IIC TECHNOLOGIES™

Final Feasibility Report
National Waterways-63
Region III - Luni River
Malipura Barrage to Jaswantpura (336.35km)

SURVEY PERIOD: 14 FEB 2016 - 26 MAR 2016

Volume - I

Prepared for:

Inland Waterways Authority of India
(Ministry of Shipping, Govt. of India)
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Document Distribution				
Date	**Revision**	**Distribution**	**Hard Copy**	**Soft Copy**
28 Nov 2016	Rev – 0	**INLAND WATERWAYS AUTHORITY OF INDIA**	01	01

26 Apr 2017	Rev – 1.0	**INLAND WATERWAYS AUTHORITY OF INDIA**	01	01
23 Nov 2017	Rev – 1.1	**INLAND WATERWAYS AUTHORITY OF INDIA**	04	04
26 Oct 2018	Rev – 1.2	**INLAND WATERWAYS AUTHORITY OF INDIA**	04	04

ACKNOWLEDGEMENT

IIC Technologies Ltd. expresses its sincere gratitude to IWAI for awarding the work of carrying out detailed hydrographic surveys in the New National Waterways in NW-63 in Region III stretch of Luni River from Malipura Barrage to Jaswantpura.

We would like to use this opportunity to pen down our profound gratitude and appreciations **to Shri Pravir Pandey, IA&AS, Chairman IWAI** for spending his valuable time and guidance for completing this Project. IIC Technologies Ltd., would also like to thank, **Shri Alok Ranjan, ICAS, Member (Finance), Shri Shashi Bhushan Shukla, Member (Traffic), Shri S.K. Gangwar, Member (Technical)** for their valuable support during the execution of project**.**

IIC Technologies Ltd, wishes to express their gratitude to **Capt. Ashish Arya, Hydrographic Chief IWAI, Cdr. P.K. Srivastava ex-Hydrographic Chief and Shri SVK Reddy, Chief Engineer-I** for their guidance and inspiration for this project. IIC Technologies Ltd, would also like to thank **Sh. Rajiv Singhal, A.H.S., IWAI** for his invaluable support and suggestions provided throughout the survey period. IIC Technologies Ltd, is pleased to place on records its sincere thanks to other staff and officers of IWAI for their excellent support and cooperation throughout the survey period.

List of Abbreviations

CD	Chart Datum
DGPS	Differential Global Positioning Systems
ETS	Electronic Total Station
GPS	Global Positioning Systems
LUN	Luni
LBM	Local Bench Mark
MSL	Mean Sea Level
RL	Reference Level
SD	Sounding Datum
SBAS	Satellite-Based Augmentation System
TBC	Trimble Business Center
PIA	Project Influence Area
NH	National Highway
SH	State Highway
HC	Horizontal Clearance
VC	Vertical Clearance

CONTENTS

1 Introduction 3
1.1 Background 3
1.2 Tributaries of Luni River 4
1.3 State/District through which Luni River passes 4
1.4 Maps 5
1.4.1 Full course of the waterway 5
1.4.2 Course of the waterway under study 5
1.5 Scope of Work 6
2 Methodology Adopted to Undertake Study 7
2.1 Recce 7
2.2 Survey Resources and Methodology 7
2.2.1 Survey Launch 7
2.2.2 Survey Equipment 7
2.2.3 Topographic Survey 8
2.2.4 Bathymetric Survey and Survey Launch 9
2.2.5 Calibration 9
2.3 Description of Bench Marks/Authentic Reference Level 9
2.4 Tidal influence Zone and Tidal Variation 11
2.5 Methodology to fix Chart Datum / Sounding Datum 11
2.5.1 Sounding Datum 11
2.5.2 Datum Calculation 11
2.6 Average of 06 years minimum Water Levels to arrive at Chart Datum (CD) 15
2.7 Transfer of Sounding Datum 15
2.8 Table indicating Tidal Variation at Different Observation Points 15
2.9 Salient features of Dam, Barrages, and Weir 15
2.9.1 Salient features of Jaswant Sagar Weir 16
2.9.2 Salient features of Malipura Weir 16
2.10 Erected IWAI Benchmark Pillars 17
2.11 Chart Datum / Sounding Datum and Reductions Details 19
2.12 HFL/MHWS values of Bridges/Cross Structures 19
2.13 Graph: Sounding Datum and HFL vs Chainage 20
2.14 Average Bed Slope 21

2.15 Details of Dam, Barrages, Weirs, Anicut, etc. 22
2.16 Details of Locks 22
2.17 Details of Aqueducts 22
2.18 Details of existing Bridges and Crossings over Waterway 23
2.19 Details of other Cross structures, pipelines, underwater cables 25
2.20 Details of High Tension Lines / Electric lines / Telecommunication lines 29
2.21 Current Meter and Discharge Details 34
2.22 Water Sample Locations 34
3 Description of Waterway 34
3.1 Sub-Stretch-01: Malipura to Gadevee (0.0km to 25.0km) 35
3.1.1 Observed and reduced Bed Profile of the stretch 37
3.2 Sub-Stretch-02: Gadevee to Dedawas Jageer (25.00km to 60.00km) 38
3.2.1 Observed and reduced Bed Profile of the stretch 40
3.3 Sub-Stretch-03: Dedawas Jageer to Dangawa (60.00km to 90.00km) 41
3.3.1 Observed and reduced Bed Profile of the stretch 43
3.4 Sub-Stretch-4: Dangawa to Champa Bhakhri (90.00km to 120.00km) 44
3.4.1 Observed and reduced Bed Profile of the stretch 46
3.5 Sub-Stretch-5: Champa Bhakhri to Tilwara (120.00km to 150.00km) 47
3.5.1 Observed and reduced Bed Profile of the stretch 49
3.6 Sub-Stretch-6: Tilwara to Kitnod (150.00km to 180.00km) 50
3.6.1 Observed and reduced Bed Profile of the stretch 52
3.7 Sub-Stretch-7: Kitnod to Bhanawas (180.00km to 210.00km) 53
3.7.1 Observed and reduced Bed Profile of the stretch 55
3.8 Sub-Stretch-8: Bhanawas to Doodiya (210.00km to 240.00km) 56
3.8.1 Observed and reduced Bed Profile of the stretch 57
3.9 Sub-Stretch-9: Doodiya to Guda Bishnoiyan (240.00km to 270.00km) 58
3.9.1 Observed and reduced Bed Profile of the stretch 60
3.10 Sub-Stretch-10: Guda Bishnoiyan to Rampuriya Bhatiy (270.00km to 300.00km) 61
3.10.1 Observed and reduced Bed Profile of the stretch 63
3.11 Sub-Stretch-11: Rampuriya Bhatiy to Pichiyak (300.00km to 336.35km) 64
3.11.1 Observed and reduced Bed Profile of the stretch 66
3.12 Other Aspects of Waterway 66
3.12.1 Fishing 66

3.12.2 Industries 66
3.12.3 Crops 67
3.12.4 Settlements 67
3.12.5 Pollution at Luni River 67
3.12.6 Important Cities/Towns 67
3.12.7 Road Network 67
3.12.8 Rail Network 69
3.12.9 Land Use 71
3.12.10 Construction Material 71
3.12.11 Conditions of banks 72
3.12.12 Jetties and Terminals 72
3.12.13 Cargo Movement 72
3.12.14 Passenger Ferry Services 72
3.12.15 Historic importance 72
3.12.16 Tourism 73
3.12.17 Irrigation Canals and Outlets 74
4 Terminals 75
4.1 Details of Terminal survey carried out 75
5 Fairway Development 75
5.1 Fairway Dimensions 75
5.2 Calculation of Dredging Quantity 75
6 Conclusion 79
6.1 Description of Waterways 79
6.2 Methods for making waterway feasible 80
6.3 Modifications/ improvement measures 81
6.4 Recommendation 81
7 Details of Annexures 83
Annexure-1 Source and type of data collected from various agencies……..84
Annexure-2 Stretch wise data of Observed Depths to Reduced Depths……...90
Annexure-3 Dredge Volumes (per km) for different classification with length of shoal……..92

Annexure-4 Water Level Details……124

Annexure-5 Survey Dates……126

Annexure-6 Details of Bank protection……128

Annexure-7 Details of Riverside Features……130

Annexure-8 Horizontal and Vertical Control……133

Annexure-9 Equipment Photographs……138

Annexure-10 Bench Mark Pillar Forms……140

Annexure-11 Levelling Data……240

Annexure-12 Current Meter Observation & Discharge Calculation……728

Annexure-13 Water Sample Analysis……730

Annexure-14 Calibration Certificates……732

Annexure-15 Survey Chart Scheming Index and chart details……735

Annexure-16 Field Photographs……744

Figure 1 - Luni River Tributaries 4

Figure 2 - Full Course of Luni River 5

Figure 3 - Map of Luni River 6

Figure 4 - Spot leveling by DGPS 9

Figure 5 - PWD Benchmark Rajasthan 9

Figure 6 - CD & HFL vs Chainage 21

Figure 7 - Sanko Bridges 24

Figure 8 - Stretch 01 Malipura to Gadevee 35

Figure 9 - Gandhav Road Bridge (NH-15) (6.850 km chainage) 36

Figure 10 - Bandh near Malipura village (0 km chainage) 36

Figure 11 - Spot levelling by DGPS (Stretch 01) 37

Figure 12 - Stretch 1 River-bed Profile 37

Figure 13 - Stretch 2 Gadevee to Dedawas Jageer 38
Figure 14 - Stretch 2 Water Accumulation 39
Figure 15 - Stretch 2 Thick Thorny Bushes Growth 39
Figure 16 - Stretch 2 River-bed Profile 40
Figure 17 - Stretch 3 Dedawas Jageer to Dangawa 41
Figure 18 - Stretch 3 Steep River Bank 42
Figure 19 - Stretch 3 Water Accumulation 42
Figure 20 - Stretch 3 JCB Operating in Sand Quarry near Jali Kheda village (59.5 km chainage) 43
Figure 21 - Stretch 3 River-bed Profile 43
Figure 22 - Stretch 4 Dangawa to Champa Bhakhri 44
Figure 23 - Stretch 4 Gadesara Road Bridge (SH-28) (84.926 km chainage) 45
Figure 24 - Stretch 4 Steep River Bank 45
Figure 25 - Stretch 4 Water Accumulation with submerged Rocks 46
Figure 26 - Stretch 4 River-bed Profile 46
Figure 27 - Stretch 5 Champa Bhakhri to Tilwara 47
Figure 28 - Stretch 5 JCB Bucket operating marks near Aamjhar village (124 km chainage) 48
Figure 29 - Stretch 5 Loose mud cliffs on the river bank 48
Figure 30 - Stretch 5 River-bed Profile 49
Figure 31 - Stretch 6 Tilwara to Kitnod 50
Figure 32 - Stretch 6 Balotra Road Bridge (NH-28) (166.308 km chainage) 51
Figure 33 - Stretch 6 Balotra Sanko Road Bridge (NH-112) (163.550 km chainage) 51
Figure 34 - Stretch 6 Temple at Tilwara (148.163 km chainage) 51
Figure 35 - Stretch 6 Textile coloring Factories (160.162 km chainage) 52
Figure 36 - Stretch 5 River-bed Profile 52
Figure 37 - Stretch 7 Kitnod to Bhanawas 53
Figure 38 - Stretch 7 Samdari Railway Bridge (197.689 km chainage) 54
Figure 39 - Stretch 7 JCB operating in Sand Quarry near Jetharni village (192.0 km chainage) 54
Figure 40 - Stretch 7 River-bed Profile 55
Figure 41 - Stretch 8 Bhanawas to Doodiya 56
Figure 42 - Stretch 8 Temple near IWAI BM LUN-12 (224.217 km chainage) 57
Figure 43 - Stretch 8 River-bed Profile 57
Figure 44 - Stretch 9 Doodiya to Guda Bishnoiyan 58
Figure 45 - Stretch 9 Kankani Road Bridge (Lower NH-65) (262.839 km chainage) 59
Figure 46 - Stretch 9 Kankani Road Bridge (Upper NH-65) (262.824 km chainage) 59

Figure 47 - Stretch 9 Luni Railway Bridge (253.522 km chainage) 60
Figure 48 - Stretch 9 River-bed Profile 60
Figure 49 - Stretch 10 Guda Bishnoiyan to Rampuriya Bhatiy 61
Figure 50 - Guda Bishnoiyan Sanko Road Bridge (273.058 km chainage) 62
Figure 51 - Excavation Activity near Goliya (294.8 km) and Guda Bishnoiyan village (274.0 km) 62
Figure 52 - Stretch 10 River-bed Profile 63
Figure 53 - Stretch 11 Rampuriya Bhatiy to Pichiyak 64
Figure 54 - Stretch 11 Pichiyak Road (334.042 km) and Bhawi Railway Bridge (331.575 km) 65
Figure 55 - Stretch 11 Cemetery (316.2 km chainage) and Temple (317.0 km chainage) 65
Figure 56 - Stretch 11 River-bed Profile 66
Figure 57 - Road Network 69
Figure 58 - Railway Network 70
Figure 59 - Mehrangarh Fort (274 km chainage, 2.4 km from survey stretch) 72
Figure 60 - Fort Siwana (182.0 km chainage, 15 km from survey stretc) 73
Figure 61 - Jodhpur City (280.0 km chainage, 22 km from survey stretch) 74
Figure 62- Umaid Bhavan Palace (280.0 km chainage, 22 km from survey stretch) 74
Figure 63 - Fairway Channel Dimensions 50m X 2m 75

Table 1 - Length of the river in states 4
Table 2 - Survey Equipment Used 8
Table 3 - Accepted Station coordinates (WGS-84) 11
Table 4 - Established CD for per kilometer stretch 15
Table 5 - Salient features of Jaswant Sagar Weir 16
Table 6 - Salient features of Malipura Weir 17
Table 7 - Accepted BM coordinates w.r.t. established CD 18
Table 8 - HFL values of Bridges/Cross Structures 19
Table 9 - Average Bed Slope 22
Table 10 - Cross Structures w.r.t. MSL 22
Table 11 - Details of cross structures 24
Table 12- Details of Other cross structures 29
Table 13 - Details of High Tension Lines 31
Table 14 - Details of Electric Poles 34
Table 15 - Stretch 1 Dredging Quantity 37

Table 16 - Stretch 2 Dredging Quantity 39
Table 17 - Stretch 3 Dredging Quantity 43
Table 18 - Stretch 4 Dredging Quantity 46
Table 19 - Stretch 5 Dredging Quantity 49
Table 20 - Stretch 6 Dredging Quantity 52
Table 21 - Stretch 7 Dredging Quantity 54
Table 22 - Stretch 8 Dredging Quantity 57
Table 23 - Stretch 9 Dredging Quantity 60
Table 24 - Stretch 10 Dredging Quantity 63
Table 25 - Stretch 11 Dredging Quantity 66
Table 26 - Major District Roads 68
Table 27 - Railway Stations 70
Table 28 - Class I Dredge Volumes 76
Table 29 - Class II Dredge Volumes of Zone 42N 77
Table 30 - Class III Dredge Volumes 78
Table 31 - Class IV Dredge Volumes 79
Table 32 - Stretch wise Average width and slope of waterway 80
Table 33 - Class-wise Reduced Dredging quantity 80
Table 34 - Class-wise availability of reduced depth of the waterway 81
Table 35 - Bridges and HTL Clearances less than Class no 81

SALIENT FEATURES AT A GLANCE

<table>
<tr><th>#</th><th>Particulars</th><th>Details</th></tr>
<tr><td>1.</td><td>Name of Consultant</td><td>IIC Technologies Limited, Hyderabad</td></tr>
<tr><td>2.</td><td>Region number & State(s)</td><td>Region – III, Rajasthan</td></tr>
<tr><td>3.</td><td>Waterway stretch, NW #
(from…. to; total length)</td><td>National Waterway No – 63
Jaswantpura to Malipura Barrage (336.35km)</td></tr>
<tr><td>4.</td><td>Navigability Status</td><td>At present river is fully dried – No Navigable</td></tr>
<tr><td>a)</td><td>Tidal & non-tidal portions
(from… to, length, average tidal variation)</td><td>The survey Stretch of Luni River is non-tidal.</td></tr>
<tr><td>b)</td><td>Least Spot Height status
(w.r.t. CD)
i) Survey period (12 Feb to 08 Mar, 2016.)
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)</td><td>Luni River is dry and the survey was conducted by topographic method.
<table>
<tr><th>LAD (m)</th><th>0 - 25 km</th><th>25 - 60 km</th><th>60 - 90 km</th><th>90 - 120 km</th><th>120 - 150 km</th><th>150 - 180 km</th><th>180 - 210 km</th><th>210 - 240 km</th><th>240 - 270 km</th><th>270 - 300 km</th><th>300 - 336.35 km</th><th>Total</th></tr>
<tr><td>< 1.2</td><td>25</td><td>35</td><td>30</td><td>30</td><td>30</td><td>30</td><td>30</td><td>30</td><td>30</td><td>30</td><td>36.35</td><td>336.35</td></tr>
<tr><td>1.2 - 1.4</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0.00</td></tr>
<tr><td>1.5 - 1.7</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0.00</td></tr>
<tr><td>1.8 - 2.0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0.00</td></tr>
<tr><td>> 2</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0.00</td></tr>
<tr><td>Total</td><td>25</td><td>35</td><td>30</td><td>30</td><td>30</td><td>30</td><td>30</td><td>30</td><td>30</td><td>30</td><td>36.35</td><td>336.35</td></tr>
</table></td></tr>
<tr><td>c)</td><td>Cross structures
i) Dams, weirs, barrages etc.
(total number; with navigation locks or not)
ii) Bridges, Power cables etc.
[total number; range of horizontal and vertical clearances]</td><td>Cross Structures
i) Weirs – 2 Nos.
ii) Bridges – 13 Nos.
Horizontal Clearance – 0.00 to 47m
Vertical Clearance w.r.t. HFL - 0.00 to 15.207m
iii) Power cables –28 Nos
Vertical Clearance w.r.t. HFL – 2.543 to 7.01m
iv) High Tension Lines –13 Nos
Vertical Clearance w.r.t. HFL – 7.941 to 25.129m</td></tr>
<tr><td>d)</td><td>Avg. discharge & no. of days</td><td>As per the Local people information, the river is totally dried for 30 years, Avg. Discharge cannot be calculated.</td></tr>
</table>

<table>
<tr><th>#</th><th>Particulars</th><th>Details</th></tr>
<tr><td>e)</td><td>Slope (1 in ….)</td><td>
<table>
<tr><th colspan="2">Chainage (km)</th><th rowspan="2">Slope (A/B)</th></tr>
<tr><th>From</th><th>To</th></tr>
<tr><td>0</td><td>25</td><td>1 : 0.411</td></tr>
<tr><td>25</td><td>60</td><td>1 : 0.383</td></tr>
<tr><td>60</td><td>90</td><td>1 : 0.528</td></tr>
<tr><td>90</td><td>120</td><td>1 : 0.728</td></tr>
<tr><td>120</td><td>150</td><td>1 : 0.397</td></tr>
<tr><td>150</td><td>180</td><td>1 : 0.612</td></tr>
<tr><td>180</td><td>210</td><td>1 : 0.715</td></tr>
<tr><td>210</td><td>240</td><td>1 : 0.806</td></tr>
<tr><td>240</td><td>270</td><td>1 : 0.84</td></tr>
<tr><td>270</td><td>300</td><td>1 : 1.069</td></tr>
<tr><td>300</td><td>336.35</td><td>1 : 1.377</td></tr>
</table>
Average slope is 1 : 0.727 for entire river stretch
</td></tr>
<tr><td>5.</td><td>Traffic potential</td><td>No Navigational traffic is present in the survey stretch of Luni River. As per the Local people informed, the river is totally dried for 30 years.</td></tr>
<tr><td>a)</td><td>Present IWT operations, ferry services, tourism, cargo, if any</td><td>No local boats or ferry services.</td></tr>
<tr><td>b)</td><td>Important industries within 50 km</td><td>Carin India – Raageshwari Gas Terminal at Ravli Nadi is 3.26km away from Luni River
Cotton Textile Mills and Industrial Area at Balotra is 2km away from Luni River</td></tr>
<tr><td>c)</td><td>Distance of Rail & Road from Industry</td><td>Carin India – Raageshwari Gas Terminal at Ravli Nadi is 1.22km away from Route-28
Cotton Textile Mills and Industrial Area at Balotra is 0.5km away from NH25</td></tr>
<tr><td>6.</td><td>Consultant’s recommendation for going ahead with TEF / DPR preparation</td><td>As the river stretch is dried for 30 yrs., No scope of TEF/DPR can be provided for the Luni River. The River Stretch is not-viable technically.</td></tr>
<tr><td>7.</td><td>Any other information/ comment</td><td>Nil</td></tr>
</table>

(Signature)

Date: Name of Consultant

1 Introduction

1.1 Background

The stretch of about 336.35 km, of Luni River, from a Bandh approx. 1.5km from Malipura village in the south to a Bandh, called Jaswant Sagar approx. 1.5km from Pichiyak village in the south and approx. 2.0km from Jaswantpura village in the west was identified for Inland Water transport facility as per a study carried out earlier. The survey task was awarded to IIC Technologies Ltd. to assess the feasibility of water transportation over this stretch of river by carrying out both bathymetric and topographic survey.

The Luni is a river of western Rajasthan state, India. It originates in the Pushkar valley of the Aravalli Range, near Ajmer at an elevation of about 550 m. At this point, the river is also known as the Sagarmati. The river then flows in the southwest direction through the hills and plains of the Marwar region in Rajasthan. The river flows south-west and enters the Thar Desert before dissipating into the marshy lands of Rann of Kutch, in Gujarat after traversing a total of 495 km. After passing Govindgarh, it meets its tributary Sarsuti, which originates from Pushkar Lake, and from then it gets its name as 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 (49km^2).

The Luni is also known as the Lavanavati, which means "Salt River" in Sanskrit, due to high salinity of its water. The Luni is not saline until it reaches Balotra. At Balotra the river water had an impact of high salt content in the soil. In spite of the high salinity, it is a major river in the region. Luni is a seasonal river, it receives much of the drainage of the southwest slopes of the Aravalli Range, the Jowai, Sukri and Jojari Rivers are its main tributaries. The Luni is the only major river in the area and it serves as an essential source of irrigation waters.

The Luni may have been the southern portion of the historic Ghaggar-Hakra river channel. The Luni River basin is 37363km² which includes all or part of the Ajmer, Barmer, Jalore, Jodhpur, Nagaur, Pali and Sirohi districts of Rajasthan and the Banaskantha and Patan districts of northern Gujarat.

1.2 Tributaries of Luni River

The major tributaries of Luni River are the Bandi, Sukri, Mithri, Khari, Jawai, Guhiya and Sagi from the left, and the Jojari River from the right.

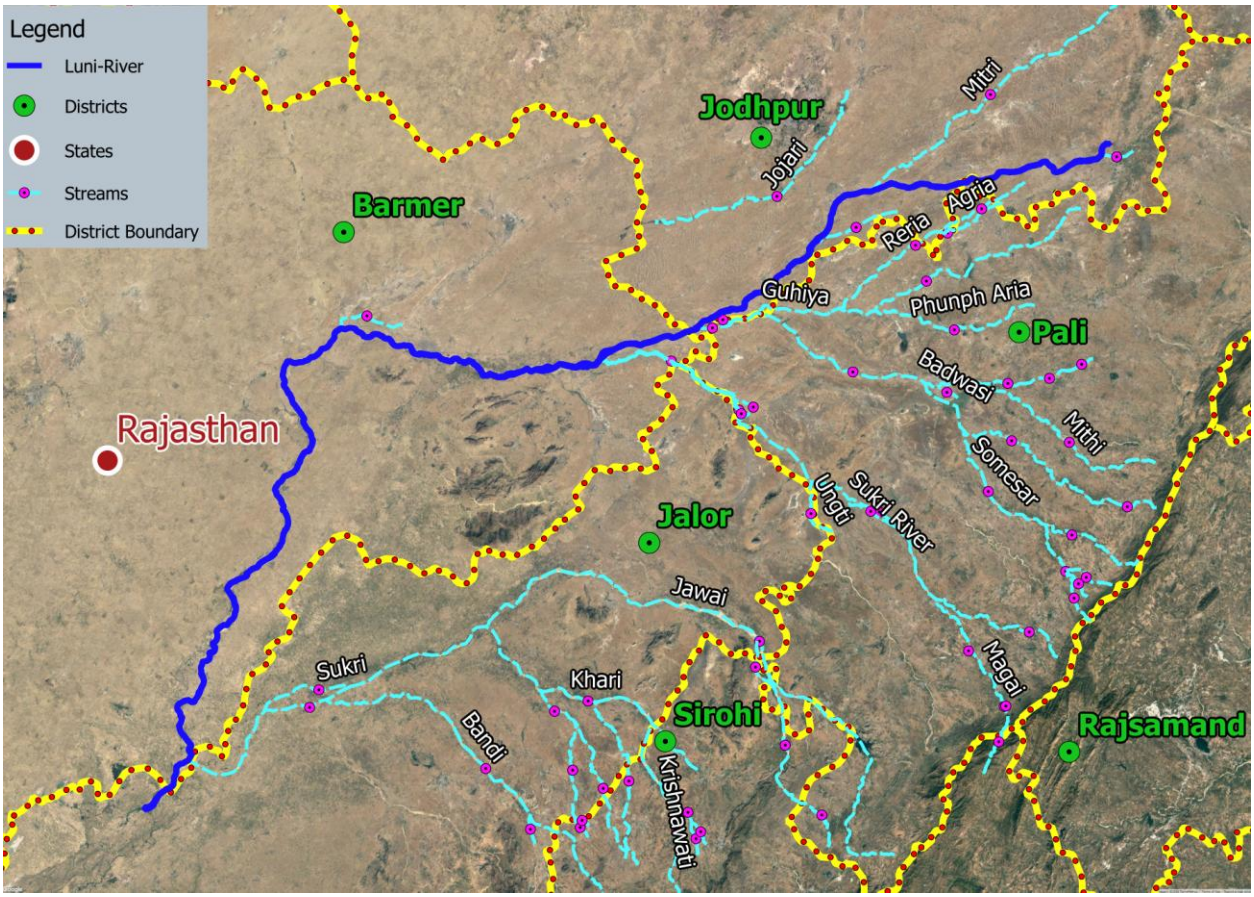


Figure 1 - Luni River Tributaries

1.3 State/District through which Luni River passes

The Survey stretch of Luni River Passes through the Barmer, Jalore, Jodhpur and Pali districts of Rajasthan.

State Name	Chainage (km)		Length in km
	From	To	
Rajasthan	0	336.35	336.35

Table 1 - Length of the river in states

1.4 Maps

1.4.1 Full course of the waterway

The map displaying the state boundary with road and rail network for the course of water way is represented as below:-

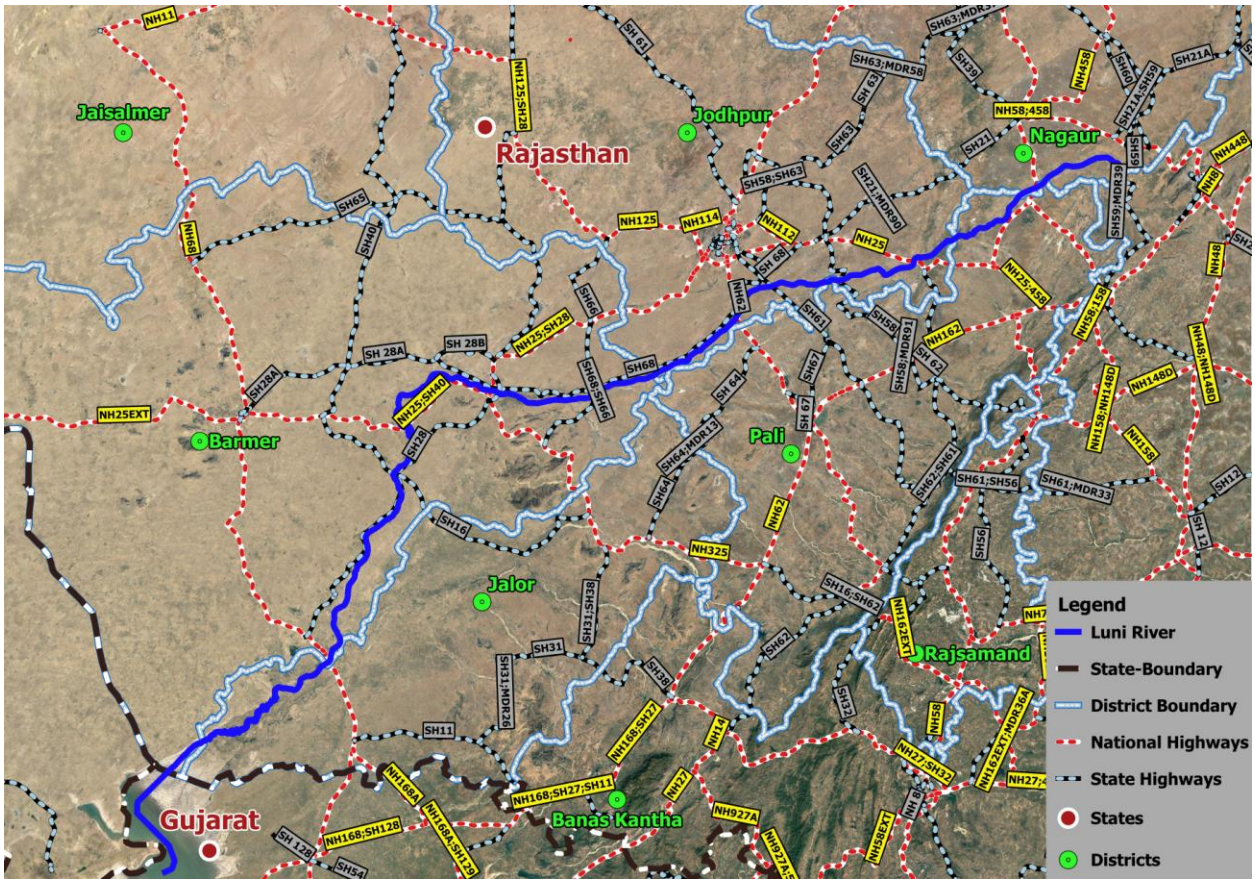


Figure 2 - Full Course of Luni River

1.4.2 Course of the waterway under study

The waterway under study is of 336.35 km in length and covers the area from Bandh near Malipura at Latitude 24°57'4.42"N, Longitude 71°38'1.51"E to Bandh at Jaswantpura Latitude 26°13'34.99"N, Longitude 73°41'20.07"E.

