Corrigendum-2

No. - NHIDCL/ Assam/Civil work/Dimapur Bypass (Assam Portion)/ 2017 **Date: 18.05.2017**

To,

All prospective bidders

Subject: Reply of 'Pre-Bid Queries' and Amendments in 'Schedule A, D and J' for the project **"Construction of Dimapur Bypass (Assam Portion) of 4/6 lane pavement on EPC basis from existing Km 159.400 of NH-36 to existing Km 102.500 of NH-39 and upto end point of Assam portion [Design Km 118.050 to design Km 132.375] (length 14.325 Km) in the State of Assam under Phase-A of SARDP-NE**

Sir,

1. The bid for the subject project was invited on 23/03/2017 with extended bid due date being 01/06/2017 (1100 Hrs).

2. Further reply of pre-bid queries and amendments in schedule 'A, D and J enclosed with this corrigendum.

3. The Hydrological modeling/Analysis is also attached with this corrigendum.

4. All the bidders are requested to follow the enclosed Amendments in Schedules as mentioned above.

Y.C Srivastava
GM (T)

Enclosure-

1. Annexure- 1; Reply of Pre- bid queries,
2. Annexure-2; Amendment in Schedule A, D, and J,
3. Annexure-3; Hydrological modeling/Analysis.

Annexure- 1

The replies for the Pre-Bid queries by this division is tabulated below-

Sl. No	*Ref.of Item*	*Queries by bidders*	Reply by NHIDCL
1	Geotechnical Report	*Kindly provide us the Geotechnical report of the project.*	**This has been uploaded on eprocure (CPPP)/NHIDCL website in Vol-III (Material Report) of final DPR. ***
2	Plan & Profile	*In some locations Vertical profile is designed for SSD, but as per manual, it has to be designed for ISD which will increase the approach length. Kindly clarify whether these particular locations are to be designed for SSD or ISD.*	**In DPR, Safe Stopping Site Distance assumed however the contractor can design it as per EPC contract agreement as per standards and good industrial practise. ***
3	Plan & Profile	*At some locations, proposed gradient is greater than limiting gradient of 3.3% proposed by the manual i.e. upto 6% gradient is proposed. Moreover, no such deviation is proposed in Schedule D. Kindly clarify the gradient at such locations.*	**Due to proximity of structures the grade is kept within 6% to avoid cost. The deviation from standard practice is now mentioned in Schedule-D and will be uploaded on eprocure (CPPP) as amendment.**
4	Typical Cross sections, Drain dimension	*Drain dimensions are given in DPR drawing. Kindly clarify that drawings given in DPR are not part of the contract documents and thickness can be designed by the EPC contractor.*	**The thickness of Drain wall has been considered as 150mm for the calculation in all cases however the contractor can design it as per EPC contract agreement as per standards and good industrial practise.**
5	TCS-1A	*Toe wall is shown for embankment more than 3m height but, proposed ROW is 60m and toe wall may not be required in full embankment length for more than 3m height. Kindly clarify.*	**As the project is in high rainfall area therefore Toe wall is to be constructed at all places where embankment height is more than 3 mtr. to avoid erosion.**
6	Breast Wall	*Breast wall may not be required in cutting areas where cutting height is very small. Please confirm that Contractor can design the slopes with breast wall also.*	**Breast walls will be required where it is nessary for slope protection and the minimum quantity for the breast wall is given in schedule B clause 12.1 however the contractor can design it as per EPC contract agreement.**
7	General	*Kindly clarify whether span of Flyover, ROB & bridges is from centre of bearing to bearing or Expansion joint to Expansion joint*	**It is from Center to Center of Bearing. Please refer to Structural drawing of C.D structures & Underpass (Vol-IX) uploaded on eprocure (CPPP)/ NHIDCL. ***
8	Clause 2.8, Pg 15	*Kindly confirm whether lengths of Service Road is including taper or not.*	**This includes Taper length also.**
9	Sch-B, Clause 2.8, pg 15	*Kindly Provide the type of pavement & thickness for Service road.*	**Specification is same as of main pavement/ carriageway. It is also provided in the Volume-9 (drawing) uploaded on eprocure (CPPP)/NHIDCL website.**

