Preparation of Two Stage Detailed Project Report (DPR) of Proposed Cluster 2 Inland Waterways

Feasibility Report for NW-31 Dhansiri/Chathe River

September 2016

Inland Waterways Authority of India

Feasibility Report

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Final

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Prepared for	Inland Waterways Authority of India
Represented by	Hydrographic Chief

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List of Abbreviations

ATF	:	Aviation Turbine Fuel
BM	:	Bench Mark
CEA	:	Central Electricity Authority
CH	:	Chainage
CP	:	Control Point
CPC	:	Calcined Petroleum Coke
CUM	:	Cubic Meter
CWC	:	Central Water Commission
DGPS	:	Differential Global Positioning System
DPR	:	Detailed Project Report
EGNOS	:	European Geo Stationary Navigation system
G&D	:	Gauge & Discharge
GPS	:	Global Positioning System
HFL	:	High Flood Level
HSD	:	High Speed Diesel
IHO	:	International Hydrographic Organization
IWAI	:	Inland Waterways Authority of India
IWT	:	Inland Water Transport
Km	:	Kilo Meter
LAD	:	Least Available Depth
M	:	Meter
MDR	:	Major District Roads
MoWR	:	Ministry of Water Resources
MS	:	Motor Spirit
NH	:	National Highway
NRL	:	Numaligarh Refinery Limited
NW	:	National Waterway
OEM	:	Original equipment manufacturer
PIA	:	Project Influence Area
RFP	:	Request for Proposal
RPC	:	Raw Petroleum Coke
RTK	:	Real Time Kinematic
SBAS	:	Satellite based Augmentation System
SH	:	State Highway
SKO	:	Superior kerosene oil
SONAR	:	SOund Navigation And Ranging
SWOT	:	Strength Weak Opportunity Threat
WAAS	:	Wide Area Augmentation System
WGS	:	World Geodetic System
WRIC	:	Western Regional Instrumentation Centre

Category – II Waterways: Stage – I Feasibility Report Salient Features at a Glance

<table>
<tr><th>Sl No</th><th>Particulars</th><th>Details</th></tr>
<tr><td>1.</td><td>Name of Consultant</td><td>DHI (India) Water & Environment Pvt.ltd</td></tr>
<tr><td>2</td><td>Cluster number & State(s)</td><td>Cluster-2 (Assam)</td></tr>
<tr><td>3</td><td>Waterway stretch, NW# (From……to……Total length……)</td><td>NW-31 , Dhansari/ Chathe River Morangi T.E to Numaligarh total length 110 km length of the river from Bridge near Morongi T.E. village Lat 26°24'40.65"N, Lon 93°53'46.75"E to Numaligarh Lat 26°42'1.20"N, Lon 93°35'15.42"E</td></tr>
<tr><td>4</td><td colspan="2">Navigability status</td></tr>
<tr><td>a</td><td>Tidal and non-tidal portions (from…… to……. Total length…….. Average tidal variation</td><td>No tidal Action</td></tr>
<tr><td>b</td><td>LAD status (wrt CD)
i) Survey period ……. To …….
ii) < 1.0 m (km)
iii) 1.0 m – 1.5 m (km)
iv) 1.5 m – 2.0 m (km)
v) > 2.0 m (km)</td><td>i. 04th Feb to Feb to 17 April 2016.
<table>
<tr><th>Chainage</th><th><1</th><th>1-1.5</th><th>1.5-2</th><th>>2</th></tr>
<tr><td>0-10</td><td>2.819</td><td>1.2</td><td>2.511</td><td>3.471</td></tr>
<tr><td>10-20</td><td>2.734</td><td>1.965</td><td>2.5</td><td>2.8</td></tr>
<tr><td>20-30</td><td>3.05</td><td>1.577</td><td>3.1</td><td>2.3</td></tr>
<tr><td>30-40</td><td>2.5</td><td>3.098</td><td>2.12</td><td>2.28</td></tr>
<tr><td>40-50</td><td>0.9</td><td>4.1</td><td>2.976</td><td>2.05</td></tr>
<tr><td>50-60</td><td>0</td><td>4.9</td><td>3.2</td><td>1.913</td></tr>
<tr><td>60-70</td><td>0.7</td><td>4</td><td>3.4</td><td>1.91</td></tr>
<tr><td>70-80</td><td>5.5</td><td>4.23</td><td>0.1</td><td>0.18</td></tr>
<tr><td>80-90</td><td>4.973</td><td>4.417</td><td>0.61</td><td>0</td></tr>
<tr><td>90-100</td><td>6.9</td><td>1</td><td>2</td><td>0.1</td></tr>
<tr><td>100-113</td><td>13</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td></td><td>43.076</td><td>30.487</td><td>22.517</td><td>17.004</td></tr>
</table></td></tr>
<tr><td>c</td><td>Cross structures
i) Dams, wiers, barrages etc. (Total number: with navigation locks or not)
ii) Bridges, Power cables etc [Total number; range of horizontal and vertical clearances]</td><td>i. No Cross structure
ii. 6 No Bridge and 9 no is power cable (Horizontal clearance is vary from – (7 m- 47 M) and Vertical clearance (2.1-2.8) w.r.to H.F.L</td></tr>
<tr><td>d</td><td>Avg. discharge and number of days</td><td>Min-21.60556Cumec. Max - 1204.956Cumec</td></tr>
<tr><td>e</td><td>Slope 1 in …..</td><td>4608</td></tr>
<tr><td>5</td><td>Traffic potential</td><td>yes</td></tr>
<tr><td>a</td><td>Present IWT operations, ferry services, tourism, cargo if any</td><td>No</td></tr>
<tr><td>b</td><td>Important industries within 50 km</td><td>Yes , Numaligarh Refinery Limited (NRL) and Tea Processing Industries</td></tr>
<tr><td>c</td><td>Distance of rail and road from industry</td><td>Approachable roads in the vicinity of waterway and railway line connectivity within 10 - 20 kms</td></tr>
</table>

6	Consultant's recommendation for going ahead with stage II (DPR preparation)	Feasible with 1.5 to 2 m LAD for 6 months months from U/s of Dhansirimukh to Numaligarh. LAD of around 1 m is available upstream of Numaligarh till Golaghat during lean season period. Bridge at Golaghat has less vertical clearance and needs modification. LAD can be enhanced with planning suitable engineering interventions/river training measures at suitable locations. This needs an elaborate study and further data collection.
7	Any other information/ comment	NIL

Sec. 1 Introductory Considerations

Transportation is the backbone of the social and economic growth of any country. A well developed and coordinated transportation network is the primary need of it. Industries, cargo, logistics and other sectors are looking forward for technologically advanced and economic ways of transportation.

In order to keep in pace with the latest advancements in the navigation and cargo handling systems and to flawlessly operate a state of the art transportation system, timely maintenance and upgradation to the latest technologies and practices are a must.

From the government agencies to the commercial (cargo handling and transport) sectors are struggling to make effective and economic use of the available options of transportation resources and infrastructure. Their activities are guided by transport costs and the capacities of different transport modes. These considerations lead to one of the main advantages of Inland Water Transport (IWT). Studies have proved that the transport capacity of IWT is high and the costs are relatively low, especially for bulk transport over long distances.

Government of India intends to develop 111 Inland Rivers on an immediate and long terms basis to bring back its lost glory, for this it is planned to conduct a Feasibility Study and recommending thereafter the possibility of preparing the DPR to achieve navigation and to develop water transport facilities in Cluster regions.

Besides economic considerations, social and environmental issues are also key issues when developing transport modalities and hence, an integrated, multi-disciplinary approach to the decision making process in inland waterway transport development investments has to be adopted.

The steps to be taken in the decision-making process of IWT development depend largely on the level of development of inland waterway transport systems already in place. The central challenge for waterway development is finding the optimal balance between adapting the means of transport to the natural physical conditions and changing these in favour of improved navigability for vessels.

This report presents in a clear way the feasibility of the River Dhansiri which is a part of the proposed Cluster 2 National Waterways in North Eastern part of India. This feasibility report further provides the need, options and interventions requirement towards preparation of DPR for developing an IWT system which is economically, socially and technologically viable.

1.1 Objective and Scope of Study

Inland Waterways Authority of India (IWAI) planned to conduct a Feasibility Study and recommending thereafter the possibility of preparing the DPR to achieve navigation and to develop water transport facilities in Dhansiri River under Cluster 2 in North East region, India. The study would consist of 2 stages:

Stage 1: Reconnaissance Survey, Collection & Review of available data and Feasibility Report

Stage 2: Preparation of Detailed Project Report (DPR) for the feasible River Stretches

Stage 1 is proposed to be carried out at this stage and is aimed for definite objective, which is indicated in the scope of work of the RFP and are defined as under:

1) To analyse the existing data such as topography, bathymetry & hydraulic conditions, geological conditions, water infrastructure, navigation related data, etc.,
2) To carryout situational analysis using the available secondary data with different authorities/stakeholder/line departments and to undertake a bathymetric/topographic survey for IWAI to identify sustainable river navigation scenarios, and
3) To prepare the Feasibility report based on the above analysis.

1.2 Details of River Stretch & Map

Table 1 provides the details of river stretch of Dhansiri River, that is considered for the preparation of Stage 1 Feasibility study.

Table 1 Details of Study Length in Dhansiri River and their location

S.No	Name of the River	Description of Inland Waterway	Districts through which River flows
1	Dhansiri RIVER In Assam State	113 km length From Bridge near Morongi T.E. village to Confluence of Brahmaputra Lat 26°24'40.65"N, Lon 93°53'46.75"E to Lat 26°42'1.20"N, Lon 93°35'15.42"E	Golaghat

1.3 Characteristic of Dhansiri River

The river Dhansiri is a major south bank tributary of river Brahmaputra. It originates in the Naga Hills, north of Kohima in Nagaland at an altitude of about 800 m above MSL. It runs through the hilly areas, rapids and rough terrain in Nagaland and enters in to alluvial plains of the Dhansiri sub division in Assam. It confluences with the river Brahmaputra at Dhansirimukh, about 30 km downstream of Numaligarh road bridge. The river traverses a total length of about 255 km from its origin to confluence and meanders at many places on its way. The river flow is augmented by inflowing tributaries namely Dayang, Diphupani, Khora, Langlong, Beopani etc.

The 113 Km stretch of Dhansiri River considered for this study lies entirely in the state of Assam from the bridge near Morongi Tea Estate (T.E) to its confluence with Brahmaputra River 30 km downstream of Numaligarh. The river has the average width of 150 m in the stretch under consideration.

Golaghat is the main town located on the banks of Dhansiri River. "Gola" means market and "Ghat" means the port of river transport. The name 'Golaghat' originated from the markets established by a business class of people called 'Marwari' (who have their origins in Rajasthan) during the middle of 19th century at the bank of the river Dhansiri in the vicinity of the district headquarters.

There are 4 river gauging stations in this river, maintained by Central Water Commission (CWC). Out of this two are in the proposed study river stretch, while the other 2 are further upstream. Figure 1 shows the Dhansiri river region in Brahmaputra basin and Figure 2 presents Dhansiri/Chathe River reach and location of CWC gauging stations.

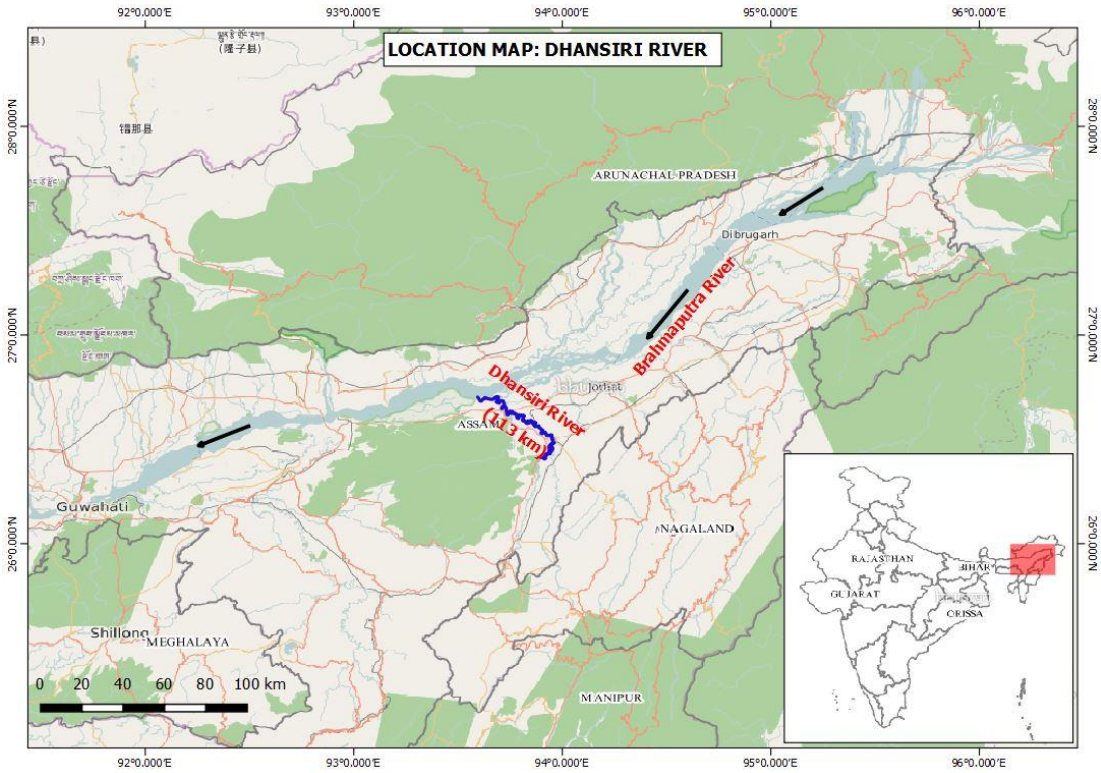


Figure 1 Location map of the River Dhansiri/Chathe

The river runs fairly close to important towns like Dimapur, Bokajan, Barpather, Jamguri, Golaghat and Numaligharh. It runs for some distance as boundary between Nagaland and Assam and within Assam it passes through Mikhir hills and plains in Sibsagar district. It passes mostly through forest land, tea gardens and farm land.

The Jorhat - Farkating branch line of North East Frontier Railway runs close and parallel to the river from Hautley ghat to Golaghat and the Gawahati-Tinsukia main line runs parallel and close the river from Barapathar to Farkating.

The gauging and discharge data from the measurement stations located at Numaligarh and Golaghat were used for the feasibility study.

Figure 2 Dhansiri/Chathe River reach and location of CWC gauging stations

1.4 Methodology Adopted to undertake the Stage 1 Study

Primary and Secondary data for the study has been collected from various departments and stakeholders in the study area. The methodology adopted for achieving the objectives outlined in the Scope of Work is briefly presented as a flow chart. The proposed activities in Stage 1 are briefly presented below:

Stage 1: Feasibility study would consist of the following activities:

- Reconnaissance Survey including bathymetry/topography
- Collection and Review of Available Data including analyses of existing data.
  - ✓ Preparation of Inception Report as per the analysis of data
- Preparation of Feasibility Report

The step by step methodology adopted for the stage 1 study is shown as a flowchart in Figure 3

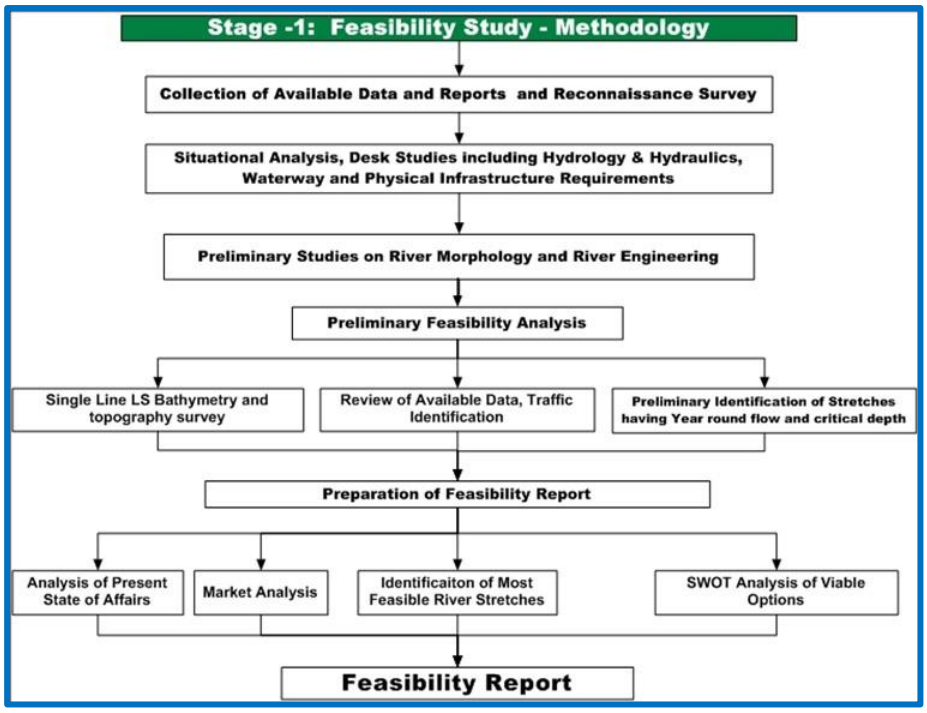


Figure 3 Flowchart showing the adopted methodology for stage 1

1.5 Primary & Secondary Data Sources

To have background knowledge and the historic navigational aspects of the study area, a detailed literature review was conducted on the following aspects.

1. Features of River Basin
   a. Climate of the Basin
   b. Physiographic Characteristics of the Basin
   c. Land Use, Land Cover and Agriculture
   d. Soil Classification
2. Proposed Hydropower projects in the upstream stretch
3. Agriculture Practices in Basin
4. Forests and Protected Areas

1.5.1 List of Secondary & Primary Data collected

Apart from the literature survey, a detailed primary and secondary data collection campaign was carried out for the preparation of the feasibility report. The data collected covers hydrological, topographical, navigational, traffic, socio-economic and other aspects in the Project Influence Area (PIA). Table 2 shows the list of data collected for the analysis and preparation of Feasibility report.

Table 2 Data collected for the preparation of the feasibility report

SL. NO	DATA TYPE	SOURCE/AGENCY
1	Topographic information: cross-sections / longitudinal profiles / Thalwegs	Based on Primary Survey conducted during the period 04th Feb to 17th Feb 2016.
2	Water levels – historical data	Water Level and Discharge (only maximum and minimum details for the past 10 years) data from IWAI
3	Monthly Maximum and Minimum discharge data for 10 years (2005 to 2015)	
4	Data pertaining to demographic particulars and local developments in study area	Economics & Statistics, Govt. of Assam
5	Goods Traffic by various transportation modes such as rail, road and IWT	Collected from various Govt. Agencies such as Railways, Economics & Statistics, Transport Department, Local Logistics and Freight Agents, Tea Owners Association and based on Local enquiry with Public.

Sec. 2 Analysis of the Present State of Affair

Figure 4 shows the region and Dhansiri River stretch in North East India being considered for feasibility study and thereafter for preparing DPR for inland navigation. The proposed study river stretch is located in the state of Assam.

The data required for the study such as depth of water available in different seasons, shoal details, visual observations on various topographical features, water level data, satellite images, etc. were gathered and analysed. Particular attention was paid to the reported lean flow during winter months and measures to be considered to maintain the desired Least Available Depth (LAD).

Hydro- morphological data was collected to understand the physical characteristics of the river such as river bottom, river banks, meander lengths, unstable slopes, channel bifurcation etc. The hydrological and sedimentological changes in the River will be identified in the second stage of the study.

Detailed analysis of the collected data was carried out. The results of this analysis and the inferences and conclusions derived from it is detailed in the following sections. Technical details of the various instruments used for the survey are also presented.

Figure 4 Dhansiri River stretch chosen for feasibility study

2.1 Details of the cross structures

Knowledge about the cross structures present in any river stretch is important in the assessment of it feasibility for navigation. The vertical and horizontal clearances of structures present across the river at various locations play a major role in determining the size of the vessel that can be plied in a region. This will also help in redesigning these structures if necessary and to check the techno-economic viability. Various types of cross structures can be present in a river stretch. They can be permanent (eg. Railway bridge) or temporary structures (eg. Wooden bridge). In the present study, type, location and vertical and horizontal clearance of each structures were identified and reported.

Two types of structures were observed along the 113 km river reach selected for the present feasibility study in Dhansiri River. They are bridges and high tension / electrical wires.

The locations of the major bridges are marked in the Figure 5. The details of the bridges noticed during the survey is given Table 3.

Nine high tension/electric lines were encountered during the survey across the proposed stretch of the Dhansiri River. The details of the high tension/ electrical lines are given in Table 4.

From the reconnaissance and bathymetric survey, it is clear that the vertical clearance of the bridges is one of the important factors in deciding the feasibility of developing the proposed river reach for Inland Navigation. It has to be noted that the observations were done during the lean period are reduced to HFL where ever the data was available. Figure 5 shows the location of few cross structures and CWC G&D stations in Dhansiri river stretch.

Figure 5 Structures and CWC offices in the Study area

Table 3 Details of the bridges noticed across the Dhansiri River

Sl No	CH (Km)	Description	Location	Latitude	Longitude	Easting (m)	Northing (m)	Horizontal clearance (m)	Vertical clearance wrt water level	Vertical clearance (m) wrt HFL
1	31.16	Numaligarh RCC Bridge	Numaligarh	26°37'51.99"	93°43'50.78"	572740.79	2945786.18	7.7	6.4	2.1
2	51.57	Rajabari Rail Bridge	Borgoria Chapori Village	26°35'41.07"	93°48'32.57"	580557.76	2941805.77	19.0	4.3	NA
3	52.65	Under Construction Bridge	Letekujan grant Village	26°35'15.15"	93°48'41.31"	580804.25	2941009.41	NA	NA	NA
4	79.90	Steel Bridge	Halmira Grant	26°31'7.26"	93°56'29.07"	593799.77	2933471.66	47.7	8.0	2.84
5	83.00	Dhansiri RCC Bridge	Near Golaghat Village	26°30'10.62"	93°57'7.01"	594862.82	2931736.54	34.0	8.8	2.84
6	113.00	Wooden bridge	Morongi T.E Village	26°24'39.97"	93°53'46.24"	589375.86	2921523.90	NIL	NIL	NA

Table 4 Detail of high tension/electric line noticed across the Dhansiri River

Sl No	Chainage (km)	Descriptions	Latitude (N)	Longitude (E)	Northing(m)	Easting(m)	Height (m)
1	25.35	High tension Line	26°38'47.05"	93°42'20.09"	2947466.13	570223.91	13.00
2	26.40	High Tension Line	26°38'41.06"	93°42'53.55"	2947287.31	571149.01	13.00
3	29.89	High tension Line	26°38'32.56"	93°43'41.71"	2947033.63	572482.76	11.00
4	31.00	Electrical Post	26°37'56.43"	93°43'46.04"	2945922.39	572608.29	8.00
5	29.92	High Tension Line	26°38'31.59"	93°43'42.14"	2947003.01	572494.01	11.00
6	30.3	High Tension Line	26°38'19.13"	93°43'44.01"	2946620.78	572548.76	12.00
7	31.21	Electrical Post	26°37'50.05"	93°43'47.95"	2945726.76	572662.47	7.00
8	31.4	Electrical post	26°37'43.63"	93°43'50.94"	2945529.38	572746.46	8.00
9	83.00	Electrical Post	26°30'8.75"	93°57'4.25"	2931678.19	594786.95	7.00

2.2 Existing Dams, Barrages ad Locks

In the full river stretch from Morongi T.E Estate to the confluence point “Dhansirimukh” of River Dhansari with River Brahmaputra, no existing barrage/Dams/ lock type of structures observed.

2.3 Details of protected area

Nambor - Doigrung Wildlife Sanctuary is near Morangi area located in Golaghat district of Assam. This wildlife sanctuary covers an area of 97.15 km^2 spreading in 3 blocks in Golaghat District. It is located 25 km from Golaghat town and about 318 km from Guwahati. The forest type is tropical semi-evergreen with pockets of pure evergreen, interspersed with small forest marshes. The area was declared as a Wildlife sanctuary in 2003. This sanctuary along with Garampani Wildlife Sanctuary (6 km^2) and Nambor Wildlife Sanctuary (37 km^2) are a part of the Kaziranga-Karbi Anglong Elephant Reserve with an estimated area of 3,270 km^2.

Nambor Wildlife Sanctuary is observed on the left bank of Dhansiri River near Morongi T.E. upstream of Golaghat. This sanctuary is famous for Hot water springs and one can easily sight Gaur and Hoolock Gibbon.

2.4 Details of NH/SH/MDR along and/or in the Vicinity

A well connected road network is present at the right hand side of Dhansiri River as the river is passing near the district headquarter region of Golaghat. Details of the road network are given in Table 5.

