



Feasibility Study (FS) / Detailed Project Report (DPR) for Up-gradation of Main road Budhal-Mahore-Gul to NHDL specifications from km 0.00 to Km 114.875 and an artery from Mahore at km 57.00 to km 68.00 on road Reasi-Arnas-Mahore (net length 125.875 km) in 31 BRTF area under project Sampark in J&K state

## Executive Summary

### Background

#### PROJECT

Project Sampark raised in Jan 1975 due to ever increasing work load of BRO in Jammu region, the Project has grown from strength to strength and the work load has increased from 843 Km of roads in 1975 to 2310 Km of roads and 145 Km of Ditch Cum Bund in 2000-01.

The Project has so far completed 2146 Km equivalent Cl-9 of formation cutting, 2078 Km of surfacing, 3457 Km of periodic renewal of road surface, 35 major permanent bridges, strengthening and overlaying of Pathankot and Agra air fields and Rajouri Air Strip.

Other major achievements of the Project are construction of Roads Budhal-Mohr-Gul, Basoli-Bani-Bhaderwah, NagrotaBy Pass; strengthening and improvement to NH double lane specification of the Roads Jammu-Rajouri-Poonch, Chakki-Dhar-Udhampur, Rajouri-Kandi-Budhal-Mohr-Gul.

The Project has been assigned the task of four laning of National Highway Pathankot-Jammu and is thus the first Project of BRO to be selected to participate in the development of the North-South corridor, the ambitious plan of the Prime Minister.

#### PROJECT STATE

Jammu & Kashmir, a state in North India with Srinagar as its capital. It is fifth largest state of India by area of 101,387 km<sup>2</sup>. It is bounded by Mountains of Himalaya in the North, Punjab & Himachal Pradesh in the South, & Pakistan in the West. Currently the state comprises 22 districts. Forests cover roughly about Twenty percent of the state. The state has 18 National Highways and total road networks for an aggregating length of about 265,000 km. The total length of the rail network in the state is about 5,983 km. The section-1 of the project road starts at Budhal, km 0.00 and ends at Gul, km 110.565 and the section-2 of the project road starts at Mahore km 57.00 and ends at 68.00 km. The project corridor of existing major district road connects three districts Rajouri, Reasi and Ramban in Jammu .The main rivers crossing the corridor is Ansi river and which further tributes into 2 sections near Badhara and continues towards Mahore. The road is a continuation of the road Rajouri-Kandi-Budhal to link it to NH-1A at Ramban through Gul. The complete road alignment passes through hilly terrain with area experiencing extreme cold winters. The annual temperature varies from 10 to 30 degree. The annual rainfall ranges from 130cm-160cm. the area experiences snowfall on most of the road stretch during the months of December, January and February.

The Project road falls under 3 districts namely Rajouri, Reasi and Ramban. But the major section of the project road falls under Reasi district.

#### Consultancy Services

The work for Consultancy Services for Preparation of Feasibility study/ Detailed Project Report on EPC mode for the up-gradation of main road Budhal-Mahore-Gul to NHDL specifications from Km 0.00 to Km 114.875 and an artery from Mahore at Km 57.00 to Km 68.00 on road Reasi-Arnas-Mahore (Net Length 125.875 Km) in 31 BRTF area under Project Sampark in J&K State have been awarded to Almondz Global Infra Consultant Ltd (AGICL) In JV with Manglam Associates, Accordingly consultants have commenced the services.

#### In line with Terms of references (TOR) the following reports has been submitted

- I. Final Inception Report was submitted vide letter no. AGICL/Jammu-BRO/18/02 dated 11<sup>th</sup> Oct. 2018, and same has been approved by the Competent Authority vide letter no. 80870/76/E8 dated 16<sup>th</sup> Feb. 2019.



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- II. Final Alignment Plan/Report was submitted vide letter no. AGICL/Jammu-BRO/19/04 dated 6<sup>th</sup> Feb. 2019, and same has been approved by the Competent Authority vide letter no. 80870/95/E8 dated 28<sup>th</sup> Feb. 2019.
- III. Final Feasibility Report was submitted vide letter no. AGICL/Jammu-BRO/19/15 dated 11<sup>th</sup> April 2019, and same has been approved by the Competent Authority vide letter no. 80870/56/E8 dated 25<sup>th</sup> Jul. 2019.
- IV. Draft Detailed Project Report (RAM Road) has been submitted vide letter no. AGICL/Jammu-BRO/19/31 Dated 20.06.2019.

