Republic of IRAQ

حکومەتی هەرێمی کوردستان
وەزارەتی ئاوەدان کردنەوە و نیشتە جێ کردن

MINISTRY OF CONSTRUCTION AND HOUSING
DIRECTORATE OF ROADS AND BRIDGES
IN DUHOK - KURDISTAN

THE WORLD BANK
Working for a World Free of Poverty

Environment and Social Impact Assessment (ESIA)
Transport Corridor Project- Road No. 2 - in Kurdistan
Segment 3 - GERSHEEN - SUHAILA

PMC
إدارة ومتابعة المشاريع ذ.م.م
Project Management and Control W.L.L

Executive Summary

Introduction

The Environmental and Social Impacts Assessment (ESIA) report is prepared in accordance with the Terms of Reference for the Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) for two segments of Road No. 2 in Kurdistan, Iraq: Batil – Gersheen (Segment 2) and Gersheen – Suhaila (Segment 3) issued by the Duhok General Directorate of Roads and Bridges (GDRB) and pertains to the 23 km stretch of the Segment 3: Gersheen Intersection – Suhaila Intersection.

ESIA is a tool that provides the decision-makers with the tool for the construction of the new road alignment in a way that is economically feasible and the least detrimental to the environment and the local population.

Project Description

Main Project Features

Segment 3: Gersheen Interchange – Suhaila Interchange approximately 23 km in length is proposed to be constructed as 3 lanes both directions dual carriageway. Segment 3 is a part of the 65 km KRG Transport Corridor (KRG TC) located in Duhok Governorate of the Northern autonomous region of Iraq – Kurdistan. The Transport Corridor connects the city of Duhok with the Ibrahim Al Khalil border with Turkey. Originally, four alternative alignments of segment 3 were considered (see Figure 0-1).

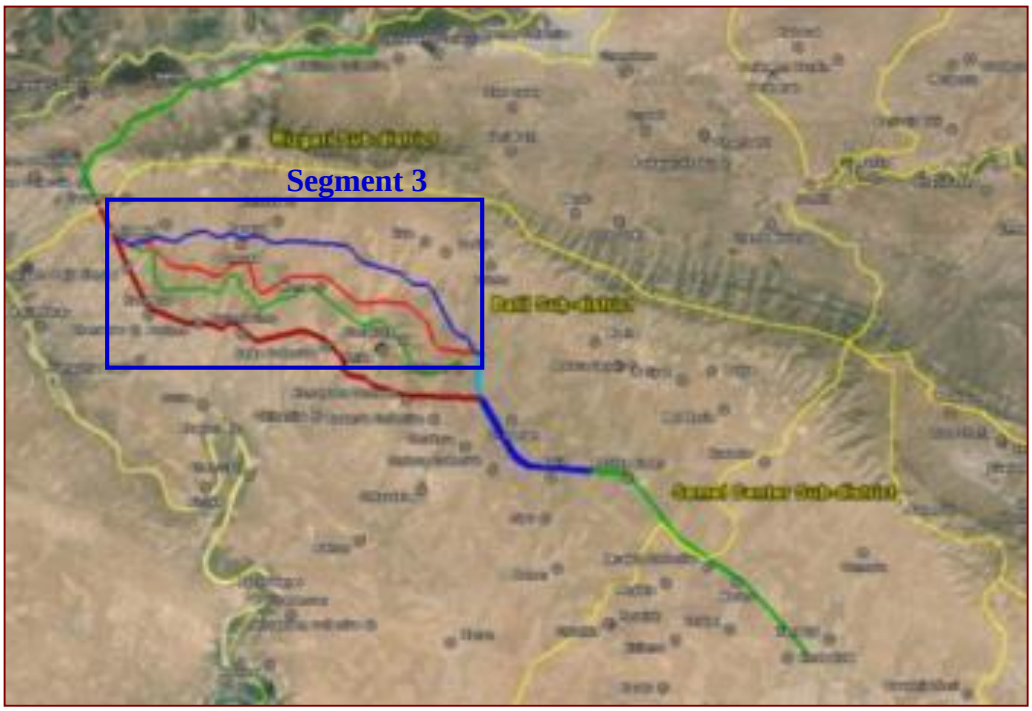

Figure 0-1: Segment 3: Gersheen - Suhaila

However, upon consideration of the number of factors, such as cost estimates, scale of land acquisition of residential areas, location of different facilities (i.e. petrol storage facility), and the final alignment was chosen (see Figure 0-2).

Figure 0-2: Chosen Alternative of Segment 3 Alignment

The construction of Segment 3 is co-financed by KRG and the World Bank. The construction cost estimate is US$ 70,873,000.

Segment 3 of TC comprises construction of 3 lanes both directions highway (dual carriageway). A Right of Way (ROW) for road construction of 100 m has been adopted for land acquisition and approved by GDRB. The boundaries of the study are defined as 1000 m from the centerline corridor along the road alignment.

The proposed design speed for this road is 100 km/h. The horizontal and vertical alignments of the Road are designed taking into consideration type of terrain, design speed, the proposed cross section and planned Right of Way (ROW).

This alternative runs 5 Km north of the existing road in almost flat area for 85% of its length before rolling down to the end point at Suhaila intersection. There are two directional interchanges Gersheen Interchange and Suhaila designed to a high standard allowing fast interchange in each direction.

52 culverts are provided at low points generally defined by shallow wadis. 4 underpasses are provided for livestock crossing. Truck lay-bys are proposed on each direction of the road. The road will be furnished with the road signs (directional, warning, etc.), lighting, guardrail, Jersey barriers, and road markings.

Materials used for road construction include soils (possible re-use of cut materials), aggregates, Portland cement mixes, asphalt mixes, geo-synthetics, composites, and metals including steel and aluminum, wood materials. Significant water consumption is anticipated for the project.

For the execution of the works on Segment 3 the following types of construction camps are likely to be required:

- A Main Camp
- Construction Yards
- Satellite Camps
- Temporary Camps

The staffing requirements for the project implementation are estimated about 90 persons including the administrative, technical staff, construction crew and miscellaneous unskilled labor. The anticipated duration of main construction activities varies from 70 days (traffic signs and road marking) to 170 days (bridges and culvert works).

Main Land Use Patterns

In total of 171.18 hectares of land are to be acquired permanently for the project including requirements of land for the ROW, culverts, underpasses, interchanges and lay-bys. The area is devoid of any kind of industrial, commercial and residential activities. The only land use in the area is agricultural, predominantly grazing of livestock and partially cultivation of wheat and barley. No cultural, religious and historic sites will be affected by the project.

Policy, Legal and Institutional Framework

The desk study on legal and institutional framework was conducted in order to assess the relevant existing legislation, policies and role of the different institutions in the project. The applicable World Bank safeguard policies were also assessed and compared to the national legislation.

Policies and Strategies:

- National Development Plan of Iraq 2011 -2014
- Kurdistan Regional Government's Economic Development Strategy
- Iraqi Transport Master Plan

Legal National Framework:

- The Law for the Protection and Improvement of Environment No. 27, 2009
- The Forestry Law No. 30, 2009
- The Law on the Protection of Wild Animals and Birds No. 17, 2010
- Public Health Law No. 89, 1981
- The Law of Antiquities and Heritage No. 55, 2002
- Regulation for the Provision of Water Resources, No. 2, 2001
- Law of Environmental Protection and Improvement in Iraqi Kurdistan Region No.8, 2008
- Law on Public Roads No. 35, 2002
- Land Acquisition Law No. 12, 1981

According to the World Bank definition the project is categorized as Category A. The policies that are viewed as most relevant to the scope of the present study are:

- Environmental Assessment (OP/BP 4.01)
- Involuntary Resettlement (OP/BP 4.12)
- OP/BP 4.11 – Physical Cultural Resources
- BP 17.50 Disclosure Policies

Institutional and Administrative Framework

The role of environmental protection is divided between different governmental institutions, which are responsible for specific aspects of environmental management. Also, some NGOs and scientific centers and universities are contributing to the nature protection in the Kurdistan Region. The key institutions and organizations involved in the Project include:

- The Ministry of Natural Resources of the Kurdistan Regional Government;
- Ministry of Agriculture and Water Resources;
- Ministry of Environment/Environmental Protection and Improvement Board;
- Ministry of Construction and Housing;

- Ministry of Municipalities and Tourism/Archeological Directorate of Duhok;
- Municipalities;
- NGO - Farasheen Organization for Environmental Protection (FOEP);
- Duhok Farmers Union;
- University of Dohuk.

A number of international donor organizations are active in the Kurdistan Region implementing projects designed to improve the livelihoods of the population.

Despite the fact that quite a number of institutions are involved in environmental protection and conservation, the institutional framework of the Kurdistan Region is characterized with a number of deficiencies:

- Dispersion of authorities and low level of coordination between different institutions;
- Overlap of jurisdiction, which might lead to overlooking the significant issues;
- Lengthy and bureaucratic process of obtaining the permits for different kind of activities, which involves several institutions.

As authorized by KRG, DGRB bears primary official responsibility for ensuring that land acquisition and resettlement associated with the new road alignment are planned and implemented in a manner consistent with the laws and regulations of Kurdistan Region, and in a manner consistent with the principles and procedures of World Bank OP 4.12.

Effective implementation of resettlement program requires coordination with the Duhok governorate along with their subordinate district governments, and with local councils and village committees functioning at the village or settlement level.

Public Consultations

Public participation makes a positive contribution to the project in terms of minimizing and avoiding potential public controversy and in identification of priorities of assessment.

Stakeholders' identification and analysis was conducted according to the World Bank categorization of the stakeholders according to their interest and influence in the present study.

The key stakeholders of the Project include:

- GDRB;
- Directorate of Agriculture of Duhok;
- Directorate of Water of Duhok;
- Directorate of Antiquities of Duhok;
- Farmers' Association of Duhok;
- Directorate for Environmental Protection and Improvement Board of Duhok;

- Local administration;
- Farmers;
- Business entities;
- Duhok University;
- Zakho University;
- Al Farasheen Environmental NGO

Raising public awareness was achieved through:

- Consultation Sessions: according to the OP 4.01requirements for category A projects two sessions were conducted on 17.07.2013 and 29.04.2014;
- Individual interviews with PAPs;
- Interviews with the governmental officials;
- Negotiations of Compensation Committee with individual PAPs on the size of the land acquisition and proposed compensation.

Based on the main issues of concern expressed by the stakeholders throughout the consultations the criteria and requirements for project acceptance are described in Chapter 5.6.

The Grievance Redress Mechanism is prepared according to the OP 4.12 on *Involuntary Land Acquisition and Resettlement* as described in Chapter 5.8.

The key findings of the public consultations are:

- Overall, the project is perceived as beneficial for economic development of the area and received support and approval of the different level of stakeholders;
- Main issues of concern:
    - The effect of land acquisition on livelihood levels of the PAPs;
    - Availability of equitable compensation for the loss of land;
    - Provision of safety measures for the road users;
    - Conservation of archeological sites and sites of cultural and religious importance;
    - Conservation of natural resources: water, soils and wildlife;
    - Minimization of the air pollution.

Baseline Conditions

Physical Environment

The road alignment is located in area, which is characterized as sub-humid upland and mountain region with semi-arid Mediterranean climatic conditions, which includes the Zagros Mountains and valleys as well as a part of the foothills. The main annual rainfall ranges between 400 mm and

1 100 mm. The mean minimum in July is about 22°C. In winter the mean monthly minimum in January is 10°C and the lowest minimum is -11°C.

The prevailing wind direction at the project area is South-East and sometimes tends to South-West and North-West. Wind speed is generally of light to moderate value with wind speeds between 0.74 m/sec at times in November and 1.20 m/sec at other times April to July.

Segment 3 is located in the area that is characterized as undulating terrain: a transitional area between low plains and the mountainous region in the north and northeast.

The road is located at the foot of the Zagros Mountains and comprises of hills 500 to 1 000 meters high. It consists of beds of gravel, conglomerate and sandstones. Gravel and conglomerate layers alternate with thin layers of reddish loam and clay. The main soil types are:

- Calcic Xerosols
- Gypsum Xerosols

A regional stratigraphic column shows the presence of a thick Jurassic and Cretaceous succession composed of carbonates, shale and anhydrates. At its type locality within Iraqi Kurdistan, the formation is composed of thin-bedded, black bituminous limestone, dolomitic limestone and black papery shale with streaks of thin black chert in the upper part.

The groundwater resources are identified as a shallow aquifer belonging to the Zakho Basin. The Zakho Basin stretches across the border between Iraq and Turkey. In Iraq, the Zakho Basin has a catchment area of about 1,107 km^2. In the early 1980s an estimated total of 24.3 MCM of good-quality (<700 mg/L TDS) water had been abstracted (9.5 MCM from deep wells and 12.3 MCM as spring discharge).

There are no wells in the vicinity of Segment 3 of the road. However, the limited information about wells in Duhok Governorate is available. It is estimated that are 1958 licensed wells and about 62 illegal wells in the Duhok Governorate. The city of Duhok depends on the water supply from Tigris River, but other localities in the Governorate depend to some extent on the groundwater abstraction for the water supply.

Surface water resources comprise seasonal runoff valleys. Generally, all the seasonal streams drain towards the Tigris River. The drainage area is characterized as undeveloped cultivated land with the catchment slopes ranging from 0.09 to 0.15 %. The catchment area is estimated as ranging from 1, 7 to 2.1 km^2. The peak runoff for 25 year period is evaluated as approximately 1.8 - 4.3 m^3/sec.

It must be noted that the ambient air quality monitoring and noise monitoring has not been performed previously in the project area, mostly due to the perception of low level of importance

of such issues. The main minor source of the air pollution in the area is dust generated by agricultural plowing.

Biological Environment

The area has been subjected to diverse human induced impacts over the millennia such as rain-fed cultivation. Therefore, natural habitats have suffered the significant level of degradation over the past several hundred years. The terrestrial ecosystem within the vicinity of the Segment 3 is characterized as Middle East Steppe ecosystem, the conservation status is defined as vulnerable.

Vegetation reflects the Mesopotamian province of the Irano-Turanian eco-region and is characterized by the dominance of the drought-tolerant low shrubs with a variety of grasses and legumes.

The area of the project is located in a general area identified as a fly-way route for migratory birds from Eastern Europe and West Siberia to Mesopotamia and Africa.

The project area does not contain any globally important habitats or ecosystems. There are no Nature Reserves or other legally protected areas in the vicinity of the project or in a close proximity. No conservation practices are exercised in the project area apart from the control of hunting to the extent they are controlled and monitored throughout the country.

The globally important mammalian species include the Euphrates Jerboa, defined by IUCN as nearly threatened and Harrison's Gerbil, defined as endangered.

Bird species identified as regionally or globally important are:

- Finsch's Wheatear (*Oenanthe finschii)*: winter visitor, regionally threatened species.
- Corncrake (*Crex Crex)*: passage migrant, globally threatened species.

Flora and fauna species that can be found in the project area are listed in section 6.2

Socio-Economic Conditions

The total population of Duhok Governorate is approximately 1.5 million people. The population growth rate is estimated as 2.23 for the year 2014. However, due to the political situation in the region the area witnessed the influx of refugees and IDPs from the neighboring regions over the past year, amounting approximately to 1.2 million people.

According to the official statistics, the ratio of males to females shows a close number of the two genders. The economically active population, between the ages 16-64 constitutes about 36 % of the total population of Duhok Governorate.

On average the household in the study area is composed of 7.1 members with almost equal distribution between males and females of whom 2.6 are young people aged between 0 and 15 years and 3.5 are adults.

The households receive income from the different sources, such as wages, social benefits, property income, etc. Overall, households receive 45.3% of their income from wages and salaries; 25.0% from self-employment and employer income; 19.8% from property income; 5.2% from social payments; 4.7% from "transfers" from outside the country. Additionally, under the food rationing system (Public Distribution System – PDS which replaced Food for Oil Program), each Iraqi is entitled to a monthly food basket for a nominal fee of 250 Iraqi dinars ($0.21). Also, government subsidizes heating/cooling of the dwellings, additional electricity supply of the dwellings by distributing fuel to households.

The main features of the PAPs households in the project area are as following:

- The household size is quite large, ranging from 6 to 9 people on average.
- Most of the households depend almost exclusively on the income from the agricultural activities.

The unemployment rate in Duhok Governorate reaches almost 17 %, which is slightly higher than the average of the Kurdistan Region.

Sewage and Effluent Disposal: the main method of effluent disposal is the cesspits. Only 5.5 % of households are connected to the sewage network. The condition of the cesspits is questionable, and the collected effluent is literally dumped into the streams that discharge into the River Tigris without any treatment.

Solid waste disposal: solid waste collection from houses in residential areas in Duhok district stands at 79 %. Unfortunately, the collected solid waste is disposed in open unauthorized areas at the rate of 40.1 %. The only authorized dumping site is located at about 17 km South-West to the road alignment.

Water Supply: 88 % of households in Duhok receive drinking water from the public water network. The main source of the drinking water is the treated water from the River Tigris. The wells as source of potable water are used mainly in the smaller villages and towns.

Electricity: The percentages of working electricity supply system are of 70.3% in the urban areas, 89.5% in the collective towns, and 79.7% in the rural area. The electricity black-outs in Duhok Governorate are reported to be from 6-15 hours per week.

Health Care: In the governorate of Duhok there is one hospital and health centers available for every 10,168 residents in the urban area, one for every 7,781 in the collective town, and one for every 5,421 in the rural area.

Education: about 30 % of the Duhok Governorate population is illiterate, education of almost 47 % of population is limited to the primary level of "read and write" only, about 10 % - level of intermediate education, about 8 % - secondary education and vocational training, and only about 5 % have higher education.

Roads and Transportation

The total length of highway road network in the Duhok Governorate is 560 km. The network of secondary roads has length of 852km.

Impacts Assessment

The negative environmental and social impacts of the construction activities of the project are expected to be relatively minor to moderate and short-term. None of the identified negative impacts of individual construction activities were scored as particularly significant. The impacts during the operational phase of the Project are fewer and less significant than during the construction phase.

The project activities with the highest number of identified negative impacts during the construction phase are:

- Site clearance;
- Operation of asphalt plant;
- Generation and disposal of construction waste;
- Excavation works and fill works;
- Embankment works;
- Construction of access roads, embankment, culverts and underpasses;
- Paving;
- Operations of the construction camp.

The most significant environmental and social impacts identified for the construction phase of the project are:

- Soil erosion and contamination caused by construction works;
- Air pollution (dust) caused by construction works;
- Surface and groundwater contamination;
- Habitats fragmented by the motorway construction and operation;
- Noise caused by construction vehicles and machines;
- Riparian habitats along the seasonal run-off valley affected by construction of underpasses and culverts.

- Health and safety of project workers.
- Land acquisition from PAPs without legal rights on agricultural activities;

The most significant environmental and social impacts identified for the operational phase of the project are:

- Air pollution (NO_X, CO, HC, PM, benzene, formaldehyde, ozone) caused by traffic;
- Deterioration of surface water and groundwater quality;
- Noise caused by traffic;
- Soil contamination;
- Habitats fragmentation;
- Disruption of livelihoods;
- Health and safety.

Indirect Impacts

Indirect impacts are defined as "caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable". The main identified indirect impacts are:

- Potential contamination of the groundwater;
- Changes in land use pattern – from predominantly agricultural to increase of low density commercial/industrial development;
- Moderate impact on permanent vegetated habitat loss.

Cumulative Impacts

Cumulative impact is defined as the impact on the environment, which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. The main cumulative impacts are:

- Increases in impervious surface might have a potential impact on water quality downstream;
- Land use and farmland conversion;
- Incremental effect of construction waste disposal on waste management in the area;
- Incremental impact on habitat fragmentation.

Irreversible Impacts

Growth inducing effects of the proposed project at the local level could result in long-term commitment of resources to urban development.

Relatively minor impacts would occur to previously disturbed habitats, non-native vegetation communities and agricultural lands. These environmental changes are considered irreversible, but not significant.

The approved alignment alternative would result in the permanent acquisition of approximately 171,18 ha of agricultural lands. Within the acquired lands there are relatively small remnants of natural and semi-natural habitats. Additionally, the long-term use of the road will have the impact on air quality and noise.

The irreversible impacts are considered minor and include:

- Change of land use pattern;
- Habitat fragmentation;
- Impact on air quality and noise

Mitigation Measures

The negative environmental and social impacts identified can be prevented or minimized by applying mitigation measures. The key mitigation measures of the construction phase of the Project include (see table A and chapter 8 for details):

- Collection and transportation of wastes to the designated disposal sites;
- Provision of adequate size culverts;
- Placement of drains to avoid cascading and soil erosion;
- All operations other than piling shall be restricted to the hours of 07.00 – 20.00;
- Piling operations should be restricted to the hours 08.00 – 19.00 and not undertaken during public and religious holidays;
- Proper and adequate maintenance of vehicles and equipment to ensure there are no excessive exhaust emissions or leakages;
- Water spraying of conveyors, stockpiles, roads and earth works during windy dry periods to prevent dust emissions;
- Covering all vehicles transporting materials likely to prevent dust generation;
- Stop the construction activities in the area of the chance find;
- Adequate signage should be provided for motorists and pedestrians;
- Designate clearly marked areas for livestock crossing;
- Provide training on potential risks and hazards of construction;
- Provide the PPE and enforce its use;
- Cash compensation or in lieu compensation for loss of lands and properties;
- Cash compensation for the loss of crops.