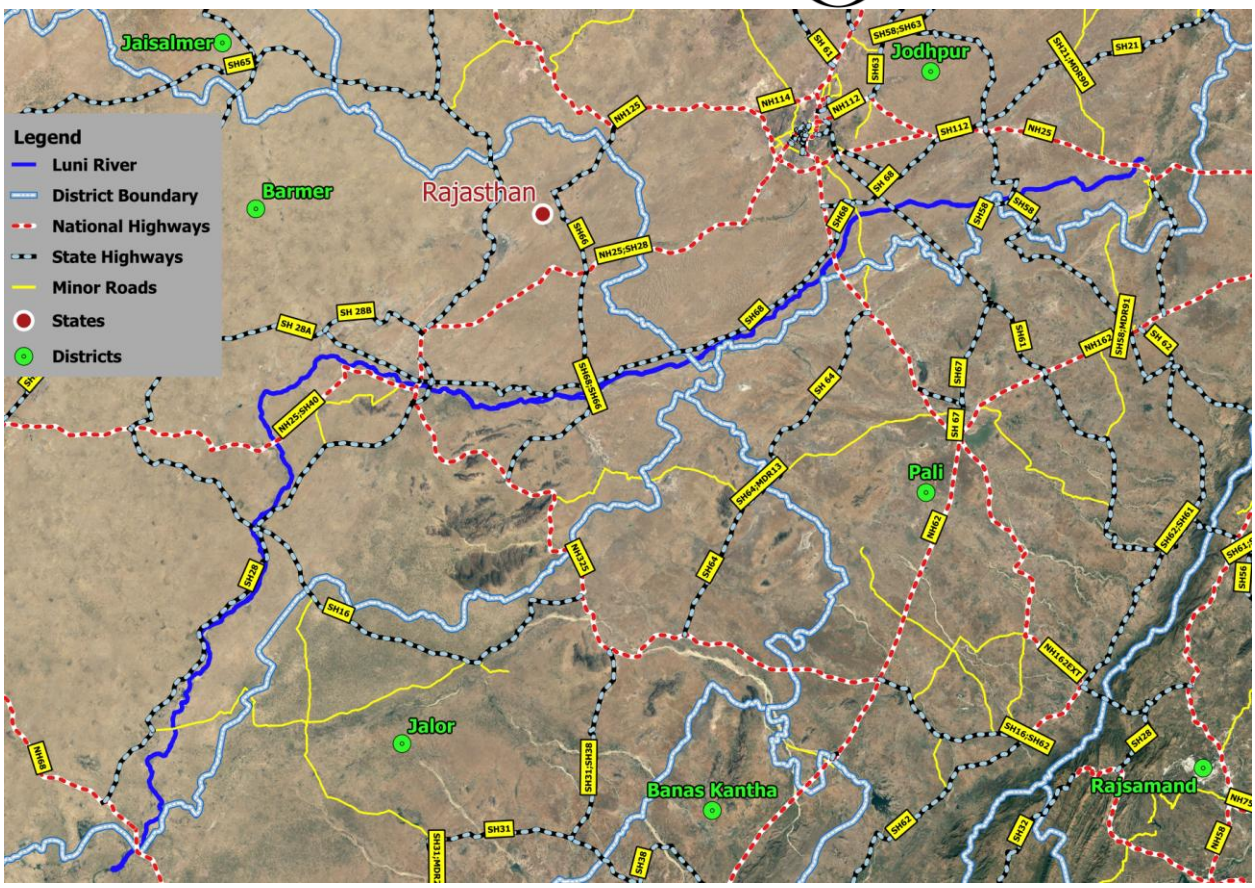


Figure 3 - Map of Luni River

1.5 Scope of Work

The major part of the work is, to conduct detailed hydrographic and topographic survey of 336.35kms length of the Luni River from Bandh near Malipura at Lat 24°57'4.42"N, Long 71°38'1.51"E to Bandh at Jaswantpura Lat 26°13'34.99"N, Long 73°41'20.07"E

The scope of the work for the conduct of a survey of Luni River includes:

- Undertake a bathymetric and topographic survey of proposed waterway.
- Establishing horizontal and vertical control stations
- Construction of benchmark pillars and establishing its reduced level w.r.to Mean Sea Level
- Setting up and deployment of water level gauges
- Current velocity and discharge measurements
- Collection and analysis of water and bottom samples.
- A collection of topographic features including existing cross structures.
- Preparation of inventory of industries in the project influence area (PIA)
- Analysis of survey data, including assessment of water availability for navigation.

- Preparation of survey charts and feasibility report

2 Methodology Adopted to Undertake Study

2.1 Recce

Advance recce of the survey area was undertaken in early Jan 2016 by a detach survey party. As per the report of the detached survey party, the river was completely dry making it impossible to conduct the Hydrographic survey, therefore topographic survey was conducted for the full river stretch. Further, we didn't found any GTS BM and CWC Gauges as per the list is given by IWAI. On inquiry with local authorities, the detach survey party recovered the Geodetic station at PWD Office at Bar, Rajasthan.

The following observation has been made.

- The survey area is 327km, from Dam at Jaswantpura to Malipura Barrage.
- River width varied between 100 mtr to 200 mtr.
- The area of the river stretch is falling under two Zones of Universal Transverse Mercator Grid system. The river stretch in Zone No. 42 is approximately 120km and that of Zone No. 43 is approximately 216km.

It was observed that most of the River stretch was dry and preliminary queries revealed that the River remains dry for most of the year. Hence a decision was taken to undertake topographic survey initially for the complete River stretch, the hydrographic survey would be undertaken depending on the field conditions and availability of water in limited pockets of the River stretch under consideration.

2.2 Survey Resources and Methodology

The survey was commenced on 14th Feb and completed on 26th Mar 2016. The survey was undertaken on a scale of 1:50000 for Zone 42N, 1:225,000 for zone 43N with sounding line spacing, kept at 150m and plotted on UTM Projection at Zone 42N and 43N as directed in the contract specifications.

2.2.1 Survey Launch

The bathymetric survey was unable to conduct due to the unavailability of water in the River stretch.

2.2.2 Survey Equipment

Following equipment was employed for the topographic survey.

Equipment	Make	Eqpt. Serial No.	Qty. Employed
DGPS Sets	Trimble R3/R4	5151478825,5316424840, 5312420677,5033444929, 5316434840	5
Auto Level	Sokkia Auto level & Accessories	257682, 229489	2
ETS	Electronic Total Station	120840 & 120775	2
Software	TBC	Version 12	1
Software	AUTOCAD	2012	1
Software	Microsoft Office	2013	1

Table 2 - Survey Equipment Used

2.2.3 Topographic Survey

The survey commenced on 14th Feb 2016 and completed on 26th Mar 2016. The weather was sunny throughout the period during survey operations. The weather was conducive, for most of the survey period, for the conduct of the survey. Temperatures were too high for the entire duration of the survey, hampering the progress of survey. The temperature ranges from 21°C to 42°C. We received rain showers for 2-3 days during the entire period of the survey.

The survey was undertaken as per the line plan provided by IWAI and the spot level points in the cross line were spaced at the 20m interval. The plotting of the chart was done on UTM Projection at Zone 42N and 43N as directed in the contract specifications. The spot levels along the river were obtained by using Trimble DGPS. The data was post processed using Trimble Business Center to get the precise position and MSL height values of the rover locations. The topographic survey for the entire survey stretch was conducted to collect the following data:

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

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.

Figure 4 - Spot leveling by DGPS

2.2.4 Bathymetric Survey and Survey Launch

The bathymetric survey by survey launch for the Luni River was not able to be conducted due to non-availability of water throughout the river.

2.2.5 Calibration

The equipment used for the survey was calibrated by the equipment supplier. The equipment calibration certificates are placed at Annexure-14 to this report.

2.3 Description of Bench Marks/Authentic Reference Level

The established benchmark of government organizations was not available for the entire survey stretch of the Luni River as per the list is given by IWAI, an inquiry with the local authorities, we came to know about GTS BM in PWD Guest House Compound at a place called Bar in Rajasthan, around 60km from the Starting point upstream. The height of GTS BM is 367.047m above MSL. We transferred the MSL height from GTS BM to newly constructed BM pillar named as IWAI BM LUN-01, but the Executive Engineer was unable to provide us the positional value.

Figure 5 - PWD Benchmark Rajasthan

To establish the origin of the survey, 25 hrs. GPS observations were carried out simultaneously on first three newly constructed BM pillars. The final coordinate of IWAI BM LUN-01 was eatablished by online processing in Trimble Business Center Software

and further IWAI BM LUN-01 is used as Reference for carrying out Baseline processing. The process of extending Horizontal control is done by doing simultaneous GPS observations on two or more BM pillars. The data then downloaded and processed in Trimble Business Center Software in Baseline Method.

The final accepted WGS-84 coordinates and details of station & IWAI Benchmark established during the conduct of survey are as follows:-

Sl. No.	Station Name	Latitude	Longitude	Height above MSL (m)	Zone	Chainage (km)	Source/ Type
1	IWAI BM LUN-01	26°13'33.29451"N	73°41'16.60293"E	261.678	43	336.27	Online Processing
2	IWAI BM LUN-02	26°11'13.15396"N	73°36'37.05852"E	252.065	43	326.11	Baseline Processing
3	IWAI BM LUN-03	26°11'02.71364"N	73°31'34.70076"E	241.495	43	315.86	Baseline Processing
4	IWAI BM LUN-04	26°09'35.36948"N	73°25'34.85916"E	230.054	43	305.10	Baseline Processing
5	IWAI BM LUN-05	26°08'45.27017"N	73°18'53.45523"E	215.318	43	293.25	Baseline Processing
6	IWAI BM LUN-06	26°09'06.15019"N	73°13'36.94451"E	204.022	43	284.01	Baseline Processing
7	IWAI BM LUN-07	26°07'40.53055"N	73°07'15.20272"E	192.726	43	273.06	Baseline Processing
8	IWAI BM LUN-08	26°03'20.32083"N	73°04'18.11718"E	185.375	43	263.01	Baseline Processing
9	IWAI BM LUN-09	25°59'45.72119"N	73°00'36.26097"E	178.918	43	253.51	Baseline Processing
10	IWAI BM LUN-10	25°56'38.94985"N	72°56'20.65593"E	168.491	43	243.17	Baseline Processing
11	IWAI BM LUN-11	25°54'31.96869"N	72°51'56.33916"E	160.439	43	233.91	Baseline Processing
12	IWAI BM LUN-12	25°52'05.66927"N	72°46'57.51900"E	153.976	43	224.21	Baseline Processing
13	IWAI BM LUN-13	25°50'48.71124"N	72°41'02.13585"E	143.207	43	213.30	Baseline Processing
14	IWAI BM LUN-14	25°48'31.49861"N	72°35'02.56280"E	133.987	43	201.81	Baseline Processing
15	IWAI BM LUN-15	25°47'55.07220"N	72°29'04.48105"E	125.772	43	191.46	Baseline Processing
16	IWAI BM LUN-16	25°47'10.92119"N	72°22'17.42057"E	117.093	43	179.19	Baseline Processing
17	IWAI BM LUN-17	25°48'57.71513"N	72°17'36.47095"E	110.94	43	169.44	Baseline Processing
18	IWAI BM LUN-18	25°50'23.33137"N	72°12'00.48861"E	108.135	43	158.39	Baseline Processing
19	IWAI BM LUN-19	25°51'36.29298"N	72°06'00.90765"E	99.368	43	146.80	Baseline Processing
20	IWAI BM LUN-20	25°50'08.52240"N	72°00'47.68756"E	93.216	43	135.05	Baseline Processing
21	IWAI BM LUN-21	25°48'45.06648"N	71°56'26.16899"E	94.14	42	126.48	Baseline Processing
22	IWAI BM LUN-22	25°43'11.42258"N	71°55'58.20285"E	85.185	42	115.72	Baseline Processing
23	IWAI BM LUN-23	25°39'38.31664"N	71°59'33.40535"E	81.797	42	106.71	Baseline Processing
24	IWAI BM LUN-24	25°35'05.78655"N	71°56'24.75494"E	84.469	42	95.97	Baseline Processing
25	IWAI BM LUN-25	25°30'33.70331"N	71°56'24.27301"E	67.457	42	85.03	Baseline Processing
26	IWAI BM LUN-26	25°25'42.34675"N	71°53'07.06322"E	63.318	42	73.76	Baseline Processing
27	IWAI BM LUN-27	25°22'01.04082"N	71°48'38.81177"E	74.172	42	62.75	Baseline Processing
28	IWAI BM LUN-28	25°18'03.71441"N	71°47'06.24089"E	57.132	42	52.37	Baseline Processing
29	IWAI BM LUN-29	25°12'18.13479"N	71°45'18.33088"E	45.889	42	39.70	Baseline Processing
30	IWAI BM LUN-30	25°09'05.76947"N	71°42'13.93388"E	39.715	42	29.58	Baseline Processing

Sl. No.	Station Name	Latitude	Longitude	Height above MSL (m)	Zone	Chainage (km)	Source/ Type
31	IWAI BM LUN-31	25°04'00.95634"N	71°43'02.14921"E	37.087	42	18.58	Baseline Processing
32	IWAI BM LUN-32	24°59'36.82557"N	71°40'55.42481"E	36.435	42	6.91	Baseline Processing
33	IWAI BM LUN-33	24°57'28.69743"N	71°37'59.16845"E	31.771	42	0.38	Baseline Processing

Table 3 - Accepted Station coordinates (WGS-84)

The details of horizontal and vertical control established and methodology followed for the conduct of survey is placed at Annexure-8.

2.4 Tidal influence Zone and Tidal Variation

The survey stretch of Luni River is non-tidal water body and no influence of tidal force was observed throughout the survey period.

2.5 Methodology to fix Chart Datum / Sounding Datum

The Luni River is to 336.35 km stretch which is between Malipura to Jaswantpura. There are no barrages or dams present in the survey stretch of the Luni River. The accumulated water depth on an average of 0.1 to 0.2 mtr is available at the downstream near Malipura bandh which is marshy and long grass vegetation where boat survey cannot be done. The water level is recorded as Dry in the records. The least MSL Value obtained during the conduct of a Topographic survey for the stretch is considered as Chart Datum.

2.5.1 Sounding Datum

The established CWC Chart Datum values are available only for the half survey stretch of Luni River. The Luni River being dry, the entire River stretch is divided in the small stretches according to the slope of the River and the least MSL Value obtained during the conduct of a Topographic survey for the stretch is considered as Chart Datum for the Dredging Volume calculations.

2.5.2 Datum Calculation

The datum for calculation of dredge volume needs to be adopted as per the gradient of the River and the average water level of the River. The datum for calculation of dredge volume was accepted as the least spot height in the stretch for the entire River. The newly established sounding datum is established by assuming the least value of the Spot height for every 01km of the River stretch.

Stretch (km)	Least Level w.r.t. MSL (m)	Established CD (m)		Stretch (km)	Least Level w.r.t. MSL (m)	Established CD (m)
0 - 1	23.124	23.124		169 - 170	108.837	108.837
1 - 2	23.012	23.012		170 - 171	109.612	109.612
2 - 3	23.254	23.254		171 - 172	109.765	109.765
3 - 4	24.054	24.054		172 - 173	110.443	110.443
4 - 5	24.254	24.254		173 - 174	111.946	111.946
5 - 6	25.33	25.33		174 - 175	112.691	112.691
6 - 7	28.496	28.496		175 - 176	112.937	112.937
7 - 8	29.404	29.404		176 - 177	113.792	113.792
8 - 9	29.595	29.595		177 - 178	114.464	114.464
9 - 10	30.442	30.442		178 - 179	115.1	115.1
10 - 11	30.215	30.215		179 - 180	116.092	116.092
11 - 12	30.254	30.254		180 - 181	116.404	116.404
12 - 13	29.522	29.522		181 - 182	116.795	116.795
13 - 14	29.874	29.874		182 - 183	117.383	117.383
14 - 15	29.855	29.855		183 - 184	117.437	117.437
15 - 16	30.245	30.245		184 - 185	117.542	117.542
16 - 17	30.578	30.578		185 - 186	118.85	118.85
17 - 18	31.841	31.841		186 - 187	119.962	119.962
18 - 19	32.194	32.194		187 - 188	121.26	121.26
19 - 20	32.685	32.685		188 - 189	121.353	121.353
20 - 21	32.845	32.845		189 - 190	123.21	123.21
21 - 22	33.297	33.297		190 - 191	123.203	123.203
22 - 23	33.985	33.985		191 - 192	123.065	123.065
23 - 24	33.695	33.695		192 - 193	123.065	123.065
24 - 25	34.305	34.305		193 - 194	125.317	125.317
25 - 26	35.167	35.167		194 - 195	126.578	126.578
26 - 27	34.933	34.933		195 - 196	127.965	127.965
27 - 28	35.261	35.261		196 - 197	127.846	127.846
28 - 29	36.266	36.266		197 - 198	128.068	128.068
29 - 30	36.115	36.115		198 - 199	128.664	128.664
30 - 31	36.715	36.715		199 - 200	129.023	129.023
31 - 32	36.653	36.653		200 - 201	129.475	129.475
32 - 33	37.84	37.84		201 - 202	130.11	130.11
33 - 34	37.958	37.958		202 - 203	130.979	130.979
34 - 35	38.963	38.963		203 - 204	133.351	133.351
35 - 36	38.467	38.467		204 - 205	133.59	133.59
36 - 37	38.9	38.9		205 - 206	133.414	133.414
37 - 38	40.328	40.328		206 - 207	134.442	134.442
38 - 39	41.043	41.043		207 - 208	134.178	134.178
39 - 40	41.498	41.498		208 - 209	135.41	135.41
40 - 41	41.51	41.51		209 - 210	136.462	136.462
41 - 42	41.5	41.5		210 - 211	137.322	137.322
42 - 43	41.696	41.696		211 - 212	137.789	137.789
43 - 44	42.393	42.393		212 - 213	138.597	138.597
44 - 45	43.392	43.392		213 - 214	139.833	139.833
45 - 46	44.934	44.934		214 - 215	139.104	139.104
46 - 47	45.399	45.399		215 - 216	141.026	141.026
47 - 48	45.933	45.933		216 - 217	141.816	141.816
48 - 49	46.411	46.411		217 - 218	143.319	143.319
49 - 50	45.591	45.591		218 - 219	144.147	144.147

Stretch (km)	Least Level w.r.t. MSL (m)	Established CD (m)		Stretch (km)	Least Level w.r.t. MSL (m)	Established CD (m)
50 - 51	46.132	46.132		219 - 220	144.519	144.519
51 - 52	47.105	47.105		220 - 221	145.155	145.155
52 - 53	47.051	47.051		221 - 222	145.723	145.723
53 - 54	47.553	47.553		222 - 223	146.244	146.244
54 - 55	46.879	46.879		223 - 224	147.741	147.741
55 - 56	47.903	47.903		224 - 225	148.432	148.432
56 - 57	47.735	47.735		225 - 226	148.816	148.816
57 - 58	48.353	48.353		226 - 227	150.075	150.075
58 - 59	48.394	48.394		227 - 228	151.018	151.018
59 - 60	48.384	48.384		228 - 229	151.282	151.282
60 - 61	48.496	48.496		229 - 230	151.27	151.27
61 - 62	48.681	48.681		230 - 231	153.56	153.56
62 - 63	48.13	48.13		231 - 232	154.597	154.597
63 - 64	49.628	49.628		232 - 233	155.946	155.946
64 - 65	49.949	49.949		233 - 234	156.187	156.187
65 - 66	49.934	49.934		234 - 235	155.957	155.957
66 - 67	50.472	50.472		235 - 236	158.192	158.192
67 - 68	52.124	52.124		236 - 237	159.435	159.435
68 - 69	53.325	53.325		237 - 238	159.587	159.587
69 - 70	53.128	53.128		238 - 239	160.717	160.717
70 - 71	53.743	53.743		239 - 240	162.372	162.372
71 - 72	54.438	54.438		240 - 241	162.849	162.849
72 - 73	53.448	53.448		241 - 242	163.703	163.703
73 - 74	54.202	54.202		242 - 243	163.729	163.729
74 - 75	54.03	54.03		243 - 244	165.041	165.041
75 - 76	56.079	56.079		244 - 245	166.116	166.116
76 - 77	57.759	57.759		245 - 246	166.773	166.773
77 - 78	57.931	57.931		246 - 247	167.674	167.674
78 - 79	59.205	59.205		247 - 248	168.343	168.343
79 - 80	58.923	58.923		248 - 249	170.148	170.148
80 - 81	59.014	59.014		249 - 250	170.734	170.734
81 - 82	59.096	59.096		250 - 251	171.75	171.75
82 - 83	59.373	59.373		251 - 252	172.644	172.644
83 - 84	60.196	60.196		252 - 253	173.381	173.381
84 - 85	60.964	60.964		253 - 254	172.759	172.759
85 - 86	61.964	61.964		254 - 255	174.172	174.172
86 - 87	61.946	61.946		255 - 256	175.005	175.005
87 - 88	62.767	62.767		256 - 257	175.019	175.019
88 - 89	63.784	63.784		257 - 258	176.267	176.267
89 - 90	64.569	64.569		258 - 259	177.793	177.793
90 - 91	64.613	64.613		259 - 260	178.447	178.447
91 - 92	64.228	64.228		260 - 261	178.383	178.383
92 - 93	65.065	65.065		261 - 262	178.714	178.714
93 - 94	65.321	65.321		262 - 263	180.043	180.043
94 - 95	65.453	65.453		263 - 264	182.047	182.047
95 - 96	65.817	65.817		264 - 265	182.589	182.589
96 - 97	65.72	65.72		265 - 266	183.591	183.591
97 - 98	65.8	65.8		266 - 267	183.743	183.743
98 - 99	66.38	66.38		267 - 268	185.002	185.002
99 - 100	66.386	66.386		268 - 269	185.61	185.61

Stretch (km)	Least Level w.r.t. MSL (m)	Established CD (m)		Stretch (km)	Least Level w.r.t. MSL (m)	Established CD (m)
100 - 101	68	68		269 - 270	186.174	186.174
101 - 102	69.538	69.538		270 - 271	187.338	187.338
102 - 103	70.352	70.352		271 - 272	188.136	188.136
103 - 104	71.25	71.25		272 - 273	189.339	189.339
104 - 105	73.095	73.095		273 - 274	190.241	190.241
105 - 106	74.304	74.304		274 - 275	191.625	191.625
106 - 107	74.929	74.929		275 - 276	192.815	192.815
107 - 108	76.231	76.231		276 - 277	193.933	193.933
108 - 109	77.786	77.786		277 - 278	195.468	195.468
109 - 110	80.234	80.234		278 - 279	195.504	195.504
110 - 111	80.443	80.443		279 - 280	196.893	196.893
111 - 112	80.609	80.609		280 - 281	197.656	197.656
112 - 113	81.404	81.404		281 - 282	198.614	198.614
113 - 114	82	82		282 - 283	200.429	200.429
114 - 115	82.405	82.405		283 - 284	200.846	200.846
115 - 116	82.82	82.82		284 - 285	201.878	201.878
116 - 117	83.656	83.656		285 - 286	203.541	203.541
117 - 118	83.912	83.912		286 - 287	203.445	203.445
118 - 119	83.807	83.807		287 - 288	205.835	205.835
119 - 120	85.76	85.76		288 - 289	205.987	205.987
120 - 121	85.933	85.933		289 - 290	206.878	206.878
121 - 122	86.486	86.486		290 - 291	207.195	207.195
122 - 123	86.582	86.582		291 - 292	209.05	209.05
123 - 124	87.254	87.254		292 - 293	210.842	210.842
124 - 125	87.622	87.622		293 - 294	211.656	211.656
125 - 126	88.309	88.309		294 - 295	212.811	212.811
126 - 127	88.662	88.662		295 - 296	213.543	213.543
127 - 128	88.755	88.755		296 - 297	215.189	215.189
128 - 129	89.751	89.751		297 - 298	214.342	214.342
129 - 130	89.336	89.336		298 - 299	215.822	215.822
130 - 131	89.864	89.864		299 - 300	216.321	216.321
131 - 132	90.429	90.429		300 - 301	218.214	218.214
132 - 133	90.895	90.895		301 - 302	218.81	218.81
133 - 134	90.492	90.492		302 - 303	221.779	221.779
134 - 135	91.035	91.035		303 - 304	223.647	223.647
135 - 136	92.006	92.006		304 - 305	224.453	224.453
136 - 137	92.032	92.032		305 - 306	226.067	226.067
137 - 138	92.58	92.58		306 - 307	227.097	227.097
138 - 139	92.448	92.448		307 - 308	228.115	228.115
139 - 140	93.049	93.049		308 - 309	229.53	229.53
140 - 141	93.757	93.757		309 - 310	231.078	231.078
141 - 142	93.935	93.935		310 - 311	231.556	231.556
142 - 143	94.585	94.585		311 - 312	231.292	231.292
143 - 144	95.137	95.137		312 - 313	232.513	232.513
144 - 145	95.743	95.743		313 - 314	232.202	232.202
145 - 146	96.27	96.27		314 - 315	234.995	234.995
146 - 147	96.851	96.851		315 - 316	234.618	234.618
147 - 148	96.673	96.673		316 - 317	235.955	235.955
148 - 149	97.296	97.296		317 - 318	235.889	235.889
149 - 150	97.987	97.987		318 - 319	238.466	238.466

Stretch (km)	Least Level w.r.t. MSL (m)	Established CD (m)		Stretch (km)	Least Level w.r.t. MSL (m)	Established CD (m)
150 - 151	98.155	98.155		319 - 320	239.26	239.26
151 - 152	99.058	99.058		320 - 321	239.345	239.345
152 - 153	99.021	99.021		321 - 322	240.154	240.154
153 - 154	100.65	100.65		322 - 323	240.745	240.745
154 - 155	101.047	101.047		323 - 324	241.285	241.285
155 - 156	101.161	101.161		324 - 325	242.132	242.132
156 - 157	101.696	101.696		325 - 326	243.376	243.376
157 - 158	102.339	102.339		326 - 327	245.106	245.106
158 - 159	102.159	102.159		327 - 328	246.486	246.486
159 - 160	103.458	103.458		328 - 329	246.174	246.174
160 - 161	103.444	103.444		329 - 330	247.092	247.092
161 - 162	103.714	103.714		330 - 331	250.159	250.159
162 - 163	104.851	104.851		331 - 332	251.124	251.124
163 - 164	104.61	104.61		332 - 333	253.396	253.396
164 - 165	106.139	106.139		333 - 334	253.589	253.589
165 - 166	106.889	106.889		334 - 335	254.049	254.049
166 - 167	107.073	107.073		335 - 336	254.655	254.655
167 - 168	107.227	107.227		336 - 336.35	260.003	260.003
168 - 169	107.595	107.595				

Table 4 - Established CD for per kilometer stretch

2.6 Average of 06 years minimum Water Levels to arrive at Chart Datum (CD)

As per the details provided by IWAI for CWC gauges, there are two gauges in the survey stretch, i.e. at Balotra (Located at Balotra and chainage is 164.362) and Gandhav (Located at Keriya and chainage is 6.77). But on site visit, it was found that there were no CWC gauges at the specified location. However, the value of the CWC gauge provided by IWAI for cross checking of the computed Chart Datum and HFL.

2.7 Transfer of Sounding Datum

The Luni River is a non-tidal river and Dry River, the lowest MSL level of per-km stretch is considered as the datum value for the computing sounding datum at different stretches.

2.8 Table indicating Tidal Variation at Different Observation Points

The survey stretch of Luni River is non-tidal and the river was fully dry during the entire course of survey and as per local information, the river is dried from last 20-25 years.