Two national highways are passing near/crossing Dhansiri River viz; NH 37 and NH39. NH 37 is one of the major road in the North Eastern part of India. The road is 680 km long and connects Dispur Numaligarh Jhansi and Dibrugarh with Saikhoghat in the east. This road crosses Dhansiri River at Numaligarh. NH 39 is 115 km long and connects Numaligarh with Nagaland border. This road is running parallel to the study stretch at the left bank side of the river. At some places this road is almost 100m close to river. Figure 6 shows a picture of a street in NH39 taken during the field reconnaissance survey.

State Highways (SH) connect major cities in the state both inter district and intra district. Six State Highways were noticed in the vicinity of Dhansiri River (Table 5). SH 1 runs parallel to Dhansiri River from Kamargaon to Golaghat and connects district HQ of Golaghat, sub-divisional HQ Titabor, sub-divisional HQ Nazira, sub-divisional HQ Sonari and Fertlizer complex at Namrup. This road also provides the starting locations of several interstate roads to the neighbouring State. SH 32 Connects District HQ Jorhat with Sub Divisional HQ Titabar.

SH 34 Provides interstate connectivity linking District HQ Golaghat in Assam with District HQ Wokha in Nagaland. SH 35 is another important road in Golaghat district Connecting Districts HQ Golaghat, this road crosses the river near Golaghat. NH-39, Silonijan and Kohora (Kaziranga) at NH-37. SH 44 is an Interatate road connecting the industrial town of Bokajan on NH-39 in Assam to the District HQ Wokha in Nagaland.

Apart from these major roads there are a lot of village roads present in the region. The bridge near T.E. village which is the starting point of the survey is part of such a village road. Figure 7 shows the major roads in the vicinity of Dhansiri River.

Figure 6 Road way From Numaligarh Junction point to the distance of the Nearest Town by NH 39

Table 5 Details of the major roads in the vicinity of Dhansiri River

Sl. No.	Type	Number	Route	Length (km)	Distance to the closest point to the river
1	NH	NH 37	Goalpara - Dispur-Nowgong-Numaligarh-Jorhat-Jhanzi-Dibrugarh-Tinsukia- Makum-Saikhoghat	680	0 (Numaligarh)
2		NH 39	Numaligarh-Naojan-Bokajan-upto Nagaland Border	115	Running parallel along left bank of the proposed stretch 0.03 – 6
3	SH	SH 1	Kamargaon – Kamarbandha – Amguri- Dillighat – Joypur	210	Running parallel along right bank of the proposed stretch (0.03 – 3)
4		SH 32	Jorhat – Barhola – Goronga	50	8
5		SH 34	Dergaon on NH 37 - Merapani on Assam-Nagaland Border	52	1.8 (Golaghat)
6		SH35	Kohara - Changlang ghat – Golaghat	97	0 (Crosses the river at Golaghat)
8	MDR	Gt-M-1	Bokakhat – Dhansiri much	5	
9		Gt-M-2	Kamargaon – Mohura chariali	4	1.2
10		Gt-M-3	Khumtai – Badulipar	7	3.4
11		Gt-M-4	Daria ali – Kaniachapori	13	
12		Gt-M-5	Dhekial – Badulipar	19	
13		Gt-M-6	Furkating Bypass	2	
14		Gt-M-7	Barpathar – Golaghat	32	
15		Gt-M-8	Silonijan – Bokajanghat	42	
16		Gt-M-9	Sarupathar – Uriamghat tiniali	31	
17		Ka-M-13	Borjuri – Dolamara	9	

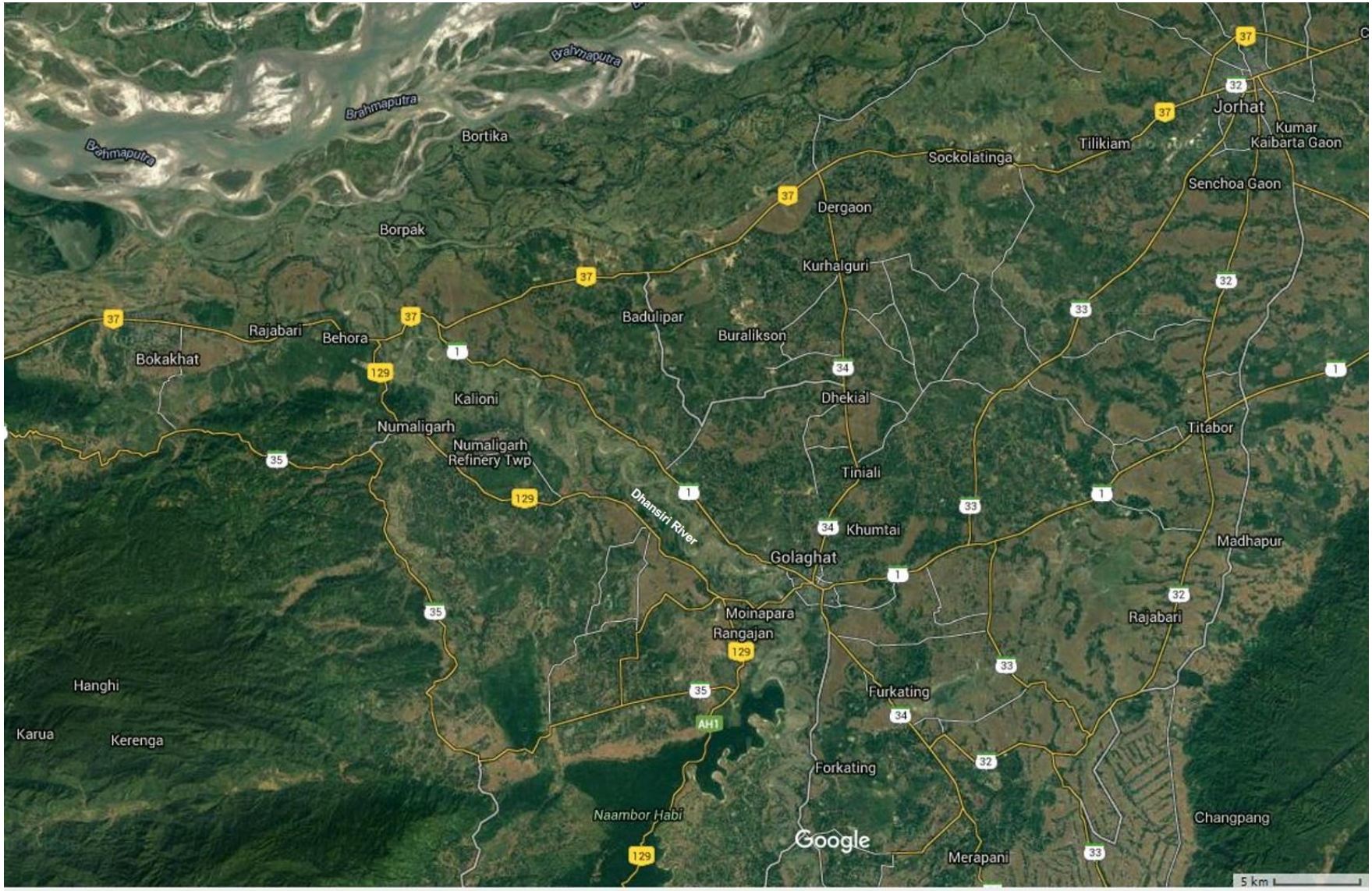


Figure 7 National and State highways present in the vicinity of Dhansiri River

2.5 Railway Line/Stations and Airport in the Vicinity

Jorhat Airport (also known as Rowriah Airport) is about 32 Kilometres away from Dhansiri River. The civil enclave, run by the Airports Authority of India is the 3rd major airport of Assam after Guwahati and Dibrugarh (by number of daily flights and yearly passenger traffic).

Numaligarh, Golaghat and Hautley railway stations are the major railway stations located in the main railway line in the vicinity of this river. Other railway stations are Jamguri, Oating, Furkating, Adharsatra, Khumtai, Bafulipar and Rangaliting. This connects Guwahat and Dibrugarh via Jorhat. Further, Furkating railway station is a junction located on the main line connecting Guwahati to Dibrugarh and Tinsukia. The line passes parallel to the river stretch under consideration at the right bank side. Near Golaghat the railwayline is as close as 110 m to the river. The railway stations that are closest to the study stretch along with the location of the Jorhat Airport is given in line present in the region is shown in Figure 8.

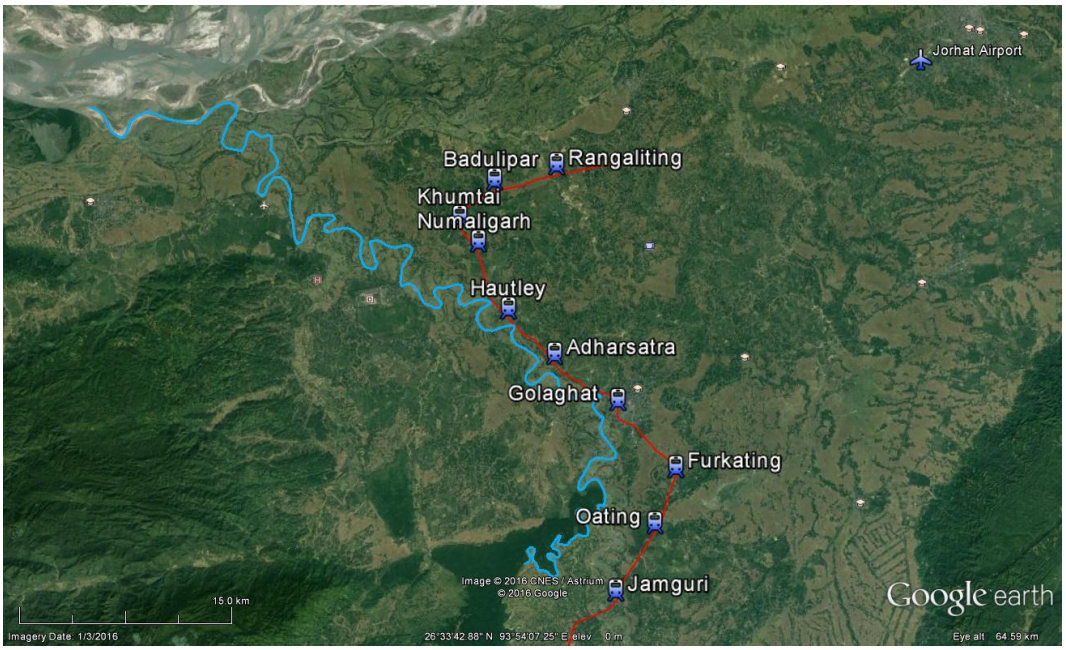


Figure 8 Nearest railway stations and Airport of Dhansiri River

The region comes under the Northeast Frontier Railway Zone, headquartered in Maligaon, Guwahati in the state of Assam, which is responsible for rail operations in the entire northeast and parts of West Bengal and Bihar. The rail network in the vicinity of the proposed waterway and how that is connected to the northeast frontier railway zone is clear from Figure 9.

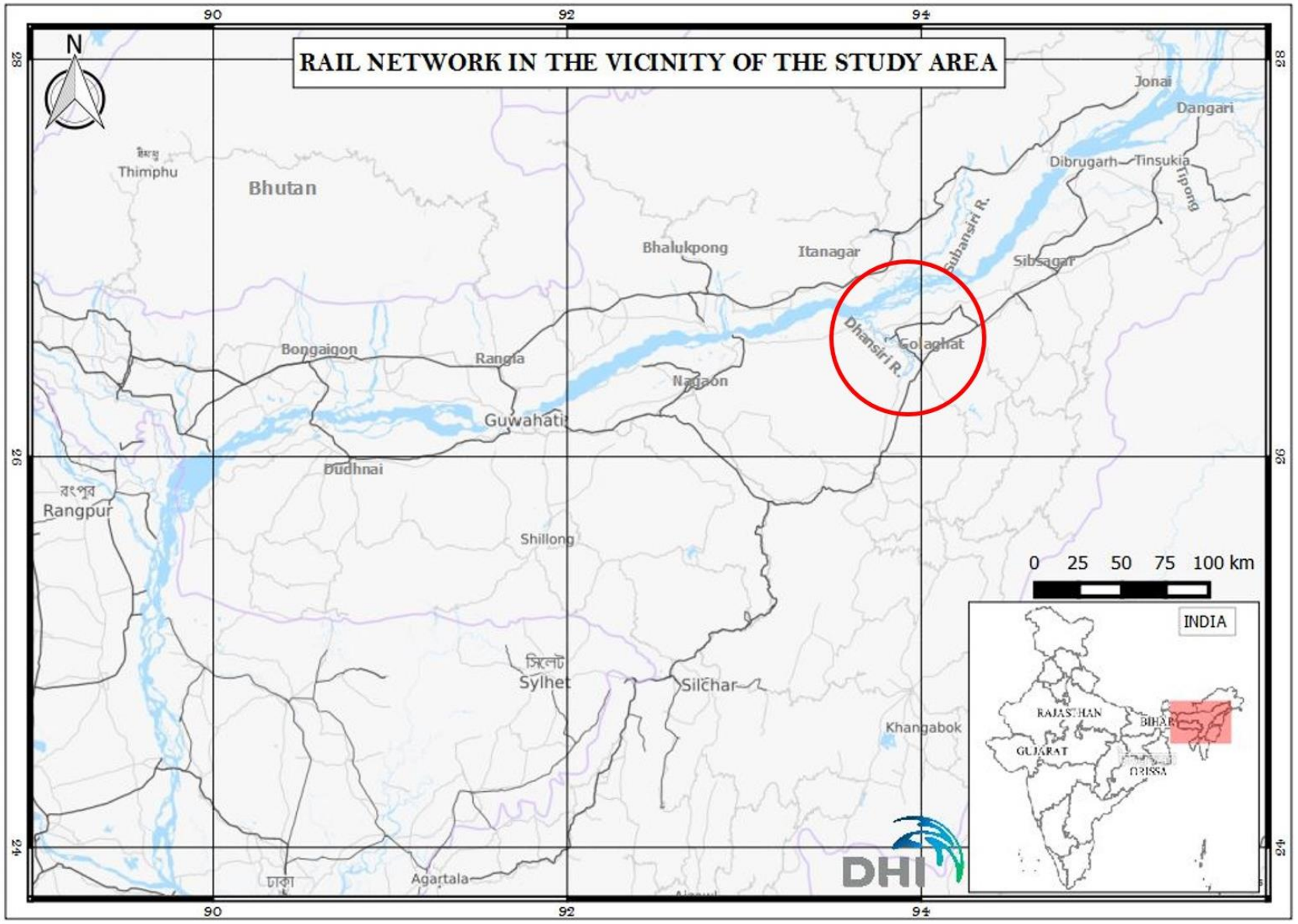


Figure 9 Rail network in the vicinity of proposed Dhansiri waterway

Sec. 3 Reconnaissance Survey – Stretch wise with photographs

The detailed field reconnaissance survey was taken up immediately after the analysis of available data. The primary tasks accomplished during the reconnaissance surveys include:

I. Single line longitudinal survey (Bathymetric survey) in the deepest depths with the help of DGPS using Automatic Hydrographic Survey System. Deepest route was accessed with the help of experienced pilots who involved in the study reach of river with local boats.
II. Details (horizontal and vertical clearances above spot water level of bridges and electric line en-route were collected and indicated on the chart and also included in the report along with their co-ordinates and location.
III. Topographical features of the proposed Inland Waterways.
IV. Typical physical features along the alignment e.g. land use pattern.
V. Preliminary identification of stretches having year round flow and critical depth for navigational purpose.
VI. Preliminary Traffic identification on the proposed Inland Waterways.
VII. Inventory of major aspects including proposed Inland Waterway width, Terrain, Bridges and structures across the proposed Inland Waterways (Type, size and location), urban areas (location extent). Geologically sensitive areas environmental features and hydrological features
VIII. Critical areas requiring detailed investigations
IX. Requirements for carrying out supplementary investigations
X. Drainage conditions.
XI. Type and extent of existing utility services along the alignment.
XII. Identification of various agencies of the govt. from whom the concerned project clearances for implementation are to be sought.

The data derived from the reconnaissance surveys were utilized for planning and programming the detailed surveys and investigations. All field studies including the traffic surveys taken up on the basis of information derived from the reconnaissance surveys.

3.1 Methodology Adopted including Resources and Equipment used

The technical details of the approach and methodology adopted for the current study is provided in the following section.

3.1.1 Reconnaissance Survey

The main objective of this reconnaissance survey is to carry out Preliminary Traffic study, Analysis of present state of traffic, collect data and to analyze the market and potential usage of proposed Inland Waterways in Assam, Arunachal Pradesh and Nagaland states with their connectivity to main hinder land for the development of stretches as national waterways.

Various data and sources used for this are:

a. Basic data state Agencies, River authorities, railways, IWAI.
b. Data of industrial, commercial / agro clusters in the hinterland of the proposed riverine ports from secondary sources like reports available in public domain were collected for further analysis
c. Data of number of barges, ships, ferries and speed boats, cargo and passenger vehicles plying on the rivers were collected from State and district level Govt. agencies and by visual observations

d. Data regarding present IWT facilities, Interstate and Intra state traffic serviced along the routes & passenger movement.
e. Data regarding commodities presently plying on the identified route and potential commodities which could be transported in future.
f. Collection of data on all aspects of transportation, trade, economics, natural resources, and the environment.
g. The rail and road connectivity to the present ports on the stretches of the rivers to derive the costs of transport.
h. The data regarding future canal and dam projects were collected in order to identify future potential routes in the given cluster.
i. Type of crops (in different seasons) and industries along the waterway.

3.1.2 Hydrographic Survey for Phase 1

The longitudinal bathymetric survey was carried out by using Automated Hydrographic Survey System (using digital Echo sounder for depth measurement, GPS for position fixing and Hypackmax data logging). The survey was conducted in WGS'84 datum.

Main objectives of the survey are

a. To assess the navigability of the waterway and to assess the shoal lengths
b. Topographical survey mainly to understand the details of the permanent structures located within this corridor.
c. To identifying cross structures which are obstructing navigation.

3.1.2.1 Horizontal Control

Importance was given for maintaining accuracy of the horizontal controls throughout the survey. The following methods were used to achieve this

i. Transfer of positions from CWC Bench Marks.
ii. Using High precision RTK DGPS in fix mode using UHF Radio Modem with IHO accuracy standards, with more than 24 hours observations at a permanent platform/base.
iv. DGPS receiving direct Satellite corrections were used.

Benchmarks (BM) (Figure 10) present at the CWC office in Golaghat was used for the current survey. The geographical details of the BM is given in Table 6

Table 6 Details of the benchmark

Latitude(N)	**26°30'13.44"**
Longitude(E)	93°57'8.41"
Elevation(M)	92.25 m

Figure 10 CWC Bench mark at Golaghat

3.1.2.2 Vertical Control

Vertical controls are as important as horizontal controls in hydrographic/topographic survey. The BMs present in the C.W.C office at at Golaghat and Numaligarh were used as reference for maintaining high accuracy. The survey was conducted in WGS-84 spheroid with no datum transformation. Table 7 gives the datum and projection details used for the current study.

World Geodetic System 1984 (WGS84) is the standard U.S. Department of Defense definition of a global reference system for geospatial information and is the reference system for the Global Positioning System (GPS). It is globally accepted as a standard reference system to use in cartography, geodesy, and navigation using GPS. It comprises a standard coordinate system for the Earth and a standard spheroidal reference surface (the *datum* or *reference ellipsoid*). The latest revision is WGS 84 (aka WGS 1984, EPSG:4326), established in 1984 and last revised in 2004. Table 7 gives the datum and projection details of WGS84.

Table 7 Datum and Projection details used for the present study

Datum Parameters	
Spheroid	WGS-84
Datum Transformation	None
Semi-major axis (a)	6378137.0 m
Semi-minor axis (b)	6356752.314245179 m
Eccentricity	0.0818 191909 28906
Inverse flattening (1/f)	298.257223563
Projection Parameters	
Grid Projection	Universal Transverse Mercator

Central Meridian (CM)	81 o East (Zone 44)
Origin Latitude (False Lat)	0.0o
Hemisphere	North
False Easting (FE)	500000.0 m
False Northing (FN)	0.0 m
Scale Factor on CM	0.999600
Units	International Metres

3.1.2.3 Equipment used

Selection of equipment and other accessories are important in determining the accuracy of the survey. Hence, only highly accurate instruments were selected for this study. The following sections give the details of the equipment and software used for the current study

Survey boat

The Bathymetric survey was conducted using a motorized boat (Figure 11). The DGPS antenna can also be seen in the picture.

Figure 11 Boat used for present survey

3.1.2.4 Positioning system

Charting the bathymetry and topography requires locating and measuring the geographic position (horizontal), and then referencing those measurements to a standard reference frame or datum (control). In modern times with the latest advancements in technology, high accurate GPS systems are used for horizontal positioning. For the current survey A Trimble DGPS (SPS361) system (Figure 12) was used.

Trimble DGPS system (SPS361)

SPS361(Figure 12) is a flexible, modular, GPS Heading receiver that delivers precise heading and sub-meter horizontal positioning accuracy for marine and OEM applications. It has an integrated Bluetooth wireless technology for cable-free configuration and operation with a

computer or cell phone. It is compatible with 4-channel WAAS (Wide Area Augmentation System), EGNOS (European Geo-Stationary Navigation System), and MSAS Satellite-Based Augmentation System (SBAS).

Figure 12 Trimble SPS 361

Echo Sounder System

Echo sounding is a type of SONAR used to determine the depth of water by transmitting sound pulses into water. The time interval between emission and return of a pulse is recorded, which is used to determine the depth of water along with the speed of sound in water at the time. This information is then typically used for navigation purposes or in order to obtain depths for charting purposes. For the current study Bathy 500 MF multi frequency echo sounder (Figure 13) was used

Bathy 500 MF multi frequency echo sounder

The Bathy-500MF Survey Echo Sounder (Figure 13) provides a high-contrast thermal chart record complete with alphanumeric annotation of important parameters such as geographic position, depth, speed of sound and offset for draft/tide. Real-time viewing of all parameters via front panel liquid-crystal display. Position input can be from either a standard C/A GPS receiver or differential GPS system. Depth data is available to external devices in digital form, via a versatile interface, whose format can be selected using the front panel keypad. Digital depth data output is available in various industry standard RS-232/422 formats or NMEA-0183. The ability to accept external annotation input from various PC-based hydrographic software is standard in the Bathy-500MF. A transducer with 210 kHz frequency along with a mounting bracket & base plate was also used for the current hydrographic survey.

Figure 13 Bathy 500 MF multi frequency echo sounder

3.1.2.5 Topographic Survey

Topographic survey was an integral part of the current survey and for that three South RTK surveying instruments (Figure 14) were used.

3.1.2.6 Calibration or equipment

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

Figure 14 Topographic survey using South RTK instrument near Dhansari Bridge no-2 (Ch. 33.17 km)

3.1.3 Conduct of survey work

The following subsections details the procedures followed throughout the current survey

3.1.3.1 Topographic Survey

Detailed survey of Dhansiri River has carried out From Bridge near Morongi T.E. village to Numaligarh (Lat 26°24'40.65"N, Lon 93°53'46.75"E to Lat 26°42'1.20"N, Lon 93°35'15.42"E). 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

The spot levels along the canal were obtained using GPS levelling technique. In the GPS spot levelling technique, the GPS control was extended using the co-ordinates and height of the BM provided by Inland Waterways Authority of India. These BMs and Points were then used as reference stations for deriving the spot levels of the rover locations in the Stop-Go method. The data was post processed to get the correct position and height.

3.1.3.2 Bathymetric Survey

Sounding operations

Bathy 500MF was used to obtain soundings the depth of the river. A working frequency of 210 KHz was used for sounding operations. The digital output from the echo sounder was fed to the HYPACK data logging software for acquisition of survey data in real time. The performance of the echo sounder was found to be satisfactory during the entire duration of the survey. Bathymetric survey was carried out from 14-02-2016 to 17-02-2016.

