BUILDING INFRASTRUCTURE - BUILDING THE NATION

राष्ट्रीय राजमार्ग एवं अवसंरचना विकास निगम लिमिटेड

NATIONAL HIGHWAYS & INFRASTRUCTURE DEVELOPMENT CORPORATION LTD.

FINAL DETAILED PROJECT REPORT

April 2020

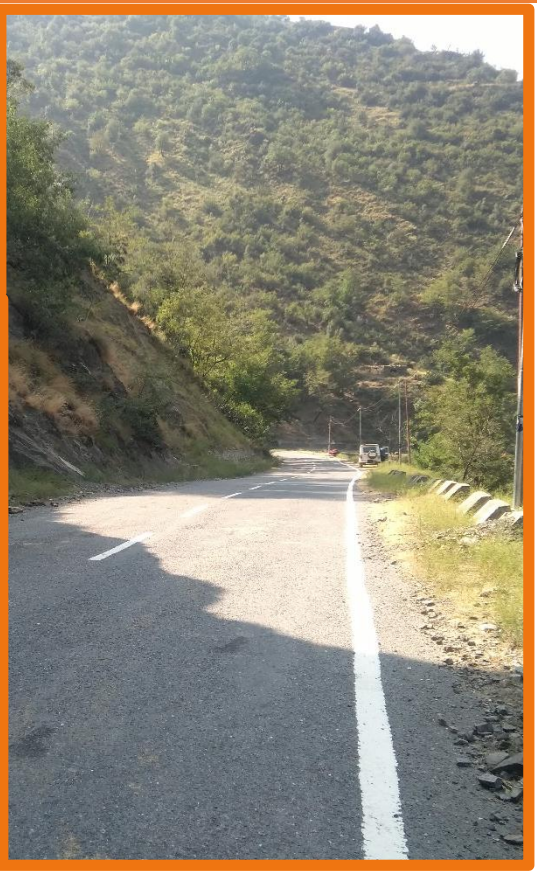
CONSULTANCY SERVICES FOR PREPERATION OF DETAILED PROJECT REPORT AND PROVIDING PRE-CONSTRUCTION ACTIVITIES IN RESPECT OF THE FOLLOWING STRETCH ON NH-244 (OLD NH-1B) IN THE STATE OF JAMMU AND KASHMIR.

(1) SUDHMAHADEV- DRANGA TUNNEL OF APPROX. LENGTH 4.5 KM AND ITS APPROACH ROAD ON CHENANI - SUDHMAHADEV-GOHA ROAD PORTION.

(2) VAILOO TUNNEL OF APPROX. LENGTH 10.0 KM UNDER SINTHAN PASS AND ITS APPROACH ROAD ON GOHA-KHELLANI- KHANABAL ROAD PORTION.

(3) ROAD PORTION FROM 82.675 TO 82.925 AT KM 83 ON BATOTE-KISHTWAR ROAD SECTION OF NH-244.

(4) EXTENDED ROAD SECTION FROM GOHA TO KHELLANI OF 30 KM LENGTH



GOHA - KHELLANI ROAD
PACKAGE-IA (KM 12.850 to KM 20.300)
VOLUME - I - MAIN REPORT

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tpf INGENIERÍA

IN ASSOCIATION WITH

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1.0 PROJECT BACKGROUND

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. In continuation to these developments National Highways and Infrastructure Development Corporation Limited (NHIDCL) has been appointed by MORT&H, to implement these projects.

NHIDCL has engaged **TPF Getinsa-Eurostudios as S.L in Association with Rodic Consultants Private Limited,** to carry out Consultancy Services for preparing Detailed Project Report for Dranga – Khellani section from Sudhmahadev – Dranga Tunnel approach road to Khellani town including a tunnel (Uni-directional) named as Khellani tunnel to bypass the Khellani town in the State of Jammu & Kashmir.

The project corridor length is 18.599 km road section from Goha to Khellani (km12.850 to km 31.449) which includes Khellani Tunnel of approx. length 1.5 Km along with one link road.

1. Link road to Goha – Km 0.000 to Km 2.016

This Project Corridor is divided in two packages:

Table 1: Details of Packages

Package	Chainage		Length (Km)	Remarks
	From	To		
I A	12+850	20+300	7.450	Road, Bridges/Vaiduct and Link road to Goha
	0+000	2+016	2.016	
I B	20+300	29+030	8.730	Road, Bridges
II	29+030	31+449	2.419	Road, Bridges & Tunnel

This document contains Package-I A, Link Road & I B: Goha -Khellani (Km 12.850 to Km 29.030 report.

2.0 EXECUTIVE SUMMARY

The National Highway (NH-1B) is entirely within the state of Jammu and Kashmir. NH 1B links Batote with Khanabal and is 274 km long. It has been renamed as National Highway 244 (NH 244). The Site is in Jammu province on NH 244. The Government of India (GOI) is planning to ease traffic volume on Jammu-Srinagar Highway and would want to connect Srinagar and border areas in J&K with alternate routes with all-weather roads. NH 244 has been selected by the GOI for this purpose.

The NHIDCL has already awarded the Consultancy Services for Preparation of Detailed Project Report and providing Pre-Construction activities in respect of the following stretches on NH-244 (old NH-1B) in the State of Jammu & Kashmir.

(i) Sudhmahadev – Dranga Tunnel of approx. length 4.5 Km and its approach roads on Chenani – Sudhmahadev – Goha road portion.

(ii) Vailoo Tunnel of approx. length 10.00 Km under Sinthan Pass and its approach roads on Goha – Khellani – Khanabal road portion to TPF Getinsa-Eurostudios as S.L in Association with Rodic Consultants Private Limited.

(iii) Road Portion from Km 82.675 to Km 82.925 at KM-83 on Batote-Kishtwar Road Section of NH-244.

(iv) Extended Road Section from Goha to Khellani of 30 Km Length

This proposed section of Goha - Khellani falls on the newly proposed alternate route for Jammu – Srinagar highway. It will divert the main traffic from NH-244 (old NH-1B) from Chenani town and traverses through newly proposed Sudhmahadev – Dranga Tunnel and then through this project road section of Goha – Khellani road and finally terminates again at NH-244 (old NH-1B).

This entire proposed road is very shorter in length and access through many untouched villages and towns in its stretch.

Also, it has proposal of one links roads through the main stretch which is proposed to connect Goha town from junction of the Sudhmahadev - Dranga Tunnel approach road. This link road will allow the people of Goha and beyond to access the proposed road from Sudhmahadev to Khellani. The length of this link road is 2.016 km.

2.1 Construction Time and Construction Cost

The overall construction time is based on the assumptions and calculations. The construction time of Goha – Khellani road portion is estimated to approx. **36** months.

The construction cost evaluation is based on the unit rates and quantities determined. **Total Project Cost of Package I A (Km 12.850 to Km 20.300) including Link Road to Goha (Km 0.000 to Km 2.016) is determined of Rs. 229.72 Cores and Package I B (Km 20.300 to Km 29.030) is determined of Rs 211.97 Crores** . These costs are civil construction cost including other charge like contingency, supervision charge, escalation and maintenance cost etc. as per detailed rate analysis.

Table 2: Summary of Estimate of Package I A including Link Road to Goha

SUMMARY OF COST PACKAGE-I A (Km 12.850 to Km 20.300) INCLUDING LINK ROAD-1 (Km 0.000 to Km 2.016)		
Item No.	**Description**	**Total Amount (Rs. in Crores)**
BILL NO. 1	SITE CLEARANCE	0.14
BILL NO. 2	EARTH WORKS	37.14
BILL NO. 3	SUB-BASES AND BASES COURSES	7.87
BILL NO. 4	BITUMINOUS COURSES	8.12
BILL NO. 5	CROSS DRAINAGE WORKS(CULVERTS)	6.21
BILL NO. 6	BRIDGE,VIADUCT	18.66
BILL NO. 7.1	TRAFFIC SIGNS, MARKINGS	0.93
BILL NO. 7.2	PROTECTION WORK AND DRAINAGE (RRM Toe Wall, Breast Wall,Gabion Wall,Drains,Rock Bolts, Shotcreting & Drainage Holes)	68.31
BILL NO. 7.3	Other Works (Tree Plantation, Rain water Harvesting)	0.58
BILL NO. 8	JUNCTION	0.05
A	**Civil Cost**	**148.01**
B	**GST @ 12% Payable on Civil Cost only (A)**	**17.76**
C	**SUB TOTAL (A+B)**	**165.77**
D	Contingencies @ 2.8% of A	4.14
E	Construction Supervision Charges @ 3% of A	4.44
F	Agency Charge @ 3% of A	4.44
G	Escalation @ 5% per annum for 2nd and Half years during construction payable to Contractor on C	8.29
H	**Total Cost including centages (C+D+E+F+G)**	**187.09**
I	Maintenance During 5 years @ 0.5 for 2nd, 3rd and 4th year and @ 1% for the 5th year on C	4.14
J	**Total Project Cost (TPC) (H+I)**	**191.23**
K	Cost of Land Acquisition Cost (including Muck Disposal	35.69

SUMMARY OF COST PACKAGE-I A (Km 12.850 to Km 20.300) INCLUDING LINK ROAD-1 (Km 0.000 to Km 2.016)		
	land cost) & Structure Compensation & FC	
L	Cost towards Utility Shifting	1.40
M	Environmental Impact Assessment	1.40
TOTAL CAPITAL COST (TCC) (J+K+L+M)		**229.72**

Table 3: Summary of Estimate of Package I B

SUMMARY OF COST Package I B (Km 20.300 to Km 29.030)		
Item No.	**Description**	**Total Amount (Rs. in Crores)**
BILL NO. 1	SITE CLEARANCE	0.14
BILL NO. 2	EARTH WORKS	49.76
BILL NO. 3	SUB-BASES AND BASES COURSES	8.25
BILL NO. 4	BITUMINOUS COURSES	8.02
BILL NO. 5	CROSS DRAINAGE WORKS(CULVERTS)	16.16
BILL NO. 6	BRIDGES, VIADUCT & VUP	17.67
BILL NO. 7.1	TRAFFIC SIGNS, MARKINGS	0.50
BILL NO. 7.2	PROTECTION AND DRAINAGE WORK (RRM TOE WALL, DRAINS,ROCK BOLTS, SHOTCRETING AND DRAINAGE HOLES)	29.50
BILL NO. 7.3	OTHER WORKS (TREE PLANTATION, RAINWATER HARVESTING)	0.62
BILL NO. 7.4	SAFETY AND TRAFFIC MANAGEMENT DURING CONSTRUCTION	0.24
A	**Civil Cost**	**130.860**
B	**GST @ 12% Payable on Civil Cost only (A)**	**15.70**
C	**SUB TOTAL (A+B)**	**146.56**
D	Contingencies @ 2.8% of A	3.66
E	Construction Supervision Charges @ 3% of A	3.93
F	Agency Charge @ 3% of A	3.93
G	Escalation @ 5% per annum for 2nd years during construction payable to Contractor on C	7.33
H	**Total Cost including centages (C+D+E+F+G)**	**165.41**
I	Maintenance During 5 years @ 0.5 for 2nd, 3rd and 4th year and @ 1% fpr the 5th year on C	3.66
J	**Total Project Cost (TPC) (H+I)**	**169.07**
K	Cost of Land Acquisition Cost (including Muck Disposal land cost) & Structure Compensation & FC	40.96
L	Cost towards Utility Shifting	0.94
M	Environmental Impact Assessment	1.00
TOTAL CAPITAL COST (TCC) (J+K+L+M)		**211.97**

3.0 PROJECT DESCRIPTION

The National Highway (NH-1B) is entirely within the state of Jammu and Kashmir. NH 1B linked Batote with Khanabal and is 274 km long. It has been renamed as National Highway 244 (NH 244). The Site is in Jammu province on NH 244. Here, project road deals with Package I: Goha – Khellani. This section of project road starts at Km 12+850 where Sudhmahadev – Dranga tunnel approach road terminates. The Government of India (GOI) is planning to ease traffic volume on Jammu-Srinagar Highway and would want to connect Srinagar and border areas in J&K with alternate routes with all-weather roads. NH 244 has been selected by the GOI for this purpose.

The NHIDCL has awarded the Consultancy Services for Preparation of Detailed Project Report and providing Pre-Construction activities in respect of the following stretches on NH-244 (old NH-1B) in the State of Jammu & Kashmir to TPF Getinsa-Eurostudios as S.L in Association with Rodic Consultants Private Limited.

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(iv) Extended Road Section from Goha to Khellani of 30 Km Length

This proposed section of Goha - Khellani falls on the newly proposed alternate route for the Jammu – Srinagar highway. The Length of the project road is 16.180 Km. It will divert the main traffic from NH-244 (old NH-1B) from Chenani town and traverses through newly proposed Sudhmahadev – Dranga Tunnel approch road and then through this project road of Goha – Khellani road and finally terminates again at NH-244 (old NH-1B). This entire proposed road is very shorter in length and access through many untouched villages and towns in its stretch. Also, it has proposal of one link road through the main stretch which is proposed to connect Goha town from junction of the Sudhmahadev - Dranga Tunnel approach road. This link road will allow the people of Goha and beyond to access the proposed road from Sudhmahadev to Khellani. The length of this link road is 2.016 km.

4.0 OVERVIEW OF NATIONAL HIGHWAYS AND INFRASTRUCTURE DEVELOPMENT CORPORATION (NHIDCL)

National Highways and Infrastructure Development Corporation is a fully owned company of the Ministry of Road Transport & Highways, Government of India.

The company promotes, surveys, establishes, designs, builds, operates, maintains and upgrades National Highways and Strategic Roads including interconnecting roads in parts of the country which share international boundaries with neighboring countries. The regional connectivity so enhanced would promote cross border trade and commerce and help safeguard India's international borders. This would lead to the formation of a more integrated and economically consolidated South and South East Asia. In addition, there would be overall economic benefits for the local population and help integrate the peripheral areas with the mainstream in a more robust manner.

The company has set a vision to become an instrument for creation and management of infrastructure of the highest standard in the country while contributing significantly towards nation building. The company has a Mission to be a professional company which works in most efficient manner and designs, develops & delivers infrastructure projects in a time bound manner.

The endeavor of the Company is to develop, construct and maintain Highways and Infrastructure in a clean manner. The Company has also become part of the 'Swachh Bharat Abhiyan'.

5.0 ACCESS ROAD

5.1 Project Description

Here the project road deals with the Goha – Khellani road along with one link road to Goha town. This entire proposed project road is 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 to the south. Jammu and Kashmir has an international border with China in the north and east, and the Line of Control separates it from the Pakistan. Jammu and Kashmir consist of three divisions: Jammu, Kashmir Valley and Ladakh, and is further divided into 22 districts.

The project road of "Goha – Khellani" starts near the end portion of "Dranga Tunnel and its approach road project" and runs north east till Khellani town. There is also a proposal for one link road which will serve the Goha town which starts near the starting point of the main project road so that the untouched part of these areas will be connected to the project road and beyond.

5.1 Road Junctions

5.1.1 Goha – Khellani main road

There are only 1 major junctions in the project stretch main road.

Table 4: Details of Major Junction

Design Chainage (Km)	Link (NH)	Type	Carriageway Width (m)	Direction L/R/Cross
29.030	NH-244	Y	7.0	L

5.1.2 Link road to Goha

There is only 01 major junction in the link road to Goha.

Table 5: Details of Major Junction

Design Chainage (Km)	Link	Type	Carriageway Width (m)	Direction L/R/Cross
2.016	Sudhmahadev – Dranga project road	T	7.0	L

5.2 Proposed Cross Drainage Structures

The details of Cross drainage Structure is tabulated below:

Table 6: Summary of Proposed Bridges and Culverts

Sr. No.	Type	No's of structures		
		Package I A	Link road to Goha	Package I B
1	Major Bridges	1	-	-
2	Minor Bridge	6	-	4
3	Viaducts	-	-	1
4	VUP	-	-	1
5	Box Culverts	16	8	28

5.3 Improvement Proposals

The improvement proposals for proposed widening include the provisions for the following major items:

a) Proposal for Widening and Reconstruction

b) Requirement of bypasses and realignment

c) Geometric Improvement Design

d) Proposed Pavement Design

e) Traffic Control and Safety Measures

f) Bridge and Cross Drainage Structures

5.4 Proposed design standards

Following table is a summary of the recommended design standards proposed to be adopted for the project road other than service road and intersections:

Table 7: Summary of Recommended Design Standard

(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	Carriageway 2-lane- 2X3.5m Paved Shoulder 2-lane- 2x1.5m Earthen Shoulder 1.0 m (Valley Side)
(v)	Camber as per IRC SP:73-2018	Carriageway Flexible- 2.50% Rigid - 2.00 % Paved Shoulder Flexible- 2.50% Rigid - 2.00 % Unpaved Shoulder Flexible- 3.50% Rigid - 3.00 %
(vi)	Right of Way	As per Plan and Profile
(vii)	Embankment/ Cutting Slope Fill height, up to 3.0 m Fill height from 3.0 m to 6.0 m Fill height exceeding 6.0 m	In filling- 1V: 2 H In filling- 1V: 1.5 H To be designed based on soil parameters, (IRC:75-1979) In cutting- 1V:1H
(viii)	Stopping Sight Distance	20 m for design speed of 20 km/hr 25 m for design speed of 25 km/hr 30 m for design speed of 30 km/hr 40 m for design speed of 35 Km /hr 45m for design speed of 40km/hr 60 m for design speed of 50km/hr
	Intermediate sight distance	40 m for design speed of 20 km/hr 50 m for design speed of 25 km/hr 60 m for design speed of 30 km/hr 80 m for design speed of 35 Km /hr 90 m for design speed of 40km/hr 120 m for design speed of 50km/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	 Ruling Minimum 150 m Absolute minimum 75 m
(xi)	Gradient (As per IRC: SP:73-2018) Clause 2.9.7.2 **Mountainous Terrain** Ruling Limiting	 5.00% 6.00%

	Steep Terrain Ruling Limiting	 6.00% 7.00%
(xii)	Minimum k factor Summit Curve Mountainous Terrain Valley Curve Mountainous Terrain	Desirable: 15 Minimum: 5 Desirable: 15 Minimum: 7
(xiii)	Bridge Clearance Vehicular underpass Light and Smaller Vehicular Underpass	 5.5 m 4.0m
(xiv)	Design Flood Frequency Bridges Sewers and Ditches	 100 years 60 years

5.5 Proposal for New construction

To meet future traffic requirement, new alignment is proposed to achieve high speed of travel with comfort and safety.

Table 8: Proposed cross sections for Package I A

Sr. No.	Design Chainage		Design Length	TCS No	TCS Details
	From	To			
1	12+850	12+920	70	TCS-2	BOTH SIDE FILL WITH LEFT SIDE GABION WALL
2	12+920	13+005	85	TCS-3	LEFT SIDE FILL WITH RETAINING/TOE .WALL & RIGHT SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)
3	13+005	13+045	40	MINOR BRIDGE	
4	13+045	13+080	35	TCS-3	LEFT SIDE FILL WITH RETAINING/TOE .WALL & RIGHT SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)
5	13+080	13+120	40	TCS-5	BOTH SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)
6	13+120	13+170	50	TCS-3	LEFT SIDE FILL WITH RETAINING/TOE .WALL & RIGHT SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)
7	13+170	13+190	20	TCS-5	BOTH SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)

Sr. No.	Design Chainage		Design Length	TCS No	TCS Details
	From	To			
8	13+190	13+220	30	TCS-3	LEFT SIDE FILL WITH RETAINING/TOE .WALL & RIGHT SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)
9	13+220	13+230	10	MINOR BRIDGE	
10	13+230	13+250	20	TCS-1	BOTH SIDE FILL WITH LEFT RETAINING/TOE WALL
11	13+250	13+330	80	TCS-3	LEFT SIDE FILL WITH RETAINING/TOE .WALL & RIGHT SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)
12	13+330	13+450	120	TCS-1	BOTH SIDE FILL WITH LEFT RETAINING/TOE WALL
13	13+450	13+470	20	TCS-3	LEFT SIDE FILL WITH RETAINING/TOE .WALL & RIGHT SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)
14	13+470	13+650	180	TCS-6	BOTH SIDE CUT (HEIGHT OF CUT ON RIGHT SIDE > 25m)
15	13+650	13+690	40	TCS-7	LEFT SIDE FILL WITH RETAINING/TOE WALL (HEIGHT OF CUT ON RIGHT SIDE > 25m)
16	13+690	13+750	60	TCS-6	BOTH SIDE CUT (HEIGHT OF CUT ON RIGHT SIDE > 25m)
17	13+750	13+800	50	TCS-5	BOTH SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)
18	13+800	13+830	30	TCS-4	LEFT SIDE FILL & RIGHT SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)
19	13+830	14+000	170	TCS-5	BOTH SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)
20	14+000	14+030	30	TCS-3	LEFT SIDE FILL WITH RETAINING/TOE .WALL & RIGHT SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)
21	14+030	14+200	170	TCS-5	BOTH SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)
22	14+200	14+230	30	TCS-3	LEFT SIDE FILL WITH RETAINING/TOE .WALL & RIGHT SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)

Sr. No.	Design Chainage		Design Length	TCS No	TCS Details
	From	To			
23	14+230	14+320	90	TCS-5	BOTH SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)
24	14+320	14+360	40	TCS-3	LEFT SIDE FILL WITH RETAINING/TOE .WALL & RIGHT SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)
25	14+360	14+395	35	TCS-5	BOTH SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)
26	14+395	14+405	10	MINOR BRIDGE	
27	14+405	14+490	85	TCS-5	BOTH SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)
28	14+490	14+590	100	TCS-3	LEFT SIDE FILL WITH RETAINING/TOE .WALL & RIGHT SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)
29	14+590	14+920	330	TCS-5	BOTH SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)
30	14+920	15+050	130	TCS-3	LEFT SIDE FILL WITH RETAINING/TOE .WALL & RIGHT SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)
31	15+050	15+130	80	TCS-5	BOTH SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)
32	15+130	15+150	20	TCS-4	LEFT SIDE FILL & RIGHT SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)
33	15+150	15+430	280	TCS-3	LEFT SIDE FILL WITH RETAINING/TOE .WALL & RIGHT SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)
34	15+430	15+680	250	TCS-5	BOTH SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)
35	15+680	15+850	170	TCS-3	LEFT SIDE FILL WITH RETAINING/TOE .WALL & RIGHT SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)
36	15+850	15+930	80	TCS-1	BOTH SIDE FILL WITH LEFT RETAINING/TOE WALL

Sr. No.	Design Chainage		Design Length	TCS No	TCS Details
	From	To			
37	15+930	16+150	220	TCS-3	LEFT SIDE FILL WITH RETAINING/TOE .WALL & RIGHT SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)
38	16+150	16+260	110	TCS-5	BOTH SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)
39	16+260	16+388	128	TCS-3	LEFT SIDE FILL WITH RETAINING/TOE .WALL & RIGHT SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)
40	16+388	16+538	150	MAJOR BRIDGE	
41	16+538	16+600	62	TCS-1	BOTH SIDE FILL WITH LEFT RETAINING/TOE WALL
42	16+600	17+120	520	TCS-3	LEFT SIDE FILL WITH RETAINING/TOE .WALL & RIGHT SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)
43	17+120	17+750	630	TCS-5	BOTH SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)
44	17+750	17+775	25	TCS-3	LEFT SIDE FILL WITH RETAINING/TOE .WALL & RIGHT SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)
45	17+775	17+795	20	MINOR BRIDGE	
46	17+795	17+810	15	TCS-1	BOTH SIDE FILL WITH LEFT RETAINING/TOE WALL
47	17+810	17+870	60	TCS-3	LEFT SIDE FILL WITH RETAINING/TOE .WALL & RIGHT SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)
48	17+870	17+920	50	TCS-5	BOTH SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)
49	17+920	17+980	60	TCS-3	LEFT SIDE FILL WITH RETAINING/TOE .WALL & RIGHT SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)
50	17+980	18+006	26	TCS-2	BOTH SIDE FILL WITH LEFT SIDE GABION WALL
51	18+006	18+026	20	MINOR BRIDGE	

Sr. No.	Design Chainage		Design Length	TCS No	TCS Details
	From	To			
52	18+026	18+050	24	TCS-1	BOTH SIDE FILL WITH LEFT RETAINING/TOE WALL
53	18+050	18+170	120	TCS-3	LEFT SIDE FILL WITH RETAINING/TOE .WALL & RIGHT SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)
54	18+170	18+370	200	TCS-5	BOTH SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)
55	18+370	18+420	50	TCS-4	LEFT SIDE FILL & RIGHT SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)
56	18+420	18+500	80	TCS-3	LEFT SIDE FILL WITH RETAINING/TOE .WALL & RIGHT SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)
57	18+500	18+530	30	TCS-5	BOTH SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)
58	18+530	18+820	290	TCS-3	LEFT SIDE FILL WITH RETAINING/TOE .WALL & RIGHT SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)
59	18+820	18+900	80	TCS-5	BOTH SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)
60	18+900	19+189	289	TCS-3	LEFT SIDE FILL WITH RETAINING/TOE .WALL & RIGHT SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)
61	19+189	19+199	10	MINOR BRIDGE	
62	19+199	19+450	251	TCS-3	LEFT SIDE FILL WITH RETAINING/TOE .WALL & RIGHT SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)
63	19+450	19+660	210	TCS-5	BOTH SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)
64	19+660	19+690	30	TCS-4	LEFT SIDE FILL & RIGHT SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)
65	19+690	19+720	30	TCS-3	LEFT SIDE FILL WITH RETAINING/TOE .WALL & RIGHT SIDE REVETMENT WALL/BREAST

Sr. No.	Design Chainage		Design Length	TCS No	TCS Details
	From	To			
					WALL. (HEIGHT OF CUT < 6m)
66	19+720	19+760	40	TCS-4	LEFT SIDE FILL & RIGHT SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)
67	19+760	19+830	70	TCS-5	BOTH SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)
68	19+830	19+920	90	TCS-3	LEFT SIDE FILL WITH RETAINING/TOE .WALL & RIGHT SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)
69	19+920	19+950	30	TCS-5	BOTH SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)
70	19+950	19+970	20	TCS-4	LEFT SIDE FILL & RIGHT SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)
71	19+970	20+170	200	TCS-3	LEFT SIDE FILL WITH RETAINING/TOE .WALL & RIGHT SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)
72	20+170	20+200	30	TCS-5	BOTH SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)
73	20+200	20+280	80	TCS-3	LEFT SIDE FILL WITH RETAINING/TOE .WALL & RIGHT SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)
74	20+280	20+300	20	TCS-5	BOTH SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 6m)
Total			**7450**		

Table 9: Proposed cross sections for Link Road to Goha

Sr. No.	Design Chainage		Design Length (m)	TCS No	TCS Detail
	From (km)	To (km)			
1	00+000	00+180	180	TCS-9	LEFT SIDE FILL WITH RETAINING/TOE WALL & RIGHT SIDE REVETMENT WALL/BREAST WALL (HEIGHT OF CUT <10 m)
2	00+180	00+220	40	TCS-11	LEFT SIDE FILL & RIGHT SIDE REVETMENT WALL/BREAST WALL(HEIGHT OF CUT<10 m)

Sr. No.	Design Chainage		Design Length (m)	TCS No	TCS Detail
	From (km)	To (km)			
3	00+220	00+260	40	TCS-10	LEFT SIDE FILL WITH RETAINING/TOE WALL RIGHT SIDE CUT (HEIGHT OF CUT <25 m)
4	00+260	00+460	200	TCS-8	BOTH SIDE FILL WITH RIGHT SIDE GABION WALL
5	00+460	00+480	20	TCS-10	LEFT SIDE FILL WITH RETAINING/TOE WALL RIGHT SIDE CUT (HEIGHT OF CUT <25 m)
6	00+480	00+560	80	TCS-9	LEFT SIDE FILL WITH RETAINING/TOE WALL & RIGHT SIDE REVETMENT WALL/BREAST WALL (HEIGHT OF CUT <10 m)
7	00+560	00+680	120	TCS-8	BOTH SIDE FILL WITH RIGHT SIDE GABION WALL
8	00+680	00+710	30	TCS-10	LEFT SIDE FILL WITH RETAINING/TOE WALL RIGHT SIDE CUT (HEIGHT OF CUT <25 m)
9	00+710	00+800	90	TCS-9	LEFT SIDE FILL WITH RETAINING/TOE WALL & RIGHT SIDE REVETMENT WALL/BREAST WALL (HEIGHT OF CUT <10 m)
10	00+800	00+850	50	TCS-8	BOTH SIDE FILL WITH RIGHT SIDE GABION WALL
11	00+850	00+870	20	TCS-10	LEFT SIDE FILL WITH RETAINING/TOE WALL RIGHT SIDE CUT (HEIGHT OF CUT <25 m)
12	00+870	00+890	20	TCS-11	LEFT SIDE FILL & RIGHT SIDE REVETMENT WALL/BREAST WALL(HEIGHT OF CUT<10 m)
13	00+890	00+920	30	TCS-10	LEFT SIDE FILL WITH RETAINING/TOE WALL RIGHT SIDE CUT (HEIGHT OF CUT <25 m)
14	00+920	00+980	60	TCS-9	LEFT SIDE FILL WITH RETAINING/TOE WALL & RIGHT SIDE REVETMENT WALL/BREAST WALL (HEIGHT OF CUT <10 m)
15	00+980	01+000	20	TCS-10	LEFT SIDE FILL WITH RETAINING/TOE WALL RIGHT SIDE CUT (HEIGHT OF CUT <25 m)

Sr. No.	Design Chainage		Design Length (m)	TCS No	TCS Detail
	From (km)	To (km)			
16	01+000	01+030	30	TCS-8	BOTH SIDE FILL WITH RIGHT SIDE GABION WALL
17	01+030	01+050	20	TCS-10	LEFT SIDE FILL WITH RETAINING/TOE WALL RIGHT SIDE CUT (HEIGHT OF CUT <25 m)
18	01+050	01+100	50	TCS-9	LEFT SIDE FILL WITH RETAINING/TOE WALL & RIGHT SIDE REVETMENT WALL/BREAST WALL (HEIGHT OF CUT <10 m)
19	01+100	01+130	30	TCS-10	LEFT SIDE FILL WITH RETAINING/TOE WALL RIGHT SIDE CUT (HEIGHT OF CUT <25 m)
20	01+130	01+170	40	TCS-9	LEFT SIDE FILL WITH RETAINING/TOE WALL & RIGHT SIDE REVETMENT WALL/BREAST WALL (HEIGHT OF CUT <10 m)
21	01+170	01+470	300	TCS-10	LEFT SIDE FILL WITH RETAINING/TOE WALL RIGHT SIDE CUT (HEIGHT OF CUT <25 m)
22	01+470	01+490	20	TCS-9	LEFT SIDE FILL WITH RETAINING/TOE WALL & RIGHT SIDE REVETMENT WALL/BREAST WALL (HEIGHT OF CUT <10 m)
23	01+490	01+510	20	TCS-10	LEFT SIDE FILL WITH RETAINING/TOE WALL RIGHT SIDE CUT (HEIGHT OF CUT <25 m)
24	01+510	01+550	40	TCS-9	LEFT SIDE FILL WITH RETAINING/TOE WALL & RIGHT SIDE REVETMENT WALL/BREAST WALL (HEIGHT OF CUT <10 m)
25	01+550	01+730	180	TCS-10	LEFT SIDE FILL WITH RETAINING/TOE WALL RIGHT SIDE CUT (HEIGHT OF CUT <25 m)
26	01+730	01+750	20	TCS-9	LEFT SIDE FILL WITH RETAINING/TOE WALL & RIGHT SIDE REVETMENT WALL/BREAST WALL (HEIGHT OF CUT <10 m)
27	01+750	01+770	20	TCS-10	LEFT SIDE FILL WITH RETAINING/TOE WALL RIGHT SIDE CUT (HEIGHT OF CUT <25 m)
28	01+770	01+820	50	TCS-8	BOTH SIDE FILL WITH RIGHT SIDE GABION WALL

Sr. No.	Design Chainage		Design Length (m)	TCS No	TCS Detail
	From (km)	To (km)			
29	01+820	01+850	30	TCS-10	LEFT SIDE FILL WITH RETAINING/TOE WALL RIGHT SIDE CUT (HEIGHT OF CUT <25 m)
30	01+850	02+016	166	TCS-12	LEFT SIDE REVETMENT WALL/BREAST WALL(HEIGHT OF CUT< 10 m.)
	TOTAL DESIGN LENGTH (km)		**2.016**		

Table 10: Proposed cross sections for Package I B

Sr. No.	Design Chainage		Design Length	TCS No	TCS Detail
	From	To			
1	20+300	20+350	50	TCS-3A	BOTH SIDE CUT (NEW CONSTRUCTION)
2	20+350	20+460	110	TCS-1A	ONE SIDE CUT & ONE SIDE FILL WITH PROTECTION AS APPLICABLE (NEW CONSTRUCTION)
3	20+460	20+480	20	TCS-6	RIGHT SIDE CUT WITH ROCK BOLTING & LEFT SIDE FILL WITH PROTECTION AS APPLICABLE (NEW CONSTRUCTION)
4	20+480	20+580	100	TCS-5A	BOTH SIDE CUT & WITH ROCK BOLTING ON RIGHT SIDE (NEW CONSTRUCTION)
5	20+580	20+640	60	TCS-6	RIGHT SIDE CUT WITH ROCK BOLTING & LEFT SIDE FILL WITH PROTECTION AS APPLICABLE (NEW CONSTRUCTION)
6	20+640	20+850	210	TCS-5A	BOTH SIDE CUT & WITH ROCK BOLTING ON RIGHT SIDE (NEW CONSTRUCTION)
7	20+850	21+040	190	TCS-3A	BOTH SIDE CUT (NEW CONSTRUCTION)
8	21+040	21+085	45	TCS-1A	ONE SIDE CUT & ONE SIDE FILL WITH PROTECTION AS APPLICABLE (NEW CONSTRUCTION)

