1 INTRODUCTION

The Ministry of Road Transport and Highways (MORT&H) is poised to develop all remote and strategically important roads of hilly terrains to perennial routes. Further, MORT&H has nominated National Highways and Infrastructure Development Corporation Limited (NHIDCL), as the implementing agency for these projects.

National Highways & Infrastructure Development Corporation (NHIDCL) has awarded the **"Consultancy Services for Feasibility Study, Preparation of Detailed Project Report and providing pre-construction services for upgradation to 2-lane with Paved Shoulder of NH configuration for Khellani - Chhatroo Road (approximate length 97.5km) in the state of Jammu & Kashmir"** to **M/S RODIC CONSULTANTS PVT. LTD.**, in Joint Venture with **M/S MONARCH SURVEYORS AND ENGINEERING CONSULTANTS PVT. LTD.**, New Delhi.

The "Letter of Commencement of Assignment" for the Consultancy service was issued vide letter no. NHIDCL/J&K/NH-244/Khellani-Khanabal/DPR/2018-19/280 dated 06.06.2019. Accordingly, as per clause 2.3 of General Condition of Contract, the commencement date of consultancy service is 21st June 2019, i.e. 15 days from the "Letter to Commencement".

2 BACKGROUND OF PROJECT

The entire project road (Khellani - Chhatroo) lies in the State of Jammu and Kashmir. The state occupies a total area of 222,236 square kilometers. Jammu and Kashmir borders with the States of Himachal Pradesh and Punjab towards the south. Jammu and Kashmir have an international border with China in the North and East, and the Line of Control separates it from Pakistan. Jammu and Kashmir consist of three divisions: Jammu, Kashmir Valley and Ladakh, and is further divided into 22 Districts.

The project road of **Khellani - Chhatroo** is part of NH-244 (Old NH-1B) which runs from Batote to Khanabal via Khellani, Thatri, Kishtwar, Vailoo, Achabal and Anantnag. The Project Road is situated in Doda and Kishtwar Districts and located at south-west part of Jammu and Kashmir state. The project road stretch goes towards east from Khellani and turns north from New Thathri and finally ends near Chhatroo traversing through Kishtwar.

As per contract, the Project Road starts from existing Km 44.500 near Khellani and passes through Gangalwar, Bhuta, Suigwari, Nai Basti, Premnagar, Thatri, Darabshalla, Kandiri,

Kishtwar, Marwah, Kodia, Dhadhpeth, Mughal Maidan, and Udil Gurjan and terminates at existing Km 142.000 near Chhattroo.

Since, the end point of "Goha – Khellani section including Khellani tunnel project" coincides with the project road (Khellani – Chatroo) near its starting location at Ex. Ch. 45+250. So, we have considered this location as our starting point. And "Vailoo tunnel project" starts near the end point of the Khellani – Chattroo project at ex. Ch. 140+460. So, we have considered this location as our end point for the project Khellani – Chhatroo.

These three projects mentioned above will work as a single stretch in future, and will facilitate the traffic going towards Vailoo/Anantnag side, instead of taking Sinthan Pass route which is closed for almost 3-4 months during winter season, so the traffic will divert from Chattroo and reach Vailoo/Anantnag via Vailoo Tunnel. This proposed section will bypass the very long and absurd stretch of Sinthan Pass.

DPRs of Goha - Khellani Tunnel project and Vailoo Tunnel project are under preparation and the project stretch of Khellani - Chhatroo will cater as link between these two tunnel projects with approaches.

Accordingly, the project corridor of Khellani-Chhatroo, starts from Ex. Km 45+250 near Khellani and ends at Ex. Km 140+460 near Chhatroo and total existing length of said section is 95.210 Km.

Key Map and location Map of the project section is presented in Fig. 2.1.

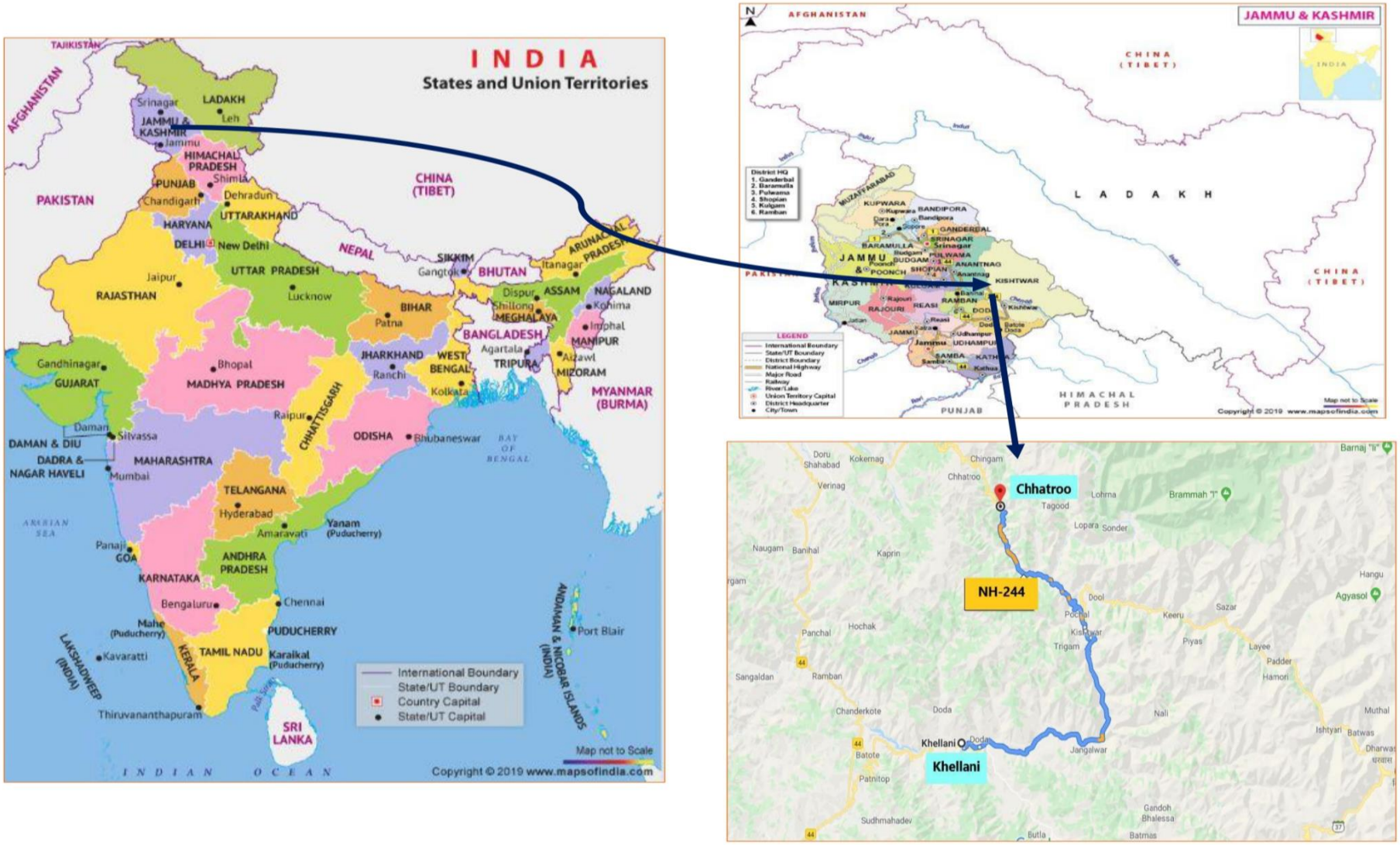


Fig: 2.1(a): Key map of the Project Stretch

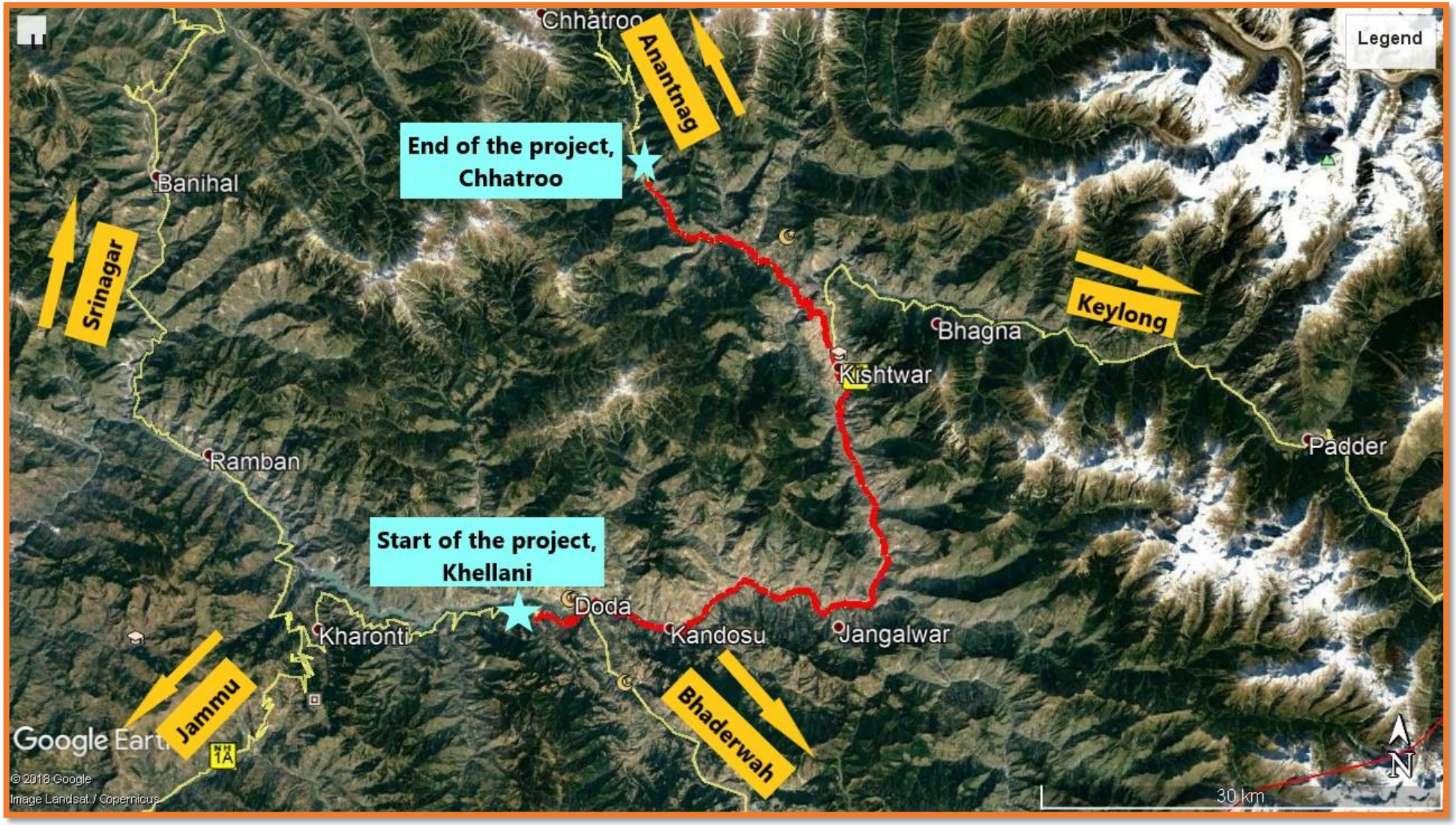


Fig: 2.1(b): Location map of the Project Stretch

2.1 Khellani - Chhatroo Project Stretch

2.1.1 Start Point

The start point of the project road is near Khellani at Ex. Km. 45+250 on NH-244. It has coordinates at 33.134658°N and 75.522470°E in Doda District of J&K.

2.1.2 End Point

The end point of the project road is near Chhatroo at Ex. Km. 140+460 on NH-244. It has coordinates at 33.439145°N and 75.604426°E in Kishtwar district of J&K.

2.1.3 Climate

Climate of Khellani is classified as warm and temperate. Doda district encounters a significant amount of rainfall. Even in the driest month there is a lot of rain. This climate is according to the Köppen-Geiger climate classification. In Doda, the average annual temperature is 18.8 °C. The annual rainfall here is averages 1182 mm.

Climate around Kishtwar is also classified as warm and temperate it receives a significant amount of rainfall during the year. This is true even for the driest month. The climate here is classified as Cf-A by the Köppen-Geiger system which implies that Kishtwar district lies in Tropical region. The average temperature in Kishtwar district is 15.4 °C. About 994 mm of precipitation falls annually.

2.1.4 Geology and Soil types

Annual rainfall in the District is usually registered 1270 mm. Soil in hilly areas is poor but in the plain areas it is fertile about 83.05% of the population lives in villages and 16.94% in urban areas. Crops like paddy maize pulses grow in abundance. In addition to this the District is also rich in fruit growing.

Most of the soils in the district of Kishtwar and Doda are sandy loam to clayey loam in nature with high rate of soil loss due to erosion. Saffron of purest quality is produced in the iron rich soil at Poochhal, Matta, Lachdayaram, Berwar and Hidyal.

3 Details of existing road

The existing road is mainly intermediate to two lane carriageways with width varying from 5.0 m to 12.0 m in entire stretch but majority of portion traverses as carriageway of 7.0m width. It traverses through mountainous terrain mainly and has its elevation ranging from 845mt to 1734mt from MSL. The surface of the carriageway is

bituminous, and surface of the shoulder is earthen of varying width of 0.5 m to 1.0 m on both the sides of the project highway. The roadside drainage network on the existing road section is not adequate.

3.1 Existing Alignment

The horizontal alignment of the existing road has stretches with sub-standard horizontal curves which need to be taken care during alignment design. The existing alignment passes through many sharp curves and sudden turns. It also encounters many hair pin bends along its stretch. The horizontal curves for most of the stretches allow a negotiable speed of 40 – 50 kmph but also at some stretches where the vehicle speed is as low as 20 – 30 kmph which require geometric improvement.

The vertical geometry also appears to be sub-standard at many places resulting in slow down of vehicle movement and inadequate sight distance. At many points it encounters longitudinal gradient more than 7% and improperly super elevated outer edges. This would require improvement of vertical curves during alignment design.

Note: - There is a major landslide prone area near Existing Chainage at Km 83, where a new tunnel has been proposed under new DPR. This proposed tunnel will bypass that prone area and will provide safe and smooth traffic flow.

3.2 Terrain Classification

The terrain of Khellani – Chhatroo Road is mountainous and runs parallel to the Chenab river valley.

3.3 Settlements

The project road passes through Gangalwar, Bhuta, Suigwari, Nai Basti, Premnagar,Thatri, Darabshalla, Kandiri, Kishtwar, Marwah, Kodia, Dhadhpeth, Mughal Maidan, and Udil Gurjan and terminates near Chhattroo. The major settlements along the project road are:

Table: Details of Major Settlements along the Project Road

Sr. No.	Village/Town Name	Existing Chainage
1	Premnagar	68+700 – 69+700
2	Thatri	80+500 – 80+700
3	Darabshalla	86+600 – 87+300
4	Kishtwar	107+700 – 113+500
5	Mughal Maidan	131+500 – 132+300
6	Chhattroo	138+200 – 142+100

3.4 Major and Minor Intersections

There are number of earthen, gravel and bituminous roads meeting/crossing the project highway. The important junctions along the project road are Bhaderwah Highway, Thathri-Gandoh road, Sarthal Road, NH-244 in Kishtwar city, Keylong-Tandi Road and Palmar-Ikhala Road. There are around 22 minor junctions and 06 major junctions along the project road.

3.5 Existing Major and Minor Bridges and Culverts

The number of major bridges across rivers and Nalla (span exceeding 60 m), minor bridges (span between 6 m to 60 m) and culverts and causeway existing on the project stretch is given table below:

Table - Details of existing Cross Drainage Structure

Sr. No.	Type	No.
1	**Major Bridge**	02
2	**ROB**	00
3	**Minor Bridge**	23
4	**Culvert**	188
5	**Causeway**	09

4 Scope of Report and Document at Stage -2 (For Alignment Finalization)

This report is the design basis of Highways along with structure which is part of alignment report Stage 2 services of the Contract. This report addresses the civil, structural and highway design criteria and related parameters adopted in the Feasibility and Detail Project Report design stage.

The major elements that are covered by this design manual are: -

- Highway Design
- Bridge Structure
- Embankment
- Other miscellaneous components

Highways and bridge shall be designed as per the latest Indian Road Congress (IRC) Codes as on August 2019. In case the IRC codes are silent about any aspect, Indian Standards (IS) Codes shall be followed. EURO, BS and American Standards Codes shall be referred if the guideline is not available in the Indian codes and to recommend the

same for concurrence/approval of Authority.

5 GENERAL DESIGN STANDARDS

5.1 Design Elements

The design of following elements has been considered:

1	Road Links	-	Cross-section, Horizontal Alignment, Vertical Alignment
2	Road Junction-	-	At-grade Intersections and Interchanges
3	Pavement of Road -	-	Flexible Pavement and Paved Shoulder including drain
4	Structures	-	Bridges, Viaduct & Culverts etc.
5	Road Signs, Markings, Safety Features and Other Accessories		

5.2 Guiding Standards for Highway Design

The design of various elements of highways for project road shall be governed by the Provisions of the following IRC Codes / Guidelines / Manuals.

1	IRC: 38-1988	-	Guidelines for Design of Horizontal Curves for Highways and design Tables.
2	IRC: 62-1976	-	Guidelines for Control of Access in Highways
3	IRC: 64-1990	-	Guidelines for capacity of Roads in Rural Areas
4	IRC: 65-1976	-	Recommended Practice for Traffic Rotaries
5	IRC: 66-1976	-	Recommended Practice for Sight Distance in Rural Highways
6	IRC: 67-2012	-	Code of Practice for Road Signs (Third Revision)
7	IRC: 73-1980	-	Geometric Design Standards for Rural (Non-Urban) Highways.
8	IRC: 86-2018	-	Geometric Design Standards for Urban Roads and streets.
9	IRC: SP: 23-1993	-	Vertical curves for Highways.
10	IRC: SP: 41-1994	-	Guidelines for the Design of At-Grade Intersections in Rural & Urban Areas.
11	MORT&H	-	Specification for Road and Bridge work, 2013 (5th Revision)
12	IRC: SP: 50-2013	-	Guidelines on Urban Drainage (First Revision)
13	IRC: SP: 44-1996	-	Highways Safety Code
14	IRC: SP: 19-2001	-	Manual for Survey, Investigation and Preparation of Road Projects
15	IRC: 92-1985	-	Guidelines for the Design of Interchanges in Urban Areas
16	IRC: 75-2015	-	Guidelines for Design of High Embankments

17	IRC: 54-1974	-	Lateral and Vertical clearances at Underpasses for Vehicular traffic.
18	IRC: SP:73-2018	-	Manual of Standards & Specifications for Two Laning of Highways.
19	IRC: SP:84-2019	-	Manual of Standards & Specifications for Four Lanning of Highways.
20	IRC: SP: 48:1998	-	Hill Road Manual
21	Manual for Safety in Road Design		

5.3 Horizontal Alignment

a) General

Highway design, all geometrical elements should be determined for consistent operation under the design speed in general. A horizontal alignment should be as smooth and consistent as possible with the surrounding topography. To achieve that, an appropriate blending with the natural contours is preferable to the one with long tangents through the terrain.

b) Sight Distances

Visibility is an important requirement for the safety of travel on roads. For this it is necessary that sight distance of adequate length is available in different situations, to permit drivers enough time and distance to control their vehicles so that chances of accidents are minimized. Sight distance is a direct function of the design speed. Two types of sight distances are considered in design of hill roads, (a) Stopping Sight Distance, which is the clear distance ahead needed by a driver to bring his vehicle to a stop before meeting a stationary object in his path. (b) Intermediate sight distance which is defined as twice the stopping sight distance. In stretches where even intermediate sight distance is not available, safe stopping site distance should be provided with traffic signs depicting “Overhead Prohibited” at all such locations.

Sight distance corresponding to various design speeds as per IRC: SP:48-1998 are given below.

Safe Sight distance for various Speeds

Design values of stopping and intermediate sight distance for various speeds		
Speed (km/h)	Design values - metres	
	Stopping sight distance	Intermediate sight distance
20	20	40
25	25	50
30	30	60
35	40	80
40	45	90
50	60	120

On hill roads stopping sight distance is absolute minimum from safety angle and must be ensured regardless of any other considerations. It would be a good practice if this value can be exceeded and visibility corresponding to intermediate sight distance provided in as much length of road as possible. Advantage of intermediate sight distance is that the driver can get reasonable opportunities to overtake with caution and driving task becomes much easier.

However as per IRC: SP:73-2018, Sight distance corresponding to various design speeds are:

Safe Sight distance for various Speeds

Speed (km/hr)	Minimum Sight Distance (m)	Overtaking Sight Distance (m)
100	360	640
80	240	470
60	180	340
40	90	165

Accordingly, the sight distance has been adopted with reference to both codes.

c) Horizontal Curve

The minimum horizontal curve radius is the limiting values of curvature for a given design speed and is determined based on from the maximum rate of super elevation and the side friction factor. As per the IRC: SP: 48:1998, the ruling and absolute minimum radii of horizontal curves for different terrain and areas are as follows:

Minimum Radii of Horizontal Curves for Various Classes of Hill Roads;

Classification	Mountainous terrain				Steep terrain			
	Areas not affected by snow		Snow bound areas		Areas not affected by snow		Snow bound areas	
	Ruling Min (m)	Absol-ute Min (m)	Ruling Min (m)	Absol-ute Min (m)	Ruling Min (m)	Absol-ute Min (m)	Ruling Min (m)	Absol-ute Min (m)
National Highways and State Highways	80	50	90	60	50	30	60	33
Major District Roads	50	30	60	33	30	14	33	15
Other District Roads	30	20	33	23	20	14	23	15
Village Roads	20	14	23	15	20	14	23	15

Note: Ruling minimum and Absolute Minimum Radii are for ruling design speed and minimum design speed respectively.

On new roads, horizontal curves are designed with liberal radius provision that blends well. The overall geometry and topography. At few location desirable minimum radius of horizontal curve has not been adopted as to avoid huge cut of hills and to minimize the via-ducts.

However, as per the IRC: SP:73–2018, the minimum ruling radii of horizontal curve for National Highways corresponding to different terrain conditions are as follows:

Type of Terrain	Minimum Radii of Horizontal Curve	
	Desirable Minimum (m)	Absolute Minimum(m)
Plain/Rolling	400	250
Mountainous and Steep	150	75

Accordingly, the horizontal curve has been adopted with reference to both codes.

d) Extra Width of Pavement and Roadways

Extra widening is necessary on curves having radius less than 300 m to counterbalance mechanical and psychological disorder of the vehicle. Extra widening is achieved by increasing the width at a uniform rate along the curve.

On curve having no transition, widening is achieved in same way as super elevation i.e. four third is being attained on the straight section before start of the curve and one third on the curve. As Per IRC: SP: 48-1998, the extra widening shall be increased as follows:

Extra width of Pavement and Roadway

Widening of Pavement at Curves						
Radius of Curve (m)	Upto 20	21 to 40	41 to 60	61 to 100	101 to 300	Above 300
Extra Width (m)						
Two-lane	1.5	1.5	1.2	0.9	0.6	Nil
Single-lane	0.9	0.6	0.6	Nil	Nil	Nil

Extra width should be given by increasing the width at uniform rate along transition curve and full width given along circular curve. Entire widening should preferably be provided on inside of the curve. The extra widening may be attained by means of offset radial to the center line. It should be ensured that the pavement edge lines are smooth and there is no apparent kink.

As Per IRC: SP: 73-2018, the extra widening shall be increased as follows:

Extra width of Pavement and Roadway

Radius of Curve	Extra Width
75-100 m	0.9 m
101-300 m	0.6 m

The value and guidelines recommended by IRC are proposed to be adopted in design. Accordingly, the extra width of pavement wherever required, has been adopted with reference to both codes.

e) Super-elevation

Super elevation shall be limited to 7%, in snow bound areas. It shall be limited to 10%, in hilly areas not bound by the snow as per IRC SP: 48 -1998.

However, Super elevation shall be limited to 7 %, if radius of curve is less than desirable minimum. it shall be limited to 5 % if radius is more than the desirable minimum and at section where project highway passes through the urban section or falls on major junction as per IRC-SP:73-2018.

Accordingly, super elevation has been adopted with reference to both codes.

5.4 Vertical Alignment

The vertical alignment should produce a smooth longitudinal profile consistent with

standard of the road and of the terrain. Wherever possible horizontal and vertical curvature should be so combined that the safety and operational efficiency of the road is enhanced.

a) Gradients

The IRC: SP: 48-1990 proposes ruling vertical grades of 5% for mountainous terrains. However, for the project road, the following standard is proposed.

