



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

**KYN Shi RIVER (NW-61) (27.870 km)**

FROM “BANGLADESH BORDER NEAR MAWPYLLUN TO BRIDGE ON NONGHYLLAM-MAWEIT  
ROAD”

Survey Period from 13.04.2016 TO 21.04.2016



## FINAL REPORT ON HYDROGRAPHICAL SURVEY OF KYN Shi RIVER, MEGHALAYA

REPORT SUBMISSION DATE- 13.09.2018

SUBMITTED BY:

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**FINAL FEASIBILITY REPORT ON  
“DETAILED HYDROGRAPHIC SURVEY IN KYNshi  
RIVER IN MEGHALAYA (27.870 KMS)**





**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 (Kynshi River) from Bangladesh Border at Mawpyllun to Bridge on Nonghyllam-Maweit Road (27.870 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 Kynshi 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.

	<p style="text-align: center;"><b>FINAL FEASIBILITY REPORT ON “DETAILED HYDROGRAPHIC SURVEY IN KYNshi RIVER IN MEGHALAYA (27.870 KMS)</b></p>	
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**List of Abbreviations**

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

	<p align="center"><b>FINAL FEASIBILITY REPORT ON</b>  <b>“DETAILED HYDROGRAPHIC SURVEY IN KYNshi</b>  <b>RIVER IN MEGHALAYA (27.870 KMS)</b></p>	
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### **Salient Features of Kynshi River**

Sl	Particulars	Details																																																								
1.	Name of the Consultant	Precision Survey consultancy																																																								
2.	Region / Cluster number & State(s)	Region IX, Meghalaya																																																								
3.	a) Waterway name b) NW # c) Total Stretch and length of declared NW (from ... to..., length...km) d) Survey Period (... to ...)	a) Kynshi River b) NW-61 c) From Bangladesh Border near Mawpyllun (Chainage-0.000 km) to Bridge on Nonghyllam-Mawait Road (Chainage-27.870 km) d) 13 <sup>th</sup> April, 2016 to 21st April, 2016																																																								
4.	Tidal & non tidal portions (from... to, length, tidal variation at every 10km)	There are no Tidal influence or portions found in this zone of River.																																																								
5.	LAD (Least Available Depth) status  i) < 1.2 m ii) 1.2 m to 1.4 m iii) 1.5 m to 1.7 m iv) 1.8 m to 2.0 m v) > 2.0 m          i) < 1.2 m ii) 1.2 m to 1.4 m iii) 1.5 m to 1.7 m iv) 1.8 m to 2.0 m v) > 2.0 m	<p style="text-align: center;"><b><u>Observed Depth</u></b></p> <table><tr><th>Sub-Stretch-1 (0 -10 km)</th><th>Sub-Stretch- 2 (10 -20 km)</th><th>Sub-Stretch - 3 (20-27.870 km)</th><th>Total (km)</th></tr><tr><td>6.8</td><td>10.00</td><td>7.870</td><td>24.67</td></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>3.2</td><td>0</td><td>0</td><td>3.2</td></tr><tr><td>Total = 10.0</td><td>Total =10.0</td><td>Total =7.870</td><td>27.870 km</td></tr></table> <p style="text-align: center;"><b><u>Reduced Depth</u></b></p> <table><tr><th>Sub-Stretch-1 (0 -10 km)</th><th>Sub-Stretch- 2 (10 -20 km)</th><th>Sub-Stretch - 3 (20-27.870 km)</th><th>Total (km)</th></tr><tr><td>6.8</td><td>10.00</td><td>7.870</td><td>24.67</td></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>3.2</td><td>0</td><td>0</td><td>3.2</td></tr><tr><td>Total = 10.0</td><td>Total =10.0</td><td>Total =7.870</td><td>27.870</td></tr></table>	Sub-Stretch-1 (0 -10 km)	Sub-Stretch- 2 (10 -20 km)	Sub-Stretch - 3 (20-27.870 km)	Total (km)	6.8	10.00	7.870	24.67	0	0	0	0	0	0	0	0	0	0	0	0	3.2	0	0	3.2	Total = 10.0	Total =10.0	Total =7.870	27.870 km	Sub-Stretch-1 (0 -10 km)	Sub-Stretch- 2 (10 -20 km)	Sub-Stretch - 3 (20-27.870 km)	Total (km)	6.8	10.00	7.870	24.67	0	0	0	0	0	0	0	0	0	0	0	0	3.2	0	0	3.2	Total = 10.0	Total =10.0	Total =7.870	27.870
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6.	<p>Cross structures</p> <p>i) Dams, weirs, barrages etc (total number; with navigation locks or not)</p> <p>ii) Bridges, Power cables etc [ total number; range of horizontal and vertical clearances w.r.t H.F.L /MHWS ]</p>	<p>i) There is no Dam, weir or Barrage found in this zone of river.</p> <p>ii) Total number of RCC Bridge- 1 (one)</p> <table><tr><th>Bridge</th><th>Horizontal Clearance (m)</th><th>Vertical Clearance w.r.t H.F.L (m)</th></tr><tr><td>Borba Sing Shyam Bridge</td><td>150 m</td><td>2.00 m</td></tr></table> <p>iii) There is no H.T line or Electric line found in this zone of river.</p>	Bridge	Horizontal Clearance (m)	Vertical Clearance w.r.t H.F.L (m)	Borba Sing Shyam Bridge	150 m	2.00 m																																																																																																																																																												
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7.	Slope	<table><tr><th colspan="2">Reach</th><th>River / Canal Bed Level Change (m)</th><th>Distance (km)</th><th>Slope (m/km)</th><th>Slope (cm/km)</th></tr><tr><th>From</th><th>To</th><td></td><td></td><td></td><td></td></tr><tr><td>1.500</td><td>4.500</td><td>1.100</td><td>3.000</td><td>0.367</td><td>36.67</td></tr><tr><td>4.600</td><td>5.500</td><td>0.500</td><td>0.900</td><td>0.556</td><td>55.56</td></tr><tr><td>5.600</td><td>6.500</td><td>0.350</td><td>0.900</td><td>0.389</td><td>38.89</td></tr><tr><td>6.600</td><td>7.500</td><td>1.650</td><td>0.900</td><td>1.833</td><td>183.33</td></tr><tr><td>7.600</td><td>8.500</td><td>1.650</td><td>0.900</td><td>1.833</td><td>183.33</td></tr><tr><td>8.600</td><td>9.500</td><td>1.650</td><td>0.900</td><td>1.833</td><td>183.33</td></tr><tr><td>9.600</td><td>10.500</td><td>1.650</td><td>0.900</td><td>1.833</td><td>183.33</td></tr><tr><td>10.600</td><td>11.500</td><td>1.700</td><td>0.900</td><td>1.889</td><td>188.89</td></tr><tr><td>11.600</td><td>12.500</td><td>1.700</td><td>0.900</td><td>1.889</td><td>188.89</td></tr><tr><td>12.600</td><td>13.500</td><td>8.900</td><td>0.900</td><td>9.889</td><td>988.89</td></tr><tr><td>13.600</td><td>14.500</td><td>9.200</td><td>0.900</td><td>10.222</td><td>1022.22</td></tr><tr><td>14.600</td><td>15.500</td><td>8.200</td><td>0.900</td><td>9.111</td><td>911.11</td></tr><tr><td>15.600</td><td>16.500</td><td>8.500</td><td>0.900</td><td>9.444</td><td>944.44</td></tr><tr><td>16.600</td><td>17.500</td><td>8.300</td><td>0.900</td><td>9.222</td><td>922.22</td></tr><tr><td>17.600</td><td>18.500</td><td>11.500</td><td>0.900</td><td>12.778</td><td>1277.78</td></tr><tr><td>18.600</td><td>19.500</td><td>6.200</td><td>0.900</td><td>6.889</td><td>688.89</td></tr><tr><td>19.600</td><td>20.500</td><td>8.800</td><td>0.900</td><td>9.778</td><td>977.78</td></tr><tr><td>20.600</td><td>21.500</td><td>9.300</td><td>0.900</td><td>10.333</td><td>1033.33</td></tr><tr><td>21.600</td><td>22.500</td><td>13.800</td><td>0.900</td><td>15.333</td><td>1533.33</td></tr><tr><td>22.600</td><td>23.500</td><td>9.500</td><td>0.900</td><td>10.556</td><td>1055.56</td></tr><tr><td>23.600</td><td>24.500</td><td>18.100</td><td>0.900</td><td>20.111</td><td>2011.11</td></tr><tr><td>24.600</td><td>25.500</td><td>9.500</td><td>0.900</td><td>10.556</td><td>1055.56</td></tr><tr><td>25.600</td><td>26.500</td><td>10.600</td><td>0.900</td><td>11.778</td><td>1177.78</td></tr><tr><td>26.600</td><td>27.870</td><td>8.700</td><td>1.27</td><td>6.850</td><td>685.04</td></tr><tr><td colspan="3">Total</td><td>24.07</td><td>Avg-7.303</td><td>Avg-730.30</td></tr></table>	Reach		River / Canal Bed Level Change (m)	Distance (km)	Slope (m/km)	Slope (cm/km)	From	To					1.500	4.500	1.100	3.000	0.367	36.67	4.600	5.500	0.500	0.900	0.556	55.56	5.600	6.500	0.350	0.900	0.389	38.89	6.600	7.500	1.650	0.900	1.833	183.33	7.600	8.500	1.650	0.900	1.833	183.33	8.600	9.500	1.650	0.900	1.833	183.33	9.600	10.500	1.650	0.900	1.833	183.33	10.600	11.500	1.700	0.900	1.889	188.89	11.600	12.500	1.700	0.900	1.889	188.89	12.600	13.500	8.900	0.900	9.889	988.89	13.600	14.500	9.200	0.900	10.222	1022.22	14.600	15.500	8.200	0.900	9.111	911.11	15.600	16.500	8.500	0.900	9.444	944.44	16.600	17.500	8.300	0.900	9.222	922.22	17.600	18.500	11.500	0.900	12.778	1277.78	18.600	19.500	6.200	0.900	6.889	688.89	19.600	20.500	8.800	0.900	9.778	977.78	20.600	21.500	9.300	0.900	10.333	1033.33	21.600	22.500	13.800	0.900	15.333	1533.33	22.600	23.500	9.500	0.900	10.556	1055.56	23.600	24.500	18.100	0.900	20.111	2011.11	24.600	25.500	9.500	0.900	10.556	1055.56	25.600	26.500	10.600	0.900	11.778	1177.78	26.600	27.870	8.700	1.27	6.850	685.04	Total			24.07	Avg-7.303	Avg-730.30
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23.600	24.500	18.100	0.900	20.111	2011.11																																																																																																																																																															
24.600	25.500	9.500	0.900	10.556	1055.56																																																																																																																																																															
25.600	26.500	10.600	0.900	11.778	1177.78																																																																																																																																																															
26.600	27.870	8.700	1.27	6.850	685.04																																																																																																																																																															
Total			24.07	Avg-7.303	Avg-730.30																																																																																																																																																															





**FINAL FEASIBILITY REPORT ON  
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8.	Discharge Report	<table><tr><th>Sl no</th><th>Chainage (km)</th><th>Discharge (cu.m/s)</th><th rowspan="4">Dated 13.04.16 to 21.04.16</th></tr><tr><td>1</td><td>1.700</td><td>218.00</td></tr><tr><td>2</td><td>6.374</td><td>105.11</td></tr><tr><td colspan="2">Avg. Discharge</td><td>161.55</td></tr></table>	Sl no	Chainage (km)	Discharge (cu.m/s)	Dated 13.04.16 to 21.04.16	1	1.700	218.00	2	6.374	105.11	Avg. Discharge		161.55
Sl no	Chainage (km)	Discharge (cu.m/s)	Dated 13.04.16 to 21.04.16												
1	1.700	218.00													
2	6.374	105.11													
Avg. Discharge		161.55													
9.	i) Present IWT operations ii) Ferry services, tourism, cargo, if any	i) As follows  ii) There is no Ferry service available in this zone of river. There is no cargo and industry found in this zone of river.													
10.	Approx. distance of Rail & Road from waterway	Nearest Railway station- Guwahati (235 km from project Site approximately) Name of National Highway close to the River-NH-62, NH-44 E, NH-127B Name of SH-1, SH-4, SH- 10													
11.	Any other information / comment														



**FINAL FEASIBILITY REPORT ON  
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RIVER IN MEGHALAYA (27.870 KMS)**



## **Section-1: Introductory Considerations**

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

Kynshi River, also known as Jadukata, is one of the important rivers in Meghalaya. This 143 km long river irrigates over 2000 sq km of area. The main tributaries of Kynshi are Umrilang (60 km long) and Um-mawblei (71 km long). Kynshi River is also known as Kynshiang at the confluence with Umkyrtha. Nongkhnum Island, the biggest river island in Meghalaya, has been formed by the bifurcation of the Kynshi River into two rivers namely- Phanliang River and Namliang River. At the point of bifurcation, there is a charming sandy beach called Wei-Phanliang, about 100 sq m in area. Kynshi is an important river for angling. Kynshi flows towards the southern part of the West Khasi Hills of Meghalaya. Finally, this river flow further south into Bangladesh.



**Figure 1- Kynshi river Site Map**



**FINAL FEASIBILITY REPORT ON  
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## 1.2 Tributaries / Network of River/ Basin

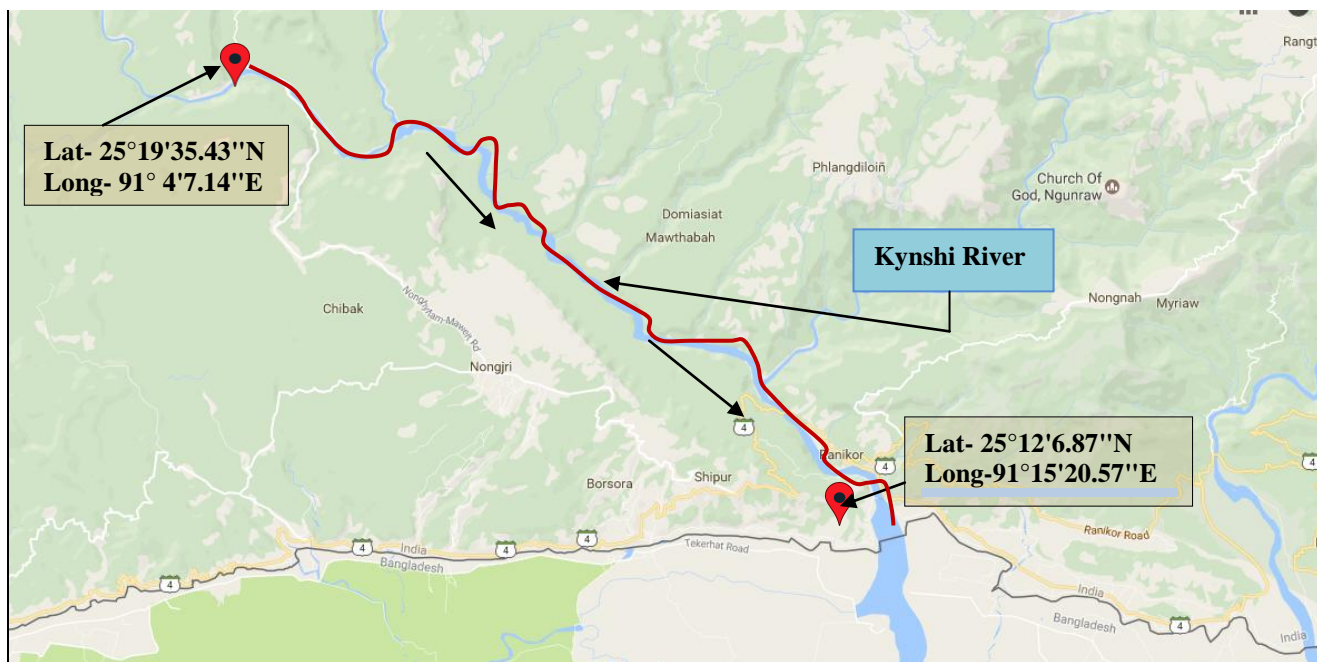
The major tributaries of this river are –

- i) Umrilang River
- ii) Um-mawblei River



## 1.3 State / District through which river passes

Firstly the river passes through West Khasi Hills District in Meghalaya and Finally Passes through Bangladesh.