The key mitigation measures during the operational and maintenance phase of the Project include (see table B and chapter 8 for details):

- Maintaining the roads drainage systems;
- Apply emergency measures for neutralization of chemicals and if necessary remove and replace the contaminated soil - in case of the accidents involving the spill of hazardous chemicals and vehicle fuel;
- Maintenance and clearance of debris in the underpass for livestock and wild animal crossing;
- Planting and maintenance of trees and bushes to form green belt along the motorway. Provision of directional and warning road signage.

Environmental and Social Management Plan

Summaries of the Environmental and Social Management Plan (ESMP) for both construction and operational phases of the Project are presented in the following tables A and B. The ESMP contains interlinked impacts, project activities, mitigation measures, monitoring, and estimated costs of mitigation and monitoring. ESMP monitoring is presented as monitoring parameters, frequency of monitoring and monitoring responsibilities.

Part of the mitigation measures included into the Environmental Management Plan are imbedded into the project design and therefore do not require additional investment. These are:

- Provision of the adequate drainage system during both construction and operational phases;
- Provision of the PPE for working personnel (responsibility of the contractor);
- Provision of warning signs for public safety;
- Provision of pathways for wildlife and livestock;
- Provision of safe crossings for pedestrians;
- Provision of waste collection and disposal.

The estimated costs of mitigation measures during the construction phase of the project reach nearly 7,313,500 US $ (large part of these costs are costs of culverts construction). The mitigation measures during the operational phase of the project are limited to standard maintenance activities. Therefore, they are not specifically priced.

The ESMP monitoring costs during the construction phase are estimated at 110,500 US $. They consist of the cost of environmental monitoring specialist (96,000 US $), and the cost of air, water, soil and noise tests (14,500 US $). The responsibilities for safeguards monitoring during the construction phase of the project lie primarily with the Supervision Engineer and the Contractor.

The annual cost of monitoring during the operational and maintenance phase of the Project estimated at 15,800 US $. The cost include 3,800 US $ for testing, and 12,000 US $ cost of environmental monitor input. The responsibilities for safeguards monitoring during the operation phase of the project lie with the GDRB.

Table A: ESMP – Construction Phase

Parameter	Impacts	Activities	Mitigation Measures	Monitoring Parameters	Monitoring Frequency	Monitoring Responsibility	Cost of Mitigation	Cost of Monitoring
Land Acquisition	Loss of crops (approximately 376 tons of cereals and few almond trees).	Expansion of the ROW. Land acquisition for underpasses, intersections, lay-bys, culverts.	Compensation for crops value for the year after acquisition	• Compliance with the land acquisition plan and disbursement of compensation. • Any unanticipated impacts and resolving the issues. • Sufficiency and adequacy of the compensation budget. • Adequacy of contingency measures. • Resolving grievance issues. • Consultation and information disclosure.	First three months – once a week. Following four months – bi-weekly. The rest of construction period – monthly.	PMT at GDRB. Compensation Committee.	Market value at the time of survey – 245,000 US $	No additional cost.
	Loss of agricultural land 1,711, 800 m^2		No monetary compensation – the land is state owned.					
	Livelihood disruption.		Monetary compensation for loss of crops. At 800 US $ per ton for the year after land acquisition. Additional financial assistance to vulnerable PAPs.				Individual financial assistance (to be reviewed case by case by GDRB).	

Parameter	Impacts	Activities	Mitigation Measures	Monitoring Parameters	Monitoring Frequency	Monitoring Responsibility	Cost of Mitigation	Cost of Monitoring
Water Resources	Local alteration of water flow and drainage at locations (location of seasonal water bodies is shown in Figure 6-9).	• Excavation. • Disposal of construction debris in surface water courses. • Uncontrolled run-off in ditches.	• Placement of excavated material and debris should be avoided in the areas of the runoff routes. • Provision of adequate size culverts. • Disconnecting road sediment sources from watercourses through use of rolling dips, water weirs and filter strips. • Use of drainage structures to minimize run-off inside ditches.	• Storage of excavated materials, compliance of culverts with design, photographic evidence, logbook inspections. • Changes to water courses.	Bi-weekly during rainy season.	Contractor – internal monitoring. Supervision Engineer.	Estimate of 7,057,500.00 US$ for culverts and underpasses construction.	Part of environmental monitoring costs of the Supervision Engineer.
	Potential contamination of surface water. (in locations specified in the	• Leakage of hazardous fluids from construction machinery.	• Vehicle used during construction/ maintenance phases should be well maintained to reduce emissions,	Conditions of vehicles, inspections of spillages, logbook records, photographic evidence.	One time prior to construction to establish baseline; One time during construction during rainy season down the temporary	Contractor – internal monitoring. Supervision Engineer.	No extra cost	500 US $ per test, minimum 12 water quality tests – 6,000 US $

Parameter	Impacts	Activities	Mitigation Measures	Monitoring Parameters	Monitoring Frequency	Monitoring Responsibility	Cost of Mitigation	Cost of Monitoring
	hydrological map.	• Accidental spills of oils and petrol. • Wash off of construction materials during rain events. • Inadequate storage of construction materials. • Inadequate disposal of liquid and solid waste at construction camp site.	be free of leaking fluids and be covered to reduce/prevent spills. • Removing or minimizing side casts. • Applying upgraded surfacing. • Allowing time restrictions during rain events. • Heaps and stockpiles of aggregate, fill and spoil should be located at sites that do not permit direct runoff into watercourses and are on land sloping of less than 1.5 %. • Avoid storage of surplus materials on site and provide for regular	Water quality testing: pH, Turbidity, Electrical Conductivity (EC), Color, Total Suspended Solids (TSS), Total Dissolved Solids (TDS), Chemical Oxygen Demand (COD), Biological Oxygen Demand (BOD), Polychlorinated Biphenyls (PCBs).	storage and handling areas of fuel and liquid waste.			

Parameter	Impacts	Activities	Mitigation Measures	Monitoring Parameters	Monitoring Frequency	Monitoring Responsibility	Cost of Mitigation	Cost of Monitoring
			disposal of all surplus materials. • Emergency response for accidental spills of hazardous materials.					
Soils	Soil erosion (along the road alignment).	• Site clearance. • Excavation/Cut operations. • Inadequate drainage.	• Placement of drains to avoid cascading. • Localized lining of receiving channels. • Construction of sufficient discharge points. • Avoid site clearance well in advance of construction. • Reinstatement and after-use.	• Conditions of natural drainage systems and/or additional drainage channels. • Photographic evidence.	Bi-weekly during the rainy season, and after sporadic rains. Duration between the time of site clearance and start of construction activities not to exceed three weeks.	Contractor – internal monitoring. Supervision Engineer.	Cost of drainage systems (as specified above).	Part of environmental monitoring costs of the Supervision Engineer.
	Soil Contamination near the temporary storage site of fuel and liquid	• Accidental spills of hazardous materials. • Leakage from construction machinery and	Same measures as for prevention of surface water contamination.	Presence of spillages, logbook records, photographic evidence. Soil testing:	Soil tests immediately after any spillages of fuel and liquid waste; One random soil test after	Supervision Engineer. Directorate of MAW of Duhok.	No extra costs	Part of environmental monitoring costs of the Supervision Engineer

Parameter	Impacts	Activities	Mitigation Measures	Monitoring Parameters	Monitoring Frequency	Monitoring Responsibility	Cost of Mitigation	Cost of Monitoring
	waste, and near the construction camp.	stored construction materials. • Inadequate disposal of liquid and solid waste at construction camp.		pH, temperature, organic content, poly-aromatic hydrocarbons (PAHs); Faecal coliforms and Total coliforms.	completion of works at locations of temporary storage of fuel and waste.			Soil tests: 1,500 US $ total.
	Loss of productive fertile soil (along the road alignment).	• Site clearance. • Excavation.	• Clearance procedures that separate topsoil. • Transport and store topsoil and possible transport to the re-use site should be adopted.	Handling of the top soil.	Monthly	Supervision Engineer.	No extra cost	Part of environmental monitoring costs of the Supervision Engineer.
Ecology and Bio-Diversity	Habitat fragmentation	• Site clearance. Landscape alteration. • Inadequate disposal of solid waste and construction debris. • Aggregate extraction.	• Provision of underpasses for wild animals. • Avoid works on or near watercourses during rainy seasons. • Using only defined and approved liquid and solid waste disposal sites.	• Habitat disruption due to construction activities. • Number of animal kills. • Provision of training for the workers on	Bi-weekly	Contractor – internal monitoring. Supervision Engineer. Directorate of Environment of Duhok.	Costs of 4 underpasses for animal crossings are included in the costs of drainage culverts. No other costs	Part of environmental monitoring costs of the Supervision Engineer.

Parameter	Impacts	Activities	Mitigation Measures	Monitoring Parameters	Monitoring Frequency	Monitoring Responsibility	Cost of Mitigation	Cost of Monitoring
			• Extracting gravel and other materials only from approved sites.	habitat fragmentation. • Site restoration after work completion. • Photographic evidence.				
	Loss of flora species.	• Vehicle movements beyond ROW. • Cutting down the trees and bushes to be used for fuel and burning.	• Providing the crew and the construction camp with the fuel for heating and cooking to avoid their use of lighting of fires for such purposes. • Confine traffic to defined routes.					
	Loss of fauna species.	• Destruction of dens, burrows and nests, clearance of feeding grounds. • Increased traffic kills; • Possible illegal hunting by off-duty construction workers.	• Limiting construction noise and vibration to day time hours. • Provision of four underpasses for wild animals and livestock. • Training for construction crew on the impact of disturbance and damage to habitats. • Avoid works along watercourses					

Parameter	Impacts	Activities	Mitigation Measures	Monitoring Parameters	Monitoring Frequency	Monitoring Responsibility	Cost of Mitigation	Cost of Monitoring
			during rainy seasons.					
Ambient Air Quality	Dust generation	• Movement of vehicles on unpaved surfaces. • Excavation; • Transporting of cut materials and aggregate materials. • Borrow pits.	• Water spraying of sites and not paved access roads. • Water troughs at entry and exit points to prevent carryover of dust emissions from sites. • Establishing speed restrictions for all vehicles. • Covering all vehicles transporting materials likely to give off excessive dust. • Construction sequencing and disturbing only small areas at a time.	• Dust abatement approach, photographic evidence. • Air quality parameters: PM10, PM2.5, SO2, NOx, CO, Ozone and HC. •	Air quality testing: - One time prior to construction to establish the baseline; - One time during construction during the dry season. Weekly monitoring of implementing of dust abatement measures	Contractor – internal monitoring. Supervision Engineer.	Cost of regular vehicles maintenance Cost of water spraying of unpaved surfaces	Part of environmental monitoring costs of the Supervision Engineer. Air quality testing – 6,000 US $
	Air pollution from emissions	• Inadequate condition of construction	• Proper and adequate maintenance of vehicles and					

Parameter	Impacts	Activities	Mitigation Measures	Monitoring Parameters	Monitoring Frequency	Monitoring Responsibility	Cost of Mitigation	Cost of Monitoring
		machinery and vehicles. • Burning of combustible materials. • Burning of the vegetation from clearance.	equipment to ensure there are no excessive exhaust emissions. • Burning of materials from clearance of trees, bushes and other combustible matter should be prohibited. • Ensure the machinery operating intermittently is shut down during idle periods.					

Parameter	Impacts	Activities	Mitigation Measures	Monitoring Parameters	Monitoring Frequency	Monitoring Responsibility	Cost of Mitigation	Cost of Monitoring
Noise and Vibration	Increased noise levels that are potentially detrimental to human health.	Operating of construction machinery and equipment.	• The contractor shall ensure all his equipment is fitted with noise muffing devices. • Ensure machinery operated intermittently is shut down or throttled down during idle periods. • Time restrictions of activities to the day-time working hours. • Provision of PPE.	• Level of occupational noise. • Operating conditions of vehicles and machines. • Use of muffling and switching off machines during idle periods. • Use of protective gear. • Logbook records, records of complaints by local residents.	Bi-weekly	Contractor – internal monitoring. Supervision Engineer.	Cost of PPE	Part of environmental monitoring costs of the Supervision Engineer. 1,000 US $ for noise tests.

Parameter	Impacts	Activities	Mitigation Measures	Monitoring Parameters	Monitoring Frequency	Monitoring Responsibility	Cost of Mitigation	Cost of Monitoring
Construction Camp	Potential soil contamination and consequent contamination of shallow aquifer.	• Storage of construction materials. • Inadequate disposal of discarded and surplus materials. • Inadequate disposal of construction debris. • Spillage of machinery oils. • Leakage of domestic effluent from septic tank.	• Location of the camp outside known aquifer recharge zones. • Provision of septic tank for sewage collection and temporary storage. • Provision of adequate infrastructure for effluent collection. • Regular disposal of effluent. • Regular disposal of solid waste. • Provision of collection pits for collection of used machinery oils. • Adequate vehicle maintenance. • Transporting wastes to the designated disposal sites.	• Disposal method of effluent and solid waste. • Approach to storage of construction materials. • Vehicle maintenance. • Contaminants in soil as specified above. • Logbook records, photographic evidence.	Bi-weekly auditing	Contractor – internal monitoring. Supervision Engineer.	No additional costs.	Part of environmental monitoring costs of the Supervision Engineer.

Parameter	Impacts	Activities	Mitigation Measures	Monitoring Parameters	Monitoring Frequency	Monitoring Responsibility	Cost of Mitigation	Cost of Monitoring
Waste Management	Potential soil contamination and consequent contamination of shallow aquifer.	<u>Liquid waste:</u> • Effluent from construction camp. • Oils, industrial effluents, grease and de-greasing solvents. <u>Solid Waste:</u> • Construction debris. • Discarded and surplus construction activities.	• Hazardous liquid and solid waste should be stored in sealed containers. • Regular disposal of liquid and solid waste at designated sites. • Avoid placing of construction camp and construction material storage areas in proximity to the aquifer recharge areas.	• Approach to temporary storage of benign construction waste prior to final disposal. • Use of designated waste disposal sites. • Photographic evidence.	Weekly	Supervision Engineer.	Cost of transporting the waste.	Part of environmental monitoring costs of the Supervision Engineer.

Public Health and Safety	Increased risk of accidents	• Movement of construction machinery. • Movement of transporting vehicles. • Borrow pits.	• All construction vehicles marked and carry adequate visual and audio warning systems. • Speed limitations on the work site vehicles. • Adequate signage for motorists and pedestrians. • Designate clearly marked areas for livestock crossing. • Mark and fence the areas of active borrow pits. • Provision of barriers at construction sites. • Access points to and from existing highways. • Construction traffic prohibited outside specified, supervised hours.	Presence of fencing/barriers and warning signs, and traffic speed limitations, photographic evidence.	Bi-weekly	Contractor – internal monitoring. Supervision Engineer. Traffic Department of Duhok.	Cost of provision of warning signs and fencing.	Part of environmental monitoring costs of the Supervision Engineer.

Parameter	Impacts	Activities	Mitigation Measures	Monitoring Parameters	Monitoring Frequency	Monitoring Responsibility	Cost of Mitigation	Cost of Monitoring
			• Timing restrictions for transportation of abnormal loads. • Provision of safe crossings for pedestrians and livestock					
	Health hazards for construction workers.	• Operating the equipment. • Noise and dust generation from construction equipment. • Vehicles movement.	• Provide training on First Aid Procedures. • Provide training on potential risks and hazards of construction. • Provide the PPE and enforce its use. • Provide warning signs.	• Use of PPE and presence of warning signs. • Application of noise abatement and dust abatement measures. • Logbook records.	Weekly	Contractor – internal monitoring. Supervision Engineer.	Cost of PPE Cost of dust abatement measures. Regular cost of vehicles and equipment maintenance.	Part of environmental monitoring costs of the Supervision Engineer.

Disruption of Local Settings	Visual and Aesthetic Impact.	• Landscape damage due to the piles of excavated materials, construction debris and discarded materials. • Clearance and trees and shrubs removal.	• All trees, native shrubbery and vegetation should be preserved and protected from damage. • Movement of crews and equipment should avoid damage to property, productive lands and known sites of historical and archeological importance. • Upon completion of the works, all surplus equipment and materials to be removed and all work areas smoothed and graded to conform to the natural appearance of the surrounding landscape.	• Approach to landscape restoration. • Photographic evidence.	Monthly	Contractor – internal monitoring. Supervision Engineer.	Cost of entry/exit ramps.	Part of environmental monitoring costs of the Supervision Engineer.

Parameter	Impacts	Activities	Mitigation Measures	Monitoring Parameters	Monitoring Frequency	Monitoring Responsibility	Cost of Mitigation	Cost of Monitoring
Heritage sites	Accidental damage to the sites of historical, cultural and religious significance.	• Excavation. • Borrow pits.	In case of a chance find the cultural resources procedures should be applied.	Inspection for presence of artifacts in excavated material, logbook records, photographic evidence.	Bi-monthly	Contractor – internal monitoring. Supervision Engineer. GDRB. Directorate of Antiquities.	N/A	Part of environmental monitoring costs of the Supervision Engineer.
Estimated additional costs:							**7,313,500** US$	**110,500** US $ (14,500 US $ plus 96,000 US $: full time input of environmental monitor)

Table 2. ESMP – Operational and Maintenance Phase

Parameter	Impacts	Activities	Mitigation Measures	Monitoring Parameters	Monitoring Frequency	Monitoring Responsibility	Annual Cost of Mitigation	Annual Cost of Monitoring
Water resources	• Flooding of drainage channels and alteration of discharge patterns. • Water resources contamination.	• Blockage of drainage systems and culverts due to the accumulation of debris. • Accidental spillage of hazardous materials. • Road maintenance.	• Regular cleaning of roadsides. • Clearing of debris after the raining season. • Emergency response for accidental spills. • Regular maintenance of culverts and drainage channels.	• Conditions of the drainage channels and culverts, photo evidence <u>Water quality testing:</u> pH, Turbidity, Electrical Conductivity (EC), Chemical Oxygen Demand (COD), Biological Oxygen Demand (BOD), Hydrocarbons (HC).	<u>Surveillance:</u> • Bi-weekly during the rainy season • Monthly during the dry season. <u>Water testing</u> Once per year during rainy season.	GDRB	Cost of regular cleaning and maintenance.	500 US $ for testing No additional cost of environmental monitoring.
Soils	• Soil erosion. • Soil contamination	• Alteration of water courses due to debris accumulation. • Accidental spills of hazardous materials. • Accumulation of pollutants from traffic emissions. • Road maintenance.	• Same measures to be applied as for the mitigation of impacts on water resources. • Additionally, provision of protective zone of vegetation.	Conditions of the drainage channels and culverts (clear of debris). <u>Soil testing:</u> pH, temperature, organic content, poly-aromatic hydrocarbons (PAHs).	<u>Surveillance:</u> • Bi-weekly during the rainy season • Monthly during the dry season. <u>Soil testing</u> Once per year during rainy season.	GDRB	• Cost of regular cleaning and maintenance • Cost of maintenance of trees.	300 US $ for soil testing No additional cost of environmental monitoring.

Parameter	Impacts	Activities	Mitigation Measures	Monitoring Parameters	Monitoring Frequency	Monitoring Responsibility	Annual Cost of Mitigation	Annual Cost of Monitoring
Bio-diversity	Habitat fragmentation Incidents of road kill of wild animals.	Fencing and motorway operation.	Ensure the culverts and underpasses are clear.	Condition of culverts and underpasses, photographic evidence.	Monthly	GDRB	Cost of regular cleaning and maintenance.	No additional cost of environmental monitoring.
Ambient Air Quality	Air pollution	• Traffic movement. • Traffic congestion due to accidents. • Transporting of the dust generating materials.	• Provision of row of trees alongside of the road alignment. • Ensure all the dust generating materials are transported by covered vehicles. • Monitor vehicles condition.	• Air quality parameters: PM10, PM2.5, SO2, NOx, CO, Ozone and HC.	Once a year – air quality testing Regular monitoring of traffic movement.	Air quality monitoring – GDRB. Regulating vehicles movement – traffic police.	Cost of maintenance of trees.	3,000 US $ for air quality testing.
Public Health and safety	Risk of accidents related to traffic	Traffic movement.	• Provision and maintenance of a median concrete barrier, a New Jersey barrier or guardrail along the road alignment. • Maintenance of street lighting to reduce accidents at night and at times of reduced visibility.	• Condition of road signage and markings. • Adequate lighting of the road. • Regular maintenance of pedestrian crossings and livestock underpasses. • Photographic evidence.	Monthly	GDRB Traffic Police	Cost of maintenance.	No additional costs of environmental monitoring.

