FINAL FEASIBILITY REPORT ON DETAILED HYDROGRAPHIC SURVEY IN RANN OF KUTCH & LUNI RIVER FROM SEA MOUTH NEAR KOTESHWAR IN RANN OF KUTCH TO GANDHAV VILLAGE IN LUNI RIVER (491.903 KM) & JAWAI RIVER FROM GANDHAV GOLIYA VILLAGE TO SANKARNA BRIDGE JALORE (123.542 km) (NW- 48) (REGION-IIIA)

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

TOJO VIKAS INTERNATIONAL PVT LTD
Plot No.4, 1st Floor, Mehrauli Road
New Delhi-110074,
Tel: +91-11-46739200/217
Fax: +91-11-26852633
Email: mail@tojovikas.com
Web: www.tojovikas.com

VOLUME – I
MAIN REPORT

Survey Period- 4-Apr-16 to 23-May-16
& 27 Oct. 2017 to 26 Nov 2017

ACKNOWLEDGEMENT

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

CONTENTS

Table of Contents

Table of Figures

List of Abbreviations:

BM	- Bench Mark
SD	- Sounding Datum
DGPS	- Differential Geo Positioning System
GTS	- Great Trigonometric Survey
LAD	- Least Available Depth
MSL	- Mean Sea Level
PPK	- Post Processing Kinematics
RTK	- Real Time Kinematics
TBM	- Temporary Bench Mark
TS	- Total Station

ANNEXURE – I TO XIV

Annexure - I	Data collected from various agencies
Annexure - II	Dredge Volume
Annexure - III	Details of Collected Water level
Annexure - IV	Details of bathymetric and topographic surveys carried out
Annexure - V	Details of Bank Protection
Annexure - VI	Details of Features across the Bank
Annexure – VII	Detailed Methodology for Horizontal and Vertical Control
Annexure – VIII	Photographs of Equipment
Annexure – IX	Details of Bench Marks
Annexure – X	Leveling Diagram of Rann of Kutch
Annexure – XI	Soil Sample Report
Annexure – XII	Water Sample Report
Annexure - XIII	Calibrations Certificates
Annexure – XIV	Field Photographs

ANNEXURE –XV: CHARTS

Drawing Title	Drawing Number	Scale
Composite Map (Rann of kutch, Luni & Jawai River)	TVIPL/IWAI/RK/LU/FD/01 TVIPL/IWAI/JW/FD/02	1:350,000 1:75,000
Detailed Hydrographic & Topographic Survey Runn Of Kutch	TVIPL/IWAI/RK/FD/03	1:10,000
Detailed Hydrographic & Topographic Survey Luni & Jawai River	TVIPL/IWAI/LU/JW/FD/04	1:5,000
Detailed Hydrographic & Topographic Survey Runn Of Kutch	TVIPL/IWAI/RK/FD/05	1:30,000

SALIENT FEATURES AT A GLANCE

#	Particulars	Details
1.	Name of Consultant	Tojo Vikas International Pvt. Ltd.
2.	Region Number& & State (s)	Region IIIA State Rajasthan & Gujarat

Sr. No	Name of River	Gujarat	Rajasthan	Total
1	Rann of Kutch	410.047	11.202	421.249
2	Luni	0	70.654	70.654
3	Jawai	0	123.542	123.542
		410.047	205.398	615.445

Total & State wise length of Rann of Kutch, Luni & Jawai River

3.	Waterway stretch, NW Number (From…. To…, total length)	Waterway Stretch- Rann of Kutch, Luni and Jawai River Waterway Name- NW- 48 Waterway Description- Rann of Kutch from Sea mouth near Koteshwar Lat 23°32' 54" N, Long 68°22'27"E to Jawai River Sankarna bridge, Jalore Lat 34°21' 37"N, Long 74°36'36"E Total Length- 615.445 km
4.	Navigability status	Chainage from 0.0 to 53.0 km is tidal Area, however 0.0 to 52.0 km is Navigable during high tide. Stretches from chainage 53.0 Km to 615.445 Km is dry
a)	Tidal & non tidal portions	Tidal & non tidal (Tidal area is from CH-0.0 to 53.0 km in Rann of Kutch & rest of the area is non-tidal).

b) LAD status (w.r.t. Reduced depth)

Rann Of Kutch & Luni River

i) Survey period

ii) < 1.2 m (km)

iii) 1.2 m to 1.4 m (km)

iv) 1.5 m to 1.7 m (km)

v) 1.8 m to 2.0 m (km)

vi) > 2.0 m (km)

	0-25 km	25-53 km	53-75 km	75-100 km	100-125 km	125-150 km	Total
Survey Period	27 Oct. to 26 Nov.2017						
< 1.2 m (km)	3.5	17	22	25	25	**25**	116.5
1.2 m to 1.4 m (km)	0	0	0	0	0	0	0
1.5 m to 1.7 m (km)	0	0	0	0	0	0	0
1.8 m to 2.0 m (km)	0	0	0	0	0	0	0
> 2.0 m (km)	21.5	11	0	0	0	0	33.5
	Total						150.0

	150-175 km	175-200 km	200-225 km	225-250 km	250-275 km	275-300 km	Total
Survey Period	27 Oct. to 26 Nov.2017			4 April to 23 May 2016			
< 1.2 m (km)	25	25	25	25	25	**25**	150
1.2 m to 1.4 m (km)	0	0	0	0	0	0	0
1.5 m to 1.7 m (km)	0	0	0	0	0	0	0
1.8 m to 2.0 m (km)	0	0	0	0	0	0	0
> 2.0 m (km)	0	0	0	0	0	0	0
	Total						150

	300-325 km	325-350 km	350-375 km	375-400 km	400-425 km	425-450 km	Total
Survey Period	4 April to 23 May 2016						
< 1.2 m (km)	25	25	25	25	25	**25**	150
1.2 m to 1.4 m (km)	0	0	0	0	0	0	0
1.5 m to 1.7 m (km)	0	0	0	0	0	0	0
1.8 m to 2.0 m (km)	0	0	0	0	0	0	0
> 2.0 m (km)	0	0	0	0	0	0	0
	Total						150

	450-475 km	475-491.903 km	Total
Survey Period	4 April to 23 May 2016		
< 1.2 m (km)	25	16.903	41.903
1.2 m to 1.4 m (km)	0	0	0
1.5 m to 1.7 m (km)	0	0	0
1.8 m to 2.0 m (km)	0	0	0
> 2.0 m (km)	0	0	0
	Total		41.903

LAD status (w.r.t. Reduced depth) of Jawai River

i) Survey period

ii) < 1.2 m (km)

iii) 1.2 m to 1.4 m (km)

iv) 1.5 m to 1.7 m (km)

v) 1.8 m to 2.0 m (km)

vi) > 2.0 m (km)

	0-25 km	25-50 km	50-75 km	75-100 km	100-123.542 km	Total
Survey Period	4 April to 23 May 2016					
< 1.2 m (km)	25	25	25	25	23.542	123.542
1.2 m to 1.4 m (km)	0	0	0	0	0	0
1.5 m to 1.7 m (km)	0	0	0	0	0	0
1.8 m to 2.0 m (km)	0	0	0	0	0	0
> 2.0 m (km)	0	0	0	0	0	0
	Total					123.542

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LAD status (Observed)
Rann of kutchh & Luni river
i) Survey period
ii) < 1.2 m (km)
iii) 1.2 m to 1.4 m (km)
iv) 1.5 m to 1.7 m (km)
v) 1.8 m to 2.0 m (km)
vi) > 2.0 m (km)

	0-25 km	25-53 km	53-75 km	75-100 km	100-125 km	125-150 km	Total
Survey Period	27 Oct.to 11 Nov.2017						
< 1.2 m (km)	0	5	23.0	25.0	25.0	**25.0**	97.0
1.2 m to 1.4 m (km)	0	0	0	0	0	0	0
1.5 m to 1.7 m (km)	0	0	0	0	0	0	0
1.8 m to 2.0 m (km)	0	0	0	0	0	0	0
> 2.0 m (km)	25.0	22.0	0	0	0	0	47
	Total						150

	150-175 km	175-200 km	200-225 km	225-250 km	250-275 km	275-300 km	Total
Survey Period	27 Oct. to 26 Nov.2017			4 April to 23 May 2016			
< 1.2 m (km)	25	25	25	25	25	**25**	150
1.2 m to 1.4 m (km)	0	0	0	0	0	0	0
1.5 m to 1.7 m (km)	0	0	0	0	0	0	0
1.8 m to 2.0 m (km)	0	0	0	0	0	0	0
> 2.0 m (km)	0	0	0	0	0	0	0
	Total						150

	300-325 km	325-350 km	350-375 km	375-400 km	400-425 km	425-450 km	Total
Survey Period	4 April to 23 May 2016						
< 1.2 m (km)	25	25	25	25	25	**25**	150
1.2 m to 1.4 m (km)	0	0	0	0	0	0	0
1.5 m to 1.7 m (km)	0	0	0	0	0	0	0
1.8 m to 2.0 m (km)	0	0	0	0	0	0	0
> 2.0 m (km)	0	0	0	0	0	0	0
	Total						150

	450-475 km	475-491.903 km	Total
	460-475Km		
Survey Period	4 April to 23 May 2016		
< 1.2 m (km)	25	16.903	41.903
1.2 m to 1.4 m (km)	0	0	0
1.5 m to 1.7 m (km)	0	0	0
1.8 m to 2.0 m (km)	0	0	0
> 2.0 m (km)	0	0	0
		Total	41.903

LAD status (Observed) of Jawai river

i) Survey period

ii) < 1.2 m (km)

iii) 1.2 m to 1.4 m (km)

iv) 1.5 m to 1.7 m (km)

v) 1.8 m to 2.0 m (km)

vi) > 2.0 m (km)

	0-25 km	**25-50 km**	**50-75 km**	**75-100 km**	**100-123.542 km**	**Total**
Survey Period	4 April to 23 May 2016					
< 1.2 m (km)	25	25	25	25	23.542	123.542
1.2 m to 1.4 m (km)	0	0	0	0	0	0
1.5 m to 1.7 m (km)	0	0	0	0	0	0
1.8 m to 2.0 m (km)	0	0	0	0	0	0
> 2.0 m (km)	0	0	0	0	0	0
					Total	123.542

c)	Cross structures i) Dams, weirs, barrages etc. ii) Bridges, Power cables etc. [total number; range of horizontal and vertical clearances]	Dams/Barrage/weirs and Navigational Locks - Not Present Damage bund at Luni river at Ch -491.903 km. Bridges- 2 Nos. Vertical Clearance w.r.t. HFL – 2.49m Horizontal Clearance- 45.0m Ford road crossing – 35 Nos. Power Cable (HT line) – 6 Vertical Clearance w.r.t. HFL - 10 m to 18m LT line - 19
d)	Avg. discharge & no. of days	NIL (Due to tidal zone & dry area)
e)	Slope	Average bed Slope- 1:0.11049
5.	Traffic potential	
a)	Present IWT operations, ferry services, tourism, cargo, if any	BSF boats & Fishing boats. Koteshwar Temple, Lakhpat fort & Kutch fossil park.
b)	Important industries in Rann of Kutch, Luni and Jawai within 50 km	Sanghi Cement industries, salt industries, Akrimota Lignite coal power station,Solar park & Wind power.
c)	Distance of Rail & Road from Rann of Kutch, Luni and Jawai	Jalore railway station is 2km away from Jawai river. Nearest highway is NH-15 & NH-8A.
6.	Consultant's recommendation for going ahead with TEF / DPR preparation	Recommendation for going ahead with TEF/ DPR Preparation.
7.	Any other information/ comment	

(Signature)

Date: Name of Consultant

1.0 INTRODUCTION

1.1 River Course

Rann of Kutch

The Great Rann of Kutch, along with the Little Rann of Kutch on its southern edge, is situated in the district of Kutch and comprises some 30,000 square kilometers (10,000 sq mi) between the Gulf of Kutch. The marsh can be accessed from the village of Kharaghoda in Surendra nagar District.

In India's summer monsoon, the flat desert of salty clay and mudflats, which average 15 meters above sea level, fills with standing water. In very wet years, the wetland extends from the Gulf of Kutch on the west through to the Gulf of Cambay on the east.

The area was a vast shallow of the Arabian Sea until continuing geological uplift closed off the connection with the sea, creating a vast lake that was still navigable during the time of Alexander. The Ghaggar River, which presently empties into the desert of northern Rajasthan, formerly emptied into the Rann of Kutch, but the lower reaches of the river dried up as its upstream tributaries were captured by the Indus and Ganges thousands of years ago. Traces of the delta and its distributary channels on the northern boundary of the Rann of Kutch were documented by the Geological Survey of India in 2000.

The Luni River, which originates in Rajasthan, drains into the desert in the northeast corner of the Rann. Other rivers feeding into the marsh include the Rupen from the east and the West Banas River from the northeast.

There are sandy islets of thorny scrub, forming a wildlife sanctuary and a breeding ground for some of the largest flocks of greater and lesser flamingos. Wildlife, including the Indian wild ass, shelter on islands of higher ground, called bets, during the flooding.

This is one of the hottest areas of India - with summer temperatures averaging and peaking at 49.5 °C. Winter temperatures reduce dramatically and can go below 0 °C (32 °F).[7]

Although most of the marsh is in protected areas, the habitats are vulnerable to cattle grazing, firewood collection and salt extraction operations, all of which may involve transportation that disturbs wildlife. There are several wildlife sanctuaries and protected reserves on the Indian side in the Rann of Kutch region. From the city of Bhuj, various ecologically rich and wildlife conservation areas of the Kutch/Kachchh district can be visited such as Indian Wild Ass Sanctuary, Kutch Desert Wildlife Sanctuary, Narayan Sarovar Sanctuary, Kutch Bustard Sanctuary, Banni Grasslands Reserve and Chari-Dhand Wetland Conservation Reserve.

In India the northern boundary of the Greater Rann of Kutch forms the International Border between India and Pakistan, it is heavily patrolled by India's Border Security Force (BSF) and Indian Army conducts exercises here to acclimatize its troops to this harsh terrain.

This inhospitable salty lowland, rich in natural gas, was one scene of perennial border disputes between India and Pakistan that, in April 1965, contributed to the Indo-Pakistani War of 1965. Later the same year, Prime Minister of the United Kingdom Harold Wilson persuaded the combatants to end hostilities and establish a tribunal to resolve the dispute. A verdict was reached in 1968 which saw Pakistan getting 10% of its claim of 9,100 square kilometers (3,500 sq mi). 90% was awarded to India, although India claimed 100% of the region. Tensions spurted again in 1999 during the Atlantique Incident.

1.1.1 State / District through which River passes – Rann of Kutch passes through the Rajasthan, Gujarat & finally merge into Gulf of Kutch.

State Wise Length

a) 11.202 Km in Rajasthan
b) 410.047 Km in Gujarat

Figure 1 – Map of Rann of Kutch

Luni River-

The Luni is a river of western Rajasthan state, India. It originates in the Pushkar valley of the Aravalli Range, near Ajmer and ends in the marshy lands of Rann of Kutch in Gujarat, after travelling a distance of 495 km. It is first known as Sagarmati, then after passing Govindgarh, it meets its tributary Sarsuti, which originates from Pushkar Lake, and from then on it gets its name Luni.

In 1892, Maharaja Jaswant Singh of Jodhpur constructed Jaswant Sagar in Pichiyak village between Bilara and Bhavi of Jodhpur district. It is one of the largest artificial lakes in India, and irrigates more than 12,000 acres (49 km2).

It is also known as Lavanavati River. It means "Salt River" in Sanskrit, due high salinity of its water. The Luni River basin is 37,363 km², which includes all or part of Ajmer, Barmer, Jalor, Jodhpur, Nagaur, Pali, and Sirohi districts of Rajasthan, Mithavirana, Jordiyali, Mavsari Vav, Radhanpur region of Banaskantha North Gujarat. Its major tributaries are the Sukri, Mithri, Bandi, Khari, Jawai, Guhiya and Sagi from the left, and the Jojari River from the right.

Rising in the western Aravalli Range in the state of Rajasthan, where it is known as the Sagarmati, it flows south-west and enters a patch of desert before dissipating into the Rann of Kutch, traversing a total of 495 km. In spite of the high salinity, it is a major river in the region and serves as a primary source of irrigation. It is not saline up to balotra district but when it meets the saline land in this area it gets saline.

It may will have been the southern portion of the Ghaggar-Hakra.
The Luni River flows in the western part of India in the state of Rajasthan. It rises in the Pushkar valley of the Aravalli Range at an elevation of five hundred fifty metres near Ajmer.
The river then flows in the southwest direction through the hills and plains of the Marwar region in Rajasthan. So, the direction in which it flows is from north-east to south-west.

State Wise Length of Luni river

a) 70.654km in Rajasthan
b) 0 km in Gujarat

Jawai River-

Jawai is a river originating in Udaipur district in Aravalli Ranges, a tributary of the Luni River.
Sukri River is its main tributary. It joins Khari river in Jalore district near Sayala. The river flows in a north-west direction for about 96 km² (60 mi). Its catchment area is 2,976 km² (1,149 sq mi) in Udaipur, Pali and Jalore districts.

Western Rajasthan's largest dam, the Jawai Dam, is located near Sumerpur in Pali district on this river only. The twin cities Sumerpur and Sheoganj are also located on the bank of Jawai only.

State Wise Length of Jawai river

a) 123.542 km in Rajasthan

b) 0 km in Gujarat

Total & State wise length of Rann of Kutch,Luni & Jawai River

State	Name of River	Gujarat	Rajasthan	Total
1	Rann of Kutch	410.047	11.202	421.249
2	Luni	0	70.654	70.654
3	Jawai	0	123.542	123.542

1.2 Map of River and Waterway

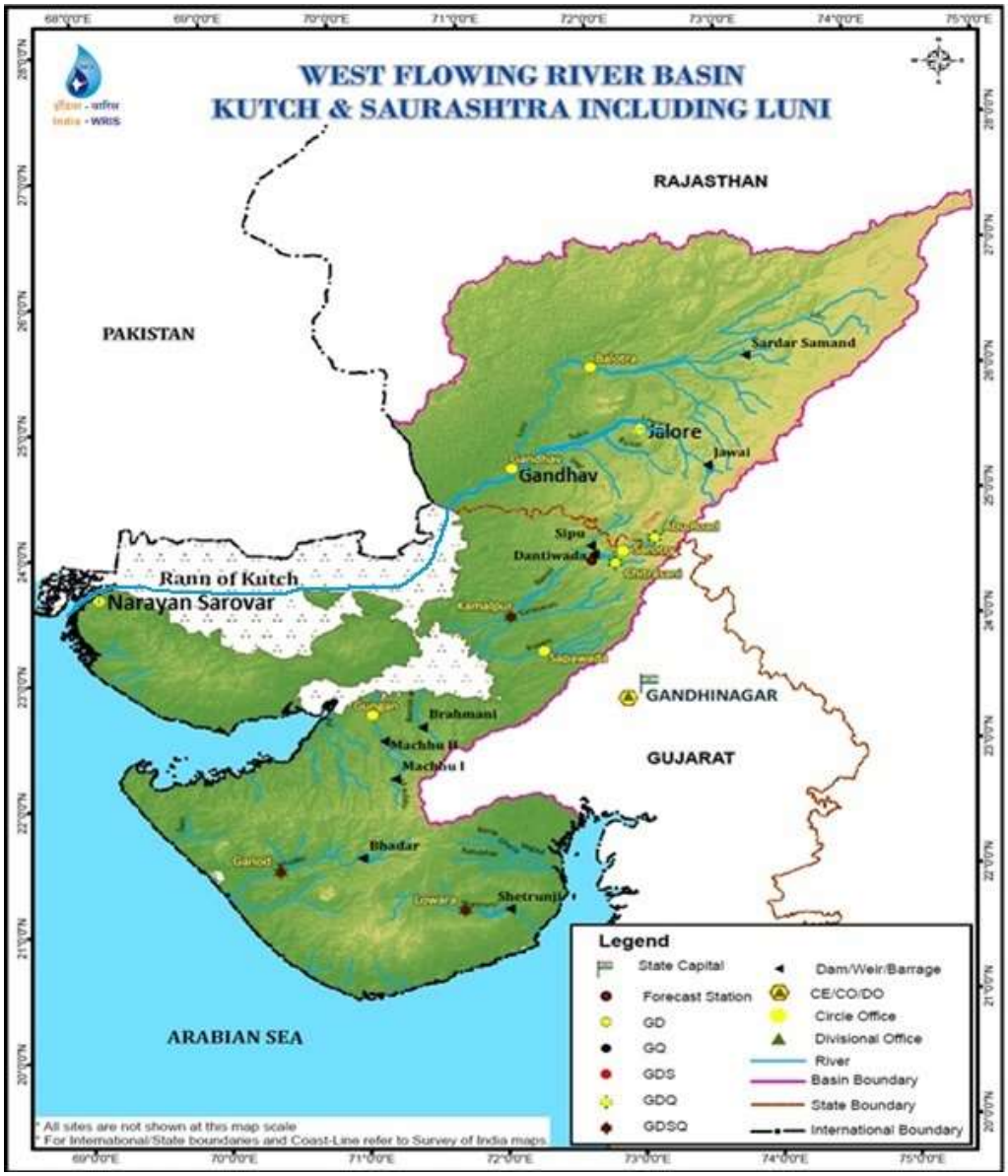


Figure 2 – Map of Rann of Kutch, Luni and Jawai River

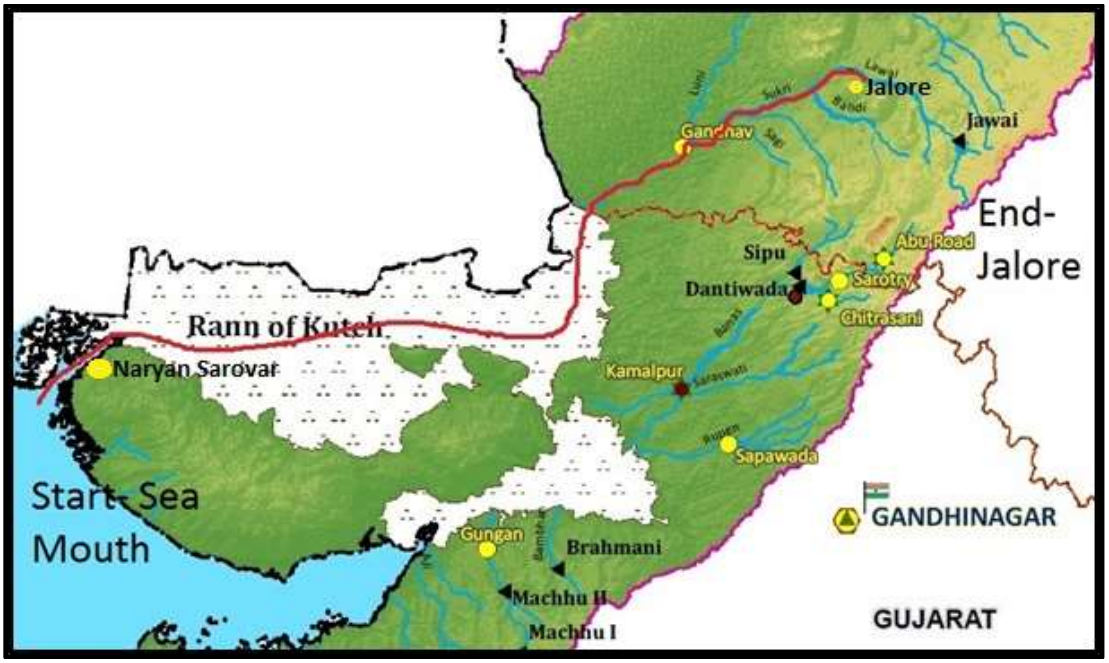


Figure 3 – Map of Waterway in Rann of Kutch, Luni and Jawai River

1.3 Scope of Work

a) Undertake a bathymetric and topographic survey of proposed waterway.

b) Establishing horizontal and vertical control stations.

c) Construction of benchmark pillars and establishing its reduced level w.r.to MSL.

d) Establishment of temporary water level gauges during survey period.

e) Current velocity and discharge measurements.

f) Collection and analysis of water and soil samples.

g) A collection of topographic features including existing cross structures.

h) Preparation of inventory of industries in the project influence area (PIA).

i) Analysis of survey data, including assessment of water availability for navigation.

j) Preparation of survey charts and detailed Hydrographic survey report.

2.0 METHODOLOGY ADOPTED

2.1 Survey Methodology and Resources

Tojo Vikas International Pvt. Ltd conducted a bathymetric & Topographic Survey in stretch of about 491.903 KM (Zone-42 From sea mouth near Narayan Sarovar to Malipura Village) in Rann of Kutch & Luni River and 123.542 km (0 to 39.869km in zone 42 & 39.869 to 123.542km in zone 43, From Gandhav Village to Jalore) in Jawai River. Total length is 615.445 km from Sea Mouth near Narayan Sarovar in Rann of Kutch to Jalore in in Jawai River.

The survey was carried out from 4-Apr-16 to 23-May-16 & 27 Oct. 2017 to 26 Nov 2017

2.2. Survey Methodology

The survey team was mobilized on 1st April 2016 and the survey was commenced on 4th April 2016. The Survey was completed on 27th May 2016. But during that period all work was not completed because of lack of permission so again after receiving permission team was mobilized on 24th Oct 2017 & the balance survey commenced on 27th Oct 2017 & completed on 26th Nov 2017.

The full survey team was utilized for transfer of sounding datum by establishing tide poles at different stretches, tide pole observation and emphasis was given for extension of horizontal and vertical control for the survey stretch of Rann of Kutch, Luni & Jawai River. The details of Horizontal and vertical control adopted for the survey of Rann of Kutch,Luni & Jawai River is placed at Annexure-VII to this report. The survey was undertaken as cross-section line spacing of 500m in Rann of Kutch, 200m in Luni & Jawai River. The Plotting of the chart was done on UTM Projection at Zone 42N & 43N as per specifications.

2.2.1 Topographic Survey

The Topographic survey was carried out from 4th Apr-2016 to 23rd May-2016 & 27th Oct. 2017 to 26th Nov 2017. The weather was sunny throughout the survey period. The survey was undertaken as per approved line plan and the spot level points in the cross line were spaced at 15-20 m interval. The plotting of the chart was done on UTM Projection at Zone 42N & Zone 43N. The spot levels along the river banks were obtained by using Sokkia DGPS.

The topographic survey was conducted to ascertain following in the survey area: -

- Spot levels
- High Bank Line
- Fixing of bridges and marks
- Assess the type of river bank
- Collection of local information along the river Banks

The spot levels along the River were obtained by using RTK and Electronic Total station. Local terrain and limitation of line of sight visibility prohibited the use of optical techniques for obtaining spot levels. GPS control was extended using the co-ordinates and height of the recovered from

Bench Marks (BM), to various BMs in the respective stretches. These BMs were then used as reference stations for deriving the spot levels of the rover locations in the Stop-Go method and Electronic Total Station. The data was post processed using Sokkia Spectrum Survey office software to get the correct position and height values of the rover locations visited during the day. The details of all spot levels are provided in the respective sheets being presented along-with this report. Additionally, a soft copy of the same in XYZ format is being handed over as deliverable data.

Field Problems:

The field work completion took much more time than anticipated due to interruption by security clearance.

2.2.2 Bathymetry Survey

Bathy-500 DF was used to obtain soundings onboard the survey boat. A working frequency of 210 KHz was used for sounding operations. The digital output from the echo sounder was 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.

Sound velocity set on the echo sounder to a range of 1548 m/s. The bar check was done before starting the survey to set the sound velocity. Bar check plate was lowered in water from 1 m, 2m,3m……and so on to maximum depth & observed the depth in Eco Sounder on every meter. If the depth shown in echo sounder does not match with depth at which bar check plate is lowered then it will be corrected with the help of **Sound velocity** adjustment. In this way we fix the sound velocity. The echo sounder transducer was mounted on the side of the boat, in all cases. The DGPS Receiver Antenna was mounted exactly above the transducer without any offset to ensure accuracy in the position of soundings. The bar-checks were carried out before/after each sounding session. On all such occasions the error observed was zero or near zero. Therefore, no corrections were necessary.

The sounding lines were run perpendicular to the orientation of river flow (i.e. perpendicular to the orientation of depth contours) in respective stretches. To check the validity of sounding data logged by normal lines, Cross lines were run on an opportunistic basis wherever feasible.

2.2.3 Equipment

Following Hydrographic and topographic equipment were employed for the Survey of Jhelum River and the photographs of the equipment used for the survey are placed at **Annexure VIII** of this report.

Table 1- Equipment Used

Equipment	Make	Qty. Deployed
Echo Sounder	Bathy 500 DF	1
DGNSS (Attached with Eco Sounder for Position)	C-Nav 1010	1
Tide Gauge	Manual (Pole type)	4
Grab Sampler	Van Veen	1
Bar Check Plate	Manual	1
Current Meter	River flow meter (Roorkee make)	1
DGPS Sets (TS Survey)	Sokkia GRX1	4
Auto Level	Leica	1
Software	HYPACK data acquisition	1
Software	AUTOCAD	1
Software	Microsoft Office	1
Software	Spectrum Survey office v.8	1

2.2.4 Calibration

Echo Sounder – Eco Sounder was calibrated on field every day evening and morning with the help of bar check plate. Bar check plate was lowered in water from 1 m, 2m……and so on to maximum depth. Value of depth in Eco Sounder on every meter was checked and to be corrected with the help of **Sound velocity** adjustment. The same procedure was followed up to maximum depth reaches.

DGPS- DGPS equipment's used for the survey was also calibrated by the equipment supplier. Tojo Vikas International Pvt. Ltd. using Sokkia GRX1. & Trimble

Auto Level- Auto Level equipment used for the survey was also calibrated by the equipment supplier. Tojo Vikas International Pvt. Ltd. using Leica made Current Meter.

No Need of Calibration for other equipment and Software's.

Currently the equipment calibration certificates are placed at **Annexure-12** of this report.

2.3 Description of Bench Marks / Authentic Reference Level used

The reference Bench Mark for Topographic survey and Pillars establishment is based on the information provided by officials of Center Water Commission (CWC) Gandhav. The reference bench mark was installed at Right bank of Luni River near NH 15 by CWC with Lat 24°59' 37.928"N Long 71°40' 50.7814"E and level erected (39.708m from MSL) on Bench Mark provided. New bench Mark Pillars naming as RK 01 to RK 42 in Rann of Kutch, LU 01 to LU 08

in Luni River and JW 01 to JW 14 in Jawai River with IWAI were constructed and erected along the River stretches from Rann of Kutch to Jalore in Jawai River.

MSL was the vertical datum used for deducing the heights for spot levels obtained as part of the topographic survey.

Figure 4 – CWC Bench Mark at Gandhav Village

Description of Bench Mark K1

The reference Bench Mark for Topographic survey and Pillars establishment is based on the information provided in Annexure-I. All the level are transferred from Piller RK 42 to RK 21 from this reference bench mark.

MSL was the vertical datum used for deducing the heights for spot levels obtained as part of the topographic survey.

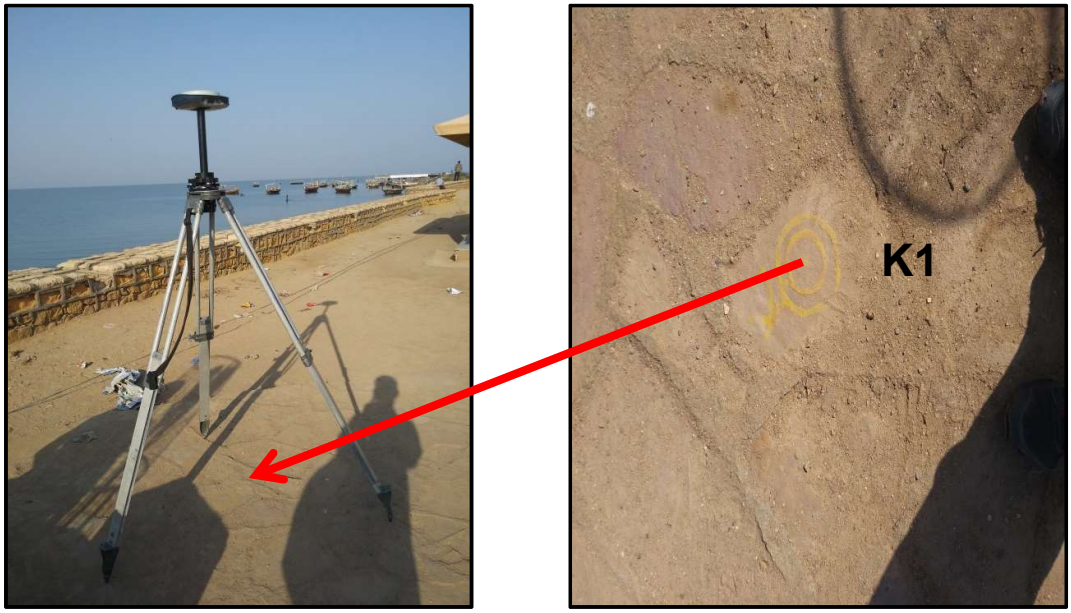


Figure 5 – Reference Bench Mark (K1) at Koteswar Narayan Sarover

2.4 Methodology to fix Chart Datum / Sounding Datum in Tidal and Non-Tidal area

As per discussion with IWAI officials, minimum bottom level has fix as chart Datum/Sounding Datum on each km for Dry River. For tidal area chart datum was fixed by the data provided by BSF(Narayan Sarovar).Details of data provided is in annexure I.

