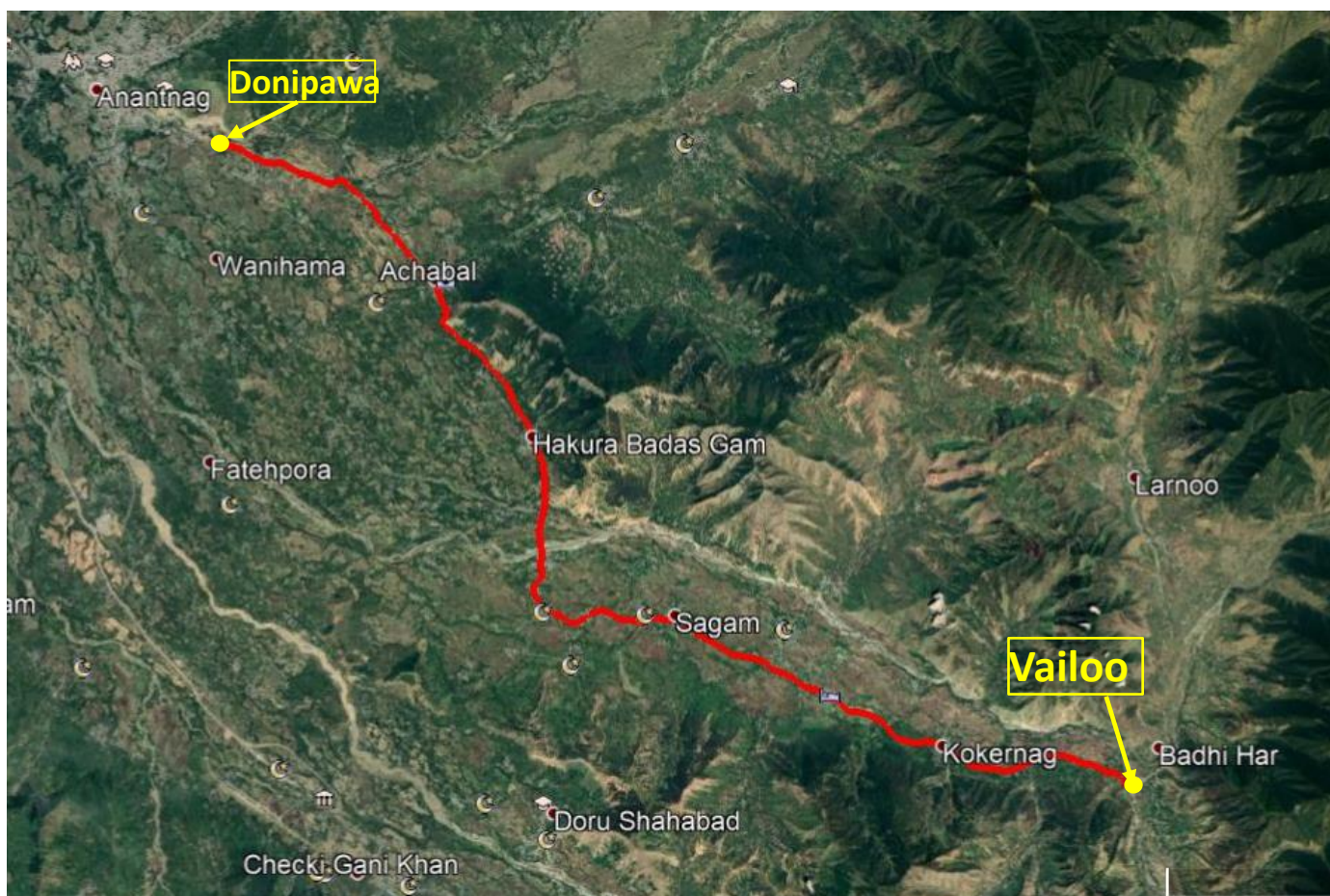


NATIONAL HIGHWAYS & INFRASTRUCTURE DEVELOPMENT CORPORATION LTD.

(MINISTRY OF ROAD TRANSPORT & HIGHWAYS, GOVT. OF INDIA)

3RD FLOOR, PTI BUILDING, 4-PARLIAMENT STREET, NEW DELHI – 110001

Consultancy Services for Feasibility Study, Preparation of Detailed Project Report and providing pre-construction services for upgradation to 2 lane with paved shoulder from (i) Km 44.500 to Km 142.000 of Chattroo Village & (ii) Km 235.00 (Vailoo Village) to Km 269.00 (Khanabal) of Khellani- Kishtwar- Chattroo- Khanabal Section of NH 244 in the state of Jammu & Kashmir



FINAL DETAILED PROJECT REPORT VAILOO TO DONIPAWA SECTION VOLUME-I B: HYDROLOGY REPORT

NOVEMBER 2020



RODIC CONSULTANTS PVT. LTD.

IN JV WITH



MONARCH SURVEYORS AND ENGINEERING CONSULTANTS PVT. LTD.

**HYDRAULIC CALCULATION FOR MINOR
BRIDGE AT CH. 158+054**

Name of River / Stream / Nala	Chainage(km)
Local Stream	9.465

Sr. No.	Segmental Length(m)	Cumulative Segmental Length(m)	Elevation (m)
1	0	0	1844
2	1000	1000	1892
3	1000	2000	1933
4	1000	3000	1987
5	1000	4000	2044
6	1000	5000	2243
7	1000	6000	2468
8	1000	7000	2664
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			

Catchment Area in Sq Km(A)	0.15
Longest Stream Length in Km (L)	7
Centroid Length in Km (Lc)	3.00
Point Rainfall Value (50 years)in mm	220
Point Rainfall Value (100 years)in mm	220
Subzone =	7