**Subsequently Final Detailed Project Report documents for Section B (i.e. from Km 57+000 to Km 68+000) is being submitted with incorporating the comments received as following:**

1. *Comments from 110 RCC Vide e mail dated 30<sup>th</sup> September 2019*
2. *HQ CE(P) Sampark Letter No. 80303/FS & DPR/R-T/142/E8 Dated 18<sup>th</sup> September 2019*
3. *Review meeting held at office of 31 BRTF dated 2<sup>nd</sup> and 3<sup>rd</sup> September 2019 and at HQ Sampark dated 04<sup>th</sup> September 2019*
4. *HQ DGBR Delhi Letter No. 44001/DGBR/SPK/337/05/West Dte Dated 17<sup>th</sup> July 2019 received vide email dated 18<sup>th</sup> July 2019*
5. *HQ 31 BRTF Letter No. 80870/50/E8 Dated 10<sup>th</sup> July 2019 received vide email on 17<sup>th</sup> July 2019*
6. *110 RCC (GREF) Letter No. 800/CE(P) SPK/03/2018-19/31/E8 Dated 08<sup>th</sup> July 2019*
7. *HQ ADGB (N-W) Chandigarh Letter No. 22009/ADGNW/SPK-204/02/E2 Estg Dated 1<sup>st</sup> July 2019*
8. *HQ CE (P) Sampark Letter No. 80315/FS & DPR/B-M-G/2018-19/120/E8 Dated 29<sup>th</sup> June 2019*

**Head Office:** Almondz Global Infra Consultants Limited.  
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**The consultancy services are to be provided in six stages as brought out below.**

**Stage:** Report and Deliverables

- Stage 1:** Inception Report
- Stage 2:** Feasibility Report
- Stage 3:** LA & Clearances I Report
- Stage 4:** Detailed Project Report (DPR)
- Stage 5:** Technical Schedules
- Stage 6:** LA & Clearances II Report

#### **Present Submission**

The present submission pertains to submission of the following volumes:

<b>Volume – I</b>	Main Report
<b>Volume – IA</b>	Annexure to Main Report
<b>Volume – II</b>	Design Report
<b>Volume – II-Part-1</b>	Road & Pavement Design
<b>Volume – II-Part-2</b>	Bridges & Structures Design
<b>Volume – II-Part-3</b>	Drainage Design Report
<b>Volume – III</b>	Material Report

<b>Volume – IV</b>	Environmental Impact Assessment, Environmental Management Plan & Resettlement Action Plan
<b>Volume – V</b>	Technical Specifications
<b>Volume – VI</b>	Rate Analysis
<b>Volume – VII</b>	Cost Estimates
<b>Volume – VIII</b>	Bill of Quantities
<b>Volume – IX</b>	Drawings

## Objectives

- The main objective of the consultancy service is to establish the technical, economical, and financial viability of the project and prepare detailed project reports for rehabilitation and upgrading of the existing road to 2-lane with PS/4 lane configuration.
- The viability of the project shall be established taking into account the requirements with regard to rehabilitation, upgrading and improvement based on highway design, pavement design, provision of service roads wherever necessary, type of intersections, rehabilitation and widening of existing and/or construction of new bridges and structures, road safety features, quantities of various items of works and cost estimates and economic analysis.
- The Detailed Project Report would inter-alia include detailed highway design, design of pavement and overlay with options for flexible or rigid pavements, design of bridges and cross drainage structures and grade separated structures, design of service roads, quantities of various items, detailed working drawings, detailed cost estimates, economic and financial viability analyses, environmental and social feasibility, social and environmental action plans as appropriate and documents required for tendering the project on commercial basis for international / local competitive bidding.
- The DPR consultant should ensure detailed project preparation incorporating aspects of value engineering, quality audit and safety audit requirement in design and implementation.
- The consultant should, along with Feasibility Report, clearly bring out through financial analysis the preferred mode of implementation on which the Civil Works for the stretches are to be taken up. The consultant should also give cost estimates along with feasibility report/ detailed Project Report.
- If at feasibility stage, employer desire to terminate the contract, the contract will be terminated after payment up to that stage.



