

ROAD AND TRANSPORTATION MASTERPLAN

PALESTINE

TA 2012013 PS 00 F10

IV.1 Road Transport

SEPTEMBER 30, 2016



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1 Introduction

The following chapter gives a comprehensive overview and a detailed proposal on four implementation phases of the road transport sector as part of NTMP. It includes the following two sub chapters: overview of road transport sector, and; road system proposal.

2 Overview of Road Transport Sector

2.1 Strategic Framework Assessment

Strategic objectives for the development of road transport sector are identified and reported in the following list:

- Identify the immediate needs of road network for improving its level of service considering safety, speed, vehicle operating costs, and mitigation of external negative impacts;
- Propose policies for road network development and construction in the context of sustainable urban development and land use;
- Design an overall strategy for road transport sector;
- Propose a trunk route and main road network map with hierarchy;
- Propose new road infrastructure, according to current needs and future demand;
- Set standards for new road infrastructure, according to EU best practices to be adopted as guidelines for the further development of road network;
- Propose a method for expropriation, compensation or parceling for land acquisition, based on EU or other appropriate international practices;
- Identify environmental issues induced by the construction of new roads;
- Identify key challenges in the acquisition of rights-of-way for new roads;
- Produce a specific Action Plan within the framework of NTMP.

To this purpose, the overall strategic approach, adopted to develop the technical solutions presented here, consists of three main assumptions:

Relation with Existing Context

Technical solutions are defined taking into account the complexity of the current situation of the specific context, but with a view to its possible positive evolution. This results in the adoption of multiple real proposals, with a high level of feasibility in a short/medium term and with a specific regard to the unavoidable constraints of the present situation and the different possibilities of intervention in Areas A, B and C.

Objective of Context's Development

Proposals are considered with specific reference to local socio-economic conditions and to the development perspectives of the different areas. For this purpose, technical proposals are aimed at boosting industrial and touristic sector and building the necessary infrastructural basis for their development.

Improvement of Road System

Interventions are defined to allow a substantial amelioration of present road system through:



- Decrease of road-based travel time in West Bank and Gaza Strip;
- Improvement of existing road alignments;
- Planning and design of new roads to reduce the traffic congestion;
- Reduction of interference between local and regional traffic;
- Improvement of road conditions in rural areas;
- Implementation of rest areas along main roads;
- Increase of safety level on road network.

The studies and analyses aimed at the definition of an improvement strategy for road transport are based on:

- Surveys¹ along main segments of road network of West Bank and Gaza Strip;
- Update/ implementation of data set provided by MoPWH, on overall condition of roads subject to investigation;
- Overall analysis of road network in the Gaza Strip and West Bank with identification of the most important infrastructure corridors (North-South Backbone roads and East-West transverse roads).

2.2 Existing Road Network

The main roads composing the existing road network in West Bank and Gaza Strip are listed below. *For more details, refer to: ¶AX.1 – Diagnostic Report.*

In West Bank, the main roads are:

- Road n°90, Eastern Backbone (Main road);
- Road n°60, Central Backbone (Main Road);
- Roads n°437, n°1, n°417, n°398 and n°3157, Central Backbone (By-pass Roads);
- Roads n°1, n°35, n°57, n°55+505 (Transverse Roads).

The overall road network length is about 3,715.13 km split as follows.

- Main roads 656.55 km;
- Regional roads 1,127.92 km;
- Local roads 1,473.75 km;
- Unpaved roads 456.91 km.

In Gaza Strip, the main roads are:

- Road n°230, Western/Coastal Backbone (Main road);
- Road n°4, Internal Backbone (commonly known as Salah al Din) (Main Road)
- Roads n°240, n°250 (Secondary and By-pass Roads).

¹The investigations were carried out in March, April and May 2016, along most of the road network of West Bank and Gaza Strip and in collaboration with the experts from MoPWH and MoT.
For more details, refer to: ¶AX.5 – Road Inventory.



The overall road network length is about 290km split as follows.

- Main roads 90km;
- Regional roads 200km;

Figure 1. Main Roads of Existing Network in West Bank and Gaza Strip





2.3 SWOT Analysis of Existing Road Network²

Road survey in West Bank and Gaza Strip led to the following considerations:

Tab 1. SWOT Analysis of Existing Road Network

Rail Transport SWOT Analysis	
Strengths	Weaknesses
<p><u>Main Roads: roads n°90,60,35,57,55,505,1,4,230</u></p> <ul style="list-style-type: none"> The pavement conditions are generally good; All of the most important road junctions are equipped with an appropriated lighting system; Some segments of the road are completely illuminated; Road markers are generally good, with the exception of road n°60 and other segments of remaining main roads, in poor or insufficient conditions. <p><u>Regional roads: roads (e.g.) n°437,438,3157,398,</u></p> <ul style="list-style-type: none"> The pavements condition is sufficiently appropriate. 	<p><u>Main Roads</u></p> <ul style="list-style-type: none"> All the junctions are at level; Elevated longitudinal slopes are found in certain road segments; Particularly deep trenches are found along the roads. The slope of the trenches is rather steep and without protection; A relevant environmental impact is noted in correspondence with the trenches; Vertical signs are scarce and lacking of proper information; The drainage system of the carriageways is not satisfactory for the disposal of rain water; Road maintenance is poor as far as the drainage system is concerned; Numerous crossings of urban areas provoke frequent bottlenecks; No connection is provided to link West Bank and Gaza Strip. <p><u>Regional and Local Roads</u></p> <ul style="list-style-type: none"> Vertical signs and road markers are missing; Elevated longitudinal slopes are found in certain road segments; Numerous crossings of urban areas provoke frequent bottlenecks; The drainage system of the carriageways is not satisfactory for the disposal of rain water; Road maintenance is poor as far as the drainage system is concerned; Guardrails are missing or in poor condition; Particularly deep trenches are found along the roads trenches. The slope of the trenches is rather steep without protection; Lack of efficient road network in the south-east areas of the West Bank; Numerous local roads are not paved and in bad condition; The geometrical characteristics (i.e. the carriageway dimensions) are not corresponding to the adopted classification.
Opportunities	Threats
<u>Main, Regional and Local Roads</u>	<u>Main, Regional and Local Roads</u>

² The SWOT Analysis is based on road survey, carried out in March, April and May 2016

<ul style="list-style-type: none">• Several existing Projects and Plans will increase the economic and social situations;• Existing studies and surveys, as well as the analysis and the data collected for NTMP, could support the understanding of problems and the possible synergies between different sectors related to Road Transport;• Existing agreements and international funds should implement a better working process at border crossing, with more efficient traffic flows.	<ul style="list-style-type: none">• Presence of abandoned areas in South East West Bank, and the absence of their economic development;• Frequent landslides in trenched road segments with associated risk of obstruction of carriageways due to fallen rocks;• Flooding on carriageway, due to uncontrolled water flux with risk of blocking transit;• High risk of road accidents at junctions, in carriageways not protected by guard-rails or new jersey and in road segments highly tortuous and steep;• Frequent bottlenecks, due to slow vehicles in highly tortuous and steep road segments;<ul style="list-style-type: none">• Lower level of service or urban roads;• High risks for road transit due to particularly violent atmospheric events;• High risks of environmental pollution from powders in some area.
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Beside the issues listed in the SWOT analysis, road survey allowed also the definition of preliminary needs deemed fundamental for the improvement of road sector in West Bank and Gaza Strip. The list of immediate needs for Main, Regional and Local Roads follows:

- Planning/Design and Construction of a by-pass and ring road intersecting with urban areas, to separate the road traffic from the urban traffic;
- Planning, Design and Construction of additional lanes for slow vehicles in the road segments where the slope is higher than 7%;
- Planning, Design, and Construction of natural and artificial tunnels and viaducts in order to reduce the slope of the alignments and excessive earthworks;
- Planning, Design, Construction of roundabouts at the junctions in order to improve traffic and reduce accidents;
- Widening of carriageway and shoulders in order to increase the level of service and road safety;
- Increase of milestones and change markers in order to improve the information to the drivers, including variable message signs;
- Planning, Design and Construction of new main and regional road network in the southern areas of West Bank;
- Paving (Bituminous) of local roads currently unpaved (Gravel);
- Planning, Design and Construction of new West Bank - Gaza Strip Corridor. *For more details, refer to: ¶VI –Logistics, BCPs and West Bank – Gaza Strip Corridor;*
- Planning, Design and Construction of new Gaza Strip Eastern Expressway;
- Definition of new road network classification, based on the geometrical characteristics of road, and expected traffic volume;
- Construction of an efficient protection system of the trenches, with retaining works, to reduce the risk of rocky material detachment;
- Increase of drainage systems of carriageways;
- Review of Asset Management Strategy (AMS) for MoPWH.

The latter issue of the previous list demands for multi-fold considerations³ that are herein presented. Current PNA classification system for roads needs to be reviewed, according to EU and/or other international best practices to facilitate the so-called Data Asset Management.

³ Considerations herein presented are based on field attentive analysis of official documents and data sheets provided by MoPWH, during road survey campaign in March, April and May 2016.



The set of available data can be considered a suitable baseline for AMS development; the section concerning the identification system is well designed, and the basic data of the road layout are available (carriageway width, shoulders etc.). Nevertheless, some comments need to be arisen:

- Pavement conditions are not represented with specific technical parameter IRI (International Roughness Index);
- Traffic loads are not represented;
- No information concerning vertical and horizontal alignments are available. It is generally recommended to typify each road section at least with a qualitative alignment range;
- No information concerning number of lanes are available. It is generally recommended to typify each road section with this information;
- No road furniture data (road safety devices, signs, guard-rails) are provided in the available data base;
- Bridge and culverts data are very poor. The only available information is the number of structure (bridge, drainages and culverts) per road section.

Maintenance cannot be neglected, reason why a process aimed at defining qualitative attributes to each road sections is suggested and shown through the functionality matrix that follows. The functionality matrix is based on a qualitative assessment of road furniture status. Each status is then linked to an approximated estimate of the related maintenance budget needs. For instance, a road section featuring less than 250m of guardrails (25% in length per km) where less than 25% does not require approx. 187m of new guardrails, namely 7,500USD having considered around 40USD per meter.

Figure 2. Functionality Matrix for Roads Qualitative Assessment

		Incidence					
		Guard-rails	Signs	Markings	Lighting	Drainage	Culvert
		<25% in length per km 25-50 % in length per km 50-75% in length per km >75 % in length per km	<5 per km 5-10 per km 10-20 per km >20 per km		<25% in length per km 25-50 % in length per km 50-75% in length per km >75 % in length per km	<25% in length per km 25-50 % in length per km 50-75% in length per km >75 % in length per km	<5 per km 5-10 per km 10-20 per km >20 per km
Functionality	<25% still works						
	25-50% still works						
	50-75% still works						
	>75% still works						

2.4 Desired Asset Management Practices

Many roads authorities have adopted the principles of asset management and various guidelines are available to help with this process. The most widely recognized standard for the optimized management of physical assets is the British Standards Institution's (BSI) Publicly Available Specification PAS 55. The PAS 55 is the basis for the recently published ISO 55000 Standards for asset management.

The requirements of PAS 55 are regarded as a minimum benchmark when assessing the asset management practices of a specific road authority. The asset management requirements are defined under the following headings:

- General requirements;
- Asset management policy;
- Asset management strategy, objectives and plans;
- Asset management enablers and controls;
- Implementation of asset management plan(s);
- Performance assessment and improvement;
- Management review.

PAS 55 assigns specific meanings to terms and definitions, defined in section 3 of PAS 55-1. The PAS 55 requirements focus on high-level policies and procedures (strategic monitoring), and one clause (4.6 Performance assessment and improvement) deals with monitoring the functional or operational requirements by specific performance indicators, indicating whether the needed level of services is met and, in general, reporting the real performance of a given road section.

Tab 2. Summary of Asset Management System Requirements from PAS 55



PAS 55 Clause	2008 Clause Title	Requirement
1.1	General requirements	Clause 4.1 requires MoPWH to establish, document, implement and maintain and continually improve the asset management system in accordance with the requirements of PAS 55. In addition, MoPWH is required to define and document the scope of the asset management system. MoPWH is also required to conduct a review to compare its current management of assets with the requirements of PAS 55 and determine the extent to which these requirements are being met or whether improvements can be made. Such a review should map the requirements of PAS 55 against the organization's existing business processes to identify alignments and/or variations in terminology between the two.
1.2	Asset management policy	Clause 4.2 requires the top management of MoPWH to authorize an overall asset management policy which, among other requirements, is consistent with the organizational strategic plan.
1.3 Asset management strategy, objectives and plans		
1.3.1	Asset management strategy	Clause 4.3.1 requires MoPWH to establish, document, implement and maintain a long term asset management strategy which shall be authorized by top management.
1.3.2	Asset management objectives	Clause 4.3.2 requires MoPWH to establish and maintain measurable management objectives that are derived from and consistent with the asset management strategy.
1.3.3	Asset management plans	Clause 4.3.3 requires MoPWH to establish, document and maintain asset management plan(s) to achieve the asset management strategy and deliver the asset management objectives throughout the life cycle.
1.3.4	Contingency planning	Clause 4.3.4 requires MoPWH to establish, implement plan(s) and/or procedure(s) for identifying and responding to incidents and emergency situations, and maintaining the continuity of critical asset management activities.
1.4 Asset management enablers and controls		
1.4.1	Structure, authority and responsibilities	Clause 4.4.1 requires MoPWH to establish and maintain an organizational structure of roles, responsibilities and authorities, consistent with the achievement of its asset management policy, strategy, objectives and plans.
1.4.2	Outsourcing of asset management activities	Clause 4.4.2 requires MoPWH to ensure control over any aspects of asset management that are outsourced.
1.4.3	Training, awareness and competence	Clause 4.4.3 requires MoPWH to ensure that any person(s) under its direct control undertaking asset management related activities has an appropriate level of competence in terms of education, training or experience.
1.4.4	Communication, participation and consultation	Clause 4.4.4 requires MoPWH to ensure that pertinent asset management information is effectively communicated to and from employees and other stakeholders including contracted service providers.
1.4.5	Asset management system documentation	Clause 4.4.5 requires MoPWH to establish, implement and maintain up-to-date documentation to ensure that its asset management system can be adequately understood, communicated and operated.
1.4.6	Information management	Clause 4.4.6 requires MoPWH to identify the asset management information it is required to comply with the requirements of Clause 4 (Asset management system requirements) considering all phases of the asset life cycle.
1.4.7 Risk management		
1.4.7.1	Risk management process(es)	Clause 4.4.7.1 requires MoPWH to establish, implement and maintain documented processes and/or procedures for the ongoing identification and assessment of asset-related and asset management-related risks, and the identification and implementation of necessary control measures throughout the life cycles of the assets.
1.4.7.2	Risk management methodology	Clause 4.4.7.1 defines requirements for MoPWH's methodology for risk management.
1.4.7.3	Risk identification and assessment	Clause 4.4.7.3 requires MoPWH to ensure that a systematic approach is adopted for the management of asset risks.
1.4.7.4	Use and maintenance of asset	Clause 4.4.7.4 requires MoPWH to maintain, update and audit the