10	Sch-B, Clause 2.8, Pg 15, & Sch-B, Clause 2.11, Pg 17, S. No. 18 & 24	*Start & End Chainage of Service Road doesn't matches with the Chainage of TCS-2 & TCS-3 mentioned in TCS schedule. Kindly Confirm the length of Service Road.*	**Please refer Clause 2.8 of schedule-B for Start and end Chainage details.**
11	Sch-B, Clause 2.8, Pg 15, & Sch-B, Clause 2.11, Pg 17, s. No. 30 & 32	*Proposed section at Ch.131.062 to Ch.131.208 is TCS-2 which is having Service road on both sides but no such Service road is proposed in Clause 2.8. Similarly at Ch.131.290 to Ch.131.486 TCS-2 is proposed for which no Service road is proposed in Clause 2.8. Kindly confirm the TCS at these locations.*	**There is no Service road in Ch.131.062 - Ch. 131.208 i.e ROB area & no service road in Ch. 131.290- Ch. 131.486. Service road locations are marked in Plan of drawing (Vol-IX).**
12	Clause 3.2, Pg 18	*Kindly provide the crust details for Junctions.*	**They are similar to main carriageway.**
13	Sch-B, Clause 5.3.1 & Clause 5.5, Pg 20	*It is given here that pavement shall be designed for minimum 103.92 msa but, in Clause 5.5, it is given that Contractor shall design the pavement for minimum design traffic of 25.98 msa which contradicts the above statement. Kindly clarify the minimum design traffic for which the pavement has to be designed.*	**Volume of Traffic is 103.92msa and design Traffic is 25% i.e 25.98msa. So, contractor shall design the pavement for minimum design traffic i.e 25.98 msa. However the contractor is to adopt rigid pavement for the project highway.**
14	Clause 7.3, Pg 25	*Kindly provide the Width of Major & Minor bridges*	**Please refer to Structural drawing of C.D Structures & Underpass (Vol-IX) uploaded on eprocure (CPPP)/NHIDCL. ***
15	Sch-B, Clause 7.3.4, Pg 26	*The end chainage of the project is 132.375 but a Major bridge is proposed at Ch.132. 344 of span 4x24 whose end chainage falls at 132.392 which is out of scope of the project. Kindly confirm the end chainage of the project.*	**The total design length of the proposed work i.e** *Construction of Dimapur Bypass (Assam Portion) of 4/6 lane pavement is* **14.325 Km. The end point of instant construction is upto design Km 132.375. The end point of the road is at the end of approach slab of 106.240 Mtr. (including approach slabs). Although the end chainage will be 132.375 Km, the bridge proper (including approach slab) will protuted 22.12 Mtr. in Nagaland part towards Kohima.**
16	Sch-B, Clause 7.4.2, Pg 27	*Width of ROB is given as 26.3m and section proposed is TCS-4 for which 32m width is proposed as per clause 2.11. Kindly clarify the width of ROB. Also clarify whether this width is including median width or not.*	**TCS-4 is referring to underpass and as per fig 7.8 of IRC SP -84-2014 the width is 14.5x2+3=32m for the underpass. Width of ROB is 26.3 mtr. Which in accordance with standard drawing of Indian Railway**
17	sen-a, Clause 9.7, S.No.4, Pg 30 & Clause 12.2, Pg 33	*It is given here that PCC M-15 Boundary pillar is to be provided at 20 m interval but, in Clause 12.2, RCC type pillar is proposed at 200m interval. Kindly clarify the interval of Boundary*	**Interval of boundary piller is referred from IRC: SP: 84-2014 and the quantity for the same is already mentioned in Schedule B.**

		pillars.	
18	Sch-B, Clause 9.7, CableDuct, Pg 31	*100 nos of single row & 180 nos of double row cable duct are proposed.Normally ducts are proposed in built-up area only and in this project, there is no Built-up area. Kindly clarify whether it is required or not. If required, please provide the size of duct.*	**The diameter of duct will be 300mm. It is required as there are important establishment e.g Army camp, CRPF camp and Dimapur town nearby. Nos mentioned in querry is actually "metres" as in BOQ item no 9.82.**
19	Sch-C, Clause 2, Bus Shelters, Pg 35 & Appendix C1, Pg 36	*It is given here that Bus Shelters shall be constructed on both sides of the Project but, in Appendix C1, Bus shelter is provided on one side only. Kindly Clarify the locations for Bus shelters.*	**Bus shelters are provided two in number in a staggered way. Hence they are in LHS & RHS nearby.**
20	sen-e, Appendix C1, Pg 36	*Length of Bus Bay is specified as 70.70 which is not matching with IRC: SP: 84-2014. Kindly clarify.*	**As the plying of Buses are very less in number, the length of bay has been shortened for economy. The deviation will now shown in Schedule D.**
21	Plan and Profile from CH:255 to CH : 261	*As per the Plan and Profile drawings it is to be noted that the fo.llowing Chaineges doesnet Indicate Existing and Proposed levels as per SCHEDULE B Clause 2.11 in the TCS Table._ List are .as follows-: 118.050;118.215;118.239, 118.378,118.402, 121.857,121.893,122.529,122.541,124.920.124.956,127.176,127.204, 127.628,127.668,128.370,128.539,128.551.128.760,129.020,129.359,129.403,129.810,130.373,130.387,130. 540, 131.062,131.208,131.290,131.486, 131.506.131.612.131.874,131.980, 132.291 Thereby We request your good self to provide the same.*	**All Levels may be had from Plan & Profile drawing (Vol-IX) uploaded on eprocure (CPPP)/NHIDCL website.**
22	Unit of Cable Duct	*You are humbly requested to provide the unit of cable duct specified in table of Clause No. 9.7 of Schedule B.*	**It is in Meter and shown in Item No 9.82 of BOQ.**
23	License for Explosives	*As per Clause 1.1(b) of Schedule F,it says "The Contractor shall obtain, as required under the Applicable Laws, the following Applicable Permits: (c) Licence for use of explosives;". It is requested to issue explosives on payment to ensure safety and security of explosives or arrange necessary explosive license as well as guidelines for safety & security of explosives*	**The clause 13.3 of Schedule-F states that ' *Applicable permits, as required, relating to environmental protection and conservation shall have been procured by the Authority in accordance with the provisions of this agreement'*. However the applicable permits other than that will be the responsibility of contractor.**

24	Commercial	*As per Clause No. : - 2.1.6, Section-2 of "Instruction to Bidders" document. it is mentioned that Demand Draft of Rs. 40,0001- towards cost of tender document should be issued in favour of •"Managing Director, National Highways and Infrastructure Development Corporation Limited, New Delhi", payable at New Delhi. Our bankers are unable to issue the said DO due to insufficient space of the system. As such. we would request you to confirm whether if we submit the DO mentioning "Managing Director, NHIDCL,New Delhi". thcij,will be acceptable or not.*	**Yes, it will be acceptable.**
		As per Article 19.2.1 in the tender document, we would request you to consider "interest free advance payment' instead of "interest bearing advance payment" as specified in contract agreement.	**As per RFP**
25	Request for Time Extension	*Considering the above issues we envisage a requirement of at least another 15(fifteen) days to submit a competitive offer based on site investigation, collection of market rates for all bought out items. So we would request you to extend the date of submission up to 24.05.2017 to enable us to partlcipate in the bid and submit a competitive offer.*	**Due date extended and uploaded on eprocure (CPPP).**
26	Dates of Providing Right of Way	*In Annex - I of Schedule-A ROW is give 60m. Is 60m. ROW available all through the project road, as the project runs through populated area. Is 60.0m ROW sufficient for the approch emdankment of ROB and Flyover*	**R.E wall has been provided for the purpose.**
27	Right of Way	*During Site visit, it is understood that the land acquisition process is in the 3A stage. Pls providethe chainage wise LA status.*	**At the time of appointed date 90 % of ROW will be handed over to the contractor as per Annexure – II of Schedule A.**
28	Design Speed	*Please provide us the types of terrain chainagewise/stretchwise for the whole 14.325 km stretch*	**The speed varies from 60Km/Hr. to 100Km/Hr. Refer Horizontal Curve details for chainages, Vol-IX (Drawing volume).**
29	Minor Bridge	*a) There are two existing minor Bridges at chainage 121+875 & 124+938 with span arrangement of 1x18m & 2x12m respectivly. Those Existing minor bridges are not*	**These two bridges are 3.5 mtr. Wide and in dilapidated condition therefore not considered as part of Schedule- A. The existing two bridges are to be demolished & reconstructed new as stated in Schedule B.**