2.9 Salient features of Dam, Barrages, and Weir

The details of Weir were collected during the conduct of survey and the details are as follows:

2.9.1 Salient features of Jaswant Sagar Weir

Salient features Jaswant Sagar Weir	
Name of the Structure	Jaswant Sagar Weir
Position Lat Long North Bank	26°13'36.589"N, 073°41'20.876"E
Position Lat Long South Bank	26°13'27.061"N, 073°41'21.118"E
Chainage	336.35 km
Nearest Village	Pichiyak
Block/Tehsil	Bilara
District	Jodhpur
State	Rajasthan
Name of River	Luni
Length of Bandh (m)	250
Height w.r.t to MSL (m)	276.777 North Bank, 277.518 South Bank
	

Table 5 - Salient features of Jaswant Sagar Weir

2.9.2 Salient features of Malipura Weir

Salient features Malipura Weir	
Name of the Structure	Malipura Weir
Position Lat Long North Bank	24°57'17.334"N 071°38'00.159"E
Position Lat Long South Bank	24°56'58.465"N 071°38'02.048"E
Chainage	0.08km
Nearest Village	Malipura
Block/Tehsil	Beawar
District	Ajmer
State	Rajasthan
Name of River	Luni
Length of Bandh (m)	530
Height w.r.t to MSL (m)	30.372 North Bank, 30.160 South Bank

Table 6 - Salient features of Malipura Weir

2.10 Erected IWAI Benchmark Pillars

The new Benchmark Pillars (IWAI BM Pillars) were constructed (33 no's) as per specification is given in RFP document and erected at an average distance of 10km along the river stretch from starting to end chainage of the river. The value of these benchmarks w.r.t. MSL was obtained by leveling them from the GTS BM at Bar, Rajasthan to IWAI BM LUN-01. MSL value was the vertical datum used for deducing the heights for spot levels obtained as part of the topographic survey. The extension of horizontal control was done by Baseline processing of 06 hourly DGPS observations carried out with the nearest reference benchmark pillars. The final accepted co-ordinates and reduced level (RL) values of these Bench Marks and other station established for setting up of reference DGPS base stations are as below:

Sl. No	Station	Chainage (km)	Location	Latitude (N) Longitude (E)	Easting (E) Northing (N)	Height above MSL (m)	CD w.r.t MSL (CD)	BM Height w.r.t. CD (m)	Zone No
1	IWAI BM LUN-33	0.38	Keriya	24°57'28.69743"N 71°37'59.16845"E	765856.586 2762872.888	31.771	23.124	8.647	42
2	IWAI BM LUN-32	6.91	Gandhav	24°59'36.82557"N 71°40'55.42481"E	770724.257 2766913.497	36.435	28.496	7.939	42
3	IWAI BM LUN-31	18.58	Dangriya	25°04'00.95634"N 71°43'02.14921"E	774115.884 2775114.380	37.087	32.194	4.893	42
4	IWAI BM LUN-30	29.58	Dheemri	25°09'05.76947"N 71°42'13.93388"E	772576.116 2784469.556	39.715	36.115	3.6	42
5	IWAI BM LUN-29	39.70	Seeloo	25°12'18.13479"N 71°45'18.33088"E	777621.031 2790495.535	45.889	41.498	4.391	42
6	IWAI BM LUN-28	52.37	Modawas	25°18'03.71441"N 71°47'06.24089"E	780422.253 2801195.528	57.132	47.051	10.081	42
7	IWAI BM LUN-27	62.75	Khudala	25°22'01.04082"N 71°48'38.81177"E	782859.195 2808555.242	74.172	48.13	26.042	42
8	IWAI BM LUN-26	73.76	Payala	25°25'42.34675"N 71°53'07.06322"E	790214.558 2815527.924	63.318	54.202	9.116	42
9	IWAI BM	85.03	Gadesara	25°30'33.70331"N	795529.545	67.457	61.964	5.493	42

Sl. No	Station	Chainage (km)	Location	Latitude (N) Longitude (E)	Easting (E) Northing (N)	Height above MSL (m)	CD w.r.t MSL (CD)	BM Height w.r.t. CD (m)	Zone No
	LUN-25			71°56'24.27301"E	2824617.955				
10	IWAI BM LUN-24	95.97	Sindari	25°35'05.78655"N 71°56'24.75494"E	795357.473 2832994.564	84.469	65.817	18.652	42
11	IWAI BM LUN-23	106.71	Bhukan	25°39'38.31664"N 71°59'33.40535"E	800434.891 2841502.817	81.797	74.929	6.868	42
12	IWAI BM LUN-22	115.72	Sanapa	25°43'11.42258"N 71°55'58.20285"E	794284.555 2847928.952	85.185	82.82	2.365	42
13	IWAI BM LUN-21	126.48	Somesara Juna	25°48'45.06648"N 71°56'26.16899"E	794835.105 2858218.053	94.14	88.662	5.478	42
14	IWAI BM LUN-20	135.05	Makarna	25°50'08.52240"N 72°00'47.68756"E	200593.437 2860891.825	93.216	92.006	1.21	43
15	IWAI BM LUN-19	146.80	Tilwara	25°51'36.29298"N 72°06'00.90765"E	209379.690 2863398.406	99.368	96.851	2.517	43
16	IWAI BM LUN-18	158.39	Temawas	25°50'23.33137"N 72°12'00.48861"E	219347.451 2860934.857	108.135	102.159	5.976	43
17	IWAI BM LUN-17	169.44	Bithuja	25°48'57.71513"N 72°17'36.47095"E	228652.638 2858103.168	110.94	108.837	2.103	43
18	IWAI BM LUN-16	179.19	Kanana	25°47'10.92119"N 72°22'17.42057"E	236414.595 2854657.066	117.093	116.092	1.001	43
19	IWAI BM LUN-15	191.46	Jethantari	25°47'55.07220"N 72°29'04.48105"E	244334.989 2855951.796	125.772	123.065	2.707	43
20	IWAI BM LUN-14	201.81	Samdari	25°48'31.49861"N 72°35'02.56280"E	254333.222 2856886.002	133.987	130.11	3.877	43
21	IWAI BM LUN-13	213.30	Ajit	25°50'48.71124"N 72°41'02.13585"E	267873.628 2860771.338	143.207	139.833	3.374	43
22	IWAI BM LUN-12	224.21	Rampura	25°52'05.66927"N 72°46'57.51900"E	274363.059 2863126.775	153.976	148.432	5.544	43
23	IWAI BM LUN-11	233.91	Bhachran	25°54'31.96869"N 72°51'56.33916"E	282756.750 2867491.429	160.439	156.187	4.252	43
24	IWAI BM LUN-10	243.17	Satlana,	25°56'38.94985"N 72°56'20.65593"E	290175.179 2871281.627	168.491	165.041	3.45	43
25	IWAI BM LUN-09	253.51	Luni	25°59'45.72119"N 73°00'36.26097"E	300821.180 2876761.027	178.918	172.759	6.159	43
26	IWAI BM LUN-08	263.01	Kankani	26°03'20.32083"N 73°04'18.11718"E	307088.640 2883272.403	185.375	182.047	3.328	43
27	IWAI BM LUN-07	273.06	Guda Bishnoiyan	26°07'40.53055"N 73°07'15.20272"E	308680.588 2891367.097	192.726	190.241	2.485	43
28	IWAI BM LUN-06	284.01	Birami	26°09'06.15019"N 73°13'36.94451"E	322766.311 2893693.694	204.022	201.878	2.144	43
29	IWAI BM LUN-05	293.25	Goliya	26°08'45.27017"N 73°18'53.45523"E	331547.907 2892934.244	215.318	211.656	3.662	43
30	IWAI BM LUN-04	305.10	Rampuriya	26°09'35.36948"N 73°25'34.85916"E	339270.050 2894495.390	230.054	226.067	3.987	43
31	IWAI BM LUN-03	315.86	Balla	26°11'02.71364"N 73°31'34.70076"E	352736.761 2896906.386	241.495	234.618	6.877	43
32	IWAI BM LUN-02	326.11	Bhawi	26°11'13.15396"N 73°36'37.05852"E	361134.018 2897135.047	252.065	245.106	6.959	43
33	IWAI BM LUN-01	336.27	Pichiyak	26°13'33.29451"N 73°41'16.60293"E	368937.766 2901366.130	261.678	260.003	1.675	43

Table 7 - Accepted BM coordinates w.r.t. established CD

2.11 Chart Datum / Sounding Datum and Reductions Details

Luni River was completely dry and the spot leveling by topographic method was attempted for the entire survey stretch of Luni River. The least MSL level for the per-kilometer stretch was obtained as the established chart Datum. The details of Topo level converted as Depth for volume calculation are forwarded as soft copy along with the report.

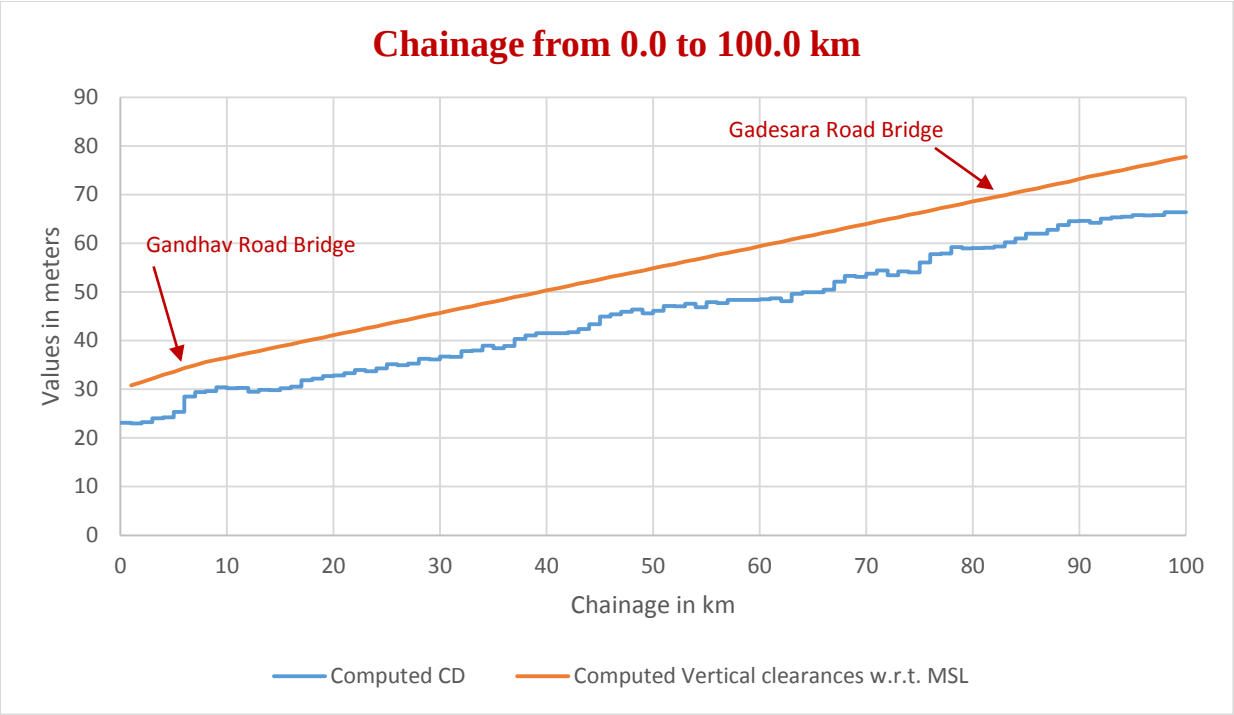
2.12 HFL/MHWS values of Bridges/Cross Structures

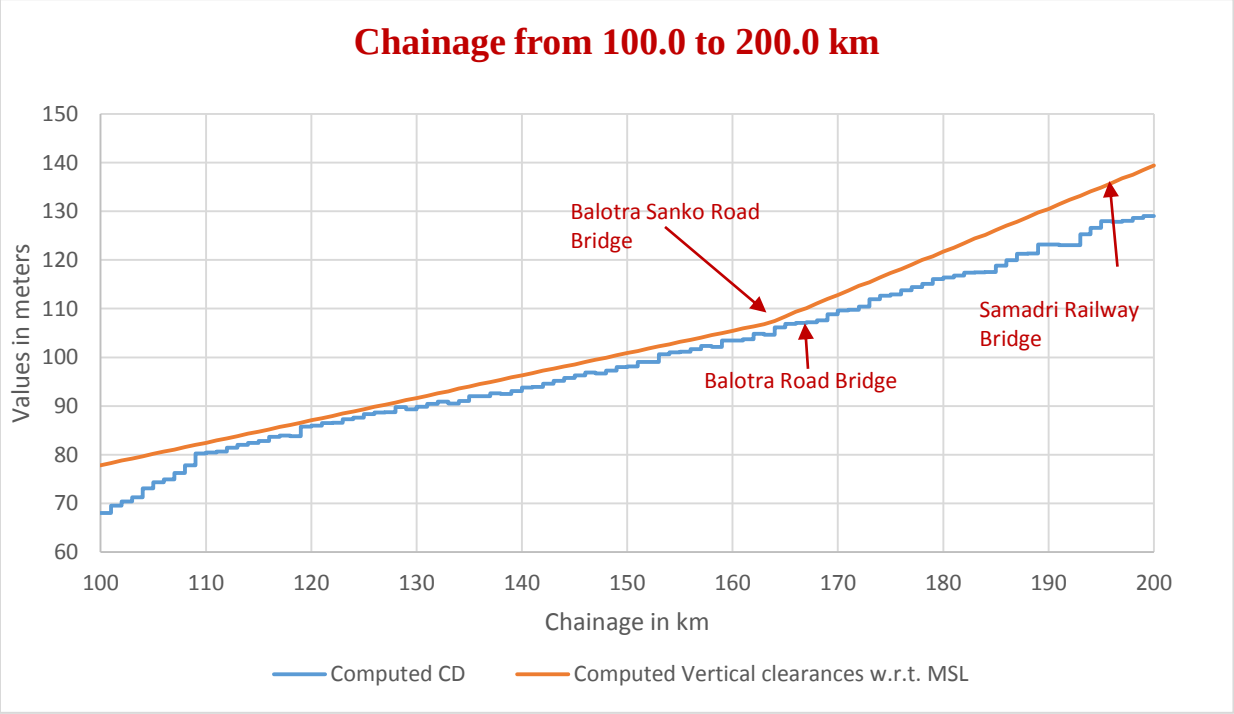
The established HFL value of CWC Gauges at Gandhav and Balotra was provided by IWAI whereas there are no gauges present physically. Therefore, the Vertical clearances of Bridges/Cross Structures w.r.t. MSL by adding the Vertical height measured using Total Station to the Least MSL of that stretch. The details of computed Vertical Clearances w.r.t. MSL for the entire stretch is as follows:

Sl. No.	Location and description of CWC gauge / Dam / Barrages / Weirs / Anicut / Locks / Aqueducts / BM	Cross-structure details	Chainage (km)	Established HFL / MHWS / FSL / MWL / FRL w.r.t. MSL (m)	Computed HFL at Cross-Structures w.r.t. MSL (m)
	A	B	C	D	E
1	Pichiyak Foot Walk Bridge (Concrete)	Bridge	336.397	-	260.005
2	Pichiyak Road Bridge (NH-112)	Bridge	334.042	-	257.910
3	Bhavi Railway Bridge (Concrete)	Bridge	331.575	-	255.815
4	Guda Bishnoiyan Sanko Road Bridge	Bridge	273.058	-	204.201
5	Kankani Road Bridge (Lower NH-65)	Bridge	262.839	-	195.250
6	Kankani Road Bridge (Upper NH-65)	Bridge	262.824	-	195.250
7	Luni Railway Bridge (Concrete)	Bridge	253.522	-	187.060
8	Samdari Railway Bridge (Concrete and Steel)	Bridge	197.689	-	137.922
9	Balotra Road Bridge (NH-28)	Bridge	166.308	-	110.306
10	Balotra Sanko Road Bridge (NH-112)	Bridge	163.55		107.830
11	Sindari Road Bridge	Bridge	92.598	-	74.821
12	Gadesara Road Bridge (NH-28)	Bridge	84.926	-	71.166
13	Gandhav Road Bridge (NH-15)	Bridge	6.850	-	35.400

Table 8 - HFL values of Bridges/Cross Structures

2.13 Graph: Sounding Datum and HFL vs Chainage





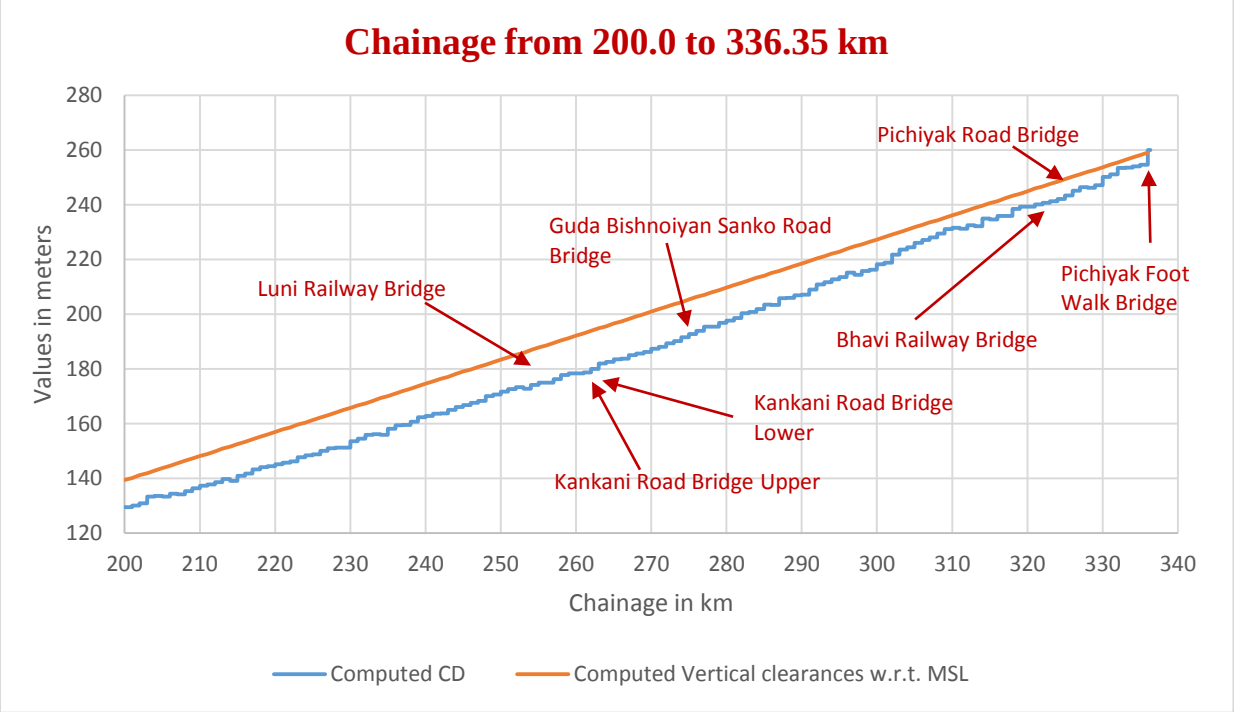


Figure 6 - CD & HFL vs Chainage

2.14 Average Bed Slope

The average bed slope for the Luni river is as follows:-

Reach and Riverbed Level (RBL)		Riverbed Level Change (m) (A)	Distance (km) (B)	Slope (A/B)
From	To			
Ch. 0 - RBL_25.218	Ch. 25 - RBL_35.485	10.267	25	1 : 0.411
Ch. 25 - RBL_35.485	Ch. 60 - RBL_48.88	13.395	35	1 : 0.383
Ch. 60 - RBL_48.88	Ch. 90 - RBL_64.728	15.848	30	1 : 0.528
Ch. 90 - RBL_64.728	Ch. 120 - RBL_86.557	21.829	30	1 : 0.728
Ch. 120 - RBL_86.557	Ch. 150 - RBL_98.469	11.912	30	1 : 0.397
Ch. 150 - RBL_98.469	Ch. 180 - RBL_116.835	18.366	30	1 : 0.612
Ch. 180 - RBL_116.835	Ch. 210 - RBL_138.278	21.443	30	1 : 0.715
Ch. 210 - RBL_138.278	Ch. 240 - RBL_162.448	24.17	30	1 : 0.806
Ch. 240 - RBL_162.448	Ch. 270 - RBL_187.634	25.186	30	1 : 0.84
Ch. 270 - RBL_187.634	Ch. 300 - RBL_219.708	32.074	30	1 : 1.069
Ch. 300 - RBL_219.708	Ch. 336.35 - RBL_269.638	49.93	36.35	1 : 1.377

Reach and Riverbed Level (RBL)		Riverbed Level Change (m) (A)	Distance (km) (B)	Slope (A/B)
From	To			

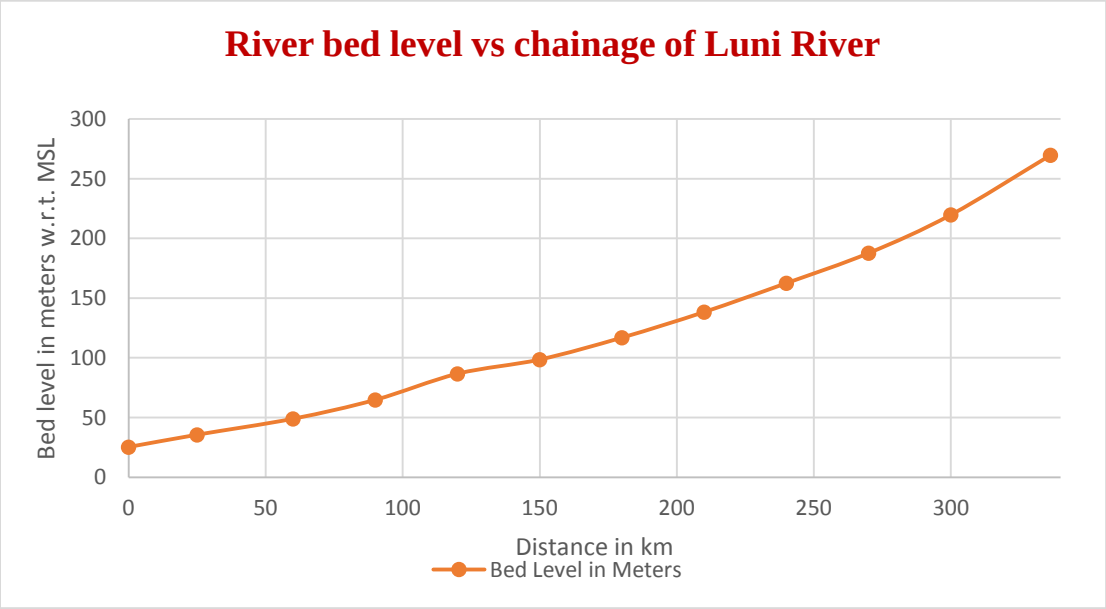


Table 9 - Average Bed Slope

2.15 Details of Dam, Barrages, Weirs, Anicut, etc.

Sl No	Structure Name	Chainage (km)	Location	Position (Lat Long)	Position (UTM)	Length (m)	Width (m)	Height w.r.t. MSL	Present condition
1	Malipura Weir	0.0	Malipura village	**Left Bank:** 24°57'17.334"N 71°38'00.159"E **Right Bank:** 24°56'58.465"N 71°38'02.048"E	**Left Bank:** 765891.20 2762523.55 **Right Bank:** 765955.50 2761943.78	530	2.5	30.372	Operational
2	Jaswant Sagar Weir	336.35	Pichiyak village	**Left Bank:** 26°13'36.589"N 73°41'20.876"E **Right Bank:** 26°13'27.061"N 73°41'21.118"E	**Left Bank:** 369050.36 2901832.88 **Right Bank:** 369061.17 2901173.04	250	1.5	276.777	Operational

Table 10 - Cross Structures w.r.t. MSL

2.16 Details of Locks

There are no Locks present in the entire survey stretch of Luni River.

2.17 Details of Aqueducts

There are no Aqueducts present in the survey stretch of Luni River.

2.18 Details of existing Bridges and Crossings over Waterway

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	HC (clear distance Between piers) (m)	VC w.r.t. HFL (m)	Remarks (complete / under - constructio n), in use or not, condition
					Left Bank Right Bank	Left Bank Right Bank						
1	Gandhav Road Bridge (NH-15)	6.850	RCC	Gandhav	**Left Bank:** 24°59'12.6633"N 71°40'57.9812"E **Right Bank:** 24°59'37.4070"N 71°40'56.1271"E	**Left Bank:** 770810.691 2766171.208 **Right Bank:** 770743.603 2766931.783	749.84	765	8.38	23	6.904	Completed and in use
2	Gadesara Road Bridge(NH -28)	84.926	RCC	Gadesara	**Left Bank:** 25°30'25.4681"N 71°56'5.4557"E **Right Bank:** 25°30'32.0410"N 71°56'23.7693"E	**Left Bank:** 795009.442 2824352.810 **Right Bank:** 795516.604 2824566.468	530.09	220	12.08	47	10.202	Completed and in use
3	Sindari Road Bridge	92.598	RCC	Sindari	**Left Bank:** 25°34'4.8585"N 71°54'41.8331"E **Right Bank:** 25°34'1.7469"N 71°54'46.1186"E	**Left Bank:** 792525.155 2831055.443 **Right Bank:** 792646.924 2830962.276	153.15	10.98	00	00	9.756	Completed and in use
4	Balotra Sanko Road Bridge (NH-112)	163.550	RCC	Balotra	**Left Bank:** 25°49'11.7575"N 72°14'24.9787"E **Right Bank:** 25°49'22.7249"N 72°14'33.1930"E	**Left Bank:** 223562.243 2858979.177 **Right Bank:** 223326.295 2858646.364	410	12.69	00	0.00	0.00	Completed and in use
5	Balotra Road Bridge(NH -28)	166.308	RCC	Balotra	**Left Bank:** 25°48'57.2713"N 72°15'55.6032"E **Right Bank:** 25°48'51.9991"N 72°15'53.4991"E	**Left Bank:** 225841.963 2858147.662 **Right Bank:** 225779.961 2857986.586	340.7	12.79	29	3.5	3.233	Completed and in use
6	Samdari Railway Bridge (Concrete And Steel)	197.689	RCC	Samdari	**Left Bank:** 25°48'8.9801"N 72°32'39.8162"E **Right Bank:** 25°47'52.8250"N 72°32'38.0023"E	**Left Bank:** 253791.996 2856109.086 **Right Bank:** 253732.175 2855612.792	494.48	2.823	37	10.34	9.854	Completed and in use
7	Luni Railway Bridge (Concrete)	253.522	RCC	Luni	**Left Bank:** 25°59'45.1425"N 73°00'37.5359"E **Right Bank:** 25°59'40.1101"N 73°00'43.6251"E	**Left Bank:** 300856.361 2876742.679 **Right Bank:** 301023.350 2876585.236	227.88	5.1	16	13.43	14.301	Completed and in use
8	Kankani Road Bridge (Upper NH-65)	262.824	RCC	Kankani	**Left Bank:** 26°03'5.0500"N 73°04'24.2826"E **Right Bank:** 26°02'56.6509"N 73°04'26.4671"E	**Left Bank:** 307253.068 2882799.940 **Right Bank:** 307309.973 2882540.577	256.9	9.31	14	15.8	15.207	Completed and in use
9	Kankani Road Bridge (Lower NH-65)	262.839	RCC	Kankani	**Left Bank:** 26°03'5.0503"N 73°04'24.9391"E **Right Bank:** 26°02'56.7372"N	**Left Bank:** 307271.317 2882799.677 **Right Bank:** 307325.978	263.27	9.45	29	7.52	15.207	Completed and 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	HC (clear distance Between piers) (m)	VC w.r.t. HFL (m)	Remarks (complete / under - construction), in use or not, condition
					Left Bank Right Bank	Left Bank Right Bank						
					73°04'27.0415"E	2882542.996						
10	Guda Bishnoiyan Sanko Road Bridge	273.058	RCC	Guda Bishnoiyan	**Left Bank:** 26°07'40.0094"N 73°07'17.9050"E **Right Bank:** 26°07'29.7844"N 73°07'23.6540"E	**Left Bank:** 312201.233 2891190.785 **Right Bank:** 312356.391 2890873.827	300	10	00	0.00	0.000	Completed and in use
11	Bhavi Railway Bridge (Concrete)	331.575	RCC	Bhavi	**Left Bank:** 26°11'54.1907"N 73°39'45.0608"E **Right Bank:** 26°11'43.7786"N 73°39'45.0280"E	**Left Bank:** 366365.968 2898342.848 **Right Bank:** 366361.756 2898022.497	298.28	5.12	45	8.8	4.691	Completed and in use
12	Pichiyak Road Bridge (NH-112)	334.042	RCC	Pichiyak	**Left Bank:** 26°12'57.9314"N 73°40'15.7604"E **Right Bank:** 26°12'57.5792"N 73°40'26.5903"E	**Left Bank:** 367238.193 2900295.273 **Right Bank:** 367538.643 2900281.360	261.09	7.29	37	5.66	3.861	Completed and in use
13	Pichiyak Footwalk Bridge (Concrete)	336.397	RCC	Pichiyak	**Left Bank:** 26°13'24.3062"N 73°41'19.8809"E **Right Bank:** 26°13'16.0995"N 73°41'19.1154"E	**Left Bank:** 369025.923 2901088.658 **Right Bank:** 369002.126 2900836.369	249.79	1	51	4.3	5.350	Completed and in use

Table 11 - Details of cross structures

The Sanko Road Bridges does not have any piers because they are laid to the ground level through pipes.

Guda Bishnoiyan Sanko Road Bridge

Balotra Sanko Road Bridge

Figure 7 - Sanko Bridges

2.19 Details of other Cross structures, pipelines, underwater cables

There are no Pipelines or underwater cables across the Luni 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)	Horizontal clearance (clear distance Between piers) (m)	Remarks (complete / under - construction), in use or not, condition
					Left Bank Right Bank	Left Bank Right Bank				
1	Gandhav Road	6.620	BT Road	Gandhav	**Left Bank:** 24°59'23.4060"N 71°40'50.2758"E **Right Bank:** 24°59'17.5920"N 71°40'50.5511"E	**Left Bank:** 770587.988 2766497.587 **Right Bank:** 770599.251 2766318.788	181.75	9.79	0	In use
2	Gandhav Goliya	12.740	Mud	Gandhav	**Left Bank:** 25°02'0.4306"N 71°42'11.6240"E **Right Bank:** 25°01'58.9024"N 71°42'11.9310"E	**Left Bank:** 772773.550 2771376.158 **Right Bank:** 772783.097 2771329.291	48.21	4.5	0	In use
3	Gadevee Bypass Road	24.31	BT Road	Gadevee	**Left Bank:** 25°06'32.2951"N 71°42'24.4496"E **Right Bank:** 25°06'33.2878"N 71°42'28.8743"E	**Left Bank:** 772965.573 2779751.442 **Right Bank:** 773088.966 2779784.488	126.5	2.52	0	In use
4	Haraniyo Ki Dhani Bypass Road	39.516	BT Road	Haraniyo Ki Dhani	**Left Bank:** 25°12'18.8799"N 71°45'25.0743"E **Right Bank:** 25°12'19.9216"N 71°45'31.8557"E	**Left Bank:** 777809.408 2790522.343 **Right Bank:** 777998.660 2790558.304	205.82	6.68	0	In use
5	Golia Jeevgraj Bypass Road	66.036	BT Road	Golia Jeevgraj	**Left Bank:** 25°23'25.6419"N 71°49'34.4210"E **Right Bank:** 25°23'17.3954"N 71°49'40.3383"E	**Left Bank:** 784359.382 2811192.352 **Right Bank:** 784530.222 2810942.000	304.12	7.73	0	In use
6	Gol Soda Culvert	139.408	Mud	Gol Soda	**Left Bank:** 25°51'49.3393"N 72°02'16.2325"E **Right Bank:** 25°51'48.9524"N 72°02'17.6392"E	**Left Bank:** 203130.446 2863939.827 **Right Bank:** 203169.360 2863927.030	40.12	5.68	0	In use
7	Tilwara Bypass Road	141.645	BT Road	Tilwara	**Left Bank:** 25°51'54.2414"N 72°05'46.9076"E **Right Bank:** 25°51'51.3231"N 72°05'43.9712"E	**Left Bank:** 209001.953 2863959.593 **Right Bank:** 208918.175 2863871.559	133.19	4.07	0	In use
8	Mandawas Bypass Road	148.917	BT Road	Mandawas	**Left Bank:** 25°51'40.1240"N 72°07'4.0165"E **Right Bank:** 25°51'37.3093"N 72°07'6.3224"E	**Left Bank:** 211140.135 2863477.628 **Right Bank:** 211202.460 2863389.563	108.02	3.97	0	In use
9	Jasol Bypass Road	160.496	BT Road	Jasol	**Left Bank:** 25°49'32.7757"N 72°12'38.3326"E **Right Bank:**	**Left Bank:** 220368.652 2859356.110 **Right Bank:**	129.48	5.85	0	In use

Sl.No	Structure Name and for road / rail	Chainage (km)	Type of Structure (RCC / Iron / Wooden)	Location	Position (Lat Long) Left Bank Right Bank	Position (UTM) Left Bank Right Bank	Length (m)	Width (m)	Horizontal clearance (clear distance Between piers) (m)	Remarks (complete / under - construction), in use or not, condition
					25°49'28.5896"N 72°12'38.0593"E	220358.304 2859227.406				
10	Gandhipura Bypass Road	164.727	BT Road	Gandhipura	**Left Bank:** 25°49'20.0974"N 72°15'10.0576"E **Right Bank:** 25°49'17.1367"N 72°15'13.1531"E	**Left Bank:** 224587.634 2858876.786 **Right Bank:** 224671.975 2858783.843	125.05	4.95	0	In use
11	Bithuja Bypass Road	170.167	BT Road	Bithuja	**Left Bank:** 25°48'58.3934"N 72°18'2.1877"E **Right Bank:** 25°48'53.0486"N 72°18'3.4533"E	**Left Bank:** 229369.582 2858109.314 **Right Bank:** 229401.466 2857944.063	171.42	6.25	0	In use
12	Kanana 2 Bypass Road	183.29	BT Road	Kanana	**Left Bank:** 25°47'15.3979"N 72°24'33.8321"E **Right Bank:** 25°47'2.1348"N 72°24'35.1970"E	**Left Bank:** 240218.759 2854719.493 **Right Bank:** 240248.761 2854310.494	411.59	8.76	0	In use
13	Kanana Bypass Road	184.825	BT Road	Kanana	**Left Bank:** 25°47'19.4662"N 72°25'27.3252"E **Right Bank:** 25°47'11.7440"N 72°25'30.8112"E	**Left Bank:** 241711.895 2854815.459 **Right Bank:** 241804.386 2854575.865	256.84	4.06	0	In use
14	Samdari Bypass Road	201.698	BT Road	Samdari	**Left Bank:** 25°48'15.4828"N 72°34'58.2778"E **Right Bank:** 25°48'6.3408"N 72°35'1.3312"E	**Left Bank:** 257653.409 2856237.782 **Right Bank:** 257733.311 2855954.845	297.36	6.99	0	In use
15	Bhanawas Bypass Road	208.648	BT Road	Bhanawas	**Left Bank:** 25°50'11.6187"N 72°38'18.0039"E **Right Bank:** 25°50'6.1622"N 72°38'19.4627"E	**Left Bank:** 263282.066 2859711.107 **Right Bank:** 263319.680 2859542.438	177.54	4.92	0	In use
16	Godon Ka Bara Bypass Road	218.974	BT Road	Godon Ka Bara	**Left Bank:** 25°51'26.5151"N 72°44'8.3454"E **Right Bank:** 25°51'21.9132"N 72°44'9.5856"E	**Left Bank:** 273079.472 2861844.392 **Right Bank:** 273111.564 2861702.166	149.39	6.13	0	In use
17	Rampura Bypass Road	220.09	BT Road	Rampura	**Left Bank:** 25°51'36.5244"N 72°44'51.4969"E **Right Bank:** 25°51'29.5205"N 72°44'43.7975"E	**Left Bank:** 274286.366 2862131.773 **Right Bank:** 274068.270 2861919.898	306.6	2.79	0	In use
18	Dhundhara Bypass Road	226.801	BT Road	Dhundhara	**Left Bank:** 25°52'32.6664"N 72°48'23.9027"E **Right Bank:** 25°52'15.4439"N 72°48'31.2678"E	**Left Bank:** 280229.733 2863759.444 **Right Bank:** 280425.936 2863225.985	576.07	7.32	0	In use
19	Bhacharna Bypass Road	234.265	BT Road	Bhacharna	**Left Bank:** 25°54'27.3088"N 72°52'4.8798"E	**Left Bank:** 286439.286 2867186.163	372.51	7.22	0	In use