2.5 Yearly minimum and maximum Water Levels

CWC Gauge was present on Luni River near NH-15. All details and photos are in annexure-1.

2.6 Transfer of Sounding Datum for tidal rivers / canals

The tidal stretch of Runn of Kutch is from 0 to 53.0km and in this stretch we are only able to establish a single tide gauge due to security reason from BSF & also because of marshy land it is difficult to establish tide gauge. So same tidal data are used for whole tidal stretch.

2.7 Salient features of Dam, Barrages, Weirs, Anicut, Locks, Aqueducts

No Dam, Barrages, Weirs, Anicut, Locks, Aqueducts was present on site. One damage bund are present on site.

2.8 Description of Bench Marks/ Authentic Reference Level used

The Bench Marks of the survey area for Topographic survey is based on the datum level erected on Bench Mark of CWC Gandhav. New bench Mark Pillars were constructed along the River stretches at every 10 km interval. The value on Bench Mark of CWC Gandhav was used to transfer of datum (MSL) to the new constructed BMs. The final co-ordinates of these Bench Marks are shown in **Table -2.**

Table 2 - Final BM Coordinates in Rann of Kutch

BM No.	Location	Chainage (KM)	Latitude (N)	Longitude (E)	Easting (m)	Northing (m)	Height above MSL (m)	Sounding Datum SD (m) w.r.t.MSL	Height w.r.t. SD (m)
RK-42	Pipar	7.9	23°32'58.79"	68°31'21.24"	451272.040	2604450.800	27.471	-4.161	31.632
RK-41	Narayan Sarovar	21.8	23°39'27.47"	68°33'23.89"	454786.190	2616392.540	8.919	-2.746	11.665
RK-40	Kanoj	27.22	23°41'08.98"	68°31'21.24"	458395.520	2619503.530	16.184	-2.194	18.378
RK-39	Koriyani	34.3	23°42'44.64"	68°39'00.05"	464323.840	2622429.720	11.747	-1.473	13.22
RK-38	Chher nani	39.3	23°46'28.15"	68°39'46.34"	465650.980	2629300.220	8.693	-0.964	9.657
RK-37	Lakhpat	53	23°48'59.25"	68°45'49.00"	475922.830	2633926.280	17.901	0.427	17.474
RK-36	Lakhpat Siyot Road	59.5	23°48'41.83"	68°49'17.47"	481820.320	2633382.050	9.824	0.424	9.4
RK-35	Sayra yax	64.2	23°46'57.67"	68°52'47.39"	487757.010	2630172.630	22.668	0.479	22.189
RK-34	Mudhan	70.53	23°46'05.78"	68°56'40.33"	494348.690	2628572.770	17.605	0.504	17.101
RK-33	Jara	75	23°43'48.47"	69°01'31.00"	502576.470	2624349.180	5.77	0.548	5.222
RK-32	Hajipir	94.8	23°39'28.68"	69°10'43.10"	518217.380	2616370.990	3.9	0.625	3.275
RK-31	Luna	105.4	23°43'52.32"	69°16'15.60"	527620.980	2624493.640	3.091	0.663	2.428
RK-30	Udhmo	133.4	23°47'25.20"	69°26'15.30"	544579.290	2631082.560	4.592	0.691	3.901
RK-29	Dhordo	136.5	23°48'20.74"	69°31'10.11"	552916.100	2632818.710	5.302	0.693	4.609
RK-28	Near gorewali	146.4	23°47'22.54"	69°36'33.62"	562077.700	2631065.490	4.894	0.696	4.198
RK-27	Ludiya	149.3	23°48'47.38"	69°43'47.72"	562077.700	2631065.490	4.894	0.697	4.197
RK-26	Dinara	153	23°52'38.41"	69°42'38.19"	572346.340	2640827.760	14.832	0.698	14.134
RK-25	Dhrobana	169.8	23°57'30.92"	69°43'56.69"	574519.800	2649835.440	6.335	0.702	5.633
RK-24	Near kuran	175.8	23°58'46.15"	69°46'37.05"	579039.660	2652173.340	6.021	0.704	5.317
RK-23	Near kuran	177.6	23°58'21.43"	69°47'18.73"	580221.600	2651419.620	17.583	0.705	16.878
RK-22	Near kuran	178.5	23°55'18.99"	69°47'08.73"	579970.240	2645807.070	191.92	0.705	191.215
RK-21	Aadhav	196.23	23°48'36.22"	69°56'00.18"	595077.210	2633510.590	6.425	0.733	5.692
RK-20	Near dholavira	218.4	23°55'43.40"	70°10'44.49"	619991.610	2646835.940	14.073	0.769	13.304
RK-19	Dholavira	227	23°52'24.15"	70°13'40.44"	625019.560	2640749.980	28.543	0.78	27.763
RK-18	Janan	231.7	23°49'50.28"	70°18'42.63"	633610.890	2636093.860	18.79	0.781	18.009
RK-17	Gadhada	244	23°52'49.88"	70°23'38.29"	641922.450	2641697.860	35.738	0.787	34.951
RK-16	Amarapar	249.5	23°54'21.59"	70°27'32.43"	648515.990	2644585.760	7.987	0.789	7.198
RK-15	Versar	263.8	23°53'47.77"	70°36'21.60"	663492.740	2643707.560	27.046	0.808	26.238
RK-14	Balasar	271.8	23°51'13.95"	70°39'40.02"	669160.390	2639040.500	29.907	0.818	29.089
RK-13	Dhabda	285	23°51'57.62"	70°46'38.85"	680993.750	2640526.910	35.8	0.836	34.964
RK-12	Near mouvana	297.3	23°49' 54.55"	70°52' 51.89"	691598.080	2636878.170	36.726	0.87	35.856
RK-11	Jakhotra	310.2	23°51' 39.74"	71°4' 20.61"	711042.220	2640386.280	4.694	1.328	3.366
RK-10	Near avaal	321.4	23°54' 34.50"	71°8' 37.67"	718234.440	2645871.650	10.26	1.525	8.735
RK-09	Fangli	328.4	23°53' 58.68"	71°14' 41.98"	728557.370	2644929.380	11.06	2.284	8.776
RK-08	Dudosan	338.2	23°59' 29.21"	71°20' 18.59"	737911.440	2655254.500	8.51	2.984	5.526
RK-07	Near masali	346.4	24°5'17.34"	71°20'3.44"	737305.340	2665959.920	12.72	3.14	9.58
RK-06	Bharadava	357.6	24°12' 18.20"	71°21' 3.29"	738778.500	2678938.740	9.26	3.362	5.898
RK-05	Padan	372.7	24°17' 29.13"	71°19' 6.22"	735315.380	2688451.190	8.66	3.442	5.218
RK-04	Near lodrani	378.9	24°24' 6.95"	71°21' 44.54"	739572.510	2700768.290	10.91	3.501	7.409
RK-03	Chandangadh	392.4	24°30'31.22"	71°22'12.58"	740160.060	2712607.140	10.51	3.783	6.727
RK-02	Radha nesda	398.4	24°32' 10.16"	71°16' 4.05"	729733.420	2715477.470	8.237	4.171	4.066
RK-01	Near mavsari	410.4	24°35' 18.83"	71°21' 24.87"	738665.330	2721434.880	14.635	5.63	9.005

Table 3 – Final BM Coordinates in Luni River

BM No.	Location	Chainage (KM)	Latitude (N)	Longitude (E)	Easting (m)	Northing (m)	Height above MSL (m)	Sounding Datum SD (m)	Height w.r.t. SD (m)
LU-08	Mdr-17	420	24°42'14.88"	71°13'41.28"	725413.140	2734019.910	8.374	4.959	3.415
LU-07	Near Khedriyadi	432.3	24°45'36.39"	71°18'47.61"	733919.640	2740363.890	10.841	7.859	2.982
LU-06	Opp Mailabas Charnan	439.8	24°46'39.81"	71°21'36.45"	738630.340	2742396.520	14.176	4.732	9.444
LU-05	Near Suthdi	451.9	24°47' 1.35"	71°24'35.21"	743641.210	2743147.350	17.353	11.157	6.196
LU-04	Near Pawta	461.4	24°49' 0.19"	71°27'41.99"	748822.970	2746898.220	20.042	16.04	4.002
LU-03	Opp Doothwa	472.5	24°53' 0.75"	71°30'57.91"	754189.490	2754402.180	32.321	18.712	13.609
LU-02	Near Rampura	482.2	24°54'24.10"	71°33'58.99"	759224.860	2757062.480	27.107	23.756	3.351
LU-01	Near Malipura	492.4	24°56'48.08"	71°38'19.42"	766449.230	2761634.060	33.112	26.147	6.965
CWC-BM	Gandhav Village	Out of survey area	24°59' 37.928"	71°40'50.7814"	770593.328	2766944.848	39.708	-	-

Table 4 – Final BM Coordinates in Jawai River

BM No.	Location	Chainage (KM)	Latitude (N)	Longitude (E)	Easting (m)	Northing (m)	Height above MSL (m)	Sounding Datum SD (m)	Height w.r.t. SD (m)
JW-01	Medawa	1.160	25°1' 20.06"	71°43'46.70"	775464.960	2770187.240	36.097	32.659	3.438
JW-02	Bhadoo and Goyton ki Dha	7.158	25°0' 27.61"	71°47'12.92"	781282.060	2768690.500	41.753	36.761	4.992
JW-03	Ankhol	15.916	25°3' 26.36"	71°51'48.96"	788908.500	2774354.500	47.185	43.075	4.11
JW-04	Juni Bali	23.092	25°6' 44.72"	71°53'58.51"	792410.000	2780538.390	52.522	46.664	5.858
JW-05	Lakhani	33.195	25°9' 48.48"	71°56'43.28"	796904.750	2786295.220	62.174	57.263	4.911
JW-06	Near khari Road Bhinmal	42.250	25°10'58.71"	72°1' 17.28"	199797.042	2788530.945	70.315	66.853	3.462
JW-07	Near Punawas	56.108	25°14'24.69"	72°7' 41.58"	210697.627	2794637.643	85.204	82.396	2.808
JW-08	Posana	65.897	25°15' 3.53"	72°14' 4.23"	221435.462	2795608.462	97.483	92.299	5.184
JW-09	Near Aasana	73.936	25°16'51.52"	72°18' 7.69"	228317.665	2798793.610	106.873	100.47	6.403
JW-10	Near Sayala	85.413	25°20'16.26"	72°22'29.00"	235754.110	2804950.504	119.378	111.428	7.95
JW-11	Near Sayala Road	93.922	25°21'55.08"	72°27'57.87"	245010.739	2807814.531	126.836	120.69	6.146
JW-12	Near Sayala Road	104.321	25°23'23.21"	72°31' 31.45"	251033.625	2810415.150	140.227	133.995	6.232
JW-13	Near Sayala Road & Sh-38	111.309	25°22'39.70"	72°35'32.32"	257743.554	2808955.427	150.128	143.42	6.708
JW-14	Near Leta	123.542	25°20' 6.04"	72°41' 0.15"	266827.412	2804061.921	168.587	162.644	5.943

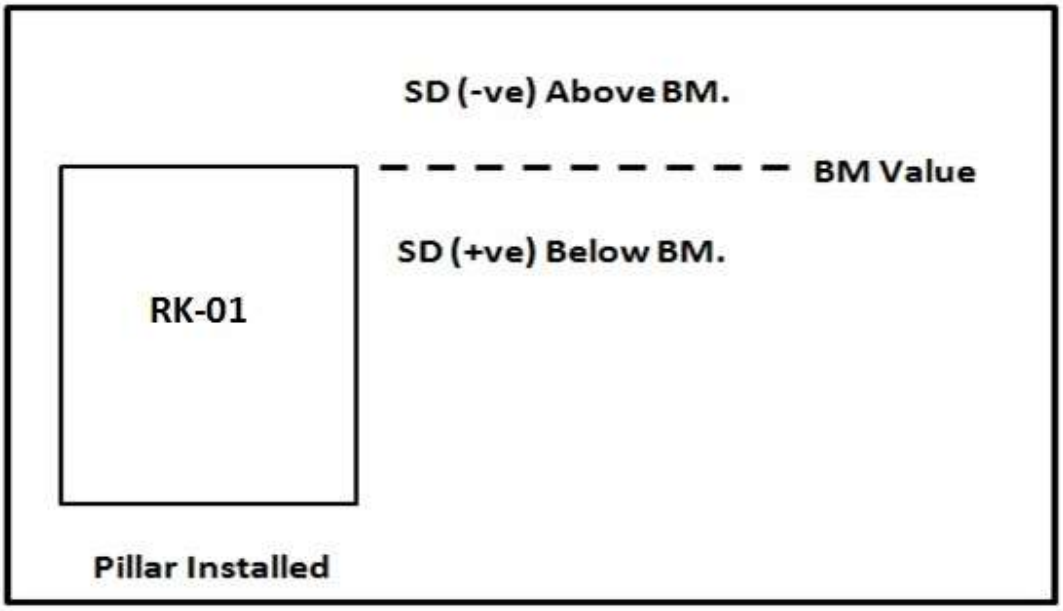


Figure 6 – Height Bench Mark (BM) w.r.t Sounding Datum (SD)

Note: - Height of Bench Mark (BM) w.r.t. sounding Datum (SD) indicates

A) Positive value indicates that BM value below SD value

B) Negative value indicates that BM value above SD Value

Station description of all bench marks in Rann of Kutch, Luni and Jawai River is placed at **Annexure- 09** of this report.

MSL was the vertical datum used for deducing the heights for spot levels obtained as part of the topographic survey.

2.9 Description of erected Tide Gauges

The wooden Tide pole was erected at Narayan Sarovar CH-22.35 on the survey stretch of Runn Of Kutch. The tide poles were erected near to BSF Bench Mark(Narayan Sarovar).The details of erected tide poles which are used for the reduction of soundings are as follows:-

Tide gauge No.	Location	Chainage (km)	Easting (m)	Northing (m)	Zero of Tide Gauge	Period of Observation
TP-1	Narayan Sarovar	22.35	451560.938	2619972.050	-2.403	27 Oct.to 11 Nov.2017

2.10 Chart Datum / Sounding Datum and Reductions Details

As per discussion with IWAI officials, in dry area from CH-53km to 491.903km in Rann of kutch & Luni & CH-0 to 123.542km in Jawai bottom level is assumed as Sounding Datum (SD) at each km of survey area .From CH-0 to 53km in Rann of kutch there is tidal stretch & we got the sounding datum from BSF (Narayan Sarovar) which is mentioned in annexure-I. By using gradient method Sounding Datum(SD) value is established from 0 to 53km stretch.

Table 5 – Chart Datum / Sounding Datum

S. No.	CWC Gauge / Dam / Barrage / Weir / Anicut / Bench Mark / Tide Gauge	Chainage (Km)	Stretch for Corrected Soundings and Topo levels (Km) C		Established Sounding Datum w.r.t. MSL (m)	Sounding Datum (m) from MSL	Correction in WL Data for Bathymetric Survey (m)	Topo Level Data to be converted as depth for volume calculation wrt SD (m)
	A	B	From	To	D	E	F= (E-WL Data in MSL)	G = (E-topo Levels in MSL)
Rann of Kutch & Luni River							Annexure III	A Separate xyz file is created
1		0	0.00	0.50		-4.965		
2		1	0.50	1.50		-4.863		
3		2	1.50	2.50		-4.762		
4		3	2.50	3.50		-4.660		
5		4	3.50	4.50		-4.558		
6		5	4.50	5.50		-4.456		
7		6	5.50	6.50		-4.355		
8		7	6.50	7.50		-4.253		
9		8	7.50	8.50		-4.151		
10		9	8.50	9.50		-4.049		
11		10	9.50	10.50		-3.948		
12		11	10.50	11.50		-3.846		
13		12	11.50	12.50		-3.744		
14		13	12.50	13.50		-3.642		
15		14	13.50	14.50		-3.541		
16		15	14.50	15.50		-3.439		
17		16	15.50	16.50		-3.337		
18		17	16.50	17.50		-3.235		
19		18	17.50	18.50		-3.134		
20		19	18.50	19.50		-3.032		
21		20	19.50	20.50		-2.930		
22		21	20.50	21.50		-2.828		
23		22	21.50	22.50		-2.727		
24		23	22.50	23.50		-2.625		
25		24	23.50	24.50		-2.523		
26		25	24.50	25.50		-2.421		
27		26	25.50	26.50		-2.320		
28		27	26.50	27.50		-2.218		
29		28	27.50	28.50		-2.116		
30		29	28.50	29.50		-2.014		
31		30	29.50	30.50		-1.913		
32		31	30.50	31.50		-1.811		
33		32	31.50	32.50		-1.709		
34		33	32.50	33.50		-1.607		
35		34	33.50	34.50		-1.506		
36		35	34.50	35.50		-1.404		

S. No.	CWC Gauge / Dam / Barrage / Weir / Anicut / Bench Mark / Tide Gauge	Chainage (Km)	Stretch for Corrected Soundings and Topo levels (Km) C		Established Sounding Datum w.r.t. MSL (m)	Sounding Datum (m) from MSL	Correction in WL Data for Bathymetric Survey (m)	Topo Level Data to be converted as depth for volume calculation wrt SD (m)
	A	B	From	To	D	E	F= (E-WL Data in MSL)	G = (E-topo Levels in MSL)
37		36	35.50	36.50		-1.302		
38		37	36.50	37.50		-1.200		
39		38	37.50	38.50		-1.099		
40		39	38.50	39.50		-0.997		
41		40	39.50	40.50		-0.895		
42		41	40.50	41.50		-0.793		
43		42	41.50	42.50		-0.691		
44		43	42.50	43.50		-0.590		
45		44	43.50	44.50		-0.488		
46		45	44.50	45.50		-0.386		
47		46	45.50	46.50		-0.284		
48		47	46.50	47.50		-0.183		
49		48	47.50	48.50		-0.081		
50		49	48.50	49.50		0.021		
51		50	49.50	50.50		0.123		
52		51	50.50	51.50		0.224		
53		52	51.50	52.50		0.326		
54		53	52.50	53.50		0.38		
55		54	53.50	54.50		0.386		
56		55	54.50	55.50		0.389		
57		56	55.50	56.50		0.394		
58		57	56.50	57.50		0.411		
59		58	57.50	58.50		0.411		
60		59	58.50	59.50		0.412		
61		60	59.50	60.50		0.424		
62		61	60.50	61.50		0.427		
63		62	61.50	62.50		0.431		
64		63	62.50	63.50		0.464		
65		64	63.50	64.50		0.478		
66		65	64.50	65.50		0.479		
67		66	65.50	66.50		0.485		
68		67	66.50	67.50		0.496		
69		68	67.50	68.50		0.497		
70		69	68.50	69.50		0.499		
71		70	69.50	70.50		0.502		
72		71	70.50	71.50		0.504		
73		72	71.50	72.50		0.506		
74		73	72.50	73.50		0.514		
75		74	73.50	74.50		0.522		

S. No.	CWC Gauge / Dam / Barrage / Weir / Anicut / Bench Mark / Tide Gauge	Chainage (Km)	Stretch for Corrected Soundings and Topo levels (Km) C		Established Sounding Datum w.r.t. MSL (m)	Sounding Datum (m) from MSL	Correction in WL Data for Bathymetric Survey (m)	Topo Level Data to be converted as depth for volume calculation wrt SD (m)
	A	B	From	To	D	E	F= (E-WL Data in MSL)	G = (E-topo Levels in MSL)
76		75	74.50	75.50		0.535		
77		76	75.50	76.50		0.548		
78		77	76.50	77.50		0.552		
79		78	77.50	78.50		0.555		
80		79	78.50	79.50		0.563		
81		80	79.50	80.50		0.567		
82		81	80.50	81.50		0.571		
83		82	81.50	82.50		0.573		
84		83	82.50	83.50		0.587		
85		84	83.50	84.50		0.589		
86		85	84.50	85.50		0.590		
87		86	85.50	86.50		0.596		
88		87	86.50	87.50		0.599		
89		88	87.50	88.50		0.602		
90		89	88.50	89.50		0.606		
91		90	89.50	90.50		0.608		
92		91	90.50	91.50		0.611		
93		92	91.50	92.50		0.615		
94		93	92.50	93.50		0.620		
95		94	93.50	94.50		0.623		
96		95	94.50	95.50		0.625		
97		96	95.50	96.50		0.627		
98		97	96.50	97.50		0.631		
99		98	97.50	98.50		0.636		
100		99	98.50	99.50		0.654		
101		100	99.50	100.50		0.655		
102		101	100.50	101.50		0.658		
103		102	101.50	102.50		0.659		
104		103	102.50	103.50		0.660		
105		104	103.50	104.50		0.662		
106		105	104.50	105.50		0.662		
107		106	105.50	106.50		0.663		
108		107	106.50	107.50		0.663		
109		108	107.50	108.50		0.665		
110		109	108.50	109.50		0.665		
111		110	109.50	110.50		0.669		
112		111	110.50	111.50		0.669		
113		112	111.50	112.50		0.670		
114		113	112.50	113.50		0.670		

S. No.	CWC Gauge / Dam / Barrage / Weir / Anicut / Bench Mark / Tide Gauge	Chainage (Km)	Stretch for Corrected Soundings and Topo levels (Km) C		Established Sounding Datum w.r.t. MSL (m)	Sounding Datum (m) from MSL	Correction in WL Data for Bathymetric Survey (m)	Topo Level Data to be converted as depth for volume calculation wrt SD (m)
	A	B	From	To	D	E	F= (E-WL Data in MSL)	G = (E-topo Levels in MSL)
115		114	113.50	114.50		0.671		
116		115	114.50	115.50		0.671		
117		116	115.50	116.50		0.673		
118		117	116.50	117.50		0.674		
119		118	117.50	118.50		0.674		
120		119	118.50	119.50		0.675		
121		120	119.50	120.50		0.676		
122		121	120.50	121.50		0.677		
123		122	121.50	122.50		0.678		
124		123	122.50	123.50		0.679		
125		124	123.50	124.50		0.680		
126		125	124.50	125.50		0.682		
127		126	125.50	126.50		0.683		
128		127	126.50	127.50		0.684		
129		128	127.50	128.50		0.685		
130		129	128.50	129.50		0.686		
131		130	129.50	130.50		0.687		
132		131	130.50	131.50		0.688		
133		132	131.50	132.50		0.689		
134		133	132.50	133.50		0.690		
135		134	133.50	134.50		0.691		
136		135	134.50	135.50		0.692		
137		136	135.50	136.50		0.692		
138		137	136.50	137.50		0.693		
139		138	137.50	138.50		0.693		
140		139	138.50	139.50		0.694		
141		140	139.50	140.50		0.694		
142		141	140.50	141.50		0.694		
143		142	141.50	142.50		0.695		
144		143	142.50	143.50		0.695		
145		144	143.50	144.50		0.695		
146		145	144.50	145.50		0.695		
147		146	145.50	146.50		0.696		
148		147	146.50	147.50		0.696		
149		148	147.50	148.50		0.696		
150		149	148.50	149.50		0.697		
151		150	149.50	150.50		0.697		
152		151	150.50	151.50		0.697		
153		152	151.50	152.50		0.697		

S. No.	CWC Gauge / Dam / Barrage / Weir / Anicut / Bench Mark / Tide Gauge	Chainage (Km)	Stretch for Corrected Soundings and Topo levels (Km) C		Established Sounding Datum w.r.t. MSL (m)	Sounding Datum (m) from MSL	Correction in WL Data for Bathymetric Survey (m)	Topo Level Data to be converted as depth for volume calculation wrt SD (m)
	A	B	From	To	D	E	F= (E-WL Data in MSL)	G = (E-topo Levels in MSL)
154		153	152.50	153.50		0.697		
155		154	153.50	154.50		0.698		
156		155	154.50	155.50		0.698		
157		156	155.50	156.50		0.698		
158		157	156.50	157.50		0.699		
159		158	157.50	158.50		0.699		
160		159	158.50	159.50		0.699		
161		160	159.50	160.50		0.700		
162		161	160.50	161.50		0.700		
163		162	161.50	162.50		0.700		
164		163	162.50	163.50		0.700		
165		164	163.50	164.50		0.701		
166		165	164.50	165.50		0.701		
167		166	165.50	166.50		0.701		
168		167	166.50	167.50		0.701		
169		168	167.50	168.50		0.701		
170		169	168.50	169.50		0.702		
171		170	169.50	170.50		0.702		
172		171	170.50	171.50		0.702		
173		172	171.50	172.50		0.703		
174		173	172.50	173.50		0.703		
175		174	173.50	174.50		0.703		
176		175	174.50	175.50		0.703		
177		176	175.50	176.50		0.704		
178		177	176.50	177.50		0.704		
179		178	177.50	178.50		0.705		
180		179	178.50	179.50		0.705		
181		180	179.50	180.50		0.705		
182		181	180.50	181.50		0.705		
183		182	181.50	182.50		0.706		
184		183	182.50	183.50		0.706		
185		184	183.50	184.50		0.706		
186		185	184.50	185.50		0.706		
187		186	185.50	186.50		0.708		
188		187	186.50	187.50		0.709		
189		188	187.50	188.50		0.710		
190		189	188.50	189.50		0.710		
191		190	189.50	190.50		0.711		
192		191	190.50	191.50		0.712		

S. No.	CWC Gauge / Dam / Barrage / Weir / Anicut / Bench Mark / Tide Gauge	Chainage (Km)	Stretch for Corrected Soundings and Topo levels (Km) C		Established Sounding Datum w.r.t. MSL (m)	Sounding Datum (m) from MSL	Correction in WL Data for Bathymetric Survey (m)	Topo Level Data to be converted as depth for volume calculation wrt SD (m)
	A	B	From	To	D	E	F= (E-WL Data in MSL)	G = (E-topo Levels in MSL)
193		192	191.50	192.50		0.712		
194		193	192.50	193.50		0.714		
195		194	193.50	194.50		0.714		
196		195	194.50	195.50		0.716		
197		196	195.50	196.50		0.718		
198		197	196.50	197.50		0.733		
199		198	197.50	198.50		0.728		
200		199	198.50	199.50		0.744		
201		200	199.50	200.50		0.749		
202		201	200.50	201.50		0.752		
203		202	201.50	202.50		0.753		
204		203	202.50	203.50		0.753		
205		204	203.50	204.50		0.754		
206		205	204.50	205.50		0.754		
207		206	205.50	206.50		0.756		
208		207	206.50	207.50		0.757		
209		208	207.50	208.50		0.761		
210		209	208.50	209.50		0.762		
211		210	209.50	210.50		0.763		
212		211	210.50	211.50		0.764		
213		212	211.50	212.50		0.762		
214		213	212.50	213.50		0.764		
215		214	213.50	214.50		0.765		
216		215	214.50	215.50		0.765		
217		216	215.50	216.50		0.767		
218		217	216.50	217.50		0.767		
219		218	217.50	218.50		0.768		
220		219	218.50	219.50		0.769		
221		220	219.50	220.50		0.774		
222		221	220.50	221.50		0.775		
223		222	221.50	222.50		0.775		
224		223	222.50	223.50		0.776		
225		224	223.50	224.50		0.778		
226		225	224.50	225.50		0.778		
227		226	225.50	226.50		0.779		
228		227	226.50	227.50		0.779		
229		228	227.50	228.50		0.780		
230		229	228.50	229.50		0.781		
231		230	229.50	230.50		0.781		

S. No.	CWC Gauge / Dam / Barrage / Weir / Anicut / Bench Mark / Tide Gauge	Chainage (Km)	Stretch for Corrected Soundings and Topo levels (Km) C		Established Sounding Datum w.r.t. MSL (m)	Sounding Datum (m) from MSL	Correction in WL Data for Bathymetric Survey (m)	Topo Level Data to be converted as depth for volume calculation wrt SD (m)
	A	B	From	To	D	E	F= (E-WL Data in MSL)	G = (E-topo Levels in MSL)
232		231	230.50	231.50		0.781		
233		232	231.50	232.50		0.781		
234		233	232.50	233.50		0.782		
235		234	233.50	234.50		0.782		
236		235	234.50	235.50		0.782		
237		236	235.50	236.50		0.783		
238		237	236.50	237.50		0.783		
239		238	237.50	238.50		0.783		
240		239	238.50	239.50		0.784		
241		240	239.50	240.50		0.784		
242		241	240.50	241.50		0.784		
243		242	241.50	242.50		0.784		
244		243	242.50	243.50		0.786		
245		244	243.50	244.50		0.787		
246		245	244.50	245.50		0.787		
247		246	245.50	246.50		0.787		
248		247	246.50	247.50		0.788		
249		248	247.50	248.50		0.788		
250		249	248.50	249.50		0.789		
251		250	249.50	250.50		0.789		
252		251	250.50	251.50		0.792		
253		252	251.50	252.50		0.793		
254		253	252.50	253.50		0.797		
255		254	253.50	254.50		0.804		
256		255	254.50	255.50		0.804		
257		256	255.50	256.50		0.805		
258		257	256.50	257.50		0.805		
259		258	257.50	258.50		0.806		
260		259	258.50	259.50		0.806		
261		260	259.50	260.50		0.806		
262		261	260.50	261.50		0.806		
263		262	261.50	262.50		0.806		
264		263	262.50	263.50		0.806		
265		264	263.50	264.50		0.808		
266		265	264.50	265.50		0.808		
267		266	265.50	266.50		0.812		
268		267	266.50	267.50		0.814		
269		268	267.50	268.50		0.814		
270		269	268.50	269.50		0.815		

S. No.	CWC Gauge / Dam / Barrage / Weir / Anicut / Bench Mark / Tide Gauge	Chainage (Km)	Stretch for Corrected Soundings and Topo levels (Km) C		Established Sounding Datum w.r.t. MSL (m)	Sounding Datum (m) from MSL	Correction in WL Data for Bathymetric Survey (m)	Topo Level Data to be converted as depth for volume calculation wrt SD (m)
	A	B	From	To	D	E	F= (E-WL Data in MSL)	G = (E-topo Levels in MSL)
271		270	269.50	270.50		0.816		
272		271	270.50	271.50		0.819		
273		272	271.50	272.50		0.818		
274		273	272.50	273.50		0.821		
275		274	273.50	274.50		0.821		
276		275	274.50	275.50		0.823		
277		276	275.50	276.50		0.823		
278		277	276.50	277.50		0.826		
279		278	277.50	278.50		0.826		
280		279	278.50	279.50		0.830		
281		280	279.50	280.50		0.830		
282		281	280.50	281.50		0.830		
283		282	281.50	282.50		0.831		
284		283	282.50	283.50		0.832		
285		284	283.50	284.50		0.834		
286		285	284.50	285.50		0.834		
287		286	285.50	286.50		0.836		
288		287	286.50	287.50		0.836		
289		288	287.50	288.50		0.838		
290		289	288.50	289.50		0.838		
291		290	289.50	290.50		0.840		
292		291	290.50	291.50		0.840		
293		292	291.50	292.50		0.843		
294		293	292.50	293.50		0.848		
295		294	293.50	294.50		0.849		
296		295	294.50	295.50		0.849		
297		296	295.50	296.50		0.863		
298		297	296.50	297.50		0.863		
299		298	297.50	298.50		0.870		
300		299	298.50	299.50		0.939		
301		300	299.50	300.50		0.941		
302		301	300.50	301.50		0.943		
303		302	301.50	302.50		0.949		
304		303	302.50	303.50		0.949		
305		304	303.50	304.50		0.951		
306		305	304.50	305.50		0.957		
307		306	305.50	306.50		0.961		
308		307	306.50	307.50		1.161		
309		308	307.50	308.50		1.207		

S. No.	CWC Gauge / Dam / Barrage / Weir / Anicut / Bench Mark / Tide Gauge	Chainage (Km)	Stretch for Corrected Soundings and Topo levels (Km) C		Established Sounding Datum w.r.t. MSL (m)	Sounding Datum (m) from MSL	Correction in WL Data for Bathymetric Survey (m)	Topo Level Data to be converted as depth for volume calculation wrt SD (m)
	A	B	From	To	D	E	F= (E-WL Data in MSL)	G = (E-topo Levels in MSL)
310		309	308.50	309.50		1.276		
311		310	309.50	310.50		1.313		
312		311	310.50	311.50		1.328		
313		312	311.50	312.50		1.334		
314		313	312.50	313.50		1.340		
315		314	313.50	314.50		1.349		
316		315	314.50	315.50		1.358		
317		316	315.50	316.50		1.379		
318		317	316.50	317.50		1.393		
319		318	317.50	318.50		1.396		
320		319	318.50	319.50		1.397		
321		320	319.50	320.50		1.398		
322		321	320.50	321.50		1.461		
323		322	321.50	322.50		1.525		
324		323	322.50	323.50		1.559		
325		324	323.50	324.50		1.593		
326		325	324.50	325.50		1.703		
327		326	325.50	326.50		1.818		
328		327	326.50	327.50		1.932		
329		328	327.50	328.50		1.996		
330		329	328.50	329.50		2.284		
331		330	329.50	330.50		2.414		
332		331	330.50	331.50		2.502		
333		332	331.50	332.50		2.557		
334		333	332.50	333.50		2.563		
335		334	333.50	334.50		2.578		
336		335	334.50	335.50		2.583		
337		336	335.50	336.50		2.591		
338		337	336.50	337.50		2.693		
339		338	337.50	338.50		2.964		
340		339	338.50	339.50		2.984		
341		340	339.50	340.50		2.99		
342		341	340.50	341.50		2.99		
343		342	341.50	342.50		3.03		
344		343	342.50	343.50		3.03		
345		344	343.50	344.50		3.05		
346		345	344.50	345.50		3.102		
347		346	345.50	346.50		3.14		
348		347	346.50	347.50		3.14		