## 1.4 Project Site Location Map



**Figure 2- Project Site Location Map**

	<p style="text-align: center;"><b>FINAL FEASIBILITY REPORT ON “DETAILED HYDROGRAPHIC SURVEY IN KYNshi RIVER IN MEGHALAYA (27.870 KMS)</b></p>	
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### 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 has been 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 30cm X 30cm X 150cm.
- 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 Kynshi River waterway and to provide an appropriate economic and organizational framework for restoring trade and navigation (cargo and passengers) on the Kynshi River with an aim to do as follows:
- Improve public and private investments into transport on the Kynshi 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 Kynshi River basin and Propose improvement of the infrastructure.

## Section-2: Methodology Adopted to undertake Study

### 2.1 Methodology Adopted including Resources and equipment used and calibration

#### ➤ Equipment:-

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 Kynshi River has been carried out from “Bangladesh Border near Mawpyllun (Latitude-25°12'6.87"N, Longitude-91°15'20.57"E) to Bridge on Nonghyllam-Maweit Road (Latitude-25°19'35.43"N, Longitude- 91°4'7.14"E).” The Length of the Topography survey has been carried out from Bangladesh Border near Mawpyllun (Chainage-0.000 km) to Bridge on Nonghyllam-Maweit Road (Chainage-27.870 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.





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○ **Bathymetry Survey**

- Bathy 500 MF was used to obtain soundings onboard the survey boat. A working frequency of 210 KHz was used for sounding operations. The digital output from the echo sounder was automatically fed to the HYPACK data logging software on a real-time basis for the acquisition of survey data. No breakdown of equipment was reported and the performance of the equipment was found to be satisfactory during the entire duration of the survey.
- The sound velocity was set to 1495 m/s on single beam echo sounder during acquisition. The Daily bar checks were done prior to the sounding operation and before the closing of the sounding operation for the day. Being very shallow depths, the echo sounder depths were also cross-checked in between by using demarcated sounding poles during the conduct of the survey. The sounding lines were run using Survey boat to identify the channel of the river for the possible stretch. The cross lines were run perpendicular to the orientation of river flow (i.e. perpendicular to the orientation of depth contours) in respective stretches. The spot sounding was also carried out in the area where the survey boat cannot be operated due to low depth. The DGPS position along with water depths was recorded simultaneously and the tidal reduction was applied to the obtained depths. However, the Bathymetry survey was not possible in Kynshi River due to insufficient layer of water in this zone of river.



	<p align="center"><b>FINAL FEASIBILITY REPORT ON “DETAILED HYDROGRAPHIC SURVEY IN KYNshi RIVER IN MEGHALAYA (27.870 KMS)</b></p>	
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## 2.2 Description of Bench Marks (B.M) / authentic Reference Level used in Survey

For the Topography survey, the Horizontal control/Vertical control has been carried out from Bench Mark No-BM-2 using DGPS observation mode in 8 hrs. The Level of the Bench Mark is-

Location Name	Geographic position		UTM position		R.L w.r.t M.S.L (m)
	Latitude (N)	Longitude (E)	Northing	Easting	
Ranikor village	25°14'08.25314"	91°13'22.09662"	2792222.575	320988.857	51.992 m.

Project file data		Coordinate System	
Name:		Name:	World wide/UTM
Size:		Datum:	WGS 1984
Modified:	8/30/2013 1:12:17 PM (UTC:-6)	Zone:	46 North
Time zone:	Mountain Standard Time	Geoid:	EGM96 (Global)
Reference number:		Vertical datum:	
Description:			
Comment 1:			
Comment 2:			
Comment 3:			

## Baseline Processing Report

### Processing Summary

Observation	From	To	Solution Type	H. Prec. (Meter)	V. Prec. (Meter)	Geodetic Az.	Ellipsoid Dist. (Meter)	ΔHeight (Meter)
BM 1 --- BM 2 (B2)	BM 2	BM 1	Fixed	0.004	0.019	130°54'27"	4063.172	-35.468
BM2 --- BM2_A (B1)	BM 2	BM2_A	Fixed	0.001	0.003	238°04'51"	125.613	-0.373
BM1 --- BM2_A (B3)	BM 1	BM2_A	Fixed	0.004	0.024	309°14'39"	4102.018	35.119





**FINAL FEASIBILITY REPORT ON  
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RIVER IN MEGHALAYA (27.870 KMS)**



<b>Baseline observation:</b>	BM1 --- BM2 (B2)
<b>Processed:</b>	Invalid leap seconds
<b>Solution type:</b>	Fixed
<b>Frequency used:</b>	Multiple Frequencies
<b>Horizontal precision:</b>	0.004 m
<b>Vertical precision:</b>	0.019 m
<b>RMS:</b>	0.020 m
<b>Maximum PDOP:</b>	4.240
<b>Ephemeris used:</b>	Broadcast
<b>Antenna model:</b>	NGS Absolute
<b>Processing start time:</b>	Invalid leap seconds (Local: UTC+5hr)
<b>Processing stop time:</b>	Invalid leap seconds (Local: UTC+5hr)
<b>Processing duration:</b>	02:40:10
<b>Processing interval:</b>	1 second

<b>From:</b>	BM2				
<b>Grid</b>		<b>Local</b>		<b>Global</b>	
<b>Easting</b>	320988.857 m	<b>Latitude</b>	N25°14'08.25314"	<b>Latitude</b>	N25°14'08.25314"
<b>Northing</b>	2792222.575 m	<b>Longitude</b>	E91°13'22.09662"	<b>Longitude</b>	E91°13'22.09662"
<b>Elevation</b>	51.992 m	<b>Height</b>	1.062 m	<b>Height</b>	1.062 m

<b>To:</b>	BM1				
<b>Grid</b>		<b>Local</b>		<b>Global</b>	
<b>Easting</b>	324024.257m	<b>Latitude</b>	N25°12'41.76"	<b>Latitude</b>	N25°12'41.76"
<b>Northing</b>	2789521.405 m	<b>Longitude</b>	E91°15'11.79"	<b>Longitude</b>	E91°15'11.79"
<b>Elevation</b>	17.063 m	<b>Height</b>	-34.059 m	<b>Height</b>	-34.059 m

	<p style="text-align: center;"><b>FINAL FEASIBILITY REPORT ON “DETAILED HYDROGRAPHIC SURVEY IN KYN Shi RIVER IN MEGHALAYA (27.870 KMS)</b></p>	
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### 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 DGPS Mode was used for transfer of sounding datum for 8 hrs in Ranikor village and in topography the same level is used to interpolate the datum. The Lowest level in the each km of Stretch is taken as Datum and same is used for reduction and other calculations.

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

For this NW, CD was not provided by IWAI. The DGPS Mode was used for transfer of sounding datum for 8 hrs in Ranikor village (show page-15-16). In topography also the same level is used to interpolate the datum. The Lowest level in the each km of Stretch is taken as Datum and same is used for reduction and other calculations as mentioned table no-5, page no-20.

### 2.6 Transfer of Sounding Datum table for tidal rivers / canals

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

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

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

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

There are no Dams, Barrage, Weirs, Anicut, Locks, Aqueducts found in this zone of river.

### 2.9 Description of erected Bench Mark Pillars:-

BM No	Location	Chainage (km)	Latitude (N)	Longitude (E)	Easting	Northing	BM Height above MSL (m)	BM Height above SD (m)
BM-1	Mawpyllun Village	1.700	25°12'41.76"	91°15'11.79"	324024.257	2789521.405	17.063	6.463
BM-2	Near Borba Sing Bridge	6.374	25°14'8.23"	91°13'22.07"	320988.857	2792222.575	51.992	41.092
BM-3	Thadteja	27.982	25°19'20.064"	91°04'18.752"	305920.661	2802026.778	182.956	171.556

**Table 2-BM Pillar Details**



### 2.9.1 C.W.C Gauge Details

BM No	Location	Chainage (km)	Latitude (N)	Longitude (E)	Easting	Northing	BM Height above MSL (m)
CWC Gauge	Ranikor	1.700	25°13'11.369"	91°14'44.216"	323264.146	2790442.147	16.656 m

**Table 3-CWC Gauge Details**



**Figure 3-CWC Gauge Site**



	<p style="text-align: center;"><b>FINAL FEASIBILITY REPORT ON “DETAILED HYDROGRAPHIC SURVEY IN KYN Shi RIVER IN MEGHALAYA (27.870 KMS)</b></p>	
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## 2.10 Details of collected Water level of different gauge stations:

Chainage (km)	Gauge station	Easting	Northing	Latitude (N)	Longitude (E)	WL w.r.t M.S.L (m)
1.500	GS (TP)-1	323883.65	2789651.84	25°12'45.95"	91°15'06.713"	10.556
4.500	GS (TP)-2	321777.77	2791200.72	25°13'35.386"	91°13'50.763"	10.900
5.500	GS (TP)-3	321145.75	2791981.36	25°14'00.482"	91°13'27.816"	11.400
6.500	GS (TP)-4	320367.95	2792587.65	25°14'19.849"	91°12'59.741"	11.750
7.500	GS (TP)-5	320030.27	2793449.98	25°14'47.724"	91°12'47.266"	13.400
8.500	GS (TP)-6	319326.25	2794049.20	25°15'06.891"	91°12'21.826"	15.050
9.500	GS (TP)-7	318361.61	2794413.41	25°15'18.306"	91°11'47.184"	16.700
10.500	GS (TP)-8	317381.21	2794413.41	25°15'17.877"	91°11'12.152"	18.400
11.500	GS (TP)-9	316436.64	2794639.55	25°15'24.809"	91°10'38.292"	20.100
12.500	GS (TP)-10	316018.90	2795507.77	25°15'52.837"	91°10'22.943"	29.000
13.500	GS (TP)-11	315235.14	2796120.52	25°16'12.4"	91°09'54.636"	38.200
14.500	GS (TP)-12	314481.11	2796753.94	25°16'32.647"	91°09'27.38"	46.400
15.500	GS (TP)-13	313817.61	2797259.49	25°16'48.777"	91°09'03.419"	54.900
16.500	GS (TP)-14	313143.06	2797882.43	25°17'08.716"	91°08'39.004"	63.200
17.500	GS (TP)-15	312519.68	2798444.79	25°17'26.708"	91°08'16.445"	74.700
18.500	GS (TP)-16	311857.58	2799121.79	25°17'48.407"	91°07'52.444"	80.900
19.500	GS (TP)-17	311687.71	2800025.21	25°18'17.685"	91°07'45.922"	89.700
20.500	GS (TP)-18	311142.41	2800441.92	25°18'30.977"	91°07'26.221"	99.000
21.500	GS (TP)-19	310478.73	2801000.79	25°18'48.834"	91°07'02.217"	112.800
22.500	GS (TP)-20	309461.95	2801156.16	25°18'53.417"	91°06'25.791"	122.300
23.500	GS (TP)-21	308740.97	2800593.80	25°18'34.813"	91°06'00.303"	140.400
24.500	GS (TP)-22	307824.46	2800272.30	25°18'23.943"	91°05'27.705"	149.900
25.500	GS (TP)-23	307058.34	2800764.57	25°18'39.583"	91°05'00.069"	160.500
26.500	GS (TP)-24	306477.81	2801578.50	25°19'05.759"	91°04'38.9"	169.200
27.500	GS (TP)-25	305774.64	2802280.25	25°19'28.232"	91°04'13.402"	179.600

**Table 4-Details of water level in different Gauge Stations**





	<b>FINAL FEASIBILITY REPORT ON “DETAILED HYDROGRAPHIC SURVEY IN KYNshi RIVER IN MEGHALAYA (27.870 KMS)</b>	
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## 2.11 Chart Datum / Sounding Datum and Reductions details:

Sl no	CWC gauge / Dam / Barrage / Weir / Anicut / Bench Mark / tide gauges	Chainage (km)	Stretch for corrected soundings and topo levels (km)	Established Sounding Datum w.r.t. MSL (m) at col. A.	Sounding Datum of Tide Gauge w.r.t. MSL (m)	Correction in WL data for Bathymetric survey (m)	Topo level data to be converted as depth for volume calculation w.r.t. SD (m)
	A	B	C (50% stretch is to be selected on both side of tide gauge)	D +ve indicates above MSL -ve indicates below MSL	E	F = (E- WL data in MSL)	G = (E- Topo levels in MSL)
1	GS-(TP)- 1	1.500	0 - 4		9.500	-1.056	Kynshi Reduced Topo.xyz
2	GS-(TP)- 2	4.500	4 - 5		10.600	-0.300	
3	GS-(TP) - 3	5.500	5 - 6		11.100	-0.300	Submitted in Soft copy
4	GS-(TP) - 4	6.500	6 - 7		11.450	-0.300	
5	GS-(TP)- 5	7.500	7 - 8		13.100	-0.300	
6	GS -(TP)- 6	8.500	8 - 9		14.750	-0.300	
7	GS-(TP)- 7	9.500	9 - 10		16.400	-0.300	
8	GS-(TP) - 8	10.500	10 - 11		18.100	-0.300	
9	GS-(TP)- 9	11.500	11 - 12		19.800	-0.300	
10	GS-(TP) - 10	12.500	12 - 13		28.700	-0.300	
11	GS-(TP)- 11	13.500	13 - 14		37.900	-0.300	
12	GS-(TP) - 12	14.500	14 - 15		46.100	-0.300	
13	GS-(TP)- 13	15.500	15 - 16		54.600	-0.300	
14	GS -(TP) -14	16.500	16 - 17		62.900	-0.300	
15	GS-(TP)- 15	17.500	17 - 18		74.400	-0.300	
16	GS-(TP) - 16	18.500	18 -19		80.600	-0.300	
17	GS-(TP) - 17	19.500	19 - 20		89.400	-0.300	
18	GS-(TP)- 18	20.500	20 - 21		98.700	-0.300	
19	GS-(TP)- 19	21.500	21- 22		112.500	-0.300	
20	GS-(TP) - 20	22.500	22 - 23		122.000	-0.300	
21	GS-(TP) -21	23.500	23 - 24		140.100	-0.300	
22	GS-(TP) - 22	24.500	24 - 25		149.600	-0.300	
23	GS-(TP) - 23	25.500	25 - 26		160.200	-0.300	
24	GS -(TP) -24	26.500	26 - 27		168.900	-0.300	
25	GS -(TP)- 25	27.500	27 - 27.870		179.300	-0.300	

**Table 5-Chart Datum / Sounding Datum & Reduction Details**



	<b>FINAL FEASIBILITY REPORT ON “DETAILED HYDROGRAPHIC SURVEY IN KYN Shi RIVER IN MEGHALAYA (27.870 KMS)</b>	
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## 2.12 Average Bed Slope:-

Reach		River / Canal Bed Level Change (m)	Distance (km)	Slope (m/km)	Slope (cm/km)
From	To				
1.500	4.500	1.100	3.000	0.367	36.67
4.600	5.500	0.500	0.900	0.556	55.56
5.600	6.500	0.350	0.900	0.389	38.89
6.600	7.500	1.650	0.900	1.833	183.33
7.600	8.500	1.650	0.900	1.833	183.33
8.600	9.500	1.650	0.900	1.833	183.33
9.600	10.500	1.650	0.900	1.833	183.33
10.600	11.500	1.700	0.900	1.889	188.89
11.600	12.500	1.700	0.900	1.889	188.89
12.600	13.500	8.900	0.900	9.889	988.89
13.600	14.500	9.200	0.900	10.222	1022.22
14.600	15.500	8.200	0.900	9.111	911.11
15.600	16.500	8.500	0.900	9.444	944.44
16.600	17.500	8.300	0.900	9.222	922.22
17.600	18.500	11.500	0.900	12.778	1277.78
18.600	19.500	6.200	0.900	6.889	688.89
19.600	20.500	8.800	0.900	9.778	977.78
20.600	21.500	9.300	0.900	10.333	1033.33
21.600	22.500	13.800	0.900	15.333	1533.33
22.600	23.500	9.500	0.900	10.556	1055.56
23.600	24.500	18.100	0.900	20.111	2011.11
24.600	25.500	9.500	0.900	10.556	1055.56
25.600	26.500	10.600	0.900	11.778	1177.78
26.600	27.870	8.700	1.27	6.850	685.04
Total			24.07	Avg-7.303	Avg-730.30

**Table 6-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.

	<p style="text-align: center;"><b>FINAL FEASIBILITY REPORT ON “DETAILED HYDROGRAPHIC SURVEY IN KYN Shi RIVER IN MEGHALAYA (27.870 KMS)</b></p>	
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## 2.16 Details of existing Bridge and Crossing over waterway:-

Sl. No	Structure Name	Chainage (km)	Location	Position				Length (m)	Width (m)	No. Of Piers	Horizontal Clearance (m)	Vertical Clearance w.r.t H.F. L (m)	Remarks
				Latitude (N)	Longitude (E)	Easting	Northing						
1	Borba Sing Syiem Steel Bridge	6.373	Chintusora Village	25°14'7.70"	91°13'20.89"	320955.892	2792206.339	149.01	9.51	2	150.0	2.00	Complete

**Table 7-Bridge Details**

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

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

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

There is no high tension line or electric line found in this zone of river.

