List of Project Roads and Design Summary

A. Proposed Project Roads

1. The investment program is proposing to improve three stretches of national highways under the Ministry of Road Transport and Highways (MORTH), one bridge in the MORTH jurisdiction, and three state roads under the jurisdiction of Manipur Public Works Department (MPWD). These are indicated in table 1 below. The first two road packages, which are part of AH-2 and AH-48, will be taken up in tranche 1.

Table 1: Summary of Consulting Services Requirement

Sl. No	Agency	Name of Road	Area	Road Length (km)
1.	MORTH	Asian Highway No 2: Panitanki-Shivamandir Mor-Medical Mor-Fulbari (Nepal-India-Bangladesh)	West Bengal	37.27
2.	MORTH	Asian Highway No. 48: Jaigaon-Hasimara-Dhupguri and Mainaguri-Changrabandha (Bhutan-India-Bangladesh)	West Bengal	90.59
3.	MORTH	Mechi River Bridge	West Bengal	0.600
4.	MORTH	Asian Highway No 1: Imphal-Moreh Road (NH)	Manipur	110.00
5.	MPWD	Greater Imphal Ring Road	Manipur	34.34
6.	MPWD	Imphal-Wangjing-Heirok-Machi-Khudengthabi Road.	Manipur	67.50
7.	MPWD	Impahl-Kanchup-Tamenglong-Tousem-Haflong	Manipur	87.50

B. Design Summary

2. **Design Standards**. The two roads forming tranche 1 (AH-2 and AH-48) have been presently designed. The road from Nepal border to Bangladesh border forms part of AH-2 and the road from Bhutan Border to Bangladesh border forms part of AH-48. The project roads are named as “Asian Highways” and will connect India to three neighboring countries - Bhutan, Nepal and Bangladesh. This warrants for a project with geometric design standard that is comparable with international standards. The selection of design standards is related to road function, volume of traffic and terrain. As per international practice, the criteria that need consideration for deciding design standards are Design speed, Lane width, Shoulder width, Bridge width, Structural capacity, Horizontal alignment, Vertical alignment, Grade, Stopping sight distance, Cross slope, Super elevation and Vertical clearance. In practice, design speed is used as an index which links road function, traffic flow and terrain to the design parameters of sight distance and curvature to ensure that a driver is presented with a reasonably consistent speed environment.

3. **Design Speeds**. The Asian Highway Classification and Design Standards provide the minimum standards and guidelines for the construction, improvement and maintenance of Asian Highway routes. These standards do not apply to built-up areas, so the design consultants have evolved standards for built primarily based on Indian Roads Congress publications and relevant recommendations of the international standards (American, Australian, British, Canadian, and Japanese). Based on these assessments, a design speed of 100-80 km/hr has been proposed in rural sections, and 50 km/hr in built-up areas.

4. **Road Width**. Road width should be minimized so as to reduce the costs of construction and maintenance whilst being sufficient to carry the traffic loading efficiently and safely. Accordingly, various cross-sections are proposed, each addressing a specific need along that portion of road traversed.

5. **Travel Way Width**. As per AASHTO, no feature of a highway has a greater influence on the safety and comfort of driving than the width and the condition of the surface. The capacity of the road is highly dependent on the width of traffic lane that will govern the safety and convenience of traffic. The carriageway widths do also have a profound influence on the capacity of the road section. For the project roads, a lane width of 3.5 m is recommended. Lane width should be at least 3.5 m on straight sections of road as per AHS. This guarantees adequate clearance for any vehicle having a width 2.55 m which is the maximum specified in EU directive 96/53/EC and 2.6 m specified by some countries. For the 2 lane rural sections, in plain terrain, a normal carriageway width of 7.0 m with 1.5 m of paved shoulders and 1.0 m of earthen shoulders is recommended. In built up urban 2 lane sections a carriageway of 7.0m, 2 x 2.25m frontage lanes for slow moving traffic with 1.5m footpath and in village sections a carriageway of 7.0m, 2 x2.0m for slow moving with 0.5m shoulder are recommended. For the 4 lane rural sections, in plain terrain, a carriageway width of 2x 7.0 m and paved shoulders 2 x1.5m, earthen shoulder 2x2m with a median of 4.5m are recommended as presented in Table 5.2 without service road. In built up urban 4 lane sections with service road, a carriageway width of 2x 7.0 m and paved shoulders 2 x1.5m, separator 2x1m with a median of 2.0m and service road on either side with a carriageway of 5.5 to 7.0 are recommended.

6. **Pavements and Structures**. Flexible pavements, bridges, cross drainage works, and other elements of the project roads have been designed based on the relevant engineering codes and specifications.