Data Processing

The topographic and hydrographic data collected during the field work was processed and analyzed using the proprietary data processing software i.e. HYPACK and AUTOCAD. Figure 15 is a flowchart that explains the sequence and process of digital data processing

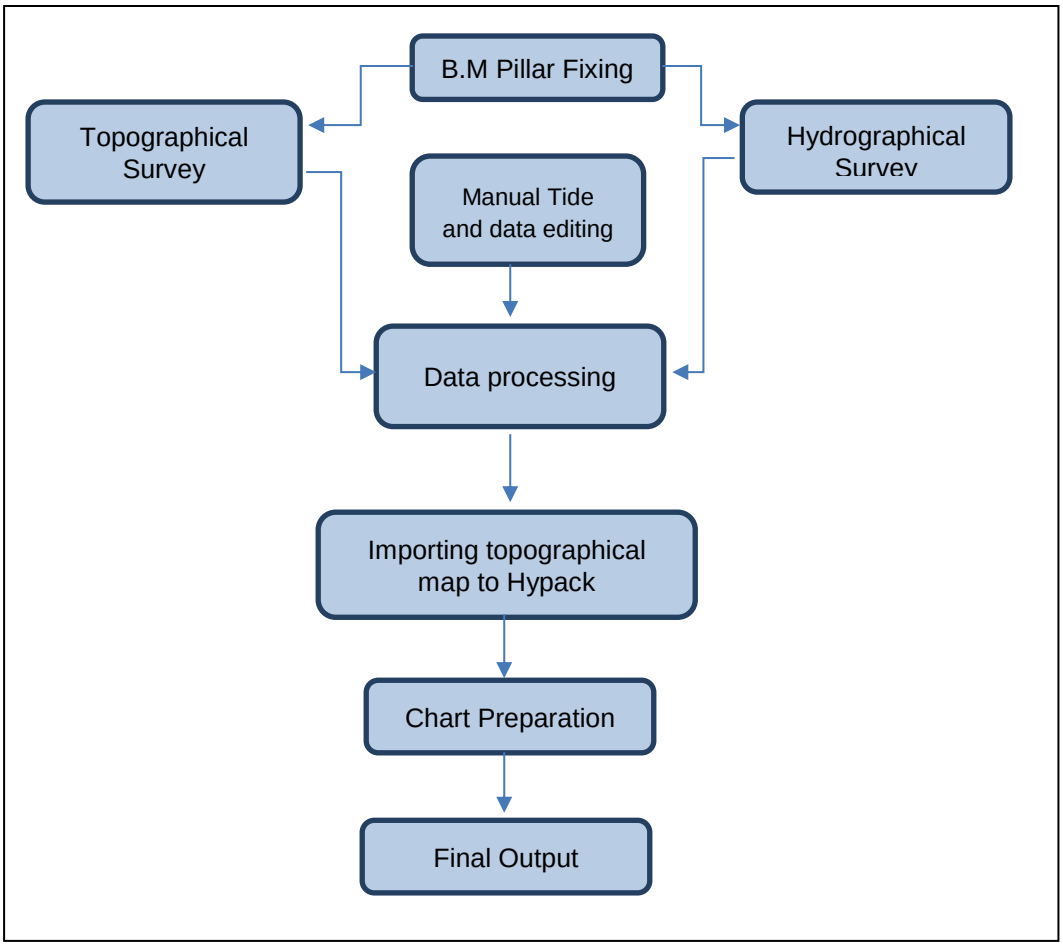


Figure 15 Flowchart showing the sequence and process of digital data processing

Control Point List and Observed water level

Control points (CP) are the points used for transferring the GTC Benchmarks at the CWC gauge site to the vicinity of the river bank. Details of the CP used in this process is given in Table 8.

The water level was recorded and the details Water level data is provided in annexure IV including Reduce level w.r.to the 6 yr. average water level collected From IWAI office.

Table 8 List of Control Points

CP	Easting(m)	Northing(m)	Latitude(N)	Longitude(E)	RL(m)
S1	623286.16	3036389.03	27°26'43.48"	94°14'51.03"	101.16
S2	623503.31	3036785.69	27°26'56.28"	94°14'59.08"	108.14
S3	624273.45	3036515.08	27°26'47.26"	94°15'27.02"	107.84
S4	623649.665	3037115.32	27°27'6.96"	94°15'4.52"	106.446
S5	624437.645	3037115.32	27°27'6.70"	94°15'33.22"	106.446
S6	619394.415	3030020.794	27°23'17.78"	94°12'27.03"	95.72
S7	619356.357	3024430.978	27°20'16.15"	94°12'23.67"	93.862
S8	617191.974	3019128.969	27°17'24.54"	94°11'3.07"	91.529
S9	617988.515	3016460.597	27°15'57.60"	94°11'31.13"	89.32
S10	614397.48	3012436.26	27°13'47.93"	94° 9'19.20"	93.75
S11	617665.939	3012952.075	27°14'3.71"	94°11'18.17"	87.973
S12	615723.388	3007205.246	27°10'57.55"	94°10'5.63"	86.1
S13	614928.607	3001186.484	27° 7'42.20"	94° 9'34.72"	85.361
S14	611118.37	2994381.43	27° 4'2.19"	94° 7'14.14"	86.98
S15	611127.879	2994382.23	27° 4'2.22"	94° 7'14.47"	86.16
S16	610582.66	2991329.441	27° 2'23.16"	94° 6'53.71"	82.66
S17	609828.78	2990399.71	27° 1'53.16"	94° 6'26.05"	83.12
S18	600730.216	2987490.856	27° 0'21.11"	94° 0'55.04"	83.78
S19	595281.324	2981101.934	26°56'54.86"	93°57'35.58"	80.94
S20	595203.83	2981102.76	26°56'54.92"	93°57'32.75"	82.95
S21	591442.14	2981747.26	26°57'16.79"	93°55'16.54"	80.62
S22	584466.426	2975681.21	26°54'1.23"	93°51'2.07"	80.3
S23	584449.34	2976082.25	26°54'14.27"	93°51'1.55"	80.05
S24	580750.50	2970384.98	26°51'9.87"	93°48'46.13"	78.57
S25	580666.07	2970373.22	26°51'9.53"	93°48'43.09"	78.78
S26	580656.722	2970379.704	26°51'9.73"	93°48'42.73"	79.59

3.2 Hydrographic and Topographic survey

Longitudinal survey was conducted for the proposed stretch of the river Dhansiri. The survey started near the Bridge near Morongi T.E. village and ended were the river confluence with Brahmaputra. Based on this survey a detailed understanding of the Maximum and minimum depths of the deepest channel, length of shoals, cross structures, land use pattern, villages at the bank etc. were obtained. The results of the survey is detailed in the following sections for each 10km chainage.

3.2.1 Description of the waterways

In order to understand the details of the shoals, available maximum depths and the condition of the banks of the River Dhansiri, the entire survey region was divided into 10 km chainages and the results of the same are present in the following sections.

3.2.1.1 Chainage 0.00 – 10.00 km (Brahmaputra confluence – Jugania Ati)

The River stretch of Dhansiri River from ch 0.0 to 10 km (Figure 16) is shown.

Figure 16 From Ch. 0.00 – 10.00 km (Brahmaputra confluence – Jugania Ati)

Depth and Shoal details

The details of the depth observed during the longitudinal survey is given in Table 9.

Table 9 Detais of the depth from 0.00 – 10.00 km (Brahmaputra confluence – Jugania Ati)

Chainage (km)		Depth of the deepest channel (m)	
From	To	Maximum	Minimum
0	10	2.7	0.35
Depth (m)		**Length (km)**	
< 1		2.82	

1 – 1.5	1.2
1.5 – 2	2.51
> 2	3.47

Land use pattern

This is the region where Dhansiri River confluence with Brahmaputra.a lot of sandy islands were noticed during the survey with scrubs. These islands change the shape and position after each flooding season. From about chainage 5.00 km the land at the left bank of the river was noticed to have utilised for agricultural purposes. The right bank was noticed to have been mostly sandy islands and shrubs.

Major villages

Left bank: Jugal Ati, Kumarani Pathar, Kumaraniati, Bahikhowa, Beloguri, Tamuli Pathar

Right bank: Jugania Ati, Now bhangi, Palashguri, Bez gaon, Bamun Gaon

3.2.1.2 Chainage 10.00 – 20.00 km (Jugania Ati – Kuruabahi Satra)

The River stretch of Dhansiri River from ch 10 to 20 km (Figure 17) is meandering in nature.

Depth and Shoal details

The maximum and minimum depth and the details of the shoal observed along this stretch of the river is given in Table 10.

Figure 17 From Ch. 10.00 – 20.00 km (Jugania Ati – Kuruabahi Satra)

Table 10 Detais of the depth from 10.00 – 20.00 km

Chainage (km)		Depth of the deepest channel (m)	
From	To	Maximum	Minimum
10	20	8.4	0.34

Depth (m)	**Length (km)**
< 1	2.73
1 – 1.5	1.96
1.5 – 2	2.51
> 2	2.8

Land use pattern
Along this 10 km stretch, both the banks of the river is used for cultivation. At some locations some land close to the river bank was observed to have been uncultivable/barren.

Major villages
Left bank: Jugania Ati, Now bhangi, Chawguri, Parangia Ati No.1, Parangia Ati, No1, Sijuri-kakajuri, moriaholla

Right bank: Jugal Ati, Dighaliati, Khotiakhuli, Nepalikhuti, Kuruabahi Satra.

3.2.1.3 Chainage 20.00 – 30.00 km (Kuruabahi Satra – Behora Grant)

The stretch of of Dhansiri River from ch 20 to 30 km (Kuruabahi Satra – Behora Grant) is shown in Figure 18. This is the stretch high tension wires were crossing at four locations.

Figure 18 From Ch 20.00 – 30.00 km (Kuruabahi Satra – Behora Grant)

Depth and Shoal details
The details of the deepest channel along this stretch of the river including the minimum and maximum depth observed during the survey is provided in Table 11.

Table 11 Details of depth from Ch. 20.00 to 30.00 Km (Kathkotia to Behora Grant)

Chainage (km)		Depth of the deepest channel (m)	
From	To	Maximum	Minimum
20	30	3.8	0.34
Depth (m)		**Length (km)**	
< 1		3.05	
1 – 1.5		1.57	
1.5 – 2		3.1	
> 2		2.3	

Land use pattern

At around 20.5 km chainage, on the right side, the river Gelabill joins Dhansiri. As in the previous stretches, the land is majorly used for agricultural purpose. Between ch. 25 and 26 km, a stretch of urban built up area was noticed.

Major villages

Left bank: Kuruabahi Satra, Khotiakhuli, Jugal Ati, Dighaliati.

Right bank: Parangia Ati no.1, Parangia Ati no.2, Siljuri – Kakajuri, Chawguri, Jugania Ati

3.2.1.4 Chainage 30.00 – 40.00 km (Behora Grant – Numaligarh Pathar)

The Stretch of Dhansiri River from chainage 30 km to 40 km is shown in Figure 19. Five cross structures were observed in this 10 km stretch of the proposed waterway. The most important one among these is the Numaligarh RCC Bridge that connects Numaligarh town with NH 37 and 39. It was already discussed in this report that the vertical clearance of the bridge is very less. Hence the bridge also plays a role in assessing the economic feasibility of the proposed waterway as well.

Figure 19 From Ch. 30.00 Km to 40.00 Km (Behora Grant – Numaligarh Pathar)

Depth and Shoal details

The maximum and the minimum depth observed along this section of the river during the survey is provided in Table 12.

Table 12 Details of depth from Ch. 30.00 Km to 40.00 Km (Behora Grant – Numaligarh Pathar)

Chainage (km)		Depth of the deepest channel (m)	
From	To	Maximum	Minimum
30	40	3.8	0.4
Depth (m)		**Length (km)**	
< 1		2.5	
1 – 1.5		3.1	
1.5 – 2		2.12	
> 2		2.28	

Figure 20 Numaligarh RCC Bridge (ch. 31.16)

Land use pattern

As two major roads (NH 37 and 39) are running along this stretch a lot of urban builtup area was noticed along the stretch. The rest of the region is utilised for agricultural purposes. A small waterbody of about 30m is joining the river at the left bank at ch. 37.6 km

Major villages

Left bank: Numaligarh Block, Numaligarh Grant Bagicha, Behora, Behora Grant

Right bank: Numaligarh Pathar, Parghat, Karaniholla, Numaligarh town, Rowdawar Gaon

3.2.1.5 Chainage 40.00 – 50.00 km (Numaligarh Pathar – Khumtai Na Gaon)

The stretch of Dhansiri River from Chainage 40 Km to 50 Km is shown in Figure 21. SH 1 of Assam state is running parallel and very close to this stretch.

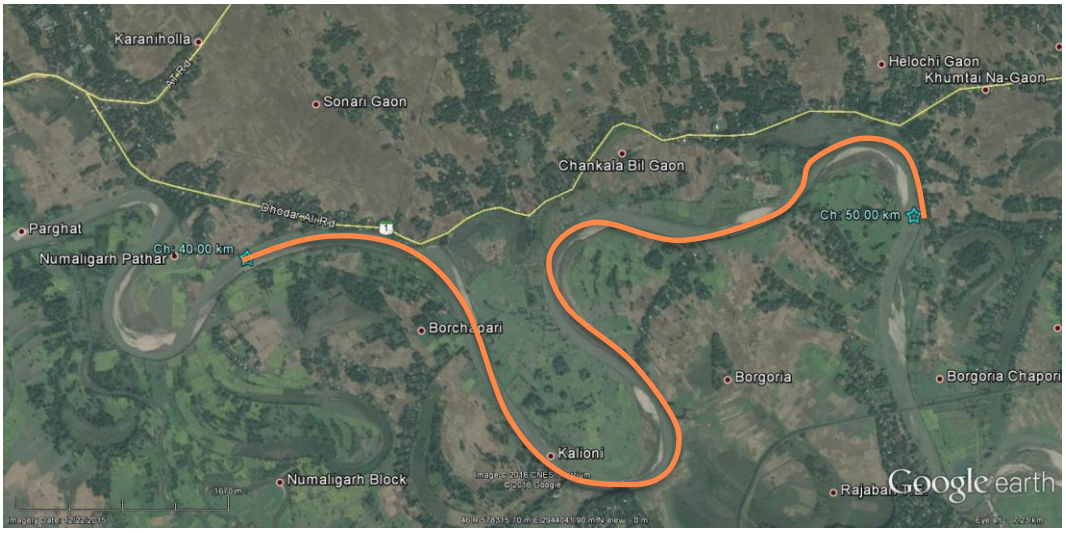


Figure 21 From Ch. 40.00 – 50.00 km (Numaligarh Pathar – Khumtai Na Gaon)

Depth and Shoal details

The maximum and the minimum depth observed along this section of the river during the survey is provided in Table 13.

Table 13 Details of depth from Ch. 40.00 – 50.00 km (Numaligarh Pathar – Khumtai Na Gaon)

Chainage (km)		Depth of the deepest channel (m)	
From	To	Maximum	Minimum
40	50	3.1	0.3
Depth (m)		**Length (km)**	
< 1		0.9	
1 – 1.5		4.1	
1.5 – 2		2.97	
> 2		2.05	

Land use pattern

The Numaligarh refinery is just below 1.5 km away from this stretch. The land use pattern on the left bank of the river is influenced greatly by the presence of the Numaligarh refinery township. Urban and rural built up areas were noticed at the left bank region.

Major villages

Left bank: Borgoria, Kalioni, Borchapari

Right bank: Khumtai Na Gaon, Helochi Gaon, Chankala Bil Gaon, Sonari Gaon.

3.2.1.6 Chainage 50.00 – 60.00 km (Khumtai Na Gaon – Bogoriani)

The stretch of the proposed water way in Dhansiri River from Ch. 50 Km to 60 Km is shown in Figure 22. Two bridges were noticed in the stretch. A rail bridge (Figure 23) at 51.57 km chainage connects the Numaligarh refinery with the Northeast frontier railway network. A concrete road bridge is under construction at 52.65 km chainage.

Figure 22 From ch. 50.00 Km 60.00 Km (Khumtai Na Gaon – Bogoriani)

Depth and Shoal details

The maximum and the minimum depth observed in the deepest channel along this section of the river during the survey is provided in Table 14.

Land use pattern

This is the region of the river where the Nimuligarh Refinary is situated at the left bank of the river. This refinery is about two kilometres away from the left bank. That region is a township and hence a vast area is built up area. The rest of the region is used mainly for paddy cultivation.

Figure 23 Rajabari Rail Bridge (Ch 51.57 km)

Table 14 Details of depth from Ch. 50.00 to 60.00 Km (Khumtai Na Gaon – Bogoriani)

Chainage (km)		Depth of the deepest channel (m)	
From	To	Maximum	Minimum
50	60	3.7	1.2
Depth (m)		**Length (km)**	
< 1		0.0	
1 – 1.5		4.9	
1.5 – 2		3.2	
> 2		1.9	

Major villages

Left bank: Bogoriani,Mitham Chapori, Dhekiajan Putta, Hatimora, Letekujan Grant, Nmaligarh Refinery Township, Rajabari T.E., Borgoria.

Right bank:Dhansiri Sapori, Leteku Chapori, Borgoria Chapori,

3.2.1.7 Chainage 60.00 – 70.00 km (Bogoriani – Koiborto)

The River stretch from ch. 60 to 70 km is shown in figure Figure 24. This is the stretch of the river where all along both the banks have access to the road network within 1 km.

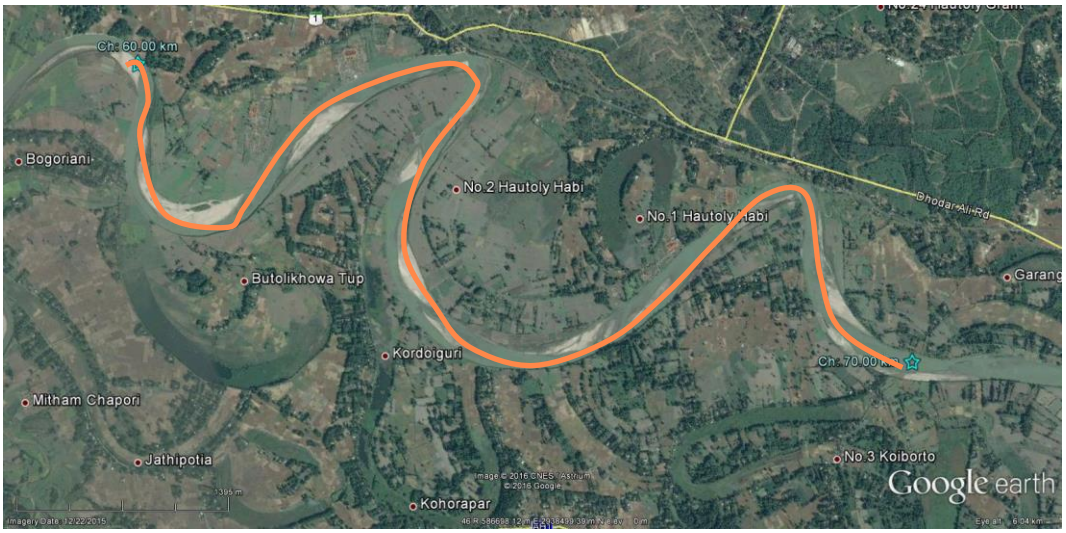


Figure 24 From Chainage 60.00 – 70.00 km (Bogoriani – Koiborto)

Depth and Shoal details

The details of the deepest channel observed along this section of the river during the survey is provided in Table 15. No cross structures were observed along this stretch of the river

Table 15 Details of depth from Ch. 60.00 – 70.00 km (Bogoriani – Koiborto)

Chainage (km)		Depth of the deepest channel (m)	
From	To	Maximum	Minimum
60	70	3.0	0.4
Depth (m)		**Length (km)**	
< 1		0.7	
1 – 1.5		4	
1.5 – 2		3.4	
> 2		1.9	

Land use pattern
The major land is used for agricultural purpose along this stretch.

Major villages
Left bank: No.3 koiborto, Chesamukh, Ponkial, Kohorapar, Kordoiguri, Butolikhowa Tup, jathipotia, Bogoriani

Right bank: Garanga Grant Gaon, Hautoly Habi, No. 1 Butolikhowa, No2. Butolikhowa

3.2.1.8 Chainage 70.00 – 80.00 km (Koiborto – Halmira Grant Gaon)

The stretch of the proposed water way in Dhansiri River from Ch. 70 Km to 80 Km is shown in Figure 25.

Depth and Shoal details
The maximum and the minimum depth observed along this section of the river during the survey is provided in Table 16.

Table 16 Details of depth from Ch. 70.00 – 80.00 km (Koiborto – Halmira Grant Gaon)

Chainage (km)		Depth of the deepest channel (m)	
From	To	Maximum	Minimum
70	80	2.3	0.3
Depth (m)		**Length (km)**	
< 1		5.5	
1 – 1.5		3.23	
1.5 – 2		1.1	
> 2		0.18	

Figure 25 From Chainage 70.00 – 80.00 km (Koiborto – Halmira Grant Gaon)

Land use pattern

Both the banks have access to the road network as in the previous stretch. As Golaghat is situated near the 70.00 km chainage an increase in the built up area was noticed near this. No change in land use in the prevailing land use pattern noticed along the river stretch..

Major villages

Left bank: Mowkhowa Grant Gaon, Dhansiripar Gaon, Gosain Satra Gaon, Na-Pamua Gaon, Dukhuti Mukh, Bholaguri Gaon, No.2 koiborto.

Right bank: Halmira Grant Gaon, Jogibari Gaon, Sensowa Gaon, Cinatoly, Garanga Grant

3.2.1.9 Chainage 80.00 – 90.00 km (Halmira Grant Gaon – Kathkotia)

The stretch of the proposed water way in Dhansiri River from Ch. 80 Km to 90 Km is shown in Figure 26

Depth and Shoal details

The maximum and the minimum depth and LAD observed along this section of the river during the survey is provided in Table 17

Table 17 Details of depth from Ch. 80.00 – 90.00 km (Halmira Grant Gaon – Kathkotia)

Chainage (km)		Depth of the deepest channel (m)	
From	To	Maximum	Minimum
80	**90**	**1.9**	**0.1**
Depth (m)		Length (km)	
< 1		**4.97**	
1 – 1.5		**4.41**	
1.5 – 2		**0.61**	

> 2	**0.2**

Land use pattern

This is the region of the river that is closest to the Golaghat district HQ. Golaghat is in the right bank of the river and hence the region in coming under the category of urben builtup area. The region outside golaghat HQ is again used for agricultural purposes along theis stretch.

Major villages

Left bank: Kathkotia, Moinapara, Golaghat Grant, Rangajan, Mowkhowa Grant Gaon.

Right bank: Bengenakhowa Grant, Amolapatty, Tetelital,

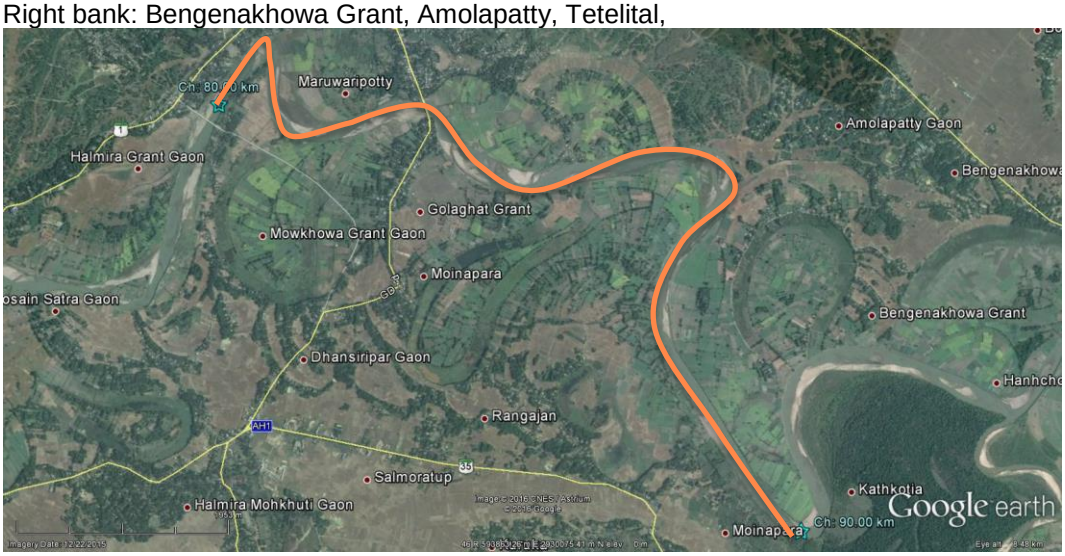


Figure 26 From CH. 80.00 – 90.00 km (Halmira Grant Gaon – Kathkotia)

3.2.1.10 Chainage 90.00 – 100.00 km (Kathkotia – Gojalitup)

The stretch of the proposed water way in Dhansiri River from Ch. 90 Km to 100 Km is shown in Figure 27. Near 94.00 km chainage, the proposed route diverts from Dhansiri River and is following a tributary of Dhansiri.

Depth and Shoal details

The details of the depth observed along the deepest channel along this stretch of the proposed waterway is given in Table 18.

Land use pattern

The left bank have thick forest coverage. Some isolated villages that comes under the urban built up area was noticed at the right bank side, and the rest of the region is used for agricultural purposes.

Major villages

Left bank: Bebejia Likson, Kathkotia.

Right bank: Gojalitup, Da – Samua, Do Gaon, Hanhchora, Bengenakhowa.

Figure 27 From ch. 90.00 – 100.00 km (Kathkotia – Gojalitup)

Table 18 Details of depth from Ch 90.00 – 100.00 km (Kathkotia – Gojalitup)

Chainage (km)		Depth of the deepest channel (m)	
From	To	Maximum	Minimum
90	100	2	0.1
Depth (m)		**Length (km)**	
< 1		7	
1 – 1.5		1.1	
1.5 – 2		1.9	
> 2		0.0	

3.2.1.11 Chainage 100.00 – 110.00 km (Gojalitup - Morongi T.E.)

The stretch of the proposed water way in Dhansiri River from Ch. 100 Km to 110 Km is shown in Figure 28.

