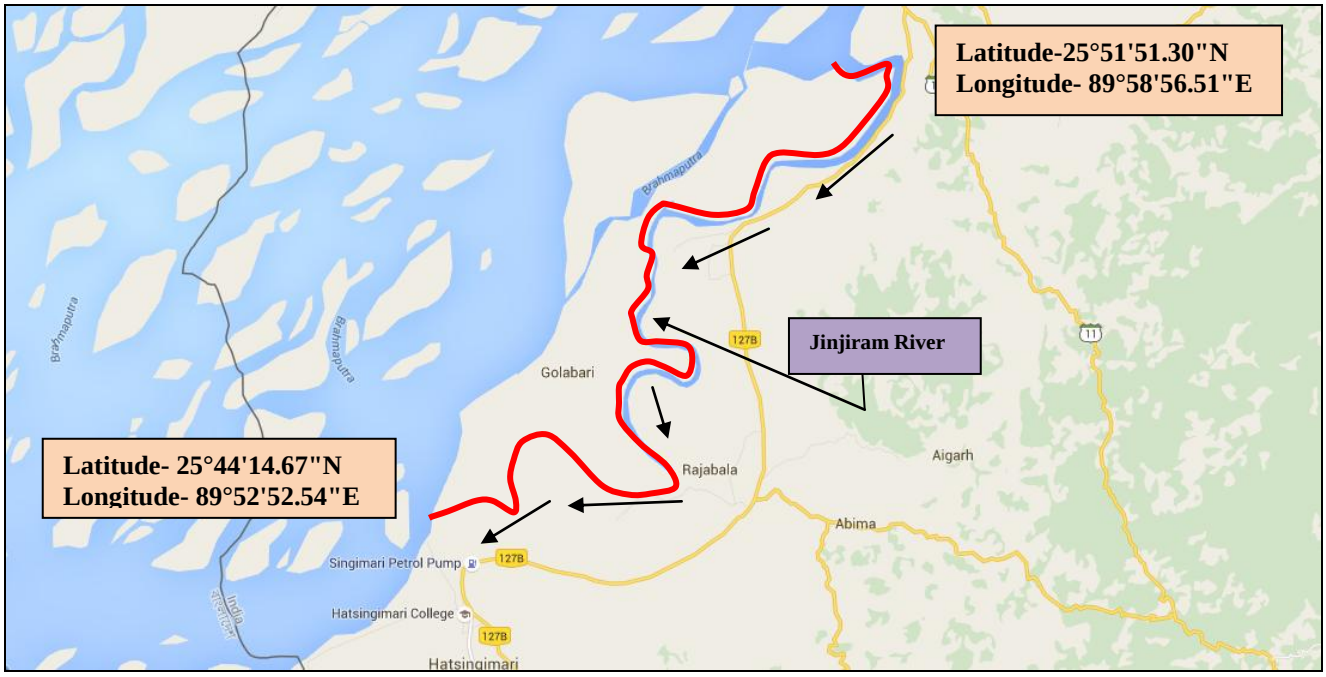

Figure 2 Project Site Location Map

1.4 Site Map:-

Figure 3- Jinjiram Site Map

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

Followings equipments were employed for the Bathymetry and Topography survey:-

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

Table 1-Detail Equipment list

- **Conduct of survey work**

  - **Topographic Survey**

    - The Topographic Survey of Jinjiram River has been carried out from "Fulerchar Point. III at Brahmaputra River (Lat. - 25°44'14.67"N, Long.-89°52'52.54"E) to Confluence with Brahmaputra River at Tumni (Lat. - 25°51'51.30"N, Long. - 89°58'56.51"E) (42.576 km)". The Length of the topography survey is from Chainage 0.00 km to Chainage 42.576 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 Bathymetry survey was not carried out in this zone of river due to insufficient layer of water.

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

For the Topography Survey, the Horizontal / Vertical control has been carried out from BM-1 by GPS observation of 24 hrs, situated near the Fulerchar point Village is used for the entire Survey work. Its value is 30.158 m w.r.t. MSL has been considered for calculating the vertical levels. Total 5 no. of BM have been established along the 42.576 km stretches of the Jinjiram River with the reference of BM-1 which was fixed near at Fulerchar point village The value of the BM-1 is tabulated below:-

Location Name	Geographic position		UTM position		Elevation (m)
	Latitude (N)	Longitude (E)	Northing	Easting	
Fulerchar point village	25°44'41.37"	89°53'10.82"	2850595.424	789556.041	30.158 m. w.r.t M.S.L

Figure 4- G.T.S Bench Mark Position of Jinjiram River

2.3 Tidal 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

The six year data of CWC Gauge was provided by IWAI. Average of last six years min. Water level has been adopted as Sounding Datum.

For dry patches, Lowest M.S.L value is used as Sounding Datum (S.D) at every km.

IWAI has provided the Sounding Datum at Fulerchar Point at the confluence with Brahmaputra River and Tumni. 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	Tumni Chainage-(Chainage - 42.576 km)	23.609 meter
2	Fulerchar Point at Confluence with Brahmaputra River (Chainage-0.00 km)	22.260 meter

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

The Minimum water levels (CD levels) of the Jinjiram River are -

Confluence at Fulerchar Point (Chainage- 0.00 km) - C.D -22.260 metre

Tumni (Chainage-42.576 km) - C.D - 23.609 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 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:-

Station	Location	Chainage (km)	Latitude (N)	Longitude (E)	Easting	Northing	BM Height above MSL (m)	BM Height above SD (m)
BM 1	Fulerchar	0.905	25°44'41.448"	89°53'10.884"	789557.779	2850597.495	30.304	8.015
BM 2	Khopati pt IV	13.095	23°55'03.123"	89°53'57.335"	795159.56	2648125.816	27.155	4.48
BM 3	Nolbari	21.981	25°47'45.804"	89°51'55.783"	787340.357	2856227.262	30.316	7.36
BM 4	Katdanga Satdubai pt II	30.762	25°49'34.678"	89°58'35.829"	798413.678	2859826.765	32.850	9.615
BM 5	Tumni Village	41.675	25°51'51.665"	89°59'27.537"	799758.396	2864077.004	31.825	8.244

Table 2 Bench Mark Details

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

Chainage (km)	Gauge station	Location	Easting	Northing	Latitude (N)	Longitude (E)	WL w.r.t M.S.L (m)
0.907	GS (TP)--1	Fulerchar Pt IV	789427.47	2850671.23	25°44'43.934"	89°53'06.27"	24.453
13.098	GS (TP)--2	Khopati Pt IV	795149.28	2852677.59	25°45'44.965"	89°56'32.994"	24.851
21.982	GS (TP)--3	Nalbari	797329.92	2856145.47	25°47'35.961"	89°57'53.975"	25.524
30.765	GS (TP)--4	Bhoralgaon	798367.9	2859888.6	25°49'36.719"	89°58'34.237"	25.605
41.677	GS (TP)--5	Tumni	799560.69	2864171.48	25°51'54.879"	89°59'20.52"	25.663
42.576	GS (TP)--6	Tumni	798913.53	2863992.19	25°51'49.536"	89°58'57.152"	25.712

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	E	F = (E- WL data in MSL)	G = (E- Topo levels in MSL)
1	GS (TP)--1	0.907	0.0-0.5		22.289	-2.164	Jinjiram Reduced Topo.xyz
2	GS (TP)--2	13.098	0.5-7.0		22.675	-2.176	
3	GS (TP)-- 3	21.982	7.0-17.5		22.956	-2.568	**Submitted in Soft Copy**
4	GS (TP)--4	30.765	17.5-26.4		23.235	-2.370	
5	GS (TP)--5	41.677	26.4-36.2		23.581	-2.082	
6	GS (TP)--6	42.576	36.2-42.576		23.609	-2.103	
7	Confluence at Fulerchar Point	0		22.26			

Table 4-Chart Datum / Sounding Datum & Reduction Details

2.12 Average Bed Slope:-

Reach		River / Canal Bed Level Change (m)	Distance (km)	Slope (m/km)	Slope (cm/km)
From	To				
0.000	0.905	0.029	0.905	0.0320	3.204
0.906	13.095	0.386	12.189	0.0317	3.167
13.096	21.981	0.281	8.885	0.0316	3.163
21.982	30.762	0.279	8.78	0.0318	3.178
30.763	42.576	0.345	11.813	0.0292	2.921
Total			42.572	0.0321	3.126

Table 5-Average Bed Slope

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

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

2.14 Details of Locks:-

There are no locks found in this river zone.

2.15 Details of Aqueducts:-

There are no aqueducts found in this zone of river.

2.16 Details of existing Bridge and Crossing over waterway:-

There is a wooden Bridge, two bamboo bridges and one under-construction Rail bridge is located in this zone of river. The Bamboo bridges are temporarily built up in this region of river. In the Rainy season, the bamboo bridges are demolished and so these bridges have no clearances.

Sl. No	Structure Name	Chainage (km)	Location	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	Under Construction Rail Bridge	2.0	Sukhchar Lauch village	25°44'46.50"	89°53'37.23"	790289.97	2850769.70	261.02	9.80	5	66.57	-	Under-Construction
2	Bamboo Bridge	16.75	Charbedbari	25°46'14.73"	89°56'53.77"	795708.893	2853607.595	17.86	1.08	-	-	-	Temporary
3	Bamboo Bridge	17.443	Khopati pt II	25°46'50.81"	89°56'33.64"	795122.580	2854705.881	10.91	1.23	-	-	-	Temporary
4	Wooden Bridge	36.751	Tumni Simlakandi village	25°51'22.98"	90° 1'6.67"	802540.72	2863257.08	178.32	6.92	17	10.15	4.462	Complete

Table 6- Bridge Details

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

There is no other cross structures, pipe lines or under water cables found in this zone of river.

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

Line	Chainage (km)	Location	Position				No of Piers	Horizontal clearance w.r.t H.F.L (m)	Vertical clearance w.r.t H.F.L (m)	Remarks
			Latitude (N)	Longitude (E)	Easting (m)	Northing (m)				
H.T.Line	1.532	Fattapara Village	25°44'54.27"	89°53'20.38"	789814.969	2850998.901	8	246.80	5.422	Complete
Electrical Line	4.510	Malakhwadas para	25°44'46.56"	89°54'42.33"	792104.202	2850811.332	4	97.31	4.765	Complete
Electrical Line	5.457	Malakhwadas para	25°45'13.20"	89°54'20.96"	791490.756	2851618.473	4	118.03	5.634	Complete
Electrical Line	7.224	Gokulpur Tangnamari	25°45'55.26"	89°54'42.50"	792062.330	2852926.652	4	90.97	7.00	Complete
Electrical Line	8.501	Howrahrpar village	25°45'34.72"	89°55'7.36"	792769.002	2852309.151	4	88.99	8.00	Complete
Electrical Line	9.482	Ferengichar	25°45'6.20"	89°55'22.01"	793197.544	2851440.302	4	111.60	9.00	Complete
Electrical Line	39.431	Tumni Lawkhowa village	25°51'54.58"	90° 0'33.90"	801605.301	2864209.326	4	348.57	9.00	Complete

Table 7- High Tension / Electrical Line

2.19 Current Meter and Discharge Details:-

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)
		Easting (m)	Northing (m)	Latitude (N)	Longitude (E)		0.5 D			
1	0.905	789379.54	2850651.14	25°44'43.31"	89°53'4.52"	0.2	0.115	0.115	277.3	31.890
2	30.762	798343.47	2859914.555	25°49'37.579"	89°58'33.381"	0.2	0.112	0.112	108.76	12.190
3	41.675	799770.3	2864219.13	25°51'56.27"	89°59'28.08"	0.3	0.121	0.121	205.76	24.896

Table 8- Details Current Metre List

2.20-a. Soil Sample Locations:-

Sample No.	Chainage (km)	Easting (m)	Northing (m)	Latitude (N)	Longitude (E)	Depth (m)
1	0.905	789379.54	2850651.14	25°44'43.31"	89°53'4.52"	0.2
2	30.762	798343.47	2859914.555	25°49'37.579"	89°58'33.381"	0.2
3	41.675	799770.3	2864219.13	25°51'56.27"	89°59'28.08"	0.3

Table 9-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	0.905	789379.54	2850651.14	25°44'43.31"	89°53'4.52"	0.2	0.10
2	30.762	798343.47	2859914.555	25°49'37.579"	89°58'33.381"	0.2	0.10
3	41.675	799770.3	2864219.13	25°51'56.27"	89°59'28.08"	0.3	0.15

Table 10- Water Sample Location

Section-3: Detailed Hydrographic Survey- Stretch Wise

3.1From Chainage 0.00 Km to Chainage 10.00 Km (Fulerchar pt IV to Ferengichar)

Figure 5- Chainage 0.00 km to 10.00 km

The River width of Jinjiram River from Chainage 0.00 km to Chainage 10.00 km is approximately 65.18 m to 71m.The average width portion of the river is 50m.

During the survey it was noticed that BM-1 is located near at Chainage of 0.905 km beside Sukhchar Lauch village. Newajespur village, Fulero village, Charkathari village, Kasaripara village, Howrahrpar village are situated right bank side of the river and Fattapara village, Malakhwadas para village, Tangramari village, Gokulpur, Khupathi Bazar, Ferengichar village are situated left bank side of the river. Besides, four numbers of ferry ghat services named Sukchar, Baparipara, Mulakhaw, Kasaripara Ferry ghat are available near at chainage of 1.350 km, 2.10 km, 2.85 km and 3.529 km respectively. These ferry services communicate daily through local villages which are also attractive for the tourist to communicate smoothly. Both side paddy lands are also noticed near the bank sides during the survey period. Malakha Ghat is also situated near at chainage of 3km and 5.3 km respectively. Two Irrigation canal and outlets are also located near at chainage of 4km in the right side of the bank and 8km in the left side of the bank. An under- construction bridge has been situated near at Chainage of 2 km. The Bridge position is- (Lat. - 25°44'46.50"N, Long. - 89°53'37.23"E). One High Tension line and five electrical lines are also located near at Chainage of 1.532 km, 4.510 km, and 5.457 km, 7.224 km, 8.501 km and 9.482 km respectively in this stretch of 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	0.00	10.00	0.02	0.3	10000	413498.080	-0.3	0.0	10000	534242.780
II	0.00	10.00	0.016	0.4	10000	629934.890	-0.3	0.0	10000	785024.700
III	0.00	10.00	0.012	0.4	10000	951906.320	-0.3	0.0	10000	1144303.630
IV	0.00	10.00	0.008	0.4	10000	1148730.700	-0.3	0.0	10000	1349763.810

Figure 6- Sukchar Ferry Ghat (Chainage- 1.350 km)

Figure 7- Under-construction Rail Bridge (Chainage -2.00 km)

Figure 8-Bevaripara Ferry Ghat (Chainage-2.10 km)

Figure 9- Molakha Ferry Ghat (Chainage- 2.85 km)

3.2 From Chainage 10.000 Km to Chainage 20.000 Km (Ferengichar to Khopati pt II village)

Figure 10- Chainage 10.00 km to Chainage 20.00 km

The River width of Jinjiram from chainage 10.00 km to 20.00 km is approximately 101m to 107m. The average width portion of the river is 60m.