S. No.	CWC Gauge / Dam / Barrage / Weir / Anicut / Bench Mark / Tide Gauge	Chainage (Km)	Stretch for Corrected Soundings and Topo levels (Km) C		Established Sounding Datum w.r.t. MSL (m)	Sounding Datum (m) from MSL	Correction in WL Data for Bathymetric Survey (m)	Topo Level Data to be converted as depth for volume calculation wrt SD (m)
	A	B	From	To	D	E	F= (E-WL Data in MSL)	G = (E-topo Levels in MSL)
349		348	347.50	348.50		3.15		
350		349	348.50	349.50		3.2		
351		350	349.50	350.50		3.272		
352		351	350.50	351.50		3.286		
353		352	351.50	352.50		3.289		
354		353	352.50	353.50		3.346		
355		354	353.50	354.50		3.346		
356		355	354.50	355.50		3.346		
357		356	355.50	356.50		3.352		
358		357	356.50	357.50		3.362		
359		358	357.50	358.50		3.362		
360		359	358.50	359.50		3.376		
361		360	359.50	360.50		3.38		
362		361	360.50	361.50		3.387		
363		362	361.50	362.50		3.382		
364		363	362.50	363.50		3.396		
365		364	363.50	364.50		3.407		
366		365	364.50	365.50		3.408		
367		366	365.50	366.50		3.412		
368		367	366.50	367.50		3.429		
369		368	367.50	368.50		3.421		
370		369	368.50	369.50		3.433		
371		370	369.50	370.50		3.434		
372		371	370.50	371.50		3.436		
373		372	371.50	372.50		3.441		
374		373	372.50	373.50		3.442		
375		374	373.50	374.50		3.45		
376		375	374.50	375.50		3.461		
377		376	375.50	376.50		3.472		
378		377	376.50	377.50		3.481		
379		378	377.50	378.50		3.495		
380		379	378.50	379.50		3.501		
381		380	379.50	380.50		3.518		
382		381	380.50	381.50		3.524		
383		382	381.50	382.50		3.532		
384		383	382.50	383.50		3.536		
385		384	383.50	384.50		3.545		
386		385	384.50	385.50		3.544		
387		386	385.50	386.50		3.546		

S. No.	CWC Gauge / Dam / Barrage / Weir / Anicut / Bench Mark / Tide Gauge	Chainage (Km)	Stretch for Corrected Soundings and Topo levels (Km) C		Established Sounding Datum w.r.t. MSL (m)	Sounding Datum (m) from MSL	Correction in WL Data for Bathymetric Survey (m)	Topo Level Data to be converted as depth for volume calculation wrt SD (m)
	A	B	From	To	D	E	F= (E-WL Data in MSL)	G = (E-topo Levels in MSL)
388		387	386.50	387.50		3.548		
389		388	387.50	388.50		3.551		
390		389	388.50	389.50		3.554		
391		390	389.50	390.50		3.558		
392		391	390.50	391.50		3.584		
393		392	391.50	392.50		3.636		
394		393	392.50	393.50		3.783		
395		394	393.50	394.50		3.824		
396		395	394.50	395.50		3.886		
397		396	395.50	396.50		3.959		
398		397	396.50	397.50		4.037		
399		398	397.50	398.50		4.108		
400		399	398.50	399.50		4.171		
401		400	399.50	400.50		4.181		
402		401	400.50	401.50		4.183		
403		402	401.50	402.50		4.194		
404		403	402.50	403.50		4.184		
405		404	403.50	404.50		4.199		
406		405	404.50	405.50		4.236		
407		406	405.50	406.50		4.393		
408		407	406.50	407.50		4.671		
409		408	407.50	408.50		4.909		
410		409	408.50	409.50		5.186		
411		410	409.50	410.50		5.464		
412		411	410.50	411.50		5.63		
413		412	411.50	412.50		5.644		
414		413	412.50	413.50		5.671		
415		414	413.50	414.50		5.688		
416		415	414.50	415.50		5.701		
417		416	415.50	416.50		5.717		
418		417	416.50	417.50		5.735		
419		418	417.50	418.50		5.75		
420		419	418.50	419.50		5.769		
421		420	419.50	420.50		5.839		
422		421	420.50	421.50		5.927		
423		422	421.50	422.50		4.959		
424		423	422.50	423.50		5.011		
425		424	423.50	424.50		5.006		
426		425	424.50	425.50		5.901		

S. No.	CWC Gauge / Dam / Barrage / Weir / Anicut / Bench Mark / Tide Gauge	Chainage (Km)	Stretch for Corrected Soundings and Topo levels (Km) C		Established Sounding Datum w.r.t. MSL (m)	Sounding Datum (m) from MSL	Correction in WL Data for Bathymetric Survey (m)	Topo Level Data to be converted as depth for volume calculation wrt SD (m)
	A	B	From	To	D	E	F= (E-WL Data in MSL)	G = (E-topo Levels in MSL)
427		426	425.50	426.50		6.308		
428		427	426.50	427.50		6.533		
429		428	427.50	428.50		6.856		
430		429	428.50	429.50		6.348		
431		430	429.50	430.50		6.248		
432		431	430.50	431.50		7.568		
433		432	431.50	432.50		7.859		
434		433	432.50	433.50		8.22		
435		434	433.50	434.50		8.204		
436		435	434.50	435.50		8.474		
437		436	435.50	436.50		8.163		
438		437	436.50	437.50		8.349		
439		438	437.50	438.50		5.33		
440		439	438.50	439.50		5.389		
441		440	439.50	440.50		4.732		
442		441	440.50	441.50		9.698		
443		442	441.50	442.50		9.466		
444		443	442.50	443.50		10.211		
445		444	443.50	444.50		11.019		
446		445	444.50	445.50		9.943		
447		446	445.50	446.50		10.732		
448		447	446.50	447.50		10.792		
449		448	447.50	448.50		11.367		
450		449	448.50	449.50		11.547		
451		450	449.50	450.50		11.474		
452		451	450.50	451.50		11.774		
453		452	451.50	452.50		11.157		
454		453	452.50	453.50		11.647		
455		454	453.50	454.50		11.45		
456		455	454.50	455.50		11.363		
457		456	455.50	456.50		12.871		
458		457	456.50	457.50		13.085		
459		458	457.50	458.50		12.728		
460		459	458.50	459.50		14.296		
461		460	459.50	460.50		14.74		
462		461	460.50	461.50		15.126		
463		462	461.50	462.50		16.04		
464		463	462.50	463.50		16.032		
465		464	463.50	464.50		17.026		

S. No.	CWC Gauge / Dam / Barrage / Weir / Anicut / Bench Mark / Tide Gauge	Chainage (Km)	Stretch for Corrected Soundings and Topo levels (Km) C		Established Sounding Datum w.r.t. MSL (m)	Sounding Datum (m) from MSL	Correction in WL Data for Bathymetric Survey (m)	Topo Level Data to be converted as depth for volume calculation wrt SD (m)
	A	B	From	To	D	E	F= (E-WL Data in MSL)	G = (E-topo Levels in MSL)
466		465	464.50	465.50		17.911		
467		466	465.50	466.50		18.067		
468		467	466.50	467.50		17.324		
469		468	467.50	468.50		17.239		
470		469	468.50	469.50		17.15		
471		470	469.50	470.50		17.012		
472		471	470.50	471.50		18.356		
473		472	471.50	472.50		16.061		
474		473	472.50	473.50		18.712		
475		474	473.50	474.50		19.303		
476		475	474.50	475.50		18.675		
477		476	475.50	476.50		18.116		
478		477	476.50	477.50		19.052		
479		478	477.50	478.50		21.335		
480		479	478.50	479.50		21.985		
481		480	479.50	480.50		22.873		
482		481	480.50	481.50		23.841		
483		482	481.50	482.50		24.912		
484		483	482.50	483.50		23.756		
485		484	483.50	484.50		23.777		
486		485	484.50	485.50		24.003		
487		486	485.50	486.50		23.177		
488		487	486.50	487.50		21.754		
489		488	487.50	488.50		21.754		
490		489	488.50	489.50		25.008		
491		490	489.50	490.50		24.885		
492		491	490.50	491.90		25.341		
Jawai River								
1		0	0.00	0.50		32.659		
2		1	0.50	1.50		34.109		
3		2	1.50	2.50		34.886		
4		3	2.50	3.50		35.462		
5		4	3.50	4.50		35.885		
6		5	4.50	5.50		35.873		
7		6	5.50	6.50		36.455		
8		7	6.50	7.50		36.761		
9		8	7.50	8.50		37.142		
10		9	8.50	9.50		36.88		
11		10	9.50	10.50		38.133		

S. No.	CWC Gauge / Dam / Barrage / Weir / Anicut / Bench Mark / Tide Gauge	Chainage (Km)	Stretch for Corrected Soundings and Topo levels (Km) C		Established Sounding Datum w.r.t. MSL (m)	Sounding Datum (m) from MSL	Correction in WL Data for Bathymetric Survey (m)	Topo Level Data to be converted as depth for volume calculation wrt SD (m)
	A	B	From	To	D	E	F= (E-WL Data in MSL)	G = (E-topo Levels in MSL)
12		11	10.50	11.50		39.273		
13		12	11.50	12.50		40.159		
14		13	12.50	13.50		41.633		
15		14	13.50	14.50		42.099		
16		15	14.50	15.50		43.075		
17		16	15.50	16.50		41.322		
18		17	16.50	17.50		44.441		
19		18	17.50	18.50		44.795		
20		19	18.50	19.50		45.658		
21		20	19.50	20.50		45.907		
22		21	20.50	21.50		45.899		
23		22	21.50	22.50		46.664		
24		23	22.50	23.50		48.073		
25		24	23.50	24.50		50.007		
26		25	24.50	25.50		51.924		
27		26	25.50	26.50		53.118		
28		27	26.50	27.50		54.068		
29		28	27.50	28.50		54.642		
30		29	28.50	29.50		53.897		
31		30	29.50	30.50		55.975		
32		31	30.50	31.50		56.587		
33		32	31.50	32.50		57.263		
34		33	32.50	33.50		58.045		
35		34	33.50	34.50		60.041		
36		35	34.50	35.50		60.979		
37		36	35.50	36.50		58.644		
38		37	36.50	37.50		62.191		
39		38	37.50	38.50		63.625		
40		39	38.50	39.50		64.898		
41		40	39.50	40.50		65.961		
42		41	40.50	41.50		66.853		
43		42	41.50	42.50		67.621		
44		43	42.50	43.50		68.658		
45		44	43.50	44.50		69.757		
46		45	44.50	45.50		71.032		
47		46	45.50	46.50		72.002		
48		47	46.50	47.50		73.302		
49		48	47.50	48.50		74.374		
50		49	48.50	49.50		75.533		

S. No.	CWC Gauge / Dam / Barrage / Weir / Anicut / Bench Mark / Tide Gauge	Chainage (Km)	Stretch for Corrected Soundings and Topo levels (Km) C		Established Sounding Datum w.r.t. MSL (m)	Sounding Datum (m) from MSL	Correction in WL Data for Bathymetric Survey (m)	Topo Level Data to be converted as depth for volume calculation wrt SD (m)
	A	B	From	To	D	E	F= (E-WL Data in MSL)	G = (E-topo Levels in MSL)
51		50	49.50	50.50		67.211		
52		51	50.50	51.50		77.956		
53		52	51.50	52.50		79.057		
54		53	52.50	53.50		80.327		
55		54	53.50	54.50		81.391		
56		55	54.50	55.50		82.396		
57		56	55.50	56.50		82.881		
58		57	56.50	57.50		84.405		
59		58	57.50	58.50		85.175		
60		59	58.50	59.50		85.937		
61		60	59.50	60.50		86.919		
62		61	60.50	61.50		88.104		
63		62	61.50	62.50		89.199		
64		63	62.50	63.50		90.307		
65		64	63.50	64.50		91.25		
66		65	64.50	65.50		92.299		
67		66	65.50	66.50		93.528		
68		67	66.50	67.50		94.825		
69		68	67.50	68.50		96.088		
70		69	68.50	69.50		97.215		
71		70	69.50	70.50		97.931		
72		71	70.50	71.50		98.051		
73		72	71.50	72.50		99.094		
74		73	72.50	73.50		100.47		
75		74	73.50	74.50		101.418		
76		75	74.50	75.50		102.497		
77		76	75.50	76.50		103.264		
78		77	76.50	77.50		104.227		
79		78	77.50	78.50		104.667		
80		79	78.50	79.50		105.824		
81		80	79.50	80.50		106.732		
82		81	80.50	81.50		108.038		
83		82	81.50	82.50		109.019		
84		83	82.50	83.50		110.481		
85		84	83.50	84.50		111.428		
86		85	84.50	85.50		112.367		
87		86	85.50	86.50		113.522		
88		87	86.50	87.50		114.659		
89		88	87.50	88.50		116.034		

S. No.	CWC Gauge / Dam / Barrage / Weir / Anicut / Bench Mark / Tide Gauge	Chainage (Km)	Stretch for Corrected Soundings and Topo levels (Km) C		Established Sounding Datum w.r.t. MSL (m)	Sounding Datum (m) from MSL	Correction in WL Data for Bathymetric Survey (m)	Topo Level Data to be converted as depth for volume calculation wrt SD (m)
	A	B	From	To	D	E	F= (E-WL Data in MSL)	G = (E-topo Levels in MSL)
90		89	88.50	89.50		117.134		
91		90	89.50	90.50		118.81		
92		91	90.50	91.50		119.445		
93		92	91.50	92.50		120.087		
94		93	92.50	93.50		120.69		
95		94	93.50	94.50		121.31		
96		95	94.50	95.50		122.949		
97		96	95.50	96.50		124.844		
98		97	96.50	97.50		126.113		
99		98	97.50	98.50		127.871		
100		99	98.50	99.50		129.187		
101		100	99.50	100.50		130.135		
102		101	100.50	101.50		131.352		
103		102	101.50	102.50		132.47		
104		103	102.50	103.50		133.995		
105		104	103.50	104.50		135.734		
106		105	104.50	105.50		136.939		
107		106	105.50	106.50		138.285		
108		107	106.50	107.50		139.607		
109		108	107.50	108.50		140.829		
110		109	108.50	109.50		142.502		
111		110	109.50	110.50		143.42		
112		111	110.50	111.50		144.022		
113		112	111.50	112.50		145.811		
114		113	112.50	113.50		147.777		
115		114	113.50	114.50		149.388		
116		115	114.50	115.50		151.263		
117		116	115.50	116.50		151.936		
118		117	116.50	117.50		152.744		
119		118	117.50	118.50		154.532		
120		119	118.50	119.50		156.599		
121		120	119.50	120.50		157.066		
122		121	120.50	121.50		158.729		
123		122	121.50	122.50		160.379		
124		123	122.50	123.542		162.644		

2.11 High Flood Level (H.F.L.) and Maximum WL/Full Reservoir Level (MWL/FRL)

From CH- 0 to 53km is tidal stretch in Rann of kutch & rest of the survey area is totally dry and all bridges in these survey area are mainly constructed as ford so there is no mark of Highest Flood Level (HFL). This is seasonal river and water flows in monsoon season only. There are two bridges India gate & railway bridge in entire survey area where HFL are marked.

2.12 Graph between Sounding Datum and HFL v/s Chainage

There is a single bridge India gate bridge exist in entire survey area where HFL are marked. HFL was fixed based on information collected from local public & marked on the pier of India gate bridge as there is no any data available with concern authority. By using gradient method HFL & Sounding datum was calculate at every 1km interval.

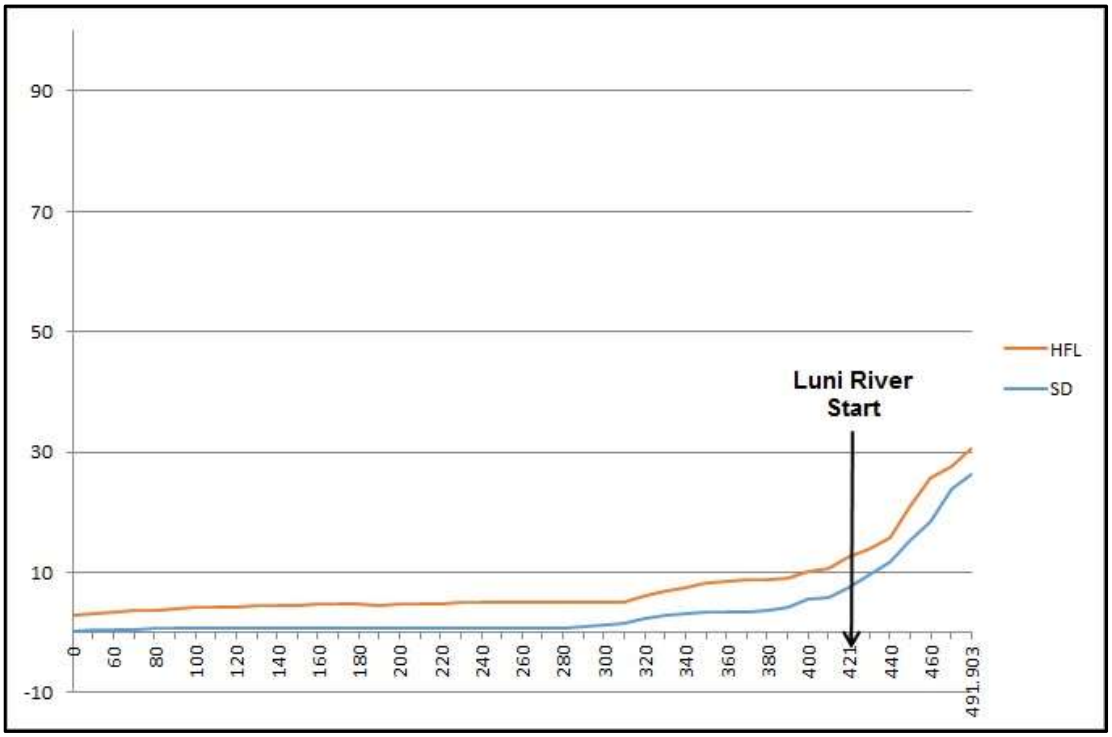


Figure 7 - Graphs between Chainage and Sounding Datum/HFL in Rann of Kutch & Luni River

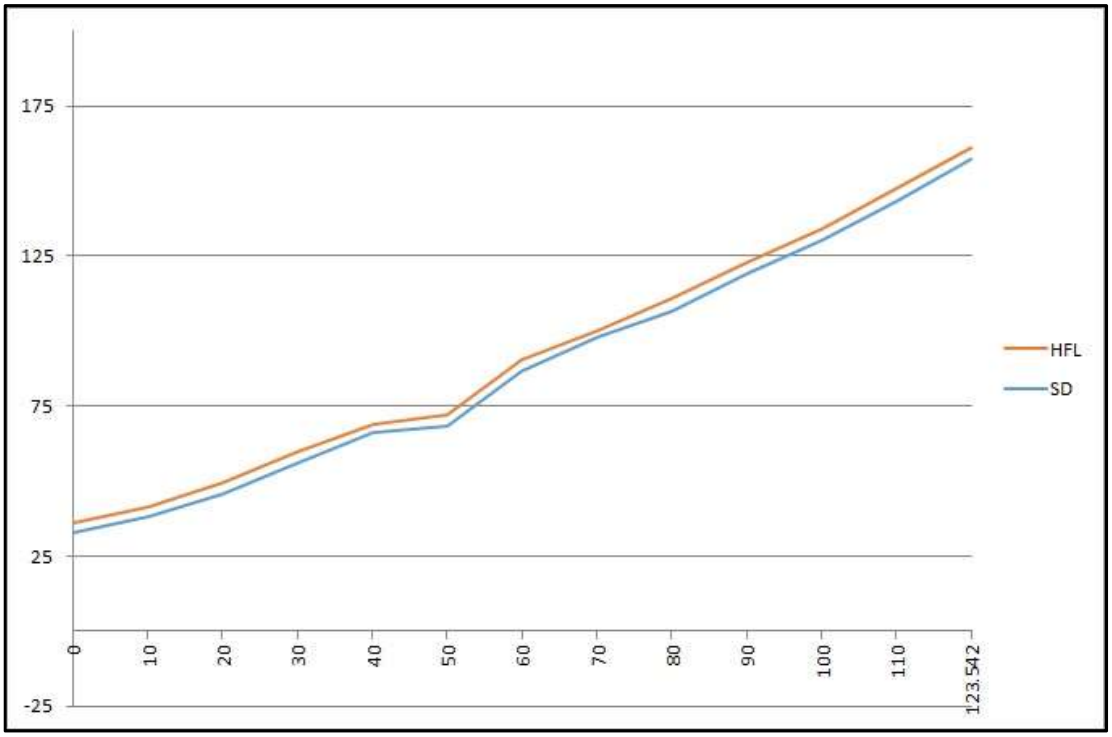


Figure 8 - Graphs between Chainage and Sounding Datum/HFL in Jawai River

2.13 Average Bed Slope

Table 6 – Average Bed Slope

Reach (km)		River / Canal Bed Level Change (m) A	Distance (km) B	Slope A/B
From	To			
Rann of Kutch & Luni river				
0	25	8	25	1:0.32
25	53	18.9	28	1:0.675
53	75	0.13	22	1:0.005909
75	100	0.048	25	1:0.00192
100	125	0.04	25	1:0.0016
125	150	0.061	25	1:0.00244
150	175	0.046	25	1:0.00184
175	200	0.042	25	1:0.00168
200	225	0.07	25	1:0.0028
225	250	0.03	25	1:0.0012
250	275	0.131	25	1:0.00524
275	300	0.161	25	1:0.00644

300	325	0.841	25	1:0.03364
325	350	1.467	25	1:0.05868
350	375	0.21	25	1:0.0084
375	400	0.723	25	1:0.02892
400	421.249	3.295	21	1:0.156905
421.249	450	5.338	29	1:0.184069
450	475	8.098	25	1:0.32392
475	491.903	6.581	16.903	1:0.389339
Jawai River				
0	25	20.045	25	1:0.8018
25	50	24.652	25	1:0.98608
50	75	25.909	25	1:1.03636
75	100	28.222	25	1:1.12888
100	123.542	35.388	23.542	1:1.503186

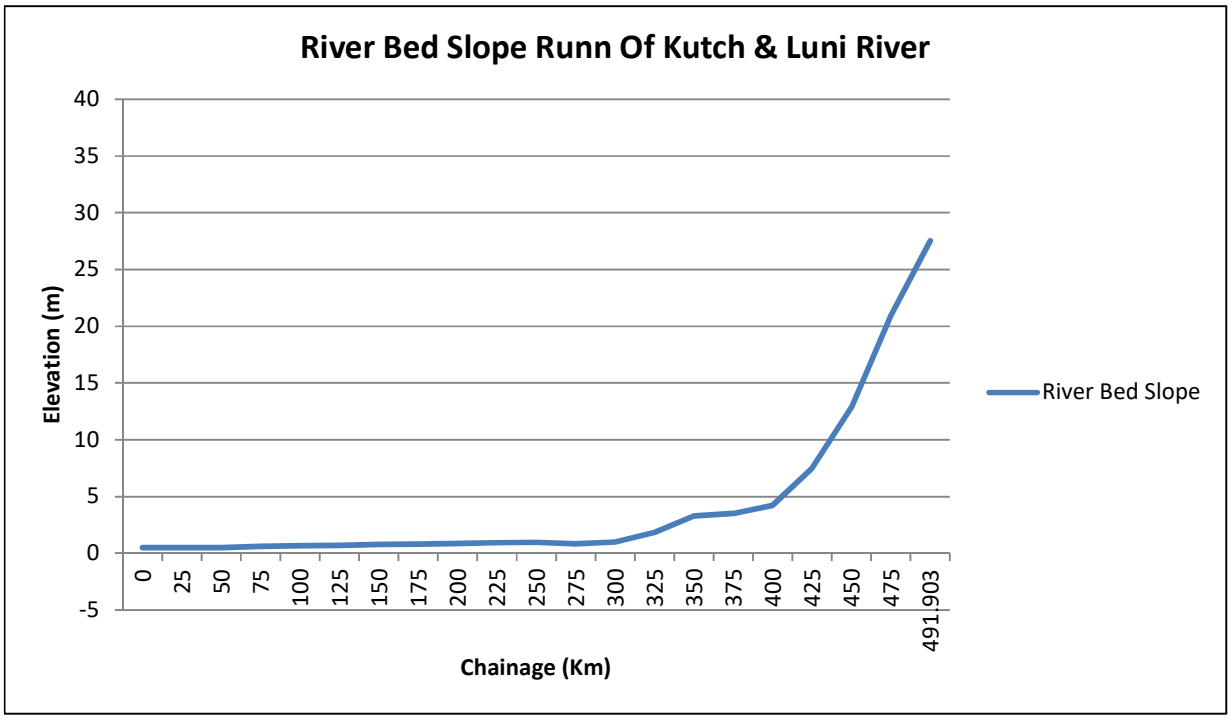


Figure 9 - Graph for Avg. Bed Slope in Runn of Kutch & Luni

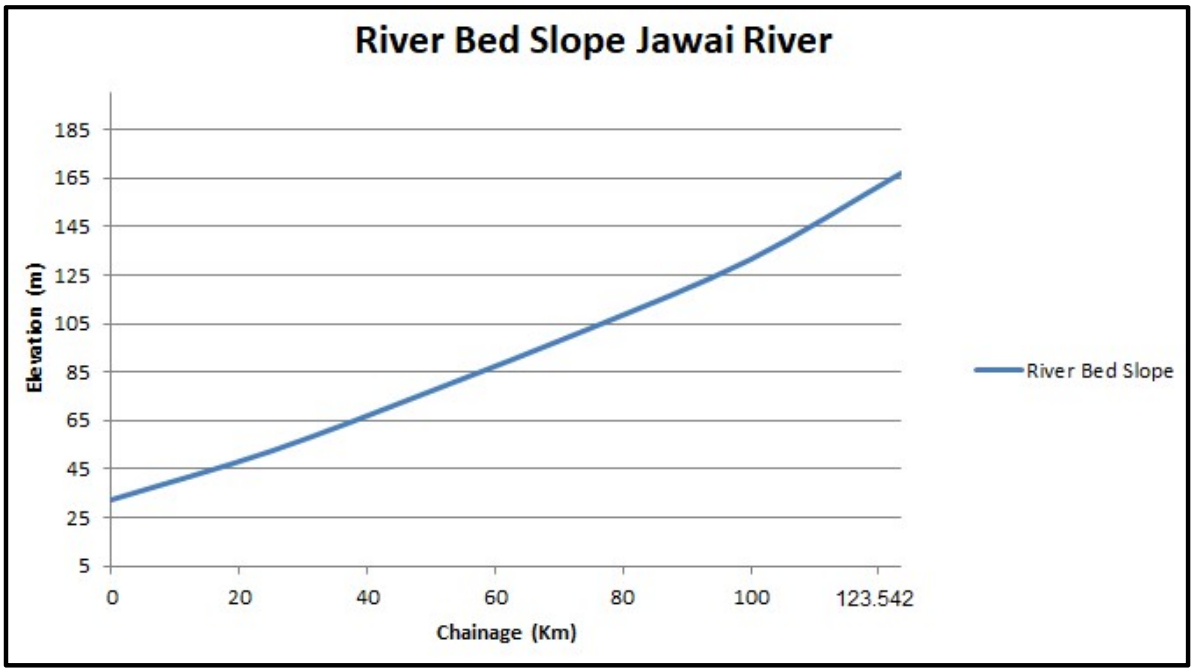


Figure 10 – Graph for Avg. Bed Slope in Jawai River

2.14 Details of Dam, Barrages, Weirs, Anicut

No Dam, Barrages, Weirs, Anicut Present in this stretch of waterway.

2.15 Details of Locks

No Lock Present in this stretch of waterway.

2.16 Details of Aqueducts

No Aqueduct Present in this stretch of waterway.

