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ALIGNMENT OPTION STUDY REPORT

ANNEXURES:

ALIGNMENT OPTION STUDY REPORT

1.1 Prologue

The National Highways Authority of India (NHAI) is responsible for execution and maintenance of National Highway stretches entrusted to the state Government within the state boundary on behalf of the Ministry of Road Transport & Highways, Government of India (MoRT&H).

The Ministry of Road Transport & Highways, Government of India has entrusted the National Highways Authority of India (NHAI) for the work of Development of Economic Corridors, Inter corridors and feeder route to improve the efficiency of freight movement in India of NH 320 (old NH 23) from:

i. Jaina More(Bokaro)to Gola(NH23),
ii. Gola to Ormanjhi (NH320B)

in the State of Jharkhand, through consultancy services. The implementation of the Project shall be done through Engineering, Procurement and Construction (EPC) or Public Private Partnership (PPP) mode of construction, the suitability of which will come out in the Project Report.

Consequently, the General Manager (Tech), National Highways Authority of India, New Delhi has appointed C.E. Testing Company Pvt. Ltd. (124A, N.S.C. Bose Road, Kolkata-92) as consultants, through a competitive bidding process, for preparation of the Project Report and to ascertain a realistic and firm cost of the project. Consultant shall also assess the Economic & Financial Viability of the proposed scheme and will provide a suitable Bidding document for implementation of the proposed project.

1.2 Project Background

Project road stretch (i) Bokaro (Jaina More) to Gola & (ii) Gola to Ormanjhi under Lot – 3 starts from an at-grade 3-Legged with NH-18 (old NH 32) near Chas in the District of Bokaro and ends with a at-grade 4-Legged junction with NH-20 (Old NH-33) at Dardag near Ormanjhi in the District of Ranchi. The entire road stretch falls in 3 districts of Jharkhand namely Bokaro, Ramgarh and Ranchi. In between the existing road passes through many important villages/localities which are stretch wise listed below:

i. Bokaro (Jaina More) to Gola stretch passes through localities/village areas of Gola, Sosokhurd, Maganpur, Lukaiya, Petarwar, Dantu, Bhadurpur, Kalyanpur, Jaina, etc.

ii. Gola to Ormanjhi stretch passes through localities/village areas of Dardag, Sandi, Baridih, Pancha, Bhusar, Sikidri, Jobla, Kulhi, Bariatu, Koiya, etc.

1.3 Start and End Point of the Project Road

The project road starts from Jaina in Bokaro district and ends at Ormanjhi in Ranchi district. Co-ordinates of the start point and end point is given below:

(a.) Start Point – Latitude = 23°30'30.84" N

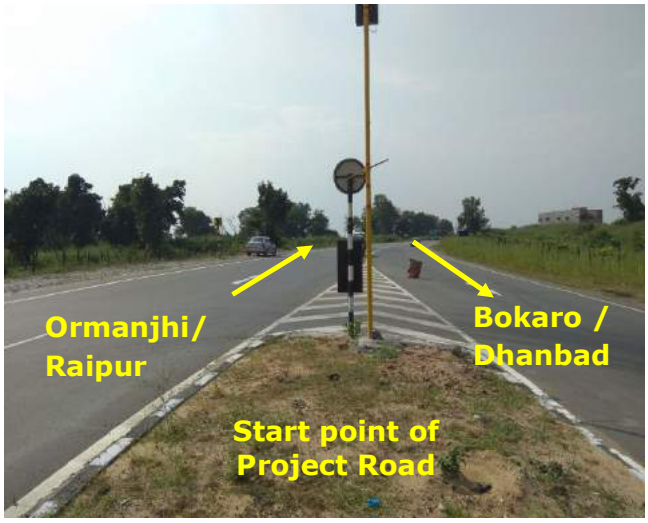
Longitude = 85°29'44.28" E

(b.) End Point – Latitude = 23°39'48.42" N

Longitude = 86° 00'7.87" E

The Design Length of the road from Jaina More to Gola & Gola to Ormanjhi now stands at 60.340 Km.

Photographs of start and end point of the project road are as follows:



Start Point of Project Road at Jaina (Bokaro)

End Point of project road at Ormanjhi (Ranchi)

1.4 Importance of the Project Road

A direct connection between Dhanbad to Raipur avoiding Ramgarh is considered in this part of Economic Corridor of Bharatmala Pariyojana. To connect Dhanbad and Raipur the alignment is proposed from Dhanbad to Bokaro through NH-18 (Old NH-32) thence to Balidih, Siwandih, Jaina, Petarwar, Gola through NH-320 (Old NH-23) thence to Koiya, Bariatu, Kulhi, Charo, Id More thorugh MDR 101 thence to Sandi, Dardag, Ormanjhi through MDR 105 & thence intersecting with NH-20 (Old NH 33) at Ormanjhi block chowk to reach Ranchi. Thereafter it follows the available route to Raipur through Gumla, Pathalgaon, etc.

1.5 Reconnaisance Survey Report

The project road starts near Jaina (Km 21+600) and ends at Ukrid Nawatoli near Ormanjhi (Km 81+618) passing through localities / village areas of Kalyanpur, Bahadurpur, Dantu, Lukaiya, Peterwar, Maganpur, Sosokhurd, Gola, Bariatu, Kulhi, Pancha, Charo, Kute, Hethnagru, Uparnagru, Chetarbari, Koalu, etc.

- Existing carriageway width of the project road varies from 7.0m and 10.0m for Ormanjhi to Gola and Gola to Bokaro (Jaina More) respectively. The existing carriageway configuration of the road is not adequate to maintain the level of service of the road.
- The overall condition of pavement was observed to be fair to good except some portion with minor types of road distresses like longitudinal cracks, potholes, edge drops and raveling.
- There are 6 nos. major intersections along existing road. The locations are Jaina (with old NH-23), Petarwar, Kashmar, Rajrappa, Gola, Id More and Ormanjhi.
- Some portion like Bahadurpur, Dantu, Petarwar, Sosokhurd, Gola, Bariatu, Sandi and Dardag the existing road passes through heavy builtup/congested area. As such, it is felt that those areas may need bypass to facilitate smooth flow of traffic. The proposed alignments of which will be finalized based on topographic surveys and design considerations. However, bypass alignment proposals of the aforesaid locations have been studied and are deliberated hereafter.
- 1 no. of Major Bridge and 10 nos. Minor Bridges are observed along the project road.
- Beside Major & Minor Bridges, 98 nos. existing culverts are found along the project road. Out of these 12 nos. are Box Culvert, 17 nos. are Hume Pipe Culvert and 69 nos. are Slab Culvert. 11 nos. of bus bay are observed along the project road.

1.6 Existing ROW

Existing ROW of road is found about 24m-30m & 10m-20m for the stretches Jaina More to Gola & Gola to Ormanjhi, respectively.

1.7 Summary of Traffic Analysis

A Summary of Traffic Analysis are given in Table No. 2.1. Traffic Projections as observed on the project road are given in Table no. 2.2(a), 2.2(b) & 2.2(c) below.

Table 2.1: ADT in number (June 2018) as Observed on the Project Road

Vehicle Type	Jaina-Petarwar Ch:36+500		Petarwar-Gola Ch:45+000		Gola-Ormanjhi Ch:74+500	
	ADT	PCU	ADT	PCU	ADT	PCU
Two Wheeler	3324	1662	4455	2227	2506	1253
Car/Jeep/Van/Taxi/Auto	4439	4439	5144	5144	3755	3755
Mini Bus	44	66	34	50	10	15
Standard Bus	232	695	247	741	105	316
LCV	895	1342	859	1289	669	1003
2-Axle	363	1089	334	1001	252	755
3-Axle	783	2360	750	2251	346	1039
Multi-Axle	388	1746	307	1383	109	492
Tractor With Trailer	57	258	23	105	56	254
Tractor Without Trailer	18	28	24	35	22	33
Cycle	507	253	251	126	135	68
Cycle Rickshaw	4	9	1	1	3	6
Hand Cart	0	1	1	2	0	0
Bullock Cart	0	0	0	0	0	0
Horse Cart	0	0	0	0	0	0
Total	**11059**	**13948**	**12429**	**14355**	**7970**	**8990**
Total Motorized Vehicles	**10547**	**13685**	**12177**	**14226**	**7832**	**8916**
Total Commercial Vehicle per day	**2765**	**-**	**2554**	**-**	**1548**	**-**

Table 2.2(a): Traffic Projection as Observed on the Project Road

Traffic Survey Location: Dantu (Km 36+500)

Year	Growth Factors	AADT															Total in Numbers	Total in PCU
		Two Wheeler	Car/Jeep/ Van/Taxi/ Auto	Mini / RTVs Bus	Stand. Bus	LCV	2-Axle	3 -Axle	Multi-Axle	Agri. Tract. With Trailor	Agri. Tract. Without Trailor	Cycle	Cycle Rickshaw	Hand Cart	Bullock Cart	Horse Cart		
2018	5.0%	3044	4003	39	206	794	322	699	345	51	16	507	4	0	0	0	10031	12522
2019	5.0%	3197	4203	41	216	834	338	733	362	54	17	532	5	0	0	0	10532	13148
2020	5.0%	3356	4414	43	227	876	355	770	380	56	18	559	5	0	0	0	11059	13806
2021	5.0%	3524	4634	45	238	920	373	809	399	59	19	587	5	0	0	0	11612	14496
2022	5.0%	3700	4866	47	250	966	392	849	419	62	20	616	5	0	0	0	12192	15221
2023	5.0%	3885	5109	50	263	1014	411	892	440	65	21	647	6	0	0	0	12802	15982
2024	5.0%	4080	5365	52	276	1065	432	936	462	68	22	679	6	0	0	0	13442	16781
2025	5.0%	4284	5633	55	289	1118	453	983	485	72	23	713	6	0	0	0	14114	17620
2026	5.0%	4498	5915	57	304	1174	476	1032	509	75	24	749	7	0	0	0	14820	18501
2027	5.0%	4723	6210	60	319	1232	500	1084	534	79	25	786	7	0	0	0	15561	19426
2028	5.0%	4959	6521	63	335	1294	525	1138	561	83	27	826	7	0	0	0	16339	20397
2029	5.0%	5207	6847	66	352	1359	551	1195	589	87	28	867	8	0	0	0	17156	21417
2030	5.0%	5467	7189	70	369	1427	579	1254	619	92	29	910	8	1	0	0	18014	22488
2031	5.0%	5741	7549	73	388	1498	608	1317	650	96	31	956	8	1	0	0	18914	23612
2032	5.0%	6028	7926	77	407	1573	638	1383	682	101	32	1004	9	1	0	0	19860	24793
2033	5.0%	6329	8323	81	428	1652	670	1452	716	106	34	1054	9	1	0	0	20853	26032
2034	5.0%	6645	8739	85	449	1734	703	1525	752	111	36	1106	10	1	0	0	21896	27334