During the survey it was noticed that both side Paddy land and open land are situated most of the places. Bottila Ferry Ghat is situated near at chainage of 13.0 km. BM-2 is situated near at chainage of 13.095 km. Charbedbari village is situated right side bank of the river and Khopatipt.II village, Takimari village are situated left bank side of the river. The two Bamboo bridges have been situated near at chainage of 16.75 km and 17.443km. Char land are found near at chainage 18km to chainage 19 km. An irrigation canal is found near at chainage of 10.381km 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	10.00	20.00	0.02	0.3	10000	445945.640	-0.3	0.0	10000	576012.650
II	10.00	20.00	0.016	0.4	10000	679240.210	-0.3	0.0	10000	846464.510
III	10.00	20.00	0.012	0.4	10000	1026602.230	-0.3	0.0	10000	1234085.090
IV	10.00	20.00	0.008	0.4	10000	1238733.480	-0.3	0.0	10000	1455507.300

Figure 11- Bamboo Bridges (Chainage- 16.75 km and 17.443 km)

3.3 From Chainage 20.00 Km to Chainage 30.00 Km (Khopati pt II village to Magurmari village)

Figure 12- Chainage 20.00 km to 30.00 km

The River width of Jinjiram River from chainage 20.00 km to 30.00 km is approximately 106 m to 110 m. The average width portion of the river is 75m.

During the survey it was noticed that Futduba village, Angarghata village, Morasati village, Ambari village are situated right bank side of the river. An Irrigation canal is found near at chainage of 23.480 km left bank side of the river. Char land are also found near at chainage of 24 km and 28 km. Katdanga village is found near at chainage at 28km left bank side of the river. Two Ferry Ghats named Katdanga Ferry Ghat and Ambari Ferry Ghat are situated near at chainage of 27.900 km and 29.396 km. Dhaluabari village is situated near at chainage of 26 km left bank side of the river.BM-3 is situated near at chainage of 21.981km.

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	0.02	0.3	10000	420518.020	-0.3	0.0	10000	543170.480
II	20.00	30.00	0.008	0.3	10000	640512.550	-0.3	0.0	10000	798202.290
III	20.00	30.00	0.006	0.4	10000	968069.900	-0.3	0.0	10000	1163723.230
IV	20.00	30.00	0.004	0.4	10000	1167905.310	-0.3	0.0	10000	1372198.040

Figure 13- Katdanga Ferry Ghat (Chainage- 27.900 km)

Figure 14- Ambari Ferry Ghat (Chainage-29.396 km)

3.4 From Chainage 30.000 Km to Chainage 42.576 Km (Magurmari village to Tumni village)

Figure 15- Chainage 30.00 km to Chainage 42.576 km

The River width of Jinjiram from chainage 30.00 km to Chainage 42.576 km is approximately 130 m to 161m.The average width portion of the river is 80m.

During the survey it was noticed that BM-4 and BM-5 are situated near at chainage of 30.762 km and 41.675 km. Magurmari village, Kumaidhara village, Gutibela village, Kathmil Market, Nemaikhata village, Tumni Lawkhowa village, Tumni Simlakandi village are situated right bank side of the river and Katdanga Satdubi Pt.II village, Rajabala village, Dowgandhi village are situated left bank side of the river. Two Ferry Ghats named Gonabari Ferry Ghat and Balebari Ferry Ghat are located near at chainage of 30.822 km and 31.800 km. Two irrigation canals are found near at chainage of 31.347 km and 34.118km right bank side of the river. Both side paddy lands are found near at chainage of 32 km to 33 km. A wooden Bridge is found near at chainage of 36.751 km.

Class	Chainage (km)		Observed				Reduced w.r.t. Sounding Datum			
	From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)
I	30.00	42.576	0.01	0.3	10000	541290.140	-0.3	0.0	10000	699165.720
II	30.00	42.576	0.009	0.3	10000	824466.020	-0.3	0.0	10000	1027444.430
III	30.00	42.576	0.006	0.3	10000	1246099.530	-0.3	0.0	10000	1497944.140
IV	30.00	42.576	0.005	0.4	10000	1503590.880	-0.3	0.0	10000	1766712.050

Figure 16- Wooden Bridge (Chainage - 36.751 km)

- **Bathymetry Survey**

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

The layer of water in the river is not sufficient for carrying out the Bathymetric survey. The length of the Bathymetry survey is 0.00 km.

- **Topographic Survey**

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

The Topography survey has been carried out from Fulerchar point III to Brahmaputra confluence near at Tumni. The length of the Topography survey is from Chainage 0.00 km to Chainage 42.576 km.

a) Prominent Dams / Barrage:-

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

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

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

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

Jinjiram River annually bears the brunt of floods and where embankment construction and repairing seems like permanent affair. Displacement of people living on the banks of rivers due to river bank erosion is another major issue here. The tributaries continue to erode the banks rapidly. The River banks are constantly being changed by means of flood of very high magnitude, channel widening, and change in channel pattern and of river bank erosion. To protect the shore and its properties various methods are in use like, geobags filling with sand, porcupine (triangle shaped concrete structure), sand bags and boulder bags called Gabions are in use to strengthen the embankments. The Embankment and the Boulder pitching are needful some places for protecting the banks of the river and also prevent the soil erosion. Beside this, the bank of the river includes with agricultural land, Ferry Ghats, electrical lines, Bamboo Bridges, wooden Bridge etc. Ferry ghats, electrical lines area are well protected by Boulder pitching.

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

Morichbari Reserve and Nokrek National park are located 18km and 61km far from the river side of jinjiram. Besides, dense forest has been also located in this zone of river which defence with another states. Wildlife animals like Tiger, wild Elephant, wild Bear, wild snake, Birds have been located in Morichbari reserve and dense forest area.

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

Near the bank side of the Jinjiram River, the wild life like Morichbari Reserve and Nokrek National Park have been located. Forest side and Wildlife area have become Unapproachable and also defence its own states from another states or country.

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

NH-51, NH- 127B are the two major communications way near the river side. Besides, SH- 2, SH-11 and SH-46 are also communicative way for the local villagers.

g) Railway Line and Stations in the vicinity:-

No Railway line or stations have been found in this zone of river.

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

The major portion of the land is occupied by agriculture. Major crops are Rice, Tea, Mustard, Maize etc have been cultivated in this zone of river. The right bank mostly occupied with scattered forest area and agriculture. The most important forest products are timber, bamboo and firewood. The land is also used for Jhum cultivation.

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

The Major crops along the river are Rice and Maize. Besides, the Horticulture crops are Orange, Lemon, Pineapple, Guava, Litchi, Banana, Jackfruit etc have been cultivated in this zone of river. Beside this, Non-traditional crops like Tea, Cashew nut; Oilseeds, Tomato, Mushroom, wheat etc. have been cultivated in this zone of river. Besides, Jhum cultivation is still practised in this zone of river.

j) Availability of Bulk / Construction Material:-

The cement factories and the brick fields are available in this stretch of river. Besides, sand is also available from the river side. These materials are useful for the Building construction or industrial hub.

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

There is no major industry found in this zone of river. Recently there are some numbers of small-scale industries like bakeries, furniture making, steel fabrication; tyre retreading, spice etc have been located in this zone of river.

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

The Jetty Services are well connected in this zone of river. The Jetty services have been located near at chainage of 1.350 km (Sukchar Ferry), 2.10 km (Baparipara Ferry), 2.85 km (Mulakhaw Ferry), 3.529 km (Kasaripara Ferry), 3.574 km, 5.332 km (Malakha Ferry), 13.20 km (Bottila Ferry), 27.900 km (Katdanga Ferry), 29.396 km (Ambari Ferry) and 30.822 km (Gonabari Ferry) and Balebari ferry ghat (Ch.-31.800 km). These passenger Jetty services are really helpful for daily communication. The Jetty services communicate through local villages which help the local people to go to their destination.

sl no	Name of Ferry ghat	Chainage (km)	Easting	Northing	Latitude (N)	Longitude (E)	Remarks
1	SUKCHAR FERRY GHAT	1.350 km	789714.6322	2850914.105	25°44'51.615"	95°53'16.756"	Temporary Jetty
2	BEVARIPARA FERRY GHAT	2.10 km	790288.3645	2850699.677	25°44'44.245"	95°53'37.155"	
3	MOLAKHA GHAT	2.85 km	791048.0255	2850414.906	25°44'34.457"	95°54'04.164"	
4	KASARIPARA FERRY GHAT	3.529 km	791737.0097	2850312.33	25°44'30.634"	95°54'28.781"	
5	BOTTILA FERRY GHA	13.000 km	795064.836	2852612.009	25°45'42.897"	95°56'29.914"	
6	KATDANGA FERRY GHAT	27.900 km	795672.039	2859854.035	25°49'37.57"	95°56'57.505"	
7	AMBARI FERRY GHAT	29.396 km	796950.00	2859743.00	25°49'33.032"	95°57'43.257"	
8	GONABARI FERRY GHAT	30.822 km	798347.537	2859942.283	25°49'38.477"	95°58'33.55"	
9	BALEBARI FERRY GHAT	31,800 km	798904.932	2860747.963	25°50'04.222"	95°58'54.2"	

m) Existing Cargo Movement:-

As much as nine nos of light passenger ferry services available in this zone of river. The light cargo movement like cycle and bicycles, vegetables, light materials are available in this zone of river.

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

Nokrek National park, Morichbari Reserve is the famous historical places in this zone of river. Nolbari, Tumni, Phulerchar, Phulbari etc. are the famous places in this zone of river.

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

Phulerchar, Tumni, Tumni simlakandi, Patakata, Nolbari, Fattapara etc villages have been located in this zone of river.

p) Availability of Passenger Ferry Services and Recreational Facilities:-

The Ferry Services are well connected in this zone of river. The Ferry services have been located near at chainage of 1.350 km (Sukchar Ferry), 2.10 km (Baparipara Ferry), 2.85 km (Mulakhaw Ferry), 3.529 km (Kasaripara Ferry), 3.574 km, 5.332 km (Malakha Ferry), 13.20 km (Bottila Ferry), 27.900 km (Katdanga Ferry), 29.396 km (Ambari Ferry) and 30.822 km (Gonabari Ferry) and Balebari ferry ghat (Ch.-31.800 km). These passenger Ferry services are really helpful for daily communication. The Ferry services communicate through local villages which help the local people and also for the tourist. The Ferry services communicate through local villages which help the local people to go to their destination.

Sl. No	Name of Ferry ghat	Chainage (km)	Easting	Northing	Latitude (N)	Longitude (E)	Remarks
1	SUKCHAR FERRY GHAT	1.350 km	789714.6322	2850914.105	25°44'51.615"	95°53'16.756"	Temporary Ferry ghat
2	BEVARIPARA FERRY GHAT	2.10 km	790288.3645	2850699.677	25°44'44.245"	95°53'37.155"	
3	MOLAKHA GHAT	2.85 km	791048.0255	2850414.906	25°44'34.457"	95°54'04.164"	
4	KASARIPARA FERRY GHAT	3.529 km	791737.0097	2850312.33	25°44'30.634"	95°54'28.781"	
5	BOTTILA FERRY GHA	13.000 km	795064.836	2852612.009	25°45'42.897"	95°56'29.914"	
6	KATDANGA FERRY GHAT	27.900 km	795672.039	2859854.035	25°49'37.57"	95°56'57.505"	
7	AMBARI FERRY GHAT	29.396 km	796950	2859743	25°49'33.032"	95°57'43.257"	
8	GONABARI FERRY GHAT	30.822 km	798347.537	2859942.283	25°49'38.477"	95°58'33.55"	
9	BALEBARI FERRY GHAT	31.800 km	798904.932	2860747.963	25°50'04.222"	95°58'54.2"	

q) Available and probable Water Sport Recreational Facilities:-

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

r) Fishing activities:-

Jinjiram River is the lifeline of the people of its important places for fishing culture. Jinjiram provides diverse habitat in its downstream for living biota such as stream, riparian zones and wetlands etc. Jinjiram has some of the richest riverine fisheries in India. The river has over fish species and forms an important component of livelihood and nutritional security in the downstream stretches in Meghalaya. The wetlands are ecologically and economically important for the local people. Fishing in Jinjiram River is very famous among the people.

s) Sand mining:-

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

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t) Tributaries:-

There is no tributary of Jinjiram River.

u)Details of Irrigation Canals and Outlets:-

The Irrigation Canal and Outlets have been found near at chainage of 4 km, 10.381km, 31.347 km and 34.118 km in the right bank side of the river and chainage of 8 km, 23.480 km in the left bank side of the river.