2.17 Details of Cross-structures in Rann of Kutch, Luni and Jawai River

Table 7 - Bridges and Cross Structure in Rann of Kutch, Luni and Jawai River

Sl No	Structure Name and for Road / Rail	Chainage (km)	Type of Structure (RCC / Iron / Wooden)	Location	Position (Lat Long)		Position (UTM)		Length (m)	Width (m)	No of Piers	Horizontal clearance (Clear distance Between	Vertical clearance w.r.t. HFL / MHWS (m)	Remarks (complete / under - construction), in use or not, condition
					Left Bank	Right Bank	Left Bank	Right Bank						
1	India Bridge (Road cum pipe line bridge) in Rann of Kutch	172.448	RCC	Khavada	23°59'13.64"N 69°44'41.93"E	23°58'59.15"N 69°44'45.16"E	575781.75 2653001.08	575875.38 2652555.92	450.00	7	11	45	2.49	Good condition in Use
2	Railway Bridge in Jawai River	112.388	Iron	Bishangarh	25°23'50.99"N 72°36'25.80"E	25°23'56.85"N 72°36'22.19"E	259278.87 2811120.63	259180.35 2811302.12	190.00	5.00	19	10	0	Good condition in Use

2.18 Details of other Cross structures, pipe-lines underwater

Table 8 – Other Cross Structure in Rann of Kutch, Luni and Jawai River

Sl No	Structure Name and for Road / Rail	Chainage (km)	Type of Structure (RCC / Iron / Wooden)	Location	Position (Lat Long)		Position (UTM)		Length (m)	Width (m)	No of Piers	Horizontal clearance (Clear distance Between piers) (m)	Vertical clearance w.r.t. HFL / MHWS (m)	Remarks (complete / under - construction), in use or not, condition
					Left Bank	Right Bank	Left Bank	Right Bank						
Rann of Kutch & Luni River														
1	Concrete Road Crossing River	355.74	Concrete Road Crossing River	Benap	24°10' 41.47"N 71°16' 13.28"E	24°11' 33.68"N 71°15' 14.55"E	730609.33 2675604.65	728925.94 2677184.13	1871.06	5.00	-	-	-	Good condition in Use
2	Concrete Road Crossing River (Under Construction)	421.30	Concrete Road Crossing River	MDR 17 Bakhasar Road	24°43' 2.63"N 71°13' 21.37"E	24°43' 13.32"N 71°13' 11.41"E	724829.33 2735480.12	724544.09 2735804.44	432.00	4.00	-	-	-	Concrete Road Crossing River (Under Construction)
3	Ford Crossing Road River	433.80	Concrete Road Crossing River	Khejariyali Village	24°46' 46.63"N 71°18' 52.26"E	24°46' 49.65"N 71°18' 46.87"E	734013.73 2742527.38	733860.78 2742617.94	178.00	7.00	-	-	-	Good condition in Use
4	Ford Crossing Road River	435.09	Concrete Road Crossing River	Khejariyali Village	24°46' 39.47"N 71°19' 35.77"E	24°46' 43.84"N 71°19' 37.90"E	735239.83 2742327.97	735297.31 2742463.51	143.00	7.00	-	-	-	Good condition in Use
5	Ford Crossing Road River	456.00	Concrete Road Crossing River	Surachand Village	24°48' 54.15"N 71°25' 9.54"E	24°48' 56.41"N 71°25' 8.00"E	744544.11 2746635.45	744499.66 2746704.30	82.00	8.00	-	-	-	Good condition in Use
6	Ford Crossing Road River	457.24	Concrete Road Crossing River	Surachand Village	24°48' 56.56"N 71°25' 36.23"E	24°49' 0.43"N 71°25' 35.74"E	745292.49 2746723.08	745276.73 2746841.77	120.00	9.00	-	-	-	Good condition in Use
7	Ford Crossing Road River	464.84	Concrete Road Crossing River	Nimbaj Vilage	24°50' 32.82"N 71°28' 9.10"E	24°50' 35.15"N 71°28' 9.90"E	749532.85 2749762.50	749554.12 2749834.55	75.00	7.50	-	-	-	Good condition in Use

Sl No	Structure Name and for Road / Rail	Chainage (km)	Type of Structure (RCC / Iron / Wooden)	Location	Position (Lat Long)		Position (UTM)		Length (m)	Width (m)	No of Piers	Horizontal clearance (Clear distance Between piers) (m)	Vertical clearance w.r.t. HFL / MHWS (m)	Remarks (complete / under - construction), in use or not, condition
					Left Bank	Right Bank	Left Bank	Right Bank						
8	Ford Crossing Road River	467.34	Concrete Road Crossing River	Taanpi Village	24°51' 14.96"N 71°29' 0.80"E	24°51' 16.31"N 71°28' 58.39"E	750961.02 2751085.72	750892.66 2751126.15	79.00	5.00	-	-	-	Good condition in Use
9	Ford Crossing Road River	470.90	Concrete Road Crossing River	Padaradi Village	24°52' 31.97"N 71°30' 13.36"E	24°52' 37.56"N 71°30' 7.47"E	752955.08 2753493.07	752786.41 2753662.07	238.00	7.00	-	-	-	Good condition in Use
10	Ford Crossing Road River	473.31	Concrete Road Crossing River	Padaradi Village	24°53' 16.34"N 71°30' 39.91"E	24°53' 14.36"N 71°30' 31.22"E	753675.19 2754872.66	753432.49 2754807.08	251.00	4.00	-	-	-	Good condition in Use
11	Ford Crossing Road River	487.01	Concrete Road Crossing River	Lalpura	24°56' 0.67"N 71°35' 46.10"E	24°56' 2.16"N 71°35' 41.71"E	762174.68 2760091.55	762050.57 2760135.26	131.50	6.00	-	-	-	Good condition in Use
12	Ford Crossing Road River	488.95	Concrete Road Crossing River	Lalpura	24°56' 44.17"N 71°36' 27.91"E	24°56' 51.31"N 71°36' 18.44"E	763322.31 2761453.06	763052.31 2761667.50	346.00	3.20	-	-	-	Good condition in Use
13	Bund	491.95	Concrete Road Crossing River	Keriya Village	24°56' 55.33"N 71°38' 2.18"E	24°57' 27.97"N 71°37' 59.34"E	765960.94 2761847.45	765861.89 2762850.45	1008.00	5.00	-	-	-	Damage Bund
Jawai River														
14	Ford Crossing Road River	9.00	Concrete Road Crossing River	Borli	25°0' 49.51"N 71°48' 30.07"E	25°1' 3.67"N 71°48' 24.91"E	783432.04 2769409.31	783278.16 2769842.12	631.00	4.50	-	-	-	Good condition in Use

Sl No	Structure Name and for Road / Rail	Chainage (km)	Type of Structure (RCC / Iron / Wooden)	Location	Position (Lat Long)		Position (UTM)		Length (m)	Width (m)	No of Piers	Horizontal clearance (Clear distance Between piers) (m)	Vertical clearance w.r.t. HFL / MHWS (m)	Remarks (complete / under - construction), in use or not, condition
					Left Bank	Right Bank	Left Bank	Right Bank						
15	Ford Crossing Road River	11.56	Concrete Road Crossing River	Jhab	5°1' 30.91"N 71°49' 47.24"E	25°1' 34.96"N 71°49' 45.56"E	785569.80 2770728.66	785520.07 2770852.39	70.00	3.50	-	-	-	Good condition in Use
16	Ford Crossing Road River	18.29	Concrete Road Crossing River	Vamal	25°4' 38.97"N 71°51' 11.95"E	25°4' 53.04"N 71°50' 58.60"E	787823.63 2776567.46	787440.12 2776992.85	601.00	3.60	-	-	-	Good condition in Use
17	Ford Crossing Road River	21.37	Concrete Road Crossing River	Juni Bali	25°6' 2.65"N 71°52' 13.19"E	25°6' 10.93"N 71°51' 57.55"E	789485.54 2779179.93	789041.73 2779425.47	446.00	6.00	-	-	-	Good condition in Use
18	Ford Crossing Road River	29.84	Concrete Road Crossing River	Morsim	25°9' 38.01"N 71°54' 44.89"E	25°9' 43.93"N 71°54' 37.67"E	793594.55 2785900.72	793388.55 2786078.54	981.00	7.00	-	-	-	Good condition in Use
19	Ford Crossing Road River	42.20	Concrete Road Crossing River	Bagora - Bhinmal Road	25°10' 48.21"N 72°1' 17.12"E	25°11' 2.36"N 72°1' 16.54"E	199785.227 2788207.693	199778.624 2788643.666	1801.00	6.00	-	-	-	Good condition in Use
20	Ford Crossing Road River	50.52	Concrete Road Crossing River	Harmoo	25°11' 17.48"N 72°5' 59.18"E	25°12' 4.50"N 72°5' 54.11"E	207706.044 2788936.121	207595.262 2790386.652	939.00	4.00	-	-	-	Good condition in Use
21	Ford Crossing Road River	59.74	Concrete Road Crossing River	Vishala Goliya Road Rohinwara	25°13' 33.55"N 72°10' 30.83"E	25°14' 32.67"N 72°10' 52.94"E	215403 2792962.813	216060.295 2794769.686	635.00	7.00	-	-	-	Good condition in Use
22	Ford Crossing Road River	65.95	Concrete Road Crossing River	Posana	25°14' 38.87"N 72°14' 10.94"E	25°15' 6.74"N 72°14' 4.00"E	221607.532 2794845.284	221430.918 2795707.177	831.00	7.00	-	-	-	Good condition in Use

Sl No	Structure Name and for Road / Rail	Chainage (km)	Type of Structure (RCC / Iron / Wooden)	Location	Position (Lat Long)		Position (UTM)		Length (m)	Width (m)	No of Piers	Horizontal clearance (Clear distance Between piers) (m)	Vertical clearance w.r.t. HFL / MHWS (m)	Remarks (complete / under - construction), in use or not, condition
					Left Bank	Right Bank	Left Bank	Right Bank						
23	Ford Crossing Road River	70.58	Concrete Road Crossing River	Borwada	25°15' 4.05"N 72°16' 52.71"E	25°15' 17.05"N 72°16' 38.46"E	226152.039 2795527.878	225761.25 2795936.12			-	-	-	Good condition in Use
24	Ford Crossing Road River	74.13	Concrete Road Crossing River	Aasana	25°15' 54.43"N 72°18' 41.88"E	25°16' 16.93"N 72°18' 29.28"E	229239.125 2797017.049	228900.353 2797716.689	685.00	6.00	-	-	-	Good condition in Use
25	Ford Crossing Road River	77.98	Concrete Road Crossing River	Tura	25°17' 30.18"N 72°19' 53.32"E	25°17' 50.19"0N 72°19' 41.17"E	231297.359 2799924.351	230969.643 2800547.044	477.00	6.00	-	-	-	Good condition in Use
26	Ford Crossing Road River	78.81	Concrete Road Crossing River	Tura	25°17' 45.29"N 72°20' 17.21"E	25°18' 1.22"N 72°20' 6.57'E	231975.119 2800376.147	231687.14 2800872.398			-	-	-	Good condition in Use
27	Ford Crossing Road River	83.33	Concrete Road Crossing River	Sayala To Veerana	25°18' 57.01"N 72°22' 27.55"E	25°19' 6.29"N 72°22' 14.96"E	235665.567 2802511.717	235318.943 2802804.267			-	-	-	Good condition in Use
28	Ford Crossing Road River	87.67	Concrete Road Crossing River	Otwala	25°20' 20.86"N 72°24' 24.14"E	25°20' 39.04"N 72°24' 3.18"E	238977.402 2805029.003	238401.995 2805599.952	774.00	7.00	-	-	-	Good condition in Use
29	Ford Crossing Road River	91.19	Concrete Road Crossing River	Khural	25°20' 54.60"N 72°26' 14.31"E	25°21' 7.02"N 72°25' 41.56"E	242078.875 2806008.105	241170.249 2806407.965	-		-	-	-	Good condition in Use
30	Ford Crossing Road River	94.76	Concrete Road Crossing River	Ummedabad	25°22' 29.53"N 72°27' 16.09"E	25°22' 45.82"N 72°26' 56.52 "E	243862.415 2808896.938	243324.763 2809408.764	360.00	7.00	-	-	-	Good condition in Use

Sl No	Structure Name and for Road / Rail	Chainage (km)	Type of Structure (RCC / Iron / Wooden)	Location	Position (Lat Long)		Position (UTM)		Length (m)	Width (m)	No of Piers	Horizontal clearance (Clear distance Between piers) (m)	Vertical clearance w.r.t. HFL / MHWS (m)	Remarks (complete / under - construction), in use or not, condition
					Left Bank	Right Bank	Left Bank	Right Bank						
31	Ford Crossing Road River	110.86	Concrete Road Crossing River	Risavadi (sardargrh)	25°23' 54.02"N 72°35' 31.32"E	25°24' 7.38"N 25°24' 7.38"N	257756.656 2811240.594	339266.746 2810429.026	-		-	-	-	Good condition in Use
32	Ford Crossing Road River	116.60	Concrete Road Crossing River	Jalore	25°22' 21.79"N 72°37' 58.92"E	25°22' 30.32"N 72°38' 1.55"E	261832.495 2808328.313	261910.679 2808589.532	800.00	4.50	-	-	-	Good condition in Use
33	Ford Crossing Road River	118.32	Concrete Road Crossing River	FCI Road	25°22' 0.039"N 72°38' 49.15"E	25°22' 1.52"N 72°38' 54.88"E	263225.162 2807634.101	263386.184 2807676.861	309.00	7.00	-	-	-	Good condition in Use
34	Ford Crossing Road River	120.39	Concrete Road Crossing River	Ratanpura	25°21' 18.38"N 72°39' 39.87"E	25°21' 24.81"N 2809516.95'E	264620.947 2806327.122	264779.765 2806539.012	160.88	6.00	-	-	-	Good condition in Use
35	Sankarna Ford Road Crossing	123.53	Concrete Road Crossing River	SANKARNA	25°20' 30.91"N 72°41' 7.59"E	25°20' 45.22"N 72°41' 10.88"E	267048.675 2804823.532	267148.303 2805262.336	305.24	7.00	-	-	-	Good condition in Use

2.19 Details of High Tension Lines / Electric lines / Tele-communication lines

HFL data collected at cross structures based on field observation is interpolated at each chainage of electric line crossings for the vertical clearance.

Table 9 - Electric Lines in Rann of Kutch, Luni and Jawai River

S. No.	Features Name	Chainage (Km)	Position (Lat, Long)		Position (UTM)		Vertical Clearance w.r.t HFL (m
			Left Bank	Right Bank	Left Bank	Right Bank	
Luni River							
1	Electrical Line	488.91	24°56'47.59"N 71°36'25.87"E	24°56'50.73"N 71°36'20.66"E	763263.76 2761557.04	763114.97 2761650.95	10.00
Jawai River							
2	Electric Line Cross	38.94	25°10' 51.54"N 71°59' 28.68"E	25°11' 3.85"N 71°59' 34.66"E	801495.53 2788338.674	801654.621 2788721.371	12.00

3	Electric Line Cross	42.21	25°10' 30.68"N 72°1' 16.94"E	25°11' 2.53"N 72°1' 16.83"E	199768.238 2787668.136	199786.864 2788648.719	10.00
4	Electric Line Cross	59.68	25°13' 37.34"N 72°10' 31.65"E	25°13' 52.96"N 72°10' 36.21"E	215428.414 2793078.998	215566.203 2793557.141	14.00
5	Electric Line Cross	65.92	25°14' 37.78"N 72°14' 10.56"E	25°15' 8.10"N 72°14' 2.33"E	221596.203 2794811.95	221385.031 2795750.004	12.00
6	HT Line Crossing	68.64	25°14' 36.45"N 72°15' 45.09"E	25°15' 14.06"N 72°15' 39.43"E	224241.789 2794716.787	224106.959 2795877.711	18.00
7	HT Line Crossing	68.93	25°14' 39.26"N 72°15' 54.60"E	25°15' 15.56"N 72°15' 50.34"E	224509.787 2794797.856	224413.305 2795917.653	18.00
8	Electric Line Cross	70.57	25°15' 2.01"N 72°16' 53.94"E	25°15' 16.60"N 72°16' 38.38"E	226185.199 2795464.387	225758.73 2795922.314	10.00
9	Electric Line Cross	83.98	25°19' 14.75"N 72°22' 45.81"E	25°19' 20.19"N 72°22' 24.31"E	236187.117 2803047.743	235588.918 2803226.973	12.00
10	Electric Line Cross	84.03	25°19' 19.55"N 72°22' 36.58"E	25°19' 20.01"N 72°22' 31.70"E	235931.793 2803200.543	235795.55 2803217.378	10.00
11	HT Line Crossing	85.08	25°19' 36.78"N 72°23' 26.9"E	25°19' 50.37"N 72°22' 45.19"E	237349.862 2803703.365	236191.239 2804144.46	10.00
12	Electric Line Cross	87.66	25°20' 16.2"N 72°24' 27.84"E	25°20' 38.6"N 72°24' 5.01"E	239078.117 2804883.565	238452.917 2805585.415	10.00
13	Electric Line Cross	94.95	25°22' 31.95"N 72°27' 24.09"E	25°22' 45.10"N 72°27' 6.31"E	244087.532 2808967.163	243598.083 2809381.378	12.00
14	Electric Line Cross	102.44	25°24' 20.71"N 72°30' 38.73"E	25°24' 56.04"N 72°30' 58.11"E	249592.425 2812212.085	250154.423 2813289.38	12.00
15	HT Line Crossing	107.56	25°23' 45.10"N 72°34' 4.70"E	25°24' 33.25"N 72°33' 25.48"E	255330.167 2811009.955	254260.851 2812511.904	14.00
16	Electric Line Cross	110.84	25°23' 55.96"N 72°35' 30.84"E	25°24' 7.41"N 72°35' 34.41"E	257744.314 2811300.544	257850.468 2811651.139	12.00
17	Electric Line Cross	110.85	25°23' 56.17"N 72°35' 31.13"E	25°24' 7.21"N 72°35' 34.62"E	257752.538 2811306.861	257856.227 2811644.878	10.00
18	Electric Line Cross	110.91	25°23' 55.35"N 72°35' 33.452"E	25°24' 4.32"N 72°35' 35.03"E	257816.994 2811280.453	257866.085 2811555.726	10.00
19	HT Line Crossing	115.11	25°23' 2.36"N 72°37' 29.86"E	25°23'10.47"N 72°37'42.04"E	261042.156 2809591.326	261387.116 2809834.872	12.00
20	Electric Line Cross	115.21	25°23' 3.68"N 72°37' 36.94"E	25°23' 10.39"N 72°37' 47.73"E	261240.82 2809628.433	261546.15 2809829.586	11.00
21	Electric Line Cross	118.30	25°21' 59.81"N 72°38' 47.37"E	25°22' 8.45"N 72°39' 9.53"E	263175.266 2807627.93	263799.567 2807882.938	13.00
22	HT Line Crossing	121.53	25°20' 53.13"N 72°40' 2.97"E	25°21' 7.52"N 72°40' 5.36"E	265253.367 2805538.753	265327.926 2805980.449	10.00
23	Electric Line Cross	123.20	25°20' 37.78"N 72°40' 55.67"E	25°20' 46.26"N 72°41' 1.64"E	266718.972 2805040.731	266890.451 2805298.814	12.00
24	Electric Line Cross	123.26	25°20' 36.92"N 72°40' 58.12"E	25°20' 45.82"N 72°41' 2.70"E	266787.032 2805013.077	266919.86 2805284.76	13.00
25	Electric Line Cross	123.31	25°20' 36.30"N 72°41' 0.12"E	25°20' 45.17"N 72°41' 4.01"E	266842.634 2804993.027	266956.15 2805264.122	12.00

2.20 Current Meter and Discharge details

The cup type current meter was used to measure the flow rates of the river. The observations were undertaken on the cross section near the BM/ Tide Gauge established during the Hydrographic survey as per RFP. The current meter observation at some stretch could not be obtained due to unavailability of sufficient water level.

Table 10 – Current Meter and Discharge Details

Stretch No.	Chainage (km)	Position				Observed Depth (m) (D)	Velocity (m/sec.)	Average Velocity (m/sec.)	X-Sectional area (sq. m.)	Discharge (Cum/sec)
		Latitude	Longitude	Easting (m)	Northing (m)		0.5 D			
1	0	23°32' 46.278"	68°22' 47.187"	436696.076	2604121.632	12.6	3.142	3.142	X sectional area was not calculated as survey was not carried from bank to bank as per SOW.	Nil Discharge as survey was not carried from bank to bank as per SOW.
2	10	23°37' 19.535"	68°25' 47.235"	441834.316	2612503.987	28.9	4.126	4.126		
3	20	23°41' 4.379"	68°30' 0.478"	449034.366	2619391.827	7.7	2.561	2.561		
4	30	23°44' 52.903"	68°34' 16.280"	456300.385	2626396.112	7.6	2.457	2.457		
5	40	23°48' 15.329"	68°38' 47.894"	464004.784	2632600.258	4.6	0.189	0.189		
6	50	23°50' 28.122"	68°44' 5.061"	472986.956	2636664.536	2.4	0.128	0.128		
6 To 64	Current meter reading was not taken due to Dry area/very shallow water.									

2.21 (A) Soil Sample Locations

Table 11 - Soil Sample Locations in Rann of Kutch, Luni River and Jawai River

Sample No.	Chainage (Km)	Latitude	Longitude	Easting (m)	Northing (m)	Depth (m)
Rann of Kutch & Luni River						
1	0	23°32' 46.278"	68°22' 47.187"	436696.076	2604121.632	12.6
2	10	23°37' 19.535"	68°25' 47.235"	441834.316	2612503.987	28.9
3	20	23°41' 4.379"	68°30' 0.478"	449034.366	2619391.827	7.7
4	30	23°44' 52.903"	68°34' 16.280"	456300.385	2626396.112	7.6
5	40	23°48' 15.329"	68°38' 47.894"	464004.784	2632600.258	4.6
6	50	23°50' 28.122"	68°44' 5.061"	472986.956	2636664.536	0.45
7	60	23°50' 29.946"	68°49' 53.914"	482855.302	2636705.537	0
8	70	23°50' 58.443"	68°55' 42.683"	492721.576	2637573.566	0
9	80	23°52' 40.892"	69°1' 21.819"	502313.812	2640722.563	0
10	90	23°53' 43.797"	69°7' 7.892"	512099.013	2642662.004	0
11	100	23°53' 59.267"	69°12' 57.177"	521974.644	2643149.449	0
12	110	23°53' 58.656"	69°18' 51.904"	532004.633	2643149.463	0
13	120	23°51' 44.283"	69°23' 2.5645"	539103.349	2639034.477	0
14	130	23°51' 51.924"	69°28' 18.506"	548038.527	2639296.469	0
15	140	23°50' 10.940"	69°32' 53.205"	555819.950	2636218.762	0
16	150	23°50' 58.388"	69°37' 56.508"	564393.792	2637713.724	0
17	160	23°56' 9.293"	69°38' 48.368"	565817.038	2647282.155	0
18	170	23°57' 58.832"	69°43' 39.730"	574036.012	2650691.147	0

Sample No.	Chainage (Km)	Latitude	Longitude	Easting (m)	Northing (m)	Depth (m)
19	180	23°58' 51.750"	69°48' 57.103"	582996.238	2652367.767	0
20	190	23°57' 34.304"	69°54' 40.299"	592710.135	2650045.223	0
21	200	23°57' 28.137"	69°59' 52.500"	601535.699	2649915.251	0
22	210	23°55' 26.098"	70°5' 16.365"	610718.810	2646229.320	0
23	220	23°56' 56.155"	70°10' 37.9525"	619788.087	2649072.185	0
24	230	23°56' 18.210"	70°16' 21.821"	629519.284	2647989.418	0
25	240	23°57' 15.361"	70°22' 3.484"	639161.602	2649837.682	0
26	250	23°56' 30.312"	70°27' 52.215"	649034.218	2648550.897	0
27	260	23°57' 27.082"	70°33' 37.522"	658777.575	2650401.825	0
28	270	23°57' 26.216"	70°39' 17.921"	668400.918	2650484.858	0
29	280	23°56' 44.874"	70°45' 13.073"	678457.170	2649334.347	0
30	290	23°55' 20.646"	70°50' 52.683"	688093.331	2646865.654	0
31	300	23°53' 1.449"	70°56' 7.004"	697041.090	2642702.258	0
32	310	23°53' 48.092"	71°1' 42.976"	706525.103	2644270.469	0
33	320	23°56' 28.089"	71°6' 36.084"	714743.025	2649314.559	0
34	330	23°59' 16.814"	71°11' 37.498"	723186.051	2654636.019	0
35	340	24°3' 24.483"	71°15' 16.940"	729267.539	2662354.748	0
36	350	24°8' 5.260"	71°15' 1.882"	728703.452	2670987.485	0
37	360	24°12' 37.213"	71°16' 38.544"	731296.752	2679399.826	0
38	370	24°17' 48.691"	71°16' 46.534"	731365.518	2688988.035	0
39	380	24°22' 29.204"	71°17' 28.409"	732404.190	2697639.256	0
40	390	24°27' 19.463"	71°14' 52.040"	727851.967	2706498.797	0
41	400	24°32' 26.383"	71°13' 15.173"	724971.646	2715899.007	0
42	410	24°37' 11.950"	71°13' 2.605"	724476.353	2724680.605	0
43	421	24°43' 7.916"	71°13' 18.324"	724741.154	2735641.443	0
44	432	24°46' 18.175"	71°18' 9.296"	732821.328	2741631.413	0
45	439.74	24°46' 44.257"	71°21' 32.072"	738504.916	2742531.227	0
46	451.14	24°47' 17.137"	71°24' 14.434"	743048.874	2743622.615	0
47	461.81	24°49' 19.374"	71°27' 15.771"	748075.859	2747475.142	0
48	472.55	24°52' 59.282"	71°30' 47.789"	753906.148	2754351.609	0
49	482.14	24°54' 42.915"	71°34' 1.385"	759281.128	2757642.640	0
50	491.7	24°57' 2.897"	71°37' 52.395"	765681.925	2762075.095	0
Jawai River						
51	1.91	25°2' 19.586"	71°44' 7.352"	776007.021	2772031.000	0
52	7.18	25°1' 1.232"	71°47' 21.228"	781493.545	2769730.160	0
53	15.99	25°3' 31.907"	71°51' 3.455"	787628.941	2774498.191	0
54	22.87	25°6' 53.345"	71°52' 22.128"	789702.970	2780745.814	0
55	33.16	25°10' 17.818"	71°56' 33.392"	796607.820	2787192.263	0
56	42.18	25°11' 0.499"	72°1' 15.524"	199748.894	2788587.004	0
57	56.25	25°13' 16.665"	72°8' 46.637"	212474.448	2792504.704	0
58	65.85	25°14' 53.346"	72°14' 3.536"	221409.433	2795295.152	0

Sample No.	Chainage (Km)	Latitude	Longitude	Easting (m)	Northing (m)	Depth (m)
59	73.76	25°16' 0.222"	72°18' 24.295"	228750.504	2797205.205	0
60	85.39	25°19' 54.258"	72°23' 6.293"	236783.905	2804252.584	0
61	93.95	25°22' 12.419"	72°26' 58.792"	243368.669	2808379.504	0
62	104.21	25°24' 24.064"	72°31' 51.167"	251619.265	2812277.699	0
63	111.32	25°23' 52.907"	72°35' 48.067"	258224.203	2811197.904	0
64	123.4	25°20' 38.833"	72°41' 5.087"	266982.894	2805068.577	0

A detailed report of Soil sample analysis is placed at **Annexure-11** of this report.

(B) Water Sample Locations

Table 12 – Water Sample Locations in Rann of Kutch

Water Sample Locations						
Sample No.	**Chainage (Km)**	**Latitude**	**Longitude**	**Easting (m)**	**Northing (m)**	**Depth (m)**
1	0	23°32' 46.278"	68°22' 47.187"	436696.076	2604121.632	12.6
2	10	23°37' 19.535"	68°25' 47.235"	441834.316	2612503.987	28.9
3	20	23°41' 4.379"	68°30' 0.478"	449034.366	2619391.827	7.7
4	30	23°44' 52.903"	68°34' 16.280"	456300.385	2626396.112	7.6
5	40	23°48' 15.329"	68°38' 47.894"	464004.784	2632600.258	4.6
6	50	23°50' 28.122"	68°44' 5.061"	472986.956	2636664.536	0.45

A detailed report of water sample analysis is placed at **Annexure-12** of this report

3. DESCRIPTION OF WATERWAY FOR RANN OF KUTCH, LUNI AND JAWAI RIVER

Hydrographic Survey was done on selected River stretch. one bridges were present in dry Portion We have divided waterways of **RANN OF KUTCH, LUNI AND JAWAI RIVER** into 25 different stretches and details of stretches are given below from Para 3.1 to Para 3.25.

3.1 Sea mouth to Narayan Sarovar (Ch. 0.0 km – 25.00 km)

Figure 11 - Sea Mouth to Naryan Sarvoar

Table 13 – Minimum – Maximum Reduce Depths, Narayana Sarovar to Lakhpat Fort

Class	Chainage (Km)		Reduced w.r.t. Sounding Datum			
	From	To	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)
1	0	25	0	25	3	77528.66
2	0	25	0	25	3	129603.43
3	0	25	0	25	3	213758.22
4	0	25	0	25	3	276159.46

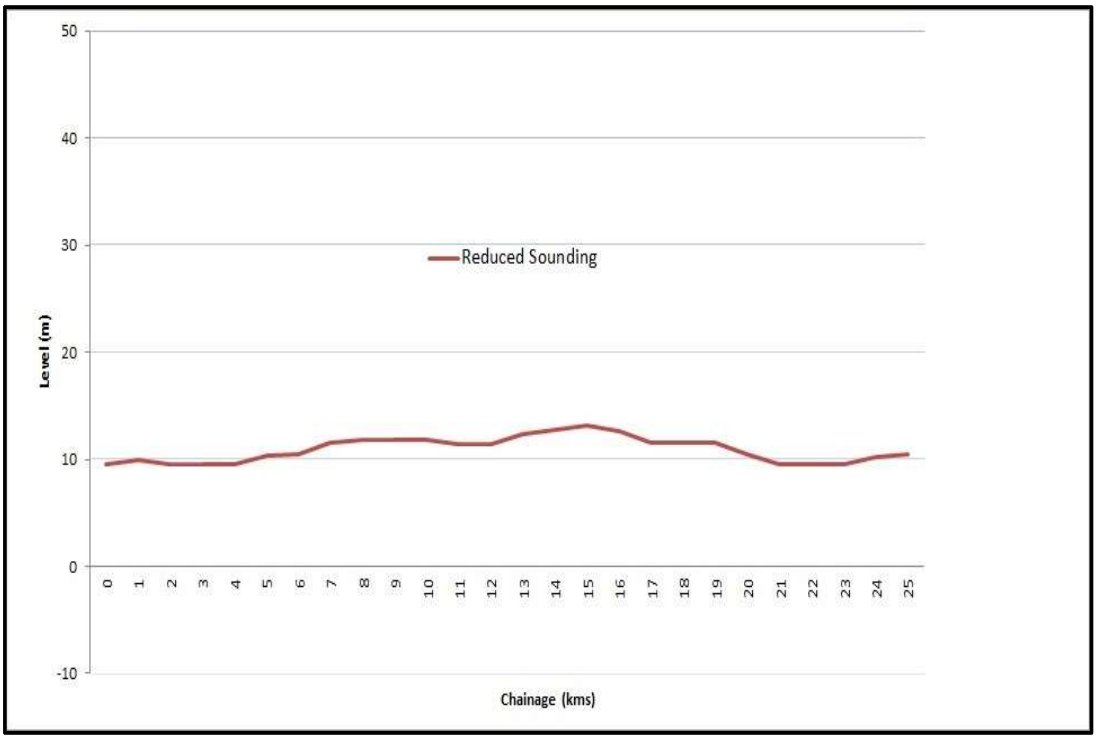


Figure 12 - Reduced Bed Profile of Sea Mouth to Narayan Sarovar

1st stretch (Ch. 0.00 to 25.00 km) start from Koori Crick Pipar Village to Narayan Sarover. No bridges present in this stretch of River. Main villages in this stretch are Pipar, Lakki, Guhar Moti, Guhar Nani, and Narayan Sarover. This stretch is near to Indo-Pak Border. River banks in this stretch are mainly unprotected. Forest area exists near this stretch. At chainage 0.00 km wild life Sanctuary is present. Security restriction from Border Security force (BSF). Sanghi cement factory exist near this stretch. There are BSF Jetties and no Terminals seen in this stretch. There are many tourist places in vicinity of this stretch also the connectivity of these places from this stretch of river through road is very good. There is no ferry, Passenger ferry services and no water sport recreational facilities are present in this stretch of waterway. No Railway Line and Railway station in Vicinity of this stretch. Average width of the stretch is 18.0 to 21.0 kms.

Figure 13 - Ch. 5.0 Km Survey in Progress in Rann of Kutch

Figure 14 - Ch. 10.5 Km Survey in Progress in Rann of Kutch

3.2 Narayan Sarovar to Lakhpat Fort (Ch. 25.0 km – 53.00 km)

Figure 15 - Narayan Sarovar to Lakhpat Fort

Table 14 - Minimum – Maximum Reduce Depths, Narayan Sarovar to Lakhpat Fort

Class	Chainage (Km)		Reduced w.r.t. Sounding Datum							
	From	To	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)
1	25	53	0	0	22	21,592.01	-0.3	11.6	17.0	77528.66
2	25	53	0	0	22	32887.20	-0.3	11.6	17.0	1446146.55
3	25	53	0	0	22	49,696.99	-0.3	11.6	17.0	2179744.66
4	25	53	0	0	22	59967.18	-0.3	11.6	17.0	2515132.33

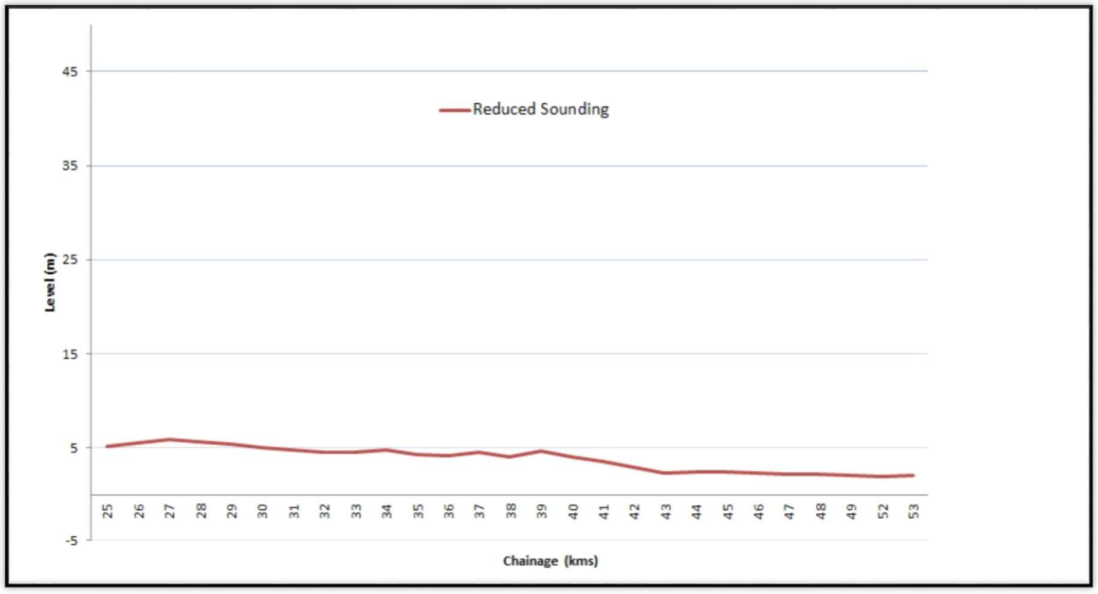


Figure 16 – Reduced Bed Profile of Narayan Sarovar to Lakhpath Fort

2nd stretch (Ch. 25 to 53.00 km) start from Narayan Sarover to Lakhpath Fort. No bridges present in this stretch of River. Main villages in this stretch are Dhunay, Budhu Bandar, Chher Moti, & Lakhpath, This stretch is near to Indo-Pak Border. The bank of this stretch are mainly unprotected and main compositions are Sand. Narayan Sarovar wild life sanctuary is present in the vicinity of this stretch. Security restriction from Border Security force (BSF). There are no Jetties and Terminals seen in this stretch. There is no ferry, Passenger ferry services and no water sport recreational facilities are present in this stretch of waterway. No Railway Line and Railway station in Vicinity of this stretch. Average width of the stretch is 18.0 to 21.0 kms

Figure 17 – Ch.35.5 Km Rann of Kutch View

Figure 18 – Ch-40.0 Km survey in progress in Rann of Kutch

Figure 19 – Ch.51.5 Km Pole Sounding in progress in Rann of Kutch

3.3 Lakhpat Fort to Mudhan Kutch (Ch. 53.00 km – 75.00 km)

Figure 20 – Lakhpat Fort to Mudhan Kutch

Table 15 - Minimum – Maximum Reduce Depths, Lakhpat Fort to Mudhan Kutch

Class	Chainage (Km)		Observed				Reduced w.r.t. Sounding Datum			
	From	To	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)
1	53	75	0	0	22	949,836.92	-0.3	0	22	1,019,314.73
2	53	75	0	0	22	1446742.95	-0.3	0	22	1,536,206.42
3	53	75	0	0	22	2,186,580.08	-0.3	0	22	2,296,661.45
4	53	75	0	0	22	2,638,406.99	-0.3	0	22	2,754,429.91

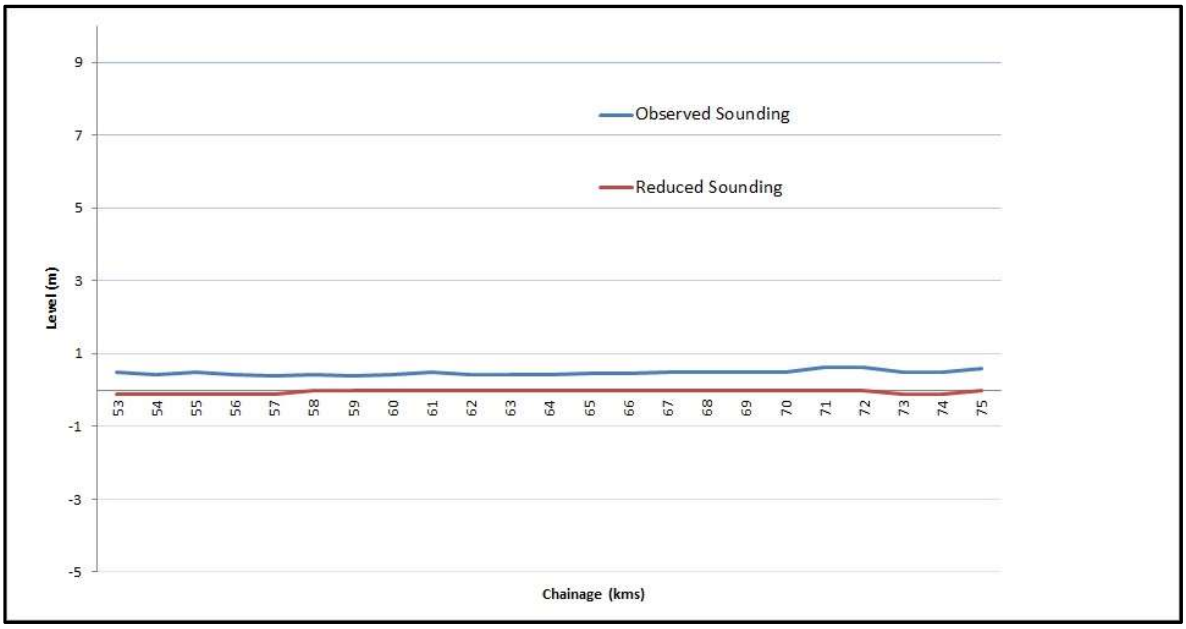


Figure 21 – Observed and Reduced Bed Profile Lakhpat Fort to Mudhan Kutch

3rd stretch (Ch. 53.00 to 75.00 km) start from Lakhpat fort and end at Mudhan Kutch. Main villages in this stretch are Karanpur,Guneri, Sayara & Mudhan. This stretch is near SH-42. All the transportation and tourist goes through this road. River banks in this stretch are mainly not protected and main compositions are Sand. In Vicinity of this stretch hilly area is not present. Hyacinth, rocks, and rapid waterfalls are not present in this stretch of River. There is no wild life Sanctuary. Security restriction from Border Security force (BSF). There are no industries along this stretch of waterway. This stretch of river is salty and water flows at the time of monsoon season only at depth around 1 to 4 foot only. There are no Jetties and Terminals seen in this stretch. There is no ferry, Passenger ferry services and no water sport recreational facilities are present in this stretch of waterway. No Railway Line and Railway station in Vicinity of this stretch. Average width of the stretch is 17.0 to 52.0 kms.