Year	Growth Factors	AADT															Total in Numbers	Total in PCU
		Two Wheeler	Car/Jeep/ Van/Taxi/ Auto	Mini / RTVs Bus	Stand. Bus	LCV	2-Axle	3 -Axle	Multi-Axle	Agri. Tract. With Trailor	Agri. Tract. Without Trailor	Cycle	Cycle Rickshaw	Hand Cart	Bullock Cart	Horse Cart		
2035	5.0%	6978	9176	89	472	1821	738	1601	790	117	38	1162	10	1	0	0	22991	28701
2036	5.0%	7327	9634	93	495	1912	775	1681	829	123	39	1220	11	1	0	0	24140	30136
2037	5.0%	7693	10116	98	520	2007	814	1765	871	129	41	1281	11	1	0	0	25347	31643
2038	5.0%	8078	10622	103	546	2108	855	1853	914	135	43	1345	12	1	0	0	26615	33225
2039	5.0%	8481	11153	108	573	2213	898	1946	960	142	46	1412	12	1	0	0	27945	34886
2040	5.0%	8906	11711	114	602	2324	942	2043	1008	149	48	1483	13	1	0	0	29343	36630
2041	5.0%	9351	12296	119	632	2440	990	2146	1058	157	50	1557	14	1	0	0	30810	38462
2042	5.0%	9818	12911	125	664	2562	1039	2253	1111	164	53	1635	14	1	0	0	32350	40385
2043	5.0%	10309	13557	131	697	2690	1091	2365	1167	173	55	1716	15	1	0	0	33968	42404
2044	5.0%	10825	14234	138	732	2825	1146	2484	1225	181	58	1802	16	1	0	0	35666	44524
2045	5.0%	11366	14946	145	768	2966	1203	2608	1286	190	61	1892	17	1	0	0	37449	46750
2046	5.0%	11934	15694	152	807	3114	1263	2738	1350	200	64	1987	17	1	0	0	39322	49088
2047	5.0%	12531	16478	160	847	3270	1326	2875	1418	210	67	2086	18	1	0	0	41288	51542
2048	5.0%	13158	17302	168	889	3433	1392	3019	1489	220	71	2191	19	1	0	0	43352	54119
2049	5.0%	13815	18167	176	934	3605	1462	3170	1563	231	74	2300	20	1	0	0	45520	56825
2050	5.0%	14506	19076	185	980	3785	1535	3328	1642	243	78	2415	21	1	0	0	47796	59667
2051	5.0%	15231	20029	194	1029	3975	1612	3495	1724	255	82	2536	22	1	0	0	50186	62650
2052	5.0%	15993	21031	204	1081	4173	1693	3670	1810	268	86	2663	23	2	0	0	52695	65782

Table 2.2(b): Traffic Projection as Observed on the Project Road

Traffic Survey Location: Lepo (Km 45+000)

Year	Growth Factors	AADT															Total in Numbers	Total in PCU
		Two Wheeler	Car/Jeep/ Van/Taxi/ Auto	Mini / RTVs Bus	Stand. Bus	LCV	2-Axle	3 -Axle	Multi-Axle	Agri. Tract. With Trailor	Agri. Tract. Without Trailor	Cycle	Cycle Rickshaw	Hand Cart	Bullock Cart	Horse Cart		
2018	5.0%	4079	4639	30	219	763	296	666	273	21	21	251	1	1	0	0	11260	12893
2019	5.0%	4283	4871	31	230	801	311	699	286	22	22	264	1	1	0	0	11823	13538
2020	5.0%	4497	5115	33	242	841	327	734	301	23	23	277	1	1	0	0	12414	14215
2021	5.0%	4722	5371	35	254	883	343	771	316	24	24	291	1	1	0	0	13035	14926
2022	5.0%	4958	5639	36	266	927	360	810	332	25	25	305	1	1	0	0	13686	15672
2023	5.0%	5206	5921	38	280	974	378	850	348	26	27	321	1	1	0	0	14371	16456
2024	5.0%	5467	6217	40	294	1022	397	893	366	28	28	337	1	1	0	0	15089	17278
2025	5.0%	5740	6528	42	308	1074	417	937	384	29	29	354	1	1	0	0	15844	18142
2026	5.0%	6027	6854	44	324	1127	438	984	403	31	31	371	1	1	0	0	16636	19049
2027	5.0%	6328	7197	46	340	1184	459	1033	423	32	32	390	1	1	0	0	17468	20002
2028	5.0%	6645	7557	49	357	1243	482	1085	444	34	34	409	1	1	0	0	18341	21002
2029	5.0%	6977	7935	51	375	1305	507	1139	467	35	36	430	1	1	0	0	19258	22052
2030	5.0%	7326	8332	54	394	1370	532	1196	490	37	38	451	1	1	0	0	20221	23155
2031	5.0%	7692	8748	56	413	1439	558	1256	514	39	39	474	1	1	0	0	21232	24312
2032	5.0%	8077	9186	59	434	1511	586	1319	540	41	41	498	1	1	0	0	22294	25528
2033	5.0%	8481	9645	62	456	1586	616	1385	567	43	44	522	1	1	0	0	23408	26804

Year	Growth Factors	AADT															Total in Numbers	Total in PCU
		Two Wheeler	Car/Jeep/ Van/Taxi/ Auto	Mini / RTVs Bus	Stand. Bus	LCV	2-Axle	3 -Axle	Multi-Axle	Agri. Tract. With Trailor	Agri. Tract. Without Trailor	Cycle	Cycle Rickshaw	Hand Cart	Bullock Cart	Horse Cart		
2034	5.0%	8905	10127	65	478	1665	647	1454	596	45	46	549	1	1	0	0	24579	28145
2035	5.0%	9350	10633	68	502	1749	679	1527	625	47	48	576	1	1	0	0	25808	29552
2036	5.0%	9817	11165	72	527	1836	713	1603	657	50	50	605	1	1	0	0	27098	31030
2037	5.0%	10308	11723	75	554	1928	748	1683	689	52	53	635	1	1	0	0	28453	32581
2038	5.0%	10824	12310	79	582	2024	786	1768	724	55	56	667	2	2	0	0	29876	34210
2039	5.0%	11365	12925	83	611	2126	825	1856	760	58	58	700	2	2	0	0	31369	35921
2040	5.0%	11933	13571	87	641	2232	866	1949	798	60	61	735	2	2	0	0	32938	37717
2041	5.0%	12530	14250	92	673	2343	910	2046	838	64	64	772	2	2	0	0	34585	39602
2042	5.0%	13156	14962	96	707	2461	955	2148	880	67	67	810	2	2	0	0	36314	41583
2043	5.0%	13814	15710	101	742	2584	1003	2256	924	70	71	851	2	2	0	0	38130	43662
2044	5.0%	14505	16496	106	779	2713	1053	2369	970	74	74	893	2	2	0	0	40036	45845
2045	5.0%	15230	17321	111	818	2848	1106	2487	1019	77	78	938	2	2	0	0	42038	48137
2046	5.0%	15991	18187	117	859	2991	1161	2611	1070	81	82	985	2	2	0	0	44140	50544
2047	5.0%	16791	19096	123	902	3140	1219	2742	1123	85	86	1034	2	2	0	0	46347	53071
2048	5.0%	17630	20051	129	947	3297	1280	2879	1179	89	90	1086	2	2	0	0	48664	55725
2049	5.0%	18512	21054	135	995	3462	1344	3023	1238	94	95	1140	3	3	0	0	51097	58511
2050	5.0%	19438	22106	142	1044	3635	1411	3174	1300	99	100	1197	3	3	0	0	53652	61436
2051	5.0%	20409	23212	149	1097	3817	1482	3333	1365	103	105	1257	3	3	0	0	56335	64508
2052	5.0%	21430	24372	157	1151	4008	1556	3500	1433	109	110	1320	3	3	0	0	59152	67734

Table 2.2(c): Traffic Projection as Observed on the Project Road

Traffic Survey Location: Near Id More (Km 74+500)

Year	Growth Factors	AADT															Total in Numbers	Total in PCU
		Two Wheeler	Car/Jeep/ Van/Taxi/ Auto	Mini / RTVs Bus	Stand. Bus	LCV	2-Axle	3 -Axle	Multi-Axle	Agri. Tract. With Trailor	Agri. Tract. Without Trailor	Cycle	Cycle Rickshaw	Hand Cart	Bullock Cart	Horse Cart		
2018	5.0%	2295	3386	9	94	594	223	308	97	50	20	135	3	0	0	0	7214	8077
2019	5.0%	2410	3556	9	98	624	235	323	102	53	21	142	3	0	0	0	7575	8481
2020	5.0%	2531	3734	10	103	655	246	339	107	55	22	149	3	0	0	0	7954	8905
2021	5.0%	2657	3920	10	108	687	259	356	112	58	23	157	3	0	0	0	8351	9351
2022	5.0%	2790	4116	11	114	722	272	374	118	61	24	165	3	0	0	0	8769	9818
2023	5.0%	2929	4322	11	119	758	285	393	124	64	25	173	4	0	0	0	9207	10309
2024	5.0%	3076	4538	12	125	796	299	412	130	67	26	181	4	0	0	0	9668	10824
2025	5.0%	3230	4765	12	132	836	314	433	137	70	28	191	4	0	0	0	10151	11366
2026	5.0%	3391	5003	13	138	877	330	454	144	74	29	200	4	0	0	0	10659	11934
2027	5.0%	3561	5254	14	145	921	347	477	151	78	30	210	4	0	0	0	11191	12531
2028	5.0%	3739	5516	14	152	967	364	501	158	82	32	221	5	0	0	0	11751	13157
2029	5.0%	3926	5792	15	160	1016	382	526	166	86	34	232	5	0	0	0	12339	13815
2030	5.0%	4122	6082	16	168	1067	401	552	174	90	35	243	5	0	0	0	12956	14506
2031	5.0%	4328	6386	17	177	1120	421	580	183	94	37	255	5	0	0	0	13603	15231
2032	5.0%	4544	6705	17	185	1176	442	609	192	99	39	268	6	0	0	0	14283	15993
2033	5.0%	4772	7040	18	195	1235	464	639	202	104	41	282	6	0	0	0	14998	16792
2034	5.0%	5010	7392	19	204	1296	488	671	212	109	43	296	6	0	0	0	15748	17632

Year	Growth Factors	AADT															Total in Numbers	Total in PCU
		Two Wheeler	Car/Jeep/ Van/Taxi/ Auto	Mini / RTVs Bus	Stand. Bus	LCV	2-Axle	3 -Axle	Multi-Axle	Agri. Tract. With Trailor	Agri. Tract. Without Trailor	Cycle	Cycle Rickshaw	Hand Cart	Bullock Cart	Horse Cart		
2035	5.0%	5261	7762	20	215	1361	512	705	223	115	45	310	7	0	0	0	16535	18513
2036	5.0%	5524	8150	21	225	1429	538	740	234	121	47	326	7	0	0	0	17362	19439
2037	5.0%	5800	8557	22	237	1501	564	777	246	127	50	342	7	0	0	0	18230	20411
2038	5.0%	6090	8985	23	248	1576	593	816	258	133	52	359	8	0	0	0	19141	21432
2039	5.0%	6395	9435	24	261	1655	622	857	271	140	55	377	8	0	0	0	20098	22503
2040	5.0%	6714	9906	26	274	1737	653	900	284	147	58	396	8	0	0	0	21103	23628
2041	5.0%	7050	10402	27	288	1824	686	945	298	154	60	416	9	0	0	0	22158	24810
2042	5.0%	7402	10922	28	302	1915	720	992	313	162	63	437	9	0	0	0	23266	26050
2043	5.0%	7773	11468	30	317	2011	756	1042	329	170	67	459	10	0	0	0	24430	27353
2044	5.0%	8161	12041	31	333	2112	794	1094	345	178	70	482	10	0	0	0	25651	28720
2045	5.0%	8569	12643	33	349	2217	834	1148	363	187	73	506	11	0	0	0	26934	30156
2046	5.0%	8998	13275	34	367	2328	876	1206	381	196	77	531	11	0	0	0	28280	31664
2047	5.0%	9448	13939	36	385	2444	919	1266	400	206	81	557	12	0	0	0	29694	33247
2048	5.0%	9920	14636	38	405	2567	965	1329	420	217	85	585	12	0	0	0	31179	34910
2049	5.0%	10416	15368	40	425	2695	1014	1396	441	227	89	615	13	0	0	0	32738	36655
2050	5.0%	10937	16136	42	446	2830	1064	1466	463	239	94	645	14	0	0	0	34375	38488
2051	5.0%	11484	16943	44	468	2971	1118	1539	486	251	98	678	14	0	0	0	36094	40412
2052	5.0%	12058	17790	46	492	3120	1173	1616	510	263	103	711	15	0	0	0	37898	42433