## 2.19 Current Meter and Discharge Details:-

Since water depth was too low between chainage 6.374 km and 27.870 km, no bathymetry survey, current or discharge measurements have been conducted. The data recorded for Ch.-1.700 km and Ch.-6.374 km are given below-

Stretch No.	Chainage (km)	Position				Observed Depth (m) (D)	Velocity (m/sec.)	Average Velocity (m/sec.)	X-Sectional area (sq. m.)	Discharge (Cu.m/sec)
		Latitude (N)	Longitude (E)	Easting (m)	Northing (m)		0.5 D			
1	1.700	25°12'41.39"	91°15'09.339"	323955.314	2789510.680	1.7	0.819	0.819	266.18	218.00
2	6.374	25°14'06.208"	91°13'22.337"	320994.738	2792159.573	0.800	0.612	0.612	171.76	105.11

**Table 8-Current Meter Details**



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**2.20-a. Soil Sample Locations:-**

Sample No.	Chainage (km)	Latitude (N)	Longitude (E)	Easting (m)	Northing (m)	Depth (m)
1	1.700	25°12'41.39"	91°15'09.339"	323955.314	2789510.680	1.7
2	6.374	25°14'06.208"	91°13'22.337"	320994.738	2792159.573	0.800

**Table 9-Soil Sample Details**

**b. Water Sample Locations:-**

Sample No.	Chainage (km)	Latitude (N)	Longitude (E)	Easting (m)	Northing (m)	Depth (m)
1	1.700	25°12'41.39"	91°15'09.339"	323955.314	2789510.680	1.7
2	6.374	25°14'06.208"	91°13'22.337"	320994.738	2792159.573	0.800

**Table 10-Water Sample Details**

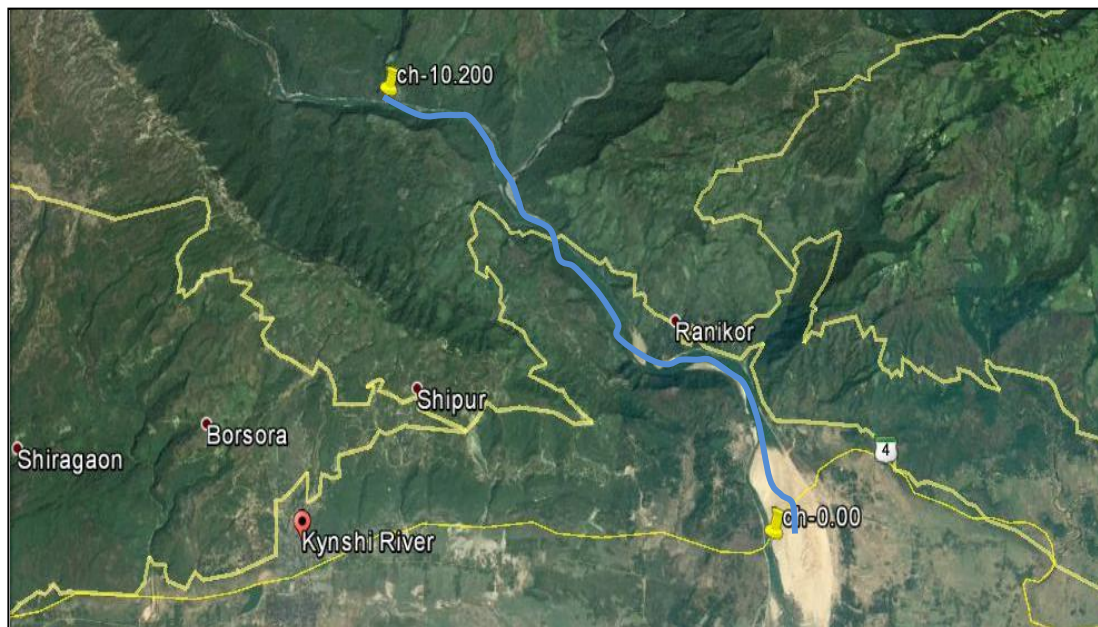


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### Section-3: Detailed Hydrographic Survey- Stretch Wise

#### 3.1 From Chainage 0.00 Km to Chainage 10.200 Km. (Indo-Bangladesh Border Area to Mawkhar)



**Figure 4 Chainage 0.00 km to Chainage 10.200 km**

The River width of Kynshi River from chainage 0.00 km to Chainage 10.200 km is approximately 964.00m to 98.28m. The average width portion of the river is 90 meter.

The River is situated in the hilly and dense forest area. So the river has been passed through some narrow channels. From Chainage 0.00 km to 1.5 km, both side of the river have been Charland and the Charland have been also seen till 3.5km on the left portion of the river. BM 1 is situated near at chainage 1.7 km right portion of the river bank. An irrigation canal has been found near at chainage of 2.4 km on the right portion of the river. BM 2 is also located near at chainage of 6.374 km right portion of the river bank. An RCC Bridge named Borba sing Syiem Bridge is situated near at chainage of 6.373 km. The Bridge's position is (Lat. - 25°14'7.70"N, Long.- 91°13'20.89"E) An Irrigation canal is also found near at chainage of 7.6 km right portion of the river bank. Bolder Pitching are also found near at chainage of chainage 8km to 8.7km to protect the river bank side. Um Rilang, the Tributary of the Kynshi river has been passed through Rajaju village. Mawpyllun, Ranikor, Alekwareng, Rajaju villages are situated right bank side of the river and Tilagaon, Rajai-A, Chintusora villages are situated left bank side of the river.

Class	Chainage (km)		Observed				Reduced w.r.t. Sounding Datum			
	From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Min. Dept h (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)
I	0.00	10.200	0.1	14.4	9000	320839.52	-0.3	13.4	10000	416736.13
II	0.00	10.200	0.003	14.4	9000	489337.24	-0.3	13.4	10000	613051.06
III	0.00	10.200	0.002	14.4	9000	740694.57	-0.3	13.4	10000	896576.74
IV	0.00	10.200	0.002	14.4	9000	894615.9	-0.3	13.4	10000	1060914.27

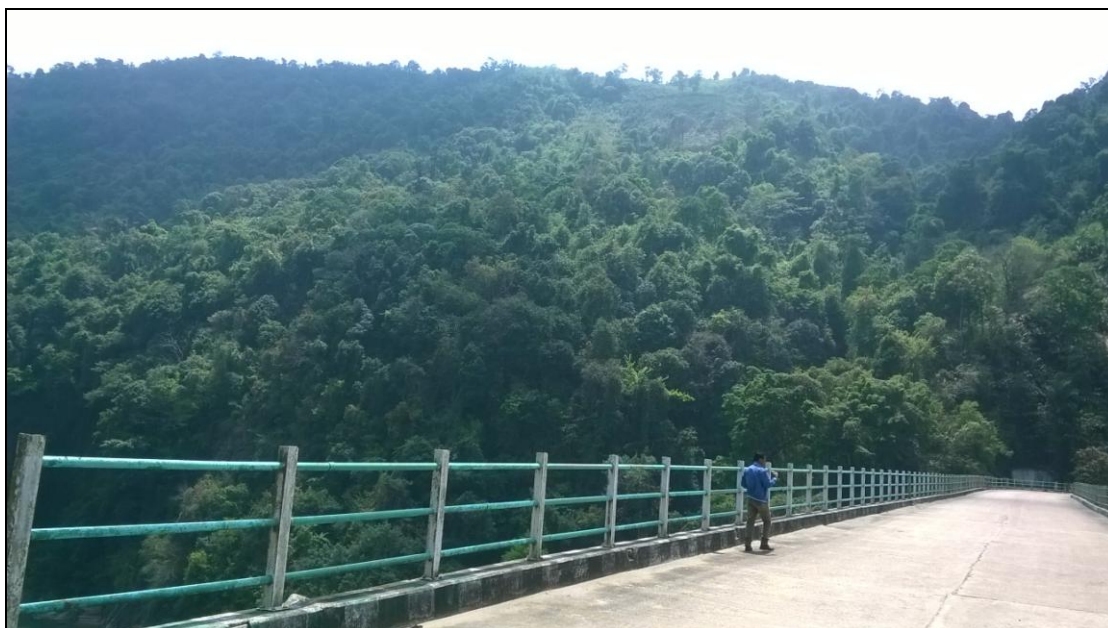




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**Figure 5 Char land**



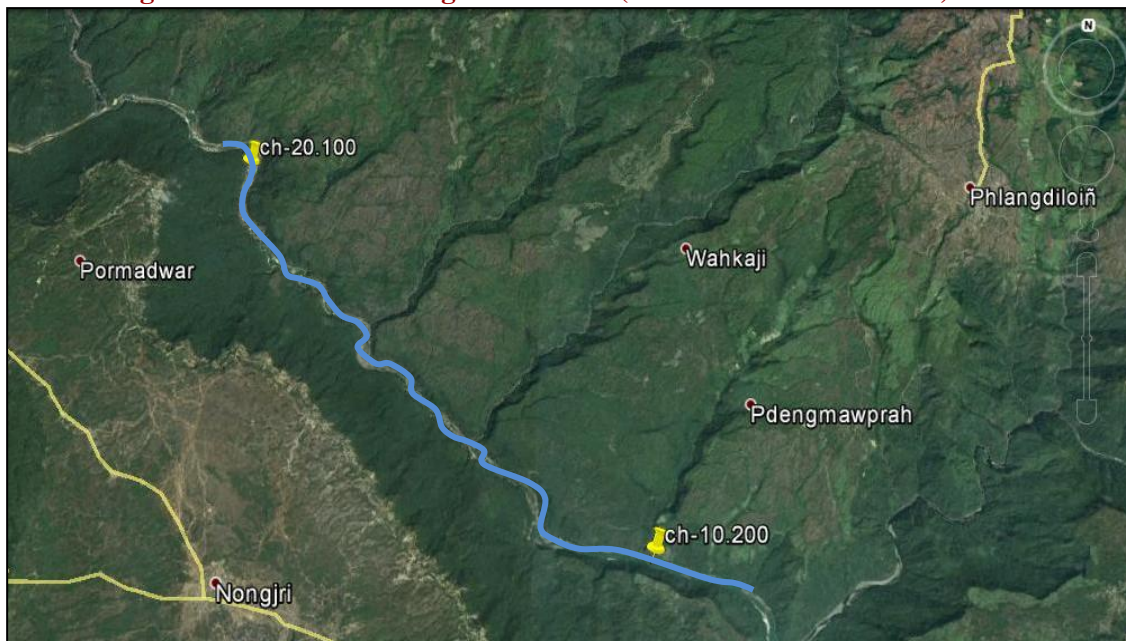
**Figure 6-Borba Sing Syiem Bridge (Chainage-6.373 km)**



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**3.2 From Chainage 10.200 Km to Chainage 20.100 Km.(Mawkhar to Pormadwar)**



**Figure 7 Chainage 10.200 km to Chainage 20.100 km**

The River width of Kynshi River from chainage 10.200 km to chainage 20.100 km is approximately 100.00 m to 136.04 m. The average water portion of the river is 70.00 meter.

Most of the river side area is dense Forest. Mawkhar, Nongkulang, Pormadwar villages are situated left bank side of the river and Nongbahjynrin, Nongmalang villages are situated right bank side of the river. Bolder Pitching have been noticed near at chainage of 11.100 km to 20.100 km both side of the river bank. Most part of the river bank is included with Forests. Both side irrigation canals are also noticed near at chainage of 13.5 km. Another irrigation canal is also situated near at chainage of 18.386km at the left bank side of the river.

Class	Chainage (km)		Observed				Reduced w.r.t. Sounding Datum			
	From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Min. Depth h (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)
I	10.200	20.100	0.1	0.4	10000	422728.13	-0.3	0	10000	546020.88
II	10.200	20.100	0.097	0.4	10000	643877.27	-0.3	0	10000	802396.08
III	10.200	20.100	0.094	0.5	10000	973153.91	-0.3	0	10000	1169836.37
IV	10.200	20.100	0.05	0.5	10000	1174241.62	-0.3	0	10000	1379725.57





**Figure 8- Bolder Pitching**

### 3.3 From Chainage 20.100 Km to Chainage 27.870 Km. (Pormadwar to Thadteja)



**Figure 9- Chainage 20.100 km to Chainage 27.870 km**

The River width of Kynshi River From chainage 20.100 km to Chainage 27.870 km is approximately 129.63m to 64m.

The average width portion of the river is 60meter. Bolder Pitching has been found near at chainage of 20.100 km to 24 km both side of the river. An irrigation canal has been found near at chainage of 22 km. Char land has been found near at chainage of 24.300 km to 26.400 km. After 26.400km, bolder pitching and char land are also noticed in some places. Pormadwar, Thadteja villages are situated on left bank side of the river. The Dense Forest has been located in this stretches 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 h (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)
I	20.100	27.870	0.1	0.4	8000	331573.78	-0.3	0.0	8000	428280.66
II	20.100	27.870	0.097	0.4	8000	505035.85	-0.3	0.0	8000	629373.16
III	20.100	27.870	0.094	0.4	8000	763311.57	-0.3	0.0	8000	917583.53
IV	20.100	27.870	0.04	0.5	8000	921039.28	-0.3	0.0	8000	1082214.59





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**Figure 10 Forest Area**



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### **3.1 Hydrographic Survey**

- **Bathymetry Survey**

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

The layer of water in the river Kynshi is not sufficient for carrying out the Bathymetric survey. The length of the bathymetric survey has been carried out only Chainage 0.00 km to Chainage 7.5 km.