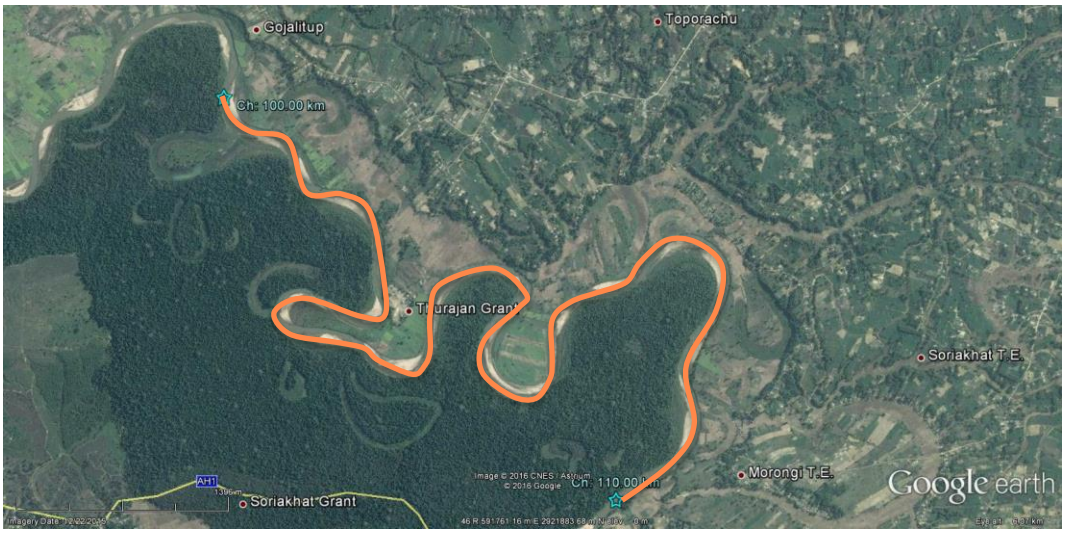


Figure 28 From Chainage 100.00 – 110.00 km (Gojalitup - Morongi T.E.)

Depth and Shoal details
No water was available along this stretch of the river for conducting the hydrographic survey.

Land use pattern
The left bank is covered with thick forest coverage at this stretch of the river. Agricultural activities were observed at the right bank side of the river bank.

Major villages
Left bank: Bebejia Likson, Kathkotia.

Right bank: Gojalitup, Da – Samua, Do Gaon, Hanhchora, Bengenakhowa.

3.2.1.12 Chainage 110.00 – 113.00 km (Gojalitup - Morongi T.E.)

The River width of Dhansiri River from Chainage 110.00 km to 113 km is shown in Figure 29

Figure 29 From Chainage 100.00 – 110.00 km (Gojalitup - Morongi T.E.)

Depth and Shoal details
No water was available in this stretch of the river to conduct the hydrographic survey.

Land use pattern
The left bank is covered with thick forest coverage at this stretch of the river. Agricultural activities were observed at the right bank side of the river bank.

Major villages
Left bank: Abhoijan T.E

Right bank: Morongi T.E.

3.2.2 Other information

The information collected about the River Dhansiri is reported in this section of the report. All these information have to be studied in detail in the stage 2. These are just the preliminary assessments of the conditions observed during the current survey.

3.2.2.1 Observed Soil Characteristics

The geomorphological map of the area of study is presented in Figure 30. River soils are types of soil that are carried and deposited by the action of rivers (Figure 30). Generally soils consist of a mixture of sand, silt and clay. Dhansiri River is meandering in nature. Because of this, heavy erosion occurs frequently at both the banks of the river. This eroded soil is one of the major soil that is carried by the river. In addition to that the river also carries soil that has been eroded due to the deforestation in the hilly catchment of the river basin. As the river reaches the plains, the change in slope of its path causes the river to slow down which in turn leads to heavy siltation along the river bed.

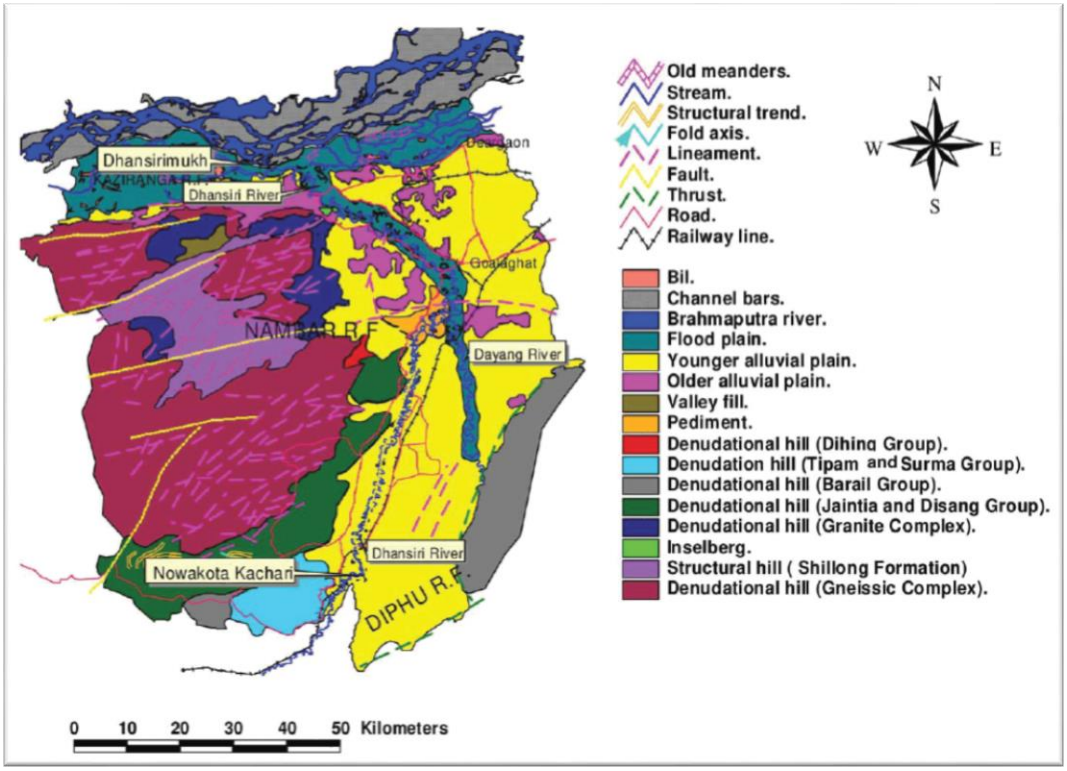


Figure 30 Geomorphological map of the study area

3.2.2.2 Conditions of banks (protected, un-protected)

Till 20 km chainage dense forest was noticed along the left bank side of the river. These regions are highly protected. Major part of the river bank is unprotected (Figure 31). At some places hard protection measures were noticed (Figure 32). Many of the banks were eroding and lack any kind of protection measures.

Figure 31 Unprotected, eroding bank of Dhansiri River ch 82.45

Figure 32 Example of protected bank in Dhansiri River near Still Bridge

3.2.3 Details of collected data

Water level and discharge data of two different gauge stations were provided by IWAI and the data were analysed. The results of the analysis is discussed below. Collected data is given in Annexure III

3.2.3.1 Yearly minimum and maximum Water Levels

Water level data of Golaghat site from 2006 to 2015 is presented in Figure 33. It can be seen clearly from the figures that the water level of this region is high during the monsoon season i.e. from the second half of June till September. The range of the variation in the maximum and minimum water levels is up to 5 meters during this season

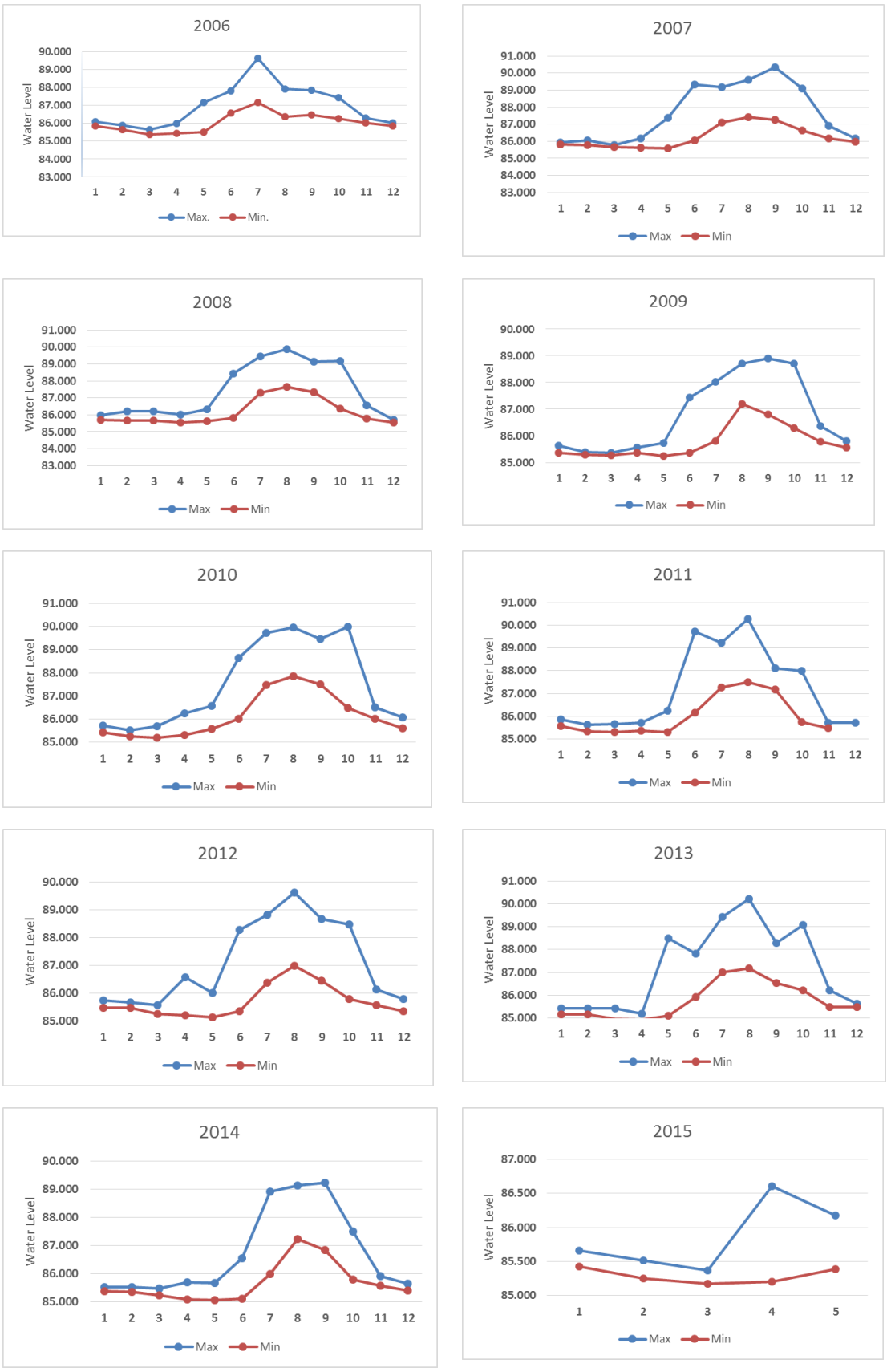


Figure 33 Water level of Golaghat from 2006 to 2015

3.2.4 Average of six years minimum Water Levels

The average of 6 year minimum water level is calculated from the secondary data collected. The lowest water level of six years is needed for calculating the Chart datum of the river. The lowest water level in the Golaghat region was during the year 2013 where the average lowest water level near went as low as is 85.138m. In the case of Numaligarh, the lowest water level of 74.27m was noticed during the year 2009. In 2011, both the locations had their highest water levels.

Figure 34 and Figure 35 are the timeseries graph of the average minimum water levels for Golaghat and Numaligarh respectively.

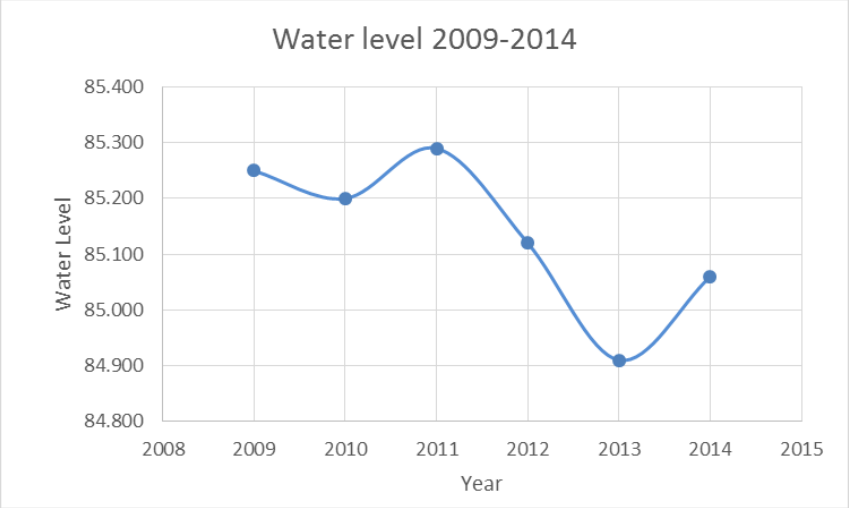


Figure 34 Average six year Minimum water level at Golaghat

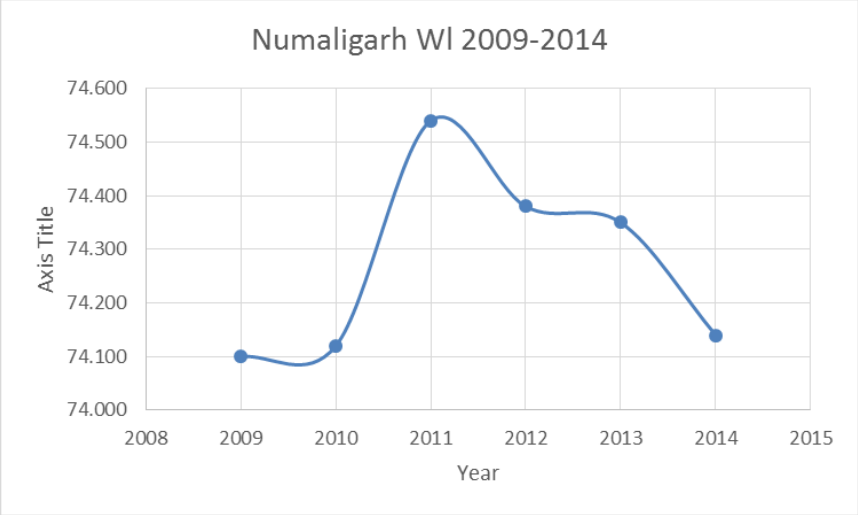


Figure 35 Average 06 Minimum water level at Numaligarh

3.2.4.1 High Flood Level (HFL)

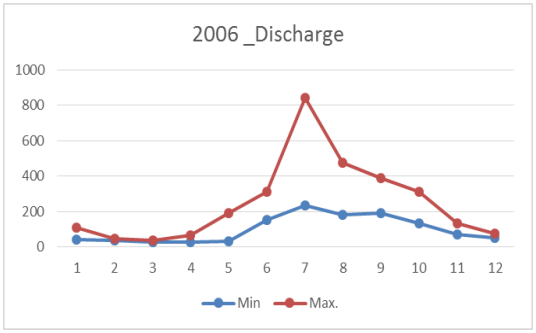
Peak HFL from 2006 to 2015 measured at Golaghat and Numaligarh G&D stations are presented in Table 19. It can be seen that the peak HFL in Golaghat was observed during the 2007 September, whereas the peak HFL occurred at Numaligarh was during2011 August. It can be inferred that the two water gauging stations do not show a linear relationship in the case of the occurrence of HFL.

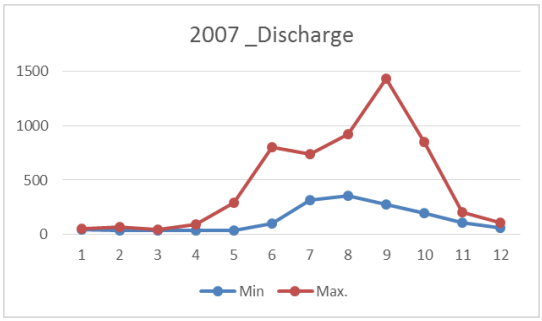
Table 19 Peak HFL given based on the historical data Golaghat and Numaligarh

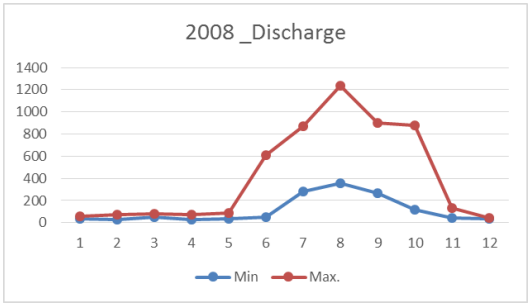
Year	Site Name	HFL	Location
11th Oct 2012	Golaghat	91.3	Near Golaghta Bridge
24th Sep 1985	Numaligarh	79.87	Near Numaliagarh Bridge

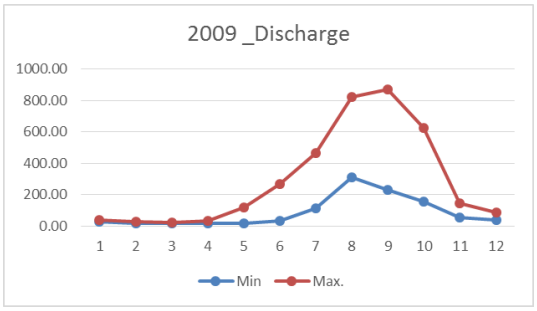
3.2.5 Monthly minimum and maximum Discharge

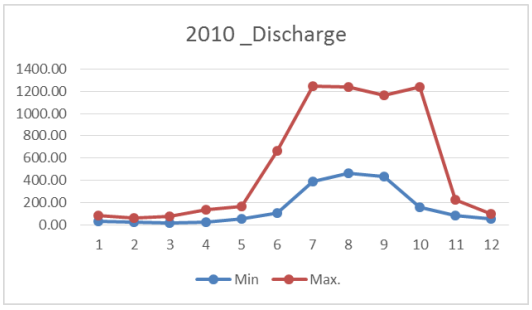
Monthly minimum and maximum Discharge data of Golaghat and Numaligarh was provided by IWAI from 2006 to 2015 is analysed and the trend is presented in Figure 36.

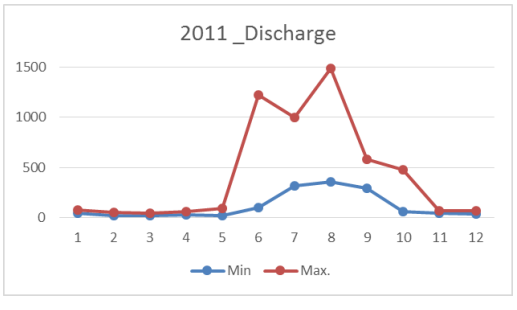












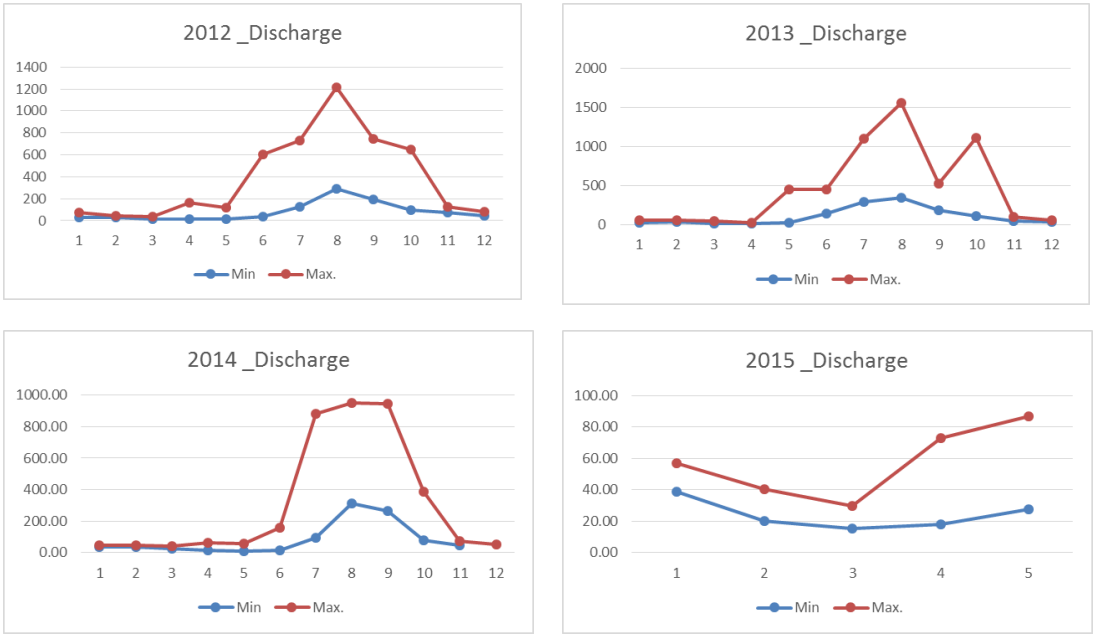


Figure 36 Monthly Minimum and maximum Discharge at Golaghat

3.2.5.1 Yearly minimum and maximum Discharge

The secondary data was collected from CWC through IWAI office for the period from 2006 to 2014 near to Golaghat area and is presented in Figure 37.

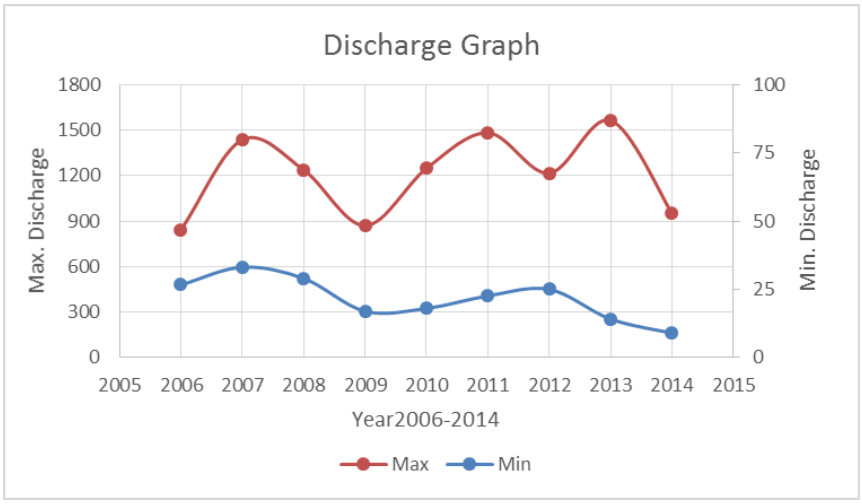


Figure 37 Yearly Minimum and maximum Discharge at Golaghat

3.2.6 Summary of Observed Water Depth and Length of Shoals

As mentioned in earlier section, a detailed analysis was conducted to identify the length of the shoal for every 10 km chainage. This was calculated with the help of the surveyed data. The analysis revealed that more than 43 km of the proposed area have depth below one metre. The minimum and maximum depth observed at each 10 km chainage is also summarised and both are presented in Table 20 . Out of this 43 km, hydrographic survey could not be conducted in a 20 km stretch upstream due to non-availability of water.

As discussed earlier, the meandering nature of the river makes the banks unstable and huge erosion is occurring on many places. This has to be tackled in order to limit the siltation along the river. It is proposed that a detailed modelling study to be conducted in order to quantify the siltation problem that might occur in the channel. The result is summarised and is presented in Table 20

Table 20 Summary of the depths observed in Dhansiri

Chainage	Min Depth	Max. Depth	<1	1-1.5	1.5-2	>2
0-10	0.3	2.7	2.819	1.2	2.511	3.471
10-20	0.3	8	2.734	1.965	2.5	2.8
20-30	0.3	3.8	3.05	1.577	3.1	2.3
30-40	0.4	3.8	2.5	3.098	2.12	2.28
40-50	0.3	3.1	0.9	4.1	2.976	2.05
50-60	1.2	4.6	0	4.9	3.2	1.913
60-70	0.3	4	0.7	4	3.4	1.91
70-80	0.3	2.4	5.5	4.23	0.1	0.18
80-90	0.1	1.9	4.973	4.417	0.61	0
90-100	0.1	2	6.9	1	2	0.1
100-113	N.A	N.A	13	0	0	0
			43.076	30.487	22.517	17.004

Sec. 4 Market Analysis

4.1 Land use Pattern along Waterway

Land Use pattern along waterway of the river is increasing based on the population and growing demand of agriculture which are observed as dominating factors in the vicinity of the river areas. Both the banks of river, agriculture, plantation and Tea plants are extensively available from the upstream of Numarigarh till Golaghat. Numaligarh Refinery complex is located just on the left bank of Dhansiri River. The landuse pattern of Dhansiri river region is presented in Figure 38.