Sr. No.	Design Chainage		Design Length	TCS No	TCS Detail
	From	To			
9	21+085	21+105	20	MINOR BRIDGE	MINOR BRIDGE
10	21+105	21+130	25	TCS-2	BOTH SIDE FILL & WITH PROTECTION ON EITHER SIDE AS APPLICABLE (NEW CONSTRUCTION)
11	21+130	21+310	180	TCS-3A	BOTH SIDE CUT (NEW CONSTRUCTION)
12	21+310	21+326	16	TCS-2	BOTH SIDE FILL & WITH PROTECTION ON EITHER SIDE AS APPLICABLE (NEW CONSTRUCTION)
13	21+326	21+346	20	MINOR BRIDGE	MINOR BRIDGE
14	21+346	21+370	24	TCS-2	BOTH SIDE FILL & WITH PROTECTION ON EITHER SIDE AS APPLICABLE (NEW CONSTRUCTION)
15	21+370	21+405	35	TCS-1A	ONE SIDE CUT & ONE SIDE FILL WITH PROTECTION AS APPLICABLE (NEW CONSTRUCTION)
16	21+405	21+445	40	Viaduct	Viaduct
17	21+445	21+520	75	TCS-3A	BOTH SIDE CUT (NEW CONSTRUCTION)
18	21+520	21+650	130	TCS-5A	BOTH SIDE CUT & WITH ROCK BOLTING ON RIGHT SIDE (NEW CONSTRUCTION)
19	21+650	21+880	230	TCS-3A	BOTH SIDE CUT (NEW CONSTRUCTION)
20	21+880	21+940	60	TCS-1A	ONE SIDE CUT & ONE SIDE FILL WITH PROTECTION AS APPLICABLE (NEW CONSTRUCTION)
21	21+940	22+000	60	TCS-3A	BOTH SIDE CUT (NEW CONSTRUCTION)
22	22+000	22+100	100	TCS-5A	BOTH SIDE CUT & WITH ROCK BOLTING ON RIGHT SIDE (NEW CONSTRUCTION)
23	22+100	22+210	110	TCS-2	BOTH SIDE FILL & WITH PROTECTION ON EITHER SIDE AS APPLICABLE (NEW CONSTRUCTION)
24	22+210	22+340	130	TCS-3A	BOTH SIDE CUT (NEW CONSTRUCTION)

Sr. No.	Design Chainage		Design Length	TCS No	TCS Detail
	From	To			
25	22+340	22+540	200	TCS-1A	ONE SIDE CUT & ONE SIDE FILL WITH PROTECTION AS APPLICABLE (NEW CONSTRUCTION)
26	22+540	22+605	65	TCS-3A	BOTH SIDE CUT (NEW CONSTRUCTION)
27	22+605	22+645	40	Minor Bridge	Minor Bridge
28	22+645	22+740	95	TCS-3A	BOTH SIDE CUT (NEW CONSTRUCTION)
29	22+740	22+840	100	TCS-5A	BOTH SIDE CUT & WITH ROCK BOLTING ON RIGHT SIDE (NEW CONSTRUCTION)
30	22+840	23+050	210	TCS-3A	BOTH SIDE CUT (NEW CONSTRUCTION)
31	23+050	23+140	90	TCS-2	BOTH SIDE FILL & WITH PROTECTION ON EITHER SIDE AS APPLICABLE (NEW CONSTRUCTION)
32	23+140	23+180	40	TCS-1A	ONE SIDE CUT & ONE SIDE FILL WITH PROTECTION AS APPLICABLE (NEW CONSTRUCTION)
33	23+180	23+460	280	TCS-3A	BOTH SIDE CUT (NEW CONSTRUCTION)
34	23+460	23+520	60	TCS-1A	ONE SIDE CUT & ONE SIDE FILL WITH PROTECTION AS APPLICABLE (NEW CONSTRUCTION)
35	23+520	23+640	120	TCS-3A	BOTH SIDE CUT (NEW CONSTRUCTION)
36	23+640	23+750	110	TCS-2	BOTH SIDE FILL & WITH PROTECTION ON EITHER SIDE AS APPLICABLE (NEW CONSTRUCTION)
37	23+750	23+810	60	TCS-3A	BOTH SIDE CUT (NEW CONSTRUCTION)
38	23+810	23+900	90	TCS-5A	BOTH SIDE CUT & WITH ROCK BOLTING ON RIGHT SIDE (NEW CONSTRUCTION)
39	23+900	23+960	60	TCS-3A	BOTH SIDE CUT (NEW CONSTRUCTION)
40	23+960	24+030	70	TCS-2	BOTH SIDE FILL & WITH PROTECTION ON EITHER

Sr. No.	Design Chainage		Design Length	TCS No	TCS Detail
	From	To			
					SIDE AS APPLICABLE (NEW CONSTRUCTION)
41	24+030	24+230	200	TCS-3A	BOTH SIDE CUT (NEW CONSTRUCTION)
42	24+230	24+320	90	TCS-2	BOTH SIDE FILL & WITH PROTECTION ON EITHER SIDE AS APPLICABLE (NEW CONSTRUCTION)
43	24+320	24+490	170	TCS-3A	BOTH SIDE CUT (NEW CONSTRUCTION)
44	24+490	24+590	100	TCS-2	BOTH SIDE FILL & WITH PROTECTION ON EITHER SIDE AS APPLICABLE (NEW CONSTRUCTION)
45	24+590	24+870	280	TCS-3A	BOTH SIDE CUT (NEW CONSTRUCTION)
46	24+870	25+010	140	TCS-1A	ONE SIDE CUT & ONE SIDE FILL WITH PROTECTION AS APPLICABLE (NEW CONSTRUCTION)
47	25+010	25+210	200	TCS-3A	BOTH SIDE CUT (NEW CONSTRUCTION)
48	25+210	25+320	110	TCS-1A	ONE SIDE CUT & ONE SIDE FILL WITH PROTECTION AS APPLICABLE (NEW CONSTRUCTION)
49	25+320	25+490	170	TCS-3A	BOTH SIDE CUT (NEW CONSTRUCTION)
50	25+490	25+560	70	TCS-2	BOTH SIDE FILL & WITH PROTECTION ON EITHER SIDE AS APPLICABLE (NEW CONSTRUCTION)
51	25+560	25+670	110	TCS-1A	ONE SIDE CUT & ONE SIDE FILL WITH PROTECTION AS APPLICABLE (NEW CONSTRUCTION)
52	25+670	25+760	90	TCS-2	BOTH SIDE FILL & WITH PROTECTION ON EITHER SIDE AS APPLICABLE (NEW CONSTRUCTION)
53	25+760	25+880	120	TCS-3A	BOTH SIDE CUT (NEW CONSTRUCTION)
54	25+880	26+020	140	TCS-1A	ONE SIDE CUT & ONE SIDE FILL WITH PROTECTION AS APPLICABLE (NEW

Sr. No.	Design Chainage		Design Length	TCS No	TCS Detail
	From	To			
					CONSTRUCTION)
55	26+020	26+150	130	TCS-3A	BOTH SIDE CUT (NEW CONSTRUCTION)
56	26+150	26+300	150	TCS-1A	ONE SIDE CUT & ONE SIDE FILL WITH PROTECTION AS APPLICABLE (NEW CONSTRUCTION)
57	26+300	26+370	70	TCS-3A	BOTH SIDE CUT (NEW CONSTRUCTION)
58	26+370	26+445	75	TCS-2	BOTH SIDE FILL & WITH PROTECTION ON EITHER SIDE AS APPLICABLE (NEW CONSTRUCTION)
59	26+445	26+480	35	TCS-1A	ONE SIDE CUT & ONE SIDE FILL WITH PROTECTION AS APPLICABLE (NEW CONSTRUCTION)
60	26+480	26+605	125	TCS-3A	BOTH SIDE CUT (NEW CONSTRUCTION)
61	26+605	26+615	10	MINOR BRIDGE	MINOR BRIDGE
62	26+615	26+770	155	TCS-1A	ONE SIDE CUT & ONE SIDE FILL WITH PROTECTION AS APPLICABLE (NEW CONSTRUCTION)
63	26+770	26+910	140	TCS-3A	BOTH SIDE CUT (NEW CONSTRUCTION)
64	26+910	27+930	1020	TCS-1A	ONE SIDE CUT & ONE SIDE FILL WITH PROTECTION AS APPLICABLE (NEW CONSTRUCTION)
65	27+930	27+990	60	TCS-3A	BOTH SIDE CUT (NEW CONSTRUCTION)
66	27+990	28+160	170	TCS-1A	ONE SIDE CUT & ONE SIDE FILL WITH PROTECTION AS APPLICABLE (NEW CONSTRUCTION)
67	28+160	28+510	350	TCS-3A	BOTH SIDE CUT (NEW CONSTRUCTION)
68	28+510	28+630	120	TCS-1A	ONE SIDE CUT & ONE SIDE FILL WITH PROTECTION AS APPLICABLE (NEW CONSTRUCTION)
69	28+630	28+650	20	VUP	VUP
70	28+650	28+770	120	TCS-4	Two lane VUP approach with 5.5m SR on both Side WITH

Sr. No.	Design Chainage		Design Length	TCS No	TCS Detail
	From	To			
					RIGHT SIDE CUT & LEFT SIDE FILL WITH PROTECTION AS APPLICALE
71	28+770	29+030	260	TCS-1B	ONE SIDE CUT & ONE SIDE FILL WITH PROTECTION AS APPLICABLE (RECONSTRUCTION)
	Total		**8730**		

5.6 Typical Cross-sections

Proposed cross-sections are shown in table given below.

Table 11: Summary of TCS for Package I A

Sr. No.	Detail	TCS	Length	
			(m)	Kms
1	TWO LANE CARRIAGEWAY WITH PAVED SHOULDER IN MOUNTAINOUS TERRAIN WITH BOTH SIDE FILL WITH LEFT RETAINING/TOE WALL	**TCS-1**	321	0.321
2	TWO LANE CARRIAGEWAY WITH PAVED SHOULDER IN MOUNTAINOUS TERRAIN WITH BOTH SIDE FILL WITH LEFT SIDE GABION WALL	**TCS-2**	96	0.096
3	TWO LANE CARRIAGEWAY WITH PAVED SHOULDER IN MOUNTANEOUS TERRAIN WITH LEFT SIDE FILL WITH RETAINING/TOE .WALL & RIGHT SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 15m)	**TCS-3**	3523	3.523
4	TWO LANE CARRIAGEWAY WITH PAVED SHOULDER IN MOUNTAINOUS TERRAIN WITH LEFT SIDE FILL & RIGHT SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 15m)	**TCS-4**	190	0.190
5	TWO LANE CARRIAGEWAY WITH PAVED SHOULDER IN MOUNTAINOUS TERRAIN WITH BOTH SIDE REVETMENT WALL/BREAST WALL. (HEIGHT OF CUT < 15m)	**TCS-5**	2780	2.780
6	TWO LANE CARRIAGEWAY WITH PAVED SHOULDER IN MOUNTAINOUS TERRAIN WITH BOTH SIDE CUT (HEIGHT OF CUT ON RIGHT SIDE > 25m)	**TCS-6**	240	0.240

Sr. No.	Detail	TCS	Length	
			(m)	Kms
7	TWO LANE CARRIAGEWAY WITH PAVED SHOULDER IN MOUNTAINOUS TERRAIN WITH LEFT SIDE FILL WITH RETAINING/TOE WALL (HEIGHT OF CUT ON RIGHT SIDE > 25m)	**TCS-7**	40	0.040
8	MAJOR BRIDGE		150	0.150
9	MINOR BRIDGE		110	0.110
TOTAL DESIGN LENGTH			**7450.00**	**7.450**

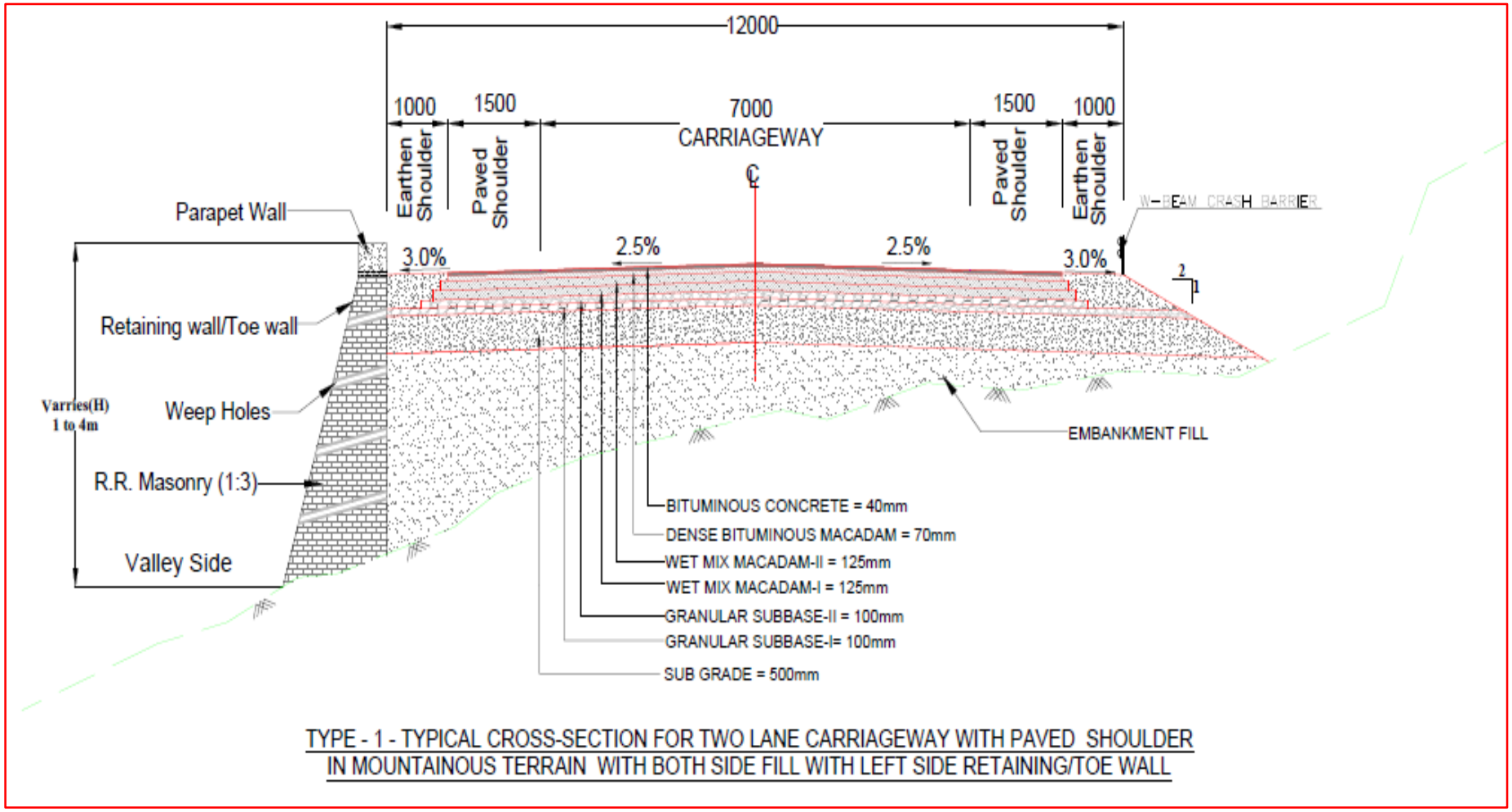
Table 12: Summary of TCS for Link road to Goha

Sr. No.	Detail	TCS	Length	
			(m)	Kms
1	TWO LANE CARRIAGEWAY IN MOUNTAINOUS TERRAIN WITH BOTH SIDE FILL WITH RIGHT SIDE GABION WALL	**TCS-8**	450	0.450
2	TWO LANE CARRIAGEWAY IN MOUNTAINOUS TERRAIN WITH LEFT SIDE FIL L WITH RETAINING/TOE WALL & RIGHT SIDE REVETMENT WALL/BREAST WALL (HEIGHT OF CUT <10 m)	**TCS-9**	580	0.580
3	TWO LANE CARRIAGEWAY IN MOUNTAINOUS TERRAIN WITH LEFT SIDE FILL WITH RETAINING/TOE WALL RIGHT SIDE CUT (HEIGHT OF CUT <25 m)	**TCS-10**	760	0.760
4	TWO LANE CARRIAGEWAY IN MOUNTAINOUS TERRAIN IN LEFT SIDE FILL & RIGHT SIDE REVETMENT WALL/BREAST WALL(HEIGHT OF CUT<10 m)	**TCS-11**	60	0.060
5	TWO LANE CARRIAGEWAY IN MOUNTAINOUS TERRAIN IN LEFT SIDE REVETMENT WALL/BREAST WALL(HEIGHT OF CUT< 10 m.)	**TCS-12**	166	0.166
TOTAL DESIGN LENGTH			***2016.00***	***2.016***

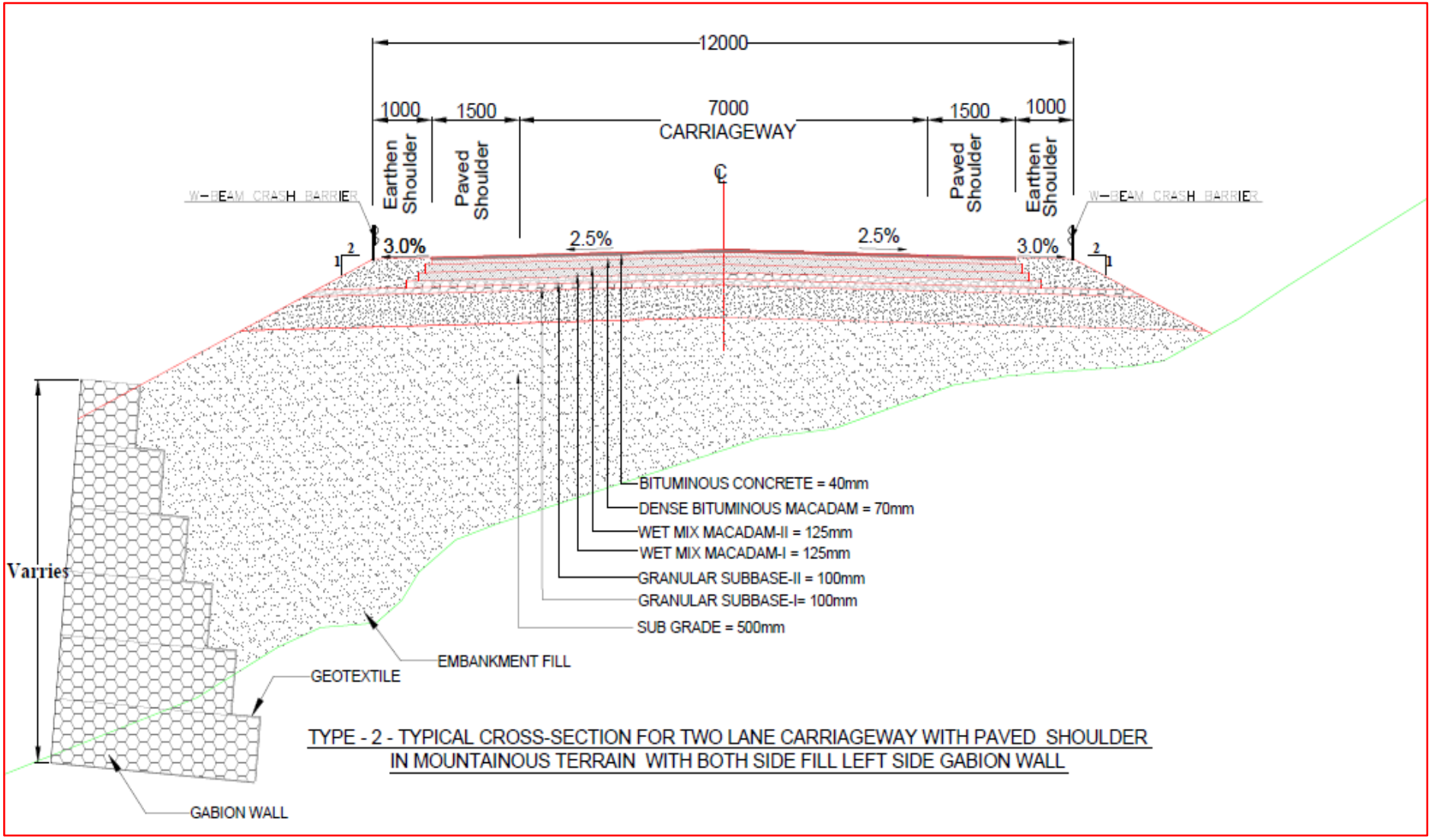
Table 13: Summary of TCS for Package I B

Sr. No.	Detail	TCS	Length	
			(m)	Kms
1	TWO LANE CARRIAGEWAY WITH PAVED SHOULDER IN MOUNTAINOUS TERRAIN ONE SIDE CUT & ONE SIDE FILL WITH PROTECTION AS APPLICABLE (NEW CONSTRUCTION)	**TCS-1A**	2700	2.700
2	TWO LANE CARRIAGEWAY WITH PAVED SHOULDER IN MOUNTAINOUS TERRAIN WITH ONE SIDE CUT & ONE SIDE FILL WITH PROTECTION AS APPLICABLE (RECONSTRUCTION)	**TCS-1B**	260	0.260
3	TWO LANE CARRIAGEWAY WITH PAVED SHOULDER IN MOUNTAINOUS TERRAIN WITH BOTH SIDE FILL & WITH PROTECTION ON EITHER SIDE AS APPLICABLE (NEW CONSTRUCTION)	**TCS-2**	870	0.870
4	TWO LANE CARRIAGEWAY WITH PAVED SHOULDER IN MOUNTAINOUS TERRAIN WITH BOTH SIDE CUT (NEW CONSTRUCTION)	**TCS-3A**	3820	3.820
5	Two lane VUP approach with 5.5m SR on both Side WITH RIGHT SIDE CUT & LEFT SIDE FILL WITH PROTECTION AS APPLICALE	**TCS-4**	120	0.120
6	TWO LANE CARRIAGEWAY WITH PAVED SHOULDER IN MOUNTAINOUS TERRAIN WITH BOTH SIDE CUT & WITH ROCK BOLTING ON RIGHT SIDE (NEW CONSTRUCTION)	**TCS-5A**	730	0.730
7	TWO LANE CARRIAGEWAY WITH PAVED SHOULDER IN MOUNTAINOUS TERRAIN WITH RIGHT SIDE CUT WITH ROCK BOLTING & LEFT SIDE FILL WITH PROTECTION AS APPLICABLE (NEW CONSTRUCTION)	**TCS-6**	80	0.080
8	MINOR BRIDGE		90	0.090
9	VIADUCT		40	0.040
10	VUP		20	0.020
TOTAL DESIGN LENGTH			**8730.00**	**8.730**

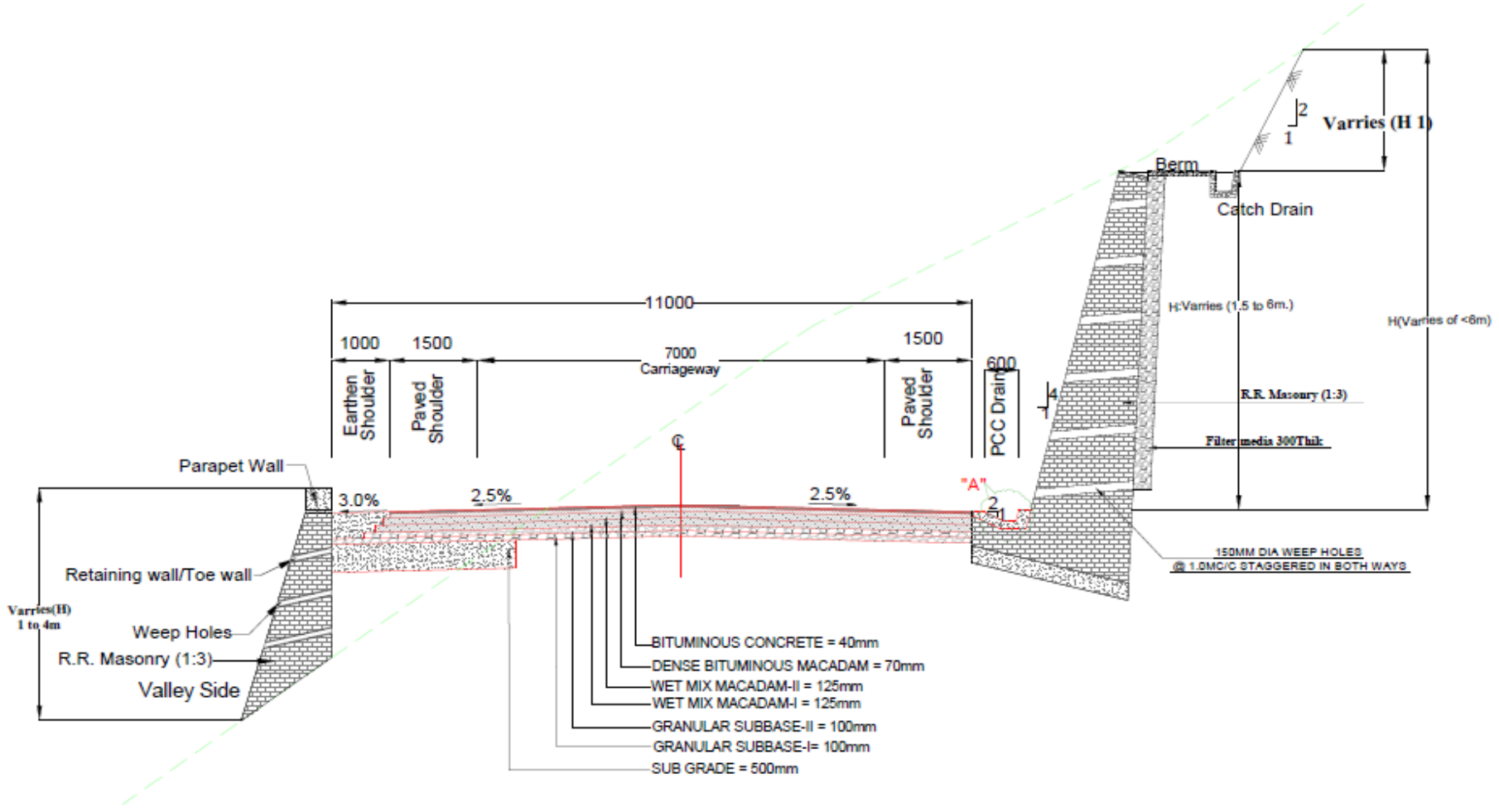
Typical Cross Section : Package I A



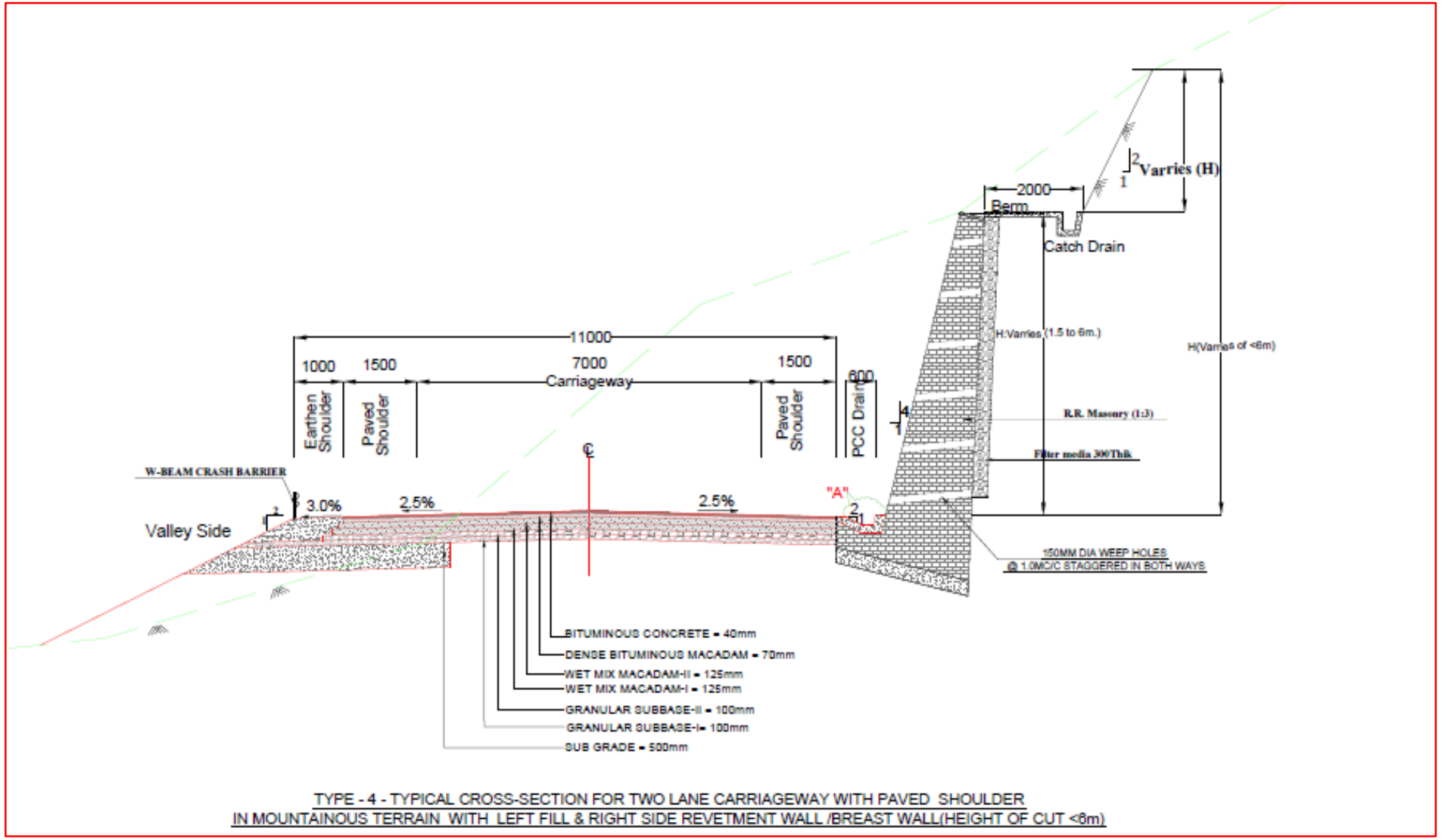
TYPE - 1 - TYPICAL CROSS-SECTION FOR TWO LANE CARRIAGEWAY WITH PAVED SHOULDER IN MOUNTAINOUS TERRAIN WITH BOTH SIDE FILL WITH LEFT SIDE RETAINING/TOE WALL



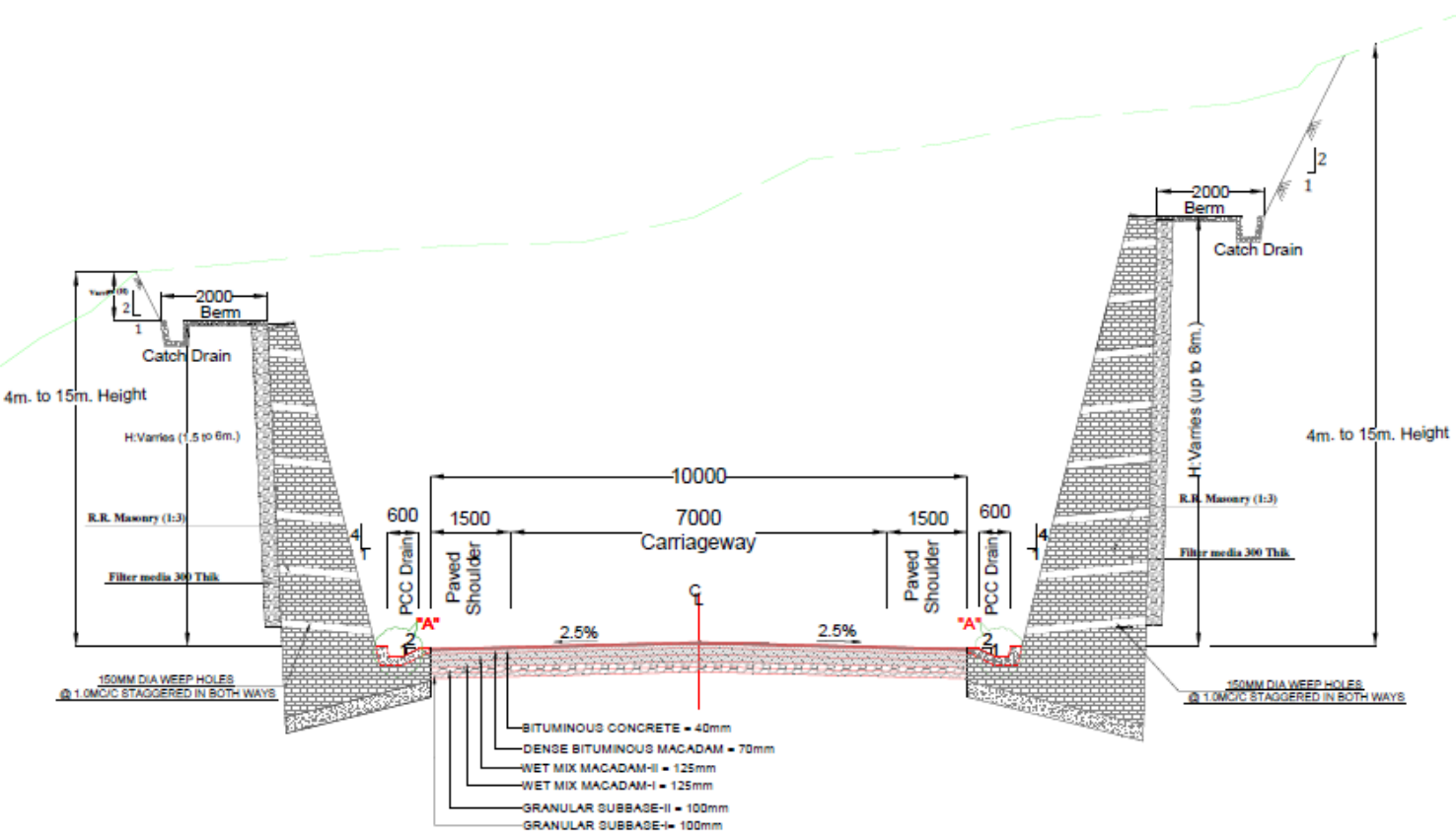
TYPE - 2 - TYPICAL CROSS-SECTION FOR TWO LANE CARRIAGEWAY WITH PAVED SHOULDER IN MOUNTAINOUS TERRAIN WITH BOTH SIDE FILL LEFT SIDE GABION WALL



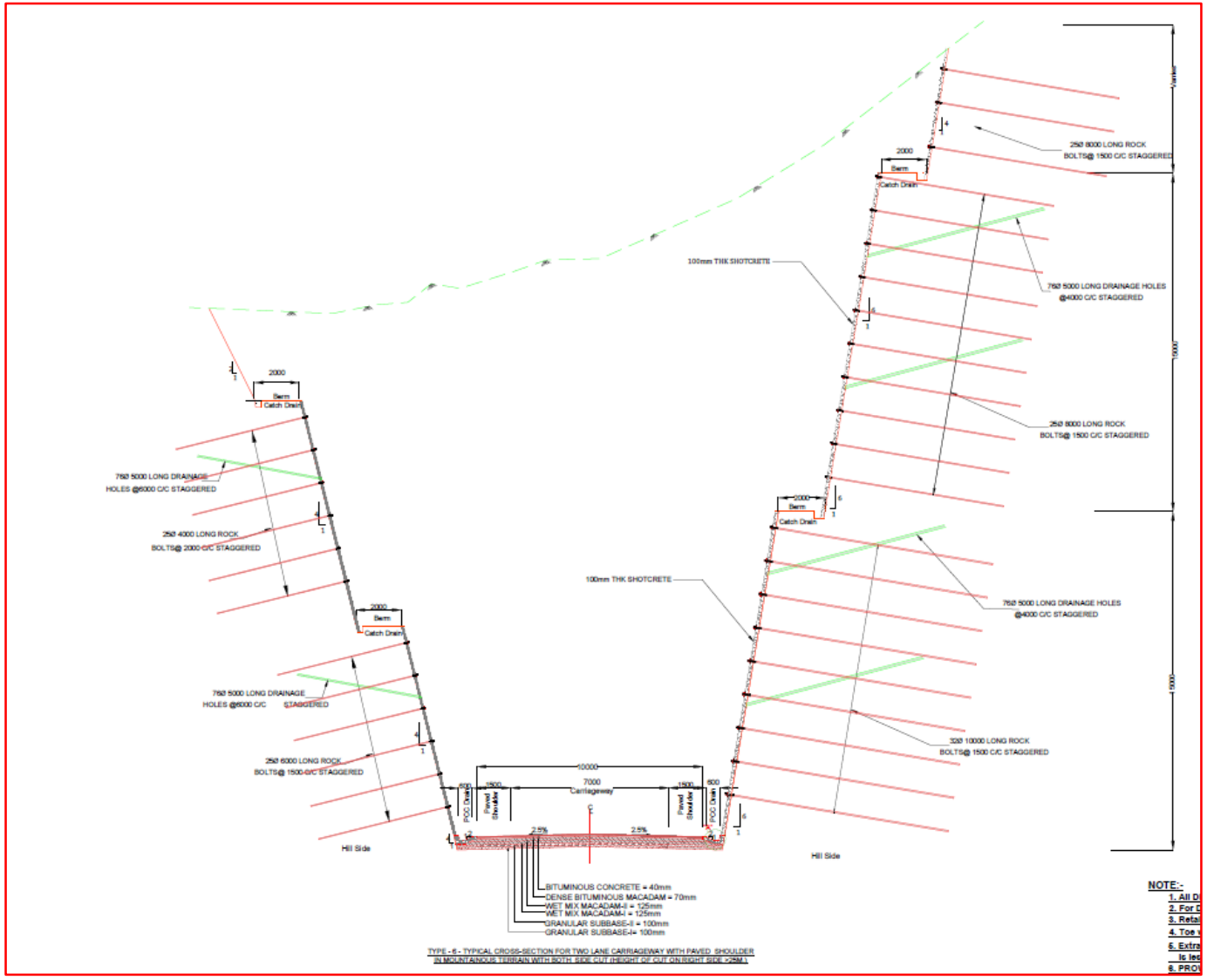
TYPE - 3 - TYPICAL CROSS-SECTION FOR TWO LANE CARRIAGEWAY WITH PAVED SHOULDER
IN MOUNTAINOUS TERRAIN WITH LEFT SIDE FILL WITH RETAINING/TOE WALL & RIGHT SIDE REVETMENT WALL /BREAST WALL (HEIGHT OF CUT <6m.)