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## Scope of Services

- a. As far as possible, the widening/improvement work to NHDL specification shall be within the existing right of way avoiding land acquisition, except for locations having inadequate width and where provisions of short bypasses, service roads, alignment corrections, improvement of intersections are considered necessary and practicable and cost effective. However bypass proposals will also be considered, wherever in urban areas, improvement to NHDL specification of the existing road is not possible. The Consultant shall furnish land acquisition details (i.e. all necessary schedules as per L.A. act) as per revenue records/ maps for further processing of land acquisition. Consultant shall also submit 3a, 3A and 3D draft notification for acquisition of land
- b. Study the possible locations and design of toll plaza, if applicable to the project. Wayside amenities required on tolled highway shall also be planned. The local and slow traffic may need segregation from the main traffic and provision of service roads and fencing may be considered, wherever necessary to improve efficiency and safety.
- c. The general scope of services is given in the sections that follow. However, the entire scope of services would, inter-alia, include the items mentioned in the Letter of Invitation and the TOR. The Consultant will also make suitable proposals for widening/improvement of the existing road and strengthening of the carriageways, as required at the appropriate time to maintain the level of service over the design period. The Consultants shall prepare documents for EPC/PPP contracts for each DPR assignment.
- d. All ready to implement 'good for construction' drawings shall be prepared.
- e. Environmental Impact Assessment, Environmental Management Plan and Rehabilitation and Resettlement Studies shall be carried out by the Consultant meeting the requirements of the lending agencies like ADB/ World Bank/JICA, etc.
- f. Wherever required, consultant will liaise with concerned authorities and arrange all clarifications. Approval of all drawings including GAD and detail engineering drawings will be got done by the consultant from the Railways. However, if Railways require proof checking of the drawings prepared by the consultants, the same will be got done by CE (P) Sampark (BRO) and payment to the proof consultant shall be made by CE (P) Sampark (BRO) directly. Consultant will also obtain final approval from Ministry of Environment and Forest for all applicable clearances. Consultant will also obtain approval for estimates for shifting of utilities of all types from the concerned authorities and competent authority within MoRTH and its implementation agencies, as applicable. Consultant is also required to prepare all Land Acquisition papers (i.e. all necessary schedule and draft 3a, 3A, and 3D,3G notification as per L.A. act) for acquisition of land either under NH Act or State Act
- g. The DPR consultant may be required to prepare the Bid Documents, based on the feasibility report, due to exigency of the project for execution if desired by CE (P) Sampark (BRO)
- h. Consultant shall obtain all types of necessary clearances required for implementation of the project on the ground from the concerned agencies. The client shall provide the necessary supporting letters and any official fees as per the demand note issued by such



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concerned agencies from whom the clearances are being sought to enable implementation.

- i. The consultant shall prepare separate documents for BOT as well as EPC contracts at Feasibility stage / DPR stage. The studies for financing options like BOT, Annuity, EPC will be undertaken in feasibility study stage.
- j. The consultant shall be guided in its assignment by the Model Concession/ Contract Agreements for PPP/ EPC projects, as applicable and the Manual of Specifications and Standards for two/ four/ six laning of highways published by IRC (IRC:SP:73 or IRC:SP:84 or IRC:SP:87, as applicable) (the "Manual") along with relevant IRC codes for design of long bridges.
- k. The consultant shall prepare the bid documents including required schedules (as mentioned above) as per EPC/ PPP documents. For that it is suggested that consultant should also go through the EPC/PPP documents of ministry before bidding the project. The Consultant shall assist the CE (P) Sampark (BRO) and it's Financial Consultant and the Legal Adviser by furnishing clarifications as required for the financial appraisal and legal scrutiny of the Project Highway and Bid Documents.
- l. Consultant shall be responsible for sharing the findings from the preparation stages during the bid process. During the bid process for a project, the consultant shall support the authority in responding to all technical queries, and shall ensure participation of senior team members of the consultant during all interaction with potential bidders including pre-bid conference, meetings, site visits etc. In addition, the consultant shall also support preparation of detailed responses to the written queries raised by the bidders.