Sl.No	Structure Name and for road / rail	Chainage (km)	Type of Structure (RCC / Iron / Wooden)	Location	Position (Lat Long) Left Bank Right Bank	Position (UTM) Left Bank Right Bank	Length (m)	Width (m)	Horizontal clearance (clear distance Between piers) (m)	Remarks (complete / under - construction), in use or not, condition
					Right Bank: 25°54'20.8869"N 72°52'16.2153"E	**Right Bank:** 286751.577 2866983.400				
20	Mori Bypass Road	243.039	BT Road	Mori	**Left Bank:** 25°56'33.7241"N 72°56'19.0991"E **Right Bank:** 25°56'25.6858"N 72°56'15.4257"E	**Left Bank:** 293576.104 2870963.313 **Right Bank:** 293470.001 2870717.550	268.21	6.33	0	In use
21	Satlana Bypass Road	246.925	BT Road	Satlana	**Left Bank:** 25°57'45.5709"N 72°57'51.2306"E **Right Bank:** 25°57'39.2824"N 72°57'55.1674"E	**Left Bank:** 296173.954 2873134.211 **Right Bank:** 296280.464 2872938.987	224.77	6.5	0	In use
22	Dhandhiya Bypass Road	254.213	BT Road	Dhandhiya	**Left Bank:** 26°00'0.7155"N 73°00'48.9535"E **Right Bank:** 25°59'57.6003"N 73°01'6.4502"E	**Left Bank:** 301181.180 2877217.084 **Right Bank:** 301666.303 2877113.829	497.05	5.91	0	In use
23	Vishnoiyon Ki Dhani Bypass Road	265.008	BT Road	Vishnoiyon Ki Dhani	**Left Bank:** 26°03'48.9873"N 73°05'19.0119"E **Right Bank:** 26°03'47.7676"N 73°05'23.8697"E	**Left Bank:** 308794.191 2884129.635 **Right Bank:** 308928.658 2884090.122	137.87	6.66	0	In use
24	Rajpuriya Road Bypass	269.325	BT Road	Rajpuriya	**Left Bank:** 26°06'4.9923"N 73°05'51.3009"E **Right Bank:** 26°05'59.1415"N 73°06'5.4500"E	**Left Bank:** 309752.749 2888301.781 **Right Bank:** 310143.254 2888115.998	432.19	5.67	0	In use
25	Khejarli Bypass Road 2	276.965	BT Road	Khejarli	**Left Bank:** 26°08'6.5303"N 73°09'34.4058"E **Right Bank:** 26°08'0.1394"N 73°09'39.2418"E	**Left Bank:** 316004.534 2891952.691 **Right Bank:** 316136.077 2891754.125	239.37	5.15	0	In use
26	Khejarli Bypass Road 1	277.539	BT Road	Khejarli	**Left Bank:** 26°08'10.3906"N 73°09'54.6808"E **Right Bank:** 26°08'6.4310"N 73°09'58.5115"E	**Left Bank:** 316569.372 2892063.521 **Right Bank:** 316674.058 2891940.175	161.87	3.79	0	In use
27	Sangasani Bypass Road	280.162	BT Road	Sangasani	**Left Bank:** 26°08'22.9925"N 73°11'24.3022"E **Right Bank:** 26°08'16.2892"N 73°11'32.2329"E	**Left Bank:** 319064.084 2892416.421 **Right Bank:** 319281.491 2892207.080	300.61	10.65	0	In use
28	Birami Bypass Road	284.047	BT Road	Birami	**Left Bank:** 26°09'4.3978"N 73°13'37.6233"E **Right Bank:** 26°09'0.0970"N 73°13'37.8641"E	**Left Bank:** 322784.422 2893639.515 **Right Bank:** 322789.305 2893507.079	135.93	4.53	0	In use
29	Birdawas Road Bypass	290.645	BT Road	Birdawas	**Left Bank:** 26°09'4.5186"N 73°17'17.0861"E	**Left Bank:** 328879.296 2893561.515	468.96	9.38	0	In use

Sl.No	Structure Name and for road / rail	Chainage (km)	Type of Structure (RCC / Iron / Wooden)	Location	Position (Lat Long) Left Bank Right Bank	Position (UTM) Left Bank Right Bank	Length (m)	Width (m)	Horizontal clearance (clear distance Between piers) (m)	Remarks (complete / under - construction), in use or not, condition
					Right Bank: 26°08'56.8295"N 73°17'31.6335"E	**Right Bank:** 329280.189 2893319.598				
30	Goliya Bypass Road	293.503	BT Road	Goliya	**Left Bank:** 26°08'45.0008"N 73°18'54.6631"E **Right Bank:** 26°08'35.1599"N 73°19'10.2224"E	**Left Bank:** 331581.339 2892925.522 **Right Bank:** 332009.542 2892617.114	530.11	6.85	0	In use
31	Khari Kalan Bypass Road 2	297.068	BT Road	Khari Kalan	**Left Bank:** 26°08'51.7050"N 73°21'10.3583"E **Right Bank:** 26°08'44.8863"N 73°21'7.7058"E	**Left Bank:** 335352.504 2893083.512 **Right Bank:** 335276.179 2892874.630	223.96	4.19	0	In use
32	Khari Kalan Bypass Road 1	298.302	BT Road	Khari Kalan	**Left Bank:** 26°08'55.7721"N 73°21'52.0931"E **Right Bank:** 26°09'4.3247"N 73°21'50.8979"E	**Left Bank:** 336513.118 2893194.025 **Right Bank:** 336483.236 2893457.608	265.97	3.72	0	In use
33	Bhaniya Bypass Road	299.459	BT Road	Bhaniya	**Left Bank:** 26°09'9.5504"N 73°22'31.8849"E **Right Bank:** 26°09'5.7599"N 73°22'32.4787"E	**Left Bank:** 337623.479 2893604.130 **Right Bank:** 337638.512 2893487.288	119.57	3.64	0	In use
34	Hoongaon Khurd Bypass Road	304.879	BT Road	Hoongaon Khurd	**Left Bank:** 26°09'35.5388"N 73°25'34.4540"E **Right Bank:** 26°09'19.9533"N 73°25'26.9406"E	**Left Bank:** 342488.658 2893864.369 **Right Bank:** 342703.106 2894341.404	521.37	8.4	0	In use
35	Balla Road Bypass2	317.02	BT Road	Balla	**Left Bank:** 26°11'15.7807"N 73°32'15.8454"E **Right Bank:** 26°11'10.8617"N 73°32'15.3494"E	**Left Bank:** 353883.517 2897295.531 **Right Bank:** 353868.044 2897144.332	150.62	6.73	0	In use
36	Balla Road Bypass1	317.104	BT Road	Balla	**Left Bank:** 26°11'17.0656"N 73°32'17.4928"E **Right Bank:** 26°11'10.1172"N 73°32'19.9410"E	**Left Bank:** 353929.696 2897334.550 **Right Bank:** 353995.253 2897119.990	224.22	7.84	0	In use
37	Matwalon Ki Dhan	321.140	RCC/ Mud	Matwalon Ki Dhan	**Left Bank:** 26°10'42.0913"N 73°34'16.9820"E **Right Bank:** 26°10'42.0045"N 73°34'8.0516"E	**Left Bank:** 357234.917 2896221.502 **Right Bank:** 356986.957 2896221.562	248.01	12.75	0	In use
38	Bari Khurd	326.845	RCC/ Mud	Bari Khurd	**Left Bank:** 26°11'35.7600"N 73°36'52.2202"E **Right Bank:** 26°11'25.4180"N 73°37'2.9922"E	**Left Bank:** 361562.324 2897826.103 **Right Bank:** 361857.952 2897504.706	390.30	17.90	0	In Use
39	Bari Khurd	328.269	BT Road	Bari Khurd	**Left Bank:**	**Left Bank:**	303.98	14.00	0	In use

Sl.No	Structure Name and for road / rail	Chainage (km)	Type of Structure (RCC / Iron / Wooden)	Location	Position (Lat Long) Left Bank Right Bank	Position (UTM) Left Bank Right Bank	Length (m)	Width (m)	Horizontal clearance (clear distance Between piers) (m)	Remarks (complete / under - construction), in use or not, condition
	Road				26°11'42.6799"N 73°37'47.3826"E **Right Bank:** 26°11'31.7222"N 73°37'47.3027"E	363095.806 2898022.760 **Right Bank:** 363090.027 2897685.634				
40	Jaswantpura Bypass Road	336.056	BT Road	Jaswantpura	**Left Bank:** 26°13'38.5685"N 73°41'7.2604"E **Right Bank:** 26°13'30.4900"N 73°41'12.4902"E	**Left Bank:** 368680.142 2901531.028 **Right Bank:** 368822.751 2901280.998	285.87	6	0	In use

Table 12- Details of Other cross structures

2.20 Details of High Tension Lines / Electric lines / Telecommunication lines

A total of 13 HTL and 28 EPs were also present in the Luni River and the height of the high tension line was also measured by ETS. There are no piers for electrical lines constructed in the river bed of Luni River.

Sl No	Type of line	Chainage (km)	Location	Position (Lat Long) Left Bank Right Bank	Position (UTM) Left Bank Right Bank	No. of Piers	Horizontal clearance (clear distance Between piers) (m)	Vertical clearance w.r.t. HFL / MHWS (m)	Remarks (complete / under - construction)
1	HTL	333.83	Pichiyak	**Left Bank:** 26°12'52.7350"N 73°40'13.6143"E **Right Bank:** 26°12'48.9027"N 73°40'27.9985"E	**Left Bank:** 367177.000 2900136.000 **Right Bank:** 367575.000 2900014.000	0	-	10.003	Complete
2	HTL	332.49	Jhurli	**Left Bank:** 26°12'10.7524"N 73°40'4.0395"E **Right Bank:** 26°12'7.2468"N 73°40'15.0679"E	**Left Bank:** 366898.000 2898847.000 **Right Bank:** 367203.000 2898736.000	0	-	8.712	Complete
3	HTL	330.89	Jhurli	**Left Bank:** 26°11'50.0913"N 73°39'19.6740"E **Right Bank:** 26°11'41.1405"N 73°39'21.7582"E	**Left Bank:** 365660.000 2898224.000 **Right Bank:** 365715.000 2897948.000	0	-	13.633	Complete
4	HTL	262.45	Kankani	**Left Bank:** 26°02'59.6026"N 73°04'8.0007"E **Right Bank:** 26°02'51.4955"N 73°04'16.5515"E	**Left Bank:** 306798.000 2882639.000 **Right Bank:** 307032.000 2882386.000	0	-	7.941	Complete

Sl No	Type of line	Chainage (km)	Location	Position (Lat Long)	Position (UTM)	No. of Piers	Horizontal clearance (clear distance Between piers) (m)	Vertical clearance w.r.t. HFL / MHWS (m)	Remarks (complete / under - construction)
				Left Bank Right Bank	Left Bank Right Bank				
5	HTL	197.60	Devaliyari	**Left Bank:** 25°48'10.9103"N 72°32'35.0029"E **Right Bank:** 25°47'49.9508"N 72°32'34.7893"E	**Left Bank:** 253659.000 2856171.000 **Right Bank:** 253641.000 2855526.000	0	-	19.806	Complete
6	HTL	170.11	Bithuja	**Left Bank:** 25°49'0.4991"N 72°17'58.9246"E **Right Bank:** 25°48'45.8383"N 72°18'0.1546"E	**Left Bank:** 229280.000 2858176.000 **Right Bank:** 229305.000 2857724.000	0	-	8.528	Complete
7	HTL	163.47	Balotra	**Left Bank:** 25°49'24.5130"N 72°14'28.4409"E **Right Bank:** 25°49'12.4312"N 72°14'23.4450"E	**Left Bank:** 223431.000 2859037.000 **Right Bank:** 223284.000 2858668.000	0	-	13.576	Complete
8	HTL	133.61	Mekarna	**Left Bank:** 25°49'36.4947"N 72°00'9.5010"E **Right Bank:** 25°49'29.2428"N 72°00'21.6705"E	**Left Bank:** 199507.000 2859930.000 **Right Bank:** 199841.000 2859699.000	0	-	12.522	Complete
9	HTL	133.53	Mekarna	**Left Bank:** 25°49'35.3096"N 72°00'7.1622"E **Right Bank:** 25°49'26.5349"N 72°00'19.5136"E	**Left Bank:** 199441.000 2859895.000 **Right Bank:** 199779.000 2859617.000	0	-	13.212	Complete
10	HTL	120.79	Aamjhar	**Left Bank:** 25°45'59.6843"N 71°55'35.4498"E **Right Bank:** 25°45'53.4405"N 71°55'50.3267"E	**Left Bank:** 191714.744 2853431.044 **Right Bank:** 192125.019 2853229.132	0	-	24.175	Complete
11	HTL	38.66	Haraniyo Ki Dhani	**Left Bank:** 25°11'55.0886"N 71°45'18.0964"E **Right Bank:** 25°11'50.8780"N 71°45'41.7819"E	**Left Bank:** 172966.882 2790888.380 **Right Bank:** 173627.285 2790742.736	0	-	25.129	Complete
12	HTL	24.72	Gadevee	**Left Bank:** 25°06'43.5793"N 71°42'21.2880"E **Right Bank:** 25°06'45.6624"N 71°42'38.8539"E	**Left Bank:** 167779.010 2781417.083 **Right Bank:** 168273.032 2781469.202	0	-	14.152	Complete
13	HTL	11.08	Gandhaw Khurd village	**Left Bank:** 25°01'14.0692"N 71°41'48.1249"E **Right Bank:** 25°01'6.6098"N 71°42'3.5075"E	**Left Bank:** 166601.184 2771293.806 **Right Bank:** 167027.157 2771053.595	0	-	15.152	Complete

Table 13 - Details of High Tension Lines

Sl No	Type of line	Chainage (km)	Location	Position (Lat Long)	Position (UTM)	No of Piers	Horizontal clearance (clear distance Between piers) (m)	Vertical clearance w.r.t. HFL / MHWS (m)	Remarks (complete / under - construction)
				Left Bank Right Bank	Left Bank Right Bank				
1	EP	65.995	Golia Jeevgraj village	**Left Bank:** 25°23'22.9197"N 71°49'33.4857"E **Right Bank:** 25°23'15.2800"N 71°49'38.8506"E	**Left Bank:** 180623.001 2811895.443 **Right Bank:** 180767.461 2811656.653	0	-	2.61	Complete
2	EP	66.408	Golia Jeevgraj village	**Left Bank:** 25°23'27.9875"N 71°49'45.2978"E **Right Bank:** 25°23'26.5116"N 71°49'51.0926"E	**Left Bank:** 180957.078 2812043.628 **Right Bank:** 181118.069 2811994.335	0	-	3.215	Complete
3	EP	163.523	Gandhipura	**Left Bank:** 25°49'24.0080"N 72°14'30.9292"E **Right Bank:** 25°49'13.0395"N 72°14'24.6872"E	**Left Bank:** 223500.000 2859020.000 **Right Bank:** 223319.001 2858686.000	0	-	6.425	Complete
4	EP	163.667	Gandhipura	**Left Bank:** 25°49'22.1597"N 72°14'34.5254"E **Right Bank:** 25°49'16.8152"N 72°14'31.9215"E	**Left Bank:** 223599.000 2858961.000 **Right Bank:** 223523.000 2858798.000	0	-	5.211	Complete
5	EP	164.335	Gandhipura	**Left Bank:** 25°49'20.8256"N 72°14'58.3889"E **Right Bank:** 25°49'17.3334"N 72°14'55.8136"E	**Left Bank:** 224263.001 2858906.000 **Right Bank:** 224189.000 2858800.000	0	-	7.01	Complete
6	EP	166.288	Gandhipura	**Left Bank:** 25°48'57.9554"N 72°15'55.1223"E **Right Bank:** 25°48'53.1443"N 72°15'53.2230"E	**Left Bank:** 225829.001 2858169.000 **Right Bank:** 225773.000 2858022.000	0	-	4.885	Complete
7	EP	169.200	Bithuja	**Left Bank:** 25°48'54.0250"N 72°17'30.5023"E **Right Bank:** 25°48'50.5040"N 72°17'29.8288"E	**Left Bank:** 228484.000 2857993.000 **Right Bank:** 228463.000 2857885.000	0	-	2.759	Complete
8	EP	177.755	Kitnod village	**Left Bank:** 25°47'3.4552"N 72°21'29.4807"E **Right Bank:** 25°46'58.1521"N 72°21'27.2659"E	**Left Bank:** 235074.000 2854454.000 **Right Bank:** 235009.000 2854292.000	0	-	3.521	Complete
9	EP	197.759	Devaliyari	**Left Bank:** 25°48'9.5928"N 72°32'41.6342"E **Right Bank:**	**Left Bank:** 253843.000 2856127.000 **Right Bank:**	0	-	6.699	Complete

Sl No	Type of line	Chainage (km)	Location	Position (Lat Long)	Position (UTM)	No of Piers	Horizontal clearance (clear distance Between piers) (m)	Vertical clearance w.r.t. HFL / MHWS (m)	Remarks (complete / under - construction)
				Left Bank Right Bank	Left Bank Right Bank				
				25°47'51.9273"N 72°32'40.2397"E	253794.000 2855584.000				
10	EP	197.801	Devaliyari	**Left Bank:** 25°48'9.7224"N 72°32'43.5338"E **Right Bank:** 25°47'51.7194"N 72°32'41.3925"E	**Left Bank:** 253896.000 2856130.000 **Right Bank:** 253826.000 2855577.000	0	-	6.699	Complete
11	EP	200.501	Samdari village	**Left Bank:** 25°48'9.5780"N 72°34'15.4918"E **Right Bank:** 25°47'56.0209"N 72°34'18.8549"E	**Left Bank:** 256458.001 2856078.000 **Right Bank:** 256544.001 2855659.000	0	-	3.178	Complete
12	EP	200.816	Samdari village	**Left Bank:** 25°48'9.5824"N 72°34'23.5315"E **Right Bank:** 25°48'2.0913"N 72°34'30.2164"E	**Left Bank:** 256682.000 2856074.000 **Right Bank:** 256864.001 2855840.000	0	-	2.543	Complete
13	EP	201.652	Samdari village	**Left Bank:** 25°48'16.4985"N 72°34'56.4119"E **Right Bank:** 25°48'8.7807"N 72°34'59.2605"E	**Left Bank:** 257602.001 2856270.000 **Right Bank:** 257677.000 2856031.000	0	-	4.12	Complete
14	EP	201.800	Samdari village	**Left Bank:** 25°48'10.9071"N 72°35'2.0888"E **Right Bank:** 25°48'7.9730"N 72°35'3.4404"E	**Left Bank:** 257757.001 2856095.000 **Right Bank:** 257793.001 2856004.000	0	-	4.251	Complete
15	EP	204.875	Ranidesipura	**Left Bank:** 25°49'6.5048"N 72°36'13.1137"E **Right Bank:** 25°49'14.1480"N 72°36'29.3653"E	**Left Bank:** 259767.001 2857770.000 **Right Bank:** 260224.001 2857997.000	0	-	3.528	Complete
16	EP	207.528	Bhanawas village	**Left Bank:** 25°49'59.8674"N 72°37'38.9936"E **Right Bank:** 25°49'52.5413"N 72°37'42.0119"E	**Left Bank:** 262189.001 2859369.000 **Right Bank:** 262269.001 2859142.000	0	-	3.667	Complete
17	EP	207.959	Bhanawas village	**Left Bank:** 25°50'1.5467"N 72°37'54.2904"E **Right Bank:** 25°49'56.6890"N 72°37'57.2593"E	**Left Bank:** 262616.001 2859413.000 **Right Bank:** 262696.001 2859262.000	0	-	6.987	Complete
18	EP	226.846	Dhundhara village	**Left Bank:** 25°52'23.7853"N 72°48'30.6133"E **Right Bank:**	**Left Bank:** 280412.001 2863483.000 **Right Bank:**	0	-	3.665	Complete

Sl No	Type of line	Chainage (km)	Location	Position (Lat Long)	Position (UTM)	No of Piers	Horizontal clearance (clear distance Between piers) (m)	Vertical clearance w.r.t. HFL / MHWS (m)	Remarks (complete / under - construction)
				Left Bank Right Bank	Left Bank Right Bank				
				25°52'20.8710"N 72°48'31.2777"E	280429.001 2863393.000				
19	EP	243.098	Doodiya	**Left Bank:** 25°56'32.2165"N 72°56'18.9059"E **Right Bank:** 25°56'28.0206"N 72°56'18.6196"E	**Left Bank:** 293570.001 2870917.000 **Right Bank:** 293560.001 2870788.000	0	-	3.905	Complete
20	EP	245.392	SatlanaVillage	**Left Bank:** 25°57'6.1388"N 72°57'11.7217"E **Right Bank:** 25°57'5.8395"N 72°57'17.8418"E	**Left Bank:** 295055.873 2871937.872 **Right Bank:** 295226.001 2871926.000	0	-	3.802	Complete
21	EP	253.782	Luni	**Left Bank:** 25°59'48.3129"N 73°00'45.2004"E **Right Bank:** 25°59'45.7280"N 73°00'50.9971"E	**Left Bank:** 301071.001 2876837.000 **Right Bank:** 301231.001 2876755.000	0	-	4.015	Complete
22	EP	254.222	Luni	**Left Bank:** 25°59'59.8027"N 73°00'53.6730"E **Right Bank:** 25°59'57.6090"N 73°01'1.9444"E	**Left Bank:** 301312.002 2877187.000 **Right Bank:** 301541.002 2877116.000	0	-	6.557	Complete
23	EP	262.703	Kankani Village	**Left Bank:** 26°02'57.6467"N 73°04'22.1349"E **Right Bank:** 26°02'55.3865"N 73°04'23.2151"E	**Left Bank:** 307190.002 2882573.000 **Right Bank:** 307219.002 2882503.000	0	-	4.352	Complete
24	EP	293.562	Goliya village	**Left Bank:** 26°08'43.8802"N 73°18'57.5475"E **Right Bank:** 26°08'36.2658"N 73°19'10.6191"E	**Left Bank:** 331661.002 2892889.999 **Right Bank:** 332021.003 2892651.000	0	-	3.765	Complete
25	EP	304.841	Rampuriya Bhatiy village	**Left Bank:** 26°09'28.6663"N 73°25'31.3013"E **Right Bank:** 26°09'22.3289"N 73°25'28.3255"E	**Left Bank:** 342613.004 2894131.000 **Right Bank:** 342528.003 2893937.000	0	-	4.001	Complete
26	EP	317.128	Balla village	**Left Bank:** 26°11'14.5241"N 73°32'18.6162"E **Right Bank:** 26°11'11.6429"N 73°32'19.7328"E	**Left Bank:** 353960.004 2897256.000 **Right Bank:** 353990.005 2897166.999	0	-	4.021	Complete
27	EP	317.317	Balla village	**Left Bank:** 26°11'20.2979"N 73°32'23.9115"E **Right Bank:**	**Left Bank:** 354109.005 2897432.000 **Right Bank:**	0	-	3.96	Complete

Sl No	Type of line	Chainage (km)	Location	Position (Lat Long)	Position (UTM)	No of Piers	Horizontal clearance (clear distance Between piers) (m)	Vertical clearance w.r.t. HFL / MHWS (m)	Remarks (complete / under - construction)
				Left Bank Right Bank	Left Bank Right Bank				
				26°11'13.6490"N 73°32'25.2552"E	354144.004 2897227.000				
28	EP	336.061	Pichiyak village	**Left Bank:** 26°13'37.1727"N 73°41'7.5593"E **Right Bank:** 26°13'31.2280"N 73°41'11.4458"E	**Left Bank:** 368688.005 2901487.999 **Right Bank:** 368794.005 2901304.000	0	-	3.772	Complete

Table 14 - Details of Electric Poles

2.21 Current Meter and Discharge Details

No current meter observation is done in Luni River due to non-availability of water.

2.22 Water Sample Locations

Water samples were not collected in Luni River due to non-availability of water.

3 Description of Waterway

For the conduct of the survey, the river was divided into eleven stretches from Malipura to Jaswantpura. The details are as follows:-

3.1 Sub-Stretch-01: Malipura to Gadevee (0.0km to 25.0km)

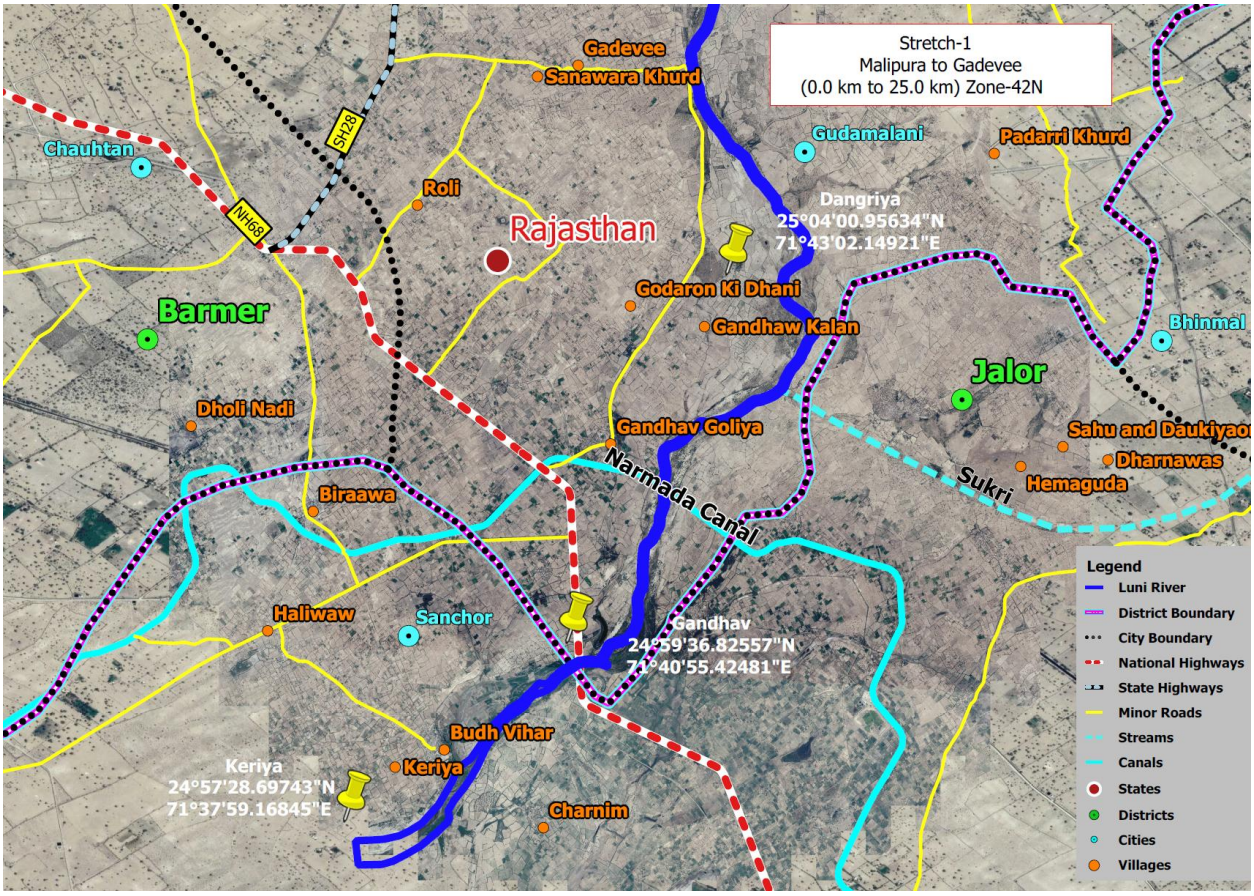


Figure 8 - Stretch 01 Malipura to Gadevee

- **Bathymetry Survey**
  a) No bathymetric survey is conducted due to the unavailability of water.
- **Topographic Survey**
  a) 25.00km of the length of the stretch for which the topographic survey has been carried out.

Stretch-01 covers 25.00km i.e. from chainage 0km to chainage 25.00km from Malipura village to Gadevee village.

Malipura is located in Barmer district. Jodhpur city is well connected by road and rail from Jaipur, Udaipur, Jaislamer, Jodhpur, Ajmer & other major cities.

Total three (03) Bench Mark pillars are covered in this stretch from IWAI BM LUN-31 to IWAI BM LUN-33. The features across this stretch are (01) Bridge Gandhav Road Bridge (NH-15) near Gandhav village and one (01) High Tension Powerline near village Gandhav Khurd. In addition to this, there is one (01) Bandh like feature which is across

the river and our survey area ends at this Bandh mentioned as Malipura Weir. Beside the existing bridge one (01) New Bridge construction is in progress.

Figure 9 - Gandhav Road Bridge (NH-15) (6.850 km chainage)

Figure 10 - Bandh near Malipura village (0 km chainage)

The area in this stretch towards the end of 10 to 15 km is having accumulated dirty water in the river along with long grass growth. The area is covered as far as possible as per the fixed interval, but some places the distance between fixes was not maintained due to water logging. The remaining portion of the river is sandy with long thick grass and thorny bush's growth.

