FINAL FEASIBILITY REPORT ON DETAILED HYDROGRAPHIC SURVEY OF KARAMNASA RIVER FROM GANGA CONFLUENCE AT KUTUBPUR (CH 0 KM), TO BRIDGE AT KAKARAIT (CH 86 KM) NATIONAL WATERWAY NO- 54

VOLUME – I

Submitted To

	INLAND WATERWAYS AUTHORITY OF INDIA **A-13, Sector-1,NOIDA** **DIST-Gautam Buddha Nagar** **UTTAR PRADESH** **PIN- 201 301(UP)** **Email: hc.iwai@nic.in** **Web: www.iwai.nic.in**

Submitted By

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ACKNOWLEDGEMENT

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We would like to use this opportunity to pen down our profound gratitude and appreciations to **Shri Pravir Pandey, IA & AS, Chairman, Shri Alok Ranjan, ICAS, Member (Finance) and Shri Shashi Bhushan Shukla, Member (Traffic).**

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List of Abbreviations

SD	Sounding Datum
CD	Chart Datum
RTK	Real time Kinematic
DGPS	Differential Global Positioning Systems
TS	Total Station
GPS	Global Positioning Systems
BM	Bench Mark
MSL	Mean Sea Level
RL	Reference Level
HFL	Highest Flood Level
HT	High Tension Line
CH	Chainage
WGS	World Geodetic System
UTM	Universal Transverse Mercator
LAD	Least Available Depth

SALIENT FEATURES AT A GLANCE

REGION-VII					
Consultant: STRABAG INDIA PVT LTD.					
Name	**KARAMNASA RIVER**		**NW -54**		
Length	86 km **Ganga Confluence** at Kutubpur to Kakrait Bridge.				
State	Bihar and Uttar Pradesh (Entire stretch of 86 Km is common in both the States)				
Survey Period	From 03rd Jan 2016 to 17th Jan 2016				
Tidal / Non-tidal	Non tidal				
Availability of Depth (reduced) (mtrs)					
	(0-25) Km	**(25-50) Km**	**(50-75) Km**	**(75-86)Km**	**Total**
<1.2	14.45	16.76	17.30	9.80	58.31
1.2-1.4	3.50	2.65	3.85	0.90	10.90
1.5-1.7	2.55	2.30	2.65	0.30	7.80
1.8-2	2.20	1.80	1.10	0.00	5.10
>2.0	2.30	1.49	0.10	0.00	3.89
TOTAL	25.00	25.00	25.00	11.00	86.00
Average Slope per KM(m)	**0.047**	**0.117**	**0.175**	**0.215**	
Width Range (m)	**100**	**110**	**60**	**62**	
Bathy Survey conducted for Length (Km)	**25.00**	**23.90**	**13.25**	**0**	**62.15**
Dredging Quantity (Observed) Cu.m					
	(0-25) Km	**(25-50) Km**	**(50-75) Km**	**(75-86)Km**	Total
Class 1	1,92,634.24	2,42,656.96	5,23,326.47	3,28,482.47	12,87,100.14
Class 2	4,23,335.99	5,42,698.28	9,60,936.34	5,46,834.63	24,73,805.24
Class 3	8,99,199.85	11,35,293.63	16,82,524.08	8,86,315.26	46,03,332.82
Class 4	12,88,173.08	15,73,207.00	21,59,166.67	10,97,222.85	61,17,769.60
Dredging Quantity (Reduced) Cu.m					
	(0-25) Km	**(25-50) Km**	**(50-75) Km**	**(75-86)Km**	Total
Class 1	3,09,068.51	5,74,605.40	8,05,836.23	3,91,633.69	20,81,143.83
Class 2	6,01,670.61	10,08,723.68	13,57,834.49	6,42,158.64	36,10,387.42
Class 3				10,18,696.42	61,35,624.93

	11,64,013.73	17,49,019.43	22,03,895.35		
Class 4	15,87,216.39	22,32,718.58	27,09,869.75	12,38,451.16	77,68,255.88
No. of Bridge					
7					
Clearances less than Class (no.)					
Class	**Horizontal**	**Vertical**			
Class 1	**4**	**6**			
Class 2	**6**	**6**			
Class 3	**6**	**6**			
Class 4	**6**	**6**			
No. of Dams, Barrages, Weirs, Anicut etc.					
NA					
Number of days Water not available					
CWC Gauge	**No CWC gauge observed in the stretch.**				
Cargo availability					
Nil					
Passenger Movement					
Yes (Across the river)					
Present IWT use					
Nil					
Recommendation of the Consultant					
1. The Karamnasa River is Utilized by small boat for ferry services across the river. 2. The availability of navigable water is only during monsoon season 3. No cargo along the river. 4. The average width of the river is 30-40 mtr, so widening of the river is required at many places. 5. Large scale fishing nets across the river, Shallow depth and under water plankton are navigational hindrance. 6. River is shallow at most of the stretches and dredging quantity is much high. 7. The River banks are well connected with the road network and are moderately connected with Railway Network. The road is near parallel on both sides throughout the river stretch.					
Viable or not-viable					
Not found technically viable as of now.					

(Signature)

Date: Name of Consultant

SECTION – I: INTRODUCTORY CONSIDERATIONS

1.1 **River Course**. Inland Waterways Authority of India has awarded contract of detailed Hydrographic Survey and feasibility report in Region VII, the National Waterways including assessment of river training works and further development cost, for eco-friendly navigation in the waterways, to Strabag India Pvt. Ltd.

The Karmanasa originates at a height of 350 m on the northern face of Kaimur Range near Sarodag in Kaimur district of Bihar. It flows in a north-westerly direction through the plains of Mirzapur, then forms the boundary between Uttar Pradesh and Bihar, and finally joins the Ganges near Chausa. The length of the river is 192 km, out of which 116 km lies in Uttar Pradesh and the rest 76 km forms the boundary between Uttar Pradesh and Bihar. Total drainage area of the Karmnasa along with its tributaries is 11,709 sq. km. There are two dams across the Karmanasa viz. Latif Shah Bund and Nuagarh dam. There also is a dam across the Chandraprabha.

The feasibility study of Karamnasa River being envisaged for the development the waterway navigation. It is expected to boost the much needed irrigation projects and water way transportation in and around the river, which will provide a better living standards of the local populace

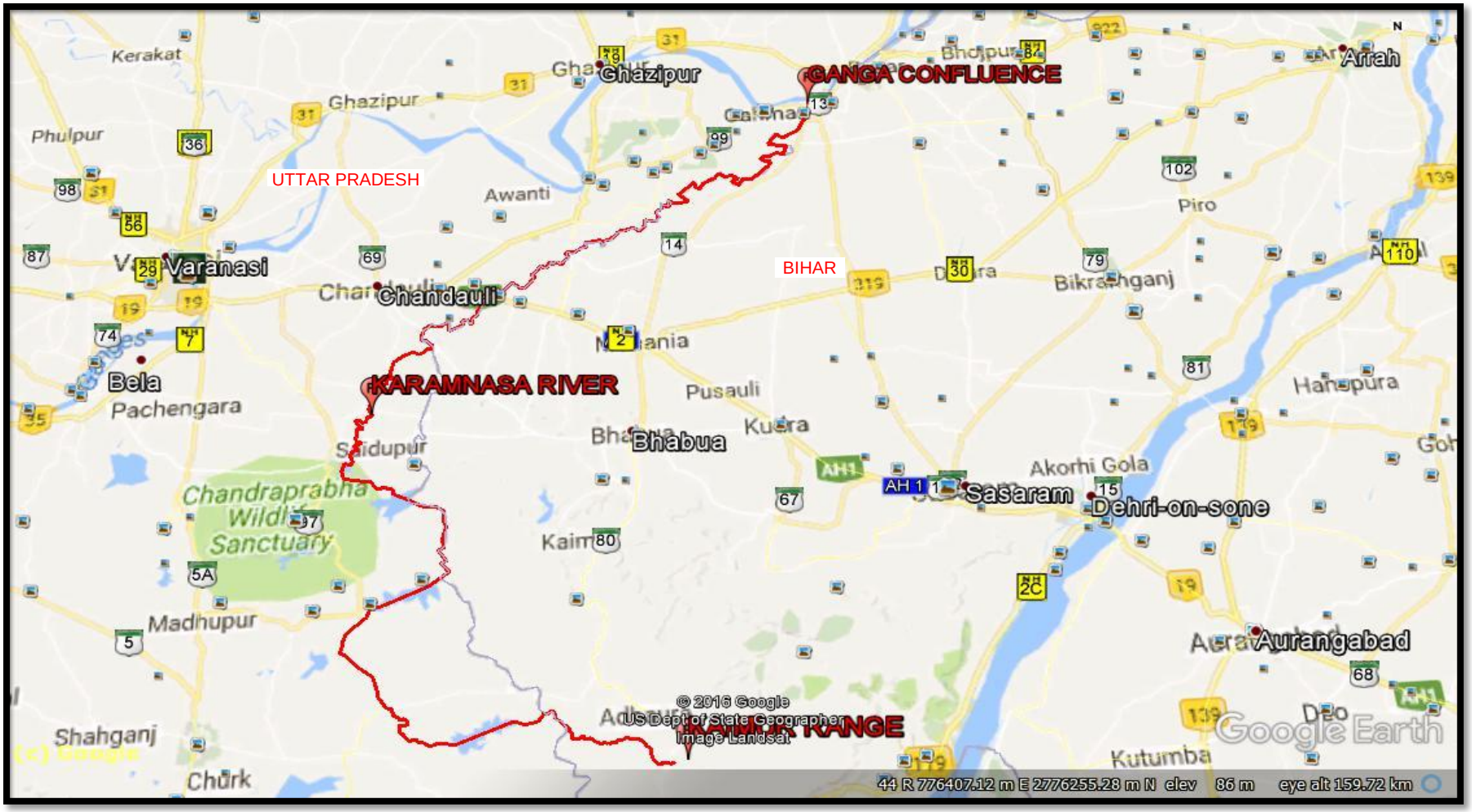
According to one legend, the sage Vishvamitra through tapasya (penance, meditation and correct practices) acquired the power to create a whole new universe. When he set out to create a new universe it aroused consternation in Indra Deva. However, he continued and after creating a copy of our universe, he started creating people, the first being Trishanku whom he decided to send up to rule his new universe. Indra Deva stopped his progress. That is how Trishanku ended up suspended head down in mid-air. The Karmanasa was born out of the saliva dripping from his mouth.

Amongst the sacred rivers of India, Karamnasa is considered to be cursed and it is believed that touching its water would ruin one's plan. There is hardly any development along the river. The people living around this river just eat dry fruits, because cooking food would require water. The name of the river means destroyer of religious merit.

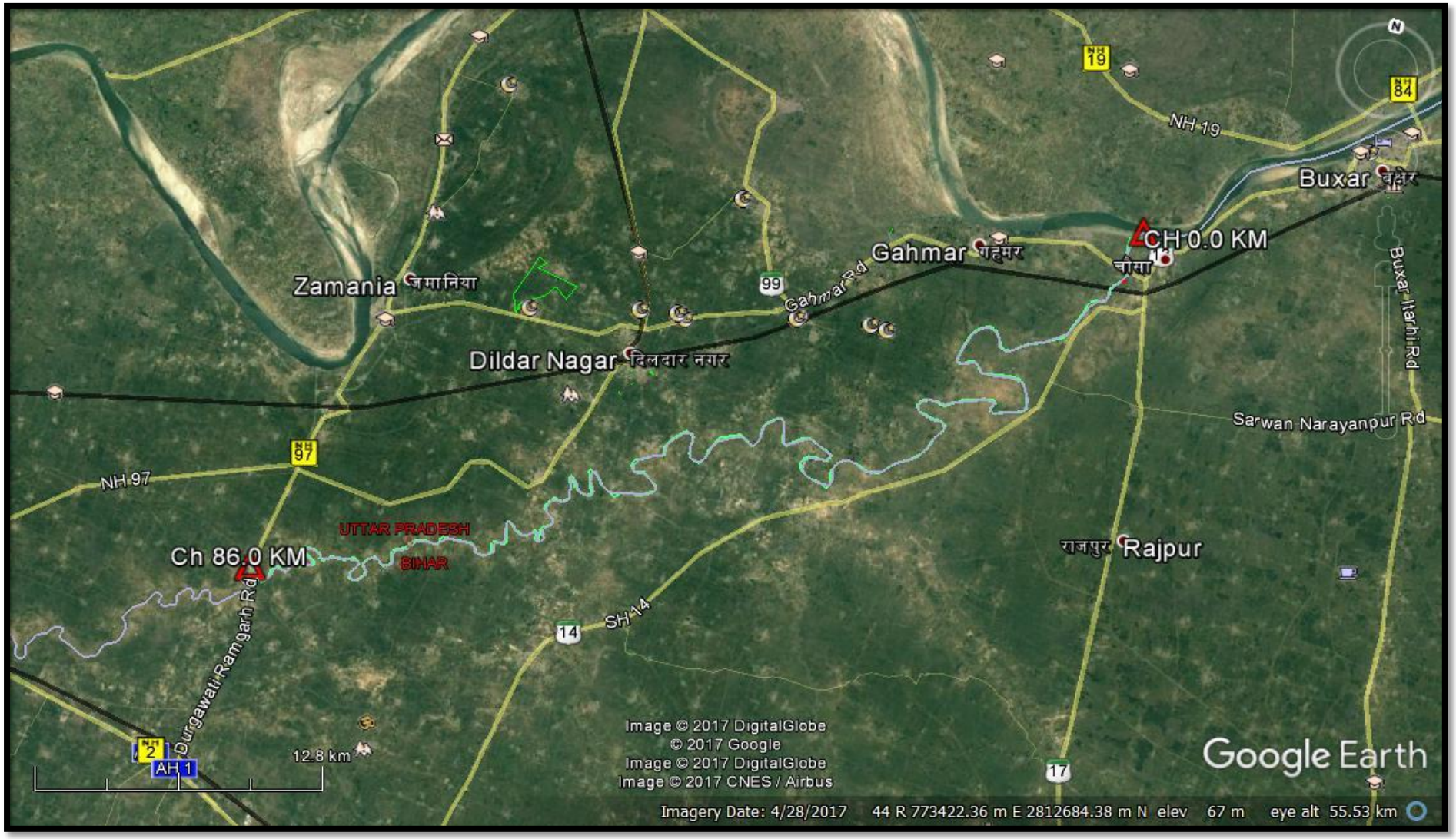
1.2 **Tributaries**. Its tributaries are Durgavati, Chandraprabha, Karunuti, Nadi and Khajuri.

1.3 **States & Districts**. It originates in Kaimur district of Bihar and flows through the states of Uttar Pradesh and Bihar. Along the boundary between Uttar Pradesh and Bihar it has the districts of Sonbhadra, Chandauli, Varanasi and Ghazipur on its left (UP side), and the districts of Kaimur and Buxar on its right (Bihar side). The course of waterway understudy of Karamnasa River is 86.0 km length of the river from Ganga confluence to upstream

1.4 (a) **Full Course of Waterway**.