1.8 Alignment Option Study and Improvement Proposals

The project road from Jaina More to Gola & Gola to Ormanjhi is located on East-West direction. The horizontal alignment of existing road stretch is passing through several congested settlements / habitational areas with presence of sharp and reverse curves, where the geometric improvement is required. Horizontal alignment of the proposed road has been designed based on the latest NHAI Office Memorandum no. NHAI/Bharatmala/EC/DPR/2016 dated 14.05.2018 and 03.01.2018 prescribed for Economic Corridor. The design has been carried out to provide seamless freight movement between origin and destinations. Geometric improvement has been done at sharp / reverse curve locations as per recommended design speed. The details of Geometric improvement done along the proposed alignment are presented below in Table No. 3 and also shown in Horizontal Alignment Plan in Annexure – 2.

Table No.– 3

(Horizontal Curve Details of Proposed Alignment)

Sl. No.	Design Chainage (km)	Radius (m)	Design Speed (kmph)
1	21+650.357	700	120
2	22+888.916	700	120
3	25+678.426	1500	120
4	35+981.965	10000	120
5	42+061.650	700	120
6	46+240.024	5000	120
7	47+919.633	1000	120
8	49+164.612	2000	120
9	54+376.278	2000	120
10	56+275.543	1000	120
11	58+707.312	2000	120
12	62+448.311	2000	120
13	64+229.878	5000	120
14	66+921.651	700	120
15	68+260.015	700	120
16	70+221.765	900	120
17	71+059.522	900	120
18	72+072.504	2000	120
19	77+726.314	2600	120
20	81+140	1000	120

Beside these locations, alignment option study has been carried out at six (6) locations listed in Table No. 4 to avoid congested built up stretches and most preferred option for each case has been recommended. Methodology for the alignment option study is provided in article no. 1.10. The detailed alignment option study has been presented in

Annexure – 1 and the entire horizontal alignment plan from Jaina More to Gola & Gola to Ormanjhi has been given in Annexure - 2.

Table – 4: (List of Bypass Alignment Option Study Locations)

SL. No.	Locations	Design Chainage (Km)		Length (km)
		From	To	
1	Bahadurpur-Dantu (L1)	24.000	35.000	11.000
2	Petarwar (L2)	35.000	42.000	7.000
3	Sosokhurd (L3)	47.500	53.250	5.750
4	Gola (L4)	54.000	60.000	6.000
5	Bariatu (L5)	60.000	63.230	3.230
6	Ormanjhi (L6)	71.350	81.450	10.100
			Total Length (Km)	**43.080**

1.9 Methodology for Alignment Option Study

1. Parameters and Scoring System

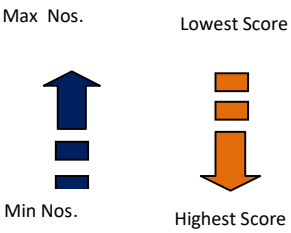
The alignment option have been analyzed and scored based on the following basic aspects:

- Engineering Aspects.
- Social Aspects.
- Environmental Aspects.
- Indicative Cost Aspects.

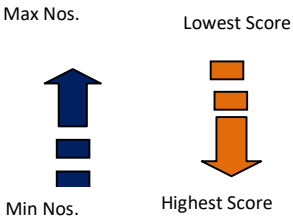
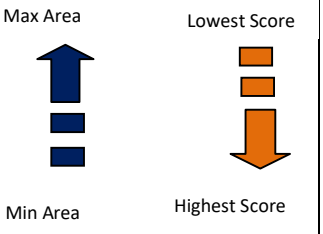
The basic aspects have been subdivided in different parameters the details and scoring principle of which are detailed below:

A. Engineering Aspects

Sl .No.	Parameters	Units	Max Score	Scoring Principle
1	Total Length	Km	10	Max Length → Min Length : Lowest Score → Highest Score
2	Avg. Design Speed	Kmph	10	Max Speed → Min Speed : Highest Score → Lowest Score
3	Horizontal Geometry : No. of horizontal curves	No.	10	Max Nos. → Min Nos. : Lowest Score → Highest Score
4	Total length of Bridges.	M	10	Max Length → Min Length : Lowest Score → Highest Score
5	No of RoBs / RuBs	Nos.	10	Max Nos. : Lowest Score

				
6	No of Grade Separators	Nos.	10	
Total Score			**60**	

B. Social Aspects

Sl .No.	Parameters	Units	Max Score	Scoring Principle
1	Approximate no. of Building to be dismantled	Nos.	10	
2	No of sensitive structure like Temple, Church, School etc. to be dismantled	Nos.	10	
3	Total Land reqd.	Ha	10	
Total Score			**30**	

C. Environmental Aspects

Sl .No.	Parameters	Units	Max Score	Scoring Principle
1	Water Bodies	Nos.	10	Max Nos. → Min Nos. : Lowest Score → Highest Score
2	Agricultural Land (approx.)	Ha.	10	Max Area → Min Area : Lowest Score → Highest Score
3	Forest Land (approx.)	Ha.	10	Max Area → Min Area : Lowest Score → Highest Score
Total Score			**30**	

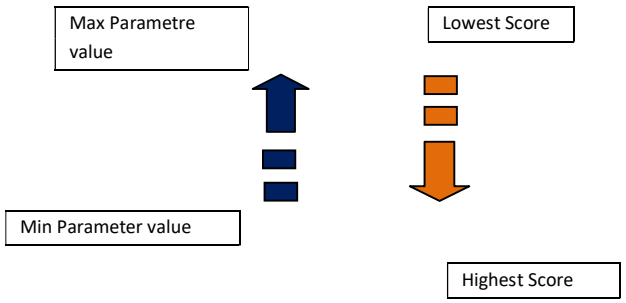
D. Indicative Cost Aspects

Sl .No.	Parameters	Units	Max Score	Scoring Principle
1	Civil Construction Cost (Approx)	Cr.	10	Max Cost → Min Cost : Lowest Score → Highest Score
2	LA Cost (Approx)	Cr.	10	Max Cost → Min Cost : Lowest Score → Highest Score

3	R&R Cost (Approx)	Cr.	10	Max Cost ↑ Min Cost; Lowest Score ↓ Highest Score
Total Score			**30**	

2. Computation of Individual Parameter Score

For Parameters with the following scoring principle, Equation 1 is to be used for computation of individual Parameter Score.

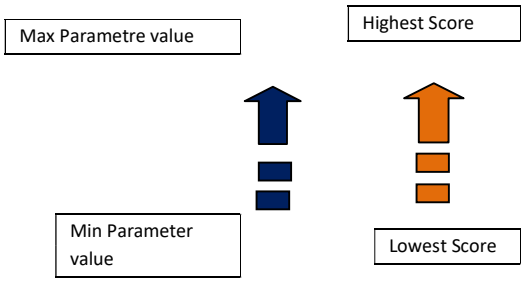


Equation 1:

Score of parameter for option: X

$$= (\text{Maximum score of the parameter}_I) \times \left(\frac{\text{Lowest value of Parameter}_I \text{ for option: X}}{\text{Value of Parameter}_I \text{ for option: X}}\right)$$

For Parameters with the following scoring principle, Equation 2 is to be used for computation of individual Parameter Score.



Equation 2:

Score of parameter for option: X

$$= (\text{Maximum score of the parameter}_I) \times \frac{\text{Value of Parameter}_I \text{ for option: X}}{\text{Highest Value of Parameter}_I \text{ for option: X}}$$

3. Decision Matrix

The final decision matrix 1 will be developed by combining the individual scores of parameters with the application of weightage for different aspects as detailed below:

Aspect	Weightage
Engineering Aspects	0.40
Social Aspects	0.20
Environment Aspects	0.10
Indicative Cost Aspects	0.30
Total	**1.00**

The final decision matrix 2 will be developed by combining the individual scores of parameters with the application of weightage for different aspects as detailed below:

Aspect	Weightage
Engineering Aspects	0.10
Social Aspects	0.40
Environment Aspects	0.20
Indicative Cost Aspects	0.30
Total	**1.00**

The final decision matrix 3 (Sensitivity check) of the weightage adopted will be done, by developing a decision matrix equal weightage for each aspect as detailed below:

Aspect	Weightage
Engineering Aspects	0.25
Social Aspects	0.25
Environment Aspects	0.25
Indicative Cost Aspects	0.25
Total	**1.00**

1.10 Presentation to Government of Jharkhand

The various alignment options have been presented before the good self of the Secretary (Road Construction Dept.) and other officials of RCD and RCD (NH Wing) on 20.06.18. After due deliberation on the prons and cons of the alignment option proposals, the most preferred alignment as proposed has been provisionally accepted by the officials.

1.11 Recommendation

From the Decision Matrices of all 6 Bypass locations given in Annexure – I, it is seen that Option-1 has scored maximum than option-2 (Existing Alignment) and option-3 (Another Alternative), so Option-1 is strongly recommended.