1 Empirical Method

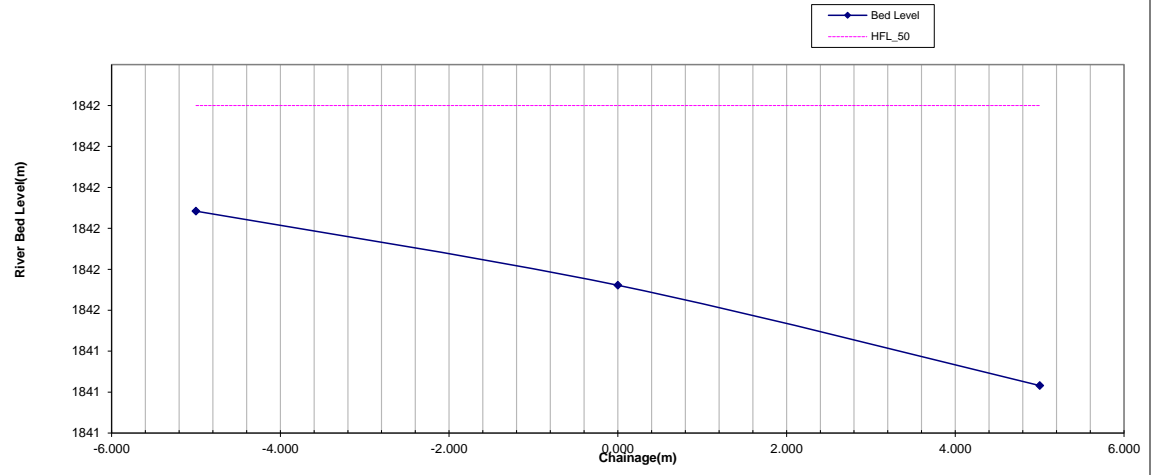
Dickens Formula	Q	=	CA ^(3/4)	
	A	=	0.15	Km ²
	C	=	19	
	Q	=	5	Cumecs

2 Rational method

Catchment Area, A	=	0.15	Km ²	=	15.000 Hectares
Length of longest stream	=	7.000	Km		
Height, H	=	820.00	m		
Time of Concentration by SP-13 formula	=	(0.87*L ³ /H) ^{0.385}			
tc	=	0.68	Hours		
50 years Return period rainfall for 24 hours as per CWC Flood Estimation Report for subzone 7	=	220	mm		
tp	=	3.55			
Design storm duration	=	3.9	hrs		
Conversion ratio for tc hours as per CWC FER for Subzone- 7	=	0.600			
tc hr rainfall	=	132.00	mm		
From code SP 13 Intensity of rainfall, Ic	=	13.66	cm/hr		
		19.48	cm/hr		
100 years Return period rainfall for 24 hours as per CWC Flood Estimation Report for subzone 7		220.00	mm		
Conversion ratio for tc hours as per CWC FER for Subzone- 7		0.600			
Conversio					
tc hr rainfall	=	132.00	mm		
From code SP 13 Intensity of rainfall, Ic	=	13.66	cm/hr		
		19.48	cm/hr		
From code SP 13 ' f ' Curve, Spread factor ' f '	=	1.000			
Runoff Co-efficient as per terrain condition, P	=	0.7			
Design discharge, Q50	=	0.0278PfAIc	Cumecs		
	=	3.99	Cumecs	Say Q50=	4
Design discharge, Q100	=	0.0278PfAIc	Cumecs		
	=	3.99	Cumecs	Say Q100=	4

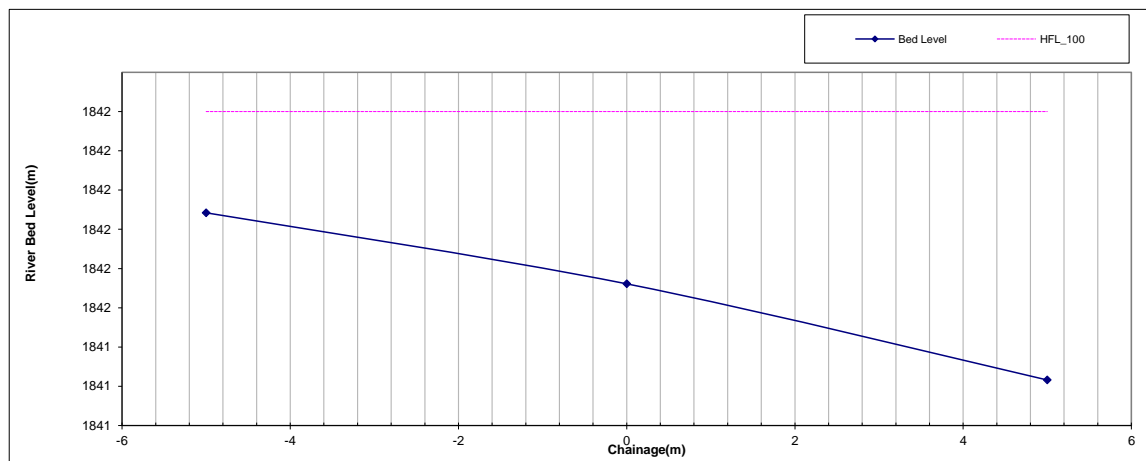
CROSS SECTION AT BRIDGE

Unobstructed Width	W	10.000
Gross length of structure		10.000



CROSS SECTION AT BRIDGE

[illegible]



Hydrological and Hydraulic Parameters relating to Proposed Bridge across Local River at Ch. 09+465 of Vailoo-Donipawa (NH-244)

Deepest Bed Level	1841.316	m	
HFL information received from local official	1842	m	
Waterway available (Abutment to Abutment)	10	m	
Top of Deck	1843.219	m GTS	
HFL information received from local enquiry	0.8m above LBL	m GTS	

Discharge Calculation

Catchment Area =	0.15	Sq. Km
Discharge by Rational Formula (Q50) =	3.99	Cumec
Discharge by Rational Formula (Q100) =	3.99	Cumec
Discharge by Unit Hydrograph Method (Q50) =	1.58	Cumec
Discharge by Unit Hydrograph Method (Q100) =	1.58	Cumec
Discharge by Dicken's Formula =	4.58	Cumec

Adopted Discharge

Second max discharge	6.869313	Cumec
For Fixing Effective Clear Waterway normal to flow	3.99	Cumec
For Fixing HFL	3.99	Cumec
Max. Discharge	3.99	Cumec

Waterway

Wetted perimeter as per Lacey's Formula	9.0	m
Waterway Provided (Abutment to Abutment)	10.0	m
Fluming ratio	1.11	m

OK

Summary of Calculation for Proposed Bridge	A 10 m Total Waterway seems to be adequate.					
Waterway available (m)	Afflux h (m)		Vel under Bridge (m/sec)		HFL (m) with afflux	
L (m)	Q50	Q100	Q50	Q100	Q50	Q100
10	0.000	0.000	0.72	0.72	1842.00	1842.00

Scour Calculation

There is no need to calculate the scour in Hard Rocky Strata.

Note:-

As per Geotechnical investigation Report it appears that below 1.5m to 3m depth in river bed there is a grayish color highly weathered & fractured basalt where scouring possibility is negligible.

Recommendation

It is recommended the proposed Bridge of 10m waterway subject to Structural Adequacy.