	risk information	risk register, which should adopt a common assessment methodology for all risks.
1.4.8	Legal and other requirements	Clause 4.4.8 requires MoPWH to establish, implement and maintain documented processes and/or procedures for identifying and accessing the legal, regulatory, statutory and other applicable asset management requirements.
1.4.9	Management of change	Where existing arrangements are revised, or new arrangements introduced that could have an impact on asset management activities, Clause 4.4.9 requires MoPWH to assess the associated risks before the arrangements are implemented.
1.5 Implementation of asset management plans		
4.5.1	Life cycle activities	Clause 4.5.1 requires MoPWH to establish, implement and maintain documented processes and/or procedures for the implementation of its asset management plan and control of activities throughout the whole life cycle.
1.5.2	Tools, facilities and equipment	Clause 4.5.2 requires MoPWH to ensure that tools, facilities and equipment are maintained and, where appropriate, calibrated.
1.6 Performance assessment and improvement		
1.6.1	Performance and condition monitoring	Clause 4.6.1 requires MoPWH to establish, implement and maintain processes and/or procedures to monitor and measure the performance of the asset management system and the performance and/or condition of assets and/or asset systems. The processes and procedures include the consideration of performance indicators and monitoring the effectiveness and efficiency of the asset management system.
1.6.2	Investigation of asset-related failures, incidents and nonconformities	Clause 4.6.2 requires MoPWH to establish, implement and maintain processes and/or procedures for the handling and investigation of failures, incidents and nonconformities associated with assets, asset systems and the asset management system.
1.6.3	Evaluation of compliance	Clause 4.6.3 requires MoPWH to establish, implement and maintain processes and/or procedures for evaluation of its compliance with applicable legal and other regulatory or absolute requirements, and shall determine the frequency of such evaluations. MoPWH is required to keep records of the results of these evaluations.
1.6.4	Audit	Clause 4.6.4 requires MoPWH to ensure that audits of the asset management system are conducted and satisfy specified requirements.
1.6.5.1	Corrective and preventive action	Clause 4.6.5.1 requires MoPWH to establish, implement and maintain processes and/or procedures for instigating corrective actions for eliminating the causes of observed poor performance and nonconformities, and preventive actions for eliminating the potential causes of nonconformities or poor performance. MOPWH is required to keep records of the corrective and preventive actions taken and communicate these to stakeholders.
1.6.5.2	Continual improvement	Clause 4.6.5.2 requires MoPWH to establish, implement and maintain processes and/or procedures for identifying opportunities and assessing, prioritizing and implementing actions to achieve continual improvement in: the optimal combination of costs, asset related risks and condition of assets and asset systems throughout the whole life cycle, and the performance of the asset management system
1.6.6	Records	Clause 4.6.6 requires MoPWH to establish and maintain records as necessary to demonstrate conformance to the requirements of its asset management system and Clause 4 of PAS 55
1.7	Management review	Clause 4.7 requires the top management of MOPWH to review its asset management system at intervals to ensure its continuing suitability, adequacy and effectiveness. Reviews shall include assessing the need for changes to the asset management system, including asset management policy, asset management strategy and asset management objectives.

3 Road Transport Network Proposal

Road transport network proposal is herein explained into its main two aspects:

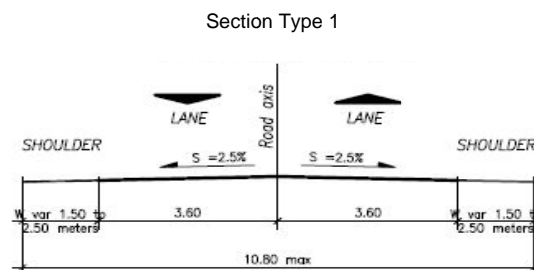
- Road Technical Specifications, and;
- Road Network Development by Phase.

3.1 RoadTransport Network Proposal Technical Specifications

The Road Standard Manual that includes Geometric Design Manual, Road Construction Manual, Procurement Manual and Maintenance Guide is being prepared by the MoPWH, based on AASHTO Manual. MoPWH Road Standard Manual will be adopted for planning, designing and construction of roads included in the NTMP.

The typical road cross sections adopted are reported below:

Figure 3. Road Section Type 1



Section Type 1var | With Lanes for Slow Vehicles

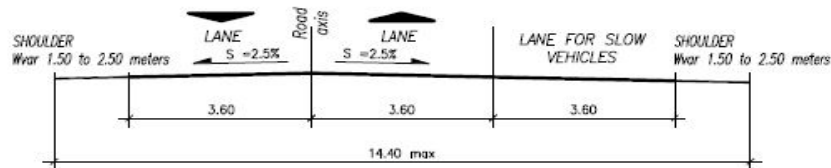


Figure 4. Section Type 2 | Two Carriageway Separate

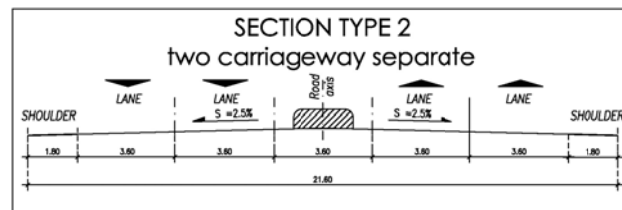


Figure 5. Road Section Type 3 | Viaduct Deck

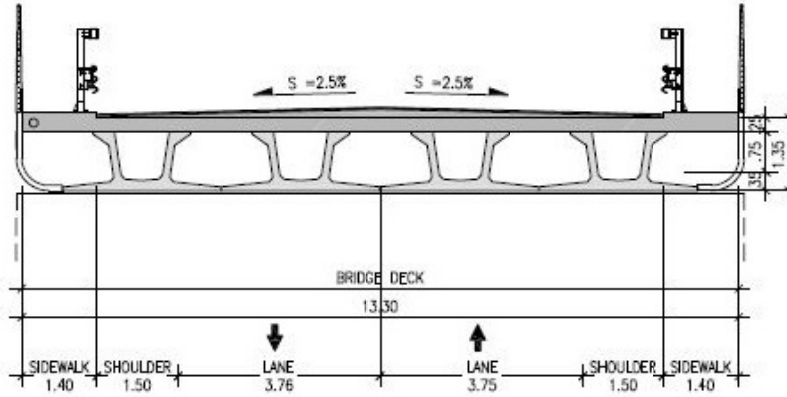
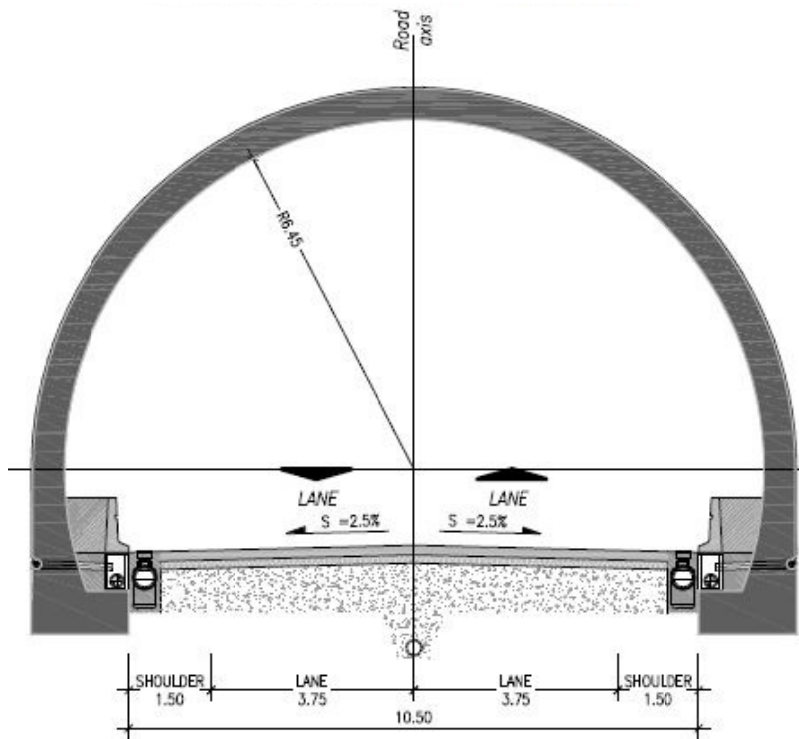


Figure 6. Road Section Type 4 | Tunnel

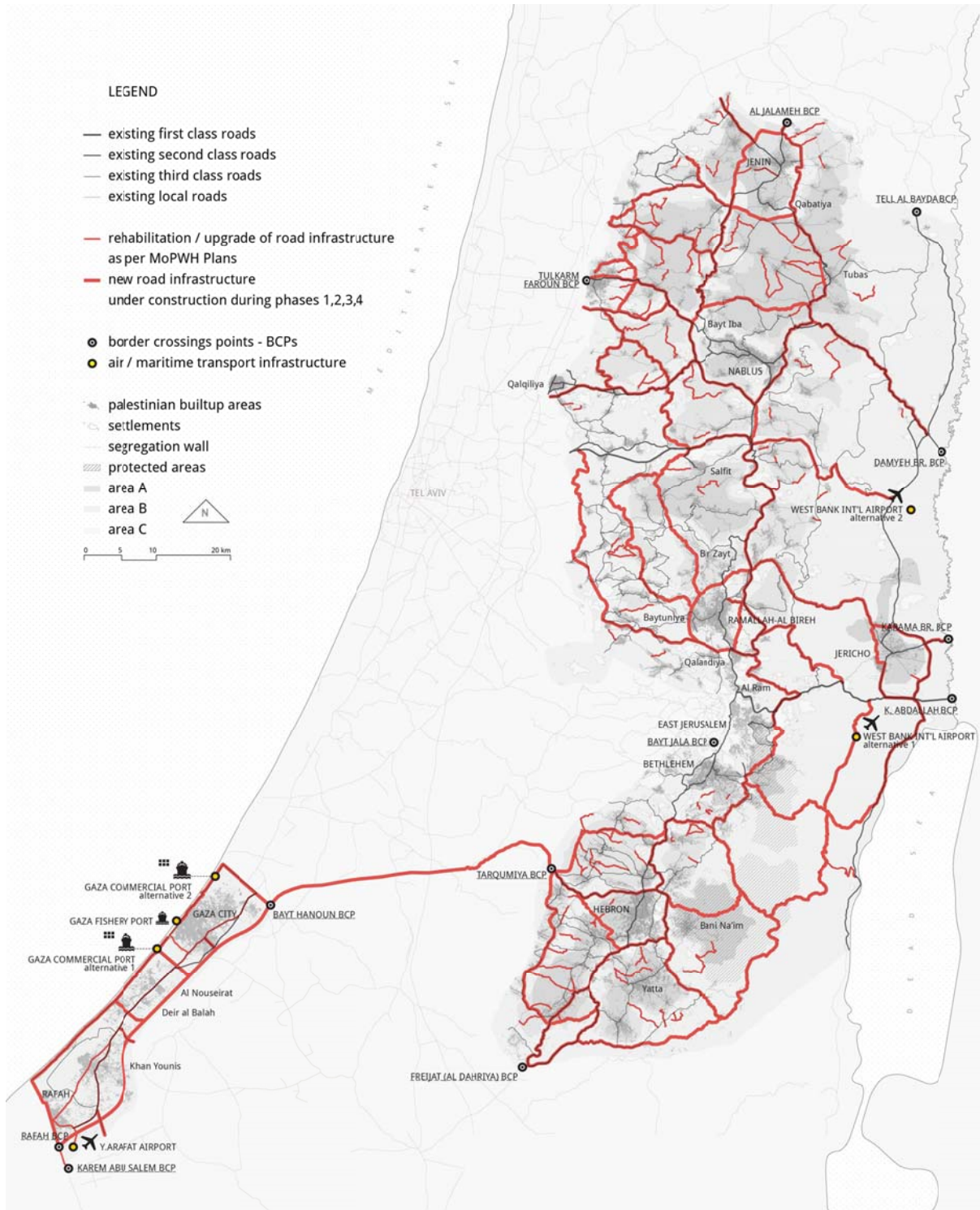




3.2 Road Transport Network Proposal Development by Phases

Road transport network proposal presented by NTMP develops and extends according to the already introduced phases. For this reason, the description of road transport network development herein presented is organized by phase. *For more details, refer to: ¶III – Road and Transportation Master Plan Overview.* Before proceeding to describe in details the development of road transport network by phase, the entire proposed system is shown in the following figure. *For more details, refer to: ¶AX.4 – Maps by Transport Sector.*