A Summary of Matrix wise Percentage Weightages for various options are given in the table below:

(Summary – Option 1 Matrix wise Percentage Weightages)

Sl. No.	Locations	Decision Matrix -1			Decision Matrix- 2			Decision Matrix -3		
		Opt. 1	Opt. 2	Opt. 3	Opt. 1	Opt. 2	Opt. 3	Opt. 1	Opt. 2	Opt. 3
1	Bahadurpur-Dantu (L1)	**97.51**	**55.68**	**62.83**	**95.02**	**50.83**	**52.12**	**95.19**	**57.36**	**59.02**
2	Petarwar (L2)	**94.09**	**59.85**	**66.09**	**94.00**	**52.20**	**61.39**	**93.09**	**60.27**	**63.65**
3	Sosokhurd (L3)	**96.97**	**64.89**	**77.06**	**93.93**	**54.98**	**70.51**	**94.85**	**63.30**	**69.77**
4	Gola (L4)	**93.32**	**60.57**	**71.28**	**91.10**	**55.89**	**64.26**	**91.18**	**60.90**	**66.93**
5	Bariatu (L5)	**90.49**	**62.04**	**63.07**	**92.65**	**61.28**	**56.50**	**89.60**	**63.24**	**59.72**
6	Ormanjhi (L6)	**93.26**	**52.73**	**64.12**	**93.23**	**46.76**	**54.15**	**92.69**	**51.49**	**57.49**

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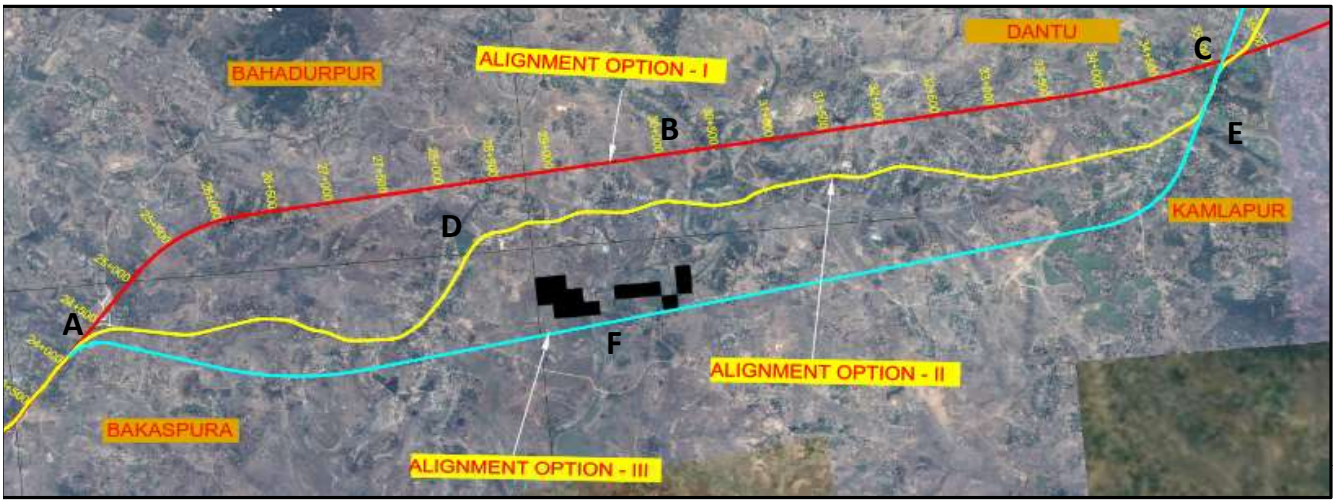
Alignment Option Study For Location-1 (L1)

Km.24.00 to Km. 35.00

Bypass Proposal at Bahadurpur-Dantu



Legend:-

Options	Symbol	Node	Length (Km)
Option-1		A-B-C	11.00
Option-2		A-D-E-C	13.54
Option-3		A-F-E-C	12.59

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Name of Economic Corridor: Raipur-Dhanbad

Name of Road: NH 23(Jaina More to Gola)

Name of Bypass: **Bahadurpur-Dantu (L1)**

Table: 1
ENGINEERING ASPECTS

Sl. No.	Parameters	Units	Max Score	Alt. Opt.-1		Alt. Opt.-2		Alt. Opt.-3	
				Quantity	Score	Quantity	Score	Quantity	Score
1	Total Length	Km	10	11.00	10.00	13.54	8.12	12.59	8.74
2	Avg. Design Speed	Kmph	10	120.00	10.00	65.00	5.42	120.00	10.00
2	Horizontal Curve	Nos.	10	1	10.00	9	1.11	3	3.33
3	Total Length of Bridges	M	10	36.00	10.00	60.00	6.00	36.00	10.00
4	No of RoBs / RuBs	Nos.	10	0.00	10.00	0.00	10.00	0.00	10.00
5	No of Grade Separators	Nos.	10	2.00	10.00	2.00	10.00	3.00	6.67
Total Score:					60.00		40.65		48.74
Average % Score:					100.00		67.75		81.23
Rank:					**1**		**3**		**2**

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Name of Economic Corridor: Raipur-Dhanbad

Name of Road: NH 23(Jaina More to Gola)

Name of Bypass: Bahadurpur-Dantu (L1)

Table: 2
SOCIAL ASPECTS

Sl .No.	Parameters	Units	Max Score	Alt. Opt.-1		Alt. Opt.-2		Alt. Opt.-3	
				Quantity	Score	Quantity	Score	Quantity	Score
1	Approximate no. of Building to be dismantled	Nos.	10	16	10.00	280	0.57	66	2.42
2	No. of Sensitive Structure like Temple, Church, School etc to be dismantled	Nos.	10	1	10.00	22	0.45	4	2.50
3	Total Land required	Ha	10	71.13	8.31	59.13	10.00	78.20	6.28
Total Score:					28.31		11.02		11.20
Average % Score:					94.37		36.73		37.33
Rank:					**1**		**3**		**2**

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Name of Economic Corridor: Raipur-Dhanbad

Name of Road: NH 23(Jaina More to Gola)

Name of Bypass: Bahadurpur-Dantu (L1)

Table: 3
ENVIRONMENT ASPECTS

Sl .No.	Parameters	Units	Max Score	Alt. Opt.-1		Alt. Opt.-2		Alt. Opt.-3	
				Quantity	Score	Quantity	Score	Quantity	Score
1	Water Bodies	Nos.	10	1	10.00	2	5.00	3	3.33
2	Agricultural Land (Approx.)	Ha.	10	30.83	7.60	23.43	10.00	44.70	5.24
3	Forest Land (Approx.)	Ha.	10	40.30	8.31	35.70	9.38	33.50	10.00
Total Score:					25.91		24.38		18.57
Average % Score:					86.370		81.270		61.900
Rank:					**1**		**2**		**3**

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Name of Economic Corridor: Raipur-Dhanbad

Name of Road: NH 23(Jaina More to Gola)

Name of Bypass: Bahadurpur-Dantu (L1)

Table: 4
INDICATIVE COST ASPECTS

Sl .No.	Parameters	Units	Max Score	Alt. Opt.-1		Alt. Opt.-2		Alt. Opt.-3	
				Quantity	Score	Quantity	Score	Quantity	Score
1	Civil Construction Cost (Approx)	Rs. (Cr.)	10	117.75	10.00	165.55	7.11	157.56	7.47
2	LA Cost (Approx)	Rs. (Cr.)	10	19.00	10.00	35.00	5.43	28.00	6.79
3	R&R Cost (Approx)	Rs. (Cr.)	10	8.00	10.00	140.00	0.57	33.00	2.42
Total Score:					30.00		13.11		16.68
Average % Score:					100.00		43.70		55.60
Rank:					**1**		**3**		**2**

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Name of Economic Corridor: Raipur-Dhanbad

Name of Road: NH 23(Jaina More to Gola)

Name of Bypass: Bahadurpur-Dantu (L1)

DECISION MATRIX: 1

Items	Alt. Opt.-1	Alt. Opt.-2	Alt. Opt.-3
Engineering Aspect Percentage weightage in Table 1 **X 0.40**	40.00	27.10	32.49
Socio - Economic Aspect Percentage weightage in Table 2 **X 0.20**	18.87	7.35	7.47
Environmental Aspect Percentage weightage in Table 3 **X 0.10**	8.64	8.13	6.19
Indicative Cost Percentage weightage in Table 4 **X 0.30**	30.00	13.11	16.68
Final percentage Weightage	**97.51**	**55.68**	**62.83**
Final Rank	**1**	**3**	**2**

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Name of Economic Corridor: Raipur-Dhanbad

Name of Road: NH 23(Jaina More to Gola)

Name of Bypass: Bahadurpur-Dantu (L1)

DECISION MATRIX: 2

Items	Alt. Opt.-1	Alt. Opt.-2	Alt. Opt.-3
Engineering Aspect Percentage weightage in Table 1 **X 0.1**	10.00	6.78	8.12
Socio - Economic Aspect Percentage weightage in Table 2 **X 0.4**	37.75	14.69	14.93
Environmental Aspect Percentage weightage in Table 3 **X 0.2**	17.27	16.25	12.38
Indicative Cost Percentage weightage in Table 4 **X 0.3**	30.00	13.11	16.68
Final percentage Weightage	**95.02**	**50.83**	**52.12**
Final Rank	**1**	**3**	**2**

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Name of Economic Corridor: Raipur-Dhanbad
Name of Road: NH 23(Jaina More to Gola)
Name of Bypass: Bahadurpur-Dantu (L1)

DECISION MATRIX: 3

Items	Alt. Opt.-1	Alt. Opt.-2	Alt. Opt.-3
Engineering Aspect Percentage weightage in Table 1 **X 0.25**	25.00	16.94	20.31
Socio - Economic Aspect Percentage weightage in Table 2 **X 0.25**	23.59	9.18	9.33
Environmental Aspect Percentage weightage in Table 3 **X 0.25**	21.59	20.32	15.48
Indicative Cost Percentage weightage in Table 4 **X 0.25**	25.00	10.93	13.90
Final percentage Weightage	**95.19**	**57.36**	**59.02**
Final Rank	**1**	**3**	**2**

Conclusion & Recommendation:
Based on Engineering, Social, Environmental and Indicative Cost Aspects, Alignement Option 1 (A-B-C) has been recommended as most preferred alignemnt.

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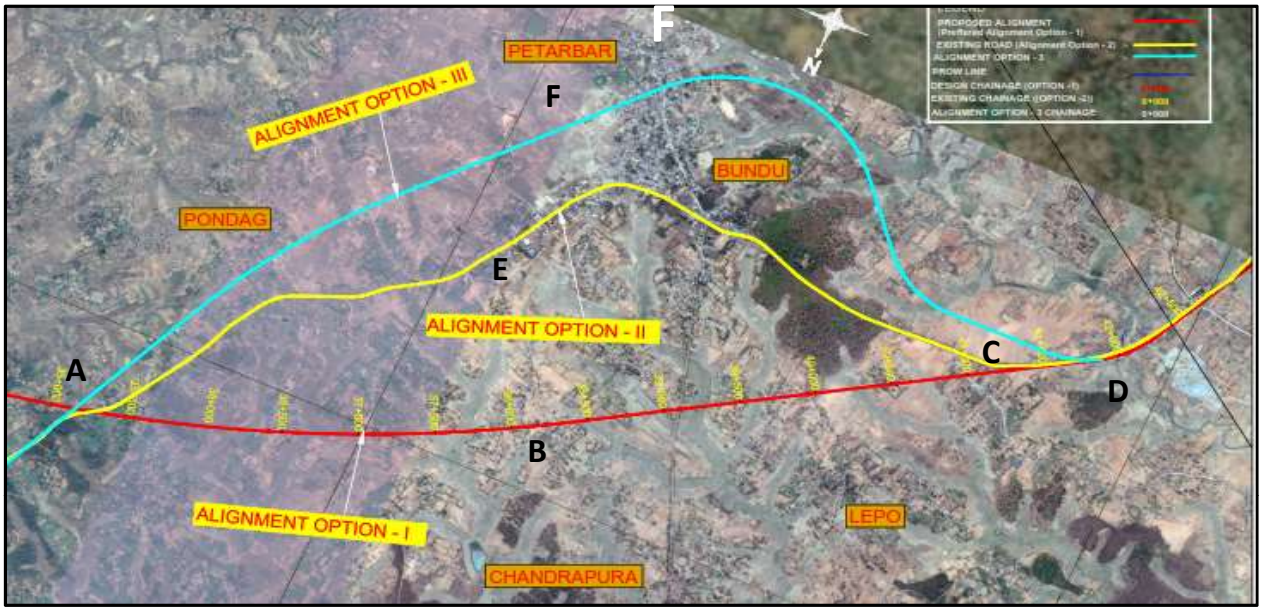
Alignment Option Study For Location-2 (L2)