**HYDRAULIC CALCULATION FOR MINOR
BRIDGE AT CH. 159+297**

Name of River / Stream / Nala	Chainage(km)
Local Stream	10.708

Sr. No.	Segmental Length(m)	Cumulative Segmental Length(m)	Elevation (m)
1	0	0	1819
2	500	500	1833
3	500	1000	1854
4	500	1500	1868
5	300	1800	1896
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			

Catchment Area in Sq Km(A)	0.11
Longest Stream Length in Km (L)	1.8
Centroid Length in Km (Lc)	0.80
Point Rainfall Value (50 years)in mm	220
Point Rainfall Value (100 years)in mm	220
Subzone =	7

1 Empirical Method

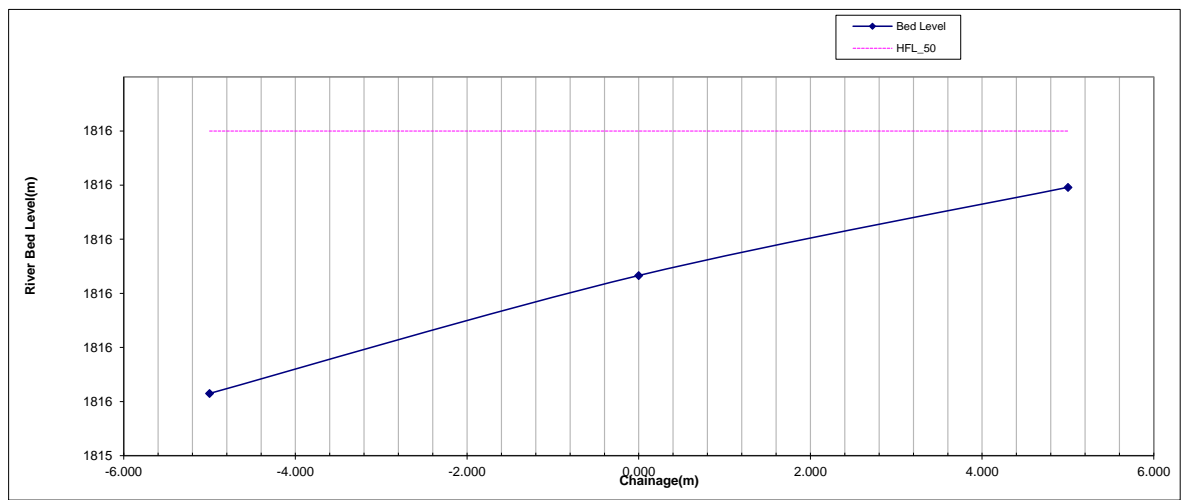
Dickens Formula	Q	=	CA ^(3/4)	
	A	=	0.11	Km ²
	C	=	19	
	Q	=	4	Cumecs

2 Rational method

Catchment Area, A	=	0.11	Km ²	=	11.000 Hectares
Length of longest stream	=	1.800	Km		
Height, H	=	77.00	m		
Time of Concentration by SP-13 formula	=	$(0.87 \cdot L^3 / H)^{0.385}$			
tc	=	0.35	Hours		
50 years Return period rainfall for 24 hours as per CWC Flood Estimation Report for subzone 7	=	220	mm		
tp	=	1.75			
Design storm duration	=	1.9	hrs		
Conversion ratio for tc hours as per CWC FER for Subzone- 7	=	0.600			
tc hr rainfall	=	132.00	mm		
From code SP 13 Intensity of rainfall, Ic	=	16.96	cm/hr		
		37.61	cm/hr		
100 years Return period rainfall for 24 hours as per CWC Flood Estimation Report for subzone 7		220.00	mm		
Conversion ratio for tc hours as per CWC FER for Subzone- 7		0.600			
Conversion ratio for tc hours as per CWC FER for Subzone- 7		0.600			
tc hr rainfall	=	132.00	mm		
From code SP 13 Intensity of rainfall, Ic	=	16.96	cm/hr		
		37.61	cm/hr		
From code SP 13 ' f ' Curve, Spread factor ' f '	=	1.000			
Runoff Co-efficient as per terrain condition, P	=	0.7			
Design discharge, Q50	=	0.0278PfA Ic	Cumecs		
	=	3.63	Cumecs	Say Q50=	4
Design discharge, Q100	=	0.0278PfA Ic	Cumecs		
	=	3.63	Cumecs	Say Q100=	4

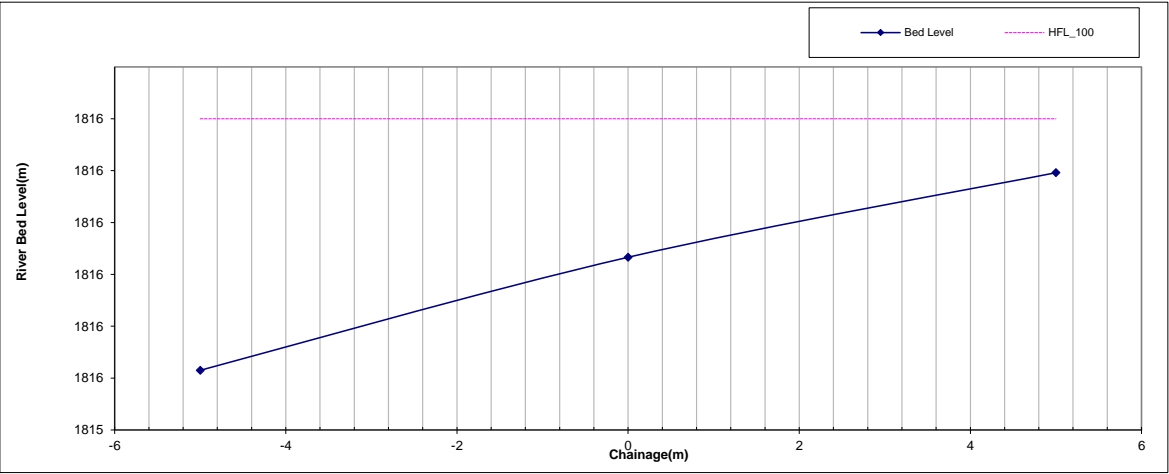
CROSS SECTION AT BRIDGE

[illegible]



CROSS SECTION AT BRIDGE

Unobstructed Width	W	10.000
Gross length of structure		10.000



Hydrological and Hydraulic Parameters relating to Proposed Bridge across Local River at Ch. 10+708 of Vailoo-Donipawa (NH-244)