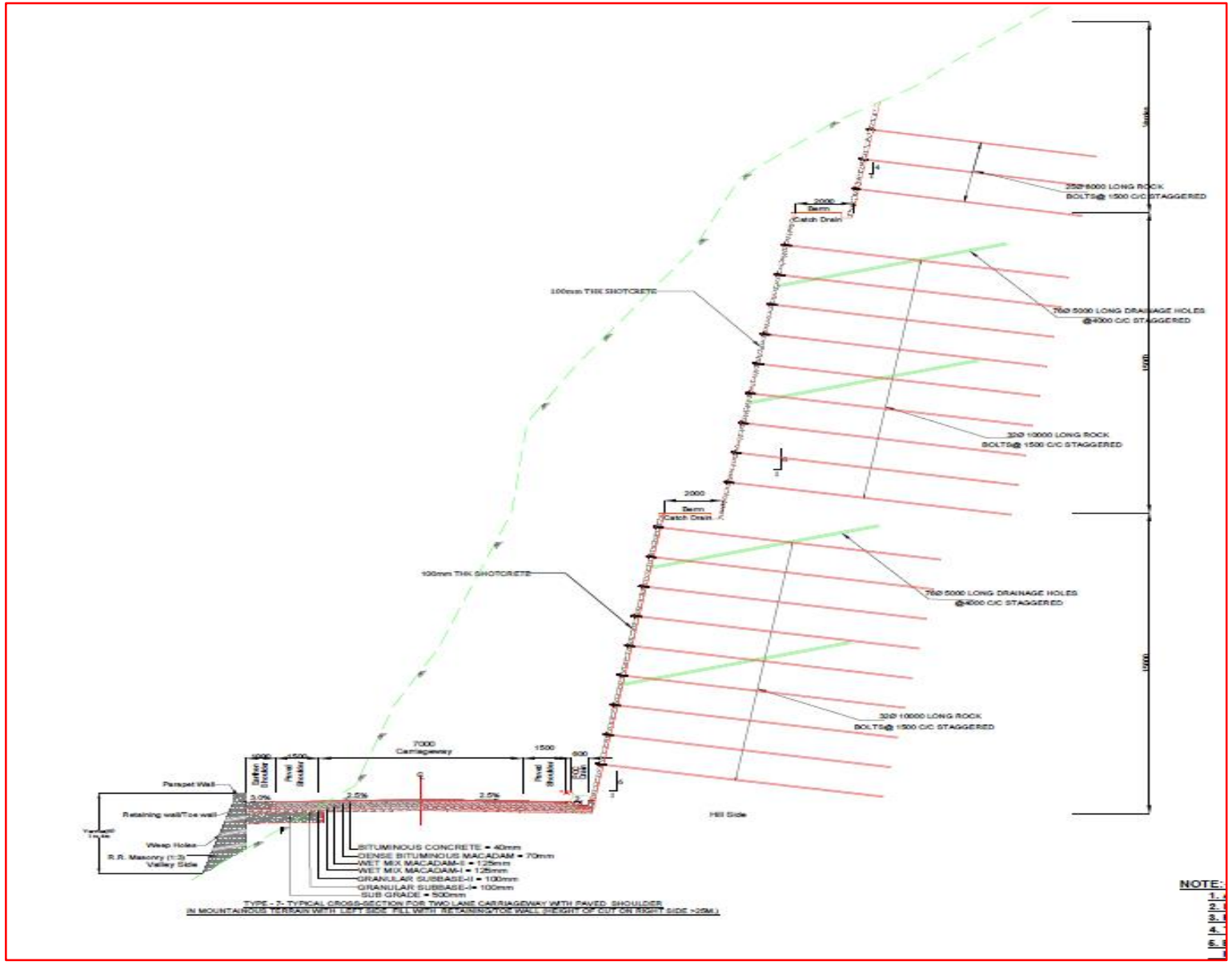
TYPE - 4 - TYPICAL CROSS-SECTION FOR TWO LANE CARRIAGEWAY WITH PAVED SHOULDER
IN MOUNTAINOUS TERRAIN WITH LEFT FILL & RIGHT SIDE REVETMENT WALL /BREAST WALL(HEIGHT OF CUT <6m)



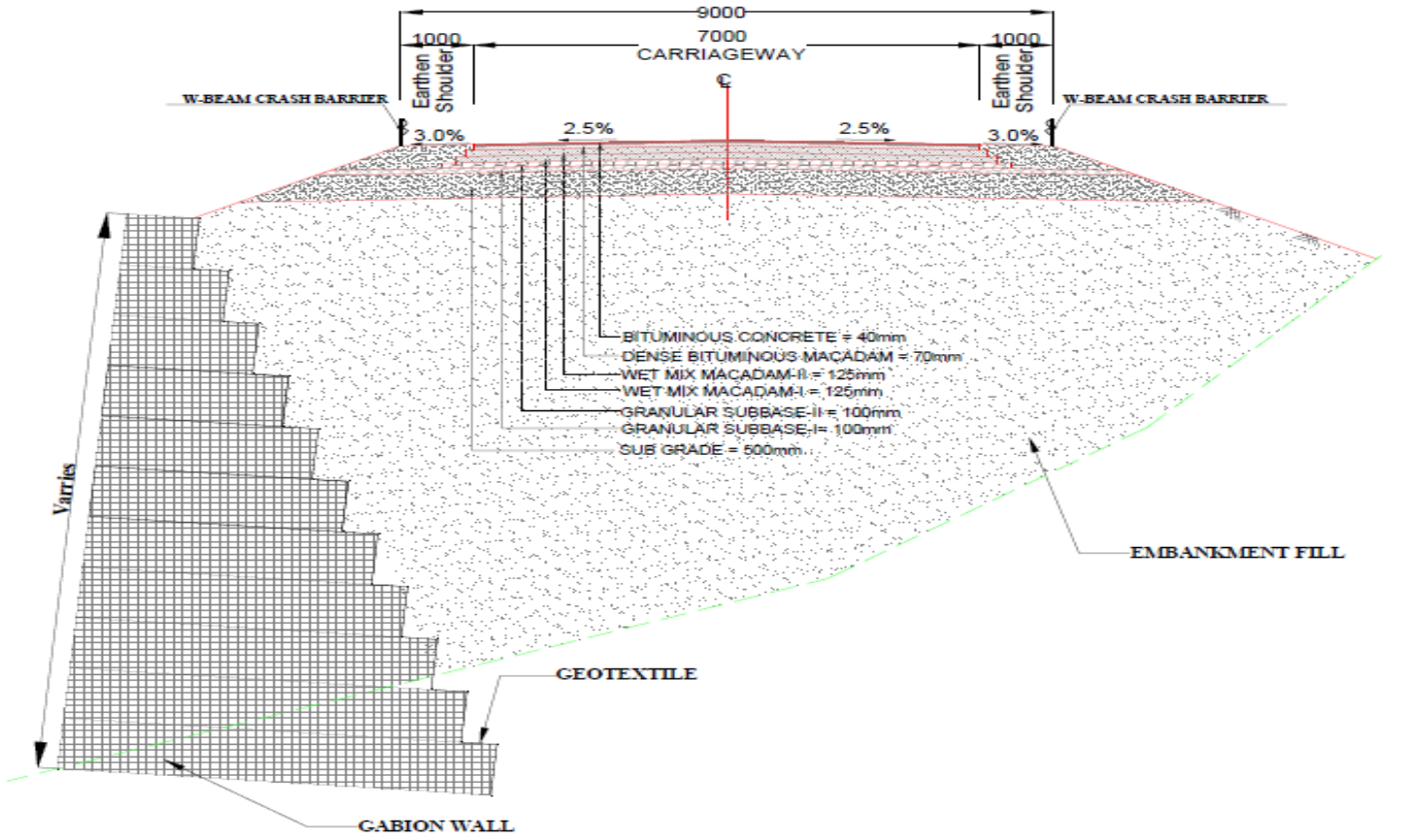
TYPE - 5 - TYPICAL CROSS-SECTION FOR TWO LANE CARRIAGEWAY WITH PAVED SHOULDER
IN MOUNTAINOUS TERRAIN WITH BOTH SIDE REVETMENT WALL /BREAST WALL (HEIGHT OF CUT <6m.)



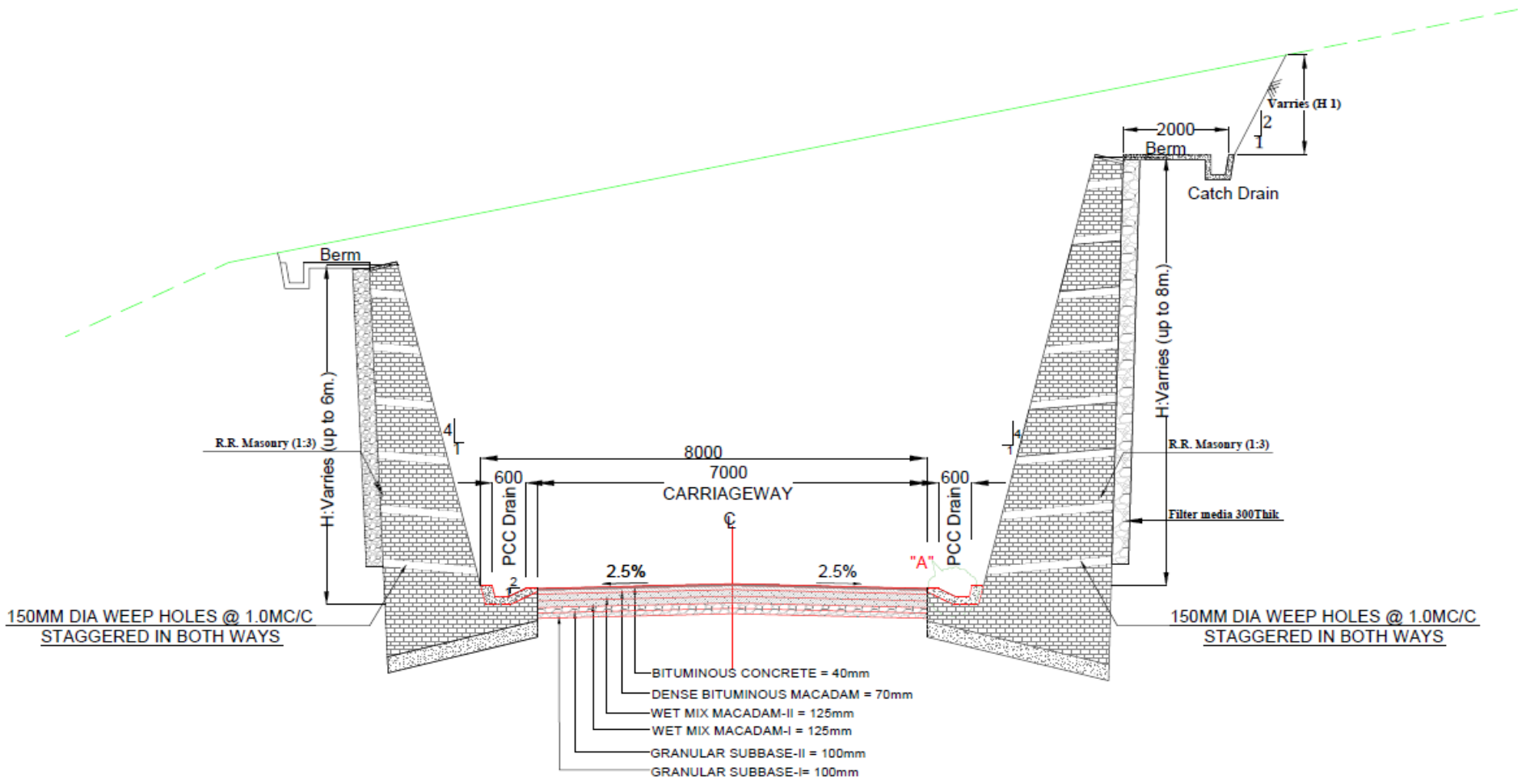
TYPE - 6 - TYPICAL CROSS-SECTION FOR TWO LANE CARRIAGEWAY WITH PAVED SHOULDER IN MOUNTAINOUS TERRAIN WITH BOTH SIDE CUT (HEIGHT OF CUT ON RIGHT SIDE >25M)


100mm THK SHOTCRETE
25Ø 6000 LONG ROCK BOLTS@ 1500 C/C STAGGERED
2000
Berm
Catch Drain
76Ø 5000 LONG DRAINAGE HOLES @4000 C/C STAGGERED
32Ø 10000 LONG ROCK BOLTS@ 1500 C/C STAGGERED
1500
7000
Carriageway
Parapet Wall
Retaining wall/Toe wall
Weep Holes
R.R. Masonry (1:3)
Valley Side
Hill Side
BITUMINOUS CONCRETE = 40mm
DENSE BITUMINOUS MACADAM = 70mm
WET MIX MACADAM-II = 125mm
WET MIX MACADAM-I = 125mm
GRANULAR SUBBASE-II = 100mm
GRANULAR SUBBASE-I= 100mm
SUB GRADE = 500mm
TYPE - 7- TYPICAL CROSS-SECTION FOR TWO LANE CARRIAGEWAY WITH PAVED SHOULDER
IN MOUNTAINOUS TERRAIN WITH LEFT SIDE FILL WITH RETAINING/TOE WALL (HEIGHT OF CUT ON RIGHT SIDE >25M.)
NOTE:

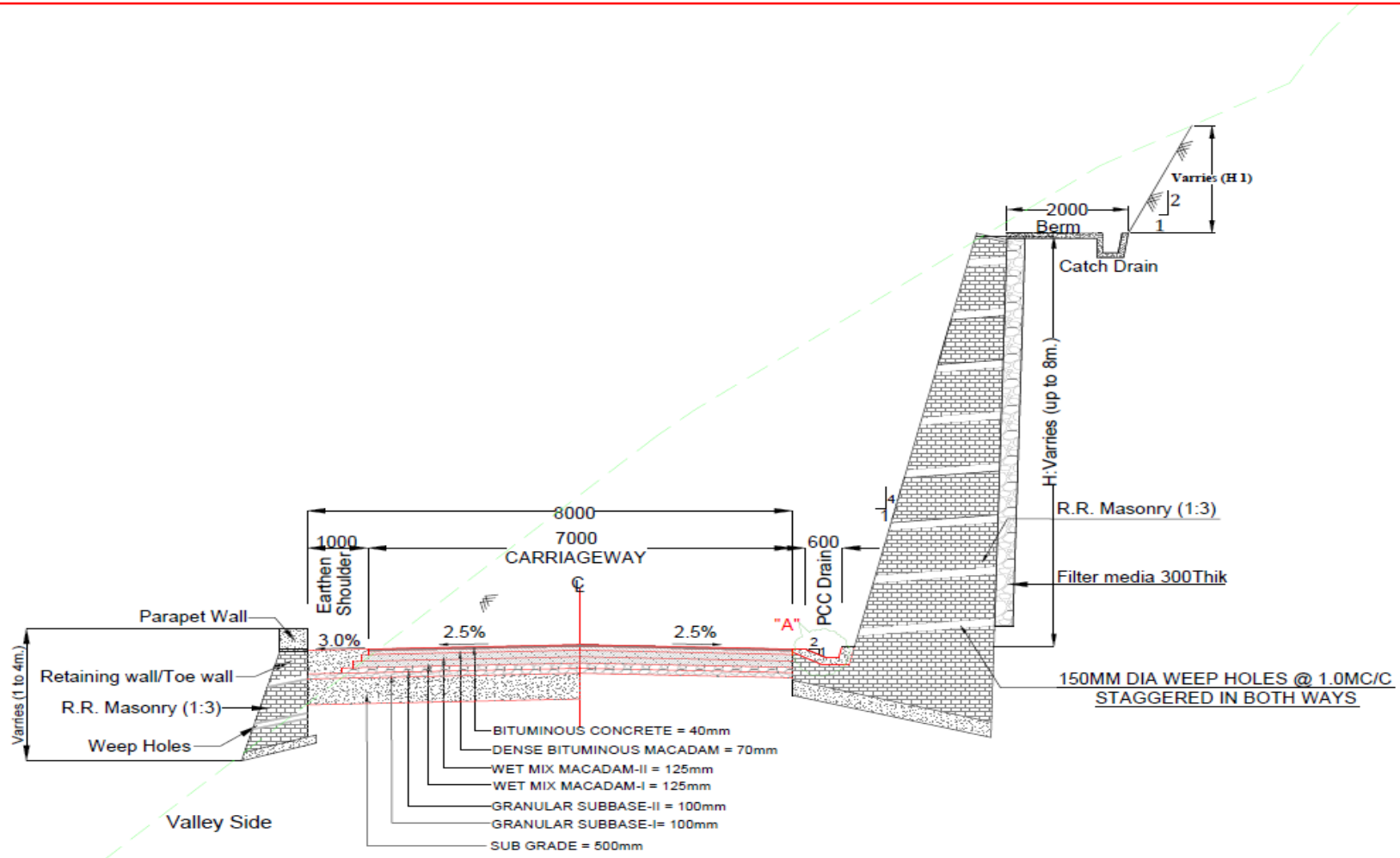
TCS of Link Road – 1



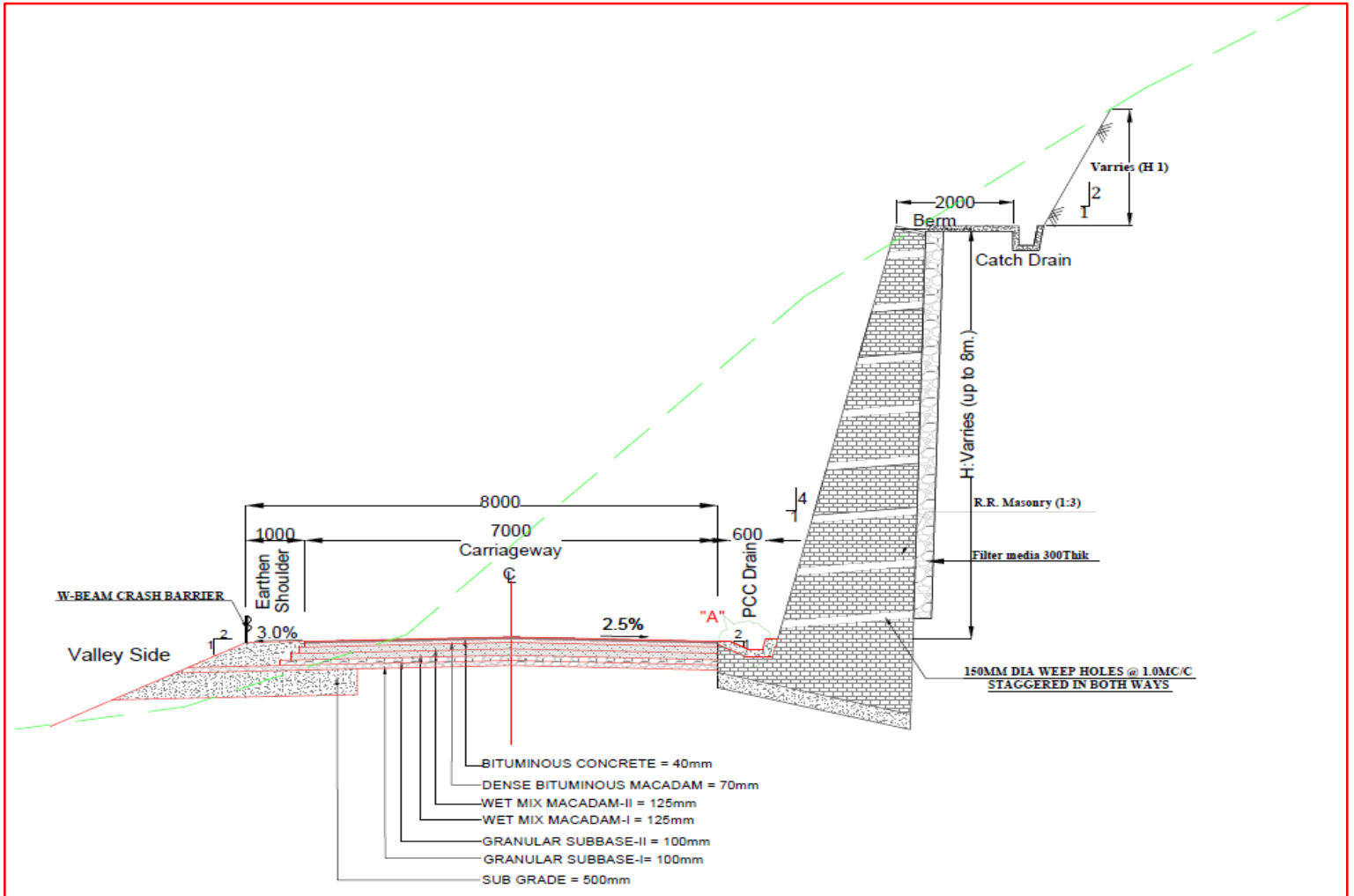
TYPE - 8 - TYPICAL CROSS-SECTION FOR TWO LANE CARRIAGEWAY IN MOUNTAINOUS TERRAIN WITH BOTH SIDE FILL RIGHT SIDE GABION WALL



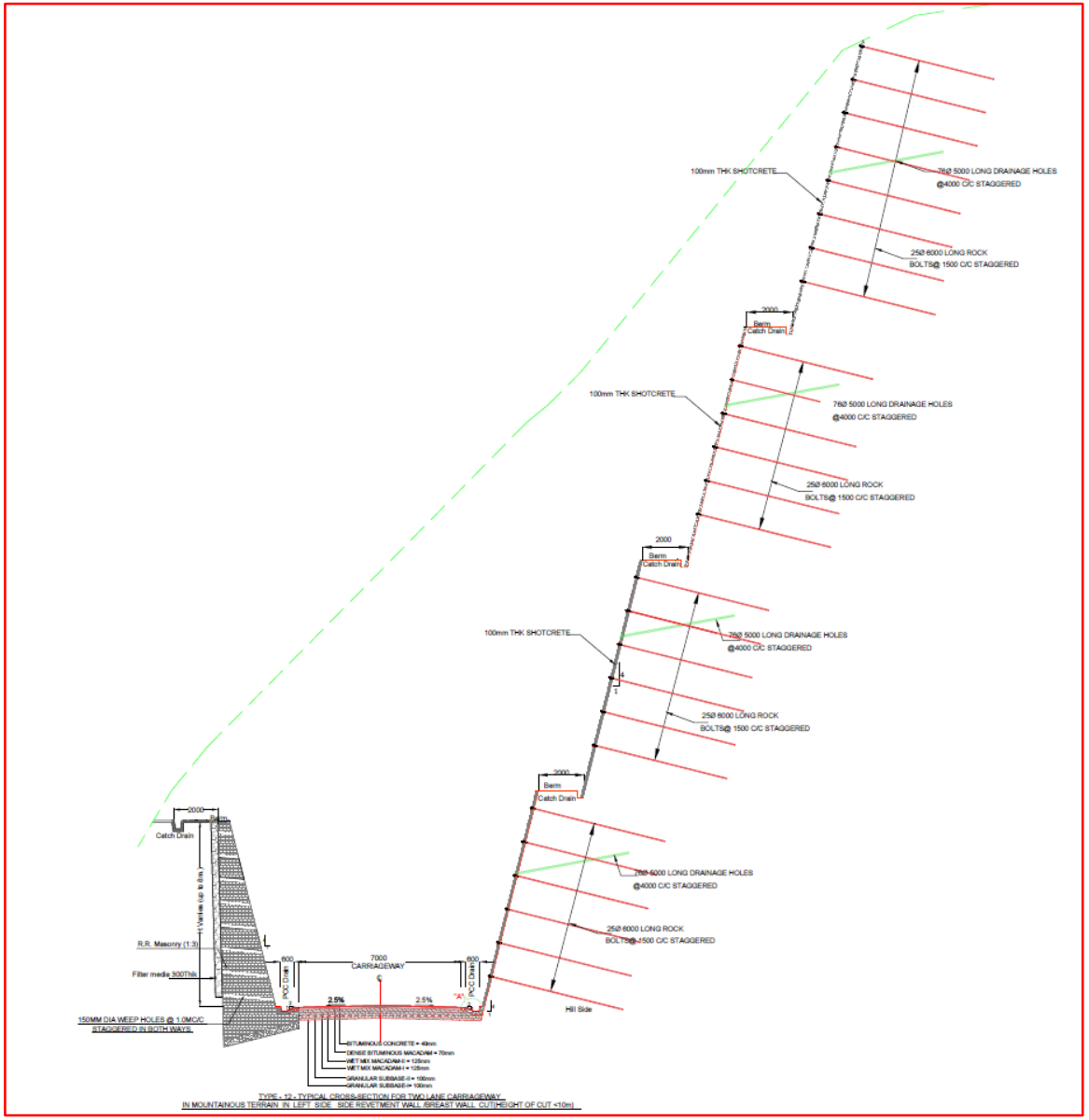
TYPE - 9 - TYPICAL CROSS-SECTION FOR TWO LANE CARRIAGEWAY
IN MOUNTAINOUS TERRAIN WITH BOTH SIDE REVETMENT WALL /BREAST WALL (HEIGHT OF CUT <10m)



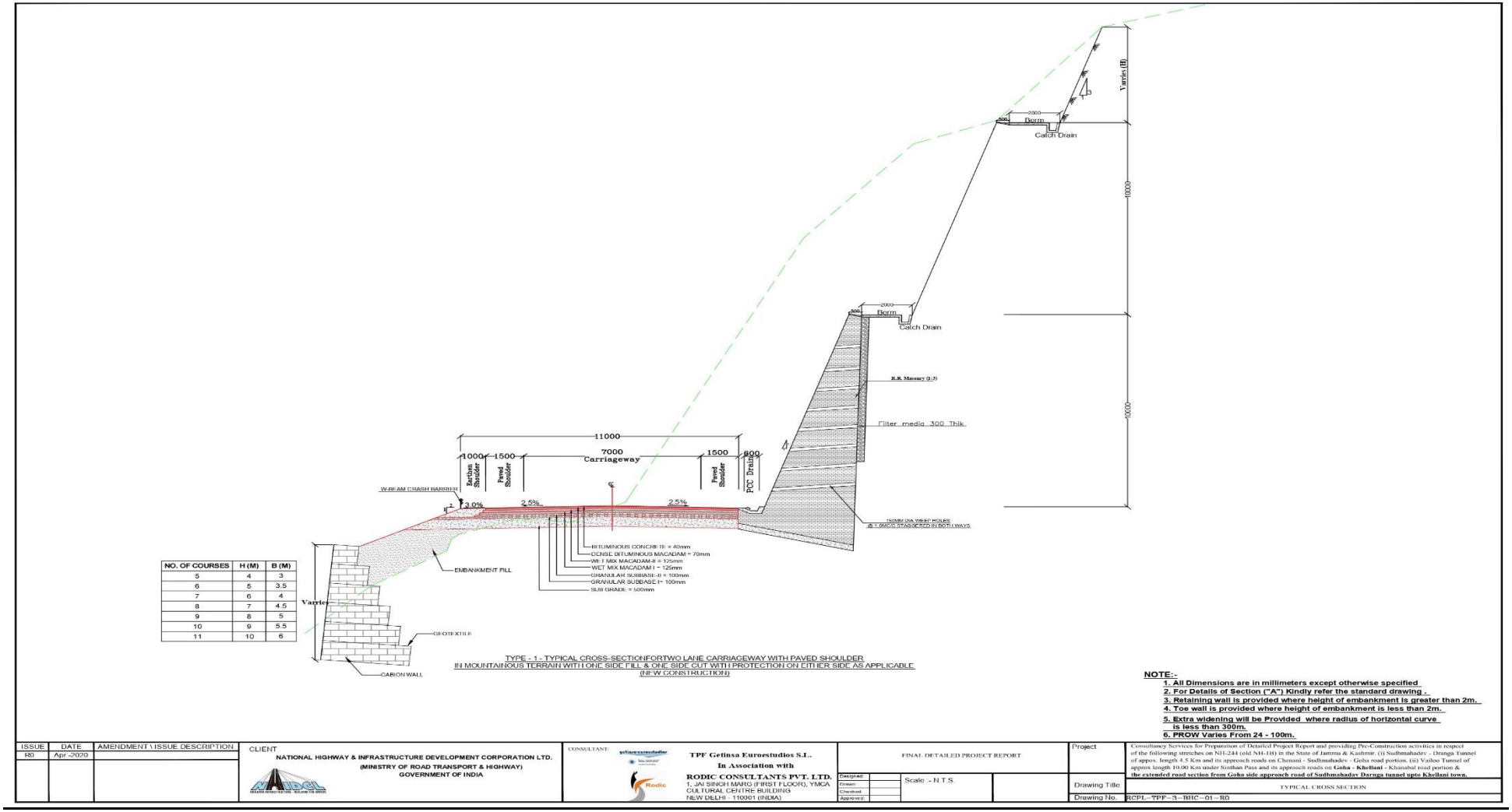
TYPE - 10 - TYPICAL CROSS-SECTION FOR TWO LANE CARRIAGEWAY IN MOUNTAINOUS TERRAIN WITH LEFT SIDE FILL WITH RETAINING/TOE WALL & RIGHT SIDE REVETMENT WALL /BREAST WALL (HEIGHT OF CUT <10m)



TYPE - 11 - TYPICAL CROSS-SECTION FOR TWO LANE CARRIAGEWAY
IN MOUNTAINOUS TERRAIN IN LEFT FILL & RIGHT SIDE REVETMENT WALL /BREAST WALL(HEIGHT OF CUT <10m)


100mm THK SHOTCRETE
76Ø 5000 LONG DRAINAGE HOLES @4000 C/C STAGGERED
25Ø 6000 LONG ROCK BOLTS@ 1500 C/C STAGGERED
2000
Berm
Catch Drain
100mm THK SHOTCRETE
76Ø 5000 LONG DRAINAGE HOLES @4000 C/C STAGGERED
25Ø 6000 LONG ROCK BOLTS@ 1500 C/C STAGGERED
2000
Berm
Catch Drain
100mm THK SHOTCRETE
76Ø 5000 LONG DRAINAGE HOLES @4000 C/C STAGGERED
25Ø 6000 LONG ROCK BOLTS@ 1500 C/C STAGGERED
2000
Berm
Catch Drain
76Ø 6000 LONG DRAINAGE HOLES @4000 C/C STAGGERED
25Ø 6000 LONG ROCK BOLTS@ 1500 C/C STAGGERED
Hill Side
2000
Berm
Catch Drain
R.R. Masonry (1:3)
Filter media 300Thk
600
7000 CARRIAGEWAY
600
RCC Drain
RCC Drain
2.5%
2.5%
"A"
150MM DIA WEEP HOLES @ 1.0M C/C STAGGERED IN BOTH WAYS.
BITUMINOUS CONCRETE = 40mm
DENSE BITUMINOUS MACADAM = 70mm
WET MIX MACADAM = 125mm
WET MIX MACADAM = 125mm
GRANULAR SUBBASE = 100mm
GRANULAR SUBBASE = 150mm
TYPE - 12 : TYPICAL CROSS-SECTION FOR TWO LANE CARRIAGEWAY IN MOUNTAINOUS TERRAIN IN LEFT SIDE SIDE REVETMENT WALL /BREAST WALL CUT(HEIGHT OF CUT <10m)

TCS of Link Road to Package I B



NO. OF COURSES	H (M)	B (M)
5	4	3
6	5	3.5
7	6	4
8	7	4.5
9	8	5
10	9	5.5
11	10	6

TYPE - 1 - TYPICAL CROSS-SECTIONFORTWO LANE CARRIAGEWAY WITH PAVED SHOULDER
IN MOUNTAINOUS TERRAIN WITH ONE SIDE FILL & ONE SIDE CUT WITH PROTECTION ON EITHER SIDE AS APPLICABLE
(NEW CONSTRUCTION)

NOTE:-

1. All Dimensions are in millimeters except otherwise specified.
2. For Details of Section ("A") Kindly refer the standard drawing .
3. Retaining wall is provided where height of embankment is greater than 2m.
4. Toe wall is provided where height of embankment is less than 2m.
5. Extra widening will be Provided where radius of horizontal curve is less than 300m.
6. PROW Varies From 24 - 100m.