Figure 7. Road Transport Network (2045)





3.2.1 Road Transport Network in Phase 1A(2-Year Investment Plan: End of 2016 – 2018)⁴

Roads proposed for Phase 1A(2-year investment plan) are listed in the following table:

Tab 3. Proposed Road Works for Phase 1A(2-Year Investment Plan)

Road Name	Road Description
Rehabilitation/Upgrade of road between Karem Abu Salem BCP and Rahaf BCP; (DESIGN AND CONSTRUCTION) L= 3.30km	The intervention consists of planning and design of a new road connecting the K. A. Salem BCP to Rafah BCP. The road will be compliant with Road Section Type 1.
New Gaza Strip Eastern Corridor (PLANNING AND DESIGN)	The intervention consists of planning and design of new Gaza Strip Eastern Expressway.
Rehabilitation/Upgrade of Salah Al-Din central axis road in Gaza Strip; (DESIGN AND CONSTRUCTION) L= 40km	The intervention consists of the rehabilitation of 16.8km of existing road that connects Khan Younis to Rafah BCP, and the rehabilitation of 23.2km of the existing Salah Al Din road, where carriageway is not in good condition and/or is not recent.
Rehabilitation/Upgrade of road connection to Yasser Arafat Airport in Gaza Strip; (DESIGN AND CONSTRUCTION) L= 2.25km	The intervention consists of a new road connecting road n°4 (near Khirbat al-Adass) to the Yasser Arafat Airport. The new road will be with two carriageways compliant with Road Section Type 2.
Upgrade of road connection to Gaza Fishery Port (DESIGN AND CONSTRUCTION) L= 3.8km	The intervention consists of a new road connecting road n° 4, road n°230 (South of Gaza). The new road will be with two carriageways compliant with Road Section Type 2.
New eastern road network: Nabi Musa, Hebron, Bethlehem (PLANNING AND DESIGN)	The intervention consists of planning and design of new eastern road network: Nabi Musa, Hebron, Bethlehem Road n°90/bis road system.
Road Connection to Karama Bridge BCP (DESIGN AND CONSTRUCTION); L=3.6km	The intervention consists of the construction of new access road to Karama Bridge BCP. The new road will be provided with two carriageways compliant with Road Section Type 2.
Road connection between Ramallah-Nablus (DESIGN AND CONSTRUCTION); L=36.6km	The project consists of the rehabilitation of road connection between Ramallah and Nablus. The intervention consists of widening of the carriageway with bituminous shoulders of width between 1.5 to 2.5m. Additional lanes for slow vehicles are needed where the slope exceeds 7%. The road will be compliant with Section Type 1 or 1var.
Urban Ring Roads in West Bank Main Cities (PLANNING AND DESIGN)	The project consists of planning and design of new urban ring roads for the following Palestinian cities: Jenin, Tubas, Tulkarm, Qalqiliya, Nablus, Ramallah, Jericho, East Jerusalem, Bethlehem, Hebron, Gaza City, Khan Younis, and Rafah.
Rural Roads Sealing - Stage I (DESIGN AND CONSTRUCTION); L=406km	The project consists of the rehabilitation of existing roads in West Bank. The rehabilitation is to be carried through: preparation and improvement of road foundation, and; with new bituminous paving. Major rural roads need also the implementation of road markings and vertical warning signs.
New "West Bank – Gaza Strip Corridor" (PLANNING AND DESIGN)	The project consists of planning and design of new "West Bank – Gaza Strip Corridor".

⁴Detailed technical sheets are provided for each of proposed roads in ¶AX.6 – Technical Sheets of Proposed Road and Rail Projects.



3.2.2 Road Transport Network in Phase 1 (2019 – 2024)

The list of roads proposed for Phase 1 is reported in the following table:

Tab 4. Proposed Road Works for Phase 1

Road Name	Road Description
<u>Rehabilitation/Upgrade of Gaza Strip coastal road (DESIGN AND CONSTRUCTION); L= 31.9km</u>	The intervention consists of the upgrading of coastal road n°230 in line with currently rehabilitated road sections consisting of two carriageways with three lanes for each direction. The segments calling for the upgrade are in Dayr Al Balah and Rafah BCP (South) and Gaza City and Bayt Hanoun BCP (North).
<u>Rehabilitation/Upgrade of Gaza Strip Main Connections to N-S Central Axis (DESIGN AND CONSTRUCTION); L= 12.55km</u>	The intervention consists of the rehabilitation of the existing transverse road. The road will be compliant with Section Type 1.
<u>New Gaza Strip Eastern Corridor (DESIGN AND CONSTRUCTION) L= 48km</u>	The intervention consists of the construction of a new expressway running along the eastern edge of Gaza Strip, from Rafah BCP to Bayt Hanoun BCP, and servicing the major cities and transport infrastructure, i.e. Y.Arafat Airport, Gaza Commercial port, Gaza Fishery Port. The new road will be compliant with Road Section Type 2.
<u>Coastal Road to Bayt Hanoun BCP Road Connection (DESIGN AND CONSTRUCTION); L= 6.5km</u>	The intervention consists of the construction of a new coastal road-Bayt Hanoun BCP road connection.
<u>New road "Bayt Ummar-Surif-Al Dhahiriya BCP" (DESIGN AND CONSTRUCTION); L= 57.6km Segment 6</u>	The intervention consists of the construction of a new Hebron Eastern ring road, from Al Arub (North) to Simiya (South). The proposed road will have the characteristic of Road Section Type 1. Additional lanes for slow vehicles are needed where the slope exceeds 7% (section type 1var).
<u>Rehabilitation/Upgrade of eastern road network: Nabi Musa to Bethlehem. (DESIGN AND CONSTRUCTION); L= 26km</u>	The intervention consists of the upgrading and widening of the existing road that will be compliant with section type 1. From 10km to Bethlehem the intervention consists in a new road with additional lane for slow vehicles (approx. 25.2km). The Road Section Type is 1 or 1var.
<u>New road "Wadi al Nar" (DESIGN AND CONSTRUCTION); L=9.5km</u>	The intervention consists of the construction of a by-pass road between Hebron and Bethlehem. The proposed road involves the construction of a new road with section type 1. Additionally, tunnels and viaduct (Section Type 3 and Section Type 4) are expected for the by-pass of Jub al Run and Al Zairiya.
<u>New "Ramallah Eastern by-pass road" (DESIGN AND CONSTRUCTION); L=12.3km</u>	The intervention consists of the construction of a new eastern by-pass road in Ramallah, from road n°60 (Qalandiya) to Al Bireh. The proposed road is to be built in compliance with Road Section Type 1; moreover, a tunnel (Road Section Type 4) is also required.
<u>New "Nablus/Huwwara" by-pass road (DESIGN AND CONSTRUCTION); L= 5.70km</u>	The project consists of the construction of a new eastern by-pass road in Huwwara. The new road will be compliant with Road Section Type 1, with a tunnel (Road Section Type 4) required for approx. 1.6km.
<u>Rehabilitation/Upgrade of main West Bank N-S Backbone (DESIGN AND CONSTRUCTION); L= 173.3km</u>	The main objective of this work is the improvement of performance of road n°60. The typical interventions are: road widening (from one to two carriageways); additional lanes for slower vehicles; by-pass roads for avoiding bottlenecks; drainage systems improvement, and; measures for safety improvement (i.e. guardrails, vertical and horizontal signs and marker). The interventions aimed at upgrading the entire N-S backbone (Road n°60) can be split as follows; from the south toward north:



	<ul style="list-style-type: none">• Road n°60 old road; L = 17km From Freijat (Al Dahriya BCP) to Kurza. The intervention consists in widening of carriageway with bituminous shoulders of width between 1.5 to 2.5m. The road will be compliant with Road Section Type 1 or 1var.• Road n°60 new road; L= 17.5km The road will be compliant with Road Section Type 1 or 1var.• Road n°60; L = 7.5km From Kurza to Hebron South. The intervention consists in widening of carriageway with bituminous shoulders of width between 1.5 to 2.5m. Additional lanes for slow vehicles are needed where the slope exceeds 7%. The road will be compliant with Road Section Type 1 or 1var.• Road n°60; L= 7km From Hebron South to Hebron East. The intervention consists of widening of carriageway with bituminous shoulders of width between 1.5 to 2.5m. Additional lane for slow vehicles are needed where the slope exceeds 7%. The road will be compliant with Road Section Type 1 or 1var.• Road n°60; L= 8km From Hebron East to Tarqumiya (road n°35). The intervention consists of widening of carriageway with bituminous shoulders of width between 1.5 to 2.5m. Additional lane for slow vehicles are needed where the slope exceeds 7%. The road will be compliant with Road Section Type 1 or 1var.• Road n°60; L = 5km From junction with road n°35 to old road n°60 (North Hebron). The intervention consists of widening of carriageway with bituminous shoulders of width between 1.5 to 2.5m. Additional lane for slow vehicles are needed where the slope exceeds 7%. The road will be compliant with Road Section Type 1 or 1var.• Road n°60; L = 6.5km From junction with old road n°60 to road n°367. The intervention consists of widening of carriageway with bituminous shoulders of width between 1.5 to 2.5m. Additional lane for slow vehicles are needed where the slope exceeds 7%. The road will be compliant with section type 1 or 1var.• Road n°3157; L = 6km From Road n°60 to road n°398. The intervention consists of carriageway widening with bituminous shoulders of width between 1.5 to 2.5m. Additional lane for slow vehicles are needed where the slope exceeds 7%. The road will be compliant with Road Section Type 1 or 1var.• Road n°398; L = 12km From road n°3157 to Hebron-Bethlehem Bridge. The intervention consists in widening of carriageway with bituminous shoulders of width between 1.5 to 2.5m. Additional lane for slow vehicles are needed where the slope exceeds 7%. The road will be compliant with Road Section
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	<p>Type 1 or 1var. By-pass road are necessary in Atamala and at Asqkira.</p> <ul style="list-style-type: none"> • New Road Wadi al Nar; L = 10km From Hebron-Bethlehem Bridge to road n° 417. • Road n°417; L = 2.1km From al Zairiya to Deir Sharaf - Al Bizzariya road. The road presents two lanes separated by new jersey barrier. The intervention consists of widening of carriageway with bituminous shoulders of width between 1.5 to 2.5m. Additional lanes for slow vehicles are needed where the slope exceeds 7%. A roundabout is needed in Bizzariya Junction. • Road n°60;L = 5.3km From Al Bizzariya Junction to road n°5275 The intervention consists of widening of carriageway with bituminous shoulders of width between 1.5 to 2.5m. Additional lanes for slow vehicles are needed where the slope exceeds 7%. A new by-pass road is needed in Silat ad Dhahr. • Road n°60; L = 9.7km From road n°5275 to road n°585. The intervention consists of widening of carriageway with bituminous shoulders of width between 1.5 to 2.5m. Additional lanes for slow vehicles are needed where the slope exceeds 7%. • Road n°60; L= 1.6km From road n°585 to road n°60 (South Jenin). The intervention consists of widening of carriageway with bituminous shoulders of width between 1.5 to 2.5m. Additional lane for slow vehicles are needed where the slope exceeds 7%. • New Road; L= 13.6km From South Jenin to road n° 60. The intervention consists of a new western by-pass road in Jenin. The new road presents geometrical characteristics to Road Section Type 1; a tunnel (3km) is necessary. • Road n°60 (J-J1) L= 1.5Km From new by-pass road in Jenin to Al Jalameh BCP. The intervention consists in widening of carriageway with bituminous shoulders of width between 1.5 to 2.5m.
<p><u>Ramallah-Jericho Road (Road n.449)</u> <u>(DESIGN AND CONSTRUCTION); L=24.5km</u></p>	<p>The project consists of the rehabilitation of road connection between Ramallah and Jericho. The intervention consists of widening of the carriageway with bituminous shoulders of width between 1.5 to 2.5m. Additional lanes for slow vehicles are needed where the slope exceeds 7%. The road will be compliant with Section Type 1 or 1var.</p>
<p><u>West Bank radial roads system connecting main cities</u> <u>(PLANNING AND DESIGN)</u></p>	<p>The intervention consists of the preparation of the planning and design for new radial roads system connecting main cities in West Bank.</p>
<p><u>New Eastern Road Network: Nabi Musa-Hebron-Bethlehem (Stage II)</u> <u>(DESIGN AND CONSTRUCTION); L= 60km</u></p>	<p>The intervention consists of the construction of a new road n°90/bis system. The new road presents geometrical characteristics of Road Section Type 1. Additional lanes for slow vehicles are needed where the slope exceeds 7%. (Section Type 1var). The length of the additional lanes is about 8km.</p>
<p><u>New road between Tulkarm ring road and Ramallah ring road</u> <u>(PLANNING AND DESIGN)</u></p>	<p>The intervention consists of planning and design for new road between Tulkarm ring road and Ramallah ring road.</p>