Deepest Bed Level	1815.515	m	
HFL information received from local official	1816	m	
Waterway available (Abutment to Abutment)	10	m	
Top of Deck	1816.41	m GTS	
HFL information received from local enquiry	0.5m above LBL	m GTS	

Discharge Calculation

Catchment Area =	0.11	Sq. Km
Discharge by Rational Formula (Q50) =	3.63	Cumec
Discharge by Rational Formula (Q100) =	3.63	Cumec
Discharge by Unit Hydrograph Method (Q50) =	0.69	Cumec
Discharge by Unit Hydrograph Method(Q100) =	0.69	Cumec
Discharge by Dicken's Formula =	3.63	Cumec

Adopted Discharge

Second max discharge	5.44364	Cumec
For Fixing Effective Clear Waterway normal to flow	3.63	Cumec
For Fixing HFL	3.63	Cumec
Max. Discharge	3.63	Cumec

Waterway

Wetted perimeter as per Lacey's Formula	8.6	m
Waterway Provided (Abutment to Abutment)	10.0	m
Fluming ratio	1.17	m

OK

Summary of Calculation for Proposed Bridge	A 10 m Total Waterway seems to be adequate.					
Waterway available (m)	Afflux h (m)		Vel under Bridge (m/sec)		HFL (m) with afflux	
L (m)	Q50	Q100	Q50	Q100	Q50	Q100
10	0.000	0.000	0.52	0.52	1816.00	1816.00

Scour Calculation

There is no need to calculate the scour in Hard Rocky Strata.

Note:-

As per Geotechnical investigation Report it appears that below 1.5m to 3m depth in river bed there is a grayish color highly weathered & fractured basalt where scouring possibility is negligible.

Recommendation

It is recommended the proposed Bridge of 10m waterway subject to Structural Adequacy.

**HYDRAULIC CALCULATION FOR MINOR
BRIDGE FOR CH. 164+396**

Name of River / Stream / Nala	Chainage(km)
Local Stream	15.807

Sr. No.	Segmental Length(m)	Cumulative Segmental Length(m)	Elevation (m)
1	0	0	1752
2	5000	5000	1840
3	5000	10000	2232
4	5000	15000	2543
5	5000	20000	3011
6	5000	25000	3308
7	5000	30000	3826
8	5000	35000	4179
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			

Catchment Area in Sq Km(A)	0.27
Longest Stream Length in Km (L)	35
Centroid Length in Km (Lc)	17.00
Point Rainfall Value (50 years)in mm	220
Point Rainfall Value (100 years)in mm	240
Subzone =	7

1 Empirical Method

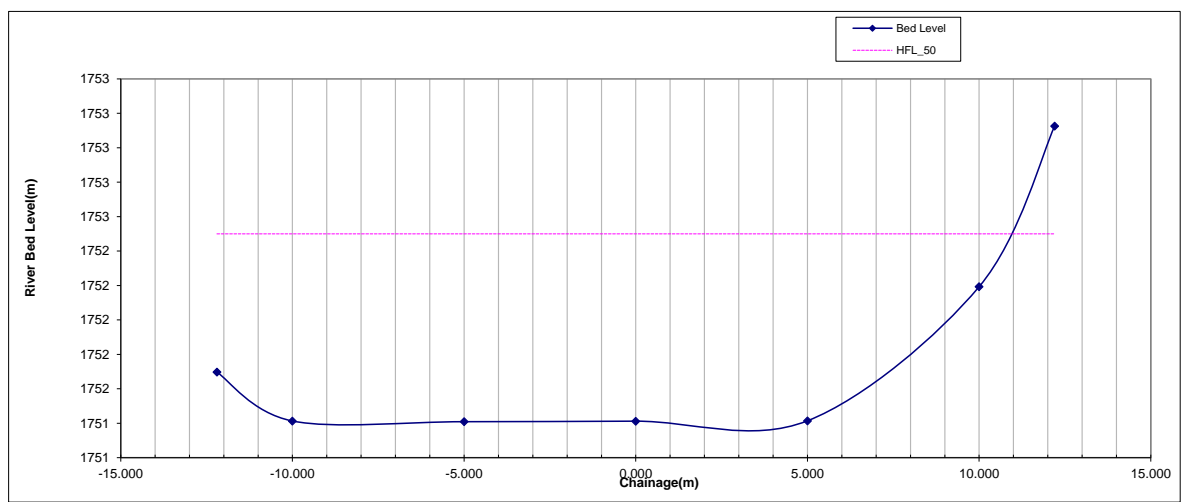
Dickens Formula	Q	=	CA ^(3/4)	
	A		0.27	Km ²
	C	=	19	
	Q		7	Cumecs

2 Rational method

Catchment Area, A	=	0.27	Km ²	=	27.000 Hectares
Length of longest stream	=	35.000	Km		
Height, H	=	2074.00	m		
Time of Concentration by SP-13 formula	=	$(0.87 \cdot L^3 / H)^{0.385}$			
tc	=	3.04	Hours		
50 years Return period rainfall for 24 hours as per CWC Flood Estimation Report for subzone 7	=	220	mm		
tp	=	8.64			
Design storm duration	=	9.5	hrs		
Conversion ratio for tc hours as per CWC FER for Subzone- 7	=	0.695			
tc hr rainfall	=	152.90	mm		
From code SP 13 Intensity of rainfall, Ic	=	5.67	cm/hr		
		5.03	cm/hr		
100 years Return period rainfall for 24 hours as per CWC Flood Estimation Report for subzone 7		240.00	mm		
Conversion ratio for tc hours as per CWC FER for Subzone- 7		0.695			
Conversion ratio for tc hours as per CWC FER for Subzone- 7		0.695			
tc hr rainfall	=	166.80	mm		
From code SP 13 Intensity of rainfall, Ic	=	6.19	cm/hr		
		5.48	cm/hr		
From code SP 13 ' f ' Curve, Spread factor ' f '	=	1.000			
Runoff Co-efficient as per terrain condition, P	=	0.7			
Design discharge, Q50	=	0.0278PfA Ic	Cumecs		
	=	2.98	Cumecs	Say Q50=	3
Design discharge, Q100	=	0.0278PfA Ic	Cumecs		
	=	3.25	Cumecs	Say Q100=	3