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

There is no Nala found in this zone of river.

w) 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 are nine nos of Ferry terminals found in this zone of river which are tabulated below:-

Sl. No	Name of Ferry ghat	Chainage (km)	Easting	Northing	Latitude (N)	Longitude (E)	Remarks
1	SUKCHAR FERRY GHAT	1.350 km	789714.6322	2850914.105	25°44'51.615"	95°53'16.756"	Temporary Ferry ghat
2	BEVARIPARA FERRY GHAT	2.10 km	790288.3645	2850699.677	25°44'44.245"	95°53'37.155"	
3	MOLAKHA GHAT	2.85 km	791048.0255	2850414.906	25°44'34.457"	95°54'04.164"	
4	KASARIPARA FERRY GHAT	3.529 km	791737.0097	2850312.33	25°44'30.634"	95°54'28.781"	
5	BOTTILA FERRY GHA	13.000 km	795064.836	2852612.009	25°45'42.897"	95°56'29.914"	
6	KATDANGA FERRY GHAT	27.900 km	795672.039	2859854.035	25°49'37.57"	95°56'57.505"	
7	AMBARI FERRY GHAT	29.396 km	796950	2859743	25°49'33.032"	95°57'43.257"	
8	GONABARI FERRY GHAT	30.822 km	798347.537	2859942.283	25°49'38.477"	95°58'33.55"	
9	BALEBARI FERRY GHAT	31.800 km	798904.932	2860747.963	25°50'04.222"	95°58'54.2"	

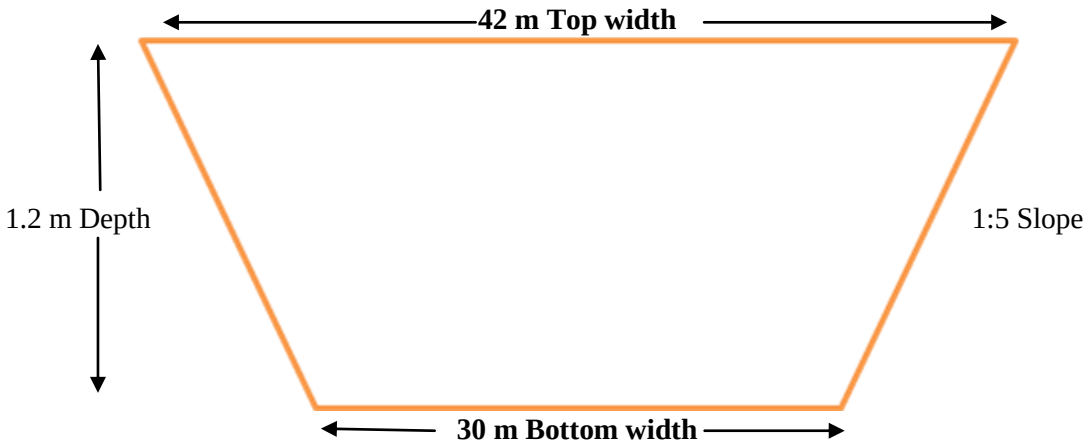
4.1 Details of Land use, owner etc.:-

The Bank of the river used mainly for cultivation. Besides, some portions of the land are surrounded by small industries and Forests. Though boulder pitching is found in some places but 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)

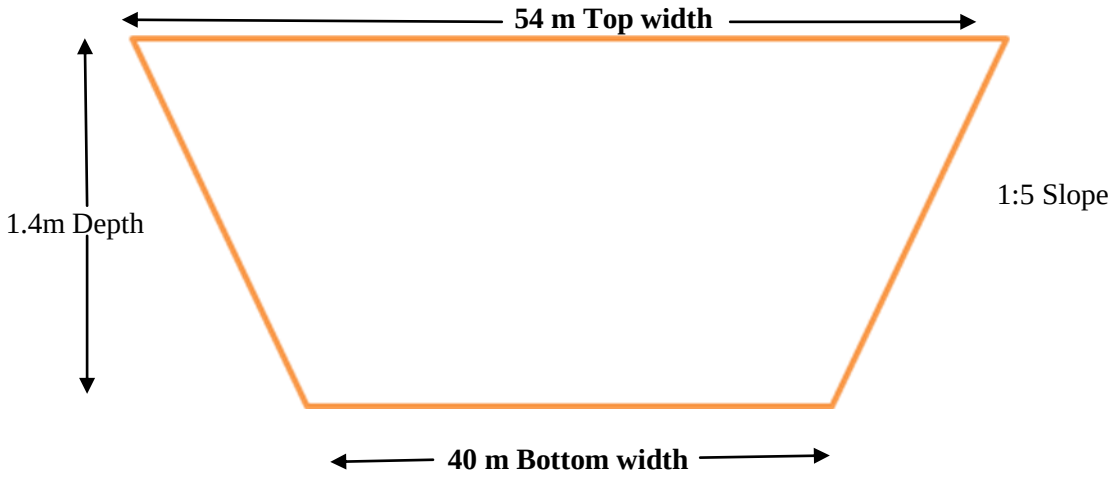
Class-I: - (Channel design: - Bottom width- 30 meter, Top width- 42 meter)



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 Qty (cubic Meter)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Avg. Depth of Cut (m)	Dredging Qty. (cubic Meter)	Cumulative Dredging Qty (cubic Meter)
Fuler char pt IV	Ferengichar	0	10	0.02	0.3	10000	1.252	413498.080	413498.080	-0.3	0	10000	1.618	534242.780	534242.780
Ferengichar	Khopati pt II	10	20	0.02	0.3	10000	1.350	445945.640	859443.720	-0.3	0	10000	1.744	576012.650	1110255.430
Khopati pt II	Magurmari	20	30	0.02	0.3	10000	1.273	420518.020	1279961.740	-0.3	0	10000	1.645	543170.480	1653425.910
Magurmari	Tumni	30	42.576	0.01	0.3	10000	1.639	541290.140	1821251.880	-0.3	0	10000	2.117	699165.720	2352591.630
Total						40000		1821251.880		Total		40000		2352591.630	

Table 11- Minimum & Maximum depth of Class-I

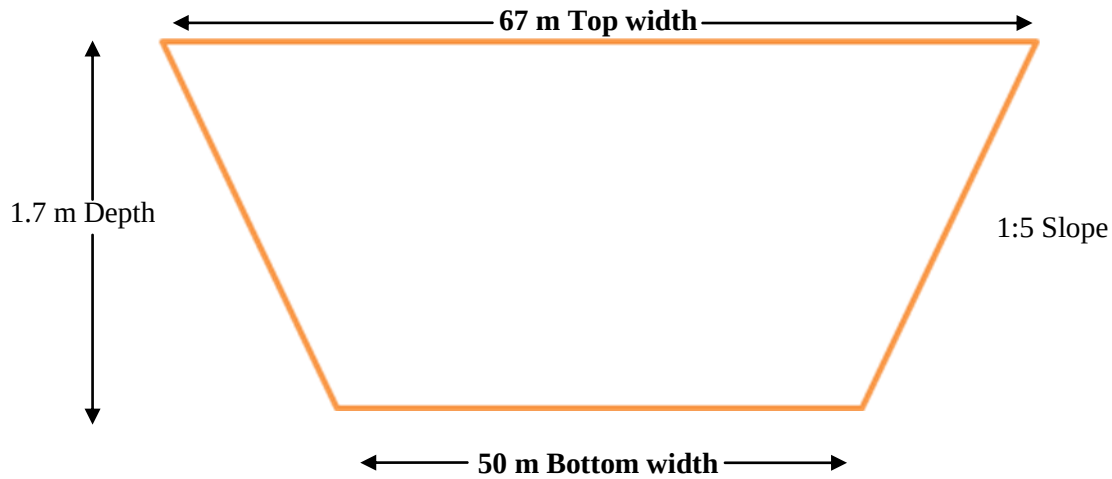
Class-II: - (Channel design: - Bottom width- 40 meter, Top width- 54 meter)



Location		Chainage (km)		As per Observed Soundings						As per Reduced Soundings					
From	To	From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Avg. Depth of Cut (m)	Dredging Qty. (cubic Meter)	Cumulative Dredging Qty (cubic Meter)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Avg. Depth of Cut (m)	Dredging Qty (cubic Meter)	Cumulative Dredging Qty (cubic Meter)
Fulerchar pt IV	Ferengichar	0	10	0.016	0.4	10000	1.431	629934.890	629934.890	-0.3	0	10000	1.783	785024.700	785024.700
Ferengichar	Khopati pt II	10	20	0.016	0.4	10000	1.543	679240.210	1309175.100	-0.3	0	10000	1.923	846464.510	1631489.210
Khopati pt II	Magurmari	20	30	0.008	0.3	10000	1.455	640512.550	1949687.650	-0.3	0	10000	1.813	798202.290	2429691.500
Magurmari	Tumni	30	42.576	0.009	0.3	10000	1.873	824466.020	2774153.670	-0.3	0	10000	2.334	1027444.430	3457135.930
Total						40000		2774153.670		Total		40000		3457135.930	

Table 12- Minimum & Maximum depth of class-II

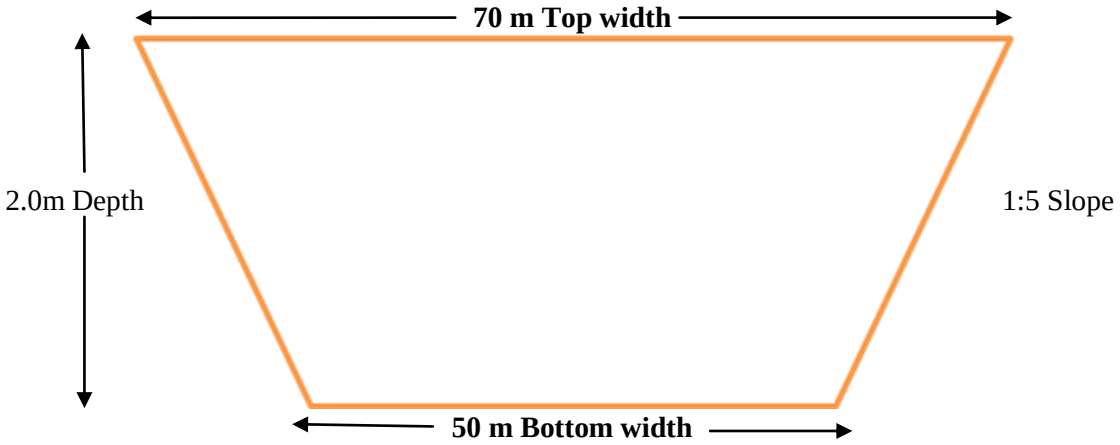
Class-III: - (Channel design: - Bottom width- 50 meter, Top width- 67 meter)



Location		Chainage (km)			As per Observed Soundings					As per Reduced Soundings					
From	To	From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Avg. Depth of Cut (m)	Dredging Qty. (cubic Meter)	Cumulative Dredging Qty (cubic Meter)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Avg. Depth of Cut (m)	Dredging Qty. (cubic Meter)	Cumulative Dredging Qty (cubic Meter)
Fulercha r pt IV	Ferengichar	0	10	0.012	0.4	10000	1.730	951906.320	951906.320	-0.3	0	10000	2.080	1144303.630	1144303.630
Ferengic har	Khop ati pt II	10	20	0.012	0.4	10000	1.866	1026602.230	1978508.550	-0.3	0	10000	2.243	1234085.090	2378388.720
Khopati pt II	Magu rmari	20	30	0.006	0.4	10000	1.760	968069.900	2946578.450	-0.3	0	10000	2.115	1163723.230	3542111.950
Magurm ari	Tumn i	30	42.576	0.006	0.3	10000	2.265	1246099.530	4192677.980	-0.3	0	10000	2.723	1497944.140	5040056.090
Total						40000		4192677.980		Total		40000		5040056.090	

Table 13- Minimum & Maximum depth of class-III

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



Location		Chainage (km)		As per Observed Soundings						As per Reduced Soundings					
From	To	From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Avg. Depth of Cut (m)	Dredging Qty. (cubic Meter)	Cumulative Dredging Qty (cubic Meter)	Min. Depth (m)	Max Depth (m)	Length of Shoal (m)	Avg. Depth of Cut (m)	Dredging Qty. (cubic Meter)	Cumulative Dredging Qty (cubic Meter)
Brahmaputra Confluence	Dikhowmukh Village	0	10	0.008	0.4	10000	2.723	1148730.700	1148730.700	-0.3	0	10000	2.454	1349763.810	1349763.810
Goshkota Village	Gaurisagar Village	10	20	0.008	0.4	10000	2.088	1238733.480	2387464.180	-0.3	0	10000	2.646	1455507.300	2805271.110
Gaurisagar Village	Sesurkhowa Village	20	30	0.004	0.4	10000	2.252	1167905.310	3555369.490	-0.3	0	10000	2.495	1372198.040	4177469.150
Sesurkhowa Village	Kamarphodia Village	30	42.576	0.005	0.4	10000	2.123	1503590.880	5058960.370	-0.3	0	10000	3.212	1766712.050	5944181.200
Total						40000		5058960.370		Total		40000		5944181.200	

Table 14- Minimum & Maximum depth of class-IV

Section 6: Conclusion

The surveyed stretch of Jinjiram River is 42.576 km in length and was not explored for any navigational possibility in earlier time. As much as 9 numbers of major and minor ferry services like Sukchar Ferry Ghat, Bevaripara Ferry Ghat, Molakha Ferry Ghat, Lalmati Ghat etc. were being operated along the survey stretch by private concerns. There is good scope for navigational aspect of the waterways. There are number of major industries existed in the nearby area, hence a large and consistent amount of cargo movement is expected through this river. The right bank of the river is moderately connected with roads and other infrastructures than the left bank. The settlements are thickly populated on the right bank where as the left bank is sparsely distributed. However, there is a good scope for developing tourism along the entire stretch of Jinjiram. The river bed of Jinjiram River is mainly sandy in nature with isolated incident of small scale and conventional sand/Gravel mining by the local peoples. The river banks of entire stretch are covered with vegetation and beyond that cultivation is prominent. Encroachment was observed in many parts of the river banks. The water flow of the river is not obstructed from top to bottom of the entire stretch. The average water velocity during the survey period is around 0.80 m/s. The cargo transportation is connected with wooden bridge, bamboo bridge etc. No Railway line or RCC bridges have been found in this zone of river. An under-construction RCC Bridge has been located near at chainage of 2 km. Morichbari Reserve and Nokrek national park are famous tourist spot in this zone of river.

The Cargo transportation is well connected with NH-51, NH-127B which is the strong cargo transportation system in this zone of river. Besides, SH-2, SH-11 and SH-46 are also situated in this zone of river but there were lots of possibility to improve the cargo transportation by Rail and roads. The Ferry services are really very helpful for daily communication and transportation system.