Figure 22 – Ch.60.0 Km Rann of Kutch View

Figure 23 – Ch. 68.5 Km Rann of Kutch view

Figure 24 – Ch.- 75 Km Rann of Kutch View

3.4 Mudhan Kutch to Haji Pir (Ch. 75.00 km – 100.00 km)

Figure 25 – Mudhan Kutch to Haji Pir

Table 16 - Minimum – Maximum Reduce Depths, Mudhan Kutch to Haji Pir

Class	Chainage (Km)		Observed				Reduced w.r.t. Sounding Datum			
	From	To	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)
1	75	100	0	0	25	1,079,875.70	-0.3	0	25	1,149,018.32
2	75	100	0	0	25	1644809.92	-0.3	0	25	1,733,825.86
3	75	100	0	0	25	2,485,860.56	-0.3	0	25	2,592,995.83
4	75	100	0	0	25	2,999,533.06	-0.3	0	25	3,115,065.52

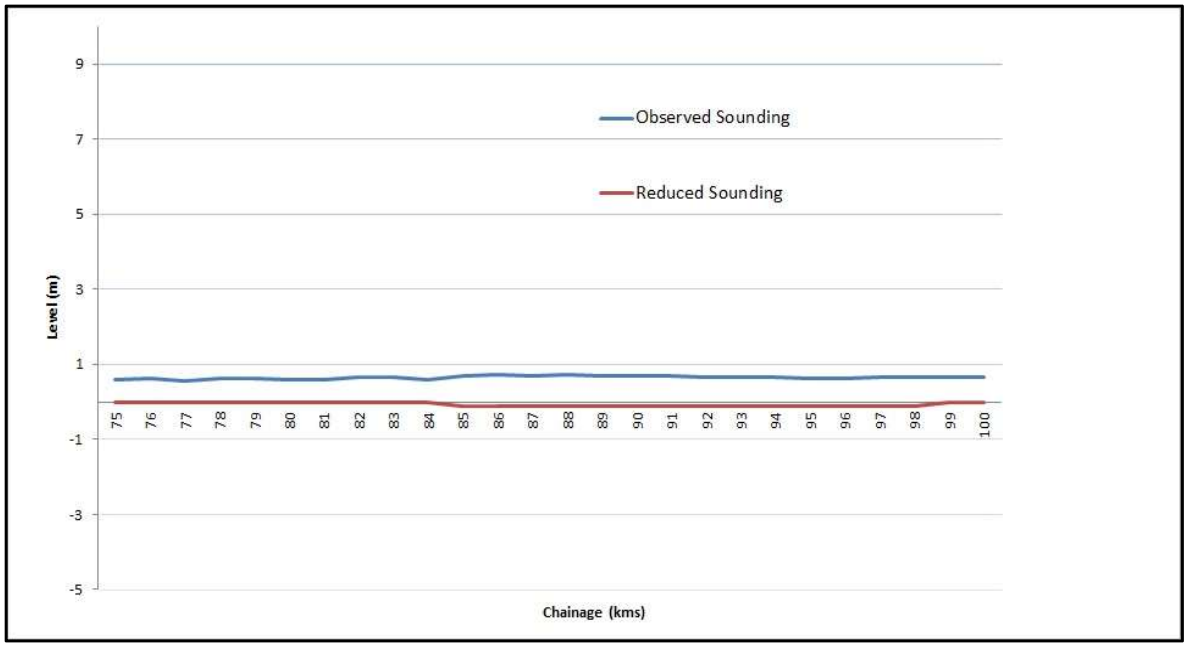


Figure 26 – Observed and Reduced Bed Profile of Mudhan Kutch to Haji Pir

4th stretch (Ch. 75 to 100 km) start from Mudhan Village and end at Haji Pir Village. No bridge is present in this stretch of River. Main villages in this stretch are Radosan, Meghpura,Golap Nesda, Golap, Padan, Chatarpura, Asaragam, Asara, Asaravas, Lodrani, Rachhena and Hemis chodar naseda. This stretch is well connected to State Highway 63. River banks in this stretch are mainly unprotected and main compositions are Sand. Forest land exists on some areas. There is no wild life Sanctuary. Security restriction from BSF. There are Salt Industries along this stretch of waterway. This stretch of river is salty and water flow at the time of monsoon season only at depth of around 1 to 4 foot only.There are no Jetties and Terminals seen in this stretch. There is no ferry, Passenger ferry services and no water sport recreational facilities are present in this stretch of waterway. No Railway Line and Railway station in Vicinity of this stretch. Average width of the stretch is 46.0 to 52.0 kms.

Figure 27 – Ch.- 78 Km Rann of Kutch View

Figure 28 – Ch. - 92 Km Rann of Kutch View

Figure 29 – Ch. - 100 Km Rann of Kutch View

3.5 Haji Pir to Udhmo Village (Ch. 100.00 km – 125.00 km)

Figure 30 – Haji Pir to Udhmo Village

Table 17 – Minimum – Maximum Reduce Depths, Haji Pir to Bhunga

Class	Chainage (Km)		Observed				Reduced w.r.t. Sounding Datum			
	From	To	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)
1	100	125	0	0	25	1,073,697.92	-0.3	0	25	963,630.87
2	100	125	0	0	25	1635402.72	-0.3	0	25	1,493,560.35
3	100	125	0	0	25	2,471,852.82	-0.3	0	25	2,292,060.69
4	100	125	0	0	25	2,982,623.96	-0.3	0	25	2,798,906.09

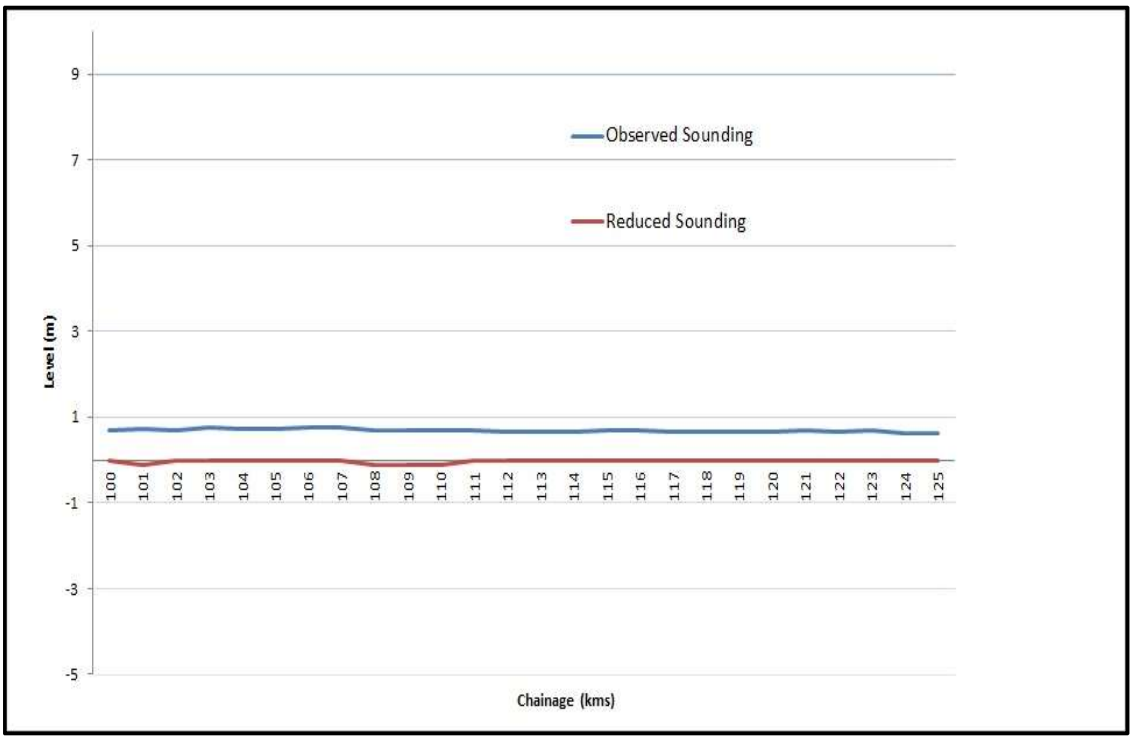


Figure 31 - Observed and Reduced Bed Profile of Haji Pir to Bhunga

5th stretch (Ch. 100 to 125 km) starts from Hajipir Village and end at Udhmo Village. Main village in this stretch are Hajipir, Udhmo, Bhunga,Dhordo. This stretch is well connected to state highway. River banks in this stretch are manly unprotected and main compositions are Sand. Only salt industries are present in this stretch of River. There is no wild life Sanctuary. Security restriction from BSF. This stretch is completely dry. No Railway Line and Railway station in Vicinity of this stretch. Average width of the stretch is 29.0 to 46.0 kms.

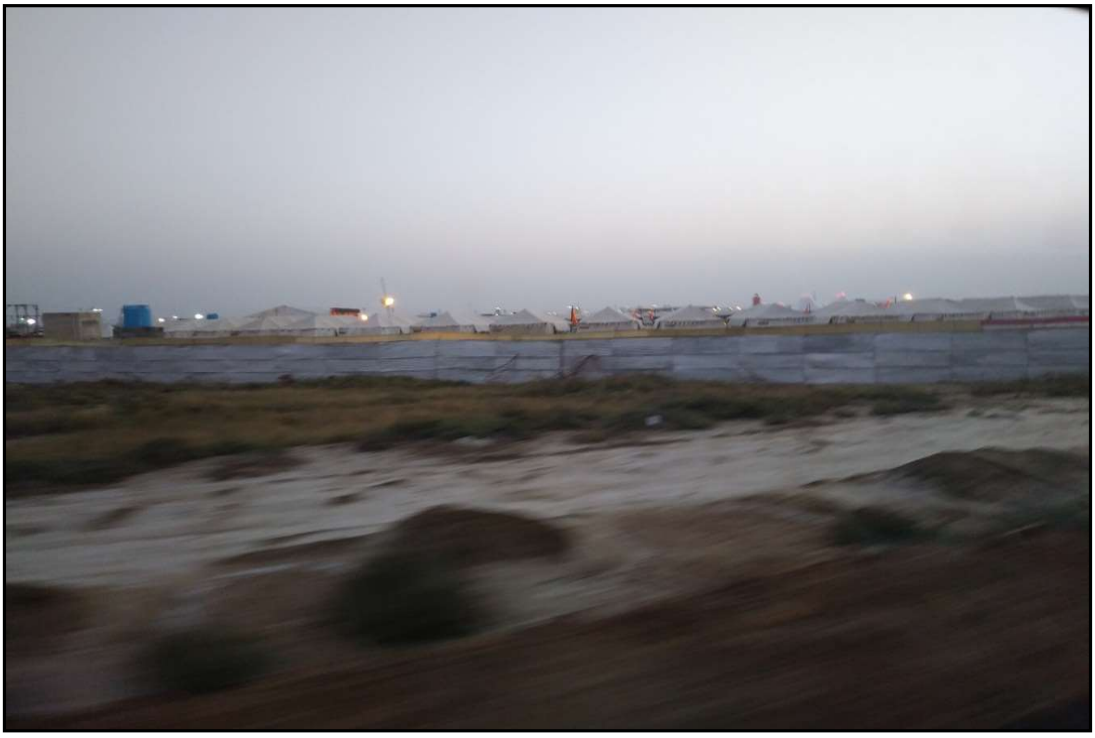


Figure 32 – Ch. 105 Km Rann of Kutch View

Figure 33 – Ch.- 120.0 Km Rann of Kutch View

3.6 Bhunga to Khavda Village (Ch. 125.00 km – 150.00 km)

Figure 34 – Udhmo to Khavda Village

Table 18 – Minimum – Maximum Reduce Depths, Bunga to Khavda Village

Class	Chainage (Km)		Observed				Reduced w.r.t. Sounding Datum			
	From	To	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)
1	125	150	0	0	25	1,072,679.61	-0.3	0	25	1,050,457.85
2	125	150	0	0	25	1633851.32	-0.3	0	25	1,601,371.14
3	125	150	0	0	25	2,469,382.51	-0.3	0	25	2,425,083.04
4	125	150	0	0	25	2,979,649.58	-0.3	0	25	2,927,841.28

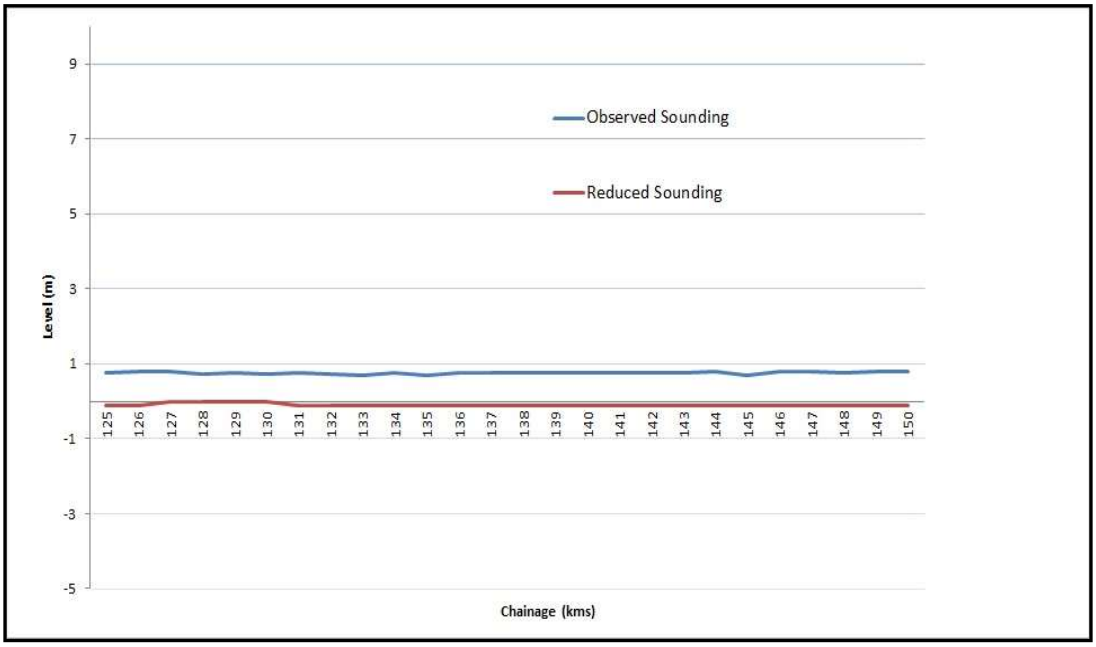


Figure 35 - Observed and Reduced Bed Profile of Bhunga to Khavda Village

6th stretch (Ch. 125 to 150 km) starts from Hajipir Village and end at Udhmo Village. Main village in this stretch are Udhmo & Khavda. This stretch is well connected to state highway. River banks in this stretch are mainly unprotected and main compositions are Sand. No industries are present in this stretch of River. There is no wild life Sanctuary. Security restriction from BSF. This stretch is completely dry. No Railway Line and Railway station in Vicinity of this stretch. Average width of the stretch is 22.0 to 29.0 kms.

Figure 36 – Ch.-131 Km Rann of Kutch View

Figure 37 – Ch. - 146 Km Rann of Kutch View

3.7 Khavda Village to India Bridge (Ch. 150.00 km – 175.00 km)

Figure 38 – Khavda Village to India Bridge

Table 19 - Minimum – Maximum Reduce Depths, Khavda Village to India Bridge

Class	Chainage (Km)		Observed				Reduced w.r.t. Sounding Datum			
	From	To	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)
1	150	175	0	0	25	1,074,691.20	-0.3	0	25	1,043,831.06
2	150	175	0	0	25	1636913.12	-0.3	0	25	1,596,136.20
3	150	175	0	0	25	2,474,018.51	-0.3	0	25	2,417,172.61
4	150	175	0	0	25	2,985,241.19	-0.3	0	25	2,929,266.34

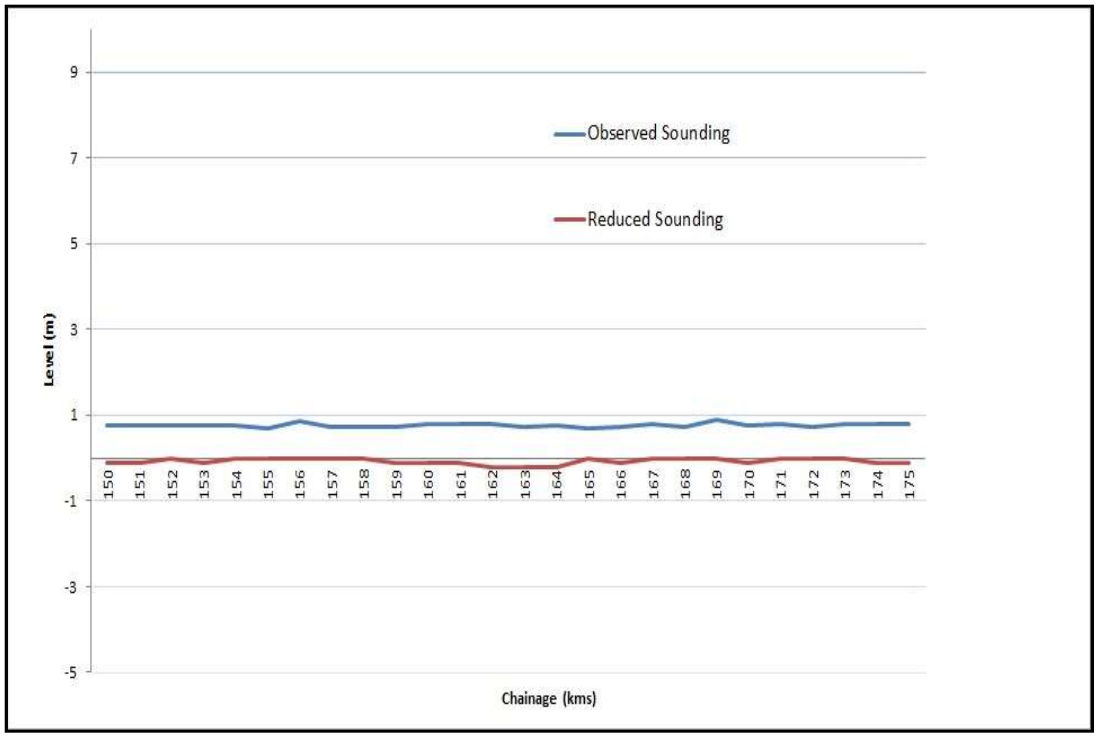


Figure 39 - Observed and Reduced Bed Profile of Khavda Village to India Bridge

7th stretch (Ch. 150 to 175 km) starts from Khadva Village and end at India bridge. Main village in this stretch are Khavda. One bridge is present in this stretch near Indo Pak boarder. This stretch is well connected to state highway. River banks in this stretch are mainly unprotected and main compositions are Salt & Sand. No industries are present in this stretch of River. There is no wild life Sanctuary. Security restriction from BSF. This stretch is completely dry. No Railway Line and Railway station in Vicinity of this stretch. Average width of the stretch is 1.50 to 22.0 kms.

Figure 40 – Ch.-158.5 Km Survey in Progress at Rann of Kutch

Figure 41 – Ch.-172.448 Km India Bridge, Rann of Kutch

3.8 India bridge to Kalo Dunger (Ch. 175.00 km – 200.00 km)

Figure 42 – India bridge to Kalo Dunger

Table 20 – Minimum – Maximum Reduce Depths, India Bridge to Kalo Dunger

Class	Chainage (Km)		Observed				Reduced w.r.t. Sounding Datum			
	From	To	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)
1	175	200	0	0	25	1,077,088.80	-0.3	0	25	1,031,780.06
2	175	200	0	0	25	1640565.15	-0.3	0	25	1,580,117.11
3	175	200	0	0	25	2,479,585.73	-0.3	0	25	2,403,061.69
4	175	200	0	0	25	2,991,957.73	-0.3	0	25	2,908,551.78

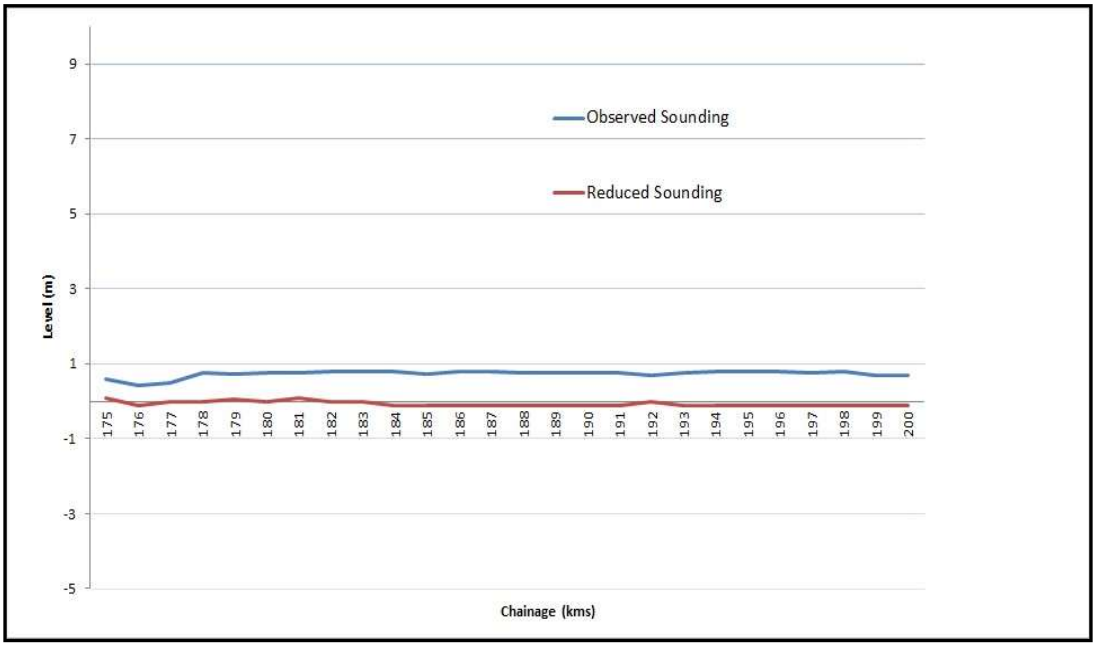


Figure 43 - Observed and Reduced Bed Profile of India bridge to Kalo Dunger

8th stretch (Ch. 175 to 200 km) starts from India bridge and end at Kalo Dunger Village. Main village in this stretch are Kalo Dunger.This stretch is well connected to state highway. River banks in this stretch are mainly unprotected and main compositions are Salt & Sand.No industries are present in this stretch of River. Chari Dhand bird Sanctuary are present in this stretch. Security restriction from BSF.This stretch is completely dry. No Railway Line and Railway station in Vicinity of this stretch. Average width of the stretch is 1.50 to 34.0 kms.

Figure 44 – Ch.-180 Km Survey in Progress at Rann of Kutch

Figure 45 – Ch.-200 Km Rann of Kutch View

3.9 Kalo Dunger to Dholavira fossil park (Ch. 200.00 km – 225.00 km)

Figure 46 – Kalo Dunger to Dholavira Fossil Park

Table 21 – Minimam – Maximum Reduce Depths, Kalo Dunger to Dholavira Fossil Park

Class	Chainage (Km)		Observed				Reduced w.r.t. Sounding Datum			
	From	To	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)
1	200	225	0	0	25	1,077,096.02	-0.3	0	25	1,015,847.49
2	200	225	0	0	25	1640463.58	-0.3	0	25	1,559,368.79
3	200	225	0	0	25	2,479,769.34	-0.3	0	25	2,378,683.24
4	200	225	0	0	25	2,992,177.91	-0.3	0	25	2,882,554.56

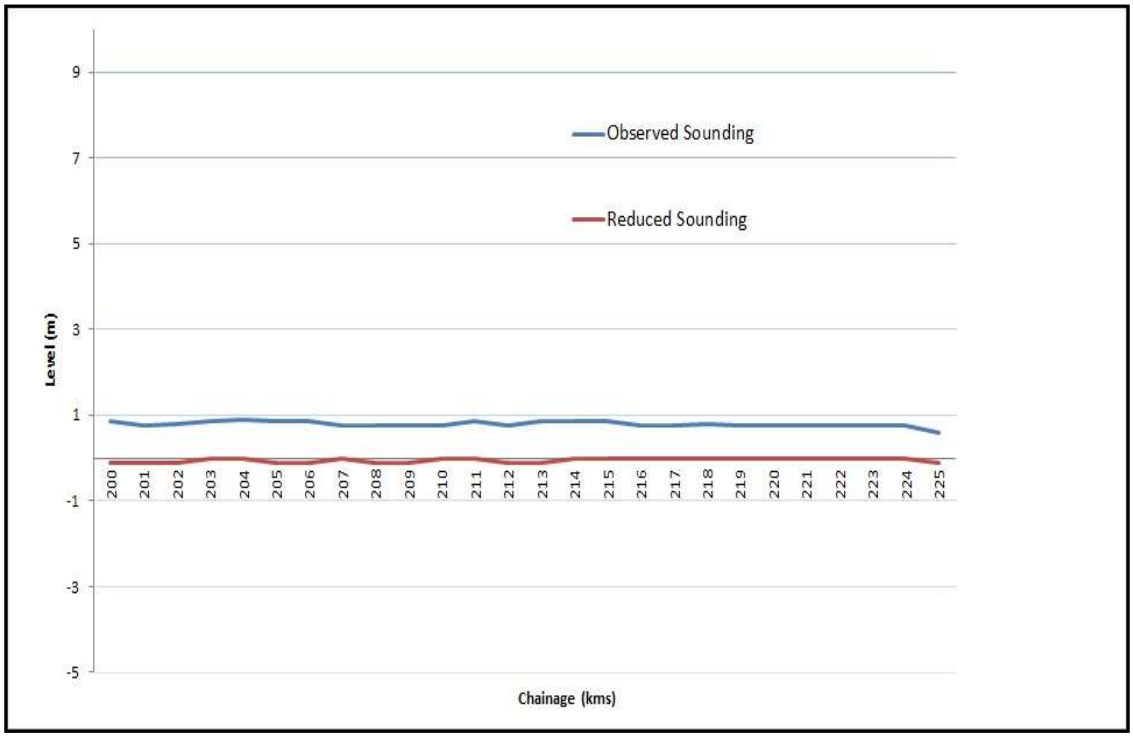


Figure 47 - Observed and Reduced Bed Profile of Kalo Dunger to Dholavira Fossil Park

9th stretch (Ch. 200 to 225 km) starts from Kalo Dunger Village and end at Dholavira Fossil Park. Main village in this stretch are Kalo Dunger & Dholavira.This stretch is well connected to state highway.A tourist place namely Dholavira Fossil Park is present in vicinity of this stretch. River banks in this stretch are mainly unprotected and main compositions are Sand. No industries are present in this stretch of River. There is no wild life Sanctuary. Security restriction from BSF.This stretch is completely dry. No Railway Line and Railway station in Vicinity of this stretch. Average width of the stretch is 34.0 to 44.0 kms.

Figure 48 – Ch.-205 Km Survey on Progress in Rann of Kutch

Figure 49 – Ch.-225 Km Rann of Kutch View

3.10 Dholavira fossil park to Amarapar Village (Ch. 225.00 km – 250.00 km)

Figure 50 – Dholavira Fossil park to Amarapar Village

Table 22 – Minimum – Maximum Reduce Dephts, Dholavira Fossil Park to Amarpar Village

Class	Chainage (Km)		Observed				Reduced w.r.t. Sounding Datum			
	From	To	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)
1	225	250	0	0	25	1,078,089.63	-0.3	0	25	1,045,739.77
2	225	250	0	0	25	1641854.98	-0.3	0	25	1,596,253.36
3	225	250	0	0	25	2,482,025.47	-0.3	0	25	2,421,236.77
4	225	250	0	0	25	2,994,906.58	-0.3	0	25	2,931,195.64

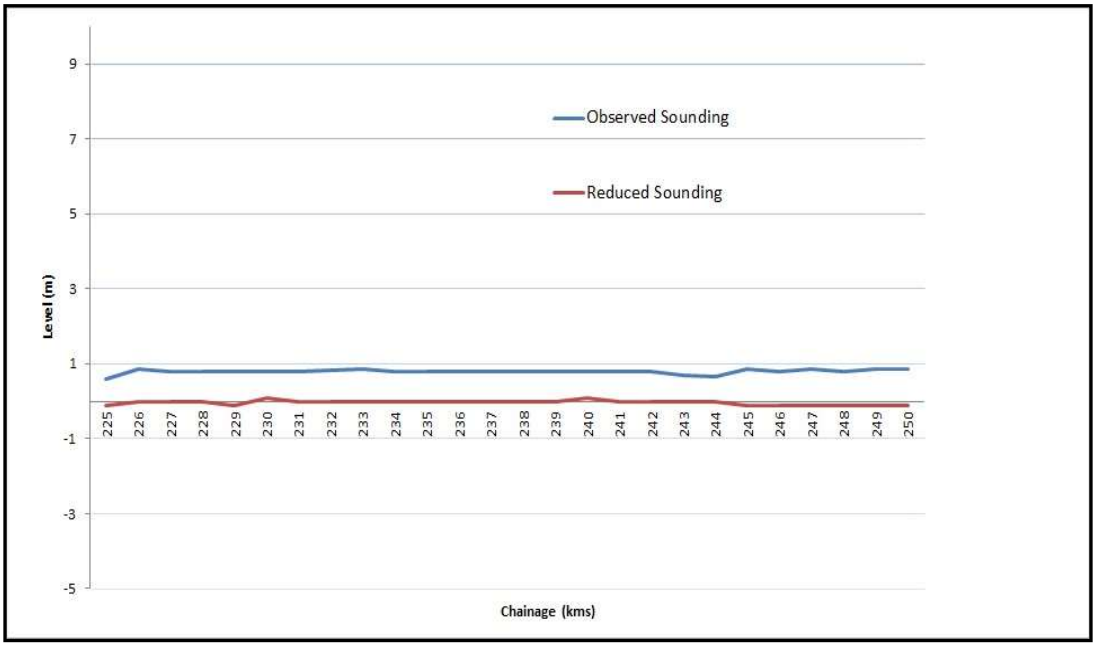


Figure 51 - Observed and Reduced Bed Profile of Dholavira Fossil Park to Amarapar Village

10th stretch (Ch. 225 to 250 km) starts from Dholavira Fossil Park and end at Amarapar Village. Main village in this stretch are Dholavira & Amarapar. This stretch is well connected to state highway. A tourist place namely Dholavira Fossil Park is present in vicinity of this stretch. River banks in this stretch are mainly unprotected and main compositions are Sand. No industries are present in this stretch of River. There is no wild life Sanctuary. Security restriction from BSF. This stretch is completely dry. No Railway Line and Railway station in Vicinity of this stretch. Average width of the stretch is 44.0 to 49.0 kms.