		shown in schedule-A. Please clarify. *b) Two minor bridges have been proposed at chainage 121+875 & 124+938 with span arrangement of 2x14m & 2x14m respectivly. Whether those Existing minor bridges shown in schedule-A will remain untouched during construction of four lane proposed new minor bridges? Please clarify.*	
31	Flyover	*Is it 6 lane carriageway Flyover including approaches? Pls Confirm.*	**It is 4-lane Flyover.**
32	Culverts	*There are 4 nos of existing Pipe Culverts found at site beyond 15 Nos of Culvert as per Cl.11 which are not shown in schedule-A under Cl.11 They are at km 118+120, 119+125, 122+160 & 124+325. Pls Clarify*	**Yes.The 4nos HP culverts mentioned were not accounted, however the Schedule-A will be amended and uploaded on eprocure (CPPP).**
33	ROB	*Pls confirm whether PSC girder will be allowed to use in place of Composite Steel Girder as per approved GAD of ROB by theRly. Dept.*	**It will be composite Steel girder on the approved GAD of ROB by theRly. Dept.**
34	River Training Works	*Pls provide the details in schedule B with drawings if the river training works and bank protection are really considered into the Tender TPC of INR 394.39 Cr.*	**In GAD, boulder pitching in abutment slope protection & pitching provided in BOQ considered. Bidder has to carry out due diligence and make provision as per sound engineering practices.**
35	General	*The Geo-tech Report for structures are to be furnished in soft copies if already carried out. Kindly provide.*	**It was already provided in GAD uploaded on eprocure (CPPP)/NHIDCL website. ***
36	General	*No Hydrological Modelling/Analysis Presented in the RFP Document.*	**It will now upload on Eprocure (CPPP). ***
37	General	*Pls update us about the utilities shifting estimates and relocation plan as on date*	**As per RFP clause 9.2 of DCA**

* It may also be noted as per Section 2 (Instructions to Bidders), clause 2.1.3 of RFP that "*Authority nor confer any right on the bidders, and the Authority shall ahve no liability whatsoever in relation to or arising out of any or all contents of the Feasibility Report/Detailed Project Report.*"