Parameter	Impacts	Activities	Mitigation Measures	Monitoring Parameters	Monitoring Frequency	Monitoring Responsibility	Annual Cost of Mitigation	Annual Cost of Monitoring
			• Maintenance of directional and warning road signage. • Maintenance of the underpass for livestock crossing. • Maintenance of guardrails barriers on curves and intersections.					
Landscape maintenance	• Soil pollution • Traffic accidents	• Use of chemicals for landscape maintenance. • Highway maintenance.	• Effective advance warning signs. • Effective material handling, storage and use. • Provision and maintenance of fencing in high risk areas. • Site supervision.	• Condition of road signage and markings. • Adequate lighting of the road. • Handling of materials. • Photographic evidence.	Weekly during maintenance.	GDRB	Cost of maintenance	No additional cost of environmental monitoring.
Estimated additional annual costs:							Regular maintenance costs	**15,800 US $** (3,800 US$ for tests plus 12,000 US $: 2 months input of environmental monitor)

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ABBREVIATIONS AND ACRONYMS

BOD	Biological Oxygen Demand
BRC	Boxed Reinforced Concrete
COC	Chemical Oxygen Demand
CC	Compensation Committee
EC	Electric Conductivity
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
GDRB	General Directorate of Roads and Bridges
GRM	Grievance Redress Mechanism
Ha	Hectare
ID	Iraqi Dinar
IUCN	International Union for Conservation of Nature
Km	Kilometer
KRG	Kurdistan Regional Government
MAWR	Ministry of Agriculture and Water Resources
MoCH	Ministry of Construction and Housing
M&E	Monitoring and Evaluation
NGO	Non-Governmental Organization
OP	Operational Procedure
PAP	Project Affected Person
PCB	Polychlorinated Biphenyls
PMT	Project Management Team
RAP	Resettlement Action Plan
ROW	Rights of Way
SA	Social Assessment
TC	Transport Corridor
TDS	Total Dissolved Solids
TSS	Total Suspended Solids
TSS	Total Suspended Solids
ToR	Terms of Reference
WB	World Bank

1 Introduction

The Project Construction of segment 3 Gersheen – Suhaila of Expressway No. 2 in KRG is part of parent Transport Corridor Project in Iraq financed by the World Bank. The Government of Iraq has committed to applying the World Bank Safeguards Policies to the entire Expressway 1 and Express 2 construction and renovation works.

The Environmental and Social Impacts Assessment (ESIA) report in prepared in accordance to the Terms of Reference for the Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) for two segments of Road No. 2 in Kurdistan, Iraq: Batil – Gersheen (segment 2) and Gersheen – Suhaila (segment 3) issued by the Duhok General Directorate of Roads and Bridges (GDRB) and pertains to the Gersheen – Suhaila (segment 3).

The MoCH/General Directorate of Roads and Bridges Duhok operates, as the core mandate for KRG, in the management, development, rehabilitation and maintenance of roads within the Duhok Governorate.

Project Management and Control WLL of Kuwait (PMC) were contracted by the GDRB to conduct the Environmental and Social Impact Assessment Study and Resettlement Action Plan for the Segment 3: Gersheen - Suhaila Intersection of Road 2 in Kurdistan.

1.1 ESIA Objectives and Scope

The main goal of the study is to provide the decision-makers with a comprehensive tool that will allow them to implement the construction of the road in a way that is economically feasible and the least detrimental to the environment and population and businesses in the vicinity of the road.

The objectives of the ESIA study are:

- Identification of the baseline environmental and social conditions;
- Identification of the potential beneficial and adverse impacts during the construction and operational phases of the project related to the specific project activities;
- Propose mitigation measures in order to minimize the adverse impacts identified;
- Prepare the ESMP that will allow the adequate implementation of the proposed mitigation measures.

The scope of the study encompasses the following:

- Detailed description of the project, including diagrams, maps, tables, and descriptive text based on existing information, and alternatives evaluation;
- Detailed description of institutional and administrative framework relevant to the project;

- Review of applicable existing legislation including the WB operational procedures and guidelines;
- Detailed description of existing environmental and social baseline conditions based on the existing literature sources and conducted surveys;
- Results and findings of the public hearings;
- Scoping of the anticipated impacts and detailed description of the most significant adverse impacts during construction and operational phases;
- Description of positive, beneficial impacts, such as induced secondary development;
- Detailed Environmental and Social Management Plan (ESMP) for the construction and operational phases;
- Monitoring requirements and monitoring plan for the implementation of ESMP;
- Institutional arrangements for the project implementation;
- Budgetary consideration for the implementation of the ESMP.

2 Project Description

2.1 General

The KRG Transport Corridor is a vital trade link for the Kurdistan Region. At present, the existing Road No. 2 presents a 2-lane, winding, poorly cambered, and highly dangerous road, which originally was not designed to accommodate the current heavy road usage by vehicles of all types including significant numbers of large freight trucks. About 3,000 heavy freight trucks enter Kurdistan/Iraq daily at Ibrahim al Khalil border crossing with Turkey, transporting goods to Iraq and transit of cargo to Gulf Region.

Traffic congestion and consequently increased time to travel combined with a high rate of accidents results in increased cost of transportation and economic losses. Improving road and safety conditions along the KRG transport corridor is thus an urgent priority for both economic and safety reasons.

2.2 Project Location

The Project Construction of segment 3 Gersheen – Suhaila of Road No. 2 is located in the Duhok Governorate of the Northern autonomous region of Iraq – Kurdistan, which borders Turkey and Syria. The Transport Corridor connects the city of Duhok with the Ibrahim Al Khalil border crossing with Turkey (Figure 2-1).

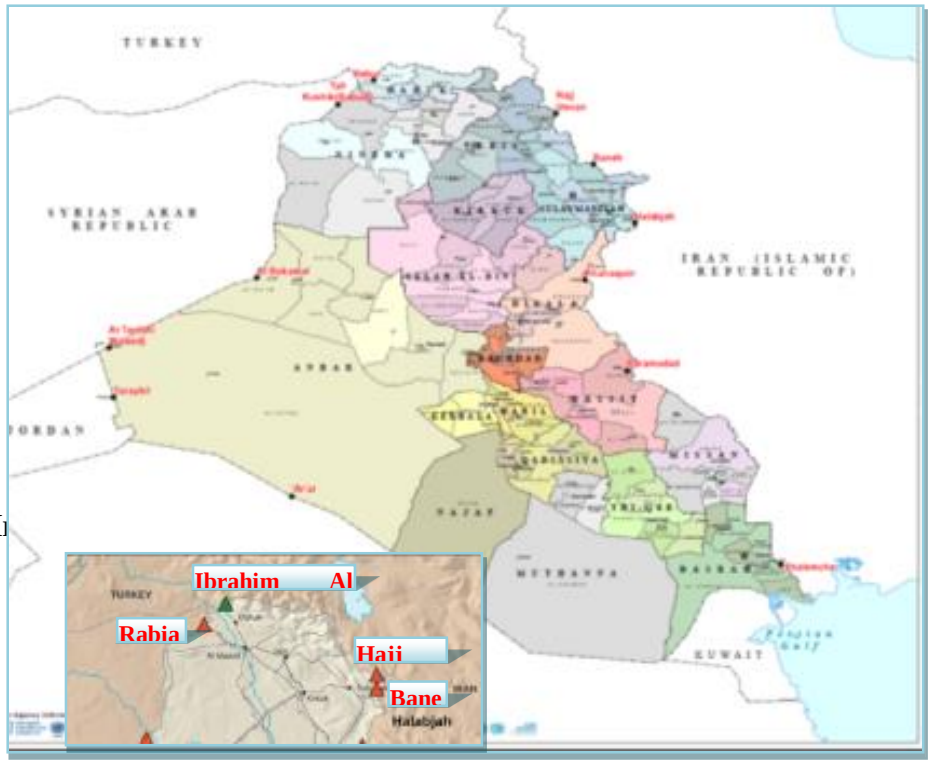


Figure 2-1: I

The project is located in the administrative sub-district of Siemel in the jurisdiction of the Batil Municipality (Figure 2-2).

Figure 2-2: Siemel Sub-District

Originally, four alternative alignments of segment 3 were considered (see section 2.11). However, upon consideration of the number of factors, such as cost estimates, scale of land acquisition of residential areas, location of different facilities (i.e. petrol storage facility), the alignment presented in Figure 2-3 was chosen.

Figure 2-3: Final Approved Alignment of Segment 3

The construction of Segment 3 is co-financed by KRG and the World Bank. The construction cost estimate is (US$) 70,873,000.

2.3 Project Background and Objectives

It is estimated that the three governorates of Duhok, Erbil and Sulaymaniyah had population of 5.2 million in 2009, which constitutes almost 14 % of the total population of Iraq. Also, the recent statistical data suggests that the population growth rate in Kurdistan is higher than the average population growth rate in Iraq.

The Region has a young and growing population, with 36% aged 0-14 years, and only 4% aged over 63. The median age in Kurdistan is just over 20 (50%) of population are less than 20 years old). The Kurdistan region's economy is based on oil industry, agriculture and tourism. Due to relative peace in the region, it has a better developed economy in comparison to other parts of Iraq. Kurdistan is experiencing economic and construction boom thus increasing the demand for sound, efficient transportation system.

According to the World Bank, the Gross Domestic Product (GDP) in Iraq in 2011 estimated to mount up to 115.39 billion US dollars. Kurdistan Region GDP is estimated to be 23.6 billion US dollars, which constitutes 20% of Iraq GDP. The average annual economic growth in Iraq rate between 2004-2012 reached 33%, which is half of what is reported for Iraqi-Kurdistan - 77%.

Transport infrastructure and operations are a key element in the Kurdistan economy, contributing for about 28 % of GDP at current prices for the year 2009. International trade is one of the major foreign exchange earner through provision of overland transshipment services to the Gulf area.

The historical data for Motor vehicles (per 1,000 people) showed that it was 180 vehicles per 1,000 people in 2009 in Kurdistan compared to 76 vehicles per 1,000 people in Duhok.

Private cars in Kurdistan compose the highest proportion of vehicle fleet (55%). Goods vehicles (all sort of trucks) compose one-third of vehicle fleet. The total number of registered vehicles in the region in 2009 is 430,600.

The degree of motorization for passenger cars grows at average rate of 3 % in Duhok, which is slightly lower than the rate reported in the region (4% on average) – see Figure 2-4. Trucks are growing at higher rate in the region (10% on average), compared with relatively high rate in Duhok (7%).

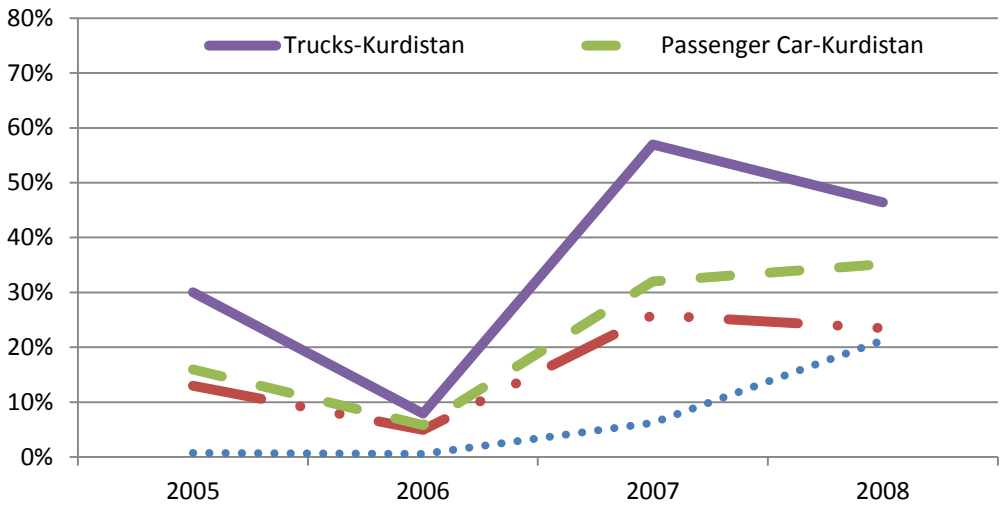


Figure 2-4: Motorization Growth Rates by Vehicle Types for Duhok and Kurdistan (2005-2008)[1]

Despite the importance of the transport sector to the national economy, the provision of appropriate infrastructure has not kept pace with economic growth. This deficiency now constrains future operation and expansion of the sector and it is vital that these issues are addressed. Of particular importance are the following:

- The rapidly growing population;
- The increasing size of the labor force and increasing rate of unemployment, requiring substantial job creation;
- Constrains in the transport sector undermine trucking industry and its national and international freight operations;
- The lack of adequate road infrastructure to support growing overland import, export and transit traffic.

Taking into consideration all the above-mentioned factors the primary objectives of the Transport Corridor upgrading and construction in KRG are as follows:

- To improve the safety of travel for the users of the road;
- To establish conditions for improved performance of the trucking industry;
- To provide opportunities for continued economic growth to reduce unemployment;
- To facilitate the movement of transit traffic;
- To enhance economic efficiency and minimize economic losses through reduction of the time to travel.

[1] Source: Kurdistan Transport Master Plan, 2010

The Government of Iraq through the Kurdistan Regional Government is financing the upgrading of three segments of this Transport Corridor (segments 1, 2 and 4) and has requested the World Bank to co-finance the upgrading of segment 3 from Gersheen-Suhaila Intersection, which is approximately 23 kilometers in long.

The project will be implemented under the supervision of the Ministry of Construction and Housing, General Directorate of Roads and Bridges of Dohuk.

2.4 Main Road Alignment Features

The proposed new road starts at E: 292598.460 and N: 4100543.205 on the existing road to Al'Asi 2.0Km east of the International road (Route -2) –Duhok –Zakho road-, and around 4.0 km north of existing Gersheen Intersection. The length of the proposed road is around 23.024Km.

The proposed route runs west in a rolling terrain crossing the International road (Route -2) –Duhok –Zakho road- at around sta.2+100. At around Sta.3+000 the road turns and runs in a north- west direction up to Sta.6+000 and then continues in a straight alignment for around 3.0Km. The proposed Horizontal Alignment consists of series of horizontal curves around (6 curves) that range in radii from a minimum of 800m to a maximum of 4000m.

The proposed design for should provide safe, convenient and economical mobility for both local traffic and international traffic. A set of geometric criteria is presented in Table 2-1.

Table 2-1: Geometric Design Criteria

Feature	Design Criteria
Design speed (V)	V= 100 km /h
Minimum Radius (R)	R = 440 m
Maximum Super-elevation	e_{max} = 6.0%
Maximum Grade	6.0% mountainous terrain (critical length =220 m) 4.0% rolling terrain (critical length =350 m)
Minimum Grade	0.30%
Rate of Vertical Curvature (K). Sag ….	52 m/one percent of grade algebraic difference 45 m/one percent of grade algebraic difference
Lane width (m)	3.75 m
Shoulder Width (m)	3.0 m (Right) and 1.2m(Left)
Median Width (m)	3.0 m
Cross slope	2.0% Lane and 4% Right Shoulder
Cut slopes	As per geotechnical investigation
Fill side slopes	As per geotechnical investigation

The proposed *Horizontal Alignment* consists of series of horizontal curves (8.0 curves) that range in radii from a minimum of 600m to a maximum of 10,000m.

Transition curves were introduced to all horizontal curves to provide a natural, easy to follow path for drivers, which will enhance safety and simulates the natural turning path of the vehicles.

The *Vertical Alignment* of this alternative was designed in accordance with the geometric design standards listed earlier in this report in addition to minimizing cut and fill.

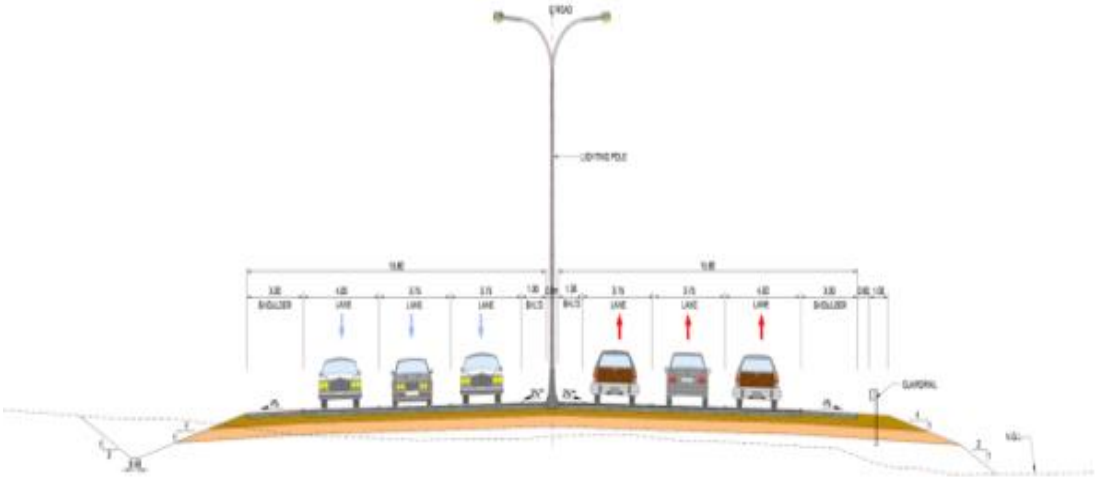
Gentle slopes were adapted to the vertical alignment for most of its entire length (around 20.5Km) of the road with a maximum grade of 4.0%. As for the last 3.0 km of the proposed route (mountainous terrain) a maximum design grade of 6.0% is adopted.

A minimum vertical grade of 0.5% is used at certain flat locations. Vertical curves lengths were carefully studied to provide K values above the AASHTO permissible values.

The proposed road design envisions provisions of the underpasses that will serve the dual purpose: U-turn for the vehicles and crossing for the livestock. Additional design features are proposed for road users, such as: signage, pedestrian crossings, barriers, etc.

The proposed design speed for this road is 100 km/h. The horizontal and vertical alignments of the Road are designed taking into consideration type of terrain, design speed, the proposed cross section and planned Right of Way (ROW).

The proposed Road is a dual carriageway highway consisting of three–lanes each direction. The proposed typical cross section is presented in Figure 2-5.



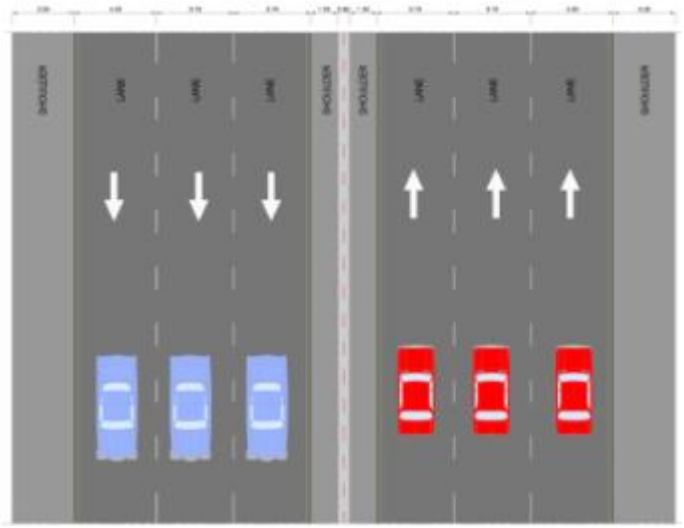


Figure 2-5: Typical Cross Section

Two Main Intersections are proposed for the New Gersheen –Suhaila Road:

- Duhok/ Zakho Road I Suhaila Intersection
- Suhaila Intersection

The area where the New Gersheen –Suhaila road starts is subject to many planned and under construction road projects. As per Duhok Master Plan these projects include upgrading part of the existing Duhok /Zakho road, new Erbil/ Ibrahim El-Khalil road, new Duhok /Zakho tunnel.

The design proposed a cloverleaf interchange type with a semi-direct connection to substitute the loop in the upper right quadrant to cater for the heavy traffic left turn movement coming from Duhok. The advantages of such interchange are as follows:

- All traffic movements are served through the interchange.
- The semi-directional turning roadway permits traffic to travel at operating speeds approaching that on the main roadways.

The semi-direct connection is combined with ramps in the lower right and upper left quadrants so that the traffic diverges/ merges with the highway traffic at a single point.

The principle disadvantages of this arrangement are the need for three structures, additional travel distance for left-turning traffic, the weaving maneuver generated, the very short weaving length typically available in addition to the large right of way required for this type on interchanges. The short weaving length was solved by introducing a collector-distributer (C-D) road.

The design also proposed a cloverleaf interchange type with a semi-direct connection for Suhaila Intersection. The semi-direct connection is to substitute the loop for the Dyrabon-Gersheen left turn movement, which is expected to be high and mainly of heavy traffic type.