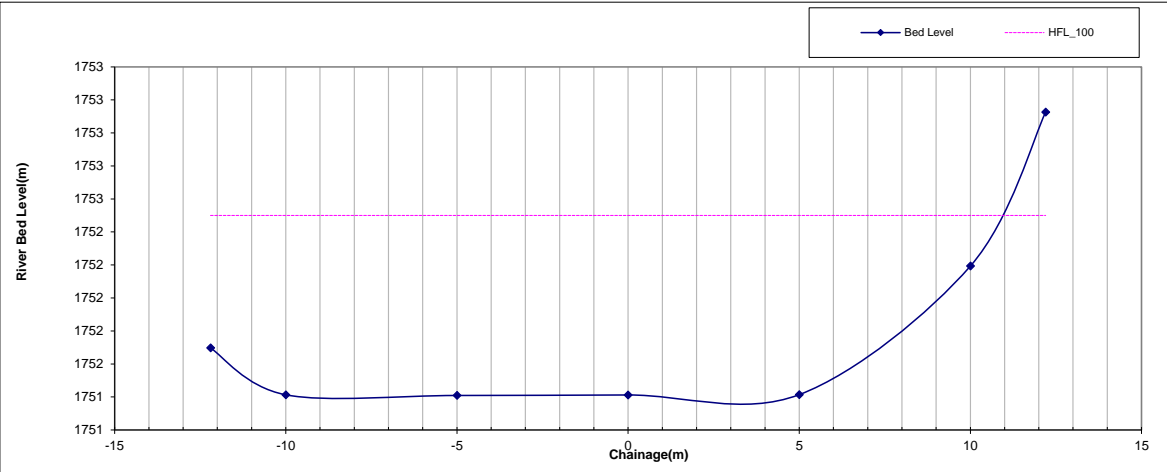
CROSS SECTION AT BRIDGE

[illegible]



CROSS SECTION AT BRIDGE

Unobstructed Width	W	24.400
Gross length of structure		24.400



Hydrological and Hydraulic Parameters relating to Proposed Bridge across Local River at Ch. 15+807 of Vailoo-Donipawa (NH-244)

Deepest Bed Level	1751.409	m	
HFL information received from local official	1752.5	m	
Waterway available (Abutment to Abutment)	24.4	m	
Top of Deck	1756.14	m GTS	
HFL information received from local enquiry	1m above LBL	m GTS	

Discharge Calculation

Catchment Area =	0.27	Sq. Km
Discharge by Rational Formula (Q50) =	2.98	Cumec
Discharge by Rational Formula (Q100) =	3.25	Cumec
Discharge by Unit Hydrograph Method (Q50) =	2.98	Cumec
Discharge by Unit Hydrograph Method(Q100) =	3.25	Cumec
Discharge by Unit Hydrograph Method (Q50) =	33.07	Cumec
Discharge by Unit Hydrograph Method(Q100) =	33.07	Cumec
Discharge by Dicken's Formula =	7.12	Cumec

Adopted Discharge

Second max discharge	10.675	Cumec
For Fixing Effective Clear Waterway normal to flow	3.25	Cumec
For Fixing HFL	3.25	Cumec
Max. Discharge	10.67	Cumec

Waterway

Wetted perimeter as per Lacey's Formula	15.7	m
Waterway Provided (Abutment to Abutment)	24.4	m
Fluming ratio	1.56	m

OK

Summary of Calculation for Proposed Bridge	A 24.4 m Total Waterway seems to be adequate.					
Waterway available (m)	Afflux h (m)		Vel under Bridge (m/sec)		HFL (m) with afflux	
L (m)	Q50	Q100	Q50	Q100	Q50	Q100
24.4	0.000	0.000	1.91	1.91	1752.50	1752.50

Scour Calculation

There is no need to calculate the scour in Hard Rocky Strata.

Note:-

As per Geotechnical investigation Report it appears that below 1.5m to 3m depth in river bed there is a grayish color highly weathered & fractured basalt where scouring possibility is negligible.

Recommendation

It is recommended to retain the Existing Bridge of 24.4m waterway subject to Structural Adequacy.

**HYDRAULIC CALCULATION FOR MINOR
BRIDGE AT CH. 164+729**

Name of River / Stream / Nala	Chainage(km)
Local Stream	16.14

Sr. No.	Segmental Length(m)	Cumulative Segmental Length(m)	Elevation (m)
1	0	0	1752
2	5000	5000	1840
3	5000	10000	2232
4	5000	15000	2543
5	5000	20000	3011
6	5000	25000	3308
7	5000	30000	3826
8	1400	31400	4015
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			

Catchment Area in Sq Km(A)	1.06
Longest Stream Length in Km (L)	31.4
Centroid Length in Km (Lc)	6.00
Point Rainfall Value (50 years)in mm	220
Point Rainfall Value (100 years)in mm	240
Subzone =	7