Annexure- 2

<table>
<tr><th>S. no.</th><th>Clause</th><th>As Existing</th><th>As Modified (To be reads as)</th></tr>
<tr><td colspan="4">Schedule- A</td></tr>
<tr><td>1.</td><td>Clause 11, Culverts</td><td>The Site includes the 15 Nos of culverts at the following locations and types:
<table>
<tr><th>S. no.</th><th>Existing Chainage</th><th>Type of Culvert</th><th>Span/Dia (m)</th><th>Width (m)</th></tr>
<tr><td>1</td><td>-</td><td>Pipe</td><td>1000mm</td><td>4</td></tr>
<tr><td>2</td><td>-</td><td>Pipe</td><td>1000mm</td><td>4</td></tr>
<tr><td>3</td><td>-</td><td>Pipe</td><td>600mm</td><td>4</td></tr>
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<tr><td>15</td><td>-</td><td>Pipe</td><td>600mm</td><td>4</td></tr>
</table></td><td>The Site includes the 19 Nos of culverts at the following locations and types:
<table>
<tr><th>S. no.</th><th>Existing Chainage</th><th>Type of Culvert</th><th>Span/Dia (m)</th><th>Width (m)</th></tr>
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<tr><td>19</td><td>-</td><td>Pipe</td><td>600mm</td><td>4</td></tr>
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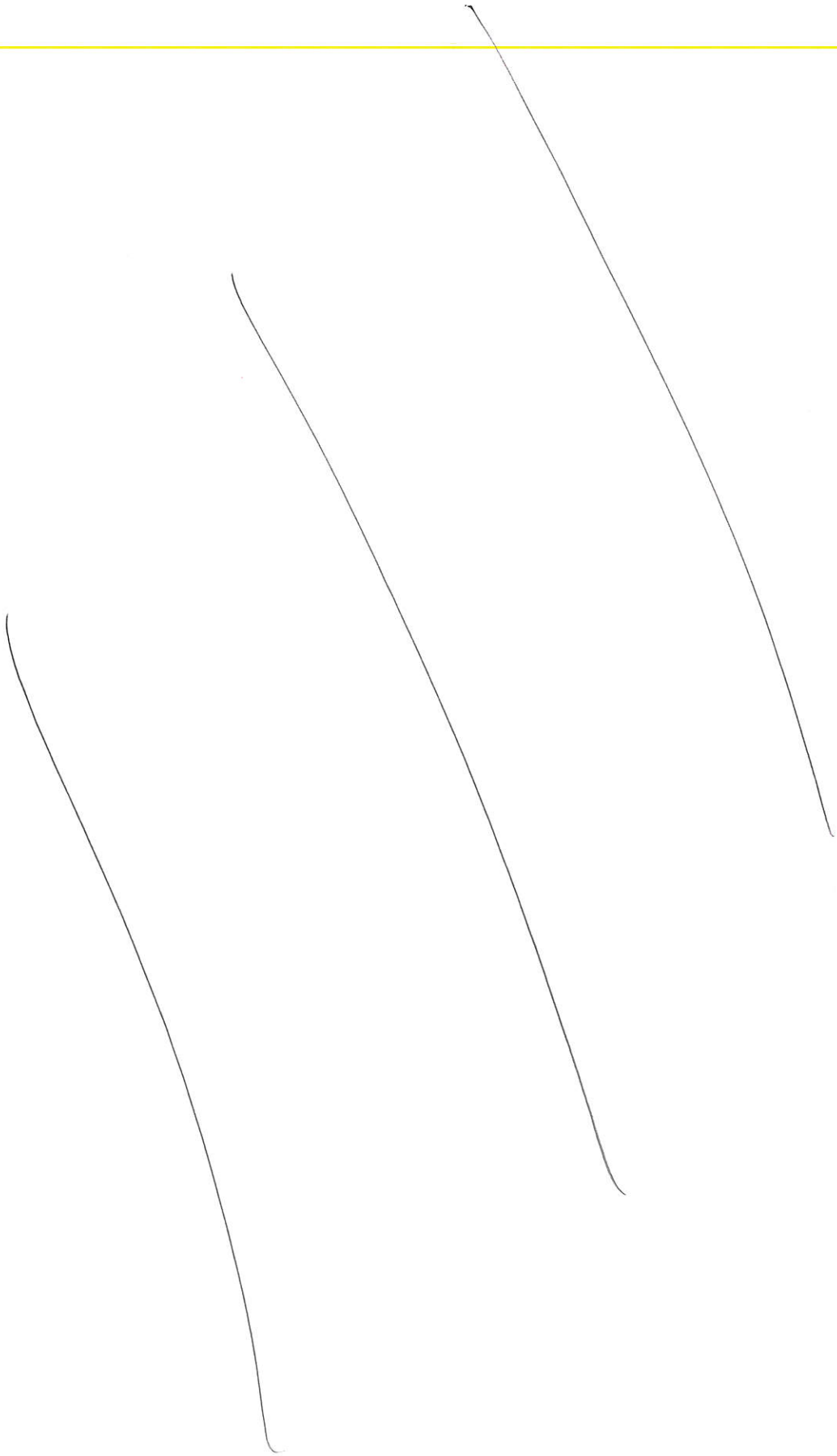
Schedule- D			
2.	Annex-I, Clause-2,	**Deviations from the Specifications and Standards** 2.1 The terms "Concessionaire", "Independent Engineer" and "Concession Agreement" used in the Manual shall be deemed to be substituted by the terms "Contractor", "Authority's Engineer" and "Agreement" respectively.	**Deviations from the Specifications and Standards** 2.1 The terms "Concessionaire", "Independent Engineer" and "Concession Agreement" used in the Manual shall be deemed to be substituted by the terms "Contractor", "Authority's Engineer" and "Agreement" respectively. 2.2 The grade of profile will be within 6% graded as against 3.30% limiting gradient as per CI. 2.9.6.2 of Manual, 2.3 The width of ROB, as approved by Railways, will be 26.30m as against 32.0m as per IRC : SP: 84-2014 Fig. 7.8. 2.4 The length of Bus bay will be 70.70m each side as against 215.0m as per IRC: SP: 84-2014 Fig. 2.5 The width of Flyover will be 27.50m as against 32.00m as per IRC: SP; 84-2014 Fig. 7.8.
Schedule- J			
3.	Clause 2.1	Project Milestone-I shall occur on the date falling on the 180th (one hundred and eightieth) day from the Appointed Date (the "Project Milestone-I").	Project Milestone-I shall occur on the date falling on the 365th (Three hundred and Sixty fifth) day from the Appointed Date (the "Project Milestone-I").
4.	Clause 3.1	Project Milestone-II shall occur on the date falling on the 550th (Five hundred and fiftieth) day from the Appointed Date (the "Project Milestone-II").	Project Milestone-II shall occur on the date falling on the 600th (Six hundred) day from the Appointed Date (the "Project Milestone-II").
5.	Clause	Project Milestone-III shall occur on the date falling on	Project Milestone-III shall occur on the date falling on the

	4.1	the 915th (Nine hundred and fifteenth) day from the Appointed Date (the "Project Milestone- III").	915th (Nine hundred and fifteenth) day from the Appointed Date (the "Project Milestone- III").
6.	Clause 5.1	The Scheduled Completion Date shall occur on the 1095th (one thousand ninety fifth) day from the Appointed Date.	The Scheduled Completion Date shall occur on the 1095th (one thousand ninety fifth) day from the Appointed Date.



Bridge No 132/2 Dhansiri1 Easting : 185680.8 Northing: 82517.42

Chainage : 131.559Km.

Calculation for Discharge : -

1. **Dicken's formula** :

Catchment Area = 950 km² RFER TOPO SHEET No 83G/9

C = 11.00 (for Guwahati region)

Therefore Discharge (Q) = C x $M^{3/4}$ 11x(950)$^{3/4}$ = **1882.29** m³/s

2. **Rational Formula for Peak Runoff from Catchment**

Catchment Area (A) = 950 km² =	95000 Hectares	95000	0.6	
L = Distance from critical point to the Bridge =	75.00 km	95000	0.6	
H =The fall in level from critical point to the Bridge site in =	560.00 m			
Nearest rain gauge station is Tezpur Io = Heaviest one hour rainfall =	6.30 cm			
Time of concentration = tc = (0.87 * L^3/H)$^{0.385}$ =	12.144 hr			
Ic = (2*Io)/ 1+ tc =	0.959 cm			
Intensity factor(f) for catchment area of 95000 Hectares =	0.63			
Catchment characteristics is Loam, lightly cultivated and covered. p =	0.5			
Therefore Discharge(Q) = 0.028*A*p*f*Ic =	**796.85** m³/s			