Figure 52 – Ch.-230.00 Km Rann of Kutch View

Figure 53 – Ch.-242.00 Km Rann of Kutch View

Figure 54 – Ch. – 250.00 Km Survey in Progress in Rann of Kutch

3.11 Amarapar Village to Nilagar (Ch. 250.00 km – 275.00 km)

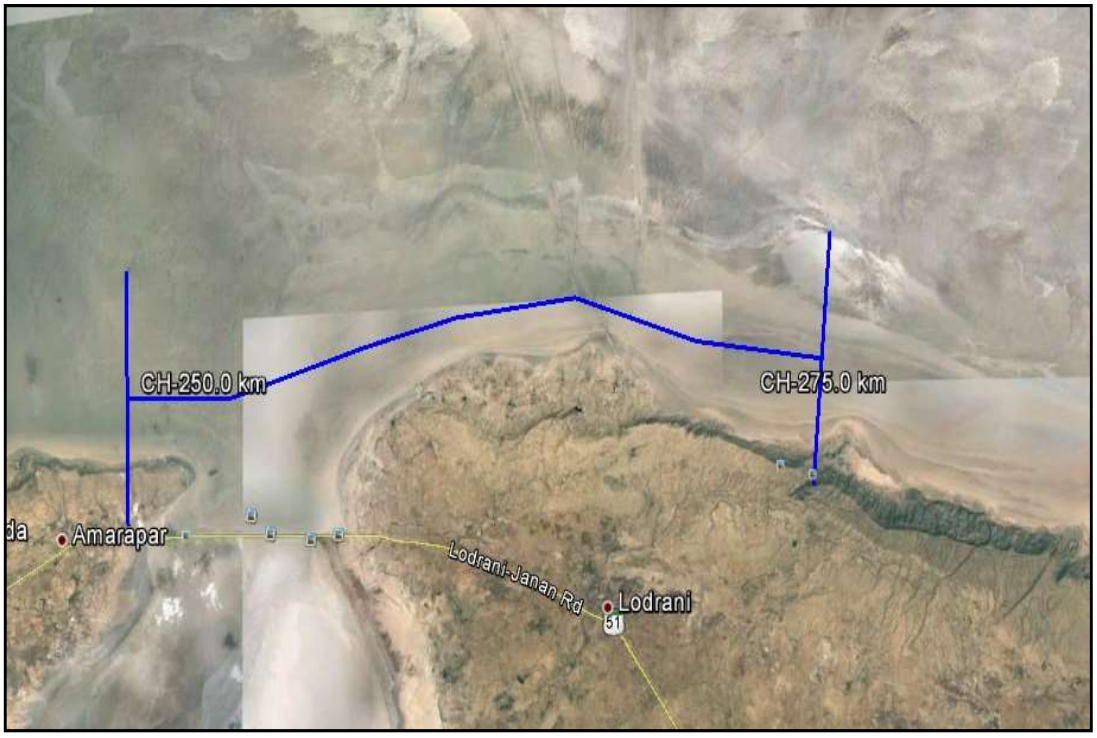


Figure 55 – Amarapar Village to Nilagar

Table 23 – Minimum – Maximum Reduce Dephts, Amarpar Village to Nilagar

Class	Chainage (Km)		Observed				Reduced w.r.t. Sounding Datum			
	From	To	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)
1	250	275	0	0	25	1,079,232.66	-0.3	0	25	1,020,391.54
2	250	275	0	0	25	1643831.68	-0.3	0	25	1,562,195.10
3	250	275	0	0	25	2,484,458.67	-0.3	0	25	2,372,618.87
4	250	275	0	0	25	2,997,845.01	-0.3	0	25	2,881,428.40

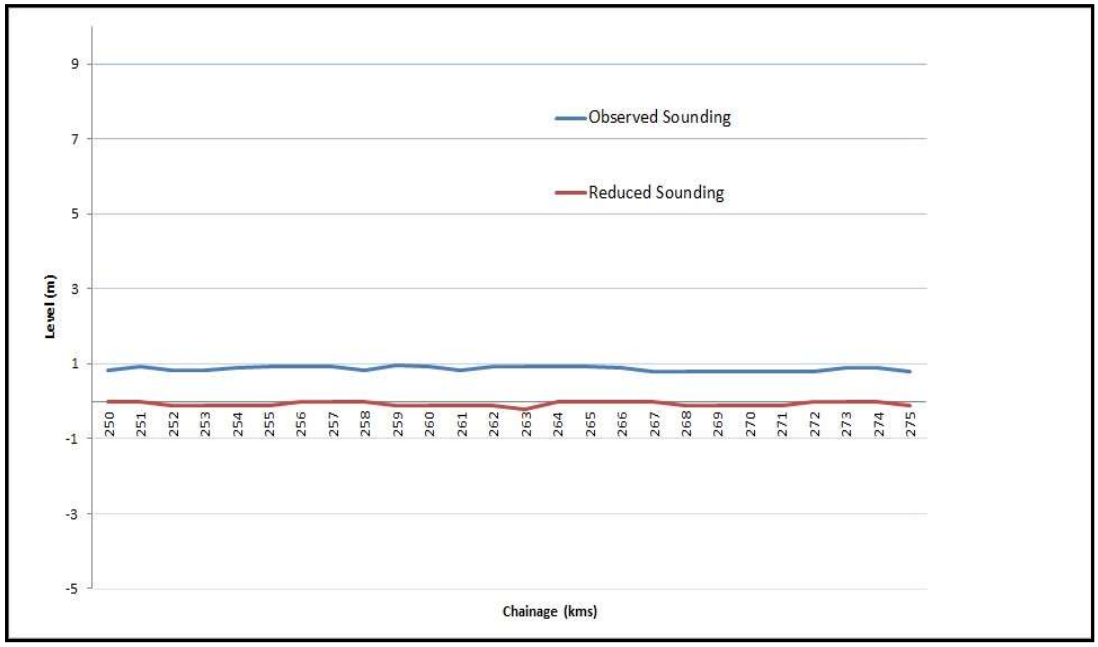


Figure 56 - Observed and Reduced Bed Profile of Amarapar Village to Nilagar

11th stretch (Ch. 250 to 275 km) starts from Amarapar Village and end at Nilagar Village. Main village in this stretch are Amarapar & Nilagar.This stretch is well connected to state highway.River banks in this stretch are mainly unprotected and main compositions are Sand. No industries are present in this stretch of River. There is no wild life Sanctuary.Security restriction from BSF.This stretch is completely dry. No Railway Line and Railway station in Vicinity of this stretch.Average width of the stretch is 33.0 to 49.0 kms.

Figure 57 – Ch.-250.30 Km Rann of Kutch View

Figure 58 – Ch.- 258 Km Rann of Kutch View

Figure 59 – Ch.- 266 Km Rann of Kutch View

Figure 60 – Ch.- 275 Km Rann of Kutch View

3.12 Nilagar to Vrajvani Village (Ch. 275.00 km – 300 km)

Figure 61 – Nilagar to Vrajvani Village

Table 24 – Minimum – Maximum Reduce Depths, Nilagar to Virajvani Village

Class	Chainage (Km)		Observed				Reduced w.r.t. Sounding Datum			
	From	To	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)
1	275	300	0	0	25	1,079,799.41	-0.3	0	25	891,730.72
2	275	300	0	0	25	1644694.72	-0.3	0	25	1,396,810.07
3	275	300	0	0	25	2,485,784.30	-0.3	0	25	2,172,114.25
4	275	300	0	0	25	2,999,437.95	-0.3	0	25	2,667,465.82

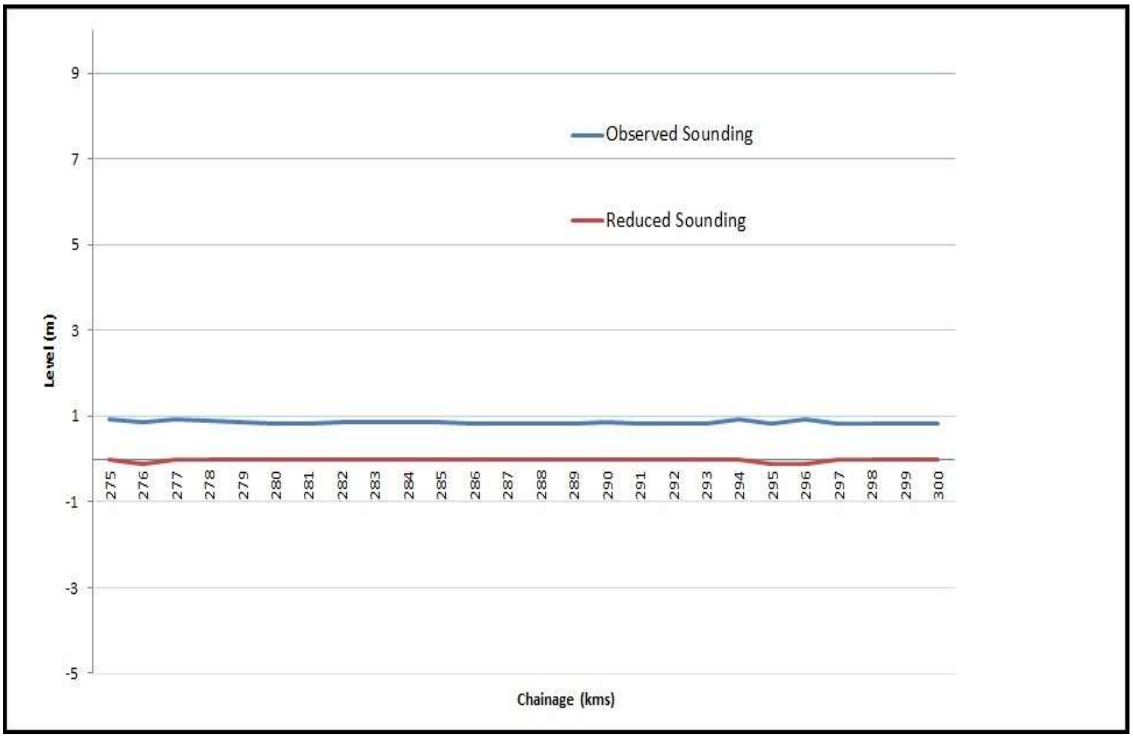


Figure 62 - Observed and Reduced Bed Profile of Nilagar to Vrajvani Village

12th stretch (Ch. 275 to 300 km) starts from Nilagar Village and end at Vrajvani Village. Main village in this stretch are Nilagar & Vrajvani.This stretch is well connected to state highway. River banks in this stretch are mainly unprotected and main compositions are Sand. No any industries are present in this stretch of River. There is no wild life Sanctuary.Security restriction from BSF.This stretch is completely dry. No Railway Line and Railway station in Vicinity of this stretch. Average width of the stretch is 33.0 to 46.0 kms.

Figure 63 – Ch.-275 Km Rann of Kutch View

Figure 64 – Ch.-295 Km Rann of Kutch View

3.13 Vrajvani Village To Fangli Village (Ch. 300.00 km – 325.0 km)

Figure 65 – Vrajvani Village To Fangli Village

Table 25 – Minimum – Maximum Reduce Depths, Virajvani Village to Fangli Village

Class	Chainage (Km)		Observed				Reduced w.r.t. Sounding Datum			
	From	To	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)
1	300	325	0	0	25	1,078,516.67	-0.3	0	25	1,124,407.77
2	300	325	0	0	25	1642740.67	-0.3	0	25	1,700,552.43
3	300	325	0	0	25	2,482,792.87	-0.3	0	25	2,557,695.92
4	300	325	0	0	25	2,995,832.15	-0.3	0	25	3,066,977.19

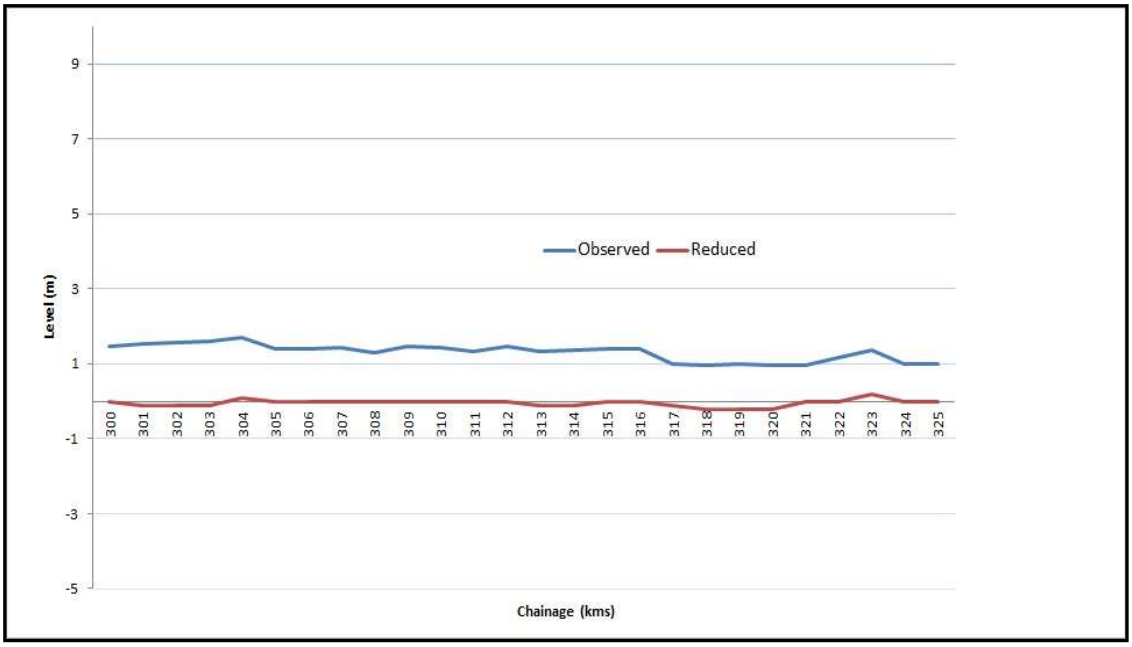


Figure 66 – Observed and Reduced Bed Profile of Vrajvani Village To Fangli Village

13th Stretch (Ch. 300 to 325 km) starts from Vrajvani Village and end at Fangli Village. Main village in this stretch are Vrajvani.,Jakhota & Fangli Village This stretch is well connected to NH 15 .River banks in this stretch are mainly unprotected and main compositions are Sand.Gujarat Solar Park is present in this stretch of River.There is no wild life Sanctuary.Security restriction from BSF.This stretch is completely dry. No Railway Line and Railway station in Vicinity of this stretch. Average width of the stretch is 46.0 to 51.0 kms.

Figure 67 – Ch.-310.5 Km Rann of Kutch View

Figure 68 – Ch.-320.0 Km Rann of Kutch View

3.14 Fangli Village to Jaloya Village (Ch. 325.00 km – 350.0 km)

Figure 69 – Fangli Village to Jaloya Village

Table 26 - Minimum – Maximum Reduce Depths, Fangli Village to Jaloya Village

Class	Chainage (Km)		Observed				Reduced w.r.t. Sounding Datum			
	From	To	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)
1	325	350	0	0	25	1,077,711.32	-0.3	0	25	1,271,034.96
2	325	350	0	0	25	1641456.06	-0.3	0	25	1,889,783.77
3	325	350	0	0	25	2,481,517.55	-0.3	0	25	2,786,417.94
4	325	350	0	0	25	2,994,355.17	-0.3	0	25	3,313,685.29

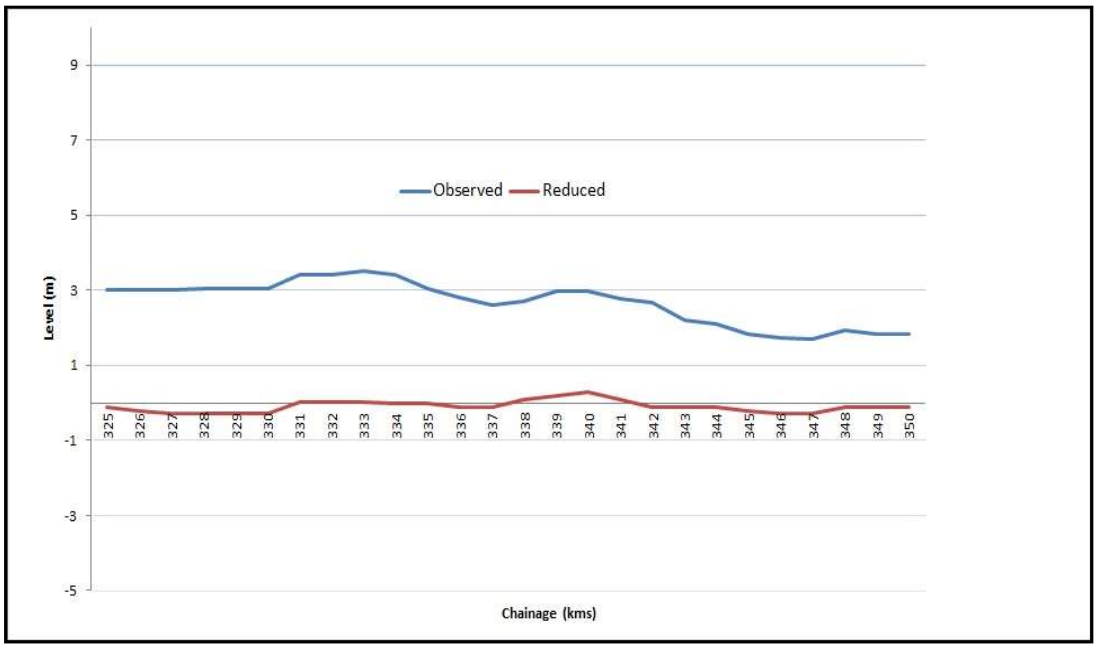


Figure 70 – Observed and Reduced Bed Profile of Fangli Village to Jaloya Village

Stretch 14th start from Fangli Village and end at Jaloya Village. Main villages in this stretch are Masali, Suigam.& Suigam This stretch is well connected to NH 15. All transportation and tourist goes through this road. River banks in this stretch are mainly not protected and main compositions are Sand. In Vicinity of this stretch hilly area is present. Hyacinth, rocks, and rapid waterfalls are not present in this stretch of River. There is no wild life Sanctuary. Security restriction from Border Security force (BSF). There are no industries along this stretch of waterway. There are no Jetties and Terminals seen in this stretch. There is no ferry, Passenger ferry services and no water sport recreational facilities are present in this stretch of waterway. No Railway Line and Railway station in Vicinity of this stretch. Average width of the stretch is 41.0 to 51.0 kms.

Figure 71 – Ch.-330.0 Km Rann of Kutch View

Figure 72 – Ch.-340.0 Km Rann of Kutch View

3.15 Jaloya Village to Bharadava Village (Ch. 350.00 km – 375.0 km

Figure 73 – Jaloya Village to Bharadava Village

Table 27 - Minimum – Maximum Reduce Depths, Jaloya Village to Bharadava Village

Class	Chainage (Km)		Observed				Reduced w.r.t. Sounding Datum			
	From	To	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)
1	350	375	0	0	25	1,074,322.76	-0.3	0	25	1,064,917.14
2	350	375	0	0	25	1636351.34	-0.3	0	25	1,626,242.94
3	350	375	0	0	25	2,473,170.69	-0.3	0	25	2,459,376.82
4	350	375	0	0	25	2,984,217.66	-0.3	0	25	2,973,251.36

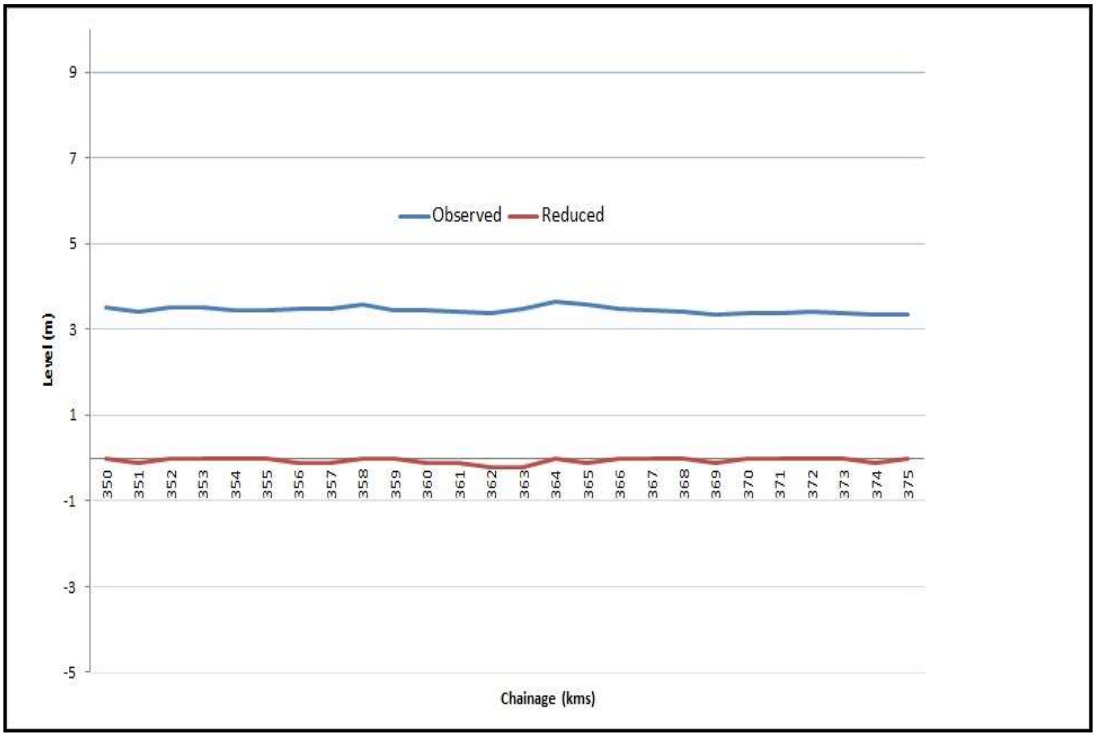


Figure 74 – Observed and Reduced Bed Profile of Bhardava Village to Chothar Nesda Village

Stretch 15th start from Jaloya Village and end at Bhardava Village. One number of bridge is present in this stretch of River. Main villages in this stretch are Masali, Jaloya, Suigam and Bharadava. This stretch is well connected to NH 15. All the transportation and tourist goes through this road. Nadeshwari Mata Temple is present in this stretch. River banks in this stretch are mainly not protected and main compositions are Sand. In Vicinity of this stretch hilly area is present. Hyacinth, rocks, and rapid waterfalls are not present in this stretch of River. There is no wild life Sanctuary. Security restriction from Border Security force (BSF). There are no industries along this stretch of waterway. There are no Jetties and Terminals seen in this stretch. There is no ferry services and no water sport recreational facilities are present in this stretch of river. No Railway Line and Railway station in vicinity of this stretch. Average width of the stretch is 25.0 to 41.0 kms.

Figure 75 – Ch.-358.38 Km Rann of Kutch View

3.16 Bhardava Village to Chothar Nesda Village (Ch. 375.00 km – 400.0 km)

Figure 76 - Bhardava Village to Chothar Nesda Village

Table 28 - Minimum – Maximum Reduce Depths, – Bhardava Village to Chothar Nesda Village

Class	Chainage (Km)		Observed				Reduced w.r.t. Sounding Datum			
	From	To	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)
1	375	400	0	0	25	1,078,152.11	-0.3	0	25	1,065,675.51
2	375	400	0	0	25	1642185.95	-0.3	0	25	1,621,175.20
3	375	400	0	0	25	2,481,963.78	-0.3	0	25	2,451,477.68
4	375	400	0	0	25	2,994,828.52	-0.3	0	25	2,957,750.67

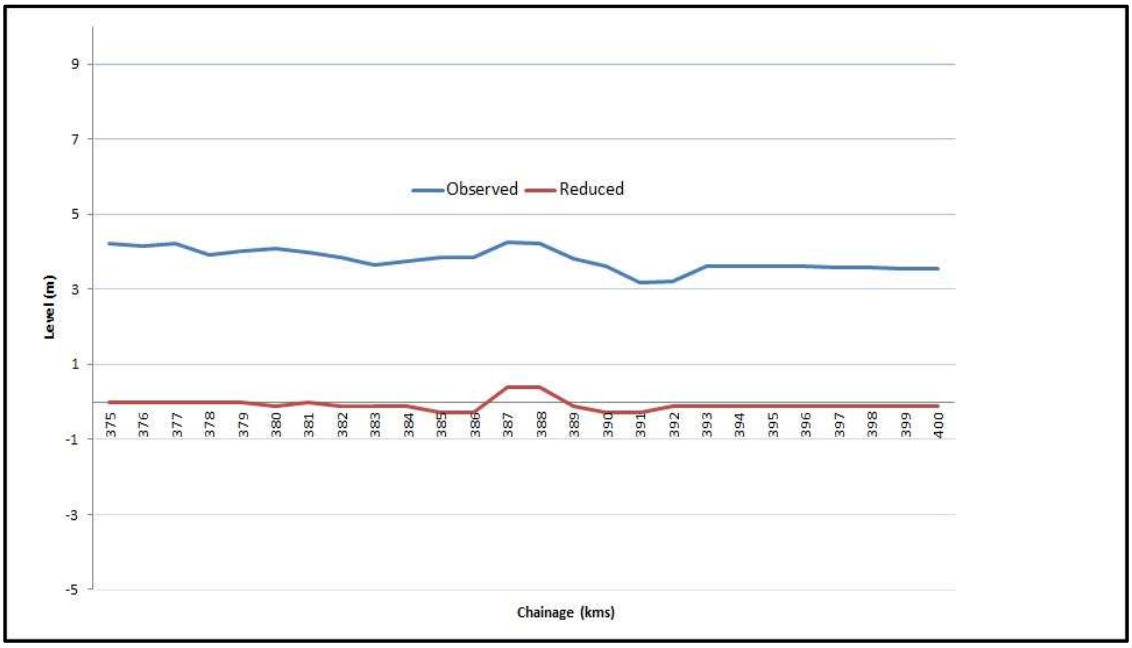


Figure 77 – Observed and Reduced Bed Profile of Bhardava Village to Chothar Nesda Village

Stretch 16th start from Bhardava Village and end at Chothar Nesda Village. Not any bridge is present in this stretch of River. Main villages in this stretch are Radosan, Meghpura,Golap Nesda, Golap, Padan, Chatarpura, Asaragam, Asara, Asaravas, Lodrani, Rachhena and Hemis chodar naseda.. This stretch is well connected to State Highway 63. River banks in this stretch are mainly unprotected and main compositions are Sand. In Vicinity of this stretch hilly area is present. Hyacinth, rocks, and rapid waterfalls are not present in this stretch of River. Forest land exists on some areas. There is no wild life Sanctuary. Security restriction from BSF. There are no Industries along this stretch of waterway. There are no Jetties and Terminals seen in this stretch. There is no ferry, Passenger ferry services and no water sport recreational facilities are present in this stretch of waterway. No Railway Line and Railway station in Vicinity of this stretch. Average width of the stretch is 25.0 to 32.0 kms.

Figure 78 – Ch.- 380.0 Km Rann of Kutch View

Figure 79 – Ch.- 390.0 Km Rann of Kutch View

3.17 Chothar Nesda Village to Bakhasar Village (Ch. 400.00 km – 421.249 km)

Figure 80 – Chothar Nesda Village to Bakhasar Village

Table 29 - Minimum – Maximum Reduce Depths, – Chothar Nesda Village to Bakhasar

Class	Chainage (Km)		Observed				Reduced w.r.t. Sounding Datum			
	From	To	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)
1	400	421.249	0	0	21.249	881,936.12	-0.3	0	21.249	841,600.01
2	400	421.249	0	0	21.249	1343317.42	-0.3	0	21.249	1,264,557.72
3	400	421.249	0	0	21.249	2,030,256.53	-0.3	0	21.249	1,894,646.17
4	400	421.249	0	0	21.249	2,449,782.82	-0.3	0	21.249	2,307,713.33

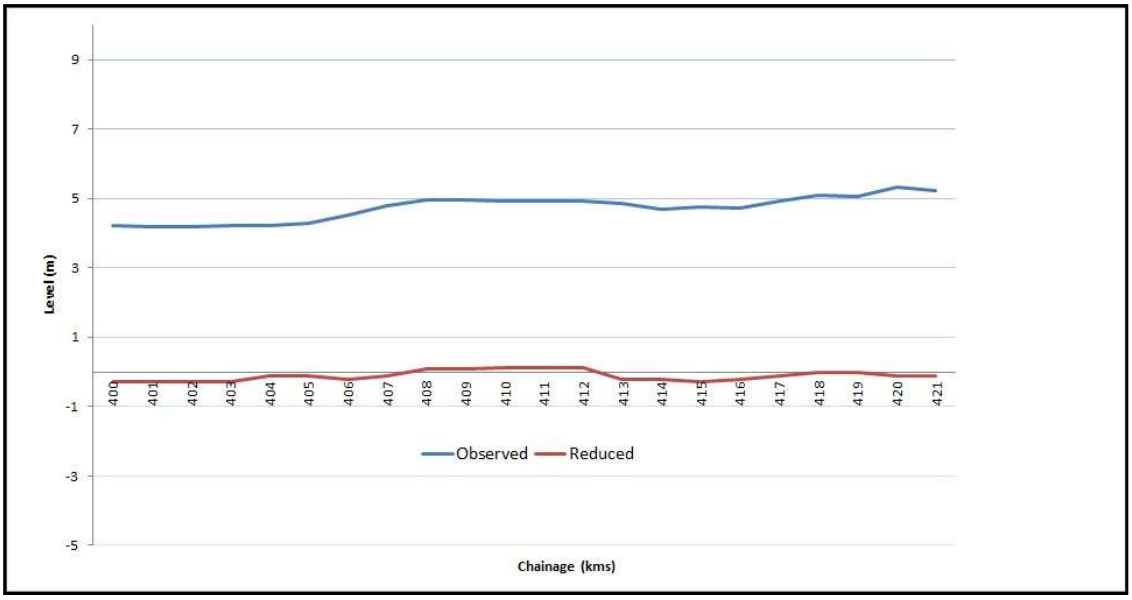


Figure 81 – Observed and Reduced Bed Profile of Chothar Nesda Village to Bakhasar

Stretch 17th starts from Chothar Naseda Village and end at Bakhasar Village. One bridge is present in this stretch of River. This bridge structure is temprory basis and used for Border Road. Main village in this stretch are Chandangarh, Kareli, Radha Naseda, Kundaliya, Baradavi, Jordayali, Rankhar, Anoriya, Tareesara Bawarawala,Nawapura, Daseriya, and Bakhasar. This stretch is well connected to Road. River banks in this stretch are mainly unprotected and main compositions are Sand. Crops and Agriculture land mainly along the river. Hyacinth, rocks, and rapid waterfalls are not present in this stretch of River. Forest land exists on some areas. There is no wild life Sanctuary. Security restriction from BSF. There are no Industries along this stretch of waterway. There are no Jetties and Terminals seen in this stretch. No tourist places in vicinity of this stretch. There is no ferry,Passenger ferry services and no water sport recreational facilities are present in this stretch of waterway. No Railway Line and Railway station in Vicinity of this stretch. At the end of this stretch Luni River start from Ch. 421.249km. Average width of the stretch is 900m to 23.0 kms.