1 Empirical Method

Dickens Formula	Q	=	CA ^(3/4)	
	A	=	1.06	Km ²
	C	=	19	
	Q	=	20	Cumecs

2 Rational method

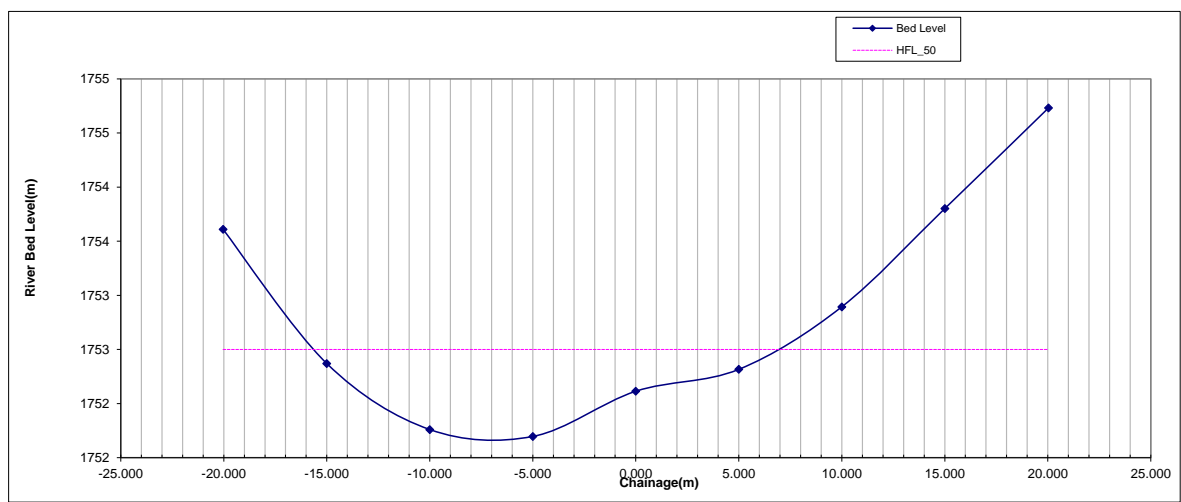
Catchment Area, A	=	1.06	Km ²	=	106.000 Hectares
Length of longest stream	=	31.400	Km		
Height, H	=	2074.00	m		
Time of Concentration by SP-13 formula	=	$(0.87 \cdot L^3 / H)^{0.385}$			
tc	=	2.68	Hours		
50 years Return period rainfall for 24 hours as per CWC Flood Estimation Report for subzone 7	=	220	mm		
tp	=	6.36			
Design storm duration	=	7.0	hrs		
Conversion ratio for tc hours as per CWC FER for Subzone- 7	=	0.695			
tc hr rainfall	=	152.90	mm		
From code SP 13 Intensity of rainfall, Ic	=	6.22	cm/hr		
		5.70	cm/hr		
100 years Return period rainfall for 24 hours as per CWC Flood Estimation Report for subzone 7		240.00	mm		
Conversion ratio for tc hours as per CWC FER for Subzone- 7		0.695			
Conversion ratio for tc hours as per CWC FER for Subzone- 7		0.695			
tc hr rainfall	=	166.80	mm		
From code SP 13 Intensity of rainfall, Ic	=	6.79	cm/hr		
		6.22	cm/hr		
From code SP 13 ' f ' Curve, Spread factor ' f '	=	0.999			
Runoff Co-efficient as per terrain condition, P	=	0.7			
Design discharge, Q50	=	0.0278PfA Ic	Cumecs		
	=	12.82	Cumecs	Say Q50=	
Design discharge, Q100	=	0.0278PfA Ic	Cumecs		
	=	13.98	Cumecs	Say Q100=	

13

14

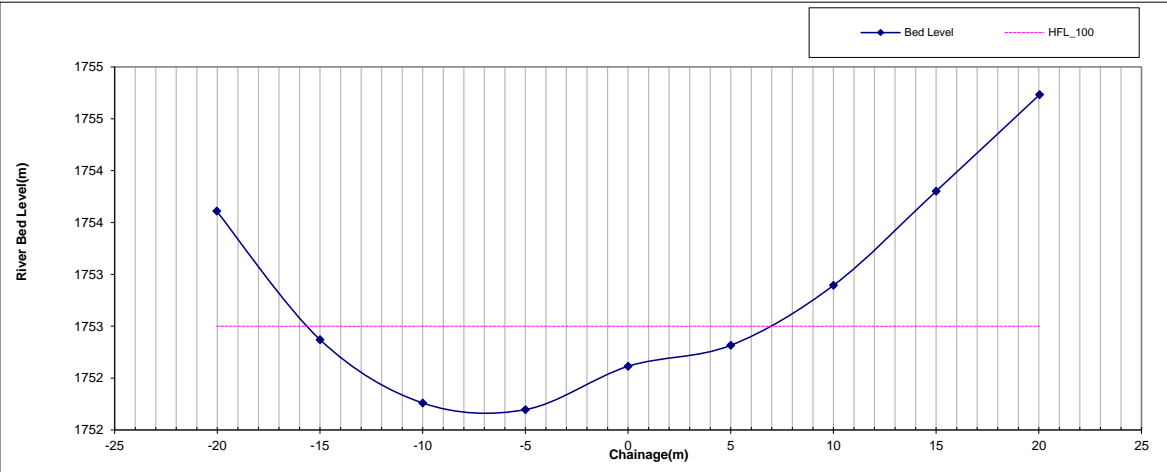
CROSS SECTION AT BRIDGE

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CROSS SECTION AT BRIDGE

Unobstructed Width	W	40.700
Gross length of structure		40.700



**Hydrological and Hydraulic Parameters relating to Proposed Bridge across Local River at Ch.
16+140 of Vailoo-Donipawa (NH-244)**

Deepest Bed Level	1751.696	m	
HFL information received from local official	1752.5	m	
Waterway available (Abutment to Abutment)	40.7	m	
Top of Deck	1757.3	m GTS	
HFL information received from local enquiry	1m above LBL	m GTS	

Discharge Calculation

Catchment Area =	1.06	Sq. Km
Discharge by Rational Formula (Q50) =	12.82	Cumec
Discharge by Rational Formula (Q100) =	13.98	Cumec
Discharge by Dicken's Formula =	19.85	Cumec

Adopted Discharge

Second max discharge	29.77311	Cumec
For Fixing Effective Clear Waterway normal to flow	13.98	Cumec
For Fixing HFL	13.98	Cumec
For Estimation of Scour	18.18	Cumec
Max. Discharge	29.77	Cumec

Waterway

Wetted perimeter as per Lacey's Formula	26.2	m
Waterway Provided (Abutment to Abutment)	40.7	m
Fluming ratio	1.55	m

OK

Summary of Calculation for Proposed Bridge	A 40.7 m Total Waterway seems to be adequate.					
Waterway available (m)	Afflux h (m)		Vel under Bridge (m/sec)		HFL (m) with afflux	
L (m)	Q50	Q100	Q50	Q100	Q50	Q100
40.7	0.000	0.000	1.63	1.63	1752.50	1752.50

Scour Calculation

There is no need to calculate the scour in Hard Rocky Strata.

Note:-

As per Geotechnical investigation Report it appears that below 1.5m to 3m depth in river bed there is a grayish color highly weathered & fractured basalt where scouring possibility is negligible.

Recommendation

It is recommended to retain the Existing Bridge of 40.7m waterway subject to Structural Adequacy.