<p><u>New Urban ring roads (DESIGN AND CONSTRUCTION); STAGE I</u> <u>L= 42.25km</u></p>	<p>The intervention consists of the construction of new ring roads for the following cities, in West Bank: Hebron, Jericho, Ramallah, Nablus, Jenin, Tulkarm and Tubas. The new road will be compliant with Road Section Type 1. Additional lanes for slow vehicles are needed where the slope exceeds 7%. (Section Type 1Var).</p> <p>Hebron ring road is composed of:</p> <ul style="list-style-type: none"> • road n°60 (East and South); • road 35 (North); • new road (West). <p>Jericho ring road is composed of:</p> <ul style="list-style-type: none"> • road n°90 (East and North); • new road (West and North); • road n°1 (South). <p>Ramallah-Al Bireh-Baytunia ring road is composed of:</p> <ul style="list-style-type: none"> • road n°60 (East); • new road (North and West); • road n°443 (South). <p>Nablus ring road is composed of:</p> <ul style="list-style-type: none"> • road n°60 (South and West); • road n°57 (East); • new road n°57 (North). <p>Jenin Ring road is composed of:</p> <ul style="list-style-type: none"> • road n°6010 and 6255 (East); • new road n°588bis (South) side; • new road (West). <p>Tubas Ring road is composed of:</p> <ul style="list-style-type: none"> • new road n°588ter. • Tulkarm Ring road is composed of: • new road connecting road n° 557 (South) to road n°574 (North).
<p><u>New West Bank – Gaza Strip Corridor -Phase 1 (LAND ACQUISITION AND PRELIMINARY WORKS);</u> <u>L=19km</u></p>	<p>The intervention consists of the construction of road n°35 widening, from road n°60 (Hebron North) to Tarqumiya BCP. The road will be compliant with Road Section Type 2.</p>
<p><u>Rural Roads Paving - Stage II (DESIGN AND CONSTRUCTION); L=406km</u></p>	<p>The project consists of the rehabilitation of existing roads in West Bank. The rehabilitation is to be carried through: preparation and improvement of road foundation, and; with new bituminous paving. Major rural roads need also the implementation of road markings and vertical warning signs.</p>

3.2.3 Road Transport Network in Phase 2 (2025-2031)

The list of roads proposed for Phase 2 is reported in the following table:

Tab 5. Proposed Road Works for Phase 2

Road Name	Road Description
<p><u>New Gaza Strip East-West Road Connections (DESIGN AND CONSTRUCTION); L=14.9km</u></p>	<p>The intervention consists of two different segments:</p> <ul style="list-style-type: none"> • SEGMENT 33.1: Expressway-Coastal Road



	<p>n°230 (existing Gaza Port). The road will be compliant with Road Section Type 1. Road total length: 5.6km.</p> <ul style="list-style-type: none"> • SEGMENT 33.2: Expressway-Coastal Road n°230 (Southern Gaza Strip border). The road will be compliant with Road Section Type 1. Road total length: 9.3km.
<p><u>New Western connection "Tulkarm ring road-Ramallah ring road"</u> (DESIGN AND CONSTRUCTION); L= 58.7km</p>	<p>The intervention consists of the construction of a new link between Ramallah and Tulkarm to be implemented in compliance with Road Section Type 1. Nevertheless, due to irregular topography, tunnels (Road Section Type 3) for a total length of 3.3km) and viaducts (Road Section Type 4) for a total length of 400m are required</p>
<p><u>West Bank radial roads system - Stage I</u> (DESIGN AND CONSTRUCTION); L= 102.8km</p>	<p>The intervention consists of the rehabilitation of some existing roads and construction of new ones all over the West Bank territory. The segments involved are described below:</p> <ul style="list-style-type: none"> • <u>SEGMENT 31.1</u>: new road, compliant with Road Section Type 1. • <u>SEGMENT 31.2</u>: rehabilitation of existing road, compliant with Road Section Type 1. • <u>SEGMENT 31.3</u>: rehabilitation of existing road, compliant with Road Section Type 1. • <u>SEGMENT 31.4</u>: rehabilitation of existing road, compliant with Road Section Type 1. • <u>SEGMENT 31.5/ 31.5bis</u>: rehabilitation of existing road, compliant with Road Section Type 1. • <u>SEGMENT 31.6</u>: construction of additional carriageway, compliant with Road Section Type 2.
<p><u>Rehabilitation/Upgrade of Ramallah-Jericho "roads n°457-458"</u> (DESIGN AND CONSTRUCTION); L=20km</p>	<p>The intervention consists of widening the existing roads n°457 and n°458 connecting Ramallah to Jericho. The rehabilitation will be constructed with bituminous shoulders of width between 1.5to 2.5m. The overall geometry of the rehabilitated road will be compliant with Road Section Type 1.</p>
<p><u>Rehabilitation/Upgrade of West-East road "Majdal to road n°90"</u> (DESIGN AND CONSTRUCTION); L= 27.4km</p>	<p>The intervention foresees the rehabilitation of road consisting of carriageway widening with bituminous shoulders of width between 1.5to 2.5m. The new road will be compliant with Road Section Type 1. Additional lanes for slow vehicles are needed where slope exceeds 7%. (Road Section Type 1 Var).</p>
<p><u>New West Bank – Gaza Strip Corridor - Phase 2</u> (COMPLETION); L= 40.2km</p>	<p>The intervention consists of the completion of West Bank - Gaza Strip Link for a total length of 40.2km; 26.7km of new construction, in compliance with Road Section Type 2, and 13.5km of existing road n° 35 widening.</p>
<p><u>Urban Ring Roads in West Bank Main Cities- Stage II</u></p>	<p>See description on previous table</p>
<p><u>Rural Road Sealing - Stage III</u></p>	<p>See description on previous table</p>

3.2.4 Road Transport Network in Phase 3 (2032 – 2037)

The list of roads proposed for Phase 3 is reported in the following table:

Tab 6. Proposed Road Works for Phase 3

Road Name	Road Description
<p><u>West Bank Radial Road System - Stage II</u></p>	<p>The intervention consists of the rehabilitation of the following roads in West Bank:</p> <ul style="list-style-type: none"> • SEGMENTS 34.4 and 34.5: rehabilitation of

	<p>existing road, compliant with Road Section Type 1 and 1 Var.</p> <ul style="list-style-type: none"> • SEGMENT 34.6: rehabilitation of existing road, compliant with Road Section Type 1 and 1 Var. • SEGMENTS 34.7: rehabilitation of existing road, compliant with Road Section Type 1 and 1 Var. • SEGMENT 34.9: rehabilitation of existing road, compliant with Road Section Type 1 and 1 Var.
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3.2.5 Road Transport Network in Phase 4 (2038 – 2045)