Figure 11 - Spot levelling by DGPS (Stretch 01)

Class	Chainage (km)		Observed					Reduced w.r.t. Sounding Datum				
	From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.
I	0	25	0.000	0.000	25000	1,058,638.95	1,058,638.95	-0.300	0.000	25000	1,338,654.23	1,338,654.23
II	0	25	0.000	0.000	25000	1,611,312.26	1,611,312.26	-0.300	0.000	25000	1,973,769.04	1,973,769.04
III	0	25	0.000	0.000	25000	2,432,618.38	2,432,618.38	-0.300	0.000	25000	2,884,915.31	2,884,915.31
IV	0	25	0.000	0.000	25000	2,934,501.53	2,934,501.53	-0.300	0.000	25000	3,407,506.79	3,407,506.79

Table 15 - Stretch 1 Dredging Quantity

3.1.1 Observed and reduced Bed Profile of the stretch

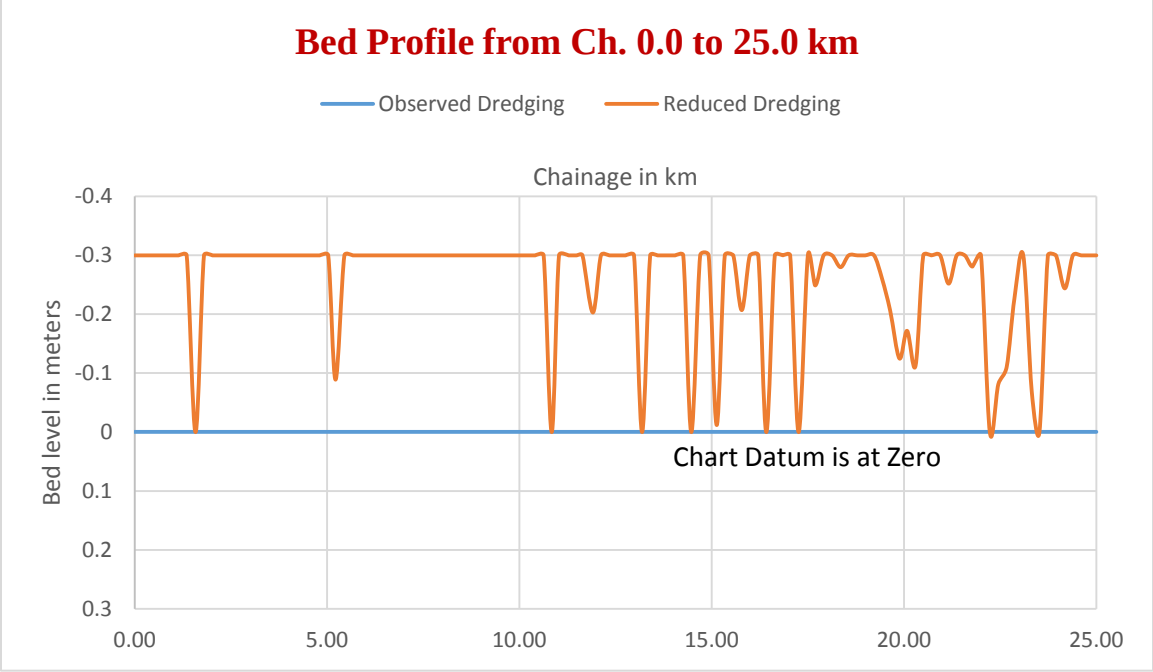


Figure 12 - Stretch 1 River-bed Profile

3.2 Sub-Stretch-02: Gadevee to Dedawas Jageer (25.00km to 60.00km)

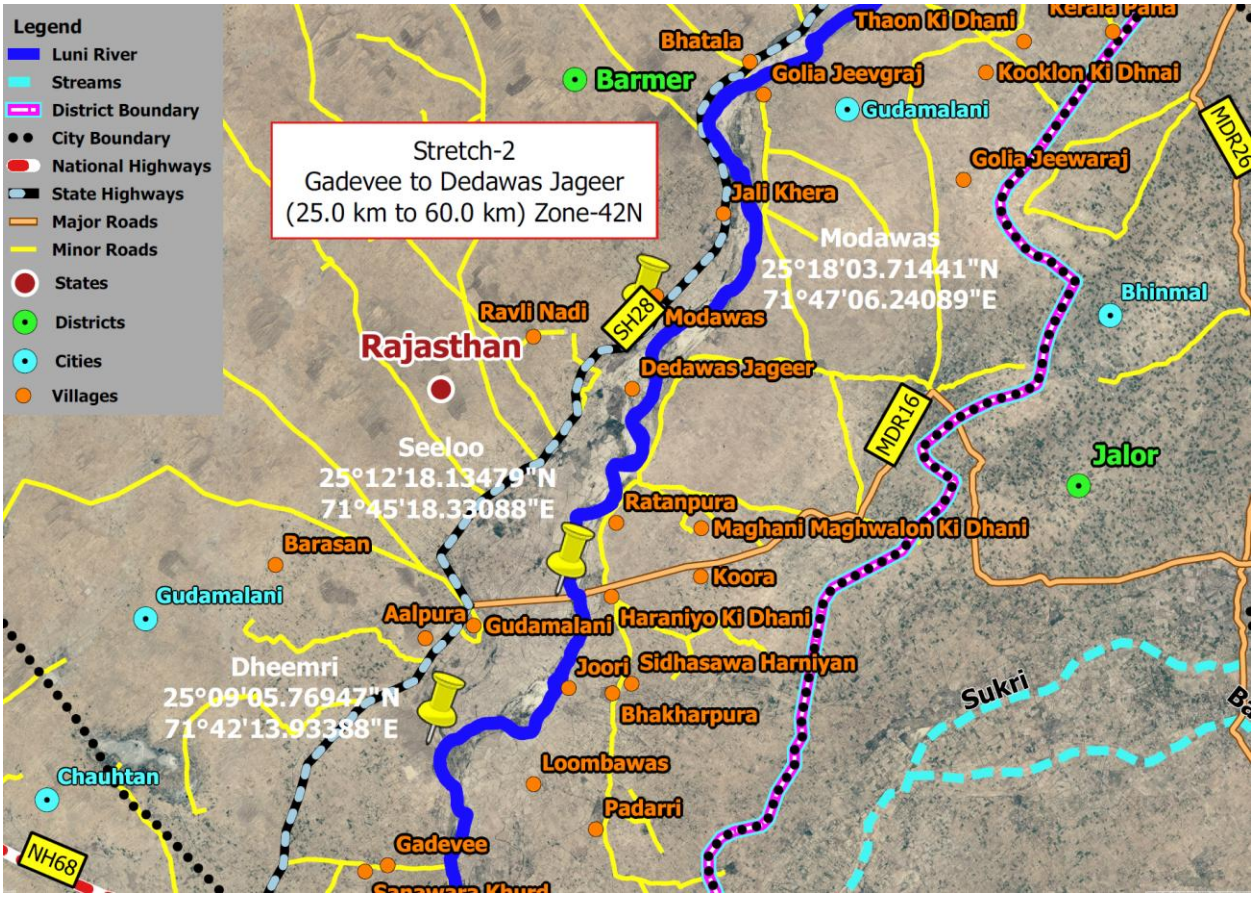


Figure 13 - Stretch 2 Gadevee to Dedawas Jageer

- **Bathymetry Survey**

a) No bathymetric survey is conducted due to the unavailability of water.

- **Topographic Survey**

b) 35.00km of the length of the stretch for which the topographic survey has been carried out.

Stretch-2 covers 35 km i.e. from 25 to 60 km chainage from the Gadevee village to Dedawas Jageer.

Gadevee is located in Barmer district. Jodhpur city is well connected by road and rail from Jaipur, Udaipur, Jaislamer, Jodhpur, Ajmer & other major cities. Total two (02) Bench Mark pillars are covered in this stretch from IWAI BM LUN-29 to IWAI BM LUN-30. The following feature is across the stretch two (02) High Tension Powerline near village Haraniyo Ki Dhani and Gadevee.

There are many places where the water is accumulated in the river, but the source of water not found. Otherwise, the river is dry and sandy with thick thorny bushes growth.

Figure 14 - Stretch 2 Water Accumulation

Figure 15 - Stretch 2 Thick Thorny Bushes Growth

Class	Chainage (km)		Observed					Reduced w.r.t. Sounding Datum				
	From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.
I	25	60	0.000	0.000	35000	1,491,833.09	2,550,472.04	-0.300	0.000	35000	1,877,668.90	3,216,323.13
II	25	60	0.000	0.000	35000	2,271,846.59	3,883,158.85	-0.300	0.000	35000	2,769,192.52	4,742,961.56
III	25	60	0.000	0.000	35000	3,431,283.11	5,863,901.49	-0.300	0.000	35000	4,049,803.77	6,934,719.08
IV	25	60	0.000	0.000	35000	4,139,427.99	7,073,929.52	-0.300	0.000	35000	4,785,774.29	8,193,281.08

Table 16 - Stretch 2 Dredging Quantity

3.2.1 Observed and reduced Bed Profile of the stretch

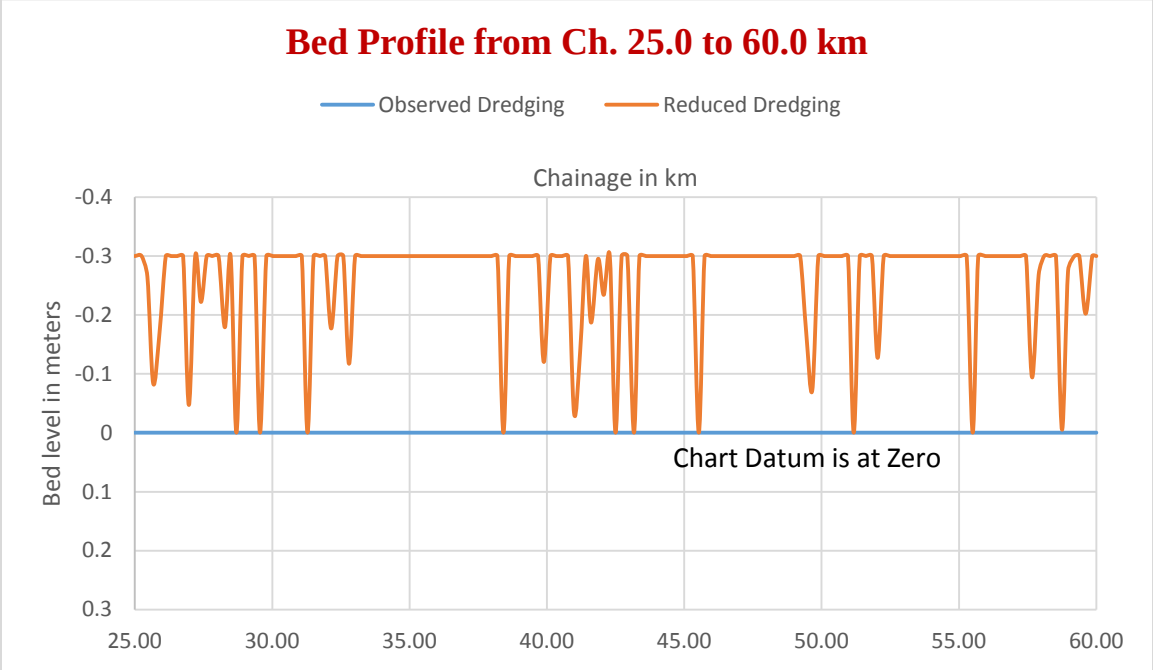


Figure 16 - Stretch 2 River-bed Profile

3.3 Sub-Stretch-03: Dedawas Jageer to Dangawa (60.00km to 90.00km)

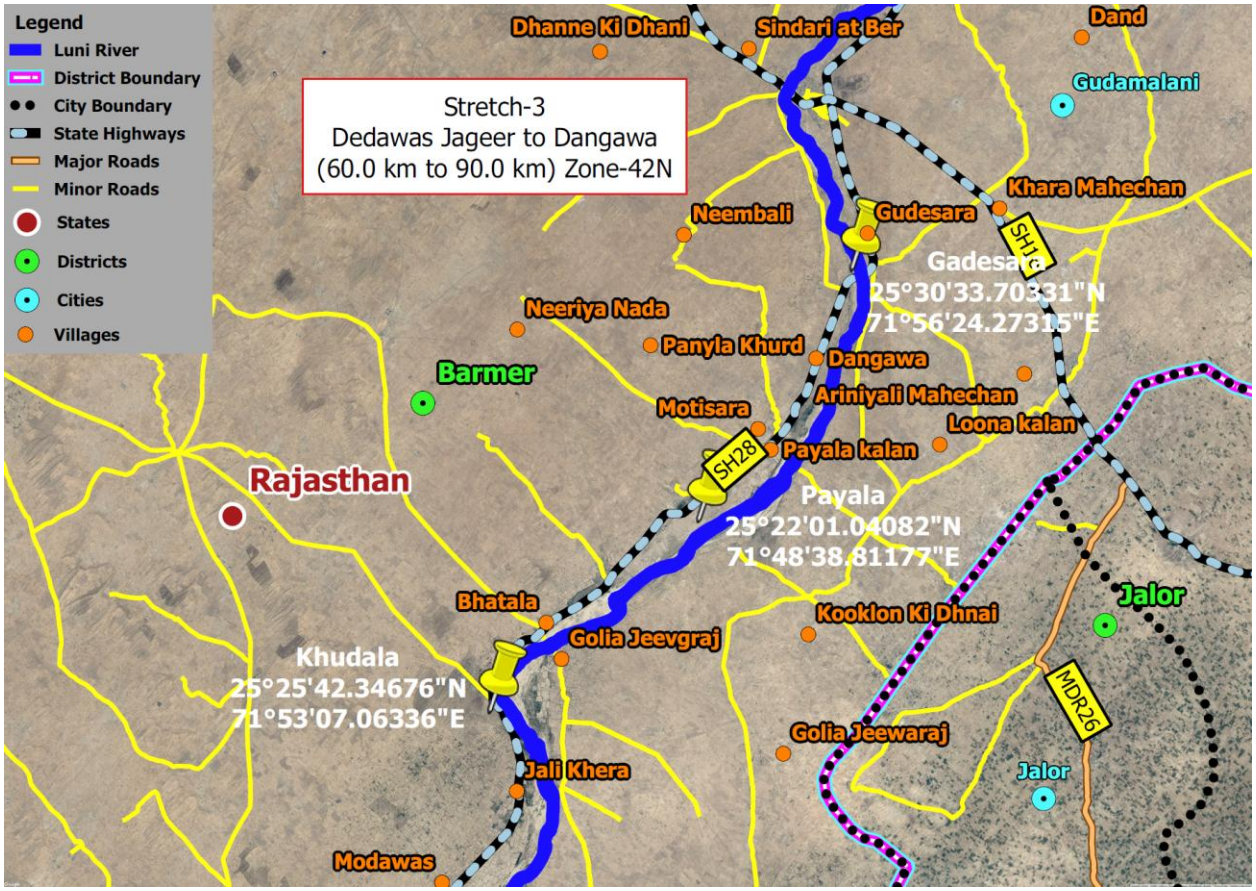


Figure 17 - Stretch 3 Dedawas Jageer to Dangawa

- **Bathymetry Survey**
  a) No bathymetric survey is conducted due to the unavailability of water.
- **Topographic Survey**
  b) 30.00km of the length of the stretch for which the topographic survey has been carried out.

Stretch-3 covers 30 km i.e. from 60 km to 90 km chainage from Dangawa to Dedawas Jageer village.

The Dedawas Jageer village is located in Barmer district. Barmer city is well connected by road and rail from Jaipur, Udaipur, Jaislamer, Jodhpur, Ajmer & other major cities. Total three (03) Bench Mark pillars are covered in this stretch from IWAI BM LUN-20 to IWAI BM LUN-22. The position of IWAI BM pillars was derived by using already derived position as Reference and processing the other IWAI BM pillars logged data in a Baseline processing method using Trimble Business Center software. The following features are across the stretch two (02) Electric line near village Golia Jeevgraj and Bhatala.

The river on both the banks has a steep slope with an approximate height of 5 mtr from the river bed. The texture of the river bank is a mixture of Rocks and loose mud making it very difficult to climb during the conduct of field work. At some places, water is accumulated but the source of water is not found.

Figure 18 - Stretch 3 Steep River Bank

Figure 19 - Stretch 3 Water Accumulation

Sand quarry is operated extensively in the river near Jali Kheda village.

Figure 20 - Stretch 3 JCB Operating in Sand Quarry near Jali Kheda village (59.5 km chainage)

The river is dry and sandy with thick thorny bush's growth. In some places, the vegetation growth is very thick.

Class	Chainage (km)		Observed					Reduced w.r.t. Sounding Datum				
	From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.
I	60	90	0.000	0.000	30000	1,289,114.53	3,839,586.57	-0.300	0.000	30000	1,628,166.57	4,844,489.70
II	60	90	0.000	0.000	30000	1,962,700.14	5,845,858.99	-0.300	0.000	30000	2,398,547.23	7,141,508.79
III	60	90	0.000	0.000	30000	2,964,402.75	8,828,304.24	-0.300	0.000	30000	3,505,803.97	10,440,523.05
IV	60	90	0.000	0.000	30000	3,576,512.65	10,650,442.17	-0.300	0.000	30000	4,142,356.12	12,335,637.20

Table 17 - Stretch 3 Dredging Quantity

3.3.1 Observed and reduced Bed Profile of the stretch

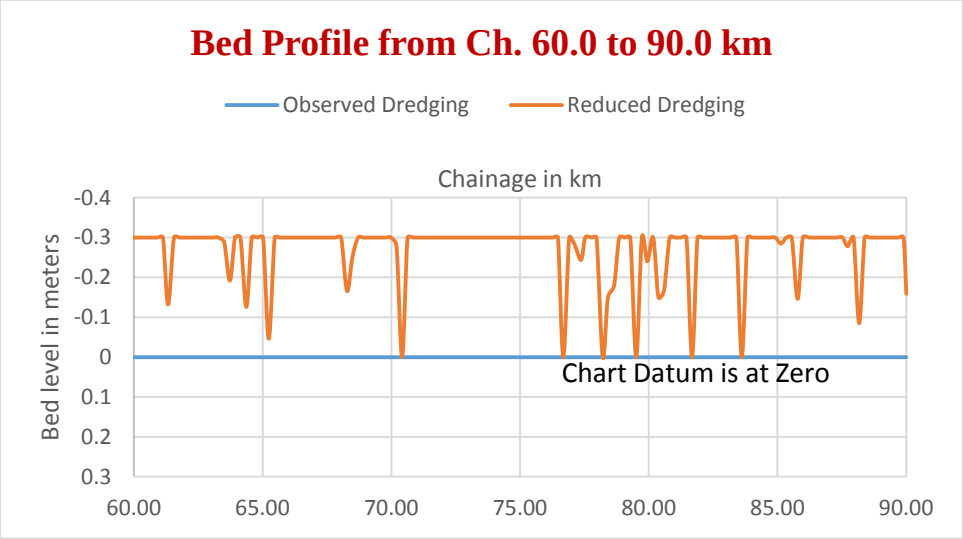


Figure 21 - Stretch 3 River-bed Profile

3.4 Sub-Stretch-4: Dangawa to Champa Bhakhri (90.00km to 120.00km)

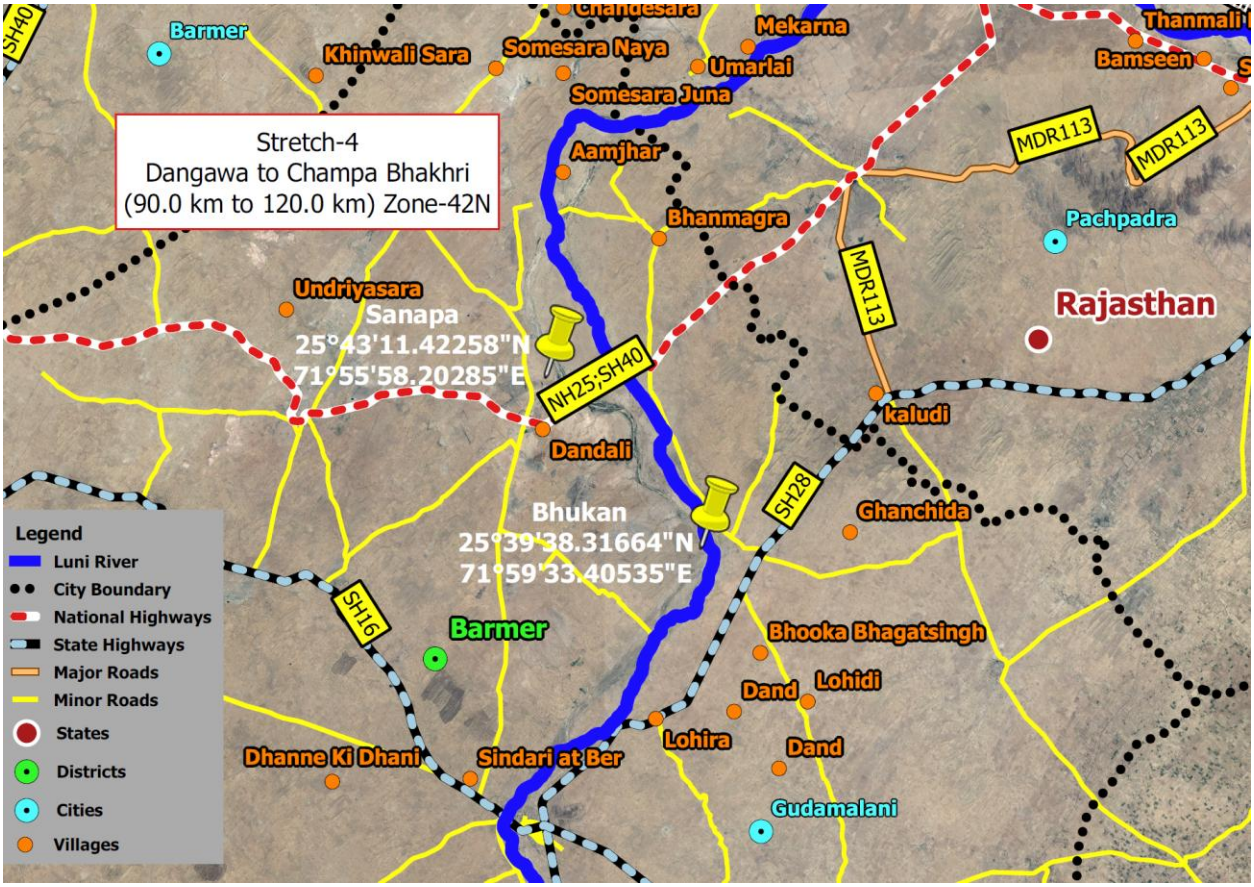


Figure 22 - Stretch 4 Dangawa to Champa Bhakhri

- **Bathymetry Survey**
  a) No bathymetric survey is conducted due to the unavailability of water.
- **Topographic Survey**
  b) 30.00km of the length of the stretch for which the topographic survey has been carried out.

Stretch-4 covers 30 km i.e. from 90km to 120 km chainage from the Dangawa village to Champa Bhakhri.

Dangawa is located in Barmer district. Jodhpur city is well connected by road and rail from Jaipur, Udaipur, Jaislamer, Jodhpur, Ajmer & other major cities. Total three (03) Bench Mark pillars are covered in this stretch from IWAI BM LUN-23 to IWAI BM LUN-25.

The following features are across the stretch one (01) Bridge Gadesara Road Bridge (SH-28) near Gadesara village and one (01) Electric line river near village Sindari.

Figure 23 - Stretch 4 Gadesara Road Bridge (SH-28) (84.926 km chainage)

The both river banks in this stretch has a steep slope with an average height varying from 3 mtr to 5 mtr from the river bed.

Figure 24 - Stretch 4 Steep River Bank

The texture of the river bank is a mixture of Rocks and loose mud, making it almost impossible to climb during the conduct of field work. In some places, water is accumulated but the source of water is not found.

Figure 25 - Stretch 4 Water Accumulation with submerged Rocks

There are places where the river is dry and sandy with thorny bush's growth.

Class	Chainage (km)		Observed					Reduced w.r.t. Sounding Datum				
	From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.
I	90	120	0.000	0.000	30000	1,276,267.48	5,115,854.05	-0.300	0.000	30000	1,596,946.50	6,441,436.20
II	90	120	0.000	0.000	30000	1,941,719.98	7,787,578.97	-0.300	0.000	30000	2,359,486.85	9,500,995.64
III	90	120	0.000	0.000	30000	2,926,728.89	11,755,033.13	-0.300	0.000	30000	3,449,895.75	13,890,418.80
IV	90	120	0.000	0.000	30000	3,529,083.56	14,179,525.73	-0.300	0.000	30000	4,076,554.11	16,412,191.31

Table 18 - Stretch 4 Dredging Quantity

3.4.1 Observed and reduced Bed Profile of the stretch

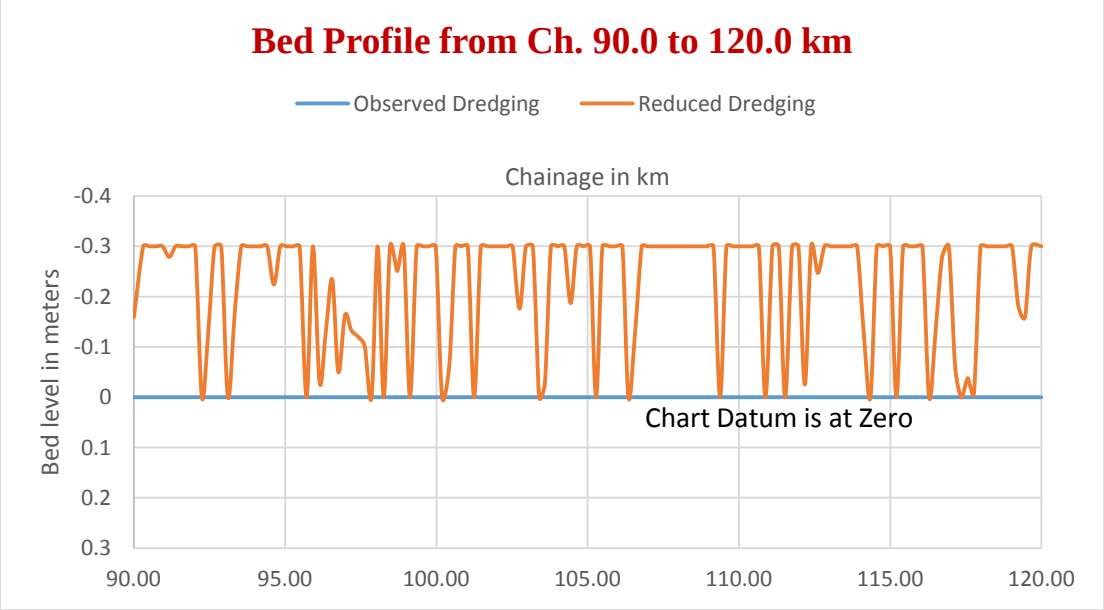


Figure 26 - Stretch 4 River-bed Profile

3.5 Sub-Stretch-5: Champa Bhakhri to Tilwara (120.00km to 150.00km)

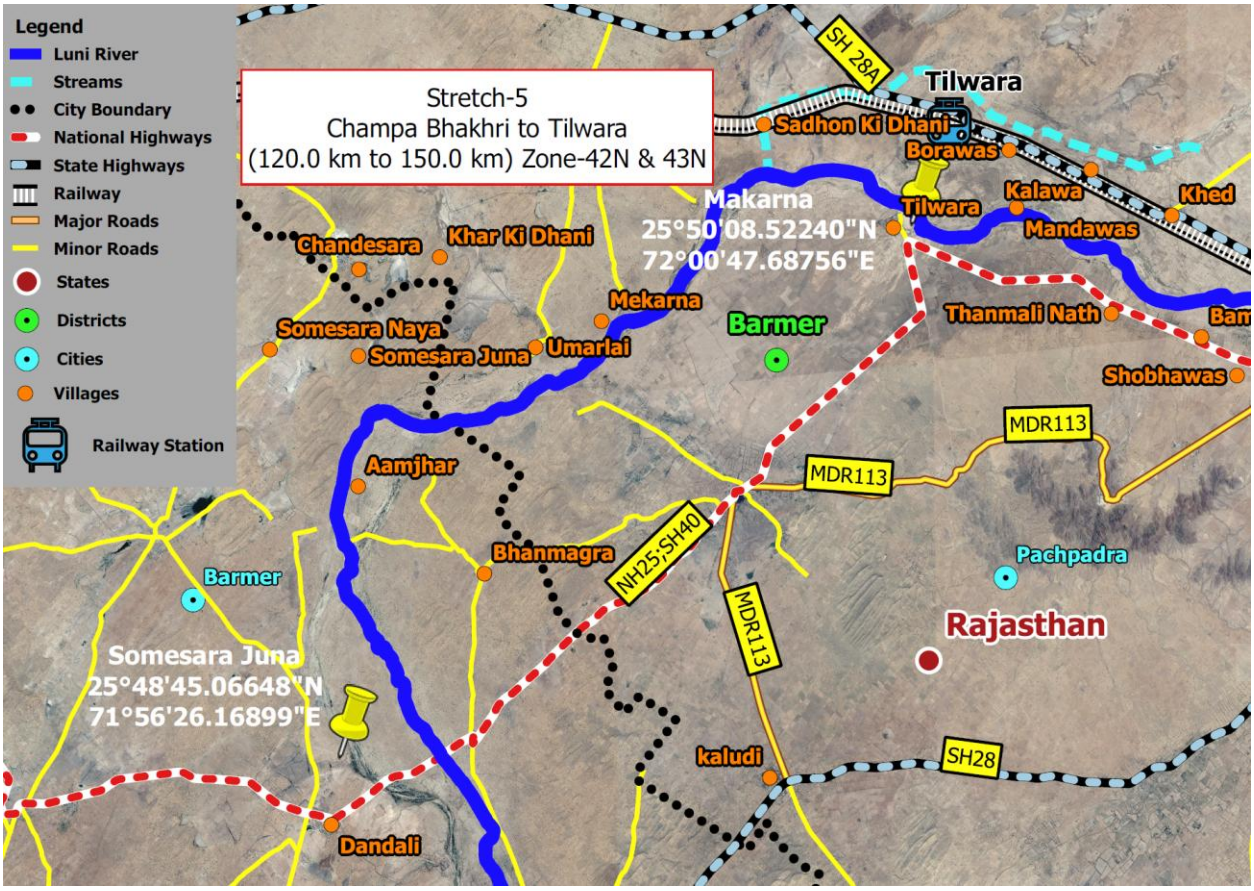


Figure 27 - Stretch 5 Champa Bhakhri to Tilwara

- **Bathymetry Survey**
  a) No bathymetric survey is conducted due to the unavailability of water.
- **Topographic Survey**
  b) 30.00km of the length of the stretch for which the topographic survey has been carried out.

Stretch-5 covers 30 km i.e. from chainage 120 km to 150 km from Champa Bhakhri village to Tilwara. In this, we have operated in Zone 43 as well as Zone 42. Zone changes near Umarlai village.

The Champa Bhakhri village is located in Barmer district. Barmer city is well connected by road and rail from Jaipur, Udaipur, Jaislamer, Jodhpur, Ajmer & other major cities. Total three (03) Bench Mark pillars are covered in this stretch from IWAI BM LUN-20 to IWAI BM LUN-22. The following features are across the stretch three (03) High Tension Powerline located in crosses the river near village Umarlai and Girli Charnan. The sand quarry is extensively operated in the river near Aamjhar village.