ISSUE	DATE	AMENDMENT \ ISSUE DESCRIPTION
R0	Apr -2020	

CLIENT: NATIONAL HIGHWAY & INFRASTRUCTURE DEVELOPMENT CORPORATION LTD. (MINISTRY OF ROAD TRANSPORT & HIGHWAY) GOVERNMENT OF INDIA

CONSULTANT: TPF Getinsa Euroestudios S.L. In Association with RODIC CONSULTANTS PVT. LTD. 1, JAI SINGH MARG (FIRST FLOOR), YMCA CULTURAL CENTRE BUILDING NEW DELHI – 110001 (INDIA)

FINAL DETAILED PROJECT REPORT

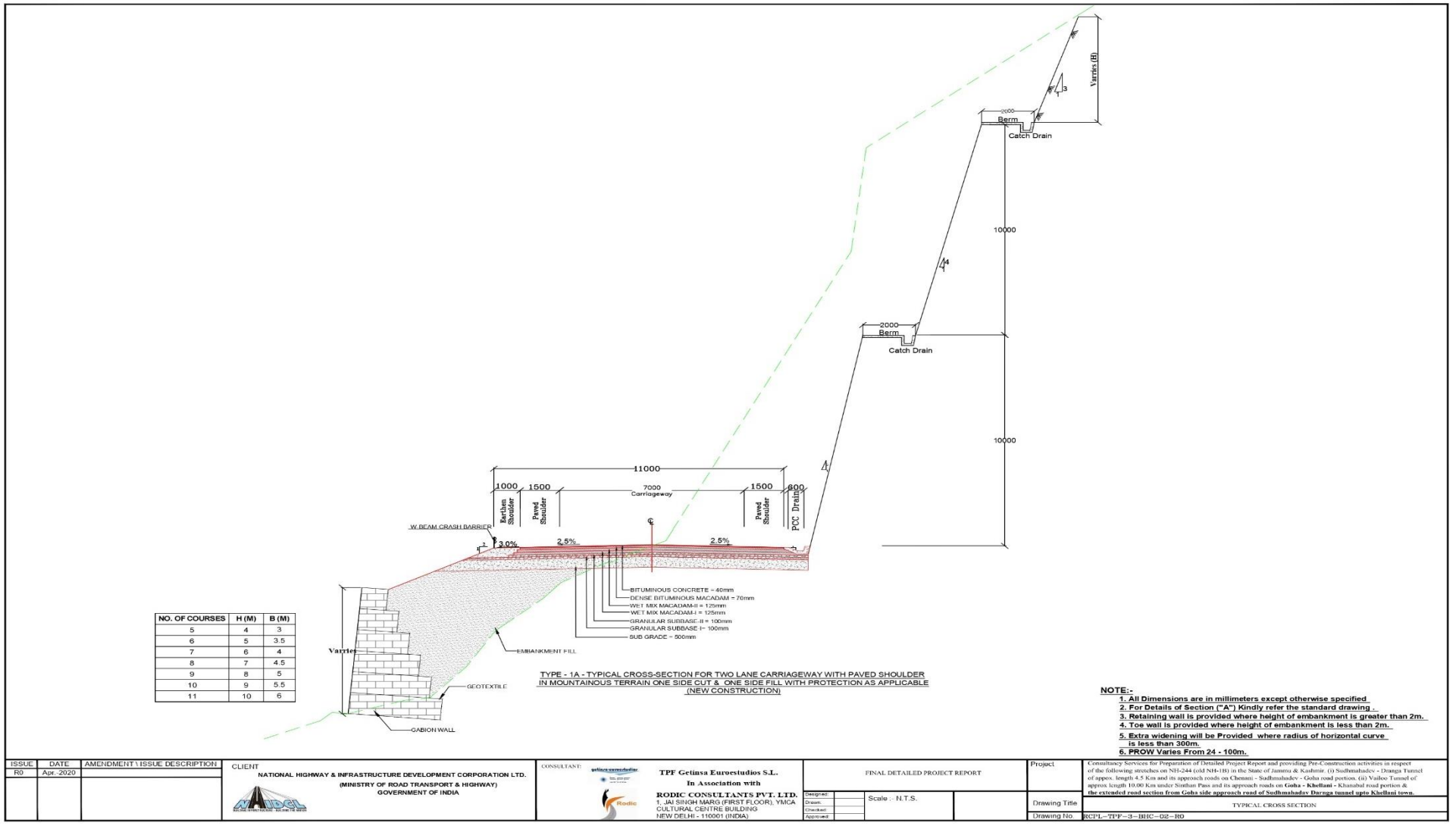
Designed / Drawn / Checked / Approved

Scale :- N.T.S.

Project: Consultancy Services for Preparation of Detailed Project Report and providing Pre-Construction activities in respect of the following stretches on NH-244 (old NH-1B) in the State of Jammu & Kashmir. (i) Sudhmahadev – Dranga Tunnel of approx. length 4.5 Km and its approach roads on Chenani - Sudhmahadev - Goha road portion. (ii) Vailoo Tunnel of approx length 10.00 Km under Sinthan Pass and its approach roads on **Goha - Khellani** - Khanabal road portion & **the extended road section from Goha side approach road of Sudhmahadav Darnga tunnel upto Khellani town.**

Drawing Title: TYPICAL CROSS SECTION

Drawing No.: RCPL–TPF–3–RHC–01–R0



NO. OF COURSES	H (M)	B (M)
5	4	3
6	5	3.5
7	6	4
8	7	4.5
9	8	5
10	9	5.5
11	10	6

TYPE - 1A - TYPICAL CROSS-SECTION FOR TWO LANE CARRIAGEWAY WITH PAVED SHOULDER IN MOUNTAINOUS TERRAIN ONE SIDE CUT & ONE SIDE FILL WITH PROTECTION AS APPLICABLE (NEW CONSTRUCTION)

NOTE:-

1. All Dimensions are in millimeters except otherwise specified
2. For Details of Section ("A") Kindly refer the standard drawing
3. Retaining wall is provided where height of embankment is greater than 2m.
4. Toe wall is provided where height of embankment is less than 2m.
5. Extra widening will be Provided where radius of horizontal curve is less than 300m.
6. PROW Varies From 24 - 100m.

ISSUE	DATE	AMENDMENT \ ISSUE DESCRIPTION
R0	Apr.-2020	

CLIENT: NATIONAL HIGHWAY & INFRASTRUCTURE DEVELOPMENT CORPORATION LTD. (MINISTRY OF ROAD TRANSPORT & HIGHWAY) GOVERNMENT OF INDIA

CONSULTANT: TPF Getinsa Euroestudios S.L. In Association with RODIC CONSULTANTS PVT. LTD. 1, JAI SINGH MARG (FIRST FLOOR), YMCA CULTURAL CENTRE BUILDING NEW DELHI - 110001 (INDIA)

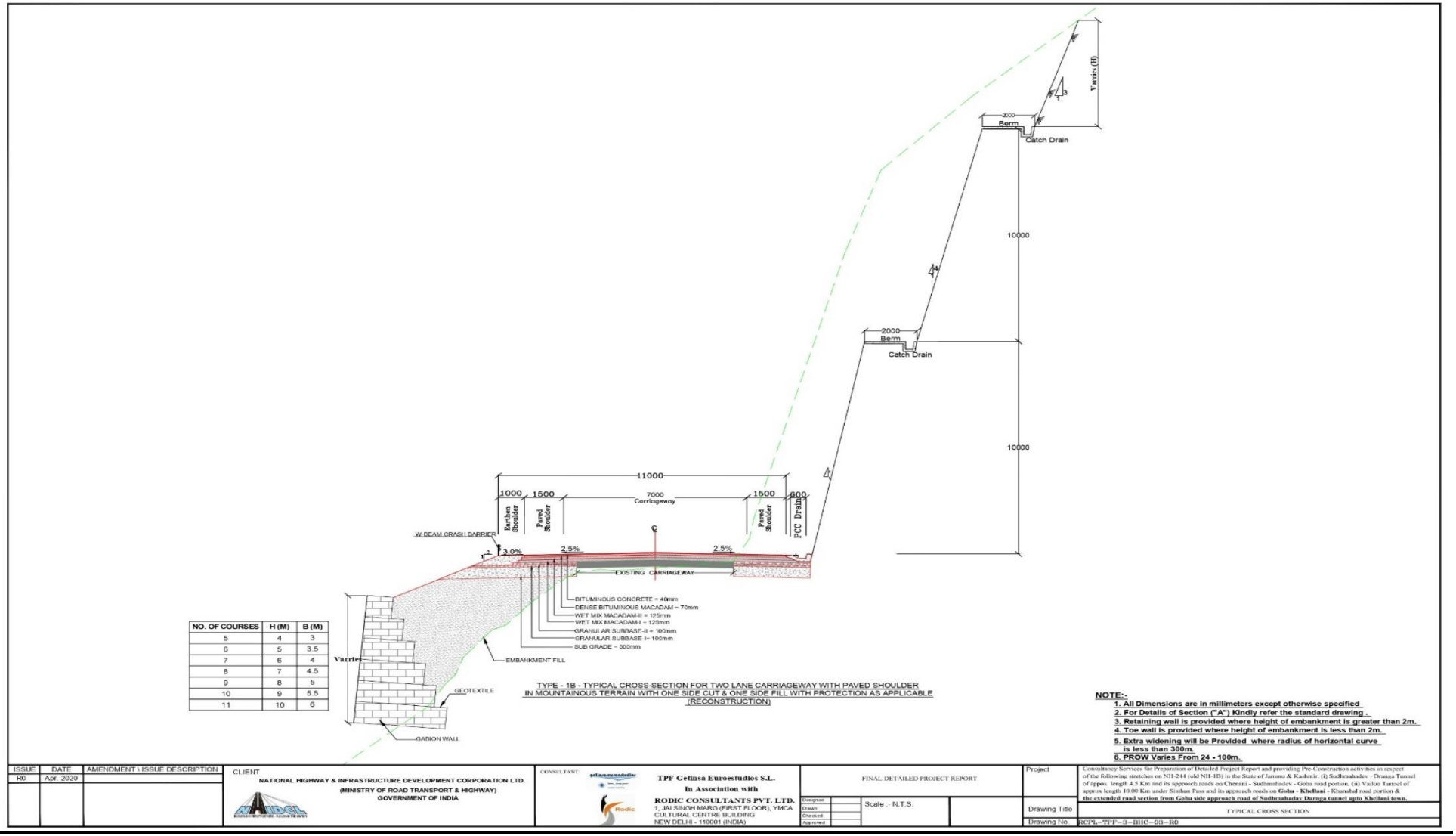
FINAL DETAILED PROJECT REPORT

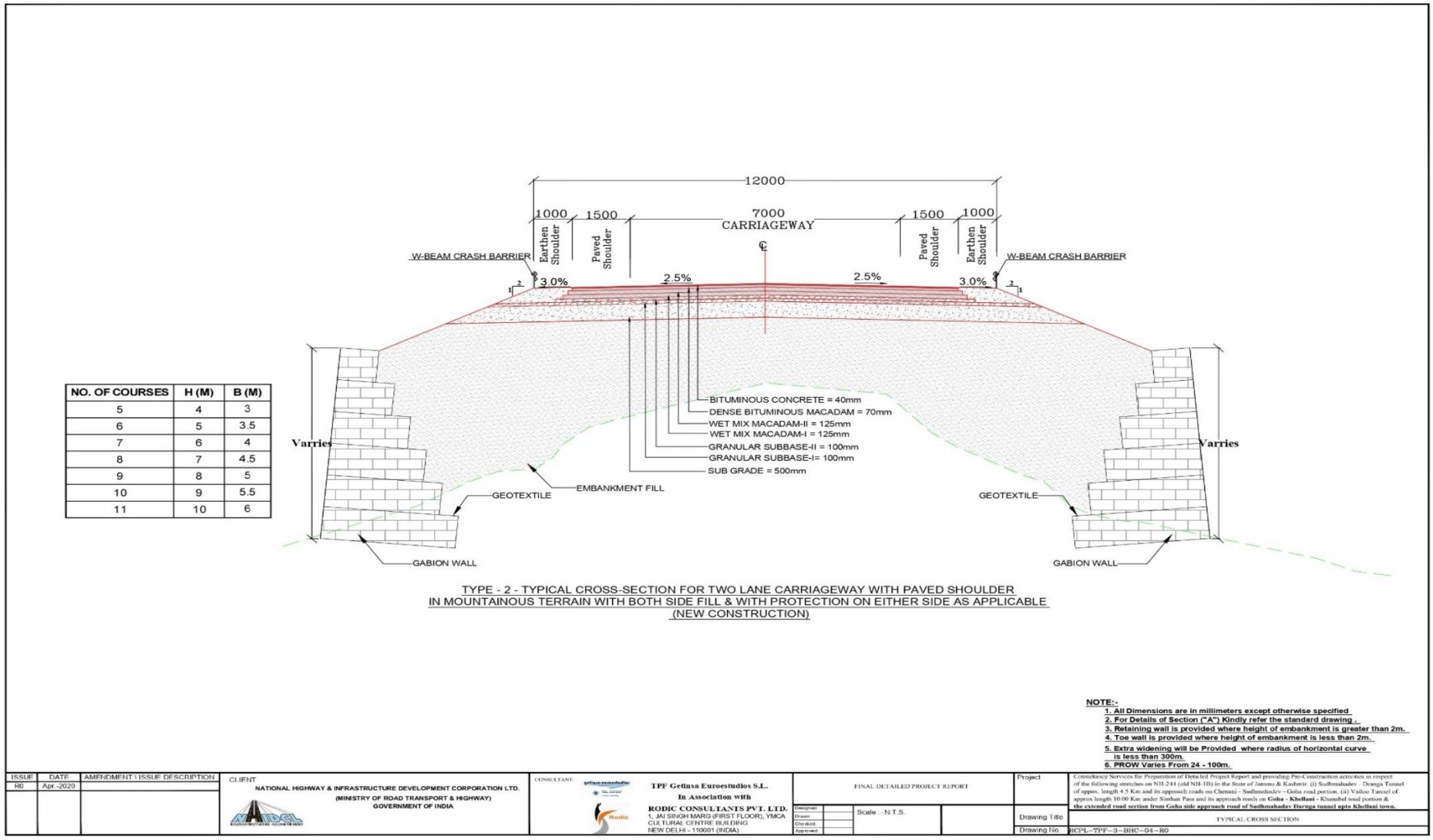
Designed: Drawn: Checked: Approved: Scale : N.T.S.

Project: Consultancy Services for Preparation of Detailed Project Report and providing Pre-Construction activities in respect of the following stretches on NH-244 (old NH-1B) in the State of Jammu & Kashmir. (i) Sudhmahadev - Dranga Tunnel of appox. length 4.5 Km and its approach roads on Chenani - Sudhmahadev - Goha road portion. (ii) Vailoo Tunnel of approx length 10.00 Km under Sinthan Pass and its approach roads on **Goha - Khellani** - Khanabal road portion & **the extended road section from Goha side approach road of Sudhmahadav Darnga tunnel upto Khellani town.**

Drawing Title: TYPICAL CROSS SECTION

Drawing No.: RCPL–TPF–3–BHC–02–R0


Varries (H)
2000
Berm
Catch Drain
10000
10000
2000
Berm
Catch Drain
11000
1000
1500
7000
Carriageway
1500
800
Kerbon Shoulder
Paved Shoulder
Paved Shoulder
PCC Drain
W BEAM CRASH BARRIER
3.0%
2.5%
2.5%
EXISTING CARRIAGEWAY
BITUMINOUS CONCRETE = 40mm
DENSE BITUMINOUS MACADAM – 70mm
WET MIX MACADAM-II = 125mm
WET MIX MACADAM-I – 125mm
GRANULAR SUBBASE-II = 100mm
GRANULAR SUBBASE I– 100mm
SUB GRADE – 300mm
EMBANKMENT FILL
Varries
GEOTEXTILE
GABION WALL
NO. OF COURSES | H (M) | B (M)
5 | 4 | 3
6 | 5 | 3.5
7 | 6 | 4
8 | 7 | 4.5
9 | 8 | 5
10 | 9 | 5.5
11 | 10 | 6
TYPE - 1B - TYPICAL CROSS-SECTION FOR TWO LANE CARRIAGEWAY WITH PAVED SHOULDER
IN MOUNTAINOUS TERRAIN WITH ONE SIDE CUT & ONE SIDE FILL WITH PROTECTION AS APPLICABLE
(RECONSTRUCTION)
NOTE:-
1. All Dimensions are in millimeters except otherwise specified
2. For Details of Section ("A") Kindly refer the standard drawing .
3. Retaining wall is provided where height of embankment is greater than 2m.
4. Toe wall is provided where height of embankment is less than 2m.
5. Extra widening will be Provided where radius of horizontal curve is less than 300m.
6. PROW Varies From 24 - 100m.
ISSUE | DATE | AMENDMENT \ ISSUE DESCRIPTION
R0 | Apr.-2020
CLIENT
NATIONAL HIGHWAY & INFRASTRUCTURE DEVELOPMENT CORPORATION LTD.
(MINISTRY OF ROAD TRANSPORT & HIGHWAY)
GOVERNMENT OF INDIA
CONSULTANT:
TPF Getinsa Euroestudios S.L.
In Association with
RODIC CONSULTANTS PVT. LTD.
1, JAI SINGH MARG (FIRST FLOOR), YMCA CULTURAL CENTRE BUILDING
NEW DELHI - 110001 (INDIA)
FINAL DETAILED PROJECT REPORT
Designed
Drawn
Checked
Approved
Scale :- N.T.S.
Project
Consultancy Services for Preparation of Detailed Project Report and providing Pre-Construction activities in respect of the following stretches on NH-244 (old NH-1B) in the State of Jammu & Kashmir. (i) Sudhmahadev - Dranga Tunnel of appox. length 4.5 Km and its approach roads on Chenani - Sudhmahadev - Goha road portion. (ii) Vailoo Tunnel of approx length 10.00 Km under Sinthan Pass and its approach roads on Goha - Khellani - Khanabal road portion & the extended road section from Goha side approach road of Sudhmahadav Darnga tunnel upto Khellani town.
Drawing Title
TYPICAL CROSS SECTION
Drawing No.
RCPL--TPF--3--BHC--03--R0



NO. OF COURSES	H (M)	B (M)
5	4	3
6	5	3.5
7	6	4
8	7	4.5
9	8	5
10	9	5.5
11	10	6

TYPE - 2 - TYPICAL CROSS-SECTION FOR TWO LANE CARRIAGEWAY WITH PAVED SHOULDER IN MOUNTAINOUS TERRAIN WITH BOTH SIDE FILL & WITH PROTECTION ON EITHER SIDE AS APPLICABLE (NEW CONSTRUCTION)

NOTE:-

1. All Dimensions are in millimeters except otherwise specified
2. For Details of Section ("A") Kindly refer the standard drawing -
3. Retaining wall is provided where height of embankment is greater than 2m.
4. Toe wall is provided where height of embankment is less than 2m.
5. Extra widening will be Provided where radius of horizontal curve is less than 300m.
6. PROW Varies From 24 - 100m.

ISSUE	DATE	AMENDMENT \ ISSUE DESCRIPTION
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CLIENT: NATIONAL HIGHWAY & INFRASTRUCTURE DEVELOPMENT CORPORATION LTD. (MINISTRY OF ROAD TRANSPORT & HIGHWAY) GOVERNMENT OF INDIA

CONSULTANT: TPF Getinsa Euroestudios S.L. In Association with RODIC CONSULTANTS PVT. LTD. 1, JAI SINGH MARG (FIRST FLOOR), YMCA CULTURAL CENTRE BUILDING NEW DELHI - 110001 (INDIA)

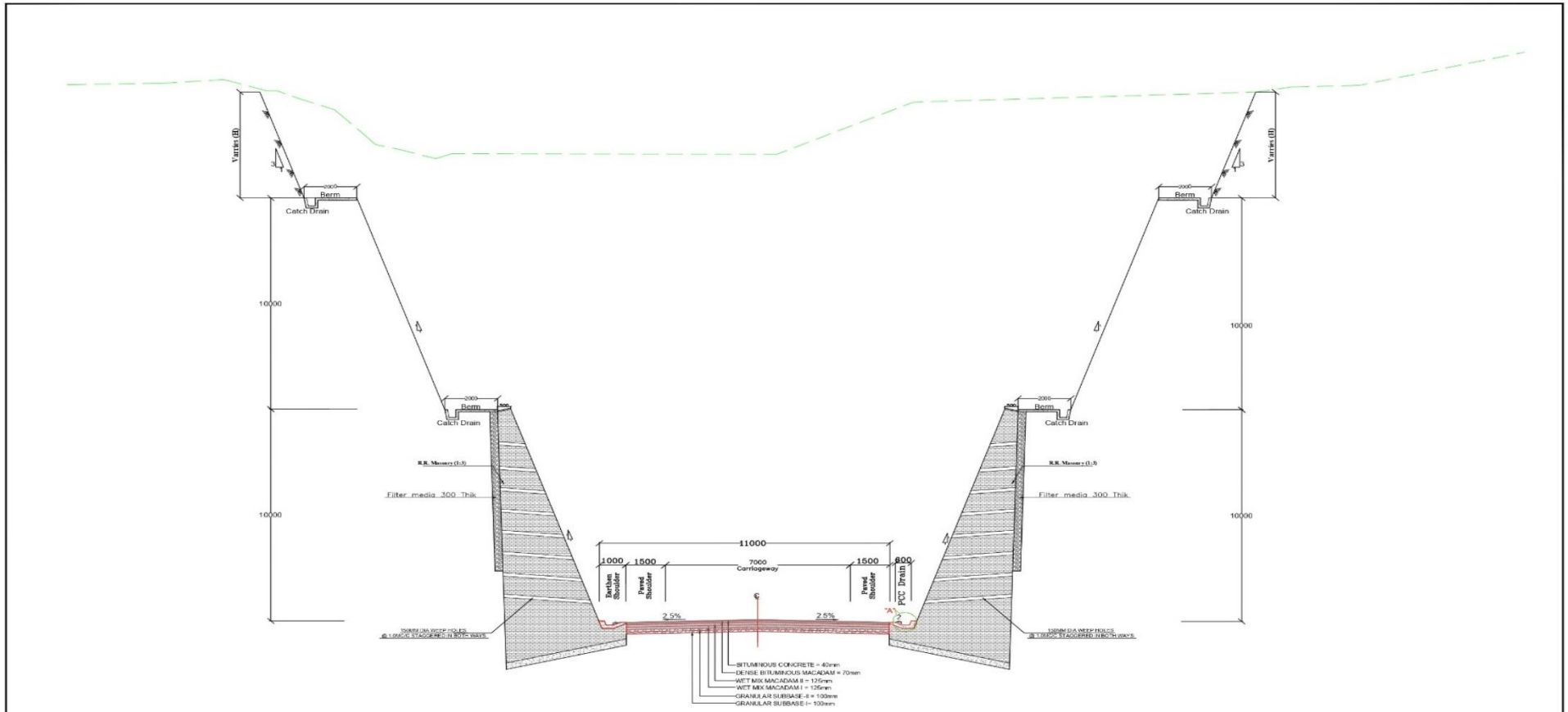
FINAL DETAILED PROJECT REPORT

Designed | Drawn | Checked | Approved | Scale :- N.T.S.

Project: Consultancy Services for Preparation of Detailed Project Report and providing Pre-Construction activities in respect of the following stretches on NH-244 (old NH-1B) in the State of Jammu & Kashmir. (i) Sudhmahadev – Dranga Tunnel of appox. length 4.5 Km and its approach roads on Chenani – Sudhmahadev – Goha road portion, (ii) Vailoo Tunnel of approx length 10.00 Km under Sinthan Pass and its approach roads on **Goha - Khellani** - Khanabal road portion & **the extended road section from Goha side approach road of Sudhmahadav Dargna tunnel upto Khellani town.**

Drawing Title: TYPICAL CROSS SECTION

Drawing No.: RCPL–TPF–3–BHC–04–R0



TYPE - 3: TYPICAL CROSS SECTION FORTWO LANE CARRIAGEWAY WITH PAVED SHOULDER IN MOUNTAINOUS TERRAIN WITH BOTH SIDE CUT & WITH PROTECTION ON EITHER SIDE AS APPLICABLE (NEW CONSTRUCTION)

NOTE:-

1. All Dimensions are in millimeters except otherwise specified
2. For Details of Section ("A") Kindly refer the standard drawing ;
3. Retaining wall is provided where height of embankment is greater than 2m.
4. Toe wall is provided where height of embankment is less than 2m.
5. Extra widening will be Provided where radius of horizontal curve is less than 300m.
6. PROW Varies From 24 - 100m.

ISSUE	DATE	AMENDMENT \ ISSUE DESCRIPTION
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CLIENT: NATIONAL HIGHWAY & INFRASTRUCTURE DEVELOPMENT CORPORATION LTD. (MINISTRY OF ROAD TRANSPORT & HIGHWAY) GOVERNMENT OF INDIA

CONSULTANT: TPF Getinsa Euroestudios S.L. In Association with RODIC CONSULTANTS PVT. LTD. 1, JAI SINGH MARG (FIRST FLOOR), YMCA CULTURAL CENTRE BUILDING NEW DELHI - 110001 (INDIA)

FINAL DETAILED PROJECT REPORT

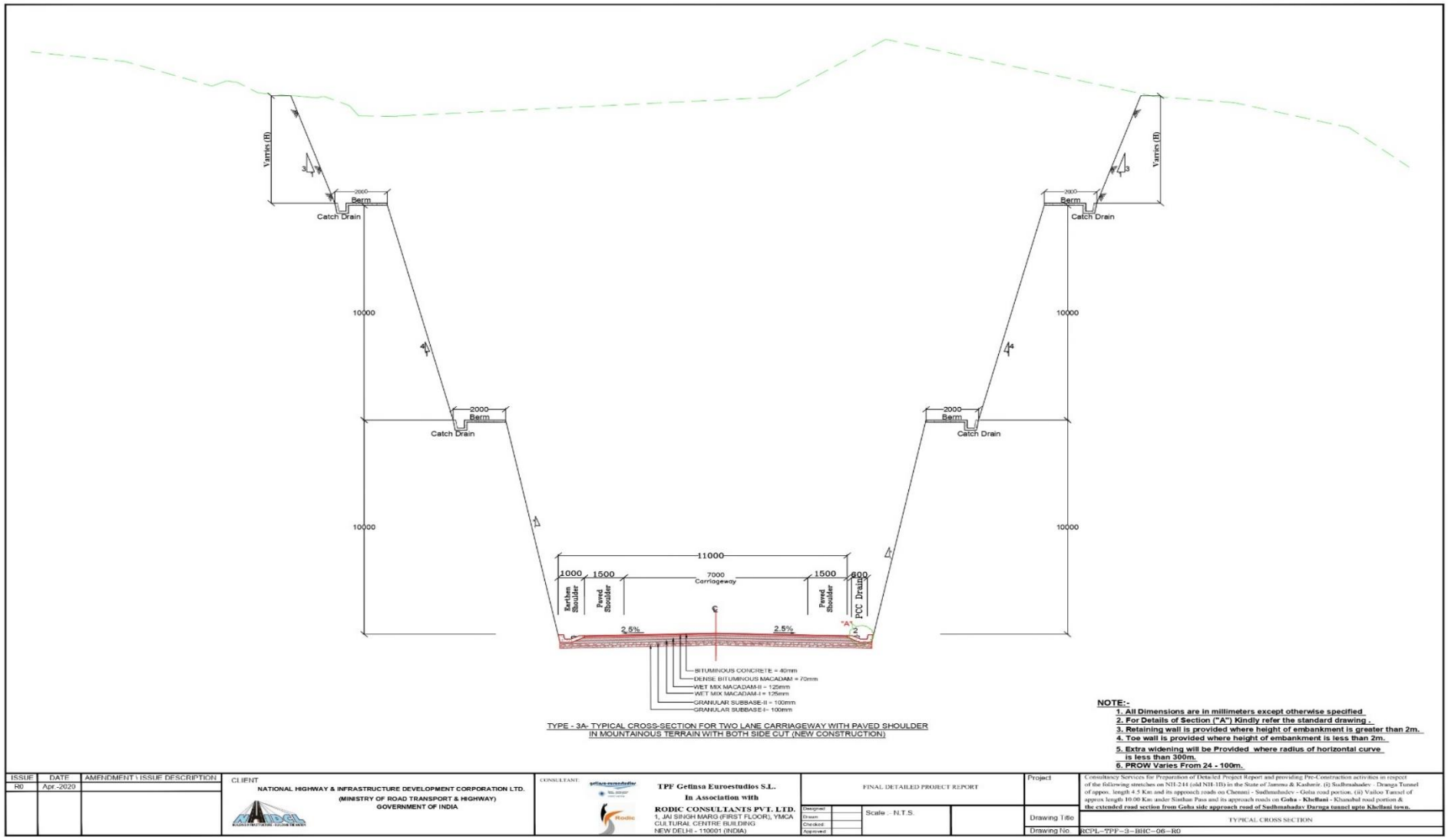
Designed / Drawn / Checked / Approved

Scale :- N.T.S.

Project: Consultancy Services for Preparation of Detailed Project Report and providing Pre-Construction activities in respect of the following stretches on NH-244 (old NH-1B) in the State of Jammu & Kashmir. (i) Sudhmahadev - Dranga Tunnel of approx. length 4.5 Km and its approach roads on Chenani - Sudhmahadev - Goha road portion. (ii) Vailoo Tunnel of approx length 10.00 Km under Sinthan Pass and its approach roads on **Goha - Khellani** - Khanabal road portion & **the extended road section from Goha side approach road of Sudhmahadav Durga tunnel upto Khellani town.**

Drawing Title: TYPICAL CROSS SECTION

Drawing No.: RCPL--TPF--3--BHC--05--R0



TYPE - 3A- TYPICAL CROSS-SECTION FOR TWO LANE CARRIAGEWAY WITH PAVED SHOULDER IN MOUNTAINOUS TERRAIN WITH BOTH SIDE CUT (NEW CONSTRUCTION)

NOTE:-

1. All Dimensions are in millimeters except otherwise specified.
2. For Details of Section ("A") Kindly refer the standard drawing ..
3. Retaining wall is provided where height of embankment is greater than 2m.
4. Toe wall is provided where height of embankment is less than 2m.
5. Extra widening will be Provided where radius of horizontal curve is less than 300m.
6. PROW Varies From 24 - 100m.