Recommended Gradients for Different Terrain Conditions

Table 6.11. Recommended Gradients for Different Terrain Conditions

Classification of Gradient	Mountainous terrain and steep terrain more than 3000 m above MSL	Steep terrain upto 3000 m height above MSL
Ruling Gradient	5% (1 in 20.0)	6% (1 in 16.7)
Limiting Gradient	6% (1 in 16.7)	7% (1 in 14.3)
Exceptional	7% (1 in 14.3)	8% (1 in 12.5)

As per IRC: SP: 73-2018 which proposes ruling vertical grades of 2.5% for Plain and Rolling and 5% for Hilly terrains. However, for the project road, the following standard is proposed.

Gradient

Nature of Terrain	Ruling Gradient	Limiting Gradient
Plain and Rolling	2.5%	3.3%
Mountainous	5.0%	6.0%
Steep	6.0%	7.0%

Accordingly, the vertical gradients have been adopted with reference to both codes.

b) Vertical Curves

As Per IRC: SP-23 design standards, the lengths of summit curves are 26.7 A and 8.4A for design speeds of 60 km/h and 40 km/h respectively and the lengths of valley curves are 15.0A and 6.6A for design speeds of 60 km/h and 40 km/h respectively. This is then, when length of vertical of curve for different speeds are greater than the sight distance.

TABLE 6. LENGTH OF VERTICAL CURVES FOR DIFFERENT SPEEDS WHEN LENGTH OF CURVE IS GREATER THAN SIGHT DISTANCE

Design speed (km/h)	Length of summit curve (metre) for			Length of valley curve (metre) for headlight distance
	Stopping sight distance	Intermediate sight distance	Overtaking sight distance	
20	0.9A	1.7A		1.3A
25	1.4A	2.6A		2.6A
30	2.0A	3.8A		3.5A
35	3.6A	6.7A		5.5A
40	4.6A	8.4A	28.4A	6.6A
50	8.2A	15.0A	57.5A	10.0A
60	14.5A	26.7A	93.7A	15.0A
65	18.4A	33.8A	120.4A	17.4A
80	32.6A	60.0A	230.1A	25.3A
100	73.6A	135.0A	426.7A	41.5A

Notes : 1. 'A' in the above Table is the algebraic difference in grades expressed as percentage.

2. The length of curves should be subject to minimum values given in Table 7.

Otherwise, the length of vertical should be subjected to minimum values given in table below.

It says that for the speed of 60 Km/hr. or 40 Km/hr., if the grade difference is calculated as 0.8% or 1.2% respectively, then there is no requirement of vertical curves otherwise minimum length of vertical curve provided should be 40 m or 20 m respectively.

Design speed (km/h)	Maximum grade change (per cent) not requiring a vertical curve	Minimum length of vertical curve (metre)
Upto 35	1.5	15
40	1.2	20
50	1.0	30
65	0.8	40
80	0.6	50
100	0.5	60

5.5 Design Speed

The project road passes through mountainous terrain. For geometric design of the highway, design speed is used as an index which links road function, traffic flow and terrain. An appropriate design speed should correspond to general topography and adjacent land use. The speed selected for design should also cater to travel needs and behavior of the road users.

The ruling and minimum design speed corresponding to the type of terrain as Per IRC: SP- 48:1998 is as:

Table 6.1. Design Speed (km /h)

Sl. No.	Road Classification	Mountainous Terrain		Steep Terrain	
		Ruling	Min	Ruling	Min
1	National and State Highways	50	40	40	30
2	Major District Roads	40	30	30	20
3	Other District Roads	30	25	25	20
4	Village Roads	25	20	25	20

Normally, ruling design speed should be guiding criteria for correlating the various geometric standards. Minimum design speed may, however, be adopted in sections where site conditions including costs do not permit adoption of ruling design speed.

However, the ruling design speed corresponding to the type of terrain as per IRC SP 73-2018 is as under:

Nature of Terrain	Cross Slope of the Ground	Design Speed (km/h)	
		Ruling	Minimum
Plain and Rolling	Up to 25 per cent	100	80
Mountainous and Steep	More than 25 per cent	60	40

Accordingly, design speed adopted to be maximum 60Km/hr. as per IRC: SP:73-2018.

5.6 Cross Sectional Elements Proposed

a) Lane Width

As per IRC: SP: 48-1998 and IRC: SP:73-2018, the standard carriageway width for two lane highway shall be 7.0 m.

b) Shoulders

The designing of shoulder has been done accordance with the concern IRC codes. According to IRC: SP 73-2018 for two lane highways in mountainous and steep terrain should be as.

Type of Section		Width of Shoulder (m)*		
		Paved	Earthen	Total
Open country with isolated built up area	Hill Side	1.5 m	-	1.5 m
	Valley Side	1.5 m	1.0 m	2.5 m
Built up area and approaches to grade separated structures/ bridges	Hill Side	0.25 m + 1.5 m (Raised)	-	1.75 m
	Valley side	0.25 m + 1.5 m (Raised)	-	1.75 m

c) Typical road Cross Section

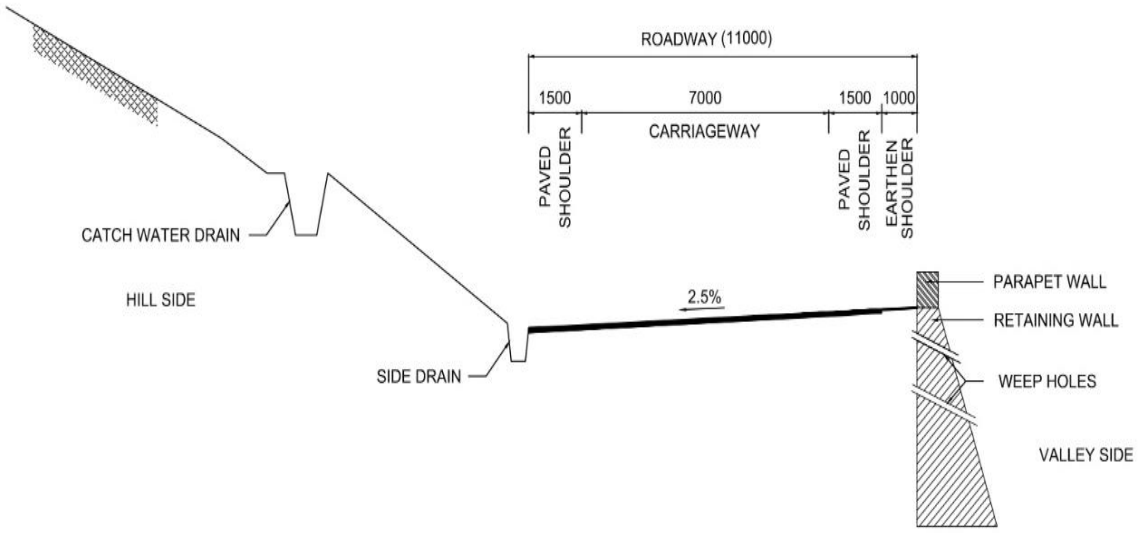
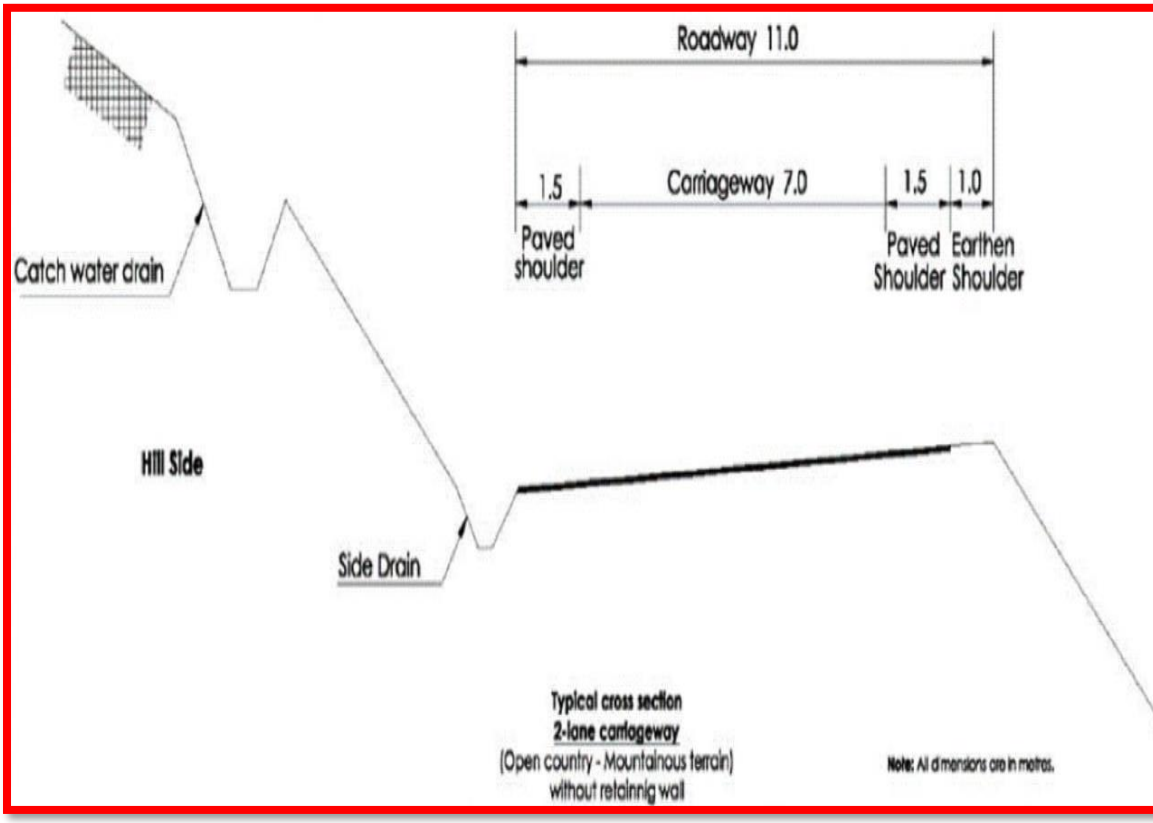
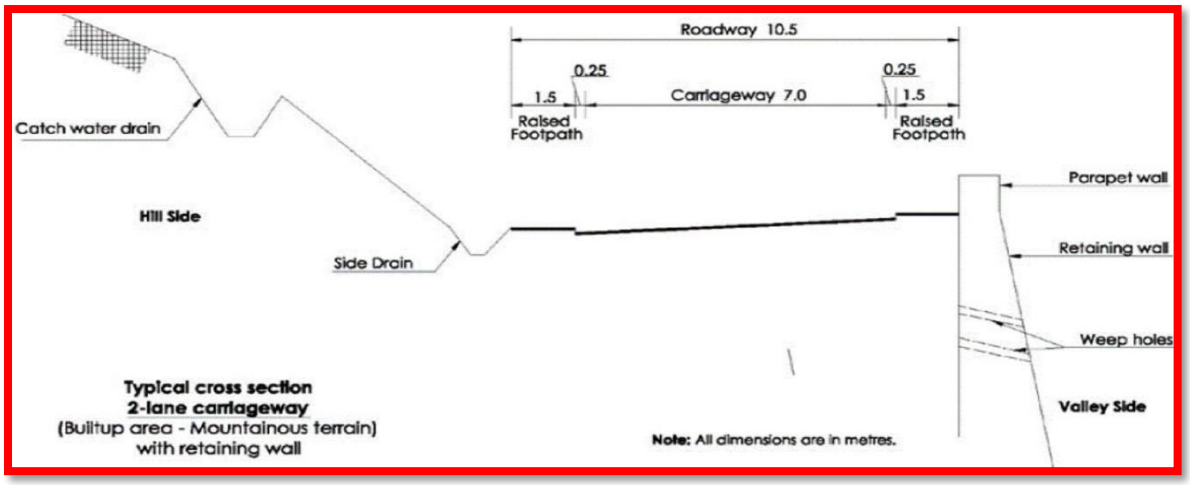


Fig 2.8 Typical Cross Section , 2-Lane Carriageway (with paved shoulder)
(Open country - Mountainous Terrain), with retaining wall and parapet
IRC : SP : 73-2018





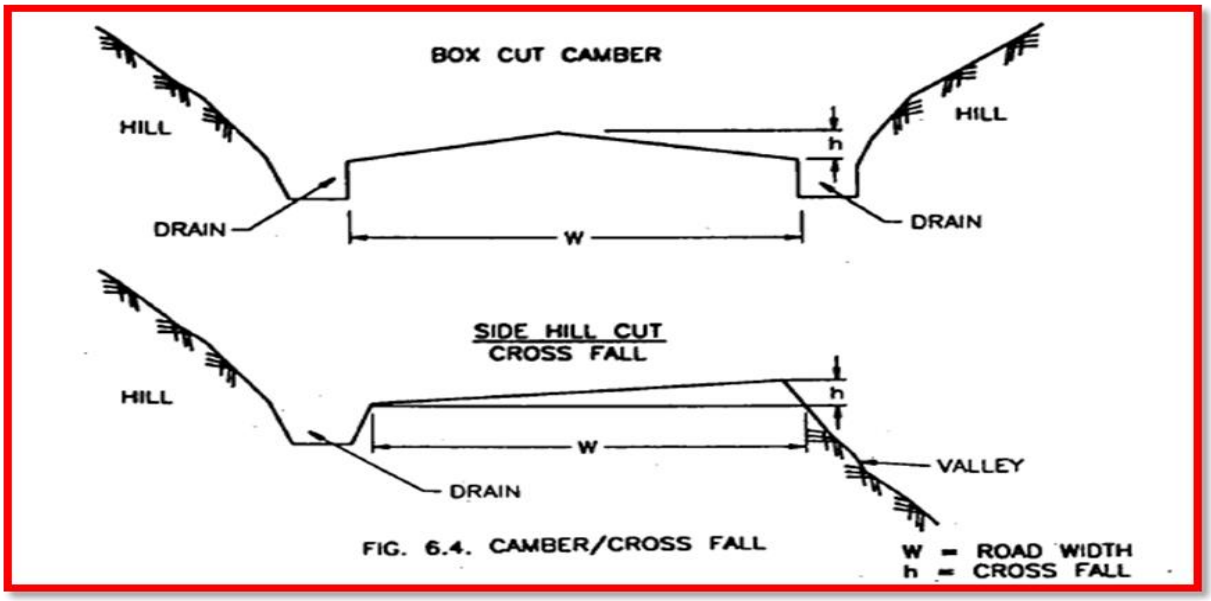
d) Pavement Camber (Cross fall)

IRC: SP: 73-2018 recommends the following camber for various surface types:

The cross fall on straight sections of road carriageway, paved shoulders and paved portion of median shall be 2.5 percent for bituminous surface and 2.0 percent for cement concrete surface.

As per IRC: SP:48-1998, the camber/cross fall on straight section be as follows

a.	Earth road	-	3 to 4 per cent (1 in 33 to 1 in 25)
b.	Gravel or WBM surface	-	2.5 to 3 per cent (1 in 40 to 1 in 33)
c.	Thin bituminous surfacing	-	2.0 to 2.5 per cent (1 in 50 to 1 in 40)
d.	High type bituminous surfacing	-	1.7 to 2.0 per cent (1 in 60 to 1 in 50)



The cross fall for earthen shoulders on straight portions shall be at least 0.5 percent steeper than the slope of the pavement and paved shoulder subject to a minimum of 3.0 percent. On super elevated sections, the earthen portion of the shoulder on the outer side of the curve shall be provided with reverse cross fall of 0.5 percent so that the earth does not drain on the carriageway and the storm water drains out with minimum travel path.

The two-lane roads shall be provided with a crown in the middle. On horizontal curves, the carriageway shall be super elevated. The cross fall on straight sections of road carriageway including paved shoulders shall be 2.5 % except at curve location. A 3.5 % of camber has been proposed for the unpaved shoulder/earthen shoulder.

5.7 Standards for At-Grade Intersections

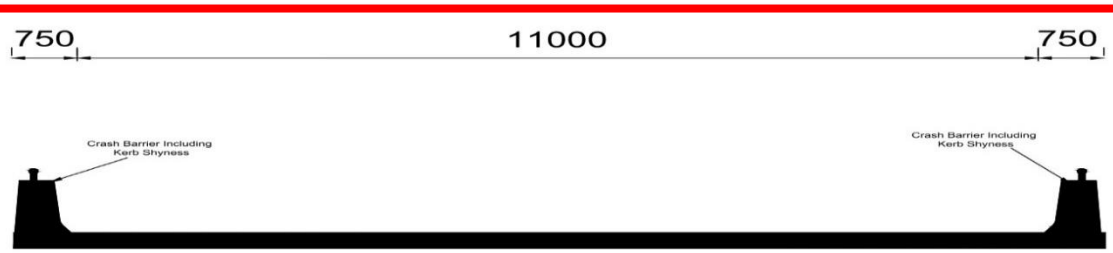
The standards proposed in IRC SP: 41 "Guidelines for the Design of At-Grade Intersection in Rural and Urban Areas" will be applied.

5.8 Traffic signs and Road Markings

The design of road traffic signs, road marking and guidelines on design and installation of road traffic signals shall be done according to the IRC standards. Further, International such as AASHTO standards will be used to augment the IRC standards if necessary.

5.9 Bridge Cross Section

The proposed cross section of bridges is adopted from the modified figure 7.4 of IRC: SP-2018. Where carriageway width is proposed to be 11.0 m including paved shoulder and 0.75 m width is adopted for crash barrier including kerb shyness on both sides.



Modified Fig 7.4 - IRC:SP:73-2018, Typical Cross Section of 2-Lane Bridge with paved shoulder and Crash Barrier including Kerb Shyness (Open country - Mountainous Terrain)

5.10 Culvert

As per IRC: SP:73-2018 overall width of all new culverts shall be equal to roadway width of the approaches. The outer most face of railing/parapet shall be in line with the outer most edge of shoulder. Typical cross section of the new culverts for a 2-lane project highway is given in Fig. below.

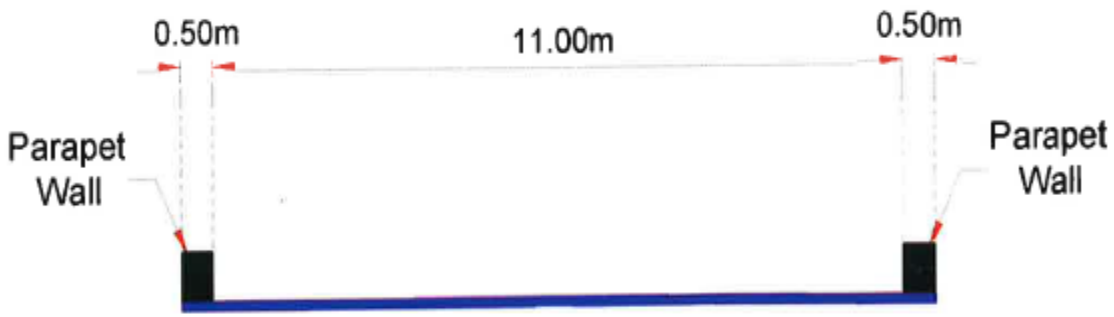


Fig 7.4 Typical cross section of Culvert at deck level for 2-Lane Highway with paved shoulder (Open country - Mountainous terrain)

6 Design Criteria

In general, the design standards used for the road, bridge and tunnel is in accordance with IRC codes. The key design standards used for the design of road for this section of alignment are listed below in table. The design standard has been guided as Per IRC SP: 73-2018 and IRC: SP-48-1998.

Design Standards			
(i)	Design Speed (Km/hr.) as per IRC SP:73-2018 Mountainous Terrain	:	60 (Ruling), 40(Minimum)
(ii)	Level of Service	:	B
(iii)	Roadway Widths (m) as per IRC SP:73-2018 Mountainous Terrain	:	11 m for 2-lanes with paved shoulders and earthen shoulder with one side hill and one side valley.
(iv)	Roadway Elements as per IRC SP:73-2018 Mountainous Terrain with Retaining wall and parapet	:	<u>Carriageway</u> 2-lane- 2X3.5m (Both Hill and Valley side) <u>Paved Shoulder</u> 2-lane- 2X1.5m

			(Both Hill and Valley side) <u>Earthen Shoulder</u> 1.0 m (Valley Side)
(v)	Camber as per IRC SP:73-2018	:	<u>Carriageway including paved shoulder</u> Flexible- 2.50% Rigid - 2.00 %
(vi)	Right of Way	:	As per Land Acquisition Plan
(vii)	Embankment/ Cutting Slope		
	Fill height, up to 3.0 m	:	In filling- 1V: 2 H
	Fill height from 3.0 m to 6.0 m	:	In filling- 1V: 1.5 H
	Fill height exceeding 6.0 m	:	In cutting- 1V:1H
(viii)	Minimum Sight Distance (m)	:	90 m for design speed of 40km/hr 180 m for design speed of 60km/hr
	Overtaking Sight Distance	:	165 m for design speed of 40km/hr 340m for design speed of 60km/hr
(ix)	**Super-elevation** Mountainous Terrain (As per IRC: SP:48-1998) Clause No-6.8.2.2		With snow bound area Maximum 7% Without snow bound area Maximum 10% **Adopted maximum 7%**
(x)	Radii for Horizontal Curves as per IRC SP:73-2018 Mountainous Terrain	:	Desirable Minimum 150 m Absolute minimum 75 m
(xi)	**Gradient** (As per IRC: SP:48-1998 and IRC: SP:73-2018)		
	Mountainous Terrain		
	Ruling	:	5.00%
	Limiting	:	6.00%
	Steep Terrain		
	Ruling	:	6.00%
	Limiting	:	7.00%
(xii)	**Minimum K factor**		
	Summit Curve		
	Mountainous Terrain	:	Ruling: 15A
		:	Minimum: 8.4A
	Valley Curve		
	Mountainous Terrain	:	Ruling: 15A

		:	Minimum: 6.6A
'A' in the above part is the algebraic difference in grade expressed in percentage.			
(xiii)	**Vertical Clearance** as per IRC: SP:48-1998. (Clause no-6.7.2.1)	:	5.0 m
	Minimum Vertical Clearance of 5 mts should be given over the entire roadway at all underpasses and similarly at overhanging cliffs and semi tunnel sections.		
(xiv)	Design Flood Frequency		
	Bridges	:	100 years
	Sewers and Ditches	:	60 years

7 Environment and Social Studies

The environment study will identify trees, forests and its zones like transition, buffer and core zones, also community resources, cultural and archeological sites, etc. There is no specific historical monument found along the project road. The project road mainly passes through forest area where permission of land acquisition will need to be taken from forest department. Also, project road passes through many landslides area where improvement of hill slopes are needed. At Ex. Ch. 83, which is a major landslide zone, a tunnel has been proposed there under entirely new project. No apple gardens were found along the project road, but project road has many vegetational and agricultural area. At exiting Ch. 105+550, there is an army-controlled area, where permission for land acquisition work will need to be taken first. There, the width of existing road is about 2.5-3.0 mt. Noise sensitive receptor required at all dense population area. Road alignment crosses seasonal Nallah/Stream through culverts and bridges.

7.1 Forest/Wildlife Identification

Forest land/ wildlife identification will be done after final alignment approval.

As per the stipulated procedure, prior clearance from Standing Committee of the National Board for Wildlife (SCNBWL) would be required for the developmental projects located within 10km of the National Park/Wildlife Sanctuary. "**Procedure for consideration of developmental projects located within 10 km of National**

Park/Wildlife Sanctuary seeking environmental clearance under the provisions of the Environmental Impact Assessment (EIA) Notification, 2006 – regarding vide Office memorandum issued by Ministry of Environment, Forest and Climate Change (IA Division), No. F. No. 22-43/2018-IA.III dated 8th August 2018.

However, Principal to be adopted while considering the highway near or with in wildlife sanctuaries /national park/Animal corridor as per circular no. RW-NH-11013/2/2019-S&R(P&B) dated 29th May 2019 from MORTH (Copy of circular enclosed).

7.2 Environmental Clearance

A report shall be prepared regarding all other clearances required to enable the construction of the project road such as environment, forest, tree cutting and railways clearances.

The clearances report shall include kilometer-wise requirement of all clearances required presented along with the strip plan including, but not limited to:

i. Requirements for environmental clearances along the project corridor
ii. Requirements for forest clearances including type of forest affected, extent of land area needing diversion
iii. Account of required felling of trees of different type and girth and value estimate of such trees based on realistic rates obtainable from concerned District forest office
iv. Plan of compensating afforestation, its land requirement with specific locations and cost involved for undertaking all activities in this regard.
v. ROB/RUBs along the project corridor to be constructed, widened or modified in any form requiring clearances from the railways

The clearances report shall also include:

i. Details of proposals made to concerned agencies and departments
ii. Date of submission of clearances proposals, Environmental impact assessment report to the competent authority
iii. Copies of all actual clearance proposals made or drafts of proposals yet to be submitted.
iv. Information regarding points of contact, current status of proposals made,

key issues raised and clear next steps to obtaining clearances.