- **Topographic Survey**

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

The Topographic survey has been carried out from “Bangladesh Border near Mawpyllun (Latitude-25°12'6.87"N, Longitude-91°15'20.57"E) to Bridge on Nonghyllam-Mawait Road (Latitude-25°19'35.43"Longitude- 91°4'7.14"E) (27.870 Km).” The length of the Topography survey is Chainage 0.00 km to Chainage 27.870 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):-**

Kynshi 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. The entire river bank is mostly covered with Boulder pitching (both side of the river bank). The dense forest, west khasi hills are located in this zone of river.

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

West Khasi hills are located in this zone of river which is the obstruction to the nearby states to enter easily in this zone of river. Besides, Indo-Bangladesh Border is also located in this zone at Ranikor which is becoming a security issue. 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 are noticed in this hilly areas.



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

The only hill range of significance in the West Khasi Hills district is the Mawthadraishan range, which runs from east to west. Hilly formations that have potential tourist attraction are the Kyllang Rock, which is formed of a huge igneous rock, located near Nongkhlaw (11-km) from Mairang and Lumsympur, on the northeastern extremity of Mawkyrwat Civil Subdivision. Apart from these, the other major hills are Lum Kyllai-Longsngun at Myriem, 40-km from Nongstoin Lum Iawpaw near Nongnah of Ranikor block, Lum Nongsynrih at Mawkyrwat Block & Lum Iangram near Umsaw Byrki about 20-km from Nongstoin. West Khasi hills and Indo-Bangladesh Border are located in this zone of river which is protected this zone.

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

NH- 62, NH- 127B, NH-44 E are the two major communications way near the river side. Besides, SH- 1, SH-4, SH-10 are also communicative way for the local villagers.

**g) Railway Line and Stations in the vicinity:-**

There is no Railway line or station found in this zone of river.

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

The district is blessed with a rich heritage of flora comprising of Khasi pines in the higher altitude areas and Teak, Sal, Titachap, Gamari and Makri Sal in the lower reaches. Orchids and pitcher plants are also found in certain pockets

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

The district is blessed with a rich heritage of flora comprising of Khasi pines in the higher altitude areas and Teak, Sal, Titachap, Gamari and Makri Sal in the lower reaches. Orchids and pitcher plants are also found in certain pockets.

**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. Coal, Limestone, Uranium and Sillimanite have been found in this zone of river.

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

Meghalaya is a industrially backward state. The Number of Industries like cement, wood, Oil Refinery and Petro Chemical are available in this zone of river. Apart from these there are a number of small-scale industries like bakeries, furniture making, steel fabrication, tyre retreading, spice etc have been located in this zone of river.



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

There are no Jetty services available in this zone of river.

**m) Existing Cargo Movement:-**

There is no cargo available in this zone of river.

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

Ranikor, Shipur, Borsora, Nongkhum River Island, west khasi hills are the important places for a good tourism and historical places in this zone of river.

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

Ranikor, Shipur, Borsora, Thadteja etc villages are located in this zone of river. Most portion of the river bank is surrounded with dense forest and hilly area.

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

There are no Ferry services available in this zone of river.

**q) Available and probable Water Sport Recreational Facilities:-**

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

**r) Fishing activities:-**

Kynshi River is the lifeline of the people of its important places for fishing culture. Kynshi provides diverse habitat in its downstream for living biota such as stream, riparian zones and wetlands etc. Kynshi 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 this zone of 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. In kynshi gravel mining was noticed during the survey period. Besides this, sand is also exported to other states as it becomes demandful for making Building or Industries.

**t) Tributaries:-**

The major tributaries of Kynshi River are -

1) Umrilang River

2) Um-mawblei River





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**u) Details of Irrigation Canals and Outlets:-**



The Irrigation Canal and Outlets have been found near at chainage of 2.4 km, 7.8 km, 13.5 km, 21.9 km, 23.7 km at right bank side of the river and 13.6 km, 18.4 km, 25.9 km at 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 Fishing and some cultivation in recent times which is the main occupation for the villagers of this region. Besides, the water is also used for industrial hubs (rare). With the help of the irrigation system, the cultivation can easily accessible. Besides, washing cloth, Fishing activities, swimming etc. have become available in this zone of river.

	<p style="text-align: center;"><b>FINAL FEASIBILITY REPORT ON “DETAILED HYDROGRAPHIC SURVEY IN KYNshi RIVER IN MEGHALAYA (27.870 KMS)</b></p>	
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## **Section 4: Terminals**

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

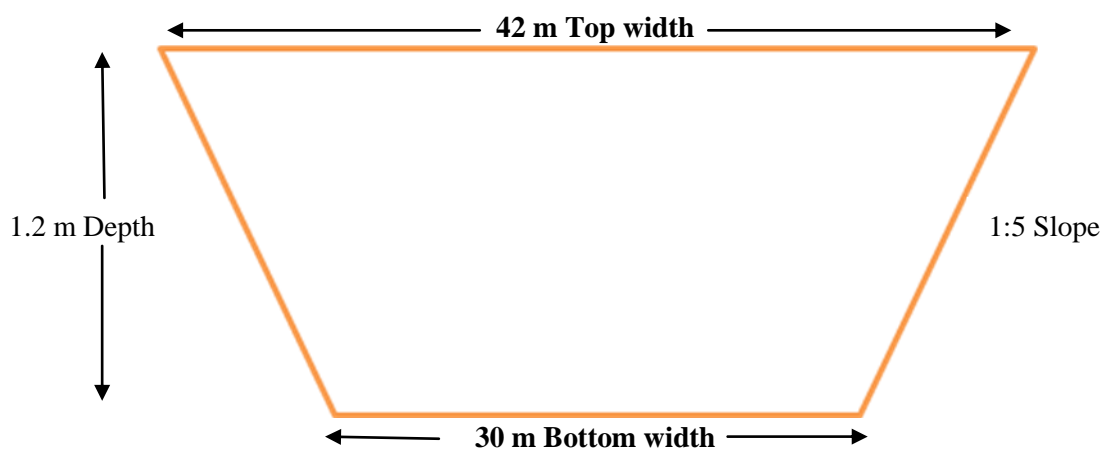
### **4.1 Details of Land use, owner etc.:-**

The Bank of the river Kynshi includes with Indo-Bangladesh Border, West Khasi hills, Ranikor village, dense forest and hilly areas. The Farmers are cultivated their crops with using this fertile land and grows a huge amount of crops like Rice, Maize etc. every year. Besides, some portions of the land are surrounded by small hills and Forests. West Khasi hills are also situated in this zone of river. 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)
Indo-Bangladesh Border Area	Mawkhari	0.00	10.200	0.1	14.4	9000	1.08	320839.52	320839.52	-0.3	13.4	9100	1.38	416736.13	416736.13
Mawkhari	Pormadwar	10.200	20.100	0.1	0.4	10000	1.28	422728.13	743567.65	-0.3	0	10000	1.65	546020.88	962757.01
Pormadwar	Thadteja	20.100	27.8700	0.1	0.4	8000	1.25	331573.78	1075141.43	-0.3	0	8000	1.62	428280.66	1391037.67
Total						27000		1075141.43		Total		27100		1391037.67	

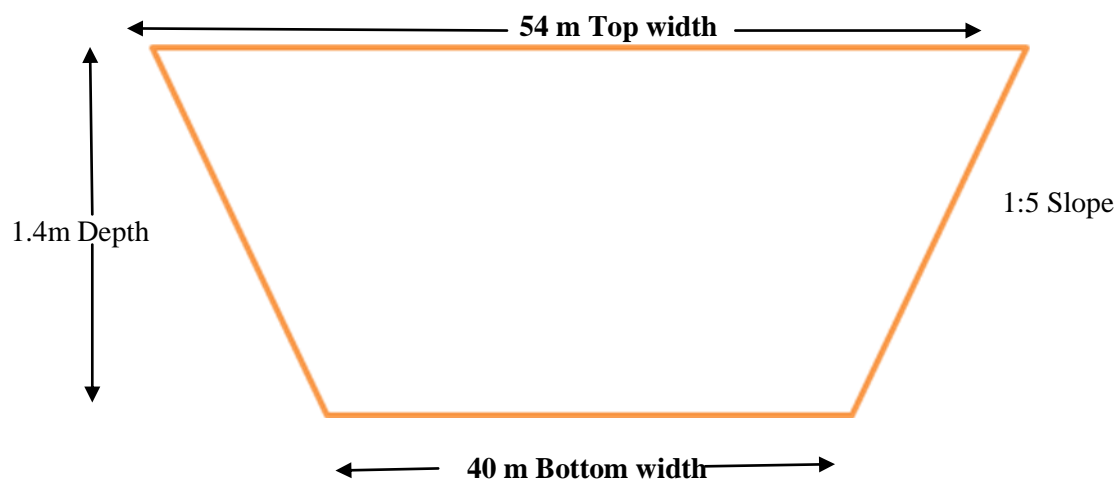
**Table 11- Dredging Quantity of Class-I**



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**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)
Indo-Bangladesh Point	Mawkhar	0.00	10.200	0.003	14.4	9000	1.23	489337.24	489337.24	-0.3	13.4	9200	1.51	613051.06	613051.06
Mawkhar	Pormadwar	10.200	20.100	0.097	0.4	10000	1.46	643877.27	1133214.5	-0.3	0	10000	1.82	802396.08	1415447.1
Pormadwar	Thadteja	20.100	27.870	0.097	0.4	8000	1.43	505035.85	1638250.36	-0.3	0	8000	1.78	629373.16	2044820.30
Total						27000		1638250.36		Total		27200		2044820.30	

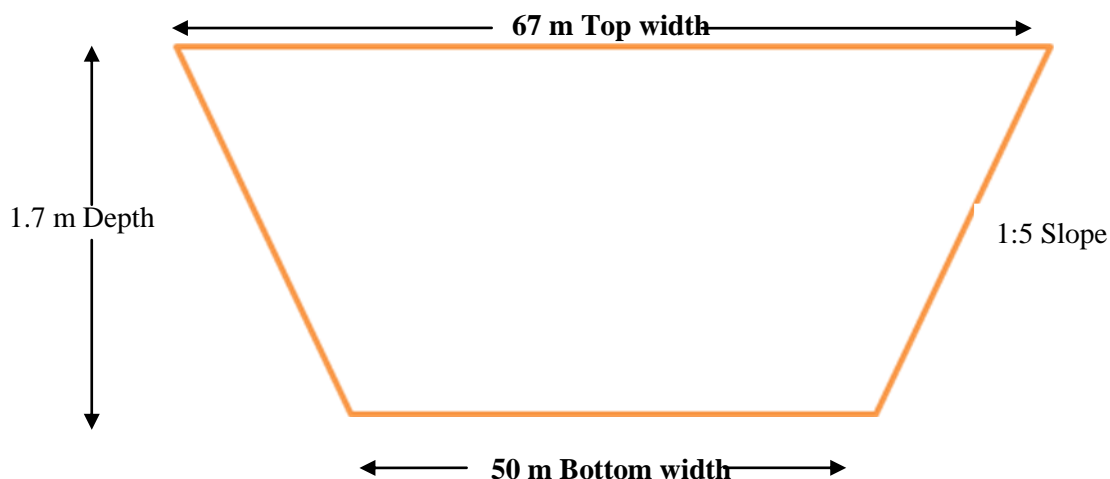
**Table 12- Dredging Quantity of Class-II**



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**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)
Indo-Bangladesh Border	Mawkhar	0.00	10.200	0.002	14.4	9000	1.45	740694.57	740694.57	-0.3	13.4	10000	1.62	896576.74	896576.74
Mawkhar	Pormadwar	10.200	20.100	0.094	0.4	10000	1.76	973153.91	1713848.5	-0.3	0	10000	2.12	1169836.4	2066413.1
Pormadwar	Thadteja	20.100	27.870	0.094	0.4	8000	1.73	763311.57	2477160.10	-0.3	0	8000	2.08	917583.53	2983996.64
Total						27000		2477160.10		Total		28000		2983996.64	

**Table 13-Dredging Quantity of Class-III**

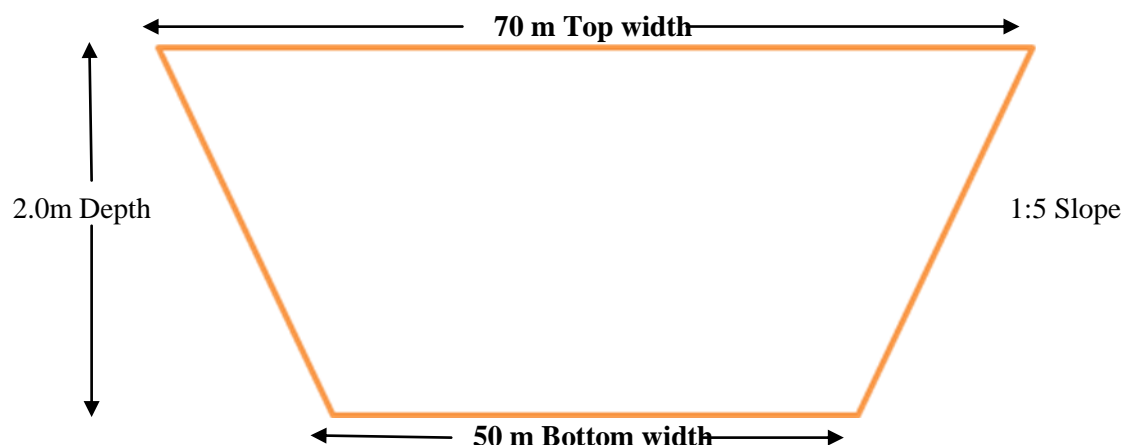




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**Class-IV: - (Channel design: - Bottom width- 50 meter, Top width- 70 meter)**



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)
Indo-Bangladesh	Mawkhair	0.00	10.200	0.002	14.4	9000	1.8	894615.9	894615.9	-0.3	13.4	10000	1.92	1060914.3	1060914.3
Mawkhair	Pormadwar	10.200	20.100	0.05	0.5	10000	2.13	1174241.6	2068857.5	-0.3	0	10000	2.5	1379725.6	2440639.8
Pormadwar	Thadteja	20.100	27.870	0.04	0.5	8000	2.09	921039.28	2989896.8	-0.3	0	8000	2.45	1082214.6	3522854.43
Total						27000		2989896.8		Total			28000	3522854.43	

**Table 14-Dredging Quantity of Class-IV**

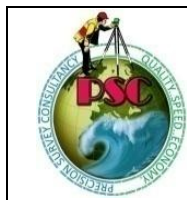
## Section 6: Conclusion

The surveyed stretch of Kynshi River is 27.870 km in length and was not explored for any navigational possibility in earlier time. There is a good scope for navigational aspect of the waterways. There are. The right bank of the river is moderately connected with roads and other infrastructures than the left bank. The river bed of Kynshi River is mainly sandy and Boulder 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 well connected with Borba sing Shyam Bridge. Besides NH-62, NH-127 B are taken a major role for a smooth communication system. Ranikor, Thadteja etc. village and Indo-Bangladesh Border are located in this zone of river.

The Cargo transportation is well connected with NH-62, NH-127B which is the strong cargo transportation system in this zone of river. Besides, SH- 1, SH-4, SH-10 are also situated in this zone of river But there were lots of possibility to improve the cargo transportation by Rail and roads.