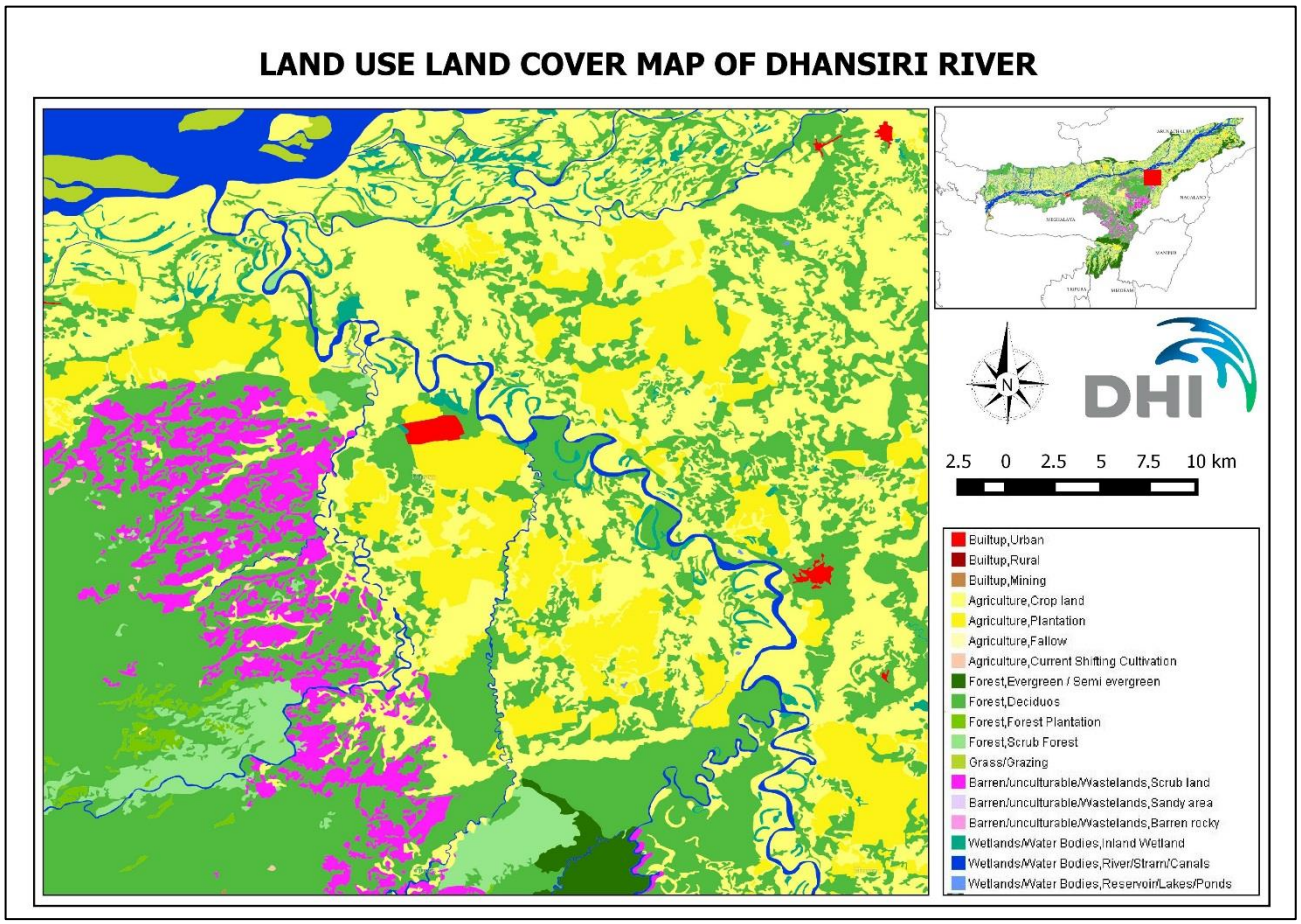


Figure 38 Landuse Map of Dhansiri River Region

4.2 Crops / Agriculture in the region

The Main crops in Golaghat district are rice, Jute, Sugarcane, fruits, Tea, Pulses, coconut, Potato, cotton, Areca nuts, vegetables, Tobaco, Wheat, Maize etc. Oilseeds are also cultivated depending on the season.

4.3 Existing Industries along Waterway

Export of diesel from Numaligarh Refinery in Assam to Parbatipur in north Bangladesh on a trial basis is proposed by Govt. of India based on recent announcement. Brahmaputra Cracker &

Polymer Limited and Numaligarh Refineries Limited are major industries observed near Golaghat. Apart from this Golaghat district has micro and small units of agro sector based products, tea products, cement, etc.

4.4 Existing Jetties and Terminals

An Existing Concrete Jetty is available in the Left bank of River Dhansari near the Numaligarh Bridge and the same has been used only in post flood seasons for local ferries. The existing river jetty at Numaligarh is shown in Figure 39 and the geographic details are provided in Table 21.

Figure 39 Existing Terminal down of Numaligarh Bridge

Table 21 Details of the existing terminal

Terminals	Latitude	Longitude	Area
Existing Terminal	26°38'4.20"N	93°43'46.18"E	Near Numaligarh Bridge reconstructed

4.5 Preliminary Traffic Identified

Numaligarh Refinery Limited (NRL), was set up at Numaligarh in the district of Golaghat (Assam) in 1999 with 3 MMTPA capacity. Recently an additional 1.5 MMTPA capacity expansion has been proposed by the Government. The products of the NRL include LPG, Naphtha, Motor Spirit (MS), Aviation Turbine Fuel (ATF) Superior Kerosene Oil (SKO) High Speed Diesel (HSD), Raw Petroleum Coke (RPC) Calcined Petroleum Coke (CPC) & Sulphur. NRL is the biggest industrial complex located in the PIA.

The study team had discussion with the member of Indian/ Assam Tea Association and it is noted that around 30 Tea Estates are located in the PIA out of 756 registered tea estates present in Assam state. The majority of tea produced in and around the PIA is being transported to Guwahati/Kolkatta for auction for exports. The tea production season is observed during April to November in a year. It was also observed that transportation cost of Rs. 6/kg is being incurred for export of Tea by roadways as on date. Most of the Tea estates had expressed their keen interest to use waterways if developed in Dhansiri River.

Further, entire Fertiliser requirement for Tea and agricultural sectors are being imported from other parts of the country by Roadways.

However, a rough estimate was made as per the preliminary data collected during the study are presented in Table 22.

Table 22 Identified preliminary traffic for Dhansiri River

Goods	Number of Trucks /day by Road	MT/Day	Month (MT) (estimated on 25 working days) by Road
Tea (outgoing)	20	240	6000
Vegitable	50	600	15000
RICE	30	360	9000
Jute (outgoing)	4	48	1200
Other items including Cement, steel, hardward, automobiles, etc.	50	600	15000
Total			46200 MT per Month

4.6 Historical and tourist places

Tourism activities including wild life Safari at Kaziranga Sanctuary is observed in the project influential area. Location named GaramPani is famous for hot Spring and is home for wide variety of endangered animals.

4.7 Availability of Passenger Ferry Services

No ferry services are available along the 113 km stretch from Moranngi T.E to Dhansiri Mukh

4.8 Critical areas

At the time of Hydrographic and spot level survey the banks of the proposed stretch was observed. This primary observation and the discussion with the local people helped in identifying the critical stretches of the river and were mapped. The Spatial attributes of the identified locations are presented in Table 23. The same are presented in Figure 40.

Table 23 Critical stretches identified in Dhansiri River

Location	Latitude	Longitude
C1	26°27'38.30"N	93°56'1.50"E
C2	26°28'41.48"N	93°56'43.44"E
C3	26°28'46.20"N	93°56'58.70"E
C4	26°28'44.94"N	93°57'40.25"E

C5	26°30'26.82"N	93°56'53.95"E
VC1	26°31'2.47"N	93°57'2.67"E
C6	26°33'30.48"	93°52'11.98"E
C7	26°34'40.71"	93°52'18.10"
C9	26°36'48.23"N	93°48'52.68"E
C10	26°36'38.51"N	93°48'13.65"E
C11	26°35'51.47"N	93°47'18.62"E
C12	26°36'45.81"N	93°44'9.76"E
C13	26°39'21.33"N	93°43'7.58"E
C14	26°40'58.26"N	93°42'52.56"E

*C = critical VC = Very critical

Figure 40 Critical points are shown in the Figure

4.9 Minimum and maximum depth observed in Dhansiri River in every km chainage

As discussed in section 3.2.1 the proposed waterway was analysed in detailed for every 10 km chainage. The upstream of river around 20 kilometres of the proposed region, the availability of water was very less and hence no sounding operations were carried out in this region. As per the TOR, only topographic survey was carried out along these stretches. The maximum and minimum depth of the proposed waterway for every km chainage is provided in Table 24 & Table 25

Table 24 Maximum and Minimum elevation measured during the Survey (where water was not available)

DHANSIRI RIVER				
Chainage	Max Elevation	Min Elevation	10 Ch Max	10 Ch Min
113	95.70	94.41	95.70 (as per Topo survey)	87.62 (as per Topo survey)
112	94.37	92.89		
111	93.03	92.12		
110	92.07	91.95		
109	91.93	91.64		
108	91.59	91.02		
107	91.01	90.78		
106	90.76	90.37		
105	90.32	88.02		
104	87.84	87.62		
103	87.68	87.17		
102	87.14	87.01		
101	87.00	86.92		
100	86.92	86.86		
99	86.88	86.45		
98	86.45	86.03		
97	85.98	85.91		
96	85.90	85.10		
95	85.09	84.76		
94	84.73	84.7		

Table 25 Maximum and Minimum Depth observed during the Survey

DHANSIRI RIVER				
Chainage	Max. Depth	Minimum Depth	Max. Depth in 10Km	Min. Depth in 10 km
0			2.7	0.3
1	1.8	0.3		
2	1.2	0.3		
3	2.3	0.4		
4	2.7	0.4		
5	2.3	0.5		
6	2.1	0.7		
7	1.1	0.8		
8	1.7	0.8		
9	1.8	0.3		
10	2.1	1	8.4	0.3

11	1.4	0.3		
12	2.4	0.4		
13	1.7	0.3		
14	1.6	0.3		
15	1.8	0.3		
16	2.4	1.2		
17	2.7	2.1		
18	8.4	1.2		
19	1.1	0.3		
20	2.6	1.1	3.8	0.3
21	3.8	0.7		
22	2.5	0.6		
23	2.3	0.2		
24	2.3	0.4		
25	2	0.7		
26	2.6	1.9		
27	2.3	0.3		
28	2.5	0.7		
29	1.7	0.3		
30	1.9	0.7	3.8	0.4
31	1.7	0.7		
32	2.1	0.6		
33	2.1	0.6		
34	2.7	1.1		
35	1.2	0.5		
36	2.5	0.4		
37	2.3	0.5		
38	3.8	0.8		
39	2.7	1.1		
40	1.8	0.2		
41	1.8	1.1	3.1	0.3
42	2.6	1.1		
43	3.1	1.3		
44	1.9	0.3		
45	2.2	0.4		
46	2.5	1.3		
47	2.2	1.2		
48	2	1.1		
49	2	1.1		
50	2.8	0.6		
51	3.5	1.2	4.6	1.2
52	2.7	1.4		
53	4.6	1.5		
54	2.6	1.6		
55	4.2	1.2		
56	3.8	1.2		
57	2.6	1.2		
58	2.8	1.3		
59	1.8	1.2		

60	2.6	1.3		
61	3	1.2	3	0.4
62	2.2	1.3		
63	2.7	1.2		
64	3	1.2		
65	2.2	1.2		
66	2.5	1.7		
67	2.5	1.1		
68	2.7	1.5		
69	2.1	0.4		
70	1.4	0.4		
71	2.4	0.3	2.4	0.3
72	1.6	0.4		
73	1.2	0.8		
74	1.6	0.8		
75	1.7	0.5		
76	1.6	0.7		
77	2.3	1.8		
78	1.9	1		
79	1.7	0.5		
80	1.8	0.3		
81	1.7	0.6	1.9	0.1
82	1.3	0.3		
83	1.3	0.4		
84	1.7	0.2		
85	1.1	0.2		
86	1.7	0.6		
87	1.9	0.3		
88	1.1	0.2		
89	1.6	0.1		
90	0.9	0.4		
91	2	0.6	2	0.1
92	1.9	0.6		
93	1.2	0.4		
94	1.6	0.1		

4.10 Selected photographs taken during the field survey

CWC office Golaghat (Ch 82.89)

CWC Bench Mark Point Golaghat (Ch. 82.89)


TRIMBLE RTK-Base Station



Water area in Dhashari

Banch Mark transfer point


CWC Gauge Station near Golaghat (Ch 82.89)

CWC. HFL point near Golaghat pump house (ch 82.87)

Golaghat Bridge (Ch 82)

Marking the BM near Dhansari Bridge no-2 (Ch,. 79.83)

Dhansari Bridge no-2 (Ch. 79.83)

showing the deepest Chanel in Bathali Kuha

Showing the Deepest portion at Khutai village

Bathali Kuha No.1 village Critical area

Critical area Ranganja

Critical areaMaruwaripotty area

Doing Hydro graphic Survey

Doing Hydrographic survey

Critical area Amola pathy Ch 87.00

Transfering RL Through Auto level

Shifting the RL in the water

Pumping water to Agriculture land

Pumping water in Agriculture land

Very critical area khumtai village Ch 48.5

Porcupines nera to Golaghat Bridge (Ch 33.04)

Flooding at the Moonsoon Period **Red line** Amola pathy Gaon

Animals are coming to the river Near Golaghat

Numaligarh Bridge

HFL value near numaligarh

Sec 5 Observations and Inferences

5.1 Waterway

The proposed navigation routes for a length of 113 km from Morongi T.E. to “Dhansirimukh”, the Brahmaputra Confluence for Dhansiri River was studied on the basis of:

1) Preliminary Analysis of limited availability of water level and discharge data during lean season being critical period due to reduced depths

2) Depths available for navigation as per single line hydrographic survey

3) Structures (weirs, bridges) across the proposed route and vertical and horizontal clearance

4) Shoals observed based on the survey

5) Reconnaissance visit made in the study area along with identified preliminary cargo from various transport modes, and

6) Based on the various reports, articles and literature studies.

5.2 LAD/Flow Depths

Based on the preliminary analysis of available data and investigation, the following results were arrived with reference to various LADs for Dhansiri River

As per the above findings, there is a need for extensive Floodplain Studies for carrying out the waterway analysis and development of IWT infrastructure. The examination of various options/measures to improve the water depth shall be studied in the DPR stage for Dhansiri River including construction of overflow type small barrages which can possible augment the water depth to a required LAD.

The most suitable method for development shall be identified with consideration on the likely morphological, sediment transport, and dredging aspects of different options. This task is expected to be fed back into from the financial and economic analysis providing refinement to the proposed development until a recommended solution is reached.

The most appropriate types and locations for structures along the river shall be identified based on the flood plain and water availability studies through modelling to investigate the likely impacts of these structures on river flow depths as well as sedimentation and morphology. This modelling will constitute an iterative process in which problems relating to LAD suggested by the results of modelling will be addressed to find more successful solutions where necessary. This will however, not be an open-ended process as the assessment of techno-economic feasibility only requires an indication of the likely costs of building and maintaining the structures which are shown to support achievement of 3m LAD as intended. Location of construction and sedimentation rates are important pieces of information to be obtained through this modelling work. The development shall be planned based on the IWAI’s guidelines related to classification of waterways.

In order to achieve the 2 m depth, a combined measure is required which must include river protection, provision of bed vanes/submerged groynes and dredging. Limitations of bandalling work is – it has to follow closely falling stage of river, closing minor channels and diverting river flow in single channel to increase depth in the navigable channel. In some reaches this method becomes successful but some river stretches remain shallow and need other training measures including dredging.

In the present circumstance, utilization of water for agriculture and other uses has already been established in Dhansiri river reach. In such circumstances only two solutions could be visualised.

1. Channelization of river and

2. Construction of barrages at suitable locations, creating ponding conditions with 2 m depth and navigational locks for ships and vessel movement.

The first alternative of channelization of river Dhansiri River covering 113 km reach would pose moderate difficulties considering the lean period discharge.

If private participation in inland navigation is expected for this river reach, no private entrepreneur would invest in vessels, terminal structure etc. when there is no assurance of waterway minimum 2.0 m draft.

A barrage is a gated dam, intended to create a pond of water during low flows, and at the same time remaining open during high flows to let them pass through unobstructed. The purposes of building the barrage could be several, namely (i) to raise the dry flow water level so that it could pass in to a contour canal for irrigation or other water uses; (ii) to raise the water level during low flows, so that navigation can take place or (iii) to create an aesthetic water body for recreation. This is only an option suggested for proposing the most feasible waterway and IWT development in Dhansiri River. This would need extensive analysis and detailing during DPR stage.

It is therefore considered that barrages with navigation locks system would provide assured waterway along with 2.00 m draft and detailed analysis shall need to be carried out. With this option, it would be possible for IWAI to explain stakeholders and invite their participation.

In this feasibility studies for Dhansiri river, it is observed that water availability for more than 75% river length out of 113 km during Lean season period (between Dec to March) is conforming to around 1 m Hence, development of navigation with year around depth of more than 2 m cannot be assured for 4 months in a year.

Water availability during Monsoon and post monsoon from April to November shall need an elaborate analysis using daily water level data. The availability of daily water level data is absent for this study since IWAI had provided only monthly maximum and minimum water level and discharge data at specific locations.

5.3 Classification of Waterway

The classification of waterways by Inland Waterway Authority of India is discussed below:

Class I: Waterways with navigable channel of minimum depth 1.2 m, bottom width 30 m (in case of rivers) and depth 1.5 m, bottom width 20 m (in case of canals) with minimum radius at bends 300 m, minimum vertical clearance 4 m, and horizontal clearance between piers 30 m, (in case of rivers) and 20 m, (in case of canals).

Class II: Waterways with navigable channel of minimum depth 1.4 m, bottom width 40 m, (in case of rivers) and depth1.8 m, bottom width 30 m, (in case of canals) with minimum radius at bends` 500m, in minimum vertical clearance 5 m, and horizontal clearance between piers 40 m, (in case of rivers) and 30 m, (in case of canals).

Class III: Waterways with navigable channel of minimum depth 1.7m, bottom. Width 50, m,(in case of rivers) and depth 2.2 m bottom width 40 m, (in case of canals) with minimum radius at bends 700m minimum. vertical clearance 7 m, and horizontal clearance between piers 50 m, (in case of rivers) and 40 m, (in case of canals).

Class IV: Waterways with navigable channel of minimum depth 2.0 m, bottom width 50 m, (in case of rivers) and depth 2.5m, bottom width 50 m, (in case of canals) with minimum radius at bends 800m, minimum vertical clearance 10 m, and horizontal clearance between piers 50 m, (in case of rivers) and 50 m, (in case of canals).

Class IV (A): Waterways on rivers only with navigable channel of minimum depth 2.0 m, bottom width 80 m, with minimum radius at bends 800 m, minimum vertical clearance 10 m, and horizontal clearance between piers 80 m.

Class V: Waterways with navigable channel of minimum depth 2.75m, bottom width 60 m, (in case of rivers) and depth 3.5 m bottom width 60 m, (in case at canals) with minimum radius at bends 900m, minimum vertical clearance 10 m, and horizontal clearance between piers 60 m, (both in case of rivers and canals).

Class V (A): Waterways on rivers only with navigable channel of minimum depth 2.75 m, bottom width 100 m, with minimum radius of bends 900 m, minimurrm vertical clearance 10 m, and horizontal clearance between piers 100 m.
On all the above cases:
a) Minimum depth of channel should be available for 95% of year.
b) Vertical clearance over the waterway should be available in at least central 75% portion of each of the spans in entire width of the waterway during lean season.

For Dhansiri River, Class I or II Waterway can be developed with a year around navigation having depth in the range of 2 to 2.5 m with suitable combination of river training, dredging and bandalling at required stretches. The same shall be carried out during Stage 2 – Preparation of DPR.

5.4 SWOT Analysis

Strength	Weakness	Opportunities	Threat
• Possibility of Interconnecting with NW - 2 • Abundant water resources for assured irrigation and IWT • Assurance of Industrial sector for using the waterway • Potential to Divert Traffic Movement from other modes such as Road and Railways • PPP Development Option • Good technological support network from IWAI Guwahati Office • Large work force of field functionaries including Field Management Committees. • Captive regional market	• Availability of good road and rail network. • .Inadequate availability of quality inputs. • Lack of Marketing Strategies • Local Unrest and Agitations for various reasons • Monsoon Uncertainness • Inadequate credit for agricultural operations. • High cost of infrastructure maintenance due to recurring floods. • Immediate project benefit.	• Huge potential attracting Industrial Investment • Availability of new technologies and farming practices. • Rising demand for diversified agriculture and horticulture product. • Increasing acceptability of Public-Private-Partnership. • Focused area of Central and State Govt. • Willingness of theStakeholders • Improved communication infrastructure. • Commercialization and globalization of agriculture and other market	• Risk Natural calamities such as Floods and Droughts • Local and Political Support and Unrest • High cost of Operation • Competition from other Modes • Shortage of skilled labor • Timely implementation of projects .

Annexure # I

Instruments Calibration Certificate

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

CALIBRATION CERTIFICATE

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

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

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

AUTHORISED SIGNATORY

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e-mail : paie@panindiagroup.com, paie@vsnl.com, www.panindiagroup.com

CALIBRATION CERTIFICATE

CUSTOMER NAME	:	PRECISION SURVEY CONSUTLANCY
ADDRESS	:	P.O. –SALAP (Jatin Xerox Center) Dist. –Howrah Pin: 711 409
INSTRUMENT	:	DGPS EQUIPMENT
SERIES	:	SPS-361
SERIAL NUMBER	:	5308K59587
CALIBRATION DATE	:	06/07/2016
VALIDITY	:	05/07/2017

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

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

Calibration Certificate

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

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

INSTRUMENT TYPE	:	GPS RTK
MODEL	:	S-86
MAKE	:	SOUTH
INSTRUMENT SR. NO.	:	H0986214510 (Accuracy –RTK Mode-Horizontal = 10mm +: PPm RMS, Vertical = 20mm +: PPm RMS H0986214519 (Static Mode – Horizontal = 2.5 mm + 1 PPm Vertical = 5mm + PPm)
CALIBRATION DATE	:	15/07/2015
VALID UPTO	:	14/07/2016
ISSUED TO	:	PRECISION SURVEY CONSULTANCY

For SOUTH PRECISION INSTRUMENT PVT. LTD.

For SOUTH PRECISION INSTRUMENT PVT. LTD.