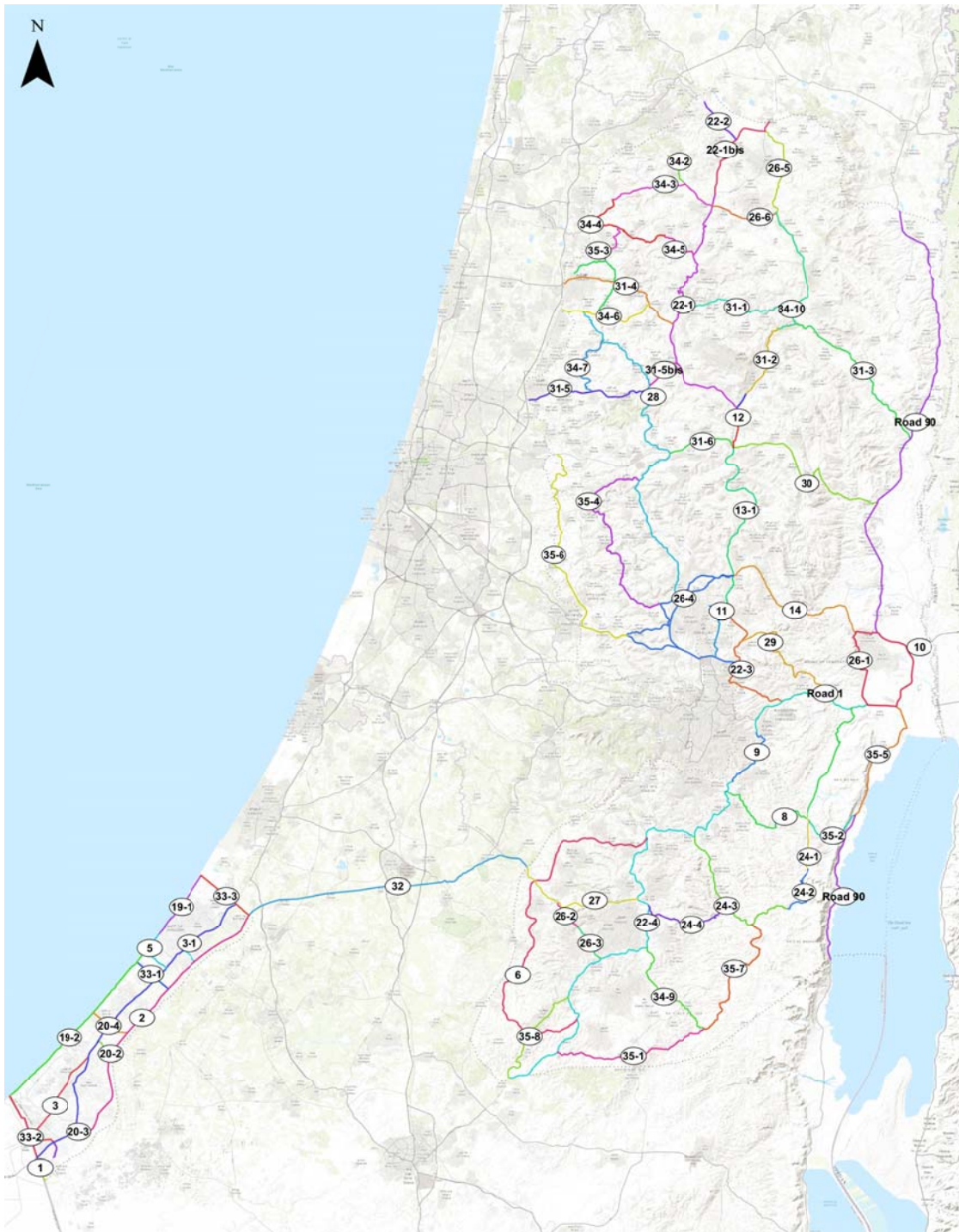
The list of roads proposed for Phase 4 is reported in the following table:

Tab 7. Proposed Road Works for Phase 4

Road Name	Road Description
<u>West Bank Perimeter Road System</u> (DESIGN AND CONSTRUCTION); L= 174.9km	<p>The intervention consists of the rehabilitation of existing roads and of the construction of new roads:</p> <ul style="list-style-type: none"> • SEGMENTS 35.1: rehabilitation of existing road, compliant with Road Section Type 1 and 1 Var. • SEGMENT 35.2: construction of new road, compliant with Road Section Type 1 and 1 Var. • SEGMENT 35.3: construction of new road, compliant with Road Section Type 1. A tunnel is needed (Road Section Type 4). • SEGMENT 35.4: construction of new road, compliant with Road Section Type 1 and 1 Var. A tunnel is needed (Road Section Type 4). • SEGMENT 35.5: rehabilitation of existing road, compliant with Road Section Type 2. • SEGMENT 35.6: rehabilitation of existing road, compliant with Road Section Types 1, 1Var, 3 and 4. • SEGMENT 35.7: construction of new road, compliant with Road Section Type 1 and 1 Var. • SEGMENT 35.8: rehabilitation of existing road.

In the following pages, all road works listed in the previous pages are presented in an overall map and table.

Figure 8. Overall Map of Proposed Road Works(Segments)



Tab 8. Overall Table of Proposed Road Works(Segments)



Road Work SEGMENTS	Road Work Description	Phasing
1	Road between Abu-Salem BCP and Rafah BCP	1A
2	New Gaza Strip Eastern Corridor	1A, 1
3 - 3.1	Salah Al Din Central Axis Road in Gaza Strip	1A
4	Road Connection to Yasser Arafat Regional Airport	1A
5	Road Connection to Gaza Fishery Port	1A
6	New Eastern Road Network: Nabi Musa-Hebron-Bethlehem	1
8	New Eastern Road Network: Nabi Musa to Bethlehem	1
9	New Connection "Wadi al-Nar"	1
10	Road Connection to Karama Br. BCP	1A
11	New Ramallah Eastern By-pass Road	1
12	New Nablus/Huwwara By-pass Road	1
13.1 - 13.2	Road Improvement between Ramallah and Nablus	1A
14	Road Improvement between Ramallah and Jericho	1
19.1 - 19.2	Gaza Strip Coastal Road	1
20.1 - 20.4	Road Connecting Gaza Strip Main N-S Axes	1
22.1 - 22.4	West Bank N-S Backbone Reinforcement	1
24.1 - 24.4	New n. 90/bis road system	1A, 1
26.1	New Urban Ring Roads – Jericho	1A, 1, 2
26.2 - 26.3	New Urban Ring Roads –Hebron	1A, 1, 2
26.4	New Urban Ring Roads - Ramallah	1A,1, 2
26.5 - 26.6	New Urban Ring Roads – Jenin	1A, 1, 2
26.7	New Urban Ring Roads – Tulkarm	1A, 1, 2
27	New West Bank - Gaza Strip Corridor	1A, 1
28	New Western Connection: Tulkarm to Ramallah	1, 2
29	Road Connecting Ramallah to Jericho	2
30	West-East Road Connecting Majdal to Road n. 90	2
31.1 - 31.6	West Bank Radial Road System	1, 2
32	New West Bank - Gaza Strip Corridor	1A, 2
33.1 - 33.3	New Gaza East-West Road Connections	1, 2
34.2 - 34.10	West Bank Radial Road System - Stage II	2
35.1 - 35.8	Completion of perimetral national road	3-4