1.4 (b) **Course of Waterway under study**.



State: Bihar and Uttar Pradesh (Entire stretch of 86 Km is common in both the States)

1.5 **Scope of Works**. Strabag India Pvt Ltd. conducted hydrographic and topographic survey of Karamnasa River from Ganga confluence at Kutubpur (Lat 25°31'6.21"N, Long 83°52'47.32"E) to Kakarait Bridge (Lat 25°18'11.21"N, Long 83°31'38.43"E) from 03 Jan 2016 to 17 Jan 16. The scope of the work for the conduct of survey of Karamnasa River includes:-

- Undertake bathymetric and topographic survey of National waterway.
- Establishing horizontal and vertical control stations
- Construction of benchmark pillars and establishing its reduced level w.r.to Mean Sea Level
- Setting up and deployment of water level gauges
- Current velocity and discharge measurements
- Collection and analysis of water and bottom samples.
- A collection of topographic features including existing cross structures.
- Analysis of survey data, including assessment of water availability for navigation.
- Preparation of survey charts and feasibility report

SECTION – 2: METHODOLOGY ADOPTED TO UNDERTAKE STUDY

2.1 **Methodology**. The detailed hydrographic and topographic survey of Karamnasa river (86 km) from Ganga confluence at Kutubpur (Ch. 0 km) to Bridge Kakarait (Ch. 86 km), was undertaken from 03rd Jan 2016 to 17th Jan 2016. Details of Horizontal & Vertical Control adopted for the survey of Karamnasa River being placed at Annexure 7 to this report. The survey was undertaken with cross-section corridor of 100m and line spacing of 100m. The plotting of chart was done on UTM projection at zone 44N as per specification. Details of survey chart scheming and sample fair sheet is placed at Annexure 15 to this report

2.1(a) **Equipment Used**. Various equipment's were used during the survey operations which is tabulated below as well as elaborately described at Annexure 8.

HYDROGRAPHIC SURVEY EQUIPMENTS

Equipment	Make	Qty. Deployed
Echo sounder	500 DF dual Frequency	2
DGPS	Trimble SPS 356/461	2
Current Meter	Vertical Axis-Cup Type	1
Grab Sampler	Vanveen grab	1
Software	HYPACK data acquisition	1
Tide Pole	Manual	06

TOPOGRAPHIC SURVEY EQUIPMENTS

Equipment	Make	Qty. Deployed
GPS Sets	Trimble Spectra	5
Auto Level	Leica	2
Total Station	Topcon	1
Total Station	Leica	1
Software	HYPACK data acquisition	1
Software	Autocad	1
Software	Trimble Spectra Survey office v.8	1

2.1(b) **Topographic Survey.** The Topographic survey was carried out between 03rd Jan2016 to 17thJan 2016. The weather was sunny and hot throughout the survey period. The survey was undertaken as per the approved line provided by IWAI. The spot level points in the crossline were spaced at 10 m interval. The plotting of the chart was done on UTM Projection at Zone 44N. The spot levels along the river banks and dry river beds were obtained by using Trimble DGPS in RTK mode. The topographic survey for the entire survey stretch was conducted to collect the following data:-

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

Topographic Spot Levelling by Trimble DGPS

The details of all spot levels are provided in the respective sheets being presented along with this report. The details of bank protection and features across the river are Placed at Annexure 5 & 6 respectively. Additionally, a soft copy of the same in XYZ format is being handed over as deliverable data.

2.1(c) **Bathymetric Survey.** Bathy 500 DF Echo Sounder was used to obtain soundings onboard the survey boat. The working frequency of 210 and 33 kHz was used for sounding operations. Trimble SP 461/ 356 DGPS was used for positioning. The digital output from the echo sounder and DGPS were automatically fed to the HYPACK data logging software on a real-time basis for the acquisition of survey data. No breakdown of equipment was reported and the performance of the equipment was found to be satisfactory during the entire duration of the survey. The cross lines were run perpendicular to the orientation of river flow (i.e. perpendicular to the orientation of depth contours) in respective stretches. The spot sounding/Topographic Spot leveling was also carried out in the area where the survey boat cannot be operated due to the low depth.

Bathymetric Survey operation

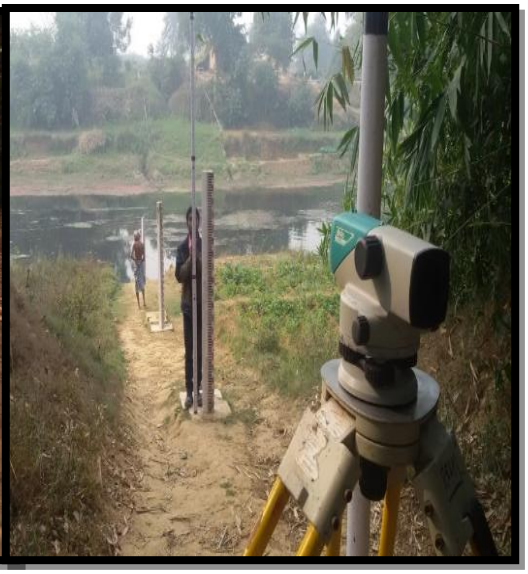
2.1(d) **Calibration.** The equipment used for the survey was calibrated by the equipment supplier. The equipment calibration certificates are placed at Annexure - 13 to this report.

2.2 **Description of Bench Mark.** Trimble Spectra Precision DGPS system was used in standalone static observation mode for 24 hrs. For establishing Geodetic Control in the survey area. Extension of the geodetic control was achieved by setting up BM pillars throughout the river stretches at every 10km chainage. Co-ordinates of such pillars were established by simultaneous Static observations between established and new stations. The data was processed using Spectra Precision Survey Office software. Details of these BM pillars along with stationed recovery descriptions being mentioned at Annexure 9.

2.2.1 **CWC BM Chakiya Arhaura, Narhan**. CWC Benchmark was recovered at Chakiya Arhaura, Narhan, U.P. Simultaneous GPS observation was carried out between TBM at Chakiya Arhaura and Control Station. Levelling were carried out for

establishing vertical control from CWC BM to TBM near the CWC gauge. RL value of the CWC bench mark at Narhan is 74.980 m.

CWC BM at Chakiya Ahraura



Levelling Between BM & TBM

Static Observation at Ch. 71.20 km &Static observation at Bhadora Base

2.3 **Tidal Influence Zone and Tidal variation**. Total 86 km length of river stretch was completely non-tidal. However, tidal observations were undertaken as per tender document for the entire duration of the survey. Tidal data being forwarded as 'Annexure 3' along with this report.

2.4 **Methodology to Fix Sounding Datum**. The datum is fixed as per the gradient of the River and the average water level observed during survey. Shallow and dry stretches of waterway, lowest MSL value at every km is to be taken for fixing the sounding datum. There are no CWC gauge present in the survey stretch. However, the datum value at Ganga confluence and CWC gauge at Narhan has been taken and intermediate datum has been interpolated. The Details of established datum value for stretches are tabulated below:-

Stretch (km)		**Established SD wrt MSL (m)**
From	**To**	
0.00	4.90	49.10
4.90	15.50	49.50
15.50	26.20	49.90
26.20	35.70	50.20
35.70	47.40	51.40
47.40	57.30	52.90
57.30	66.20	54.00
66.10	75.00	56.30
75.00	82.20	57.40
82.20	86.00	59.00

2.5 **Maximum and Minimum Water Level**. No CWC gauge in the survey stretch.

2.6 **Salient Features of Dam, Barrages, Weirs, Anicut, Locks and Aqueducts, etc**. There is no dam, barrage, weir, anicut, lock and aqueduct exists in the whole river stretch.

2.7 **Description of Erected Bench Mark Pillars**. New Bench Mark Pillar (10 Nos) were constructed as per the Specification of Tender Documents. The Extension of Horizontal and Vertical Control was carried out by base line processing method with the nearest reference station. Details of erected BM pillars is Place at Annexure 9.The final accepted co-ordinate and Reference Level value of Karamnasa BM Pillar are as below:-

BM No.	Location	Chainage (km)	Latitude (N)	Longitude (E)	Easting (m)	Northing (m)	BM Ht above MSL (m)	BM Ht above SD (m)
KR P1	Kutubpur	1.095	25°30'39.82"N	83°52'24.96"E	788840.943	2824660.064	56.776	7.676
KR P2	Sonpa	8.640	25°27'40.43"N	83°50'24.05"E	785580.512	2819065.742	54.652	5.152
KR P3	Dehri	22.402	25°25'49.43"N	83°48'47.64"E	782958.965	2815591.134	57.606	7.706
KR P4	Dewal	30.063	25°23'50.91"N	83°47'2.82"E	780104.918	2811881.013	61.735	11.535
KR P5	Dhanari	41.422	25°24'4.05"N	83°44'3.43"E	775080.367	2812182.132	61.176	9.776
KR P6	Chitrakoni	53.344	25°22'1.30"N	83°41'1.02"E	770056.358	2808300.056	62.04	9.140
KR P7	Baraura	61.243	25°21'3.26"N	83°38'59.75"E	766700.504	2806446.328	61.838	7.838
KR P8	Deorhi	71.021	25°19'42.00"N	83°35'56.21"E	761615.034	2803844.577	64.679	8.379
KR P9	Masaudha	79.027	25°18'44.70"N	83°33'21.36"E	757317.151	2801997.222	63.638	6.238
KR 10	Kakarait	85.332	25°18'8.64"N	83°31'39.38"E	754485.057	2800833.248	65.356	6.356

2.8 **Description of Erected Tide Gauges**. Tide gauges were erected throughout the river stretch. Water level reading as per prescribed format along with chainage is mentioned at **Annexure 3**. The Detail of erected tide pole which are used for reduction of Sounding is as follows.

Tide Gauge No	Location	Chainage (km)	Easting/ Northing (m)	Zero of Tide Gauge W.r.t MSL (m)	Period of Observation
TP1	Chausa	1.095	788926.559E 2824742.280N	48.478	During the Conduct of Bathy Survey
TP2	Sonpa	8.64	785563.770E 2819087.760N	49.143	During the Conduct of Bathy Survey
TP3	Bhilampur	22.402	782960.0900E 2815634.910N	49.462	During the Conduct of Bathy Survey
TP4	Deval	30.063	780101.2686E 2811832.950N	49.602	During the Conduct of Bathy Survey
TP5	Dhanari village	41.422	775121.216E 2812224.190N	51.555	During the Conduct of Bathy Survey
TP6	Chitrakoni village	53.344	769937.550E 2808228.920N	52.83	During the Conduct of Bathy Survey
TP7	Gharohiyan village	61.243	766701.869E 2806479.634N	53.865	During the Conduct of Bathy Survey
TP8	Deorhi village	71.021	761623.444E 2803901.832N	55.86	During the Conduct of Bathy Survey
TP9	Garhwa Village	79.027	757347.285E 2801980.685N	57.28	During the Conduct of Bathy Survey
TP10	Kakarait village	85.332	754527.521E 2800868.672N	58.63	During the Conduct of Bathy Survey

Tidal Observation at Ch.8.64 km

2.9 **Transfer of Sounding Datum**. Sounding Datum reduction table being mentioned below on the erected tide gauges as well as CWC Gauges:-

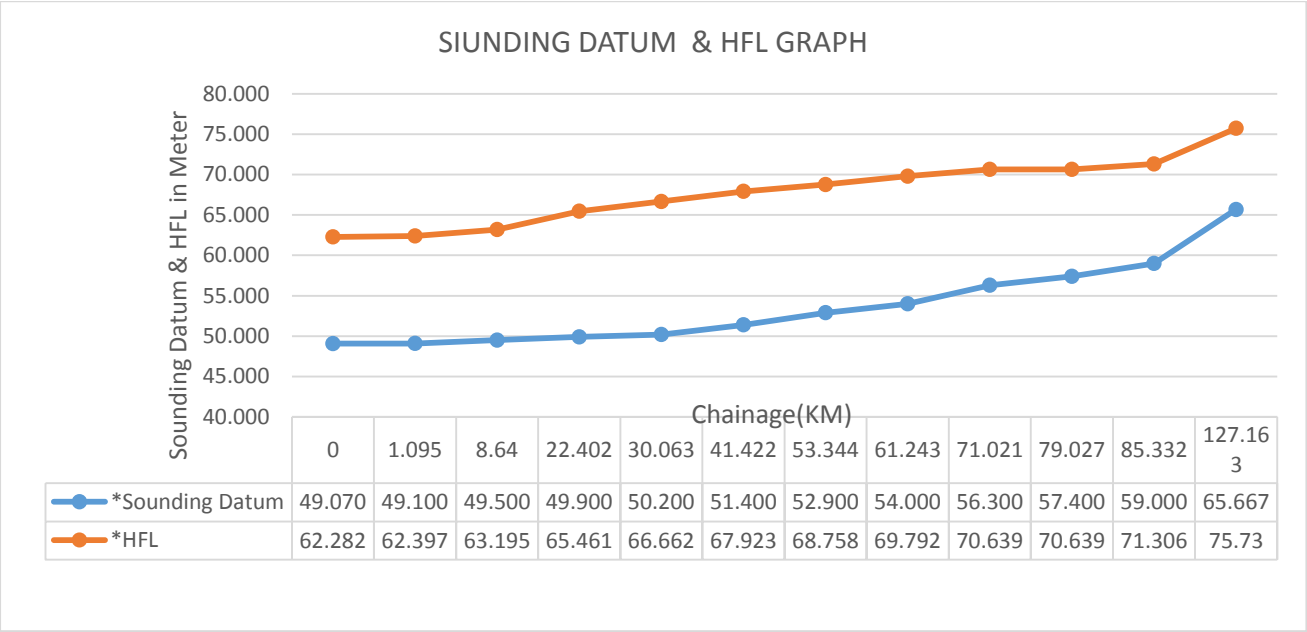
CHART DATUM / SOUNDING DATUM AND REDUCTION TABLE

Sl#	Location of CWC gauge / Dam / Barrage / Weir / Anicut / Bench Mark / tide gauges	Chainage (km)	Stretch for corrected soundings and topo levels (km)	Established Sounding Datum w.r.t. MSL (m) at col. A.	Sounding Datum of Tide Gauge wrt MSL (m)	Correction in WL data for Bathymetric survey (m)	Topo level data converted as depth for volume calculation wrt SD (m)	HFL (m)
	A	B	C	D +ve indicates above MSL -ve indicates below MSL	E	F = (E- WL data in MSL)	G = (E- topo levels in MSL)	
1	NARHAN CWC	127.163		65.667		**Details at Annexure-3.**	**A separate xyz file is created and soft copy submit with report**	75.73
2	KR_P10	85.332	82.2-86.0		**59.000**			71.306
3	KR_P9	79.027	75.0-82.2		**57.400**			70.639
4	KR_P8	71.021	66.1-75.0		**56.300**			69.792
5	KR_P7	61.243	57.3-66.1		**54.000**			68.758
6	KR_P6	53.344	47.4-57.3		**52.900**			67.923
7	KR_P5	41.422	35.7-47.4		**51.400**			66.662
8	KR_P4	30.063	26.2-35.7		**50.200**			65.461
9	KR_P3	22.402	15.5-26.2		**49.900**			64.651
10	KR_P2	8.64	4.9-15.5		**49.500**			63.195
11	KR_P1	1.095	0.0-4.9		**49.100**			62.397
12	Ganga Confl. (1140)	0			**49.070**			62.282

2.10 **HFL at Gauge Stations and Cross-Structures**. HFL wrt MSL at CWC Gauge locations was provided by the IWAI department and the same being utilized in interpolation method for deriving the HFL at cross-structures

Sl	Location and Description of CWC Gauge/ Dam/etc.	Cross-Structure Details	Chainage (km)	Established HFL wrt MSL (m)	Computed HFL at Cross – Structure wrt MSL (m)
	A	B	C	D	E
1	Ganga Confl. (1140)		0.00	62.282	
2	Chausa Bridge	Chausa	2.35		62.530
3	Chausa Rail Bridge	Chausa	3.48		62.650
4	Deval Bridge	Deval	29.94		65.448
5	Taj Pur Bridge UC	Taj Pur	48.33		67.393
6	Baraura Bridge	Baraura	61.77		68.814
7	Devari Bridge	Devari	71.2		69.811
8	Kakarait Bridge	Kakarait	85.98		71.374
9	Narhan CWC Gauge	-	127.163	75.730	

2.11**Graph: Sounding Datum and HFL vs Chainage**.