ISSUE	DATE	AMENDMENT \ ISSUE DESCRIPTION
R0	Apr.-2020	

CLIENT: NATIONAL HIGHWAY & INFRASTRUCTURE DEVELOPMENT CORPORATION LTD. (MINISTRY OF ROAD TRANSPORT & HIGHWAY) GOVERNMENT OF INDIA

CONSULTANT: TPF Getinsa Euroestudios S.L. In Association with RODIC CONSULTANTS PVT. LTD. 1, JAI SINGH MARG (FIRST FLOOR), YMCA CULTURAL CENTRE BUILDING NEW DELHI - 110001 (INDIA)

FINAL DETAILED PROJECT REPORT

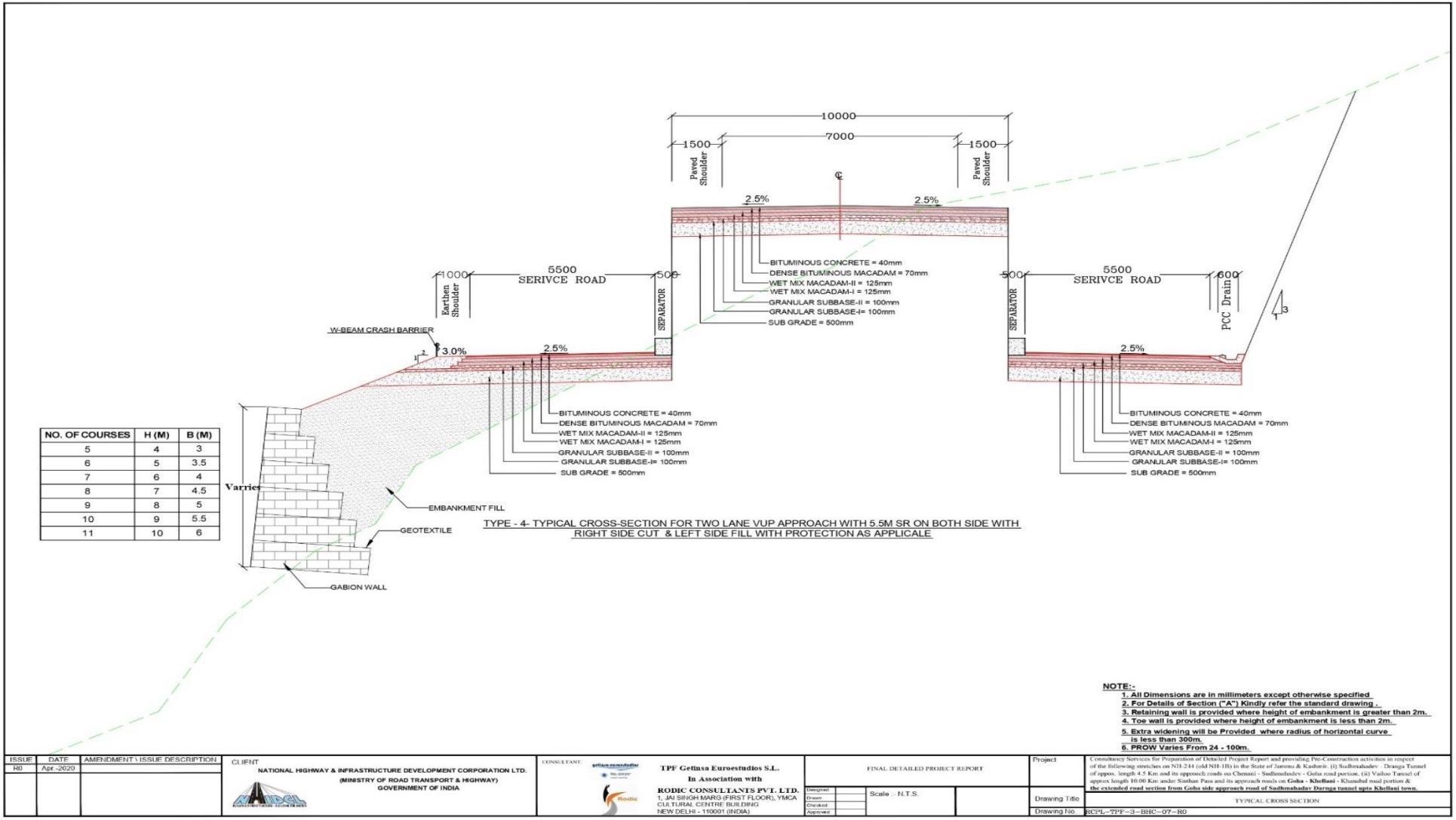
Designed / Drawn / Checked / Approved

Scale :- N.T.S.

Project: Consultancy Services for Preparation of Detailed Project Report and providing Pre-Construction activities in respect of the following stretches on NH-244 (old NH-1B) in the State of Jammu & Kashmir. (i) Sudhmahadev - Dranga Tunnel of approx. length 4.5 Km and its approach roads on Chenani - Sudhmahadev - Goha road portion. (ii) Vailoo Tunnel of approx length 10.00 Km under Sinthan Pass and its approach roads on **Goha - Khellani** - Khanabal road portion & **the extended road section from Goha side approach road of Sudhmahadav Darnga tunnel upto Khellani town.**

Drawing Title: TYPICAL CROSS SECTION

Drawing No.: RCPL-TPF-3-BHC-06-R0



NO. OF COURSES	H (M)	B (M)
5	4	3
6	5	3.5
7	6	4
8	7	4.5
9	8	5
10	9	5.5
11	10	6

TYPE - 4- TYPICAL CROSS-SECTION FOR TWO LANE VUP APPROACH WITH 5.5M SR ON BOTH SIDE WITH RIGHT SIDE CUT & LEFT SIDE FILL WITH PROTECTION AS APPLICALE

NOTE:-

1. All Dimensions are in millimeters except otherwise specified
2. For Details of Section ("A") Kindly refer the standard drawing .
3. Retaining wall is provided where height of embankment is greater than 2m.
4. Toe wall is provided where height of embankment is less than 2m.
5. Extra widening will be Provided where radius of horizontal curve is less than 300m.
6. PROW Varies From 24 - 100m.

ISSUE	DATE	AMENDMENT \ ISSUE DESCRIPTION
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CLIENT: NATIONAL HIGHWAY & INFRASTRUCTURE DEVELOPMENT CORPORATION LTD. (MINISTRY OF ROAD TRANSPORT & HIGHWAY) GOVERNMENT OF INDIA

CONSULTANT: TPF Getinsa Euroestudios S.L. In Association with RODIC CONSULTANTS PVT. LTD. 1, JAI SINGH MARG (FIRST FLOOR), YMCA CULTURAL CENTRE BUILDING NEW DELHI - 110001 (INDIA)

FINAL DETAILED PROJECT REPORT

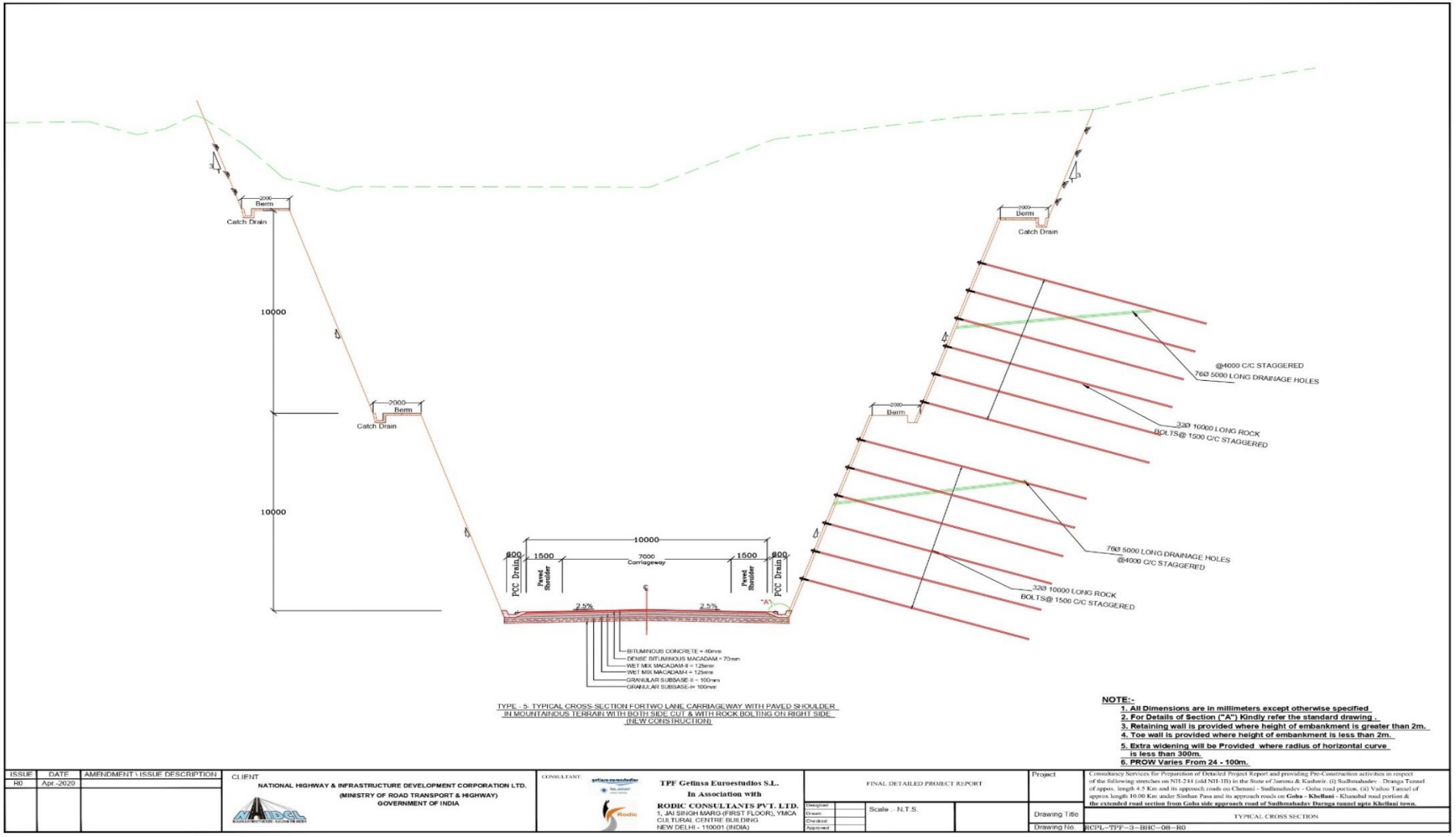
Designed / Drawn / Checked / Approved

Scale :- N.T.S.

Project: Consultancy Services for Preparation of Detailed Project Report and providing Pre-Construction activities in respect of the following stretches on NH-244 (old NH-1B) in the State of Jammu & Kashmir. (i) Sudhmahadev - Dranga Tunnel of approx. length 4.5 Km and its approach roads on Chenani - Sudhmahadev - Goha road portion. (ii) Vailoo Tunnel of approx length 10.00 Km under Sinthan Pass and its approach roads on **Goha - Khellani** - Khanabal road portion & **the extended road section from Goha side approach road of Sudhmahadav Darnga tunnel upto Khellani town.**

Drawing Title: TYPICAL CROSS SECTION

Drawing No.: RCPL–TPF–3–BHC–07–R0



TYPE - 5: TYPICAL CROSS SECTION FOR TWO LANE CARRIAGEWAY WITH PAVED SHOULDER IN MOUNTAINOUS TERRAIN WITH BOTH SIDE CUT & WITH ROCK BOLTING ON RIGHT SIDE (NEW CONSTRUCTION)

NOTE:-

1. **All Dimensions are in millimeters except otherwise specified**
2. **For Details of Section ("A") Kindly refer the standard drawing .**
3. **Retaining wall is provided where height of embankment is greater than 2m.**
4. **Toe wall is provided where height of embankment is less than 2m.**
5. **Extra widening will be Provided where radius of horizontal curve is less than 300m.**
6. **PROW Varies From 24 - 100m.**

ISSUE	DATE	AMENDMENT \ ISSUE DESCRIPTION
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CLIENT: NATIONAL HIGHWAY & INFRASTRUCTURE DEVELOPMENT CORPORATION LTD. (MINISTRY OF ROAD TRANSPORT & HIGHWAY) GOVERNMENT OF INDIA

CONSULTANT: TPF Getinsa Euroestudios S.L. In Association with RODIC CONSULTANTS PVT. LTD. 1, JAI SINGH MARG (FIRST FLOOR), YMCA CULTURAL CENTRE BUILDING NEW DELHI - 110001 (INDIA)

FINAL DETAILED PROJECT REPORT

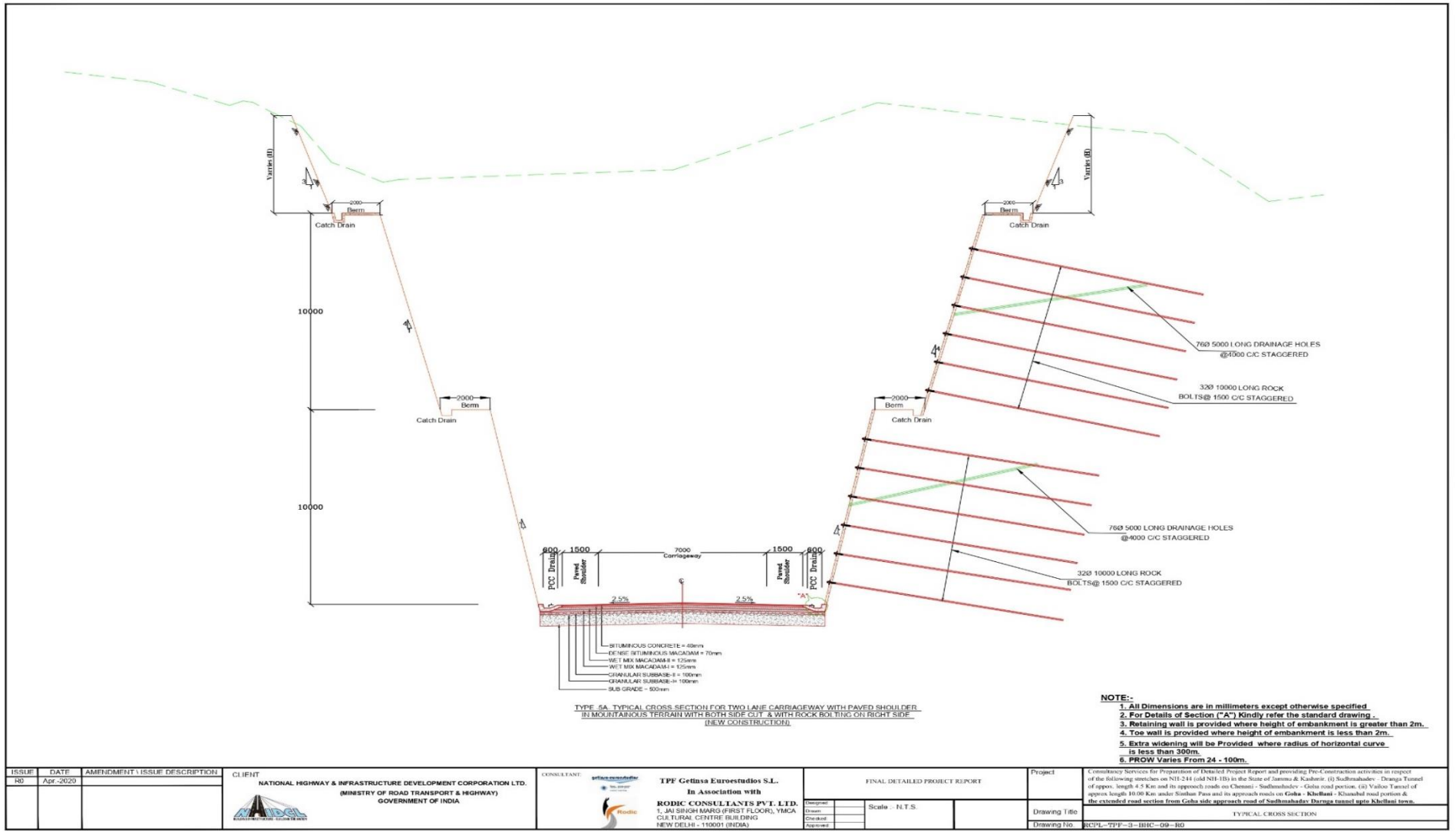
Designed / Drawn / Checked / Approved

Scale :- N.T.S.

Project: Consultancy Services for Preparation of Detailed Project Report and providing Pre-Construction activities in respect of the following stretches on NH-244 (old NH-1B) in the State of Jammu & Kashmir. (i) Sudhmahadev – Dranga Tunnel of appox. length 4.5 Km and its approach roads on Chenani - Sudhmahadev - Goha road portion. (ii) Vailoo Tunnel of approx length 10.00 Km under Sinthan Pass and its approach roads on **Goha - Khellani** - Khanabal road portion & **the extended road section from Goha side approach road of Sudhmahadav Darnga tunnel upto Khellani town.**

Drawing Title: TYPICAL CROSS SECTION

Drawing No.: RCPL--TPF--3--BHC--08--R0



TYPE -5A- TYPICAL CROSS SECTION FOR TWO LANE CARRIAGEWAY WITH PAVED SHOULDER IN MOUNTAINOUS TERRAIN WITH BOTH SIDE CUT & WITH ROCK BOLTING ON RIGHT SIDE (NEW CONSTRUCTION)

NOTE:-

1. All Dimensions are in millimeters except otherwise specified
2. For Details of Section ("A") Kindly refer the standard drawing .
3. Retaining wall is provided where height of embankment is greater than 2m.
4. Toe wall is provided where height of embankment is less than 2m.
5. Extra widening will be Provided where radius of horizontal curve is less than 300m.
6. PROW Varies From 24 - 100m.

ISSUE	DATE	AMENDMENT \ ISSUE DESCRIPTION
R0	Apr.-2020	

CLIENT: NATIONAL HIGHWAY & INFRASTRUCTURE DEVELOPMENT CORPORATION LTD. (MINISTRY OF ROAD TRANSPORT & HIGHWAY) GOVERNMENT OF INDIA

CONSULTANT: TPF Getinsa Euroestudios S.L. In Association with RODIC CONSULTANTS PVT. LTD. 1, JAI SINGH MARG (FIRST FLOOR), YMCA CULTURAL CENTRE BUILDING NEW DELHI - 110001 (INDIA)

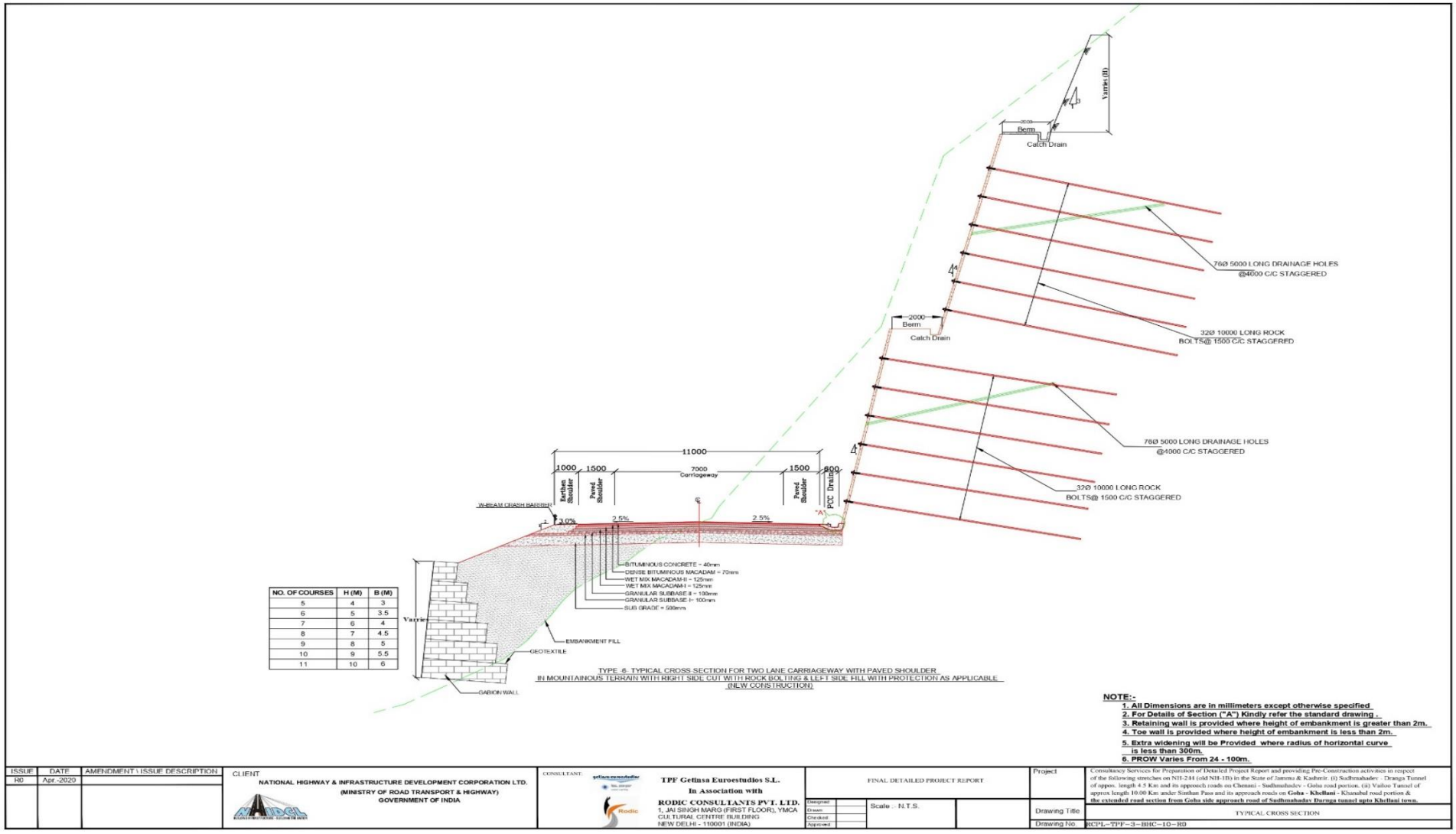
FINAL DETAILED PROJECT REPORT

Designed / Drawn / Checked / Approved — Scale :- N.T.S.

Project: Consultancy Services for Preparation of Detailed Project Report and providing Pre-Construction activities in respect of the following stretches on NH-244 (old NH-1B) in the State of Jammu & Kashmir. (i) Sudhmahadev – Dranga Tunnel of appox. length 4.5 Km and its approach roads on Chenani - Sudhmahadev - Goha road portion. (ii) Vailoo Tunnel of approx length 10.00 Km under Sinthan Pass and its approach roads on **Goha - Khellani** - Khanabal road portion & **the extended road section from Goha side approach road of Sudhmahadav Darnga tunnel upto Khellani town.**

Drawing Title: TYPICAL CROSS SECTION

Drawing No.: RCPL-TPF-3-BHC-09-R0



NO. OF COURSES	H (M)	B (M)
5	4	3
6	5	3.5
7	6	4
8	7	4.5
9	8	5
10	9	5.5
11	10	6

TYPE -6- TYPICAL CROSS SECTION FOR TWO LANE CARRIAGEWAY WITH PAVED SHOULDER IN MOUNTAINOUS TERRAIN WITH RIGHT SIDE CUT WITH ROCK BOLTING & LEFT SIDE FILL WITH PROTECTION AS APPLICABLE (NEW CONSTRUCTION)

NOTE:-
1. All Dimensions are in millimeters except otherwise specified
2. For Details of Section ("A") Kindly refer the standard drawing .
3. Retaining wall is provided where height of embankment is greater than 2m.
4. Toe wall is provided where height of embankment is less than 2m.
5. Extra widening will be Provided where radius of horizontal curve is less than 300m.
6. PROW Varies From 24 - 100m.

ISSUE	DATE	AMENDMENT \ ISSUE DESCRIPTION
R0	Apr.-2020	

CLIENT: NATIONAL HIGHWAY & INFRASTRUCTURE DEVELOPMENT CORPORATION LTD. (MINISTRY OF ROAD TRANSPORT & HIGHWAY) GOVERNMENT OF INDIA

CONSULTANT: TPF Getinsa Euroestudios S.L. In Association with RODIC CONSULTANTS PVT. LTD. 1, JAI SINGH MARG (FIRST FLOOR), YMCA CULTURAL CENTRE BUILDING NEW DELHI - 110001 (INDIA)

FINAL DETAILED PROJECT REPORT

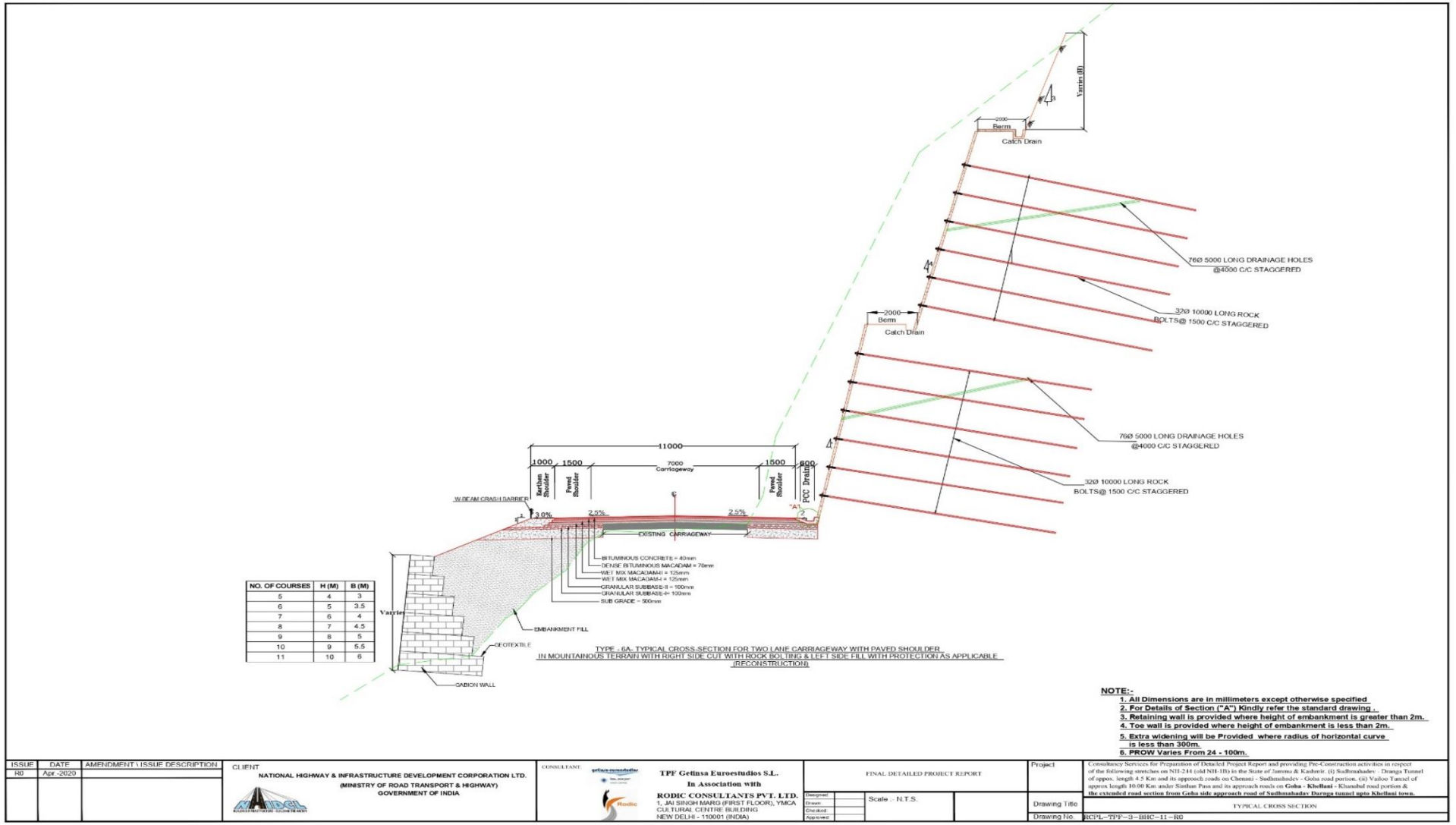
Designed / Drawn / Checked / Approved

Scale :- N.T.S.

Project: Consultancy Services for Preparation of Detailed Project Report and providing Pre-Construction activities in respect of the following stretches on NH-244 (old NH-1B) in the State of Jammu & Kashmir. (i) Sudhmahadev - Dranga Tunnel of appox. length 4.5 Km and its approach roads on Chenani - Sudhmahadev - Goha road portion. (ii) Vailoo Tunnel of approx length 10.00 Km under Sinthan Pass and its approach roads on **Goha - Khellani** - Khanabal road portion & **the extended road section from Goha side approach road of Sudhmahadav Darnga tunnel upto Khellani town.**

Drawing Title: TYPICAL CROSS SECTION

Drawing No.: RCPL–TPF–3–BHC–10–RD


Varies (H)
2000
Berm
Catch Drain
76Ø 5000 LONG DRAINAGE HOLES
@4000 C/C STAGGERED
32Ø 10000 LONG ROCK
BOLTS@ 1500 C/C STAGGERED
2000
Berm
Catch Drain
76Ø 5000 LONG DRAINAGE HOLES
@4000 C/C STAGGERED
32Ø 10000 LONG ROCK
BOLTS@ 1500 C/C STAGGERED
11000
1000
1500
7000
Carriageway
1500
800
Berm Shoulder
Paved Shoulder
Paved Shoulder
PCC Drain
W-BEAM CRASH BARRIER
3.0%
2.5%
2.5%
EXISTING CARRIAGEWAY
BITUMINOUS CONCRETE = 40mm
DENSE BITUMINOUS MACADAM = 70mm
WET MIX MACADAM-II = 125mm
WET MIX MACADAM-I = 125mm
GRANULAR SUBBASE-II = 100mm
GRANULAR SUBBASE-I= 100mm
SUB GRADE – 500mm
Varies
EMBANKMENT FILL
GEOTEXTILE
GABION WALL
NO. OF COURSES | H (M) | B (M)
5 | 4 | 3
6 | 5 | 3.5
7 | 6 | 4
8 | 7 | 4.5
9 | 8 | 5
10 | 9 | 5.5
11 | 10 | 6
TYPE – 6A- TYPICAL CROSS-SECTION FOR TWO LANE CARRIAGEWAY WITH PAVED SHOULDER IN MOUNTAINOUS TERRAIN WITH RIGHT SIDE CUT WITH ROCK BOLTING & LEFT SIDE FILL WITH PROTECTION AS APPLICABLE (RECONSTRUCTION)
NOTE:-
1. All Dimensions are in millimeters except otherwise specified
2. For Details of Section ("A") Kindly refer the standard drawing ;
3. Retaining wall is provided where height of embankment is greater than 2m.
4. Toe wall is provided where height of embankment is less than 2m.
5. Extra widening will be Provided where radius of horizontal curve is less than 300m.
6. PROW Varies From 24 - 100m.
ISSUE | DATE | AMENDMENT \ ISSUE DESCRIPTION
R0 | Apr.-2020
CLIENT
NATIONAL HIGHWAY & INFRASTRUCTURE DEVELOPMENT CORPORATION LTD.
(MINISTRY OF ROAD TRANSPORT & HIGHWAY)
GOVERNMENT OF INDIA
CONSULTANT:
TPF Getinsa Euroestudios S.L.
In Association with
RODIC CONSULTANTS PVT. LTD.
1, JAI SINGH MARG (FIRST FLOOR), YMCA CULTURAL CENTRE BUILDING
NEW DELHI - 110001 (INDIA)
FINAL DETAILED PROJECT REPORT
Designed
Drawn
Checked
Approved
Scale :- N.T.S.
Project
Consultancy Services for Preparation of Detailed Project Report and providing Pre-Construction activities in respect of the following stretches on NH-244 (old NH-1B) in the State of Jammu & Kashmir. (i) Sudhmahadev - Dranga Tunnel of approx. length 4.5 Km and its approach roads on Chenani - Sudhmahadev - Goha road portion. (ii) Vailoo Tunnel of approx length 10.00 Km under Sinthan Pass and its approach roads on Goha - Khellani - Khanabal road portion & the extended road section from Goha side approach road of Sudhmahadev Dranga tunnel upto Khellani town.
Drawing Title
TYPICAL CROSS SECTION
Drawing No.
RCPL--TPF--3--BHC--11--R0

5.7 Pavement Design

Flexible pavement is proposed new carriageway and reconstruction. Design period of 15 years considered for new carriageway. The Pavement improvement proposal for entire project road is presented in below Table.

Table 14: Improvement Proposal for New Pavement

Crust Composition for New Pavement as per IRC 37 – 2018										
Homogeneous Section	Design Chainage		CBR	MSA	Crust				S.Grade	Total Thickness
	From	To			BC	DBM	WMM	GSB		
Package I A	12+850	20+300	10	20	40	70	250	200	500	**1060**
Link Road to Goha	0+000	2+016								
Package I B	20+300	29+030								

5.8 Traffic Control and Safety Measures

5.8.1 Road Marking & Traffic Signs

Road markings will be made for center and edge lines using reflective thermoplastic paints. Appropriate road markings will also be provided at junctions and crossings. Road signs are to place according to IRC: 67-2012. The signs are to be placed on embankment so that extreme edge of sign would be 2.0 m away from the edge of the carriageway. The location of each sign is to be decided in accordance with the guidelines there in.

5.9 Major Bridge/ Minor Bridge & Cross Drainage Structures

5.9.1 Bridges

There are 1 major bridge ,6 minor bridges & 16 box culverts are proposed in Package I A, 8 box culverts in Link road to Goha and 4 minor bridges, 1 viaduct, 1 VUP & 28 box culverts are porposed in Package I. The Brief summary of improvement proposal of bridges and cross drainage structures are given in below Table.

5.9.2 Culverts

Improvement proposal for culvert are given in below Table.