Km.35.000 to Km. 42.000

Bypass Proposal at Petarwar



Legend:-

Options	Symbol	Node	Length (Km)
Option-1		A-B-C-D	7.00
Option-2		A-E-C-D	8.17
Option-3		A-F-D	10.10

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Name of Economic Corridor: Raipur-Dhanbad

Name of Road: Jaina More - Gola - Ormanjhi

Name of Bypass: **Petarwar Bypass (L2)**

Table: 1
ENGINEERING ASPECTS

Sl. No.	Parameters	Units	Max Score	Alt. Opt.-1		Alt. Opt.-2		Alt. Opt.-3	
				Quantity	Score	Quantity	Score	Quantity	Score
1	Total Length	Km	10	7.00	10.00	8.17	8.57	10.10	6.93
2	Avg. Design Speed	Kmph	10	120.00	10.00	65.00	5.42	120.00	10.00
2	Horizontal Curve	Nos.	10	2	10.00	12	1.67	4	5.00
3	Total Length of Bridges	M	10	0.00	10.00	0.00	10.00	0.00	10.00
4	No of RoBs / RuBs	Nos.	10	0.00	10.00	0.00	10.00	0.00	10.00
5	No of Grade Separators	Nos.	10	2.00	5.00	1.00	10.00	2.00	5.00
Total Score:					55.00		45.66		46.93
Average % Score:					91.67		76.10		78.22
Rank:					**1**		**3**		**2**

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Name of Economic Corridor: Raipur-Dhanbad

Name of Road: Jaina More - Gola - Ormanjhi

Name of Bypass: Petarwar Bypass (L2)

Table: 2
SOCIAL ASPECTS

Sl .No.	Parameters	Units	Max Score	Alt. Opt.-1		Alt. Opt.-2		Alt. Opt.-3	
				Quantity	Score	Quantity	Score	Quantity	Score
1	Approximate no. of Building to be dismantled	Nos.	10	40	10.00	180	2.22	98	4.08
2	No. of Sensitive Structure like Temple, Church, School etc to be dismantled	Nos.	10	0	10.00	4	0.00	0	10.00
3	Total Land required	Ha	10	47.20	8.05	38.00	8.05	71.00	5.35
Total Score:					28.05		10.27		19.43
Average % Score:					93.50		34.23		64.77
Rank:					**1**		**3**		**2**

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Name of Economic Corridor: Raipur-Dhanbad

Name of Road: Jaina More - Gola - Ormanjhi

Name of Bypass: Petarwar Bypass (L2)

Table: 3
ENVIRONMENT ASPECTS

Sl .No.	Parameters	Units	Max Score	Alt. Opt.-1		Alt. Opt.-2		Alt. Opt.-3	
				Quantity	Score	Quantity	Score	Quantity	Score
1	Water Bodies	Nos.	10	2	10.00	4	5.00	3	6.67
2	Agricultural Land (Approx.)	Ha.	10	24.80	7.58	18.80	10.00	38.30	4.91
3	Forest Land (Approx.)	Ha.	10	22.40	8.57	19.20	10.00	32.70	5.87
Total Score:					26.15		25.00		17.45
Average % Score:					87.170		83.330		58.170
Rank:					**1**		**2**		**3**

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Name of Economic Corridor: Raipur-Dhanbad

Name of Road: Jaina More - Gola - Ormanjhi

Name of Bypass: Petarwar Bypass (L2)

Table: 4
INDICATIVE COST ASPECTS

Sl .No.	Parameters	Units	Max Score	Alt. Opt.-1		Alt. Opt.-2		Alt. Opt.-3	
				Quantity	Score	Quantity	Score	Quantity	Score
1	Civil Construction Cost (Approx)	Rs. (Cr.)	10	47.10	10.00	70.78	6.65	82.65	5.70
2	LA Cost (Approx)	Rs. (Cr.)	10	15.00	10.00	28.00	5.36	24.00	6.25
3	R&R Cost (Approx)	Rs. (Cr.)	10	20.00	10.00	90.00	2.22	49.00	4.08
Total Score:					30.00		14.23		16.03
Average % Score:					100.00		47.43		53.43
Rank:					**1**		**3**		**2**

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Name of Economic Corridor: Raipur-Dhanbad

Name of Road: Jaina More - Gola - Ormanjhi

Name of Bypass: Petarwar Bypass (L2)

DECISION MATRIX: 1

Items	Alt. Opt.-1	Alt. Opt.-2	Alt. Opt.-3
Engineering Aspect Percentage weightage in Table 1 **X 0.40**	36.67	30.44	31.29
Socio - Economic Aspect Percentage weightage in Table 2 **X 0.20**	18.70	6.85	12.95
Environmental Aspect Percentage weightage in Table 3 **X 0.10**	8.72	8.33	5.82
Indicative Cost Percentage weightage in Table 4 **X 0.30**	30.00	14.23	16.03
Final percentage Weightage	**94.09**	**59.85**	**66.09**
Final Rank	**1**	**3**	**2**

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Name of Economic Corridor: Raipur-Dhanbad

Name of Road: Jaina More - Gola - Ormanjhi

Name of Bypass: Petarwar Bypass (L2)

DECISION MATRIX: 2

Items	Alt. Opt.-1	Alt. Opt.-2	Alt. Opt.-3
Engineering Aspect Percentage weightage in Table 1 **X 0.1**	9.17	7.61	7.82
Socio - Economic Aspect Percentage weightage in Table 2 **X 0.4**	37.40	13.69	25.91
Environmental Aspect Percentage weightage in Table 3 **X 0.2**	17.43	16.67	11.63
Indicative Cost Percentage weightage in Table 4 **X 0.3**	30.00	14.23	16.03
Final percentage Weightage	**94.00**	**52.20**	**61.39**
Final Rank	**1**	**3**	**2**

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Name of Economic Corridor: Raipur-Dhanbad
Name of Road: Jaina More - Gola - Ormanjhi
Name of Bypass: Petarwar Bypass (L2)

DECISION MATRIX: 3

Items	Alt. Opt.-1	Alt. Opt.-2	Alt. Opt.-3
Engineering Aspect Percentage weightage in Table 1 **X 0.25**	22.92	19.03	19.56
Socio - Economic Aspect Percentage weightage in Table 2 **X 0.25**	23.38	8.56	16.19
Environmental Aspect Percentage weightage in Table 3 **X 0.25**	21.79	20.83	14.54
Indicative Cost Percentage weightage in Table 4 **X 0.25**	25.00	11.86	13.36
Final percentage Weightage	**93.09**	**60.27**	**63.65**
Final Rank	**1**	**3**	**2**

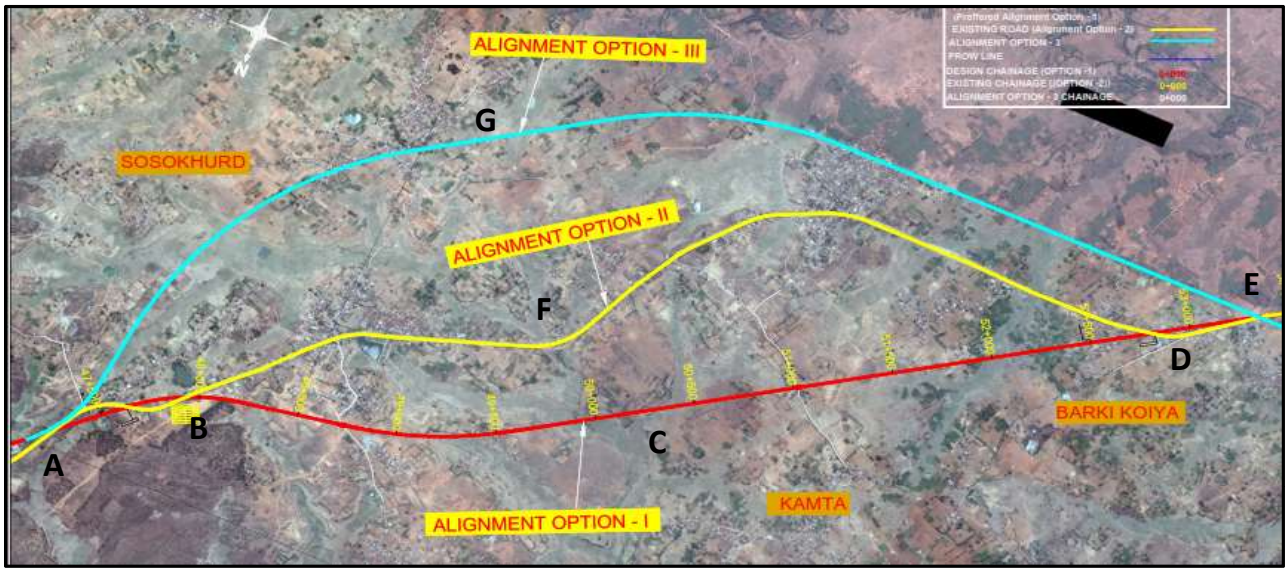
Conclusion & Recommendation:
Based on Engineering, Social, Environmental and Indicative Cost Aspects, Alignement Option 1 (A-B-C-D) has been recommended as most preferred alignemnt.

Sudhir Kumar
Project Director
NHAI, PIU
Dhanbad

Alignment Option Study For Location-3 (L3)

Km.47.500 to Km. 53.250

Bypass Proposal at Sosokhurd



Legend:-

Options	Symbol	Node	Length (Km)
Option-1		A-B-C-D-E	5.75
Option-2		A-B-F-D-E	6.30
Option-3		A-G-E	7.30

Sudhir Kumar

Project Director
NHAI, PIU
Dhanbad

Name of Economic Corridor: Raipur-Dhanbad

Name of Road: NH 320 (Jaina More -Gola-Ormanjhi)

Name of Bypass: **Km.47.500 to Km. 53.250** 5.75

Table: 3
ENVIRONMENT ASPECTS

Sl .No.	Parameters	Units	Max Score	Alt. Opt.-1		Alt. Opt.-2		Alt. Opt.-3	
				Quantity	Score	Quantity	Score	Quantity	Score
1	Water Bodies	Nos.	10	0	10.00	1	5.00	4	2.25
2	Agricultural Land (Approx.)	Ha.	10	36.81	6.74	24.80	10.00	34.50	7.19
3	Forest Land (Approx.)	Ha.	10	2.75	10.00	3.20	8.59	14.50	1.90
Total Score:					26.74		23.59		11.34
Average % Score:					89.130		78.630		37.800
Rank:					**1**		**2**		**3**