Note: Environmental Clearance approval from MoEF is not required as per Clause 7(f) of Environmental Impact Assessment notification 2006 and its amendment S.O.2559 (E) dated 22nd August 2013, S.O. 382(E) Dt 3rd February 2015 and S.O. 996(E) Dt 10th April 2015.

"Expansion of National **Highway greater than 100 Km involving additional Right of way or land acquisition greater than 40m on existing alignments and 60m on realignments or bypasses".**

7.3 Social Assessment

A base line socio-economic and census survey will be conducted to assess the impacts on the people, properties and loss of livelihood. The socioeconomic survey will establish the benchmark for monitoring of R&R activities. A social assessment is conducted for the entire project to identify mechanisms to improve project designs to meet the needs of different stakeholders. A summary of stakeholder discussions, issue raised and how the project design was developed to meet stakeholders need would be prepared.

The consultant shall prepare Land Acquisition Plan and assist NHIDCL in acquisition of land under various Acts.

The social analysis represents to determine the actual impact due to both options of alignment of the project road. Major aspect of social study is to minimize the social impact with best possible engineering solutions at the optimal point. The social screening survey will be;

- To assess the negative impact due to project road and to suggest the mitigation measures for this.
- To avoid / minimize the adverse impact on nearby communities and natural environment.
- To minimize household (HH) falling on direct path of new alignment.
- People indirectly or directly affected by the way of disruption of livelihood, breakage in community linkages.
- Impact on land acquisition and resettlement, on indigenous people and on human safety etc.

In order to minimize or avoid the adverse impact, all necessary modifications will be made in later stage. However, in case of unavoidable negative impacts, these will be mitigating through suggested appropriate measures needed to be adopted during construction and operational stages.

7.4 Benefits of the project

The entire NH-244 (NH-1B) is getting upgraded in different packages, of which Khellani – Chhatroo project is a significant part. The major benefit of this project is to ensure the connectivity from Khellani to Chhatroo section. This leads to free traffic flow from Khellani side to Vailoo side, since its end location coincides with the starting location of Vailoo Tunnel project. And hence it bypasses the long and absurd Sinthan pass. It will provide great benefits to Doda and Kishtwar districts also to the region around. Income generation activity will be improved due to construction of this road. Many new opportunities will come in way, once the new road starts operating. It will boost the tourism and economic development in the concerned region.

7.5 Objective of the Resettlement Action Plan (RAP)

The Resettlement and Rehabilitation Plan and assess feasibility and effectiveness of income restoration strategies and suitability and availability to relocation sites will be prepared. The resettlement plan which accounts for land acquisition and resettlement impacts would be based on a 25% socio-economic survey and 100 % census survey of project affected people which provides the complete assessment of the number of affected households and persons, including common property resources. All untitled occupants are recorded at the initial stages and identify cards will be issued to ensure there is no further influx of people into the project area. All consultations with affected persons (to include list of participants) should be fully documented and records made available to NHIDCL.

To ensure that the project affecting the people are duly compensated. A Resettlement Action Plan (RAP) would be drawn up as an integral part of project. This objective will ensure that road construction is socially sound, sustainable and contribute to the development of social goals.

The prime objective of this RAP is to ensure and provide a policy framework to ensure

that the affected and displaced persons are aptly resettled and rehabilitated (to improve their livelihood and standard of living or at least to restore them in real terms). The aim of this Resettlement is to mitigate all such unavoidable negative impacts caused due to the project and to resettle the displaced people and restore their livelihoods. It will ensure that no impact found in the project area or in other words no loss of livelihood.

Property resources, and social infrastructure. Poor, women and other disadvantaged section of society will be compensated as per R & R Policy.

7.6 Impact on Land Acquisition and Involuntary Resettlement

Improving the standards of living of the displaced poor and other vulnerable groups, including women, to at least minimum standards. In rural areas provide them with legal and affordable access to land and resources, and in urban areas provide them with appropriate income sources and legal and affordable access to adequate housing.

Development procedures in a transparent, consistent, and equitable manner if land acquisition is done through negotiated settlement. So, to ensure that those people who enter into negotiated settlements will maintain the same or better income and livelihood status.

7.7 Total land Requirement for the Project

The total land required for the project shall be worked out based on approved alignment.

7.8 Loss of income and Livelihood

Impacted Project affected person (PAP's) will be compensated as per R & R policy and Entitlement matrix.

Displaced person and vulnerable person found in the project area will get benefit according to the law applicable (women, men, and vulnerable groups).

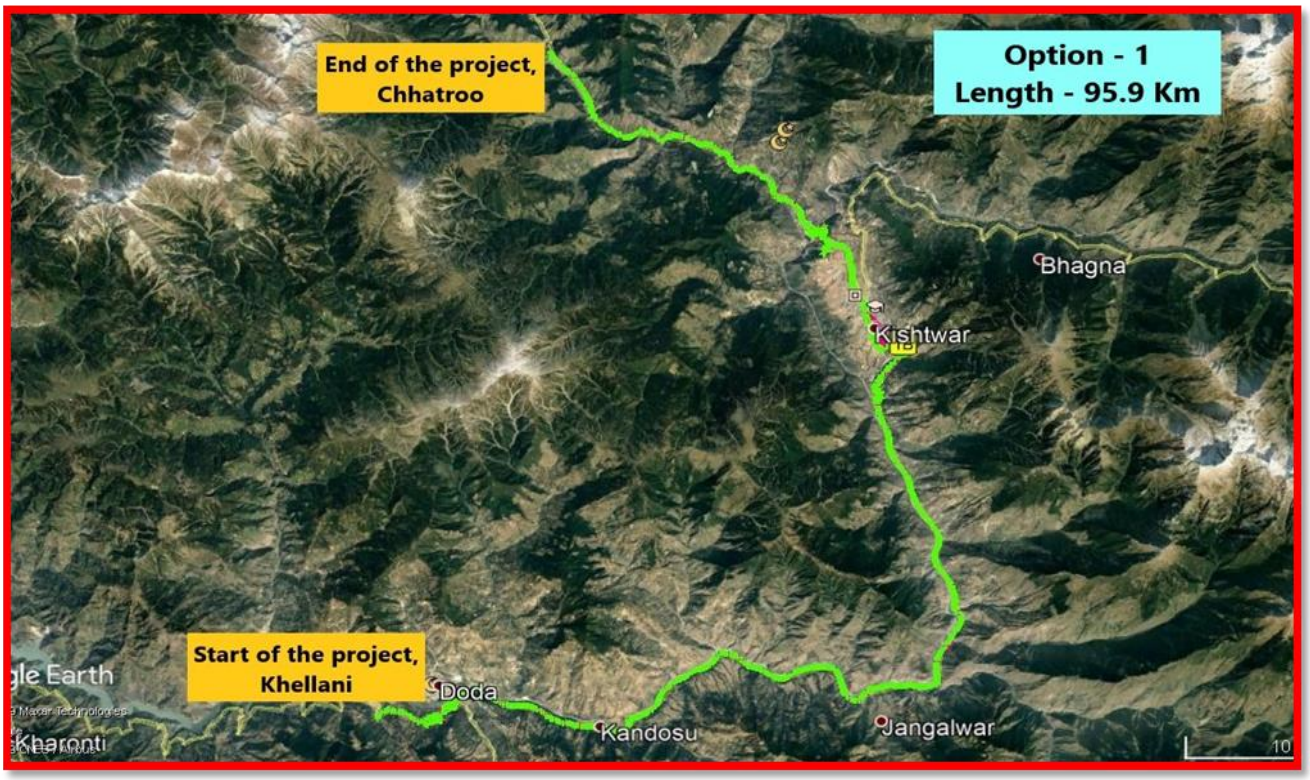
Many households are found in project area which will be displaced and impacted during land acquisition and construction stage. The main localities are Premnagar, Thatri, Darabsala, Kishtwar and Chhatroo. Transportation facilities will be improved to avail social services (Ex-Hospital, Bank, marketplace) so, income generation activities will also be improved because it passes through the main locality of the area.

8 Alignment Options Study

8.1 Alignment Option 1

Salient Features

This is considered as Option – 1, where the project road runs almost through the existing alignment of Khellani – Chhatroo section except at some realignments/curve improvements proposed at 10 locations. The Location of the Project Road lies in Doda and Kishtwar Districts of J&K. The Project Road starts from proposed Ch. 0+000 (At Ex. Ch. 45.250) near Khellani and passes through Gangalwar, Bhuta, Suigwari, Nai Basti, Premnagar,Thatri, Darabshalla, Kandiri, Kishtwar, Marwah, Kodia, Dhadhpeth, Mughal Maidan, and Udil Gurjan and ends at proposed Ch. 95+914 (At Ex Ch. 140+460) near Chhatroo (**Start of Vailoo Tunnel project**).



(i) <u>Coordinates for start at Khellani & end at Chhatroo points</u>

	Easting (m)	Northing (m)	Latitude (Decimal)	Longitude (Decimal)	Remarks
Start	548731.98	3666334.67	33.134658°	75.522463°	At Khellani
End	556183.10	3700139.87	33.439185°	75.604451°	At Chhatroo

(ii) Length of Road portion – 95.331 Km excluding Length of Bridges i.e. 0.583 km.

(iii) The alignment has 01 no. of Major Bridge and 21 nos. of minor bridges.

Sr. No	Design Chainage	Type of Structure	Span Arrangement	Carriageway width (m)	Overall Width (m)	Proposal
1	09+430	**Major Bridge**	1X70	8.30	13.25	Retained with minor repairs
2	18+510	Minor Bridge	1X9	7.00	10.50	Retained with Widening
3	20+088	Minor Bridge	1X22.5	7.00	8.70	Retained with foundation protection
4	23+474	Minor Bridge	1X24.5	7.00	8.90	Retained with minor repairs
5	27+975	Minor Bridge	1X7.5	7.00	12.20	Retained with minor repairs
6	29+720	Minor Bridge	1X7.5	7.00	12.20	Retained with minor repairs
7	34+250	Minor Bridge	1X11.5	7.00	11.00	Retained with minor repairs
8	34+992	Minor Bridge	1X24.5	7.00	8.20	Retained with minor repairs
9	37+278	Minor Bridge	1X10	7.50	12.50	Reconstruction
10	37+963	Minor Bridge	1X38	7.00	8.30	Retained with minor repairs
11	42+548	Minor Bridge	1X38.3	7.00	8.30	Retained with minor repairs
12	46+565	Minor Bridge	1X32.7	7.00	8.30	Retained with minor repairs
13	46+865	Minor Bridge	1X6.5	7.00	9.00	Retained with minor repairs
14	52+190	Minor Bridge	1X36	7.00	8.30	Retained with minor repairs
15	55+310	Minor Bridge	1X10	7.50	12.50	Reconstruction
16	68+930	Minor Bridge	1X10	7.50	12.50	Reconstruction
17	77+475	Minor Bridge	1X50.4	7.50	8.90	Retained
18	77+475	Minor Bridge	1X40.8	3.50	5.20	Retained (under Construction)
19	79+700	Minor Bridge	1X50.2	7.50	12.50	New Construction
20	83+865	Minor Bridge	1X35	7.50	12.50	New Construction
21	86+575	Minor Bridge	1X39.6	7.50	12.50	Reconstruction
22	94+777	Minor Bridge	1X8.1	7.50	12.50	Reconstruction

(iv) Right of Way

Right-of-way (ROW) is proposed with 24 m in bypass/realignments & rural areas and 12.5m ROW in built-up areas. This option consists of undivided two lane with paved shoulder as per manual. Also, the additional land may be required at junction locations in accordance with proposed junction design, Road amenities location and Toll location if required.

(v) Project Road

The project road is connecting to Chhatroo through Khellani, Gangalwar, Bhuta, Suigwari, Nai Basti, Premnagar,Thatri, Darabshalla, Kandiri, Kishtwar, Marwah, Kodia, Dhadhpeth, Mughal Maidan & Udil Gurjan.

(vi) Terrain

The project road passes through mountainous terrain.

(vii) Land use

The land use along the alignment are forest land. Some parts also encounter built up area and agricultural land. Land use pattern map has been attached in drawing volume.

(viii)Major crossroads

There are 06 major and 22 minor intersections at project road. The details are in below table;

Design Chainage	Towards	Type	Types
1+484	Doda	Y	Minor
8+500	Khellani	Y	Minor
9+375	Bhaderwah	Y	**Major**
9+650	Doda	T	Minor
12+500	Sohra	Y	Minor
16+100	Kakrassu	Y	Minor
17+160	Himote	Y	Minor
20+440	Jhajka	Y	Minor
29+120	Kandhot	Y	Minor
32+640	Kandote	Y	Minor
35+840	Kathawa	Y	Minor
38+000	Kilhoatran	T	**Major**
40+470	Balgran	Y	Minor
42+070	Mandar	Y	Minor
42+576	Salana	T	**Major**
54+330	Agral	Y	Minor
58+100	Sarthal	Y	Minor
60+680	Army Camp	Y	Minor
62+400	Kishtwar City	Y	**Major**
65+845	Kishtwar City	Y	**Major**
66+345	Keylong	Y	**Major**
68+300	Hunjal	Y	Minor
68+930	Poochal	+	Minor
78+560	To Palmad (Pakal Dul Hydroelectric Plant)	Y	Minor
79+745	Thakrae	Y	Minor
84+365	Thagood	Y	Minor
86+545	Sangam Bhatti	Y	Minor
93+420	Batwari	Y	Minor

(ix) Bypass/Realignments/Curve Improvements Requirements

There are 10 numbers of curve improvements proposed in this option 1 alignment. Details are as under:

Design Chainage in km		Length (Km)	Realignment/Curve Improvements
From	To		
6.100	8.500	2.40	Curve Improvement (Hair Pin Bends)
39.900	41.000	1.10	Realignment (scope under Ch. 83 project)
46.400	46.600	0.20	Curve Improvement
56.400	56.600	0.20	Curve Improvement
57.200	60.100	2.90	Curve Improvement
70.700	70.900	0.20	Curve Improvement
72.300	77.600	5.30	Curve Improvement (Hair Pin Bends)
83.700	84.000	0.30	Curve Improvement
88.100	88.500	0.40	Curve Improvement
94.100	94.200	0.10	Curve Improvement
Total Length		**13.10**	

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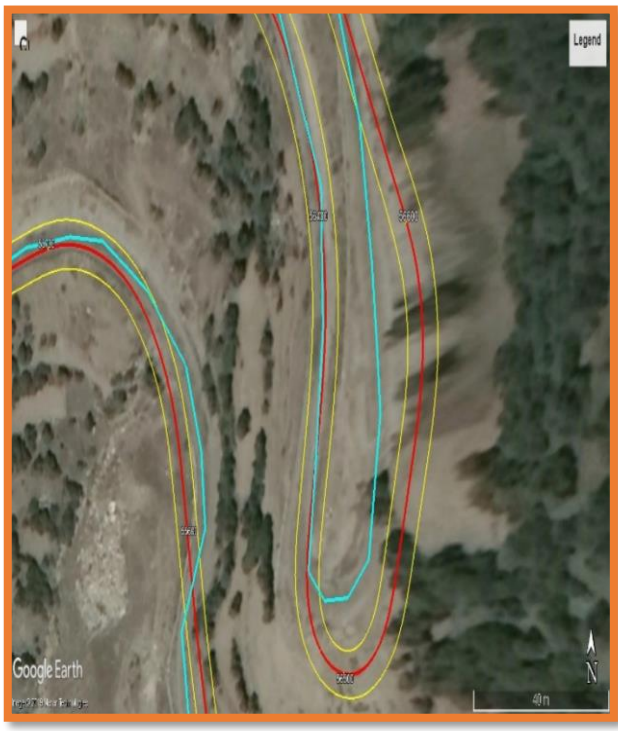
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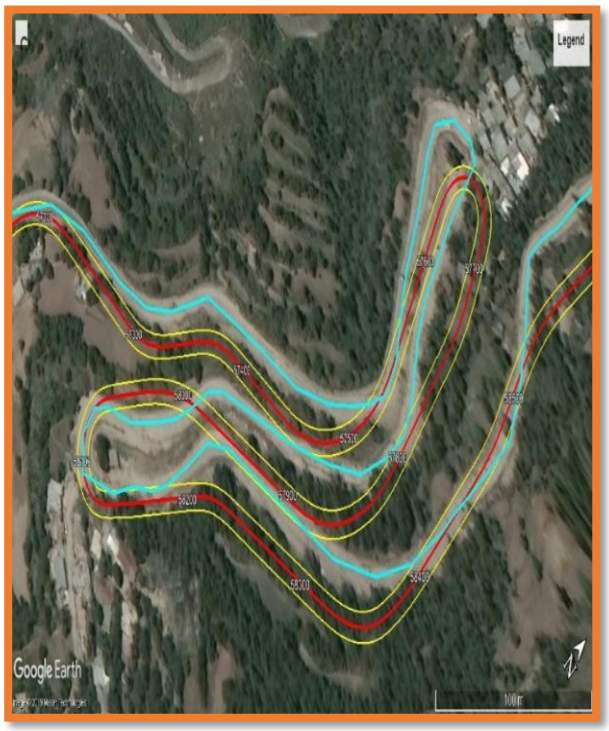
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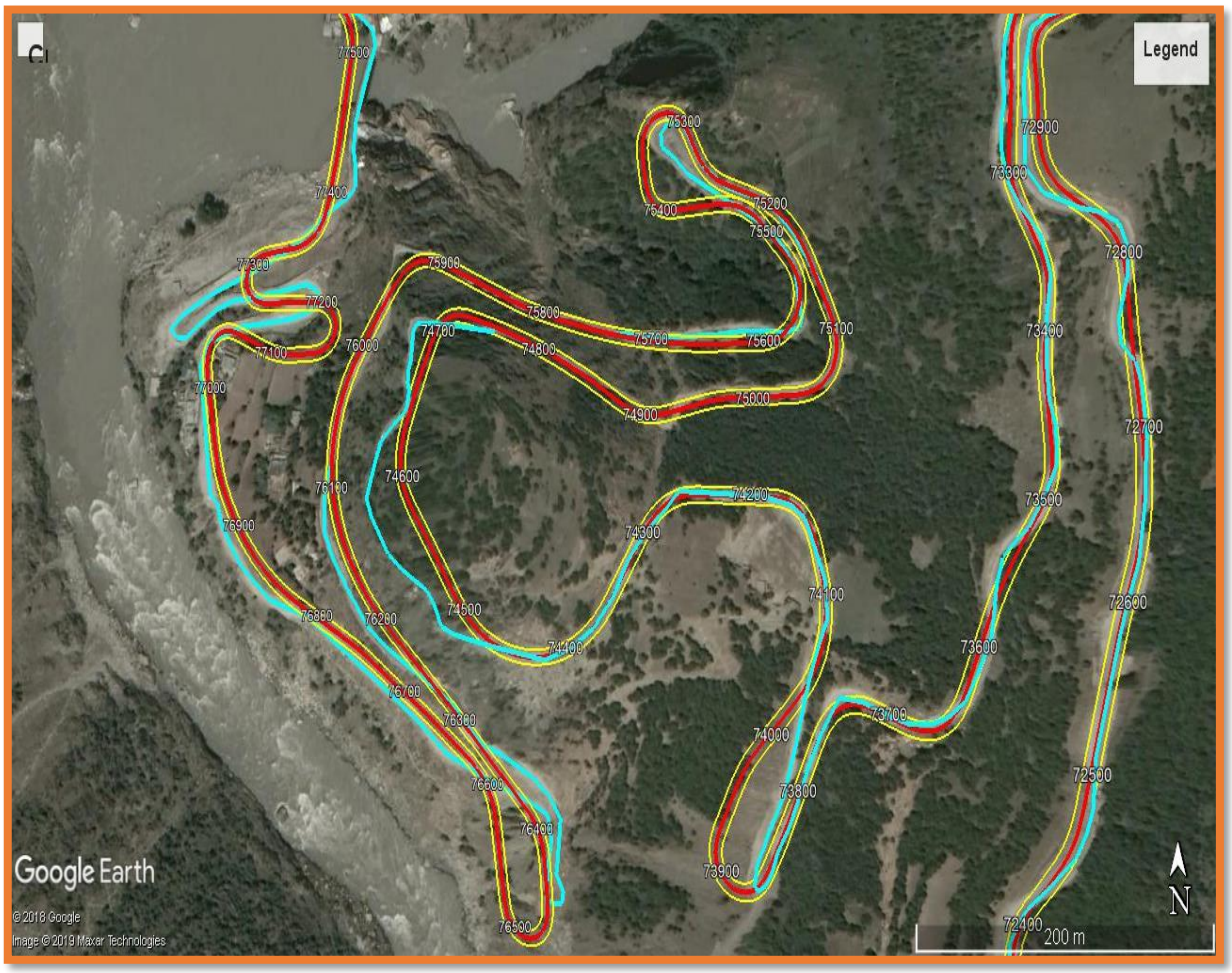
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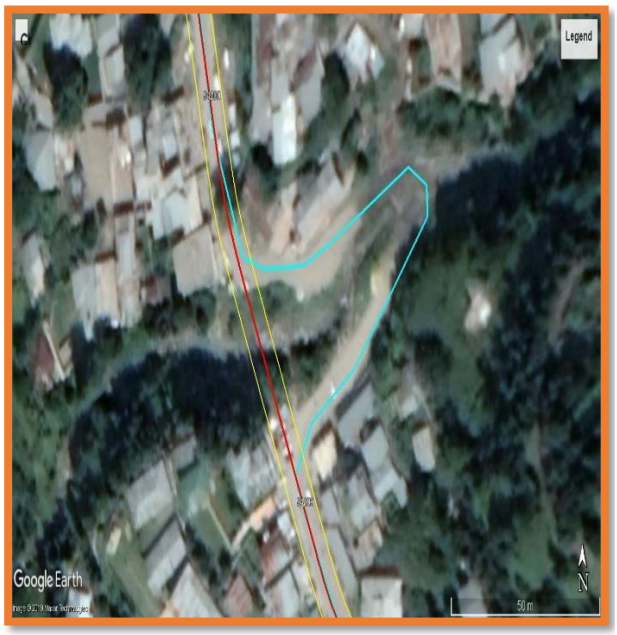


Existing Alignment

Proposed Alignment

(x) Typical Cross Section and Alignment Plan

The proposed cross sections are developed with two lanes with paved shoulder in accordance with 2-lane manual.

(xi) Land Acquisition Requirement

Total Land available is approx. **104.0 Hec.** and additional land to be acquired approx. **109.4 Hec.** in this option.

(xii) Utility Shifting

There will be a proposal for utility shifting since there are few utility features along with the project road.