Chainage(KM)	0	1.095	8.64	22.402	30.063	41.422	53.344	61.243	71.021	79.027	85.332	127.163
*Sounding Datum	49.070	49.100	49.500	49.900	50.200	51.400	52.900	54.000	56.300	57.400	59.000	65.667
*HFL	62.282	62.397	63.195	65.461	66.662	67.923	68.758	69.792	70.639	70.639	71.306	75.73

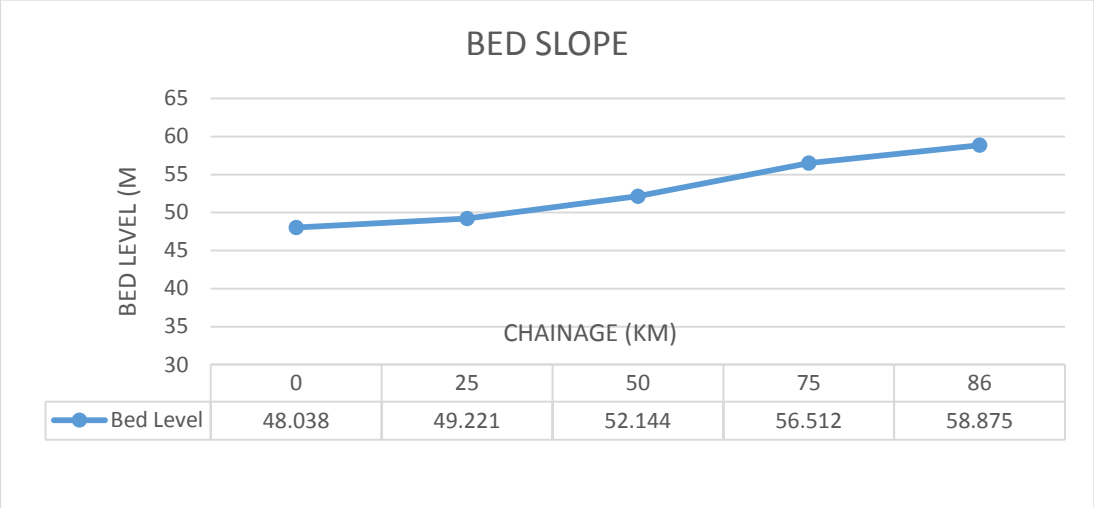
HFL AND SOUNDING DATUM TABLE

GAUGE NAME	CHAINAGE (KM)	SOUNDING DATUM(M)	HFL(M)
Ganga Confl. (1140)	0.0	49.070	62.282
TP_KR 1	1.095	49.100	62.397
TP_KR 2	8.64	49.500	63.195
TP_KR 3	22.402	49.900	65.461
TP_KR 4	30.063	50.200	66.662
TP_KR 5	41.422	51.400	67.923
TP_KR 6	53.344	52.900	68.758
TP_KR 7	61.243	54.000	69.792
TP_KR 8	71.021	56.300	70.639
TP_KR 9	79.027	57.400	70.639
TP_KR 10	85.332	59.000	71.306
NARHAN CWC	127.163	65.667	75.73

2.12**Average Bed Slope**. Average bed slope of the whole river stretch being tabulated below:-

Chainage		River Bed Level (m)		River Bed Level Change (m)	Distance (km)	Slope
From (km)	To (km)					
Ch. 0.0 km	Ch. 25.00 km	48.038	49.221	1.183	25	1:21133
Ch. 25.00 km	Ch. 50.00 km	49.221	52.144	2.923	25	1:8553
Ch. 50.00 km	Ch. 75.00 km	52.144	56.512	4.368	25	1:5723
Ch. 75.00 km	Ch. 86.0 km	56.512	58.875	2.363	11	1:4655

BED SLOPE VS CHAINAGE GRAPH



2.13 **Details of Dam, Barrages, Weirs, Anicuts, etc**. There is no existence of dam, barrage, weir or Anicuts in the whole river stretch.

2.14 **Details of Locks**. There is no lock observed in the surveyed river portion.

2.15 **Details of Aqueducts**. There is no aqueduct in this portion of the river.

2.16 **Details of Existing Bridges & Crossings**. There are total seven in no's bridges are present across the river. Details is tabulated below:-

S No	Structure Name	Chainage (km)	Location	Position (Lat Long)		Position (UTM)		Length (m)	Width (m)	No of Piers	Horizontal clearance (Distance Between piers) (m)	Vertical clearance wrt HFL (m)	Remarks
				Left Bank	Right Bank	Left Bank	Right Bank						
1	Chausa Bridge	2.35	Chausa	25°29'59.76"N 83°52'43.48"E	25°30'1.27"N 83°52'36.22"E	789384.067E 2823438.709N	789180.444E 2823480.433N	207.8	7.6	07	33.13	3.5	Completed
2	Chausa Rail Bridge	3.48	Chausa	25°29'31.76"N 83°52'20.27"E	25°29'31.45"N 83°52'11.02"E	788754.671E 2822562.394N	788496.852E 2822547.178N	258.7	10.4	17	12.67	2.8	Completed
3	Deval Bridge	29.94	Deval	25°23'45.66"N 83°47'7.35"E	25°23'51.53"N 83°47'7.77"E	780234.191E 2811722.451N	780242.187E 2811903.412N	181	7.2	6	35.2	3.3	Completed
4	Taj Pur Bridge UC	48.33	Tajpur	25°23'17.28"N 83°41'402.51"E	25°23'18.32"N 83°41'38.81"E	771169.482E 2810662.899N	771065.766E 2810692.166N	-	-	-	-	-	Under Construction
5	Baraura Bridge	61.77	Baraura	25°20'54.95"N 83°39'14.30"E	25°20'54.89"N 83°39'10.44"E	767112.236E 2806198.990N	767004.189E 2806194.044N	108.1	7.5	5	25.82	2.4	Completed
6	Devari Bridge	71.2	Devari	25°19'40.67"N 83°35'57.79"E	25°19'45.47"N 83°35'56.75"E	761660.060E 2803804.756N	761628.539E 2803951.097N	157.44	7.1	7	25.04	2.1	Under Construction
7	Kakarait Bridge	85.98	Kakarait	25°18'7.09"N 83°31'37.14"E	25°18'13.75"N 83°31'39.03"E	754423.709E 2800784.475N	754472.943E 2800990.897N	212.2	7.6	9	25.52	2	Completed

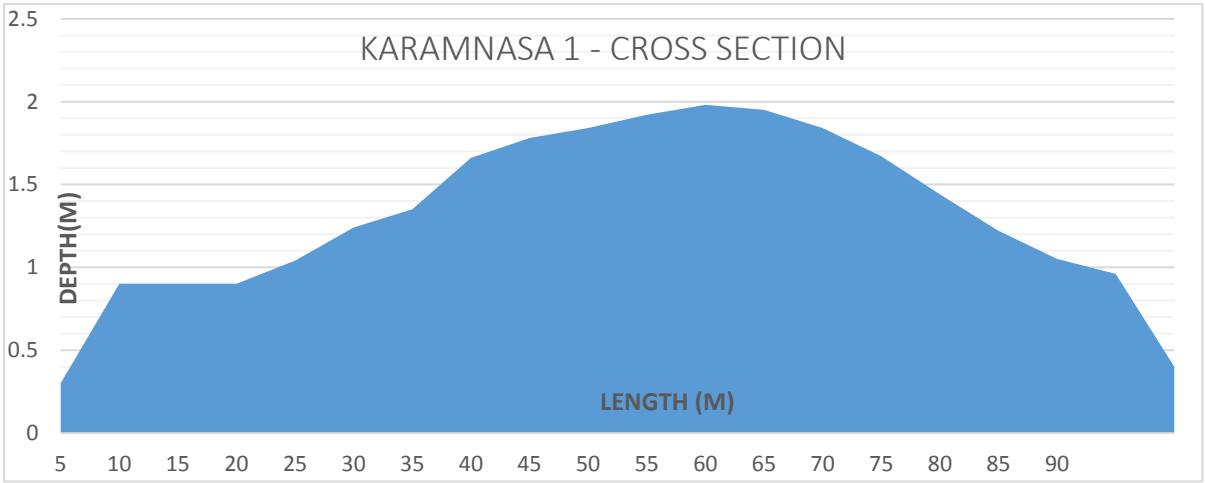
2.17 **Details of Other Cross Structures**. There is no other cross structure, pipe-line and underwater cable present in this river stretch.

2.18 **High Tension Lines / Electric Lines / Tele-Communication Lines**. There is no high tension line, electric line or tele-communication cable exists in the river corridor.

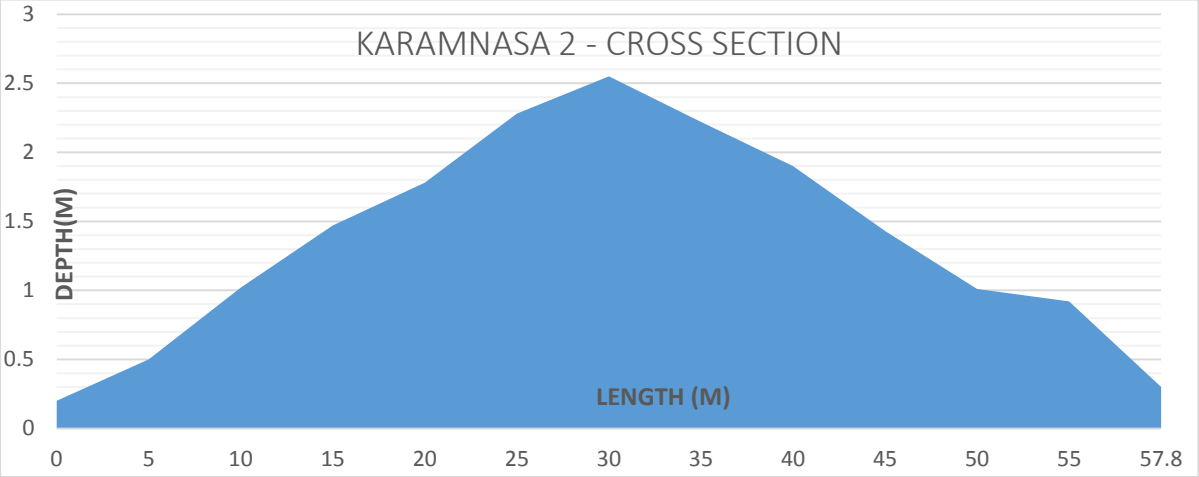
2.19 **Current Meter and Discharge Details**. Current meter observations and discharge calculations were undertaken at every 10 km interval approximately. Details of the same is tabulated below:-

S. No	Chainage (KM)	Position				Observed Depth(m)	Velocity m/sec	X-Sectional Area (sq. m)	Discharge m3/Sec
		Easting (m)	Northing (m)	Latitude	Longitude				
1	0.2	7894468.19	2825384.57	25°31'2.88"N	83°52'47.99"E	2.1	0.54	126.89	68.521
2	10.1	784454.99	2819008.57	25°27'39.35"N	83°49'43.73"E	1.7	0.5	85.308	42.654
3	20.05	784980.46	2816152.31	25°26'6.26"N	83°50'0.37"E	4.6	0.55	298.934	164.414
4	30.07	780057.60	2811821.86	25°23'48.99"N	83°47'1.09"E	1.1	0.5	61.348	30.674
5	40.02	775755.10	2813235.25	25°24'37.80"N	83°44'28.34"E	2.4	0	31.48	0
6	49	771049.77	2810293.48	25°23'5.37"N	83°41'37.95"E	1.2	0	34.963	0
7	60.6	766735.40	2807050.8	25°21'22.86"N	83°39'1.43"E	1.1	0	0	0
8	70	761917.39	2803889.71	25°19'43.27"N	83°36'7.03"E	0.8	0	0	0