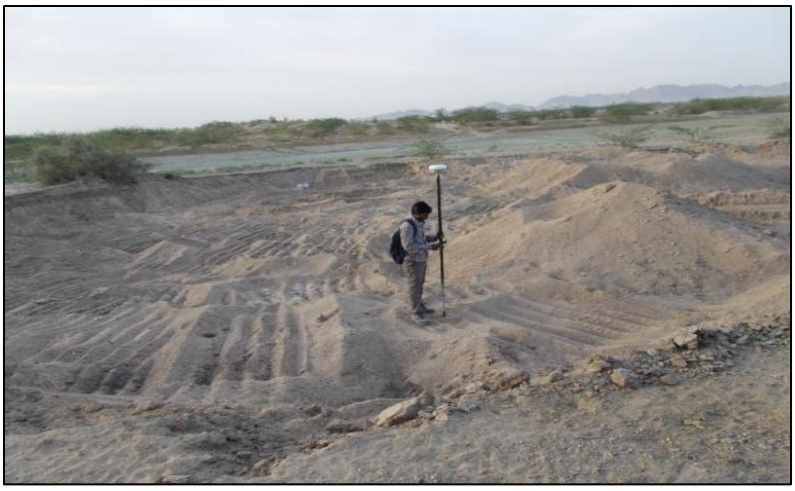


Figure 28 - Stretch 5 JCB Bucket operating marks near Aamjhar village (124 km chainage)

While approaching towards "IWAI BM LUN-23" the river bank becomes sloppy with loose mud cliffs, which makes it difficult to climb during the conduct of field work.

Figure 29 - Stretch 5 Loose mud cliffs on the river bank

The river is completely dry and sandy with rocks and thorny bush's growth.

Class	Chainage (km)		Observed					Reduced w.r.t. Sounding Datum				
	From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.
I	120	133	0.000	0.000	13000	554,101.10	5,669,955.15	0.000	-0.300	13000	700,646.35	7,142,082.55
II	120	133	0.000	0.000	13000	843,185.45	8,630,764.42	0.000	-0.300	13000	1,032,133.57	10,533,129.21
III	120	133	0.000	0.000	13000	1,272,145.03	13,027,178.16	0.000	-0.300	13000	1,507,084.40	15,397,503.20
IV	120	133	0.000	0.000	13000	1,534,406.38	15,713,932.11	0.000	-0.300	13000	1,779,919.04	18,192,110.35

Class	Chainage (km)	Observed	Reduced w.r.t. Sounding Datum

	From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.
I	133	150	0.000	0.000	17000	734,826.52	734,826.52	-0.300	0.000	17000	923,481.91	923,481.91
II	133	150	0.000	0.000	17000	1,119,267.43	1,119,267.43	-0.300	0.000	17000	1,361,443.01	1,361,443.01
III	133	150	0.000	0.000	17000	1,691,361.75	1,691,361.75	-0.300	0.000	17000	1,991,921.09	1,991,921.09
IV	133	150	0.000	0.000	17000	2,040,636.62	2,040,636.62	-0.300	0.000	17000	2,354,819.47	2,354,819.47

Table 19 - Stretch 5 Dredging Quantity

3.5.1 Observed and reduced Bed Profile of the stretch

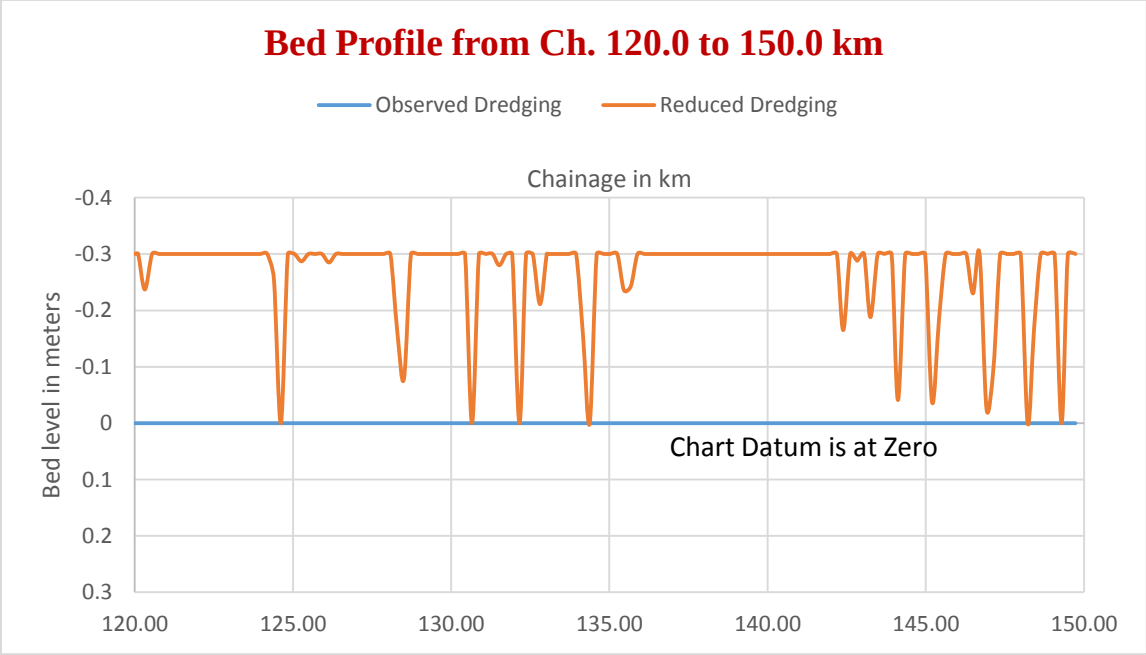


Figure 30 - Stretch 5 River-bed Profile

3.6 Sub-Stretch-6: Tilwara to Kitnod (150.00km to 180.00km)

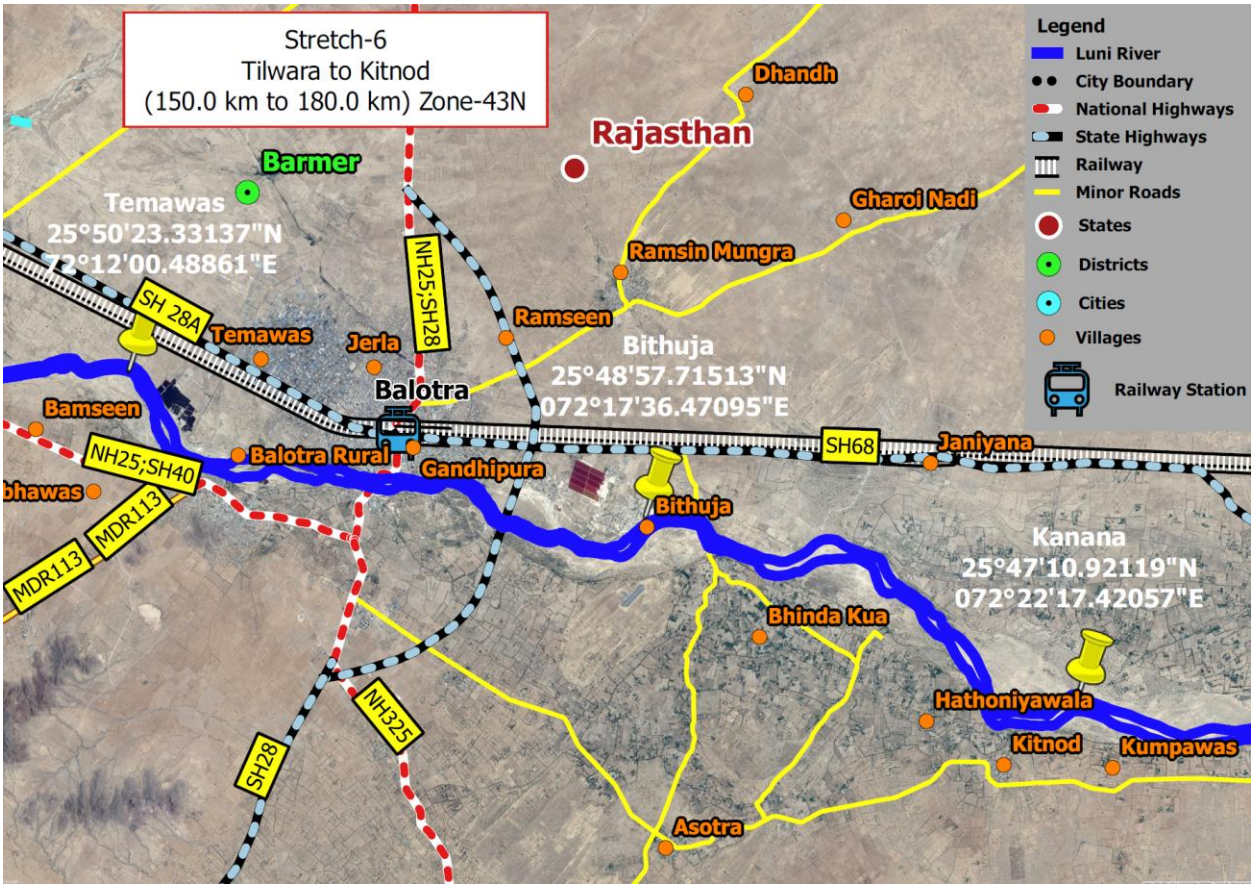


Figure 31 - Stretch 6 Tilwara to Kitnod

- **Bathymetry Survey**
  a) No bathymetric survey is conducted due to the unavailability of water.
- **Topographic Survey**
  b) 30.00km of the length of the stretch for which the topographic survey has been carried out.

Stretch-6 covers 30 km i.e. from 150 km to 180 km from Tilwara village to Kitnod.

Tilwara is located in Barmer district. Barmer city is well connected by road and rail from Jaipur, Udaipur, Jaislamer, Jodhpur, Ajmer & other major cities. Total three (03) Bench Mark pillars are covered in this stretch from IWAI BM LUN-17 to IWAI BM LUN-19. The following features are across the stretch Bridges two (02) Balotra Road Bridge

(NH-28) , Balotra Sanko Road Bridge (NH-112) near Balotra village and one (01) High Tension Powerline and five (05) Electric lines passing in this stretch of river.

Figure 32 - Stretch 6 Balotra Road Bridge (NH-28) (166.308 km chainage)

Figure 33 - Stretch 6 Balotra Sanko Road Bridge (NH-112) (163.550 km chainage)

In addition, there is one (01) Temple on the bank of the river near the Village – Tilwara

Figure 34 - Stretch 6 Temple at Tilwara (148.163 km chainage)

Many Textile coloring factories are operated at Balotra along the river bank in this stretch. The toxic wastewater discharged from these factories is accumulated in small pits in the river.

Figure 35 - Stretch 6 Textile coloring Factories (160.162 km chainage)

The sand quarry is extensively operated on the river near the Village – Bhinda Kua. The river is mostly dry and sandy with thorny bush's growth.

Class	Chainage (km)		Observed					Reduced w.r.t. Sounding Datum				
	From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.
I	150	180	0.000	0.000	30000	1,286,730.33	2,021,556.85	-0.300	0.000	30000	1,631,970.57	2,555,452.48
II	150	180	0.000	0.000	30000	1,958,880.62	3,078,148.05	-0.300	0.000	30000	2,402,366.33	3,763,809.34
III	150	180	0.000	0.000	30000	2,957,811.90	4,649,173.65	-0.300	0.000	30000	3,507,927.13	5,499,848.22
IV	150	180	0.000	0.000	30000	3,568,394.59	5,609,031.21	-0.300	0.000	30000	4,143,183.58	6,498,003.05

Table 20 - Stretch 6 Dredging Quantity

3.6.1 Observed and reduced Bed Profile of the stretch

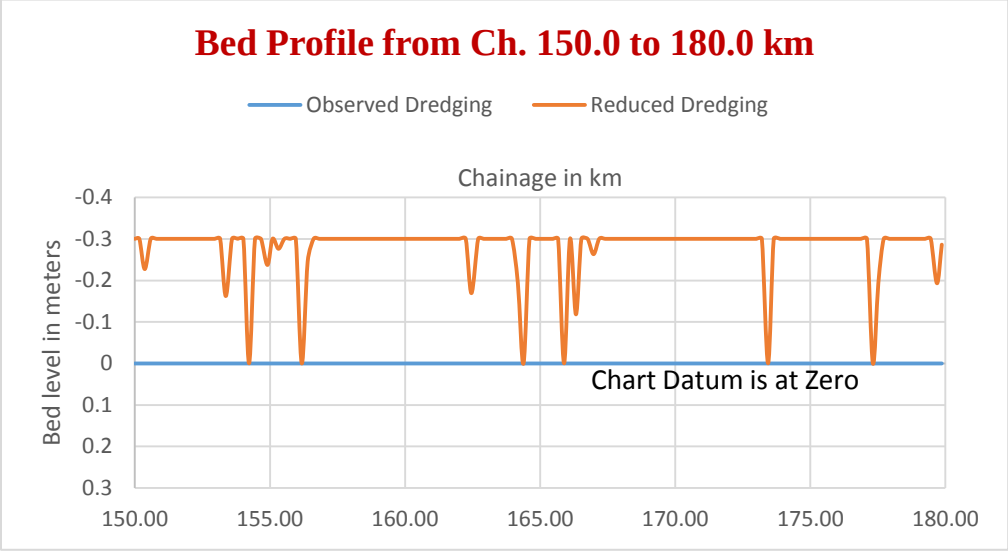


Figure 36 - Stretch 5 River-bed Profile

3.7 Sub-Stretch-7: Kitnod to Bhanawas (180.00km to 210.00km)

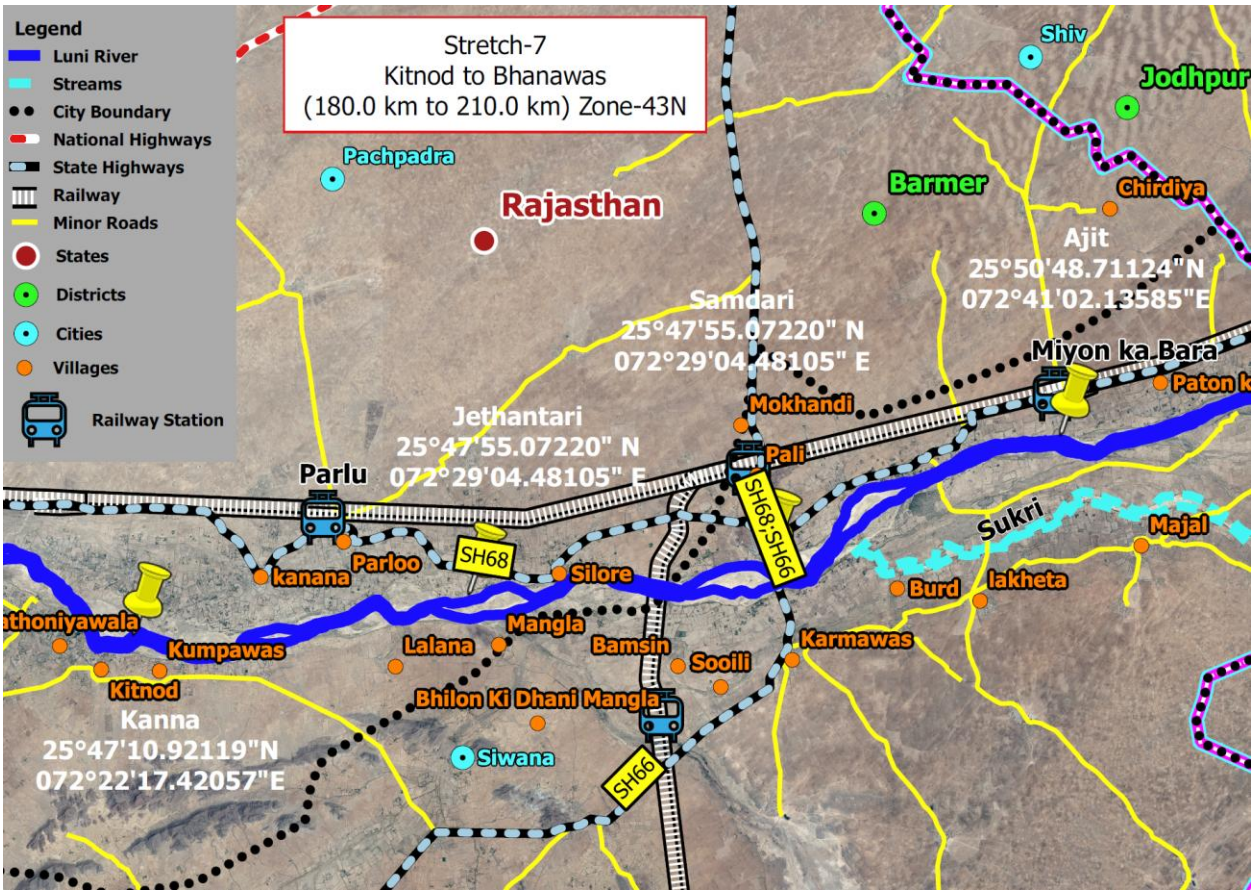


Figure 37 - Stretch 7 Kitnod to Bhanawas

- **Bathymetry Survey**
  a) No bathymetric survey is conducted due to the unavailability of water.
- **Topographic Survey**
  b) 30.00km of the length of the stretch for which the topographic survey has been carried out.

Stretch-7 covers 30km i.e. from 180 km to 210 km chainage from Kitnod village to Bhanawas village.

Kitnod is located in Barmer district. Barmer city is well connected by road and rail from Jaipur, Udaipur, Jaislamer, Jodhpur, Ajmer & other major cities. Total three (03) Bench Mark pillars are covered in this stretch from IWAI BM LUN-14 to IWAI BM LUN-16. The features across the river in this stretch are one (01) Bridge Samdari Railway Bridge (Concrete and Steel) near Southwest of Samdari village. In addition to this, there is one (01) High Tension Powerline and ten (10) Electric line located in this stretch.

Figure 38 - Stretch 7 Samdari Railway Bridge (197.689 km chainage)

The sand quarry activity is prominent in this stretch of the river near Samdari and Jetharni village.

Figure 39 - Stretch 7 JCB operating in Sand Quarry near Jetharni village (192.0 km chainage)

The river is completely dry and sandy with thorny bushes growth.

Class	Chainage (km)		Observed					Reduced w.r.t. Sounding Datum				
	From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.
I	180	210	0.000	0.000	30000	1,292,840.33	3,314,397.18	-0.300	0.000	30000	1,652,889.44	4,208,341.92
II	180	210	0.000	0.000	30000	1,969,188.85	5,047,336.90	-0.300	0.000	30000	2,431,540.41	6,195,349.75
III	180	210	0.000	0.000	30000	2,976,230.41	7,625,404.06	-0.300	0.000	30000	3,549,052.85	9,048,901.07
IV	180	210	0.000	0.000	30000	3,591,230.53	9,200,261.74	-0.300	0.000	30000	4,189,494.58	10,687,497.63

Table 21 - Stretch 7 Dredging Quantity

3.7.1 Observed and reduced Bed Profile of the stretch

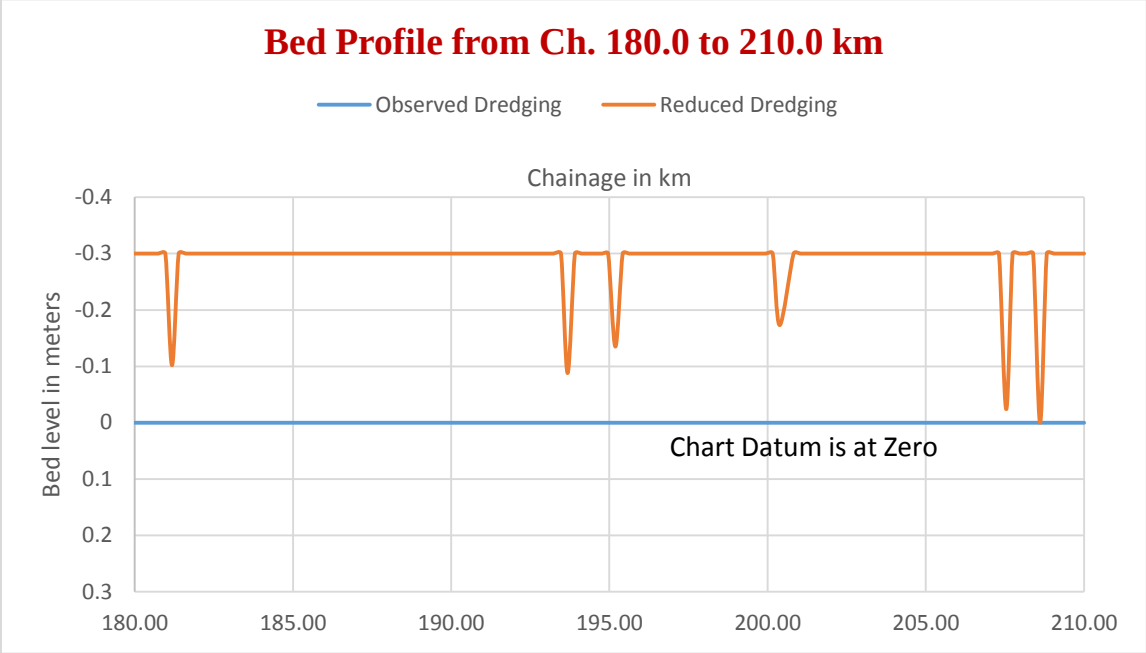


Figure 40 - Stretch 7 River-bed Profile

3.8 Sub-Stretch-8: Bhanawas to Doodiya (210.00km to 240.00km)

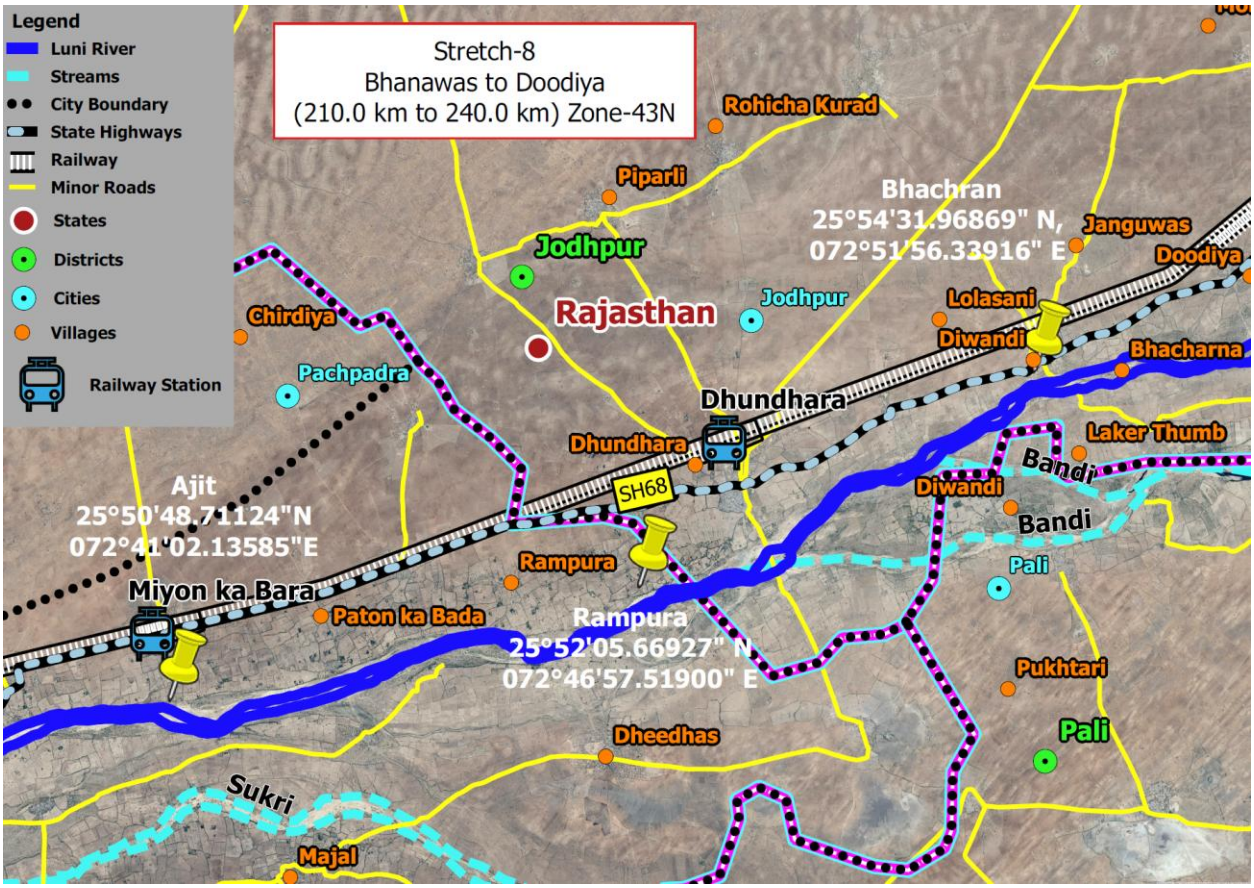


Figure 41 - Stretch 8 Bhanawas to Doodiya

- **Bathymetry Survey**
  a) No bathymetric survey is conducted due to the unavailability of water.
- **Topographic Survey**
  b) 30.00km of the length of the stretch for which the topographic survey has been carried out.

Stretch-8 covers 30.00km i.e. from 210 km to 240 km chainage from Bhanawas village to Doodiya village.

Bhanawas is located in Barmer district. Barmer city is well connected by road and rail from Jaipur, Udaipur, Jaislamer, Jodhpur, Ajmer & other major cities. Total three (03) Bench Mark pillars are covered in this stretch from IWAI BM LUN-11 to IWAI BM LUN-13. The features across the river in this stretch are one (01) Electric line located in this stretch crossing the river near village Dhundhara. In addition to this, there is one (01) Temple constructed near IWAI BM LUN-12.

Figure 42 - Stretch 8 Temple near IWAI BM LUN-12 (224.217 km chainage)

The discharge of the city waste in the river is near Diwandi village. There is some water accumulation in the river due to the discharge of city waste; otherwise, the river is dry and sandy with thorny bush's growth.

Class	Chainage (km)		Observed					Reduced w.r.t. Sounding Datum				
	From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.
I	210	240	0.000	0.000	30000	1,292,224.62	4,606,621.80	-0.300	0.000	30000	1,651,790.15	5,860,132.07
II	210	240	0.000	0.000	30000	1,968,253.21	7,015,590.11	-0.300	0.000	30000	2,429,791.86	8,625,141.61
III	210	240	0.000	0.000	30000	2,974,805.43	10,600,209.49	-0.300	0.000	30000	3,546,683.14	12,595,584.21
IV	210	240	0.000	0.000	30000	3,589,506.56	12,789,768.30	-0.300	0.000	30000	4,186,851.52	14,874,349.15

Table 22 - Stretch 8 Dredging Quantity

3.8.1 Observed and reduced Bed Profile of the stretch

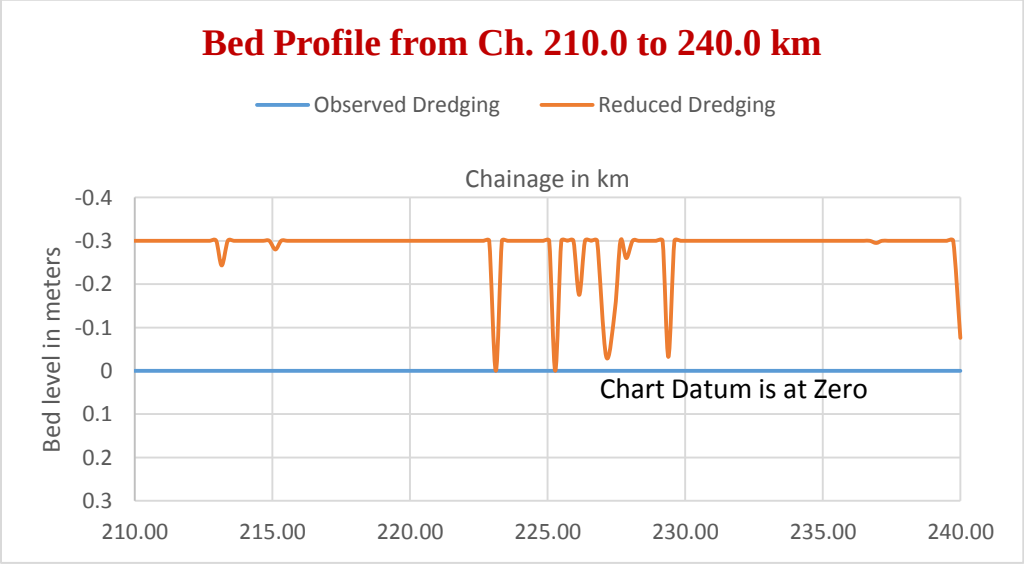


Figure 43 - Stretch 8 River-bed Profile

3.9 Sub-Stretch-9: Doodiya to Guda Bishnoiyan (240.00km to 270.00km)

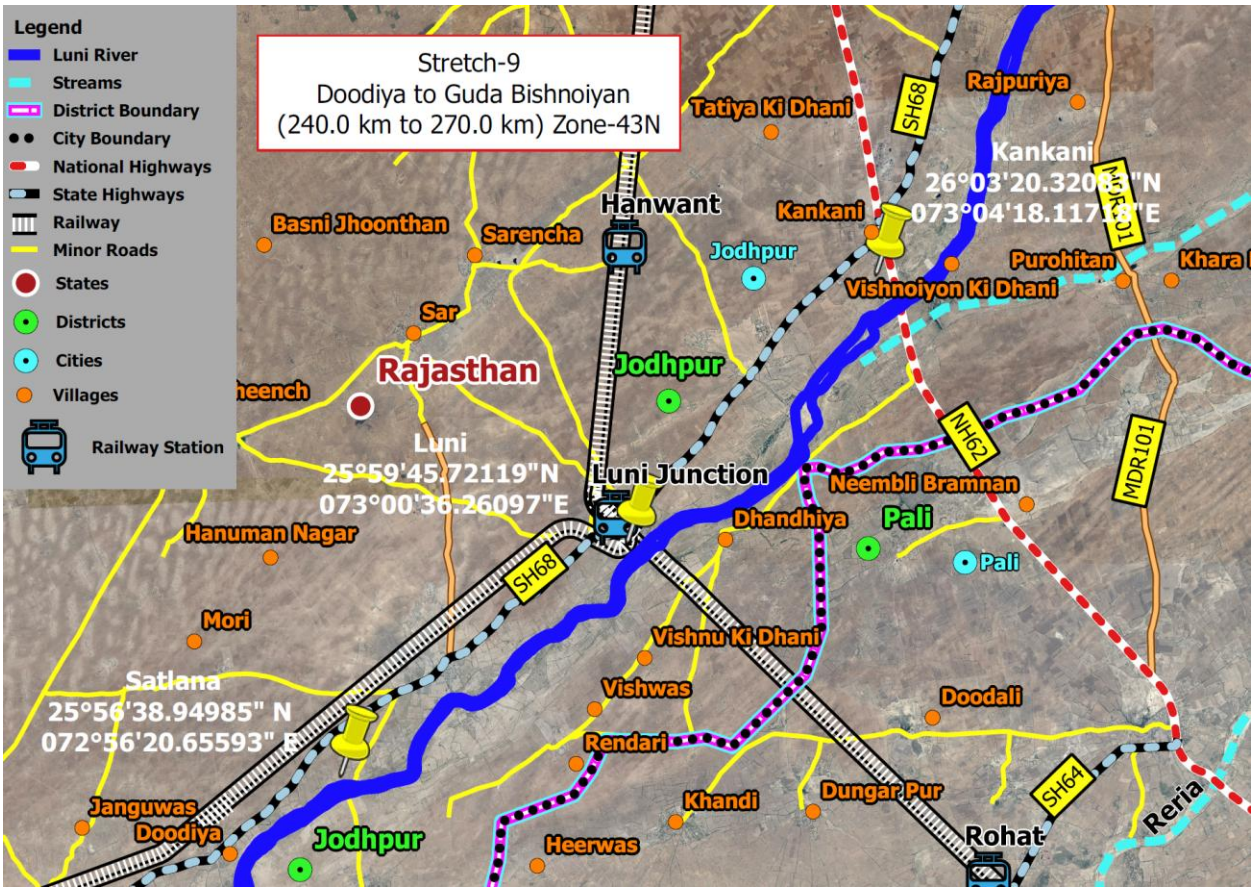


Figure 44 - Stretch 9 Doodiya to Guda Bishnoiyan

- **Bathymetry Survey**
  a) No bathymetric survey is conducted due to the unavailability of water.
- **Topographic Survey**
  b) 30.00km of the length of the stretch for which the topographic survey has been carried out.