Sudhir Kumar
Project Director
NHAI, PIU
Dhanbad

Name of Economic Corridor: Raipur-Dhanbad

Name of Road: Jaina More -Gola-Ormanjhi

Name of Bypass: **Km.47.500 to Km. 53.250**

Table: 1
ENGINEERING ASPECTS

Sl. No.	Parameters	Units	Max Score	Alt. Opt.-1		Alt. Opt.-2		Alt. Opt.-3	
				Quantity	Score	Quantity	Score	Quantity	Score
1	Total Length	Km	10	5.75	10.00	6.30	9.13	7.30	7.88
2	Avg. Design Speed	Kmph	10	120.00	10.00	80.00	6.67	120.00	10.00
2	Horizontal Curve	Nos.	10	2	10.00	4	5.00	3	6.67
3	Total Length of Bridges	M	10	0.00	10.00	0.00	10.00	0.00	10.00
4	No of RoBs / RuBs	Nos.	10	0.00	10.00	0.00	10.00	0.00	10.00
5	No of Grade Separators	Nos.	10	2.00	10.00	2.00	10.00	3.00	6.67
Total Score:					60.00		50.80		51.22
Average % Score:					100.00		84.67		85.37
Rank:					**1**		**3**		**2**

Sudhir Kumar
Project Director
NHAI, PIU
Dhanbad

Name of Economic Corridor: Raipur-Dhanbad

Name of Road: Jaina More -Gola-Ormanjhi

Name of Bypass: **Km.47.500 to Km. 53.250**

Table: 2
SOCIAL ASPECTS

Sl .No.	Parameters	Units	Max Score	Alt. Opt.-1		Alt. Opt.-2		Alt. Opt.-3	
				Quantity	Score	Quantity	Score	Quantity	Score
1	Approximate no. of Building to be dismantled	Nos.	10	13	10.00	90	1.44	18	7.22
2	No. of Sensitive Structure like Temple, Church, School etc to be dismantled	Nos.	10	0	10.00	1	0.00	0	10.00
3	Total Land required	Ha	10	39.56	7.08	28.00	10.00	49.00	5.71
Total Score:					27.08		11.44		22.93
Average % Score:					90.27		38.13		76.43
Rank:					**1**		**3**		**2**

Sudhir Kumar
Project Director
NHAI, PIU
Dhanbad

Name of Economic Corridor: Raipur-Dhanbad

Name of Road: Jaina More -Gola-Ormanjhi

Name of Bypass: **Km.47.500 to Km. 53.250**

Table: 3
ENVIRONMENT ASPECTS

Sl .No.	Parameters	Units	Max Score	Alt. Opt.-1		Alt. Opt.-2		Alt. Opt.-3	
				Quantity	Score	Quantity	Score	Quantity	Score
1	Water Bodies	Nos.	10	0	10.00	1	5.00	4	2.25
2	Agricultural Land (Approx.)	Ha.	10	36.81	6.74	24.80	10.00	34.50	7.19
3	Forest Land (Approx.)	Ha.	10	2.75	10.00	3.20	8.59	14.50	1.90
Total Score:					26.74		23.59		11.34
Average % Score:					89.130		78.630		37.800
Rank:					**1**		**2**		**3**

Sudhir Kumar
Project Director
NHAI, PIU
Dhanbad

Name of Economic Corridor: Raipur-Dhanbad

Name of Road: Jaina More -Gola-Ormanjhi

Name of Bypass: **Km.47.500 to Km. 53.250**

Table: 4
INDICATIVE COST ASPECTS

Sl .No.	Parameters	Units	Max Score	Alt. Opt.-1		Alt. Opt.-2		Alt. Opt.-3	
				Quantity	Score	Quantity	Score	Quantity	Score
1	Civil Construction Cost (Approx)	Rs. (Cr.)	10	51.53	10.00	69.47	7.42	77.88	6.62
2	LA Cost (Approx)	Rs. (Cr.)	10	6.00	10.00	9.00	6.67	6.00	10.00
3	R&R Cost (Approx)	Rs. (Cr.)	10	6.50	10.00	45.00	1.44	9.00	7.22
Total Score:					30.00		15.53		23.84
Average % Score:					100.00		51.77		79.47
Rank:					**1**		**2**		3

Sudhir Kumar
Project Director
NHAI, PIU
Dhanbad

Name of Economic Corridor: Raipur-Dhanbad

Name of Road: Jaina More -Gola-Ormanjhi

Name of Bypass: Km.47.500 to Km. 53.250

DECISION MATRIX: 1

Items	Alt. Opt.-1	Alt. Opt.-2	Alt. Opt.-3
Engineering Aspect Percentage weightage in Table 1 **X 0.40**	40.00	33.87	34.15
Socio - Economic Aspect Percentage weightage in Table 2 **X 0.20**	18.05	7.63	15.29
Environmental Aspect Percentage weightage in Table 3 **X 0.10**	8.91	7.86	3.78
Indicative Cost Percentage weightage in Table 4 **X 0.30**	30.00	15.53	23.84
Final percentage Weightage	**96.97**	**64.89**	**77.06**
Final Rank	**1**	**3**	**2**

Sudhir Kumar

Project Director
NHAI, PIU
Dhanbad

Name of Economic Corridor: Raipur-Dhanbad

Name of Road: Jaina More -Gola-Ormanjhi

Name of Bypass: Km.47.500 to Km. 53.250

DECISION MATRIX: 2

Items	Alt. Opt.-1	Alt. Opt.-2	Alt. Opt.-3
Engineering Aspect Percentage weightage in Table 1 **X 0.1**	10.00	8.47	8.54
Socio - Economic Aspect Percentage weightage in Table 2 **X 0.4**	36.11	15.25	30.57
Environmental Aspect Percentage weightage in Table 3 **X 0.2**	17.83	15.73	7.56
Indicative Cost Percentage weightage in Table 4 **X 0.3**	30.00	15.53	23.84
Final percentage Weightage	**93.93**	**54.98**	**70.51**
Final Rank	**1**	**3**	**2**

Sudhir Kumar

Project Director
NHAI, PIU
Dhanbad

Name of Economic Corridor: Raipur-Dhanbad
Name of Road: Jaina More -Gola-Ormanjhi
Name of Bypass: Km.47.500 to Km. 53.250

DECISION MATRIX: 3

Items	Alt. Opt.-1	Alt. Opt.-2	Alt. Opt.-3
Engineering Aspect Percentage weightage in Table 1 **X 0.25**	25.00	21.17	21.34
Socio - Economic Aspect Percentage weightage in Table 2 **X 0.25**	22.57	9.53	19.11
Environmental Aspect Percentage weightage in Table 3 **X 0.25**	22.28	19.66	9.45
Indicative Cost Percentage weightage in Table 4 **X 0.25**	25.00	12.94	19.87
Final percentage Weightage	**94.85**	**63.30**	**69.77**
Final Rank	**1**	**3**	**2**

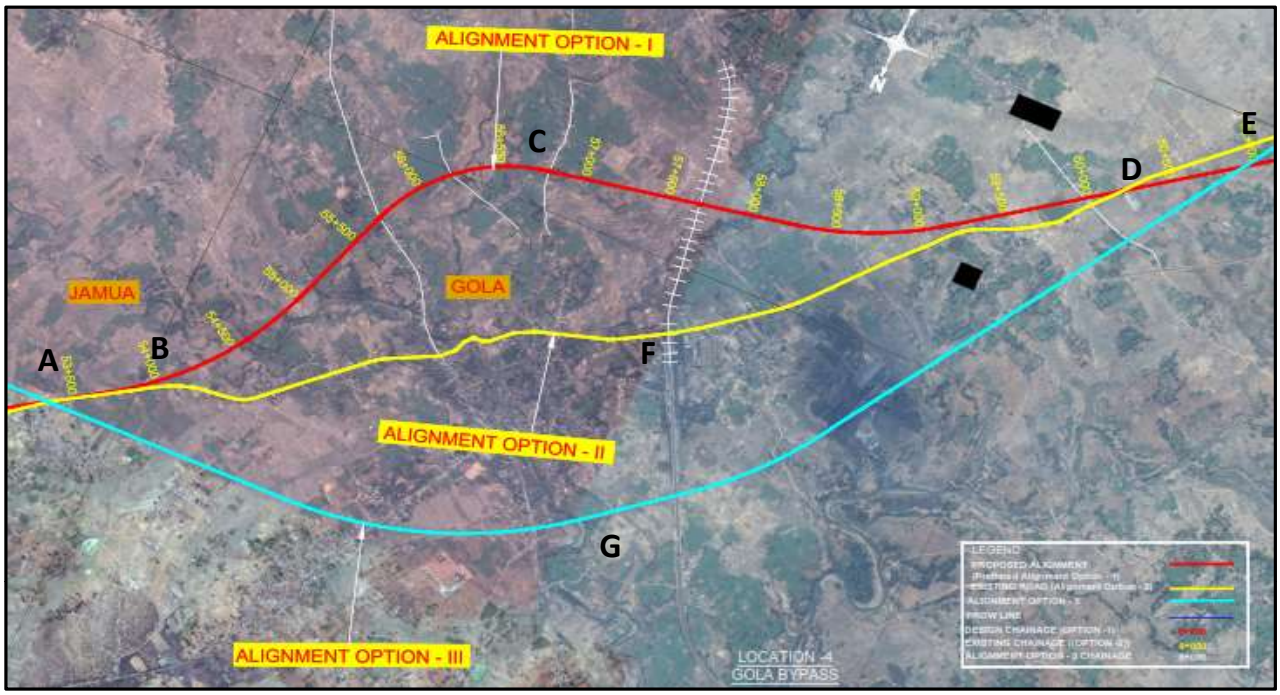
Conclusion & Recommendation:
Based on Engineering, Social, Environmental and Indicative Cost Aspects, Alignement Option 1 (A-B-C-D-E) has been recommended as most preferred alignemnt.

Sudhir Kumar
Project Director
NHAI, PIU
Dhanbad

Alignment Option Study For Location-4 (L4)

From Km. 54.000 to 60.000

Bypass Proposal at Gola (Location-4)



Legend:-

Options	Symbol	Node	Length (Km)
Option-1		A-B-C-D-E	6.00
Option-2		A-B-F-D-E	5.70
Option-3		A-G-E	7.20

Sudhir Kumar

Project Director
NHAI, PIU
Dhanbad

Name of Economic Corridor: Raipur-Dhanbad

Name of Road: Jaina More -Gola-Ormanjhi

Name of Bypass: Bypass Proposal at Gola (Location-4)

Table: 1
ENGINEERING ASPECTS

Sl. No.	Parameters	Units	Max Score	Alt. Opt.-1		Alt. Opt.-2		Alt. Opt.-3	
				Quantity	Score	Quantity	Score	Quantity	Score
1	Total Length	Km	10	6.00	9.50	5.70	10.00	7.20	7.92
2	Avg. Design Speed	Kmph	10	120.00	10.00	40.00	3.33	120.00	10.00
2	Horizontal Curve	Nos.	10	3	6.67	8	2.50	2	10.00
3	Total Length of Bridges	M	10	24.00	10.00	60.00	4.00	45.00	5.33
4	No of RoBs / RuBs	Nos.	10	1.00	10.00	1.00	10.00	1.00	10.00
5	No of Grade Separators	Nos.	10	2.00	10.00	2.00	10.00	3.00	6.67
Total Score:					56.17		39.83		49.92
Average % Score:					93.62		66.38		83.20
Rank:					**1**		**3**		**2**

Sudhir Kumar
Project Director
NHAI, PIU
Dhanbad

Name of Economic Corridor: Raipur-Dhanbad

Name of Road: Jaina More -Gola-Ormanjhi

Name of Bypass: Bypass Proposal at Gola (Location-4)