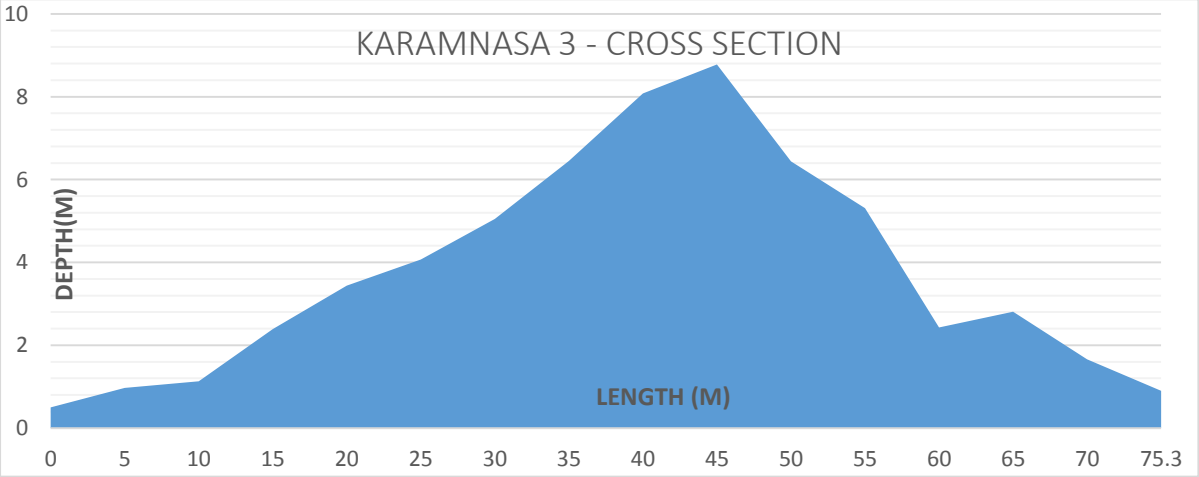
KARAMNASA 1- CROSS SECTION



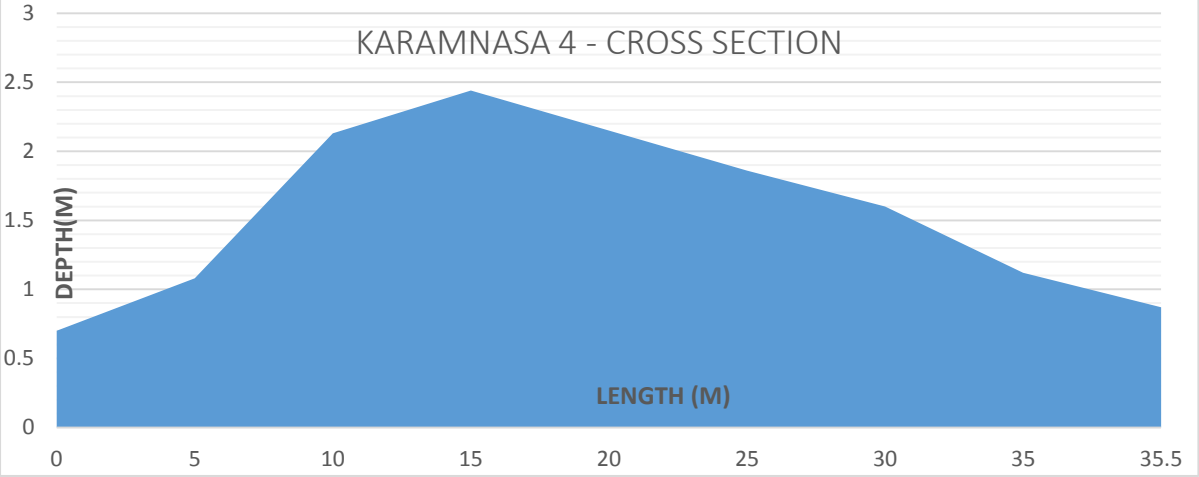
KARAMNASA 2- CROSS SECTION



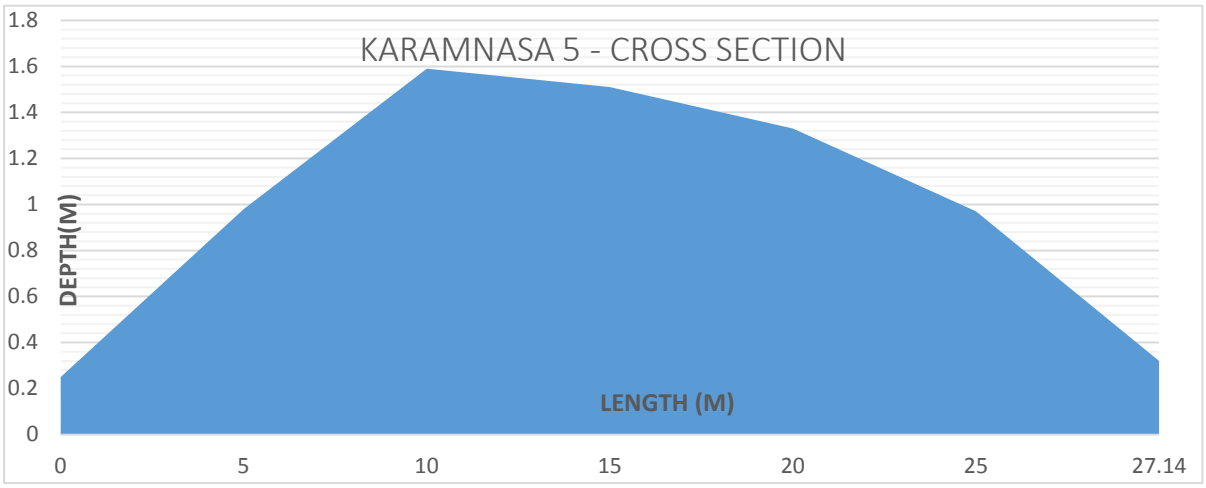
KARAMNASA 3- CROSS SECTION



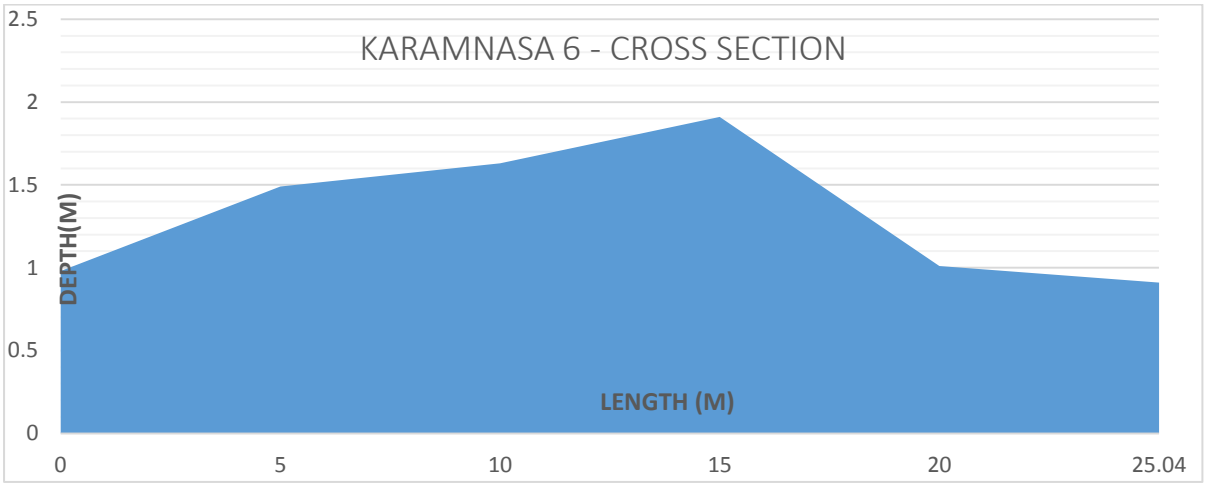
KARAMNASA 4- CROSS SECTION



KARAMNASA 5- CROSS SECTION



KARAMNASA 6- CROSS SECTION



2.20(a)**Soil Sample Locations**. Details of soil sample location being appended below:-

S.No	Chainage (KM)	Latitude	Longitude	Easting (m)	Northing (m)	Depth (m)
1	0.1	25°31'2.88"N	83°52'47.99"E	789468.187	2825384.553	3.9
2	9.98	25°27'39.35"N	83°49'43.73"E	784454.987	2819008.570	1.2
3	19.95	25°26'6.26"N	83°50'0.37"E	784980.460	2816152.310	4.6
4	30.10	25°23'48.99"N	83°47'1.09"E	780057.600	2811821.876	1.1

S.No	Chainage (KM)	Latitude	Longitude	Easting (m)	Northing (m)	Depth (m)
5	40.05	25°24'37.80"N	83°44'28.34"E	775755.100	2813235.492	1.2
6	49.00	25°23'5.37"N	83°41'37.92"E	771048.951	2810293.479	0.8
7	60.60	25°21'22.86"N	83°39'1.43"E	766735.056	2807050.816	1.4
8	69.900	25°19'43.27"N	83°36'7.03"E	761917.408	2803889.726	0.8
9	80.40	25°18'55.88"N	83°32'52.96"E	756516.034	2802326.741	0.2
10	85.90	25°18'9.62"N	83°31'41.01"E	754530.963	2800864.163	0.2

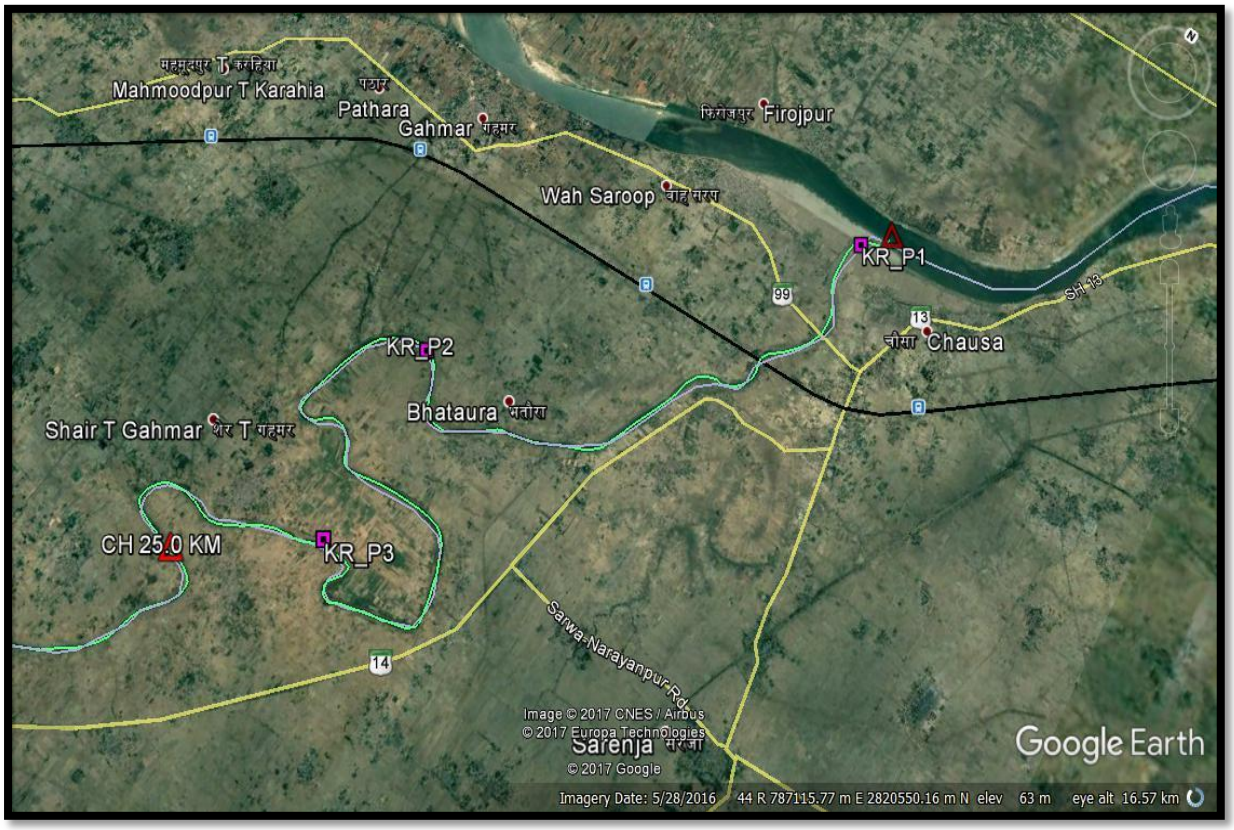
2.20(b) **Water Samples**. Water sample locations are tabulated below:-

S.No	Chainage (KM)	Easting (m)	Northing (m)	Latitude	Longitude	Total Depth (d) (m)	Mid-Depth (0.5d) (m)
1	0.1	789468.187	2825384.553	25°31'2.88"N	83°52'47.99"E	3.9	1.95
2	9.98	784454.987	2819008.570	25°27'39.35"N	83°49'43.73"E	1.2	0.6
3	19.95	784980.460	2816152.310	25°26'6.26"N	83°50'0.37"E	4.6	2.3
4	30.10	780057.600	2811821.876	25°23'48.99"N	83°47'1.09"E	1.1	0.55
5	40.05	775755.100	2813235.492	25°24'37.80"N	83°44'28.34"E	1.2	0.6
6	49.00	771048.951	2810293.479	25°23'5.37"N	83°41'37.92"E	0.8	0.4
7	60.60	766735.056	2807050.816	25°21'22.86"N	83°39'1.43"E	1.4	0.7
8	69.900	761917.408	2803889.726	25°19'43.27"N	83°36'7.03"E	0.8	0.4
9	80.40	756516.034	2802326.741	25°18'55.88"N	83°32'52.96"E	0.2	0.1
10	85.90	754530.963	2800864.163	25°18'9.62"N	83°31'41.01"E	0.2	0.1

SECTION-3

3.**Description of Waterway**.

3.1 **Sub-Stretch 1: From Ch 0 km to Ch 25 km**. This stretch of the surveyed river is having length of 25 km and average width of 100m. Bench Mark pillars 1, 2 & 3 are located in this section at Ch. 1.095 km, Ch. 8.64 km and Ch.22.40 respectively. Details of BM pillars along with station recovery descriptions is placed at annexure 9. Soil and water samples were collected at Ch. 0.2 km, Ch. 9.98 & Ch.19.95 km. Report from authorized laboratory for the same being attached with Annexure 11 & 12. Current meter observation and discharge measurement were carried out at Ch. 0.1 km, Ch. 10.1 & Ch.20.05 km. In this river stretch, there is neither any forest zone nor restricted zone. Farmers were seen engaging in agricultural activities. Primary crops are mustard, wheat, beans, peas, tomato, cabbage, carrot, radish, etc.