6.1 Dredging volume:-

Class Details	As per Observed Soundings (Cubic Meter)	As per Reduced Soundings (Cubic Meter)
Class I	1821251.88	2352591.63
Class II	2774153.67	3457135.93
Class III	4192677.98	5040056.09
Class IV	5058960.37	5944181.20

Annexure:-

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

The Chart Datum value and HFL values of Tumni and Fulerchar Point at Confluence with Brahmaputra 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	0.03	0.3	1000	37224.54	37224.54	-0.3	0	1000	48225.87	48225.87
1	2	0.02	0.2	1000	38263.95	75488.49	-0.3	0	1000	49421.67	97647.54
2	3	0.02	0.3	1000	48587.57	124076.06	-0.3	0	1000	62758.51	160406.05
3	4	0.02	0.3	1000	41912.14	165988.2	-0.3	0	1000	54138.61	214544.66
4	5	0.02	0.3	1000	38135.29	204123.49	-0.3	0	1000	49258.78	263803.44
5	6	0.02	0.2	1000	42057.78	246181.27	-0.3	0	1000	54323.91	318127.35
6	7	0.03	0.3	1000	45142.76	291324.03	-0.3	0	1000	58307.88	376435.23
7	8	0.02	0.2	1000	41880.36	333204.39	-0.3	0	1000	54095.03	430530.26
8	9	0.02	0.2	1000	41583.88	374788.27	-0.3	0	1000	53711.41	484241.67
9	10	0.02	0.2	1000	38709.81	413498.08	-0.3	0	1000	50001.11	534242.78
10	11	0.03	0.2	1000	40545.12	454043.2	-0.3	0	1000	52372.87	586615.65
11	12	0.02	0.2	1000	41566.15	495609.35	-0.3	0	1000	53690.92	640306.57
12	13	0.03	0.3	1000	74055.81	569665.16	-0.3	0	1000	95656.97	735963.54
13	14	0.03	0.2	1000	41798.39	611463.55	-0.3	0	1000	53989.78	789953.32
14	15	0.02	0.3	1000	41456.74	652920.29	-0.3	0	1000	53548.09	843501.41
15	16	0.02	0.3	1000	38840.29	691760.58	-0.3	0	1000	50168.39	893669.8
16	17	0.02	0.3	1000	41937.36	733697.94	-0.3	0	1000	54167.81	947837.61
17	18	0.02	0.3	1000	45296.9	778994.84	-0.3	0	1000	58507.61	1006345.2
18	19	0.02	0.3	1000	41655.69	820650.53	-0.3	0	1000	53802.01	1060147.2
19	20	0.02	0.2	1000	38793.19	859443.72	-0.3	0	1000	50108.2	1110255.4
20	21	0.02	0.2	1000	41558.93	901002.65	-0.3	0	1000	53684.06	1163939.5
21	22	0.02	0.3	1000	41142.07	942144.72	-0.3	0	1000	53143.88	1217083.4

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)
22	23	0.02	0.3	1000	42055.24	984199.96	-0.3	0	1000	54320.89	1271404.3
23	24	0.01	0.3	1000	44562.6	1028762.6	-0.3	0	1000	57558	1328962.3
24	25	0.02	0.2	1000	41373.24	1070135.8	-0.3	0	1000	53442.62	1382404.9
25	26	0.02	0.3	1000	38800.66	1108936.5	-0.3	0	1000	50116.94	1432521.8
26	27	0.02	0.2	1000	42008.57	1150945	-0.3	0	1000	54259.87	1486781.7
27	28	0.02	0.2	1000	42098.34	1193043.4	-0.3	0	1000	54376.52	1541158.2
28	29	0.02	0.3	1000	41650.75	1234694.1	-0.3	0	1000	53796.77	1594955
29	30	0.02	0.3	1000	45267.62	1279961.7	-0.3	0	1000	58470.93	1653425.9
30	31	0.02	0.3	1000	42055.6	1322017.3	-0.3	0	1000	54321.93	1707747.8
31	32	0.02	0.2	1000	41848.8	1363866.1	-0.3	0	1000	54054.62	1761802.5
32	33	0.02	0.3	1000	45112.73	1408978.9	-0.3	0	1000	58270.69	1820073.2
33	34	0.02	0.2	1000	42090.18	1451069.1	-0.3	0	1000	54366.39	1874439.5
34	35	0.02	0.2	1000	32278.6	1483347.7	-0.3	0	1000	41693.48	1916133
35	36	0.02	0.2	1000	42053.05	1525400.7	-0.3	0	1000	54318.23	1970451.3
36	37	0.02	0.2	1000	45350.01	1570750.7	-0.3	0	1000	58576.78	2029028
37	38	0.02	0.2	1000	42090.17	1612840.9	-0.3	0	1000	54366.1	2083394.1
38	39	0.02	0.2	1000	44387.43	1657228.3	-0.3	0	1000	57335.72	2140729.9
39	40	0.02	0.2	1000	41473.06	1698701.4	-0.3	0	1000	53567.2	2194297.1
40	41	0.02	0.2	1000	51454.58	1750156	-0.3	0	1000	66462.82	2260759.9
41	42	0.02	0.3	1000	42029.91	1792185.9	-0.3	0	1000	54287.88	2315047.8
42	42.576	0.01	0.3	1000	29066.02	1821251.9	-0.3	0	1000	37543.88	2352591.6
Total				43000	1821251.9		Total		43000	2352591.6	

Table 15- Dredging Quantity 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	0.027	0.3	1000	56815.91	56815.91	-0.3	0	1000	70808.69	70808.69
1	2	0.016	0.4	1000	58279.29	115095.2	-0.3	0	1000	72626.78	143435.47
2	3	0.016	0.4	1000	74006.13	189101.33	-0.3	0	1000	92225.71	235661.18
3	4	0.017	0.4	1000	63838.82	252940.15	-0.3	0	1000	79555.48	315216.66
4	5	0.017	0.3	1000	58087.25	311027.4	-0.3	0	1000	72388.33	387604.99
5	6	0.018	0.3	1000	64060	375087.4	-0.3	0	1000	79831.14	467436.13
6	7	0.028	0.3	1000	68757.97	443845.37	-0.3	0	1000	85685.53	553121.66
7	8	0.017	0.3	1000	63789.95	507635.32	-0.3	0	1000	79494.42	632616.08
8	9	0.017	0.3	1000	63338.47	570973.79	-0.3	0	1000	78931.94	711548.02
9	10	0.017	0.3	1000	58961.1	629934.89	-0.3	0	1000	73476.68	785024.7
10	11	0.027	0.3	1000	61756.8	691691.69	-0.3	0	1000	76960.9	861985.6
11	12	0.017	0.3	1000	63311.97	755003.66	-0.3	0	1000	78899.31	940884.91
12	13	0.028	0.3	1000	112796.99	867800.65	-0.3	0	1000	140566.23	1081451.1
13	14	0.027	0.3	1000	63664.45	931465.1	-0.3	0	1000	79338.19	1160789.3
14	15	0.018	0.3	1000	63146.82	994611.92	-0.3	0	1000	78693.88	1239483.2
15	16	0.018	0.3	1000	59159.3	1053771.2	-0.3	0	1000	73723.91	1313207.1
16	17	0.018	0.4	1000	63876.27	1117647.5	-0.3	0	1000	79602.08	1392809.2
17	18	0.016	0.3	1000	68993.98	1186641.5	-0.3	0	1000	85979.51	1478788.7
18	19	0.016	0.3	1000	63446.36	1250087.8	-0.3	0	1000	79066.33	1557855
19	20	0.018	0.3	1000	59087.27	1309175.1	-0.3	0	1000	73634.17	1631489.2
20	21	0.017	0.3	1000	63302.65	1372477.8	-0.3	0	1000	78887.42	1710376.6
21	22	0.019	0.3	1000	62666.93	1435144.7	-0.3	0	1000	78095.38	1788472
22	23	0.018	0.3	1000	64056.53	1499201.2	-0.3	0	1000	79827.21	1868299.2
23	24	0.008	0.3	1000	67873.77	1567075	-0.3	0	1000	84583.28	1952882.5
24	25	0.019	0.3	1000	63018.52	1630093.5	-0.3	0	1000	78533.34	2031415.8
25	26	0.017	0.3	1000	59098.46	1689192	-0.3	0	1000	73648.03	2105063.9
26	27	0.017	0.3	1000	63984.98	1753176.9	-0.3	0	1000	79737.64	2184801.5
27	28	0.019	0.3	1000	64121.61	1817298.6	-0.3	0	1000	79907.71	2264709.2
28	29	0.019	0.3	1000	63439.33	1880737.9	-0.3	0	1000	79057.42	2343766.6
29	30	0.017	0.3	1000	68949.77	1949687.7	-0.3	0	1000	85924.86	2429691.5
30	31	0.019	0.3	1000	64057.02	2013744.7	-0.3	0	1000	79827.57	2509519.1
31	32	0.019	0.3	1000	63742.35	2077487	-0.3	0	1000	79435.41	2588954.5
32	33	0.017	0.3	1000	68712.09	2146199.1	-0.3	0	1000	85628.23	2674582.7

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	0.016	0.3	1000	64109.65	2210308.8	-0.3	0	1000	79893.33	2754476
34	35	0.018	0.2	1000	49165.68	2259474.4	-0.3	0	1000	61269.99	2815746
35	36	0.018	0.3	1000	64053.14	2323527.6	-0.3	0	1000	79822.84	2895568.9
36	37	0.018	0.3	1000	69074.82	2392602.4	-0.3	0	1000	86080.49	2981649.4
37	38	0.018	0.3	1000	64109.43	2456711.8	-0.3	0	1000	79892.61	3061542
38	39	0.018	0.3	1000	67609.86	2524321.7	-0.3	0	1000	84254.92	3145796.9
39	40	0.017	0.3	1000	63168.35	2587490	-0.3	0	1000	78719.94	3224516.8
40	41	0.017	0.3	1000	78373.88	2665863.9	-0.3	0	1000	97669.47	3322186.3
41	42	0.009	0.3	1000	64017.16	2729881.1	-0.3	0	1000	79777.43	3401963.7
42	42.576	0.009	0.3	1000	44272.59	2774153.7	-0.3	0	1000	55172.2	3457135.9
Total				43000	2774153.7		Total		43000	3457135.9	

Table 16-Dredging Quantity 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	0.024	0.3	1000	85695.56	85695.56	-0.3	0	1000	103026.18	103026.18
1	2	0.012	0.4	1000	88082.73	173778.29	-0.3	0	1000	105884.64	208910.82
2	3	0.012	0.4	1000	111852.85	285631.14	-0.3	0	1000	134458.67	343369.49
3	4	0.014	0.4	1000	96486.18	382117.32	-0.3	0	1000	115986.91	459356.4
4	5	0.014	0.3	1000	87794.46	469911.78	-0.3	0	1000	105538.37	564894.77
5	6	0.016	0.3	1000	96819.5	566731.28	-0.3	0	1000	116387.11	681281.88
6	7	0.026	0.3	1000	103920.52	670651.8	-0.3	0	1000	124923.74	806205.62
7	8	0.014	0.3	1000	96411.25	767063.05	-0.3	0	1000	115896.48	922102.1
8	9	0.014	0.3	1000	95728.47	862791.52	-0.3	0	1000	115075.82	1037177.9
9	10	0.014	0.3	1000	89114.8	951906.32	-0.3	0	1000	107125.71	1144303.6
10	11	0.024	0.3	1000	93339.48	1045245.8	-0.3	0	1000	112203.69	1256507.3
11	12	0.014	0.3	1000	95689.31	1140935.1	-0.3	0	1000	115029.09	1371536.4
12	13	0.026	0.3	1000	170480.46	1311415.6	-0.3	0	1000	204935.56	1576472
13	14	0.024	0.3	1000	96223.05	1407638.6	-0.3	0	1000	115670.35	1692142.3
14	15	0.016	0.3	1000	95440.86	1503079.5	-0.3	0	1000	114730.22	1806872.5
15	16	0.016	0.3	1000	89413.21	1592492.7	-0.3	0	1000	107484	1914356.5
16	17	0.016	0.4	1000	96542.56	1689035.3	-0.3	0	1000	116054.65	2030411.2
17	18	0.012	0.3	1000	104277.19	1793312.4	-0.3	0	1000	125352.1	2155763.3
18	19	0.012	0.3	1000	95892.42	1889204.9	-0.3	0	1000	115273.12	2271036.4
19	20	0.016	0.3	1000	89303.69	1978508.6	-0.3	0	1000	107352.31	2378388.7
20	21	0.014	0.3	1000	95676.44	2074185	-0.3	0	1000	115013.2	2493401.9
21	22	0.018	0.4	1000	94715.72	2168900.7	-0.3	0	1000	113858.67	2607260.6
22	23	0.016	0.4	1000	96814.52	2265715.2	-0.3	0	1000	116381.5	2723642.1
23	24	0.006	0.3	1000	102583.45	2368298.7	-0.3	0	1000	123316.31	2846958.4
24	25	0.018	0.3	1000	95247.11	2463545.8	-0.3	0	1000	114497.41	2961455.8
25	26	0.014	0.3	1000	89321.64	2552867.4	-0.3	0	1000	107374.02	3068829.8
26	27	0.014	0.3	1000	96706.12	2649573.6	-0.3	0	1000	116250.71	3185080.5
27	28	0.018	0.3	1000	96913.16	2746486.7	-0.3	0	1000	116500.01	3301580.6
28	29	0.018	0.3	1000	95880.79	2842367.5	-0.3	0	1000	115258.91	3416839.5
29	30	0.014	0.3	1000	104210.95	2946578.5	-0.3	0	1000	125272.49	3542112
30	31	0.018	0.3	1000	96815.99	3043394.4	-0.3	0	1000	116383.22	3658495.2

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)
31	32	0.018	0.3	1000	96339.8	3139734.2	-0.3	0	1000	115810.72	3774305.9
32	33	0.014	0.3	1000	103851.48	3243585.7	-0.3	0	1000	124840.63	3899146.5
33	34	0.012	0.3	1000	96895.39	3340481.1	-0.3	0	1000	116478.6	4015625.1
34	35	0.016	0.3	1000	74308.73	3414789.8	-0.3	0	1000	89327.17	4104952.3
35	36	0.016	0.3	1000	96809.82	3511599.7	-0.3	0	1000	116375.86	4221328.2
36	37	0.016	0.3	1000	104400	3615999.7	-0.3	0	1000	125499.72	4346827.9
37	38	0.016	0.3	1000	96895.14	3712894.8	-0.3	0	1000	116477.91	4463305.8
38	39	0.016	0.3	1000	102187.68	3815082.5	-0.3	0	1000	122840.4	4586146.2
39	40	0.014	0.3	1000	95471.63	3910554.1	-0.3	0	1000	114766.81	4700913
40	41	0.006	0.2	1000	118454.48	4029008.6	-0.3	0	1000	142395.11	4843308.1
41	42	0.006	0.3	1000	96755.45	4125764	-0.3	0	1000	116310.16	4959618.3
42	42.576	0.006	0.3	1000	66913.94	4192678	-0.3	0	1000	80437.83	5040056.1
Total				43000	4192678		Total		43000	5040056.09	