### 6.1 Dredging volume:-

Class Details	As per observed soundings (Cubic meter)	As per Reduced soundings (Cubic meter)
Class I	1075141.43	1391037.67
Class II	1638250.36	2044820.30
Class III	2477160.10	2983996.64
Class IV	2989896.80	3522854.43



**FINAL FEASIBILITY REPORT ON  
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**Annexure:-**

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

The Chart Datum value has 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:-**

Class -I											
Chainage (km)		As per Observed Soundings					As per Reduced Soundings				
From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (cubic meter)	Cumulative Dredging Qty. (cubic meter)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cubic meter)	Cumulative Dredging Qty. (cubic meter)
0	1	0.1	4.9	1000	36622.29	36622.29	-0.2	3.8	1000	47303.19	47303.19
1	2	1.1	11.8	1000	7963.28	44585.57	1	10.1	1000	11327.68	58630.87
2	3	2.9	14.4	0	0	44585.57	1.1	13.4	100	42.95	58673.82
3	4	0.2	14.4	1000	21732.35	66317.92	-0.3	13.4	1000	29307.26	87981.08
4	5	0.1	0.4	1000	41036.58	107354.5	-0.3	0	1000	53005.2	140986.28
5	6	0.1	0.4	1000	43154.02	150508.52	-0.3	0	1000	55740.21	196726.49
6	7	0.1	0.4	1000	45242.37	195750.89	-0.3	0	1000	58438.06	255164.55
7	8	0.1	0.3	1000	38744.89	234495.78	-0.3	0	1000	50045.24	305209.79
8	9	0.1	0.3	1000	43159.23	277655.01	-0.3	0	1000	55746.35	360956.14
9	10	0.1	0.3	1000	43184.51	320839.52	-0.3	0	1000	55779.99	416736.13
10	11	0.1	0.3	1000	43189.43	364028.95	-0.3	0	1000	55785.74	472521.87
11	12	0.1	0.3	1000	40559.25	404588.2	-0.3	0	1000	52388.7	524910.57
12	13	0.1	0.3	1000	45241.66	449829.86	-0.3	0	1000	58436.7	583347.27
13	14	0.1	1.4	1000	43176.65	493006.51	-0.3	0	1000	55769.53	639116.8
14	15	0.1	0.4	1000	42996.68	536003.19	-0.3	0	1000	55537.38	694654.18
15	16	0.1	0.3	1000	40456.29	576459.48	-0.3	0	1000	52256.02	746910.2
16	17	0.1	0.3	1000	42776.98	619236.46	-0.3	0	1000	55253.42	802163.62
17	18	0.1	0.3	1000	40538.77	659775.23	-0.3	0	1000	52362.55	854526.17
18	19	0.1	0.3	1000	40920.71	700695.94	-0.3	0	1000	52855.35	907381.52
19	20	0.1	0.3	1000	42871.71	743567.65	-0.3	0	1000	55375.49	962757.01
20	21	0.1	0.4	1000	40807.65	784375.3	-0.3	0	1000	52709.89	1015466.9
21	22	0.1	0.3	1000	40877.14	825252.44	-0.3	0	1000	52799.48	1068266.4
22	23	0.1	0.3	1000	40868.69	866121.13	-0.3	0	1000	52788.38	1121054.8
23	24	0.1	0.3	1000	43150.63	909271.76	-0.3	0	1000	55735.76	1176790.5
24	25	0.1	0.3	1000	43050.56	952322.32	-0.3	0	1000	55606.62	1232397.1
25	26	0.1	0.3	1000	43088.67	995410.99	-0.3	0	1000	55655.99	1288053.1
26	27	0.1	0.3	1000	43163.62	1038574.6	-0.3	0	1000	55752.7	1343805.8
27	27.87	0.1	0.3	1000	36566.82	1075141.43	-0.3	0	1000	47231.84	1391037.67
Total				27000	1075141.43		Total		27100	1391037.67	

**Table 15-Minimum & Maximum Depth for class-I**



**FINAL FEASIBILITY REPORT ON  
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**Class-II:-**

Class-II											
Chainage (km)		As per Observed soundings					As per Reduced soundings				
From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (cubic meter)	Cumulative Dredging Qty. (cubic meter)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cubic meter)	Cumulative Dredging Qty. (cubic meter)
0	1	0.003	4.9	1000	55781.31	55781.31	-0.3	3.8	1000	69515.08	69515.08
1	2	1	12.4	1000	12451.61	68232.92	1	11.1	1000	16863.74	86378.82
2	3	2.8	14.4	0	0	68232.92	1.1	13.4	200	330.27	86709.09
3	4	0.197	14.4	1000	33430.46	101663.38	-0.3	13.4	1000	43225.81	129934.9
4	5	0.099	0.4	1000	62504.5	164167.88	-0.3	0	1000	77892.75	207827.65
5	6	0.099	0.4	1000	65729.96	229897.84	-0.3	0	1000	81912.58	289740.23
6	7	0.099	0.4	1000	68910.87	298808.71	-0.3	0	1000	85876.33	375616.56
7	8	0.099	0.4	1000	59014.38	357823.09	-0.3	0	1000	73542.56	449159.12
8	9	0.098	0.4	1000	65737.47	423560.56	-0.3	0	1000	81921.69	531080.81
9	10	0.098	0.4	1000	65776.68	489337.24	-0.3	0	1000	81970.25	613051.06
10	11	0.098	0.4	1000	65784.25	555121.49	-0.3	0	1000	81979.97	695031.03
11	12	0.097	0.3	1000	61777.47	616898.96	-0.3	0	1000	76987.44	772018.47
12	13	0.097	0.4	1000	68909.85	685808.81	-0.3	0	1000	85874.81	857893.28
13	14	0.097	0.4	1000	65764.69	751573.5	-0.3	0	1000	81955.2	939848.48
14	15	0.098	0.4	1000	65490.09	817063.59	-0.3	0	1000	81612.82	1021461.3
15	16	0.098	0.4	1000	61620.69	878684.28	-0.3	0	1000	76791.43	1098252.7
16	17	0.098	0.4	1000	65155.37	943839.65	-0.3	0	1000	81195.74	1179448.5
17	18	0.098	0.4	1000	61747.32	1005587	-0.3	0	1000	76949.75	1256398.2
18	19	0.098	0.4	1000	62328.32	1067915.3	-0.3	0	1000	77674.01	1334072.2
19	20	0.097	0.3	1000	65299.22	1133214.5	-0.3	0	1000	81374.91	1415447.1
20	21	0.098	0.4	1000	62156.35	1195370.9	-0.3	0	1000	77460.17	1492907.3
21	22	0.098	0.3	1000	62262.09	1257633	-0.3	0	1000	77589.9	1570497.2
22	23	0.099	0.4	1000	62248.51	1319881.5	-0.3	0	1000	77573.17	1648070.4
23	24	0.097	0.4	1000	65724.77	1385606.2	-0.3	0	1000	81905.47	1729975.9
24	25	0.098	0.4	1000	65572.42	1451178.7	-0.3	0	1000	81716.92	1811692.8
25	26	0.098	0.3	1000	65630.49	1516809.1	-0.3	0	1000	81789.11	1893481.9
26	27	0.098	0.3	1000	65744.79	1582553.9	-0.3	0	1000	81930.49	1975412.4
27	27.870	0.098	0.3	1000	55696.43	1638250.36	-0.3	0	1000	69407.93	2044820.30
				27000	1638250.36		Total		27200	2044820.30	

**Table 16-Minimum & Maximum Depth for class-II**



**FINAL FEASIBILITY REPORT ON  
“DETAILED HYDROGRAPHIC SURVEY IN KYN Shi  
RIVER IN MEGHALAYA (27.870 KMS)**



**Class-III:**

Class-III											
Chainage (km)		As per Observed soundings					As per Reduced soundings				
From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (cubic meter)	Cumulative Dredging Qty. (cubic meter)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cubic meter)	Cumulative Dredging Qty. (cubic meter)
0	1	0.002	4.9	1000	84307.04	84307.04	-0.3	3.8	1000	101346.98	101346.98
1	2	0.8	12.4	1000	19341.78	103648.82	0.7	10.7	1000	25438.9	126785.88
2	3	2.3	14.4	0	0	103648.82	1.3	13.4	1000	2113.71	128899.59
3	4	0.194	14.4	1000	51115.91	154764.73	-0.3	13.4	1000	63327.88	192227.47
4	5	0.098	0.4	1000	94469.62	249234.35	-0.3	0	1000	113561.68	305789.15
5	6	0.098	0.4	1000	99344.46	348578.81	-0.3	0	1000	119422.89	425212.04
6	7	0.098	0.4	1000	104151.73	452730.54	-0.3	0	1000	125201.64	550413.68
7	8	0.098	0.4	1000	89194.06	541924.6	-0.3	0	1000	107220.03	657633.71
8	9	0.096	0.4	1000	99355.74	641280.34	-0.3	0	1000	119436.08	777069.79
9	10	0.096	0.4	1000	99414.23	740694.57	-0.3	0	1000	119506.95	896576.74
10	11	0.096	0.4	1000	99426.15	840120.72	-0.3	0	1000	119521.38	1016098.1
11	12	0.094	0.3	1000	93370.31	933491.03	-0.3	0	1000	112241.93	1128340.1
12	13	0.094	0.4	1000	104150.56	1037641.6	-0.3	0	1000	125199.87	1253539.9
13	14	0.1	0.4	1000	99396.1	1137037.7	-0.3	0	1000	119484.43	1373024.4
14	15	0.1	0.4	1000	98982.1	1236019.8	-0.3	0	1000	118986.7	1492011.1
15	16	0.1	0.3	1000	93133.7	1329153.5	-0.3	0	1000	111957.1	1603968.2
16	17	0.1	0.3	1000	98475.22	1427628.7	-0.3	0	1000	118377.61	1722345.8
17	18	0.1	0.3	1000	93323.76	1520952.5	-0.3	0	1000	112185.43	1834531.2
18	19	0.1	0.3	1000	94203.53	1615156	-0.3	0	1000	113243.22	1947774.4
19	20	0.1	0.3	1000	98692.48	1713848.5	-0.3	0	1000	118638.7	2066413.1
20	21	0.1	0.4	1000	93942.91	1807791.4	-0.3	0	1000	112930.18	2179343.3
21	22	0.1	0.3	1000	94102.87	1901894.3	-0.3	0	1000	113121.35	2292464.6
22	23	0.1	0.3	1000	94083.04	1995977.3	-0.3	0	1000	113097.26	2405561.9
23	24	0.1	0.3	1000	99336.22	2095313.5	-0.3	0	1000	119412.38	2524974.3
24	25	0.1	0.3	1000	99106.29	2194419.8	-0.3	0	1000	119137.36	2644111.6
25	26	0.1	0.3	1000	99193.82	2293613.6	-0.3	0	1000	119242.03	2763353.7
26	27	0.1	0.3	1000	99366.84	2392980.5	-0.3	0	1000	119449.95	2882803.6
27	27.870	0.1	0.3	1000	84179.58	2477160.1	-0.3	0	1000	101193.02	2983996.64
Total				27000	2477160.1		Total		28000	2983996.64	

**Table 17-Minimum & Maximum Depth for class-III**







**FINAL FEASIBILITY REPORT ON  
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RIVER IN MEGHALAYA (27.870 KMS)**



**Class-IV:**

Class -IV											
Chainage (km)		As per Observed Soundings					As per Reduced Soundings				
From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (cubic meter)	Cumulative Dredging Qty. (cubic meter)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cubic meter)	Cumulative Dredging Qty. (cubic meter)
0	1	0.002	4.9	1000	101728.22	101728.22	-0.3	4.1	1000	119529.51	119529.51
1	2	0.8	12.4	1000	23778.42	125506.64	0.7	11	1000	30962.93	150492.44
2	3	2.3	14.4	0	0	125506.64	1.3	13.4	1000	4662.45	155154.89
3	4	0.191	14.4	1000	62105.89	187612.53	-0.3	13.4	1000	75035.49	230190.38
4	5	0.097	0.4	1000	113990.53	301603.06	-0.3	0	1000	133936.93	364127.31
5	6	0.097	0.4	1000	119872.58	421475.64	-0.3	0	1000	140849.98	504977.29
6	7	0.097	0.4	1000	125672.93	547148.57	-0.3	0	1000	147665.05	652642.34
7	8	0.097	0.4	1000	107624.31	654772.88	-0.3	0	1000	126457.85	779100.19
8	9	0.094	0.4	1000	119886.2	774659.08	-0.3	0	1000	140865.89	919966.08
9	10	0.094	0.4	1000	119956.82	894615.9	-0.3	0	1000	140948.19	1060914.3
10	11	0.094	0.4	1000	119971.16	1014587.1	-0.3	0	1000	140965.31	1201879.6
11	12	0.091	0.3	1000	112663.92	1127251	-0.3	0	1000	132379.06	1334258.6
12	13	0.091	0.4	1000	125671.67	1252922.7	-0.3	0	1000	147663.01	1481921.7
13	14	0.091	0.4	1000	119934.79	1372857.4	-0.3	0	1000	140922.72	1622844.4
14	15	0.094	0.4	1000	119435.24	1492292.7	-0.3	0	1000	140335.48	1763179.9
15	16	0.094	0.4	1000	112377.71	1604670.4	-0.3	0	1000	132043.36	1895223.2
16	17	0.094	0.4	1000	118824.08	1723494.5	-0.3	0	1000	139617.82	2034841
17	18	0.094	0.3	1000	112607.28	1836101.8	-0.3	0	1000	132313.61	2167154.6
18	19	0.094	0.4	1000	113669.78	1949771.5	-0.3	0	1000	133560.34	2300715
19	20	0.091	0.3	1000	119085.99	2068857.5	-0.3	0	1000	139924.86	2440639.8
20	21	0.094	0.4	1000	113354.76	2182212.3	-0.3	0	1000	133191.49	2573831.3
21	22	0.094	0.3	1000	113547.96	2295760.2	-0.3	0	1000	133418.3	2707249.6
22	23	0.097	0.4	1000	113523.68	2409283.9	-0.3	0	1000	133389.74	2840639.4
23	24	0.091	0.4	1000	119862.5	2529146.4	-0.3	0	1000	140836.86	2981476.2
24	25	0.094	0.4	1000	119585.51	2648731.9	-0.3	0	1000	140512.06	3121988.3
25	26	0.094	0.3	1000	119690.72	2768422.7	-0.3	0	1000	140635.63	3262623.9
26	27	0.094	0.3	1000	119899.64	2888322.3	-0.3	0	1000	140882.1	3403506
27	27.870	0.094	0.3	1000	101574.51	2989896.80	-0.3	0	1000	119348.41	3522854.43
Total				27000	2989896.80		Total		28000	3522854.43	

**Table 18-Minimum & Maximum Depth for class-IV**

	<b>FINAL FEASIBILITY REPORT ON “DETAILED HYDROGRAPHIC SURVEY IN KYN Shi RIVER IN MEGHALAYA (27.870 KMS)</b>	
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**Annexure-3: Observed Depth in 200 meter interval:**

Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Observed		Observed		Observed		Observed	
	Min	Max	Min	Max	Min	Max	Min	Max
0	0.1	0.3	0.005	0.3	0.002	0.3	0.002	0.3
200	0.2	0.5	0.007	0.5	0.003	0.3	0.003	0.3
400	0.5	0.7	0.003	0.7	0.003	0.5	0.003	0.5
600	0.4	0.6	0.2	0.6	0.1	0.4	0.002	0.4
800	1.6	2.6	1.6	2.6	1.6	2.6	1.6	2.6
1000	4.4	4.9	4.1	4.9	3.8	4.9	3.7	4.9
1200	1.1	9	1	9	0.8	10.2	0.8	10.2
1400	6.8	10.3	6.4	10.3	6.2	10.3	6.2	10.3
1600	5.1	11.8	4.9	12.4	3.7	12.4	1.8	12.4
1800	4.7	8	4	8.8	3.4	8.8	3.4	8.8
2000	4.4	4.8	3.9	4.9	3.7	5	3.6	5.1
2200	5.3	7.7	5.1	8.7	5	9.1	5	9.1
2400	2.9	5.5	2.8	5.7	2.5	5.7	2.3	5.7
2600	3.1	3.7	3	3.7	2.3	3.7	2.3	3.7
2800	4.5	9.1	4.1	9.1	3.7	9.1	3.5	9.2
3000	7.3	14.4	6.2	14.6	5.7	14.4	5.6	14.4
3200	9	13.8	7.7	14.3	5.3	14.3	5.3	14.3
3400	0.2	0.3	0.198	0.3	0.196	0.3	0.194	0.3
3600	0.3	0.4	0.299	0.4	0.298	0.4	0.297	0.4
3800	0.2	0.3	0.198	0.3	0.196	0.3	0.194	0.3
4000	0.2	0.3	0.197	0.4	0.194	0.4	0.191	0.4
4200	0.2	0.3	0.198	0.4	0.196	0.4	0.194	0.4
4400	0.1	0.4	0.099	0.4	0.098	0.4	0.097	0.4
4600	0.2	0.3	0.198	0.3	0.196	0.3	0.194	0.3
4800	0.2	0.3	0.197	0.4	0.194	0.4	0.191	0.4
5000	0.2	0.3	0.199	0.4	0.198	0.4	0.197	0.4
5200	0.1	0.2	0.099	0.3	0.098	0.3	0.097	0.3
5400	0.2	0.3	0.198	0.3	0.196	0.3	0.194	0.3
5600	0.2	0.3	0.197	0.4	0.194	0.4	0.191	0.4
5800	0.1	0.2	0.099	0.3	0.098	0.3	0.097	0.3
6000	0.2	0.4	0.198	0.4	0.196	0.4	0.194	0.4
6200	0.2	0.3	0.198	0.3	0.196	0.3	0.194	0.3
6400	0.3	0.4	0.297	0.4	0.294	0.4	0.291	0.4
6600	0.1	0.2	0.099	0.3	0.098	0.3	0.097	0.3
6800	0.2	0.3	0.198	0.3	0.196	0.3	0.194	0.3
7000	0.1	0.2	0.099	0.3	0.098	0.3	0.097	0.3
7200	0.2	0.3	0.198	0.3	0.196	0.3	0.194	0.3



**FINAL FEASIBILITY REPORT ON  
“DETAILED HYDROGRAPHIC SURVEY IN KYN Shi  
RIVER IN MEGHALAYA (27.870 KMS)**



Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Observed		Observed		Observed		Observed	
	Min	Max	Min	Max	Min	Max	Min	Max
7400	0.2	0.3	0.197	0.4	0.194	0.4	0.191	0.4
7600	0.1	0.3	0.099	0.3	0.098	0.3	0.097	0.3
7800	0.2	0.3	0.198	0.4	0.196	0.4	0.194	0.4
8000	0.1	0.3	0.099	0.3	0.098	0.3	0.097	0.3
8200	0.2	0.3	0.198	0.3	0.196	0.3	0.194	0.3
8400	0.1	0.3	0.098	0.4	0.096	0.4	0.094	0.4
8600	0.2	0.3	0.199	0.3	0.198	0.3	0.197	0.3
8800	0.1	0.3	0.098	0.3	0.096	0.3	0.094	0.3
9000	0.2	0.3	0.197	0.4	0.194	0.4	0.191	0.4
9200	0.1	0.3	0.099	0.4	0.098	0.4	0.097	0.4
9400	0.2	0.3	0.199	0.4	0.198	0.4	0.197	0.4
9600	0.1	0.2	0.098	0.3	0.096	0.3	0.094	0.3
9800	0.2	0.3	0.197	0.4	0.194	0.4	0.191	0.4
10000	0.1	0.3	0.099	0.3	0.098	0.3	0.097	0.3
10200	0.2	0.3	0.198	0.4	0.196	0.4	0.194	0.4
10400	0.1	0.3	0.098	0.3	0.096	0.3	0.094	0.3
10600	0.2	0.3	0.197	0.3	0.194	0.3	0.191	0.3
10800	0.1	0.2	0.099	0.3	0.098	0.3	0.097	0.3
11000	0.2	0.3	0.198	0.3	0.196	0.3	0.194	0.3
11200	0.1	0.2	0.099	0.3	0.098	0.3	0.097	0.3
11400	0.2	0.2	0.198	0.3	0.196	0.3	0.194	0.3
11600	0.1	0.2	0.097	0.3	0.094	0.3	0.091	0.3
11800	0.2	0.2	0.198	0.3	0.196	0.3	0.194	0.3
12000	0.1	0.3	0.099	0.3	0.098	0.3	0.097	0.3
12200	0.2	0.2	0.198	0.3	0.196	0.3	0.194	0.3
12400	0.1	0.2	0.097	0.3	0.094	0.3	0.091	0.3
12600	0.2	0.3	0.199	0.4	0.198	0.4	0.197	0.4
12800	0.1	0.3	0.099	0.3	0.098	0.3	0.097	0.3
13000	0.2	0.2	0.198	0.3	0.196	0.3	0.194	0.3
13200	0.1	0.4	0.097	0.4	0.094	0.4	0.091	0.4
13400	0.2	0.3	0.199	0.3	0.198	0.3	0.197	0.3
13600	0.1	0.2	0.098	0.3	0.096	0.3	0.094	0.3
13800	0.2	0.3	0.198	0.3	0.196	0.3	0.194	0.3
14000	0.2	0.4	0.197	0.4	0.194	0.4	0.191	0.4
14200	0.1	0.2	0.099	0.3	0.098	0.3	0.097	0.3
14400	0.2	0.3	0.198	0.3	0.196	0.3	0.194	0.3
14600	0.2	0.2	0.199	0.3	0.198	0.3	0.197	0.3
14800	0.1	0.2	0.098	0.3	0.096	0.3	0.094	0.3
15000	0.2	0.3	0.197	0.3	0.194	0.3	0.191	0.3
15200	0.1	0.3	0.099	0.4	0.098	0.4	0.097	0.4
15400	0.2	0.3	0.198	0.3	0.196	0.3	0.194	0.3



**FINAL FEASIBILITY REPORT ON  
“DETAILED HYDROGRAPHIC SURVEY IN KYNshi  
RIVER IN MEGHALAYA (27.870 KMS)**



Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Observed		Observed		Observed		Observed	
	Min	Max	Min	Max	Min	Max	Min	Max
15600	0.1	0.2	0.099	0.3	0.098	0.3	0.097	0.3
15800	0.2	0.3	0.198	0.3	0.196	0.3	0.194	0.3
16000	0.1	0.2	0.098	0.2	0.096	0.2	0.094	0.2
16200	0.2	0.3	0.199	0.3	0.198	0.3	0.197	0.3
16400	0.1	0.3	0.098	0.4	0.096	0.4	0.094	0.4
16600	0.2	0.2	0.197	0.3	0.194	0.3	0.191	0.3
16800	0.1	0.2	0.099	0.3	0.098	0.3	0.097	0.3
17000	0.2	0.3	0.199	0.3	0.198	0.3	0.197	0.3
17200	0.1	0.2	0.098	0.2	0.096	0.2	0.094	0.2
17400	0.2	0.3	0.197	0.3	0.194	0.3	0.191	0.3
17600	0.1	0.2	0.099	0.2	0.098	0.2	0.097	0.2
17800	0.2	0.2	0.198	0.3	0.196	0.3	0.194	0.3
18000	0.1	0.2	0.098	0.3	0.096	0.3	0.094	0.3
18200	0.2	0.3	0.197	0.4	0.194	0.4	0.191	0.4
18400	0.1	0.2	0.098	0.3	0.096	0.3	0.094	0.3
18600	0.2	0.3	0.199	0.3	0.198	0.3	0.197	0.3
18800	0.2	0.2	0.198	0.3	0.196	0.3	0.194	0.3
19000	0.2	0.3	0.197	0.3	0.194	0.3	0.191	0.3
19200	0.2	0.3	0.199	0.3	0.198	0.3	0.197	0.3
19400	0.1	0.2	0.099	0.3	0.098	0.3	0.097	0.3
19600	0.2	0.2	0.198	0.3	0.196	0.3	0.194	0.3
19800	0.1	0.3	0.097	0.3	0.094	0.3	0.091	0.3
20000	0.2	0.2	0.199	0.3	0.198	0.3	0.197	0.3
20200	0.1	0.2	0.098	0.3	0.096	0.3	0.094	0.3
20400	0.2	0.4	0.198	0.4	0.196	0.4	0.194	0.4
20600	0.2	0.3	0.197	0.3	0.194	0.3	0.191	0.3
20800	0.1	0.2	0.099	0.2	0.098	0.2	0.097	0.2
21000	0.2	0.3	0.199	0.3	0.198	0.3	0.197	0.3
21200	0.1	0.2	0.098	0.3	0.096	0.3	0.094	0.3
21400	0.2	0.3	0.198	0.3	0.196	0.3	0.194	0.3
21600	0.1	0.2	0.099	0.3	0.098	0.3	0.097	0.3
21800	0.2	0.3	0.198	0.3	0.196	0.3	0.194	0.3
22000	0.2	0.3	0.197	0.3	0.194	0.3	0.191	0.3
22200	0.1	0.3	0.099	0.3	0.098	0.3	0.097	0.3
22400	0.2	0.3	0.199	0.3	0.198	0.3	0.197	0.3
22600	0.2	0.3	0.198	0.3	0.196	0.3	0.194	0.3
22800	0.2	0.3	0.297	0.3	0.294	0.3	0.291	0.3
23000	0.1	0.3	0.099	0.4	0.098	0.4	0.097	0.4
23200	0.2	0.3	0.198	0.4	0.196	0.4	0.194	0.4
23400	0.1	0.2	0.099	0.3	0.098	0.3	0.097	0.3
23600	0.2	0.2	0.198	0.3	0.196	0.3	0.194	0.3



**FINAL FEASIBILITY REPORT ON  
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RIVER IN MEGHALAYA (27.870 KMS)**



Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Observed		Observed		Observed		Observed	
	Min	Max	Min	Max	Min	Max	Min	Max
23800	0.1	0.2	0.097	0.3	0.094	0.3	0.091	0.3
24000	0.2	0.3	0.199	0.3	0.198	0.3	0.197	0.3
24200	0.1	0.3	0.098	0.4	0.096	0.4	0.094	0.4
24400	0.2	0.2	0.199	0.3	0.198	0.3	0.197	0.3
24600	0.2	0.3	0.198	0.3	0.196	0.3	0.194	0.3
24800	0.1	0.3	0.098	0.4	0.096	0.4	0.094	0.4
25000	0.2	0.3	0.199	0.3	0.198	0.3	0.197	0.3
25200	0.1	0.2	0.098	0.3	0.096	0.3	0.094	0.3
25400	0.2	0.2	0.197	0.3	0.194	0.3	0.191	0.3
25600	0.1	0.3	0.099	0.3	0.098	0.3	0.097	0.3
25800	0.2	0.2	0.198	0.3	0.196	0.3	0.194	0.3
26000	0.1	0.3	0.099	0.3	0.098	0.3	0.097	0.3
26200	0.2	0.2	0.198	0.3	0.196	0.3	0.194	0.3
26400	0.1	0.2	0.098	0.3	0.096	0.3	0.094	0.3
26600	0.2	0.2	0.199	0.3	0.198	0.3	0.197	0.3
26800	0.1	0.3	0.098	0.3	0.096	0.3	0.094	0.3
27000	0.2	0.2	0.197	0.3	0.194	0.3	0.191	0.3
27200	0.1	0.3	0.098	0.3	0.096	0.3	0.094	0.3
27400	0.2	0.3	0.299	0.3	0.298	0.3	0.297	0.3
27600	0.2	0.2	0.197	0.3	0.194	0.3	0.191	0.3
27870	0.1	0.2	0.099	0.2	0.098	0.2	0.097	0.2

**Table 19- Observed Depth in 200 m. interval**





**FINAL FEASIBILITY REPORT ON  
“DETAILED HYDROGRAPHIC SURVEY IN KYNshi  
RIVER IN MEGHALAYA (27.870 KMS)**



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

Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Reduced		Reduced		Reduced		Reduced	
	Min	Max	Min	Max	Min	Max	Min	Max
0	-0.1	0.1	-0.3	0.1	-0.3	0.2	-0.3	0.2
200	-0.2	0.1	-0.2	0.1	-0.2	0.2	-0.2	0.2
400	-0.1	0.1	-0.1	0.1	-0.3	0.2	-0.3	0.2
600	-0.1	0.1	-0.2	0.2	-0.2	0.2	-0.2	0.3
800	0.5	1.0	0.5	1.0	0.1	1.0	0.1	1.0
1000	3.0	3.8	2.8	3.8	2.2	3.8	2.2	4.1
1200	1.0	8.6	1.0	8.6	0.7	8.6	0.7	9.6
1400	5.8	9.2	5.4	9.2	5.2	9.2	5.2	9.2
1600	4.5	10.1	3.3	11.1	2.7	10.7	1.6	11
1800	4.5	7.2	3.3	7.2	2.3	7.8	2.3	7.8
2000	3.5	3.8	2.8	3.8	2.7	3.9	2.6	4.2
2200	4.2	6.6	4.1	7.3	4.0	8	3.8	8
2400	1.8	4.4	1.8	4.6	1.3	4.6	1.3	4.6
2600	2.1	2.6	2	2.6	1.6	2.6	1.5	2.6
2800	3.5	8	3.1	8	2.6	8	2.5	8
3000	6.2	13.4	5.1	13.4	4.6	13.4	4.5	13.4
3200	7.7	13.2	6.4	13.2	4.3	13.2	4	13.2
3400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
3600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
3800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
4000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
4200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
4400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
4600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
4800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
5000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
5200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
5400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
5600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
5800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
6000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
6200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
6400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
6600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
6800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
7000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
7200	-0.3	0	-0.3	0	-0.3	0	-0.3	0



**FINAL FEASIBILITY REPORT ON  
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Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Reduced		Reduced		Reduced		Reduced	
	Min	Max	Min	Max	Min	Max	Min	Max
7400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
7600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
7800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
8000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
8200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
8400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
8600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
8800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
9000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
9200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
9400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
9600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
9800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
10000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
10200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
10400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
10600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
10800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
11000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
11200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
11400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
11600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
11800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
12000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
12200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
12400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
12600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
12800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
13000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
13200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
13400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
13600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
13800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
14000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
14200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
14400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
14600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
14800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
15000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
15200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
15400	-0.3	0	-0.3	0	-0.3	0	-0.3	0



**FINAL FEASIBILITY REPORT ON  
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RIVER IN MEGHALAYA (27.870 KMS)**



Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Reduced		Reduced		Reduced		Reduced	
	Min	Max	Min	Max	Min	Max	Min	Max
15600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
15800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
16000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
16200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
16400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
16600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
16800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
17000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
17200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
17400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
17600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
17800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
18000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
18200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
18400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
18600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
18800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
19000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
19200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
19400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
19600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
19800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
20000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
20200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
20400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
20600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
20800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
21000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
21200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
21400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
21600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
21800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
22000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
22200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
22400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
22600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
22800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
23000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
23200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
23400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
23600	-0.3	0	-0.3	0	-0.3	0	-0.3	0