(xiii)Horizontal Curve Detail of Option 1

HIP No.	Arc Start Chainage	Arc End Chainage	HIP Chainage	Radius in m	Transition length	SPEED in Kmph
1	00+037	00+057	00+047	30	30	30
2	00+233	00+247	00+240	30	30	30
3	00+315	00+327	00+321	80	25	40
4	00+404	00+407	00+406	80	25	40
5	00+457	00+474	00+466	50	20	30
6	00+524	00+541	00+533	20	20	20
7	00+577	00+643	00+610	70	15	30
8	00+675	00+827	00+751	350	15	50

HIP No.	Arc Start Chainage	Arc End Chainage	HIP Chainage	Radius in m	Transition length	SPEED in Kmph
9	00+901	00+915	00+908	50	40	40
10	00+985	00+998	00+992	40	25	30
11	01+050	01+062	01+056	40	25	30
12	01+135	01+143	01+139	100	20	40
13	01+186	01+199	01+193	100	20	40
14	01+271	01+287	01+279	80	25	40
15	01+386	01+425	01+406	50	20	30
16	01+488	01+505	01+496	30	30	30
17	01+598	01+608	01+603	40	25	30
18	01+649	01+706	01+678	500	0	50
19	01+741	01+895	01+818	100	20	40
20	01+949	01+963	01+956	30	30	30
21	02+017	02+036	02+027	50	20	30
22	02+088	02+107	02+098	30	30	30
23	02+168	02+179	02+174	40	25	30
24	02+323	02+348	02+335	200	20	50
25	02+402	02+434	02+418	40	25	30
26	02+496	02+500	02+498	100	20	40
27	02+552	02+562	02+557	100	20	40
28	02+639	02+729	02+684	100	20	40
29	02+776	02+785	02+780	40	25	30
30	02+841	02+913	02+877	70	15	30
31	02+956	02+963	02+959	40	25	30
32	03+016	03+024	03+020	40	25	30
33	03+071	03+079	03+075	50	20	30
34	03+154	03+165	03+160	50	20	30
35	03+245	03+260	03+252	150	15	40
36	03+301	03+343	03+322	20	20	20
37	03+449	03+530	03+490	70	30	40
38	03+603	03+615	03+609	40	25	30
39	03+672	03+673	03+672	40	25	30
40	03+729	03+772	03+750	50	20	30
41	03+830	03+848	03+839	30	30	30
42	03+904	03+950	03+927	50	20	30
43	04+043	04+053	04+048	100	20	40
44	04+108	04+208	04+158	70	30	40
45	04+264	04+283	04+274	100	20	40
46	04+342	04+384	04+363	20	20	20
47	04+499	04+599	04+549	70	30	40
48	04+665	04+688	04+677	70	30	40
49	04+773	04+843	04+808	80	15	30

HIP No.	Arc Start Chainage	Arc End Chainage	HIP Chainage	Radius in m	Transition length	SPEED in Kmph
50	04+886	04+914	04+900	40	25	30
51	04+972	04+978	04+975	50	20	30
52	05+064	05+074	05+069	40	25	30
53	05+142	05+150	05+146	30	30	30
54	05+209	05+214	05+211	100	20	40
55	05+273	05+290	05+282	70	30	40
56	05+349	05+356	05+352	150	15	40
57	05+439	05+453	05+446	200	20	50
58	05+510	05+543	05+527	100	20	40
59	05+594	05+599	05+597	100	20	40
60	05+652	05+668	05+660	100	20	40
61	05+715	05+724	05+720	300	15	50
62	05+777	05+797	05+787	70	15	30
63	05+836	05+839	05+838	70	15	30
64	05+883	05+889	05+886	70	15	30
65	05+927	05+935	05+931	70	15	30
66	05+996	06+012	06+004	70	15	30
67	06+050	06+060	06+055	50	20	30
68	06+108	06+113	06+111	100	20	40
69	06+174	06+215	06+195	20	20	20
70	06+756	06+798	06+777	20	20	20
71	07+380	07+423	07+401	20	20	20
72	07+857	07+899	07+878	500	0	50
73	07+926	07+930	07+928	100	20	40
74	07+984	07+990	07+987	100	20	40
75	08+060	08+071	08+066	150	15	40
76	08+111	08+113	08+112	100	20	40
77	08+180	08+203	08+191	70	30	40
78	08+351	08+406	08+378	30	30	30
79	08+481	08+489	08+485	50	40	40
80	08+547	08+550	08+548	100	15	30
81	08+615	08+619	08+617	100	20	40
82	08+677	08+679	08+678	100	20	40
83	08+753	08+777	08+765	200	20	50
84	08+861	08+872	08+867	500	0	50
85	08+955	08+959	08+957	70	15	30
86	09+002	09+005	09+004	40	25	30
87	09+052	09+098	09+075	200	20	50
88	09+140	09+158	09+149	200	20	50
89	09+203	09+205	09+204	200	20	50
90	09+275	09+313	09+294	150	15	40

HIP No.	Arc Start Chainage	Arc End Chainage	HIP Chainage	Radius in m	Transition length	SPEED in Kmph
91	09+356	09+372	09+364	20	20	20
92	09+471	09+501	09+486	50	20	30
93	09+570	09+616	09+593	200	20	50
94	09+684	09+693	09+689	50	20	30
95	09+746	09+759	09+753	100	20	40
96	09+809	09+861	09+835	200	20	50
97	09+904	09+916	09+910	300	15	50
98	09+981	09+994	09+988	200	20	50
99	10+044	10+051	10+047	100	20	40
100	10+099	10+112	10+106	100	20	40
101	10+169	10+182	10+176	150	15	40
102	10+257	10+288	10+273	125	15	40
103	10+328	10+353	10+340	200	20	50
104	10+468	10+474	10+471	150	30	50
105	10+531	10+630	10+581	125	15	40
106	10+668	10+682	10+675	300	15	50
107	10+735	10+739	10+737	200	20	50
108	10+782	10+817	10+800	300	15	50
109	10+889	10+912	10+900	200	20	50
110	11+057	11+069	11+063	200	20	50
111	11+094	11+147	11+120	300	0	40
112	11+186	11+188	11+187	200	20	50
113	11+235	11+237	11+236	200	20	50
114	11+310	11+323	11+317	70	30	40
115	11+405	11+417	11+411	50	20	30
116	11+458	11+464	11+461	70	15	30
117	11+509	11+518	11+514	70	15	30
118	11+561	11+573	11+567	50	20	30
119	11+616	11+649	11+632	100	20	40
120	11+675	11+712	11+693	300	0	40
121	11+728	11+777	11+753	200	15	40
122	11+812	11+835	11+824	70	15	30
123	11+871	11+872	11+871	80	15	30
124	11+927	11+938	11+932	80	25	40
125	12+018	12+028	12+023	80	25	40
126	12+086	12+091	12+089	50	20	30
127	12+134	12+180	12+157	50	20	30
128	12+251	12+257	12+254	30	30	30
129	12+315	12+325	12+320	40	25	30
130	12+388	12+410	12+399	80	25	40
131	12+498	12+511	12+504	40	25	30

HIP No.	Arc Start Chainage	Arc End Chainage	HIP Chainage	Radius in m	Transition length	SPEED in Kmph
132	12+581	12+583	12+582	40	25	30
133	12+629	12+632	12+630	100	20	40
134	12+661	12+689	12+675	500	0	50
135	12+704	12+744	12+724	500	0	50
136	12+780	12+785	12+782	100	15	30
137	12+817	12+823	12+820	100	15	30
138	12+845	12+863	12+854	200	0	30
139	12+891	12+893	12+892	150	15	40
140	12+932	12+939	12+936	200	20	50
141	13+001	13+027	13+014	125	15	40
142	13+094	13+114	13+104	200	20	50
143	13+165	13+174	13+170	70	15	30
144	13+212	13+215	13+214	100	20	40
145	13+263	13+270	13+266	100	20	40
146	13+315	13+353	13+334	100	20	40
147	13+417	13+436	13+426	150	15	40
148	13+479	13+516	13+497	70	15	30
149	13+557	13+570	13+563	40	25	30
150	13+622	13+625	13+623	40	25	30
151	13+681	13+741	13+711	500	0	50
152	13+755	13+801	13+778	500	0	50
153	13+817	13+833	13+825	70	15	30
154	13+865	13+898	13+881	70	15	30
155	14+005	14+009	14+007	125	15	40
156	14+050	14+059	14+055	50	20	30
157	14+114	14+119	14+117	100	20	40
158	14+188	14+192	14+190	80	25	40
159	14+243	14+274	14+258	70	15	30
160	14+311	14+312	14+312	50	20	30
161	14+356	14+374	14+365	125	15	40
162	14+444	14+456	14+450	70	30	40
163	14+521	14+540	14+531	100	20	40
164	14+587	14+599	14+593	70	15	30
165	14+663	14+677	14+670	40	25	30
166	14+728	14+794	14+761	300	15	50
167	14+853	14+926	14+890	70	15	30
168	14+969	14+986	14+978	40	25	30
169	15+042	15+074	15+058	150	15	40
170	15+168	15+179	15+174	80	15	30
171	15+218	15+223	15+220	50	20	30
172	15+272	15+309	15+291	50	20	30

HIP No.	Arc Start Chainage	Arc End Chainage	HIP Chainage	Radius in m	Transition length	SPEED in Kmph
173	15+370	15+386	15+378	25	25	25
174	15+443	15+447	15+445	40	25	30
175	15+504	15+508	15+506	30	30	30
176	15+568	15+579	15+574	40	25	30
177	15+634	15+670	15+652	500	0	50
178	15+724	15+834	15+779	500	0	50
179	15+935	15+952	15+944	200	15	40
180	16+000	16+008	16+004	40	25	30
181	16+072	16+074	16+073	20	35	25
182	16+137	16+145	16+141	40	25	30
183	16+261	16+271	16+266	70	30	40
184	16+334	16+339	16+336	30	30	30
185	16+403	16+412	16+407	40	25	30
186	16+459	16+459	16+459	100	20	40
187	16+514	16+514	16+514	100	20	40
188	16+567	16+578	16+572	50	20	30
189	16+674	16+723	16+698	100	20	40
190	16+766	16+812	16+789	80	15	30
191	16+867	16+868	16+867	30	30	30
192	16+919	16+936	16+927	50	20	30
193	16+975	16+988	16+982	100	15	30
194	17+030	17+044	17+037	40	25	30
195	17+096	17+100	17+098	40	25	30
196	17+170	17+181	17+176	30	30	30
197	17+236	17+239	17+237	70	15	30
198	17+287	17+300	17+294	30	30	30
199	17+351	17+362	17+356	125	15	40
200	17+414	17+419	17+416	150	15	40
201	17+491	17+511	17+501	50	20	30
202	17+553	17+568	17+561	50	20	30
203	17+667	17+679	17+673	200	20	50
204	18+048	18+057	18+052	50	20	30
205	18+106	18+144	18+125	50	20	30
206	18+203	18+220	18+212	80	25	40
207	18+255	18+368	18+311	500	0	50
208	18+397	18+454	18+425	500	0	50
209	18+484	18+504	18+494	50	20	30
210	18+556	18+563	18+559	100	20	40
211	18+655	18+716	18+685	200	20	50
212	18+775	18+786	18+781	100	20	40
213	18+844	18+853	18+849	100	20	40

HIP No.	Arc Start Chainage	Arc End Chainage	HIP Chainage	Radius in m	Transition length	SPEED in Kmph
214	18+898	18+939	18+919	100	20	40
215	19+039	19+065	19+052	150	30	50
216	19+249	19+376	19+312	90	25	40
217	19+460	19+643	19+551	700	0	50
218	19+795	19+917	19+856	800	0	50
219	19+935	19+973	19+954	300	15	50
220	20+011	20+041	20+026	150	15	40
221	20+097	20+141	20+119	300	15	50
222	20+211	20+288	20+249	1000	0	50
223	20+399	20+410	20+405	80	25	40
224	20+467	20+490	20+479	80	25	40
225	20+566	20+624	20+595	100	20	40
226	20+672	20+685	20+679	100	20	40
227	20+802	20+823	20+813	100	20	40
228	20+891	20+914	20+902	300	15	50
229	20+965	20+980	20+973	100	20	40
230	21+028	21+035	21+031	100	20	40
231	21+123	21+131	21+127	100	20	40
232	21+181	21+197	21+189	200	20	50
233	21+372	21+571	21+471	500	0	50
234	21+592	21+623	21+607	500	0	50
235	21+754	21+859	21+806	500	0	50
236	21+944	21+964	21+954	100	20	40
237	22+045	22+097	22+071	150	15	40
238	22+197	22+232	22+215	150	15	40
239	22+286	22+383	22+334	200	20	50
240	22+457	22+496	22+476	500	0	50
241	22+579	22+598	22+589	100	20	40
242	22+660	22+703	22+682	100	20	40
243	22+786	22+797	22+791	100	20	40
244	22+870	22+891	22+880	50	20	30
245	22+941	22+959	22+950	40	25	30
246	23+092	23+099	23+096	100	20	40
247	23+130	23+189	23+159	300	0	40
248	23+219	23+259	23+239	100	20	40
249	23+309	23+393	23+351	100	20	40
250	23+472	23+517	23+494	150	15	40
251	23+536	23+824	23+680	500	0	50
252	23+865	24+198	24+032	550	0	50
253	24+265	24+285	24+275	100	20	40
254	24+336	24+373	24+354	100	20	40

HIP No.	Arc Start Chainage	Arc End Chainage	HIP Chainage	Radius in m	Transition length	SPEED in Kmph
255	24+454	24+476	24+465	300	15	50
256	24+515	24+549	24+532	100	20	40
257	24+598	24+641	24+619	100	20	40
258	24+683	24+706	24+694	50	20	30
259	24+792	24+863	24+827	200	20	50
260	24+954	24+967	24+960	50	20	30
261	25+013	25+056	25+034	100	15	30
262	25+118	25+193	25+155	80	15	30
263	25+231	25+232	25+232	100	20	40
264	25+289	25+305	25+297	100	20	40
265	25+357	25+360	25+359	100	20	40
266	25+457	25+469	25+463	150	15	40
267	25+513	25+544	25+529	80	25	40
268	25+611	25+622	25+616	70	30	40
269	25+680	25+683	25+682	80	25	40
270	25+750	25+782	25+766	500	0	50
271	25+896	25+928	25+912	300	15	50
272	25+968	25+989	25+979	300	15	50
273	26+057	26+067	26+062	100	45	50
274	26+164	26+204	26+184	300	15	50
275	26+242	26+245	26+243	125	15	40
276	26+290	26+294	26+292	100	20	40
277	26+344	26+354	26+349	125	15	40
278	26+395	26+401	26+398	100	20	40
279	26+463	26+478	26+471	70	30	40
280	26+536	26+538	26+537	80	25	40
281	26+690	26+700	26+695	100	45	50
282	26+807	26+850	26+829	500	0	50
283	26+941	27+026	26+984	500	0	50
284	27+049	27+173	27+111	500	0	50
285	27+201	27+225	27+213	200	20	50
286	27+267	27+276	27+272	100	20	40
287	27+425	27+434	27+430	50	40	40
288	27+500	27+506	27+503	100	20	40
289	27+556	27+561	27+559	100	20	40
290	27+661	27+663	27+662	40	25	30
291	27+717	27+732	27+724	200	20	50
292	27+765	27+804	27+785	500	0	50
293	27+861	27+885	27+873	40	25	30
294	27+962	27+994	27+978	20	20	20
295	28+050	28+071	28+061	30	30	30

HIP No.	Arc Start Chainage	Arc End Chainage	HIP Chainage	Radius in m	Transition length	SPEED in Kmph
296	28+145	28+160	28+153	100	20	40
297	28+208	28+224	28+216	50	20	30
298	28+281	28+297	28+289	30	30	30
299	28+356	28+362	28+359	40	25	30
300	28+414	28+421	28+417	200	20	50
301	28+445	28+499	28+472	500	0	50
302	28+577	28+620	28+598	100	20	40
303	28+681	28+708	28+694	200	20	50
304	28+784	28+815	28+800	150	30	50
305	28+939	28+951	28+945	80	25	40
306	29+015	29+056	29+035	50	20	30
307	29+108	29+121	29+115	50	20	30
308	29+170	29+175	29+172	40	25	30
309	29+235	29+237	29+236	30	30	30
310	29+300	29+301	29+300	80	25	40
311	29+364	29+366	29+365	80	25	40
312	29+430	29+436	29+433	200	20	50
313	29+498	29+508	29+503	150	30	50
314	29+562	29+571	29+566	100	20	40
315	29+622	29+663	29+642	80	25	40
316	29+717	29+728	29+722	20	20	20
317	29+781	29+787	29+784	40	25	30
318	29+863	29+882	29+873	200	20	50
319	29+935	29+950	29+943	50	20	30
320	30+001	30+043	30+022	80	25	40
321	30+099	30+106	30+102	100	20	40
322	30+188	30+232	30+210	70	15	30
323	30+279	30+291	30+285	40	25	30
324	30+341	30+351	30+346	50	20	30
325	30+391	30+403	30+397	70	15	30
326	30+464	30+483	30+474	100	20	40
327	30+541	30+554	30+548	125	15	40
328	30+595	30+608	30+601	125	15	40
329	30+647	30+671	30+659	100	20	40
330	30+747	30+781	30+764	100	20	40
331	30+861	30+875	30+868	100	20	40
332	30+918	30+921	30+920	100	20	40
333	30+968	30+989	30+978	100	20	40
334	31+032	31+047	31+040	100	20	40
335	31+162	31+196	31+179	300	15	50
336	31+268	31+384	31+326	200	20	50

HIP No.	Arc Start Chainage	Arc End Chainage	HIP Chainage	Radius in m	Transition length	SPEED in Kmph
337	31+457	31+520	31+488	300	15	50
338	31+617	31+700	31+658	500	0	50
339	31+735	31+751	31+743	100	20	40
340	31+792	31+826	31+809	150	15	40
341	31+862	31+924	31+893	500	0	50
342	31+926	32+038	31+982	500	0	50
343	32+076	32+166	32+121	500	0	50
344	32+240	32+254	32+247	100	20	40
345	32+304	32+351	32+328	100	20	40
346	32+399	32+446	32+422	100	20	40
347	32+517	32+528	32+523	100	20	40
348	32+579	32+613	32+596	300	15	50
349	32+673	32+695	32+684	100	20	40
350	32+789	32+864	32+826	300	15	50
351	32+962	32+976	32+969	125	15	40
352	33+033	33+038	33+035	100	20	40
353	33+082	33+085	33+083	200	15	40
354	33+242	33+286	33+264	150	30	50
355	33+415	33+421	33+418	50	20	30
356	33+480	33+481	33+481	30	30	30
357	33+538	33+546	33+542	50	20	30
358	33+623	33+659	33+641	30	30	30
359	33+744	33+767	33+755	30	30	30
360	33+826	33+841	33+833	50	20	30
361	33+885	33+893	33+889	100	20	40
362	33+999	34+032	34+015	500	0	50
363	34+089	34+104	34+097	25	25	25
364	34+222	34+262	34+242	25	25	25
365	34+309	34+336	34+322	150	15	40
366	34+433	34+444	34+438	20	20	20
367	34+530	34+546	34+538	100	20	40
368	34+728	34+754	34+741	500	0	50
369	34+825	34+844	34+834	500	0	50
370	34+896	34+907	34+901	50	20	30
371	34+949	34+984	34+967	50	20	30
372	35+043	35+074	35+059	100	20	40
373	35+133	35+300	35+217	900	0	50
374	35+358	35+371	35+364	70	30	40
375	35+428	35+446	35+437	80	25	40
376	35+497	35+566	35+532	300	15	50
377	35+617	35+627	35+622	150	30	50

HIP No.	Arc Start Chainage	Arc End Chainage	HIP Chainage	Radius in m	Transition length	SPEED in Kmph
378	35+713	35+777	35+745	200	20	50
379	35+818	35+941	35+880	500	0	50
380	36+006	36+070	36+038	500	0	50
381	36+093	36+180	36+137	500	0	50
382	36+339	36+440	36+390	200	20	50
383	36+478	36+544	36+511	150	15	40
384	36+633	36+661	36+647	200	20	50
385	36+855	36+856	36+855	50	20	30
386	36+906	36+916	36+911	50	20	30
387	36+968	36+976	36+972	100	20	40
388	37+043	37+079	37+061	500	0	50
389	37+186	37+197	37+192	100	20	40
390	37+257	37+286	37+272	150	30	50
391	37+354	37+408	37+381	200	20	50
392	37+433	37+460	37+447	500	0	50
393	37+502	37+503	37+503	200	20	50
394	37+594	37+606	37+600	200	20	50
395	37+713	37+719	37+716	100	20	40
396	37+779	37+781	37+780	100	20	40
397	37+847	37+862	37+854	30	30	30
398	37+923	37+932	37+927	20	20	20
399	37+994	38+006	38+000	20	20	20
400	38+158	38+188	38+173	70	30	40
401	38+250	38+326	38+288	150	15	40
402	38+665	38+684	38+674	200	20	50
403	38+758	38+770	38+764	100	20	40
404	38+816	38+831	38+824	100	20	40
405	38+854	38+950	38+902	500	0	50
406	39+115	39+209	39+162	150	15	40
407	39+254	39+286	39+270	100	20	40
408	39+340	39+550	39+445	500	0	50
409	39+557	39+623	39+590	500	0	50
410	39+633	39+703	39+668	500	0	50
411	39+805	39+825	39+815	100	20	40
412	39+913	39+970	39+942	500	0	50
413	40+162	40+438	40+300	300	15	50
414	40+598	40+633	40+616	150	30	50
415	40+670	40+745	40+708	500	0	50
416	40+820	40+985	40+902	500	0	50
417	41+096	41+127	41+111	300	15	50
418	41+284	41+286	41+285	100	20	40

HIP No.	Arc Start Chainage	Arc End Chainage	HIP Chainage	Radius in m	Transition length	SPEED in Kmph
419	41+365	41+388	41+376	200	20	50
420	41+457	41+496	41+476	500	0	50
421	41+528	41+529	41+528	100	20	40
422	41+624	41+682	41+653	400	0	40
423	41+728	41+744	41+736	100	20	40
424	41+789	41+814	41+801	100	20	40
425	41+888	41+912	41+900	20	20	20
426	41+966	41+981	41+974	20	20	20
427	42+050	42+054	42+052	60	35	40
428	42+128	42+176	42+152	500	0	50
429	42+286	42+318	42+302	80	25	40
430	42+385	42+467	42+426	70	30	40
431	42+520	42+565	42+542	500	0	50
432	42+712	42+721	42+716	150	30	50
433	42+813	42+830	42+821	80	25	40
434	42+936	42+946	42+941	150	30	50
435	43+062	43+076	43+069	80	25	40
436	43+135	43+145	43+140	100	20	40
437	43+205	43+234	43+219	200	0	30
438	43+364	43+365	43+365	70	15	30
439	43+415	43+426	43+421	50	20	30
440	43+493	43+496	43+494	50	20	30
441	43+596	43+598	43+597	50	0	20
442	43+730	43+732	43+731	150	15	40
443	43+787	43+793	43+790	30	30	30
444	43+854	43+884	43+869	40	25	30
445	43+949	43+966	43+957	50	20	30
446	44+100	44+101	44+101	100	20	40
447	44+160	44+184	44+172	150	30	50
448	44+235	44+242	44+239	150	15	40
449	44+389	44+402	44+395	80	15	30
450	44+446	44+456	44+451	40	25	30
451	44+507	44+508	44+507	50	20	30
452	44+592	44+597	44+594	100	20	40
453	44+644	44+663	44+654	50	20	30
454	44+708	44+745	44+726	100	20	40
455	45+000	45+102	45+051	200	20	50
456	45+183	45+229	45+206	150	15	40
457	45+284	45+297	45+291	100	20	40
458	45+462	45+478	45+470	100	20	40
459	45+666	45+682	45+674	200	20	50

HIP No.	Arc Start Chainage	Arc End Chainage	HIP Chainage	Radius in m	Transition length	SPEED in Kmph
460	45+778	45+865	45+822	200	20	50
461	46+001	46+110	46+055	300	15	50
462	46+194	46+220	46+207	500	0	50
463	46+354	46+365	46+360	500	0	50
464	46+455	46+475	46+465	40	25	30
465	46+541	46+586	46+564	30	30	30
466	46+668	46+710	46+689	70	30	40
467	46+772	46+787	46+780	40	20	25
468	46+839	46+860	46+849	25	25	25
469	46+914	46+929	46+921	50	20	40
470	46+979	47+019	46+999	200	20	50
471	47+133	47+286	47+210	300	15	50
472	47+366	47+392	47+379	50	20	30
473	47+447	47+463	47+455	50	20	30
474	47+550	47+554	47+552	50	20	30
475	47+599	47+608	47+604	20	20	20
476	47+654	47+667	47+660	50	20	30
477	47+709	47+710	47+710	100	20	40
478	47+826	47+903	47+864	200	20	50
479	47+951	47+966	47+958	100	20	40
480	48+048	48+091	48+069	300	15	50
481	48+155	48+212	48+183	500	0	50
482	48+247	48+257	48+252	200	20	50
483	48+314	48+334	48+324	200	20	50
484	48+390	48+472	48+431	150	15	40
485	48+519	48+537	48+528	50	20	30
486	48+613	48+640	48+627	200	20	50
487	48+701	48+704	48+702	80	15	30
488	48+752	48+778	48+765	50	20	30
489	48+830	48+839	48+835	50	20	30
490	48+878	48+906	48+892	80	15	30
491	48+947	48+967	48+957	50	20	30
492	49+023	49+054	49+039	80	25	40
493	49+115	49+123	49+119	100	20	40
494	49+200	49+250	49+225	500	0	50
495	49+342	49+365	49+353	80	15	30
496	49+406	49+424	49+415	100	20	40
497	49+479	49+553	49+516	500	0	50
498	49+595	49+626	49+611	50	20	30
499	49+698	49+712	49+705	20	20	20
500	49+765	49+769	49+767	30	30	30