Table 17-Dredging Quantity 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	0.021	0.3	1000	103529.14	103529.14	-0.3	0	1000	121655.86	121655.86
1	2	0.008	0.4	1000	106283.64	209812.78	-0.3	0	1000	124882.86	246538.72
2	3	0.008	0.4	1000	134965.58	344778.36	-0.3	0	1000	158583.96	405122.68
3	4	0.011	0.4	1000	116423.79	461202.15	-0.3	0	1000	136797.72	541920.4
4	5	0.011	0.4	1000	105937.52	567139.67	-0.3	0	1000	124476.05	666396.45
5	6	0.014	0.4	1000	116826.25	683965.92	-0.3	0	1000	137269.99	803666.44
6	7	0.024	0.3	1000	125393.16	809359.08	-0.3	0	1000	147336.35	951002.79
7	8	0.011	0.3	1000	116333.09	925692.17	-0.3	0	1000	136691.12	1087693.9
8	9	0.011	0.4	1000	115509.06	1041201.2	-0.3	0	1000	135722.98	1223416.9
9	10	0.011	0.3	1000	107529.47	1148730.7	-0.3	0	1000	126346.92	1349763.8
10	11	0.021	0.3	1000	112625.94	1261356.6	-0.3	0	1000	132335.05	1482098.9
11	12	0.011	0.4	1000	115463.55	1376820.2	-0.3	0	1000	135669.16	1617768
12	13	0.024	0.4	1000	205707.14	1582527.3	-0.3	0	1000	241705.43	1859473.5
13	14	0.021	0.3	1000	116106.38	1698633.7	-0.3	0	1000	136424.44	1995897.9
14	15	0.014	0.3	1000	115163.23	1813796.9	-0.3	0	1000	135316.4	2131214.3
15	16	0.014	0.4	1000	107889.07	1921686	-0.3	0	1000	126769.39	2257983.7
16	17	0.014	0.4	1000	116490.42	2038176.4	-0.3	0	1000	136875.91	2394859.6
17	18	0.008	0.3	1000	125825.04	2164001.5	-0.3	0	1000	147844.04	2542703.6
18	19	0.008	0.3	1000	115705.91	2279707.4	-0.3	0	1000	135954.01	2678657.6
19	20	0.014	0.4	1000	107756.8	2387464.2	-0.3	0	1000	126613.47	2805271.1
20	21	0.011	0.4	1000	115447.66	2502911.8	-0.3	0	1000	135650.69	2940921.8
21	22	0.017	0.4	1000	114287.78	2617199.6	-0.3	0	1000	134287.81	3075209.6
22	23	0.014	0.4	1000	116820.64	2734020.3	-0.3	0	1000	137263.44	3212473.1
23	24	0.004	0.4	1000	123778.39	2857798.7	-0.3	0	1000	145439.38	3357912.4
24	25	0.017	0.4	1000	114727.94	2972526.6	-0.3	0	1000	134718.88	3492631.3
25	26	0.011	0.4	1000	107777.41	3080304	-0.3	0	1000	126638.05	3619269.4
26	27	0.011	0.4	1000	116689.38	3196993.4	-0.3	0	1000	137109.66	3756379
27	28	0.017	0.4	1000	116939.49	3313932.9	-0.3	0	1000	137403.23	3893782.3
28	29	0.017	0.4	1000	115692.51	3429625.4	-0.3	0	1000	135938.22	4029720.5
29	30	0.011	0.4	1000	125744.11	3555369.5	-0.3	0	1000	147748.68	4177469.2
30	31	0.017	0.3	1000	116822.48	3672192	-0.3	0	1000	137265.64	4314734.8

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)
31	32	0.017	0.3	1000	116247.85	3788439.8	-0.3	0	1000	136590.6	4451325.4
32	33	0.011	0.4	1000	125310.38	3913750.2	-0.3	0	1000	147239.31	4598564.7
33	34	0.008	0.4	1000	116917.54	4030667.7	-0.3	0	1000	137377.63	4735942.3
34	35	0.014	0.3	1000	89663.48	4120331.2	-0.3	0	1000	105354.14	4841296.5
35	36	0.014	0.3	1000	116815.55	4237146.8	-0.3	0	1000	137257.32	4978553.8
36	37	0.014	0.4	1000	125972.4	4363119.2	-0.3	0	1000	148017.01	5126570.8
37	38	0.014	0.4	1000	116917.28	4480036.5	-0.3	0	1000	137377.29	5263948.1
38	39	0.014	0.4	1000	123304.08	4603340.5	-0.3	0	1000	144881.63	5408829.7
39	40	0.011	0.4	1000	115199.38	4718539.9	-0.3	0	1000	135358.58	5544188.3
40	41	0.011	0.4	1000	142931.94	4861471.9	-0.3	0	1000	167944.55	5712132.9
41	42	0.005	0.4	1000	116748.26	4978220.1	-0.3	0	1000	137178.7	5849311.6
42	42.576	0.005	0.4	1000	80740.26	5058960.4	-0.3	0	1000	94869.65	5944181.2
Total				43000	5058960.4		Total		43000	5944181.2	

Table 18- Dredging Quantity for class-IV

Annexure-3 Observed Depth in 200 meter interval depth:-

Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Observed		Observed		Observed		Observed	
	Min	Max	Min	Max	Min	Max	Min	Max
0	0.2	0.3	0.199	0.3	0.198	0.3	0.197	0.3
200	0.1	0.2	0.098	0.2	0.096	0.2	0.094	0.2
400	0.1	0.2	0.097	0.3	0.094	0.3	0.091	0.3
600	0.1	0.2	0.098	0.2	0.096	0.3	0.094	0.3
800	0.03	0.1	0.027	0.2	0.024	0.2	0.021	0.3
1000	0.04	0.2	0.038	0.1	0.036	0.2	0.034	0.3
1200	0.1	0.2	0.098	0.2	0.096	0.2	0.094	0.3
1400	0.02	0.1	0.019	0.1	0.018	0.2	0.017	0.2
1600	0.03	0.1	0.027	0.2	0.024	0.3	0.021	0.3
1800	0.05	0.01	0.046	0.3	0.042	0.3	0.038	0.3
2000	0.02	0.1	0.016	0.4	0.012	0.4	0.008	0.4
2200	0.05	0.02	0.048	0.3	0.046	0.3	0.044	0.3
2400	0.03	0.01	0.029	0.1	0.028	0.2	0.027	0.3
2600	0.1	0.3	0.097	0.3	0.094	0.3	0.091	0.3
2800	0.02	0.1	0.019	0.2	0.018	0.3	0.017	0.3
3000	0.03	0.2	0.028	0.3	0.026	0.3	0.024	0.3
3200	0.1	0.3	0.099	0.4	0.098	0.4	0.097	0.4
3400	0.02	0.1	0.018	0.2	0.016	0.3	0.014	0.3
3600	0.1	0.2	0.097	0.2	0.094	0.3	0.091	0.3
3800	0.1	0.2	0.098	0.3	0.096	0.3	0.094	0.3
4000	0.02	0.1	0.017	0.2	0.014	0.2	0.011	0.3
4200	0.2	0.3	0.198	0.3	0.196	0.3	0.194	0.3
4400	0.03	0.1	0.028	0.2	0.026	0.2	0.024	0.3
4600	0.02	0.1	0.019	0.2	0.018	0.3	0.017	0.3
4800	0.02	0.2	0.017	0.3	0.014	0.3	0.011	0.3
5000	0.1	0.2	0.096	0.2	0.092	0.3	0.088	0.4
5200	0.05	0.1	0.046	0.2	0.042	0.2	0.038	0.3
5400	0.02	0.2	0.018	0.2	0.016	0.3	0.014	0.3
5600	0.02	0.1	0.019	0.3	0.018	0.3	0.017	0.3
5800	0.03	0.2	0.027	0.2	0.024	0.3	0.021	0.3
6000	0.04	0.1	0.039	0.2	0.038	0.3	0.037	0.3
6200	0.03	0.2	0.028	0.3	0.026	0.3	0.024	0.3
6400	0.04	0.1	0.039	0.2	0.038	0.3	0.037	0.3
6600	0.05	0.2	0.048	0.3	0.046	0.3	0.044	0.3
6800	0.06	0.3	0.057	0.3	0.054	0.3	0.051	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
7000	0.03	0.1	0.028	0.2	0.026	0.3	0.024	0.3
7200	0.02	0.2	0.017	0.3	0.014	0.3	0.011	0.3
7400	0.04	0.2	0.038	0.3	0.036	0.3	0.034	0.3
7600	0.02	0.1	0.018	0.2	0.016	0.3	0.014	0.3
7800	0.03	0.2	0.029	0.2	0.028	0.3	0.027	0.3
8000	0.02	0.1	0.017	0.2	0.014	0.3	0.011	0.3
8200	0.03	0.2	0.026	0.2	0.022	0.3	0.018	0.4
8400	0.1	0.2	0.096	0.3	0.092	0.3	0.088	0.3
8600	0.04	0.1	0.038	0.2	0.036	0.3	0.034	0.3
8800	0.03	0.2	0.029	0.3	0.028	0.3	0.027	0.3
9000	0.02	0.1	0.017	0.2	0.014	0.3	0.011	0.3
9200	0.03	0.1	0.029	0.2	0.028	0.3	0.027	0.3
9400	0.02	0.2	0.018	0.3	0.016	0.3	0.014	0.3
9600	0.03	0.1	0.029	0.2	0.028	0.3	0.027	0.3
9800	0.04	0.2	0.038	0.2	0.036	0.2	0.034	0.3
10000	0.06	0.1	0.057	0.2	0.054	0.3	0.051	0.3
10200	0.1	0.2	0.098	0.2	0.096	0.3	0.094	0.3
10400	0.03	0.1	0.027	0.2	0.024	0.3	0.021	0.3
10600	0.04	0.2	0.038	0.3	0.036	0.3	0.034	0.3
10800	0.03	0.1	0.028	0.2	0.026	0.3	0.024	0.3
11000	0.05	0.2	0.049	0.3	0.048	0.3	0.047	0.3
11200	0.02	0.1	0.017	0.2	0.014	0.2	0.011	0.2
11400	0.1	0.2	0.096	0.3	0.092	0.3	0.088	0.3
11600	0.04	0.1	0.036	0.2	0.032	0.2	0.028	0.3
11800	0.05	0.2	0.048	0.3	0.046	0.3	0.044	0.3
12000	0.03	0.1	0.029	0.2	0.028	0.3	0.027	0.4
12200	0.04	0.2	0.037	0.3	0.034	0.3	0.031	0.3
12400	0.05	0.3	0.049	0.3	0.048	0.3	0.047	0.3
12600	0.04	0.2	0.038	0.3	0.036	0.3	0.034	0.3
12800	0.05	0.3	0.049	0.3	0.048	0.3	0.047	0.3
13000	0.03	0.2	0.028	0.3	0.026	0.3	0.024	0.3
13200	0.04	0.1	0.037	0.2	0.034	0.2	0.031	0.3
13400	0.05	0.2	0.048	0.3	0.046	0.3	0.044	0.3
13600	0.03	0.1	0.027	0.2	0.024	0.3	0.021	0.3
13800	0.04	0.2	0.038	0.3	0.036	0.3	0.034	0.3
14000	0.03	0.1	0.028	0.2	0.026	0.3	0.024	0.3
14200	0.04	0.2	0.039	0.3	0.038	0.3	0.037	0.3
14400	0.05	0.3	0.047	0.3	0.044	0.3	0.041	0.3
14600	0.03	0.2	0.026	0.2	0.022	0.3	0.018	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
14800	0.04	0.3	0.036	0.3	0.032	0.3	0.028	0.3
15000	0.02	0.1	0.018	0.2	0.016	0.3	0.014	0.3
15200	0.1	0.2	0.099	0.3	0.098	0.3	0.097	0.3
15400	0.05	0.2	0.047	0.3	0.044	0.3	0.041	0.4
15600	0.02	0.2	0.019	0.2	0.018	0.3	0.017	0.4
15800	0.03	0.3	0.028	0.3	0.026	0.3	0.024	0.3
16000	0.04	0.2	0.039	0.3	0.038	0.3	0.037	0.3
16200	0.05	0.3	0.048	0.4	0.046	0.4	0.044	0.4
16400	0.1	0.3	0.097	0.3	0.094	0.3	0.091	0.3
16600	0.02	0.1	0.018	0.2	0.016	0.2	0.014	0.3
16800	0.03	0.2	0.027	0.3	0.024	0.3	0.021	0.3
17000	0.04	0.2	0.038	0.3	0.036	0.3	0.034	0.3
17200	0.05	0.1	0.048	0.2	0.046	0.2	0.044	0.3
17400	0.03	0.3	0.029	0.3	0.028	0.3	0.027	0.3
17600	0.02	0.3	0.017	0.3	0.014	0.3	0.011	0.3
17800	0.03	0.2	0.026	0.3	0.022	0.3	0.018	0.3
18000	0.02	0.2	0.016	0.3	0.012	0.3	0.008	0.3
18200	0.04	0.3	0.038	0.3	0.036	0.3	0.034	0.3
18400	0.04	0.2	0.039	0.3	0.038	0.3	0.037	0.3
18600	0.1	0.2	0.097	0.2	0.094	0.3	0.091	0.3
18800	0.04	0.1	0.039	0.2	0.038	0.3	0.037	0.3
19000	0.05	0.2	0.048	0.3	0.046	0.3	0.044	0.3
19200	0.03	0.1	0.029	0.2	0.028	0.3	0.027	0.4
19400	0.04	0.2	0.038	0.3	0.036	0.3	0.034	0.4
19600	0.03	0.2	0.027	0.2	0.024	0.3	0.021	0.3
19800	0.02	0.1	0.018	0.2	0.016	0.3	0.014	0.3
20000	0.03	0.1	0.027	0.2	0.024	0.3	0.021	0.4
20200	0.02	0.2	0.018	0.3	0.016	0.3	0.014	0.4
20400	0.1	0.2	0.098	0.2	0.096	0.3	0.094	0.3
20600	0.03	0.1	0.029	0.2	0.028	0.2	0.027	0.3
20800	0.02	0.2	0.017	0.3	0.014	0.3	0.011	0.3
21000	0.03	0.1	0.026	0.2	0.022	0.2	0.018	0.3
21200	0.03	0.2	0.026	0.3	0.022	0.3	0.018	0.3
21400	0.1	0.2	0.098	0.3	0.096	0.3	0.094	0.3
21600	0.03	0.1	0.029	0.2	0.028	0.3	0.027	0.3
21800	0.04	0.2	0.037	0.3	0.034	0.3	0.031	0.4
22000	0.02	0.3	0.019	0.3	0.018	0.4	0.017	0.4
22200	0.02	0.1	0.018	0.2	0.016	0.3	0.014	0.3
22400	0.02	0.2	0.019	0.3	0.018	0.3	0.017	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
22600	0.03	0.1	0.028	0.2	0.026	0.3	0.024	0.4
22800	0.04	0.2	0.037	0.3	0.034	0.3	0.031	0.3
23000	0.05	0.3	0.048	0.3	0.046	0.3	0.044	0.3
23200	0.02	0.1	0.017	0.2	0.014	0.3	0.011	0.3
23400	0.01	0.2	0.008	0.3	0.006	0.3	0.004	0.3
23600	0.02	0.1	0.018	0.2	0.016	0.3	0.014	0.4
23800	0.03	0.2	0.029	0.3	0.028	0.3	0.027	0.3
24000	0.03	0.1	0.027	0.2	0.024	0.3	0.021	0.3
24200	0.04	0.2	0.036	0.3	0.032	0.3	0.028	0.4
24400	0.03	0.1	0.026	0.2	0.022	0.3	0.018	0.3
24600	0.1	0.2	0.098	0.3	0.096	0.3	0.094	0.3
24800	0.02	0.2	0.019	0.3	0.018	0.3	0.017	0.3
25000	0.03	0.1	0.027	0.2	0.024	0.3	0.021	0.3
25200	0.04	0.2	0.039	0.3	0.038	0.3	0.037	0.3
25400	0.05	0.3	0.048	0.3	0.046	0.3	0.044	0.3
25600	0.1	0.2	0.099	0.3	0.098	0.3	0.097	0.3
25800	0.03	0.2	0.028	0.2	0.026	0.3	0.024	0.3
26000	0.02	0.2	0.017	0.2	0.014	0.3	0.011	0.4
26200	0.1	0.2	0.098	0.3	0.096	0.3	0.094	0.4
26400	0.03	0.1	0.027	0.2	0.024	0.3	0.021	0.3
26600	0.04	0.2	0.038	0.3	0.036	0.3	0.034	0.4
26800	0.03	0.1	0.028	0.2	0.026	0.3	0.024	0.3
27000	0.02	0.1	0.019	0.2	0.018	0.3	0.017	0.3
27200	0.03	0.2	0.027	0.3	0.024	0.3	0.021	0.3
27400	0.04	0.2	0.036	0.3	0.032	0.3	0.028	0.4
27600	0.03	0.1	0.026	0.2	0.022	0.3	0.018	0.4
27800	0.1	0.2	0.098	0.2	0.096	0.3	0.094	0.3
28000	0.02	0.1	0.019	0.2	0.018	0.2	0.017	0.3
28200	0.03	0.2	0.027	0.3	0.024	0.3	0.021	0.3
28400	0.04	0.1	0.039	0.2	0.038	0.3	0.037	0.3
28600	0.03	0.2	0.028	0.3	0.026	0.3	0.024	0.3
28800	0.02	0.2	0.019	0.2	0.018	0.3	0.017	0.3
29000	0.04	0.3	0.038	0.3	0.036	0.3	0.034	0.4
29200	0.05	0.2	0.047	0.3	0.044	0.3	0.041	0.4
29400	0.1	0.2	0.098	0.2	0.096	0.3	0.094	0.3
29600	0.02	0.3	0.017	0.3	0.014	0.3	0.011	0.3
29800	0.03	0.1	0.028	0.2	0.026	0.3	0.024	0.3
30000	0.1	0.2	0.098	0.2	0.096	0.3	0.094	0.3
30200	0.02	0.3	0.019	0.3	0.018	0.3	0.017	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
30400	0.03	0.1	0.027	0.2	0.024	0.2	0.021	0.3
30600	0.03	0.2	0.026	0.3	0.022	0.3	0.018	0.3
30800	0.1	0.2	0.096	0.3	0.092	0.3	0.088	0.3
31000	0.1	0.2	0.098	0.3	0.096	0.3	0.094	0.3
31200	0.03	0.1	0.029	0.2	0.028	0.3	0.027	0.3
31400	0.04	0.1	0.037	0.2	0.034	0.2	0.031	0.3
31600	0.02	0.1	0.019	0.2	0.018	0.2	0.017	0.3
31800	0.03	0.2	0.028	0.2	0.026	0.2	0.024	0.3
32000	0.04	0.2	0.039	0.3	0.038	0.3	0.037	0.3
32200	0.05	0.2	0.048	0.2	0.046	0.3	0.044	0.3
32400	0.1	0.3	0.097	0.3	0.094	0.3	0.091	0.3
32600	0.1	0.2	0.098	0.3	0.096	0.3	0.094	0.4
32800	0.02	0.1	0.017	0.2	0.014	0.2	0.011	0.3
33000	0.02	0.2	0.018	0.3	0.016	0.3	0.014	0.3
33200	0.02	0.1	0.018	0.2	0.016	0.3	0.014	0.3
33400	0.02	0.2	0.019	0.2	0.018	0.3	0.017	0.3
33600	0.03	0.1	0.027	0.2	0.024	0.3	0.021	0.4
33800	0.02	0.2	0.016	0.2	0.012	0.3	0.008	0.3
34000	0.03	0.1	0.026	0.2	0.022	0.3	0.018	0.3
34200	0.02	0.2	0.018	0.2	0.016	0.3	0.014	0.3
34400	0.03	0.1	0.029	0.2	0.028	0.2	0.027	0.3
34600	0.1	0.2	0.097	0.2	0.094	0.3	0.091	0.3
34800	0.02	0.1	0.019	0.2	0.018	0.3	0.017	0.3
35000	0.03	0.1	0.028	0.2	0.026	0.2	0.024	0.3
35200	0.05	0.2	0.049	0.2	0.048	0.2	0.047	0.3
35400	0.02	0.2	0.018	0.3	0.016	0.3	0.014	0.3
35600	0.03	0.1	0.027	0.2	0.024	0.2	0.021	0.3
35800	0.04	0.2	0.038	0.2	0.036	0.3	0.034	0.3
36000	0.1	0.2	0.097	0.2	0.094	0.3	0.091	0.3
36200	0.1	0.2	0.098	0.3	0.096	0.3	0.094	0.4
36400	0.02	0.2	0.018	0.2	0.016	0.3	0.014	0.3
36600	0.02	0.2	0.019	0.3	0.018	0.3	0.017	0.3
36800	0.03	0.1	0.027	0.2	0.024	0.3	0.021	0.3
37000	0.04	0.2	0.036	0.3	0.032	0.3	0.028	0.3
37200	0.03	0.1	0.026	0.2	0.022	0.3	0.018	0.3
37400	0.02	0.2	0.018	0.3	0.016	0.3	0.014	0.3
37600	0.1	0.2	0.099	0.3	0.098	0.3	0.097	0.3
37800	0.03	0.1	0.027	0.2	0.024	0.3	0.021	0.3
38000	0.02	0.1	0.019	0.2	0.018	0.3	0.017	0.4

Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Observed		Observed		Observed		Observed	
	Min	Max	Min	Max	Min	Max	Min	Max
38200	0.03	0.2	0.028	0.3	0.026	0.3	0.024	0.3
38400	0.03	0.1	0.029	0.2	0.028	0.2	0.027	0.3
38600	0.02	0.2	0.018	0.3	0.016	0.3	0.014	0.3
38800	0.03	0.1	0.027	0.2	0.024	0.3	0.021	0.3
39000	0.1	0.2	0.098	0.3	0.096	0.3	0.094	0.3
39200	0.1	0.2	0.097	0.3	0.094	0.3	0.091	0.4
39400	0.02	0.1	0.018	0.2	0.016	0.3	0.014	0.3
39600	0.03	0.2	0.028	0.2	0.026	0.3	0.024	0.3
39800	0.04	0.2	0.039	0.3	0.038	0.3	0.037	0.3
40000	0.02	0.1	0.017	0.2	0.014	0.3	0.011	0.3
40200	0.03	0.1	0.026	0.2	0.022	0.3	0.018	0.3
40400	0.04	0.2	0.036	0.3	0.032	0.3	0.028	0.4
40600	0.1	0.2	0.098	0.3	0.096	0.3	0.094	0.3
40800	0.1	0.1	0.099	0.2	0.098	0.2	0.097	0.3
41000	0.02	0.2	0.017	0.3	0.014	0.3	0.011	0.3
41200	0.03	0.1	0.029	0.2	0.028	0.3	0.027	0.3
41400	0.04	0.2	0.038	0.2	0.036	0.3	0.034	0.4
41600	0.1	0.2	0.098	0.3	0.096	0.3	0.094	0.3
41800	0.03	0.2	0.027	0.2	0.024	0.3	0.021	0.4
42000	0.01	0.3	0.009	0.3	0.008	0.3	0.007	0.3
42200	0.02	0.2	0.018	0.2	0.016	0.3	0.014	0.4
42400	0.1	0.2	0.099	0.2	0.098	0.3	0.097	0.3
42576	0.1	0.2	0.099	0.3	0.098	0.3	0.097	0.3

Annexure-4 Reduced Depth in 200 meter interval depth:-

Chainage (in meter)	Class-I Reduced		Class-II Reduced		Class-III Reduced		Class-IV Reduced	
	Min	Max	Min	Max	Min	Max	Min	Max
0.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
200.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
400.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
600.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
800.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
1000.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
1200.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
1400.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
1600.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
1800.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
2000.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
2200.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
2400.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
2600.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
2800.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
3000.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
3200.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
3400.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
3600.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
3800.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
4000.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
4200.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
4400.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
4600.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
4800.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
5000.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
5200.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
5400.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
5600.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
5800.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
6000.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
6200.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
6400.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
6600.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
6800.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0

Chainage (in meter)	Class-I Reduced		Class-II Reduced		Class-III Reduced		Class-IV Reduced	
	Min	Max	Min	Max	Min	Max	Min	Max
7000.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
7200.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
7400.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
7600.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
7800.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
8000.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
8200.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
8400.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
8600.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
8800.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
9000.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
9200.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
9400.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
9600.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
9800.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
10000.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
10200.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
10400.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
10600.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
10800.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
11000.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
11200.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
11400.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
11600.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
11800.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
12000.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
12200.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
12400.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
12600.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
12800.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
13000.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
13200.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
13400.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
13600.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
13800.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
14000.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
14200.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
14400.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
14600.000	-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
14800.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
15000.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
15200.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
15400.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
15600.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
15800.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
16000.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
16200.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
16400.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
16600.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
16800.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
17000.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
17200.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
17400.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
17600.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
17800.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
18000.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
18200.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
18400.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
18600.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
18800.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
19000.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
19200.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
19400.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
19600.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
19800.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
20000.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
20200.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
20400.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
20600.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
20800.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
21000.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
21200.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
21400.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
21600.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
21800.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
22000.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
22200.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
22400.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0

Chainage (in meter)	Class-I Reduced		Class-II Reduced		Class-III Reduced		Class-IV Reduced	
	Min	Max	Min	Max	Min	Max	Min	Max
22600.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
22800.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
23000.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
23200.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
23400.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
23600.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
23800.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
24000.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
24200.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
24400.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
24600.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
24800.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
25000.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
25200.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
25400.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
25600.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
25800.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
26000.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
26200.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
26400.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
26600.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
26800.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
27000.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
27200.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
27400.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
27600.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
27800.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
28000.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
28200.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
28400.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
28600.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
28800.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
29000.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
29200.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
29400.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
29600.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
29800.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
30000.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
30200.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0

Chainage (in meter)	Class-I Reduced		Class-II Reduced		Class-III Reduced		Class-IV Reduced	
	Min	Max	Min	Max	Min	Max	Min	Max
30400.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
30600.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
30800.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
31000.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
31200.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
31400.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
31600.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
31800.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
32000.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
32200.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
32400.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
32600.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
32800.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
33000.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
33200.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
33400.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
33600.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
33800.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
34000.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
34200.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
34400.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
34600.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
34800.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
35000.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
35200.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
35400.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
35600.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
35800.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
36000.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
36200.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
36400.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
36600.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
36800.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
37000.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
37200.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
37400.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
37600.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
37800.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
38000.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0

Chainage (in meter)	Class-I Reduced		Class-II Reduced		Class-III Reduced		Class-IV Reduced	
	Min	Max	Min	Max	Min	Max	Min	Max
38200.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
38400.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
38600.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
38800.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
39000.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
39200.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
39400.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
39600.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
39800.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
40000.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
40200.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
40400.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
40600.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
40800.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
41000.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
41200.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
41400.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
41600.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
41800.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
42000.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
42200.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
42400.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
42576.000	-0.3	0	-0.3	0	-0.3	0	-0.3	0

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
20.12.15	GS(TP)--1	0.907	24 hrs	0.27	24.183	24.453	22.289	-2.103
20.12.15	GS (TP)--2	13.098	24 hrs	0.32	24.531	24.851	22.675	-2.082
28.12.15	GS (TP)--3	21.982	24 hrs	0.38	25.144	25.524	22.956	-2.370
28.12.15	GS (TP)--4	30.765	24 hrs	0.47	25.135	25.605	23.235	-2.568
06.01.16	GS (TP)--5	41.677	24 hrs	0.53	25.133	25.663	23.581	-2.176
06.01.16	GS (TP)-6	42.576	24 hrs	0.59	25.122	25.712	23.609	-2.164

Table 19- Details of Collected water level of Different gauge stations

Annexure-6 Details of Bathymetric surveys carried out:-

The layer of water in the river Jinjiram is not sufficient for carrying out the Bathymetry survey.

Annexure-7 Bank Protection along the Bank:-

The bank of the river is generally protected by embankment and Boulder pitching. Boulder pitching, embankment has been protected in this river side. Besides, Morichbari Reserve and dense forest sides are protected the bank side of the river. However, in the rainy season, flood damages the crops (paddy field), wooden and Bamboo bridges etc. Due to this, the State Government has to incur heavy non plan expenditure for repairing of roads and bridges every year. To counteract the flood menace, permanent measures for protecting paddy fields, cultivation lands and habitats are necessary. As such, enhanced allocation is required for flood control projects.

Annexure-8 Details of Features across the Bank:-

The bank of the river includes with villages, agricultural field, Ferry ghat, Irrigation canals and outlets, Wooden Bridge, Bamboo Bridges, Electric lines, Forest etc. The both side river bank are highly protected by embankment and bolder pitching due to flood, erosion etc. The villagers are also situated near the bank side of the river. Recently different kinds of industries are also located near the bank side of the river. West Garo Hills, Tura peak, Morichbari Reserve, Nokrek National park have been situated in this zone of river and protected the river side. Tumni, Fulerchar, Nolbari, Golabari, Rajabala etc. villages have been located 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:-

For the Topography Survey, the Horizontal / Vertical control has been carried out from BM-1 by GPS observation of 24 hrs, situated near the Fulerchar point Village is used for the entire Survey work. Its value is 30.158 m w.r.t. MSL has been considered for calculating the vertical levels. Total 5 no. of BM have been established along the 42.576 km stretch of the Jinjiram River with the reference of BM-1 which was fixed near at Fulerchar point village.