From Ch 0 km to 25 km

Dredging quantity for substretch-1

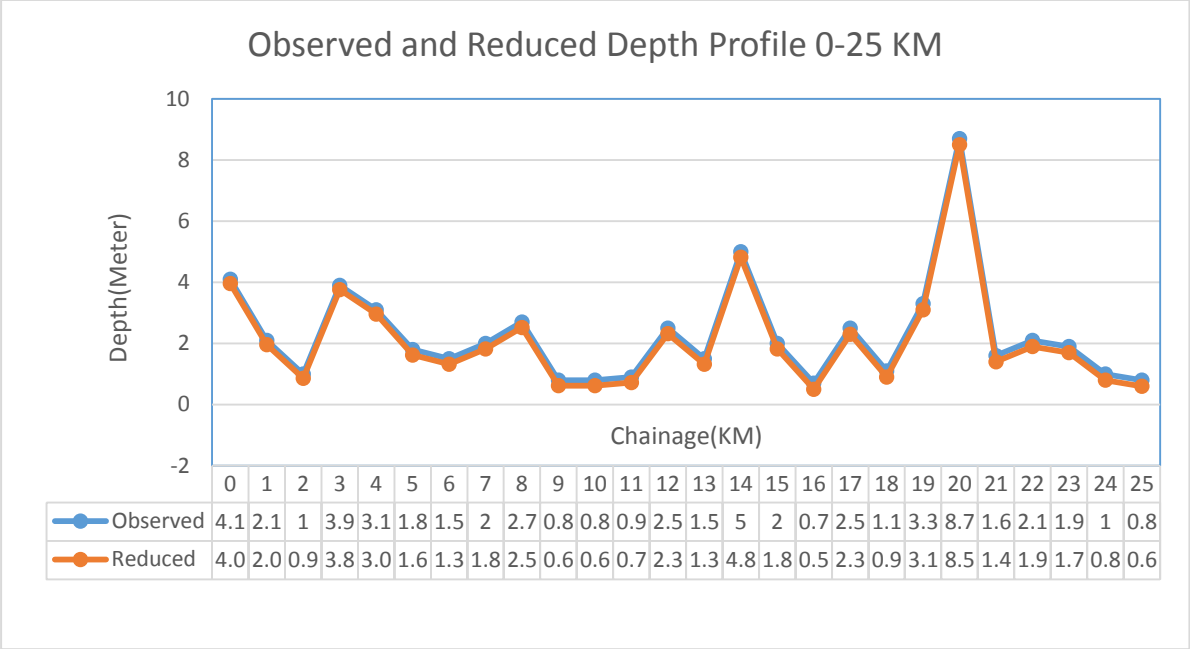
	Chainage (km)		Observed				Reduced wrt Sounding Datum			
Type	**From**	**To**	**Min Depth (m)**	**Max Depth (m)**	**Length of Shoal (m)**	**Dredging Qty (cu.m)**	**Min Depth (m)**	**Max Depth (m)**	**Length of Shoal (m)**	**Dredging Qty (cu.m)**
Class-I	0	25	0	6.7	6,500	1,92,634.20	-0.2	6.5	8,600	3,09,068.50
Class-II	0	25	0	6.7	8,600	4,23,336.00	-0.2	6.5	11,900	6,01,670.60
Class-III	0	25	0	6.7	14,000	8,99,199.90	-0.2	6.5	15,600	11,64,013.73
Class-IV	0	25	0	6.7	16,000	12,88,173.00	-0.2	6.5	17,400	15,87,216.39

(a) **Bathymetry Survey & Topographic Survey**.

SUB-STRETCH-1 (0-25 KM)		
Type of Survey	**Chainage (km)**	**Remarks**
Bathymetry Survey	0.0 km to 9.13 km	covered by bathymetric survey
	9.48 km to 25.00 km	covered by bathymetric survey
Topographic Survey	9.13 km to 9.48 km	Being Dry/Very Shallow covered by topographic method
	0.0 km to 25.00 km	Riverbank, prominent features along the bank.

Ganga Confluence at Ch 0 km

(c) **Observed & Reduced Depth Profile of the Stretch**. Both observed and reduced Depth profile being attached to the annexure along with this report.



Chainage (km)		River Bed Level (m)		River Bed Level Change (m)	Slope
From	To	From	To		
0.0	25.00	48.038	49.221	1.183	1:21133

(d) **Prominent Dam/ Barrage**. There is neither any dam nor any barrage exists in this stretch.

(d) **Tidal Stretch**. This 25 km of river stretch is completely non-tidal.

(e) **Bank**. This portion of the river is having un-protected bank.

(f) **Hindrances**. Strong fishing nets across the river, shallow depth and under water plankton are hindrances for navigation.

Under Water Plankton at Ch 4.7 km &Fishing Net at Ch 8.30 km

(g) **Encroachment**. No encroachment was observed in this stretch.

(h) **Protected Area**. There is no wildlife, Defence, Atomic power plant and any other protected area present in this river stretch.

(i) **NH/ SH**. State Highway 13, 14 and 17 of the state of Bihar exist within 5km range from the river. SH 99 runs across the river i.e Chausa Bridge at Ch 2.35 km.

(j) **Railway Station**. Chausa Railway Bridge runs across the river at Ch 3.48 km. Chausa and Barakalan railway station exist at 2 km towards eastern side and 1.5 km western side respectively from the river.

(k) **Land Use Pattern**. Land on either banks of the river being utilised for either agricultural or residential purpose.

l) **Crops**. Both the banks of Karamnasa River are very fertile. Primary crops are mustard and wheat but seasonal vegetable crops are also cultivated viz. peas, cauliflower, potato, tomato, cabbage, carrot, radish, etc. (winter crops).

Crops at Ch. 0.5 km &Ch. 7.2 km

Shallow Depth at Ch. 16 km

(m) **Bulk Construction Material**. There is neither any factory for construction material nor any raw material available along the river stretch.

(n) **Existing Industry**. There is no major or minor industry exists in this stretch.

(o) **Existing Ghats, Jetties and Terminals**. There is no ghat, jetty and terminal was observed in this portion.

(p) **Cargo Movement**. There is no cargo movement observed in this portion of the water way during the course of survey.

(p) **Prominent City/ town or Place of Worship**. Prominent towns are Chausa, Kutubpur and Bara.

(q) **Ferry**. There is no ferry service available in this river stretch.

(r) **Water Sports Recreational Facilities**. There is no facility for water sports in this section. However, at Ganga confluence it can be developed due to water availability throughout the year.

(s) **Fishing Activity**. Small wooden boats were seen engaging in fishing activity in this river portion.

Fishing Activity at Ch. 3.6 km &Ch. 6 km

(t) **Sand Mining**. No sand mining activity was found in this stretch.

(u) **Tributaries**. There is no tributary of Karamnasa River present in this portion.

(v) **Details of Irrigational Canals**. There is no irrigational canal present in this section.

(w) **Details of Nalas**. There is no drain/ nala observed polluting the river in this portion.

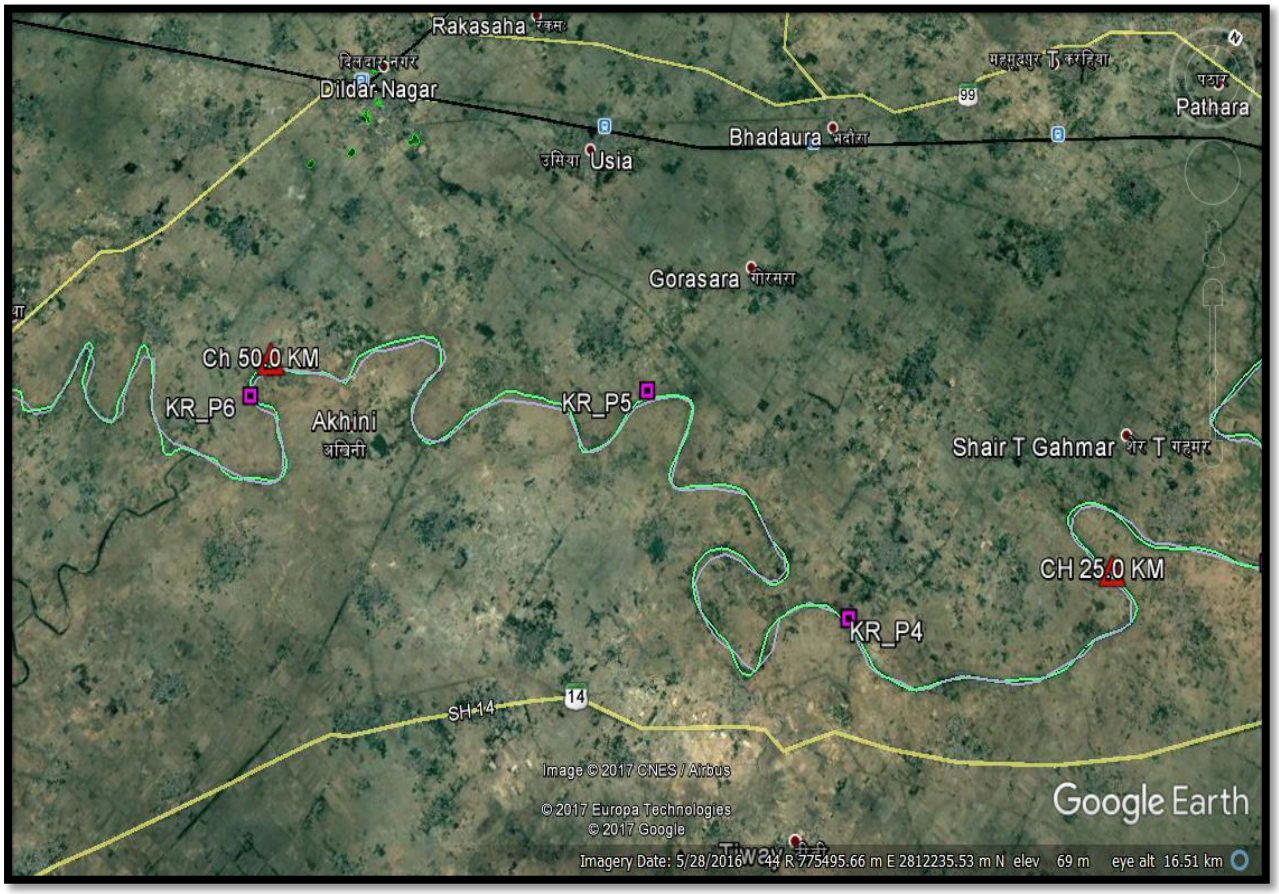
(x) **Usage of Water**. Water in this portion primarily irrigation purpose.

(y) **Details of Cross-Structures**. There are two bridges in this portion viz. Chausa Bridge at Ch. 2.35 km and Chausa Rail Bridge at Ch. 3.48 km. Details are enumerated below:-

S No	Structure Name	Chainage (km)	Location	Position (Lat Long)		Position (UTM)		Length (m)	Width (m)	No of Piers	Horizontal clearance (Distance Between piers) (m)	Vertical clearance wrt HFL (m)	Remarks
				Left Bank	Right Bank	Left Bank	Right Bank						
1	Chausa Bridge	2.35	Chausa	25°29'59.76"N 83°52'43.48"E	25°30'1.27"N 83°52'36.22"E	789384.067E 2823438.709N	789180.444E 2823480.433N	207.8	7.6	07	33.13	3.5	Completed
2	Chausa Rail Bridge	3.48	Chausa	25°29'31.76"N 83°52'20.27"E	25°29'31.45"N 83°52'11.02"E	788754.671E 2822562.394N	788496.852E 2822547.178N	258.7	10.4	17	12.67	2.8	Completed

Chausa Bridge at Ch 2.35 km &Chausa Rail Bridge at Ch 3.48 km

3.2 **Sub-Stretch 2: From Ch 25 km to Ch 50 km**. This stretch of the surveyed river is having length of 25 km and average width of 110m. Bench Mark pillars no's 2 is located in this section at Ch. 30.36 km and Ch.41.42 km Details of BM pillars along with station recovery descriptions is placed at Annexure 9. Soil and water samples were collected at Ch. 30.1 km, Ch.40.05 & Ch. 49.0 Km. Report from authorized laboratory for the same being attached with Annexure 11 & 12. Current meter observation and discharge measurement were carried out at Ch.30.07 km. Ch.40.02 km and Ch.49.0 kmin this river stretch, there is neither any forest zone nor restricted zone. Farmers were seen engaging in agricultural activities. Primary crops are mustard, wheat, beans, peas, tomato, cabbage, carrot, radish, etc.



From Ch 25 km to 50 km

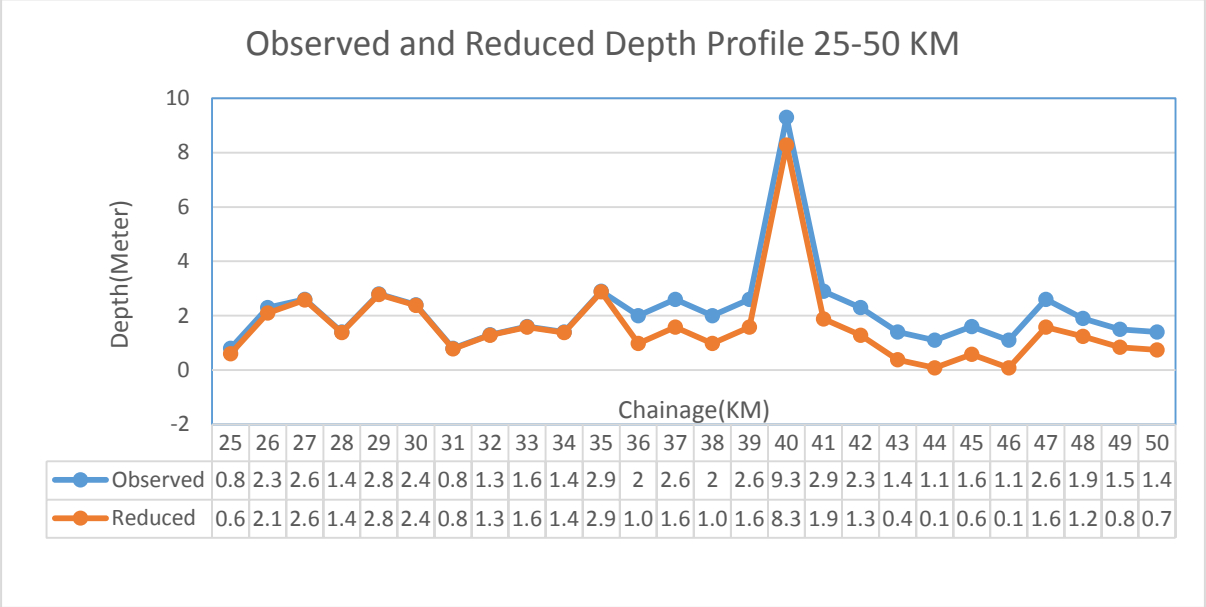
Dredging quantity for substretch-2

	Chainage (km)		Observed				Reduced wrt Sounding Datum			
Type	**From**	**To**	**Min Depth (m)**	**Max Depth (m)**	**Length of Shoal (m)**	**Dredging Qty (cu.m)**	**Min Depth (m)**	**Max Depth (m)**	**Length of Shoal (m)**	**Dredging Qty (cu.m)**
Class-I	25	50	0	8.0	6,300	2,42,657.00	-0.3	7.00	15,300	5,74,605.40
Class-II	25	50	0	8.0	8,500	5,42,698.30	-0.3	7.00	17,300	10,08,723.70
Class-III	25	50	0	8.0	12,900	11,35,294.00	-0.3	7.00	19,700	17,49,019.43
Class-IV	25	50	0	8.0	15,400	15,73,207.00	-0.3	7.00	21,100	22,32,718.58

(a) **Bathymetry Survey & Topographic Survey**.

SUB-STRETCH-2 (25-50 KM)		
Type of Survey	**Chainage (km)**	**Remarks**
Bathymetry Survey	25.0 km to 32.5 km	covered by bathymetric survey
	32.8 km to 33.70 km	covered by bathymetric survey
	34.10 km to 48.90 km	covered by bathymetric survey
Topographic Survey	32.5 km to 32.8 km	Being Dry/Very Shallow covered by topographic method
	33.70 km to 34.10 km	Being Dry/Very Shallow covered by topographic method
	49.0 km to 50.0 km	Being Dry/Very Shallow covered by topographic method
	25 km to 50.00 km	Riverbank, prominent features along the bank.