HIP No.	Arc Start Chainage	Arc End Chainage	HIP Chainage	Radius in m	Transition length	SPEED in Kmph
501	49+841	49+858	49+850	100	20	40
502	49+926	50+024	49+975	100	20	40
503	50+090	50+130	50+110	30	30	30
504	50+208	50+225	50+217	30	30	30
505	50+288	50+305	50+297	100	20	40
506	50+550	50+554	50+552	50	20	30
507	50+627	50+651	50+639	100	20	40
508	50+691	50+772	50+732	500	0	50
509	50+799	50+810	50+804	80	15	30
510	50+857	50+885	50+871	50	20	30
511	50+953	50+959	50+956	50	20	30
512	51+025	51+143	51+084	500	0	50
513	51+253	51+300	51+277	150	15	40
514	51+341	51+395	51+368	150	15	40
515	51+461	51+469	51+465	100	20	40
516	51+513	51+591	51+552	300	0	40
517	51+893	51+982	51+937	800	0	50
518	52+102	52+130	52+116	500	0	50
519	52+199	52+211	52+205	150	15	40
520	52+364	52+382	52+373	100	20	40
521	52+434	52+484	52+459	300	15	50
522	52+738	52+746	52+742	200	20	50
523	52+926	53+011	52+968	500	0	50
524	53+156	53+175	53+165	150	15	40
525	53+231	53+272	53+251	150	15	40
526	53+327	53+346	53+337	50	20	30
527	53+395	53+406	53+401	50	20	30
528	53+505	53+533	53+519	500	0	50
529	53+588	53+598	53+593	80	25	40
530	53+661	53+672	53+666	70	30	40
531	53+714	53+762	53+738	500	0	50
532	53+827	53+847	53+837	50	20	30
533	53+910	53+919	53+915	30	30	30
534	53+981	54+025	54+003	100	20	40
535	54+135	54+168	54+151	100	20	40
536	54+317	54+340	54+329	100	20	40
537	54+397	54+409	54+403	100	20	40
538	54+459	54+530	54+494	150	15	40
539	54+578	54+589	54+583	100	20	40
540	54+962	55+009	54+986	30	30	30
541	55+043	55+118	55+081	500	0	50

HIP No.	Arc Start Chainage	Arc End Chainage	HIP Chainage	Radius in m	Transition length	SPEED in Kmph
542	55+186	55+217	55+202	100	20	40
543	55+283	55+330	55+306	30	30	30
544	55+368	55+586	55+477	300	0	40
545	55+629	55+692	55+661	50	20	30
546	55+798	55+844	55+821	50	20	30
547	55+974	56+013	55+993	20	20	20
548	56+061	56+074	56+067	100	20	40
549	56+127	56+148	56+137	30	30	30
550	56+260	56+421	56+341	85	25	40
551	56+484	56+500	56+492	15	30	20
552	56+564	56+582	56+573	50	20	30
553	56+654	56+764	56+709	125	35	50
554	56+845	56+876	56+861	50	20	30
555	56+929	56+956	56+943	50	20	30
556	57+004	57+014	57+009	20	20	20
557	57+073	57+205	57+139	62	20	30
558	57+295	57+309	57+302	50	20	30
559	57+360	57+369	57+365	50	20	30
560	57+443	57+531	57+487	70	15	30
561	57+636	57+653	57+644	15	30	20
562	57+704	57+714	57+709	100	15	30
563	57+804	57+857	57+830	70	30	40
564	57+974	58+002	57+988	100	20	40
565	58+057	58+099	58+078	20	20	20
566	58+200	58+202	58+201	50	20	30
567	58+332	58+344	58+338	50	40	40
568	58+452	58+457	58+454	100	20	40
569	58+503	58+524	58+514	100	20	40
570	58+572	58+610	58+591	100	20	40
571	58+665	58+679	58+672	50	20	30
572	58+737	58+763	58+750	50	20	30
573	58+931	58+976	58+953	150	15	40
574	59+018	59+029	59+024	50	20	30
575	59+078	59+093	59+086	40	25	30
576	59+173	59+196	59+184	100	20	40
577	59+260	59+265	59+263	125	15	40
578	59+314	59+320	59+317	30	30	30
579	59+372	59+452	59+412	50	20	30
580	59+553	59+568	59+561	30	30	30
581	59+624	59+626	59+625	50	20	30
582	59+700	59+762	59+731	200	20	50

HIP No.	Arc Start Chainage	Arc End Chainage	HIP Chainage	Radius in m	Transition length	SPEED in Kmph
583	59+838	59+866	59+852	200	20	50
584	60+087	60+100	60+093	100	20	40
585	60+158	60+248	60+203	80	25	40
586	60+298	60+352	60+325	100	20	40
587	60+420	60+431	60+426	100	20	40
588	60+499	60+509	60+504	100	20	40
589	60+597	60+622	60+609	20	20	20
590	60+665	60+672	60+669	50	20	30
591	60+715	60+734	60+724	50	20	30
592	60+779	60+786	60+783	50	20	30
593	60+829	60+842	60+836	50	20	30
594	60+899	60+945	60+922	50	20	30
595	61+006	61+011	61+008	100	20	40
596	61+075	61+081	61+078	200	20	50
597	61+134	61+135	61+135	50	20	30
598	61+186	61+197	61+191	100	20	40
599	61+259	61+261	61+260	100	20	40
600	61+366	61+410	61+388	500	0	50
601	61+500	61+579	61+540	50	40	40
602	61+645	61+659	61+652	150	15	40
603	61+785	61+804	61+794	100	20	40
604	61+854	61+877	61+866	50	20	30
605	61+921	61+940	61+931	50	20	30
606	62+000	62+034	62+017	100	15	30
607	62+077	62+097	62+087	50	20	30
608	62+148	62+163	62+155	50	20	30
609	62+208	62+226	62+217	200	20	50
610	62+346	62+387	62+366	20	20	20
611	62+429	62+431	62+430	50	20	30
612	62+499	62+514	62+507	50	20	30
613	62+575	62+593	62+584	50	20	30
614	62+638	62+654	62+646	50	20	30
615	62+700	62+703	62+702	100	20	40
616	62+753	62+785	62+769	100	20	40
617	62+858	62+877	62+868	50	20	30
618	62+980	63+021	63+001	20	20	20
619	63+072	63+120	63+096	100	20	40
620	63+241	63+251	63+246	50	20	30
621	63+292	63+298	63+295	70	15	30
622	63+343	63+346	63+344	40	25	30
623	63+395	63+408	63+402	50	20	30

HIP No.	Arc Start Chainage	Arc End Chainage	HIP Chainage	Radius in m	Transition length	SPEED in Kmph
624	63+513	63+577	63+545	50	20	30
625	63+663	63+671	63+667	30	30	30
626	63+764	63+766	63+765	100	20	40
627	63+857	63+901	63+879	45	25	30
628	64+048	64+144	64+096	400	0	40
629	64+186	64+224	64+205	500	0	50
630	64+438	64+620	64+529	900	0	50
631	64+678	64+702	64+690	200	20	50
632	64+724	64+860	64+792	500	0	50
633	64+904	65+100	65+002	400	0	40
634	65+661	65+669	65+665	500	0	50
635	65+723	65+784	65+754	1000	0	50
636	65+852	65+877	65+864	100	20	40
637	65+950	65+974	65+962	200	20	50
638	66+087	66+227	66+157	400	15	50
639	66+324	66+357	66+341	40	25	30
640	66+453	66+485	66+469	150	30	50
641	66+603	66+617	66+610	200	20	50
642	66+681	66+716	66+699	100	20	40
643	66+840	66+864	66+852	500	0	50
644	66+999	67+024	67+011	500	0	50
645	67+071	67+088	67+080	500	0	50
646	67+202	67+250	67+226	500	0	50
647	67+331	67+484	67+407	900	0	50
648	67+581	67+616	67+599	150	30	50
649	67+721	67+731	67+726	70	30	40
650	67+794	67+835	67+815	125	15	40
651	67+911	67+927	67+919	500	0	50
652	68+014	68+022	68+018	100	20	40
653	68+063	68+071	68+067	100	20	40
654	68+133	68+178	68+155	500	0	50
655	68+271	68+352	68+312	300	15	50
656	68+379	68+406	68+393	500	0	50
657	68+427	68+454	68+441	200	0	30
658	68+524	68+533	68+528	500	0	50
659	68+656	68+731	68+693	150	30	50
660	68+784	68+865	68+824	200	15	40
661	69+022	69+038	69+030	150	15	40
662	69+086	69+150	69+118	150	15	40
663	69+291	69+303	69+297	100	20	40
664	69+427	69+439	69+433	50	40	40

HIP No.	Arc Start Chainage	Arc End Chainage	HIP Chainage	Radius in m	Transition length	SPEED in Kmph
665	69+521	69+546	69+534	100	20	40
666	69+664	69+744	69+704	150	30	50
667	69+867	69+869	69+868	200	20	50
668	69+960	69+972	69+966	150	30	50
669	70+034	70+052	70+043	200	20	50
670	70+118	70+126	70+122	20	20	20
671	70+181	70+191	70+186	40	25	30
672	70+276	70+296	70+286	80	25	40
673	70+397	70+420	70+408	30	30	30
674	70+498	70+519	70+509	200	20	50
675	70+630	70+648	70+639	50	20	30
676	70+866	70+908	70+887	20	20	20
677	71+104	71+117	71+110	30	30	30
678	71+174	71+189	71+181	50	20	30
679	71+392	71+430	71+411	50	20	30
680	71+520	71+530	71+525	30	30	30
681	71+594	71+609	71+602	30	30	30
682	71+707	71+718	71+712	70	15	30
683	71+760	71+801	71+781	20	20	20
684	71+857	71+870	71+864	100	20	40
685	71+926	71+952	71+939	100	20	40
686	72+028	72+038	72+033	50	20	30
687	72+082	72+103	72+093	50	20	30
688	72+170	72+194	72+182	80	25	40
689	72+286	72+305	72+295	100	20	40
690	72+384	72+399	72+392	50	20	30
691	72+452	72+462	72+457	80	25	40
692	72+628	72+693	72+661	200	20	50
693	72+803	72+813	72+808	40	25	30
694	72+868	72+880	72+874	40	25	30
695	72+953	72+960	72+957	20	20	20
696	73+004	73+026	73+015	40	20	25
697	73+073	73+109	73+091	20	20	20
698	73+208	73+213	73+210	50	20	30
699	73+298	73+304	73+301	50	20	30
700	73+362	73+369	73+365	50	20	30
701	73+414	73+420	73+417	125	15	40
702	73+480	73+495	73+487	50	20	30
703	73+529	73+569	73+549	300	0	40
704	73+651	73+664	73+657	30	30	30
705	73+731	73+743	73+737	30	30	30

HIP No.	Arc Start Chainage	Arc End Chainage	HIP Chainage	Radius in m	Transition length	SPEED in Kmph
706	73+868	73+910	73+889	20	20	20
707	73+964	73+979	73+971	100	20	40
708	74+042	74+102	74+072	70	15	30
709	74+150	74+159	74+154	30	30	30
710	74+256	74+285	74+270	50	20	30
711	74+364	74+494	74+429	80	25	40
712	74+591	74+618	74+604	50	20	30
713	74+705	74+715	74+710	20	20	20
714	74+741	74+865	74+803	500	0	50
715	74+893	74+909	74+901	50	20	30
716	74+961	74+974	74+967	150	15	40
717	75+057	75+087	75+072	30	30	30
718	75+158	75+207	75+182	80	15	30
719	75+252	75+263	75+257	40	20	25
720	75+305	75+341	75+323	20	20	20
721	75+387	75+397	75+392	20	20	20
722	75+461	75+483	75+472	50	20	30
723	75+541	75+581	75+561	30	30	30
724	75+653	75+772	75+713	500	0	50
725	75+809	75+817	75+813	200	20	50
726	75+917	75+928	75+923	30	30	30
727	76+024	76+188	76+106	125	15	40
728	76+392	76+410	76+401	50	20	30
729	76+462	76+503	76+482	20	20	20
730	76+586	76+608	76+597	50	20	30
731	76+720	76+773	76+746	500	0	50
732	76+826	76+955	76+890	150	15	40
733	77+024	77+045	77+035	20	20	20
734	77+099	77+110	77+105	70	15	30
735	77+161	77+177	77+169	15	30	20
736	77+215	77+233	77+224	300	0	40
737	77+268	77+284	77+276	15	30	20
738	77+352	77+360	77+356	30	30	30
739	77+505	77+508	77+507	30	30	30
740	77+573	77+588	77+581	80	25	40
741	77+672	77+676	77+674	70	15	30
742	77+726	77+781	77+754	125	15	40
743	77+933	78+056	77+994	125	35	50
744	78+166	78+199	78+182	200	20	50
745	78+266	78+304	78+285	500	0	50
746	78+429	78+478	78+454	500	0	50

HIP No.	Arc Start Chainage	Arc End Chainage	HIP Chainage	Radius in m	Transition length	SPEED in Kmph
747	78+561	78+597	78+579	200	20	50
748	78+836	78+877	78+857	200	20	50
749	79+041	79+178	79+110	500	0	50
750	79+230	79+265	79+248	500	0	50
751	79+421	79+508	79+465	500	0	50
752	79+534	79+572	79+553	300	15	50
753	79+629	79+643	79+636	30	30	30
754	79+738	79+759	79+749	50	40	40
755	79+964	79+980	79+972	70	30	40
756	80+047	80+048	80+047	100	20	40
757	80+120	80+134	80+127	50	20	30
758	80+236	80+249	80+242	100	20	40
759	80+311	80+328	80+320	100	20	40
760	80+424	80+522	80+473	500	0	50
761	80+594	80+624	80+609	100	20	40
762	80+715	80+717	80+716	50	20	30
763	80+786	80+810	80+798	70	15	30
764	80+849	80+851	80+850	70	15	30
765	80+897	80+905	80+901	80	25	40
766	80+936	81+042	80+989	500	0	50
767	81+067	81+077	81+072	100	20	40
768	81+140	81+140	81+140	100	20	40
769	81+229	81+277	81+253	50	0	20
770	81+311	81+355	81+333	50	0	20
771	81+412	81+416	81+414	70	15	30
772	81+499	81+513	81+506	50	20	30
773	81+566	81+571	81+569	200	20	50
774	81+631	81+648	81+639	100	20	40
775	81+688	81+747	81+717	500	0	50
776	81+781	81+810	81+796	200	20	50
777	81+875	81+912	81+893	80	25	40
778	81+980	82+003	81+992	50	20	30
779	82+067	82+132	82+100	100	20	40
780	82+200	82+278	82+239	500	0	50
781	82+297	82+354	82+326	500	0	50
782	82+410	82+424	82+417	50	20	30
783	82+486	82+489	82+488	30	30	30
784	82+551	82+597	82+574	50	20	30
785	82+662	82+692	82+677	200	20	50
786	82+735	82+743	82+739	150	15	40
787	82+801	82+808	82+804	50	20	30

HIP No.	Arc Start Chainage	Arc End Chainage	HIP Chainage	Radius in m	Transition length	SPEED in Kmph
788	82+861	82+879	82+870	20	20	20
789	82+933	82+955	82+944	80	25	40
790	83+019	83+054	83+037	300	15	50
791	83+100	83+112	83+106	80	15	30
792	83+154	83+180	83+167	50	20	30
793	83+352	83+389	83+370	100	20	40
794	83+494	83+497	83+496	70	15	30
795	83+547	83+565	83+556	50	20	30
796	83+642	83+655	83+648	70	30	40
797	83+754	83+768	83+761	30	30	30
798	83+905	83+912	83+909	30	30	30
799	83+977	84+048	84+012	300	15	50
800	84+096	84+321	84+208	300	15	50
801	84+384	84+401	84+393	50	20	30
802	84+458	84+478	84+468	50	20	30
803	84+535	84+546	84+541	100	20	40
804	84+590	84+611	84+601	150	15	40
805	84+663	84+684	84+674	200	20	50
806	84+760	84+771	84+766	50	20	30
807	84+823	84+850	84+837	100	20	40
808	84+899	85+127	85+013	300	15	50
809	85+186	85+234	85+210	500	0	50
810	85+259	85+413	85+336	500	0	50
811	85+512	85+538	85+525	300	15	50
812	85+604	85+623	85+614	40	25	30
813	85+681	85+690	85+685	300	15	50
814	85+809	85+830	85+820	200	20	50
815	85+916	85+928	85+922	100	20	40
816	85+984	85+994	85+989	100	20	40
817	86+054	86+068	86+061	70	15	30
818	86+112	86+195	86+154	100	20	40
819	86+336	86+468	86+402	150	15	40
820	86+507	86+536	86+521	50	20	30
821	86+593	86+607	86+600	50	20	30
822	86+659	86+676	86+668	50	20	30
823	86+791	86+803	86+797	50	20	30
824	86+860	86+872	86+866	125	15	40
825	86+924	86+978	86+951	100	20	40
826	87+040	87+042	87+041	50	20	30
827	87+088	87+163	87+126	100	15	30
828	87+280	87+293	87+286	100	20	40

HIP No.	Arc Start Chainage	Arc End Chainage	HIP Chainage	Radius in m	Transition length	SPEED in Kmph
829	87+392	87+420	87+406	70	30	40
830	87+516	87+532	87+524	50	20	30
831	87+659	87+718	87+689	70	30	40
832	87+816	87+822	87+819	100	20	40
833	87+931	87+953	87+942	100	20	40
834	88+149	88+176	88+163	70	30	40
835	88+257	88+280	88+269	70	30	40
836	88+397	88+430	88+413	50	20	30
837	88+497	88+506	88+502	150	15	40
838	88+541	88+550	88+546	125	15	40
839	88+587	88+595	88+591	125	15	40
840	88+636	88+645	88+641	100	20	40
841	88+742	88+752	88+747	50	20	30
842	88+798	88+827	88+812	50	20	30
843	88+891	88+898	88+894	50	20	30
844	88+967	88+988	88+978	100	20	40
845	89+044	89+047	89+046	100	20	40
846	89+143	89+149	89+146	100	20	40
847	89+203	89+240	89+221	200	20	50
848	89+367	89+390	89+379	100	20	40
849	89+497	89+513	89+505	100	20	40
850	89+641	89+645	89+643	100	20	40
851	89+696	89+698	89+697	100	20	40
852	89+767	89+826	89+796	80	25	40
853	89+924	89+931	89+927	80	25	40
854	89+986	89+990	89+988	50	20	30
855	90+049	90+057	90+053	50	20	30
856	90+150	90+167	90+158	40	25	30
857	90+220	90+226	90+223	100	20	40
858	90+272	90+284	90+278	100	20	40
859	90+325	90+374	90+350	500	0	50
860	90+420	90+423	90+421	50	20	30
861	90+479	90+480	90+480	30	30	30
862	90+563	90+575	90+569	70	30	40
863	90+672	90+675	90+674	50	20	30
864	90+721	90+740	90+731	50	20	30
865	90+797	90+811	90+804	50	20	30
866	90+853	90+862	90+858	50	20	30
867	90+907	90+920	90+913	50	20	30
868	90+965	91+004	90+985	500	0	50
869	91+135	91+170	91+153	100	20	40

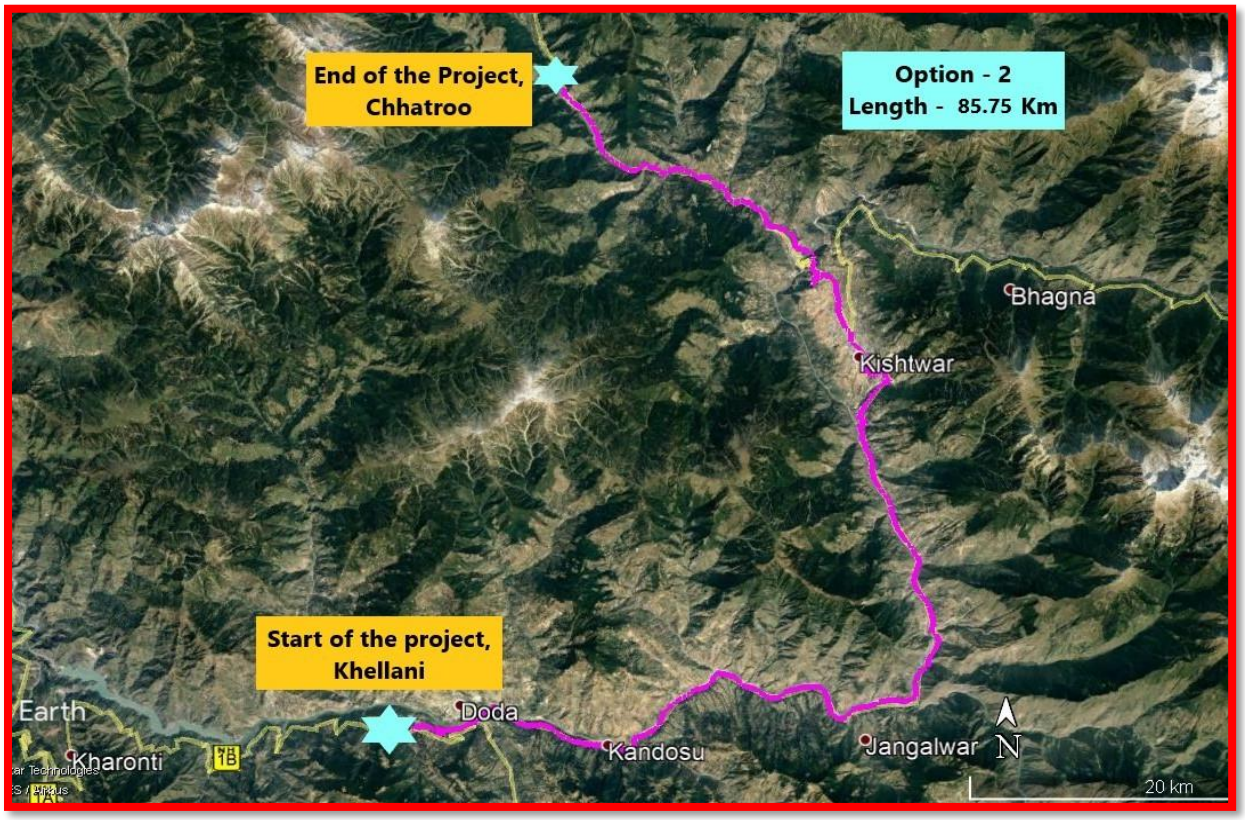
HIP No.	Arc Start Chainage	Arc End Chainage	HIP Chainage	Radius in m	Transition length	SPEED in Kmph
870	91+226	91+295	91+261	150	15	40
871	91+344	91+360	91+352	200	20	50
872	91+436	91+456	91+446	70	30	40
873	91+555	91+580	91+567	50	40	40
874	91+658	91+696	91+677	100	20	40
875	91+762	91+763	91+762	30	30	30
876	91+818	91+842	91+830	20	20	20
877	91+902	91+915	91+909	30	30	30
878	92+037	92+047	92+042	200	20	50
879	92+102	92+105	92+103	100	20	40
880	92+194	92+200	92+197	50	20	30
881	92+250	92+276	92+263	50	20	30
882	92+398	92+475	92+436	100	20	40
883	92+554	92+575	92+565	30	30	30
884	92+633	92+640	92+637	40	25	30
885	92+784	92+805	92+795	200	20	50
886	92+895	92+935	92+915	200	20	50
887	93+007	93+037	93+022	100	20	40
888	93+102	93+125	93+114	50	20	30
889	93+177	93+181	93+179	50	20	30
890	93+299	93+332	93+315	500	0	50
891	93+396	93+401	93+398	100	20	40
892	93+447	93+465	93+456	100	20	40
893	93+514	93+530	93+522	200	20	50
894	93+595	93+599	93+597	100	20	40
895	93+649	93+652	93+651	80	25	40
896	93+710	93+730	93+720	50	20	30
897	93+800	93+809	93+805	30	30	30
898	93+879	93+886	93+882	100	20	40
899	93+955	94+000	93+977	80	25	40
900	94+056	94+069	94+062	50	20	30
901	94+173	94+177	94+175	100	20	40
902	94+249	94+381	94+315	125	15	40
903	94+429	94+450	94+439	100	20	40
904	94+586	94+640	94+613	200	20	50
905	94+726	94+728	94+727	30	30	30
906	94+782	94+794	94+788	50	20	30
907	94+843	94+850	94+846	50	20	30
908	94+936	94+979	94+958	100	20	40
909	95+085	95+102	95+094	100	20	40
910	95+217	95+339	95+278	150	15	40

HIP No.	Arc Start Chainage	Arc End Chainage	HIP Chainage	Radius in m	Transition length	SPEED in Kmph
911	95+432	95+452	95+442	30	30	30
912	95+550	95+560	95+555	200	20	50
913	95+664	95+710	95+687	100	20	40
914	95+850	95+863	95+857	50	20	30

8.2 Alignment Option 2

Salient Features

This is considered as Option – 2, where the proposed road of project stretches runs through many realignments and curve improvements. The realignments/curve improvements are proposed at 26 locations. The Location of the Project Road lies entirely in Doda and Kishtwar districts of J&K. The Project Road starts from proposed Ch. 0+000 (At Ex. Ch. 45.250) near Khellani and passes through Gangalwar, Bhuta, Suigwari, Nai Basti, Premnagar,Thatri, Darabshalla, Kandiri, Kishtwar, Marwah, Kodia, Dhadhpeth, Mughal Maidan, and Udil Gurjan and ends at proposed Ch. 85+757 (At Ex Ch. 140+460) near Chhatroo and has total proposed length of 85.757 Km.