The width of proposed loops and ramps is 5.5m (one lane) with 2.4m right shoulder and 1.2 left shoulders, while the width of collector-distributer road is 7.5m with 2.4m right shoulder. Areas of traffic merging and diverging were carefully designed. Tapers and auxiliary lanes (acceleration and deceleration) were introduced at both ends of all ramps to ensure smoothness and safety for traffic using these ramps.

Horizontal curves used for ramps had a radii ranging from 240m to 284m, which allows for design speed of 70km/hr. While 80m radii were used for loops which allows for design speed of 50km/h.

Figure 2-6 and Figure 2-7 show the configuration of both interchanges while geometric details of these interchanges are shown in the Preliminary design drawings, which shall be submitted with this report.

The need to provide a safe and efficient facility to accommodate for crossing and U- turning movements is essential on such divided highway. The fact of having a narrow median with relatively high speed and traffic of mainly heavy vehicles lead to the decision of providing U-Turn and crossing movements through grade separated structures to eliminate and minimize crossing and turning conflicts thus enhancing safety. Crossings are proposed at four locations at Sta. 7+100, Sta. 11+500, Sta.15+990 & 18+440.

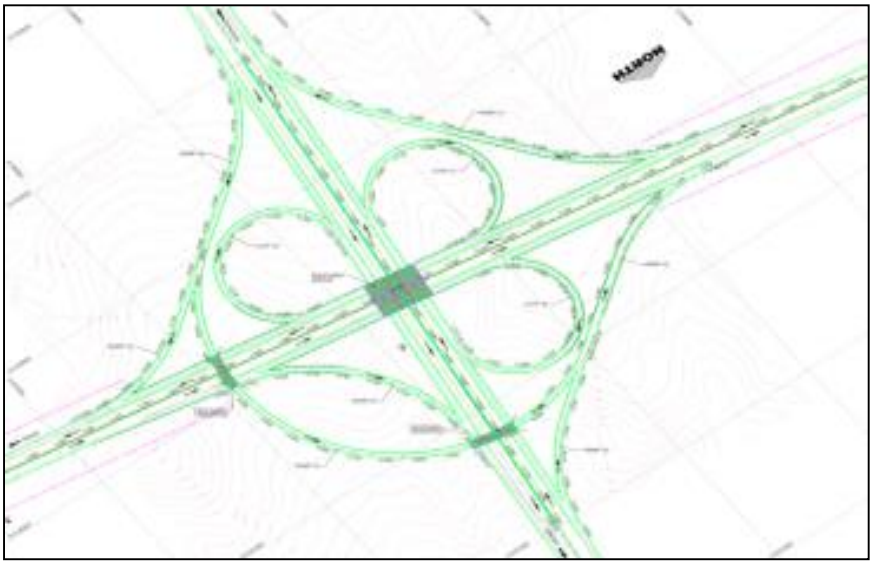


Figure 2-6: Gersheen Interchange

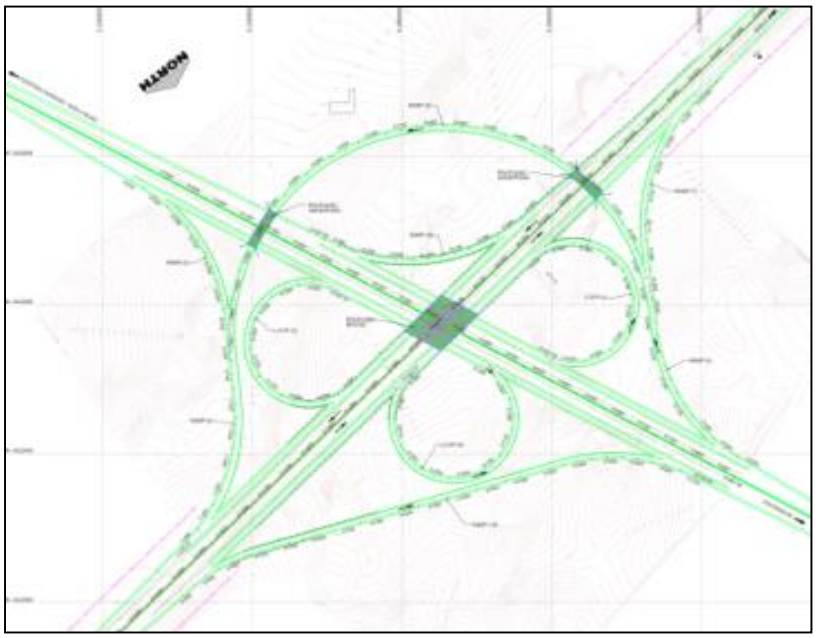


Figure 2-7: Suhaila Interchange

The road design envisions construction of 52 culverts for drainage purposes as shown Table 2-2:

Table 2-2: Culverts within Segment 3 Alignment

No.	Station	Culvert Size	Length (m)
1	0+217	3-(2.0x2.0)	55.20
2	0+748	2.5x1.5	77.20
3	0+992	2.5x2.0	62.50
4	1+540	2.0x1.5	55.20
5	1+721	2.0x1.5	100.30
6	2+594	2-(2.0x2.0)	69.00
7	3+380	2-(2.0x2.0)	63.70
8	4+141	3-(2.5x2.5)	72.00
9	4+956	2-(2.0x2.0)	67.60
10	5+416	2-(2.0x2.0)	71.10
11	5+444	3.0x2.0	74.30
12	5+834	1.5x1.5	48.10
13	6+363	1.5x1.5	56.60
14	6+730	3-(2.5x2.0)	58.00
15	7+045	1.5x1.5	98.25
16	7+534	2-(2.5x2.0)	57.40
17	7+996	2-(2.5x2.0)	59.45
18	8+781	1.5x1.5	58.50
19	8+996	1.5x1.5	62.40
20	9+336	2.0x1.5	68.40

No.	Station	Culvert Size	Length (m)
21	9+546	1.5x1.5	67.40
22	10+045	1.5x1.5	49.80
23	10+135	2-(2.5x2.0)	63.40
24	10+693	1.5x1.5	48.15
25	10+990	2-(2.0x2.0)	51.70
26	11+458	1.5x1.5	93.00
27	11+611	2.0x2.0	78.40
28	11+848	1.5x1.5	58.85
29	12+447	1.5x1.5	72.00
30	12+713	2-(2.5x2.0)	65.50
31	13+206	1.5x1.5	73.20
32	13+519	2-(2.0x2.0)	86.00
33	13+924	2.5x2.0	74.45
34	14+091	2.0x1.5	64.52
35	14+395	1.5x1.5	65.15
36	14+616	1.5x1.5	45.40
37	14+910	1.5x1.5	69.70
38	15+290	3.0x2.0	78.30
39	15+383	2.5x1.5	87.75
40	15+651	3.0x2.0	62.20
41	16+044	1.5x1.5	96.60
42	16+413	1.5x1.5	77.80
43	16+855	1.5x1.5	59.15
44	16+982	1.5x1.5	44.20
45	17+461	2.0x2.0	51.75
46	18+080	2.0x2.0	120.00
47	18+860	2.5x2.0	97.36
48	19+207	2.0x1.5	65.00
49	19+489	1.5x1.5	64.70
50	19+769	1.5x1.5	61.20
51	20+794	2.5x2.5	89.80
52	22+039	2.5x1.5	85.80

In order to accommodate for safe livestock crossing four underpasses are proposed as shown in Table 2- 3. Location of the underpasses was selected based on the footpaths of livestock and animals along the alignment.

Table 2-3: Underpasses within Segment 3 Alignment

No.	Station	Size m
1	Underpass No.1 At Station (7+100)	12X5.4
2	Underpass No.2 At Station (11+500)	12X5.4
3	Underpass No.3 At Station (15+960)	12X5.4
4	Underpass No.4 At Station (18+880)	12X5.4

Truck lay-bys are proposed on the proposed road at three locations on each direction of the road. Lay-bys are important for drivers needing to stop for a short time to rest or for maintenance purposes. The proposed lay-bys have a 6.0m width and 100m length enough for more than 4 large trucks (Figure 2-8). Tapers and auxiliary lanes (acceleration and deceleration) at both ends were provided to ensure the smoothness and safety for merging and diverging traffic in addition to proper marking and signs.

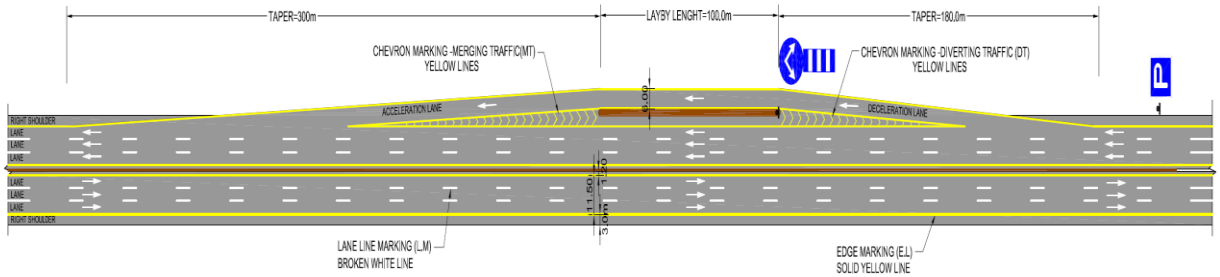


Figure 2-8: Typical Lay-By

Preliminary road furniture and safety measures are proposed in this stage. A detailed study / design for marking and signs, road lighting, guardrail, median barriers, etc. will be developed in the next design phase.

The road will be furnished with the street lighting (Figure 2-9). The suggested design is that the lighting poles will be placed in the median, protected by the Jersey barriers.

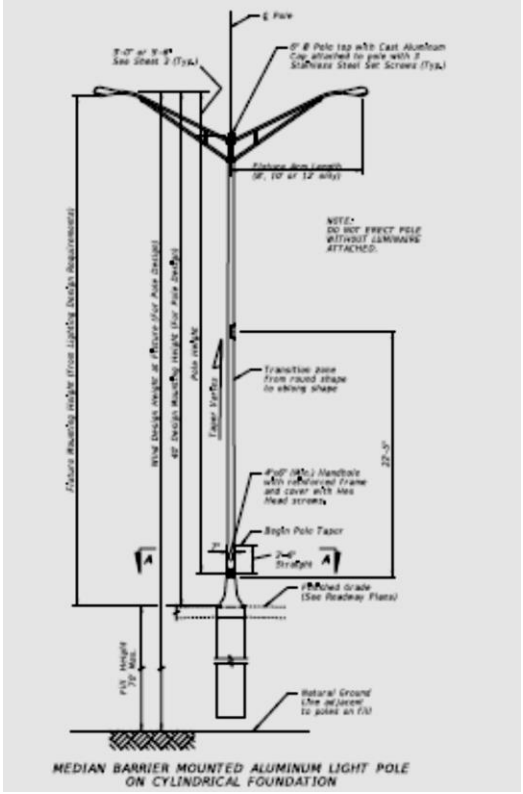


Figure 2-9: Typical Median Placed Highway Lighting Pole

2.5 Equipment and Materials

Equipment can be divided into machinery for six major construction purposes: clearing, earthmoving, shaping, and compacting the natural formation; installing underground drainage; producing and handling the road-making aggregate; manufacturing asphalt and concrete; placing and compacting the pavement layers; and constructing bridges, culverts and underpasses.

For clearing vegetation and undesirable materials from the roadway, the bulldozer is employed. The construction of rock cuts is commonly done with shovels, draglines, and mobile drills. Shaping the formation and moving earth from cuttings to embankments is accomplished with bulldozers, graders, hauling scrapers, elevating graders, loaders, and large dump trucks. The material is placed in layers, brought to the proper moisture content, and compacted to the required density. Compaction is accomplished with tamping, sheep-foot, grid, steel-wheeled, vibrating, and pneumatic-tired rollers. Backhoes, back actors, and trenchers are used for drainage work.

In order to avoid high haulage costs, the materials used for base course construction are preferably located near the construction site; it is not feasible to use expensive materials for long lengths of road construction. The excavation process is the same as for rock cuts, although rippers may be

used for obtaining lower-grade material. Crushers, screens, and washers produce stone of the right size, shape, and cleanliness.

The placement of paving material involves a paving machine for distributing the aggregate, asphalt, or concrete uniformly and to the required thickness, shape, and width. The paving machine can slip-form the edges of the course. As it progresses down the road, it applies some preliminary compaction and also screeds and finishes the pavement surface.

In producing a spray-and-chip seal surface (or a bituminous surface treatment), a porous existing surface is covered with a film of hot, fluid bitumen that is sprayed in sufficient quantity to fill voids, cracks, and crevices without leaving excess bitumen on the surface. The surface is then sprayed with more viscous hot bitumen, which is immediately covered with a layer of uniform-size stone chips spread from a dump truck. The roadway is then rolled to seat the stone in the sticky bitumen, and excess stone is later cleared by a rotary broom.

The expected equipment and machinery used for construction of segment 3 are presented in Table 2-4. Materials used for road construction include soils (possible re-use of cut materials), aggregates, Portland cement mixes, asphalt mixes, geo-synthetics, composites, and metals including steel and aluminum, wood materials. The description and materials requirements are presented in the Annex 1.

Table 2-4: Machinery and Equipment

Activity	Machinery and Equipment
Clearing	Bulldozer
	Front End Loader
	Jack Hammer
	Crane with Ball
Excavation & Earth Moving	Bulldozer
	Backhoe
	Front End Loader
	Dump truck
	Jack Hammer
	Scraper
Structure Construction	Crane
	Welding Generator
	Concrete Mixer
	Concrete Pump
	Concrete Vibrator

Activity	Machinery and Equipment
	Air Compressor
	Pneumatic Tools
	Bulldozer
	Cement and Dump Trucks
	Front End Loader
	Dump truck
	Paver
Grading and Compacting	Grader
Landscaping & Clean-Up	Bulldozer

Significant water consumption is anticipated for the project for the following:

- Concrete batching plant with capacity of 400 m^3/day requires around 100 m^3/day of water;
- Compaction of fill – approximately 22 m^3/m of the new road;
- Spraying for prevention of dust generation;
- Human consumption.

2.6 Project Facilities

For the execution of the works on Segment 3 the following types of construction camps are likely to be required:

- A Main Camp, the operational center, with prefabricated offices and parking areas for administration and technical staff. This will also include areas for materials testing and storage, and equipment cleaning and maintenance. The need for residential accommodation is likely to be relatively minor;
- Construction Yards, comprising rock crushing and screening plant, pre-cast concrete yards, asphalt and concrete batching plants;
- Satellite Camps, additional area for equipment cleaning and materials storage;
- Temporary Camps may be needed at specific sites such as bridge crossings, where there will be a short-term concentration of equipment, materials and labor.

2.7 Estimate of the Staffing Requirements

It is estimated that about 90 staff is required for construction of segment 3. The estimate of the staffing requirements is presented in Table 2-5.

Table 2-5: Estimate of Staffing Requirements

Type	Job Title	Number
Administrative Staff	Secretary	2
	IT support	2
	Serving personnel	2
	Security personnel	3
	Parking attendants	3
	Logistics Coordinator	2
	Warehouse/storage coordinator	4
	HR officer	1
	Procurement officer	1
Technical Staff	General Manager/Team Leader	1
	Senior Road Engineer	1
	Materials Engineer	1
	Road Engineer	2
	Structural Engineer	1
	Geo-technical Engineer	1
	Drainage Engineer	1
	Pavement Engineer	1
	Quantity Surveyor	1
	HS&E specialist	2
	Social expert	1
	Quality Assurance Engineer	1
Construction Crew	Machinery and equipment operators	25
	Unskilled labor	30
Total		**89**

2.8 Duration of Construction Activities

The anticipated duration of the main construction activities varies from 70 days to 170 days (see Table 2-6).

Table 2-6: Duration of Main Construction Activities

#	Activity	Duration (days)
1	Main road works	
1.1	Clearance	95
1.2	Cut/excavation	130
1.3	Fill operations	120
1.4	Curbstone works	85
1.5	Base sub-layer	100
1.6	Base layer	100
1.7	Tiling	75
1.8	Bridges and culverts works	170
1.9	Utilities installation	90
1.10	Installing reinforced concrete structures	130
1.11	Installing road lighting equipment	90
1.12	Paving	110
1.13	Installation of guardrails and barriers	100
1.14	Traffic signs installation and road markings	70

2.9 Anticipated Operational Activities

The main operational activity of the new road will be the traffic movement. The traffic study conducted by GDRB has provided the estimates of the current traffic flow and composition on Segment 3, which summarized in Table 2-7.

Table 2-7: Traffic Data

Travel Direction	Passenger Car	Pickup	Light Vehicle	Bus	2-axle	3-axle	>=4 axle	Total
In 2013	1,218 (26%)	562 (12%)	141 (3%)	47 (1%)	141 (3%)	281 (6%)	2,295 (49%)	**4,684**

Other activities during the operational phase are estimated as following:

- Landscape maintenance;
- Road structure maintenance including maintenance of pavement surface, drainage systems, etc.
- Auxiliary road structures maintenance such as street lighting, signs, markings

2.10 Main Land Use Patterns

The prevalent land use in the project area is agricultural, composed of the rain-fed cultivation of cereals and livestock grazing.

The rain-fed agriculture is prevalent, with the wheat and barley as main cultivated crops. The rain-fed farming systems are essentially as following: continuous wheat with fertilizer applications juxtaposed with a barley/fallow rotation, which usually does not include fertilizer use, but may incorporate chickpeas one year in three or four.

It must be noted that there are no certain areas designated for livestock grazing, but rather customary boundaries between local communities are respected. Customary the herds of about 500 sheep and goats are wondering around the area on ad hoc basis.

The area is devoid of any kind of industrial, commercial and residential activities. The only land use in the area is agricultural, predominantly grazing of livestock and partially cultivation of wheat and barley. No cultural, religious and historic sites will be affected by the project. The map showing the location of sites of historic, cultural significance and the 1,100 m corridor as specified by the ToR is presented in the Chapter 4.

2.11 Project Alternatives

Four alternatives were considered for the alignment of Segment 3 as shown in Figure 2-10.

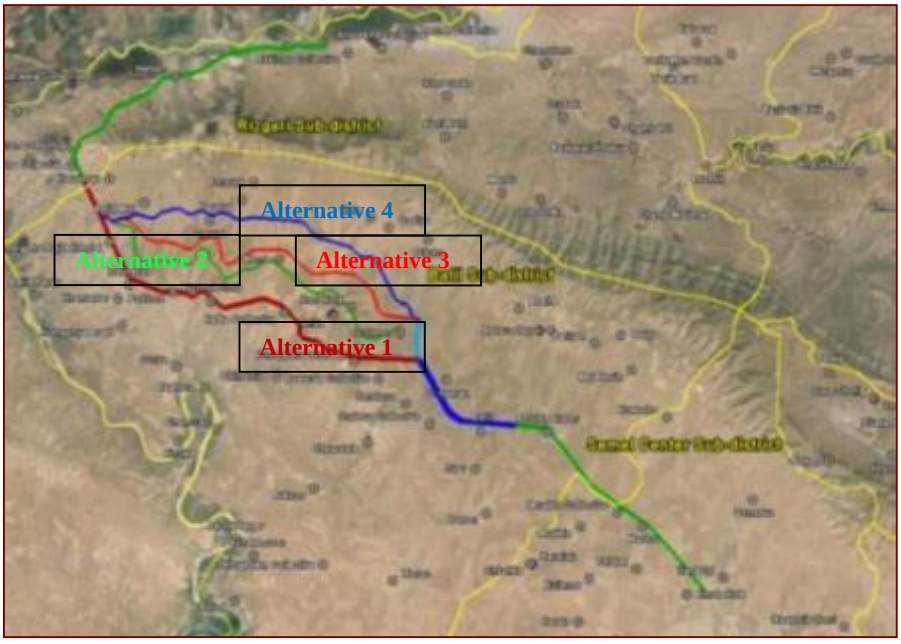


Figure 2-10: Segment 3 Alternative Alignments

Alternative 1: This option follows the currently existing 2 lane road between Gersheen to Suhaila intersection with a total length of 21.50 km.

The road crosses 6 local settlements. The total population of these settlements is around 4,000 people, with a range between 140 – 2,000 inhabitants per settlement.

ROW will affect assets and structures along the alignment, requiring high cost of resettlement and relocation. At the same time this alignment would continue to cross the agricultural land already crossed by the existing road. Natural habitats are considered as insignificant.

This option is passing rough topographical terrain, characterized by distinctive deep valleys and higher slopes than the other three options. This topography makes the soil erosion issue a higher concern than is the case for the other alternatives.

The cost of upgrading is estimated approximately 81,293,000 US $.

Alternative 2: This alignment is the closest to the existing road Alternative 1. The length is 21.4 km. Horizontal alignment consists of series of curves (17 curves) that range in radii from minimum 440 m to a maximum of 2000 m.