(c) **Observed & Reduced Depth Profile of the Stretch**. Both observed and reduced Depth profile being attached to the annexure along with this report.



Chainage (km)		River Bed Level (m)		River Bed Level Change (m)	Slope
From	To	From	To		
25	50.00	49.221	52.144	2.923	1:8553

(d) **Prominent Dam/ Barrage**. There is neither any dam nor any barrage exists in this stretch.

(d) **Tidal Stretch**. This 25 km of river stretch is completely non-tidal.

(e) **Bank**. This portion of the river is having un-protected bank.

(f) **Hindrances**. Shallow depth, under water Plankton and bamboo barrier seem to be significant navigational hazard in the water way.

Underwater Plankton at Ch 35.00 Km&Bamboo Brrier at Ch 33.65 km

Shallow depth at Ch 43.0 km

(g) **Encroachment**. No encroachment was observed in this stretch.

(h) **Protected Area**. There is no wildlife, Defence, Atomic power plant and any other protected area present in this river stretch.

(i) **NH/ SH**. State Highway 14 and 17 of the state of Bihar exist within 5km range from the river.

(j) **Railway Station**. Gahmar Raiway Station is located 4 km towards north western side from the river.

(k) **Land Use Pattern**. Land on either banks of the river being utilised for either agricultural or residential purpose.

(l) **Crops**. Both the banks of Karamnasa River are very fertile. Primary crops are mustard and wheat but seasonal vegetable crops are also cultivated viz. peas, cauliflower, potato, tomato, cabbage, carrot, radish, etc. (winter crops).

Crop at Ch. 45.5 km

(m) **Bulk Construction Material**. There is neither any factory for construction material nor any raw material available along the river stretch.

(n) **Existing Industry**. There is no major or minor industry exists in this stretch.

(o) **Existing Ghats, Jetties and Terminals**. There is no ghat, jetty and terminal was observed in this portion.

(p) **Cargo Movement**. There is no cargo movement observed in this portion of the water way during the course of survey.

(p) **Prominent City/ town or Place of Worship**. There is no prominent town present in this section.

(q) **Ferry**. There is no ferry service available in this river stretch.

(r) **Water Sports Recreational Facilities**. There is no facility for water sports in this section.

(s) **Fishing Activity**. Sparse fishing activity was monitored in this section.

(t) **Sand Mining**. No sand mining activity was found in this stretch.

(u) **Tributaries**. There is no tributary of Karamnasa River present in this portion.

(v) **Details of Irrigational Canals**. There is no irrigational canal present in this section.

(w) **Details of Nalas**. There is no drain/ nala observed polluting the river in this portion.

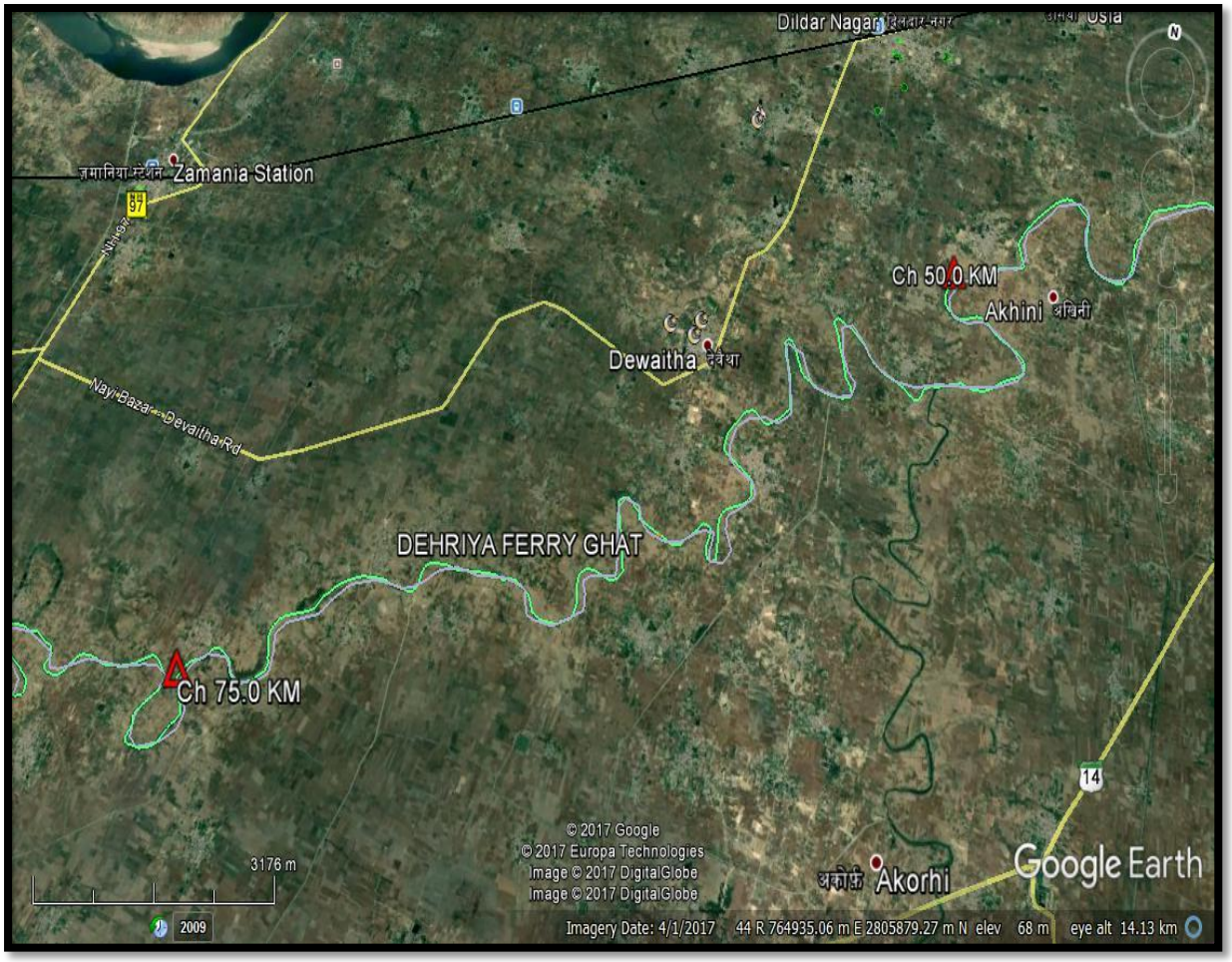
(x) **Usage of Water**. Water in this portion primarily irrigation purpose.

(y) **Details of Cross-Structures**. There are two bridges in this portion viz. Deval Bridge at Ch. 29.94 km and Tajpur Under construction Bridge at Ch. 48.33 km. Details are enumerated below:-

S No	Structure Name	Chainage (km)	Location	Position (Lat Long)		Position (UTM)		Length (m)	Width (m)	No of Piers	Horizontal clearance (Distance Between piers) (m)	Vertical clearance wrt HFL (m)	Remarks
				Left Bank	Right Bank	Left Bank	Right Bank						
1	Deval Bridge	29.94	Deval	25°23'45.66"N 83°47'7.35"E	25°23'51.53"N 83°47'7.77"E	780234.191E 2811722.451N	780242.187E 2811903.412N	181	7.2	6	35.2	3.3	Completed
2	Taj Pur Bridge UC	48.33	Tajpur	25°23'17.28"N 83°41'402.51"E	25°23'18.32"N 83°41'38.81"E	771169.482E 2810662.899N	771065.766E 2810692.166N	-	-	-	-	-	Under Construction

Deval Bridge at Ch. 29.94kmTajpur U/C Bridge at Ch. 48.33km

3.3 **Sub-Stretch 3: From Ch 50 km to Ch 75 km**. This stretch of the surveyed river is having length of 25 km and average width of 60m. Bench Mark pillar no 3 is located in this section at Ch. 53.34 km, Ch.61.24 km and Ch. 71.02 km. Details of BM pillar along with station recovery descriptions is placed at Annexure9. Soil and water samples were collected at Ch.60.60 km and Ch. 69.90 km. Report from authorized laboratory for the same being attached with Annexure 11& 12. Current meter observation and discharge measurement were carried out at Ch. 60.60 km and Ch.70.0 km. In this river stretch. Small wooden boats were engaging in ferry service and fishing activities at Ch. 64.50 km (Dehriya ferry Ghat). There is neither any forest zone nor restricted zone. Farmers were seen engaging in agricultural activities. Primary crops are mustard, wheat, beans, peas, tomato, cabbage, carrot, radish, etc.



From Ch 50 km to 75 km

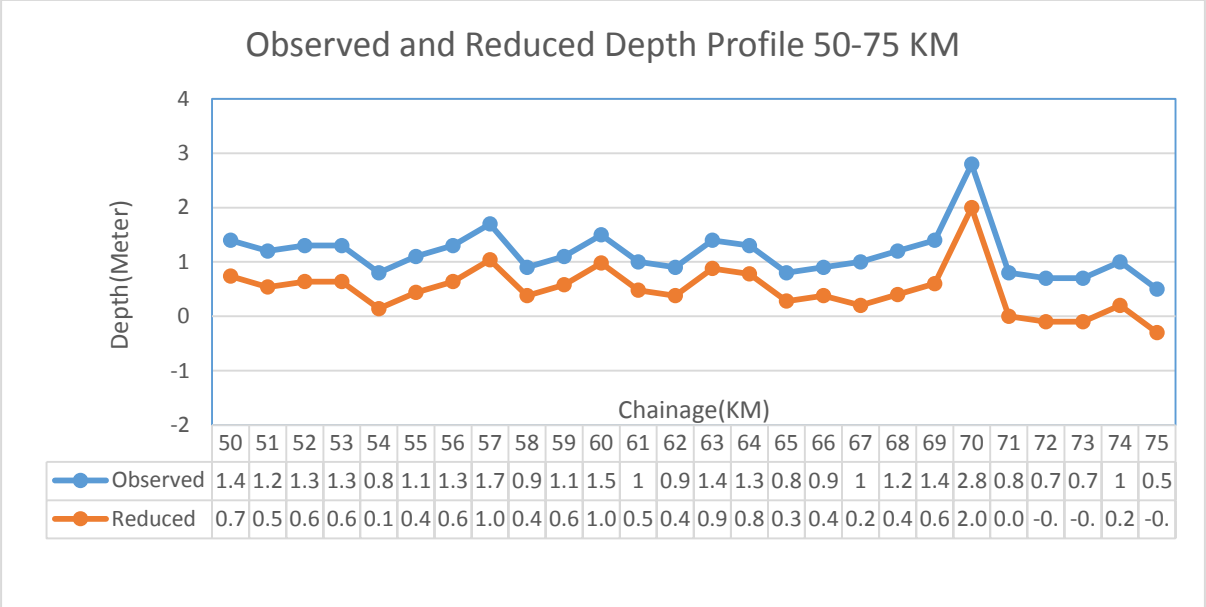
Dredging quantity for substretch-3

	Chainage (km)		Observed				Reduced wrt Sounding Datum			
Type	**From**	**To**	**Min Depth (m)**	**Max Depth (m)**	**Length of Shoal (m)**	**Dredging Qty (cu.m)**	**Min Depth (m)**	**Max Depth (m)**	**Length of Shoal (m)**	**Dredging Qty (cu.m)**
Class-I	50	75	0	4.8	15,000	5,23,326.50	-0.3	4.0	23,700	8,05,836.20
Class-II	50	75	0	4.8	19,700	9,60,936.30	-0.3	4.0	24,300	13,57,834.50
Class-III	50	75	0	4.8	22,500	16,82,524.00	-0.3	4.0	24,800	22,03,895.35
Class-IV	50	75	0	4.8	24,200	21,59,167.00	-0.3	4.0	24,900	27,09,869.75

(a) **Bathymetry Survey & Topographic Survey**.

SUB-STRETCH-3 (50-75 KM)		
Type of Survey	**Chainage (km)**	**Remarks**
Bathymetry Survey	51.40 km to 54.10 km	covered by bathymetric survey
	55.80 km to 61.20 km	covered by bathymetric survey
	61.80 km to 65.40 km	covered by bathymetric survey
	66.70 km to 67.05 km	covered by bathymetric survey
	68.60 km to 68.80 km	covered by bathymetric survey
	69.90 km to 70.90 km	covered by bathymetric survey
Topographic Survey	50.00 km to 51.40 km	Being Dry/Very Shallow covered by topographic method
	54.10 km to 55.80 km	Being Dry/Very Shallow covered by topographic method
	61.20 km to 61.80 km	Being Dry/Very Shallow covered by topographic method
	65.40 km to 66.70 km	Being Dry/Very Shallow covered by topographic method
	67.05 km to 68.60 km	Being Dry/Very Shallow covered by topographic method
	68.80 km to 69.90 km	Being Dry/Very Shallow covered by topographic method
	70.90 km to 75.0 km	Being Dry/Very Shallow covered by topographic method
	50 km to 75.00 km	Riverbank, prominent features along the bank.

(c) **Observed & Reduced Depth Profile of the Stretch**. Both observed and reduced depth profile being attached to the annexure along with this report.



Chainage (km)		River Bed Level (m)		River Bed Level Change (m)	Slope
From	To	From	To		
50	75.00	52.144	56.512	4.368	1:5723

(d) **Prominent Dam/ Barrage**. There is neither any dam nor any barrage exists in this stretch.

(d) **Tidal Stretch**. This 25 km of river stretch is completely non-tidal.

(e) **Bank**. This portion of the river is having un-protected bank.

(f) **Hindrances**. Shallow depth seems to be hindrance for navigation.

(g) **Encroachment**. No encroachment was observed in this stretch.

(h) **Protected Area**. There is no wildlife, Defence, Atomic power plant and any other protected area present in this river stretch.

(i) **NH/ SH**. State Highway 14 and 99 of the state of Bihar exist within 5km range from the river.

(j) **Railway Station**. Bhadaura Railway Station is located 6.5 km towards western side from the river.

(k) **Land Use Pattern**. Land on either banks of the river being utilised for either agricultural or residential purpose.

Shiv Temple at Ch 71.10 km

(l) **Crops**. Both the banks of Karamnasa River are very fertile. Primary crops are mustard and wheat but seasonal vegetable crops are also cultivated viz. peas, cauliflower, potato, tomato, cabbage, carrot, radish, etc. (winter crops).

(m) **Bulk Construction Material**. There is neither any factory for construction material nor any raw material available along the river stretch.

(n) **Existing Industry**. There is no major or minor industry exists in this stretch.

(o) **Existing Ghats, Jetties and Terminals**. There is no ghat, jetty and terminal was observed in this portion.