Stretch-9 covers 30.00km i.e. from 240 km to 270 km chainage from Doodiya village to Guda Bishnoiyan village.

Doodiya is located in Jodhpur district. Jodhpur city is well connected by road and rail from Jaipur, Udaipur, Jaislamer, Barmer, Ajmer & other major cities. Total three (03) Bench Mark pillars are covered in this stretch from IWAI BM LUN-08 to IWAI BM LUN-10.

The features across the river in this stretch are three Bridges (03) Kankani Road Bridge (Lower NH-65), Kankani Road Bridge (Upper NH-65) near to Kankani village and Luni Railway Bridge (Concrete) near the Luni village in addition there are three (01) High Tension Power line and three (05) Electric line is located in this stretch. High Tension Power line crosses the river near village Kankani. The electric line crosses the river near village Kankani, Luni, Satlana, and Doodiya.

Figure 45 - Stretch 9 Kankani Road Bridge (Lower NH-65) (262.839 km chainage)

Figure 46 - Stretch 9 Kankani Road Bridge (Upper NH-65) (262.824 km chainage)

Figure 47 - Stretch 9 Luni Railway Bridge (253.522 km chainage)

There are one (01) Bituminous Track roads crossing the river near Satlana village, the river is completely dry and sandy with thick thorny bush's growth.

Class	Chainage (km)		Observed					Reduced w.r.t. Sounding Datum				
	From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.
I	240	270	0.000	0.000	30000	1,290,625.91	5,897,247.71	-0.300	0.000	30000	1,645,534.94	7,505,667.01
II	240	270	0.000	0.000	30000	1,965,681.24	8,981,271.35	-0.300	0.000	30000	2,421,754.24	11,046,895.85
III	240	270	0.000	0.000	30000	2,970,120.70	13,570,330.19	-0.300	0.000	30000	3,535,957.18	16,131,541.39
IV	240	270	0.000	0.000	30000	3,583,696.11	16,373,464.41	-0.300	0.000	30000	4,174,880.87	19,049,230.02

Table 23 - Stretch 9 Dredging Quantity

3.9.1 Observed and reduced Bed Profile of the stretch

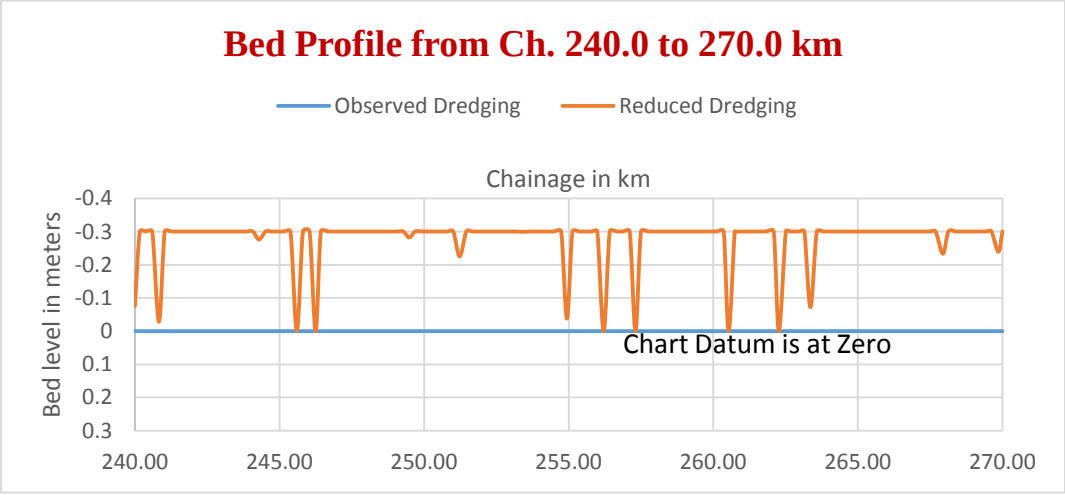


Figure 48 - Stretch 9 River-bed Profile

3.10 Sub-Stretch-10: Guda Bishnoiyan to Rampuriya Bhatiy (270.00km to 300.00km)

Figure 49 - Stretch 10 Guda Bishnoiyan to Rampuriya Bhatiy

- **Bathymetry Survey**
  a) No bathymetric survey is conducted due to the unavailability of water.
- **Topographic Survey**
  b) 30.00km of the length of the stretch for which the topographic survey has been carried out.

Stretch-10 covers 30 km i.e. from 270 km to 300 km chainage from Guda Bishnoiyan to Rampuriya Bhatiy.

Guda Bishnoiyan is located in Jodhpur district. Jodhpur city is well connected by road and rail from Jaipur, Udaipur, Jaislamer, Barmer, Ajmer & other major cities. Total four (04) Bench Mark pillars are covered in this stretch from IWAI BM LUN-04 to IWAI BM LUN-07.

The features across the river in this stretch are Bridge (01), Guda Bishnoiyan Sanko Road Bridge near South of Guda Bishnoiyan village and in addition (02) Electric lines are located in this stretch. The electric line crosses the river near village Rampuriya Bhatiy and Goliya.

Figure 50 - Guda Bishnoiyan Sanko Road Bridge (273.058 km chainage)

Excavation activity is there in the river near the Village – Goliya and Guda Bishnoiyan.

Figure 51 - Excavation Activity near Goliya (294.8 km) and Guda Bishnoiyan village (274.0 km)

The river is completely dry and sandy with thick thorny bush's growth. It's very difficult to distinguish between river bed and river bank.

Class	Chainage (km)	Observed	Reduced w.r.t. Sounding Datum

	From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.
I	270	300	0.000	0.000	30000	1,294,532.79	7,191,780.50	-0.300	0.000	30000	1,650,236.71	9,155,903.72
II	270	300	0.000	0.000	30000	1,971,760.61	10,953,031.96	-0.300	0.000	30000	2,429,407.30	13,476,303.15
III	270	300	0.000	0.000	30000	2,980,118.19	16,550,448.38	-0.300	0.000	30000	3,548,281.61	19,679,823.00
IV	270	300	0.000	0.000	30000	3,595,915.63	19,969,380.04	-0.300	0.000	30000	4,189,557.19	23,238,787.21

Table 24 - Stretch 10 Dredging Quantity

3.10.1 Observed and reduced Bed Profile of the stretch

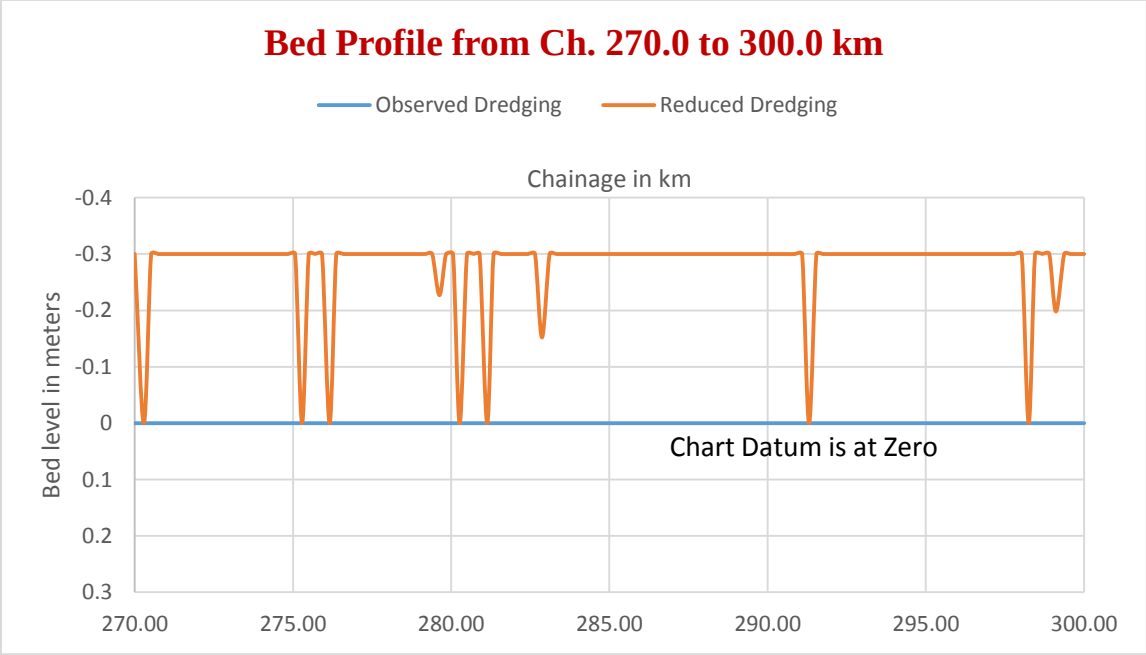


Figure 52 - Stretch 10 River-bed Profile

3.11 Sub-Stretch-11: Rampuriya Bhatiy to Pichiyak (300.00km to 336.35km)

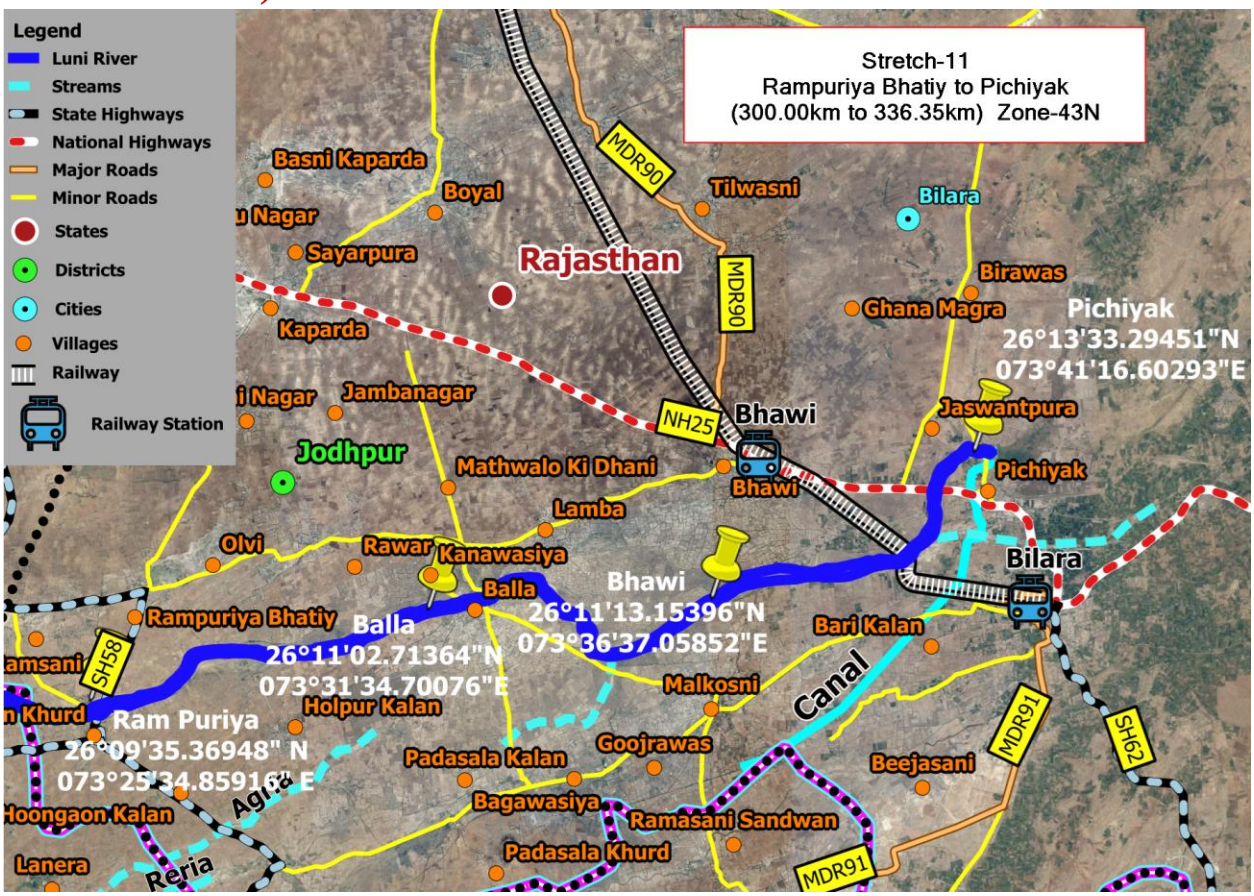


Figure 53 - Stretch 11 Rampuriya Bhatiy to Pichiyak

- **Bathymetry Survey**
  a) No bathymetric survey is conducted due to the unavailability of water.
- **Topographic Survey**
  b) 36.35km of the length of the stretch for which the topographic survey has been carried out.

Stretch-11 covers 36.35 km i.e. from 300 km to 336.35 km chainage from Rampuriya Bhatiy to Pichiyak.

Jaswant Sagar Bandh is located near the Pichiyak village in Jodhpur district and Rampuriya Bhatiy village is also in Jodhpur district. Jodhpur city is well connected by road and rail from Jaipur, Udaipur, Jaislamer, Barmer, Ajmer & other major cities. Total three (03) Bench Mark pillars are covered in this stretch from IWAI BM LUN-01 to IWAI BM LUN-03. The features across the river in this stretch are (02) Bridge, Pichiyak Road Bridge (NH-112) and Bhawi Railway Bridge (Concrete), there are three (03) Bandh

like feature Jaswant Sagar Bandh near Pichiyak village, Bandh near Bhawi village and Bandh near Matwalon Ki Dhan village.

Figure 54 - Stretch 11 Pichiyak Road (334.042 km) and Bhawi Railway Bridge (331.575 km)

In addition to this, there are three (03) High Tension Power line and three (03) Electric line is located in this stretch. High Tension Power line crosses the river near village Pichiyak and Jhurli. The electric line crosses the river near village Pichiyak and Balla. There are features along the river. They are one (01) Cemetery, one (01) Temple within the river.

The river is completely dry and sandy with thick thorny bush's growth. It was very much difficult for the team to appreciate the river bank as there is no change in the terrain of the river.

Figure 55 - Stretch 11 Cemetery (316.2 km chainage) and Temple (317.0 km chainage)

Class	Chainage (km)		Observed					Reduced w.r.t. Sounding Datum				
	From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.
I	300	336.35	0.000	0.000	36350	1,557,932.22	8,749,712.72	-0.300	0.000	36350	1,993,124.50	11,149,028.22
II	300	336.35	0.000	0.000	36350	2,372,527.11	13,325,559.07	-0.300	0.000	36350	2,931,914.77	16,408,217.92
III	300	336.35	0.000	0.000	36350	3,584,555.60	20,135,003.98	-0.300	0.000	36350	4,278,398.19	23,958,221.19
IV	300	336.35	0.000	0.000	36350	4,324,987.81	24,294,367.85	-0.300	0.000	36350	5,049,806.68	28,288,593.89

Table 25 - Stretch 11 Dredging Quantity

3.11.1 Observed and reduced Bed Profile of the stretch

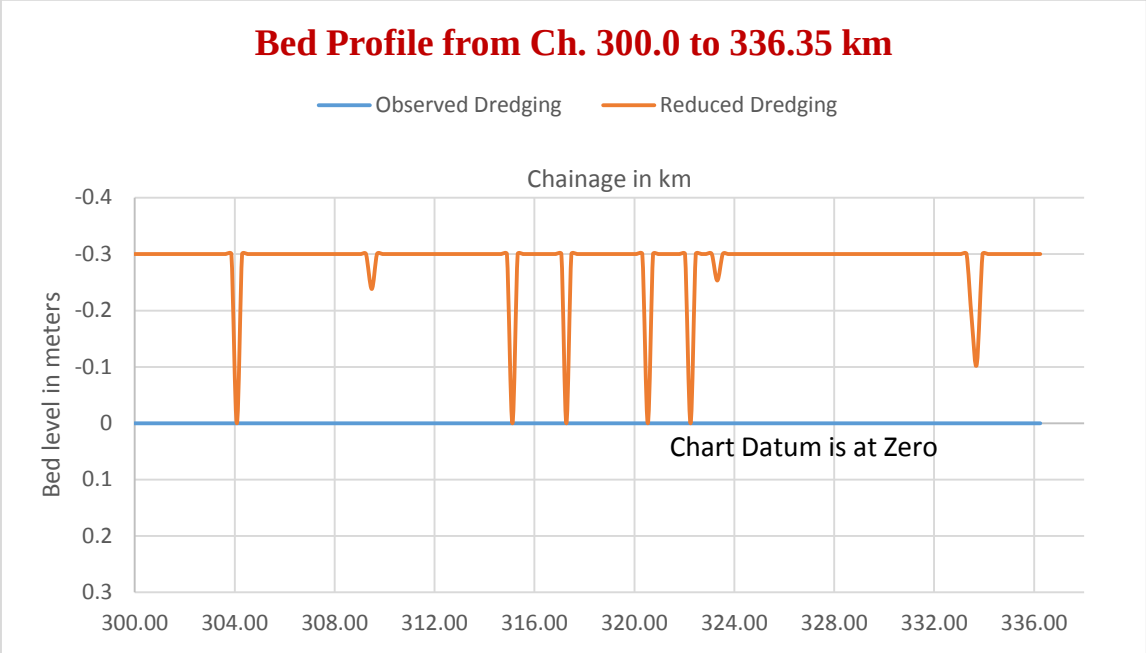


Figure 56 - Stretch 11 River-bed Profile

3.12 Other Aspects of Waterway

3.12.1 Fishing

No fishing activities exist on the entire survey stretch of the Luni River. No scope of fishing does exist in the river due to non-availability of water. The fishing boats/any other type country boats are also not available in the Luni River due to non-availability of water.

3.12.2 Industries

Balotra is a city in Barmer District of Rajasthan State in India. It is about 100km from Jodhpur. The town is home to more than 5,000 textile units and is located on the coast of the river Luni. The town is famous for hand block printing and textile industry.

Various textiles were operated in the town in the past, but presently many textile factories are closed due to the untreated toxic discharge to the river making the soil polluted and unfertile. As the river is dry so the need of ferry service is not possible.

3.12.3 Crops

Agricultural production is mainly from Kharif crops, which are grown in the summer season and seeded in June and July. These are then harvested in September and October and include Bajra, Pulses such as Guar, Jowar, Maize, Sesame, and Groundnuts. Over the past few decades, the development of irrigation features including canals and tube wells have changed the crop pattern with desert districts in Rajasthan now producing Rabi crops including wheat, mustard, and cumin seed along with cash crops.

3.12.4 Settlements

There are only two (02) important cities present Jodhpur and Barmer but are away from the river. The settlements near the river are present, but sparsely populated. The main settlements are Pichiyak village, Luni village, Samdari village, Balotra and Sindari village.

3.12.5 Pollution at Luni River

Apart from the irrigation feature by the artificial lake, the river in the town of Balotra, Barmer district, Rajasthan is already dried out. Due to the excessive growth of the textile industries in this town, the rate of intoxication of the river water has highly increased, resulting in the death of the Luni River. An organization has set up a march to spread the awareness of the dying river. Luni has become the most polluted river due to the discharge of textile industry effluents.

3.12.6 Important Cities/Towns

There are only two famous places near the river one is Jodhpur and second is Balotra. There are various places, but they all are like villages. The population distribution is very sparse.

3.12.7 Road Network

3.12.7.1 National Highway

Two national highways are passing through the Luni River. National Highway number NH25 is passing through the villages Bilara, Bhawi, Binawas and towards Jodhpur. National Highway number NH25 is passing parallel and far from the River. NH68 passes through the Gandhav to Siwara Village. NH62 is crossing the river at Kankani Village to Rohat which is Barmer to Pali Road.

3.12.7.2 State Highway

SH28 runs parallel to the river from Ramji Ka Gol on the left bank through Gudamalani, Bhatala, Payala Kalan and crosses the River near Dangawa and follows the right bank towards Sindhari, Bhukan, Kaludi, Tapra, Asada and again crosses the River at Balotra.

SH16 which comes from Sirana and crosses the River perpendicular at Sindhari and goes towards Sarani.

SH68 starts from Balotra and runs parallel to the left bank of the river passing through Parlu, Silore, Samdari, Dhundhara, Satlana, Kankani to Dangiyawas.

SH66 falls on the right bank of the River coming from Siwana through Meli, Karma was and crosses the river perpendicular at Samdari and merges with SH68.

SH61 falls on the right bank of the River coming from Sardar Samand towards Jodhpur. It crosses the River at Sangasani and Khejarli Kalan.

SH58 falls on the right bank of the River coming from Sojal towards Umed Nagar. It crosses the River at Hoongaon and Rampuriya Bhatiy.

3.12.7.3 Major District Roads

Gulbarga and Yadgir districts had a good road network. The major district road route numbers are listed below:

S.No.	Route	Description
1	16	From Sayala to Gudamalani village
2	101	From Rohat to Jodhpur

Table 26 - Major District Roads

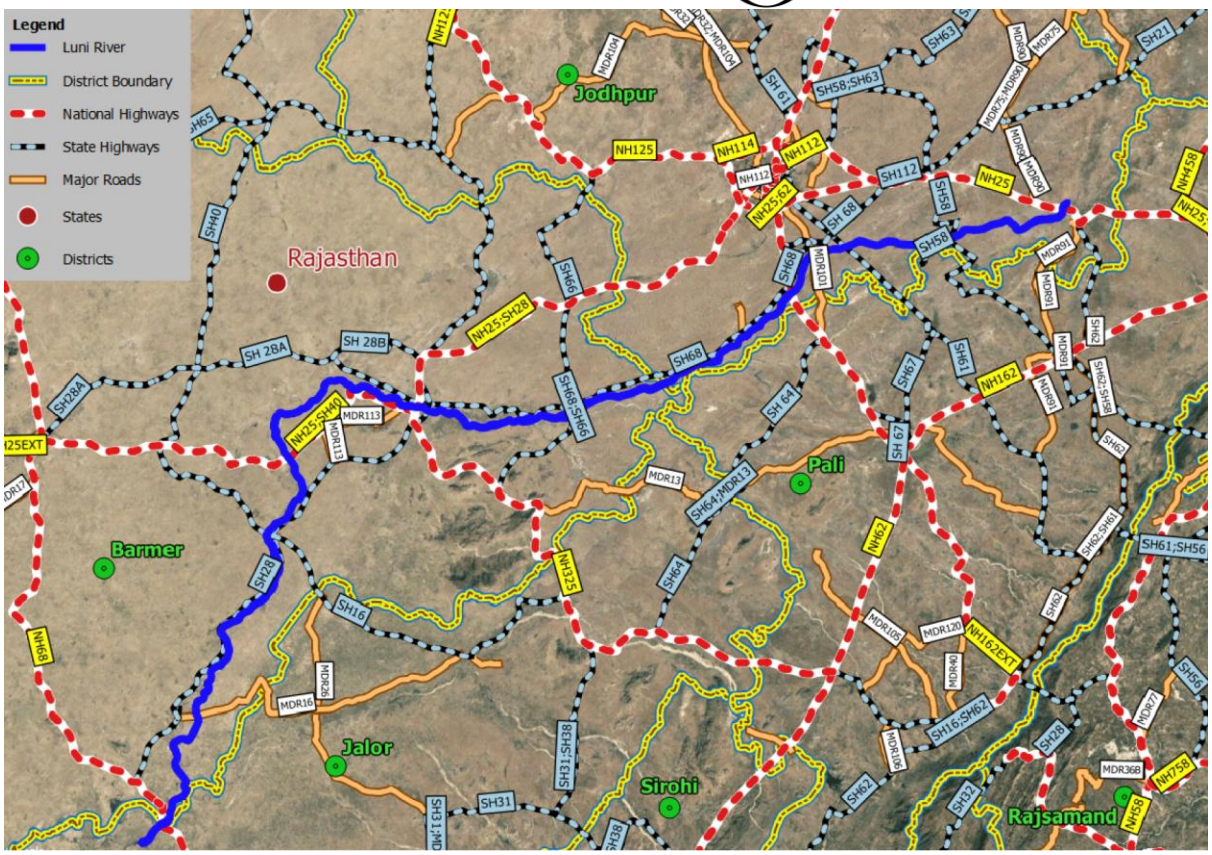


Figure 57 - Road Network

3.12.8 Rail Network

The nearest major Railway station in the proximity is Jodhpur Junction. The railway line follows the river parallel along the left bank from Gole Railway station till Luni Junction railway station. In the entire stretch, there are only three places where the railway line crosses the river. They are between Bhawi-Bilara, Luni-Rohat, and Samdari-Bamsin.

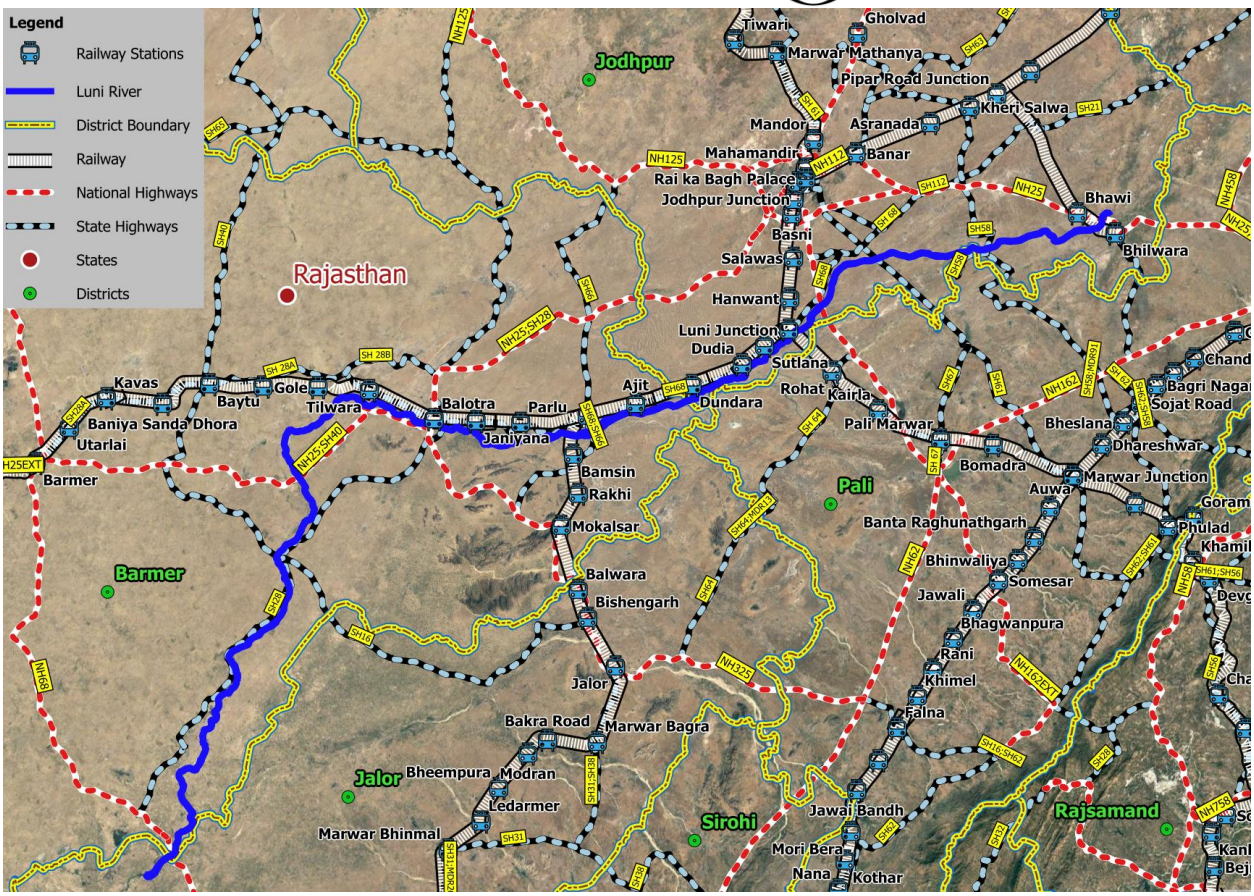


Figure 58 - Railway Network

The following are the list of Stations which is in the project influence area vicinity.

Location	Passage	Station Names
Ajit	Parallel to River	Ajit Railway Station
Balotra	Parallel to River	Balotra Junction Railway Station
Bhawi	Perpendicular to River	Bhawi Railway Station
Bilara	Perpendicular to River	Bilara Railway Station
Dhundhara	Parallel to River	Dhundhara Railway Station
Doodiya	Parallel to River	Doodiya Railway Station
Gole	Parallel to River	Gole Railway Station
Janiyana	Parallel to River	Janiyana Railway Station
Luni	Perpendicular to River	Luni Junction Railway Station
Parlu	Parallel to River	Parlu Railway Station
Rohat	Perpendicular to River	Rohat Railway Station
Samdari	Parallel to River	Samdari Junction Railway Station
Satlana	Parallel to River	Satlana Railway Station
Tilwara	Parallel to River	Tilwara Railway Station
Bamsin	Perpendicular to River	Bamsin Railway Station

Table 27 - Railway Stations

3.12.9 Land Use

The entire river stretch is fully dependent on the monsoons and bore wells for cultivation.

In Jodhpur District, the land use is divided into Forest area, Cultivation area and Net area Sown.

- Geographical area – 2256.4 ha
- Cultivable area – 1816 ha
- Forest area – 6.996 ha
- Land under nonagricultural use – 80.1 ha
- Permanent pastures – 121.9 ha
- Cultivable wasteland – 40.6 ha
- Barren and uncultivable land – 145.3

In Barmer District:

- Geographical area – 2817.3 ha
- Cultivable area – 2184.7 ha
- Forest area – 32 ha
- Land under nonagricultural use – 72.8 ha
- Permanent pastures – 202.3 ha
- Cultivable wasteland – 199.3 ha
- Barren and uncultivable land – 125.7 ha

In Pali District:

- Geographical area – 1238700 ha
- Cultivable area – 181862 ha
- Forest area – 96358 ha
- Land under nonagricultural use – 194130 ha
- Permanent pastures – 135591ha
- Cultivable wasteland – 132545 ha
- Barren and uncultivable land – 47201 ha

3.12.10 Construction Material

Jodhpur and Barmer district, which are the storehouses of a variety of building stones and ornamental stones. Different types of limestone, marble, and granites obtained from this area of the district are used as decorative and building stone. The granites are being mined only for tile making, however, big sized blocks can also be extracted.