The route of this Alignment passes near four local settlements, where the closest is in about 200m distance from the new ROW. The total population of these settlements is less than 1,100 inhabitants where each settlement population varies between 130 and 500 people. The land acquisition and resettlement impacts are less than for the alternative 1.

This alternative passes through cultivated areas and grazing pastures where the impact of fragmenting these lands is of some significance.

Alternative 2 is located at a lower elevation than alternatives 3 & 4 but at a slightly higher elevation than Alternative 1, consequently Thus the flood risk is higher than the flood risk of Alternatives 3and 4 and can also lead to more significant soil erosion.

Alternative 3: This alternative runs almost parallel to the east of Alternative 2. The length is 20.4 km. Horizontal alignment consists of series of curves (17 curves) that range in radii from minimum 440 m to a maximum of 1,000 m.

There is only one settlement of less than 300 people around 400m from the alignment ROW.

Alternative 3 crosses the same agricultural area that Alternative 2. The topography of the area is more flat with shallower valleys. This feature makes the severity of potential soil erosion caused by seasonal floods less significant.

The natural ecosystem is similar to that of Alternatives 2 and 1 with slight differences in terms of the presence of livestock during the spring.

Alternative 4: The length is 23.04 km. Horizontal alignment consists of series of curves (20 curves) that range in radii from minimum 440 m to a maximum of 1600 m.

The nearest settlement Kadia Village is around 1.2 km from the proposed ROW,

This Alternative is passing through flattened agriculture planes for almost 85% of the alignment with some very shallow depressions flow from the mountains to the east of the Alignment.

The natural habitats are observed to the east of the alignment. Agricultural land fragmentation and habitat fragmentation are more severe that for the other three alternatives.

Soil erosion is considered mush less due to the topography of the area and seasonal run-off valleys being rather shallow with limited recharge areas reducing the risk of flooding drastically.

The cost of upgrading is estimated approximately 70,873,000.

Taking into consideration of the above-mentioned factors, the Alternative 4 was chosen and approved by GDRB.

3 Methodology and Approach

The project is executed in compliance with the provided ToR and the World Bank Safeguard Guidelines. The sections below provide the overview of the methodology applied in project execution.

3.1 Literature Review and Analysis

The initial stage of the project comprises information collection. The information collection involves the desk study review and analysis of the available information, such as previous studies, engineering design, Internet and literature sources as such Framework Study prepared by the Arabtech Jardaneh Company.

Information collection also includes the series of interviews with the relevant stakeholders, such as representatives of MoCH/General Directorate of Roads and Bridges Dohuk, and representatives of other authorities and local communities.

The literature review encompasses the following;

- Engineering design for the Segment 3 and description of the main features of the project such as geometrical design, materials, schedule of works;
- Traffic study, including current traffic conditions and projections for the life time of the project comprising traffic volume and composition;
- Available land use maps and descriptions;
- Policies, legislative, institutional and administrative framework;
- Applicable World Bank Operational Procedures and Policies;
- Available studies pertaining to the physical environment in the project area, including climatic conditions, geology and soils, water resources, hydro-geological modeling, air quality and noise;
- Available studies related to the biological environment, such as eco-systems, flora and fauna, migratory birds, protected areas, sensitive environmental receptors;
- Reports on the previous public consultations in particular the results of the Scoping Session conducted by the Arabtech Jardaneh Company at the time of the preparation of the framework study;
- Statistical data relevant to the baseline socio-economic conditions.

3.2 Reconnaissance Visits

In order to visualize and register the existing conditions the number of the reconnaissance field visits was conducted to the project area. The field visits were conducted on 15.01.2014, 17.02.2014

– 27.02.2014, and 16.03.2014 – 15.04.2014. During the field visits the following issues were observed and recorded:

- All existing features of the area;
- Land use pattern in the area;
- Existing physical and biological resources in the project area, especially presence of the micro-habitats and sensitive environmental receptors, such as riparian habitats along the existing seasonal water courses;
- Verification of existence or absence of cultural, religious and historical sites in the vicinity of the 1 km corridor along the road alignment as specified in the TOR;
- Interviews and social profiling of PAPs;
- Comprehensive census survey

The field visits were conducted in coordination with the PMT team members at GDRB.

3.3 Anticipated Impacts Evaluation

Impacts evaluation constitutes prediction of environmental and ecological changes relative to baseline taking into account the nature, magnitude and seriousness of the anticipated impacts:

- Identifying potential impacts which may be harmful or beneficial to the environment;
- Identifying receivers, habitats or resources which are vulnerable to change;
- Defining the project/environment interactions;
- Examining the chain of events linking cause with effect;
- Describing and predicting the reasonable case scenario and/or the worst case scenario;
- Predicting the likely nature, extent and magnitude of the anticipated changes and effects such that an evaluation, in quantitative terms as far as possible.

It must be noted that the impacts have different level of significance during construction and operational phases.

The impacts significance evaluation is performed using the Leopold Matrix (LM)[2]. This matrix has: on the horizontal axis, the actions that cause environmental impact, and on the vertical axis, the existing environmental conditions that may be affected by those actions. This provides a format for comprehensive review of the interactions between proposed anthropogenic actions and environmental factors.

[2] Leopold et al., 1971

3.4 Impacts Mitigation

The methodologies proposed for mitigation give priority to avoidance of impacts. The proposed mitigation measures are evaluated for their feasibility of implementation. The assessment methods will:

- Identify and evaluate mitigation measures in order to avoid, reduce or remedy the impacts;
- Assess the effectiveness of mitigation measures; and
- Define the residual environmental impacts, which are the net impacts remaining with the mitigation measures in place.

3.5 Air Quality and Noise Modeling

For the evaluation of the potential impacts on air quality the MOVES modeling was used. EPA's Office of Transportation and Air Quality (OTAQ) has developed the Motor Vehicle Emission Simulator (MOVES). This new emission modeling system estimates emissions for mobile sources covering a broad range of pollutants and allows multiple scale analysis. MOVES currently estimates emissions from cars, trucks & motorcycles.

The following type of data is needed for the model

1- Design specifications
2- Traffic data (provided in the engineering design study)
3- Fuel type
4- Components of the vehicles fleet
5- Age and distribution of the vehicles age.
6- Climate data

Equipment noise emissions at a reference distance of 50 feet will be used for the evaluation of noise levels on the job site. Construction noise prediction technique includes the following steps:

- Identification of areas (including limits) with the potential to be impacted by construction noise;
- Identification of construction operations and their potential to create noise impacts;
- Determining time periods during which specific operations will occur;
- Estimation of duration and frequency of each significant noise-producing event;
- Simple quantitative analysis using manual analysis techniques
- Determine components of each construction operation in terms of equipment type and source noise level.

Since noise level measurements were not available, and in order to estimate the expected noise levels during the operation of the road, a noise prediction model was used. The input of the model

included Duhok climatic data as well as the projected traffic data. The traffic data included vehicle classification, speed of vehicles, as well as pavement surface conditions and characteristics.

3.6 Social Assessment

In order to estimate the overall permanent and temporary land acquisition and resettlement impacts a detailed survey was conducted by the project team during December 2013 – February 2014. The census survey consisted of several stages:

- Reconnaissance field visits to the project area, assisted by the Senior Land Surveyor of GDRB, Eng. Abdullah Cimo, in order to register the land use patterns, existing business entities along the road alignment, main crops cultivated in the area, pastoral activities pattern, infrastructure, amount of land that is the subject to permanent acquisition, existing if any cultural/religious/historic sites, existing if any dwellings and physical assets.
- In order to acquire the proposed compensation rates for different types of land acquisition, and in order to acquire the information on the possibility of the in lieu compensation, the interviews with the governmental officials were carried out, namely the representatives of the Compensation Committee.
- Consultations with the local administration on the level of the sub-district of Siemel administration and the heads of administration of the villages which are the permanent residence of PAPs;
- Socio-economic survey of PAPs was conducted through the series of the structured interviews with the heads of the households with the help of the Kurdish translator. The interviewer registered the information due to the fact that the prevailing number of the household are illiterate or have a very low level of education and therefore are not capable of filling the questionnaire.
- The census survey covered 100% of the households affected and provided inventory of 100 of assets affected by the road ROW in the project area. The results of the inventory have been confirmed by each affected household. The key purpose of the census survey was to identify and enumerate affected people, create an inventory of affected land and other assets, and to establish key data for many other aspects of resettlement planning.

3.7 Public Consultations

Consultation Session is an essential part of the ESIA process that includes all stakeholders potentially affected by the project, whether from the public or private sectors. The main purpose of the session is to present the proposed project and to solicit feedback concerning environmental impacts.

In additon to the Consultation Session, meetings and interviews were conducted with the PAPs, which served the dual purposes: registering the issues of concern and conducting a comprehensive census survey.

Further, the results of the Consultation session were taken into consideration in the process of the impacts significance evaluation.

3.8 ESMP

The ESMP provides description of feasible and cost-effective measures that may reduce potentially significant adverse environmental impacts to acceptable levels. The plan includes compensatory measures if mitigation measures are not feasible, cost-effective, or sufficient. Specifically, the ESMP:

- Identifies and summarizes all anticipated significant adverse environmental impacts including involuntary resettlement;
- Describes - with technical details - each mitigation measure, including the type of impact to which it relates and the conditions under which it is required together with responsibilities, frequency of monitoring, and anticipated costs, as appropriate.

Environmental monitoring during construction and operational phases provides information about key environmental aspects of the project, particularly the environmental impacts of the project and the effectiveness of mitigation measures.

The ESMP identifies monitoring objectives and specifies the type of monitoring, with linkages to the impacts assessed and the mitigation measures. Specifically, the monitoring section of the ESMP provides: a specific description, and technical details, of monitoring measures, including the parameters to be measured, methods to be used, sampling locations, frequency of measurements, detection limits (where appropriate), and definition of thresholds that will signal the need for corrective actions; monitoring and reporting procedures to ensure early detection of conditions that necessitate particular mitigation measures, and furnish information on the progress and results of mitigation.

The ESMP encompasses:

- Implementation schedule for measures that must be carried out as part of the project, showing phasing and coordination with overall project implementation plans;
- Capital and recurrent cost estimates and sources of funds for implementing the ESMP.

Very importantly, ESMP provides description of the administrative and institutional framework required for the successful implementation of the project.

4 Policy, Legal and Institutional Framework

4.1 Relevant Strategies and Policies

4.1.1 National Development Plan 2011 -2014

The National Development Plan of Iraq set the following strategic objectives:

- Increase in the gross domestic product (GDP) at a rate of 9.38% per year during the plan period.
- Generate 3 to 4.5 million new jobs based on the proportion between capital concentration and work that will be used in activities and projects adopted by the Plan.
- Diversify the Iraqi economy through achievement of gradual increases in the rate of participation by other sectors in GDP, particularly the production, agriculture, and industrial sectors, along with tourism, which is a sector with some accomplishments and promise.
- Strengthen the role of the domestic and foreign private sectors, either in terms of the magnitude of investment anticipated within the country, estimated at about 46 percent, or in terms of job opportunities.
- Improve and increase productivity and promote the concept of competition, by focusing on comprehensive rural development and the creation of job opportunities, particularly for vulnerable groups such as youth and women, and focus on ensuring basic services, particularly educational and healthcare services, for rural areas and vulnerable groups.
- Establish a spatial development trend characterized by fair distribution of infrastructure services and public services (water and sanitation, health, education, etc.) among all of Iraq's provinces in a manner consistent with their population size and the extent of their deprivation and need.
- Establish sustainable development that balances economic, social, and environmental considerations so as to optimize use of available natural resources without undermining the right of future generations to benefit from those resources. Further to this, focus on keeping up with international developments in the areas of climate change and the use of environmentally friendly technologies.
- Strengthen the role of local governments in developing their provinces and building capacity for coordination and complementarities, using their comparative advantages.

Estimated the investment that must be secured at around 218 trillion Iraqi dinars, i.e., US$186 billion during the five years of the plan; US$100 billion would be funded by the federal budget at a rate of 30 percent per year of the overall budget. The remaining US$86 billion would be funded by the domestic and foreign private sectors; the public and private sectors would contribute 53.7 percent and 46.3 percent, respectively.

The Plan sought to reserve 12.5 percent of its investments for the regional development program and 17 percent (31.6 US $ billion) for the Kurdistan region.

In regards to transportation sector the objectives for road and bridge activities during the plan period focus on two axes.

The first axis consists of:

- Improving the condition of the current road network by repairing existing roads and reconstructing bridges affected by the war, military operations, and sabotage, as well as installing instructional, directional, and warning signs
- Performing periodic maintenance on the existing road and bridge network, using modern and advanced techniques that would more quickly and economically implement repair and maintenance procedure, including the cold in-place asphalt pavement recycling technology recently approved in Iraq.

The second axis consists of increasing the network's capacity and its level of user safety and security, and protecting it from damage, by:

- Completing the remaining portions of highways previously constructed, and completing links between these roads and city centers that had not yet been linked thereto
- Constructing new highways, particularly Highway No. 2, to link urban centers and complete the link between Iraq and neighboring countries that have not been linked by highways to date
- Continuing to construct secondary lanes on arterial roads and one-lane roads, particularly those that have reached maximum capacity
- Expanding construction of crossroads among the provinces, thereby reducing travel time
- Expanding construction of bypass roads that reduce congestion in cities and limit entry of through-traffic to city centers
- Continuing to implement the plans' remaining stages to replace floating bridges with fixed bridges
- Continuing to eliminate railroad crossings
- Furnishing outer roads with instructional, directional, and warning signs
- Protecting the road network from excessive weight by constructing weigh stations to detect and deter vehicle weights and axle loads that exceed the allowable limits
- Continuing the program of constructing rural roads and increasing their reach to serve the greatest number of rural villages and agricultural projects and ensure their connection of agricultural production centers with markets.

4.1.2 Kurdistan Regional Government's Economic Development Strategy

The aim of the KRG's strategy[3] is to develop Kurdistan's economy to the long-term benefit of the people, by nurturing a new and more innovative private sector that will produce goods and services in a competitive and sustainable environment. In order to support a vibrant private sector, the Kurdistan National Assembly, the Region's parliament, passed in 2006 an investment law that is one of the most investor-friendly in the entire Middle East. This policy is in line with Iraq's Economic Reform Strategy.

4.1.3 Iraqi Transport Master Plan

The Iraqi transport Master Plan[4] was produced as a joint venture between the Iraqi and Italian Governments, with the aim to identify a plan of infrastructure investments and maintenance operations for roads, railways, airports, maritime and fluvial and intermodal facilities. A strategic multi-modal transport model was developed for the whole country with 91 internal zones, each corresponding to one or more districts, and 43 external zones representing other countries. In the Kurdistan region, there is a greater level of aggregation with 3 model zones in the Governorate of Duhok, 4 for Erbil and 5 for Sulaymaniyah.

Under this study, the values of time for Iraq were estimated at US$1.30/hour for employed people and US$0.432/hour for non-employed people, and at US$2.94/hour for freight vehicles (2004 values).

4.2 Legislative Framework

The legislative framework provides a basis for addressing different aspects of the activities pertaining to the road construction and operation and maintenance.

4.2.1 National Legislation

The national legislative framework comprises laws, regulations and instructions issued by the Iraqi Government and by KRG. The summary of the legislation relevant to the scope of the present project and applicable for the whole road length including the segments beyond the scope of the Segment 3 are presented in Table 4-1.

[3] http://www.krg.org/articles/detail.asp?lngnr=12&smap=03010800&rnr=145&anr=18617
[4] Iraqi Transport Master Plan (ITMP), October 2005, CIITI, Italian Consortium for Iraqi Transport Infrastructure.

Table 4-1: National Environmental Legislation in Iraq

Legislation	Brief Overview	Issued By:
The Law for the Protection and Improvement of Environment No. 27, 2009	Main issues addressed by the Law: • Establishment of the Environmental Council • Importance of conducting EIAs • Water protection • Control of noise emissions • Ecological protection • Hazard Management	Iraqi Government
The Forestry Law No. 30, 2009	Main issues addressed by the Law: • Combating desertification • Enhancing the environmental situation • Protection and control of forests	Iraqi Government
The Law on the Protection of Wild Animals and Birds No. 17, 2010	Main issues addressed by the Law: • Protection of wild animals and natural resources • Hunting licensing and permits • Punitive system for illegal hunting	Iraqi Government
Public Health Law No. 89, 1981	Main issues addressed by the Law: • Provision of health care for citizens; • Public health awareness; • Provision of health environment in the work place	Iraqi Government
The Regulation for the Protection of Rivers No. 25, 1967 and instruction Corrections issued in pursuance to the provisions of Article 16	Main provisions: • Defines water resources • Water contamination • Requirements for physical and chemical testing of water • Limit values for chemical and physical content	Iraqi Government
The Law of Antiquities and Heritage No. 55, 2002	Main provisions of the Law: • Defines all movable and immovable antiquities, archeological properties and artifacts	Iraqi Government

Legislation	Brief Overview	Issued By:
	• Regulates communication channels for each type of contact between the public and revealed and non-revealed archeological sites • Governs contact with archeological sites for developmental activities in case their location is within the vicinity of archeological sites	
Regulation for the Provision of Water Resources, No. 2, 2001	The regulation states that it is prohibited to discharge any amount of contaminants into any water bodies unless the special permit was obtained.	Iraqi Government
The Law of Environmental Protection and Improvement Board in the Iraqi Kurdistan Region No. 3, 2010	Main provisions of the Law: • Environmental and public health protection • Pollution prevention • Preservation of natural resources and biodiversity • Encourage environmental awareness	KRG
Law of Environmental Protection and Improvement in Iraqi Kurdistan Region No.8, 2008	Main provisions: • Environmental protection of the Kurdistan region • Prevention of pollution • Protection of natural resources • Raising environmental awareness • Making the environmental policy a part of the developmental planning • Environmental Impact Assessment requirements • Environmental inspection and monitoring	KRG
Law on Public Roads No. 35, 2002	The law provisions for the procedures and practices for the resettlement and acquisition of land and properties during road construction and rehabilitation	KRG

Legislation	Brief Overview	Issued By:
	Compensation procedures are presented in (Annex 1) Part III: • General Directorate of Roads and Bridges identifies land and properties that are located on the ROW and presents the request for acquisition to the Governor • The Governor forms a Committee for compensation and acquisition. The Committee has the right to appoint expert(s) • Public Roads Act No. 35 of 2002 specifies that the authorities have the right to acquisition of 25 % of the area of the land without any compensation to the owner. In case there are crops planted in the same area the state compensates for the value of the crops for the year including the value of the crops planted on the 25 % part that is state acquisition but no compensation is provided for the value of the land. • The Committee for the acquisition and compensation provide assessment of the crops value according to the Ministers Decree No. 360 of 2008 based on specification of the type of crops, their financial value and quantities.	
The Law for Investment in Kurdistan Region No. 4, 2006	The law stipulates that any investor has an obligation to safeguard the environment, public health and safety and to comply with the standardization and quality control systems according to the International standards.	KRG
Instruction No. 2, 2011	Provide measures for the protection of the ambient air quality from pollution and sets	KRG

Legislation	Brief Overview	Issued By:
	limits for the pollutant from different industries	
Instruction for the Environment Protection and Improvement Board No. 1, 2011	Includes instructions on control of noise levels in Kurdistan Region and sets limits in decibels within different type of activities	KRG
Land Acquisition Law No. 12, 1981	The Law specifies that the State has the right to remove encroachers' state-owned lands without compensation.	Iraqi Government

4.2.2 International Conventions and Treaties Signed by Iraq

The number of international conventions were signed and ratified by the Iraqi Government. These conventions and treaties are presented in Table 4-2.

Table 4-2: International Conventions and Treaties ratified by Iraq

Name of the Convention/Treaty	Brief overview
Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and Their Disposal	The convention governs the movement of hazardous wastes across the international boundaries. • It prohibits any movement/export/import across boundaries. • Reduction of hazardous waste generation to the minimum taking into consideration social, economic and technological aspects • Environmentally sound management of hazardous wastes • Ensure the safety of workers handling hazardous materials through implementation of prevention measures
UN Convention for Biological Diversity	• Conservation of biological diversity, the sustainable use of its components. • Introduce the procedures minimizing any adverse impacts on the biodiversity and its components and allow for public participation for the projects requiring ESIA studies.
UN Conventions to Combat Desertification	• Minimize the effects of the drought through preparation of the national action plans and strategies • Provide and implement procedures to minimize the land degradation and loss of productivity of the land

Name of the Convention/Treaty	Brief overview
	• Mainstreaming of measures to combat desertification into national development plans
RAMSAR Convention for Wetlands	• Conservation and sustainable utilization of wetlands • Reduce loss of wetlands • Recognizing the fundamental ecological functions of wetlands and their economic, cultural, scientific, and recreational value
Montreal Protocol on Substances that Deplete the Ozone Layer	• Control of the emission substances that have detrimental effect on the ozone layer
UNESCO World Heritage Convention	• Addresses the need to ensure that effective and active measures are taken for the protection, conservation and presentation of cultural and natural heritage • Mainstreaming the procedures for protection of the sites of the cultural and natural heritage into comprehensive planning programs. • Set up services and operating methods for the protection of natural and cultural heritage.
United Nations Framework Convention on Climate Change (UNFCCC) and Kyoto Protocol	• Sets an overall framework for intergovernmental efforts to tackle the challenge posed by climate change • Considers the protection of climate system from industrial and other emissions of carbon dioxide and other Green House Gases (GHGs).