(p) **Cargo Movement**. There is no cargo movement observed in this portion of the water way during the course of survey.

(p) **Prominent City/ town or Place of Worship**. The only town in this section is Bhadaura.

(q) **Ferry**. There is only one ferry Ghat at Ch. 64.50 km in this river stretch.

Dehriya Ferry Ghat at Ch. 64.50 km

(r) **Water Sports Recreational Facilities**. There is no facility for water sports in this section.

(s) **Fishing Activity**. Fishing activity was prominent by wooden fishing boat.

Fishing Activity at Ch. 57.50 km

(t) **Sand Mining**. No sand mining activity was found in this stretch.

(u) **Tributaries**. There is no tributary of Karamnasa River present in this portion.

(v) **Details of Irrigational Canals**. There is no irrigational canal present in this section.

(w) **Details of Nalas**. There is no drain/ nala observed polluting the river in this portion.

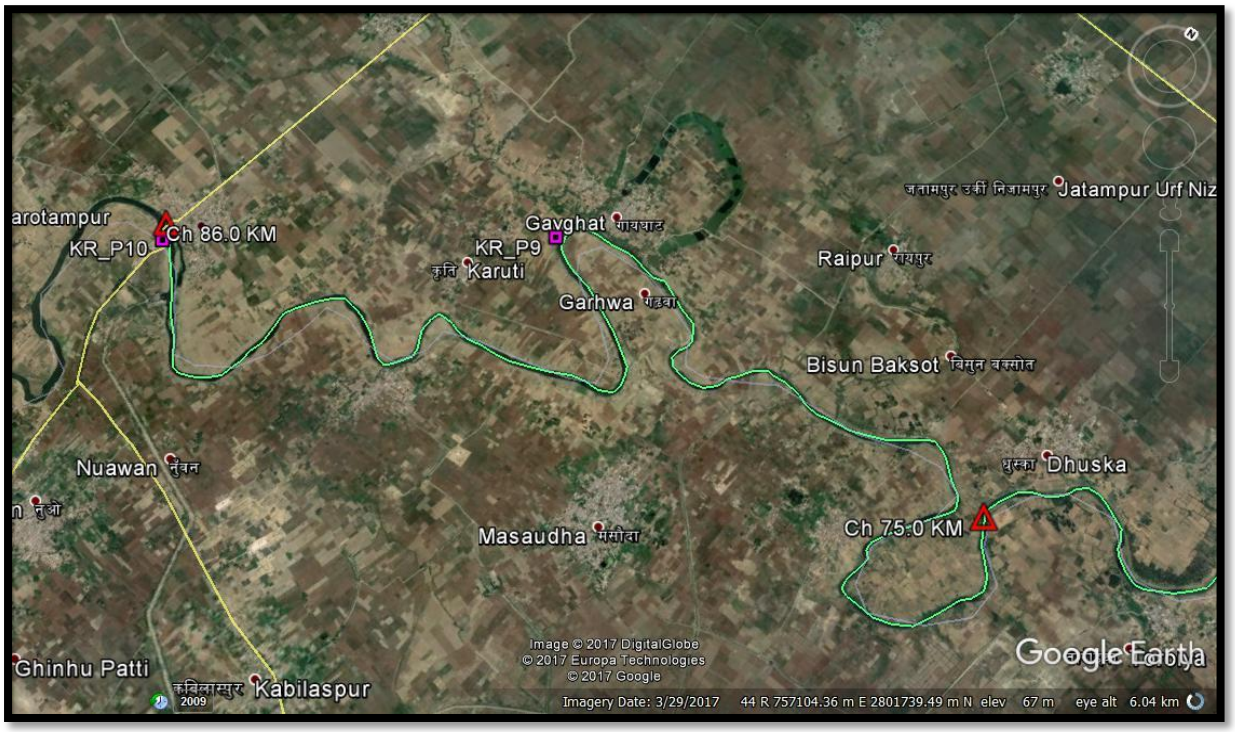
(x) **Usage of Water**. Water in this portion primarily irrigation purpose.

(y) **Details of Cross-Structures**. There are two bridges in this portion viz. Baraura Bridge at Ch. 61.77 km and Devari Bridge at Ch. 71.2 km. Details are enumerated below:-

S No	Structure Name	Chainage (km)	Location	Position (Lat Long)		Position (UTM)		Length (m)	Width (m)	No of Piers	Horizontal clearance (Distance Between piers) (m)	Vertical clearance wrt HFL (m)	Remarks
				Left Bank	Right Bank	Left Bank	Right Bank						
1	Baraura Bridge	61.77	Baraura	25°20'54.95"N 83°39'14.30"E	25°20'54.89"N 83°39'10.44"E	767112.236E 2806198.990N	767004.189E 2806194.044N	108.1	7.5	5	25.82	2.4	Completed
2	Devari Bridge	71.2	Devari	25°19'40.67"N 83°35'57.79"E	25°19'45.47"N 83°35'56.75"E	761660.060E 2803804.756N	761628.539E 2803951.097N	157.44	7.1	7	25.04	2.1	Under Construction

Baraura Bridge at Ch. 61.77 km Devari Bridge Ch 71.20

3.4 **Sub-Stretch 4: From Ch 75 km to Ch 86 km**. This stretch of the surveyed river is having length of 9 km and average width of 62m. Bench Mark pillar no's 2 is located in this section at Ch. 79.027 km and Ch.85.33 km Details of BM pillars along with station recovery descriptions is placed at Annexure 9. Soil and water samples were collected at Ch.80.40 km and 85.90 km. Report from authorized laboratory for the same being attached with Annexure 11 & 12. There is neither any forest zone nor restricted zone. Farmers were seen engaging in agricultural activities. Primary crops are mustard, wheat, beans, peas, tomato, cabbage, carrot, radish, etc.



From Ch 75 km to 86 km

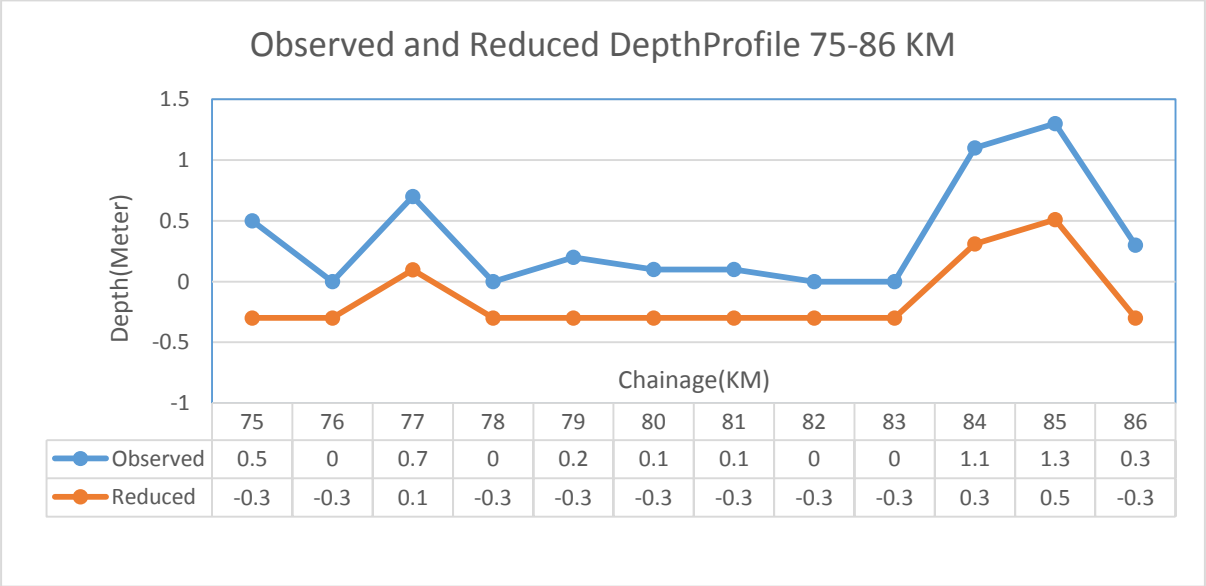
Dredging quantity for substretch-4

	Chainage (km)		Observed				Reduced wrt Sounding Datum			
Type	**From**	**To**	**Min Depth (m)**	**Max Depth (m)**	**Length of Shoal (m)**	**Dredging Qty (cu.m)**	**Min Depth (m)**	**Max Depth (m)**	**Length of Shoal (m)**	**Dredging Qty (cu.m)**
Class-I	75	86	0	1.8	9,100	3,28,482.50	-0.3	1.0	11,000	3,91,633.70
Class-II	75	86	0	1.8	9,400	5,46,834.60	-0.3	1.0	11,000	6,42,158.60
Class-III	75	86	0	1.8	10,500	8,86,315.30	-0.3	1.0	11,000	10,18,696.42
Class-IV	75	86	0	1.8	11,000	10,97,223.00	-0.3	1.0	11,000	12,38,451.16

(a) **Bathymetry Survey & Topographic Survey**.

SUB-STRETCH-4 (75-86 KM)		
Type of Survey	**Chainage (km)**	**Remarks**
Topographic Survey	75.0 km to 86.0 km	Being Dry/Very Shallow covered by topographic method
	75 km to 86.00 km	Riverbank, prominent features along the bank.

(c) **Observed & Reduced Depth Profile of the Stretch**. Both observed and reduced Depth profile being attached to the annexure along with this report.



Chainage (km)		River Bed Level (m)		River Bed Level Change (m)	Slope
From	To	From	To		
75	86.00	56.512	58.875	2.363	1:4655

(d) **Prominent Dam/ Barrage**. There is neither any dam nor any barrage exists in this stretch.

(d) **Tidal Stretch**. This 11 km of river stretch is completely non-tidal.

(e) **Bank**. This portion of the river is having un-protected bank.

(f) **Hindrances**. Shallow depth seems to be hindrance for navigation

Shallow stretch at Ch 80 km

(g) **Encroachment**. No encroachment was observed in this stretch.

(h) **Protected Area**. There is no wildlife, Defence, Atomic power plant and any other protected area present in this river stretch.

(i) **NH/ SH**. State Highway 14 and NH97 of the state of Bihar exist within 5km range from the river.

(j) **Railway Station**. Nearest railway station is Bhadaura and Zamania which is located approximately 8 km away from the river stretch towards western side.

(k) **Land Use Pattern**. Land on either banks of the river being utilised for either agricultural or residential purpose.

(l) **Crops**. Both the banks of Karamnasa River are very fertile. Primary crops are mustard and wheat but seasonal vegetable crops are also cultivated viz. peas, cauliflower, potato, tomato, cabbage, carrot, radish, etc. (winter crops).

(m) **Bulk Construction Material**. There is neither any factory for construction material nor any raw material available along the river stretch.

(n) **Existing Industry**. There is no major or minor industry exists in this stretch.

(o) **Existing Ghats, Jetties and Terminals**. There is no ghat, jetty and terminal was observed in this portion.

(p) **Cargo Movement**. There is no cargo movement observed in this portion of the water way during the course of survey.

(p) **Prominent City/ town or Place of Worship**. There are two town in this section is Bhadaura & Zamania.

(q) **Ferry**. There is no ferry service available in this river stretch.

(r) **Water Sports Recreational Facilities**. There is no facility for water sports in this section.

(s) **Fishing Activity**. Scanty fishing activity was monitored in this section.

(t) **Sand Mining**. No sand mining activity was found in this stretch.

(u) **Tributaries**. There is no tributary of Karamnasa River present in this portion.

(v) **Details of Irrigational Canals**. There is no irrigational canal present in this section but well is relevant for irrigation

Well at Ch. 82.15 km

(w) **Details of Nalas**. There is no drain/ nala observed polluting the river in this portion.

(x) **Usage of Water**. Water in this portion primarily irrigation purpose.

(y) **Details of Cross-Structures**. The only bridge i.e. Kakarat Bridge is situated at Ch. 85.98 km across the river. Details being tabulated below:-

S No	Structure Name	Chainage (km)	Location	Position (Lat Long)		Position (UTM)		Length (m)	Width (m)	No of Piers	Horizontal clearance (Distance Between piers) (m)	Vertical clearance wrt HFL (m)	Remarks
				Left Bank	Right Bank	Left Bank	Right Bank						
1	Kakarait Bridge	85.98	Kakarait	25°18'7.09"N 83°31'37.14"E	25°18'13.75"N 83°31'39.03"E	754423.709E 2800784.475N	754472.943E 2800990.897N	212.2	7.6	9	25.52	2	Completed

Kakarait Bridge at Ch. 85.98 km

SECTION – 4

4.1 **Terminals.** There is no terminal present in this waterway. However, development of terminal at Narainapur is recommended due to depth availability throughout the year proximity to the road rail networks. SH99 & SH13 is passing & across the Karamnasa River. Chausa Railway stations are located 3.5 km away from the proposed terminal respectively. This proposed terminal will cater for passenger as well as cargo movement throughout the river. Details of the proposed terminal being tabulated below:-

Sl No	Ch. (km)	Location	Position (Lat/ long)		Position (UTM)		Length (m)	Width (m)	Area (sq.m)	Present Land Use
			Start	End	Start	End				
1	2.7	NarainaPur	25°29'48.09"N 83°52'34.20"E	25°29'51.44"N 83°52'36.93"E	789132.410E 2823073.160N	789206.590E 2823177.870N	130	20	2500	Agricultural Land

Proposed Terminal at Ch. 2.70 km

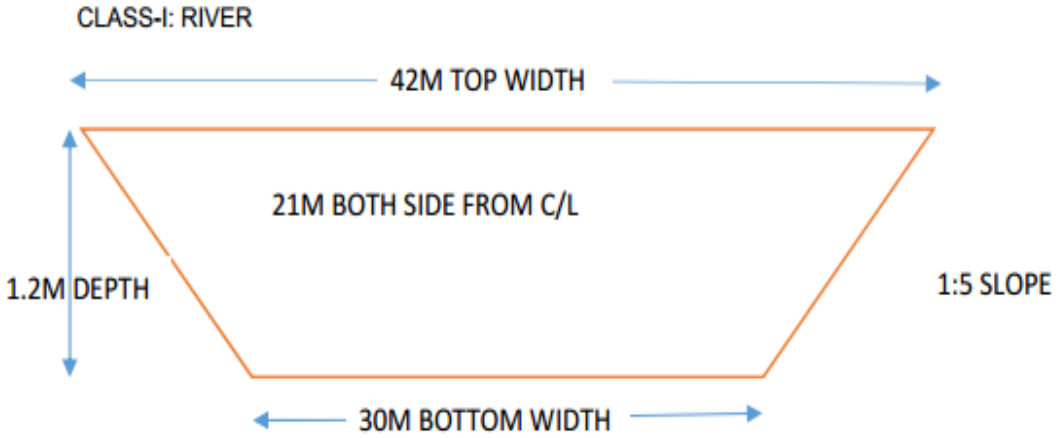
SECTION – 5

5.1 Fairway Development The dredging channel is designed by linking deepest sounding of each cross sections and the dredging quantity is estimated for developing a navigable channel with the following dimension. The best suitable dredging channel class for the survey stretch of Karamnasa River is identified as Class-II and the dredge volume for the Class I to Class-IV were also calculated for the entire survey stretch. The details of Fairway channel dimension used for the dredging calculation are as follows:-