Table 15: Summary of structures proposed

Sr. No.	Type	No's of structures		
		Package I A	Link road to Goha	Package I B
1	Major Bridges	1	-	-
2	Minor Bridge	6	-	4

Sr. No.	Type	No's of structures		
		Package I A	Link road to Goha	Package I B
3	Viaducts	-	-	1
4	VUP	-	-	1
5	Box Culverts	16	8	28

Table 16: General Arrangement Structures (Package I A)

Sr. No.	Type of Structure	Design Chainage	Start Chainage	End Chainage	Total Length (M)	Span Arrangement	Type of Superstructure	Deck Width (M)	Remarks
1	Minor Bridge	13+190	13+180	13+200	20	1X20	Precast RCC Girder with cast in situ deck slab	12.5	2 Lane Bridge
2	Minor Bridge	14+373	14+363	14+383	20	1X20	Precast RCC Girder with cast in situ deck slab	12.5	2 Lane Bridge
3	Major Bridge	16+635	16+548	16+723	175	7X25	Precast PSC Girder with cast in situ deck slab	12.5	2 Lane Bridge
4	Minor Bridge	17+940	17+920	17+960	40	2X20	Precast RCC Girder with cast in situ deck slab	12.5	2 Lane Bridge
5	Minor Bridge	18+165	18+155	18+175	20	1X20	Precast RCC Girder with cast in situ deck slab	12.5	2 Lane Bridge
6	Minor Bridge	18+820	18+810	18+830	20	1X20	Precast RCC Girder with cast in situ deck slab	12.5	2 Lane Bridge
7	Minor Bridge	19+390	19+385	19+395	10	1X10	RCC Solid Slab	12.5	2 Lane Bridge

Package I B

Sr. No.	Type of Structure	Design Chainage	Start Chainage	End Chainage	Total Length (M)	Span Arrangement	Type of Superstructure	Deck Width (M)	Remarks
1	Minor Bridge	21+095	21+085	21+105	20	1X20	Precast RCC Girder with cast in situ deck slab	12.5	2 Lane Bridge
2	Minor Bridge	21+336	21+326	21+346	20	1X20	Precast RCC Girder with cast in situ deck slab	12.5	2 Lane Bridge
3	Viaduct	21+425	21+405	21+445	40	2X20	Precast RCC Girder with cast in situ deck slab	12.5	2 Lane Bridge
4	Minor Bridge	22+625	22+605	22+645	40	2X20	Precast RCC Girder with cast in situ deck slab	12.5	2 Lane Bridge
5	Minor Bridge	26+610	26+605	26+615	10	1x10	RCC Solid Slab	12.5	2 Lane Bridge
6	VUP	28+640	28+630	28+650	20	1X20	Precast RCC Girder with cast in situ deck slab	12.5	2 Lane VUP

Table 17: Culvert List

Package I A

Sr. No.	Proposed Structure	Design Chainage	Proposed Span	Earth cushion
1	Box culvert	13+040	1x3x4	
2	Box culvert	13+705	1x3x4	4.0m
3	Box culvert	14+050	1x3x4	
4	Box culvert	14+250	1x3x4	3.0m
5	Box culvert	14+445	1x3x3	2.0m
6	Box culvert	14+690	1x3x3	3.0m
7	Box culvert	15+235	1x6x6	2.0m
8	Box culvert	15+375	1x3x3	3.0m
9	Box culvert	15+860	1x2x2	
10	Box culvert	16+315	1x3x3	6.0m
11	Box culvert	16+915	1x6x6	6.0m
12	Box culvert	17+015	1x3x3	4.0m
13	Box culvert	18+325	1x3x3	
14	Box culvert	18+615	1x6x6	6.0m
15	Box culvert	20+095	1x6x6	5.0m
16	Box culvert	20+240	1x3x3	2.0m

Link Road to Goha

Sr. No.	Proposed Structure	Center Chainage	Proposed Span	Subgrade Below Culvert (M)
1	Box culvert	0+400	1x4x4	
2	Box culvert	0+580	1x6x6	4
3	Box culvert	0+650	1x4x4	4
4	Box culvert	0+820	1x6x6	
5	Box culvert	1+003	1x4x4	

Sr. No.	Proposed Structure	Center Chainage	Proposed Span	Subgrade Below Culvert (M)
6	Box culvert	1+215	1x4x4	
7	Box culvert	1+600	1x4x4	
8	Box culvert	1+785	1x4x4	

Package I B

Sr. No.	Proposed Structure	Center Chainage	Proposed Span	Earth Fill
1	Box culvert	20+425	1x6x6	7.0m
2	Box culvert	20+580	1x3x3	2.0m
3	Box culvert	20+630	1x3x3	
4	Box culvert	21+685	1x3x3	
5	Box culvert	22+150	1x6x6	9.0m
6	Box culvert	22+455	1x3x3	7.0m
7	Box culvert	22+515	1x3x3	6.0m
8	Box culvert	23+110	1x6x6	10.0m
9	Box culvert	23+500	1x6x6	
10	Box culvert	23+650	1x4x4	4.0m
11	Box culvert	23+700	1x4x4	4.0m
12	Box culvert	24+000	1x6x6	8.0m
13	Box culvert	24+540	1x4x4	7.0m
14	Box culvert	24+980	1x6x6	4.0m
15	Box culvert	25+280	1x6x6	4.0m
16	Box culvert	25+700	1x4x4	8.0m
17	Box culvert	26+220	1x3x3	6.0m
18	Box culvert	26+425	1x6x6	5.0m
19	Box culvert	26+715	1x6x6	2.0m
20	Box culvert	27+035	1x4x4	4.0m
21	Box culvert	27+140	1x6x6	6.0m
22	Box culvert	27+300	1x3x3	4.0m

Sr. No.	Proposed Structure	Center Chainage	Proposed Span	Earth Fill
23	Box culvert	27+375	1x3x3	4.0m
24	Box culvert	27+500	1x3x3	5.0m
25	Box culvert	27+610	1x3x3	2.0m
26	Box culvert	27+890	1x3x3	3.0m
27	Box culvert	28+130	1x3x3	2.0m
28	Box culvert	28+755	1x3x3	4.0m

6.0 COST ESTIMATE

Preliminary cost estimate for the project Road is finalised based on the improvement proposed. The preliminary cost estimate is worked out based on the quantities calculated for major items of work to be executed in the project and rates derived after detail analysis.

Table 18: Cost of Civil Works

Section	Design Length (m)	Base Cost / Civil Cost excluding GST (Crore)	Civil Cost including GST @ 6% (Crore)	Construction Cost including centages (Crore)	Total Project Cost (Crore)
Package I- A	7.450	111.30	165.77	191.23	229.72
Link road to Goha	2.016	36.71			
Package I-B	8.730	130.860	146.56	169.07	211.97
Total Cost		**278.87**	**312.33**	**360.3**	**441.69**

Table 19: Summary of Estimate of Package I A including Link Road

Item No.	Description	Total Amount (Rs. in Crores)
BILL NO. 1	SITE CLEARANCE	0.14
BILL NO. 2	EARTH WORKS	37.14
BILL NO. 3	SUB-BASES AND BASES COURSES	7.87
BILL NO. 4	BITUMINOUS COURSES	8.12
BILL NO. 5	CROSS DRAINAGE WORKS(CULVERTS)	6.21
BILL NO. 6	BRIDGE,VIADUCT	18.66
BILL NO. 7.1	TRAFFIC SIGNS, MARKINGS	0.93
BILL NO. 7.2	PROTECTION WORK AND DRAINAGE (RRM Toe Wall, Breast Wall,Gabion Wall,Drains,Rock Bolts, Shotcreting & Drainage Holes)	68.31
BILL NO. 7.3	Other Works (Tree Plantation, Rain water Harvesting)	0.58
BILL NO. 8	JUNCTION	0.05
A	**Civil Cost**	**148.01**
B	**GST @ 12% Payable on Civil Cost only (A)**	**17.76**
C	**SUB TOTAL (A+B)**	**165.77**
D	Contingencies @ 2.8% of A	4.14
E	Construction Supervision Charges @ 3% of A	4.44
F	Agency Charge @ 3% of A	4.44
G	Escalation @ 5% per annum for 2nd and Half years during construction payable to Contractor on C	8.29
H	**Total Cost including centages (C+D+E+F+G)**	**187.09**

Item No.	Description	Total Amount (Rs. in Crores)
I	Maintenance During 5 years @ 0.5 for 2nd, 3rd and 4th year and @ 1% for the 5th year on C	4.14
J	**Total Project Cost (TPC) (H+I)**	**191.23**
K	Cost of Land Acquisition Cost (including Muck Disposal land cost) & Structure Compensation & FC	35.69
L	Cost towards Utility Shifting	1.40
M	Environmental Impact Assessment	1.40
TOTAL CAPITAL COST (TCC) (J+K+L+M)		**229.72**

Table 20: Summary of Estimate of Package I B

Item No.	Description	Total Amount (Rs. in Crores)
BILL NO. 1	SITE CLEARANCE	0.14
BILL NO. 2	EARTH WORKS	49.76
BILL NO. 3	SUB-BASES AND BASES COURSES	8.25
BILL NO. 4	BITUMINOUS COURSES	8.02
BILL NO. 5	CROSS DRAINAGE WORKS(CULVERTS)	16.16
BILL NO. 6	BRIDGES, VIADUCT & VUP	17.67
BILL NO. 7.1	TRAFFIC SIGNS, MARKINGS	0.50
BILL NO. 7.2	PROTECTION AND DRAINAGE WORK (RRM TOE WALL, DRAINS,ROCK BOLTS, SHOTCRETING AND DRAINAGE HOLES)	29.50
BILL NO. 7.3	OTHER WORKS (TREE PLANTATION, RAINWATER HARVESTING)	0.62
BILL NO. 7.4	SAFETY AND TRAFFIC MANAGEMENT DURING CONSTRUCTION	0.24
A	**Civil Cost**	**130.860**
B	**GST @ 12% Payable on Civil Cost only (A)**	**15.70**
C	**SUB TOTAL (A+B)**	**146.56**
D	Contingencies @ 2.8% of A	3.66
E	Construction Supervision Charges @ 3% of A	3.93
F	Agency Charge @ 3% of A	3.93
G	Escalation @ 5% per annum for 2nd years during construction payable to Contractor on C	7.33
H	**Total Cost including centages (C+D+E+F+G)**	**165.41**
I	Maintenance During 5 years @ 0.5 for 2nd, 3rd and 4th year and @ 1% for the 5th year on C	3.66
J	**Total Project Cost (TPC) (H+I)**	**169.07**
K	Cost of Land Acquisition Cost (including Muck Disposal land cost) & Structure Compensation & FC	40.96
L	Cost towards Utility Shifting	0.94
M	Environmental Impact Assessment	1.00
TOTAL CAPITAL COST (TCC) (J+K+L+M)		**211.97**

Table 21: General Abstract of Cost of Package I A

Sr. No.	Detail	Unit	No	Length	Rate	Cost
1	**Road Work**					
	Site Clearance					**1111622.23**
(a)	Typical Cross Section Type- 1	Km	1	0.321	20066516.22	6441351.71
(b)	Typical Cross Section Type- 2	Km	1	0.096	20296319.50	1948446.67
(c)	Typical Cross Section Type- 3	Km	1	3.509	19191336.48	67347965.18
(d)	Typical Cross Section Type- 4	Km	1	0.190	18834607.43	3578575.41
(e)	Typical Cross Section Type- 5	Km	1	2.775	18166600.00	50412315.00
(f)	Typical Cross Section Type- 6	Km	1	0.240	19325819.90	4638196.78
(g)	Typical Cross Section Type- 7	Km	1	0.036	19491879.28	701707.65
(h)	Cutting & Filling					297797849.00
(i)	Extra Widening					749966.92
2	**Culvert**					
(i)	Construction of Culvert					**34088693.48**
Total Road Works Cost						**468816690.03**
3	**Bridges Cum Via Duct**					
(i)	Construction of Bridges					186579692.62
Total Bridge Works Cost						**186579692.62**
4	**Other Works**					
(i)	RRM Retaining Wall & Drain					87386460.61
(ii)	"W" metal beam crash barrier					2158609.00
(iii)	Gabion Wall					41214985.30
(iv)	RRM Breast Wall					260510181.69
(v)	Rock Bolts, Shotcreting and Drainage Holes					54082223.73
(vi)	Traffic Signs					7316900.00
(vii)	Miscellaneous					4968090.00
Total Other Works Cost						**457637450.32**
Grand Total						**1113033832.98**

Table 22: General Abstract of Cost of Link road to Goha

Sr. No.	Detail	Unit	No	Length	Rate	Cost
1	**Road Work**					
	Site Clearance					**301531.579**
(a)	Typical Cross Section Type- 8	Km	1	0.426	1,45,05,812	61,79,475.70
(b)	Typical Cross Section Type- 9	Km	1	0.576	1,27,16,620	73,24,773.12
(c)	Typical Cross Section Type- 10	Km	1	0.752	1,34,75,086	1,01,33,264.60
(D)	Typical Cross Section Type- 11	Km	1	0.060	1,33,63,437	8,01,806.23
(E)	Typical Cross Section Type- 12	Km	1	0.166	1,33,26,148	22,12,140.51
(d)	Cutting & Filling					7,10,36,753.29
2	**Culvert**					
(i)	Construction of Culvert					2,80,38,751.83
Total Road Works Cost						**126028496.863**
3	**Other Works**					
(i)	RRM Retaining Wall & Drain					3,52,96,849.11
(ii)	"W" metal beam crash barrier					1,85,820.00
(iii)	Gabion Wall					4,26,63,378.24

Sr. No.	Detail	Unit	No	Length	Rate	Cost
(iv)	RRM Breast Wall					6,39,62,922.28
(v)	Rock Bolts, Shotcreting and Drainage Holes					9,56,84,280.65
(vi)	Traffic Signs					19,60,946.67
(vii)	**Junction**					
a)	Minor Junction					4,56,765.28
(viii)	Miscellaneous					8,32,220.00
Total Other Works Cost						**24,10,43,182.22**
Grand Total						**36,70,71,679.08**

Table 23: General Abstract of Cost of Package I B

Sr. No.	Detail	Unit	No	Length	Rate	Cost
1	**Road Work**					
	Site Clearance					**1376420.77**
(a)	Typical Cross Section Type- 1A	Km	1	2.633	19832507.00	52218197.64
(b)	Typical Cross Section Type- 1B	Km	1	0.260	18589451.01	4833257.26
(c)	Typical Cross Section Type- 2	Km	1	0.830	21254194.61	17640981.53
(d)	Typical Cross Section Type- 3A	Km	1	3.817	18547660.00	70796418.22
(e)	Typical Cross Section Type- 4	Km	1	0.117	19053900.00	2229306.30
(f)	Typical Cross Section Type- 5A	Km	1	0.727	19376460.00	14086686.42
(g)	Typical Cross Section Type- 6	Km	1	0.077	19627978.04	1511354.31
(h)	Service Road					2740975.97
(i)	Cutting & Filling					492656775.30
(j)	Extra Widening					1657997.33
2	**Culvert**					
(i)	Construction of Culvert					**161579589.18**
Total Road Works Cost						**823327960.22**
3	**Bridges,Via Duct&VUP**					
(i)	Construction of Bridges ,Viaduct & VUP					176715788.52
Total Bridge Works Cost						**176715788.52**
4	**Other Works**					
(i)	RRM Retaining Wall & Drain					22078922.52
(ii)	"W" metal beam crash barrier					14691841.20
(iii)	Gabion Wall					110611931.68
(iv)	Rock Bolts, Shotcreting and Drainage Holes					147591608.30
(v)	Traffic Signs					5002134.00
(vi)	Safety and traffic management during construction					2417076.70
(vii)	Miscellaneous					6165929.36
Total Other Works Cost						**308559443.76**
Grand Total						**1308603192.51**

6.1 List Clearances required for the Project

Following clearances are required before the commencement of construction work. Out of these, few are critical and need to be obtained immediately to avoid the time lag at later date

Table 24: Project Clearances

Sr. No.	Item	Agency
1	Forest Clearance	Jammu and Kashmir Forest Department.
2	Pollution Clearance-No Objection Certificate (NOC) (Exempted)	Jammu and Kashmir State Pollution Control Board.
3	Shifting of services and utilities including underground water pipeline sewerage line and optical fiber cables	BSNL, BSEB, Public Health Engineering department, Optical fiber cable operator.
4	Clearance for cutting trees and transporting	Forest Department, Department of Horticulture.
5	Dismantling of structure falling within right of way	Competent Land Acquisition Authority.

6.2 Recommendations

- To avoid the accident due to land slide on the present Goha-Khellani Road and also to avoid poor geometry of this road, a new alignment is being proposed from the end of the Sudhmahadev-Dranga Tunnel to Khellani town. Also Goha town is being connected with a link road which will reduce the travel time, cost of the surroundings area.
- No household will get displaced in the project area due to the construction of this road. No Displaced person (DPs) in the project area as it will not affect any CPR (Common Property resources) or any livelihood. Therefore, Resettlement Plan will not be needed for the project area.

Table 25: Base Cost

Section	Design Length (m)	Base Cost / Civil Cost excluding GST (Crore)	Civil Cost including GST @ 6% (Crore)	Construction Cost including centages (Crore)	Total Project Cost (Crore)
Package I- A	7.450	111.30	165.77	191.23	229.72
Link road to Goha	2.016	36.71			
Package I-B	8.730	130.860	146.56	169.07	211.97
Total Cost		**278.87**	**312.33**	**360.3**	**441.69**

- The project can be constructed in 36 months period with strategic planning and through one construction package. The estimated basic cost is given in above table.
- The proposed road is required for alternate route in future from Chenani to Srinagar via Sudhmahdev, Goha, Khellani, Kishtwar, Donipawa and Khanbal.

7.0 SOCIOECONOMIC PROFILE OF THE PROJECT AREAS

Socio-Economic profile of Jammu and Kashmir

As per details from Census 2011, Jammu and Kashmir has population of 1.25 Crores, an increase from figure of 1.01 Crore in 2001 census. Total population of Jammu and Kashmir as per 2011 census is 12,541,302 of which male and female are 6,640,662 and 5,900,640 respectively. In 2001, total population was 10,143,700 in which males were 5,360,926 while females were 4,782,774. The total population growth in this decade was 23.64 percent while in previous decade it was 29.04 percent. The population of Jammu and Kashmir forms 1.04 percent of India in 2011. In 2001, the figure was 0.99 percent. Recently as per Jammu and Kashmir census data, 96.73% houses are owned while 2.19% were rented. In all, 73.51% couples in Jammu and Kashmir lived-in single-family

Jammu and Kashmir Population 2018.

As per projection, population of Jammu and Kashmir in 2018 is 1.44 Crore.

Table 26: Jammu and Kashmir Table Data

Description	2001	2011
Approximate Population	1.01 Crore	1.25 Crores
Actual Population	10,143,700	12,541,302
Male	5,360,926	6,640,662
Female	4,782,774	5,900,640
Population Growth	29.04%	23.64%
Percentage of total Population	0.99%	1.04%
Sex Ratio	892	889
Child Sex Ratio	941	862
Density/km2	46	56
Density/mi2	118	146
Area (Km2)	222,236	222,236
Area mi2	85,806	85,806
Total Child Population (0-6 Age)	1,485,803	2,018,905
Male Population (0-6 Age)	765,394	1,084,355
Female Population (0-6 Age)	720,409	934,550
Literacy	55.52 %	67.16 %
Male Literacy	66.60 %	76.75 %
Female Literacy	43.00 %	56.43 %
Total Literate	4,807,286	7,067,233
Male Literate	3,060,628	4,264,671

Jammu and Kashmir Religious Data

Jammu and Kashmir are Muslim majority state in India with approximately 68.31 % of state population following Islam as their religion. Hinduism is second most popular religion in state of Jammu and Kashmir with approximately 28.44 % following it. In Jammu and Kashmir state, Christianity is followed by 0.28 %, Jainism by 0.02 %, Buddhism by 0.90 % and Sikhism by 1.87 %. Around 0.01 % stated 'Other Religion', approximately 0.16 % stated 'No Particular Religion'.

Table 27: Jammu and Kashmir Religious Data

Description	Population	Percentage
Muslim	8,567,485	68.31 %
Hindu	3,566,674	28.44 %
Sikh	234,848	1.87 %
Buddhist	112,584	0.90 %
Christian	35,631	0.28 %
Jain	2,490	0.02 %
Other Religion	1,508	0.01 %

Marwah is a Tehsil located in Kishtwar district of Jammu & Kashmir. It is one of 4 Tehsils of Kishtwar district. There are 27 villages and 0 towns in Marwah Tehsil.

As per the Census India 2011, Marwah Tehsil has 7,106 households, population of 35,572 of which 18,364 are males and 17,208 are females. The population of children between age 0-6 is 6,953 which is 19.55% of total population.

The sex-ratio of Marwah Tehsil is around 937 compared to 889 which is average of Jammu & Kashmir state. The literacy rate of Marwah Tehsil is 43.5% out of which 54.47% males are literate and 31.79% females are literate. The total area of Marwah is 307.35 sq.km with population density of 116 per sq.km.

Out of total population, 100% of population lives in Urban area and 0 lives in Rural area. There are 0 Scheduled Caste (SC) and 1.01% Scheduled Tribe (ST) of total population in Marwah Tehsil.

8.0 DESIGN STANDARDS, METHODOLOGIES AND SPECIFICATIONS

8.1 Design Standards and Methodologies

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	Carriageway 2-lane- 2X3.5m Paved Shoulder 2-lane- 2x1.5m Earthen Shoulder 1.0 m (Valley Side)
(v)	Camber as per IRC SP:73-2018	Carriageway Flexible- 2.50% Rigid - 2.00 % Paved Shoulder Flexible- 2.50% Rigid - 2.00 % Unpaved Shoulder Flexible- 3.50% Rigid - 3.00 %
(vi)	Right of Way	As per Plan and Profile
(vii)	Embankment/ Cutting Slope Fill height, up to 3.0 m Fill height from 3.0 m to 6.0 m Fill height exceeding 6.0 m	In filling- 1V: 2 H In filling- 1V: 1.5 H To be designed based on soil parameters, (IRC:75-1979) In cutting- 1V:1H
(viii)	Stopping Sight Distance	20 m for design speed of 20 km/hr 25 m for design speed of 25 km/hr 30 m for design speed of 30 km/hr 40 m for design speed of 35 Km /hr 45m for design speed of 40km/hr 60 m for design speed of 50km/hr
	Intermediate sight distance	40 m for design speed of 20 km/hr 50 m for design speed of 25 km/hr 60 m for design speed of 30 km/hr 80 m for design speed of 35 Km /hr 90 m for design speed of 40km/hr 120 m for design speed of 50km/hr
(ix)	Super-elevation	With snow bound area

	Mountainous Terrain (As per IRC: SP:48-1998) Clause No-6.8.2.2	Maximum 7% Without snow bound area Maximum 10% Adopted maximum 7%
(x)	Radii for Horizontal Curves as per IRC SP:73-2018 Mountainous Terrain	 Ruling Minimum 150 m Absolute minimum 75 m
(xi)	Gradient (As per IRC: SP:73-2018) Clause 2.9.7.2 **Mountainous Terrain** Ruling Limiting **Steep Terrain** Ruling Limiting	 5.00% 6.00% 6.00% 7.00%
(xii)	Minimum k factor Summit Curve Mountainous Terrain Valley Curve Mountainous Terrain	Desirable: 15 Minimum: 5 Desirable: 15 Minimum: 7
(xiii)	Bridge Clearance Vehicular underpass Light and Smaller Vehicular Underpass	 5.5 m 4.0m
(xiv)	Design Flood Frequency Bridges Sewers and Ditches	 100 years 60 years

9.0 TRAFFIC SURVEYS AND ANALYISIS

9.1 General

Traffic surveys, analysis and demand forecast are an important element of any feasibility /detailed project report preparation. Traffic analysis and demand forecasting are directly related to several important aspects of project road planning and design i.e. capacity augmentation proposals, geometric design features, planning , pavement design, economic and financial analysis etc. Towards this the consultant has undertaken detailed traffic surveys, analysis, forecasting and carry out lanning requirements. Various steps followed in this regard are described in the subsequent paragraphs.

9.2 Objectives

- To carry out traffic surveys and estimation of base year traffic demand
- Identification of travel pattern and influence area of project road
- Traffic demand forecasting up to project life
- Assess capacity requirement of project road, to estimate tollable traffic.

9.3 Traffic Surveys Schedule

It is very important, that the existing information on traffic flow, commodity movement and traffic pattern is required to assess the traffic behavior on a project road. To collect such information to satisfy the Terms of Reference (TOR) and project requirements, following various types of traffic surveys were carried out:

- Classified Volume Count (CVC) Survey
- Axle Load Spectrum Survey

Traffic survey locations were selected after detailed reconnaissance survey and in line with the TOR. All the traffic surveys were carried out as per the IRC guidelines given in IRC: SP 19-2001, IRC 37:2012, IRC: 108-2015, IRC SP: 41-1994, IRC: 102-1988, IRC 103-2012 and IRC: 09-1972 etc.

All the above surveys were carried out manually by employing enough trained enumerators recording information in the pre-designed formats. The enumerators were

selected from locally available educated people familiar with traffic characteristics and condition of the project road. They were properly briefed and trained about the survey work before putting them on actual survey work in field. An experienced supervisor was kept in-charge for all the locations.

The locations for the various surveys were so selected that all vehicles can be viewed and interpreted easily without endangering the safety of enumerators and drivers. The most important part of all traffic survey was to exercise adequate quality control. The quality assurance was achieved through:

- Proper briefing and demonstration to enumerators before the start of work;
- Continuous independent checking by Traffic engineers / supervisor in the field during the survey work;
- Checking of filled in survey formats by Traffic engineer; and
- Validation of computer data entry with raw surveyed data

The survey data were recorded in the pre-designated approved formats for each type of survey. All the above traffic surveys were carried out as per the schedule finalized after considering requirements of TOR and project requirements as presented below.

9.4 Traffic Surveys Methodology

Classified Volume Count Survey

The objective of classified traffic volume count survey is to estimate traffic intensity on the project road. The classified volume count surveys at two strategic locations have been carried out for 7 days, @ 24 hours/day. The traffic is counted in number of vehicles by vehicle category-wise in each direction in a 15- minute interval over 24 hrs. a day for 7 days. The counts were recorded in the approved formats as per IRC specifications.

9.5 Traffic Survey Analysis at Goha – Khellani Existing Road.

Traffic Homogeneous Section

The traffic homogeneous sections have been identified based on the major traffic generator locations along the project corridor. All the traffic survey assessments have

been carried out at Kalota. The passenger traffic has been observed to vary with respect to the influence of village/towns falling along the project corridor. The major traffic generators settlements and its connections (diversion) points are:

Traffic surveys locations were selected to capture representative traffic volume on the homogeneous sections with a view to capture section wise traffic flow characteristics, the total stretch has been segmented in to two homogeneous sections, based upon the major intersections that act as main collectors or distributors (diversion) of traffic along the project road. The traffic homogeneous section in the road section is as follows:

Table 28 : Traffic Homogenous Section

Sr. No.	Homogeneous Section	Existing Length
1	Goha – Khellani existing road at Kalota	22681 m

Traffic Survey Planning and Selection of Survey Location

A comprehensive traffic survey plan has been prepared for the project road after considering traffic intensity on homogeneous sections and travel characteristics. Detailed site visit of project road and its influence/alternative transport network has been carried out between on 26th October 2018 to 1st November 2018. Traffic survey locations were finalized by consultation with client officials. Reasoning with detailed justification for selection of each traffic survey location is given in below Table

Table 29 : Traffic Survey Locations Justification/Rational

Sr.No.	Chainages	Justification/Rational
Classified Volume Count Surveys (CVC)		
1	Kalota	Kalota has been selected to get the idea of traffic in homogeneous section of Goha – Khellani existing road

Analysis of Traffic Surveys - Base Year Traffic Estimation

- **General**

The base year traffic pattern is the primary input for checking existing level of service and determination of future traffic demand of project influence area. The consultant has conducted Classified Volume Count Surveys, Intersection Volume Count, O-D and commodity, Axle load and speed & delay surveys to examine the base year traffic intensity, travel characteristics, loading patterns and travel speed on project road. For

traffic estimation and projection, the year 2017 has been taken as base year.

The following section provides detailed traffic analysis and important observations about traffic pattern along the project corridor. The data collected during traffic surveys was entered into the computer for further analysis and to obtain information about traffic characteristics and travel pattern along the project road. The results of the analysis can be further used for designing the pavement crust, cross-section, planning and for economic and financial analysis. The traffic analysis was carried out as per the guidelines given in IRC: SP 19-2001, IRC: 108-2015, IRC: 64-1990, IRC SP: 41-1994.

- **Classification of Vehicles and PCU Values**

To convert recorded vehicles into a common scale, the Passenger Car Units (PCU) equivalent factor as per IRC: 64-1990 has been adopted. The PCU equivalent factors adopted are as given in Table.

Table 30 : Classification of Vehicles Recommended PCU Equivalents Factors

Sr.No	Vehicle Type	PCU Value
Fast Moving Vehicles		
1	Cars/Utility Vehicles/Jeeps/Vans & 3 Wheelers	1.0
2	2 Wheelers	0.5
3	LCV Passenger/LCV Goods/Mini-Bus	1.5
4	Standard Bus	3.0
5	Two and 3 Axle Truck	3.0
6	Multi Axle Truck/Heavy Construction Machinery/Trailer	4.5
7	Agricultural Tractor (with Trailer)	4.5
8	Agricultural Tractor (without Trailer)	1.5
Slow Moving Vehicles		
1	Bicycle	0.5
2	Cycle Rickshaw	2.0
3	Animal Drawn Vehicle (Bullock cart)	8.0
4	Animal Drawn Vehicle (Horse drive)	4.0
5	Hand cart	3.0

Analysis of Classified Volume Count Survey

- **Average Daily Traffic (ADT)**

7-Day, 24 hrs. Continuous volume counts were undertaken to obtain a realistic picture of the current volume and composition of the traffic. The analysis of traffic counts

provided an estimate of the Average Daily Traffic (ADT) and the analysis has been carried out in terms of total number of vehicles as well as in respect to Passenger Car Unit (PCU). Location wise results of traffic analysis are discussed below:

- **Kalota**

Classified Volume count survey was carried out at Kalota.

Total ADT at this station were recorded as 3024 in terms of number and 4657 in terms of PCU. Fast moving vehicles were recorded as 99.89% of the total traffic (in No.). The directional distribution for all vehicles observed is 49.70 percent flow towards Kishtwar direction and 50.30 percent towards Sudhmahadev direction. Summary of classified traffic volume count survey results is shown in Table below.

Table 31 : Summary of Classified Volume Count Survey at all count stations

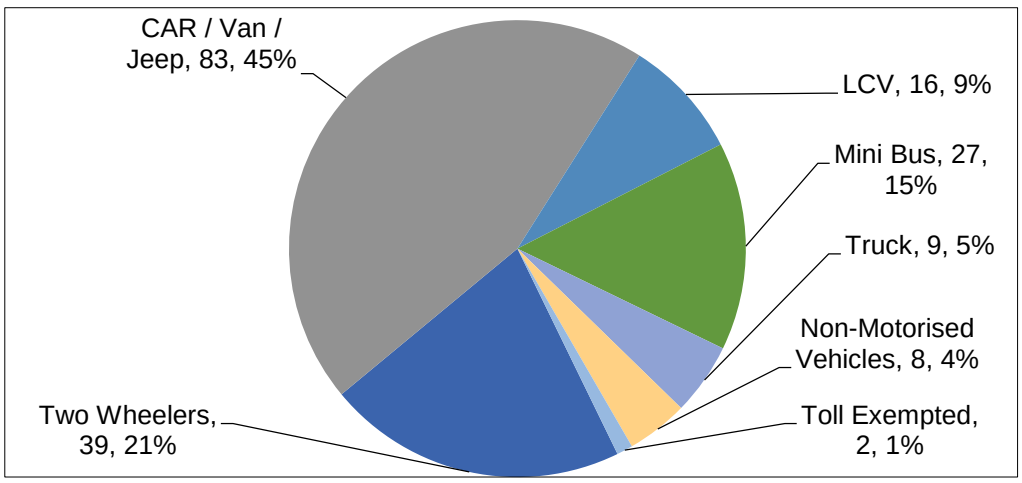
Location	Total AADT		Total ADT		Directional Distribution (%)	
	No.	PCU	No.	PCU	Towards Kisthwar	Towards Sudhmahadev
Kalota	184	199	184	198	49.46	50.55

Survey has been carried out for seven days 24 hours continuously; the traffic flow on all the days in the week will not be same. There will be variation of traffic for each day.

- **Traffic Composition**

The traffic compositions observed in survey location of Kalota are presented graphically in Figure below.

Composition of Traffic at Kalota Village



- **Estimation of Seasonal Correction Factor**

Seasonal Correction factors by vehicle types are required to account for variations in the pattern of traffic volume on the project road sections over different seasons of the year. Seasonal correction trends were assessed based on the sale of automobile fuels i.e. petrol and diesel data along the project road. Seasonal correction factors were worked out to arrive at Annual Average Daily Traffic (AADT).

The monthly petrol and diesel sales data were collected from fuel station on the project road. The SCF was calculated separately for petrol and diesel driven vehicles. The calculated SCF based on monthly fuel consumption are presented in the following Table below.

Table- 32 : Seasonal Correction Factors (SCF) Based on Fuel Consumption

For Whole Section	Petrol	Diesel
	0.95	1.04

Traffic Survey Analysis has been attached in **Annexure-II**

- **Annual Average Daily Traffic (AADT)**

The seasonal correction factors presented above are used to convert Average Daily Traffic (ADT) to Annual Average Daily Traffic (AADT).

Table- 33 : Annual Average Daily Traffic In Both Directions

Description	Direction	Fast Passenger Vehicles			Fast Commercial Vehicles			Slow Modes		Total Traffic	Tollable Traffic
		Two-Wheeler	Car / Jeep /Van	Bus / Mini-Bus	LCV	Truck 2 Axle Truck	Toll Exempted Vehicle / Fire Tender/Govt Heavy Vehicle	Cycle	Mini LCV		
PCU		0.5	1.0	1.5	1.5	3.0	3.0	0.5	1.0		
AADT (Vehicles)	To Khellani	19	41	14	2	4	1	4	6	91	67
	To Hambel	20	42	14	2	5	1	4	5	93	68
	Combined	**39**	**83**	**27**	**4**	**9**	**2**	**8**	**11**	**184**	**135**
AADT (PCU)	To Khellani	10	41	20	3	12	3	2	6	98	83
	To Hambel	10	42	20	3	16	3	2	5	101	86
	Combined	**19**	**83**	**41**	**6**	**28**	**6**	**4**	**11**	**199**	**169**

9.6 Traffic Survey Analysis at Khellani on NH-244.

Traffic Homogeneous Section

The traffic homogeneous sections have been identified based on the major traffic generator locations along the project corridor. All the traffic survey assessments have been carried out at Khellani on NH - 244. The passenger traffic has been observed to vary with respect to the influence of village/towns falling along the project corridor. The major traffic generators settlements and its connections (diversion) points are:

Traffic surveys locations were selected to capture representative traffic volume on the homogeneous sections with a view to capture section wise traffic flow characteristics, the total stretch has been segmented in to one homogeneous sections, based upon the major intersections that act as main collectors or distributors (diversion) of traffic along the project road. The traffic homogeneous section in the road section is as follows:

Table- 34 : Traffic Homogenous Section

Sr. No.	Homogeneous Section	Proposed Length
1	Goha – Khellani road	16.180 m

Traffic Survey Planning and Selection of Survey Location

A comprehensive traffic survey plan has been prepared for the project road after considering traffic intensity on homogeneous sections and travel characteristics. Detailed site visit of project road and its influence/alternative transport network has been carried out between on 26th October 2018 to 1st November 2018. Traffic survey locations were finalized by consultation with client officials. Reasoning with detailed justification for selection of each traffic survey location is given in below Table

Table 35 : Traffic Survey Locations Justification/Rational

Sr.No.	Chainages	Justification/Rational
Classified Volume Count Surveys (CVC)		
1	Khellani	Khellani has been selected to get the idea of traffic in homogeneous section of Goha – Khellani road

Analysis of Traffic Surveys - Base Year Traffic Estimation

- **General**

The base year traffic pattern is the primary input for checking existing level of service

and determination of future traffic demand of project influence area. The consultant has conducted Classified Volume Count Surveys, Intersection Volume Count, O-D and commodity, Axle load and speed & delay surveys to examine the base year traffic intensity, travel characteristics, loading patterns and travel speed on project road. For traffic estimation and projection, the year 2017 has been taken as base year.