Table: 2
SOCIAL ASPECTS

Sl .No.	Parameters	Units	Max Score	Alt. Opt.-1		Alt. Opt.-2		Alt. Opt.-3	
				Quantity	Score	Quantity	Score	Quantity	Score
1	Approximate no. of Building to be dismantled	Nos.	10	20	10.00	150	1.33	60	3.33
2	No. of Sensitive Structure like Temple, Church, School etc to be dismantled	Nos.	10	0	10.00	3	0.00	0	10.00
3	Total Land required	Ha	10	41.40	6.28	26.00	10.00	50.00	5.20
Total Score:					26.28		11.33		18.53
Average % Score:					87.60		37.77		61.77
Rank:					**1**		**3**		**2**

Sudhir Kumar
Project Director
NHAI, PIU
Dhanbad

Name of Economic Corridor: Raipur-Dhanbad

Name of Road: Jaina More -Gola-Ormanjhi

Name of Bypass: Bypass Proposal at Gola (Location-4)

Table: 3
ENVIRONMENT ASPECTS

Sl .No.	Parameters	Units	Max Score	Alt. Opt.-1		Alt. Opt.-2		Alt. Opt.-3	
				Quantity	Score	Quantity	Score	Quantity	Score
1	Water Bodies	Nos.	10	1	10.00	0	10.00	0	10.00
2	Agricultural Land (Approx.)	Ha.	10	39.57	5.05	20.00	10.00	38.50	5.19
3	Forest Land (Approx.)	Ha.	10	1.83	10.00	6.00	3.05	11.50	1.59
Total Score:					25.05		23.05		16.78
Average % Score:					83.500		76.830		55.930
Rank:					**1**		**2**		**3**

Sudhir Kumar
Project Director
NHAI, PIU
Dhanbad

Name of Economic Corridor: Raipur-Dhanbad

Name of Road: Jaina More -Gola-Ormanjhi

Name of Bypass: Bypass Proposal at Gola (Location-4)

Table: 4
INDICATIVE COST ASPECTS

Sl .No.	Parameters	Units	Max Score	Alt. Opt.-1		Alt. Opt.-2		Alt. Opt.-3	
				Quantity	Score	Quantity	Score	Quantity	Score
1	Civil Construction Cost (Approx)	Rs. (Cr.)	10	83.30	10.00	111.83	7.45	124.02	6.72
2	LA Cost (Approx)	Rs. (Cr.)	10	7.00	10.00	7.00	10.00	7.00	10.00
3	R&R Cost (Approx)	Rs. (Cr.)	10	10.00	10.00	75.00	1.33	30.00	3.33
Total Score:					30.00		18.78		20.05
Average % Score:					100.00		62.60		66.83
Rank:					**1**		**3**		**2**

Sudhir Kumar
Project Director
NHAI, PIU
Dhanbad

Name of Economic Corridor: Raipur-Dhanbad

Name of Road: Jaina More -Gola-Ormanjhi

Name of Bypass: Bypass Proposal at Gola (Location-4)

DECISION MATRIX: 1

Items	Alt. Opt.-1	Alt. Opt.-2	Alt. Opt.-3
Engineering Aspect Percentage weightage in Table 1 **X 0.40**	37.45	26.55	33.28
Socio - Economic Aspect Percentage weightage in Table 2 **X 0.20**	17.52	7.55	12.35
Environmental Aspect Percentage weightage in Table 3 **X 0.10**	8.35	7.68	5.59
Indicative Cost Percentage weightage in Table 4 **X 0.30**	30.00	18.78	20.05
Final percentage Weightage	**93.32**	**60.57**	**71.28**
Final Rank	**1**	**3**	**2**

Sudhir Kumar

Project Director
NHAI, PIU
Dhanbad

Name of Economic Corridor: Raipur-Dhanbad

Name of Road: Jaina More -Gola-Ormanjhi

Name of Bypass: Bypass Proposal at Gola (Location-4)

DECISION MATRIX: 2

Items	Alt. Opt.-1	Alt. Opt.-2	Alt. Opt.-3
Engineering Aspect Percentage weightage in Table 1 **X 0.1**	9.36	6.64	8.32
Socio - Economic Aspect Percentage weightage in Table 2 **X 0.4**	35.04	15.11	24.71
Environmental Aspect Percentage weightage in Table 3 **X 0.2**	16.70	15.37	11.19
Indicative Cost Percentage weightage in Table 4 **X 0.3**	30.00	18.78	20.05
Final percentage Weightage	**91.10**	**55.89**	**64.26**
Final Rank	**1**	**3**	**2**

Sudhir Kumar

Project Director
NHAI, PIU
Dhanbad

Name of Economic Corridor: Raipur-Dhanbad
Name of Road: Jaina More -Gola-Ormanjhi
Name of Bypass: Bypass Proposal at Gola (Location-4)

DECISION MATRIX: 3

Items	Alt. Opt.-1	Alt. Opt.-2	Alt. Opt.-3
Engineering Aspect Percentage weightage in Table 1 **X 0.25**	23.41	16.60	20.80
Socio - Economic Aspect Percentage weightage in Table 2 **X 0.25**	21.90	9.44	15.44
Environmental Aspect Percentage weightage in Table 3 **X 0.25**	20.88	19.21	13.98
Indicative Cost Percentage weightage in Table 4 **X 0.25**	25.00	15.65	16.71
Final percentage Weightage	**91.18**	**60.90**	**66.93**
Final Rank	**1**	**3**	**2**

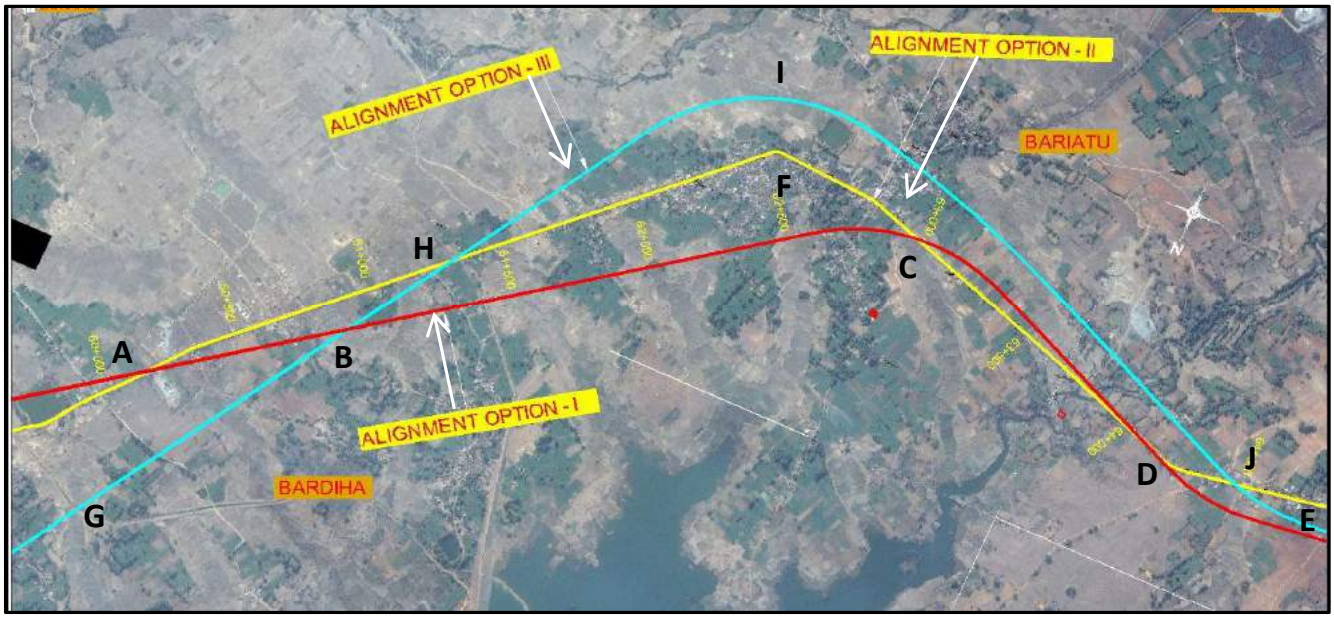
Conclusion & Recommendation:
Based on Engineering, Social, Environmental and Indicative Cost Aspects, Alignement Option 1 (A-B-C-D-E) has been recommended as most preferred alignemnt.

Sudhir Kumar
Project Director
NHAI, PIU
Dhanbad

Alignment Option Study For Location-5 (L5)

From Km. 60.000 to Km. 63.230

Bypass Proposal at Bariatu(L5)



Legend:-

Options	Symbol	Node	Length (Km)
Option-1		A-B-C-D-E	3.23
Option-2		A-H-F-C-D-E	4.32
Option-3		G-B-H-I-J-E	4.60

Sudhir Kumar

Project Director
NHAI, PIU
Dhanbad

Name of Economic Corridor: Raipur-Dhanbad

Name of Road: Jaina More -Gola-Ormanjhi

Name of Bypass: Bypass Proposal at Bariatu(L5)

Table: 1
ENGINEERING ASPECTS

Sl. No.	Parameters	Units	Max Score	Alt. Opt.-1		Alt. Opt.-2		Alt. Opt.-3	
				Quantity	Score	Quantity	Score	Quantity	Score
1	Total Length	Km	10	3.23	10.00	4.32	7.48	4.60	7.02
2	Avg. Design Speed	Kmph	10	120.00	10.00	40.00	3.33	120.00	10.00
2	Horizontal Curve	Nos.	10	1	10.00	4	2.50	2	5.00
3	Total Length of Bridges	M	10	54.00	6.67	36.00	10.00	36.00	10.00
4	No of RoBs / RuBs	Nos.	10	0.00	10.00	0.00	10.00	0.00	10.00
5	No of Grade Separators	Nos.	10	3.00	3.33	1.00	10.00	2.00	5.00
Total Score:					50.00		43.31		47.02
Average % Score:					83.33		72.18		78.37
Rank:					**1**		**3**		**2**

Sudhir Kumar
Project Director
NHAI, PIU
Dhanbad

Name of Economic Corridor: Raipur-Dhanbad

Name of Road: Jaina More -Gola-Ormanjhi

Name of Bypass: Bypass Proposal at Bariatu(L5)

Table: 2
SOCIAL ASPECTS

Sl .No.	Parameters	Units	Max Score	Alt. Opt.-1		Alt. Opt.-2		Alt. Opt.-3	
				Quantity	Score	Quantity	Score	Quantity	Score
1	Approximate no. of Building to be dismantled	Nos.	10	6	10.00	85	0.71	28	2.14
2	No. of Sensitive Structure like Temple, Church, School etc to be dismantled	Nos.	10	0	10.00	0	10.00	0	10.00
3	Total Land required	Ha	10	19.00	8.95	17.00	10.00	32.00	5.31
Total Score:					28.95		20.71		17.45
Average % Score:					96.50		69.03		58.17
Rank:					**1**		**2**		**3**

A-H-F-C-D-E

Sudhir Kumar
Project Director
NHAI, PIU
Dhanbad

Name of Economic Corridor: Raipur-Dhanbad

Name of Road: Jaina More -Gola-Ormanjhi

Name of Bypass: Bypass Proposal at Bariatu(L5)