(i) Coordinates for start & end points

	Easting (m)	Northing (m)	Latitude (Decimal)	Longitude (Decimal)	Remarks
Start	548692.47 E	3666317.21 N	33.134481°	75.522046°	At Khellani
End	556182.06 E	3700140.89 N	33.439197°	75.604429°	At Chhatroo

(ii) Length of Road portion – 84.327 Km excluding Length of Bridges i.e. 1429.5 m.

(iii) The alignment has 05 nos. of Major Bridges and 19 nos. of minor bridges.

Sr. No.	Design Chainage	Type of Structure	Span Arrangement (No.x length)	Carriageway width (m)	Overall Width (m)	Total Span (m)	Proposal
1	04+750	**Major Bridge**	1X70	8.30	13.30	70.00	Retained with minor repairs
2	13+748	Minor Bridge	1X9	7.00	10.50	9.00	Retained with Widening
3	15+327	Minor Bridge	1X22.5	7.00	8.70	22.50	Retained with foundation protection
4	18+707	Minor Bridge	1X24.5	7.00	8.90	24.50	Retained with minor repairs
5	23+150	Minor Bridge	1X55	7.50	12.50	55.00	New Construction
6	24+795	Minor Bridge	1X50	7.50	12.50	50.00	New Construction
7	28+610	Minor Bridge	1X30+1X30	7.50	12.50	60.00	New Construction
8	29+060	Minor Bridge	1X50	7.50	12.50	50.00	New Construction
9	29+660	**Major Bridge**	1X65	7.50	12.50	65.00	New Construction
10	30+590	**Major Bridge**	1X40+1X80+ 1X40	7.50	12.50	160.00	New Construction
11	32+635	**Major Bridge**	2X30+1X80+ 2X30	7.50	12.50	200.00	New Construction
12	36+148	Minor Bridge	1X20	7.50	12.50	20.00	New Construction
13	36+783	Minor Bridge	1X38.3	7.00	8.30	38.30	Retained with minor repairs
14	40+750	Minor Bridge	1X40	7.50	12.50	40.00	New Construction
15	40+986	Minor Bridge	1X6.5	7.00	9.00	6.50	Retained with minor repairs

Sr. No.	Design Chainage	Type of Structure	Span Arrangement (No.x length)	Carriageway width (m)	Overall Width (m)	Total Span (m)	Proposal
16	46+170	Minor Bridge	1X36	7.00	8.30	36.00	Retained with minor repairs
17	49+275	Minor Bridge	1X10	7.50	12.50	10.00	Reconstruction
18	62+865	Minor Bridge	1X10	7.50	12.50	10.00	Reconstruction
19	67+175	**Major Bridge**	2X25+1X62.5 +1X125 +1X62.5+2X25	7.50	12.50	350.00	New Construction
20	70+140	Minor Bridge	1X50	7.50	12.50	50.00	New Construction
21	73+770	Minor Bridge	1X35	7.50	12.50	35.00	New Construction
22	76+475	Minor Bridge	1X39.6	7.50	12.50	39.60	New Construction
23	81+700	Minor Bridge	1X20	7.50	12.50	20.00	New Construction
24	84+618	Minor Bridge	1X8.1	7.50	12.50	8.10	Reconstruction

(iv) Right of Way (ROW)

Right-of-way (ROW) are proposed with 24 m in rural areas including bypass/realignments section and 12.5m ROW in built-up areas. This option consists of undivided two lane with paved shoulder as per manual. Also, the additional land may be required at junction locations in accordance with proposed junction design, road amenities locations and Toll plaza location if required.

At this stage on submission of Alignment option, we have assumed existing ROW in built-up area between building line and in Rural areas from toe lines of the formation width. Based on that we have calculated the additional land to be acquired.

(v) Terrain

The project road passes through mountainous terrain.

(vi) Land use

The land use along the alignment are mainly forest, built up area and agricultural land. Land use pattern map has been attached in drawing volume.

(vii) Major crossroads

There are 11 major and 17 minor intersections at project road. The details are in below table;

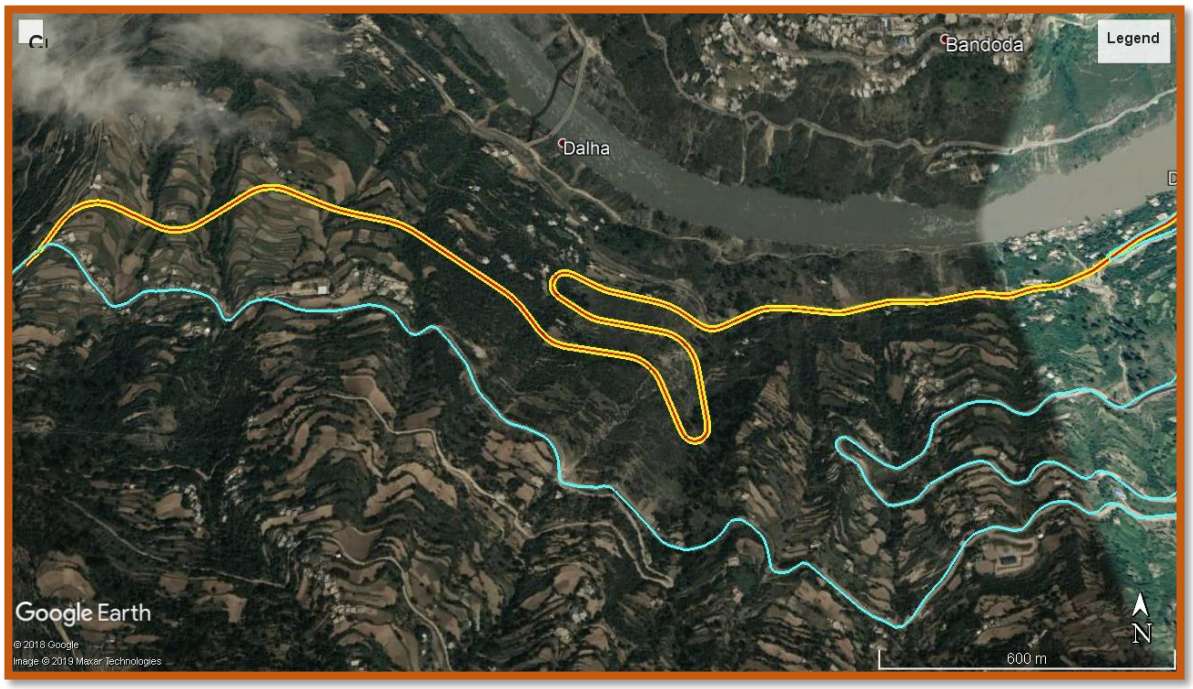
Design Chainage	Towards	Jun. Type	Types
0+000	Gangalwar	Y	**Major**
3+850	Khellani	Y	**Major**
4+700	Bhaderwah	Y	**Major**
4+970	Doda	T	Minor
7+800	Sohra	Y	Minor
11+400	Kakrassu	Y	Minor
12+400	Himote	Y	Minor
15+700	Jhajka	Y	Minor
24+210	Kandhot	Y	Minor
27+700	Kandote	Y	Minor
30+460	Thatri (NH-244)	Y	**Major**
32+720	Thatri and Kihotran	Y	**Major**
34+800	Balgran	Y	Minor
36+300	Mandar	Y	Minor
36+810	Salana	**T**	**Major**
48+280	Agral	Y	Minor
52+050	Sarthal	Y	Minor
54+810	Army Camp	Y	Minor
56+320	Kishtwar City	Y	**Major**
59+775	Kishtwar City	Y	**Major**
60+260	Keylong	Y	**Major**
62+225	Hunjal	Y	Minor
62+860	Poochal	+	Minor
67+000	Marwah	Y	**Major**
70+200	Marwah	Y	**Major**
74+275	Thagood	Y	Minor
76+450	Sangam Bhatti	Y	Minor
83+260	Batwari	Y	Minor

(viii)Bypass/Realignments Requirements

There are numbers of realignment and curve improvements proposed in this option 2 alignment. Details are as under:

Design Chainage		Length (Km)	Realignment/Curve Improvement
From	To		
0.000	3.860	3.860	Realignment
11.300	11.400	0.100	Curve Improvement

Design Chainage		Length (Km)	Realignment/Curve Improvement
From	To		
23.100	23.200	0.100	Curve Improvement
23.338	23.500	0.162	Curve Improvement
24.700	24.860	0.160	Curve Improvement
28.500	28.700	0.200	Curve Improvement
29.000	29.160	0.160	Curve Improvement
29.600	29.730	0.130	Curve Improvement
30.400	32.800	2.400	**Bypass to New Thatri**
34.200	35.000	0.800	**Realignment (Scope under Ch. 83 Project)**
36.100	36.200	0.100	Curve Improvement
37.980	38.100	0.120	Curve Improvement
40.520	41.000	0.480	Curve Improvement in Kandiri built-up
41.650	41.800	0.150	Curve Improvement
43.700	43.810	0.110	Curve Improvement
44.080	44.210	0.130	Curve Improvement
48.700	49.200	0.500	Curve Improvement
49.760	50.700	0.940	Curve Improvement
51.600	52.200	0.600	Curve Improvement
54.550	54.620	0.070	Curve Improvement
64.600	64.900	0.300	Curve Improvement
66.700	70.300	3.600	Realignment (Also bypass the Bandarkoot, Helmet Top)
73.600	73.900	0.300	Curve Improvement
78.000	78.400	0.400	Curve Improvement
81.640	81.760	0.120	Curve Improvement
82.300	82.500	0.200	Curve Improvement
83.900	84.000	0.100	Curve Improvement
Total Length		**16.292**	


Bandoda
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© 2018 Google
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600 m
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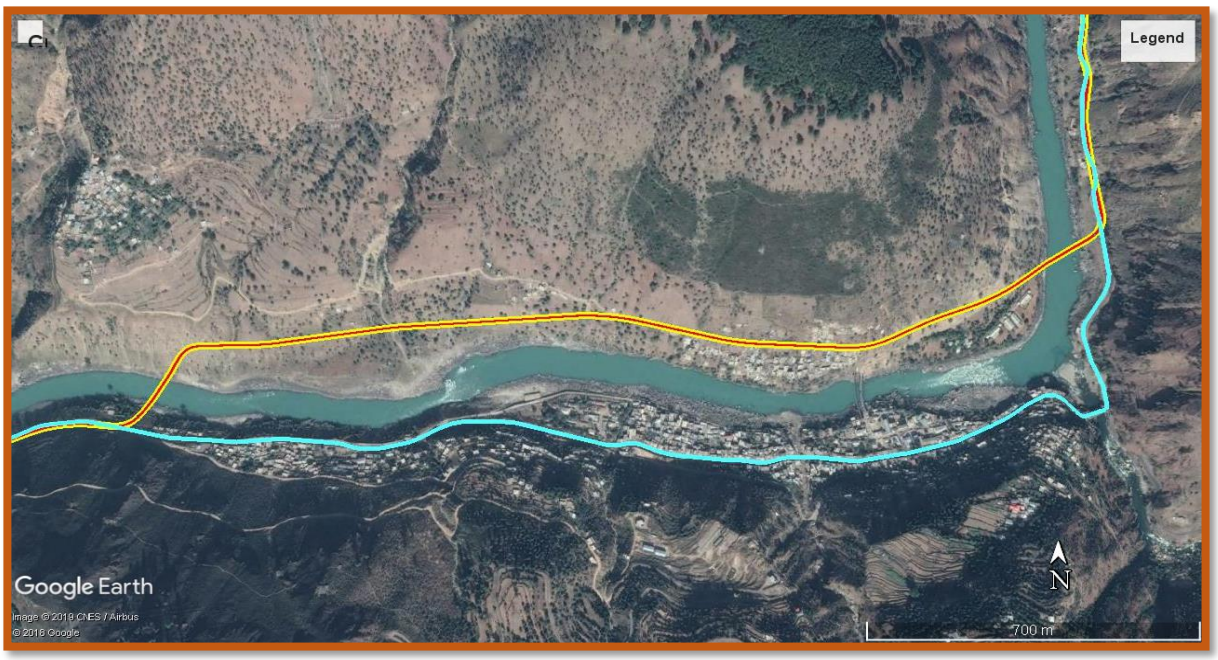
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Image © 2018 CNES / Airbus
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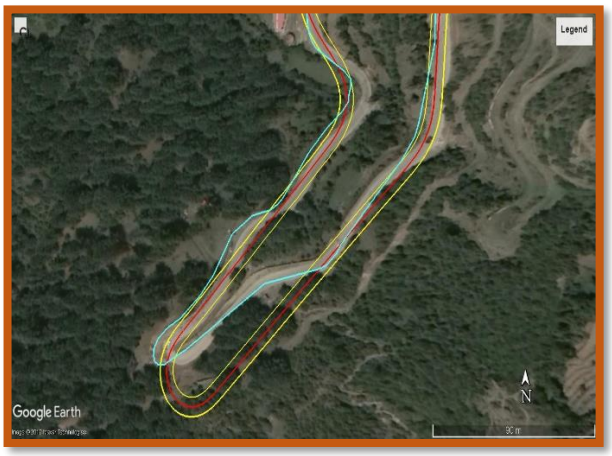
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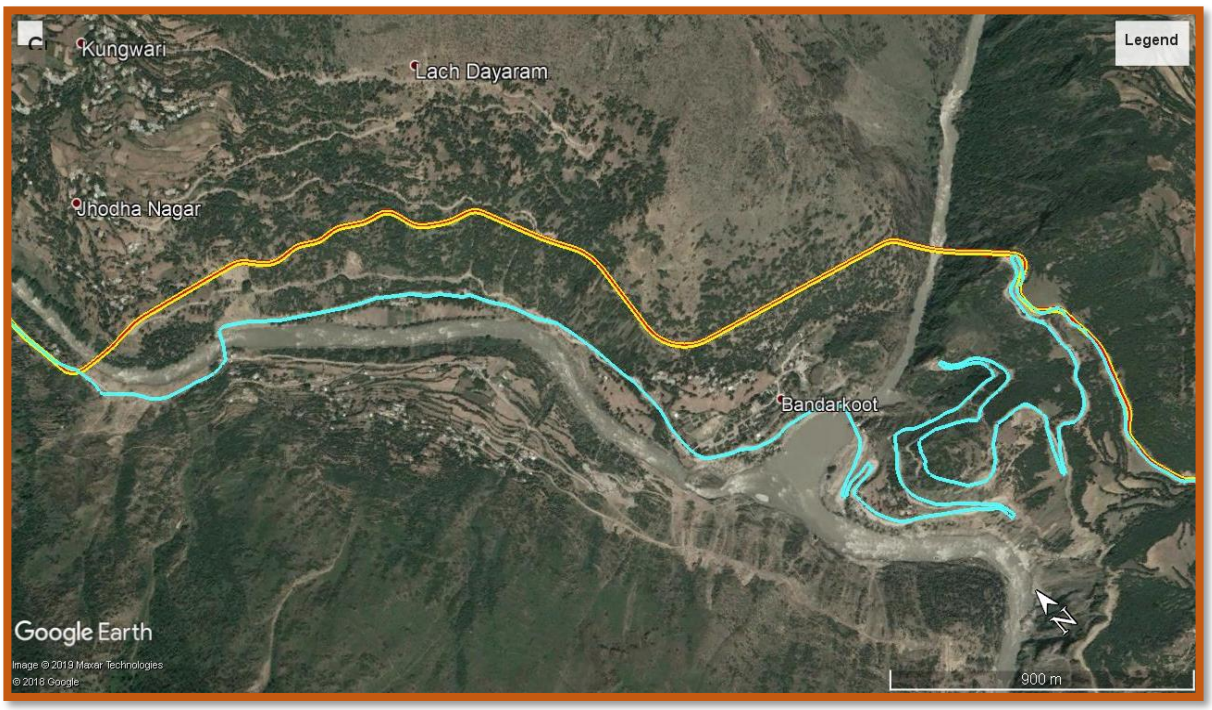
Kungwari
Lach Dayaram
Legend
Jhodha Nagar
Bandarkoot
Google Earth
Image © 2019 Maxar Technologies
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900 m

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Existing Alignment

Proposed Alignment

(ix) Typical Cross Section and Alignment Plan

The proposed cross sections are developed for two lanes with paved shoulder in accordance with 2-lane manual.

(x) Land Acquisition Requirement

Total Land available is approx. **81.7 Hec.** and additional land to be acquired approx. **110.5 Hec.** in this option.

(xi) Utility Shifting

There will be a proposal for utility shifting since there are few utility features along with the project road.

(xii) Horizontal Curve Detail of Option 2

HIP No.	Arc Start Chainage	Arc End Chainage	HIP Chainage	Radius in m	SPEED in Kmph
1	00+040	00+051	00+046	50	30
2	00+134	00+253	00+193	100	40
3	00+376	00+455	00+415	100	40
4	00+601	00+675	00+638	100	40
5	00+757	00+849	00+803	500	50
6	00+926	00+982	00+954	200	50
7	01+235	01+282	01+258	200	50
8	01+357	01+413	01+385	100	40
9	01+573	01+656	01+615	100	40
10	01+802	01+859	01+830	30	30
11	02+013	02+117	02+065	100	40
12	02+282	02+301	02+292	100	40
13	02+403	02+463	02+433	30	30
14	02+565	02+569	02+567	100	40
15	02+698	02+758	02+728	200	50
16	02+829	02+840	02+835	50	40
17	02+963	02+985	02+974	100	40
18	03+042	03+043	03+042	200	50
19	03+149	03+162	03+155	100	40
20	03+282	03+286	03+284	100	40
21	03+375	03+390	03+383	150	40
22	03+495	03+505	03+500	100	40
23	03+559	03+581	03+570	100	40

HIP No.	Arc Start Chainage	Arc End Chainage	HIP Chainage	Radius in m	SPEED in Kmph
24	03+635	03+636	03+635	100	40
25	03+689	03+700	03+695	100	40
26	03+791	03+792	03+792	100	40
27	03+934	03+947	03+941	200	50
28	04+000	04+018	04+009	200	50
29	04+076	04+096	04+086	200	50
30	04+263	04+278	04+270	150	40
31	04+326	04+335	04+330	70	40
32	04+391	04+424	04+407	200	50
33	04+466	04+484	04+475	200	50
34	04+529	04+531	04+530	200	50
35	04+601	04+639	04+620	150	40
36	04+681	04+698	04+690	20	20
37	04+797	04+827	04+812	50	30
38	04+892	04+934	04+913	200	50
39	05+007	05+014	05+010	70	40
40	05+077	05+085	05+081	100	40
41	05+134	05+186	05+160	200	50
42	05+229	05+241	05+235	300	50
43	05+306	05+319	05+312	200	50
44	05+369	05+375	05+372	100	40
45	05+424	05+437	05+431	100	40
46	05+493	05+507	05+500	150	40
47	05+582	05+613	05+597	125	40
48	05+652	05+677	05+665	200	50
49	05+793	05+799	05+796	150	50
50	05+856	05+955	05+905	125	40
51	06+000	06+012	06+006	300	50
52	06+064	06+134	06+099	300	50
53	06+214	06+237	06+226	200	50
54	06+382	06+394	06+388	200	50
55	06+419	06+472	06+446	300	40
56	06+511	06+513	06+512	200	50
57	06+560	06+562	06+561	200	50
58	06+636	06+648	06+642	70	40
59	06+727	06+737	06+732	70	40
60	06+787	06+843	06+815	125	40
61	06+885	06+897	06+891	50	30
62	06+939	06+971	06+955	100	40
63	07+002	07+032	07+017	300	40
64	07+053	07+096	07+074	200	40

HIP No.	Arc Start Chainage	Arc End Chainage	HIP Chainage	Radius in m	SPEED in Kmph
65	07+144	07+147	07+146	70	40
66	07+202	07+205	07+204	125	40
67	07+251	07+261	07+256	80	40
68	07+342	07+352	07+347	80	40
69	07+410	07+415	07+413	50	30
70	07+458	07+504	07+481	50	30
71	07+575	07+581	07+578	30	30
72	07+639	07+649	07+644	40	30
73	07+712	07+734	07+723	80	40
74	07+819	07+825	07+822	50	40
75	07+898	07+908	07+903	70	40
76	07+959	07+963	07+961	125	40
77	08+085	08+103	08+094	150	40
78	08+148	08+151	08+150	150	40
79	08+232	08+253	08+243	200	50
80	08+322	08+348	08+335	125	40
81	08+416	08+434	08+425	200	50
82	08+484	08+494	08+489	100	40
83	08+532	08+542	08+537	125	40
84	08+584	08+590	08+587	100	40
85	08+635	08+673	08+654	100	40
86	08+733	08+749	08+741	150	40
87	08+804	08+808	08+806	70	40
88	08+876	08+878	08+877	70	40
89	08+940	08+943	08+942	70	40
90	08+996	09+055	09+025	500	50
91	09+133	09+148	09+140	150	40
92	09+199	09+206	09+203	70	40
93	09+307	09+309	09+308	150	40
94	09+360	09+367	09+363	70	40
95	09+422	09+426	09+424	100	40
96	09+487	09+499	09+493	100	40
97	09+560	09+565	09+562	70	40
98	09+618	09+625	09+622	100	40
99	09+671	09+683	09+677	125	40
100	09+750	09+762	09+756	70	40
101	09+827	09+846	09+836	100	40
102	09+923	09+987	09+955	70	40
103	10+052	10+084	10+068	200	50
104	10+167	10+212	10+190	70	40
105	10+284	10+287	10+285	50	40

HIP No.	Arc Start Chainage	Arc End Chainage	HIP Chainage	Radius in m	SPEED in Kmph
106	10+357	10+364	10+361	100	40
107	10+461	10+463	10+462	100	40
108	10+515	10+526	10+520	100	40
109	10+587	10+597	10+592	50	40
110	10+669	10+686	10+678	30	30
111	10+743	10+745	10+744	40	30
112	10+801	10+804	10+803	30	30
113	10+865	10+876	10+870	40	30
114	10+930	10+967	10+949	500	50
115	11+020	11+131	11+075	500	50
116	11+192	11+254	11+223	500	50
117	11+280	11+288	11+284	100	40
118	11+344	11+373	11+359	70	40
119	11+429	11+439	11+434	100	40
120	11+518	11+521	11+520	70	40
121	11+598	11+600	11+599	50	40
122	11+678	11+684	11+681	70	40
123	11+827	11+829	11+828	70	40
124	11+938	11+977	11+957	100	40
125	12+027	12+051	12+039	80	40
126	12+111	12+131	12+121	70	40
127	12+188	12+192	12+190	80	40
128	12+274	12+290	12+282	70	40
129	12+352	12+357	12+354	70	40
130	12+420	12+429	12+425	30	30
131	12+510	12+562	12+536	50	40
132	12+651	12+671	12+661	300	50
133	12+730	12+747	12+739	70	40
134	12+811	12+819	12+815	70	40
135	12+910	12+922	12+916	200	50
136	13+283	13+293	13+288	80	40
137	13+366	13+374	13+370	50	40
138	13+447	13+460	13+453	80	40
139	13+493	13+606	13+549	500	50
140	13+628	13+677	13+653	500	50
141	13+722	13+742	13+732	70	40
142	13+812	13+832	13+822	200	50
143	13+892	13+953	13+922	200	50
144	14+012	14+024	14+018	100	40
145	14+081	14+090	14+086	100	40
146	14+135	14+176	14+156	100	40