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Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Reduced		Reduced		Reduced		Reduced	
	Min	Max	Min	Max	Min	Max	Min	Max
23800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
24000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
24200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
24400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
24600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
24800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
25000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
25200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
25400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
25600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
25800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
26000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
26200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
26400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
26600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
26800	-0.3	0	-0.3	0	-0.3	0	-0.3	0
27000	-0.3	0	-0.3	0	-0.3	0	-0.3	0
27200	-0.3	0	-0.3	0	-0.3	0	-0.3	0
27400	-0.3	0	-0.3	0	-0.3	0	-0.3	0
27600	-0.3	0	-0.3	0	-0.3	0	-0.3	0
27870	-0.3	0	-0.3	0	-0.3	0	-0.3	0

**Table 20- Reduced Depth in 200 meter interval**

	<b>FINAL FEASIBILITY REPORT ON “DETAILED HYDROGRAPHIC SURVEY IN KYNshi RIVER IN MEGHALAYA (27.870 KMS)</b>	
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**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:-**

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
GS (TP)- 1	1.500	24 hrs	0.25	10.306	10.556	9.500	-1.056
GS(TP)- 2	4.500	24 hrs	0.29	10.610	10.900	10.600	-0.300
GS (TP)-3	5.500	24 hrs	0.31	11.090	11.400	11.100	-0.300
GS (TP)-4	6.500	24 hrs	0.37	11.380	11.750	11.450	-0.300
GS(TP)- 5	7.500	24 hrs	0.43	12.970	13.400	13.100	-0.300
GS(TP)- 6	8.500	24 hrs	0.47	14.580	15.050	14.750	-0.300
GS(TP)- 7	9.500	24 hrs	0.53	16.170	16.700	16.400	-0.300
GS(TP)- 8	10.500	24 hrs	0.59	17.810	18.400	18.100	-0.300
GS(TP)- 9	11.500	24 hrs	0.63	19.470	20.100	19.800	-0.300
GS (TP)-10	12.500	24 hrs	0.68	28.320	29.000	28.700	-0.300
GS(TP)- 11	13.500	24 hrs	0.73	37.470	38.200	37.900	-0.300
GS(TP)- 12	14.500	24 hrs	0.77	45.630	46.400	46.100	-0.300
GS (TP)-13	15.500	24 hrs	0.79	54.110	54.900	54.600	-0.300
GS(TP)- 14	16.500	24 hrs	0.81	62.390	63.200	62.900	-0.300
GS (TP)-15	17.500	24 hrs	0.83	73.870	74.700	74.400	-0.300
GS (TP)-16	18.500	24 hrs	0.85	80.050	80.900	80.600	-0.300
GS(TP)- 17	19.500	24 hrs	0.87	88.830	89.700	89.400	-0.300
GS(TP)- 18	20.500	24 hrs	0.91	98.090	99.000	98.700	-0.300
GS (TP)-19	21.500	24 hrs	0.93	111.870	112.800	112.500	-0.300
GS(TP)- 20	22.500	24 hrs	0.95	121.350	122.300	122.000	-0.300
GS(TP)- 21	23.500	24 hrs	0.25	140.150	140.400	140.100	-0.300
GS (TP)-22	24.500	24 hrs	0.29	149.610	149.900	149.600	-0.300
GS (TP)-23	25.500	24 hrs	0.31	160.190	160.500	160.200	-0.300
GS(TP)- 24	26.500	24 hrs	0.37	168.830	169.200	168.900	-0.300
GS(TP)- 25	27.500	24 hrs	0.43	179.170	179.600	179.300	-0.300

**Table 21- Details of Collected water level of Different gauge stations**



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

The layer of water in the river Kynshi is not sufficient for carrying out the Bathymetry survey. The length of the Bathymetry Survey is from Chainage 0.00 km to Chainage 5.700 km.

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

The bank of the river is generally protected by embankment and Boulder pitching. Boulder pitching and embankment have been protected both side in this river side. Besides, forest side are also protected the bank of the river. However, in the rainy season, the bank became damage in some places. 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. West Khasi hills, Indo-Bangladesh Border are protected the bank side properly.



	<p style="text-align: center;"><b>FINAL FEASIBILITY REPORT ON “DETAILED HYDROGRAPHIC SURVEY IN KYNshi RIVER IN MEGHALAYA (27.870 KMS)</b></p>	
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#### **Annexure-8: Details of Features across the Bank:-**

The bank of the river includes with villages, West Khasi hills, Indo-Bangladesh Border area, Irrigation canals and outlets, Forest, Hills etc. The both side river bank are highly protected by embankment and bolder pitching. 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. Ranikor, Pormadwar etc. villages are located near the riverside.

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

- **Establishment of Horizontal Control:-**

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

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

#### **Establishment of Vertical Control:-**



Vertical control has been carried out from BM-2 by DGPS observation of 24 hrs, situated near the Ranicore Village is used for the entire Survey work. Its value is 51.992 m. w.r.t. MSL has been considered for calculating the vertical levels. Total 3 no. of BM have been established along the 27.870 kms stretch of the Kynshi River with the reference of BM-2 which was fixed near at Ranicore village.

#### **Topography Survey:-**

The survey was commenced on 13<sup>th</sup> April, 2016 and completed on 21st April, 2016. Then the days was Summer season and the climate become sunny which reached about 35° 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 46 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

	<p style="text-align: center;"><b>FINAL FEASIBILITY REPORT ON “DETAILED HYDROGRAPHIC SURVEY IN KYNshi RIVER IN MEGHALAYA (27.870 KMS)</b></p>	
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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 with stand 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 11-Topography Survey Instrument**

○ **Bathymetry Survey:-**

The bathymetry survey was 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.

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



**Figure 12- Bathymetry Survey Instrument**



#### **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

#### **Survey Vessel:-**

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



**Figure 13 Survey Boat**



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



**Figure 14 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 15 Echo Sounder Instrument**





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○ **Current Meter:-**

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



**Figure 16- Current Meter**

● **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	2789521.405	324024.257	25°12'41.76"	91°15'11.79"	17.063
Pillar Established by: - Precision Survey Consultancy. Surveyor – Mr. Debasis Mondal; Date of Establishment -02.01.2016					
<b>Station Description :-</b> Benchmark is located near Mawpyllun 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 number can be seen on the face of the pillar.  The measurements of the bench mark pillar from notable locations / edges as follows:					
<b>Life of Station : 15Yrs</b>		Datum: - WGS 84		<b>ZONE :46 R</b>	

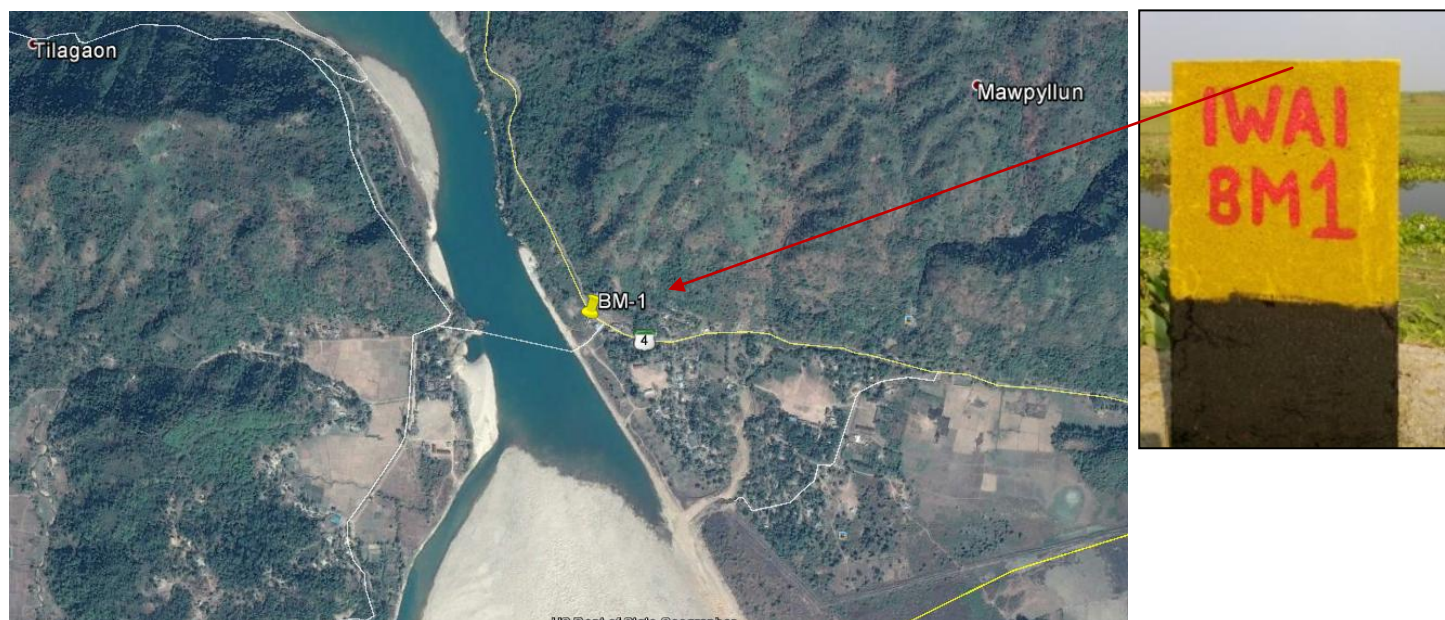


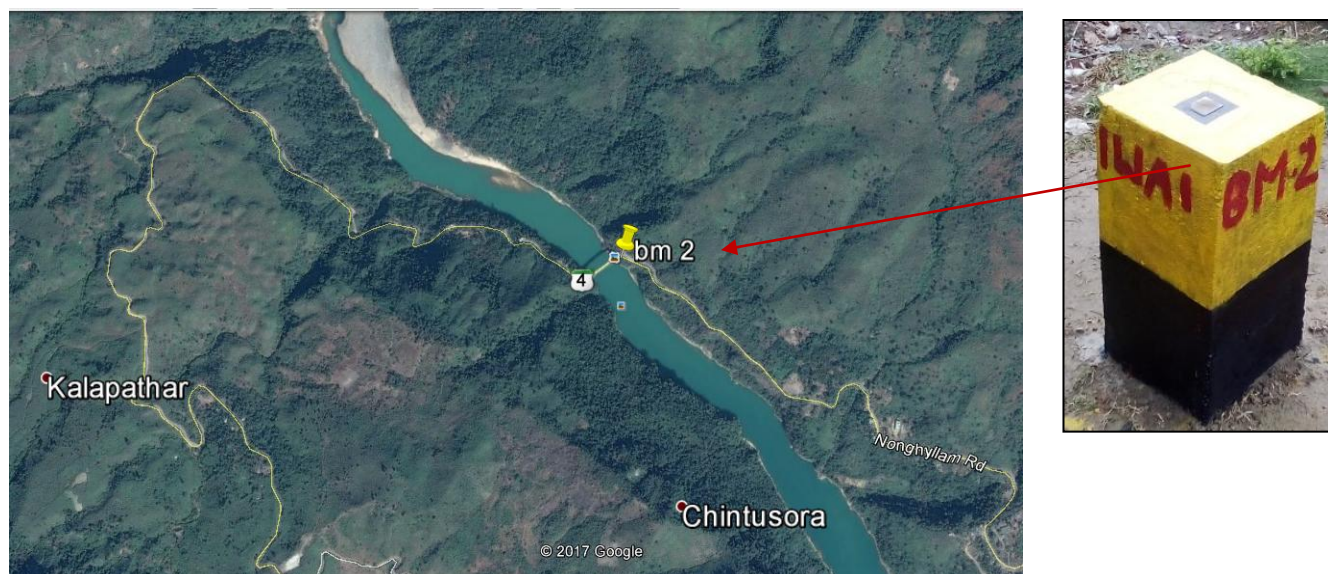


Figure 17-BM Form & Google image view of BM-1





	<p style="text-align: center;"><b>FINAL FEASIBILITY REPORT ON “DETAILED HYDROGRAPHIC SURVEY IN KYNshi RIVER IN MEGHALAYA (27.870 KMS)</b></p>	
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BM Name	Northing (m)	Easting (m)	Latitude (N)	Longitude (E)	RL (m)
BM 2	2792222.575	320988.857	25°14'8.23"	91°13'22.07"	51.992
Pillar Established by: - Precision Survey Consultancy. Surveyor – Mr. Debasis Mondal; Date of Establishment -02.01.2016					
<b>Station Description :-</b>					
<p>Benchmark is located near Ranikor village.</p> <p>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.</p> <p>The pillar extends 60.cms above ground level. Inscription “IWAI”, “PSC” and BM number can be seen on the face of the pillar.</p> <p>The measurements of the bench mark pillar from notable locations / edges as follows:</p>					
<b>Life of Station : 15Yrs</b>		Datum: - WGS 84		<b>ZONE :46 R</b>	





**Figure 18-BM Form & Google image view of BM-2**

	<b>FINAL FEASIBILITY REPORT ON “DETAILED HYDROGRAPHIC SURVEY IN KYNshi RIVER IN MEGHALAYA (27.870 KMS)</b>	
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BM Name	Northing (m)	Easting (m)	Latitude (N)	Longitude (E)	RL (m)
BM 3	2802026.778	305920.661	25°19'20.064"	91°04'18.752"	182.956
Pillar Established by: - Precision Survey Consultancy. Surveyor – Mr. Debasis Mondal; Date of Establishment -04.01.2016					
<b>Station Description :-</b> Benchmark is located near Thadteja 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 number can be seen on the face of the pillar.  The measurements of the bench mark pillar from notable locations / edges as follows					
<b>Life of Station : 15Yrs</b>		Datum: - WGS 84		<b>ZONE :46 R</b>	



**Figure 19-BM Form & Google image view of BM-3**

	<p style="text-align: center;"><b>FINAL FEASIBILITY REPORT ON “DETAILED HYDROGRAPHIC SURVEY IN KYNshi RIVER IN MEGHALAYA (27.870 KMS)</b></p>	
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#### **Annexure-12: Levelling Calculation:**

##### **Leveling from GS-1 to BM-1**

BS	IS	FS	RISE(+)	FALL(-)	RL	REMARKS
0.422					17.063	BM-1
0.670		2.480		2.058	15.005	
0.815		1.876		1.206	13.799	
0.672		1.675		0.860	12.939	
0.885		1.988		1.316	11.623	
		1.952		1.067	10.556	GS-1

**Figure 20-Leveling Calculation of Kynshi River**





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**Annexure-13: Soil Sample:**