3. **Conveyence Factor & Slope method**

A) C/S No: 1 Offset : 10m(U/S) HFL (m): 136.536

Sl No.	Offset Distance (m)	Bed level (m)	Segment No	Segment width (m)	Height at start (m)	Height at end (m)	Difference in height (m)	Area of segment (m²)	Wetted perimeter (m)
1	29.000	136.536	-	-	-	-	-	-	-
2	35.000	136.229	1	6.000	0.000	0.307	0.307	0.921	6.008
3	40.000	135.816	2	5.000	0.307	0.720	0.413	2.567	5.017
4	45.000	135.374	3	5.000	0.720	1.162	0.442	4.705	5.019
5	50.000	134.542	4	5.000	1.162	1.994	0.832	7.890	5.069
6	55.000	133.939	5	5.000	1.994	2.597	0.603	11.478	5.036
7	60.000	133.351	6	5.000	2.597	3.185	0.588	14.455	5.034
8	65.000	133.191	7	5.000	3.185	3.345	0.154	16.325	5.002
9	70.000	133.058	8	5.000	3.345	3.690	0.076	17.588	5.001
10	75.000	132.937	9	5.000	3.690	3.599	0.039	18.223	5.000
11	76.861	132.896	10	1.861	3.599	3.640	0.419	6.736	1.908
12	80.000	133.401	11	3.139	3.640	3.135	0.505	10.633	3.179
13	85.000	134.241	12	5.000	3.135	2.295	0.042	13.575	5.000
14	90.000	135.257	13	5.000	2.295	1.279	2.258	8.935	5.486
15	92.887	136.536	14	2.887	1.279	0.000	2.258	1.846	3.665
							Total	**134.030**	**61.760**

Hydraulic mean depth, R = Area/ Perimeter = 2.170

Surface condition : Clean, straight bank, full stage, no rifts or deep pools in fair condition Rugosity F. 0.0400

Conveyence factor (C1) = (Area x $R^{2/3}$) n = 5631.1057

B) C/S No: 2 Offset : At Alignment HFL (m): 136.536

Sl No.	Offset Distance (m)	Bed level (m)	Segment No	Segment width (m)	Height at start (m)	Height at end (m)	Diff in height (m)	Area of segment (m²)	Wetted perimeter (m)
1	25.000	136.536	-	-	-	-	-	-	-
2	30.000	135.824	1	5.000	0.000	0.712	0.712	1.780	5.050
3	35.000	134.540	2	5.000	0.712	1.996	1.284	6.770	5.162
4	40.000	133.256	3	5.000	1.996	3.280	1.284	13.190	5.162
5	45.000	132.623	4	5.000	3.280	3.913	0.633	17.983	5.040
6	50.000	132.558	5	5.000	3.913	3.978	0.065	19.728	5.000
7	52.488	132.526	6	2.488	3.978	4.010	0.032	9.937	2.488
8	55.000	132.970	7	2.512	4.010	3.566	0.444	9.515	2.551
9	60.000	133.437	8	5.000	3.566	3.099	0.467	16.663	5.022
10	65.000	134.005	9	5.000	3.099	2.531	0.568	14.075	5.032
11	70.000	134.088	10	5.000	2.531	2.448	0.083	12.448	5.001
12	75.000	134.157	11	5.000	2.448	2.379	0.069	12.068	5.000
13	80.000	136.536	12	5.000	2.379	0.000	2.379	5.947	5.537
14	80.000	136.536	13	0.000	0.000	0.000	0.000	0.000	0.000
15	80.000	136.536	14	0.000	0.000	0.000	0.000	0.000	0.000
					Total			140.103	56.047

Hydraulic mean depth, R = Area/ Perimeter = 2.500

Surface condition : Clean, straight bank, full stage, no rifts or deep pools in fair condition Rugosity F. 0.0400

Conveyence factor (C2) = (Area x $R^{2/3}$) n = 6471.081

C) C/S No: 3 Offset : 100 m D/S HFL (m): 136.036

Sl. No	Offset Dist(m)	Bed Level (m)	Segment No	Segment Width(m)	Height at start(m)	Height at end(m)	Diff. in height(m)	Area of (m^2)	Wetted Perimeter(m)
1	20.000	136.036	-	-	-	-	-	-	-
2	25.000	133.977	1	5.000	0.000	2.059	2.059	5.147	5.407
3	30.000	131.670	2	5.000	2.059	4.366	2.307	16.063	5.507
4	31.956	131.476	3	1.956	4.366	4.560	0.194	8.730	1.966
5	35.000	131.703	4	3.044	4.560	4.333	0.227	13.535	3.052
6	40.000	132.065	5	5.000	4.333	3.971	0.362	20.760	5.013
7	45.000	132.427	6	5.000	3.971	3.609	0.362	18.950	5.013
8	50.000	132.791	7	5.000	3.609	3.245	0.364	17.135	5.013
9	55.000	133.231	8	5.000	3.245	2.805	0.440	15.125	5.019
10	60.000	133.630	9	5.000	2.805	2.406	0.399	13.028	5.016
11	65.000	134.249	10	5.000	2.406	1.787	0.619	10.483	5.038
12	70.000	135.301	11	5.000	1.787	0.735	1.052	6.305	5.109
13	72.000	136.036	12	2.000	0.735	0.000	0.735	0.735	2.131
14	72.000	136.036	13	0.000	0.000	0.000	0.000	0.000	0.000
Total								**145.995**	**53.285**

Hydraulic mean depth, R = Area/ Perimeter = 2.740

Surface condition : Clean, straight bank, full stage, no rifts or deep pools in fair condition Rugosity F. 0.0400

Conveyence factor (C3) = (Area x $R^{2/3}$)/ n = 7146.589

Mean Conveyence Factor (C_f) = (C1xC2xC3)$^{1/3}$ = 6385.915

Longitudinal Bed Slope, S = 0.0014

Discharge through the channel, Q = C_f x $(S)^{1/2}$ = **241.95** m^3/s

Highest discharge from the three method is = 1882.29 m^3/s

Second highest discharge is = 796.85 m^3/s

Maximum discharge is greater than 1.5 times second highest discharge

Hence Design Discharge is = **1196.00 m^3/s**

Proposed bridge :

Span scheme and type of foundation :

Design discharge = Q = 1196.00 m^3/s

Lacey's waterway = L = 4.8 $\sqrt{Q}$ = 166.00 m.