Authorised Signatory

Authorised Signatory

Annexure # II

Observed and Reduced Data

Name of Gauge Station.	Chainage	CD average 6year min WL	Observed WL	Reduced WL
	0	68.635		
	3.682	69.28	69.326	-0.046
	26.424	73.267	72.990	0.277
	26.424	73.267	72.925	0.342
Numaligarh	32.156	74.272		
	51	78.234	77.382	0.852
	51	78.234	77.347	0.887
Golaghat	83.843	85.138	85.075	0.063
	83.843	85.138	85.250	-0.112
	92.91	88.336	88.490	-0.154
	113.955	95.76	95.760	0.000

Date	Start Water Level	End Water Level
14-02-2016	88.49	85.25
15-02-2016	85.075	77.347
16-02-2016	77.382	72.925
17-02-2016	72.99	69.326

Annexure # IV

Water depth and Reduced water Depth value

Chainage (km)	Easting	Northing	latitude	Longitude	Rl in (m)	Wl in (m)
0.11	594952.2	2925650	26.448	93.9524	0.34	0.49
0.27	594956.3	2925781	26.44918	93.95245	0.63	0.78
0.38	595025	2925856	26.44985	93.95315	0.19	0.34
0.49	595055.7	2925999	26.45114	93.95346	0.34	0.49
0.61	595069.4	2926099	26.45205	93.95361	0.18	0.33
0.72	595056.8	2926274	26.45362	93.9535	0.7	0.85
0.87	595044.3	2926384	26.45462	93.95338	0.18	0.33
0.99	595023	2926481	26.4555	93.95317	0.41	0.56
1.11	595012.4	2926613	26.45669	93.95308	1.11	1.26
1.22	594999.3	2926729	26.45774	93.95295	0.3	0.45
1.37	594977.3	2926830	26.45865	93.95274	0.18	0.33
1.48	594952.5	2926927	26.45953	93.9525	0.21	0.36
1.59	594910	2927059	26.46073	93.95208	1.33	1.48
1.71	594866.9	2927150	26.46155	93.95166	0.66	0.81
1.82	595649.7	2928949	26.47773	93.95964	1.21	1.32
1.93	595473.1	2928905	26.47735	93.95787	0.2	0.31
2.05	595379.8	2928942	26.47769	93.95693	0.59	0.7
2.21	595211.4	2929032	26.47852	93.95525	0.58	0.69
2.33	595060.2	2929077	26.47893	93.95374	0.71	0.82
2.47	594919.7	2929115	26.47929	93.95233	0.76	0.87
2.59	594814	2929133	26.47946	93.95127	0.8	0.91
2.71	594684.9	2929138	26.4795	93.94998	0.7	0.81
2.82	594520.3	2929113	26.47929	93.94832	0.98	1.09
2.95	594353.8	2929060	26.47883	93.94665	0.44	0.88
3.06	594268.1	2929008	26.47836	93.94579	0.37	0.42
3.17	593952.3	2928763	26.47617	93.9426	0.43	0.48
3.29	593889	2928684	26.47547	93.94196	0.16	0.55
3.40	593852.2	2928359	26.47253	93.94157	0.16	0.31
3.53	593799.2	2928270	26.47173	93.94103	0.16	0.31
3.65	593750	2928176	26.47089	93.94053	0.39	0.54
3.77	593696.7	2928076	26.46999	93.93999	0.61	0.76
3.93	593637.2	2927981	26.46913	93.93938	0.48	0.63
4.04	593544.9	2927815	26.46764	93.93844	0.25	0.4
4.15	593474.6	2927692	26.46654	93.93773	0.9	1.05
4.26	593423.4	2927606	26.46576	93.93721	0.33	0.48
4.38	593363.1	2927525	26.46503	93.9366	0.14	0.29
4.50	593177.5	2927370	26.46365	93.93473	0.9	1.05
4.64	593135	2927277	26.46281	93.93429	0.67	0.82
4.76	593090.3	2927105	26.46126	93.93383	0.48	0.63
4.87	593088.7	2926978	26.46011	93.93381	0.42	0.57
4.99	593255.9	2927502	26.46483	93.93552	0.6	0.75
5.11	593923.7	2928489	26.4737	93.94229	0.2	0.3

Chainage (km)	Easting	Northing	latitude	Longitude	Rl in (m)	Wl in (m)
5.22	593972.2	2928585	26.47456	93.94279	0.64	0.31
5.34	594054.1	2928728	26.47585	93.94362	0.25	0.75
5.45	594104	2928819	26.47667	93.94413	0.43	0.36
5.56	594149.4	2928918	26.47756	93.94459	0.88	0.54
5.68	595772	2929097	26.47907	93.96088	1	0.99
5.79	595792	2929196	26.47996	93.96109	1.22	1.11
5.90	595800.4	2929301	26.4809	93.96118	1.77	1.33
6.01	595723.5	2929365	26.48148	93.96041	0.85	1.88
6.13	595637.6	2929427	26.48205	93.95956	0.2	0.96
6.24	595625.2	2929526	26.48295	93.95944	1.45	0.31
6.37	595590.3	2929629	26.48388	93.9591	0.97	1.56
6.49	595533.7	2929715	26.48466	93.95854	0.97	1.08
6.61	595453.1	2929803	26.48546	93.95773	0.79	1.08
6.72	595383.4	2929886	26.48622	93.95704	0.35	0.9
6.87	595330.8	2929975	26.48702	93.95652	0.58	0.46
6.98	595270	2930056	26.48775	93.95592	0.24	0.69
7.11	595175.4	2930159	26.48869	93.95498	0.52	0.35
7.23	595112.8	2930237	26.4894	93.95435	1.16	0.63
7.34	595037.9	2930329	26.49023	93.95361	0.2	1.27
7.50	594959	2930417	26.49104	93.95282	0.22	0.31
7.61	594778.9	2930504	26.49183	93.95102	0.32	0.33
7.72	594659.1	2930587	26.49259	93.94983	0.53	0.43
7.85	594572.7	2930738	26.49396	93.94897	0.22	0.64
7.98	594545.4	2930836	26.49485	93.9487	1.18	0.33
8.09	594567.5	2930956	26.49592	93.94894	0.4	1.29
8.21	594617.6	2931061	26.49688	93.94945	0.22	0.51
8.32	594665.7	2931150	26.49767	93.94994	0.65	0.33
8.45	594742.1	2931289	26.49892	93.95071	0.22	0.76
8.58	594780.5	2931382	26.49976	93.9511	0.44	0.33
8.71	594836.7	2931497	26.50079	93.95168	0.22	0.55
8.88	594890.3	2931602	26.50174	93.95222	0.29	0.33
9.00	594933.1	2931715	26.50276	93.95266	0.2	0.4
9.11	594851.9	2931844	26.50393	93.95185	0.87	0.31
9.24	594766.5	2932025	26.50557	93.95101	0.57	0.81
9.37	594685.3	2932086	26.50612	93.9502	0.45	0.51
9.50	594546.8	2932198	26.50714	93.94882	0.45	0.39
9.61	594451.5	2932260	26.5077	93.94787	0.84	0.39
9.72	594355.2	2932334	26.50838	93.94691	0.41	0.78
9.84	594256.5	2932359	26.50861	93.94592	1.06	0.35
9.96	594166.3	2932405	26.50904	93.94502	0.61	1
10.07	594072.9	2932572	26.51055	93.94409	0.61	0.55
10.19	594046	2932674	26.51148	93.94383	1.35	0.55

Chainage (km)	Easting	Northing	latitude	Longitude	Rl in (m)	Wl in (m)
10.30	594048	2932776	26.51239	93.94386	1.35	1.29
10.43	594113.8	2932918	26.51367	93.94453	1.35	1.29
10.56	594170.2	2933002	26.51442	93.9451	1.35	1.29
10.68	594267.9	2933077	26.5151	93.94609	0.61	1.29
10.79	594440	2933161	26.51585	93.94782	0.61	0.55
10.90	594538.1	2933194	26.51614	93.94881	0.61	0.55
11.01	594632.2	2933238	26.51652	93.94975	1.99	0.55
11.12	594700.2	2933311	26.51718	93.95044	2	1.93
11.26	594650.3	2933398	26.51797	93.94995	2	1.94
11.37	594549.6	2933403	26.51802	93.94894	1.38	1.94
11.51	594421.4	2933407	26.51806	93.94765	0.46	1.32
11.64	594321.7	2933389	26.51791	93.94665	1.26	0.4
11.76	594191	2933372	26.51776	93.94534	1.59	1.2
11.87	594071.7	2933383	26.51788	93.94414	0.81	1.53
12.01	593964.2	2933385	26.5179	93.94306	0.52	0.75
12.13	593862.7	2933386	26.51792	93.94204	0.46	0.46
12.24	593729.5	2933383	26.5179	93.94071	0.52	0.4
12.36	593627.1	2933385	26.51792	93.93968	0.58	0.46
12.49	593527.6	2933406	26.51812	93.93868	0.46	0.52
12.60	593412.8	2933417	26.51822	93.93753	0.75	0.4
12.71	593303.2	2933447	26.5185	93.93643	1.54	0.69
12.86	593204.1	2933430	26.51835	93.93544	0.5	1.48
12.98	593101.2	2933406	26.51814	93.9344	0.5	0.44
13.09	592966.2	2933377	26.51789	93.93304	0.87	0.44
13.22	592800.1	2933322	26.51741	93.93137	0.37	0.81
13.38	592706.3	2933287	26.5171	93.93043	0.51	0.31
13.49	592582.7	2933262	26.51688	93.92919	0.75	0.45
13.66	592437.2	2933220	26.51651	93.92773	0.78	0.69
13.78	592365.4	2933150	26.51588	93.927	0.39	0.72
13.89	592212.8	2933129	26.5157	93.92547	0.4	0.33
14.04	592103.6	2933109	26.51553	93.92437	1.26	0.34
14.15	592007.9	2933138	26.5158	93.92341	0.87	1.2
14.29	591910.5	2933244	26.51676	93.92244	0.48	0.81
14.45	591877.8	2933405	26.51822	93.92212	0.48	0.42
14.61	591891.9	2933533	26.51937	93.92228	0.43	0.42
14.72	591894	2933680	26.5207	93.92231	0.96	0.37
14.84	591841.9	2933817	26.52194	93.92179	0.6	0.9
14.96	591789.1	2933979	26.5234	93.92128	0.45	0.54
15.08	591712.5	2934052	26.52406	93.92051	0.37	0.39
15.19	591638	2934142	26.52489	93.91977	1.2	0.31
15.31	591608.9	2934240	26.52577	93.91949	1.44	1.14
15.45	591589.6	2934346	26.52673	93.9193	0.37	1.38

Chainage (km)	Easting	Northing	latitude	Longitude	Rl in (m)	Wl in (m)
15.57	591564.8	2934451	26.52768	93.91906	0.42	0.31
15.73	591499.9	2934558	26.52865	93.91842	0.46	0.36
15.85	591442.4	2934654	26.52952	93.91785	0.46	0.4
15.98	591351.7	2934772	26.53059	93.91694	0.58	0.4
16.14	591214.4	2934875	26.53153	93.91557	0.48	0.52
16.27	591102.3	2934912	26.53187	93.91445	1.45	0.42
16.39	590949.6	2934925	26.532	93.91292	0.64	1.39
16.50	590826.2	2934916	26.53192	93.91168	0.42	0.58
16.61	590728.1	2934891	26.53171	93.91069	0.94	0.36
16.73	590576.6	2934799	26.53088	93.90917	0.4	0.88
16.84	590488.6	2934744	26.53039	93.90828	1.03	0.34
16.96	590413.4	2934672	26.52975	93.90752	0.48	0.97
17.07	590353.8	2934591	26.52902	93.90691	0.7	0.42
17.18	590251.9	2934445	26.52771	93.90588	0.43	0.64
17.34	590250.2	2934343	26.52679	93.90586	0.6	0.37
17.46	590114.7	2934204	26.52554	93.90449	0.91	0.54
17.60	589995.5	2934122	26.52481	93.90329	0.37	0.85
17.72	589891	2934082	26.52445	93.90223	0.37	0.31
17.83	589760.8	2934053	26.5242	93.90093	0.63	0.31
17.94	589654.8	2934043	26.52412	93.89986	1.53	0.57
18.05	589555.8	2934058	26.52426	93.89887	1.32	1.47
18.17	589467	2934114	26.52477	93.89798	1.59	1.26
18.31	589404.1	2934192	26.52548	93.89736	1.15	1.53
18.45	589341.8	2934274	26.52623	93.89674	1.26	1.09
18.56	589298.9	2934395	26.52732	93.89631	1.06	1.2
18.68	589293	2934534	26.52857	93.89626	0.84	1
18.82	589311.7	2934633	26.52946	93.89646	1.57	0.78
18.95	589350.9	2934730	26.53034	93.89686	0.64	1.51
19.11	589390.6	2934855	26.53146	93.89727	1.41	0.58
19.24	589447	2934964	26.53245	93.89784	1.36	1.35
19.35	589545.3	2935077	26.53345	93.89883	1.21	1.3
19.47	589656.7	2935184	26.53441	93.89996	0.93	1.15
19.61	589731.1	2935254	26.53505	93.90071	0.76	0.87
19.72	589859.1	2935358	26.53597	93.902	0.88	0.7
19.86	589965.5	2935438	26.53669	93.90308	0.69	0.82
20.01	590051.7	2935491	26.53717	93.90395	0.51	0.63
20.16	590168.6	2935537	26.53757	93.90512	1.69	0.45
20.27	590269.8	2935643	26.53852	93.90615	1.17	1.63
20.38	590334.1	2935758	26.53955	93.9068	0.94	1.11
20.49	590297.3	2935934	26.54115	93.90644	2.38	0.88
20.61	590148	2936035	26.54207	93.90495	1.53	2.32
20.72	590067.4	2936095	26.54261	93.90415	0.66	1.47

Chainage (km)	Easting	Northing	latitude	Longitude	Rl in (m)	Wl in (m)
20.85	589981.8	2936160	26.54321	93.90329	0.51	0.6
20.96	589888.8	2936199	26.54357	93.90236	1.18	0.45
21.07	589770.9	2936227	26.54383	93.90118	0.91	1.12
21.20	589682.3	2936274	26.54426	93.90029	0.7	0.85
21.33	589594.1	2936322	26.5447	93.89941	0.52	0.64
21.45	589438.8	2936407	26.54547	93.89786	0.61	0.46
21.57	589338.6	2936470	26.54605	93.89686	0.37	0.55
21.68	589241.7	2936535	26.54664	93.89589	0.57	0.31
21.79	589093.5	2936642	26.54762	93.89441	0.37	0.51
21.94	589004.5	2936694	26.54809	93.89352	0.48	0.31
22.05	588927.5	2936761	26.5487	93.89275	0.55	0.42
22.17	588830.7	2936860	26.5496	93.89179	0.37	0.49
22.29	588749.2	2936920	26.55014	93.89097	0.43	0.31
22.43	588645.7	2936914	26.5501	93.88993	0.43	0.37
22.54	588614.8	2937021	26.55107	93.88963	0.87	0.37
22.68	588556.6	2937136	26.55211	93.88905	0.36	0.81
22.83	588472.6	2937199	26.55268	93.88822	0.46	0.3
22.95	588404.1	2937306	26.55365	93.88754	0.37	0.4
23.08	588338.8	2937431	26.55479	93.88689	1.59	0.31
23.20	588287.7	2937526	26.55564	93.88638	0.45	1.53
23.31	588306.1	2937646	26.55673	93.88658	0.4	0.39
23.45	588363.9	2937827	26.55836	93.88717	0.39	0.34
23.56	588458.1	2937995	26.55987	93.88813	0.34	0.33
23.67	588532.5	2938102	26.56083	93.88888	0.64	0.28
23.83	588574.3	2938194	26.56166	93.88931	2.53	0.58
23.98	588500.5	2938262	26.56228	93.88857	2.32	2.47
24.11	588368.1	2938312	26.56274	93.88724	2.31	2.26
24.23	588227.7	2938321	26.56283	93.88583	1.98	2.25
24.37	588106.7	2938296	26.56261	93.88462	1.84	1.92
24.52	588002.7	2938261	26.5623	93.88357	1.71	1.78
24.63	587875.2	2938231	26.56204	93.88229	1.14	1.65
24.74	587748.1	2938170	26.5615	93.88101	1.67	0.78
24.86	587612.2	2938031	26.56025	93.87964	1.65	0.76
24.99	587521.5	2937984	26.55983	93.87872	2.15	1.26
25.10	587429	2937929	26.55934	93.87779	1.7	0.81
25.22	587255.8	2937885	26.55896	93.87605	1.61	0.72
25.33	587158.4	2937861	26.55874	93.87507	1.22	0.33
25.46	587045.7	2937878	26.55891	93.87394	1.73	0.84
25.58	586947.4	2937858	26.55873	93.87295	1.22	0.33
25.69	586783.6	2937832	26.5585	93.8713	1.2	0.31
25.81	586673.8	2937835	26.55853	93.8702	1.76	0.87
25.93	586574.9	2937855	26.55872	93.86921	1.28	0.39

Chainage (km)	Easting	Northing	latitude	Longitude	RL in (m)	WL in (m)
26.04	586393.2	2937919	26.55931	93.86739	1.46	0.57
26.16	586302.9	2937962	26.55971	93.86649	1.64	0.75
26.27	586213.6	2938011	26.56015	93.86559	1.83	0.94
26.43	586067.4	2938135	26.56128	93.86413	2.12	1.23
26.59	585995.6	2938212	26.56198	93.86342	1.77	0.88
26.72	585922.1	2938335	26.5631	93.86269	1.47	0.58
26.84	585876.9	2938477	26.56439	93.86225	1.53	0.64
26.96	585849.9	2938598	26.56547	93.86198	1.25	0.36
27.12	585838.7	2938789	26.5672	93.86188	1.92	1.03
27.24	585849.8	2938893	26.56814	93.862	1.28	0.39
27.35	585892.2	2939035	26.56942	93.86244	2.46	1.57
27.46	585943.9	2939133	26.5703	93.86296	1.25	0.36
27.58	585989.4	2939225	26.57113	93.86343	1.29	0.4
27.69	586072.1	2939281	26.57163	93.86426	1.62	0.73
27.80	586175.6	2939312	26.5719	93.8653	1.23	0.34
27.93	586279.1	2939323	26.572	93.86634	2.12	1.23
28.04	586361.5	2939382	26.57253	93.86717	1.2	0.31
28.15	586460.5	2939445	26.57309	93.86817	2.34	1.45
28.26	586549.2	2939498	26.57356	93.86906	2.04	1.15
28.38	586625.6	2939564	26.57415	93.86984	1.2	0.31
28.52	586659.8	2939658	26.575	93.87019	1.46	0.57
28.65	586802.1	2939727	26.57561	93.87162	1.25	0.36
28.77	586872.6	2939839	26.57662	93.87233	1.22	0.33
28.88	586869.6	2939960	26.57771	93.87231	2.06	1.17
28.99	586771.6	2939988	26.57797	93.87133	1.71	0.82
29.11	586676.3	2940026	26.57832	93.87038	1.32	0.43
29.26	586578.8	2940056	26.5786	93.8694	1.7	0.81
29.37	586474.3	2940068	26.57871	93.86835	1.65	0.76
29.49	586335.9	2940095	26.57897	93.86696	1.2	0.31
29.61	586150.4	2940100	26.57902	93.8651	1.22	0.33
29.72	586043.7	2940086	26.5789	93.86403	1.25	0.36
29.85	585855.1	2940050	26.57858	93.86213	1.44	0.55
29.96	585752.8	2940022	26.57834	93.8611	1.28	0.39
30.08	585574.1	2939944	26.57764	93.8593	1.25	0.36
30.24	585406.4	2939846	26.57677	93.85761	2.01	1.12
30.39	585316.1	2939784	26.57622	93.8567	1.28	0.39
30.51	585266.7	2939646	26.57497	93.8562	1.67	0.78
30.62	585138.1	2939587	26.57445	93.8549	1.61	0.72
30.73	585032.8	2939569	26.5743	93.85384	1.22	0.33
30.84	584932.5	2939579	26.57439	93.85284	2.33	1.44
30.96	584832.5	2939597	26.57456	93.85183	1.86	0.97
31.08	584738.8	2939635	26.57491	93.8509	1.25	0.36

Chainage (km)	Easting	Northing	latitude	Longitude	RL in (m)	WL in (m)
31.19	584647.6	2939698	26.57548	93.84998	2.58	1.69
31.30	584584	2939779	26.57622	93.84935	1.98	1.09
31.43	584541.8	2939871	26.57705	93.84893	1.31	0.42
31.54	584519.1	2939976	26.578	93.84871	1.5	0.61
31.70	584533.8	2940154	26.57961	93.84887	1.32	0.43
31.83	584581	2940245	26.58042	93.84935	1.43	0.54
31.98	584658.7	2940369	26.58154	93.85014	1.38	0.49
32.09	584728.2	2940469	26.58243	93.85085	1.29	0.4
32.25	584818.3	2940579	26.58342	93.85176	1.62	0.73
32.37	584877.3	2940660	26.58415	93.85236	1.25	0.36
32.49	584942.3	2940792	26.58534	93.85302	2.04	1.15
32.60	584906.9	2940903	26.58634	93.85267	2.1	1.21
32.72	584834.1	2940981	26.58706	93.85194	1.35	0.46
32.87	584766	2941056	26.58773	93.85126	1.94	1.05
32.98	584578.9	2941120	26.58832	93.84939	1.68	0.79
33.11	584437.2	2941131	26.58843	93.84797	2.33	1.44
33.22	584334.8	2941114	26.58828	93.84694	2.16	1.27
33.33	584223	2941085	26.58803	93.84581	1.71	0.82
33.49	584053.1	2941034	26.58758	93.8441	1.62	0.73
33.61	583959.9	2940992	26.5872	93.84317	1.73	0.84
33.72	583829.6	2940925	26.5866	93.84185	1.46	0.57
33.85	583752.5	2940846	26.5859	93.84107	1.2	0.31
33.97	583661.9	2940798	26.58547	93.84016	1.83	0.94
34.08	583543.7	2940781	26.58533	93.83897	1.64	0.75
34.21	583366.2	2940805	26.58555	93.83719	1.58	0.69
34.33	583273.4	2940847	26.58594	93.83626	1.22	0.33
34.47	583117.4	2940886	26.5863	93.8347	1.2	0.31
34.58	582935.4	2940832	26.58582	93.83287	2.31	1.42
34.71	582845.2	2940746	26.58505	93.83196	2.07	1.18
34.84	582801.3	2940656	26.58424	93.83151	1.85	0.96
34.96	582789.5	2940534	26.58314	93.83138	2.04	1.15
35.12	582805.8	2940416	26.58207	93.83154	3.21	2.32
35.24	582884.9	2940282	26.58086	93.83232	2.75	1.86
35.35	582983.5	2940169	26.57983	93.83331	2.07	1.18
35.47	583113.1	2940054	26.57879	93.8346	2	1.11
35.58	583191.2	2939990	26.5782	93.83538	1.56	0.67
35.70	583275.2	2939922	26.57759	93.83622	1.44	0.55
35.82	583354.6	2939861	26.57703	93.83701	1.22	0.33
35.94	583430.8	2939782	26.57631	93.83777	1.4	0.51
36.05	583428.9	2939664	26.57525	93.83775	1.49	0.6
36.20	583396.4	2939568	26.57438	93.83741	1.28	0.39
36.33	583341.1	2939483	26.57362	93.83685	2.25	1.36

Chainage (km)	Easting	Northing	latitude	Longitude	Reduced Depth in (m)	Observed depth in (m)
36.45	583220	2939413	26.57299	93.83563	2.54	1.65
36.56	583094.4	2939395	26.57284	93.83437	2.55	1.66
36.73	582994.6	2939409	26.57297	93.83337	2.24	1.35
36.85	582893.1	2939441	26.57326	93.83235	1.94	1.05
36.96	582764.1	2939525	26.57403	93.83106	2.06	1.17
37.10	582678.7	2939594	26.57466	93.83021	1.82	0.93
37.22	582594.7	2939650	26.57517	93.82937	3.27	2.38
37.33	582459.3	2939673	26.57539	93.82801	2.88	1.99
37.44	582355.7	2939687	26.57552	93.82697	2.58	1.69
37.57	582250.8	2939694	26.57559	93.82592	1.8	0.91
37.68	582151.1	2939708	26.57572	93.82492	3.78	2.89
37.79	582055.6	2939833	26.57685	93.82397	3.98	3.09
37.92	581993.9	2939913	26.57758	93.82335	2.97	2.08
38.03	581938.2	2940000	26.57837	93.8228	1.94	1.05
38.14	581906.5	2940109	26.57935	93.82249	1.51	0.62
38.26	581901.4	2940213	26.58029	93.82244	1.2	0.31
38.39	581872.6	2940309	26.58116	93.82216	2.07	1.18
38.50	581847.6	2940419	26.58216	93.82192	2.13	1.24
38.62	581789.7	2940572	26.58354	93.82135	2.19	1.3
38.74	581751.3	2940670	26.58442	93.82097	1.67	0.78
38.85	581701	2940768	26.58531	93.82047	2.18	1.29
38.96	581643.8	2940851	26.58607	93.8199	1.58	0.69
39.09	581592.2	2940940	26.58687	93.81939	1.43	0.54
39.22	581531	2941022	26.58762	93.81878	2.06	1.17
39.34	581411.3	2941152	26.58879	93.81758	2.1	1.21
39.45	581303.4	2941213	26.58936	93.8165	1.64	0.75
39.56	581205.3	2941246	26.58966	93.81552	1.67	0.78
39.71	581034.1	2941197	26.58923	93.8138	2.24	1.35
39.82	580942.1	2941146	26.58877	93.81287	1.74	0.85
39.94	580837.8	2941051	26.58792	93.81182	1.83	0.94
40.06	580751.3	2941000	26.58746	93.81095	1.34	0.45
40.19	580670.7	2940937	26.5869	93.81013	1.46	0.57
40.32	580554.7	2940965	26.58716	93.80897	2.42	1.53
40.43	580535.6	2941083	26.58822	93.80879	4.2	3.31
40.55	580534.7	2941194	26.58922	93.80878	2.21	1.32
40.66	580539.4	2941295	26.59014	93.80884	1.47	0.58
40.77	580553.7	2941409	26.59116	93.80899	1.35	0.46
40.88	580590.3	2941567	26.59259	93.80937	1.5	0.61
41.00	580596	2941668	26.5935	93.80943	2.64	1.75
41.11	580584.7	2941767	26.5944	93.80932	2	1.11
41.22	580585.7	2941872	26.59534	93.80934	1.73	0.84