HIP No.	Arc Start Chainage	Arc End Chainage	HIP Chainage	Radius in m	SPEED in Kmph
147	14+277	14+302	14+289	150	50
148	14+486	14+613	14+550	90	40
149	14+697	14+880	14+788	700	50
150	15+033	15+154	15+093	800	50
151	15+172	15+210	15+191	300	50
152	15+248	15+278	15+263	150	40
153	15+334	15+378	15+356	300	50
154	15+448	15+525	15+486	1000	50
155	15+637	15+647	15+642	80	40
156	15+705	15+728	15+716	80	40
157	15+804	15+861	15+832	100	40
158	15+909	15+922	15+916	100	40
159	16+039	16+060	16+050	100	40
160	16+128	16+151	16+140	300	50
161	16+202	16+217	16+210	100	40
162	16+265	16+272	16+268	100	40
163	16+360	16+368	16+364	100	40
164	16+418	16+434	16+426	200	50
165	16+609	16+808	16+708	500	50
166	16+829	16+860	16+845	500	50
167	16+991	17+096	17+043	500	50
168	17+181	17+201	17+191	100	40
169	17+282	17+334	17+308	150	40
170	17+434	17+469	17+452	150	40
171	17+523	17+620	17+571	200	50
172	17+694	17+733	17+714	500	50
173	17+817	17+835	17+826	100	40
174	17+898	17+940	17+919	100	40
175	18+023	18+034	18+028	100	40
176	18+101	18+114	18+107	70	40
177	18+178	18+208	18+193	70	40
178	18+323	18+331	18+327	100	40
179	18+361	18+420	18+390	300	40
180	18+450	18+490	18+470	100	40
181	18+540	18+624	18+582	100	40
182	18+703	18+748	18+726	150	40
183	18+767	19+055	18+911	500	50
184	19+097	19+429	19+263	550	50
185	19+496	19+517	19+506	100	40
186	19+567	19+605	19+586	100	40
187	19+685	19+708	19+696	300	50

HIP No.	Arc Start Chainage	Arc End Chainage	HIP Chainage	Radius in m	SPEED in Kmph
188	19+746	19+781	19+763	100	40
189	19+830	19+872	19+851	100	40
190	19+914	19+938	19+926	50	30
191	20+023	20+095	20+059	200	50
192	20+186	20+198	20+192	50	30
193	20+250	20+286	20+268	100	40
194	20+355	20+419	20+387	80	40
195	20+463	20+472	20+468	125	40
196	20+521	20+536	20+529	100	40
197	20+588	20+592	20+590	100	40
198	20+688	20+701	20+694	150	40
199	20+744	20+776	20+760	80	40
200	20+842	20+853	20+848	70	40
201	20+912	20+914	20+913	80	40
202	20+981	21+013	20+997	500	50
203	21+127	21+159	21+143	300	50
204	21+199	21+220	21+210	300	50
205	21+288	21+298	21+293	100	50
206	21+395	21+435	21+415	300	50
207	21+473	21+476	21+474	125	40
208	21+521	21+525	21+523	100	40
209	21+575	21+585	21+580	125	40
210	21+626	21+632	21+629	100	40
211	21+694	21+709	21+702	70	40
212	21+767	21+769	21+768	80	40
213	21+921	21+931	21+926	100	50
214	22+039	22+081	22+060	500	50
215	22+172	22+257	22+215	500	50
216	22+280	22+404	22+342	500	50
217	22+432	22+456	22+444	200	50
218	22+498	22+507	22+503	100	40
219	22+656	22+659	22+658	50	40
220	22+889	22+901	22+895	80	40
221	23+027	23+103	23+065	500	50
222	23+272	23+350	23+311	300	50
223	23+682	23+724	23+703	100	40
224	23+786	23+813	23+799	200	50
225	23+889	23+920	23+905	150	50
226	24+037	24+044	24+040	80	40
227	24+108	24+160	24+134	80	40
228	24+312	24+321	24+316	70	40

HIP No.	Arc Start Chainage	Arc End Chainage	HIP Chainage	Radius in m	SPEED in Kmph
229	24+459	24+460	24+459	100	40
230	24+525	24+527	24+526	200	50
231	24+593	24+599	24+596	150	50
232	24+655	24+666	24+660	200	50
233	24+899	24+920	24+910	200	50
234	24+994	25+018	25+006	80	40
235	25+074	25+110	25+092	80	40
236	25+163	25+170	25+167	100	40
237	25+253	25+282	25+268	80	40
238	25+343	25+351	25+347	70	40
239	25+410	25+412	25+411	80	40
240	25+459	25+468	25+464	100	40
241	25+523	25+540	25+532	100	40
242	25+600	25+612	25+606	125	40
243	25+653	25+666	25+660	125	40
244	25+705	25+729	25+717	100	40
245	25+805	25+839	25+822	100	40
246	25+920	25+933	25+926	100	40
247	25+977	25+980	25+978	100	40
248	26+026	26+047	26+037	100	40
249	26+091	26+106	26+098	100	40
250	26+220	26+255	26+237	300	50
251	26+327	26+443	26+385	200	50
252	26+515	26+578	26+547	300	50
253	26+675	26+758	26+717	500	50
254	26+793	26+809	26+801	100	40
255	26+850	26+885	26+867	150	40
256	26+920	26+982	26+951	500	50
257	26+985	27+097	27+041	500	50
258	27+134	27+224	27+179	500	50
259	27+298	27+312	27+305	100	40
260	27+362	27+410	27+386	100	40
261	27+457	27+504	27+481	100	40
262	27+575	27+587	27+581	100	40
263	27+637	27+671	27+654	300	50
264	27+731	27+754	27+742	100	40
265	27+847	27+922	27+884	300	50
266	28+020	28+035	28+027	125	40
267	28+092	28+096	28+094	100	40
268	28+140	28+143	28+142	200	40
269	28+300	28+344	28+322	150	50

HIP No.	Arc Start Chainage	Arc End Chainage	HIP Chainage	Radius in m	SPEED in Kmph
270	28+459	28+540	28+500	125	40
271	28+737	28+773	28+755	200	50
272	28+842	28+880	28+861	500	50
273	28+962	29+057	29+010	500	50
274	29+135	29+238	29+186	150	40
275	29+427	29+446	29+436	500	50
276	29+557	29+574	29+565	500	50
277	29+824	29+936	29+880	500	50
278	30+038	30+052	30+045	70	40
279	30+109	30+126	30+117	80	40
280	30+178	30+246	30+212	300	50
281	30+272	30+426	30+349	300	40
282	30+482	30+496	30+489	50	40
283	30+704	30+711	30+708	50	40
284	30+841	30+904	30+872	500	50
285	31+128	31+166	31+147	500	50
286	31+523	31+673	31+598	500	50
287	31+834	31+927	31+880	500	50
288	32+119	32+197	32+158	200	50
289	32+282	32+332	32+307	500	50
290	32+392	32+514	32+453	500	50
291	32+713	32+731	32+722	50	40
292	32+962	32+987	32+975	200	50
293	33+058	33+071	33+065	100	40
294	33+117	33+131	33+124	100	40
295	33+154	33+250	33+202	500	50
296	33+415	33+509	33+462	150	40
297	33+555	33+587	33+571	100	40
298	33+640	33+851	33+746	500	50
299	33+858	33+924	33+891	500	50
300	33+933	34+004	33+969	500	50
301	34+105	34+125	34+115	100	40
302	34+213	34+270	34+242	500	50
303	34+462	34+738	34+600	300	50
304	34+899	34+933	34+916	150	50
305	34+970	35+045	35+008	500	50
306	35+120	35+285	35+203	500	50
307	35+396	35+427	35+412	300	50
308	35+584	35+586	35+585	100	40
309	35+665	35+688	35+676	200	50
310	35+757	35+796	35+777	500	50

HIP No.	Arc Start Chainage	Arc End Chainage	HIP Chainage	Radius in m	SPEED in Kmph
311	35+828	35+829	35+829	100	40
312	35+925	35+982	35+953	400	40
313	36+029	36+043	36+036	100	40
314	36+133	36+148	36+140	70	40
315	36+213	36+218	36+215	70	40
316	36+290	36+297	36+294	70	40
317	36+365	36+413	36+389	500	50
318	36+523	36+555	36+539	80	40
319	36+621	36+704	36+663	70	40
320	36+756	36+802	36+779	500	50
321	36+948	36+957	36+953	150	50
322	37+049	37+067	37+058	80	40
323	37+173	37+182	37+178	150	50
324	37+299	37+313	37+306	80	40
325	37+371	37+382	37+377	100	40
326	37+441	37+471	37+456	200	30
327	37+578	37+589	37+583	150	40
328	37+642	37+671	37+657	100	40
329	37+726	37+775	37+750	150	40
330	37+993	38+017	38+005	70	40
331	38+092	38+097	38+094	50	40
332	38+184	38+196	38+190	70	40
333	38+320	38+321	38+321	100	40
334	38+380	38+404	38+392	150	50
335	38+455	38+463	38+459	150	40
336	38+605	38+610	38+607	100	40
337	38+663	38+676	38+670	70	40
338	38+733	38+742	38+737	100	40
339	38+798	38+811	38+804	125	40
340	38+860	38+879	38+869	70	40
341	38+935	38+965	38+950	100	40
342	39+217	39+318	39+267	200	50
343	39+399	39+446	39+422	150	40
344	39+501	39+513	39+507	100	40
345	39+678	39+694	39+686	100	40
346	39+882	39+899	39+890	200	50
347	39+995	40+081	40+038	200	50
348	40+217	40+326	40+271	300	50
349	40+410	40+436	40+423	500	50
350	40+496	40+585	40+541	500	50
351	40+770	40+783	40+776	50	40

HIP No.	Arc Start Chainage	Arc End Chainage	HIP Chainage	Radius in m	SPEED in Kmph
352	40+858	40+884	40+871	70	40
353	40+956	40+993	40+974	70	40
354	41+054	41+069	41+061	100	40
355	41+128	41+147	41+137	200	50
356	41+252	41+405	41+329	300	50
357	41+477	41+501	41+489	70	40
358	41+580	41+593	41+587	70	40
359	41+688	41+723	41+705	100	40
360	41+826	41+854	41+840	500	50
361	41+924	42+001	41+963	200	50
362	42+050	42+064	42+057	100	40
363	42+147	42+190	42+168	300	50
364	42+254	42+311	42+282	500	50
365	42+346	42+356	42+351	200	50
366	42+415	42+430	42+423	200	50
367	42+490	42+560	42+525	150	40
368	42+616	42+635	42+625	70	40
369	42+718	42+740	42+729	200	50
370	42+795	42+799	42+797	200	40
371	42+854	42+867	42+861	70	40
372	42+950	42+954	42+952	200	50
373	43+033	43+057	43+045	100	40
374	43+116	43+139	43+127	80	40
375	43+204	43+212	43+208	100	40
376	43+289	43+339	43+314	500	50
377	43+422	43+443	43+433	100	40
378	43+497	43+509	43+503	100	40
379	43+564	43+632	43+598	500	50
380	43+673	43+692	43+682	70	40
381	43+758	43+782	43+770	70	40
382	43+841	43+864	43+852	100	40
383	43+914	43+923	43+918	100	40
384	43+983	44+044	44+014	100	40
385	44+115	44+136	44+125	50	40
386	44+203	44+242	44+223	100	40
387	44+282	44+353	44+318	500	50
388	44+518	44+542	44+530	100	40
389	44+616	44+634	44+625	100	40
390	44+732	44+747	44+740	500	50
391	44+835	44+875	44+855	100	40
392	44+935	44+948	44+941	100	40

HIP No.	Arc Start Chainage	Arc End Chainage	HIP Chainage	Radius in m	SPEED in Kmph
393	44+997	45+133	45+065	500	50
394	45+234	45+281	45+257	150	40
395	45+322	45+376	45+349	150	40
396	45+442	45+450	45+446	100	40
397	45+494	45+571	45+532	300	40
398	45+873	45+962	45+918	800	50
399	46+083	46+111	46+097	500	50
400	46+180	46+191	46+186	150	40
401	46+345	46+363	46+354	100	40
402	46+415	46+464	46+440	300	50
403	46+719	46+726	46+723	200	50
404	46+907	46+991	46+949	500	50
405	47+137	47+155	47+146	150	40
406	47+211	47+235	47+223	150	40
407	47+297	47+326	47+311	100	40
408	47+379	47+400	47+389	100	40
409	47+481	47+509	47+495	500	50
410	47+563	47+574	47+569	80	40
411	47+636	47+648	47+642	70	40
412	47+690	47+738	47+714	500	50
413	47+808	47+818	47+813	70	40
414	47+891	47+897	47+894	50	40
415	47+971	47+997	47+984	100	40
416	48+098	48+131	48+115	100	40
417	48+281	48+304	48+292	100	40
418	48+360	48+373	48+367	100	40
419	48+423	48+494	48+458	150	40
420	48+542	48+552	48+547	100	40
421	48+926	48+973	48+949	30	30
422	49+007	49+082	49+044	500	50
423	49+150	49+181	49+165	100	40
424	49+247	49+293	49+270	30	30
425	49+332	49+549	49+440	300	40
426	49+592	49+656	49+624	50	30
427	49+762	49+808	49+785	50	30
428	49+937	49+977	49+957	20	20
429	50+024	50+038	50+031	100	40
430	50+091	50+112	50+101	30	30
431	50+224	50+385	50+305	85	40
432	50+453	50+469	50+461	15	20
433	50+538	50+556	50+547	50	30

HIP No.	Arc Start Chainage	Arc End Chainage	HIP Chainage	Radius in m	SPEED in Kmph
434	50+628	50+738	50+683	125	50
435	50+819	50+850	50+834	50	30
436	50+903	50+930	50+916	50	30
437	50+978	50+988	50+983	20	20
438	51+046	51+178	51+112	62	30
439	51+269	51+282	51+276	50	30
440	51+334	51+343	51+338	50	30
441	51+416	51+505	51+461	70	30
442	51+614	51+631	51+622	15	20
443	51+686	51+697	51+692	100	30
444	51+786	51+839	51+813	70	40
445	51+956	51+985	51+970	100	40
446	52+040	52+082	52+061	20	20
447	52+183	52+185	52+184	50	30
448	52+316	52+328	52+322	50	40
449	52+436	52+440	52+438	100	40
450	52+487	52+508	52+497	100	40
451	52+555	52+593	52+574	100	40
452	52+649	52+663	52+656	50	30
453	52+721	52+747	52+734	50	30
454	52+914	52+960	52+937	150	40
455	53+002	53+012	53+007	50	30
456	53+062	53+077	53+070	40	30
457	53+157	53+179	53+168	100	40
458	53+244	53+249	53+247	125	40
459	53+298	53+303	53+301	30	30
460	53+355	53+436	53+396	50	30
461	53+537	53+552	53+544	30	30
462	53+608	53+610	53+609	50	30
463	53+684	53+746	53+715	200	50
464	53+821	53+850	53+836	200	50
465	54+070	54+083	54+077	100	40
466	54+142	54+231	54+187	80	40
467	54+282	54+336	54+309	100	40
468	54+406	54+414	54+410	100	40
469	54+487	54+492	54+490	100	40
470	54+552	54+573	54+562	30	30
471	54+662	54+682	54+672	50	30
472	54+727	54+734	54+730	50	30
473	54+777	54+790	54+783	50	30
474	54+847	54+893	54+870	50	30

HIP No.	Arc Start Chainage	Arc End Chainage	HIP Chainage	Radius in m	SPEED in Kmph
475	54+953	54+959	54+956	100	40
476	55+023	55+029	55+026	200	50
477	55+082	55+083	55+082	50	30
478	55+133	55+144	55+139	100	40
479	55+206	55+209	55+207	100	40
480	55+313	55+358	55+336	500	50
481	55+448	55+527	55+487	50	40
482	55+593	55+606	55+600	150	40
483	55+733	55+751	55+742	100	40
484	55+801	55+825	55+813	50	30
485	55+869	55+888	55+879	50	30
486	55+947	55+982	55+965	100	30
487	56+025	56+045	56+035	50	30
488	56+095	56+110	56+103	50	30
489	56+156	56+173	56+165	200	50
490	56+294	56+335	56+314	20	20
491	56+377	56+379	56+378	50	30
492	56+447	56+462	56+455	50	30
493	56+523	56+541	56+532	50	30
494	56+586	56+602	56+594	50	30
495	56+648	56+651	56+650	100	40
496	56+701	56+733	56+717	100	40
497	56+806	56+825	56+816	50	30
498	56+928	56+969	56+949	20	20
499	57+020	57+069	57+044	100	40
500	57+189	57+199	57+194	50	30
501	57+241	57+246	57+243	70	30
502	57+291	57+294	57+293	40	30
503	57+344	57+357	57+350	50	30
504	57+461	57+525	57+493	50	30
505	57+611	57+619	57+615	30	30
506	57+712	57+714	57+713	100	40
507	57+805	57+849	57+827	45	30
508	57+996	58+092	58+044	400	40
509	58+135	58+173	58+154	500	50
510	58+387	58+568	58+477	900	50
511	58+626	58+650	58+638	200	50
512	58+672	58+808	58+740	500	50
513	58+853	59+048	58+950	400	40
514	59+588	59+596	59+592	500	50
515	59+651	59+711	59+681	1000	50

HIP No.	Arc Start Chainage	Arc End Chainage	HIP Chainage	Radius in m	SPEED in Kmph
516	59+779	59+804	59+792	100	40
517	59+878	59+901	59+889	200	50
518	60+014	60+154	60+084	400	50
519	60+251	60+285	60+268	40	30
520	60+380	60+412	60+396	150	50
521	60+530	60+544	60+537	200	50
522	60+609	60+644	60+626	100	40
523	60+767	60+791	60+779	500	50
524	60+926	60+952	60+939	500	50
525	60+999	61+016	61+007	500	50
526	61+129	61+178	61+153	500	50
527	61+258	61+411	61+335	900	50
528	61+508	61+544	61+526	150	50
529	61+649	61+658	61+653	70	40
530	61+721	61+763	61+742	125	40
531	61+838	61+855	61+846	500	50
532	61+941	61+949	61+945	100	40
533	61+991	61+998	61+994	100	40
534	62+060	62+105	62+083	500	50
535	62+199	62+280	62+239	300	50
536	62+307	62+334	62+320	500	50
537	62+355	62+381	62+368	200	30
538	62+451	62+460	62+456	500	50
539	62+584	62+658	62+621	150	50
540	62+711	62+793	62+752	200	40
541	62+949	62+965	62+957	150	40
542	63+014	63+078	63+046	150	40
543	63+218	63+230	63+224	100	40
544	63+354	63+367	63+361	50	40
545	63+449	63+473	63+461	100	40
546	63+592	63+672	63+632	150	50
547	63+795	63+797	63+796	200	50
548	63+887	63+900	63+893	150	50
549	63+968	63+973	63+970	200	50
550	64+043	64+048	64+046	30	30
551	64+115	64+117	64+116	40	30
552	64+194	64+215	64+205	80	40
553	64+316	64+339	64+327	30	30
554	64+417	64+438	64+427	200	50
555	64+549	64+566	64+558	50	30
556	64+785	64+827	64+806	20	20

HIP No.	Arc Start Chainage	Arc End Chainage	HIP Chainage	Radius in m	SPEED in Kmph
557	65+023	65+036	65+030	30	30
558	65+093	65+108	65+101	50	30
559	65+311	65+349	65+330	50	30
560	65+439	65+450	65+444	30	30
561	65+514	65+529	65+521	30	30
562	65+627	65+637	65+632	70	30
563	65+680	65+720	65+700	20	20
564	65+776	65+790	65+783	100	40
565	65+845	65+872	65+859	100	40
566	65+948	65+958	65+953	50	30
567	66+002	66+023	66+013	50	30
568	66+089	66+113	66+101	80	40
569	66+206	66+224	66+215	100	40
570	66+304	66+319	66+311	50	30
571	66+371	66+381	66+376	80	40
572	66+548	66+613	66+580	200	50
573	66+723	66+732	66+728	40	30
574	66+786	66+800	66+793	40	30
575	66+860	66+875	66+868	40	30
576	66+955	66+977	66+966	30	30
577	67+327	67+369	67+348	100	40
578	67+978	68+173	68+075	150	40
579	68+395	68+490	68+442	200	50
580	68+577	68+610	68+594	500	50
581	68+811	68+813	68+812	50	40
582	68+883	68+918	68+900	200	50
583	68+985	69+004	68+994	70	40
584	69+082	69+091	69+086	50	40
585	69+160	69+165	69+163	100	40
586	69+250	69+259	69+254	80	40
587	69+317	69+325	69+321	80	40
588	69+382	69+390	69+386	80	40
589	69+456	69+510	69+483	100	40
590	69+574	69+588	69+581	70	40
591	69+917	70+005	69+961	500	50
592	70+186	70+235	70+211	50	30
593	70+369	70+474	70+422	500	50
594	70+542	70+573	70+558	100	40
595	70+656	70+666	70+661	80	40
596	70+741	70+747	70+744	70	40
597	70+794	70+802	70+798	125	40

HIP No.	Arc Start Chainage	Arc End Chainage	HIP Chainage	Radius in m	SPEED in Kmph
598	70+851	70+857	70+854	80	40
599	70+885	70+990	70+937	500	50
600	71+015	71+025	71+020	100	40
601	71+088	71+088	71+088	100	40
602	71+174	71+202	71+188	50	30
603	71+256	71+280	71+268	50	30
604	71+346	71+352	71+349	100	40
605	71+417	71+463	71+440	100	40
606	71+515	71+516	71+515	200	50
607	71+564	71+581	71+573	100	40
608	71+621	71+681	71+651	500	50
609	71+715	71+744	71+729	200	50
610	71+808	71+846	71+827	80	40
611	71+908	71+933	71+921	70	40
612	71+986	72+087	72+036	150	40
613	72+128	72+206	72+167	500	50
614	72+224	72+285	72+254	500	50
615	72+341	72+425	72+383	70	40
616	72+489	72+527	72+508	50	30
617	72+586	72+616	72+601	200	50
618	72+659	72+667	72+663	150	40
619	72+710	72+721	72+715	70	30
620	72+779	72+796	72+787	30	30
621	72+860	72+871	72+865	80	40
622	72+930	72+965	72+947	300	50
623	73+009	73+014	73+012	100	40
624	73+082	73+083	73+082	50	40
625	73+260	73+298	73+279	100	40
626	73+402	73+407	73+404	100	40
627	73+455	73+474	73+465	50	30
628	73+550	73+564	73+557	70	40
629	73+663	73+677	73+670	30	30
630	73+814	73+821	73+817	30	30
631	73+886	73+957	73+921	300	50
632	74+005	74+230	74+117	300	50
633	74+281	74+398	74+339	90	40
634	74+442	74+454	74+448	100	40
635	74+498	74+519	74+508	150	40
636	74+571	74+591	74+581	200	50
637	74+664	74+677	74+671	70	40
638	74+731	74+756	74+744	100	40

HIP No.	Arc Start Chainage	Arc End Chainage	HIP Chainage	Radius in m	SPEED in Kmph
639	74+806	75+034	74+920	300	50
640	75+092	75+140	75+116	500	50
641	75+166	75+320	75+243	500	50
642	75+419	75+445	75+432	300	50
643	75+511	75+530	75+520	40	30
644	75+587	75+597	75+592	300	50
645	75+716	75+737	75+727	200	50
646	75+823	75+834	75+829	100	40
647	75+891	75+900	75+895	100	40
648	75+955	75+971	75+963	100	40
649	76+024	76+101	76+062	100	40
650	76+242	76+373	76+307	150	40
651	76+412	76+442	76+427	50	30
652	76+498	76+510	76+504	50	30
653	76+564	76+584	76+574	70	40
654	76+696	76+712	76+704	70	40
655	76+765	76+954	76+859	150	40
656	76+995	77+059	77+027	100	40
657	77+182	77+195	77+188	100	40
658	77+294	77+322	77+308	70	40
659	77+416	77+436	77+426	70	40
660	77+561	77+619	77+590	70	40
661	77+717	77+723	77+720	100	40
662	77+832	77+854	77+843	100	40
663	78+050	78+077	78+064	70	40
664	78+162	78+192	78+177	70	40
665	78+283	78+334	78+308	70	40
666	78+400	78+408	78+404	150	40
667	78+444	78+453	78+448	125	40
668	78+489	78+497	78+493	125	40
669	78+539	78+548	78+544	100	40
670	78+635	78+638	78+637	50	30
671	78+690	78+828	78+759	100	40
672	79+017	79+048	79+033	200	50
673	79+114	79+141	79+127	200	50
674	79+261	79+295	79+278	150	50
675	79+392	79+417	79+404	150	50
676	79+531	79+553	79+542	200	50
677	79+631	79+734	79+683	100	40
678	79+816	79+978	79+897	125	40
679	80+050	80+067	80+058	40	30