Provide a 4 span bridge 24.00 m c/c bearings as shown in the G.A.D.

Clear waterway becomes = 94.24 m.

(Centre to centre distance between bearings on piers = 0.6 m.

Thickness of pier shafts was taken as 1.0 m.

Bearing centre at abutment to front face of abutment shaft is 0.280 m.)

Hence clear waterway provided is 57% of Lacey's waterway , o.k.

Calculation for scour depth and depth of foundation.

For calculation of scour design discharge = 1.3x1196 = 1554.80 m^3/s

Clear waterway provided = 94.24 m.

Hence d_b = 1554.8 / 94.24 16.50 m^3/s per metre

Silt factor :

As per soil investigation report , soil below lowest bed is greyish clay,some / trace silt having cohesion 0.15 kg/m^2.

Silt factor as per soil investigation report is 2.57.

Hence considered silt factor as 2.57

Depth of scour = d_{sm} = 1.34 x $(d_b^2/k_{sf})^{1/3}$ 6.34 m. below H.F.L.

Hence depth of normal scour is at R.L. = 130.20 m.

Lowest bed level is at R.L. 132.53 m.

Hence depth of normal scour below H.F.L. is taken as = 6.34 m.

Maxm. Depth of scour at abutment location = 6.34x 1.27 = 8.05 m. below H.F.L.

R.L.of maxm. scour at abutment location = 128.48 m.

Maxm. Depth of scour at pier location = 6.34 x 2.0 = 12.68 m. below H.F.L.

R.L.of maxm. scour at pier location = 123.86 m.

For open foundation , depth of foundation to be taken at least 2.0m. Below maximum scour level .

Hence, founding level for abutment will be not above R.L. 128.48-2.0 = 126.48 m.

And founding level for pier will be not above R.L. 123.86-2.0 = 121.86 m.

Hence depth of abutment foundation becomes 132.526 - 126.48= 6.042 m.below lowest bed ,

And depth of pier foundation becomes 132.526 - 121.86= 10.670 m.below lowest bed ,

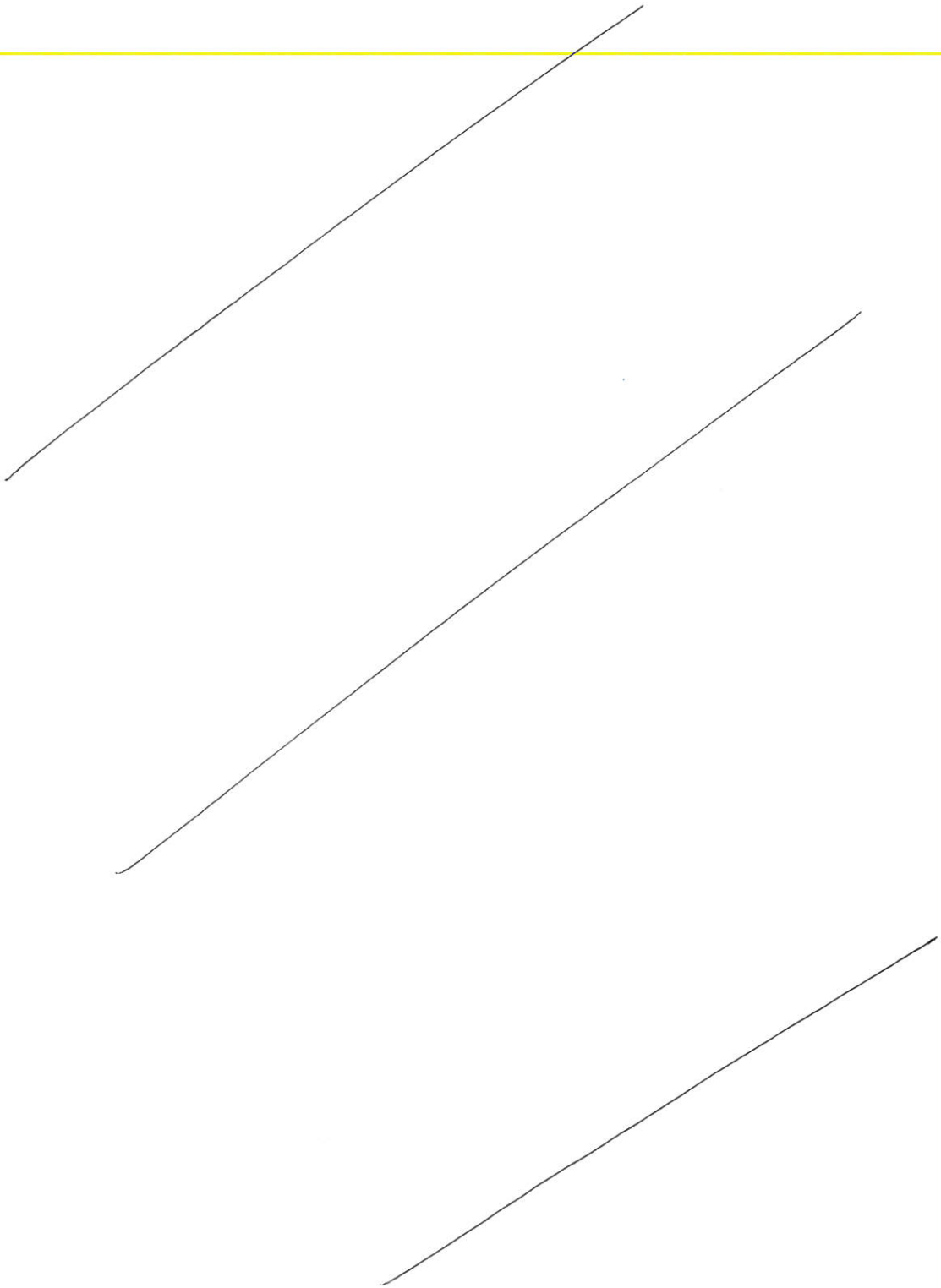
which is not practicable Hence deep foundation (Well foundation) is suggested for both piers and abutments .