## Area of the Project

The Project road falls under Reasi District only.

## Location

**Section B -** Connecting Mahore to Arnas towards Reasi District (RAM),

Section B starts from Km 57.00 to Km 68.00 on road Reasi-Arnas-Mahore.

Start Chainage(Km)	Existing End Chainage (Km)	Design End Chainage	GPS Co-Ordinate (UTM)	
			Start Point	End Point
Ch. 57+000 at Mahore.	Ch. 68+000 at Mahore.	Ch. 67+424 at Mahore	43 S, 485494.26 m E, 3685156.83 m N	43S, 486453.34 m E, 3686443.94 m N

## Geographical area

The state of Jammu and Kashmir covers an area of 222,236 sq.km. Jammu and Kashmir borders with the states of Himachal Pradesh and Punjab to the south. Jammu and Kashmir has an international border with China in the north and east, and the Line of Control separates it from the Pakistan. Jammu and Kashmir consists of three divisions: Jammu, Kashmir Valley and Ladakh, and is further divided into 22 districts. Jammu and Kashmir is home to several valleys such as the Kashmir Valley, Tawi Valley, Chenab Valley, Poonch Valley, Sind Valley and Lidder Valley. The main Kashmir Valley is

100 km. The Indus, Tawi, Ravi and Chenab are the major rivers flowing through the state. Jammu and Kashmir is home to several Himalayan glaciers.

## Topography & Climate

With an average altitude of 5,753 metres (18,875 ft) above sea-level, the Siachen Glacier is 76 km (47 mi) long making it the longest Himalayan glacier. In the south around Jammu, the climate is typically monsoonal. In the hot season, Jammu city is very hot and can reach up to 40 °C whilst in July and August, very heavy though erratic rainfall occurs with monthly extremes of up to 650 millimeters.

Because of Jammu and Kashmir's wide range of elevations, its biogeography is diverse. North-western thorn scrub forests and Himalayan subtropical pine forests are found in the low elevations of the far southwest. These give way to a broad band of western Himalayan broadleaf forests running from northwest-southeast across the Kashmir Valley. Rising into the mountains, the broadleaf forests grade into western Himalayan subalpine conifer forests. Above tree line are found north-western Himalayan alpine shrub and meadows. Much of the northeast of the state is covered by the Karakoram-West Tibetan Plateau alpine steppe. Around the highest elevations, there is no vegetation, simply rock and ice.

The Jhelum River is the only major Himalayan River which flows through the Kashmir valley. The Indus, Tawi, Ravi and Chenab are the major rivers flowing through the state. Jammu and Kashmir is home to several Himalayan glaciers. With an average altitude of 5,753 metres (18,875 ft) above sea-level, the Siachen Glacier is 70 km (43 mi) long making it the longest Himalayan glacier.

The climate of Jammu and Kashmir varies greatly owing to its rugged topography. In the south around Jammu, the climate is typically monsoonal, though the region is sufficiently far west to average 40 to 50 mm (1.6 to 2 inches) of rain per months between January and March. In the hot season, Jammu city is very hot and can reach up to 40 °C (104 °F) whilst in July and August, very heavy though erratic rainfall occurs with monthly extremes of up to 650 millimetres (25.5 inches). In September, rainfall declines, and by October conditions are hot but extremely dry, with minimal rainfall and temperatures of around 29 °C (84 °F).

Across from the Pir Panjal range, the South Asian monsoon is no longer a factor and most precipitation falls in the spring from southwest cloud bands. Because of its closeness to the Arabian Sea, Srinagar receives as much as 25 inches (635 millimetres) of rain from this source, with the wettest months being March to May with around 85 millimetres (3.3 inches) per month. Across from the main Himalaya Range, even the southwest cloud bands break up and the climate of Ladakh and Zanskar is extremely dry and cold. Annual precipitation is only around 100 mm (4 inches) per year and humidity is very low. This region, almost all above 3,000 metres (9,750 ft) above sea level and winters are extremely cold. In Zanskar, the average January temperature is -20 °C (-4 °F) with extremes as low as -40 °C (-40 °F). All the rivers freeze over and locals actually do river crossings during this period because their high levels from glacier melt in summer inhibits crossing. In summer in Ladakh and Zanskar, days are typically a warm 20 °C (68 °F) but with the low humidity and thin air nights can still be cold.