Class of Channel Depth (m) Bottom	Depth (m)	Bottom width (m)	Slope
Class -I	1.2	30	1:5
Class -II	1.4	40	1:5
Class -III	1.7	50	1:5
Class -IV	2	50	1:5

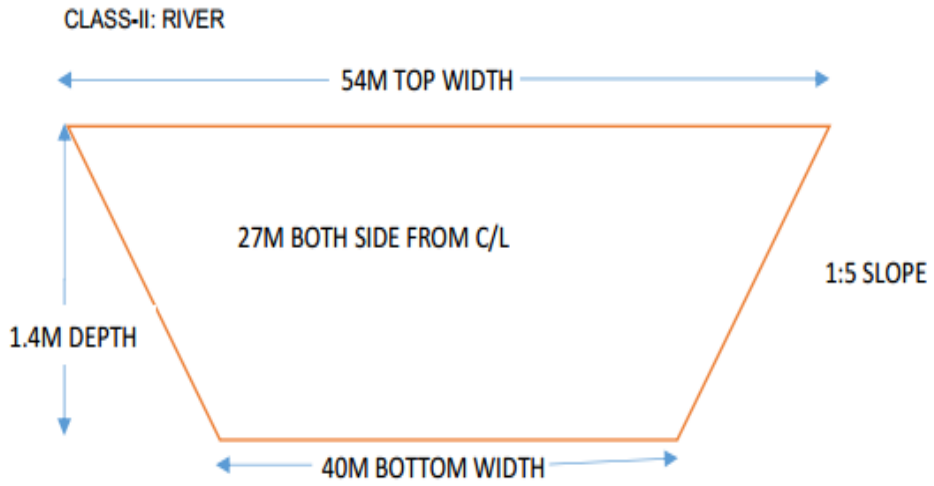
5.2 Calculation of Dredging Quantity The dredge volume calculations were accomplished using the HYPACK dredge volume computation utility. For clarity and ease of calculations, the complete channel profile was divided into segments of 1 km each (enclosed at Annexure-2). The Tin v/s Channel volume with Hypack Standard algorithm was used to calculate the dredge volume. The stretch wise summary of the dredge volume for a different class of fairway is as follows:-

1) 30m x 1.2m with side slope 1:5, along the deepest route.



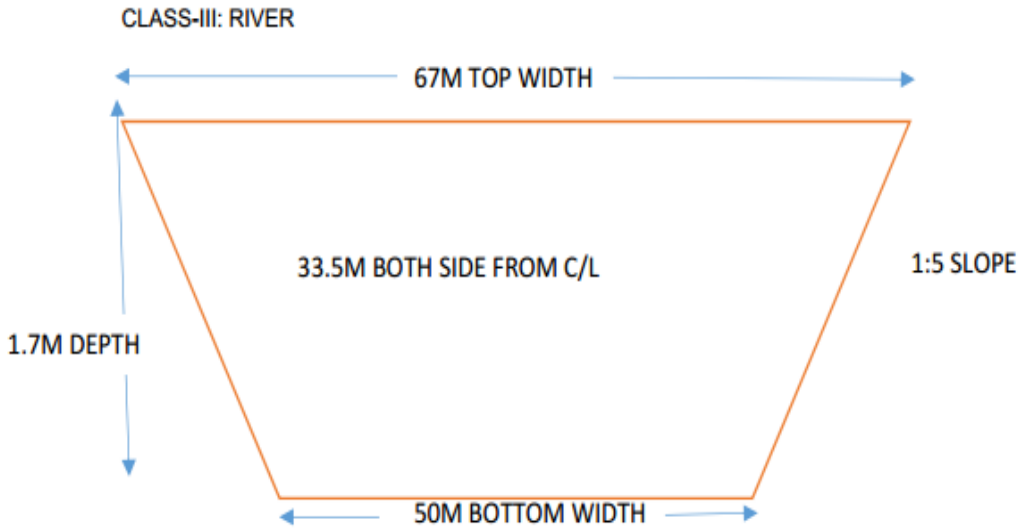
CLASS - I											
Chainage (km)		**Observed**					**Reduced w.r.t Sounding Datum**				
From	**To**	**Min. Depth (m)**	**Max. Depth (m)**	**Length of Shoal (m)**	**Dredging Qty (Cu.m)**	**Cumulative Drg. Qty. (cu.m)**	**Min. Depth (m)**	**Max. Depth (m)**	**Length of Shoal (m)**	**Dredging Qty (Cu.m)**	**Cumulative Drg. Qty. (cu.m)**
Kutubpur Ch.0	kusahi Ch.25.0	0.0	6.7	6,500	1,92,634.24	1,92,634.24	-0.2	6.5	8,600.00	3,09,068.51	3,09,068.51
kusahi Ch.25.0	Akhini Ch.50.0	0.0	8.0	6,300	2,42,656.96	4,35,291.20	-0.3	7.0	15,300.00	5,74,605.40	8,83,673.91
Akhini Ch.50.0	Toroiya Ch.75.0	0.0	4.8	15,000	5,23,326.47	9,58,617.67	-0.3	4.0	23,700.00	8,05,836.23	16,89,510.14
Toroiya Ch.75.0	Kakarait Ch.86.0	0.0	1.8	9,100	3,28,482.47	12,87,100.14	-0.3	1.0	11,000.00	3,91,633.69	20,81,143.83

2) 40m x 1.4m with side slope 1:5, along the deepest route.



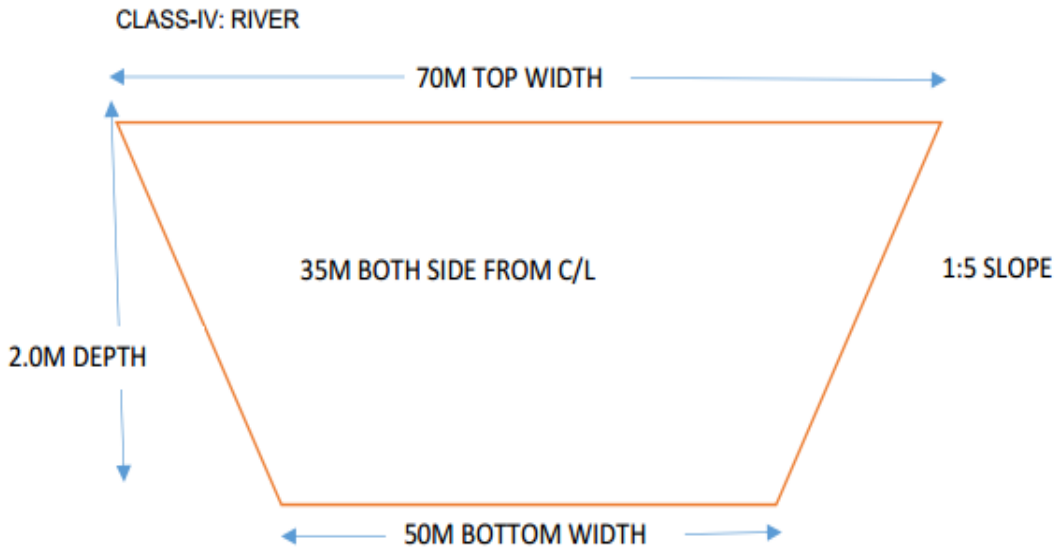
CLASS - II											
Chainage (km)		**Observed**					**Reduced w.r.t Sounding Datum**				
From	**To**	**Min. Depth (m)**	**Max. Depth (m)**	**Length of Shoal (m)**	**Dredging Qty (Cu.m)**	**Cumulative Drg. Qty. (cu.m)**	**Min. Depth (m)**	**Max. Depth (m)**	**Length of Shoal (m)**	**Dredging Qty (Cu.m)**	**Cumulative Drg. Qty. (cu.m)**
Kutubpur Ch.0	kusahi Ch.25.0	0.0	6.7	8,600	4,23,335.99	4,23,335.99	-0.2	6.5	11,900	6,01,670.61	6,01,670.61
kusahi Ch.25.0	Akhini Ch.50.0	0.0	8.0	8,500	5,42,698.28	9,66,034.27	-0.3	7.0	17,300	10,08,723.68	16,10,394.29
Akhini Ch.50.0	Toroiya Ch.75.0	0.0	4.8	19,700	9,60,936.34	19,26,970.61	-0.3	4.0	24,300	13,57,834.49	29,68,228.78
Toroiya Ch.75.0	Kakarait Ch.86.0	0.0	1.8	9,400	5,46,834.63	24,73,805.24	-0.3	1.0	11,000	6,42,158.64	36,10,387.42

3) 50m x 1.7m with side slope 1:5, along the deepest route.



CLASS - III											
Chainage (km)		**Observed**					**Reduced w.r.t Sounding Datum**				
From	**To**	**Min. Depth (m)**	**Max. Depth (m)**	**Length of Shoal (m)**	**Dredging Qty (Cu.m)**	**Cumulative Drg. Qty. (cu.m)**	**Min. Depth (m)**	**Max. Depth (m)**	**Length of Shoal (m)**	**Dredging Qty (Cu.m)**	**Cumulative Drg. Qty. (cu.m)**
Kutubpur Ch.0	kusahi Ch.25.0	0.0	6.7	14,000	8,99,199.85	8,99,199.85	-0.2	6.5	15,600	11,64,013.73	11,64,013.73
kusahi Ch.25.0	Akhini Ch.50.0	0.0	8.0	12,900	11,35,293.63	20,34,493.48	-0.3	7.0	19,700	17,49,019.43	29,13,033.16
Akhini Ch.50.0	Toroiya Ch.75.0	0.0	4.8	22,500	16,82,524.08	37,17,017.56	-0.3	4.0	24,800	22,03,895.35	51,16,928.51
Toroiya Ch.75.0	Kakarait Ch.86.0	0.0	1.8	10,500	8,86,315.26	46,03,332.82	-0.3	1.0	11,000	10,18,696.42	61,35,624.93

4) 50m x 2.0m with side slope 1:5, along the deepest route.



CLASS - IV											
Chainage (km)		**Observed**					**Reduced w.r.t Sounding Datum**				
From	**To**	**Min. Depth (m)**	**Max. Depth (m)**	**Length of Shoal (m)**	**Dredging Qty (Cu.m)**	**Cumulative Drg. Qty. (cu.m)**	**Min. Depth (m)**	**Max. Depth (m)**	**Length of Shoal (m)**	**Dredging Qty (Cu.m)**	**Cumulative Drg. Qty. (cu.m)**
Kutubpur Ch.0	kusahi Ch.25.0	0.0	6.7	16,000	1288173.08	12,88,173.08	-0.2	6.5	17,400	1587216.39	15,87,216.39
kusahi Ch.25.0	Akhini Ch.50.0	0.0	8.0	15,400	1573207	28,61,380.08	-0.3	7.0	21,100	2232718.58	38,19,934.97
Akhini Ch.50.0	Toroiya Ch.75.0	0.0	4.8	24,200	2159166.67	50,20,546.75	-0.3	4.0	24,900	2709869.75	65,29,804.72
Toroiya Ch.75.0	Kakarait Ch.86.0	0.0	1.8	11,000	1097222.85	61,17,769.60	-0.3	1.0	11,000	1238451.16	77,68,255.88

SECTION – 6

6.1 **Conclusion**. The river corridor consists of a length of 86 km from Kutubpur at Ganga confluence (Ch. 0 km) to Kakarait Bridge (Ch. 86.0 km). The entire river is non-tidal and one of the tributary of Ganga. The surveyed stretch of Karamnasa River is utilized by small boat for ferry services and the waterway can be best utilized for cargo transfer and passenger ferry service on improving the depth of existing waterway. There are seven cross structures exist in the waterway, which are presently in use. The dredging on the Waterway will improve the depth of the channel for any navigational requirement. The River banks are well connected with the road network and are moderately connected with Railway Network. The road is near parallel on both sides throughout the river stretch.

The 86.0 km of river length is having a length of 58.31 km of depth below 1.2 m, 10.90km of depth between 1.2 m to 1.4 m, 7.80 km of depth between 1.5 m to 1.7 m, 5.10 km of depth between 1.8 m to 2.0 m and 3.89 km of depth more than 2 m. There is neither any dam nor any barrage exists in river stretch. Minimum and maximum horizontal clearance of cross structures are 12.67m and 35.2mrespectively. Minimum and maximum vertical clearances of cross structures are 2.10m & 3.30m wrt HFL respectively. There is no power cable present in the survey stretch.

There is neither any protected area (Atomic/ Port/ Wildlife/ Research) nor any hindrance exist in the whole waterway. Information gathered from local populace that the availability of maximum water is only during monsoon season. There is no cargo, passenger ferry and tourism facility is available in the river stretch. Both banks of the Karamnasa River is very much fertile. Cultivation of wheat, mustard, peas, potato and carrot etc. has been noticed during the course of survey. Land along the river is mainly utilized for agricultural purpose. However, in some places, it is also used as residential purposes. The whole river stretch is well connected with the rail and road networks within 5 to 10 Km. Prominent cities are Chausa, Dildarnagar, Bhadaura and Zamania.

There is only one ferry service by wooden boats present at Ch.64.50 km.There is no water sport facility available in the whole river portion. There are no any Tourism facilities are present in survey Stretch. Cities along the river viz Chausa, Dildarnagar, Bhadaura and Zamania etc. are well connected with both rail and road networks

There is no terminal present in this waterway. However, development of terminal at NarainaPur (Ch. 2.70 km) seems viable. This place is well connected by rail and road networks. The proposed terminal will cater for passenger as well as cargo movement throughout the river.

The feasibility survey were carried out at river Karamnasa (length 86.0 km) from Ganga confluence at Kutubpur (Ch. 0 km) to Kakarait Bridge (Ch. 86.0 km).The Dredging quantity being tabulated below: -

Class	Drg. Qty. (cu.m)
Class I	20,81,143.83
Class II	36,10,387.42
Class III	61,35,624.93
Class IV	77,68,255.88

Consultant Recommendation

- The Karamnasa River is utilized by small boat for ferry services across the river.
- The availability of navigable water is only during monsoon season.
- No cargo along the river.
- The average width of the river is 30-40 mtr, so widening of the river is required at many places.
- Large scale fishing nets across the river, Shallow depth and under water plankton are navigational hindrance.
- River is shallow at most of the stretches and dredging quantity is much high.
- The River banks are well connected with the road network and are moderately connected with Railway Network. The road is near parallel on both sides throughout the river stretch.
- Hence, the waterway is not found technically viable as of now.