Chainage (km)	Easting	Northing	latitude	Longitude	Reduced Depth in (m)	Observed depth in (m)
41.33	580582.6	2941976	26.59629	93.80931	1.4	0.51
41.45	580584.3	2942077	26.5972	93.80934	1.71	0.82
41.57	580591	2942177	26.5981	93.80941	1.37	0.48
41.68	580585.1	2942283	26.59906	93.80936	1.2	0.31
41.80	580589.9	2942391	26.60003	93.80941	2.13	1.24
41.91	580623.1	2942487	26.6009	93.80975	1.31	0.42
42.03	580671	2942586	26.60178	93.81024	2.18	1.29
42.14	580753.2	2942722	26.60301	93.81108	1.25	0.36
42.25	580808.9	2942812	26.60382	93.81164	1.47	0.58
42.38	580938	2942954	26.60509	93.81295	2.42	1.53
42.54	581012.7	2943022	26.60571	93.8137	1.4	0.51
42.65	581163	2943146	26.60681	93.81522	1.2	0.31
42.77	581251.2	2943271	26.60794	93.81611	1.23	0.34
42.90	581286.3	2943364	26.60878	93.81647	1.64	0.75
43.03	581329.1	2943567	26.6106	93.81691	1.4	0.55
43.15	581270.9	2943720	26.61199	93.81634	1.31	0.46
43.26	581187.9	2943810	26.61281	93.81551	1.22	0.37
43.37	581051.1	2943889	26.61353	93.81414	2.42	1.57
43.49	580950.7	2943900	26.61363	93.81313	1.57	0.72
43.62	580847.2	2943892	26.61356	93.81209	1.31	0.46
43.73	580683.6	2943837	26.61308	93.81045	2.26	1.41
43.85	580580.1	2943791	26.61267	93.8094	1.3	0.45
43.96	580491.7	2943744	26.61225	93.80851	1.76	0.91
44.09	580391.9	2943699	26.61185	93.80751	1.31	0.46
44.20	580325.2	2943617	26.61112	93.80683	1.18	0.33
44.36	580143.6	2943586	26.61084	93.80501	2.3	1.45
44.51	580041.5	2943585	26.61084	93.80398	1.79	0.94
44.63	579890.7	2943601	26.61099	93.80247	1.84	0.99
44.76	579754.5	2943630	26.61126	93.8011	1.75	0.9
44.90	579650.1	2943664	26.61158	93.80006	1.69	0.84
45.02	579551.7	2943720	26.61209	93.79907	1.87	1.02
45.16	579435.8	2943791	26.61273	93.79791	1.67	0.82
45.28	579296.9	2943913	26.61385	93.79652	1.42	0.57
45.39	579189.8	2943986	26.61451	93.79545	1.16	0.31
45.51	579109.9	2944135	26.61586	93.79466	1.18	0.33
45.65	578935	2944192	26.61639	93.79291	2.3	1.45
45.78	578827.5	2944188	26.61635	93.79183	1.79	0.94
45.90	578693.5	2944161	26.61612	93.79048	1.39	0.54
46.01	578579.2	2944123	26.61578	93.78933	2.14	1.29
46.13	578444.5	2944014	26.6148	93.78797	2.56	1.71
46.25	578377.4	2943930	26.61405	93.78729	2.36	1.51

Chainage (km)	Easting	Northing	latitude	Longitude	Reduced Depth in (m)	Observed depth in (m)
46.36	578335.9	2943833	26.61318	93.78687	2.29	1.44
46.48	578308.6	2943648	26.6115	93.78658	2.26	1.41
46.59	578348	2943459	26.6098	93.78696	2.14	1.29
46.70	578418.5	2943289	26.60826	93.78766	2.08	1.23
46.82	578468.4	2943202	26.60747	93.78816	1.94	1.09
46.95	578571	2943044	26.60604	93.78918	1.54	0.69
47.08	578625.4	2942952	26.6052	93.78972	1.15	0.3
47.20	578727.7	2942814	26.60396	93.79074	1.18	0.33
47.32	578775.6	2942701	26.60293	93.79121	2.69	1.84
47.46	578782.1	2942592	26.60195	93.79127	1.61	0.76
47.58	578778.3	2942487	26.601	93.79123	1.9	1.05
47.70	578748	2942357	26.59982	93.79091	1.9	1.05
47.85	578694.2	2942258	26.59893	93.79037	2.05	1.2
47.97	578551.9	2942144	26.59791	93.78893	2.02	1.17
48.09	578414	2942121	26.59771	93.78754	1.99	1.14
48.20	578305.8	2942149	26.59797	93.78646	1.64	0.79
48.32	578203.7	2942199	26.59843	93.78544	3.56	2.71
48.44	578118.4	2942251	26.59891	93.78458	1.73	0.88
48.55	578020.8	2942295	26.59931	93.78361	1.25	0.4
48.67	577927.5	2942342	26.59974	93.78267	2.3	1.45
48.79	577875.1	2942429	26.60052	93.78215	2.93	2.08
48.93	577810.9	2942522	26.60137	93.78151	2.29	1.44
49.04	577769.9	2942620	26.60225	93.78111	2	1.15
49.15	577737.9	2942750	26.60344	93.78079	2.12	1.27
49.27	577720.9	2942850	26.60433	93.78063	1.81	0.96
49.40	577716.1	2942950	26.60524	93.78059	1.6	0.75
49.53	577720	2943055	26.60619	93.78063	1.34	0.49
49.64	577709.3	2943182	26.60733	93.78053	2.68	1.83
49.75	577697.4	2943293	26.60833	93.78042	1.94	1.09
49.90	577684.7	2943393	26.60924	93.7803	1.37	0.52
50.01	577620	2943473	26.60997	93.77965	1.16	0.31
50.13	577601.3	2943611	26.61121	93.77947	2.12	1.27
50.24	577603.3	2943715	26.61215	93.7795	1.75	0.9
50.35	577617.1	2943817	26.61307	93.77965	1.36	0.51
50.46	577628.5	2943916	26.61397	93.77977	1.54	0.69
50.59	577637.9	2944020	26.6149	93.77987	1.87	1.02
50.70	577666	2944117	26.61577	93.78016	1.3	0.45
50.83	577717.7	2944228	26.61678	93.78068	1.63	0.78
50.95	577726.5	2944328	26.61768	93.78078	1.84	0.99
51.09	577697.1	2944439	26.61868	93.78049	1.51	0.66
51.22	577517.3	2944555	26.61974	93.77869	1.51	0.66

Chainage (km)	Easting	Northing	latitude	Longitude	Reduced Depth in (m)	Observed depth in (m)
51.34	577418.6	2944640	26.62051	93.7777	1.43	0.58
51.50	577241.9	2944700	26.62106	93.77593	1.44	0.59
51.61	577137.3	2944751	26.62153	93.77488	2.18	1.33
51.74	577006.5	2944824	26.6222	93.77357	1.79	0.94
51.89	576928.1	2944887	26.62277	93.77279	1.16	0.31
52.00	576867.6	2944984	26.62365	93.77219	1.93	1.08
52.12	576730.4	2945031	26.62408	93.77081	1.33	0.48
52.24	576634.7	2945061	26.62436	93.76985	1.63	0.78
52.37	576477.8	2945073	26.62448	93.76828	1.81	0.96
52.49	576358.1	2945075	26.6245	93.76708	2.68	1.83
52.62	576247.1	2945062	26.62439	93.76596	1.27	0.42
52.78	576133.2	2945049	26.62428	93.76482	1.3	0.45
52.89	576017.2	2945014	26.62396	93.76365	2.65	1.8
53.05	575891	2944944	26.62334	93.76238	1.54	0.69
53.18	575802.5	2944895	26.62291	93.76148	1.22	0.37
53.31	575686.4	2944795	26.622	93.76031	2.43	1.58
53.42	575617.5	2944702	26.62117	93.75961	1.55	0.7
53.53	575545.3	2944607	26.62032	93.75888	1.93	1.08
53.66	575359.5	2944592	26.62019	93.75702	1.79	0.94
53.77	575267	2944636	26.62059	93.75609	1.52	0.67
53.89	575173.1	2944709	26.62125	93.75515	2.05	1.2
54.05	575112.8	2944789	26.62198	93.75455	1.42	0.57
54.16	575086.7	2944896	26.62295	93.75429	1.79	1.45
54.28	575081.2	2945045	26.6243	93.75425	1.34	1
54.43	575112	2945142	26.62517	93.75456	1.73	1.39
54.58	575212.7	2945281	26.62642	93.75558	1.57	1.23
54.70	575317.1	2945363	26.62715	93.75664	1.4	1.06
54.81	575441.3	2945425	26.6277	93.75789	1.25	0.91
54.92	575622.2	2945492	26.6283	93.75971	1.31	0.97
55.04	575717.9	2945527	26.62861	93.76067	0.82	0.48
55.17	575818.5	2945535	26.62868	93.76168	1.19	0.85
55.31	575884.8	2945618	26.62943	93.76235	1.74	1.4
55.43	575853.8	2945732	26.63046	93.76205	3.15	2.81
55.54	575770.8	2945833	26.63138	93.76122	3.79	3.45
55.67	575668	2945875	26.63176	93.76019	2.65	2.31
55.78	575567.8	2945873	26.63175	93.75919	2.87	2.53
55.91	575452	2945887	26.63188	93.75802	1.16	0.82
56.02	575345.7	2945906	26.63206	93.75696	0.74	0.4
56.13	575253.3	2945835	26.63141	93.75602	1.63	1.29
56.27	575096.1	2945825	26.63133	93.75444	1.64	1.3
56.39	574995.7	2945816	26.63126	93.75343	1.4	1.06

Chainage (km)	Easting	Northing	latitude	Longitude	Reduced Depth in (m)	Observed depth in (m)
56.50	574864.5	2945823	26.63133	93.75212	1.36	1.02
56.62	574710.1	2945853	26.63161	93.75057	1.13	0.79
56.73	574613.8	2945894	26.63199	93.7496	0.88	0.54
56.84	574517.1	2945929	26.6323	93.74863	1.51	1.17
56.95	574417.8	2945911	26.63215	93.74763	2.51	2.17
57.07	574320.5	2945884	26.63191	93.74666	1.9	1.56
57.19	574226.4	2945846	26.63157	93.74571	1.79	1.45
57.30	574131.8	2945794	26.63111	93.74475	2.12	1.78
57.42	573994	2945705	26.63031	93.74337	1.52	1.18
57.56	573886.1	2945566	26.62907	93.74227	2.14	1.8
57.68	573859.6	2945452	26.62804	93.742	2.24	1.9
57.79	573872.9	2945331	26.62694	93.74213	2	1.66
57.90	573836.2	2945147	26.62529	93.74175	2.03	1.69
58.02	573825.6	2945044	26.62435	93.74164	1.7	1.36
58.13	573806.1	2944945	26.62346	93.74143	0.79	0.45
58.28	573803.4	2944844	26.62254	93.7414	0.88	0.54
58.39	573812.4	2944743	26.62164	93.74149	0.74	0.4
58.51	573789.7	2944606	26.6204	93.74125	2.2	1.86
58.62	573745.7	2944514	26.61958	93.7408	1.43	1.09
58.75	573648	2944355	26.61814	93.73981	1.3	0.96
58.86	573579.7	2944272	26.6174	93.73912	1.69	1.35
58.97	573535.2	2944168	26.61646	93.73867	2.36	2.02
59.10	573467.7	2944024	26.61516	93.73798	1.33	0.99
59.22	573423.6	2943926	26.61428	93.73753	1.12	0.78
59.33	573326	2943792	26.61308	93.73654	1.27	0.93
59.46	573164.9	2943824	26.61337	93.73493	1.39	1.05
59.61	573105.6	2943908	26.61413	93.73434	2.47	2.13
59.72	573052.4	2944008	26.61504	93.73381	2.54	2.2
59.85	573001.9	2944146	26.61629	93.73331	2.54	2.2
59.98	572953.2	2944320	26.61786	93.73283	1.28	0.94
60.10	573006.6	2944494	26.61943	93.73338	0.95	0.61
60.21	573006.4	2944617	26.62054	93.73338	0.76	0.42
60.33	573011.3	2944721	26.62148	93.73344	0.75	0.41
60.44	573020	2944827	26.62243	93.73353	0.75	0.41
60.56	573027.5	2944938	26.62344	93.73361	0.75	0.41
60.68	573034.4	2945038	26.62434	93.73369	0.79	0.45
60.81	573037.1	2945195	26.62576	93.73372	1.6	1.26
60.92	573033.3	2945300	26.6267	93.73369	2.14	1.8
61.09	573020	2945419	26.62778	93.73356	1.45	1.11
61.24	572969.4	2945515	26.62865	93.73306	0.77	0.43
61.36	572840.5	2945598	26.62941	93.73177	0.34	0

Chainage (km)	Easting	Northing	latitude	Longitude	Reduced Depth in (m)	Observed depth in (m)
61.48	572724.2	2945687	26.63021	93.73061	1.1	0.76
61.59	572688.7	2945788	26.63113	93.73026	0.71	0.37
61.71	572650.5	2945887	26.63202	93.72988	1.54	1.2
61.82	572637.4	2945988	26.63293	93.72975	2.68	2.34
61.97	572628.8	2946160	26.63449	93.72968	1.19	0.85
62.10	572618	2946264	26.63543	93.72957	0.98	0.64
62.22	572634.7	2946402	26.63667	93.72975	0.85	0.51
62.34	572687.5	2946505	26.63761	93.73029	0.8	0.46
62.45	572713.8	2946678	26.63916	93.73056	0.7	0.36
62.56	572708.5	2946865	26.64085	93.73052	1.45	1.11
62.67	572704.8	2946968	26.64179	93.73049	0.91	0.57
62.78	572706.9	2947139	26.64332	93.73052	0.7	0.36
62.93	572711.5	2947241	26.64424	93.73057	0.68	0.34
63.05	572710.8	2947341	26.64515	93.73057	0.88	0.54
63.17	572652.5	2947463	26.64625	93.72999	0.7	0.36
63.32	572630.4	2947573	26.64725	93.72977	0.72	0.38
63.44	572674.5	2947670	26.64812	93.73022	1.49	1.15
63.57	572649.6	2947808	26.64936	93.72998	1.39	1.05
63.69	572597.8	2947960	26.65074	93.72947	0.95	0.61
63.80	572534.9	2948105	26.65205	93.72885	1.67	1.33
63.92	572473.6	2948190	26.65283	93.72823	1.15	0.81
64.03	572345.4	2948327	26.65407	93.72695	0.92	0.58
64.14	572265.3	2948397	26.6547	93.72615	1.04	0.7
64.26	572180.6	2948451	26.6552	93.72531	1.94	1.6
64.39	572016.9	2948514	26.65577	93.72366	0.68	0.34
64.53	571915.4	2948558	26.65617	93.72265	0.79	0.45
64.65	571799.3	2948566	26.65625	93.72148	2.66	2.32
64.77	571668.4	2948545	26.65608	93.72016	1.73	1.39
64.88	571558.6	2948519	26.65585	93.71906	0.68	0.34
65.01	571453.2	2948483	26.65552	93.718	0.88	0.54
65.12	571376.7	2948418	26.65494	93.71723	2.53	2.19
65.24	571288.6	2948344	26.65428	93.71634	1.75	1.41
65.35	571214.2	2948275	26.65366	93.71559	1.09	0.75
65.49	571145.5	2948190	26.6529	93.71489	1.05	0.71
65.60	571096.4	2948103	26.65211	93.71439	2.39	2.05
65.71	571042.5	2947988	26.65107	93.71384	2.02	1.68
65.84	571013.5	2947889	26.65018	93.71355	1.16	0.82
65.97	570987.7	2947788	26.64928	93.71328	0.77	0.43
66.09	570970.3	2947674	26.64824	93.7131	1.63	1.29
66.24	570964.3	2947557	26.64719	93.71303	1.1	0.76
66.37	570951.3	2947443	26.64616	93.7129	0.83	0.49

Chainage (km)	Easting	Northing	latitude	Longitude	Reduced Depth in (m)	Observed depth in (m)
66.49	570927.1	2947307	26.64493	93.71265	1.18	0.84
66.60	570891.5	2947191	26.64389	93.71228	0.86	0.52
66.72	570757.3	2947080	26.64289	93.71093	1.06	0.72
66.83	570656.9	2947065	26.64276	93.70992	1.73	1.39
66.95	570572.2	2947133	26.64338	93.70907	0.68	0.34
67.08	570449.1	2947238	26.64434	93.70784	0.95	0.61
67.21	570374.9	2947307	26.64496	93.7071	2.06	1.72
67.32	570308.8	2947413	26.64592	93.70644	0.8	0.46
67.48	570292	2947567	26.64731	93.70628	2.71	2.43
67.59	570301.8	2947675	26.64829	93.70638	1.97	1.69
67.71	570335.3	2947812	26.64953	93.70673	1.93	1.65
67.85	570433	2947978	26.65102	93.70772	1.69	1.41
67.96	570500.7	2948067	26.65182	93.7084	1.64	1.36
68.07	570600.8	2948141	26.65248	93.70941	0.96	0.68
68.23	570697.5	2948168	26.65272	93.71039	0.69	0.41
68.36	570784.6	2948229	26.65326	93.71127	0.82	0.54
68.50	570894.6	2948329	26.65416	93.71238	1.21	0.93
68.62	570989.3	2948395	26.65475	93.71333	1.49	1.21
68.73	571088.6	2948477	26.65549	93.71433	1.18	0.9
68.86	571176.5	2948554	26.65618	93.71522	1.78	1.5
68.98	571250.4	2948622	26.65679	93.71597	0.91	0.63
69.11	571335	2948698	26.65747	93.71682	1.3	1.02
69.24	571460.1	2948824	26.6586	93.71809	1.18	0.9
69.36	571537.9	2948912	26.65939	93.71887	0.8	0.52
69.48	571624.2	2949008	26.66026	93.71975	0.74	0.46
69.60	571722.4	2949159	26.66161	93.72074	1.78	1.5
69.71	571770.1	2949251	26.66244	93.72123	0.97	0.69
69.85	571833.6	2949436	26.66411	93.72187	0.68	0.4
69.98	571846.5	2949542	26.66507	93.72201	1.3	1.02
70.09	571827.1	2949669	26.66621	93.72182	0.76	0.48
70.20	571797.9	2949781	26.66722	93.72154	1.84	1.56
70.32	571758.6	2949873	26.66806	93.72115	1.49	1.21
70.44	571704.1	2949960	26.66884	93.7206	0.66	0.38
70.56	571634.6	2950048	26.66964	93.71991	1.9	1.62
70.68	571506.5	2950178	26.67083	93.71863	0.73	0.45
70.79	571425.9	2950260	26.67157	93.71782	0.76	0.48
70.92	571303	2950414	26.67296	93.7166	0.66	0.38
71.03	571227.2	2950486	26.67362	93.71584	2.18	1.9
71.19	571212.9	2950598	26.67463	93.7157	1.36	1.08
71.32	571217.8	2950704	26.67558	93.71576	0.98	0.7
71.43	571248.4	2950850	26.67691	93.71607	1.18	0.9

Chainage (km)	Easting	Northing	latitude	Longitude	Reduced Depth in (m)	Observed depth in (m)
71.54	571288.6	2950957	26.67787	93.71648	1.33	1.05
71.66	571323.8	2951055	26.67875	93.71684	1.16	0.88
71.80	571383.5	2951136	26.67948	93.71745	0.73	0.45
71.91	571433.4	2951230	26.68033	93.71795	1.66	1.38
72.05	571432	2951361	26.68151	93.71795	1.15	0.87
72.16	571359.5	2951439	26.68222	93.71722	2.08	1.8
72.27	571246	2951484	26.68263	93.71609	1.27	0.99
72.38	571147.9	2951504	26.68282	93.7151	1.49	1.21
72.49	571047.1	2951497	26.68275	93.71409	2.26	1.98
72.64	570948.7	2951475	26.68256	93.7131	2.58	2.3
72.78	570855	2951439	26.68224	93.71215	2.66	2.38
72.90	570737.8	2951357	26.6815	93.71097	0.73	0.45
73.02	570610.1	2951337	26.68133	93.70969	1.03	0.75
73.17	570506.6	2951323	26.68121	93.70865	1.46	1.18
73.30	570353.8	2951376	26.6817	93.70711	2.63	2.35
73.41	570235.8	2951455	26.68241	93.70593	2.63	2.35
73.53	570147.2	2951544	26.68322	93.70505	3.37	3.09
73.66	570077.1	2951616	26.68388	93.70435	2.6	2.32
73.78	569993.2	2951686	26.68452	93.70351	1.97	1.69
73.93	569891.2	2951745	26.68505	93.70248	4.67	4.39
74.05	569786.1	2951735	26.68497	93.70143	3.57	3.29
74.17	569664.4	2951659	26.68429	93.7002	3.47	3.19
74.28	569569.5	2951520	26.68304	93.69924	2.8	2.52
74.41	569542.7	2951328	26.68131	93.69896	1.95	1.67
74.56	569538.3	2951228	26.6804	93.69891	0.79	0.51
74.71	569485.9	2951123	26.67946	93.69838	1.03	0.75
74.82	569416.5	2950994	26.6783	93.69767	0.7	0.42
74.98	569367.2	2950870	26.67718	93.69717	1.25	0.97
75.09	569356	2950770	26.67628	93.69705	1.48	1.2
75.20	569340.4	2950621	26.67493	93.69689	1.28	1
75.31	569322	2950520	26.67402	93.6967	1.1	0.82
75.42	569305.6	2950421	26.67313	93.69653	1.1	0.82
75.55	569223.5	2950363	26.67261	93.6957	1.99	1.71
75.66	569123.3	2950364	26.67262	93.69469	2.11	1.83
75.81	568962.4	2950336	26.67237	93.69307	2.2	1.92
75.93	568861.9	2950328	26.67231	93.69206	2.2	1.92
76.07	568718.8	2950337	26.6724	93.69062	2.27	1.99
76.21	568558.8	2950366	26.67267	93.68902	2.41	2.13
76.34	568426.4	2950386	26.67286	93.68769	2.26	1.98
76.45	568303.1	2950414	26.67311	93.68645	2.02	1.74
76.56	568185.8	2950456	26.67349	93.68527	2.53	2.25

Chainage (km)	Easting	Northing	latitude	Longitude	Reduced Depth in (m)	Observed depth in (m)
76.68	568095	2950501	26.67391	93.68436	2.72	2.44
76.81	568015.6	2950562	26.67447	93.68357	3.73	3.45
76.92	567943.2	2950641	26.67518	93.68285	6.62	6.34
77.03	567909.8	2950752	26.67618	93.68252	6.71	6.43
77.14	567909.5	2950852	26.67709	93.68252	2.41	2.13
77.26	567859.4	2950943	26.67791	93.68202	3.77	3.49
77.38	567847.6	2951046	26.67884	93.68191	2.47	2.19
77.54	567833.3	2951150	26.67979	93.68177	1.67	1.39
77.67	567833.8	2951258	26.68075	93.68178	1.12	0.84
77.79	567844.1	2951410	26.68213	93.68189	1.55	1.27
77.92	567865.3	2951531	26.68322	93.68211	2.15	1.87
78.05	567896.6	2951632	26.68413	93.68243	1.64	1.36
78.17	567942.7	2951743	26.68513	93.6829	1.33	1.38
78.29	568035.7	2951827	26.68588	93.68384	0.49	0.54
78.41	568084.3	2952012	26.68755	93.68434	1	1.05
78.53	568197.2	2952161	26.68889	93.68548	1.08	1.13
78.65	568270.8	2952230	26.68951	93.68622	0.4	0.45
78.78	568333	2952325	26.69036	93.68686	1.75	1.8
78.90	568413.1	2952403	26.69106	93.68766	1.49	1.54
79.01	568478.8	2952501	26.69194	93.68833	0.62	0.67
79.14	568623.1	2952617	26.69299	93.68979	0.77	0.82
79.28	568716.1	2952787	26.69452	93.69073	0.64	0.69
79.39	568781.7	2952882	26.69537	93.69139	0.67	0.72
79.52	568812.9	2953010	26.69653	93.69172	0.31	0.36
79.63	568807.8	2953110	26.69743	93.69167	0.64	0.69
79.78	568810.3	2953231	26.69852	93.6917	0.41	0.45
79.93	568788.1	2953329	26.69941	93.69148	0.82	0.87
80.04	568747.6	2953457	26.70057	93.69108	1.75	1.8
80.18	568645.8	2953554	26.70145	93.69007	1.51	1.56
80.31	568558.8	2953607	26.70193	93.68919	1.01	1.06
80.42	568444.5	2953672	26.70252	93.68805	0.62	0.67
80.54	568336.8	2953718	26.70294	93.68697	0.59	0.64
80.66	568235.1	2953733	26.70309	93.68595	0.86	0.91
80.77	568054.7	2953756	26.7033	93.68413	0.7	0.75
80.90	567965.1	2953704	26.70283	93.68323	0.49	0.54
81.02	567869	2953673	26.70256	93.68226	0.79	0.84
81.18	567747.5	2953639	26.70225	93.68104	0.73	0.78
81.29	567523.1	2953624	26.70213	93.67878	0.37	0.42
81.43	567390.3	2953568	26.70164	93.67745	1.81	1.86
81.54	567310.9	2953499	26.70101	93.67664	0.53	0.58
81.66	567213.2	2953419	26.70029	93.67566	0.37	0.42