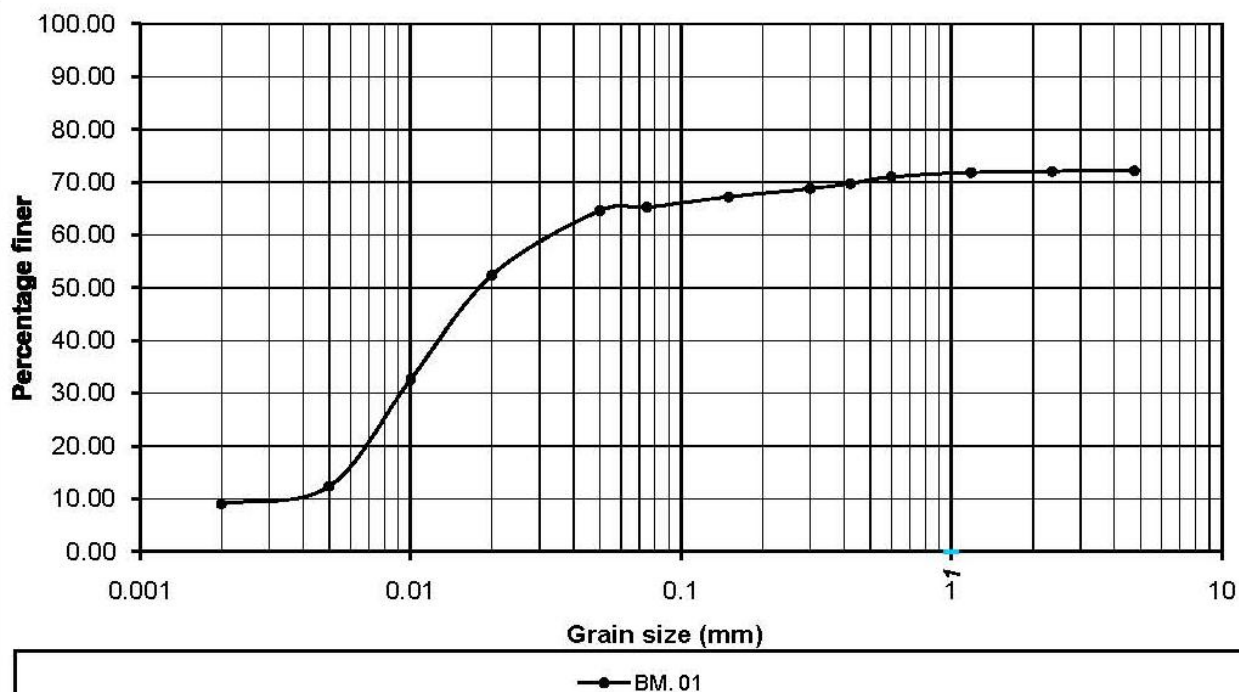
RESULTS OF TEST OF SOIL SAMPLES										
SITE-KYN Shi RIVER										
PHYSICAL ANALYSIS OF SOIL										
SL. NO	B.M	GRAVEL (%)	SAND (%)	SILT+CLAY (%)	SPECIFIC GRAVITY	PH VALUE	SILT (%)	CLAY (%)	Cu	Cc
1	1	26.21	18.85	54.29	2.65	7.48	46.25	8.04	7.65	0.95
2	2	16.80	34.19	46.66	2.64	7.40	37.45	9.21	6.03	1.35



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**GRAIN SIZE DISTRIBUTION CURVES**



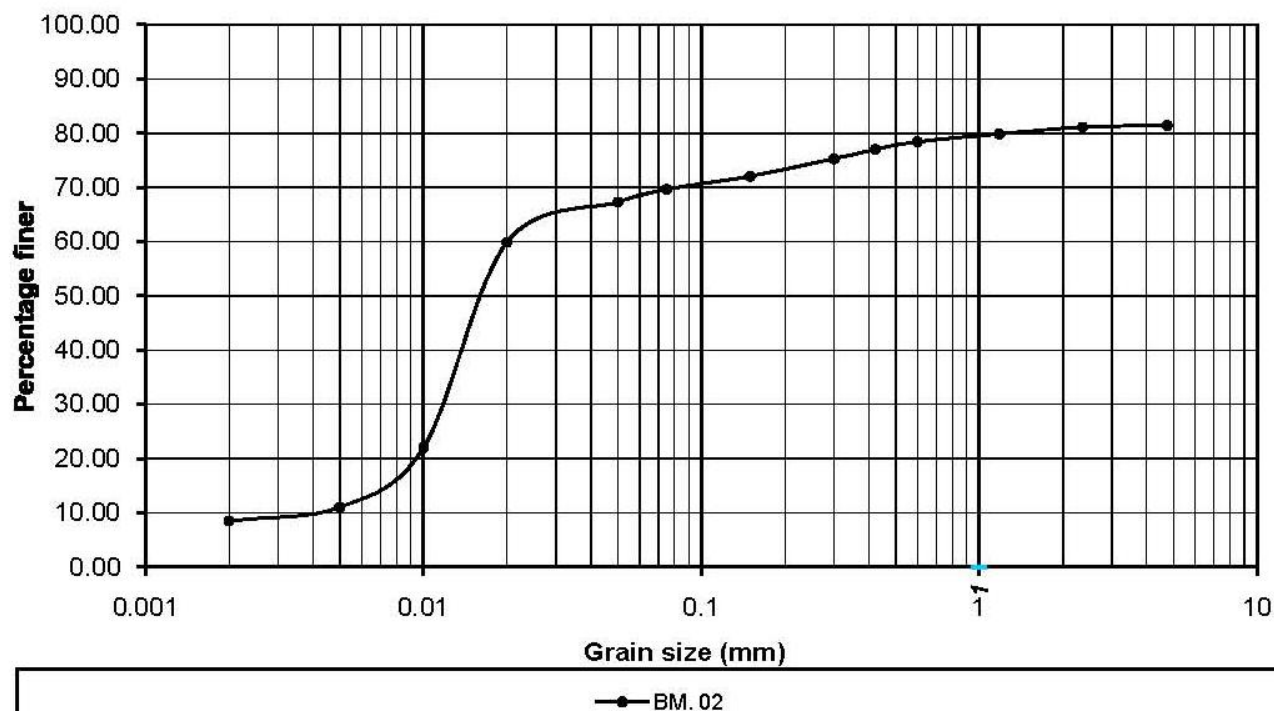
Grain size (mm)	<0.002	0.002-0.075	0.075-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Sand (%)	Gravel (%)
BM. 01	9.03	43.87	19.24	27.86
*Silt & Clay				



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**GRAIN SIZE DISTRIBUTION CURVES**



Grain size (mm)	<0.002	0.002-0.075	0.075-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Sand (%)	Gravel (%)
BM. 02	8.52	35.76	37.10	18.62

\*Silt & Clay

	<p align="center"><b>FINAL FEASIBILITY REPORT ON “DETAILED HYDROGRAPHIC SURVEY IN KYN Shi RIVER IN MEGHALAYA (27.870 KMS)</b></p>	
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**Annexure-14: Water Sample:**

<b><u>RESULTS OF EXAMINATION OF SAMPLES OF WATER</u></b>					
<b>SITE-KYN Shi RIVER</b>					
<b>PARAMETER-pH Value at 25<sup>0</sup>C</b>					
<b>SL. NO</b>	<b>B.M</b>	<b>LOCATION</b>	<b>PARAMETER</b>	<b>WATER SAMPLE RESULTS</b>	<b>PERMISSIBLE LIMIT IS:456-2000</b>
1	1	UPPER	pH Value at 25 <sup>0</sup> C (mg/l)	6.9	6.5-8.5
2		MIDDLE		6.7	
3		LOWER		6.2	
4	2	UPPER		6.8	
5		MIDDLE		6.7	
6		LOWER		6.3	

<b><u>RESULTS OF EXAMINATION OF SAMPLES OF WATER</u></b>					
<b>SITE-KYN Shi RIVER</b>					
<b>PARAMETER-Chloride as Cl (mg/l)</b>					
<b>SL. NO</b>	<b>B.M</b>	<b>LOCATION</b>	<b>PARAMETER</b>	<b>WATER SAMPLE RESULTS</b>	<b>PERMISSIBLE LIMIT IS:456-2000</b>
1	1	UPPER	Chloride as Cl (mg/l)	6.00	2000 mg/l for concrete not containing embedded steel and 500 mg/l for reinforced concrete work
2		MIDDLE		7.00	
3		LOWER		116.0	
4	2	UPPER		6.00	
5		MIDDLE		8.00	
6		LOWER		112.0	



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**RESULTS OF EXAMINATION OF SAMPLES OF WATER**

SITE-KYN Shi RIVER

**PARAMETER-Sulphates as  $\text{SO}_4$  (mg/l)**

SL. NO	B.M	LOCATION	PARAMETER	WATER SAMPLE RESULTS	PERMISSIBLE LIMIT IS:456-2000
1	1	UPPER	Sulphates as $\text{SO}_4$ (mg/l)	162	400 (mg/l)
2		MIDDLE		174	
3		LOWER		23	
4	2	UPPER		155	
5		MIDDLE		172	
6		LOWER		29	

**RESULTS OF EXAMINATION OF SAMPLES OF WATER**



SITE-KYN Shi RIVER

**PARAMETER-Sediment Concentration (mg/l)**

SL. NO	B.M	LOCATION	PARAMETER	WATER SAMPLE RESULTS	PERMISSIBLE LIMIT IS:456-2000
1	1	UPPER	Sediment Concentration (mg/l)	23	2000 (mg/l)
2		MIDDLE		25	
3		LOWER		45	
4	2	UPPER		22	
5		MIDDLE		26	
6		LOWER		43	



### Annexure-15: Calibration Certificate

	
<b>PAN INDIA CONSULTANTS PVT. LTD.</b>	
SALES DEPARTMENT	
CORPORATE ADDRESS : 105, PHASE IV, UDYOG VIHAR, GURGAON-122015, HARYANA, INDIA PHONES : +91 124 4300950, 4013954. FAX : +91 124 2346646, 2342880, CIN - U74899DL1985PTC021177 e-mail : paie@panindiagroup.com, paie@vsnl.com, www.panindiagroup.com	
<b><u>CALIBRATION CERTIFICATE</u></b>	
CUSTOMER NAME	: PRECISION SURVEY CONSULTANCY
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	: 05/02/2016
VALIDITY	: 04/02/2017
THIS IS TO CERTIFY THAT THE ABOVE INSTRUMENT WAS CHECKED AND CALIBRATED IN ACCORDANCE WITH THE APPLICABLE FACTORY PROCEDURES.	
For <b>PAN INDIA CONSULTANTS PVT. LTD.</b>	
	
<b>AUTHORISED SIGNATORY</b>	
REGD. OFFICE : OFFICE NO. 1, D-4, COMMERCIAL AREA, VASANT KUNJ, NEW DELHI-110070, INDIA PHONES : +91 11 26137657, 26137659, 26899952, 26899962, 26132214 FAX : +91 11 26138633 e-mail : nmspl@panindiagroup.com URL : www.panindiagroup.com	

**Figure 21 Calibration of DGPS Equipment**



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RIVER IN MEGHALAYA (27.870 KMS)



**PAN INDIA CONSULTANTS PVT. LTD.**

SALES DEPARTMENT

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

**CALIBRATION CERTIFICATE**

CUSTOMER NAME	:	PRECISION SURVEY CONSUTLANCY
ADDRESS	:	P.O. -SALAP, P.S.-Vichitra SP-45,KWIC NH-6, Dist. -Howrah Pin: 711 403 W.B
INSTRUMENT	:	Echo Sounder
SERIES	:	Bathy 500 MF
SERIAL NO.	:	B5MF0560
CALIBRATION DATE	:	05/03/2016
VALIDITY	:	04/03/2017

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

for PAN INDIA CONSULTANTS PVT. LTD.

  
  
AUTHORISED SIGNATORY

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

Figure 22 Calibration of Echo Sounder



FINAL FEASIBILITY REPORT ON  
“DETAILED HYDROGRAPHIC SURVEY IN KYNshi  
RIVER IN MEGHALAYA (27.870 KMS)



**SOUTH**

**SOUTH PRECISION INSTRUMENT PVT. LTD.**

FA - 229 B, Ground Floor, Mansarovar Garden, New Delhi-110015  
Ph. : 011- 45544114, 65568870 Fax: 011- 45530854 Mob.: 9999999255

**Calibration Certificate**

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

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

**INSTRUMENT TYPE** : GPS RTK  
**MODEL** : S-86  
**MAKE** : SOUTH  
**INSTRUMENT SR. NO.** : H0986214510 (Accuracy -RTK Mode-Horizontal = 10mm  
+: PPm RMS, Vertical = 20mm +: PPm RMS H0986214519  
(Static Mode - Horizontal = 2.5 mm + 1 PPm Vertical =  
5mm + PPm)  
**CALIBRATION DATE** : 07/03/2016  
**VALID UPTO** : 06/03/2017  
**ISSUED TO** : PRECISION SURVEY CONSULTANCY

For SOUTH PRECISION INSTRUMENT PVT. LTD.  
For SOUTH PRECISION INSTRUMENT PVT. LTD.

Authorized Signatory

Authorised Signatory

**Figure 23 Calibration of South**





**FINAL FEASIBILITY REPORT ON  
“DETAILED HYDROGRAPHIC SURVEY IN KYN Shi  
RIVER IN MEGHALAYA (27.870 KMS)**



**Annexure-16: Field Photographs:**



**Figure 24-River bank side**



**FINAL FEASIBILITY REPORT ON  
“DETAILED HYDROGRAPHIC SURVEY IN KYNshi  
RIVER IN MEGHALAYA (27.870 KMS)**





**Figure 25-Topographical survey Instruments**



**Figure 26 -Site Picture- Current Meter**



	<b>FINAL FEASIBILITY REPORT ON “DETAILED HYDROGRAPHIC SURVEY IN KYN Shi RIVER IN MEGHALAYA (27.870 KMS)</b>	
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### Annexure-17: Survey Charts:-

KYN Shi RIVER ( NW-61 )								
Sl. No.	Chart No.	Location	Chainage (Form.....km. To.....km.)	Chart Datum And Water Level (m.) w.r.t. MSL			Value of Reduction	Remarks
				Chainage (km.)	CD (m.)	WL (m.)		
1.	P_01	Mawpyllun to Ranikor	0.00 to 4.570 km.	1.500	9.500	10.556	-1.056	GS:- 1
				4.500	10.600	10.900	-0.300	GS:- 2
2.	P_02	Ranikor to Rajaju	4.570 to 7.875 km.	4.500	10.600	10.900	-0.300	GS:- 2
				5.500	11.100	11.400	-0.300	GS:- 3
				6.500	11.450	11.750	-0.300	GS:- 4
				7.500	13.100	13.400	-0.300	GS:- 5
3.	P_03	Rajaju to Mawkhar	7.875 to 11.595 km.	7.500	13.100	13.400	-0.300	GS:- 5
				8.500	14.750	15.050	-0.300	GS:- 6
				9.500	16.400	16.700	-0.300	GS:- 7
				10.500	18.100	18.400	-0.300	GS:- 8
				11.500	19.800	20.100	-0.300	GS:- 9
4.	P_04	Mawkhar to Nongbahjynrin	11.595 to 15.495 km.	11.500	19.800	20.100	-0.300	GS:- 9
				12.500	28.700	29.000	-0.300	GS:- 10
				13.500	37.900	38.200	-0.300	GS:- 11
				14.500	46.100	46.400	-0.300	GS:- 12
				15.500	54.600	54.900	-0.300	GS:- 13
5.	P_05	Nongbahjynrin to Nongkulang	15.495 to 19.000 km.	15.500	54.600	54.900	-0.300	GS:- 13
				16.500	62.900	63.200	-0.300	GS:- 14
				17.500	74.400	74.700	-0.300	GS:- 15
				18.500	80.600	80.900	-0.300	GS:- 16
				19.500	89.400	89.700	-0.300	GS:- 17
6.	P_06	Nongkulang to Pormadwar	19.000 to 24.370 km.	19.500	89.400	89.700	-0.300	GS:- 17
				20.500	98.700	99.000	-0.300	GS:- 18
				21.500	112.500	112.800	-0.300	GS:- 19
				22.500	122.000	122.300	-0.300	GS:- 20
				23.500	140.100	140.400	-0.300	GS:- 21
				24.500	149.600	149.900	-0.300	GS:- 22
7.	P_07	Pormadwar to Thadteja	24.370 to 27.870 km.	24.500	149.600	149.900	-0.300	GS:- 22
				25.500	160.200	160.500	-0.300	GS:- 23
				26.500	168.900	169.200	-0.300	GS:- 24
				27.500	179.300	179.600	-0.300	GS:- 25

Table 22- Survey Charts

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

**Survey period:** - 13<sup>th</sup> April, 2016 to 21<sup>th</sup> April, 2016

✦ **G.S.:-** Gauge Station