The following section provides detailed traffic analysis and important observations about traffic pattern along the project corridor. The data collected during traffic surveys was entered into the computer for further analysis and to obtain information about traffic characteristics and travel pattern along the project road. The results of the analysis can be further used for designing the pavement crust, cross-section, planning and for economic and financial analysis. The traffic analysis was carried out as per the guidelines given in IRC: SP 19-2001, IRC: 108-2015, IRC: 64-1990, IRC SP: 41-1994.

- **Classification of Vehicles and PCU Values**

To convert recorded vehicles into a common scale, the Passenger Car Units (PCU) equivalent factor as per IRC: 64-1990 has been adopted. The PCU equivalent factors adopted are as given in Table.

Table 36 : Classification of Vehicles Recommended PCU Equivalents Factors

Sr.No	Vehicle Type	PCU Value
	Fast Moving Vehicles	
1	Cars/Utility Vehicles/Jeeps/Vans & 3 Wheelers	1.0
2	2 Wheelers	0.5
3	LCV Passenger/LCV Goods/Mini Bus	1.5
4	Standard Bus	3.0
5	Two and 3 Axle Truck	3.0
6	Multi Axle Truck/Heavy Construction Machinery/Trailer	4.5
7	Agricultural Tractor (with Trailer)	4.5
8	Agricultural Tractor (without Trailer)	1.5
	Slow Moving Vehicles	
1	Bicycle	0.5
2	Cycle Rickshaw	2.0
3	Animal Drawn Vehicle (Bullock cart)	8.0
4	Animal Drawn Vehicle (Horse drive)	4.0
5	Hand cart	3.0

Analysis of Classified Volume Count Survey

- **Average Daily Traffic (ADT)**

7-Day, 24 hrs. Continuous volume counts were undertaken to obtain a realistic picture of the current volume and composition of the traffic.

The analysis of traffic counts provided an estimate of the Average Daily Traffic (ADT) and the analysis has been carried out in terms of total number of vehicles as well as in respect to Passenger Car Unit (PCU). Location wise results of traffic analysis are discussed below:

- **Khellani**

Classified Volume count survey was carried out at Khellani.

Total ADT at this station were recorded as 3024 in terms of number and 4657 in terms of PCU. Fast moving vehicles were recorded as 99.89% of the total traffic (in No.). The directional distribution for all vehicles observed is 49.70 percent flow towards Kishtwar direction and 50.30 percent towards Sudhmahadev direction. Summary of classified traffic volume count survey results is shown in Table below.

Table 37 : Summary of Classified Volume Count Survey at all count stations

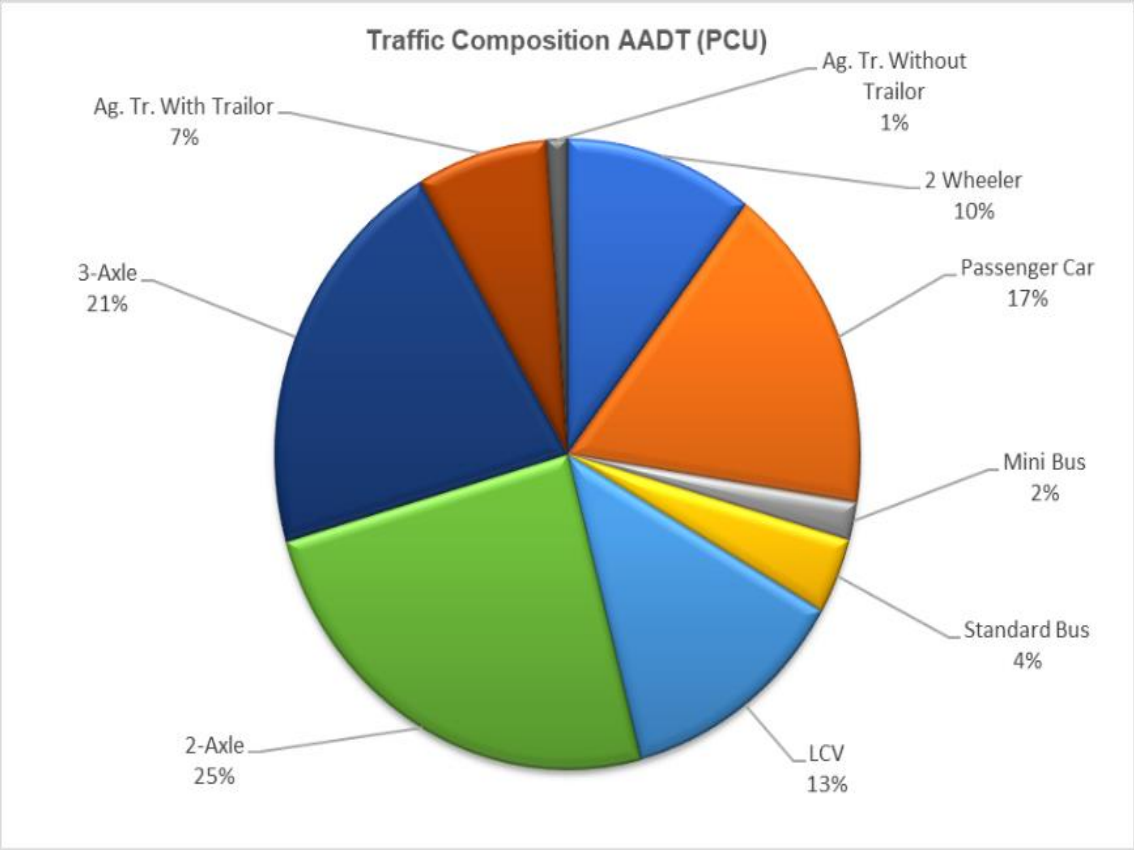
Sr. No.	Location	Total AADT (No)	Total AADT (PCU)	Total ADT (No)	Total ADT (PCU)	Directional Distribution (%)	
						Towards Kisthwar	Towards Sudhmahadev
1	Khellani	2947	4538	3024	4657	49.70	50.30

Survey has been carried out for seven days 24 hours continuously; the traffic flow on all the days in the week will not be same. There will be variation of traffic for each day.

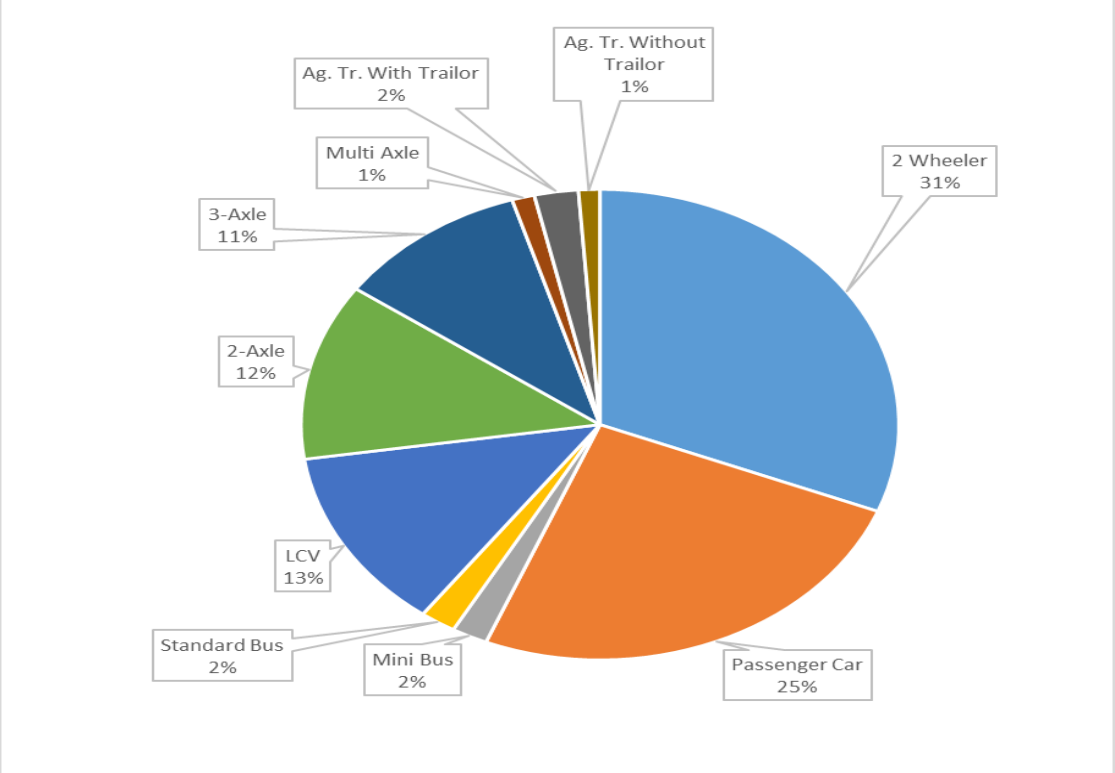
- **Traffic Composition**

The traffic compositions observed in survey location of Khellani are presented graphically in Figure below.

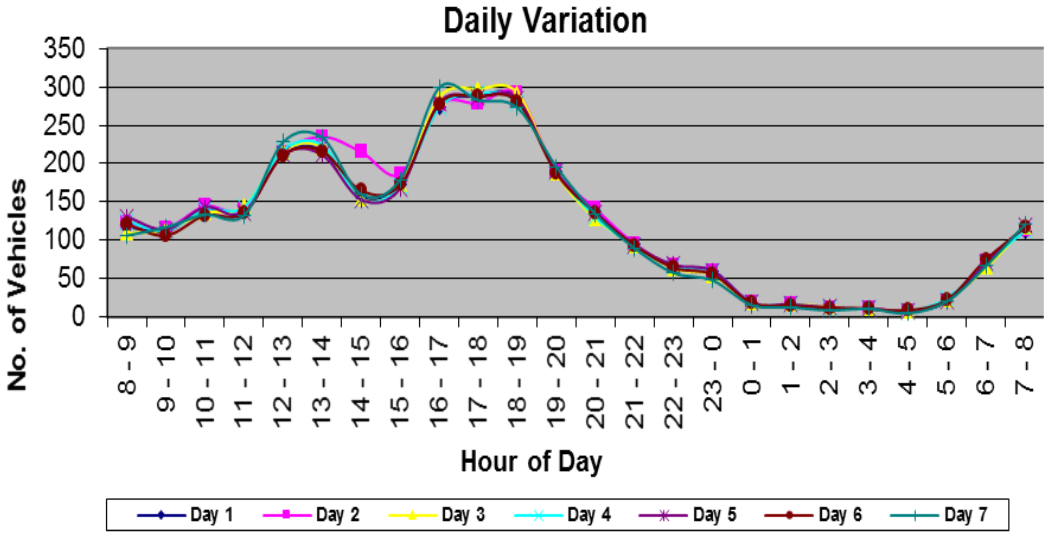
Composition of Traffic by PCU at Khellani Town



Composition of Traffic by Volume at Khellani Town



Daily and Hourly Variation of Traffic at Khellani Town



- **Estimation of Seasonal Correction Factor**

Seasonal Correction factors by vehicle types are required to account for variations in the pattern of traffic volume on the project road sections over different seasons of the year. Seasonal correction trends were assessed based on the sale of automobile fuels i.e. petrol and diesel data along the project road. Seasonal correction factors were worked out to arrive at Annual Average Daily Traffic (AADT).

The monthly petrol and diesel sales data were collected from fuel station on the project road. The SCF was calculated separately for petrol and diesel driven vehicles. The calculated SCF based on monthly fuel consumption are presented in the following Table below.

Table 38 : Seasonal Correction Factors (SCF) Based on Fuel Consumption

For Whole Section	Petrol	Diesel
	0.95	1.04

Traffic Survey Analysis has been attached in **Annexure-II**

- **Annual Average Daily Traffic (AADT)**

The seasonal correction factors presented above are used to convert Average Daily Traffic (ADT) to Annual Average Daily Traffic (AADT).

Table 39 : Average Daily Traffic (ADT) to Annual Average Daily Traffic (AADT)

PCU Equivalents	0.5		1		1.5		3		1.5		3		3		4.5		4.5		1.5		Total All Vehicles	
Vehicle Type	FAST MOVING VEHICLES																					
	2 Wheeler		Passenger Car		Bus				LCV		Truck						Agricultural Tractor					
					Mini Bus		Standard Bus		4 Tyre		2-Axle		3-Axle		Multi Axle		With Trailor		Without Trailor			
Direction	UP	DN	UP	DN	UP	DN	UP	DN	UP	DN	UP	DN	UP	DN	UP	DN	UP	DN	UP	DN	UP	DN
Day 1	445	463	392	369	27	29	27	23	184	195	171	176	146	156	18	12	31	37	16	19	1457	1478
Day 2	478	477	386	370	28	30	22	28	185	192	172	178	152	153	18	20	33	36	19	17	1493	1501
Day 3	463	461	370	358	27	29	28	26	175	194	182	189	149	156	16	18	36	32	14	19	1460	1482
Day 4	412	478	367	379	27	29	36	28	188	182	180	188	141	163	21	12	37	36	16	18	1426	1513
Day 5	453	464	360	379	24	30	31	36	184	182	172	175	160	145	20	21	36	35	17	18	1457	1486
Day 6	465	439	351	388	27	30	23	28	175	178	185	182	163	144	20	19	36	34	16	17	1462	1460
Day 7	461	438	371	358	29	25	28	26	192	182	175	181	160	166	19	17	33	35	18	16	1485	1444
Total	3178	3219	2595	2600	191	204	197	197	1283	1307	1236	1269	1072	1083	131	117	243	246	113	121	10238	10363
Total Up/Down	6397		5196		395		394		2590		2506		2155		248		488		234		20602	
Average	453	459	370	371	27	29	28	28	183	186	176	181	153	154	18	16	34	35	16	17	1458	1476
AADT No.	914		743		57		57		370		358		308		36		70		34		2947	
AADT PCU	457		743		86		171		555		1074		924		162		315		51		4538	

Axle Load Survey

To estimate vehicle loading spectrum on project road, and to determine vehicle damage factor for the commercial vehicles, the axle load surveys have been carried out at identified locations. The data collected from the Axle Load Survey has been compiled and analyzed through "Fourth power" pavement damage rule to arrive at the vehicles damage factor (VDF). The survey is analyzed to obtain Vehicle Damage Factor (VDF) and is presented below:

Table 40 : Adopted VDF by Homogeneous Sections

Khellani Village	
Vehicle Type	**VDF**
LCV	0.459
2 Axle Truck	4.932
3 Axle Truck	0.765
Bus	0.619
Multi axle	3.930

Vehicle Damage Factor of 2 Axle Truck is more because there were maximum empty number of 3 Axle and Multi Axle Trucks whose weights were measured during Axle Load Survey.

Table 41 : 2-Axle Truck

Total	**60**	
Empty	2	3.33%
Loaded	58	96.67%
3-Axle		
Total	**68**	
Empty	64	94.12%
Loaded	4	5.88%
Multi -Axle		
Total	**5**	
Empty	3	60%
Loaded	2	40%

The equivalent single axle loads (ESALs) have been calculated assuming that the project road will be opened to traffic in the beginning of year **2021**.

The equivalent single axle loads (ESALs) have been calculated assuming that the project road will be opened to traffic in the beginning of year 2021. VDF Details are provided in table below:

Table 42 : MSA Calculation (Khellani on NH-244)

Year	Standard Bus	LCV	2 Axle	3 Axle	MAV	Yearly Design ESA	Cumulative Design ESA	MSA	Design Period
VDF	0.62	0.46	4.93	0.76	3.93				
2019	114	370	358	308	36	347906			
2020	120	407	376	323	38	366541			
2021	126	448	395	340	40	386231			
2022	132	488	414	357	42	406742			
2023	139	532	435	374	44	428387	428387	**0.428**	**1-year**
2024	145	580	457	393	46	451232	879619		
2025	153	632	480	413	48	475347	1354966		
2026	160	689	504	433	51	500808	1855774		
2027	168	744	529	455	53	527233	2383007	**2.383**	**5-year**
2028	177	803	555	478	56	555090	2938096		
2029	186	868	583	502	59	584459	3522555		
2030	195	937	612	527	62	615426	4137981		
2031	205	1012	643	553	65	648081	4786062		
2032	215	1083	675	581	68	681841	5467903	**5.468**	**10-year**
2033	226	1159	709	610	71	717384	6185287		
2034	237	1240	744	640	75	754806	6940093		
2035	249	1327	781	672	79	794208	7734300		
2036	261	1420	821	706	83	835696	8569996		
2037	274	1505	862	741	87	878431	9448427	**9.448**	**15-year**

Table 43 : Adopted MSA as per IRC Recommendation

Section	Design Chainage		Calculated MSA	Adopted Design MSA
	From	To	(2022-2036)	(2022-2036)
Goha-Khellani road	12/850	29/030	9.448	20

MSA is calculated here as 9.448 for 15 years but according to clause 5.4.1 of IRC SP:73-2018, Flexible pavement is subjected to the condition that design traffic shall not be less than 20 MSA. So, it's adopted as 20 MSA.

9.7 Growth Rate

The various methods specified vide IRC 108: 2015 are taken into consideration for arriving at reasonable growth rate for traffic in future. The results of such methods along with proposed growth rate for each type of vehicle are presented vide Table below:

Table 44 : Comparative Analysis

Growth Rate of Economic Indicators for the State of Jammu and Kashmir													
Sr. No.	Year	Per Capita Income (PCI)			Population			NSDP			GSDP		
		Rs.	Growth	Gr. rate (%)	In 000's	Growth	Gr. rate (%)	Rs. (In crores)	Growth	Gr. rate (%)	Rs. (In crores)	Growth	Gr. rate (%)
1	2004-05	21734			10717			23292			27305		
2	2005-06	22406	672	3.09	10877	160	1.49	24371	1079	4.63	28883	1578	5.78
3	2006-07	23375	969	4.32	11035	158	1.45	25794	1423	5.84	30602	1719	5.95
4	2007-08	24470	1095	4.68	11192	157	1.42	27387	1593	6.18	32561	1959	6.40
5	2008-09	25641	1171	4.79	11350	158	1.41	29102	1715	6.26	34664	2103	6.46
6	2009-10	26518	877	3.42	11506	156	1.38	30512	1410	4.85	36225	1561	4.50
7	2010-11	27666	1148	4.33	11659	153	1.33	32256	1744	5.72	38270	2045	5.65
8	2011-12	28790	1124	4.06	11806	147	1.26	33990	1734	5.38	41203	2933	7.66
9	2012-13	30035	1245	4.32	11952	146	1.24	35898	1908	5.61	43402	2199	5.34
10	2013-14	31448	1413	4.70	12096	144	1.20	38039	2141	5.96	45847	2445	5.63
11	2014-15	30612	-836	-2.66	12235	139	1.15	37453	-586	-1.54	45126	-721	-1.57
12	2015-16	35034	4422	14.45	12261	26	0.21	42955	5502	14.69	51757	6631	14.69
Average yearly growth rate (%)				**4.50**			**1.23**			**5.78**			**6.05**

Table 45 : Adopted of Growth Rates

Growth Rates of Vehicular Traffic for the state of Jammu and Kashmir								
Sr. No.	**Description**	**2 Wheelers**	**Cars/jeeps**	**Buses**	**Trucks**			**LCV and Mini LCV**
1	Trend Growth of Vehicles	9.04	15.56	3.66	4.16			17.62
2	Growth from regression analysis	9.45	14.95	3.31	3.33			17.21
3	Considered for Revenue/Capacity	9.24	15.26	3.49	3.75			17.42
Sr. no.	**Period**	**2 Wheelers**	**Cars/jeeps**	**Buses**	**Trucks**			**LCV and Mini LCV**
					2 Axle	**3 Axle**	**M Axle**	
1	Up to 2020	10.0	10.0	5.0	5.0	5.0	5.0	10.0
2	2021 -2025	9.0	9.0	5.0	5.0	5.0	5.0	9.0
3	2026 – 2030	8.0	8.0	5.0	5.0	5.0	5.0	8.0
4	2031 – 2035	7.0	7.0	5.0	5.0	5.0	5.0	7.0
5	Beyond 2035	6.0	6.0	5.0	5.0	5.0	5.0	6.0

Table 46: Summary of Projected Total AADT Traffic PCU Volume / day

Homogeneous Section	Year 2019	Year 2022	Year 2029	Year 2031	Year 2036
Goha – Khellani (Ch. 12+850 to km 31+449)	4538	5903	10404	12053	17000

9.8 Capacity Analysis

Capacity analysis is fundamental to the planning, design and operation of roads. It is a valuable tool for evaluation of the investment needed for the future improvements. The capacity figures used for determining the desired carriageway width in differing terrain w. r. t. traffic volume and composition are as per IRC: 64-1990. As per IRC 64:1990, it is recommended that on major arterial routes LOSB should be adopted for the design purpose. On other roads under exceptional circumstances, LOSC could also be adopted for design. For LOS C, Design service volume can be taken as 40 % higher than those for LOS B. For augmentation of the facilities and up gradation of the project highway, the design service volume for the mountainous/hilly terrain condition and level of Service B & C is shown in Table:

Table 47: Design Service Volume for Different Lane Configurations

Lane Configuration	Design Service Volume (PCUs per day) Level of Service B	Design Service Volume (PCUs per day) Level of Service C
2-Lane with 1.5m Paved Shoulder	9000	10000
4-Lane with 1.5m Paved Shoulder	10000	20000

9.9 Lane Requirements

Based on the assessment of the traffic demand on the various homogeneous sections of the Project Highway, the Consultant have carried out detailed option analysis for Two-laning with paved shoulders. Based on the estimated Capacity & Design Service Volume, the number of lanes required for the project road is worked out for LOS B & LOS C which is presented in Table below.

Table 48: Lanning Requirement for the Project Corridor

Homogeneous Sections	LOS B	LOS C
	2-Lane with Paved Shoulder	2-Lane with Paved Shoulder
Goha - Khellani (Ch.12+850 to km 29+030)	2018	2028

It is revealed from the capacity analysis results and considering future traffic growth, the Project road requires 2-lane configuration.

10.0 FINANCIAL AND ECONOMIC ANALYSIS

Financial Study is carried out for Goha-Khellani Road from km 12+850 (from end point of Sudhmahadev – Dranga Tunnel approach road) to km 29+030 along with one link road.

The proposed length of Goha – Khellani road section is 16.180 km, Link road to Goha is 2.016 Km length. The commercial viability is assessed for 15 years concession period by making financial analysis (BOT / Annuity analysis) as given below.

Construction Cost – 360.30 Cr. at 3 Years Concession Period

For above alternatives viability has been assessed for all possible modes i.e. BOT & PPP.

10.1 Approach

The viability of any BOT / Annuity package depends on working cash flows available to service the debt and equity. This working cash flow is basically dependent upon the following:

a) Capital Cost

b) Traffic Forecast

c) User Fee Structure

d) Operation and Maintenance Expenses

e) Interest on Debt

f) Tax

Infrastructure projects are typically capital intensive and are characterised by long payback periods. To look at such projects on a commercial format, it becomes necessary to adopt measures, which significantly improve the financial viability of the project. Such steps include optimising capital costs and drawing up a user fee structure based on benefit analysis and revenue optimisation principles.

In this ultimate analysis, the extent to which such projects raise non-budgetary resources depend on the ability of the project to service investments at commercial terms. Presently, average returns on equity are structured to range from 12% to 13% per

annum on an IRR basis.

Likewise, debt instruments placed with financial institutions provide an average return of around 9% to 12% per annum. To raise the resources for such project, it is necessary that the project is expected to give the lucrative returns at healthy debt-equity ratio.

The main objective of Financial Analysis is to examine the viability of implementing the project on a BOT / PPP basis. The analysis attempts to ascertain the extent to which the investment can be recovered through toll revenue and the gap, if any, be funded through Grant / Subsidy. This covers aspects like financing through debt and equity, loan repayment, debt servicing, taxation, depreciation, Annuity etc. The viability of the project is evaluated on the basis of Project FIRR (Financial Internal Rate of Return on total investment). The FIRR is estimated on the basis of cash flow analysis, where both costs and revenue have been indexed to take account of inflation. Financial analysis has been carried out for debt equity ratio of 70:30.

10.2 Capital Cost

The construction is expected to be executed completely in 36 months; year-wise progress will be 30% in first year, 40% in Second year, 30% in Third year.

A. Base Cost

The civil construction cost for the project road is considered as base cost. The construction is expected to be executed completely in 36 months; year-wise progress will be 30% in first year, 40% in Second year, 30% in Third. Total Project cost showing these additional provisions are tabulated below:

Table 49 : Phasing of Cost

Section	Proposed Length (km)	Base Cost (Cr.)	Phasing of Cost
I	16.180 and link road	360.30	30% In First Year, 40% in Second Year, 30% in Third.

B. Cost Escalation

The price escalation provision assumes an increase compound base of 5% per annum on construction cost based on 2012 rates. This is in line with conventional trend of inflation rates.

C. Interest During Construction

A Debt Equity ratio of 70:30, which is commonly used, for infrastructure projects, has been considered for financial analysis of this project. For the loan repayment in Annuity, a repayment schedule of 15 years has been adopted. The interest on long term debt has been taken as 11.75%. The rate for calculation of IDC has also been taken as 11.75%.

D. Landed Project Cost

In base construction cost, provision for physical contingency (2.8% of the base construction cost) has been made to arrive at the Engineering procurement cost (EPC). In addition to the above, a provision of 1.0% Administrative Charge, 1.0% Quality Control Charges, 0.5% Road Safety Charge, 2% Supervision Charges and 5% Escalation charges on total cost have been made to get the project cost.

Table 50 : This financial implication increases the TPC of Civil Construction Cost.

Sr. No.	Item of Works	Cost (cr.)
A	Civil Works	312.33
	Civil Construction Cost (A)	
B	Financial Cost (B)	129.36
Cost (A + B)		**441.69**

10.3 Operation and Maintenance Costs

Maintenance during defect liability period is considered for 4 Years for Goha-Khellani road, Link Road to Goha and Link Road to Bargran. Cost of O&M is calculated based on the article 14 of EPC aggrement- 0.5% for 2nd, 3rd, 4th years & 1% for 5th year of Rs. 7.146 Cr.

1. Location of Toll Plazas

A Toll Plaza has already been proposed on Sudhmhadev-Dranga between Km 0.00 - km 12.850 project. So, no Toll plaza is proposed for this project.

2. Traffic Assumptions and Forecast

Light vehicles especially Two/Three wheelers and slow-moving vehicles are exempted from user fee as per guide lines for toll roads. Tollable traffic has been assessed leaving slow moving and light vehicles except light commercial vehicles, car, mini buses, trucks and Tractor with trailers.

3. Concession Period

The guiding principle for determining project specific concession period is the carrying capacity of the respective highway at the end of the proposed concession period. As such, the concession period is proposed based on volume of present and projected traffic. In other ways concession period ends in the year when capacity of respective highway exhaust to cater project traffic volume.

Table provided below shows existing traffic and the year when traffic exceeds the capacity of the highway, calculated for **"LEVEL OF SERVICE B (LOS B)** and warrants capacity augmentation.

Table 51 : Lane Capacity and Augmentation Required for the Project Corridor

Homogeneous Sections	LOS B	LOS C
	2-Lane with Paved Shoulder	2-Lane with Paved Shoulder
Extended portion of Sudhmahadev – Dranga Tunnel approcah road including Khellani road (CH. Km12+850 to km 29+030)	2018	Beyond Analysis Period

A. Advertisement Revenue

The advertisement has been not recommended on the project road due to safety concern to the road users. So, revenue generation from the advisement is not taken in to consideration for this project.

10.4 Financial Model Input and Analysis

A. Grant and Its Treatment

It shall be equal to the sum specified in the bid and as accepted by the authority but in no case greater than the equity and shall be further restricted to a sum not exceeding 40% of TPC i.e. maximum 40% of TPC (Total Project Cost). It shall be due and payable to the Concessionaire as per PPP guidelines. Further it shall be disbursed proportionately along with the loan funds. For analysis, VGF of 40% have been adopted to ensure minimum 12% IRR.

B. Proposed Sources of Finance

In general, the developer shall crystallize the sources of finance by optimizing his equity

returns keeping in view the project cash flows, terms, and conditions of various financing options available. Further the market standing, and financial strength of the Developer would largely determine the terms and conditions of finance offered to the Developer by various lending agencies. For the study, following sources of finance have been taken:

- Equity: To be provided by the Developer
- Subsidy / Grant for viability of funding, to be provided by the client.
- Debt: To be arranged by the Developer / Concessionaire

C. Expenses

Expenses can broadly be classified based on the phases in which they are incurred, viz. construction period expenses and operation & maintenance period expenses.

D. Construction Period Expenses

- Preliminary and pre-operative expenses
- Contingency allowance
- Interest during construction period
- Finance Charges

E. Operation and Maintenance Period Expenses

- Toll collection expenses
- Administrative expenses for day-to-day operation including insurances
- Maintenance expenses, which include routine and periodic maintenance
- Interest expenses incurred for servicing term loans
- Tax

F. Financial Viability

To assess whether the project is a profitable proposition, the returns to investors are measured by the post-tax project FIRR and the equity FIRR, which is estimated from the cash-flow statements, based on discounted cash-flow technique. The returns expected by the investors are a function of the value of equity issues on the Indian stock Markets,

Interest rates on commercial loans, the risk profile of the investment and alternative investment opportunities. To qualify the project in terms of attractive financial returns, the following criteria are adopted:

- Post tax IRR on Project Investment : minimum 12%
- Post tax IRR on Equity : minimum 12%
- DSCR : >1.0
- BCR : >1.3
- NPV @ 12% : must be positive

10.5 Recommendation & Conclusion on Type of Financing

Project road section is financially not viable based on the forecasted traffic and MORT&H user fee with 40% government subsidy and maximum concession period of 20 years.

Therefore, EPC contract option is being proposed for the entire project section with single package.

10.6 Economic Analysis

An infrastructure project is subjected to economic appraisal to ensure that the investment proposed would yield appropriate return to the national economy. It is therefore important that decisions about investments in roads are made on objective judgments and therefore, Economic appraisal has been carried out for each traffic homogenous section of entire Project road.

The basic purpose of the economic analysis is to enable the decision-makers in the Government to decide whether the project is worthy of investment keeping in view the benefits to the society. The Proposal for project road i.e. Goha - Khellani is new road alignment of length 16.180 km including one link road to Goha. In order to assess the benefits accrued to the society; both the options of 'Existing' and 'Proposed' have to be compared. For this purpose, the entire existing Road has been considered along with its proposed maintenance and improvement proposals.

A. Economic Analysis Approach

The economic evaluation has been carried out within the broad framework of social cost benefit analysis. The objective is to determine the best improvement scheme out of several proposals, which will lead to minimizing total transport costs and maximizing benefits to the road users.

The benefits accruing to society from the proposed improvement are mainly reduced vehicle operating cost, reduced travel time cost and reduced accident costs. Total transport costs comprise of two basic components as shown in below **Table.**

Table- 52 : Total Transport Costs

Road Supplier Costs	Road User Costs
Construction Costs	Vehicle Operating Costs (VOC) both MT & NMT
Maintenance Costs	Travel Time Costs
Replacement Costs: Costs of Environmental Impact Mitigation Measures, Costs of Rehabilitation and Resettlement (R&R) measures	

These costs are generated using HDM – IV for every year of the analysis period (cost-benefit stream) from which economic indicator parameters that essential for viability of project namely Net Present Value (NPV), Economic Rate of Return (EIRR) and Benefit Cost Ratio (B/C) are the final economic outputs.

NPV is the present value of Net Benefits (NB) during the project period. EIRR is the discount rate at which the NPV of the Net Benefit (NB) is zero. Net Benefit is the cumulative sum of the difference between yearly benefit and yearly costs incurred after discounting.

$$NB = \sum_{n=1}^{M} (Benefit(n) - Cost(n))$$

Savings from vehicle emission reduction and less energy consumption due to improved facility are also important economic savings which are possible to calculate but these quantities are not converted to economic cost inside the software. So these benefits are not included.

The appraisal period (including the construction period) has been taken as 30 years after

which a residual value of investment is assumed as 10%.

10.7 Project Economic Evaluation using HDM - 4

Economic evaluation for Goha - Khellani road section is carried out by consideration of two alternatives In HDM – 4.

A. Alternative 1: Existing

For without project consideration, project road will carry existing traffic on it without any improvement and maintenance in present condition. But here at present there is no connecting road and the alignment is totally newly proposed.

B. Alternative 2: Proposed

For with project consideration, Project road is constructed with two lane. In this alternative, project road improvements are made by proposing totally new alignment with structures and road.

10.8 Project Cost and Scheduling

Project road is proposed to undertake new construction. Accordingly, economic analysis of the project road is being carried out as follows:

Table- 53 : Section Details

Homogeneous Section	Existing Chainage		Improvement
	From	To	
Extended portion from Sudhmahadev-Dranga tunnel approach road to Khellani town including Khellani Road	12+850	29+030	Undivided two-lane carriageway with paved shoulder including Khellani road, Goha link road and Bargran link road

The Economic analysis was carried out for 30-year benefit period (2022-2052). For performing economic evaluation, a 'project' is formulated in which comparison is made proposed.

10.9 Capital Cost

Total capital cost is Rs. 544.806 Crore for project road portion. For economic evaluation base costs have been taken as factor cost of civil works and other cost related to land

acquisition social environmental and utility relocations that mean Capital cost is the total construction cost of civil works for the project improvement.

The construction cost for each homogeneous section is tabulated in **Table** for the year 2020 at which Project will start to implement. Therefore, the project cost of present year is increased with 5 % inflation rate for two successive years. The construction cost of project will be utilized in four phases i.e. 30 % in first year and 40 % in second year, 30% in third.