Table: 3
ENVIRONMENT ASPECTS

Sl .No.	Parameters	Units	Max Score	Alt. Opt.-1		Alt. Opt.-2		Alt. Opt.-3	
				Quantity	Score	Quantity	Score	Quantity	Score
1	Water Bodies	Nos.	10	2	5.00	1	10.00	1	10.00
2	Agricultural Land (Approx.)	Ha.	10	18.90	8.57	16.20	10.00	30.18	5.37
3	Forest Land (Approx.)	Ha.	10	0.10	10.00	0.80	1.25	1.82	0.55
Total Score:					23.57		21.25		15.92
Average % Score:					78.570		70.830		53.070
Rank:					**1**		**2**		**3**

A-H-F-C-D-E

Sudhir Kumar
Project Director
NHAI, PIU
Dhanbad

Name of Economic Corridor: Raipur-Dhanbad

Name of Road: Jaina More -Gola-Ormanjhi

Name of Bypass: Bypass Proposal at Bariatu(L5)

Table: 4
INDICATIVE COST ASPECTS

Sl .No.	Parameters	Units	Max Score	Alt. Opt.-1		Alt. Opt.-2		Alt. Opt.-3	
				Quantity	Score	Quantity	Score	Quantity	Score
1	Civil Construction Cost (Approx)	Rs. (Cr.)	10	57.26	10.00	87.14	6.57	86.22	6.64
2	LA Cost (Approx)	Rs. (Cr.)	10	3.00	10.00	6.00	5.00	5.00	6.00
3	R&R Cost (Approx)	Rs. (Cr.)	10	3.00	10.00	42.50	0.71	14.00	2.14
Total Score:					30.00		12.28		14.78
Average % Score:					100.00		40.93		49.27
Rank:					**1**		**3**		**2**

Sudhir Kumar
Project Director
NHAI, PIU
Dhanbad

Name of Economic Corridor: Raipur-Dhanbad

Name of Road: Jaina More -Gola-Ormanjhi

Name of Bypass: Bypass Proposal at Bariatu(L5)

DECISION MATRIX: 1

Items	Alt. Opt.-1	Alt. Opt.-2	Alt. Opt.-3
Engineering Aspect Percentage weightage in Table 1 **X 0.40**	33.33	28.87	31.35
Socio - Economic Aspect Percentage weightage in Table 2 **X 0.20**	19.30	13.81	11.63
Environmental Aspect Percentage weightage in Table 3 **X 0.10**	7.86	7.08	5.31
Indicative Cost Percentage weightage in Table 4 **X 0.30**	30.00	12.28	14.78
Final percentage Weightage	**90.49**	**62.04**	**63.07**
Final Rank	**1**	**3**	**2**

A-H-F-C-D-E

Sudhir Kumar

Project Director
NHAI, PIU
Dhanbad

Name of Economic Corridor: Raipur-Dhanbad

Name of Road: Jaina More -Gola-Ormanjhi

Name of Bypass: Bypass Proposal at Bariatu(L5)

DECISION MATRIX: 2

Items	Alt. Opt.-1	Alt. Opt.-2	Alt. Opt.-3
Engineering Aspect Percentage weightage in Table 1 **X 0.1**	8.33	7.22	7.84
Socio - Economic Aspect Percentage weightage in Table 2 **X 0.4**	38.60	27.61	23.27
Environmental Aspect Percentage weightage in Table 3 **X 0.2**	15.71	14.17	10.61
Indicative Cost Percentage weightage in Table 4 **X 0.3**	30.00	12.28	14.78
Final percentage Weightage	**92.65**	**61.28**	**56.50**
Final Rank	**1**	**2**	**3**

A-H-F-C-D-E

Sudhir Kumar

Project Director
NHAI, PIU
Dhanbad

Name of Economic Corridor: Raipur-Dhanbad
Name of Road: Jaina More -Gola-Ormanjhi
Name of Bypass: Bypass Proposal at Bariatu(L5)

DECISION MATRIX: 3

Items	Alt. Opt.-1	Alt. Opt.-2	Alt. Opt.-3
Engineering Aspect Percentage weightage in Table 1 **X 0.25**	20.83	18.05	19.59
Socio - Economic Aspect Percentage weightage in Table 2 **X 0.25**	24.13	17.26	14.54
Environmental Aspect Percentage weightage in Table 3 **X 0.25**	19.64	17.71	13.27
Indicative Cost Percentage weightage in Table 4 **X 0.25**	25.00	10.23	12.32
Final percentage Weightage	**89.60**	**63.24**	**59.72**
Final Rank	**1**	**2**	**3**

Conclusion & Recommendation:
Based on Engineering, Social, Environmental and Indicative Cost Aspects, Alignement Option 1 (A-B-C-D-E) has been recommended as most preferred alignemnt.

A-H-F-C-D-E

Sudhir Kumar
Project Director
NHAI, PIU
Dhanbad

Name of Economic Corridor: Raipur-Dhanbad

Name of Road: Jaina More -Gola-Ormanjhi

Name of Bypass: Ormanjhi Bypass (L6)

Table: 1
ENGINEERING ASPECTS

Sl. No.	Parameters	Units	Max Score	Alt. Opt.-1		Alt. Opt.-2		Alt. Opt.-3	
				Quantity	Score	Quantity	Score	Quantity	Score
1	Total Length	Km	10	10.10	10.00	14.74	6.85	12.70	7.95
2	Avg. Design Speed	Kmph	10	120.00	10.00	40.00	3.33	120.00	10.00
2	Horizontal Curve	Nos.	10	5	8.00	58	0.69	4	10.00
3	Total Length of Bridges	M	10	48.00	10.00	48.00	10.00	192.00	2.50
4	No of RoBs / RuBs	Nos.	10	0.00	10.00	0.00	10.00	0.00	10.00
5	No of Grade Separators	Nos.	10	8.00	6.25	7.00	7.14	5.00	10.00
Total Score:					54.25		38.01		50.45
Average % Score:					90.42		63.35		84.08
Rank:					**1**		**3**		**2**

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Name of Road: Jaina More -Gola-Ormanjhi

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Table: 1
ENGINEERING ASPECTS

Sl. No.	Parameters	Units	Max Score	Alt. Opt.-1		Alt. Opt.-2		Alt. Opt.-3	
				Quantity	Score	Quantity	Score	Quantity	Score
1	Total Length	Km	10	10.10	10.00	14.74	6.85	12.70	7.95
2	Avg. Design Speed	Kmph	10	120.00	10.00	40.00	3.33	120.00	10.00
2	Horizontal Curve	Nos.	10	5	8.00	58	0.69	4	10.00
3	Total Length of Bridges	M	10	48.00	10.00	48.00	10.00	192.00	2.50
4	No of RoBs / RuBs	Nos.	10	0.00	10.00	0.00	10.00	0.00	10.00
5	No of Grade Separators	Nos.	10	8.00	6.25	7.00	7.14	5.00	10.00
Total Score:					54.25		38.01		50.45
Average % Score:					90.42		63.35		84.08
Rank:					**1**		**3**		**2**

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Table: 2
SOCIAL ASPECTS

Sl .No.	Parameters	Units	Max Score	Alt. Opt.-1		Alt. Opt.-2		Alt. Opt.-3	
				Quantity	Score	Quantity	Score	Quantity	Score
1	Approximate no. of Building to be dismantled	Nos.	10	8	10.00	120	0.67	70	1.14
2	No. of Sensitive Structure like Temple, Church, School etc to be dismantled	Nos.	10	0	10.00	3	0.00	0	10.00
3	Total Land required	Ha	10	92.50	7.19	66.50	10.00	109.20	6.09
Total Score:					27.19		10.67		17.23
Average % Score:					90.63		35.57		57.43
Rank:					**1**		**3**		**2**

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Table: 3
ENVIRONMENT ASPECTS

Sl .No.	Parameters	Units	Max Score	Alt. Opt.-1		Alt. Opt.-2		Alt. Opt.-3	
				Quantity	Score	Quantity	Score	Quantity	Score
1	Water Bodies	Nos.	10	0	10.00	1	0.00	1	0.00
2	Agricultural Land (Approx.)	Ha.	10	88.24	6.91	61.00	10.00	101.10	6.03
3	Forest Land (Approx.)	Ha.	10	4.26	10.00	5.50	7.75	8.10	5.26
Total Score:					26.91		17.75		11.29
Average % Score:					89.700		59.170		37.630
Rank:					**1**		**2**		**3**

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Table: 4
INDICATIVE COST ASPECTS

Sl .No.	Parameters	Units	Max Score	Alt. Opt.-1		Alt. Opt.-2		Alt. Opt.-3	
				Quantity	Score	Quantity	Score	Quantity	Score
1	Civil Construction Cost (Approx)	Rs. (Cr.)	10	140.46	10.00	214.44	6.55	266.07	5.28
2	LA Cost (Approx)	Rs. (Cr.)	10	15.00	10.00	21.00	7.14	17.00	8.82
3	R&R Cost (Approx)	Rs. (Cr.)	10	4.00	10.00	60.00	0.67	35.00	1.14
Total Score:					30.00		14.36		15.24
Average % Score:					100.00		47.87		50.80
Rank:					**1**		**3**		**2**

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DECISION MATRIX: 1

Items	Alt. Opt.-1	Alt. Opt.-2	Alt. Opt.-3
Engineering Aspect Percentage weightage in Table 1 **X 0.40**	36.17	25.34	33.63
Socio - Economic Aspect Percentage weightage in Table 2 **X 0.20**	18.13	7.11	11.49
Environmental Aspect Percentage weightage in Table 3 **X 0.10**	8.97	5.92	3.76
Indicative Cost Percentage weightage in Table 4 **X 0.30**	30.00	14.36	15.24
Final percentage Weightage	**93.26**	**52.73**	**64.12**
Final Rank	**1**	**3**	**2**

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DECISION MATRIX: 2

Items	Alt. Opt.-1	Alt. Opt.-2	Alt. Opt.-3
Engineering Aspect Percentage weightage in Table 1 **X 0.1**	9.04	6.34	8.41
Socio - Economic Aspect Percentage weightage in Table 2 **X 0.4**	36.25	14.23	22.97
Environmental Aspect Percentage weightage in Table 3 **X 0.2**	17.94	11.83	7.53
Indicative Cost Percentage weightage in Table 4 **X 0.3**	30.00	14.36	15.24
Final percentage Weightage	**93.23**	**46.76**	**54.15**
Final Rank	**1**	**3**	**2**

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DECISION MATRIX: 3

Items	Alt. Opt.-1	Alt. Opt.-2	Alt. Opt.-3
Engineering Aspect Percentage weightage in Table 1 **X 0.25**	22.61	15.84	21.02
Socio - Economic Aspect Percentage weightage in Table 2 **X 0.25**	22.66	8.89	14.36
Environmental Aspect Percentage weightage in Table 3 **X 0.25**	22.43	14.79	9.41
Indicative Cost Percentage weightage in Table 4 **X 0.25**	25.00	11.97	12.70
Final percentage Weightage	**92.69**	**51.49**	**57.49**
Final Rank	**1**	**3**	**2**

Conclusion & Recommendation:
Based on Engineering, Social, Environmental and Indicative Cost Aspects, Alignement Option 1 (A-B-C-D-E) has been recommended as most preferred alignemnt.

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