**HYDRAULIC CALCULATION FOR MINOR
BRIDGE AT CH. 170+424**

Name of River / Stream / Nala	Chainage(km)
Local Stream	21.865

Sr. No.	Segmental Length(m)	Cumulative Segmental Length(m)	Elevation (m)
1	0	0	1666
2	500	500	1692
3	500	1000	1723
4	300	1300	1746
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			

Catchment Area in Sq Km(A)	0.15
Longest Stream Length in Km (L)	1.3
Centroid Length in Km (Lc)	1.00
Point Rainfall Value (50 years)in mm	180
Point Rainfall Value (100 years)in mm	180
Subzone =	7

1 Empirical Method

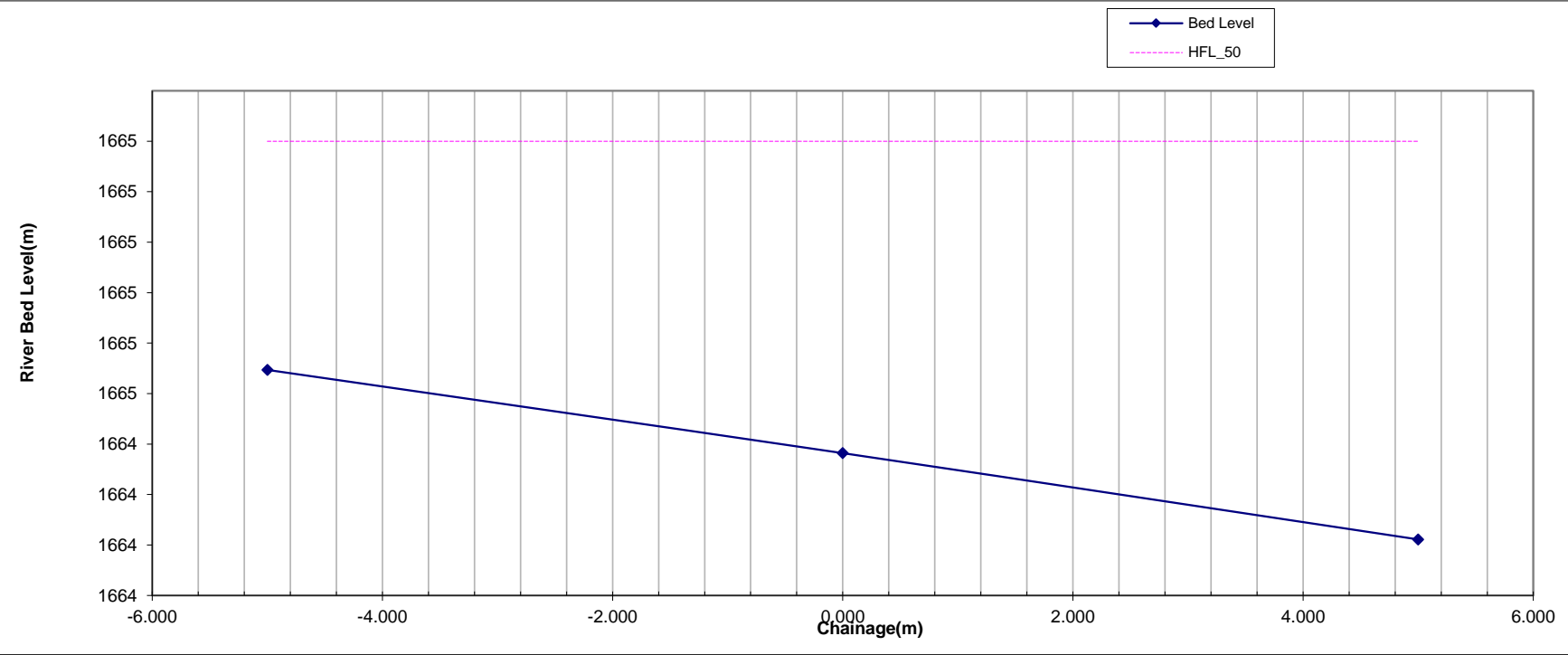
Dickens Formula	Q	=	CA ^(3/4)	
	A		0.15	Km ²
	C	=	14	
	Q		3	Cumecs

2 Rational method

Catchment Area, A	=	0.15	Km ²	=	15.000 Hectares
Length of longest stream	=	1.300	Km		
Height, H	=	80.00	m		
Time of Concentration by SP-13 formula	=	$(0.87 * L^3 / H)^{0.385}$			
tc	=	0.24	Hours		
50 years Return period rainfall for 24 hours as per CWC Flood Estimation Report for subzone 7	=	180	mm		
tp	=	1.70			
Design storm duration	=	1.9	hrs		
Conversion ratio for tc hours as per CWC FER for Subzone- 7	=	0.600			
tc hr rainfall	=	108.00	mm		
From code SP 13 Intensity of rainfall, Ic	=	15.15	cm/hr		
		45.48	cm/hr		
100 years Return period rainfall for 24 hours as per CWC Flood Estimation Report for subzone 7		180.00	mm		
Conversion ratio for tc hours as per CWC FER for Subzone- 7		0.600			
Conversio					
tc hr rainfall	=	108.00	mm		
From code SP 13 Intensity of rainfall, Ic	=	15.15	cm/hr		
		45.48	cm/hr		
From code SP 13 ' f ' Curve, Spread factor ' f '	=	1.000			
Runoff Co-efficient as per terrain condition, P	=	0.7			
Design discharge, Q50	=	0.0278PfAIc	Cumecs		
	=	4.42	Cumecs	Say Q50=	4
Design discharge, Q100	=	0.0278PfAIc	Cumecs		
	=	4.42	Cumecs	Say Q100=	4