HIP No.	Arc Start Chainage	Arc End Chainage	HIP Chainage	Radius in m	SPEED in Kmph
680	80+120	80+126	80+123	100	40
681	80+172	80+184	80+178	100	40
682	80+225	80+274	80+250	500	50
683	80+320	80+323	80+321	50	30
684	80+379	80+380	80+380	30	30
685	80+463	80+475	80+469	70	40
686	80+572	80+575	80+574	50	30
687	80+621	80+640	80+631	50	30
688	80+697	80+711	80+704	50	30
689	80+753	80+762	80+758	50	30
690	80+807	80+820	80+813	50	30
691	80+865	80+904	80+885	500	50
692	81+035	81+070	81+053	100	40
693	81+126	81+195	81+161	150	40
694	81+244	81+260	81+252	200	50
695	81+337	81+356	81+346	70	40
696	81+455	81+480	81+467	50	40
697	81+562	81+612	81+587	100	40
698	81+765	81+780	81+773	100	40
699	81+889	81+891	81+890	200	50
700	81+954	81+972	81+963	200	50
701	82+035	82+051	82+043	100	40
702	82+110	82+133	82+122	70	40
703	82+242	82+318	82+280	100	40
704	82+398	82+419	82+408	30	30
705	82+477	82+484	82+480	40	30
706	82+628	82+649	82+638	200	50
707	82+738	82+778	82+758	200	50
708	82+850	82+880	82+865	100	40
709	82+946	82+968	82+957	50	30
710	83+020	83+024	83+022	50	30
711	83+142	83+175	83+159	500	50
712	83+239	83+244	83+242	100	40
713	83+290	83+308	83+299	100	40
714	83+357	83+374	83+365	200	50
715	83+438	83+442	83+440	100	40
716	83+492	83+495	83+494	80	40
717	83+553	83+573	83+563	50	30
718	83+644	83+653	83+648	30	30
719	83+722	83+729	83+726	100	40
720	83+798	83+843	83+821	80	40

HIP No.	Arc Start Chainage	Arc End Chainage	HIP Chainage	Radius in m	SPEED in Kmph
721	83+899	83+912	83+906	50	30
722	84+016	84+020	84+018	100	40
723	84+092	84+224	84+158	125	40
724	84+272	84+293	84+283	100	40
725	84+430	84+483	84+456	200	50
726	84+569	84+572	84+570	30	30
727	84+626	84+637	84+631	50	30
728	84+686	84+694	84+690	50	30
729	84+780	84+823	84+801	100	40
730	84+929	84+946	84+937	100	40
731	85+060	85+182	85+121	150	40
732	85+276	85+296	85+286	30	30
733	85+394	85+404	85+399	200	50
734	85+507	85+554	85+530	100	40
735	85+693	85+707	85+700	50	30

9 Options Comparative Study

Sr. No.	Description	Option 1	Option 2
1	**Start (km)**	Km 0+000 near Khellani on NH-244	Km 0+000 near Khellani on NH-244
2	**End (km)**	Km 95+914 near Chhatroo.	Km 85+757 near Chhatroo.
3	**Proposed Length of Alignment (km)**	95.914 Km	85.757 Km
4	**Built-up stretch**	1. Gangalwar- 0+000 – 0+900 2. Bhuta –2+600 – 3+100 3. Suigwari -17+200- 17+700 4. Nai Basti - 18+900 -19+100 5. Premnagar -24+600-25+100 6. Thatri – 35+800 – 38+000 7. Darabshala - 42+000-42+600 8. Kandiri – 46+200 – 46+700 9. Kishtwar– 63+300 – 69+200 10. Marwah – 77+600 – 78+300 11. Kodia – 81+300-81+600 12. Dhadpeth – 83+400 – 83+800	1. Suigwari-12+450 –12+950 2. Nai Basti -14+140– 14+380 3. Premnagar -19+640 - 20+340 4. Darabshala – 36+300 – 36+900 5. Kandiri – 40+500 – 41+000 6. Kishtwar– 56+250 – 63+100 7. Kodia – 71+300-71+500 8. Dhadpeth – 73+300 – 73+900 9. Mughal Maidan – 77+300 – 78+000 10. Udil Gurjan – 82+100 – 82+600

Sr. No.	Description	Option 1	Option 2
		13. Mughal Maidan – 87+400 – 88+100 14. Udil Gurjan – 92+200 – 92+800 15. Chhatroo – 93+900 – 95+100	11.Chhatroo – 83+750 – 84+900
5	**Realignment/Curve improvement**	10 Nos. with length approximately **13.10 Km.**	27 Nos. with length approximately **16.292 Km.**
Proposed Structures			
6	**No. of Culverts**	240	258
7	**No. of Minor Bridge**	**21nos. (512.6 m)** (Retained – 13) (Reconstruction – 4) (New Construction – 4)	**19 nos. (584.5 m)** (Retained – 06) (Reconstruction – 03) (New Construction – 10)
8	**No. of Major Bridge**	**01no. (70 m)** (Retained)	**05nos. (845m)** (Retained – 01) (New Construction – 04)
No of affected Settlements			
9	**Buildings**	135-140	120-130
10	**Boundary Wall**	35-40	29-30
11	**Terrain**	Mountainous	Mountainous
12	**Design Speed**	20-50 km/hr	20-50 km/hr
13	**Geometrics - Horizontal**	It has radius from 15 m to 1000 m to meet the available geometry and to minimize cutting and filling through this terrain.	It has radius from 15 m to 1000 m. It is going through many realignments and curve improvements over existing road at many locations.
14	**Existing Land use pattern through**	Forest area, Agricultural and built-up land.	Forest area, Agricultural and built up land.

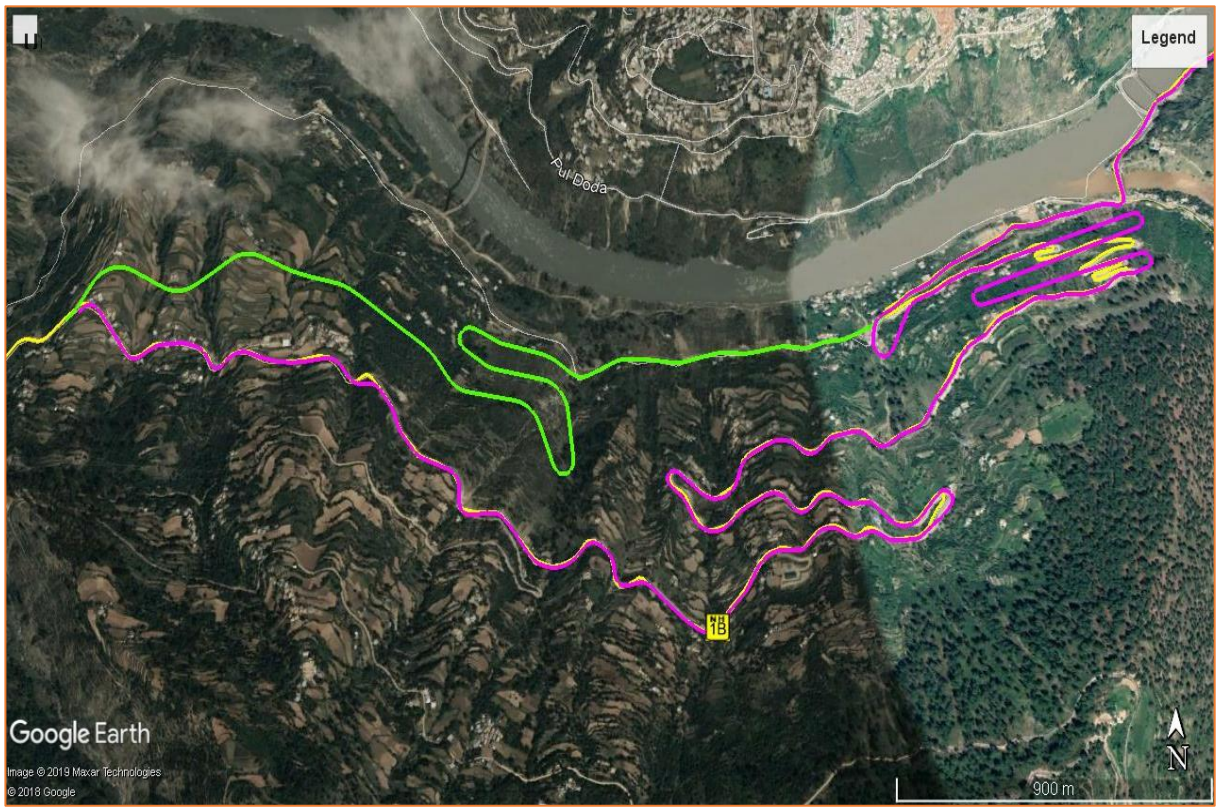
Sr. No.	Description	Option 1	Option 2
	proposed alignment		
15	**Land acquisition details**	Total Land required- 213.4 Ha. Available – 104.0 Ha. To be acquired- 109.4 Ha.	Total Land required- 192.2 Ha. Available – 81.7 Ha. To be acquired- 110.5 Ha.
18	**Total Cost in Crore (Approx.)**	896.35	934.03
19	**Social Impact**	Forest covering area in this option is more, since its longer in length.	Forest covering area is less, because realignments and curve improvements in this option have shorten the proposed length.
		Households getting impact is more in this option, because this option is almost passing through the existing alignment.	Many villages and Built ups have been bypassed via realignments. Also, curve improvements have ignored many households in this option.
		Proposed length in this option requires less land.	This option requires more land.
		This option has no ROB.	This option also has no ROB.
		Connectivity to the local people is high with respect to option-2 (Which will ensure the connectivity of many built up areas through the stretch.	Connectivity to the local people is less with respect to option 1, as this option has many realignments ignoring some of the built-up areas.

Sr. No.	Description	Option 1	Option 2
		This alignment has more curves and many hair pin bends.	This alignment is made with many curve improvements and realignments according to design standards & speed. Also, near existing chainages like 5+700 and 74+000, very long hair pin bends have been ignored.
		Utilities getting impact in this option are more.	Utilities getting impact in this option are less.
		R & R issue may get more impact in this option.	No major impact in this alignment and the work will be done smoothly due to R & R impacts issues will be less.
20	**Environmental Impact**	As per EIA notification 2006 and its amendment S.O.2559 (E) dated 22nd August 2013, S.O 996(E) dated 10th April 2015, S.O 382(E) dated 3rd February 2015 Environmental Clearance Exempted from the purview of the Environmental Impact Assessment.	As per EIA notification 2006 and its amendment S.O.2559 (E) Dt 22nd August 2013, S.O 996(E) Dt 10th April 2015, S.O 382(E) Dt 3rd February 2015 Environmental Clearance Exempted from the purview of the Environmental Impact Assessment.
		It will require permission from forest department since it covers forest area.	It will also require permission from forest department.
		Trees cutting will be more as this option is longer in length.	Trees cutting will be less.

Sr. No.	Description	Option 1	Option 2
		Impact on Environment, and pollution rise during construction activity will be less as compared to option 2 because it almost passes through existing alignment and will be mitigated from EMP implementation.	Impact on Environment, and pollution rise during construction activity will be more as compared to option 1, because it has many new alignments which will cause construction of roads with a fresh start and will be mitigated from EMP implementation.
		After approval of alignment, there will be tree counting and Forest area identification.	After approval of alignment will be tree counting Forest area identification.
21	**Proposed improvement as per Manual**	As per IRC- SP:73-2018, formation width 11 m is proposed including 7m C/W and 1.5 m PS either side and 1m ES on valley side in open countries – Mountainous terrain with retaining wall and Parapet.	As per IRC- SP:73-2018, formation width 11 m is proposed including 7m C/W and 1.5 m PS either side and 1m ES on valley side in open countries – Mountainous terrain with retaining wall and Parapet.
		As per IRC- SP:73-2018, formation width 12.5 m is proposed including 7.5m C/W, 1.5 m PS and 1m ES on either side in built up stretch of the project road.	As per IRC- SP:73-2018, formation width 12.5 m is proposed including 7.5m C/W, 1.5 m PS and 1m ES on either side in built up stretch of the project road.
22	**Merits**	Proposed alignment is mostly following with existing road.	Far from few Built-up area which will provide ease in road construction and congestion.
		Land acquisition is less.	It has less curves and hair pin bends as compared to Option-1.

Sr. No.	Description	Option 1	Option 2
		It passes through more built up which will provide more suitability for locals.	It is shorter in length.
		Involves lesser Structures in alignment.	Proposed road has been designed in avg. design speed of 40kmph
23	**De-merits**	It is longer in length for about 10 .1 kms.	Land acquisition is more compere to option 1
		Involvement of R&R is more due to going through many built-up areas.	New Bridges/ structures are more and Leads to more trees cutting.
		It has many sharp curves and turns. It also encounters many hair pin bends. Design speed is varying b/w 20-50kmph	Cost is more as compared to option 1.
24	**Recommendation**	Not Recommended	Recommended

Comparison of Realignments in both options with the existing road



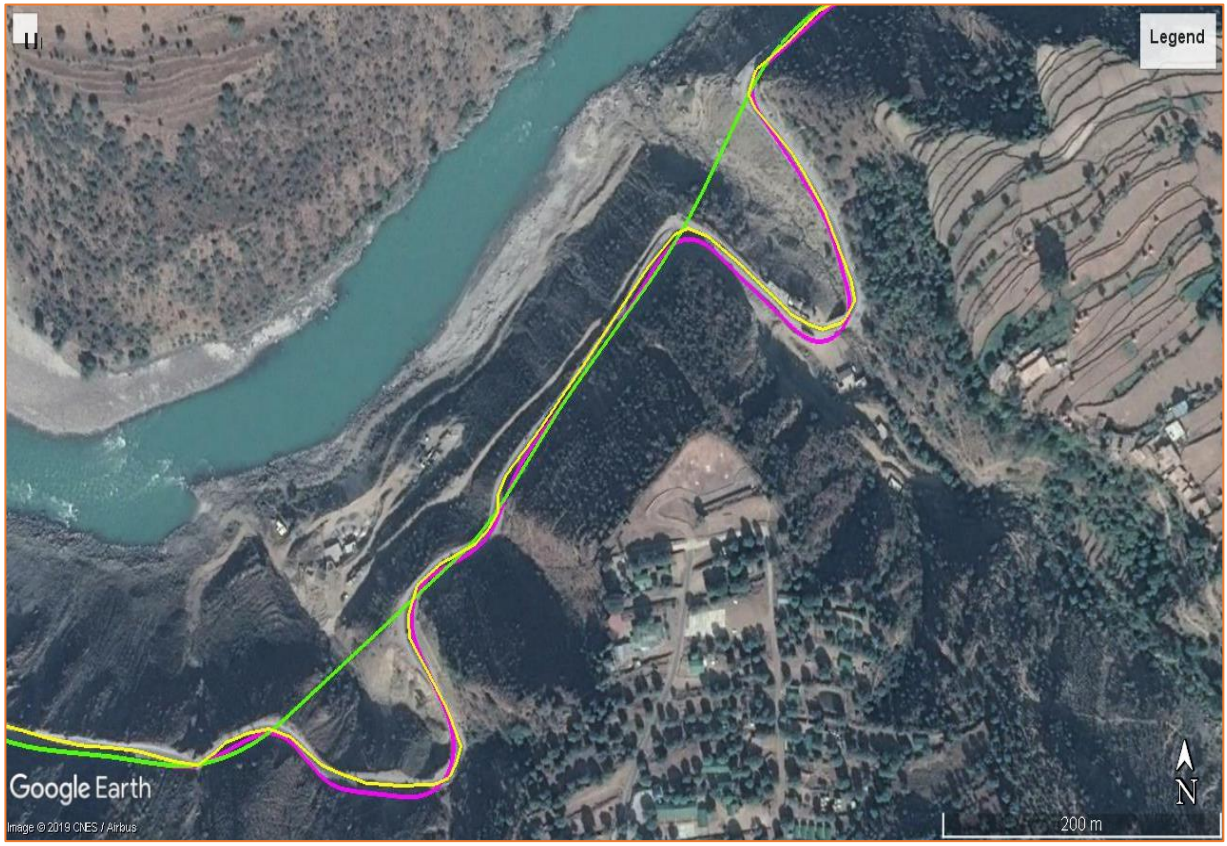

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Image © 2019 CNES / Airbus
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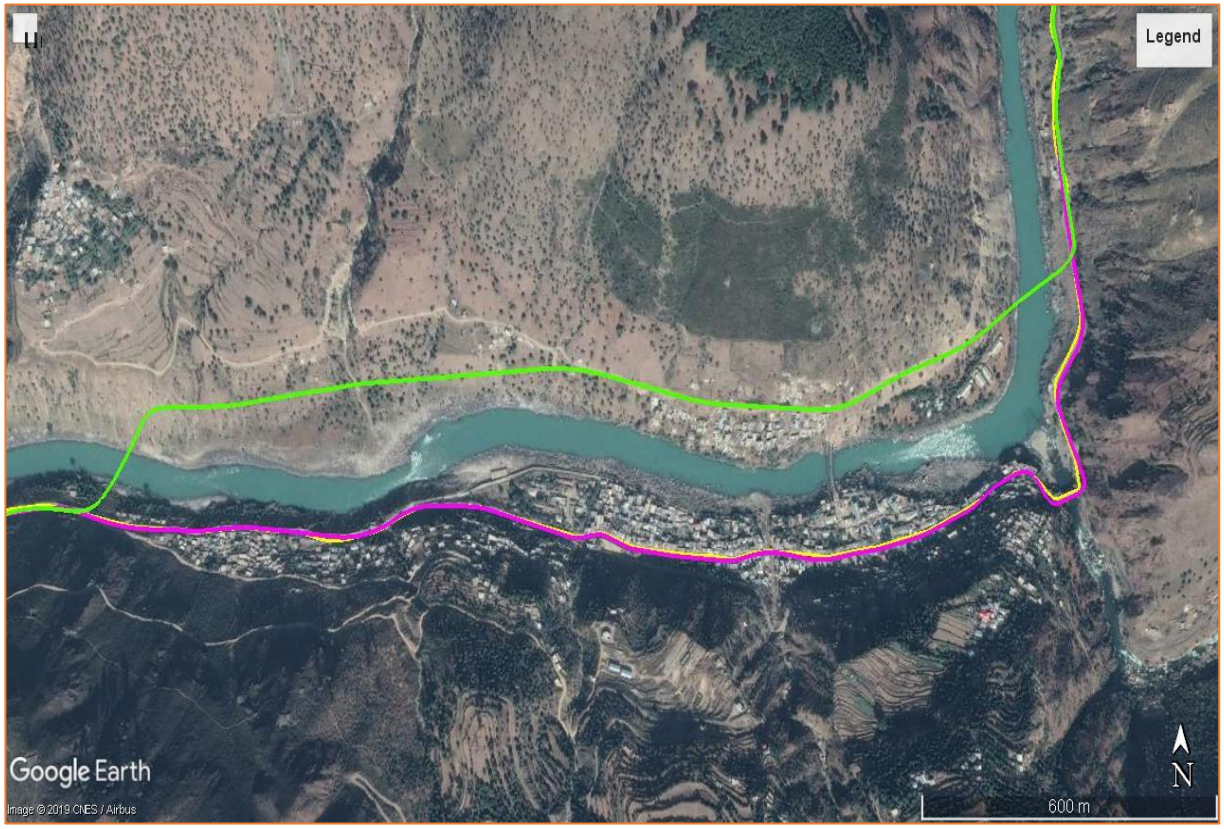
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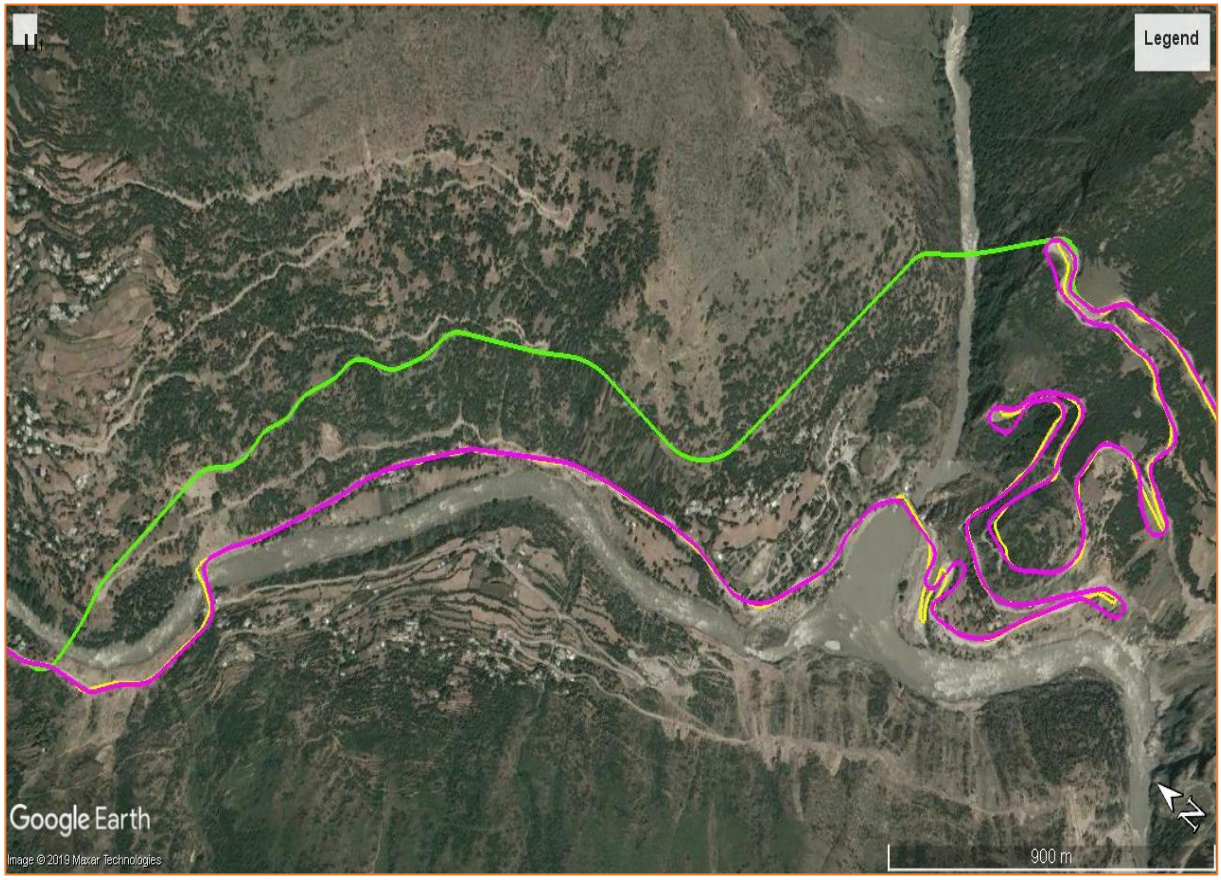

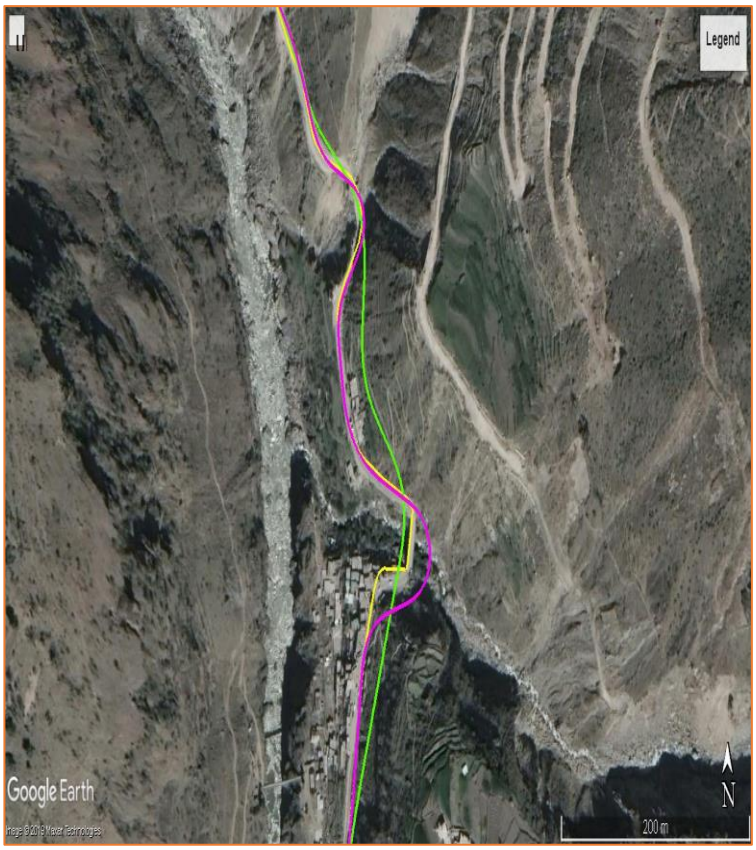

EXISTING ROAD

OPTION - 1

OPTION - 2