## Tourism

Before the insurgency intensified in 1989, tourism formed an important part of the Kashmir economy. The tourism economy in the Kashmir valley was worst hit. However, the holy shrines of Jammu and Buddhist monasteries of Ladakh continue to remain popular pilgrimage and tourist destinations. Every year thousands of Hindu pilgrims visit holy shrines of Vaishno Devi and Amarnath, which has had significant impact on the State's economy. It was estimated in 2007 that the Vaishno Devi Yatra contributed Rs. 4.75 billion (USD 74 million) to the local economy annually a few years ago. The contribution should be significantly greater now as the number of Indian visitors have increased considerably. Foreign tourists have been slower to return. The British government still advises against all



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travel to Jammu & Kashmir with the exceptions to cities of Jammu & Srinagar. The travel between these two cities on Jammu- Srinagar highway and the region of Ladakh. While Canada excludes the entire region excepting Leh. Besides Kashmir, several areas in the Jammu region have a lot of tourist potential as well. Bahu Fort in Jammu city is the major attraction for the tourists visiting that city. Bagh- e- Bahu is another tourist destination. The local aquarium established by the fisheries department is visited by many. Tourists from across India visit in a pilgrimage to Shri Mata Vaishno Devi. Mata Vaishno Devi is located in the Trikuta Hills about 40 to 45 km from Jammu city. Approximately 10 million pilgrims visit this holy place every year.

Tourism in Kashmir valley has rebounded in recent years and in 2009 the State became one of the top tourist destinations of India. Gulmarg- one of the most popular Ski resort destination in India is also home to the world's highest green golf course. The State's recent decrease in violence has boosted the economy and tourism. It was reported that more than a million tourists visited Kashmir in 2011.

## Demographics

Jammu and Kashmir has a Muslim majority population. Though Islam is practiced by about 67% of the population of the state and by 97% of the population of the Kashmir valley, the state has large communities of Buddhists, Hindus (inclusive of Megh Bhagats) and Sikhs.

In Jammu, Hindus constitute 65% of the population, Muslims 31% and Sikhs, 4%; In Ladakh, Buddhists constitute about 46% of the population, the remaining being Muslims. The people of Ladakh are of Indo-Tibetan origin, while the southern area of Jammu includes many communities tracing their ancestry to the nearby Indian states of Haryana and Punjab, as well as the city of Delhi. In totality, the Muslims constitute 67% of the population, the Hindus about 30%, the Buddhists 1%, and the Sikhs 2% of the population.

According to political scientist Alexander Evans, approximately 95% of the total population of 160,000–170,000 of Kashmiri Brahmins, also called Kashmiri Pundits, (i.e. approximately 150,000 to 160,000) left the Kashmir Valley in 1990 as militancy engulfed the state. According to an estimate by the Central Intelligence Agency, about 300,000 Kashmiri Pundits from the entire state of Jammu and Kashmir have been internally displaced due to the ongoing violence.

## Administration

Jammu and Kashmir consists of three divisions: Jammu, Kashmir Valley and Ladakh, and is further divided into 22 districts. The Siachen Glacier, although under Indian military control, does not lie under the administration of the state of Jammu and Kashmir.