4.2.3 ESIA Requirements in National Legislation

There are two valid laws currently in force that regulate the preparation of the ESIA in Kurdistan Region: the Law for the Protection and Improvement of Environment No. 27, 2009 (issued by the Iraqi government) and the Law of Protection and Improvement in Iraqi Kurdistan Region, No 8, 2008 (issued by the KRG).

In the view of the present study it's deemed that the Law issued by KRG will be more applicable as more relevant to the study area.

The provisions of the Law of Protection and Improvement in Iraqi Kurdistan Region, No 8, 2008 are as following:

Articles 12, 13, 14 and 15 discuss the procedures related to ESIA studies as follows:

Article 12: Requires any individual, institution or agency performing an activity that may impact the environment to conduct an ESIA study to assess environmental impacts generated from project activities and consequently obtaining the Ministry of Environment's approval for it.

The study must include the following:

1. Assessment of the positive and negative impacts as a result of the project;
2. Proposed mitigation measures to prevent or treat contamination and pollution sources in accordance with the acceptable environmental standards and guidelines.
3. The probably emergency pollution cases and the prevention / reservations that must be implemented.
4. Assessment of suitable alternatives for using cleaner environment techniques.
5. Reduce and manage wastes and adopt measures for reuse of recycling.
6. Assessment of the cost of environmental benefits and damages that will be generated as a result of the project.

Article 13: The Minister may request from any individual, institution or agency to prepare an ESIA study prior to practicing of any activity that may potentially affect or impact the environment in accordance with the requirements of environmental protection.

Article 14: The Board for Environmental Protection and Improvement in Kurdistan will establish standards and specifications, necessary controls to identify projects and areas that are subject to environmental impact assessment studies and the preparation of lists relative to these projects and the development of systems and procedures for environmental impact assessment.

Article 15: All concerned parties must comply, in coordination with the Ministry and prior to obtaining the approval for any project to take the following measures and actions:

First: to work to prevent negative environmental impacts resulting from its projects or projects that are being supervised by these parties.

Second: take all appropriate measures to ensure the application of the rules contained in this law, including the regulations and instructions issued under this law.

Third: monitor and follow-up on environmental regulations and standards and commitments to their projects or the projects under supervision; And to provide the Board with periodic reports about it.

Fourth: Coordination with the Board before issuing any approvals or permits related to the exercise of strategic or major activities that may significantly impact the environment.

4.2.4 Contractual Obligations

Contracts signed with contractors for the provision of road works include special provisions pertaining to the protection of the environment and public and workers health and safety in compliance with the Law of Environmental Protection and Improvement in Iraqi Kurdistan Region, No 8 for 2008, in particular, Clause no. 5, Article (12) which is related to Environmental Assessments and Environmental Permits.

The applicable terms of contract relevant to environmental and social/health and safety issues are as follows:

- Contractors are obliged to protect the Environment, including dust control management;
- Contractors are obliged to provide all health and safety procedures and protective equipment such as provision of traffic safety signage and warning signs mandatory in three languages: English, Arabic and Kurdish;
- Contractors are obliged to provide Personal Protective Equipment (PPE) for workers;
- All works must comply with Iraqi technical specifications relating to roads and bridges (SORB) in addition to special standards and specifications provided in the plans, and to comply with the necessary general conditions of contract; and the Instructions of Implementing Governmental Contracts for the year 2011 issued by the Ministry of Planning of the Kurdistan Regional Government, Iraq.

4.2.5 Land Acquisition and Resettlement Provisions

The Law that governs land and property acquisition and resettlement is the Public Roads Law No. 35 of 2002, which details procedures and practices to be followed on resettlement and acquisition of land and property relating to road construction and rehabilitation.

The ownership of land in Kurdistan Region has its own specifics:

- For legal purposes land in Kurdistan Region is all state-owned;
- Privately owned land with the Western understanding of property ownership exists almost exclusively in the urban areas
- In agricultural areas the leased state-owned agricultural land is considered as “private land” by leasees.

Although the leased land is officially state owned the leasees receive compensation on the following basis: the State can acquire up to 25% of the leased State land without compensation, except that cash compensation is given to leases for the crops grown on these lands as well as for crops grown on the remaining packet of leased land for one year. Cash compensation amounts for various types of crops and trees are based on the Council of Ministers’ Decision No. 360 of 2008.

In instances where an entire parcel of leased land must be acquired from a leasee, cash compensation is provided for the value of the crops on that land for one year, and the leasee is entitled for the allocation of 12% of the total land parcel as "privately" owned land.

In the instances where the small businesses have been granted licenses for operation along the public roads and the land on which they operate is required for the road upgrade, the law stipulates that the license can be revoked and the land reclaimed without compensation. The license issued to the business owner specifies that such appropriation may be made and that no compensation will be provided for structure and equipment losses or livelihoods losses in such instances.

Additionally, Land Acquisition Law No. 12 of 1981 specifies that the State has the right to remove encroachers' state-owned lands without compensation. The law stipulates that the private land acquired for public purposes is not compensated if the size of the acquired land does not exceed 25 % of total land plot. If the acquired size of land exceeds 25 %, the owner is entitled to compensation calculated according to the market price of the land.

National laws do not require consideration of alternatives to relocation of affected peoples who are encroaching on state lands.

There are some precedents have been set whereby the Government has compensated unlicensed and encroaching occupants on road ROWs. In these cases, compensation amounts were determined by a committee comprised of:

1. Deputy Provincial Governor (head of the committee);
2. Director of the Roads and Bridges;
3. Real Estate Registration Office Director;
4. Agriculture Director;
5. Representative from the Agricultural Associations;
6. State Properties Representative in the Governorate;
7. Affected Person or anybody representing him/her

This is the main discrepancy between the national laws and WB OP 4.12. It has been agreed that the WB OP4.12 will apply to project activities and guide preparation of all social safeguards instruments such as the RPF and RAPs under the project.

4.2.6 World Bank Safeguard Operational Policies

According to the World Bank WB OP 4.01 the project is classified as Category A. "A proposed project is classified as Category A if it is likely to have significant adverse environmental impacts that are sensitive,-diverse, or unprecedented. These impacts may affect an area broader than the sites or facilities subject to physical works".

The World Bank provides operational safeguard policies for the projects implemented and/or funded by the World Bank. The main purpose of these policies is to ensure prevention or minimization of the adverse environmental and social impacts and to increase socio-economic benefits.

The main safeguard policies are:

- OP/BP 4.01 Environmental Assessment
- OP/BP 4.04 Natural Habitats
- OP/BP 4.09 Pest Management
- OP/BP 4.10 Indigenous Peoples
- OP/BP 4.11 Physical Cultural Resources
- OP/BP 4.12 Involuntary Resettlement
- OP/BP 4.36 Forests
- OP/BP 4.37 Safety of Dams
- OP/BP 7.50 Projects on International Waterways
- OP/BP 7.60 Projects in Disputed Areas
- BP 17.50 Disclosure Policies

The policies that are viewed as most relevant to the scope of the present study are:

- Environmental Assessment (OP/BP 4.01)
- Involuntary Resettlement (OP/BP 4.12)
- OP/BP 4.11 – Physical Cultural Resources
- BP 17.50 Disclosure Policies

Additionally, Environmental, Health, and Safety Guidelines for Toll Roads are viewed as applicable for the project.

OP/BP 4.01 Environmental Assessment

This policy is triggered if a project is likely to have significant adverse environmental impacts in its area of influence. For category A projects, a comprehensive ESIA will be required with emphasis in integrating environmental measures in project planning, design, implementation and operation, in addition to help ensure the environmental soundness and sustainability of investment projects.

The Environmental Assessment takes into account the natural environment (air, water, and land); human health and safety; and social aspects (involuntary resettlement, physical cultural resources, etc.) in addition to trans-boundary and global environmental aspects.

This operational policy states the roles of the Bank and the Borrower:

The Bank mainly screens and sets the environmental assessment category and advises the borrower in terms of the Environmental Assessment requirements. The Bank reviews the findings and recommendations of the EA to determine whether they provide an adequate basis for processing the project for Bank financing. When the borrower has completed or partially completed EA work prior to the Bank's involvement in a project, the Bank reviews the EA to ensure its consistency with this policy. The Bank may, if appropriate, require additional EA work, including public consultation and disclosure.

The Borrower assists the bank in proper screening and will be responsible for carrying out environment assessment in compliance with the Bank's rules and national laws. The Borrower will also be responsible in consulting project affected persons and local Non-Governmental Organizations. The Borrower will disclose the draft/final documents and respond to any feedback provided from the Bank and/or the Public/stakeholders.

OP/BP 4.12 Involuntary Resettlement

This policy requires that adverse social impacts of projects it supports be mitigated, including when land or property is acquired or its use modified under a project so that PAPs suffer loss of income, residence, livelihoods or access to resources, either permanent or temporary, whether the land occupation/use is legal or illegal. Resettlement or relocation of PAPs adversely affected by project activities must be undertaken in accordance with laws, regulations and guidelines for Resettlement/Land Acquisition of KRG and OP 4.12. If there is a gap between KRG laws and the Bank's OP 4.12 then the Bank's provisions must apply.

According to OP 4.12, the main objectives of this policy are:

- Involuntary resettlement should be avoided where feasible, or minimized, exploring all viable alternative project designs.
- Where it is not feasible to avoid relocation, resettlement activities should be conceived and executed as sustainable development programs, providing sufficient investment resources to enable the persons displaced by the project to share in project benefits.
- Displaced persons should be assisted in their efforts to improve their livelihoods and standards of living or at least to restore them, in real terms, to pre-displacement levels or to levels prevailing prior to the beginning of project implementation, whichever is higher.

This policy covers direct economic and social impacts that both result from Bank-assisted investment projects, and are caused by:

The Involuntary taking of land resulting in:

- Relocation or loss of shelter
- Loss of assets or access to assets; or
- Loss of income sources or means of livelihood, whether or not the affected persons must move to another location; or
- The involuntary restriction of access to legally designated parks and protected areas resulting in adverse impacts on the livelihoods of the displaced persons.

The Bank's OP 4.12 on Involuntary Land Acquisition and Resettlement requires that affordable and accessible procedures for third party settlement of disputes arising from resettlement (i.e., grievance redress mechanisms) be made available. This GRM should take into account the availability of judicial recourse as well as traditional and community dispute resolution mechanisms. A checklist of issues recommended for consideration in establishing a GRM includes the following:

- Developing an inventory of reliable conflict mediation organizations in the project area to determine if any can be used instead of creating new ones.
- Reviewing GRM design and operation for simplicity, accessibility, affordability, and accountability. Good practice is to ensure that PAPs are well-informed about the existence and mode of operation of the GRM, that they can lodge grievances orally and in the local language, that explicit time limits are set for addressing grievances, and that appeals procedures are well-specified.
- GRMs must be given authority to effectively resolve complaints. To support this, GRM committees usually include government officials (local and provincial), project officials, staff from other agencies with a substantial role in resettlement activities, and representatives of local communities and NGOs.

In addition to the two safeguard policies stated above the **OP/BP 4.11 – Physical Cultural Resources** is also applicable if any accidental discoveries or chance finds were encountered during construction activities.

BP 17.50 WB Disclosure Policies

This Bank Policy supports decision making process by the Borrower and Bank through allowing public access to information on environmental and social aspects of projects.

Disclosure of key project documents, including Executive summaries in English and the local language, is mandated:

- In Country – prior to project appraisal in local language and in English

- In the WB Info Shop before project appraisal in English with the Executive Summary in English and in the local language

Environmental, Health, and Safety Guidelines for Toll Roads

The EHS Guidelines for Toll Roads include information relevant to construction, operation and maintenance of large, sealed road projects including associated bridges and overpasses.

Environmental issues during the construction and operation of roads are similar to those of other large infrastructure projects involving significant earth moving and civil works and their prevention and control recommendations are presented in the General EHS Guidelines.

These impacts include, among others,

- construction site waste generation;
- soil erosion and sediment control from materials sourcing areas and site preparation activities;
- fugitive dust and other emissions (e.g. from vehicle traffic, land clearing and movement, and materials stockpiles);
- noise from heavy equipment and truck traffic;
- and potential hazardous materials and oil spills associated with heavy equipment operation and fuelling activities.

Environmental issues specific to construction and operation of roads include the following: Habitat alteration and fragmentation

- Storm water
- Waste
- Noise
- Air emissions
- Wastewater

4.2.7 Differences between the WB Safeguard Policies and National Legislation

The differences in national legislation and WB safeguard Policies in regards to the resettlement issues are summarized in Table 4-3.

Table 4-3: Differences between National Legislation and WB Policies

Issue	WB	National Legislation
Avoidance or minimization of displacement of people	Avoid or minimize by exploring all viable	Not specified in national legislation

Issue	WB	National Legislation
	alternatives; If resettlement is required – execute as sustainable program;	
Definitions of Adversely Affected Persons	• Relocation or loss of shelter • Loss of assets or access to assets; or • Loss of income sources or means of livelihood, whether or not the affected persons must move to another location; or • The involuntary restriction of access to legally designated parks and protected areas resulting in adverse impacts on the livelihoods of the displaced persons.	People impacted by involuntary taking of land resulting in loss of land, assets and livelihoods in both laws No. 35 and 12
Requirement for Resettlement Action Plan (RAP)/Resettlement Policy Framework (RPF)	Full RAP required for 200+ adversely affected people. Abbreviated RAP for less than 200 adversely affected people	Law No. 35 provides for identification through land title registration and a compensation committee is formed to verify adversely affected persons
Consultations	Affected persons, communities, local authorities, NGOs – on eligibility criteria for compensation and assistance; Displaced persons & their communities and host communities – participate in planning, implementing and monitoring resettlement	The only consultation requirement is the negotiation procedure between affected parties with the compensation committee according to the Law No. 35
Impact on Informal Settlers	Included, but only entitled to resettlement assistance for structure and other assets lost (not land), and livelihood losses during resettlement.	Laws No. 35 and No. 12 do not provide for resettlement assistance or mitigation for informal/illegal settlers.
Compensation for Housing/Structures	Replacement structures provided or full replacement costs	Cash compensation for these assets as per established public valuation records according to the Ministers Decree No. 360

Issue	WB	National Legislation
		of 2008 based on specification of the type of crops, their financial value and quantities
Compensation for Land	Agricultural land: market value of land of equal productive potential in vicinity plus the cost of preparing land to levels similar to affected land plus cost of transfer taxes & registration	Law No. 35 provides for acquisition of 25% of land without compensation In case of acquisition of whole packets of leased state land compensation is offered for 25% of that land packet size
Livelihood Support/ Transitional Assistance	Provide mitigation to fully redress livelihood losses including cash compensation, short-term employment opportunities on project activities, development assistance such as land preparation, credit facilities, training or job opportunities (includes business premises); For impacts on agricultural land – PAPs that are actively cultivating affected land are given combination of training, money to invest to improve productivity, agricultural extension and income restoration allowance. Adversely affected owners of land and entities are entitled for compensation and also the employees who work at those entities and whose livelihood will be adversely affected.	Not provided for.

In the view of the difference between the National Legislation and WB Safeguard Guidelines in definition of persons eligible for compensation and provision of compensation measures, it has been agreed that the WB instructions will prevail over the national legislation provisions.

4.3 Institutional Framework

The role of environmental protection is divided between different governmental institutions, which are responsible for specific aspects of environmental management. Also, some NGOs and scientific centers and universities are contributing to the nature protection in the Kurdistan Region.

The **Ministry of Natural Resources** of the Kurdistan Regional Government is responsible for the development of natural resources in the region. The Ministry of Natural Resources is the sole authorized signatory of production-sharing agreements with companies willing to invest in the exploration of hydrocarbons and mineral resources in the region. The ministry is also the authority awarding licenses for transportation and storage infrastructure, hydrocarbons and minerals production operations as well as refining, petrochemicals and retail operations.

Under the production sharing contracts, the companies are mandated to contribute to an environment fund every year. They are required to meet international petroleum industry standards of practice and adhere to the Kurdistan Region's laws to prevent pollution and protect the environment. This includes the protection of fauna and flora, property, agricultural areas and fisheries. Other obligations in the contracts include preventing environmental damage when constructing pipelines, and decommissioning or surrendering contract areas according to international petroleum industry standards of practice.

The Ministry has recently established a Health, Safety and Environment Department (HSED) to assume primary responsibility for the Ministry's regulatory activities in these areas.

The HSED's mission is to strive for the development of the Kurdistan Region's hydrocarbon resources in a socially and environmentally responsible manner, to meet the growing needs of the local population. Its activities are aimed at protecting the Region's environment (including its biodiversity, wild habitat and water resources) and promoting safe and environmentally sound practices in the industries regulated by the ministry, while encouraging the optimal exploitation of the Kurdistan's natural resources. In particular, the Health, Safety and Environment Department:

- Regulates and monitors the hydrocarbons industry to identify and reduce unsafe and environmentally damaging behavior at all stages of exploration, development, production and rehabilitation;
- Supervises the industry to ensure compliance with the provisions of applicable primary and secondary legislations, accepted standards and guidelines for environmental protection and health and safety; and
- Develops and promulgates suitable instructions and guidelines on environmental and health and safety issues related to the exploitation of natural resources in the Region.

Ministry of Agriculture and Water Resources regulates agricultural research, agriculture, national resources and forestry throughout Kurdistan.

In regards to water resources MAWR is responsible for the construction, operation and maintenance of water supply and sewage facilities and the national water resources management.

- Survey the different water resources, conserve them, and determine ways, means and priorities for their implementation and use.
- Develop the potential water resources in Kurdistan, increase their capacity and improve their quality, protect them from pollution, supervise them and administer their affairs and put forth programs and plans to meet future water needs by providing additional water resources
- Regulate, and advise on, the construction of public and private wells, investigate groundwater resources, drill exploratory, reconnaissance, and production wells, and license well drilling rigs and drillers.
- Issue permits to engineers and licensed professionals to perform public water and sewerage works, and participates in organizing special training courses to qualify them in order to improve the standard of such works and to reduce water losses and pollution.
- Regulate the uses of water, prevent its waste, and conserve its consumption.

In regards to the agricultural issues in Kurdistan the responsibilities of the Ministry include:

- Setting of agricultural policy and future plans and projects in Kurdistan.
- Management of public rangelands and forests.
- Protection of soil, pastureland and flora.
- Pesticide and fertilizers authorizing.
- Support of different agricultural sectors

Ministry of Environment/Environmental Protection and Improvement Board is the major governmental agency responsible for environmental conservation and protection.

The duties and authorities of the Ministry include but are not limited to:

- Establishing the general policy for protection of the environment, and putting forward, as required, essential plans and programs to implement them.
- Establishing the specifications and standards for elements of the environment.
- Monitoring and verifying environmental elements in coordination with scientific research centers and in accordance to the specifications set by the MOE.
- Proposing draft laws and regulation related to the Environment.

- Inspecting and auditing private and public institutions to ensure compliance with environmental requirements (parameters and specifications).
- Conducting and sponsoring research and studies on environment related issues.
- Issuing conditions and instructions, as required, for agricultural, development, commercial, industrial and housing projects.

Ministry of Construction and Housing: Over the past ten years, Kurdistan has experienced a boom in infrastructure and construction development. The Ministry of Construction and Housing is one of the vital ministries within the KRG. The ministry has two major activities; the first is the construction of roads, and the second is the construction of housing projects and all other public service buildings. For the road sector, the Ministry has developed a Master Plan up to 2030, which was finished at 2011 as a road map for the future. The Ministry has already started implementing its components. The priority is highway construction – roads of at least two lanes connecting all of the major cities. The second stage of the master plan is the construction of express motorways.

Ministry of Municipalities and Tourism/Archeological Directorate of Duhok is entrusted with the following responsibilities:

- Develop and implement the archaeological policy of the region with regards to identification, supervision, protection, maintenance, register and restoration of archaeological sites.
- Promote archaeological sites on national and international levels.
- Conduct public awareness about archaeological sites in accordance to prevalent laws and regulations.

Municipalities are responsible for solid and liquid waste management, land use planning within their jurisdiction, licensing of economical and urban activities, construction and maintenance of roads and other infrastructures. It must be mentioned that it is a common practice in Kurdistan Region that a Mayor will act as a "citizen's lawyer" in resolution of issues with the relevant authorities.