Rhyolites of different colour and shades occur around Jodhpur. The Mogra area contains black rhyolites with white specks and is being used for chips making, other areas are Kakani (Green colour), Rohit (red colour), Malani rhyolites and granite occurring around Jodhpur Agolai, shergarh, Balesar, Thob, and Pipad have vast resources for road metal and railway ballast.

3.12.11 Conditions of banks

The bank is unprotected along the River.

3.12.12 Jetties and Terminals

Lack of the jetties and Terminals along the River

3.12.13 Cargo Movement

Lack of the cargo movements along the River

3.12.14 Passenger Ferry Services

No passenger ferry service is available on the River.

3.12.15 Historic importance

Jodhpur was founded by Rao Jodha, a chief of the Rathore clan, in 1459. The city is known as the "Sun City" because of its bright and sunny weather throughout the year. It is named after him only. Jodhpur was previously known as Marwar. It is the second largest city in Rajasthan.

Mehrangarh Fort is spectacular hilltop fort is situated on a 150m high hill and it is one of the largest forts in India & still run by the Maharaja of Jodhpur. This fort has a museum which houses antiques, ornaments & weapons.

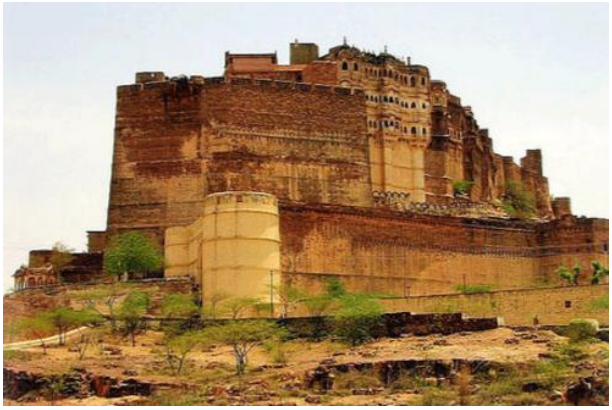


Figure 59 - Mehrangarh Fort (274 km chainage, 2.4 km from survey stretch)

Barmer district was known by the name Mallinath. Mallinath was the son of Rao Salkha and Mallinath is a God who is still worshiped by Rajputs. The whole area around the river Luni was said to have Malani, derived from the name Mallinath. In the 18th century the name Barmer or Balmer was adopted by the British rulers of India and is derived from the name of the earlier 13th-century ruler Bahada Rao Parmar (Panwar) or Bar Rao Parmar (Panwar), it was named Bahadamer ("The Hill Fort of Bahada").

Famous Fort Siwana or Gadh Siwana is situated on a hilltop in Siwana about 35.6km from Balotra. The fort was built by a famous Jaitamal Rathore Rajput ruler Raja Bhoj's son Veernarayan.

Figure 60 - Fort Siwana (182.0 km chainage, 15 km from survey stretc)

3.12.16 Tourism

Balotra is a city in Barmer District of Rajasthan state in India. It is about 100 km from Jodhpur. The town is famous for an Annual Desert and Tribal Fair at Tilwara. The town is well connected to Jodhpur by rail and buses at frequent intervals.

- From Balotra towards Jalore (14 km), there is India's Third Brahma Temple in the village of Asotra.
- From Balotra towards Barmer (11 km), there is an Ancient Temple of Lord Shri Vishnu named as Shri Ranchore Ray, Khed Mandir in the village of Khed.
- The Famous Rani Bhatiyaniji temple is also here in a village named Jasol 4 km from Balotra.
- About 13 km away from Balotra is located the famous Jain Temple Nakoda. The place receives religious devotees from across India.

Jodhpur was founded by Rao Jodha, a chief of the Rathore clan, in 1459. The city is known as the "Sun City" because of its bright and sunny weather throughout the year. It is named after him only. Jodhpur in Rajasthan, India was previously known as Marwar. Jodhpur is the second largest city in Rajasthan.

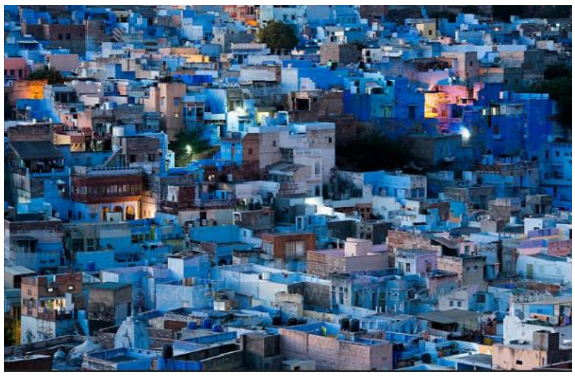


Figure 61 - Jodhpur City (280.0 km chainage, 22 km from survey stretch)

It is divided into two parts - the old city and the new city. The old city is separated by a 10km long wall surrounding it. Also, it has eight Gates leading out of it. The new city is outside the walled city. Jodhpur is a very popular tourist destination. The landscape is scenic and mesmerizing. Jodhpur city has many beautiful palaces and forts such as Mehrangarh Fort, Jaswant Thada, Umaid Bhavan Palace and Rai ka Bag Palace. Other charms of Jodhpur include Government Museum and its beautiful Umed garden. The 'Sun City', instituted by Rao Jodha is a tourist hotspot also because of its premier museum and haven of indigenous art.

Figure 62- Umaid Bhavan Palace (280.0 km chainage, 22 km from survey stretch)

3.12.17 Irrigation Canals and Outlets

The Luni River is not having any irrigation canal and outlets. However, there is one canal namely as Narmada Main Canal, which does not have any connection with the Luni River but crossing the river underground through a pipeline between Gandhav Goliya village and Mailawas Gusaiyan village.

4 Terminals

4.1 Details of Terminal survey carried out

In this River, stretch could not find any adequate proposed terminal, due to the unavailability of water in this stretch.

5 Fairway Development

5.1 Fairway Dimensions

As per the specification of the survey, dredging quantity was required to be estimated for a channel dimension of 50m x 2m with Side slope of 1:5, along with the deepest route.

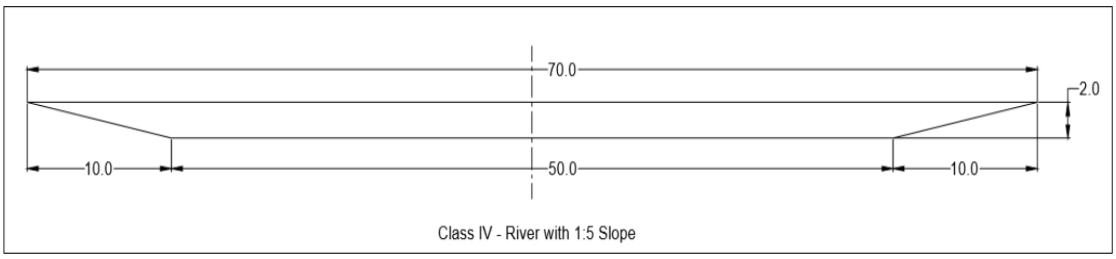
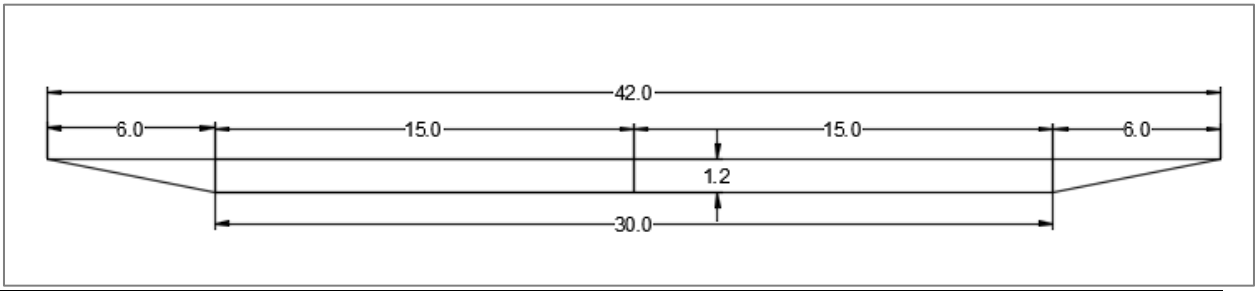


Figure 63 - Fairway Channel Dimensions 50m X 2m

5.2 Calculation of Dredging Quantity

The dredge volume calculations were accomplished using the HYPACK dredge volume computation utility. The channel template was created as per the different classification and kilometer wise dredging calculation was carried out (enclosed at Annexure 2). The Hypack Standard volume algorithm was used to calculate the dredge volume in each segment. The stretch wise summary of the dredge volume for a different class of fairway is as follows:

Class I



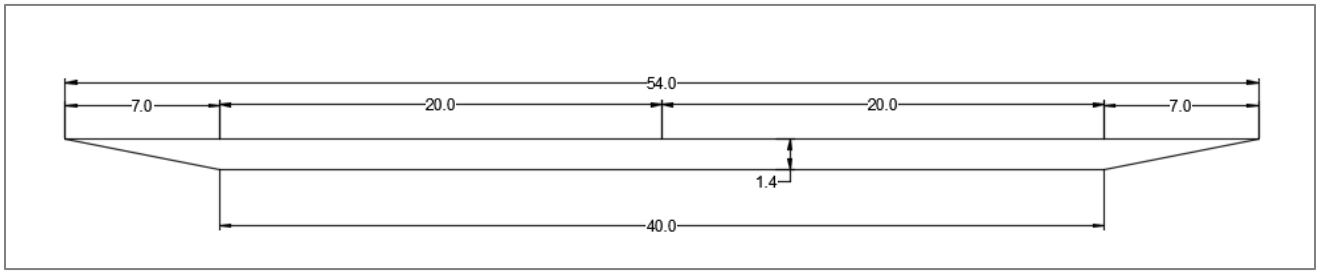
Zone 42N

Location		Chainage (km)		Observed					Reduced w.r.t. Sounding Datum				
From	To	From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.
Malipura	Gadevee	0	25	0.000	0.000	25000	1,058,638.95	1,058,638.95	-0.300	0.000	25000	1,338,654.23	1,338,654.23
Gadevee	Dedawas Jageer	25	60	0.000	0.000	35000	1,491,833.09	2,550,472.04	-0.300	0.000	35000	1,877,668.90	3,216,323.13
Dedawas Jageer	Dangawa	60	90	0.000	0.000	30000	1,289,114.53	3,839,586.57	-0.300	0.000	30000	1,628,166.57	4,844,489.70
Dangawa	Champa Bhakhri	90	120	0.000	0.000	30000	1,276,267.48	5,115,854.05	-0.300	0.000	30000	1,596,946.50	6,441,436.20
Champa Bhakhri	Umarlai	120	133	0.000	0.000	13000	554,101.10	5,669,955.15	-0.300	0.000	13000	700,646.35	7,142,082.55
					Total	**133000**	**5,669,955.15**	**5,669,955.15**		**Total**	**133000**	**7,142,082.55**	**7,142,082.55**

Zone 43N													
Location		Chainage (km)		Observed					Reduced w.r.t. Sounding Datum				
From	To	From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.
Umarlai	Tilwara	133	150	0.000	0.000	17000	734,826.52	6,404,781.67	-0.300	0.000	17000	923,481.91	8,065,564.46
Tilwara	Kitnod	150	180	0.000	0.000	30000	1,286,730.33	7,691,512.00	-0.300	0.000	30000	1,631,970.57	9,697,535.03
Kitnod	Bhanawas	180	210	0.000	0.000	30000	1,292,840.33	8,984,352.33	-0.300	0.000	30000	1,652,889.44	11,350,424.47
Bhanawas	Doodiya	210	240	0.000	0.000	30000	1,292,224.62	10,276,576.95	-0.300	0.000	30000	1,651,790.15	13,002,214.62
Doodiya	Guda Bishnoiyan	240	270	0.000	0.000	30000	1,290,625.91	11,567,202.86	-0.300	0.000	30000	1,645,534.94	14,647,749.56
Guda Bishnoiyan	Rampuriya Bhatiy	270	300	0.000	0.000	30000	1,294,532.79	12,861,735.65	-0.300	0.000	30000	1,650,236.71	16,297,986.27
Rampuriya Bhatiy	Pichiyak	300	336.35	0.000	0.000	36350	1,557,932.22	14,419,667.87	-0.300	0.000	36350	1,993,124.50	18,291,110.77
					Total	**203250**	**8,749,712.72**	**14,419,667.87**		**Total**	**203250**	**11,149,028.22**	**18,291,110.77**

Table 28 - Class I Dredge Volumes

Class II



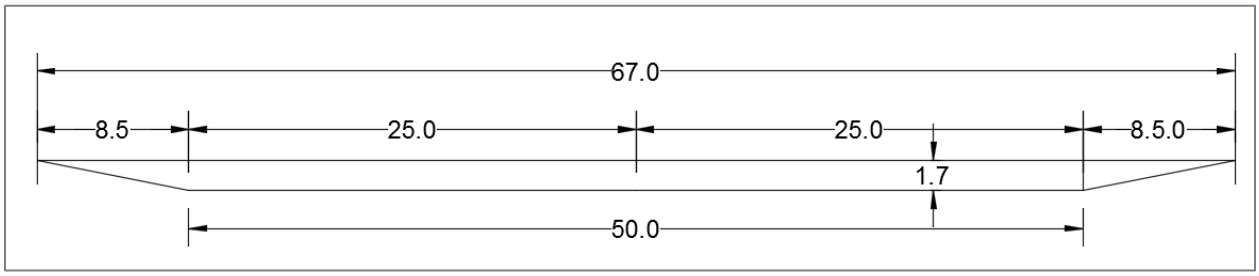
Zone 42N			
Location	Chainage (km)	Observed	Reduced w.r.t. Sounding Datum

From	To	From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.
Malipura	Gadevee	0	25	0.000	0.000	25000	1,611,312.26	1,611,312.26	-0.300	0.000	25000	1,973,769.04	1,973,769.04
Gadevee	Dedawas Jageer	25	60	0.000	0.000	35000	2,271,846.59	3,883,158.85	-0.300	0.000	35000	2,769,192.52	4,742,961.56
Dedawas Jageer	Dangawa	60	90	0.000	0.000	30000	1,962,700.14	5,845,858.99	-0.300	0.000	30000	2,398,547.23	7,141,508.79
Dangawa	Champa Bhakhri	90	120	0.000	0.000	30000	1,941,719.98	7,787,578.97	-0.300	0.000	30000	2,359,486.85	9,500,995.64
Champa Bhakhri	Umarlai	120	133	0.000	0.000	13000	843,185.45	8,630,764.42	-0.300	0.000	13000	1,032,133.57	10,533,129.21
			Total			**133000**	**8,630,764.42**	**8,630,764.42**		**Total**	**133000**	**10,533,129.21**	**10,533,129.21**

Zone 43N													
Location		Chainage (km)		Observed					Reduced w.r.t. Sounding Datum				
From	To	From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.
Umarlai	Tilwara	133	150	0.000	0.000	17000	1,119,267.43	9,750,031.85	-0.300	0.000	17000	1,361,443.01	11,894,572.22
Tilwara	Kitnod	150	180	0.000	0.000	30000	1,958,880.62	11,708,912.47	-0.300	0.000	30000	2,402,366.33	14,296,938.55
Kitnod	Bhanawas	180	210	0.000	0.000	30000	1,969,188.85	13,678,101.32	-0.300	0.000	30000	2,431,540.41	16,728,478.96
Bhanawas	Doodiya	210	240	0.000	0.000	30000	1,968,253.21	15,646,354.53	-0.300	0.000	30000	2,429,791.86	19,158,270.82
Doodiya	Guda Bishnoiyan	240	270	0.000	0.000	30000	1,965,681.24	17,612,035.77	-0.300	0.000	30000	2,421,754.24	21,580,025.06
Guda Bishnoiyan	Rampuriya Bhatiy	270	300	0.000	0.000	30000	1,971,760.61	19,583,796.38	-0.300	0.000	30000	2,429,407.30	24,009,432.36
Rampuriya Bhatiy	Pichiyak	300	336.35	0.000	0.000	36350	2,372,527.11	21,956,323.49	-0.300	0.000	36350	2,931,914.77	26,941,347.13
					Total	**203250**	**13,325,559.07**	**21,956,323.49**		**Total**	**203250**	**16,408,217.92**	**26,941,347.13**

Table 29 - Class II Dredge Volumes of Zone 42N

Class III



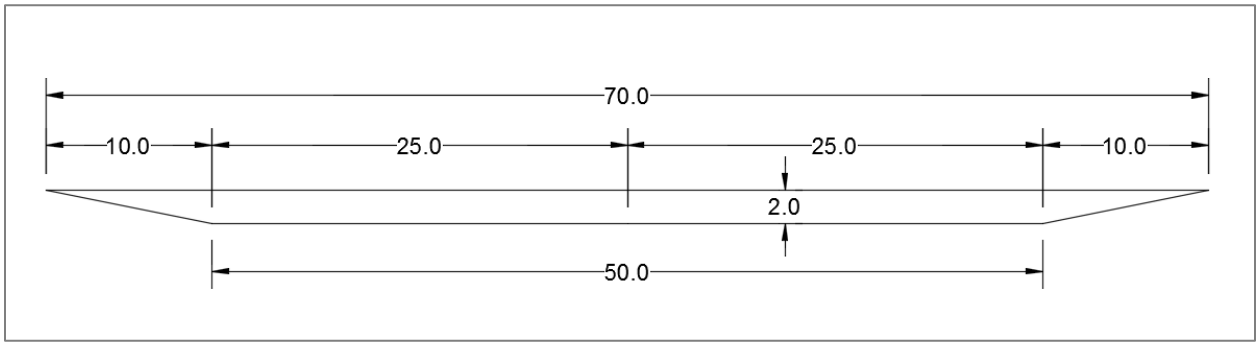
Zone 42N			
Location	Chainage (km)	Observed	Reduced w.r.t. Sounding Datum

From	To	From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.
Malipura	Gadevee	0	25	0.000	0.000	25000	2,432,618.38	2,432,618.38	-0.300	0.000	25000	2,884,915.31	2,884,915.31
Gadevee	Dedawas Jageer	25	60	0.000	0.000	35000	3,431,283.11	5,863,901.49	-0.300	0.000	35000	4,049,803.77	6,934,719.08
Dedawas Jageer	Dangawa	60	90	0.000	0.000	30000	2,964,402.75	8,828,304.24	-0.300	0.000	30000	3,505,803.97	10,440,523.05
Dangawa	Champa Bhakhri	90	120	0.000	0.000	30000	2,926,728.89	11,755,033.13	-0.300	0.000	30000	3,449,895.75	13,890,418.80
Champa Bhakhri	Umarlai	120	133	0.000	0.000	13000	1,272,145.03	13,027,178.16	-0.300	0.000	13000	1,507,084.40	15,397,503.20
					Total	**133000**	**13,027,178.16**	**13,027,178.16**		**Total**	**133000**	**15,397,503.20**	**15,397,503.20**

Zone 43N													
Location		Chainage (km)		Observed					Reduced w.r.t. Sounding Datum				
From	To	From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.
Umarlai	Tilwara	133	150	0.000	0.000	17000	1,691,361.75	14,718,539.91	-0.300	0.000	17000	1,991,921.09	17,389,424.29
Tilwara	Kitnod	150	180	0.000	0.000	30000	2,957,811.90	17,676,351.81	-0.300	0.000	30000	3,507,927.13	20,897,351.42
Kitnod	Bhanawas	180	210	0.000	0.000	30000	2,976,230.41	20,652,582.22	-0.300	0.000	30000	3,549,052.85	24,446,404.27
Bhanawas	Doodiya	210	240	0.000	0.000	30000	2,974,805.43	23,627,387.65	-0.300	0.000	30000	3,546,683.14	27,993,087.41
Doodiya	Guda Bishnoiyan	240	270	0.000	0.000	30000	2,970,120.70	26,597,508.35	-0.300	0.000	30000	3,535,957.18	31,529,044.59
Guda Bishnoiyan	Rampuriya Bhatiy	270	300	0.000	0.000	30000	2,980,118.19	29,577,626.54	-0.300	0.000	30000	3,548,281.61	35,077,326.20
Rampuriya Bhatiy	Pichiyak	300	336.35	0.000	0.000	36350	3,584,555.60	33,162,182.14	-0.300	0.000	36350	4,278,398.19	39,355,724.39
					Total	**203250**	**20,135,003.98**	**33,162,182.14**		**Total**	**203250**	**23,958,221.19**	**39,355,724.39**

Table 30 - Class III Dredge Volumes

Class IV



Zone 42N			
Location	Chainage (km)	Observed	Reduced w.r.t. Sounding Datum

From	To	From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.
Malipura	Gadevee	0	25	0.000	0.000	25000	2,934,501.53	2,934,501.53	-0.300	0.000	25000	3,407,506.79	3,407,506.79
Gadevee	Dedawas Jageer	25	60	0.000	0.000	35000	4,139,427.99	7,073,929.52	-0.300	0.000	35000	4,785,774.29	8,193,281.08
Dedawas Jageer	Dangawa	60	90	0.000	0.000	30000	3,576,512.65	10,650,442.17	-0.300	0.000	30000	4,142,356.12	12,335,637.20
Dangawa	Champa Bhakhri	90	120	0.000	0.000	30000	3,529,083.56	14,179,525.73	-0.300	0.000	30000	4,076,554.11	16,412,191.31
Champa Bhakhri	Umarlai	120	133	0.000	0.000	13000	1,534,406.38	15,713,932.11	-0.300	0.000	13000	1,779,919.04	18,192,110.35
					Total	**133000**	**15,713,932.11**	**15,713,932.11**		**Total**	**133000**	**18,192,110.35**	**18,192,110.35**

Location		Chainage (km)		Observed					Reduced w.r.t. Sounding Datum				
From	To	From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.
Umarlai	Tilwara	133	150	0.000	0.000	17000	2,040,636.62	17,754,568.73	-0.300	0.000	17000	2,354,819.47	20,546,929.82
Tilwara	Kitnod	150	180	0.000	0.000	30000	3,568,394.59	21,322,963.32	-0.300	0.000	30000	4,143,183.58	24,690,113.40
Kitnod	Bhanawas	180	210	0.000	0.000	30000	3,591,230.53	24,914,193.85	-0.300	0.000	30000	4,189,494.58	28,879,607.98
Bhanawas	Doodiya	210	240	0.000	0.000	30000	3,589,506.56	28,503,700.41	-0.300	0.000	30000	4,186,851.52	33,066,459.50
Doodiya	Guda Bishnoiyan	240	270	0.000	0.000	30000	3,583,696.11	32,087,396.52	-0.300	0.000	30000	4,174,880.87	37,241,340.37
Guda Bishnoiyan	Rampuriya Bhatiy	270	300	0.000	0.000	30000	3,595,915.63	35,683,312.15	-0.300	0.000	30000	4,189,557.19	41,430,897.56
Rampuriya Bhatiy	Pichiyak	300	336.35	0.000	0.000	36250	4,324,987.81	40,008,299.96	-0.300	0.000	36250	5,049,806.68	46,480,704.24
						Total	**203250**	**24,294,367.85**	**40,008,299.96**			**Total**	**203250**	**28,288,593.89**	**46,480,704.24**

Table 31 - Class IV Dredge Volumes

6 Conclusion

The aim is to undertake bathymetric survey, topographic survey, collection of data on cargo movement, industry survey, tourism facilities etc. in the project area; prepare detailed hydrographic survey charts, topographic survey charts, and feasibility report.

6.1 Description of Waterways

The surveyed stretch of Luni River is 336.35 km in length starting from Malipura (Downstream) to Jaswantpura (Upstream). There is no major scope for a navigational aspect of the waterway due to non-availability of water throughout the season in the full river stretch. The river banks are well connected with the road network. The road runs parallel to some places on Left bank and at some places on the Right bank. There are only two (02) important cities present Jodhpur and Barmer but are away from the river. The settlements near the river are present, but sparsely populated. The main settlements are Pichiyak village, Luni village, Samdari village, Balotra and Sindari village. There are no major industries present in the area, other than the small textile coloring industries in

Balotra. The stretch wise minimum and maximum width range, average width and average slope of the waterway are as below:-

S.No.	Location		Chainage (km)		Width Range of waterway		Average Width	Average slope (in m/km)
	From	To	From	To	Min	Max		
1	Malipura	Gadevee	0	25	1.387	576.050	147.327	1 : 0.411
2	Gadevee	Dedawas Jageer	25	60	99.941	495.850	118.869	1 : 0.383
3	Dedawas Jageer	Dangawa	60	90	22.754	368.310	137.294	1 : 0.528
4	Dangawa	Champa Bhakhri	90	120	47.141	369.080	101.995	1 : 0.728
5	Champa Bhakhri	Tilwara	120	150	99.930	221.660	110.158	1 : 0.397
6	Tilwara	Kitnod	150	180	99.939	371.860	157.058	1 : 0.612
7	Kitnod	Bhanawas	180	210	102.280	905.580	301.301	1 : 0.715
8	Bhanawas	Doodiya	210	240	100.550	944.380	249.727	1 : 0.806
9	Doodiya	Guda Bishnoiyan	240	270	99.990	558.450	170.647	1 : 0.840
10	Guda Bishnoiyan	Rampuriya Bhatiy	270	300	100.010	323.870	165.975	1 : 1.069
11	Rampuriya Bhatiy	Pichiyak	300	336.35	100.020	360.700	171.346	1 : 1.377

Table 32 - Stretch wise Average width and slope of waterway

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. The class-wise details of reduced dredging quantities of the waterways are as tabulated below:-

Reduced w.r.t. CD Dredging Values				
Class /Km Stretch	**I**	**II**	**III**	**IV**
0 - 25 (km)	1,338,654.23	1,973,769.04	2,884,915.31	3,407,506.79
25 - 60 (km)	1,877,668.90	2,769,192.52	4,049,803.77	4,785,774.29
60 - 90 (km)	1,628,166.57	2,398,547.23	3,505,803.97	4,142,356.12
90 - 120 (km)	1,596,946.50	2,359,486.85	3,449,895.75	4,076,554.11
120 - 133 (km)	700,646.35	1,032,133.57	1,507,084.40	1,779,919.04
133 - 150 (km)	923,481.91	1,361,443.01	1,991,921.09	2,354,819.47
150 - 180 (km)	1,631,970.57	2,402,366.33	3,507,927.13	4,143,183.58
180 - 210 (km)	1,652,889.44	2,431,540.41	3,549,052.85	4,189,494.58
210 - 240 (km)	1,651,790.15	2,429,791.86	3,546,683.14	4,186,851.52
240 - 270 (km)	1,645,534.94	2,421,754.24	3,535,957.18	4,174,880.87
270 - 300 (km)	1,650,236.71	2,429,407.30	3,548,281.61	4,189,557.19
300 - 336.35 (km)	1,993,124.50	2,931,914.77	4,278,398.19	5,049,806.68
Total	**18,291,110.77**	**26,941,347.13**	**39,355,724.39**	**46,480,704.24**

Table 33 - Class-wise Reduced Dredging quantity

Due to the continuous gradient of the river and the water level will not be available during the summer season the navigation aspect will not be fulfilled throughout the year. The Navigational Barrage/Lock is required to maintain the minimum depth required for

navigation and regulate the water level in the river. The class-wise details of reduced depth at different stretches of the waterways are as tabulated below:-

Sl. No.	Chainage (km)		< 1.2		1.2 - 1.4		1.5 - 1.7		1.8 - 2.0		> 2.0	
	From	To	Availability of Depth (km)	% of availability	Availability of Depth (km)	% of availability	Availability of Depth (km)	% of availability	Availability of Depth (km)	% of availability	Availability of Depth (km)	% of availability
1	0	25	25	100%	0	0 %	0	0 %	0	0 %	0	0 %
2	25	60	35	100%	0	0 %	0	0 %	0	0 %	0	0 %
3	60	90	30	100%	0	0 %	0	0 %	0	0 %	0	0 %
4	90	120	30	100%	0	0 %	0	0 %	0	0 %	0	0 %
5	120	150	30	100%	0	0 %	0	0 %	0	0 %	0	0 %
6	150	180	30	100%	0	0 %	0	0 %	0	0 %	0	0 %
7	180	210	30	100%	0	0 %	0	0 %	0	0 %	0	0 %
8	210	240	30	100%	0	0 %	0	0 %	0	0 %	0	0 %
9	240	270	30	100%	0	0 %	0	0 %	0	0 %	0	0 %
10	270	300	30	100%	0	0 %	0	0 %	0	0 %	0	0 %
11	300	336.35	36.35	100%	0	0 %	0	0 %	0	0 %	0	0 %
		Total	**336.35**	**100%**	**0**	**0 %**	**0**	**0 %**	**0**	**0 %**	**0**	**0 %**

Table 34 - Class-wise availability of reduced depth of the waterway

6.3 Modifications/ improvement measures

Improvement measures for design and depth improvement are required for the first phase of the development. The low height bridges and the sanko bridges need to be raised up to enable safe navigation. There are various road constructed across the river at about 2 feet above the river bed, for that new bridge constructions have to be made. River banks are not protected and are prone to erosion in the full stretch of Luni River. The limitation for improvement of navigational aspects also includes the gradient of the river, non-availability of the water throughout all seasons. The class-wise modification details of cross structure and high tension line clearance are as tabulated below:-

Bridges Clearances less than Class			High Tension lines Clearances less than Class	
Class	Horizontal	Vertical	Horizontal	Vertical
I	12	4	0	HTL -10 EP-28
II	12	5		
III	12	7		
IV	13	9		

Table 35 - Bridges and HTL Clearances less than Class no

6.4 Recommendation

There is no major scope for a navigational aspect of the waterway due to its geographic condition and non-availability of water throughout the region. The River banks are well connected with the road network and major distribution of settlements. The road runs parallel to some places on left bank and right bank. There are no major industries situated

near and no major cargo movements is envisaged for this survey stretch. No scope for the future development of the River was recommended for navigational purpose and the survey Stretch is not-viable for development as navigable channel.

The purpose of the survey was for assessing the River stretch from the Malipura Ranvalli to Jaswantpura for the development of water transport facilities in the new National Waterway (NW-63). All conspicuous objects within and in the vicinity of the survey area have been fixed. The deliverable sheets contain mean sea level values of elevation information, important landmarks with the state of the River banks. The survey is considered complete in all respects.

7 Details of Annexures

Annexure-1 Source and type of data collected from various agencies……..84
Annexure-2 Stretch wise data of Observed Depths to Reduced Depths……....90
Annexure-3 Dredge Volumes (per km) for different classification with length of shoal..92
Annexure-4 Water Level Details……124
Annexure-5 Survey Dates……126
Annexure-6 Details of Bank protection……128
Annexure-7 Details of Riverside Features……130
Annexure-8 Horizontal and Vertical Control……...……133
Annexure-9 Equipment Photographs……...……138
Annexure-10 Bench Mark Pillar Forms……140
Annexure-11 Levelling Data……240
Annexure-12 Current Meter Observation & Discharge Calculation……728
Annexure-13 Water Sample Analysis……..……..……..…730
Annexure-14 Calibration Certificates……..……732
Annexure-15 Survey Chart Scheming Index and chart details……735
Annexure-16 Field Photographs……...……744

Volume - II