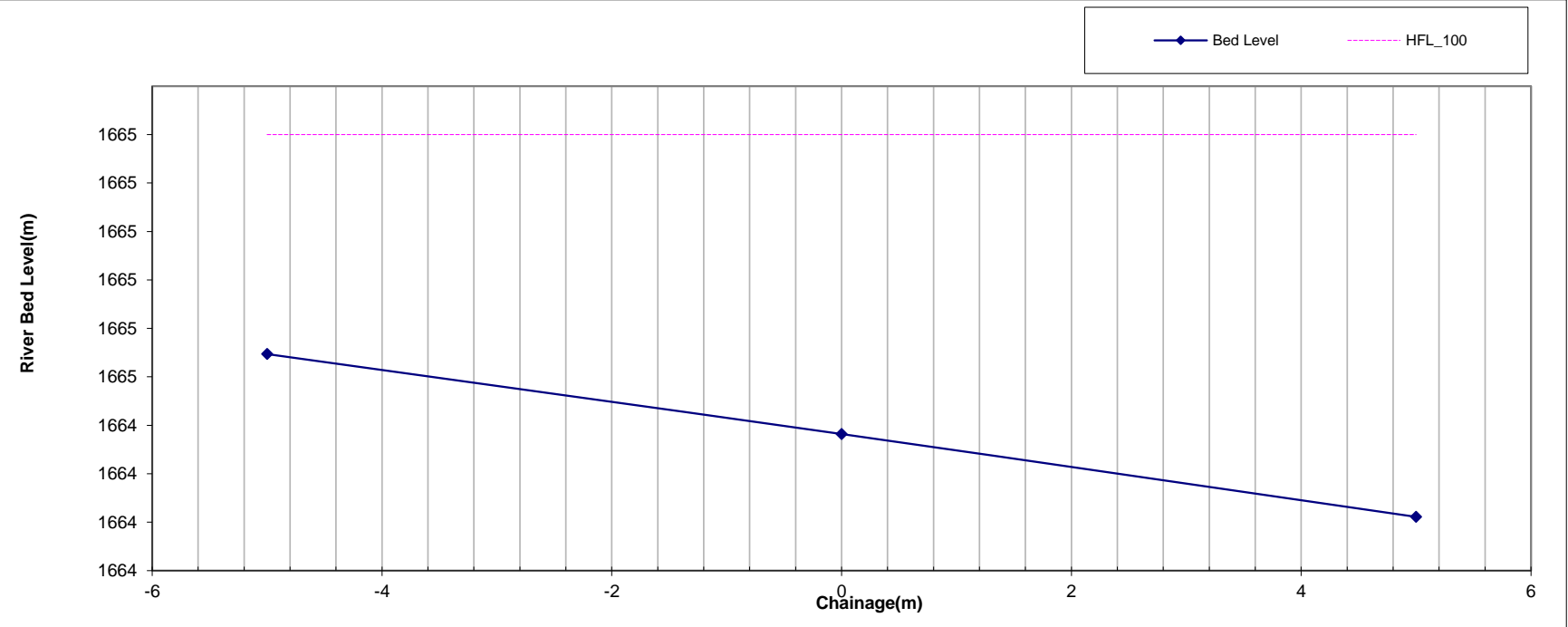
CROSS SECTION AT BRIDGE

HFL _50	1665.00	Q50= 4							
Offset(m)	Bed Level	Natural HFL	LWL	Distance	h	Avg h	Diff in h	Area	Perimeter
(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m ²)	(m)
			1664.211	0.000	0.000	0.000	0.000	0.000	0.000
			1664.211	0.000	0.000	0.000	0.000	0.000	0.000
			1664.211	0.000	0.000	0.000	0.000	0.000	0.000
			1664.211	0.000	0.000	0.000	0.000	0.000	0.000
			1664.211	0.000	0.000	0.000	0.000	0.000	0.000
			1664.211	0.000	0.000	0.000	0.000	0.000	0.000
			1664.211	0.000	0.000	0.000	0.000	0.000	0.000
			1664.211	0.000	0.000	0.000	0.000	0.000	0.000
			1664.211	0.000	0.000	0.000	0.000	0.000	0.000
			1664.211	0.000	0.000	0.000	0.000	0.000	0.000
			1664.211	0.000	0.000	0.000	0.000	0.000	0.000
			1664.211	0.000	0.000	0.000	0.000	0.000	0.000
			1664.211	0.000	0.000	0.000	0.000	0.000	0.000
-5.000	1664.547	1665	1664.211	-5.000	0.453	0.226	0.453	-1.132	5.020
0.000	1664.382	1665	1664.211	5.000	0.618	0.535	0.165	2.677	5.003
5.000	1664.211	1665	1664.211	5.000	0.789	0.703	0.171	3.517	5.003
			1664.211	-5.000	0.000	0.394	0.789	-1.972	5.062
			1664.211	0.000	0.000	0.000	0.000	0.000	0.000
			1664.211	0.000	0.000	0.000	0.000	0.000	0.000
			1664.211	0.000	0.000	0.000	0.000	0.000	0.000
			1664.211	0.000	0.000	0.000	0.000	0.000	0.000
			1664.211	0.000	0.000	0.000	0.000	0.000	0.000
			1664.211	0.000	0.000	0.000	0.000	0.000	0.000
			1664.211	0.000	0.000	0.000	0.000	0.000	0.000
			1664.211	0.000	0.000	0.000	0.000	0.000	0.000
			1664.211	0.000	0.000	0.000	0.000	0.000	0.000
			1664.211	0.000	0.000	0.000	0.000	0.000	0.000
			1664.211	0.000	0.000	0.000	0.000	0.000	0.000
			1664.211	0.000	0.000	0.000	0.000	0.000	0.000
			1664.211	0.000	0.000	0.000	0.000	0.000	0.000
			1664.211	0.000	0.000	0.000	0.000	0.000	0.000
							Sum =	3.090	20.088
								R	0.154
								n	0.055
								K	16.1291101
								S	0.03
								V	0.90
								Keq	16.12911
								Q	2.79
								Dd (max)	0.789
								Dd (av)	0.310
						Unobstructed Width		W	10.000
						Gross length of structure			10.000



CROSS SECTION AT BRIDGE

[illegible]



Hydrological and Hydraulic Parameters relating to Proposed Bridge across Local River at Ch. 21+865 of Vailoo-Donipawa (NH-244)

Deepest Bed Level	1664.211	m	
HFL information received from local official	1665	m	
Waterway available (Abutment to Abutment)	10	m	
Top of Deck	1667	m GTS	
HFL information received from local enquiry	0.8m above LBL	m GTS	

Discharge Calculation

Catchment Area =	0.15	Sq. Km
Discharge by Rational Formula (Q50) =	4.42	Cumec
Discharge by Rational Formula (Q100) =	4.42	Cumec
Discharge by Unit Hydrograph Method (Q50) =	2.79	Cumec
Discharge by Unit Hydrograph Method(Q100) =	2.79	Cumec
Discharge by Dicken's Formula =	3.37	Cumec

Adopted Discharge

Second max discharge	4.190466	Cumec
For Fixing Effective Clear Waterway normal to flow	4.42	Cumec
For Fixing HFL	4.42	Cumec
Max. Discharge	4.42	Cumec

Waterway

Wetted perimeter as per Lacey's Formula	9.5	m
Waterway Provided (Abutment to Abutment)	10.0	m
Fluming ratio	1.06	m OK

Summary of Calculation for Proposed Bridge	A 10 m Total Waterway seems to be adequate.					
Waterway available (m)	Afflux h (m)		Vel under Bridge (m/sec)		HFL (m) with afflux	
L (m)	Q50	Q100	Q50	Q100	Q50	Q100
10	0.000	0.000	0.9	0.9	1665.00	1665.00

Scour Calculation

There is no need to calculate the scour in Hard Rocky Strata.

Note:-

As per Geotechnical investigation Report it appears that below 1.5m to 3m depth in river bed there is a grayish color highly weathered & fractured basalt where scouring possibility is negligible.

Recommendation

It is recommended the proposed Bridge of 10m waterway subject to Structural Adequacy.