Farasheen Organization for Environmental Protection (FOEP): located in Zakho. Farasheen NGO has helped to build civil society networks to activate grassroots support for the protection of the environment, particularly the watersheds of Kurdistan, northern Iraq. Further, FOEP strives to build capacity within Duhok Governorate, both in government and in academia, to help restore and protect the environment.

Duhok Farmers Union: The not-for-profit cooperative provides free technical assistance and training to farmers. The co-op also facilitates access to low-interest lines of credit to purchase or rent agricultural equipment and supplies — such as seed and fertilizer — and to secure needed

farm services at lower costs than the farmers could otherwise find. Also, this co-op negotiates on behalf of farmers with the governmental institutions.

University of Dohuk is currently implementing the program "Restoration and Preservation of the Natural Environment, Water for Every One (WFEO) - National Strategy to Save Water Resources" within the framework of the Kurdistan Water Program.

The Kurdistan Water Program (KWP) is a Regional Water Program was created in 2005. KWP is a platform bringing together competent organizations working regularly on water issues in the region. KWP represents the Global Water Partnership in the Kurdistan Region, and as such has the responsibility of implementing its principles and initiatives in the region. KWP goal is to promote and exchange knowledge on IWRM for the sustainable use of the region's water resources. The main goals of the KWP are:

- To contribute and encourage the transformation of national water policies towards sustainability and to integrate water concerns into sectorial policies.
- To meet the strategic target to halve the proportion of people who do not have access to safe drinking water and adequate sanitation.
- To build synergies by setting up active water partnerships at the regional and the national level.
- To build capacity, to raise public awareness and to educate the youth and women on water issues.

A number of international donor organizations are active in the Kurdistan Region and are implementing projects designed to improve the livelihoods of the population. In some cases, the environmental protection guidelines applied by the agencies are stricter than the requirements of the National Legislation. Among the international agencies are:

- The World Bank;
- JICA – Japanese International Cooperation Agency;
- Embassy of Finland;
- FAO;
- Permaculture Institute of Australia.

Despite the fact that quite a number of institutions are involved in environmental protection and conservation, the institutional framework of the Kurdistan Region is characterized with a number of deficiencies:

- Dispersion of authorities and low level of coordination between different institutions;
- Overlap of jurisdiction, which might lead to overlooking the significant issues;

- Lengthy and bureaucratic process of obtaining the permits for different kind of activities that involve the number of institutions. For example: for operating a crusher for construction operations, a Contractor must seek agreement from 8 different entities and Departments which include: Ministry for Communication and Transportation; Ministry of Electricity; Ministry of Agriculture and Water Resources; General Directorate of Antiquities and Heritage; Ministry of Environment; Kurdistan Board of Investment; Ministry of Construction and Housing/ Directorate of Roads and Bridges and the Land Registration Department.

4.4 Administrative Framework for Land Acquisition

As authorized by KRG, GDRB of Duhok bears primary official responsibility for ensuring that land acquisition and resettlement associated with the new road alignment are planned and implemented in a manner consistent with the laws and regulations of Kurdistan Region, and in a manner consistent with the principles and procedures of World Bank OP 4.12.

In accordance with the national legislation, the Compensation Committee has been established. The primary function of the CC is to establish and manage effective means for valuation of land and other assets that will be affected by the road, to establish and administer RAP eligibility criteria for all categories of affected persons, to assess and certify compensation amounts due affected persons, to recommend approval for timely payment of compensation in full to affected persons, and to ensure full and effective delivery of all other forms of assistance to affected persons.

The Compensation Committee comprises of:

1. Deputy Provincial Governor (head of the committee);
2. Director of the Roads and Bridges;
3. Real Estate Registration Office Director;
4. Agriculture Director;
5. Representative from the Agricultural Associations;
6. State Properties Representative in the Governorate;
7. Affected Person or anybody representing him/her

Effective implementation of resettlement program will require coordination with the Duhok governorate along with their subordinate district governments, and with local councils and village committees functioning at the village or settlement level.

Governorate and district-level officials have participated in the census and survey process. The governorate will have a role to play in determining increases to compensation, above the unit compensation rates, to take account of local extenuating circumstances, variation in production output capacity, or other location-specific factors. The cooperation of governorate and districts

also will be solicited on an ad-hoc basis for many other aspects of RAP implementation. This may include facilitation of external project monitoring, addressing grievances from affected persons, working with local councils and beneficiary committees to facilitate assistance to significantly affected persons or vulnerable persons, and facilitating local consultations and information disclosure.

At district level, the local council will have a more direct role in working with the GDRB to ensure that local facilities and services that are damaged or disrupted because of the project are rehabilitated or restored. The local council also will play a leading role in formulating, and facilitating the work of village committees. Similar to governorate level officials, the local council may be involved in facilitation of external project monitoring, addressing grievances from affected persons, and facilitating local consultations and information disclosure.

At the village or settlement level, the village level committees - existing formal, informal or customary organizations in local village or settlement - will play an important ad-hoc role in facilitating RAP implementation in devising strategies or opportunities to assist affected persons whose livelihoods are significantly affected, who may lack formal legal rights, who may be displaced from communal land or structures, or who are otherwise vulnerable to disadvantage because of the project.

The hierarchy of local administration is presented in Figure 4-1.

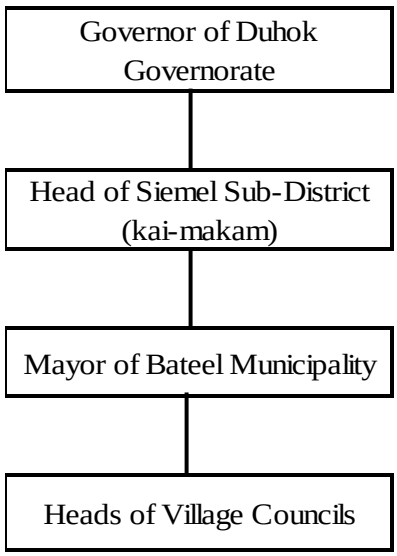


Figure 4-1: Hierarchy of Local Administration

5 Public Consultations

Public participation in the ESIA process has an important role in integrating economic, social and environmental objectives. Public participation makes a positive contribution to the project in terms of minimizing and avoiding potential public controversy and in identification of priorities of assessment.

Public participation was provided for through the following:

- Two Consultation sessions;
- A number of structured consultations with different levels of stakeholders

5.1 Stakeholders Identification and Analysis

A stakeholder is any entity with a declared or conceivable interest or stake in a project. Stakeholders fall into one or more of the following categories: international actors, national or political actors, public sector agencies, interest groups, commercial/private for-profit, nonprofit organizations, civil society members, and users/consumers.

Stakeholder analysis is a way of determining who among stakeholders can have the most positive or negative influence on the project, who is likely to be most affected by the effort, and how to work with stakeholders with different levels of interest and influence.

Generally, the stakeholders can be divided into the following categories (Figure 5-1).

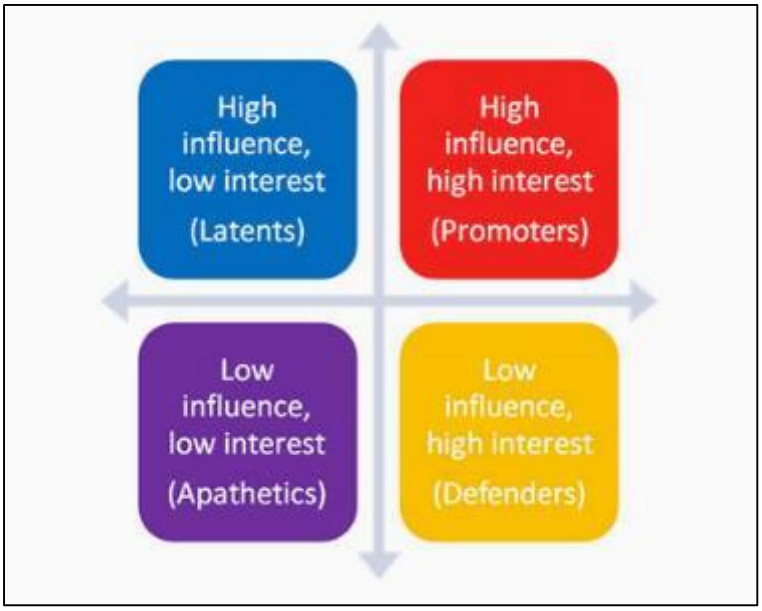


Figure 5-1: Stakeholder Categories

Influence means that an individual or a group might apply power in some way and thus induce changes to the project. Interest means that people or organizations might be interest in the project in general or directly affected by it.

Based on this approach, the stakeholders identified for the project are presented in Table 5-1.

Table 5-1: Stakeholders Analysis

Stakeholder	Interest	Influence
Farmers	Loss of agricultural land and crops due to land acquisition	Negotiations on the land acquisition mitigation and compensation
Business entities	Loss of part of the property; Potential disturbance to business activities due to obstruction of access	Negotiations on the land acquisition mitigation and compensation
Water Directorate of Duhok	To ensure that water resources in the area are not affected by the project	Regulates the use of water resources
Agricultural Directorate of Duhok	To minimize loss of productive fertile land	Regulates distribution of agricultural land parcels; Part of Compensation Committee
Directorate for Environmental Protection and Improvement Board of Duhok	To ensure that there is minimal impact on bio-diversity along the road alignment; Avoidance of pollution of air, soils and water resources	Issues conditions and instructions for agricultural development, commercial, industrial and housing projects.
General Directorate of Roads and Bridges of Duhok	Provision of adequate and cost effective alignment alternative	Part of Compensation Committee; Road planning and design; Approval of the road alignment.
Directorate of Tourism and Archeology of Duhok	Avoidance of damage to the sites of historical and cultural importance. Ensure that in chance of accidental discovery the department is informed and proper procedure is followed	Delay in construction works and change in the alignment in case of the chance discovery
Local administration: Governor of Duhok, Kai-makam of Siemel District, Batil Municipality, Administrators of local	To ensure that farmers rights are met; No additional pressure is imposed on the municipal waste disposal	Responsible for provision of municipal services; Governor has the power to overrule the decision of the Compensation Committee;

Stakeholder	Interest	Influence
villages adjacent to the road		Part of Compensation Committee
Farmers' Union of Duhok	To ensure the farmers' rights are met during land acquisition	Representing farmers in the Compensation Committee
Farasheen Environmental NGO	To ensure protection of environment	Close connection with the community, academics and Directorate of Environment
World Bank	To ensure that social and environmental safeguard are met according to the agreement with KRG	Funding agency
University of Duhok University of Zakho	Whether there is an interaction between their activities and road construction	Involved in developing strategy on sustainable water use in the region
Duhok Security Directorate and Duhok Traffic Department	To ensure safety of road users	Issue regulations on speed restriction, control drivers behavior, control road signage and marking

5.2 Public Awareness

Public awareness in the ESIA process is defined as public participation in all stages of the project planning and implementation. Keeping public informed ensures better level of the project acceptance, which is crucial to successful and timely completion of the project.

The plan of the road construction, although without any specific details, has been announced via local media. However, it must be stated, that this type of announcement was largely overlooked by the general public. Some of the governmental institutions due to the lack of coordination between them were not fully aware of the proposed development.

The further steps in public awareness are:

- Consultation Sessions;
- Consultations and interviews with individual PAPs;
- Interviews with the governmental officials;
- Negotiations of Compensation Committee with individual PAPs on the size of the land acquisition and proposed compensation.

5.3 Public Consultations

Public consultation in the EIA process is defined as participation in all stages of the project planning and implementation. Keeping public informed and seeking their opinions ensures better level of the project acceptance, which is crucial to successful and timely completion of the project.

The road construction Project, although without specific details, was announced via local media. The further steps in public consultation were:

- Consultation Sessions;
- Interviews with individual PAPs;
- Interviews with the governmental officials;
- Negotiations of Compensation Committee with individual PAPs on the size of the land acquisition and proposed compensation.

5.4 First Consultation Session

This public hearing exercise enables the stakeholders and public to understand the project and its activities, as well as to ensure that their concerns and issues were considered during all phases of the project especially at the planning phase.

The public consultation session at the announcement of the project was held on July 17th, 2013 at Jiyan Hotel in Duhok. Approximately 40 people attended the Consultation Session including representatives of governmental institutions, NGOs and CBOs and PAPs. The list of participants is presented in Annex 3.

5.4.1 Objectives of the Consultation Session

The main purpose of the session is to present the proposed project and to solicit feedback concerning environmental impacts. The main objectives of the Consultation session included:

- Informing the public about the project, including the proposed design of the road alignment, the need for land acquisition, and rationale for the road construction;
- Identifying and prioritize the main issues of concern of different stakeholders;
- Obtaining stakeholders acceptance of the project;
- Identifying significant effects and factors to be studied in detail;
- Defining the project boundaries.

The session started with the presentation of the Project and the purpose of the ESIA study:

- Proposed road alignment;
- Project description and main attributes;
- Purpose of the ESIA study and process of ESIA;
- Key potential issues;
- Role of public participation.

Subsequently, the participants were divided into four working groups with the objective to provide recommendation and suggestions for the key issues to be addressed and expressed their main concerns.

5.4.2 Main Results of the Consultation Session

Overall the participants expressed their support for the project and considered it as positive development in terms of the following:

- Improved safety of road users for motorists and for the entities alongside of the road;
- Reduced time to travel and ease of access to urban centers;
- Opportunity of the economic development and consequently additional employment opportunities;
- Improved access to the settlements located in the close proximity to the road alignment.

The participants also expressed their main concerns pertaining to the following issues:

- Socio-Economic Issues:
  - The effect of land acquisition on livelihood levels of the PAPs;
  - Impact on the household income due to the loss of crops;
  - Equitable compensation for the loss of land plots and possibility of obtaining the alternative plots;
  - Provision of employment opportunities for local residents in the project activities;
  - Communication with the relevant institutions and complaints resolution;
  - Provision of safety measures for the road users;
  - Minimization of impact on business entities during road construction;
  - Provision of opportunity for the local residence to supervise the project implementation;
  - Conservation of archeological sites and sites of cultural and religious importance.
- Environmental Issues:
  - Conservation of natural resources: water, soils and wildlife;
  - Minimization of the air pollution;
  - Location of the road alignment and the associated facilities, such as construction camp and repair stations in the areas distanced from the environmentally sensitive receptors;
  - Avoidance and minimization of the negative impacts on biodiversity;
  - Provision of "green belt" of the row of trees alongside of the road alignment.

All these issues are taken into consideration in the detailed road design, possible alternatives in the road alignment and design features, and most significantly in the impacts significance evaluation.

Figure 5-2: First Consultation Session

5.5 Second Consultation Session

The second Consultation session was conducted at the Jiyan Hotel, Duhok on 29th of April, 2014. Large number of PAPs were invited to attend the second Consultation Session. However, very few of them actually attended it despite confirming their attendance to GDRB justifying by various reasons such as lack of available transportation and being busy.

The objectives of the Consultation Session were:

- Informing the stakeholders about the chosen alignment for Segment 3;
- To obtain the stakeholders approval of the chosen alignment;
- To obtain the assessment of the anticipated adverse impacts by the stakeholders;
- To ensure that the all relevant stakeholders are informed about the land acquisition and the availability of compensation for the acquired land.

The participants of the second session represented main stakeholders involved in the project:

- GDRB
- Environmental Department of Duhok
- Department of Agriculture of Duhok
- Department of Antiquities of Duhok
- General Directorate of Municipalities of Duhok
- Traffic Police
- Dohuk University
- Farasheen Environmental NGO
- Head of Siemel District Administration (kai-makam)
- Heads of local villages administration
- Farmers

The list of the participants and signatures are presented in the Annex 4. The session was conducted in Arabic language, since all the invitees have an excellent command of the language. The officials from GDRB also provided some explanation in Kurdish in order to ensure the complete understanding of the issues by the participants. Majority of the participants (65%) had previous knowledge about the project.

The session started with description of the Project, its background and objectives, and the preliminary related environmental and social issues.

After the presentation of the Project and its anticipated potential environmental and social impacts, the participants were invited to discuss the various potential impacts of the road construction, which they perceive as negative or positive through the Q&A session. The session was organized in a manner that encouraged discussion and participation of the stakeholders in identifying the environmental and social issues of concern.

During the second Consultation session the stakeholders were asked to fill the survey questionnaire. The survey was conducted for the purpose of the social validation of the proposed road alternatives. The questionnaire was translated into Arabic language, and the participants were assisted by the team in filling it. The questionnaire is presented in the Annex 5.

The results of the questionnaire survey were processed by using the SPSS software. 69 % of the participants have previous knowledge about the chosen road alignment. The presentation by PMC team clarified the details of the chosen alignment for the participants. The participants in general approve the chosen alignment, 90% of the participants found the chosen alignment as suitable and appropriate. Therefore, the social validation of the chosen alignment was obtained.

The participants were informed about the possibility of land acquisition required for the project and the availability of the compensation for the acquired parcels of land. Most of the farmers had already some communication and negotiations with the Compensation Committee.

Most of the participants view the construction of the road as beneficial: 90% considered that one of the benefits of the road construction will be increase in property value, and 93 % considered that the road will provide better access to the water resources and other resources in the area.

The participants evaluated the most significant issues related to the road construction as presented in Table 5-2.

Table 5-2: Evaluation of Significant Issues

Air Pollution	Soil/Groundwater Contamination from solid waste	Soil/Groundwater Contamination from liquid waste	Land acquisition	Safety	Difficulty in Accessing Pastures	Aesthetic Impact
55.7 %	51.2 %	41.3%	79.3%	37.9%	41.3%	48.2%

Noise generation during construction and operational phases was not viewed as a significant issue. The participants evaluated the effluent generation and disposal during construction phase as an activity most damaging to the environment. The evaluation of the most detrimental Project activities in terms of their impacts on the environment is presented in Table 5-3.

Table 5-3: Evaluation of Activities Detrimental to Environment

Excavation	Debris Generation and Disposal	Effluent Generation and Disposal	Heavy traffic movement	Traffic emissions	Loss of property
55.1%	48.2%	65.5%	48.2%	41.3%	17.2%

The participants viewed the construction of the road as beneficial in terms of the improved accessibility and consequently better supply of the settlements, opportunity of the induced secondary development, improved safety for pedestrians and livestock crossing, reduced time to travel. The Evaluation of the road benefits is presented in Table 5-4.

Table 5-4: Evaluation of the Potential Benefits

Improved access to facilities and services	Improved access to markets	Business development on the road sides	Improved water supply	Improved supply of food items	Reduced time to travel	Improved safety of travel	Improved safety of pedestrian crossing	Improved crossing for livestock
72.4%	72.4%	75.8%	72.4%	75.8%	79.3%	89.6%	89.6%	68.9%

The participants were requested to evaluate the role of the institutions involved in the road related issues management. The majority of respondents perceived the governor's office as the most important institution, due to the fact that the Governor has the power to overrule the decisions of the Compensation Committee (see Table 5-5).

Table 5-5: Evaluation of the Role of Institutions

GDRB	Ministry of Environment	Ministry of Agriculture and Water	Ministry of Finance	Governor's Office	Municipality
65.5%	58.6%	58.6%	48.2%	68.9%	56.1%

It must be noted that there is a difference in the project impacts perceptions by the representatives of the local authorities and the farmers. While the officials discussed the environmental and social impacts and provided the recommendations specified below, the main concern of the farmers was the land acquisition issue and availability of cash compensation. Some of them expressed resentment about the issue; in particular Mr. Shawkat Mohsen Abdul Kareem who insisted that the road design should include the construction of the detour road to the village of his residence, and on higher compensation fee.

The participants of the second session have expressed a number of suggestions and recommendations:

Environmental concerns

- Provision of the green belt along the road sides to minimize the air pollution;
- Provision of water spraying during construction activities to minimize the dust generation;
- Provision of measures to protect soil from erosion;
- Avoid disturbance to wildlife;
- Provision of adequate systems to preserve the flow and the conditions of the seasonal run off valleys.

Archeological and Cultural Heritage:

- Ensure that the road alternative is distanced from the archeological and cultural heritage sites;
- Ensure that the proper proceedings will be implemented in case of the accidental findings during construction

Socio- Economic Concerns:

- Minimize acquisition of the already cultivated lands;
- Avoid construction activities before the crops are collected;
- Provide alternative land parcels to replace the acquired ones;
- Priority of local population employment.
- Provision of infrastructure to the settlements

Figure 5-3: Photographic Evidence of the Second Consultation Session

5.6 Consultations with PAPs

The team has conducted interviews with the individual PAPs along the road alignment. The interviews were conducted during the period of 12 - 25 of March, 2014. The meetings were held in the village of Kolli. The Kurdish translator was employed. Due to the fact, that the most of population is mostly illiterate. The interviews were conducted orally, and the recommendations recorded by the consultants.