Figure 82 – Ch.- 422.0 Km DGPS Survey on Progress

3.18 Chothar Nesda Village To Sankariya (Ch. 421.249 km – 450.0 km)

Figure 83 – Chothar Nesda Village to Sankariya Village

Table 30 - Minimum – Maximum Reduce Depths, Chothar Nesda Village To Sankariya Village

Class	Chainage (Km)		Observed				Reduced w.r.t. Sounding Datum			
	From	To	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)
1	421.249	450	0	0	28.751	1,148,662.89	-0.3	0	28.751	1,451,995.51
2	421.249	450	0	0	28.751	1,749,826.21	-0.3	0	28.751	2,140,796.43
3	421.249	450	0	0	28.751	2,645,070.73	-0.3	0	28.751	3,132,164.21
4	421.249	450	0	0	28.751	3,191,724.12	-0.3	0	28.751	3,701,107.31

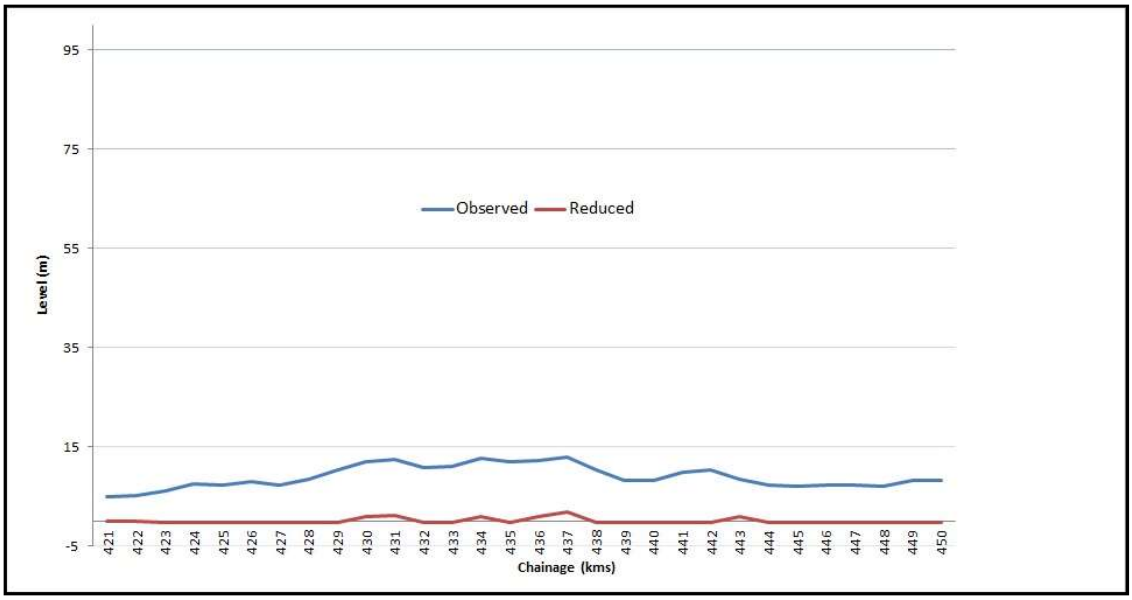


Figure 84 – Observed and Reduced Bed Profile of Chothar Nesda Village to Sankariya

Stretch 18th (Ch. 421.249 to 450 km) starts from Bakhasar Village and end at Sankariya Village. One ford road crossing is present in this stretch of River. Main village in this stretch are Khejarayali, Suthadi Bhawatra and Snakrriya. River banks in this stretch are mainly unprotected and main compositions are Sand. Crops and Agriculture land mainly along the river. Hyacinth, rocks, and rapid waterfalls are not present in this stretch of River. Forest land exists on some areas. There is no wildlife Sanctuary. There are no Industries along this stretch of waterway. There are no Jetties and Terminals seen in this stretch. No tourist places in vicinity of this stretch. No any Railway Line and Railway station in Vicinity of this stretch. Gram, Cumin, Cotton and Wheat are main crops in this stretch. Average width of the stretch is 50m to 900m.

Figure 85 - Ch.-435.20 Km Ford Bridge River on Luni River

Figure 86 – Ch.- 439.80 Km Pillar LU 06 on Luni River

3.19 Sankariya Village To Chimara Village (Ch. 450.00 km – 475.0 km)

Figure 87 – Sankariya Village to Chimara Village

Table 31 - Minimum – Maximum Reduce Depths, Sankariya Village To Chimara Village

Class	Chainage (Km)		Observed				Reduced w.r.t. Sounding Datum			
	From	To	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)
1	450	475	0	0	25	953,959.82	-0.3	0	25	1,219,898.57
2	450	475	0	0	25	1,453,074.49	-0.3	0	25	1,794,918.18
3	450	475	0	0	25	2,196,569.10	-0.3	0	25	2,620,866.36
4	450	475	0	0	25	2,650,596.37	-0.3	0	25	3,093,935.42

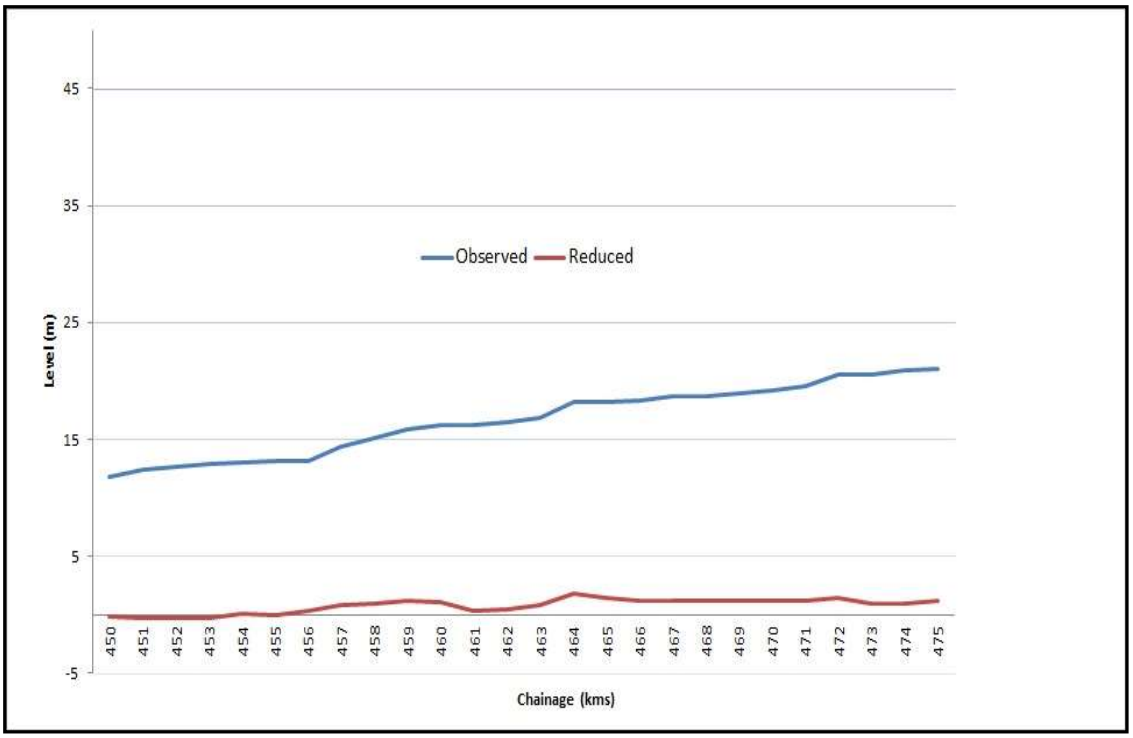


Figure 88 - Observed and Reduced Bed Profile of Sankariya Village To Chimara Village

Stretch 19th (Ch. 450 to 475 km) starts from Sankariya Village To Chimara Village. No bridge is present in this stretch of River. Main village in this stretch are Khejarayali, Snakrriya, Bhawatra and Chimara. This stretch is not connected to Road. River banks in this stretch are mainly unprotected and main compositions are Sand. Crops and Agriculture land mainly along the river. Hyacinth, rocks, and rapid waterfalls are not present in this stretch of River. Forest land exists on some areas. There is no wild life Sanctuary. There are no Industries along this stretch of waterway. There are no Jetties and Terminals seen in this stretch. No tourist places in vicinity of this stretch. Not Railway Line and Railway station in Vicinity of this stretch. Gram, Cumin, Cotton and Wheat are main crops in this stretch. Average width of the stretch is 50m to 150m

Figure 89 – Ch.-457.15 Km Ford Bridge River on Luni River

Figure 90 – Ch.- 461.40 Km DGPS Survey on Pillar 04 in Luni River

3.20 Chimara Village To Malipura village (Ch. 475.00 km – 491.903 km)

Figure 91 – Chimara Village To Malipura Village

Table 32 - Minimum – Maximum Reduce Depths, Chimara Village To Malipura Village

Class	Chainage (Km)		Observed				Reduced w.r.t. Sounding Datum			
	From	To	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)
1	475	491.903	0	0	16.903	705,159.44	-0.3	0	16.903	902,136.01
2	475	491.903	0	0	16.903	1,074,064.10	-0.3	0	16.903	1,327,551.13
3	475	491.903	0	0	16.903	1,623,337.15	-0.3	0	16.903	1,938,169.53
4	475	491.903	0	0	16.903	1,958,777.87	-0.3	0	16.903	2,287,779.82

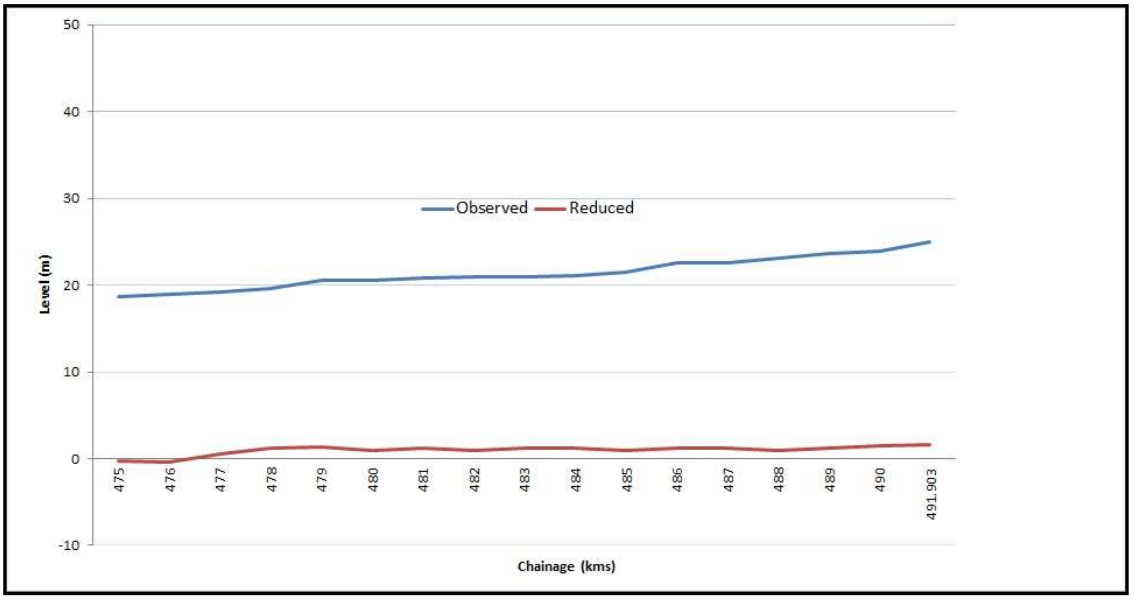


Figure 92- Observed and Reduced Bed Profile of Chimara Village To Malipura Village

Stretch 20th (Ch. 475.0 to 491.903 km) starts from Chimara Village in Luni Riavr and end at damage bund, Malipura village in Luni River.From damage bund malipura onward (Ch. 491.903 km) in Luni River was surveyed by M/S IIC Technologies. No bridge is present in this stretch of River. Main village in this stretch are Lalpura, Shivpura,Silosan,& Keriya,This stretch is well connected to Road. River banks in this stretch are manly unprotected. Crops and Agriculture land mainly along the river. Hyacinth, rocks, and rapid waterfalls are not present in this stretch of River. Forest land exists on some areas. There is no wild life Sanctuary. There are no Industries along this stretch of waterway. There are no Jetties and Terminals seen in this stretch. No tourist places in vicinity of this stretch. There is no ferry, Passenger ferry services and no water sport recreational facilities are present in this stretch of waterway. No Railway Line and Railway station in Vicinity of this stretch. Cotton and Wheat are main crops in this stretch. Average width of the stretch is 150m to 290m

Figure 93 - Ch.-485.50 Km Luni River View

Jawai River

3.21 Hemaguda Village to Navi Village (Ch. 0.0 km – 25.0 km)

Figure 94 - Hemaguda Village to Navi Village

Table 33 - Minimum – Maximum Reduce Depths, – Hemaguda Village to Navi Village

Class	Chainage (Km)		Observed				Reduced w.r.t. Sounding Datum			
	From	To	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)
1	0	25	0	0	25	1,076,085.16	-0.3	0	25	1,346,757.39
2	0	25	0	0	25	1,541,259.62	-0.3	0	25	1,853,897.77
3	0	25	0	0	25	2,477,221.93	-0.3	0	25	2,914,492.12
4	0	25	0	0	25	2,989,120.35	-0.3	0	25	3,446,793.52

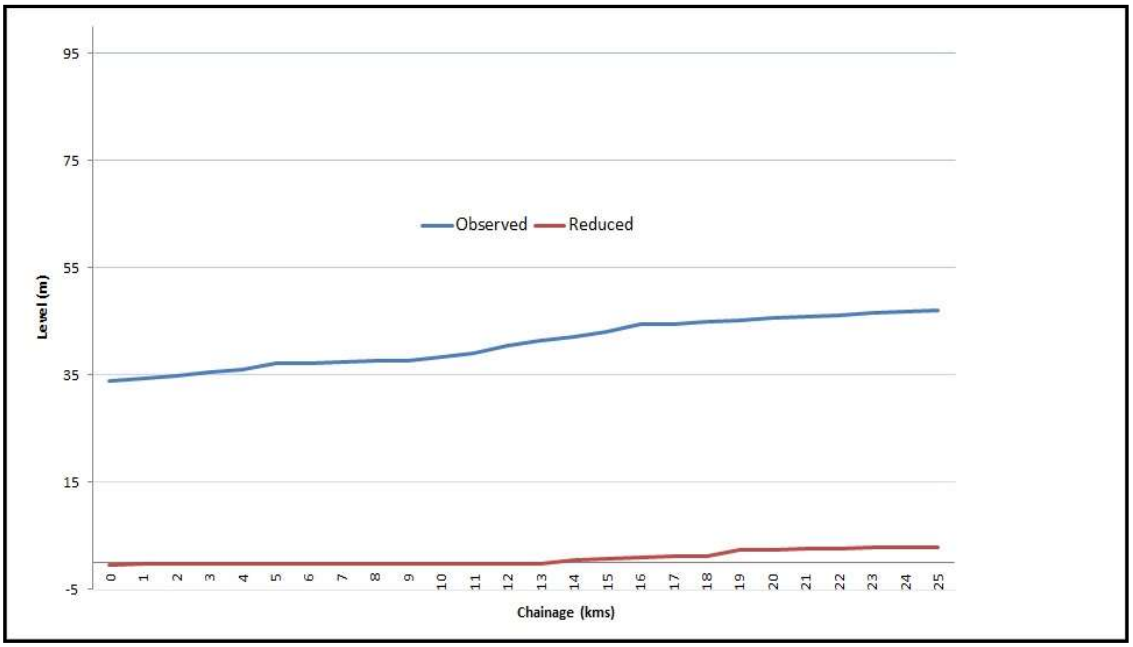


Figure 95 - Observed and Reduced Bed Profile of – Hemaguda Village to Navi Village

First stretch (Ch.0.0 to 25.0 km) starts from Hemguda Village and end at Navi Village. No bridge is present in this stretch of River. Main village in this stretch are Gura Hema,Jhab and Hemaguda. This stretch is well connected to Road. River banks in this stretch are mainly unprotected.Crops and Agriculture land mainly along the river. Hyacinth, rocks, and rapid waterfalls are not present in this stretch of River. Forest land exists on some areas. There is no wild life Sanctuary. There are no Industries along this stretch of waterway. There are no Jetties and Terminals seen in this stretch. No tourist places in vicinity of this stretch. There is no ferry, Passenger ferry services and no water sport recreational facilities are present in this stretch of waterway. No Railway Line and Railway station in Vicinity of this stretch. Gram, Cumin, Cotton and Wheat are main crops in this stretch. Average width of the stretch is 400m to 1.10 kms.

Figure 96 - Ch.-10.50 Km Jawai River View

3.22 Navi Village To Harmoo Village (Ch. 25.0 km – 50.0 km)

Figure 97 – Navi Village to Harmoo Village

Table 34 - Minimum – Maximum Reduce Depths, – Navi Village to Harmoo Village

Class	Chainage Km)		Observed				Reduced w.r.t. Sounding Datum			
	From	To	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)
1	25	50	0	0	25	428,216.84	-0.3	0	25	540,918.36
2	25	50	0	0	25	613,360.94	-0.3	0	25	743,609.98
3	25	50	0	0	25	985,774.71	-0.3	0	25	1,167,707.22
4	25	50	0	0	25	1,189,471.86	-0.3	0	25	1,379,842.14

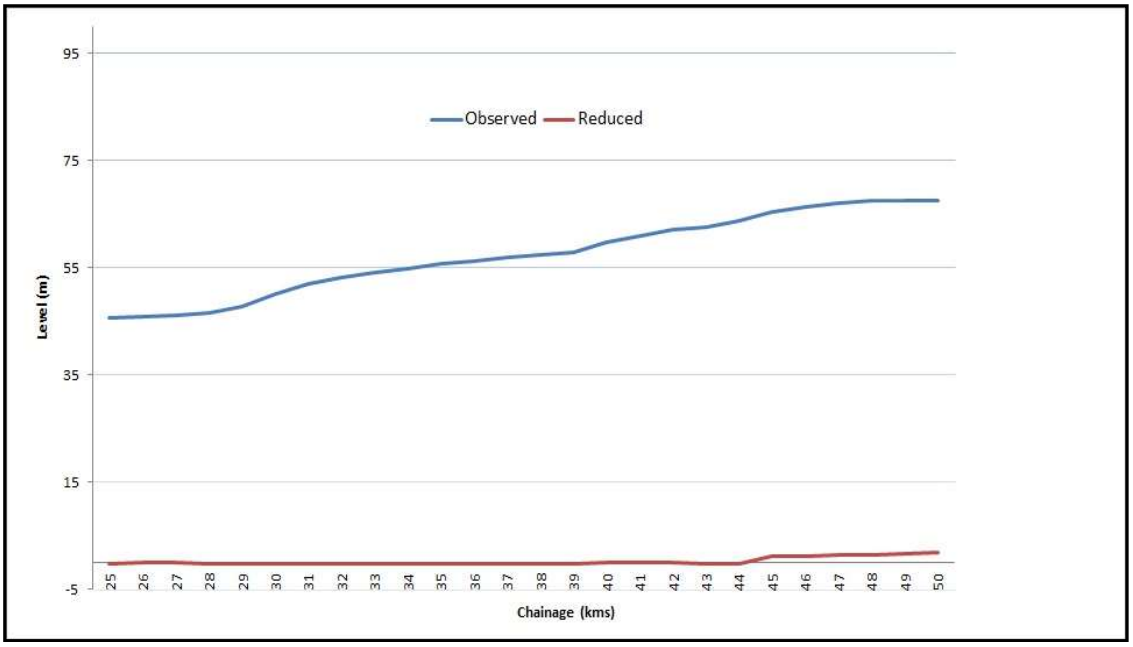


Figure 98 - Observed and Reduced Bed Profile of Navi Village To Harmoo Village

Second stretch (Ch. 25.0 to 50. km) starts from Navi Village and end at Harmoo Village. No bridge is present in this stretch of River. Main village in this stretch are Morsim,Pata ki Dhani and Dhumbadiya Village. This stretch is well connected to Road. River banks in this stretch are manly unprotected. Crops and Agriculture land mainly along the river. Hyacinth, rocks, and rapid waterfalls are not present in this stretch of River. Forest land exists on some areas. There is no wild life Sanctuary. There are no Industries along this stretch of waterway. There are no Jetties and Terminals seen in this stretch. No tourist places in vicinity of this stretch. There is no ferry, Passenger ferry services and no water sport recreational facilities are present in this stretch of waterway. No Railway Line and Railway station in Vicinity of this stretch.Cumin, Cotton and Wheat are main crops in this stretch. Average width of the stretch is 150m to 400m

Figure 99 - Ch 35.62 Km Topogrphic Survey on Progress in Jawai

3.23 Harmoo Village To Aasana Village (Ch. 50.0 km – 75.0 km)

Figure 100 - Harmoo Village to Aasana Village

Table 35 - Minimum – Maximum Reduce Depths, – Harmoo Village To Aasana Village

Class	Chainage (Km)		Observed				Reduced w.r.t. Sounding Datum			
	From	To	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)
1	50	75	0	0	25	1,078,693.07	-0.3	0	25	1,383,968.52
2	50	75	0	0	25	1,545,042.27	-0.3	0	25	1,896,513.88
3	50	75	0	0	25	2,483,279.16	-0.3	0	25	2,970,006.18
4	50	75	0	0	25	2,996,416.01	-0.3	0	25	3,504,947.64

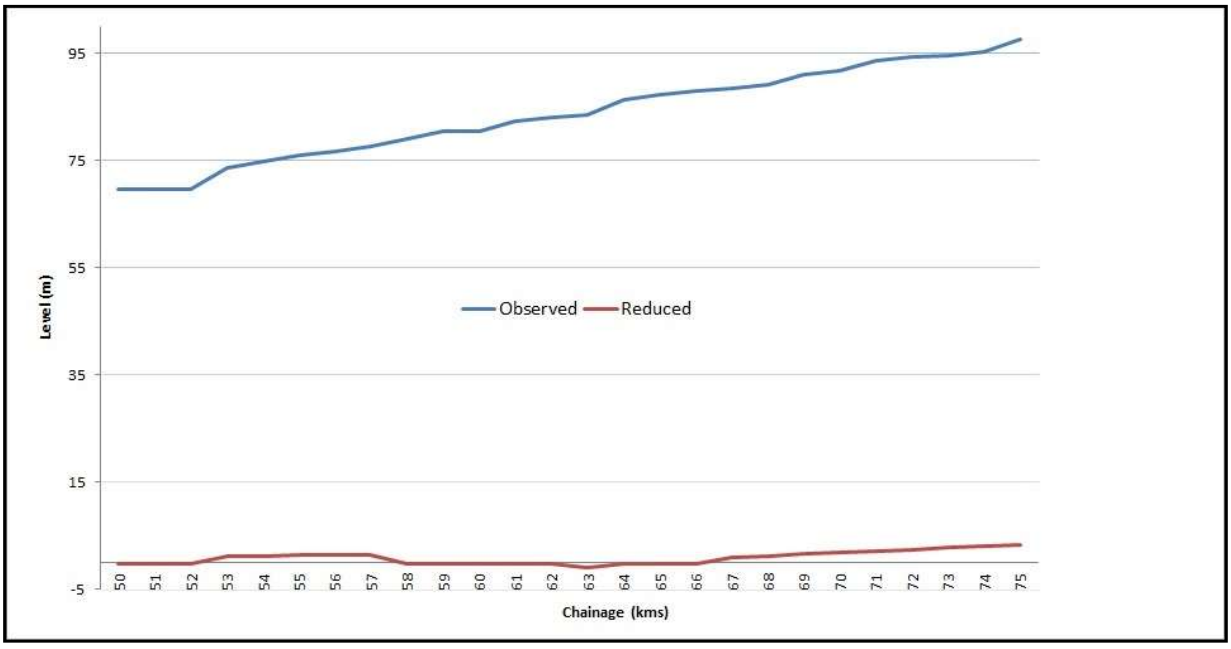


Figure 101 - Observed and Reduced Bed Profile of Harmoo Village to Aasana Village

Third stretch (Ch. 50.0 to 75.0 km) starts from Harmoo Village & end at Aasana Village.Crops and Agriculture land mainly along the river. Hyacinth, rocks, and rapid waterfalls are not present in this stretch of River. Forest land exists on some areas. There is no wild life Sanctuary. There are no Industries along this stretch of waterway. There are no Jetties and Terminals seen in this stretch. No tourist places in vicinity of this stretch. There is no ferry,Passenger ferry services and no water sport recreational facilities are present in this stretch of waterway. No Railway Line and Railway station in Vicinity of this stretch. Gram, Cumin, Cotton and Wheat are main crops in this stretch. Average width of the stretch is 140m to 550m

Figure 102 - Ch.-60.274 Km Jawai River View

Figure 103 - Ch. – 71.534 Km Jawai River View

3.24 Aasana Village to Dangara Village (Ch. 75.0 km – 100.0 km)

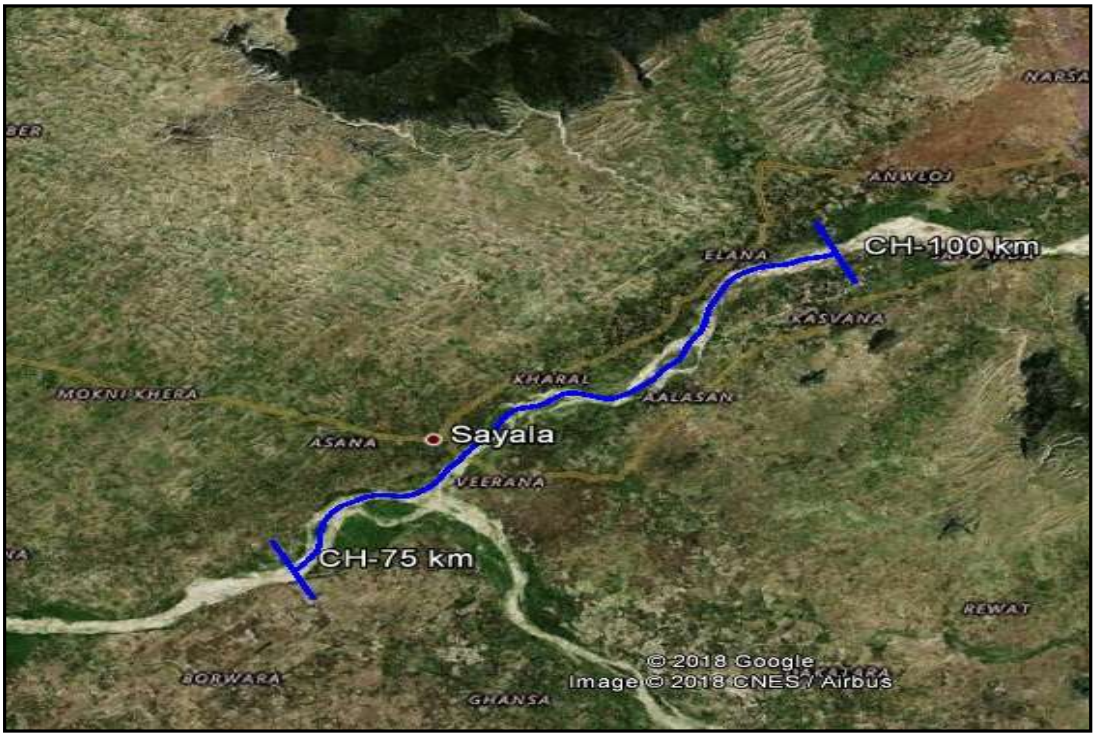


Figure 104 - Aasana Village To Dangara Village

Table 36 - Minimum – Maximum Reduce Depths, – Aasana Village To Dangara Village

Class	Chainage (Km)		Observed				Reduced w.r.t. Sounding Datum			
	From	To	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)
1	75	100	0	0	25	1,076,046.09	-0.3	0	25	1,376,960.89
2	75	100	0	0	25	1,541,403.29	-0.3	0	25	1,888,742.30
3	75	100	0	0	25	2,477,125.47	-0.3	0	25	2,958,702.60
4	75	100	0	0	25	2,988,989.62	-0.3	0	25	3,492,310.90

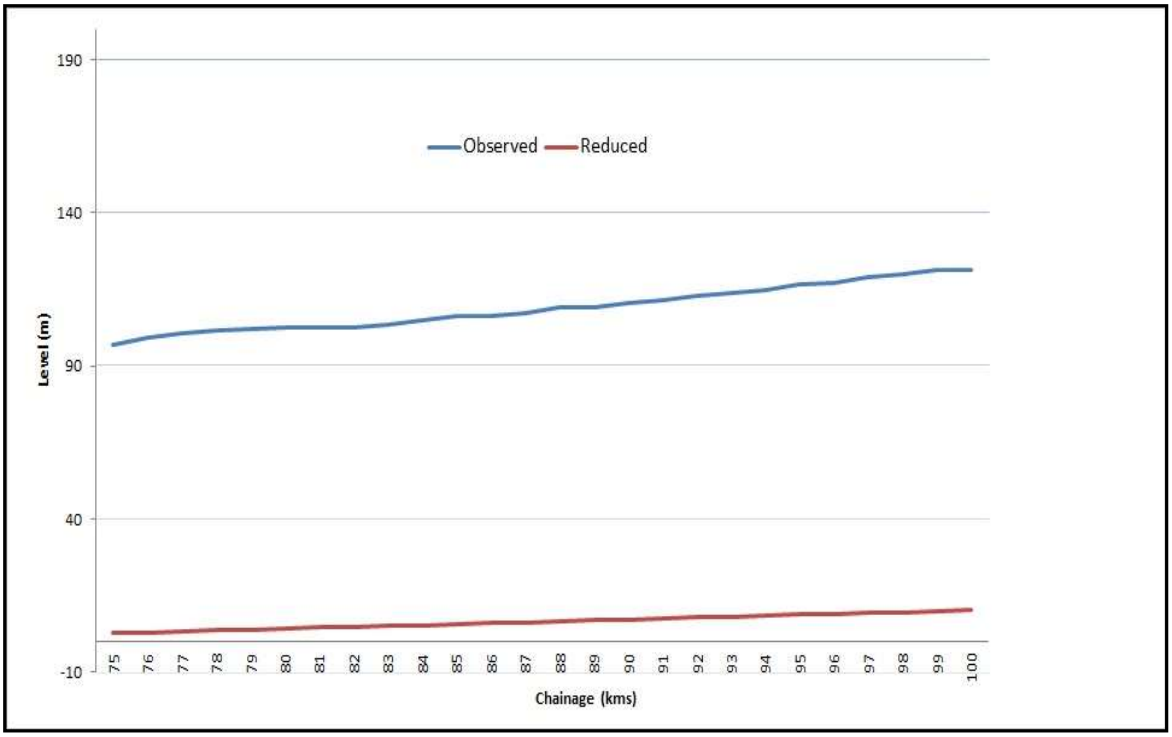


Figure 105 - Observed and Reduced Bed Profile of Aasana Village to Dangra Village

Fourth stretch (Ch. 75.0 to 100.0 km) starts from Aasna Village and end at Dangra Village. No bridge is present in this stretch of River. Main village in this stretch are Aasana, Tura, Veerana, Sayala, Rewatra, Otwala, Khural, Alasan, Ummedabad, Katarosan, Keshwana and Dangra. This stretch is well connected to Road from both bank of river. River banks in this stretch are manly unprotected. Crops and Agriculture land mainly along the river. Hyacinth, rocks, and rapid waterfalls are not present in this stretch of River. Forest land exists on some areas. There is no wild life Sanctuary. There are no Industries along this stretch of waterway. There are no Jetties and Terminals seen in this stretch. No tourist places in vicinity of this stretch. There is no ferry, Passenger ferry services and no water sport recreational facilities are present in this stretch of waterway. No Railway Line and Railway station in Vicinity of this stretch. Gram, Cumin, Cotton and Wheat are main crops in this stretch. Average width of the stretch is 600m to 1.35 kms.