Chainage (km)	Easting	Northing	latitude	Longitude	Reduced Depth in (m)	Observed depth in (m)
81.78	567158.1	2953332	26.69951	93.6751	0.95	1
81.89	567095.5	2953251	26.69878	93.67447	1.33	1.38
82.00	567038.2	2953155	26.69792	93.67388	1.03	1.08
82.16	566989.6	2953066	26.69712	93.67339	0.32	0.37
82.32	566949.5	2952972	26.69627	93.67298	0.32	0.37
82.43	566862.1	2952847	26.69515	93.6721	1.14	1.19
82.54	566773.5	2952733	26.69413	93.6712	0.7	0.75
82.68	566704.9	2952659	26.69346	93.67051	0.33	0.38
82.81	566632.2	2952589	26.69283	93.66977	1	1.05
82.92	566536.3	2952505	26.69207	93.66881	0.32	0.37
83.03	566443.3	2952431	26.69141	93.66787	0.32	0.37
83.16	566268.6	2952336	26.69057	93.66611	2.21	2.26
83.31	566180.2	2952283	26.69009	93.66521	0.86	0.91
83.44	566069.4	2952232	26.68963	93.6641	0.49	0.54
83.56	565938.4	2952190	26.68926	93.66278	0.53	0.58
83.71	565818.9	2952171	26.68909	93.66158	1.88	1.93
83.83	565634.9	2952144	26.68886	93.65973	0.91	0.96
83.95	565496.1	2952132	26.68875	93.65833	0.77	0.82
84.11	565381	2952134	26.68878	93.65717	0.92	0.97
84.27	565269.2	2952149	26.68892	93.65605	1.31	1.36
84.40	565120.3	2952155	26.68899	93.65456	0.76	0.81
84.52	564972.3	2952175	26.68917	93.65307	0.5	0.55
84.64	564856.9	2952186	26.68928	93.65191	0.56	0.61
84.79	564745	2952219	26.68958	93.65079	0.85	0.9
84.93	564649.7	2952254	26.6899	93.64983	1.18	1.23
85.04	564504.8	2952289	26.69022	93.64838	1.16	1.21
85.15	564386.6	2952327	26.69057	93.64719	1.22	1.27
85.27	564294.7	2952369	26.69095	93.64627	0.82	0.87
85.38	564206.9	2952418	26.6914	93.64539	0.49	0.54
85.50	564112.2	2952481	26.69197	93.64444	0.44	0.49
85.63	564058.2	2952566	26.69274	93.6439	1.06	1.11
85.79	563921.1	2952652	26.69353	93.64253	1.55	1.6
85.95	563806.3	2952695	26.69392	93.64138	1.43	1.48
86.07	563671	2952740	26.69433	93.64002	0.56	0.61
86.18	563527.9	2952788	26.69477	93.63858	0.53	0.58
86.30	563427.7	2952843	26.69527	93.63758	0.76	0.81
86.42	563334.5	2952879	26.6956	93.63664	1.15	1.2
86.55	563179.7	2952925	26.69602	93.63509	1.49	1.54
86.68	563078.4	2952955	26.6963	93.63407	0.86	0.91
86.84	562960.9	2952995	26.69666	93.63289	0.67	0.72
86.98	562850	2953021	26.6969	93.63178	0.64	0.69

Chainage (km)	Easting	Northing	latitude	Longitude	Reduced Depth in (m)	Observed depth in (m)
87.09	562703.5	2953057	26.69724	93.63031	0.65	0.7
87.25	562574.4	2953079	26.69744	93.62901	0.85	0.9
87.36	562472.2	2953102	26.69765	93.62799	0.71	0.76
87.49	562331.4	2953111	26.69774	93.62657	0.53	0.58
87.63	562222.8	2953114	26.69777	93.62548	0.91	0.96
87.76	562115.6	2953083	26.6975	93.6244	1.36	1.41
87.87	561987.8	2953039	26.6971	93.62311	2.58	2.63
87.99	561875.6	2953012	26.69686	93.62198	1.75	1.8
88.11	561777.3	2952973	26.69652	93.62099	2.34	2.39
88.25	561685.9	2952916	26.69601	93.62007	2.33	2.38
88.37	561545	2952780	26.69478	93.61865	2.34	2.39
88.49	561469.9	2952680	26.69388	93.61789	1.63	1.68
88.60	561412	2952582	26.69301	93.6173	1	1.05
88.75	561360.7	2952487	26.69215	93.61678	0.73	0.78
88.87	561321.7	2952392	26.6913	93.61639	1.45	1.5
88.98	561248.3	2952275	26.69024	93.61564	1.6	1.65
89.10	561207.3	2952178	26.68937	93.61523	1.1	1.15
89.26	561168.3	2952086	26.68854	93.61483	0.89	0.94
89.38	561142.9	2951974	26.68752	93.61457	0.37	0.42
89.50	561128.8	2951829	26.68622	93.61442	0.49	0.54
89.63	561119.1	2951714	26.68518	93.61432	0.59	0.64
89.79	561081.1	2951611	26.68425	93.61393	0.32	0.37
89.92	561042.1	2951496	26.68322	93.61353	0.32	0.37
90.03	561067.1	2951346	26.68186	93.61378	0.32	0.37
90.15	560873.8	2951350	26.6819	93.61183	0.56	0.61
90.29	560690.8	2951296	26.68142	93.60999	0.56	0.61
90.42	560607.7	2951234	26.68087	93.60915	0.37	0.42
90.53	560476.1	2951219	26.68074	93.60783	2.23	2.28
90.65	560373.6	2951273	26.68123	93.6068	1.42	1.47
90.76	560282.5	2951314	26.68161	93.60589	0.95	1
90.87	559725.7	2951915	26.68706	93.60032	1.16	1.21
90.99	559669	2952005	26.68787	93.59976	0.79	0.84
91.10	559618.4	2952092	26.68865	93.59925	1.07	1.12
91.25	559569.5	2952367	26.69115	93.59877	0.37	0.42
91.38	559568.1	2952700	26.69415	93.59878	0.86	0.91
91.50	559512	2952830	26.69532	93.59822	0.61	0.66
91.61	559418.5	2952976	26.69665	93.59728	0.68	0.73
91.72	559346.4	2953063	26.69744	93.59656	1.87	1.92
91.85	559233.3	2953191	26.69859	93.59543	0.73	0.78
91.96	559166.2	2953266	26.69927	93.59476	0.31	0.36
92.09	559082.6	2953345	26.69999	93.59393	0.31	0.36

Chainage (km)	Easting	Northing	latitude	Longitude	Reduced Depth in (m)	Observed depth in (m)
92.23	559571.4	2952584	26.6931	93.5988	0.32	0.37
92.36	559481.7	2952422	26.69165	93.59789	0.43	0.48
92.48	559499.2	2952289	26.69044	93.59806	0.73	0.78
92.59	559549	2952183	26.68948	93.59856	0.76	0.81
92.72	559832.6	2951774	26.68578	93.60139	2.09	2.14
92.83	559897.9	2951698	26.68509	93.60204	2.16	2.21
92.99	560020.9	2951555	26.68379	93.60327	2.56	2.61
93.10	560086.2	2951478	26.6831	93.60392	2.17	2.22
93.24	560198.1	2951374	26.68215	93.60504	1.52	1.57
93.39	593084.4	2926864	26.45908	93.93376	0.42	0.52
93.53	593146.9	2926751	26.45806	93.93438	0.42	0.63
93.65	593280.2	2926724	26.45781	93.93571	0.43	0.53
93.77	593396.2	2926777	26.45828	93.93688	0.54	0.64
93.89	593477.3	2926852	26.45895	93.9377	0.52	0.63
94.00	593540.8	2926940	26.45974	93.93834	0.62	0.74
94.10	593601.4	2927035	26.46059	93.93895	0.62	0.71
94.21	593662.6	2927120	26.46136	93.93957	0.62	0.72
94.34	593710.4	2927193	26.46201	93.94006	0.62	0.73
94.45	593769.4	2927276	26.46275	93.94066	0.62	0.74
94.57	593884.4	2927415	26.464	93.94182	0.62	2.12
94.70	593966.8	2927470	26.4645	93.94265	2.01	1.95
94.82	594061.4	2927522	26.46496	93.9436	1.84	1.74
94.93	594177	2927544	26.46515	93.94477	1.62	1.52
95.04	594285.7	2927563	26.46532	93.94586	1.42	1.42
95.13	594385.4	2927575	26.46541	93.94686	1.34	1.21
95.24	594489.5	2927555	26.46523	93.9479	1.12	1.23
95.34	594555	2927505	26.46477	93.94855	1.13	1.12
95.45	594633	2927445	26.46423	93.94933	1.05	1.13
95.55	594697.2	2927380	26.46364	93.94997	1.05	1.15
95.66	594759.5	2927306	26.46296	93.95059	1.05	1.05
95.77	594805	2927232	26.46229	93.95104	0.94	1.02
95.89	593822.8	2927357	26.46349	93.9412	0.94	0.73
Chainage	**Easting**	**Northing**	**latitude**	**Longitude**	**Reduced depth in (m)**	**Topo data in (m)**
96.04166	589413.4	2921551	26.41135	93.89656	0	95.76
96.1037	589486.7	2921603	26.41182	93.8973	0	95.73
96.19515	589560	2921656	26.41229	93.89804	0	95.7
96.27396	589610.5	2921692	26.41261	93.89855	0	95.66
96.34879	589689.9	2921737	26.41301	93.89935	0	95.63

Chainage (km)	Easting	Northing	latitude	Longitude	Reduced data in (m)	Topo data in (m)
96.43879	589738.1	2921799	26.41357	93.89984	0	95.6
96.51024	589762.3	2921870	26.41421	93.90008	0	95.57
96.57694	589769.9	2921960	26.41502	93.90017	0	95.54
96.66694	589764.4	2922031	26.41567	93.90012	0	95.5
96.72753	589752.8	2922097	26.41626	93.90001	0	95.47
96.81753	589735.9	2922185	26.41706	93.89984	0	95.44
96.87978	589701.1	2922235	26.41751	93.8995	0	95.41
96.96099	589638.3	2922299	26.41809	93.89887	0	95.38
97.05233	589590.7	2922339	26.41846	93.8984	0	95.34
97.14016	589526.9	2922390	26.41892	93.89776	0	95.31
97.20318	589481.3	2922469	26.41963	93.89731	0	95.28
97.28024	589526.8	2922544	26.42031	93.89777	0	95.25
97.37031	589576.5	2922583	26.42066	93.89827	0	95.22
97.46031	589642.2	2922623	26.42102	93.89893	0	95.18
97.52444	589722.6	2922663	26.42138	93.89974	0	95.15
97.61143	589808.6	2922690	26.42161	93.90061	0	95.12
97.70332	589872.6	2922695	26.42165	93.90125	0	95.09
97.78267	589958	2922679	26.4215	93.9021	0	95.06
97.83775	590038.5	2922634	26.42109	93.90291	0	95.02
97.92775	590074.6	2922563	26.42045	93.90326	0	94.99
98.01776	590080	2922509	26.41996	93.90331	0	94.96
98.10775	590047.5	2922425	26.4192	93.90298	0	94.93
98.19775	590015	2922341	26.41845	93.90265	0	94.9
98.25837	589982.6	2922257	26.41769	93.90232	0	94.86
98.34837	589950.1	2922173	26.41693	93.90199	0	94.83
98.42799	589939.4	2922113	26.4164	93.90188	0	94.8
98.52206	589929.6	2922024	26.41559	93.90177	0	94.77
98.61206	589940.5	2921945	26.41488	93.90188	0	94.74
98.70207	589990.2	2921865	26.41415	93.90237	0	94.7
98.79494	590055.4	2921803	26.41359	93.90302	0	94.67
98.88494	590120.5	2921741	26.41302	93.90367	0	94.64
98.9458	590163.8	2921659	26.41228	93.9041	0	94.61
99.0358	590204.9	2921579	26.41155	93.9045	0	94.58
99.1258	590227	2921522	26.41104	93.90472	0	94.54
99.2053	590256.4	2921437	26.41027	93.90501	0	94.51
99.2953	590285.9	2921352	26.4095	93.9053	0	94.48
99.39387	590318	2921279	26.40884	93.90561	0	94.45
99.46674	590359.5	2921199	26.40812	93.90602	0	94.42
99.55561	590434.3	2921135	26.40753	93.90677	0	94.38
99.65695	590497.6	2921099	26.4072	93.9074	0	94.35

Chainage (km)	Easting	Northing	latitude	Longitude	Reduced data in (m)	Topo data in (m)
99.74695	590582.7	2921073	26.40697	93.90825	0	94.32
99.83947	590683.4	2921062	26.40686	93.90926	0	94.29
99.91629	590773.3	2921058	26.40681	93.91016	0	94.26
100.0078	590865.5	2921066	26.40688	93.91109	0	94.22
100.091	590941.1	2921052	26.40675	93.91185	0	94.19
100.181	591019.6	2921005	26.40632	93.91263	0	94.16
100.2828	591083	2920951	26.40583	93.91326	0	94.13
100.3728	591131	2920875	26.40514	93.91374	0	94.1
100.45	591185.4	2920789	26.40436	93.91428	0	94.06
100.54	591259.5	2920738	26.4039	93.91502	0	94.03
100.6246	591323.1	2920695	26.4035	93.91565	0	94
100.7049	591407.8	2920664	26.40322	93.9165	0	93.97
100.8046	591491.6	2920652	26.4031	93.91734	0	93.94
100.9095	591569.5	2920671	26.40327	93.91812	0	93.9
100.9906	591652.5	2920726	26.40376	93.91895	0	93.87
101.0806	591712.8	2920812	26.40453	93.91957	0	93.84
101.1429	591740.8	2920888	26.40522	93.91985	0	93.81
101.2075	591746.7	2920978	26.40603	93.91992	0	93.78
101.2975	591727.9	2921037	26.40657	93.91973	0	93.74
101.385	591699.2	2921095	26.40709	93.91945	0	93.71
101.475	591634.4	2921158	26.40766	93.9188	0	93.68
101.5705	591571.4	2921218	26.40821	93.91818	0	93.65
101.6381	591528.6	2921298	26.40893	93.91775	0	93.62
101.7281	591496.5	2921387	26.40974	93.91744	0	93.58
101.7874	591485.3	2921454	26.41035	93.91733	0	93.55
101.8696	591498.9	2921543	26.41115	93.91747	0	93.52
101.968	591499.5	2921602	26.41168	93.91748	0	93.49
102.0294	591483.4	2921683	26.41241	93.91733	0	93.46
102.1194	591435.4	2921769	26.41319	93.91685	0	93.42
102.1981	591394.7	2921815	26.41361	93.91645	0	93.39
102.2853	591320.7	2921866	26.41408	93.91571	0	93.36
102.3753	591246.8	2921893	26.41433	93.91497	0	93.33
102.4648	591160.7	2921907	26.41445	93.91411	0	93.3
102.5497	591072	2921922	26.41459	93.91322	0	93.26
102.6286	590989	2921955	26.4149	93.91239	0	93.23
102.6918	590939.1	2922024	26.41553	93.91189	0	93.2
102.7853	590936	2922103	26.41624	93.91187	0	93.17
102.8675	590946.9	2922165	26.4168	93.91198	0	93.14
102.9575	591001.5	2922241	26.41748	93.91254	0	93.1

Chainage (km)	Easting	Northing	latitude	Longitude	Reduced data in (m)	Topo data in (m)
103.0463	591061.8	2922297	26.41798	93.91314	0	93.07
103.1333	591145.7	2922329	26.41827	93.91399	0	93.04
103.2159	591233.1	2922346	26.41841	93.91486	0	93.01
103.2892	591318.1	2922327	26.41824	93.91572	0	92.98
103.3792	591387.1	2922282	26.41782	93.9164	0	92.94
103.4754	591442.4	2922234	26.41739	93.91696	0	92.91
103.5799	591490.9	2922158	26.4167	93.91744	0	92.88
103.6485	591540.9	2922076	26.41595	93.91793	0	92.85
103.7247	591613.6	2922001	26.41527	93.91866	0	92.82
103.8147	591681.1	2921988	26.41516	93.91933	0	92.78
103.876	591751	2922019	26.41543	93.92003	0	92.75
103.934	591792.2	2922099	26.41615	93.92045	0	92.72
104.024	591812.3	2922156	26.41667	93.92066	0	92.69
104.0872	591828.5	2922212	26.41717	93.92083	0	92.66
104.1468	591827.1	2922302	26.41798	93.92082	0	92.62
104.2368	591811.3	2922363	26.41853	93.92066	0	92.59
104.3012	591790.9	2922419	26.41904	93.92046	0	92.56
104.3912	591744.5	2922497	26.41974	93.92	0	92.53
104.4812	591711.4	2922552	26.42024	93.91968	0	92.5
104.5722	591628.2	2922586	26.42056	93.91884	0	92.46
104.6622	591545	2922620	26.42087	93.91801	0	92.43
104.7253	591457.7	2922646	26.42111	93.91714	0	92.4
104.8015	591369.2	2922662	26.42126	93.91625	0	92.37
104.904	591314.6	2922694	26.42155	93.91571	0	92.34
104.9903	591255.1	2922742	26.42199	93.91511	0	92.3
105.0803	591245.6	2922844	26.42291	93.91503	0	92.27
105.1447	591268.3	2922927	26.42366	93.91526	0	92.24
105.2347	591322.1	2922999	26.42431	93.9158	0	92.21
105.3036	591374.5	2923037	26.42464	93.91633	0	92.18
105.3936	591454.4	2923078	26.42501	93.91714	0	92.14
105.4737	591506.8	2923123	26.42541	93.91766	0	92.11
105.5636	591567.3	2923189	26.42601	93.91828	0	92.08
105.6302	591605.3	2923260	26.42664	93.91866	0	92.05
105.7283	591631.5	2923346	26.42742	93.91893	0	92.02
105.8152	591650.8	2923410	26.42799	93.91913	0	91.98
105.9026	591683	2923502	26.42883	93.91946	0	91.95
105.9687	591743.6	2923565	26.42938	93.92007	0	91.92
106.0543	591830.6	2923572	26.42945	93.92094	0	91.89
106.1434	591889.3	2923542	26.42917	93.92153	0	91.86
106.2334	591921.5	2923463	26.42845	93.92185	0	91.82

Chainage (km)	Easting	Northing	latitude	Longitude	Reduced data in (m)	Topo data in (m)
106.3188	591915.8	2923374	26.42765	93.92178	0	91.79
106.4088	591859.7	2923303	26.42702	93.92122	0	91.76
106.4988	591802.8	2923240	26.42645	93.92064	0	91.73
106.5739	591739.6	2923176	26.42587	93.92	0	91.7
106.6508	591676.4	2923112	26.4253	93.91936	0	91.66
106.7227	591645.3	2923043	26.42468	93.91905	0	91.63
106.8193	591643.9	2922966	26.42399	93.91903	0	91.6
106.8746	591685.9	2922908	26.42346	93.91945	0	91.57
106.9398	591782.4	2922904	26.42342	93.92041	0	91.54
107.0297	591837.6	2922900	26.42338	93.92097	0	91.5
107.0962	591902.5	2922895	26.42333	93.92162	0	91.47
107.1862	591989.6	2922872	26.42311	93.92249	0	91.44
107.2744	592054.8	2922859	26.42299	93.92314	0	91.41
107.34	592143.5	2922844	26.42285	93.92403	0	91.38
107.43	592231.6	2922842	26.42283	93.92491	0	91.34
107.4907	592296.7	2922850	26.42289	93.92557	0	91.31
107.5634	592373.8	2922896	26.42331	93.92634	0	91.28
107.6534	592419.4	2922936	26.42367	93.9268	0	91.25
107.7326	592470.8	2922988	26.42413	93.92732	0	91.22
107.8226	592511.1	2923068	26.42485	93.92773	0	91.18
107.8908	592546.6	2923139	26.42549	93.92809	0	91.15
107.9595	592583.4	2923221	26.42623	93.92847	0	91.12
108.0171	592633.4	2923267	26.42664	93.92897	0	91.09
108.1071	592700.4	2923283	26.42678	93.92964	0	91.06
108.1662	592757.8	2923287	26.42681	93.93022	0	91.02
108.2411	592847.3	2923297	26.4269	93.93112	0	90.99
108.3259	592901	2923322	26.42712	93.93166	0	90.96
108.4159	592952.6	2923376	26.4276	93.93218	0	90.93
108.4973	592997.8	2923448	26.42825	93.93264	0	90.9
108.5741	593029.4	2923532	26.42901	93.93296	0	90.86
108.6458	593075.6	2923599	26.42961	93.93343	0	90.83
108.7234	593143.5	2923635	26.42993	93.93411	0	90.8
108.8134	593214.9	2923642	26.42999	93.93483	0	90.77
108.9119	593289	2923619	26.42978	93.93557	0	90.74
109.0019	593366.8	2923574	26.42936	93.93635	0	90.7
109.0984	593459.7	2923541	26.42906	93.93728	0	90.67
109.1784	593549.2	2923532	26.42897	93.93817	0	90.64
109.2849	593645.6	2923535	26.42899	93.93914	0	90.61
109.3749	593723.9	2923551	26.42913	93.93993	0	90.58
109.4479	593801.7	2923624	26.42979	93.94071	0	90.54
109.5379	593835.6	2923707	26.43054	93.94106	0	90.51

Chainage (km)	Easting	Northing	latitude	Longitude	Reduced data in (m)	Topo data in (m)
109.6178	593851.6	2923779	26.43118	93.94123	0	90.48
109.6896	593862.1	2923868	26.43199	93.94134	0	90.45
109.7796	593862.8	2923948	26.43271	93.94135	0	90.42
109.8444	593857.4	2924020	26.43335	93.9413	0	90.38
109.9344	593828.6	2924105	26.43413	93.94102	0	90.35
110.0196	593807.8	2924166	26.43468	93.94081	0	90.32
110.1096	593753.2	2924238	26.43533	93.94027	0	90.29
110.2033	593690.6	2924296	26.43586	93.93965	0	90.26
110.2933	593615.7	2924345	26.43631	93.9389	0	90.22
110.3596	593538.7	2924399	26.4368	93.93813	0	90.19
110.4521	593464.8	2924450	26.43727	93.9374	0	90.16
110.5406	593424.3	2924503	26.43774	93.93699	0	90.13
110.5988	593395.1	2924591	26.43854	93.93671	0	90.1
110.6765	593386.7	2924679	26.43933	93.93663	0	90.06
110.7617	593382.8	2924737	26.43986	93.93659	0	90.03
110.8517	593365.8	2924813	26.44054	93.93643	0	90
110.9247	593316.8	2924882	26.44118	93.93594	0	89.97
111.0177	593235.2	2924920	26.44153	93.93513	0	89.94
111.1077	593166.1	2924943	26.44174	93.93444	0	89.9
111.1665	593076	2924967	26.44196	93.93353	0	89.87
111.2279	592994.7	2925005	26.44231	93.93272	0	89.84
111.3029	592950.4	2925044	26.44266	93.93228	0	89.81
111.3854	592929.6	2925102	26.44318	93.93208	0	89.78
111.4567	592936.7	2925176	26.44386	93.93215	0	89.74
111.5467	592972.7	2925251	26.44453	93.93252	0	89.71
111.6301	593012.9	2925310	26.44506	93.93293	0	89.68
111.7668	593076.1	2925374	26.44563	93.93356	0	89.65
111.8568	593134.5	2925433	26.44616	93.93415	0	89.62
111.9206	593267.8	2925464	26.44643	93.93549	0	89.58
112.0057	593357.8	2925461	26.4464	93.9364	0	89.55
112.0957	593416.1	2925435	26.44616	93.93698	0	89.52
112.1857	593480.8	2925380	26.44566	93.93762	0	89.49
112.2507	593539.7	2925312	26.44504	93.93821	0	89.46
112.3129	593598.6	2925244	26.44442	93.9388	0	89.42
112.4029	593647.1	2925201	26.44403	93.93928	0	89.39
112.4959	593695.8	2925162	26.44368	93.93976	0	89.36
112.5825	593775.5	2925120	26.4433	93.94056	0	89.33
112.6725	593863.2	2925089	26.44301	93.94144	0	89.3
112.7319	593948.4	2925074	26.44286	93.94229	0	89.26
112.8219	594037.8	2925063	26.44276	93.94319	0	89.23
112.9111	594096.8	2925056	26.4427	93.94378	0	89.2

Chainage (km)	Easting	Northing	latitude	Longitude	Reduced data in (m)	Topo data in (m)
112.9963	594183	2925030	26.44246	93.94464	0	89.17
113.0863	594260.1	2924985	26.44205	93.94541	0	89.14
113.1898	594314.1	2924920	26.44145	93.94595	0	89.1
113.2639	594363.9	2924845	26.44077	93.94644	0	89.07
113.3668	594465.4	2924824	26.44058	93.94746	0	89.04
113.4862	594532.3	2924856	26.44086	93.94813	0	89.01
113.5883	594607.4	2924927	26.44149	93.94889	0	88.98
113.6705	594660.7	2925034	26.44245	93.94943	0	88.94
113.7391	594676.5	2925134	26.44336	93.9496	0	88.91
113.8291	594664.8	2925216	26.4441	93.94949	0	88.88
113.8917	594641.1	2925280	26.44468	93.94925	0	88.85
113.9817	594589.3	2925354	26.44535	93.94874	0	88.82