Topography Survey:-

The survey was commenced on 10 th December 2015 and completed on 12th January 2016. Then the days winter season and the climate become normal which reached about 15◦ 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 45 R 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 17-Topography Survey Instrument

- **Bathymetry Survey:-**

The Bathymetry survey was generally carried out using Bathy 500MF portable shallow water Echo-sounder 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.

The Bathymetry survey was not carried out in this zone of river due to lacking of water. The layer of water is not sufficient for carrying out the Bathymetry survey.

Annexure-10 Photographs of Equipment:-

Following equipments were employed for the Bathymetry and Topography survey:-

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

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

- **Positioning System:-**
  - **1 no Trimble DGPS system (SPS361)**

Figure 18 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 19 Echo Sounder Instrument

- **Current Meter:-**

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

- **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 Bench Mark Forms:-

BM Name	Northing (m)	Easting (m)	Latitude (N)	Longitude (E)	RL (m)
BM 1	2850597.495	789557.779	25°44'41.448"	89°53'10.884"	30.304
Pillar Established by: - Precision Survey Consultancy. Surveyor – Mr. Debasis Mondal; Date of Establishment – 15.12.2015					
Station Description :-					
Benchmark is located near Fulerchar Pt-IV village. The BM is denoted by a "." mark engraved on a plate. The plate is fixed on a 5cm diameter GI pipe. The GI pipe is cemented with construction pillar of 30cmX30cmX150cm. The pillar extends 60.cms above ground level. Inscription "IWAI", "PSC" and BM No. can be seen on the face of the pillar. The measurements of the bench mark pillar from notable locations / edges as follows: East from SH-2 -1.83km.					
Life of Station : 15 Yrs	**Datum: - WGS 84**			**ZONE : 45 R**	

Figure 20 BM Form & Google image view of BM-1

BM Name	Northing (m)	Easting (m)	Latitude (N)	Longitude (E)	RL (m)
BM 2	2648125.816	795159.56	23°55'03.123"	89°53'57.335"	27.155
Pillar Established by: - Precision Survey Consultancy. Surveyor – Mr. Debasis Mondal ; Date of Establishment – 18.12.2015					
Station Description :-					
Benchmark is located near Khopati Pt IV village. The BM is denoted by a "." mark engraved on a plate. The plate is fixed on a 5cm diameter GI pipe. The GI pipe is cemented with construction pillar of 30cmX30cmX150cm. The pillar extends 60.cms above ground level. Inscription "IWAI", "PSC" and BM No. can be seen on the face of the pillar. The measurements of the bench mark pillar from notable locations / edges as follows: East from NH-127 B – 3.73 km.					
Life of Station : 15Yrs	**Datum: - WGS 84**				**ZONE : 45 R**

Figure 21- BM Form & Google image view of BM-2

BM Name	Northing (m)	Easting (m)	Latitude (N)	Longitude (E)	RL (m)
BM 3	2856227.262	787340.357	25°47'45.804"	89°51'55.783"	30.316

Pillar Established by: - Precision Survey Consultancy. Surveyor – Mr. Debasis Mondal ;
Date of Establishment – 25.12.2015

Station Description :-

Benchmark is located at Nalbari village.

The BM is denoted by a "." mark engraved on a plate. The plate is fixed on a 5cm diameter GI pipe. The GI pipe is cemented with construction pillar of 30cmX30cmX150cm.

The pillar extends 60.cms above ground level. Inscription "IWAI", "PSC" and BM No.can be seen on the face of the pillar.

The measurements of the bench mark pillar from notable locations / edges as follows:

East From NH-127 B–1.33 Km.
North from Nolbari- 0.64 km.

Life of Station : 15Yrs	Datum: - WGS 84	ZONE : 45 R

Figure 22- BM Form & Google image view of BM-3

BM Name	Northing (m)	Easting (m)	Latitude (N)	Longitude (E)	RL (m)
BM 4	2859826.765	798413.678	25°49'34.678"	89°58'35.829"	32.850

Pillar Established by: - Precision Survey Consultancy. Surveyor – Mr. Debasis Mondal ;
Date of Establishment – 27.12.2015

Station Description :-

Benchmark is located near Bhoral Gaon village close to the NH-127 B and SH-2.

The BM is denoted by a "." mark engraved on a plate. The plate is fixed on a 5cm diameter GI pipe. The GI pipe is cemented with construction pillar of 30cmX30cmX150cm.

The pillar extends 60.cms above ground level. Inscription "IWAI", "PSC" and BM No. can be seen on the face of the pillar.

The measurements of the bench mark pillar from notable locations / edges as follows:

North From SH-11 -7 km.

Life of Station : 15Yrs	Datum: - WGS 84	ZONE : 45 R

Figure 23- BM Form & Google image view of BM-4

BM Name	Northing (m)	Easting (m)	Latitude (N)	Longitude (E)	RL (m)
BM 5	2864077.004	799758.396	25°51'51.665"	89°59'27.537"	31.825

Pillar Established by: - Precision Survey Consultancy. Surveyor – Mr. Debasis Mondal ;
Date of Establishment – 03.01.2016

Station Description :-

Benchmark is located near at Tumni village.

The BM is denoted by a "." mark engraved on a plate. The plate is fixed on a 5cm diameter GI pipe. The GI pipe is cemented with construction pillar of 30cmX30cmX150cm.

The pillar extends 60.cms above ground level. Inscription "IWAI", "PSC" and BM No. can be seen on the face of the pillar.

The measurements of the bench mark pillar from notable locations / edges as follows:

East From NH-127 B – 3.19 km.

North From Tumni -0.86 km.

Life of Station : 15 Yrs	Datum: - WGS 84	ZONE : 45 R

Figure 24- BM Form & Google image view of BM-5

Annexure-12 -Levelling Calculation:-

BS	IS	FS	RISE(+)	FALL(-)	RL	REMARKS
0.540					30.304	BM-1
0.438		2.085		1.545	28.759	
0.384		2.145		1.707	27.052	
0.822		1.990		1.606	25.446	
		1.815		0.993	24.453	GS-1

BS	IS	FS	RISE(+)	FALL(-)	RL	REMARKS
0.675					27.155	BM-2
0.455		1.890		1.215	25.940	
		1.544		1.089	24.851	GS-2

BS	IS	FS	RISE(+)	FALL(-)	RL	REMARKS
0.573					30.316	BM-3
0.685		2.085		1.512	28.804	
0.485		2.145		1.460	27.344	
		2.305		1.820	25.524	GS-3

BS	IS	FS	RISE(+)	FALL(-)	RL	REMARKS
0.488					32.850	BM-4
0.559		1.974		1.486	31.364	
0.874		2.128		1.569	29.795	
0.672		2.375		1.501	28.294	
0.535		1.856		1.184	27.110	
		2.040		1.505	25.605	GS-4

BS	IS	FS	RISE(+)	FALL(-)	RL	REMARKS
0.385					31.825	BM-5
0.465		1.855		1.470	30.355	
0.874		2.385		1.920	28.435	
0.485		2.149		1.275	27.160	
		1.982		1.497	25.663	GS-5

Table 20 Leveling Calculation of Jinjiram river

Annexure-13 Soil Sample:-

RESULT OF TEST OF SOIL SAMPLES

SITE: JINJIRAM RIVER

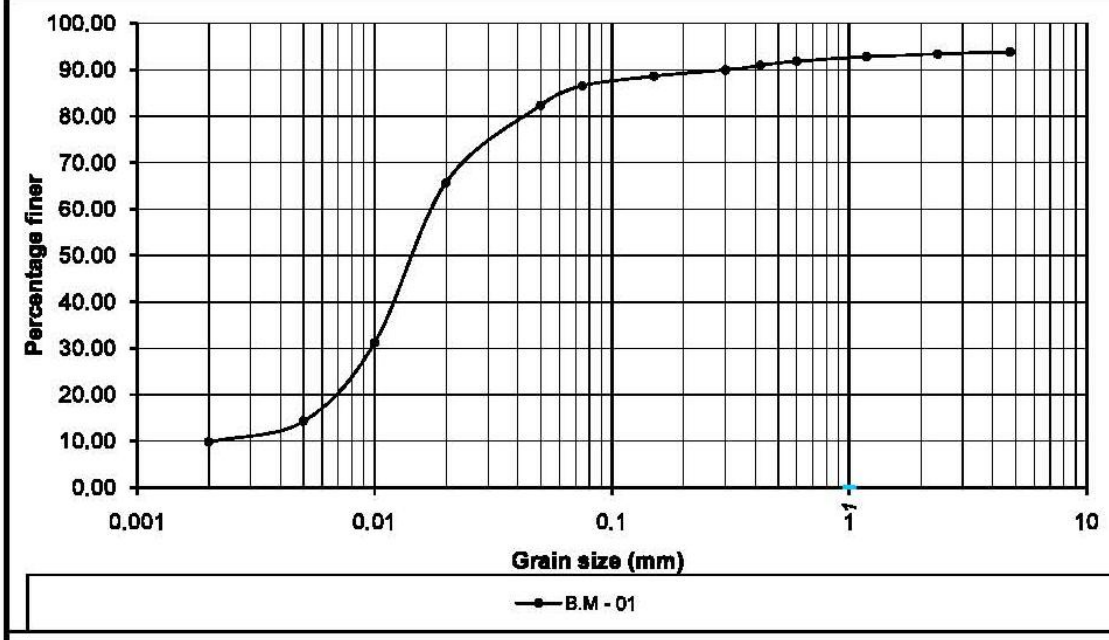
RESULTS OF TEST OF SOIL SAMPLES

SITE – JINJIRAM RIVER

PHYSICAL ANALYSIS OF SOIL

Sl.No.	B.M	GRAVEL (%)	SAND (%)	SILT+CLAY (%)	SPECIFIC GRAVITY	pH VALUE	SILT (%)	CLAY (%)	Cu	Cc
1	1	6.12	23.56	70.32	2.61	7.3	60.50	9.82	6.19	2.22
2	4	9.01	20.54	70.45	2.62	7.2	62.00	8.45	4.38	1.03
3	5	5.12	34.15	60.73	2.64	7.4	53.50	7.23	4.00	1.08

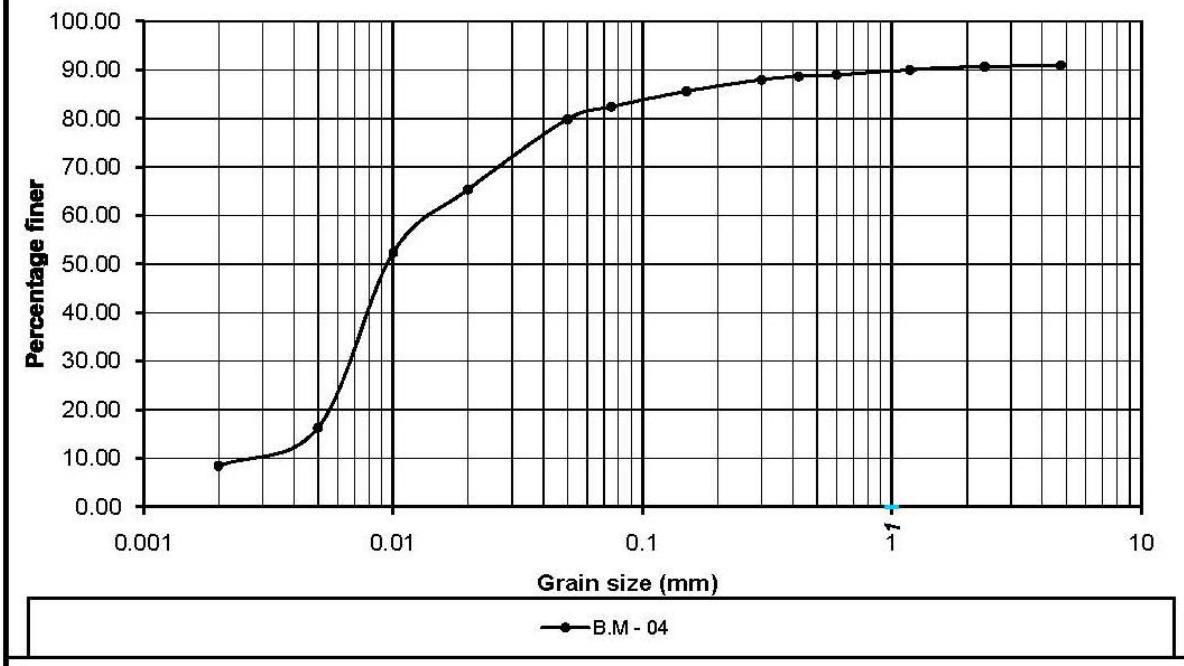
GRAIN SIZE DISTRIBUTION CURVES



Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Sand (%)**	**Gravel (%)**
B.M - 01	9.8	60.5	23.6	6.1

*Silt & Clay

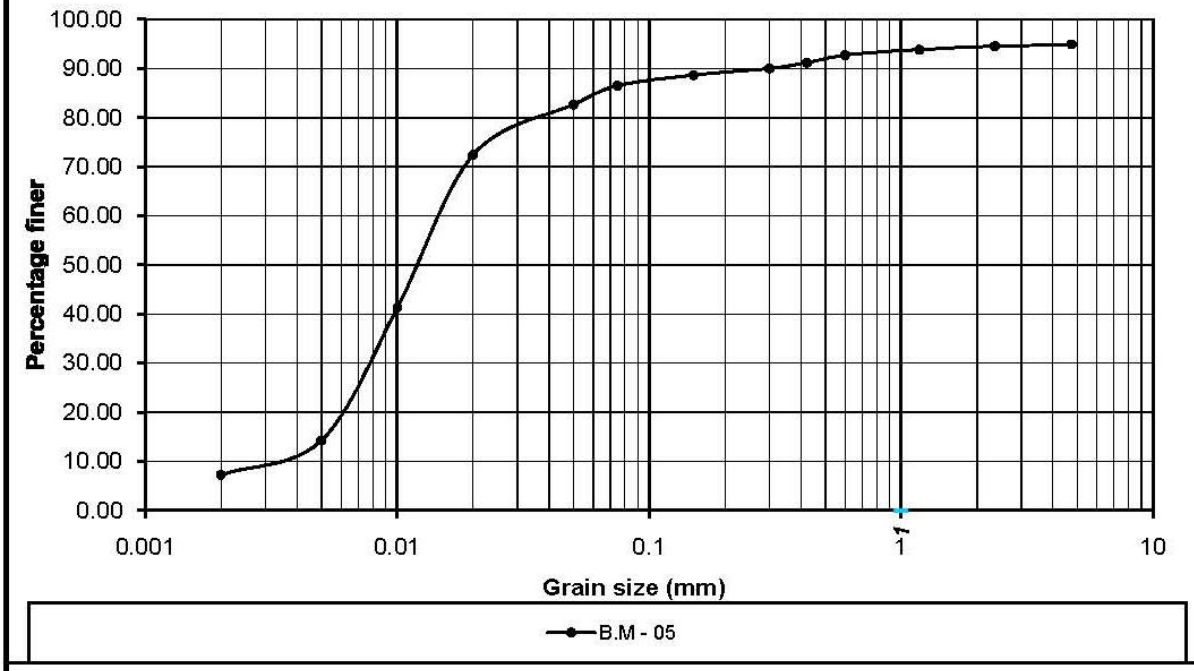
GRAIN SIZE DISTRIBUTION CURVES



Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Sand (%)**	**Gravel (%)**
B.M - 04	8.5	62.0	20.5	9.0