Figure 106 – Ch.-80.30 Km Jawai River View

Figure 107 - Ch.-86.51 Km Electric Line Crossing

3.25 Dangra Village to Jalore Village (Ch. 100.0 km – 123.542 km)

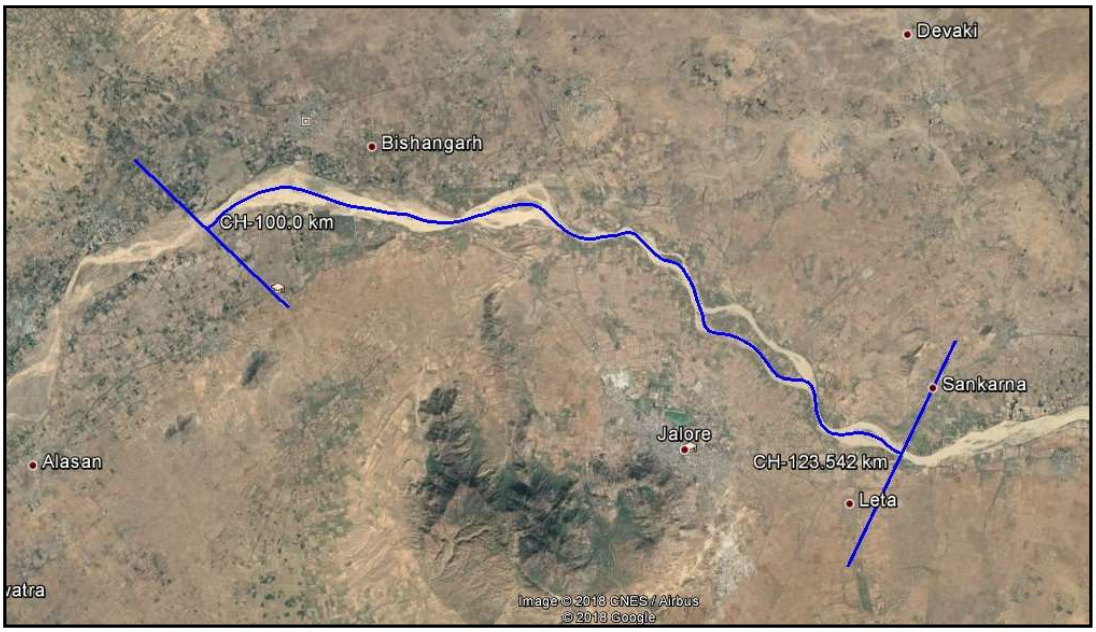


Figure 108 – Dangra Village to Jalore Village

Table 37 - Minimum – Maximum Reduce Depths, – Dangra Village to Jalore Village

Class	Chainage (Km)		Observed				Reduced w.r.t. Sounding Datum			
	From	To	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)
1	100	123.542	0	0	23.542	942,354.61	-0.3	0	23.542	1,198,946.11
2	100	123.542	0	0	23.542	1,349,851.20	-0.3	0	23.542	1,645,639.68
3	100	123.542	0	0	23.542	2,169,388.79	-0.3	0	23.542	2,578,009.52
4	100	123.542	0	0	23.542	2,617,660.96	-0.3	0	23.542	3,044,458.41

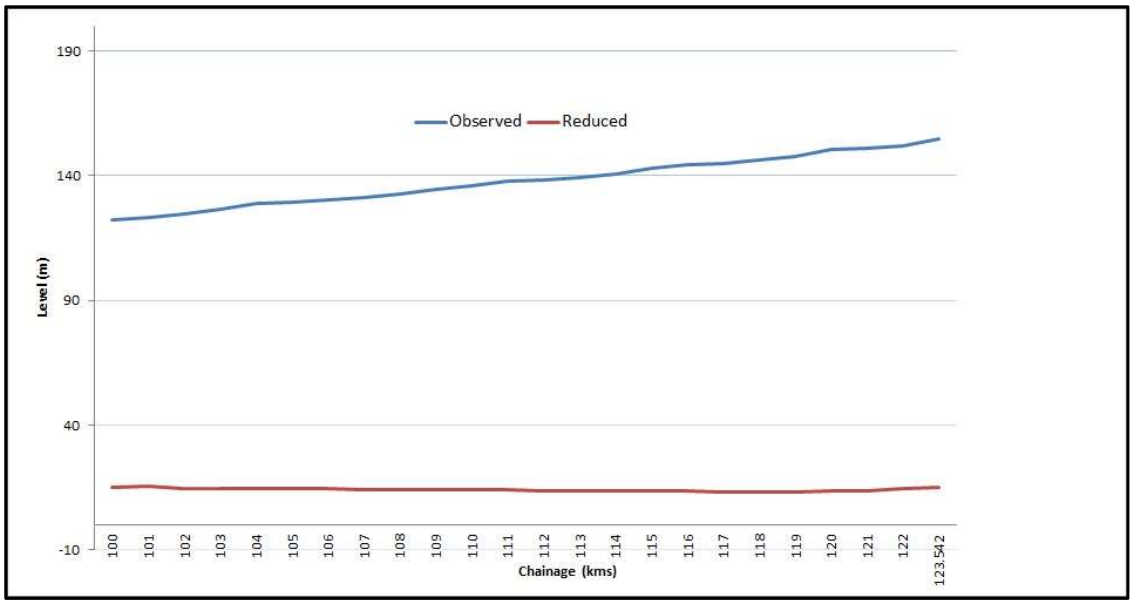


Figure 109 - Observed and Reduced Bed Profile of Dangra Village to Jalore Village

Fifth stretch (Ch. 100 to 123.542 km) starts from Dangra Village in and end at Jalore Village. One railway bridge is present in this stretch of River. Main village in this stretch are Tadawa,Sanfara, Mandawala, Bishangarh, Tikhi, Paharpura, Saradrgarh, Samtipura, Maheshpura, Ratanpura, Leta, Sankarna and Jalore. This stretch is well connected to Road from both bank of river. River banks in this stretch are mainly unprotected. Crops and Agriculture land mainly along the river. Hyacinth, rocks, and rapid waterfalls are not present in this stretch of River. Forest land exists on some areas. There is no wild life Sanctuary. No Security issues. There are no Industries along this stretch of waterway. There are no Jetties and Terminals seen in this stretch. No tourist places in vicinity of this stretch. There is no ferry Passenger ferry services and no water sport recreational facilities are present in this stretch of waterway. Jalore Railway station is present nearly 2km from this stretch. Gram, Cumin, Cotton and Wheat are main crops in this stretch. Average width of the stretch is 40m to 1.35 kms

Figure 110 - Ch.-110.47 Km Electric Line Crossing

Figure 111 - Ch.-118.50 Km River View

4. LOCATIONS FOR TERMINAL CONSTRUCTION

Total 03 (Three) terminal locations are proposed for construction of terminals along the Rann of Kutch during high tides. The locations have been proposed based on following considerations:

- Availability of suitable depths for vessel berthing
- Connectivity to hinterland
- Distance from city traffic limits
- Possibility of future expansion
- Possibility of Industrial setup along the river stretch in future

Table 38 – Terminal Locations

Stretch No.	Chainage (km)	Location	Position	
			Easting (m)	Northing (m)
1	22.50	Narayan Sarovar (Rann of Kutch)	452348.520	2619849.610
2	35.00	Chher Moti (Rann of Kutch)	462924.550	2627619.240
3	421.249	Near Bakhasar MDR 17 Road	728116.990	2733273.190

4.1 Terminal 1 (Near Narayan Sarovar Ch. 22.5 km):

The suggested location is near Narayan sarovar in Rann of Kutch. This Terminal is connected to NH-41. This portion of River is Tidal. Depth for berthing of vessel is not suitable so the dredging required for suitable depth. The location is well connected to road and can be developed as a start/end point terminal. The location has potential to be developed into a major terminal in future. Land use is government.

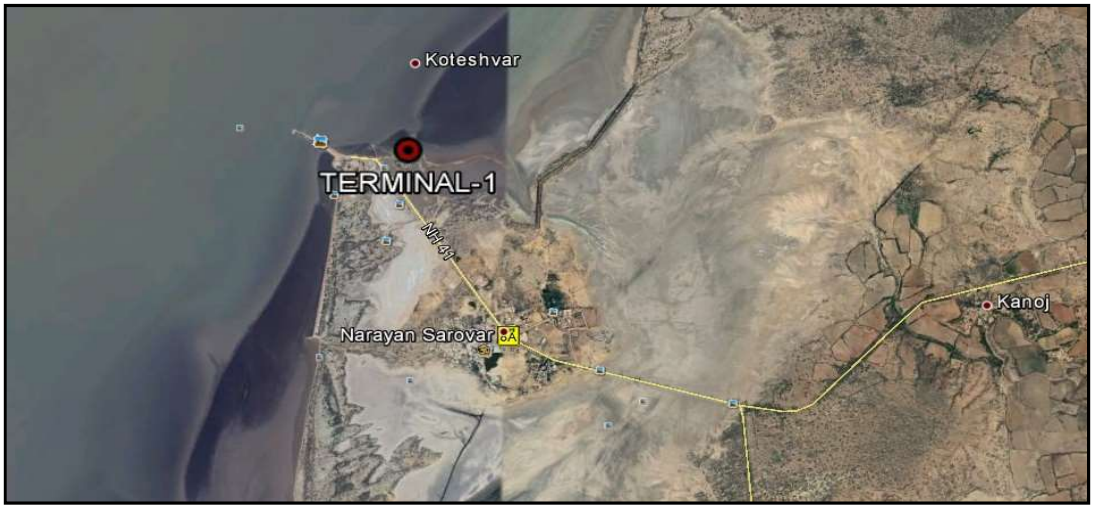


Figure 112 - Terminal 1 (Narayan Sarovar)

4.2 Terminal 2 (Near Chher Moti at Ch. 35.00 km):

The suggested location is near to Akrimota lignite coal power station in Rann of Kutch. The village near by this terminal is Chher Moti.This Terminal is connected to State Highway 6 via NH 8. This portion of River is Tidal. Depth for berthing of vessel is not suitable so the dredging required for suitable depth. The location is well connected to road and can be developed as a start/end point terminal. The location has potential to be developed into a major terminal in future. Land use is government & private.

Figure 113 - Near Chher Moti at Ch. 35.00 km

4.3 Terminal 3 (Near Bakhasar MDR 17 Road Ch. 421.249 km):

The suggested location is near Bakhasar MDR 17 in Rann of Kutch. Bakhasar is located in Sanchore Tehsil of Jalore district in Rajasthan, India. It is situated 50km away from sub-district headquarter Sanchore and 200km away from district headquarter Jalore. There is no railway station near to Bakhasar in less than 10 km. However Abu Road Rail Way Station is major railway station 122 KM near to Bhakasar . This Terminal is connected to NH-15 via internal road & MDR17. This portion of River is dry. As this portion of river is totally dry so the capital dredging is required for suitable depth to make the river navigable. The location is well connected to road and can be developed as a start/end point Terminal.The location has potential to be developed into a major terminal in future. Land use is Government

Figure 114 – Near Bakhasar MDR 17 Road Ch. 421.249 km

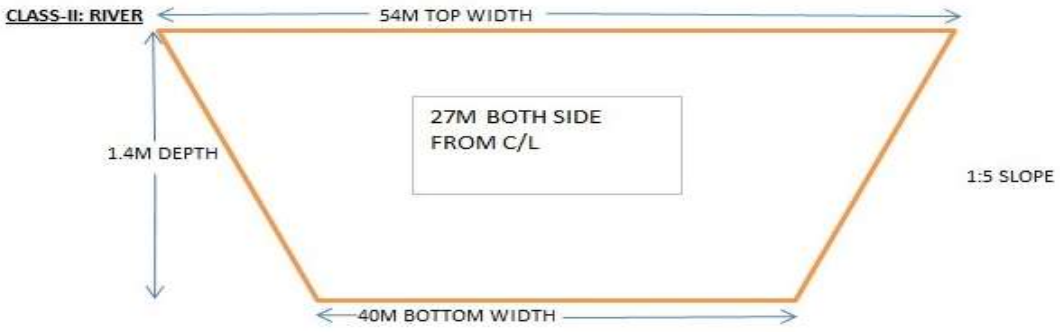
5. FAIRWAY DEVLOPMENTS

As per the client requirement, fairway dimension of channel has made of 4 types.

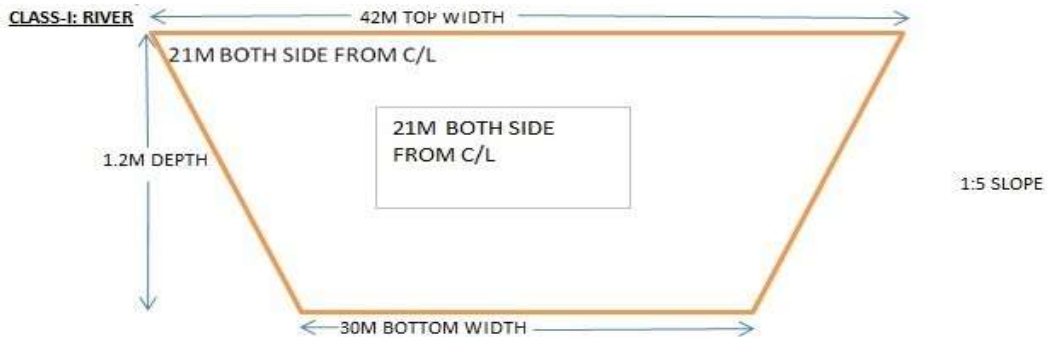
1) 50m x 2.0m with Side slope of 1:5, along the deepest route.

2) 50m x 1.7m with Side slope of 1:5, along the deepest route.

3) 40m x 1.4m with Side slope of 1:5, along the deepest route.



4) 30m x 1.2m with Side slope of 1:5, along the deepest route.



Dredging quantity for the depths of **2.0 m,1.7 m, 1.4 m and 1.2 m** is calculated stretch wise. The dredge volume calculations were accomplished using the HYPACK dredge volume computation utility (Standard Hypack method) The stretch wise results of the dredge volume are given below:-

Table 39 - Dredging Volume Summary of Rann of Kutch, Luni & Jawai Rivers at 2.0m (Class IV)

``Dredging Volume Summary in Runn Of Kutch at 2.0 M depth (Zone-42)											
Chainage		**Observed**					**Reduced w.r.t. Sounding Datum**				
From	**To**	**Min. Depth (m)**	**Max. Depth (m)**	**Length of Shoal (km)**	**Dredging Qty. (cu.m.)**	**Cumulative drg. qty. (cu.m.)**	**Min. Depth (m)**	**Max. Depth (m)**	**Length of Shoal (km)**	**Dredging Qty. (cu.m.)**	**Cumulative drg. qty. (cu.m.)**
0	25	Tidal Stretch		0	0	0.00	0	25	3.0	276,159.46	276,159.46
25	53			0	59967	59967.18	-0.3	11.6	17.0	2,394,799.90	2,670,959.36
52	75	0	0	25	2,638,406.99	2,698,374.17	-0.3	0	22	2,754,429.91	5,425,389.27
75	100	0	0	25	2,999,533.06	5,697,907.23	-0.3	0	25	3,115,065.52	8,540,454.79
100	125	0	0	25	2,982,623.96	8,680,531.19	-0.3	0	25	2,798,906.09	11,339,360.88
125	150	0	0	25	2,979,649.58	11,660,180.77	-0.3	0	25	2,927,841.28	14,267,202.16
150	175	0	0	25	2,985,241.19	14,645,421.96	-0.3	0	25	2,929,266.34	17,196,468.50
175	200	0	0	25	2,991,957.73	17,637,379.69	-0.3	0	25	2,908,551.78	20,105,020.28
200	225	0	0	25	2,992,177.91	20,629,557.60	-0.3	0	25	2,882,554.56	22,987,574.84
225	250	0	0	25	2,994,906.58	23,624,464.18	-0.3	0	25	2,931,195.64	25,918,770.48
250	275	0	0	25	2,997,845.01	26,622,309.19	-0.3	0	25	2,881,428.40	28,800,198.88
275	300	0	0	25	2,999,437.95	29,621,747.14	-0.3	0	25	2,667,465.82	31,467,664.70
300	325	0	0	25	2,995,832.15	32,617,579.29	-0.3	0	25	3,066,977.19	34,534,641.89
325	350	0	0	25	2,994,355.17	35,611,934.46	-0.3	0	25	3,313,685.29	37,848,327.18
350	375	0	0	25	2,984,217.66	38,596,152.12	-0.3	0	25	2,973,251.36	40,821,578.54
375	400	0	0	25	2,994,828.52	41,590,980.64	-0.3	0	25	2,957,750.67	43,779,329.21
400	421.25	0	0	21.249	2,449,782.82	44,040,763.46	-0.3	0	21.249	2,307,713.33	46,087,042.54
Dredging Volume Summary in Luni River at 2.0 M depth (Zone-42)											
421.25	450	0	0	28.75	3,191,724.12	47,232,487.58	-0.3	0	28.75	3,701,107.31	49,788,149.85
450	475	0	0	25	2,650,596.37	49,883,083.95	-0.3	0	25	3,093,935.42	52,882,085.27
475	491.903	0	0	16.90	1,958,777.87	51,841,861.82	-0.3	0	16.90	2,287,779.82	55,169,865.09
Total					**51,841,861.82**		**Total**				**55,169,865.09**
Dredging Volume Summary in Jawai River at 2.0 M depth (Zone-42)											
0	25	0	0	25	2,989,120.35	2,989,120.35	-0.3	0	25	3,446,793.52	3,446,793.52
25	39.869	0	0	14.869	1,794,888.42	4,784,008.77	-0.3	0	14.869	2,077,736.76	5,524,530.28
Zone 42						**4,784,008.77**	**Zone 42**				**5,524,530.28**

Dredging Volume Summary in Jawai River at 2.0 M depth (Zone-43)											
39.869	50	0	0	10.131	1,189,471.86	5,973,480.63	-0.3	0	10.131	1,379,842.14	6,904,372.42
50	75	0	0	25	2,996,416.01	8,969,896.64	-0.3	0	25	3,504,947.64	10,409,320.06
75	100	0	0	25	2,988,989.62	11,958,886.26	-0.3	0	25	3,492,310.90	13,901,630.96
100	123.542	0	0	23.542	2,617,660.96	14,576,547.22	-0.3	0	23.542	3,044,458.41	16,946,089.37
Zone 43						9,792,538.45	**Zone 43**				11,421,559.09
Total						**14,576,547.22**	**Total**				**16,946,089.37**
Total Observed Qty. Rann, Luni & Jawai						**66,418,409.04**	**Total Observed Qty. Rann, Luni & Jawai**				**118,202,997.00**

Table 40 – Dredging Volume Summary of Rann of Kutch, Luni & Jawai at 1.7m (Class III)

Dredging Volume Summary in Runn Of Kutch at 1.70 M depth (Zone 42)											
Chainage		**Observed**					**Reduced w.r.t. Sounding Datum**				
From	**To**	**Min. Depth (m)**	**Max. Depth (m)**	**Length of Shoal (km)**	**Dredging Qty. (cu.m.)**	**Cumulative drg. qty. (cu.m.)**	**Min. Depth (m)**	**Max. Depth (m)**	**Length of Shoal (km)**	**Dredging Qty. (cu.m.)**	**Cumulative drg. qty. (cu.m.)**
0	25	Tidal Stretch		0	-	0	0	25	3.0	213,758.22	213,758.22
25	53			0	49,696.99	49696.99	-0.3	11.6	17.0	2,082,966.51	2,296,724.73
52	75	0	0	25	2,186,580.08	2236277.07	-0.3	0	22	2,296,661.45	4,593,386.18
75	100	0	0	25	2,485,860.56	4,722,137.63	-0.3	0	25	2,592,995.83	7,186,382.01
100	125	0	0	25	2,471,852.82	7,193,990.45	-0.3	0	25	2,292,060.69	9,478,442.70
125	150	0	0	25	2,469,382.51	9,663,372.96	-0.3	0	25	2,425,083.04	11,903,525.74
150	175	0	0	25	2,474,018.51	12,137,391.47	-0.3	0	25	2,417,172.61	14,320,698.35
175	200	0	0	25	2,479,585.73	14,616,977.20	-0.3	0	25	2,403,061.69	16,723,760.04
200	225	0	0	25	2,479,769.34	17,096,746.54	-0.3	0	25	2,378,683.24	19,102,443.28
225	250	0	0	25	2,482,025.47	19,578,772.01	-0.3	0	25	2,421,236.77	21,523,680.05
250	275	0	0	25	2,484,458.67	22,063,230.68	-0.3	0	25	2,372,618.87	23,896,298.92
275	300	0	0	25	2,485,784.30	24,549,014.98	-0.3	0	25	2,172,114.25	26,068,413.17
300	325	0	0	25	2,482,792.87	27,031,807.85	-0.3	0	25	2,557,695.92	28,626,109.09
325	350	0	0	25	2,481,517.55	29,513,325.40	-0.3	0	25	2,786,417.94	31,412,527.03
350	375	0	0	25	2,473,170.69	31,986,496.09	-0.3	0	25	2,459,376.82	33,871,903.85
375	400	0	0	25	2,481,963.78	34,468,459.87	-0.3	0	25	2,451,477.68	36,323,381.53
400	421.249	0	0	21.249	2,030,256.53	36,498,716.40	-0.3	0	21.249	1,894,646.17	38,218,027.70
Dredging Volume Summary in Luni River at 1.70 M depth (Zone 42)											
421.25	450	0	0	28.75	2,645,070.73	39,143,787.13	-0.3	0	28.75	3,132,164.21	41,350,191.91
450	475	0	0	25	2,196,569.10	41,340,356.23	-0.3	0	25	2,620,866.36	43,971,058.27
475	491.903	0	0	16.90	1,623,337.15	42,963,693.38	-0.3	0	16.90	1,938,169.53	45,909,227.80
		Total			**42,963,693.380**		**Total**			**45,909,227.800**	
Dredging Volume Summary in Jawai River at 1.70 M depth (Zone 42)											
0	25	0	0	25	2,477,221.93	2,477,221.93	-0.3	0	25	2,914,492.12	2,914,492.12
25	39.869	0	0	14.869	1,487,509.95	3,964,731.88	-0.3	0	14.869	1,757,965.11	4,672,457.23
Zone 42						3,964,731.88	**Zone 42**				4,672,457.23

Dredging Volume Summary in Jawai River at 1.70 M depth (Zone 43)											
39.869	50	0	0	10.131	985,774.71	4,950,506.59	-0.3	0	10.131	1,167,707.22	5,840,164.45
50	75	0	0	25	2,483,279.16	7,433,785.75	-0.3	0	25	2,970,006.18	8,810,170.63
75	100	0	0	25	2,477,125.47	9,910,911.22	-0.3	0	25	2,958,702.60	11,768,873.23
100	123.542	0	0	23.542	2,169,388.79	12,080,300.01	-0.3	0	23.542	2,578,009.52	14,346,882.75
Zone 43						8,115,568.13	Zone 43				9,674,425.52
		Total			12,080,300.01		Total			14,346,882.75	
Total Observed Qty. Rann,Luni & Jawai						**55,043,993.39**	**Total Observed Qty. Rann,Luni & Jawai**				**60,256,110.55**

Table 41 – Dredging Volume Summary of Rann of Kutch, Luni & Jawai at 1.4m (Class-II)

Dredging Volume Summary in Runn Of Kutch River at 1.40 M depth (Zone 42)											
From	**To**	**Min. Depth (m)**	**Max. Depth (m)**	**Length of Shoal (km)**	**Dredging Qty. (cu.m.)**	**Cumulative drg. qty. (cu.m.)**	**Min. Depth (m)**	**Max. Depth (m)**	**Length of Shoal (km)**	**Dredging Qty. (cu.m.)**	**Cumulative drg. qty. (cu.m.)**
0	25			0	0.00	0	0	25	3	129,603.43	129,603.43
25	53			0	32887.20	32887	-0.3	11.6	17	1,410,006.47	1,539,609.90
53	75	0	0	22	1446742.95	1,479,630.15	-0.3	0	22	1,536,206.42	3,075,816.32
75	100	0	0	25	1644809.92	3,124,440.07	-0.3	0	25	1,733,825.86	4,809,642.18
100	125	0	0	25	1,635,402.72	4,759,842.79	-0.3	0	25	1,493,560.35	6,303,202.53
125	150	0	0	25	1,633,851.32	6,393,694.11	-0.3	0	25	1,601,371.14	7,904,573.67
150	175	0	0	25	1,636,913.12	8,030,607.23	-0.3	0	25	1,596,136.20	9,500,709.87
175	200	0	0	25	1,640,565.15	9,671,172.38	-0.3	0	25	1,580,117.11	11,080,826.98
200	225	0	0	25	1,640,463.58	11,311,635.96	-0.3	0	25	1,559,368.79	12,640,195.77
225	250	0	0	25	1,641,854.98	12,953,490.94	-0.3	0	25	1,596,253.36	14,236,449.13
250	275	0	0	25	1,643,831.68	14,597,322.62	-0.3	0	25	1,562,195.10	15,798,644.23
275	300	0	0	25	1,644,694.72	16,242,017.34	-0.3	0	25	1,396,810.07	17,195,454.30
300	325	0	0	25	1,642,740.67	17,884,758.01	-0.3	0	25	1,700,552.43	18,896,006.73
325	350	0	0	25	1,641,456.06	19,526,214.07	-0.3	0	25	1,889,783.77	20,785,790.50
350	375	0	0	25	1,636,351.34	21,162,565.41	-0.3	0	25	1,626,242.94	22,412,033.44
375	400	0	0	25	1,642,185.95	22,804,751.36	-0.3	0	25	1,621,175.20	24,033,208.64
400	421.25	0	0	21.249	1,343,317.42	24,148,068.78	-0.3	0	21.249	1,264,557.72	25,297,766.36
Dredging Volume Summary in Luni River at 1.40 M depth (Zone 42)											
421.25	450	0	0	28.75	1,749,826.21	25,897,894.99	-0.3	0	28.75	2,140,796.43	27,438,562.79
450	475	0	0	25	1,453,074.49	27,350,969.48	-0.3	0	25	1,794,918.18	29,233,480.97
475	491.9	0	0	16.9	1,074,064.10	28,425,033.58	-0.3	0	16.9	1,327,551.13	30,561,032.10
		Total			28,425,033.580		Total			30,561,032.300	
Dredging Volume Summary in Jawai River at 1.40 M depth(Zone 42)											
0	25	0	0	25	1,541,259.62	1,541,259.62	-0.3	0	25	1,853,897.77	1,853,897.77
25	39.869	0	0	14.869	925,609.85	2,466,869.47	-0.3	0	14.869	1,119,839.61	2,973,737.38
Zone 42						2,466,869.47	Zone 42				**2,973,737.38**
Dredging Volume Summary in Jawai River at 1.40 M depth(Zone 43)											
39.869	50	0	0	10.131	613,360.94	3,080,230.41	-0.3	0	10.131	743,609.98	3,717,347.36
50	75	0	0	25	1,545,042.27	4,625,272.68	-0.3	0	25	1,896,513.88	5,613,861.24
75	100	0	0	25	1,541,403.29	6,166,675.97	-0.3	0	25	1,888,742.30	7,502,603.54
100	123.54	0	0	23.542	1,349,851.20	7,516,527.17	-0.3	0	23.542	1,645,639.68	9,148,243.22
Zone 43						5,049,657.70	Zone 43				**6,174,505.84**
Total					**7,516,527.17**		**Total**			**9,148,243.22**	
Total Observed Qty. Rann, Luni & Jawai River					**35,941,560.75**		**Total Redused Qty. Rann, Luni & Jawai River**			**39,709,275.52**	

Table 42 – Dredging Volume Summary of Rann of Kutch, Luni & Jawai at 1.2m (Class I)

Dredging Volume Summary in Runn Of Kutch River at 1.20 M depth (Zone 42)											
Chainage		Observed					Reduced w.r.t. Sounding Datum				
From	To	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)	Cumulative drg. qty. (cu.m.)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)	Cumulative drg. qty. (cu.m.)
0	25	Tidal Stretch		0	0	0	0	25	3.0	77,528.66	77,528.66
25	53			0	21592.01	21,592.01	-0.3	11.6	17.0	978,649.66	1,056,178.32
53	75	0	0	22	949836.92	971,428.93	-0.3	0	22	1,019,314.73	2,075,493.05
75	100	0	0	25	1,079,875.70	2,051,304.63	-0.3	0	25	1,149,018.32	3,224,511.37
100	125	0	0	25	1,073,697.92	3,125,002.55	-0.3	0	25	963,630.87	4,188,142.24
125	150	0	0	25	1,072,679.61	4,197,682.16	-0.3	0	25	1,050,457.85	5,238,600.09
150	175	0	0	25	1,074,691.20	5,272,373.36	-0.3	0	25	1,043,831.06	6,282,431.15
175	200	0	0	25	1,077,088.80	6,349,462.16	-0.3	0	25	1,031,780.06	7,314,211.21
200	225	0	0	25	1,077,096.02	7,426,558.18	-0.3	0	25	1,015,847.49	8,330,058.70
225	250	0	0	25	1,078,089.63	8,504,647.81	-0.3	0	25	1,045,739.77	9,375,798.47
250	275	0	0	25	1,079,232.66	9,583,880.47	-0.3	0	25	1,020,391.54	10,396,190.01
275	300	0	0	25	1,079,799.41	10,663,679.88	-0.3	0	25	891,730.72	11,287,920.73
300	325	0	0	25	1,078,516.67	11,742,196.55	-0.3	0	25	1,124,407.77	12,412,328.50
325	350	0	0	25	1,077,711.32	12,819,907.87	-0.3	0	25	1,271,034.96	13,683,363.46
350	375	0	0	25	1,074,322.76	13,894,230.63	-0.3	0	25	1,064,917.14	14,748,280.60
375	400	0	0	25	1,078,152.11	14,972,382.74	-0.3	0	25	1,065,675.51	15,813,956.11
400	421.249	0	0	21.249	881,936.12	15,854,318.86	-0.3	0	21.249	841,600.01	16,655,556.12
Dredging Volume Summary in Luni River at 1.20 M depth (Zone 42)											
421.25	450	0	0	28.75	1,148,662.89	17,002,981.75	-0.3	0	28.75	1,451,995.51	18,107,551.63
450	475	0	0	25	953,959.82	17,956,941.57	-0.3	0	25	1,219,898.57	19,327,450.20
475	491.903	0	0	16.90	705,159.44	18,662,101.01	-0.3	0	16.90	902,136.01	20,229,586.21
		Total			18,662,101.010		Total			20,229,586.200	
Dredging Volume Summary in Jawai River at 1.20 M depth(Zone 42)											
0	25	0	0	25	1,076,085.16	1,076,085.16	-0.3	0	25	1,346,757.39	1,346,757.39
25	39.869	0	0	14.869	646,143.52	1,722,228.68	-0.3	0	14.869	814,494.73	2,161,252.12
Zone 42						**1,722,228.68**	**Zone 42**				**2,161,252.12**
Dredging Volume Summary in Jawai River at 1.20 M depth(Zone 43)											
39.869	50	0	0	10.131	428,216.84	2,150,445.52	-0.3	0	10.131	540,918.36	2,702,170.48
50	75	0	0	25	1,078,693.07	3,229,138.59	-0.3	0	25	1,383,968.52	4,086,139.00
75	100	0	0	25	1,076,046.09	4,305,184.68	-0.3	0	25	1,376,960.89	5,463,099.89
100	123.542	0	0	23.542	942,354.61	5,247,539.29	-0.3	0	23.542	1,198,946.11	6,662,046.00
Zone 43						3,525,310.61	Zone 43				4,500,793.88
Total					**5,247,539.29**	**Total**				**6,662,046.00**	
Total Observed Qty. Rann,Luni& Jawai River					**23,909,640.30**	**Total Redused Qty. Rann,Luni& Jawai River**					**26,891,632.20**

Dredging quantity, minimum & maximum depths and length of shoal have been calculated per km wise and the same is at Annexure-2.

6 CONCLUSION & RECOMMENDATION

6.1 Description of Waterways

The survey area from 0.0 to 52.0 km of Rann of Kutch is used for navigation (during High-tide only) by BSF vessels transiting to BSF Jetty. The upper stretches are navigable for small fishing at different area. The dry area is observed from chainage 53km to 491.903 km in Rann of Kutch & Luni River. The dry area is also observed in Jawai River from chainage 0.0 to 123.542km.

The Rann of Kutch begins to dry up in October every year, steadily transforming into the desolate and surreal salt desert. The tourist season runs until March. It encompasses a true saline desert where thousands of greater flamingo (Phoenicopterus roseus) nest in the world famous 'Flamingo City' located in the mud flats of the Rann, about 10 km from Nir outpost on Kala Dungar hill. Koteshwar Mahadev temple is situated at Narayan Sarovar in Rann of Kutch. Lakhpat Fort is another tourist attraction at chainage 52 km.

Important industries near Rann of Kutch are Sanghi Cement industries, Salt industries, Akrimota Lignite coal Power Station, Solar park & Wind power. All these industries are situated within 50km of survey area.

6.2 Methods for Making Waterway Feasible

The waterway may be developed as a Class IV navigational river by carrying out capital dredging to achieve the navigability.

Table 43 - Dredging quantity from sea mouth CH-0.0 to Bakhasar CH-421.249 km

Class	Observed						Reduced w.r.t. Sounding Datum			
	From	To	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)
I	00	421.249	0	0	369.0	15,854,318.86	-0.3	25	388.0	16,65,5556.12
II	00	421.249	0	0	369.0	24,148,068.78	-0.3	25	388.0	25,297,766.36
III	00	421.249	0	0	369.0	36,498,716.40	-0.3	25	388.0	38,218,027.70
IV	00	421.249	0	0	369.0	44,040,763.46	-0.3	25	388.0	46,087,042.54

6.3 Modifications/ Improvement Measures

Improvement measures for design and depth improvement are required on the first phase of the development. The limitation for improvement of navigational aspects includes the gradient of the river, non-availability of the water throughout the period at intermediate stretches.

The purpose of the survey was for assessing the river stretch from confluence with the Arabian Sea for the development of water transport facilities in the new National Waterway (NW-48).

Table 44 - Dredging Summary of Rann of Kutch & Luni River

Class	Observed						Reduced w.r.t. Sounding Datum			
	From	To	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)
I	00	491.903	0	0	438.9	18,662,101.01	-0.3	25	458.9	20,229,586.21
II	00	491.903	0	0	438.9	28,425,033.58	-0.3	25	458.9	30,561,032.10
III	00	491.903	0	0	438.9	42,963,693.38	-0.3	25	458.9	45,909,227.80
IV	00	491.903	0	0	438.9	51,841,861.82	-0.3	25	458.9	55,169,865.09

Table 45 - Dredging Summary of Jawai River

Class	Observed						Reduced w.r.t. Sounding Datum			
	From	To	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (km)	Dredging Qty. (cu.m.)
I	00	123.542	0	0	123.542	5,247,539.29	-0.3	0	123.542	6,662,046.00
II	00	123.542	0	0	123.542	7,516,527.17	-0.3	0	123.542	9,148,243.22
III	00	123.542	0	0	123.542	12,080,300.01	-0.3	0	123.542	14,346,882.75
IV	00	123.542	0	0	123.542	14,576,547.22	-0.3	0	123.542	16,946,089.37

6.4 Recommendation:

Recommended for class IV with capital dredging from sea mouth CH-0.0 to Bakhasar.CH-421.249 km. The level difference from sea mouth to Bakhasar. is 10.892m

On the basis of Hydrographic study, it is recommended that DPR study with river modelling is required for developing navigational canal from Sea mouth to Bakhasar and Port at Bakhasar.

7. DETAILS OF ANNEXURES

Annexure - I	Data collected from various agencies
Annexure - II	Dredge Volume
Annexure - III	Details of Collected Water level
Annexure - IV	Details of bathymetric and topographic surveys carried out
Annexure - V	Details of Bank Protection
Annexure - VI	Details of Features across the Bank
Annexure – VII	Detailed Methodology for Horizontal and Vertical Control
Annexure – VIII	Photographs of Equipment
Annexure – IX	Details of Bench Marks
Annexure – X	Levelling Diagram of Rann of Kutch
Annexure – XI	Soil Sample Report
Annexure – XII	Water Sample Report
Annexure - XIII	Calibrations Certificates
Annexure – XIV	Field Photographs
Annexure – XV	Charts