The cost estimate for each section has been calculated separately based on the quantities worked out for major items of work to be executed in the project on the basis of preliminary engineering design of roads, structures and the adopted rates. A conversion factor of 0.85 has been used to convert financial cost into economic costs.

The economic cost for each package is as under:

Table 54 : Total Project Cost

Homogeneous Section	Financial Cost (Cr.)	Economical Cost (Cr.)
Goha – Khellani Road	129.36	109.96

10.10 Maintenance Cost

For Two lanes with Paved shoulder road

Routine maintenance cost - Rs. 5, 50,000 per km per year

Periodic maintenance cost - Rs 8,55,000 per km (40mm BC+80mm DBM), Shoulder

10.11 Project Benefits

Project Benefits mainly occurs due to Reduction in Vehicle operating cost and travel time savings.

The vehicle operating cost (VOC) components are

- Fuel
- Lubricants
- Tyres

- Spare Parts
- Maintenance Labour
- Wages of Crew
- Fixed costs including overheads, administration, interest on borrowed capital
- Depreciations
- Travel time cost

11.0 ENVIROMENTAL SCREENING AND PRELIMINARY ENVIROMENTAL ASSESSMENT

The project road is considered to help in providing better connectivity from Goha to Khellani in Doda District and is envisaged to provide better riding quality to the users, that reduces the travel time and distance. Some of the likely social impacts that affect the present environment are:

- Nearby communities and the natural environment.
- Peoples and properties falling in the direct path of road development.
- People indirectly affected by way of disruption of livelihood.
- Breakages in the accustomed travel paths and community linkages.
- Disturbances to natural environment due to soil erosion.
- Changes to streams and underground water.
- Interference with animal and plant life.
- Other impacts
- The environmental impacts as below may be direct, indirect or cumulative:
- Impacts on soil
- Impacts on water resources
- Impacts on air quality
- Impacts on flora and fauna
- Impacts on communities and their economic activity
- Impacts arising from land acquisition and resettlement
- Impacts on indigenous people
- Impacts on cultural heritage
- Impacts on aesthetic and landscape
- Impacts on the noise environment
- Impacts on human safety
- Other impacts

11.1 Scope

1. In order to make these roads people friendly and environment friendly, it is necessary that the steps are taken from the beginning and plans/ designs/ alignments are finalized in such a way that to the extent possible the adverse impacts are avoided at the designing stage itself. Where avoidance is not possible then the social and

environmental adverse impacts should be suitably compensated by adopting mitigation measures. The displaced persons must be compensated and rehabilitated so that the adverse impact is minimized, and the living conditions of the people improve, and the environment also improves. These steps are:

2. Avoiding at the designing stage especially while completing the alignments
3. Mitigating the adverse impacts at designing stage and construction /operation phase.
4. Compensating the affected people/environment and rehabilitation and resettlement measures

The EA steps are screening and scoping, determining of baseline conditions, analysis of potential environmental impacts, considerations of alternatives, development of mitigative and compensatory measures, designing of monitoring and evaluation plans and documentation. At various stages, the key steps involved in environmental assessments are as given below:

Stages in Road planning		**EA Activity**
Concept	-	Screening, Scoping, Consultation
Pre-feasibility	-	Determining baseline condition
Feasibility	-	Selection of preferred solution
Engineering design	-	Assessment of alternative design/ methods development of environmental management plan
Construction	-	Effects and compliance
Operation & Maintenance	-	Monitoring, Evaluation, Reporting

11.2 Objective

The overall aim of conducting various studies is to supply input of Environmental concerns to be detailed in highway design. The goal is to minimize the adverse Environmental Impact with the best possible engineering solutions at the most optimal cost. This needs complete co-ordination between the engineering, environmental teams

during the entire design process.

For the Environmental impact study, a reconnaissance survey was conducted using environmental survey formats and analysis is made showing project affected areas, trees, sensitive areas, cultural heritage sites, waterways and any other factors needing mitigation, Characteristics of the existing environment are defined providing the basis for project impact comparisons. An analysis of potential impacts magnitude and duration of impact on physical (air, water etc.), natural and social environment through public consultations is made.

Specifically, from social impact assessment point of view congested areas and likely impacts are found and options are suggested to be considered for integration in the engineering design while proposing junction improvement, road barriers, silent zones near the schools and hospitals etc.

11.3 Policy and Legal Framework

This session presents a review of the international agreements and commitments, existing institutions and legislations relevant to the project at the National and State level. The environmental assessment process needs to adopt environmental regulations and guidelines of Government of India (GoI) and ADB's World Bank Safeguards.

i. International Agreements and Commitments

India is party to various international agreements/conventions/treaties for conservation of environment at global level. Important among them have briefly described and analyzed vis- a- vis the project development.

ii. Ramsar Convention on Wetlands, 1971:

Convention on Wetlands, signed in Ramsar, Iran, in 1971, is an inter-governmental treaty, which provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. Out of 19 designated wetlands of International Importance in India, none of them is in project influence area.

iii. Convention on Protection of the World Cultural and Natural Heritage, 1972:

The United Nations Educational, Scientific and Cultural Organization (UNESCO), which

seeks to encourage the identification, protection and preservation of cultural and natural heritage around the world considered to be of outstanding value to humanity has embodied these objectives in an international treaty called the Convention concerning the Protection of the World Cultural and Natural Heritage in 1972. There are Twenty-six world cultural heritage and natural sites in India. None of them is in project influence area.

iv. Vienna Convention for Protection of the Ozone layer, 1985 and Montreal Protocol on Substances Depleting the Ozone layer, 1987:

The Vienna Convention outlines states responsibilities for protecting human health and the environment against the adverse effects of ozone depletion, and established the framework under which the Montreal Protocol was negotiated. The Montreal Protocol stipulates that the production and consumption of compounds that deplete ozone in the stratosphere chlorofluorocarbons (CFCs), halons, carbon tetrachloride, and methyl chloroform) are to be phased out by 2010. The project does not envisage production and consumption of ODS.

v. United Nations Framework Convention on Climate Change (UNFCC), 1994:

As per the convention the reduction/limitation requirements of Green House Gases (GHG) only to developed countries. The only reporting obligation for developing countries relates to the construction of a GHG inventory (GHG sources and sinks, potential vulnerability to climate change, adaptation measures and other steps being taken to address climate change). India acceded to the Kyoto Protocol but has not ratified it and hence the carbon emission limits are not binding upon India.

vi. Convention on Biological Diversity (CBD) 1992:

The Convention on Biological Diversity (CBD) is dedicated to promoting sustainable development and came into force in 1992 Rio Earth Summit. India signed the CBD in 1994. Member Parties have committed themselves to achieve by 2010, a significant reduction of the current rate of biodiversity loss at the global, regional and national level as a contribution to poverty alleviation and to the benefit of all life on earth.

11.4 Country's Legal Framework and Regulatory Requirements

The implementation of the Goha to Khellani in Doda District Road will comply with the environmental acts, policies, rules, and regulations of the Government of India which has a comprehensive coverage of environmental issues and requirements. This environmental legal framework imposes command and controls on certain activities deemed detrimental to the environmental integrity and encompass the conservation of various components of the biological and physical environment and environmental assessment procedures and requirements for public consultation. The policies and requirements which are most relevant in the context of this project are provided in Table below.

Table 55 : Summary of Environmental Legislations Applicable to the Project

Sr. No	Act / Rules	Purpose	Applicable	Reason for Applicability	Authority
1	Environment Protection Act-1986	To protect and improve overall environment	Yes	It is umbrella legislation and notifications; rules and schedules are promulgated under this act.	MOEFCC. Gol; J&K State Gov. SPCB
2	Environment Impact Assessment Notification,14t h Sep-2006	To accord environmental clearance to new development activities listed in schedule of EIA notification.	No	None of the Projects are located either in eco- sensitive areas or 1000m above mean sea level.	MoEF. SEIAA
4	Office memorandum dated 18.05.12, by MoEF in view of Apex Court order dated 27.2.2012	Conserve top soil, aquatic biodiversity, hydrological regime etc. by haphazard and unscientific mining of minor minerals	Yes	In case of renewal of quarries and opening of new borrow areas	SEIAA
5	National Environment Appellate Authority Act (NEAA) 1997	Address Grievances regarding the process of environmental clearance.	Yes	Grievances if any will be dealt with, within this act.	NEAA
6	Forest	To check	Yes	Kishtwar Dense forest	State Forest

Sr. No	Act / Rules	Purpose	Applicable	Reason for Applicability	Authority
	Conservation act 1980	deforestation by restricting conversion of forested areas into non- forested areas		Area fall under road and Approach Construction.	Dept. and MOEFCC regional Office.
7	Forest (Conservation & Afforestation) Rules	To restore tree, cover equal to or more for trees likely to be cut	Yes	Significant Tree cutting is involved in Projects.	DFOs, FCC
8	Air (Prevention and Control of Pollution) Act, 1981	To control air pollution by controlling emission of air Pollutants as per the prescribed standards.	Yes	For construction; for obtaining NOC for establishment of hot mix plant, workers' camp, construction camp, etc.	J&KSPCB
9	Water (Prevention and Control of Pollution) Act1974	To control water pollution by controlling discharge of pollutants as per the prescribed standards	Yes	This act will be applicable during construction for (establishments of hot mix plant, construction camp, workers' camp, etc.	J&KSPCB
10	Permission of Abstraction of Ground water	To conserve and augment the groundwater resources	No	All infrastructure projects used Chasma (Springs Water) Local Concerned Official permission required if Applicable.	CGWA
11	Noise Pollution (Regulation and Control Act) 1990	The standards for noise for day and night have been promulgated by the MoEF for various land uses.	Yes	Vehicular noise on project routes required to assess for future years and necessary protection measure need to be considered in design.	SPCB
12	Explosive Act 1984	Safe transportation, storage and use of explosive material	Yes	In case of opening new Quarries, Blasting	Chief Controller of Explosives
13	Mines & Minerals Development Act, 1957	To regulate excavation, production, storage, collection, distribution,	Yes	Project requires sand, aggregates, soil and other minor minerals in large quantity.	District Collector and State Mines Dept.

Sr. No	Act / Rules	Purpose	Applicable	Reason for Applicability	Authority
		transportation, manufacturing, possession, purchase and sell of any minor mineral including soil			
14	Central Motor Vehicle Act 1988 and Central Motor Vehicle Rules1989	To check vehicular air and noise pollution.	Yes	These rules will be applicable to road users and construction Machinery.	Motor Vehicle Department
15	Forest Conservation Act 1980	To maintain ecological stability through conservation and restoration of biological diversity.	Yes	This policy will be applicable as project intervention needs forest land to be acquired.	Forest Dept UT of J&K, GoI Parivesh
16	Construction and Demolition Waste Management Rules, 2016	To ensure all such waste are disposed in environmentally acceptable manner and prevent from land and water pollution			Municipal Corporation and SPCB
17	Solid Waste Management Rules, 2016 and Plastic Waste Management Rules 2016	Mandated the source segregation of waste in order to channelize the waste to wealth by recovery, reuse and recycle.		Domestic wastes food leftovers, vegetable peels, plastic, house sweepings, clothes, ash, paper, cardboard, plastic, wastes like batteries, bulbs, tube lights etc.	SPCB
18	Hazardous and other Wastes (Management and Trans Boundary Movement) Rules, 2016.	To ensure that transport storage, use, and disposal of such waster do not pollute land and water environment and do not causes danger to health		Hazardous wastes from construction and demolition like tar and tar products (bitumen, felt, waterproofing compounds, etc.), wood dust from treated wood, lead having products, chemical admixtures, sealants, adhesive solvents, paints etc.	SPCB

Sr. No	Act / Rules	Purpose	Applicable	Reason for Applicability	Authority
19	Batteries (Management and Handling) Rules, 2001 as amended 2010.	Notified with an aim of channelizing the used lead acid batteries for environmentally sound recycling.		Applicable to all the projects when disposal of used lead-acid battery is involved.	
	E-waste (Management and Handling) Rules, 2011	to channelize the E-waste for environmentally sound recycling which is largely controlled by the un-organized sector who are adopting crude practices that results into higher pollution and less recovery,		Due to use and disposal of electrical and electronic wastes generated in the building, like PC, printers, cartridges, CDs, Xerox machine etc. collectors	SPCB
21	The Building and Other Construction Workers (regulation of employment and conditions of service) Act, 1996	To regulate the employment and conditions of construction workers and to provide for their safety, health and welfare measure and for other matter incidental thereto	Yes	A large number of construction workers skilled, semiskilled or unskilled will be employed temporarily during Construction Phase of the project	Ministry of Labor and Employment Government of India
22	Bonded Labour (Abolition) Act,1976 and Rules, 1976	Abolition of bonded labor.	Yes	- Do-	- Do-
23	Contract Labour (Regulation and Abolition) Act1970 and rules, 1971	Prevent exploitation of contract labor and also to introduce better conditions of work.	Yes	- Do-	- Do-
24	Employees Provident Funds and Miscellaneous Provisions Act1952	Promote and secure the well-being of the employees where contractors employ more than 20 persons during Construction	Yes	- Do-	- Do-
25	Minimum Wages	Ensure that workers	Yes	- Do-	- Do-

Sr. No	Act / Rules	Purpose	Applicable	Reason for Applicability	Authority
	Act 1948 along with Central Rules1950	get at least minimum wages as fixed by the state/central Govt. whichever is higher			
26	Public Liability and Insurance Act 1991	Protection form hazardous materials and accidents.	Yes	Contractor need to stock hazardous material like diesel, Bitumen, Emulsions	- Do-

Evaluation of Impacts

The environmental impact assessment process involves four basic steps, and these are:

- Identification
- Interpretation
- Evaluation
- Communication

Several techniques are available for the assessment of impacts. Each of these techniques has its own advantages and disadvantages. The selection of any of these techniques for any particular project depends largely upon the judgment of the analyst. The technique chosen should be comprehensive, easy to understand, systematic and flexible. Considering these criteria, for present project, the matrix method is proposed to be considered for evaluation and assessment.

Potential impacts and mitigation measure

1. Impact on Physical Environment

➢ **Impact on Climate**

Preparation Goha to Khellani Doda District road Construction activities of the road involves various localized activities. Perceptible changes in the elements of microclimate are anticipated since there are Approx. 1000 numbers of trees that are envisaged to be cut due to the proposed road. There will be an increase in daytime temperature on the road surface and soil due to loss of shade trees.

➢ **Mitigation Measures**

No major impacts were anticipated due to proposed Road activities. However minor changes in the climate due to cutting of large number of healthy trees.

- **Impact on Topography**

During construction phase topography along the road will change a little on account of cutting, filling and construction of project related structures etc.

- **Mitigation Measures**

Change in topography has been avoided to the maximum extent while finalizing the alignment and at design stage.

- **Geology**

Substantial quantities of crushed rock and sand will be required for the proposed project. Though the extraction of rock aggregates and fill material decreases the quantity, this impact will be limited to the location of the quarries and borrow areas only and is unlikely to cause or contribute significantly to their depletion. Hence, the impact on general geology of the region is insignificant and will be limited to the construction stage.

- **Mitigation Measures**

Construction material sites have been identified, where the extent of material available is in excess so that it will not affect the geological characteristics of the locality.

2. IMPACT ON ENVIRONMENTAL RESOURCES

- **Impact on Surface Water Quality**

Minimal Impact on surface water

- **Construction Phase**

Since three numbers of water bodies exist within corridor of impact, the proposed Road activities will have minor impacts on the surface water quality in the area. The level of turbidity in river water is high and construction activities will further increase this level and results in sediment deposit, interfere with photosynthesis for aquatic culture. Sometimes contamination of surface water may take place due to

spills of construction materials, oil, grease, fuel and paint etc. This can be kept under check by adequate precautionary/mitigative measures. During construction phase care would be exercised to control dust so that the water available in the reservoirs and wells especially those located very near to the ROW may not be contaminated.

- **Operation Phase**

It is envisaged that there is possibility of positive impacts, during operation phase, due to the proposed Road activities. The extent of vehicles going on to the berms causing dust etc. would reduce and the drainage system will reduce any adverse effect of soil erosion.

- **Mitigation Measures**

The mitigation measures to check soil erosion will help to check water pollution by turbidity. Lining by stone pitching of existing watercourses around new bridges and culverts is proposed to reduce soil erosion

3. **Impact on Air Quality**

- **Construction Phase:**

The present air quality of the area is good, smoothening of riding surface and smooth traffic flow will minimize these impacts. However, during construction phase this level will go towards higher side and interfere with daily routine of human beings and environment. An increase in pollution load in the ambient air due to increase in traffic flow pollutant load will also increase. Since there were no polluting activities in the area as well as traffic flow is also very low, likely impacts are also low. During construction phase it is expected to increase up to certain level, but potential would be minor, because stringent control measures will be adopted during construction. Construction activities like site clearance, earth filling, material loading and unloading though the impacts are expected to be localized, and temporary and confined to the construction areas only.

- **Mitigation Measures**

Water will be sprinkled regularly to reduce adverse effects caused by dust and

particulate matter. Vehicles delivering construction materials will be covered to reduce spills and dust. Asphalt mixing sites will be located more than 500 m downwind from any settlement. Mixing equipment will be sealed and fitted with dust removal device.

4. Impact on Noise Level

➢ **Construction Phase:**

There is no problem of noise level in most of the project area. Increased in noise due to construction activities will be expected. In order to avoid the rise in noise level, construction machinery will be located away from the settlements and thus the impact will be controlled.

➢ **Operational Phase:**

Widening of the existing carriageway will lead to improvements in geometrics and surface of the road and it may lower the noise level. Also, smooth traffic flow will bring noise level to the acceptable limits.

➢ **Mitigation Measures**

Construction machinery will be located at least 500m away from the settlements. Contractor will provide earplugs & safety equipment's to workers, which will reduce impact. Noisy operations and their duration will be scheduled and prevent nighttime activities. In addition to above, the contractor will follow guidelines given in handbook of CPCB and JKSPCB.

5. IMPACT ON ECOLOGICAL RESOURCES

➢ **Impact on Terrestrial Ecology/Wild life**

In the operation phase environmental quality would be considerably improved by adopting environmentally sound engineering designs maintaining the aesthetic quality through landscaping and arboriculture practices.

➢ **Mitigation Measures**

The divisional forest department and Forest Conservation committee requires

planting of two trees against every tree to be cut, as compensation. After Forest Clearance Forest Conservation Committee Suggesting tree cutting and Plantation Schedule as per J&K afforestation policy.

- **Impact on Vegetation Cover and Trees**

Site clearing and earthwork operation during construction phase will result in removal of and/or damage to vegetation cover and trees. During construction phase felling of trees for fuel and poaching of fauna may take place.

- **Mitigation Measures**

The contractor at his cost will take requisite measures to inform the construction workers to protect natural resources and wild life. If, however, some damage occurs, the contractor promptly revegetates disturbed vegetation cover as soon as possible. Contractor will provide fuel to the laborer's, Compensatory afforestation for trees lost will be carried out at the rate of 1:2 at locations to be agreed with NHIDCL / Forest Department.

Impact on Human Use Values

- **Induced Development (Change in Land use pattern)**

The improvement of the proposed Road activities is expected to cause some changes in the land use. In this process, areas presently under agriculture and vegetation cover may be diverted for development and other usage. But status of the change will be insignificant.

The impact of the road improvement on the socio-economic environment will be significantly beneficial, as it is likely to stimulate the economic growth of the area. The specific benefits of the road improvement will include reduction in travel time, travel cost, reduction in the time to get agricultural goods Like Apple to market.

- **Mitigation Measures**

Maximum effort has been made to avoid any changes in the land use pattern.

- **Loss of Monuments/Historical Areas**

The present project does not have any adverse impact on monuments / historical

places because project road passes away from these areas.

- **Mitigation Measures**

Maximum effort has been made to avoid any disturbance to the religious structures along the road.

- **Health, Safety and Hygiene for Construction Workers**

The most significant impact of the project on public health is likely to arise from construction camps. These camps are anticipated to house up to 350 people for 36 months. Given this concentration of people, the potential for disease andillness to be transmitted will increase.

- **Mitigation Measures**

The contractor will follow guidelines given by CPCB on construction operation, so that he takes requisite measures to locate and construct the camps in a manner that will not pollute the environment. The possible locations for siting these labour camps have been identified during field survey.

11.5 Muck Dumping Plans

The dumping locations shall be Identified on government land in consultation with district administration, and muck disposal plan will be prepared accordingly.

12.0 INITIAL SOCIAL ASSESSMENT

Improved roads will bring great benefits to women and girls. Direct benefits include a decrease in travel time and an increase in reliable and convenient transport services. Indirect benefits include improved access to products and services, including social services such as health, education, as well as other government services. During construction, women will also benefit from the increased employment opportunities. However, road construction and improvements may also lead to potential negative impacts such as the spread of STIs (sexually transmitted infections), trafficking, and road safety issues. Potential negative impacts will be addressed through community awareness raising sessions that will be implemented by the NGO. The NGO will coordinate with relevant organization or mobilize its own short-term experts in carrying out the activities. In addition, the contractor will also carry out HIV/AIDS awareness program among worker camps and nearby community as mandated in their contract.

Carry out meaningful consultations with displaced persons, host communities, and concerned nongovernment organizations. Inform all displaced persons of their entitlements and resettlement options. Ensure their participation in planning, implementation, and monitoring and evaluation of resettlement programs. Pay particular attention to the needs of vulnerable groups, especially those below the poverty line, the landless, the elderly, women and children, and indigenous peoples, and those without legal title to land, and ensure their participation in consultations. Establish a grievance redress mechanism to receive and facilitate resolution of the concerns of displaced persons. Support the social and cultural institutions of displaced persons and their host population. Where involuntary resettlement impacts and risks are highly complex and sensitive, compensation and resettlement decisions should be preceded by a social preparation phase.

Improve, or at least restore, the livelihoods of all displaced persons through;

1. land-based resettlement strategies when affected livelihoods are land based where possible or cash compensation at replacement cost for land when the loss of land does not undermine livelihoods,
2. prompt replacement of assets with access to assets of equal or higher value,

3. prompt compensation at full replacement cost for assets that cannot be restored, and
4. additional revenues and services through benefit sharing schemes where possible.

Provide physically and economically displaced persons with needed assistance, including the following:

- if there is relocation, secured tenure to relocation land, better housing at resettlement sites with comparable access to employment and production opportunities, integration of resettled persons economically and socially into their host communities, and extension of project benefits to host communities;
- transitional support and development assistance, such as land development, credit facilities, training, or employment opportunities; and
- civic infrastructure and community services, as required.

Improve the standards of living of the displaced poor and other vulnerable groups, including women, to at least national 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.

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

Ensure that displaced persons without titles to land or any recognizable legal rights to land are eligible for all compensation, relocation and rehabilitation measures, except land.

Prepare a resettlement plan elaborating on the entitlements of displaced persons, the income and livelihood restoration strategy, institutional arrangements, monitoring and reporting framework, budget, and time-bound implementation schedule. This resettlement plan will be approved by ADB prior to contract award.

Disclose a draft resettlement plan, including documentation of the consultation process in a timely manner, before project appraisal, in an accessible place and a form and language(s) understandable to displaced persons and other stakeholders. Disclose the

final resettlement plan and its updates to displaced persons and other stakeholders.

Conceive and execute involuntary resettlement as part of a development project or program. Include the full costs of resettlement in the presentation of project's costs and benefits. For a project with significant involuntary resettlement impacts, consider implementing the involuntary resettlement component of the project as a stand-alone operation.

Pay compensation and provide other resettlement entitlements before physical or economic displacement. Implement the resettlement plan under close supervision throughout project implementation.

Monitor and assess resettlement outcomes, their impacts on the standard of living of displaced persons, and whether the objectives of the resettlement plan have been achieved by taking into account the baseline conditions and the results of resettlement monitoring. Disclose monitoring reports.

- **Social Impact on Community**

Improved roads will bring great benefits to women and girls. Direct benefits include a decrease in travel time and an increase in reliable and convenient transport services. Indirect benefits include improved access to products and services, including social services such as health, education, as well as other government services. During construction, women will also benefit from the increased employment opportunities. However, road construction and improvements may also lead to potential negative impacts such as the spread of STIs (sexually transmitted infections), trafficking, and road safety issues. Potential negative impacts will be addressed through community awareness raising sessions that will be implemented by the NGO. The NGO will coordinate with relevant organization or mobilize its own short-term experts in carrying out the activities. In addition, the contractor will also carry out HIV/AIDS awareness program among worker camps and nearby community as mandated in their contract.

Carry out meaningful consultations with displaced persons, host communities, and concerned nongovernment organizations. Inform all displaced persons of their entitlements and resettlement options. Ensure their participation in planning, implementation, and monitoring and evaluation of resettlement programs. Pay attention

to the needs of vulnerable groups, especially those below the poverty line, the landless, the elderly, women and children, and indigenous peoples, and those without legal title to land, and ensure their participation in consultations. Establish a grievance redress mechanism to receive and facilitate resolution of the concerns of displaced persons. Support the social and cultural institutions of displaced persons and their host population. Where involuntary resettlement impacts and risks are highly complex and sensitive, compensation and resettlement decisions should be preceded by a social preparation phase.

Improve, or at least restore, the livelihoods of all displaced persons through;

I. land-based resettlement strategies when affected livelihoods are land based where possible or cash compensation at replacement cost for land when the loss of land does not undermine livelihoods,

II. prompt replacement of assets with access to assets of equal or higher value,

III. prompt compensation at full replacement cost for assets that cannot be restored, and

IV. additional revenues and services through benefit sharing schemes where possible.

Provide physically and economically displaced persons with needed assistance, including the following:

(i) if there is relocation, secured tenure to relocation land, better housing at resettlement sites with comparable access to employment and production opportunities, integration of resettled persons economically and socially into their host communities, and extension of project benefits to host communities;

(ii) transitional support and development assistance, such as land development, credit facilities, training, or employment opportunities; and

(iii) civic infrastructure and community services, as required.

Improve the standards of living of the displaced poor and other vulnerable groups, including women, to at least national 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.

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

Ensure that displaced persons without titles to land or any recognizable legal rights to land are eligible for all compensation, relocation and rehabilitation measures, except land.

Prepare a resettlement plan elaborating on the entitlements of displaced persons, the income and livelihood restoration strategy, institutional arrangements, monitoring and reporting framework, budget, and time-bound implementation schedule. This resettlement plan will be approved by ADB prior to contract award.

Disclose a draft resettlement plan, including documentation of the consultation process in a timely manner, before project appraisal, in an accessible place and a form and language(s) understandable to displaced persons and other stakeholders. Disclose the final resettlement plan and its updates to displaced persons and other stakeholders.

Conceive and execute involuntary resettlement as part of a development project or program. Include the full costs of resettlement in the presentation of project's costs and benefits. For a project with significant involuntary resettlement impacts, consider implementing the involuntary resettlement component of the project as a stand-alone operation.

Pay compensation and provide other resettlement entitlements before physical or economic displacement. Implement the resettlement plan under close supervision throughout project implementation.

Monitor and assess resettlement outcomes, their impacts on the standard of living of displaced persons, and whether the objectives of the resettlement plan have been achieved by taking into account the baseline conditions and the results of resettlement monitoring. Disclose monitoring reports.

13.0 RECOMMENDATIONS

1. To avoid the accident due to land slide on the present Goha-Khellani Road and also to avoid poor geometry of this road, a new alignment is being proposed from the end of the Sudhmahadev-Dranga Tunnel to Khellani town. Also Goha is being connected with a link road which will reduce the travel time, cost of the surroundings area.
2. No household will get displaced in the project area due to the construction of this road. No Displaced person (DPs) in the project area as it will not affect any CPR (Common Property resources) or any livelihood. Therefore, Resettlement Plan will not be needed for the project area.
3. The process of land acquisition must be initialised immediately after the approval of the alignment, to expedite the construction of road.
4. The project can be constructed in 36 months period with strategic planning and through one construction package. The estimated basic cost is given below table.

Table- 56 : Cost Estimate

Section	Design Length (m)	Base Cost / Civil Cost excluding GST (Crore)	Civil Cost including GST @ 6% (Crore)	Construction Cost including centages (Crore)	Total Project Cost (Crore)
Package I-A	7.45	111.3	165.77	191.23	229.72
Link road to Goha	2.016	36.71			
Package I-B	8.73	130.86	146.56	169.07	211.97
Total Cost		**278.87**	**312.33**	**360.3**	**441.69**

Table- 57 : MSA Calculation - Annexure – I

								Khellani on NH-244	
Year	**Standard Bus**	**LCV**	**2 Axle**	**3 Axle**	**MAV**	**Yearly Design ESA**	**Cumulative Design ESA**	**MSA**	**Design Period**
VDF	0.62	0.46	4.93	0.76	3.93				
2019	114	370	358	308	36	347906			
2020	120	407	376	323	38	366541			
2021	126	448	395	340	40	386231			
2022	132	488	414	357	42	406742			
2023	139	532	435	374	44	428387	428387	**0.428**	**1-year**
2024	145	580	457	393	46	451232	879619		
2025	153	632	480	413	48	475347	1354966		
2026	160	689	504	433	51	500808	1855774		
2027	168	744	529	455	53	527233	2383007	**2.383**	**5-year**
2028	177	803	555	478	56	555090	2938096		
2029	186	868	583	502	59	584459	3522555		
2030	195	937	612	527	62	615426	4137981		
2031	205	1012	643	553	65	648081	4786062		
2032	215	1083	675	581	68	681841	5467903	**5.468**	**10-year**
2033	226	1159	709	610	71	717384	6185287		
2034	237	1240	744	640	75	754806	6940093		
2035	249	1327	781	672	79	794208	7734300		
2036	261	1420	821	706	83	835696	8569996		
2037	274	1505	862	741	87	878431	9448427	**9.448**	**15-year**

Table- 58 : Traffic Survey Analysis - Annexure-II

PCU Equivalents	0.5		1		1.5		3		1.5		3		3		4.5		4.5		1.5		Total Fast-Moving Vehicles		Total All Vehicles	
Vehicle Type	FAST MOVING VEHICLES																							
	2-Wheeler		Passenger Car		Bus				LCV		Truck						Agricultural Tractor							
					Mini-Bus		Standard Bus		4 Tyre		2-Axle		3-Axle		Multi Axle		With Trailor		Without Trailor					
Direction	UP	DN	UP	DN	UP	DN	UP	DN	UP	DN	UP	DN	UP	DN	UP	DN	UP	DN	UP	DN	UP	DN	UP	DN
Day 1	445	463	392	369	27	29	27	23	184	195	171	176	146	156	18	12	31	37	16	19	1457	1478	1457	1478
Day 2	478	477	386	370	28	30	22	28	185	192	172	178	152	153	18	20	33	36	19	17	1493	1501	1493	1501
Day 3	463	461	370	358	27	29	28	26	175	194	182	189	149	156	16	18	36	32	14	19	1460	1482	1460	1482
Day 4	412	478	367	379	27	29	36	28	188	182	180	188	141	163	21	12	37	36	16	18	1426	1513	1426	1513
Day 5	453	464	360	379	24	30	31	36	184	182	172	175	160	145	20	21	36	35	17	18	1457	1486	1457	1486
Day 6	465	439	351	388	27	30	23	28	175	178	185	182	163	144	20	19	36	34	16	17	1462	1460	1462	1460
Day 7	461	438	371	358	29	25	28	26	192	182	175	181	160	166	19	17	33	35	18	16	1485	1444	1485	1444
Total	3178	3219	2595	2600	191	204	197	197	1283	1307	1236	1269	1072	1083	131	117	243	246	113	121	10238	10363	10238	10363
Total Up/Down	6397		5196		395		394		2590		2506		2155		248		488		234		20602		20602	
Average	453	459	370	371	27	29	28	28	183	186	176	181	153	154	18	16	34	35	16	17	1458	1476	1458	1476
AADT No.	914		743		57		57		370		358		308		36		70		34		2947		2947	
AADT PCU	457		743		86		171		555		1074		924		162		315		51		4538		4538	

PCU Equivalents	0.5		1		1.5		3		1.5		3		3		4.5		4.5		1.5		Total Fast-Moving Vehicles		Total All Vehicles	
Vehicle Type	FAST MOVING VEHICLES																							
	2-Wheeler		Passenger Car		Bus				LCV		Truck						Agricultural Tractor							
					Mini Bus		Standard Bus		4 Tyre		2-Axle		3-Axle		Multi Axle		With Trailor		Without Trailor					
Direction	UP	DN	UP	DN	UP	DN	UP	DN	UP	DN	UP	DN	UP	DN	UP	DN	UP	DN	UP	DN	UP	DN	UP	DN
Day 1	456	475	402	378	28	30	28	24	189	200	175	180	150	160	18	12	32	38	16	19	1494	1516	1494	1516
Day 2	490	489	396	379	29	31	23	29	190	197	176	183	156	157	18	20	34	37	19	17	1531	1539	1531	1501
Day 3	475	473	379	367	28	30	29	27	179	199	187	194	153	160	16	18	37	33	14	19	1497	1520	1497	1520
Day 4	423	490	376	389	28	30	37	29	193	187	185	193	145	167	22	12	38	37	16	18	1463	1552	1463	1552
Day 5	465	476	369	389	25	31	32	37	189	187	176	179	164	149	20	22	37	36	17	18	1494	1524	1494	1524
Day 6	477	450	360	398	28	31	24	29	179	183	190	187	167	148	21	19	37	35	16	17	1499	1497	1499	1497
Day 7	473	449	380	367	30	26	29	27	197	187	179	186	164	170	19	17	34	36	18	16	1523	1481	1523	1481
Total	3259	3302	2662	2667	196	209	202	202	1316	1340	1268	1302	1099	1111	134	120	249	252	116	124	10501	10629	10501	10591
Total Up/ Down	6561		5329		405		404		2656		2570		2210		254		501		240		21130		21092	
Average	465	472	381	381	28	30	29	29	188	192	182	186	157	159	20	18	36	36	17	18	1503	1521	1503	1521
ADT No.	938		762		58		58		380		368		316		37		72		35		3024		3024	
ADT PCU	469		762		87		174		570		1104		948		167		324		53		4657		4657	