*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 (%)**
B.M - 05	7.23	53.50	34.15	5.12

*Silt & Clay

Annexure-14 Water Sample:-

RESULTS OF EXAMINATION OF SAMPLES OF WATER

SITE- RIVER JHINJIRAM

PARAMETER – pH Value at 25°C

SL.NO	B.M	DATE	LOCATION	PARAMETER	WATER SAMPLE RESULTS	PERMISSIBLE LIMITS IS:456-2000
1	1	16.1.2016	Upper	pH Value at 25°C	6.6	6.5 - 8.5
			Middle		7.1	
			Bottom		6.5	
2	4	18.1.2016 – 19.1.2016	Upper		6.6	
			Middle		7.0	
			Bottom		6.4	
3	5	20.1.2016	Upper		6.5	
			Middle		7.2	
			Bottom		6.4	

RESULTS OF EXAMINATION OF SAMPLES OF WATER

SITE- RIVER JHINJIRAM

PARAMETER – Chloride as Cl (mg/l)

SL.NO	B.M	DATE	LOCATION	PARAMETER	WATER SAMPLE RESULTS	PERMISSIBLE LIMITS IS:456-2000
1	1	16.1.2016	Upper	Chloride as Cl (mg/l)	10	2000 mg/l for concrete not containing embedded steel and 500 mg/l for reinforced concrete work.
			Middle		9	
			Bottom		6	
2	4	18.1.2016 – 19.1.2016	Upper		11	
			Middle		8	
			Bottom		5	
3	5	20.1.2016	Upper		9	
			Middle		7	
			Bottom		6	

RESULTS OF EXAMINATION OF SAMPLES OF WATER

SITE- RIVER JHINJIRAM

PARAMETER – Sulphates as SO_4 (mg/l)

SL.NO	B.M	DATE	LOCATION	PARAMETER	WATER SAMPLE RESULTS	PERMISSIBLE LIMITS IS:456-2000
1	1	16.1.2016	Upper	Sulphates as SO_4 (mg/l)	74	400(mg/l)
			Middle		69	
			Bottom		46	
2	4	18.1.2016 – 19.1.2016	Upper		75	
			Middle		68	
			Bottom		45	
3	5	20.1.2016	Upper		74	
			Middle		68	
			Bottom		46	

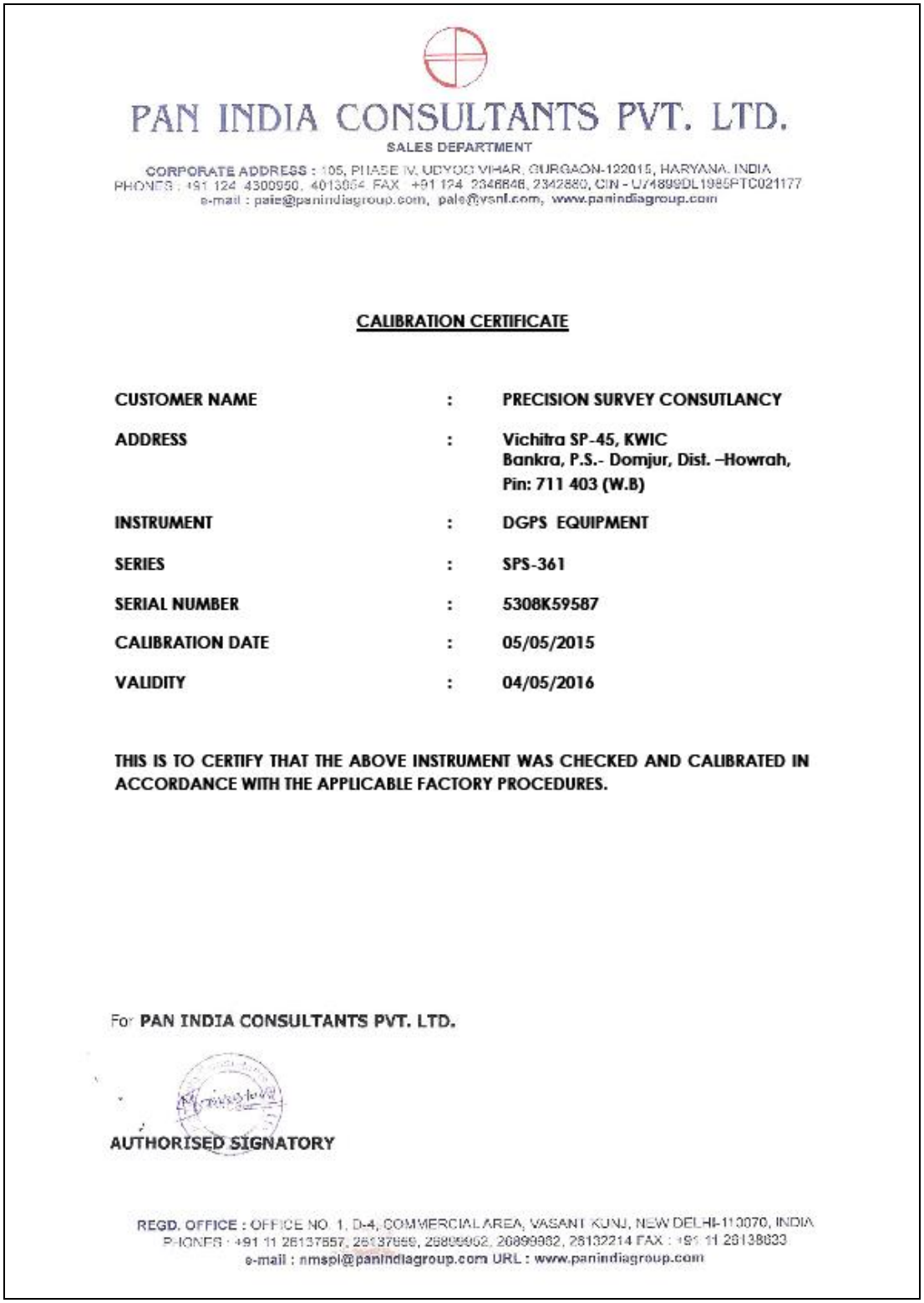
RESULTS OF EXAMINATION OF SAMPLES OF WATER

SITE- RIVER JHINJIRAM

PARAMETER – Sediment Concentration(mg/l)

SL.NO	B.M	DATE	LOCATION	PARAMETER	WATER SAMPLE RESULTS	PERMISSIBLE LIMITS IS:456-2000
1	1	16.1.2016	Upper	Sediment Concentration(mg/l)	30	2000(mg/l)
			Middle		45	
			Bottom		140	
2	4	18.1.2016-19.1.2016	Upper		35	
			Middle		48	
			Bottom		145	
3	5	20.1.2016	Upper		40	
			Middle		50	
			Bottom		148	

Annexure-15 Calibration Certificate:-



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PHONES : +91 124 4300950, 4013064 FAX : +91 124 2346846, 2342880, CIN - U74899DL1995PTC021177
e-mail : pais@panindiagroup.com, pais@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	:	05/05/2015
VALIDITY	:	04/05/2016

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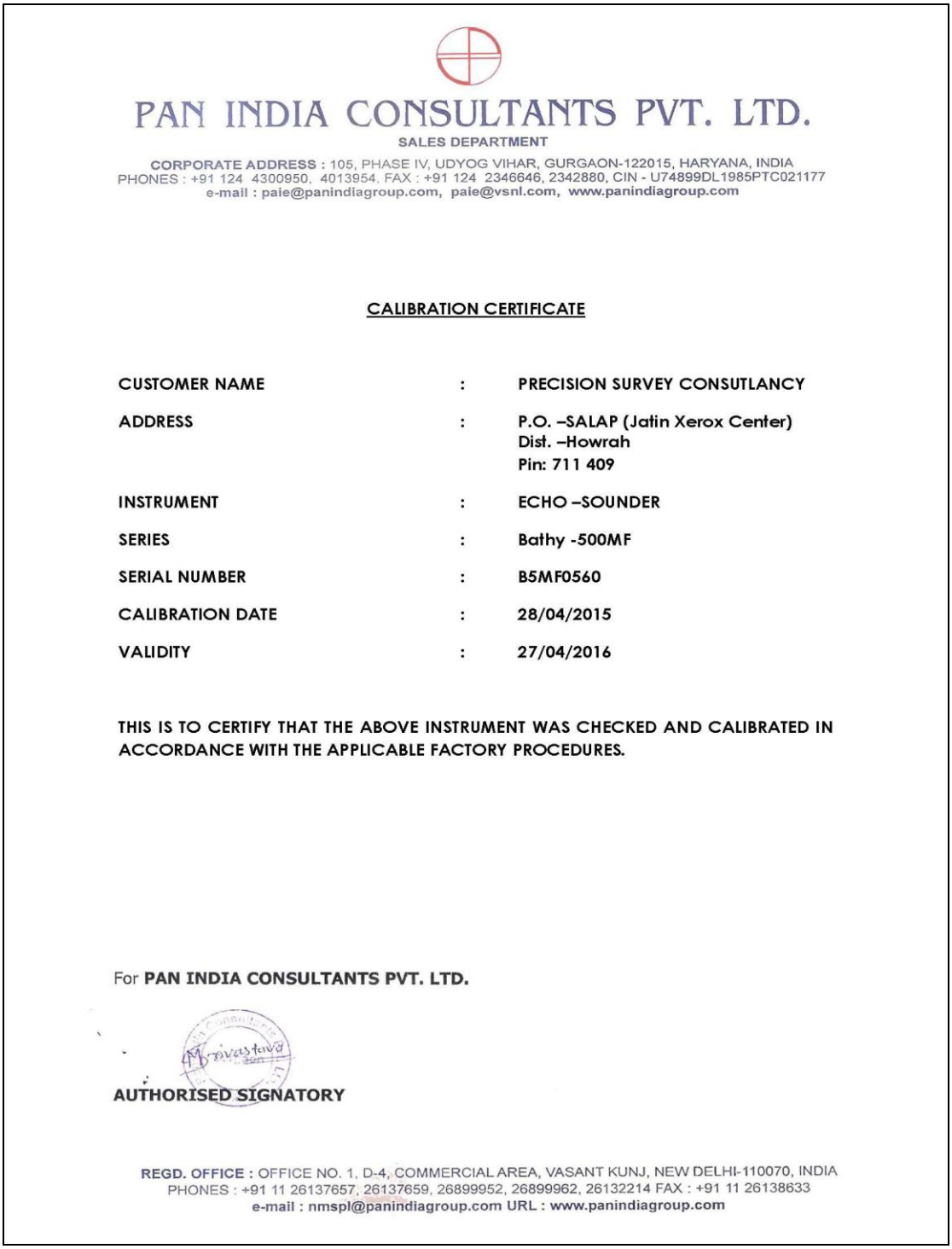
e-mail : nmspl@panindiagroup.com URL : www.panindiagroup.com

Figure 25- Calibration Certificate of DGPS



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 (Jatin Xerox Center) Dist. –Howrah Pin: 711 409
INSTRUMENT	:	ECHO –SOUNDER
SERIES	:	Bathy -500MF
SERIAL NUMBER	:	B5MF0560
CALIBRATION DATE	:	28/04/2015
VALIDITY	:	27/04/2016

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

For PAN INDIA CONSULTANTS PVT. LTD.

AUTHORISED SIGNATORY

REGD. OFFICE : OFFICE NO. 1, D-4, COMMERCIAL AREA, VASANT KUNJ, NEW DELHI-110070, INDIA
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Figure 26- Calibration Certificate of Echo Sounder

SOUTH

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

Calibration Certificate

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

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

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

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

Authorised Signatory

Figure 27- Calibration Certificate of GPS-RTK

Annexure-16 Site Picture:-

Figure 28 Site Picture of Topography Survey

Annexure-17 Survey Charts:-

LIST OF SURVEY CHARTS OF JINJIRAM RIVER (NW-50)								
Sl. No.	**Chart No.**	**Location**	**Chainage (Form…….km. To…...km.)**	**Chart Datum And Water Level w.r.t M.S.L**			**Value of Reduction**	**Remarks**
				Chainage (km)	**CD (m)**	**WL (m)**		
1.	P_01	Fulerchar Pt-IV to Malakhawa	0.0 km to 5.0 km	0.907	22.289	24.453	-2.164	GS :- 1
				13.098	22.675	24.851	-2.176	GS:- 2
2.	P_02	Malakhawa to Khopati Pt-IV	5.0 km to 13.0 km	13.098	22.675	24.851	-2.176	GS:- 2
				21.982	22.956	25.524	-2.568	GS:- 3
3.	P_03	Khopati Pt-IV to Khopati Pt-II	13.0 km to 23.5 km	21.982	22.956	25.524	-2.568	GS:- 3
				30.765	23.235	25.605	-2.370	GS:- 4
4.	P_04	Khopati Pt-II to Magurmari	23.5 kmto 30.2 km	30.765	23.235	25.605	-2.370	GS:- 4
				41.677	23.581	25.663	-2.082	GS:- 5
5.	P_05	Magurmari to Rajabala Bhlukamari	30.2 km to 35.0 km	41.677	23.581	25.663	-2.082	GS:- 5
6.	P_06	Rajabala Bhlukamari to Tumni Lawkhowa	35.0 km to 40.1 km	41.677	23.581	25.663	-2.082	GS:- 5
				42.576	23.609	25.712	-2.103	GS:- 6
7.	P_07	Tumni Lawkhowa to Rajabala Terserari	40.1 km to 42.576 km	42.576	23.609	25.712	-2.103	GS:- 6

Table 21- Survey Chart

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

Survey period: - 10th December, 2015 to 12th January, 2016

✧ **G.S:-** Gauge Station