Kishtwar, Ramban, Reasi, Samba, Bandipora, Ganderbal, Kulgam and Shopian are newly formed district

Jammu Division	Name	Headquarters	Area (Km <sup>2</sup> )	Population 2001 Census	Population 2011 Census
	Kathua District	Kathua	2,651	550,084	615,711
	Jammu District	Jammu	3,097	1,343,756	1,526,406
	Samba District	Samba	904	245,016	318,611
	Udhampur District	Udhampur	4,550	475,068	555,357
	Reasi District	Reasi	1,719	268,441	314,714
	Rajouri District	Rajouri	2,630	483,284	619,266
	Poonch District	Poonch	1,674	372,613	476,820
	Doda District	Doda	11,691	320,256	409,576



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	Ramban District	Ramban	1,329	180,830	283,313
	Kishtwar District	Kishtwar	1,644	190,843	231,037

## Transport

### Road

Road Transport plays a vital role in the economic development of J&K State. Transport, whether passenger carrier or goods carrier, is important rather fundamental requirement for economic development of state. Accessibility of essential commodities in far flung areas depends on connectivity through road transport. Transport has and is playing significant role in this regard. Number of vehicles registered was 122638 during the year 2016-17 against which during the current financial year 2017-18 ending October, 2017, department has registered 101705 vehicles including 10028 commercial vehicles. Public and private transport has increased manifolds over the years. As against 818093 vehicles (both public and private) registered in 2011, the number of vehicles has reached to 1589895 ending October 2017.

### Railways

The rail link of fifty-three kilometers Jammu-Udhampur, 25 kilometers Udhampur-Katra and 119 kilometers Banihal-Baramulla links of Jammu-Srinagar-Baramulla line have already been completed and were functional. Katra-Banihal is the only missing link between Jammu-Baramulla.

### Air

The State of Jammu and Kashmir nestles between the lofty Himalayas to the North and Northeast, down to the plains bordered by the Ravi River to the South and the Southeast because of the varied terrain in the state, surface communications are long and arduous and the need had been felt for long to have an aviation organization set up under the direct control of the State Government.

## PROJECT ALIGNMENT DESCRIPTION

The project road is divided into two sections

**Section A** : Budhal-Mahore-Gul (BMG) – It starts from Budhal (Ch. 0.000 km) in Rajouri district and ends at Gul (Ch 110+565 km) in Ramban district.

Start Chainage(Km)	End Chainage (Km)	GPS Co-Ordinate (UTM)	
		Start Point	End Point
Ch. 0+000 at Budhal.	Ch. 110+565 at Gul.	43 S, 467111.86 m E, 3692122.49 m N	43S, 500280.75 m E, 3681052.43 m N

And

**Section B**: Reasi-Arnas-Mahore (RAM) which lies in the middle of the section - It starts from Mahore (Ch. 57.000 km) in Reasi district and ends at km 68.000. Length of the project is 11.000 km.



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			Start Point	End Point
Ch. 57+000 at Mahore.	Ch. 68+000 at Mahore.	Ch. 67+424 at Mahore	43 S, 485494.26 m E, 3685156.83 m N	43S, 486453.34 m E, 3686443.94 m N

Several presentations have been given at office of Commander 31 BRTF regarding the alternative options for the alignment. The Alignment has been approved after the meeting and presentation on Alignment Options of the project corridor held at

1. At 31 BRTF, Rajouri on 03-12-2018 & 04-12-2018
2. At CE office Sampark, Jammu on 05-12-2018
3. At office of HQ ADGBR (N-W), Chandigarh on 01-02-2019

Subsequently Draft Detailed Project Report has been submitted vide letter no. AGICL/Jammu-BRO/19/31 Dated 20.06.2019.

### RIGHT OF WAY [ROW]

The details of existing ROW is collected from concerned departments during detailed investigations and since Khasra Map of existing Road is not available so assuming the existing center line as reference the same is shown in the following

S. No.	Existing Chainage		ROW		
	From	To	Hill Side	Valley Side	Total
<b>Section B -RAM Road*</b>					
1.	57+000	68+000	16.76 m (55 feet)	12.19 m (25 feet)	24.38 m (80 feet)

\*The Existing ROW of RAM Road is sourced from letter No. 2100/RAM/LA/XY/E2 dated 01.09.2019, from the office of Officer Commanding, 110 RCC (GREF).

### ABUTTING LAND USE PATTERN

Section B - An Artery from Mahore at existing Km 57.00 to existing Km 68.00		
Type of Land	Length(Km)	Percentage (%)
Agricultural	N/A	0
Habilitations	0.650	5.91
Barren	2.25	20.45
Forest	8.10	73.64

### TERRAIN

The project alignment passes through steep/mountainous terrain.