Provide top of well cap for abutment at about 4.0m below G.L. , ie..at 133.00 m. R.L.
And top of well cap for pier foundation at lowest bed level , ie. , at 132.53 m. R.L.

Calculation for formation level :-

Highest Flood Level	:	136.536 m.
Vertical clearance	:	1.200 m.
Depth of superstructure (RCC. T-beam slab superstructure)		2.370 m.
Thickness of wearing course	:	0.065 m.
Increase due to inclination	:	0.204
Required formation level	:	**140.375 m.**

Provide formation level at centre of deck as **140.38 m.**



Bridge No 133/1 Dhansiri3 Easting : 185680.8 Northing: 82517.42

Chainage : 132.344 Km.

Calculation for Discharge : -

1. **Dicken's formula** :

Catchment Area = 960 km² RFER TOPO SHEET : 83G/9

C = 11.00 (for Guwahati region)

Therefore Discharge (Q) = C x $M^{3/4}$ 11x(960)$^{3/4}$ = **1897.13** m³/s

2. **Rational Formula for Peak Runoff from Catchment**

Catchment Area (A) = 960 km² =	96000	Hectares	96000	0.6
L = Distance from critical point to the Bridge =	76.00	km	96000	0.6
H =The fall in level from critical point to the Bridge site in =	566.00	m		
Nearest rain gauge station is Tezpur Io = Heaviest one hour rainfall =	6.30	cm		
Time of concentration = tc = (0.87 * L^3/H)$^{0.385}$ =	12.281	hr		
Ic = (2*Io)/ 1+ tc =	0.949	cm		
Intensity factor(f) for catchment area of 96000 Hectares =	0.62			
Catchment characteristics is Loam lightly cultivated or covered p =	0.5			
Therefore Discharge(Q) = 0.028*A*p*f*Ic =	**790.58**	m³/s		

3. **Conveyence Factor & Slope method**

A) C/S No: 1 Offset : 100mU/S HFL (m): 136.898

Sl No.	Offset Distance (m)	Bed level (m)	Segment No	Segment width (m)	Height at start (m)	Height at end (m)	Difference in height (m)	Area of segment (m^2)	Wetted perimeter (m)
1	-45.891	136.898	-	-	-	-	-	-	-
2	-43.176	135.457	1	2.715	0.000	1.441	1.441	1.956	3.074
3	-36.946	132.151	2	6.230	1.441	4.747	3.306	19.276	7.053
4	-31.616	130.874	3	5.330	4.747	6.024	1.277	28.705	5.481
5	-24.937	129.275	4	6.679	6.024	7.623	1.599	45.574	6.868
6	-16.767	128.087	5	8.170	7.623	8.811	1.188	67.133	8.256
7	-9.647	127.052	6	7.120	8.811	9.846	1.035	66.419	7.195
8	0.000	126.941	7	9.647	9.846	9.957	0.111	95.520	9.648
9	4.407	126.889	8	4.407	9.957	10.009	0.052	43.995	4.407
10	12.284	127.594	9	7.877	10.009	9.304	0.705	76.064	7.908
11	15.662	127.875	10	3.378	9.304	9.023	0.281	30.954	3.390
12	22.080	128.408	11	6.418	9.023	8.490	0.533	56.199	6.440
13	29.435	129.130	12	7.355	8.490	7.768	0.722	59.789	7.390
14	36.306	129.486	13	6.871	7.768	7.412	0.356	52.151	6.880
15	41.004	129.504	14	4.698	7.412	7.394	0.018	34.779	4.698
16	44.512	130.795	15	3.508	7.394	6.103	1.291	23.674	3.738
17	49.317	132.562	16	4.805	6.103	4.336	1.767	25.080	5.120
18	61.108	136.898	17	11.791	4.336	0.000	4.336	25.563	12.563
							Total	**752.830**	**110.108**

Hydraulic mean depth, R = Area/ Perimeter = 6.837

Surface condition : Clean, straight bank, full stage, no rifts or deep pools in fair condition Rugosity F. 0.0400

Conveyence factor (C1) = (Area x $R^{2/3}$) n = 68234.63

B) C/S No: 2 Offset : At Alignment HFL (m): 136.898

Sl No.	Offset Distance (m)	Bed level (m)	Segment No	Segment width (m)	Height at start (m)	Height at end (m)	Diff in height (m)	Area of segment (m^2)	Wetted perimeter (m)
				-	-	-	-	-	-
1	-38.281	136.898							
2	-34.777	134.152	1	3.504	0.000	2.746	2.746	4.811	4.452
3	-29.018	129.639	2	5.759	2.746	7.259	4.513	28.809	7.317
4	-23.834	128.807	3	5.184	7.259	8.091	0.832	39.787	5.250
5	-12.339	127.864	4	11.495	8.091	9.034	0.943	98.426	11.534
6	-8.413	127.374	5	3.926	9.034	9.524	0.490	36.429	3.956
7	0.000	126.964	6	8.413	9.524	9.934	0.410	81.850	8.423
8	7.347	128.823	7	7.347	9.934	8.075	1.859	66.156	7.579
9	12.731	129.495	8	5.384	8.075	7.403	0.672	41.667	5.426
10	19.040	130.489	9	6.309	7.403	6.409	0.994	43.570	6.387
11	23.868	132.555	10	4.828	6.409	4.343	2.066	25.955	5.251
12	29.024	134.762	11	5.156	4.343	2.136	2.207	16.703	5.608
13	34.016	136.898	12	4.992	2.136	0.000	2.136	5.331	5.430
14	34.016	136.898	13	0.000	0.000	0.000	0.000	0.000	0.000
							Total	**489.495**	**76.613**

Hydraulic mean depth, R = Area/ Perimeter = 6.389
Surface condition : Clean, straight bank, full stage, no rifts or deep pools in fair condition Rugosity F. 0.0400
Conveyence factor (C2) = (Area x $R^{2/3}$)/ n = 42397.335

C) C/S No: 3 Offset : 100mD/S HFL (m): 136.848

Sl. No	Offset Distance (m)	Bed level (m)	Segment No	Segment width (m)	Height at start (m)	Height at end (m)	Diff in height (m)	Area of segment (m^2)	Wetted perimeter (m)
1	-36.400	136.848							
2	-32.506	134.573	1	3.894	0.000	2.275	2.275	4.429	4.510
3	-24.866	130.110	2	7.640	2.275	6.738	4.463	34.430	8.848
4	-20.697	129.610	3	4.169	6.738	7.238	0.500	29.133	4.199
5	-15.000	128.707	4	5.697	7.238	8.141	0.903	43.807	5.768
6	-9.304	128.003	5	5.696	8.141	8.845	0.704	48.376	5.739
7	0.000	126.907	6	9.304	8.845	9.941	1.096	87.392	9.368
8	8.617	127.651	7	8.617	9.941	9.197	0.744	82.456	8.649
9	17.586	128.792	8	8.969	9.197	8.056	1.141	77.371	9.041
10	22.061	130.732	9	4.475	8.056	6.116	1.940	31.710	4.877
11	28.762	132.417	10	6.701	6.116	4.431	1.685	35.338	6.910
12	32.477	134.775	11	3.715	4.431	2.073	2.358	12.081	4.400
13	35.743	136.848	12	3.266	2.073	0.000	2.073	3.385	3.868
							Total	**489.909**	**76.178**

Hydraulic mean depth, R = Area/ Perimeter = 6.431
Surface condition : Clean, straight bank, full stage, no rifts or deep pools in fair condition Rugosity F. 0.0400
Conveyence factor (C3) = (Area x $R^{2/3}$)/ n = 42355.589
Mean Conveyence Factor (C_f) = $(C1 \times C2 \times C3)^{1/3}$ = 49668.919
Longitudinal Bed Slope, S = 0.0002
Discharge through the channel, $Q = C_f \times (S)^{0.5}$ = **672.42** m^3/s

Highest discharge from the three method is = 1897.13 m^3/s
Second highest discharge is = 790.58 m^3/s
Maximum discharge is greater than 1.5 times second highest discharge
Hence Design Discharge is = **1186.00 m^3/s**

Proposed bridge :

Span scheme and type of foundation :

Design discharge = Q = 1186.00 m^3/s
Lacey's waterway = L = 4.8 $\sqrt{Q}$ = 165.30 m.

Provide a 4 span bridge 24.00 m c/c bearings as shown in the G.A.D.
Clear waterway becomes = 94.24 m.
(Centre to centre distance between bearings on piers = 0.6 m.
Thickness of pier shafts was taken as 1.0 m.
Bearing centre at abutment to front face of abutment shaft i 0.280 m.)
Hence clear waterway provided is 57% of Lacey's waterway , o.k.

Calculation for scour depth and depth of foundation.

For calculation of scour design discharge = 1.3x1186 = 1541.80 m^3/s
Clear waterway provided = 94.24 m.
Hence d_s = 1541.8 / 94.24 16.36 m^3/s per metre
Silt factor :
As per soil investigation report , soil below lowest bed is greyish clay,some / trace silt having cohesion 0.15 kg/m^2.
Silt factor as per soil investigation report is 1.8

Hence considered silt factor as	1.8	
Depth of scour $= d_{sm} = 1.34 \times (d_b^2/k_{sf})^{1/3}$	7.10	m. below H.F.L.
Hence depth of normal scour is at R.L. =	129.80	m.
Lowest bed level is at R.L.	126.96	m.
Hence depth of normal scour below H.F.L. is taken as =	9.93	m.
Maxm. Depth of scour at abutment location = 9.93x 1.27 =	12.62	m. below H.F.L.
R.L.of maxm. scour at abutment location =	124.28	m.
Maxm. Depth of scour at pier location = 9.93 x 2.0 =	19.87	m. below H.F.L.
R.L.of maxm. scour at pier location =	117.03	m.

For open foundation , depth of foundation to be taken at least 2.0m. Below maximum scour level .

Hence, founding level for abutment will be not above R.L 124.28-2.0 =	122.28	m.
And founding level for pier will be not above R.L. 117.03-2.0	115.03	m.
Hence depth of abutment foundation becomes 126.964 - 122.28=	4.682	m.below lowest bed .
And depth of pier foundation becomes 126.964 - 115.03=	11.934	m.below lowest bed .

which is not practicable Hence deep foundation (Well foundation) is suggested for both piers and abutments .

Provide top of well cap for abutment foundation at R.L.	132.00	m. R.L.
And top of well cap for pier foundation at lowest water level . ie. . at	130.50	m. R.L.

Calculation for formation level :-

Highest Flood Level	:	136.898	m.
Vertical clearance	:	1.200	m.
Depth of superstructure (RCC. T-beam slab superstructure		2.370	m.
Thickness of wearing course	:	0.065	m.
Increase due to inclination	:	0.242	
Required formation level	:	140.775	m.
Provide formation level at centre of deck as		140.78	m.