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## IMPORTANT SETTLEMENTS

There is only one major settlement on the project road from Km 57+000 to Km 68+000.

Section B - An Artery from Mahore at existing Km 57.00 to existing Km 68.00				
S.No	Name of Settlement	Existing Chainage		Length(m)
		From	To	
1	Mahore	66+660	67+310	650.00

## TRAFFIC

S. No.	Type of Survey	Place	Existing Chainage (km)	Duration
1.	Classified Traffic Volume Count Survey	Mahore	67+900	24 x 7
2.	Axle Load Survey	Mahore	67+900	24 hrs
3.	Origin and Destination Survey	Mahore	67+900	24 hrs

Detailed analysis of the traffic has been given in Chapter 7 Vol 1 (Main Report)

## PAVEMENT COMPOSITIONS

The method of design followed is a modification of the CBR method incorporating mechanistic approach. The empirical pavement design presented in IRC: 37-2018. "GUIDELINES FOR THE DESIGN OF FLEXIBLE PAVEMENTS" (Fourth Revision) and IRC:SP:63-2018 "GUIDELINES FOR THE USE OF INTERLOCKING CONCRETE BLOCK PAVEMENT" has been extended to cater design traffic.

The traffic used in design is in terms of the cumulative number of standard axles to be carried during the design life of the road.

Use of the CBR method for pavement design, the sub grade strength of the new carriageway were assessed in terms of the CBR value as per the procedure prescribed in the standards.

Pavement Design for Reconstruction Section								
Homogenous Section	Design Chainage		Design CBR (%)	Adopted Design Traffic (msa)	Design Period(year)	Pavement Composition (mm)		
	From	To				BC	DBM	WMM
Reasi-Arnas-Mahore	57+000	66+000	5	5 msa	20	30	65	250
	66+650	67+424	5	5 msa	20	30	65	250
								150
								150



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CC Block pavement composition								
Homogenous Section	Design Chainage		Design CBR (%)	Adopted Design Traffic (msa)	Pavement Composition (mm)			
	From	To			CC Block	Sand bed	WMM	GSB
Reasi-Arnas-Mahore	66+000	66+650	5	5 msa	80	35	175	250

### Submergence

There is no submergence area coming under the project corridor.

### CROSS DRAINAGE WORKS

There is No Existing Major Bridge and Minor Bridges and total 59 Existing culverts , Details of Existing Structure have been given in Vol I (A).

### RAILWAY TRACKS / CROSSINGS

There is no railway crossing in the existing project road.

### Toll plaza

There are no Toll plaza coming along the project corridor.

### Investigations and Surveys

Details for the following have been attached in Vol. 1(A)

- **Road Inventory Survey**
- **Pavement Condition Survey**
- **Culvert and Bridge Inventory Survey**

### DESIGN PARAMETERS

Guidelines, contained in IRC:SP:73-2018, IRC: 86, IRC: 38, IRC:37 2018 and IRC: SP: 48-1998 and IRC:52., Detailed design paramaters which have been taken into consideration have been given in Chapter 6 of Vol I (Main Report).

### TYPICAL CROSS SECTION

Typical Cross-Sections for the road part have been proposed. Detailed drawings for the proposed Typical Cross-Sections have been given in Volume IX (Drawings)

## RESETTLEMENT AND REHABILITATION (R&R) POLICY

The Ministry of Rural Development (Department of Land resources) has prepared the National Policy on Resettlement and Rehabilitation for the people who will be affected by the project. The policy describes the principle and approach to minimize and mitigate the negative social and economic impacts caused by the project. The R&R policy broadly addresses all issues such as compensation, assistance, replacement value, vulnerable group, etc. The policy ensures that people affected by project must be able to restore their livelihood to the pre project level. The Project alignment is proposed in such away with minimum Resettlement and Rehabilitation.

### COST ESTIMATE

An contingencies of 5.0 % has been taken against the provision for Forest & Environmental clearance, Road Diversion etc.

The final work out of total project costs are given in Cost Estimate supported by various annexure is **Rs. 90.8362 Crore**.

This Chapter has been provided as separate Volumes:

Volume-IV: Cost Estimate

Volume-V: Bill of Quantities