All the interviewed had previous knowledge about the road construction, and generally viewed it as a beneficial development for the area;

- The main concern of PAPs is the land acquisition and equitable compensation for it. Most prefer cash payments for the acquired land. However, some also expressed their concerns about the loss of the source of income and are interested whether the additional land plots will be available for them for cultivation and livestock grazing;
- The main recommendation of PAPs was to provide the infrastructure improvements to their villages and towns, in addition to improved roads accessing the settlements.

Figure 5-4: Interviews with PAPs

5.7 Consultations with Relevant Stakeholders

The summary of main meetings is presented in Table 5-6.

Table 5-6: Summary of Meetings with the Key Stakeholders

Date	Stakeholder	Brief Summary
4.11.2013	GDRB - PMT	Discussion and clarification of the TOR and preparation and approval of the work plan
15.11.2013	GDRB - PMT	Obtaining the framework study documents and engineering design

Date	Stakeholder	Brief Summary
21.11.2013	GDRB - PMT	Discussion of the progress of the project
27.11.2013	Compensation Committee	Verify the findings of the field study in regards to eligibility for compensation and location on the ROW of the identified business entities and agricultural activities
17.12.2013	GDRB - PMT	Discussion of the progress of the project; Clarification of any alignment and design changes
21.12.2013	Duhok Department of Environment; Mr. Idris Kareem	Discuss the main environmental issues of concern
24.12.2013	Duhok Farmers Union, Mr. Hazem Pamir Loz	Discuss the main concern of farmers in regards to the land acquisition and crop losses
7.01.2014	Batil Agricultural Division, Walid Arab Suleiman	Discuss the main crops pattern in the project area, productivity, existence of wells in the vicinity of the project corridor
15.01.2014	Compensation Committee	Discuss the preliminary findings and estimates of land acquisition
25.01.2014	Duhuk Archeological Directorate, Mr. Ethil Ibrahim Abdullah	Update on the final road geometry and design; Discuss the concerns about chance discovery of important sites

5.8 Project Acceptance

Overall, the stakeholders expressed their support for the project and viewed it as beneficial for the area. However, during the Consultation Session and consultations with stakeholders the number of issues was raised.

Based on stakeholders suggestions and recommendations project acceptance criteria are summarized in Table 5-7.

Table 5-7: Project Acceptance: Criteria and Requirements

Parameter	Acceptance Criteria	Requirements
Land Acquisition	Avoidance and minimization of land acquisition where possible; Minimization of crop losses; Equitable compensation for land, crops and loss of income	Detailed census survey; Preparation of RAP; Provision of GRM
Water resources	Avoidance of surface and ground water contamination;	Condition of water bodies in the vicinity of the road alignment.

Parameter	Acceptance Criteria	Requirements
	Avoidance of changes of surface water discharge areas;	Information regarding existing users, local abstraction and discharge consents; Extent of catchments to be affected
Soil	Minimize soil contamination; Re-use of cut materials; Avoidance of soil erosion	Review of the project design for the amounts and composition of cut materials and areas to be affected; Desk study on soils type
Air quality	Minimization of air pollution from emissions; Abatement of dust generation	Assessment of the air pollution sources in the project area
Ecology	Avoid loss of flora and fauna species; Minimize habitat fragmentation	Desk study on species and habitats in the project area; Field visits
Waste management	Avoid uncontrolled disposal of generated solid waste and effluent in unauthorized areas	Current waste management practices in the project area; Population projections and future developments
Project facilities	Construction camp and service stations at sufficient distance from sensitive environmental receptors;	Identification of environmentally sensitive areas
Cultural and historical heritage	Avoid damage to the sites of historical, cultural and religious importance	An archaeological desk based assessment; A site visit and walkover survey
Aesthetic and visual impact	Reconstitution of the road sides to the pre-construction state; Landscaping and trees planting	Assessment of the current landscaping practices

5.9 Grievance Redress Mechanism

The Bank's OP 4.12 on *Involuntary Land Acquisition and Resettlement* requires that affordable and accessible procedures for third party settlement of disputes arising from resettlement (i.e., grievance redress mechanisms) be made available. This GRM takes into account the availability of judicial recourse as well as traditional and community dispute resolution mechanisms. GRMs must be given authority to effectively resolve complaints.

The proposed GRM is presented in

Table 5-8.

Table 5-8: GRM Procedure

Step	Description	Responsibility	Timeframe/Duration
1	Receiving a written complaint, registering the date of receiving and entering the database for complaints. For illiterate persons or persons with very low level of literacy, they should be allowed to lodge a verbal complaint at the local administration office, contractors office or directly to the Project Grievance Officer, which will be further transferred in a written form to a GDRB.	Project Grievance Officer	1 working day
2	Acknowledgement of the receipt of the complaint and registering the acknowledgement date in the database	Project Grievance Officer	7 working days
3	The complaint via email is addressed to the designated authority in the KRG PMT	Project Grievance Officer	1 working day
4	Preparation of the response to the complaint	Responsible Officer at GDBR	20 working days
5	Receiving the response to the complaint and registering it in the database. If the proposed resolution requires cash expenditure, Management consent and approval is sought	Project Grievance Officer	1 working day
6	The written response is delivered by hand and includes a form for the complainant to (1) acknowledge receipt, and (2) agree to the terms of the	Project Grievance Officer	14 days

Step	Description	Responsibility	Timeframe/Duration
	proposed resolution. In the event the complainant refuses to agree to the terms, he/she is invited to resubmit the complaint with explanation, and the process is repeated. The response for illiterate persons will be communicated to them through the local administration office.		

6 Baseline Environmental and Socio-Economic Conditions

6.1 Physical Environment

This section provides an overview of the physical environment in the project area.

6.1.1 Climate

The road alignment is located in the area, which is characterized as sub-humid upland and mountain region with semi-arid Mediterranean climatic conditions, which includes the Zagros Mountains and valleys as well as a part of the foothills. The main annual rainfall ranges between 400 mm and 1 100 mm. The mean minimum in July is about 22ºC. In winter the mean monthly minimum in January is 10ºC and the lowest minimum is -11ºC.

The average rainfall for Iraq can be seen from the Figure 6-1:

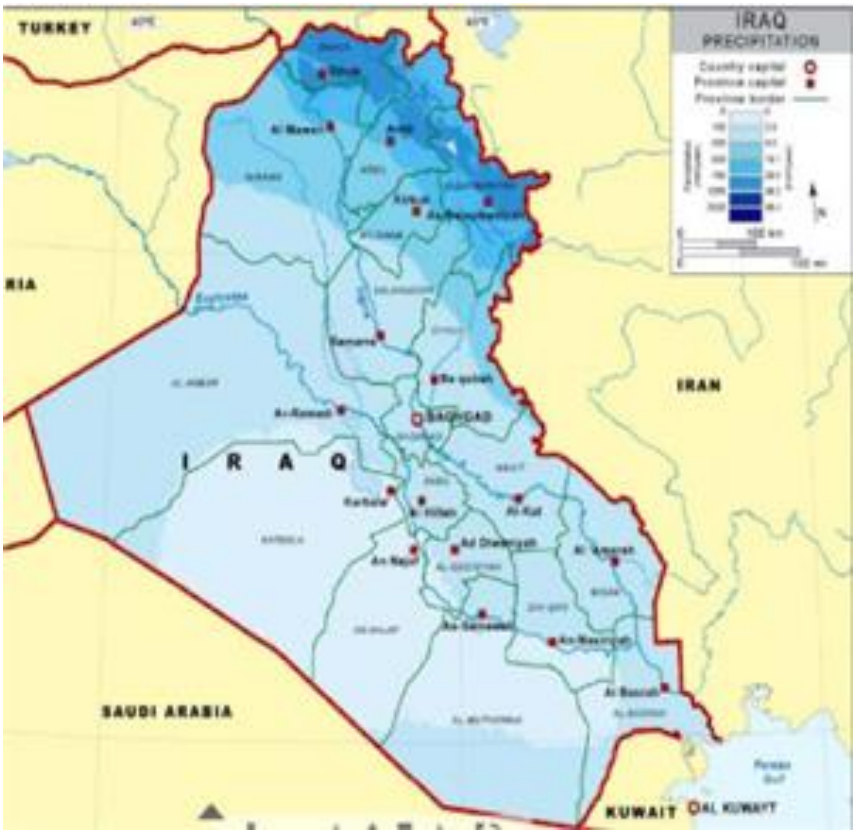


Figure 6-1: Precipitation Map of Iraq[5]

[5] FAO: Iraq Country Pasture/Forage Resource Profile

The nearest weather station to the project area is Zakho Metrological Station, which is around 17 km from Gersheen.

The average yearly rainfall in the project area was around 446 mm for the years 2003-2012. The highest rainfall is reported during January-February with 92 mm (Figure 6-2).

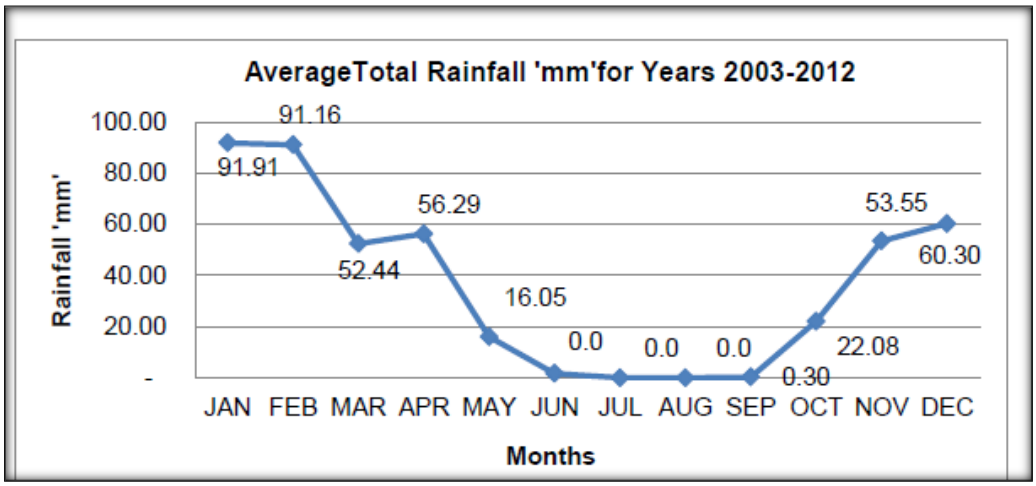


Figure 6-2: Mean Monthly Rainfall for Zakho Weather Station (2003 – 2012)

Temperature

Figure below presents the mean minimum temperatures measured for the years 2003-2012; lowest - in January (3.44°C) and the highest monthly average temperature in July (41.4°C). The average temperature for the ten years period was 20.75 °C (Figure 6-3).

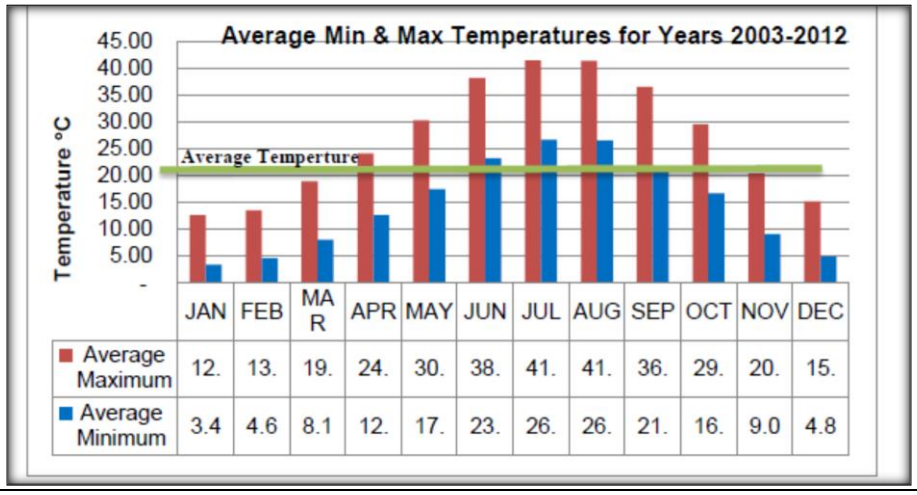


Figure 6-3: Average Temperatures for Zakho Weather Station (2003 – 2012)

Wind Speed and Direction

The prevailing wind direction at the project area is south-east, occasionally it tends to South-West and North-West. Wind speed is generally of light to moderate value with wind speeds between 0.74 m/sec at times in November and 1.20 m/sec at other times April to July.

6.1.2 Topography

Segment 3 is located in the area that is characterized as Undulating terrain: a transitional area between low plains and the mountainous region in the north and northeast. This category covers 67 000 km^2 and is divided into two sub-divisions one outside the mountainous region (42 000 km^2) at altitudes ranging from 100-200 m, and the other within this region (25 000 km^2) at an altitude varying from 200-450 m.

6.1.3 Geology and Soils

6.1.3.1 Soils

The road is located at the foot of the Zagros Mountains and comprises of hills 500 to 1 000 meters high. It consists of beds of gravel, conglomerate and sandstones. Gravel and conglomerate layers alternate with thin layers of reddish loam and clay. The area is characterized by rolling hilly landscape with low parallel hill ridges and extensive valleys and plains. The hills are generally rounded and have thin soil. The level areas of valleys commonly consist of three different terraces. The lowest terrace has the most fertile arable soil.

The soils are characterized as alluvial brown fertile soils belonging to the following types:

Calcic Xerosols: The subsoil has a reddish brown color and a sub angular blocky or blocky structure. The organic matter content is 0.5 to 0.9 percent in areas under cultivation; under neutral conditions it is expected to be about 1.0 percent or higher. These soils are very strongly calcareous below about 40 cm depth due to the presence of a zone of lime accumulation. At present they are used for dry farmed wheat and barley under a system of one year wheat and one year fallow.

Gypsum xerosols: These soils are similar to the calcic xerosols with a strong zone of gypsum accumulation. The subsoil is reddish brown and has sub-angular blocky or blocky structure. The zone of gypsum accumulation occurs at 20 to 80 cm depth. The thickness of the soil over the gypsum zone determines their agricultural value. Only those parts, which have at least 60 cm of soil above the gypsum zone are suitable for cropping. See soils map in Figure 6-4.

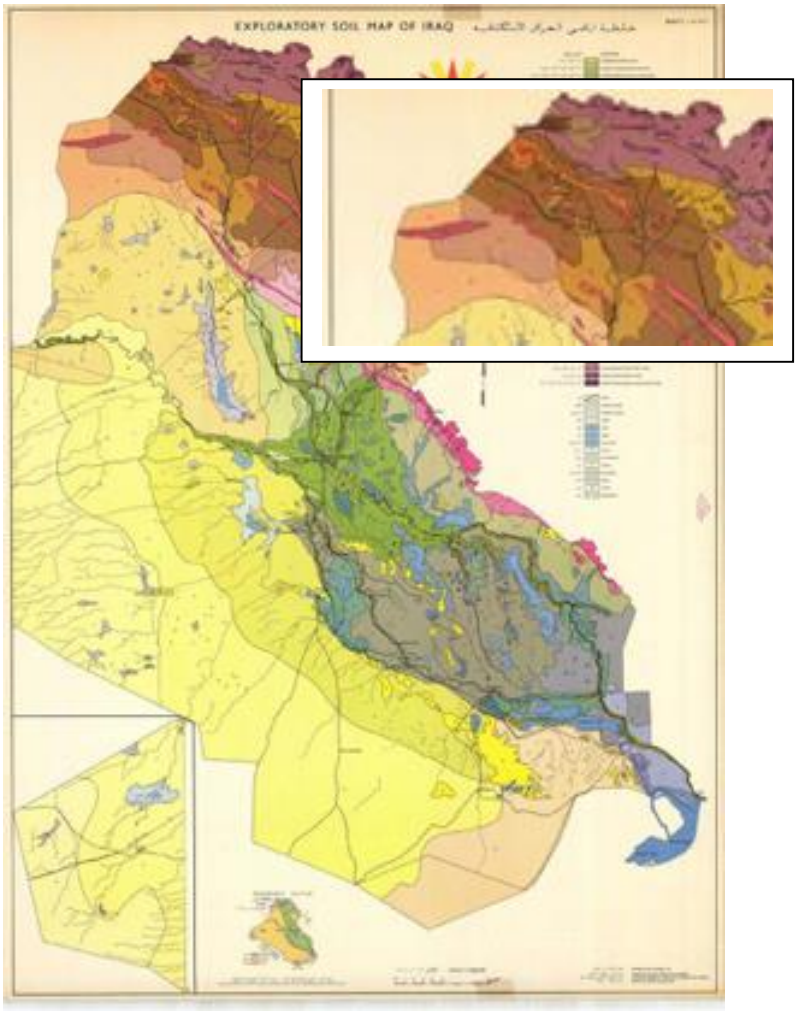


Figure 6-4: Soil Map of Iraq[6]

6.1.3.2 Geology

North Iraq is the north-eastern part of the Arabian Peninsula, which is a region of tectonic compression of particularly unstable area marked by convergent movements of the Arabian and Eurasian Plates that closed Tethys paleo-ocean and formed Zagros Belt in the north-eastern part of the Arabian Plate. This belt contains folded strata and normal faults trending NW – SE in the north-eastern part of the Arabian Peninsula toward Iran and turning E-W in its northern part toward Turkey.

[6] FAO: Iraq Country Pasture/Forage Resource Profile

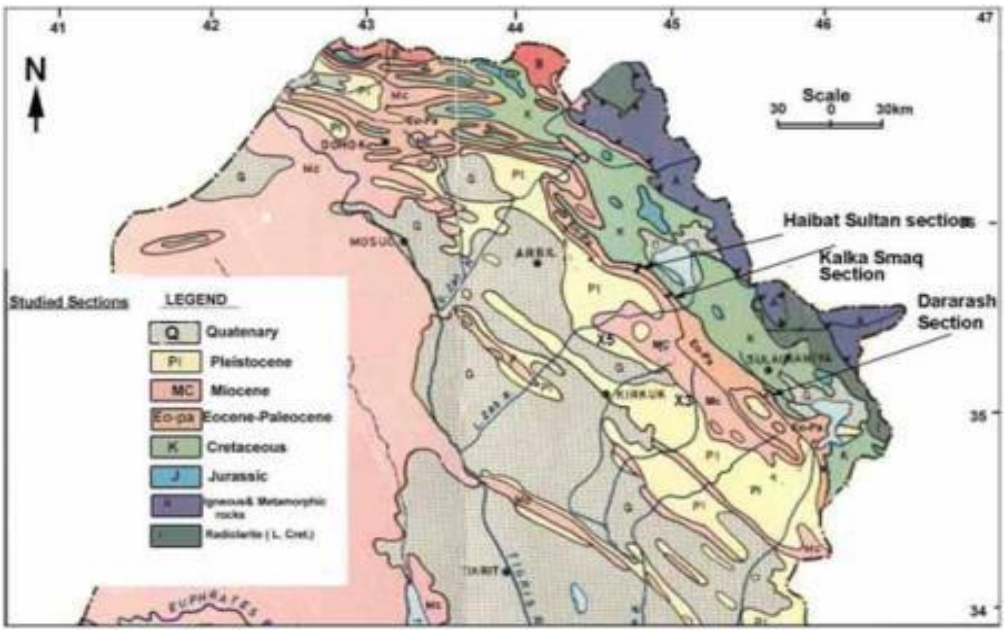


Figure 6-5: Geological Formations in the Project Area

Stratigraphically, the sections contain deposits of the Tethys Ocean during Jurassic and Cretaceous periods (Figure 6-6). The ocean was mainly of dysoxic-anoxic paleo-environments along the equator and tectonically unrest that permitted preservation of high organic matter and development of oil and gas reserves.

The litho-stratigraphic section constitutes marine and subordinated lagoon beds deposited in the southern Tethys Ocean as sediment of carbonates, shale and anhydrates in a geologic time extending through Jurassic, Cretaceous and Paleocene up to Middle Miocene Fatha (Lower Fars Anhydrate) formation with double plunging anticline closures extending NW – SE turning towards north-western parts of Iraq, especially in the Sinjar Mountain to W – E trend.

A regional stratigraphic column[7] presented in figure below shows the presence of a thick Jurassic and Cretaceous succession composed of carbonates, shale and anhydrates. The Jurassic Sargelu formation is extending through the whole of North Iraq.

In Iraqi Kurdistan, the formation is composed of thin-bedded, black bituminous limestone, dolomitic limestone and black papery shale with streaks of thin black chert in the upper part with fossils of mainly *Posidinia spp., Parkensonia spp., Stephanoceras spp., Rhynchonella spp.*, plant fragments and poor impression of ammonites (figure 21). They are overlain by bituminous limestone and shale of Upper Jurassic Naokelekan formation with highly bituminous contoured beds without chert, and above thin-bedded black limestone with abundant chert and *Posidonia*

[7] US Geological Survey (Pollastro et al.1999)

ornate. The underlying formation is Lower Jurassic Allan Anhydrate formation that marked the lowest regional seal.

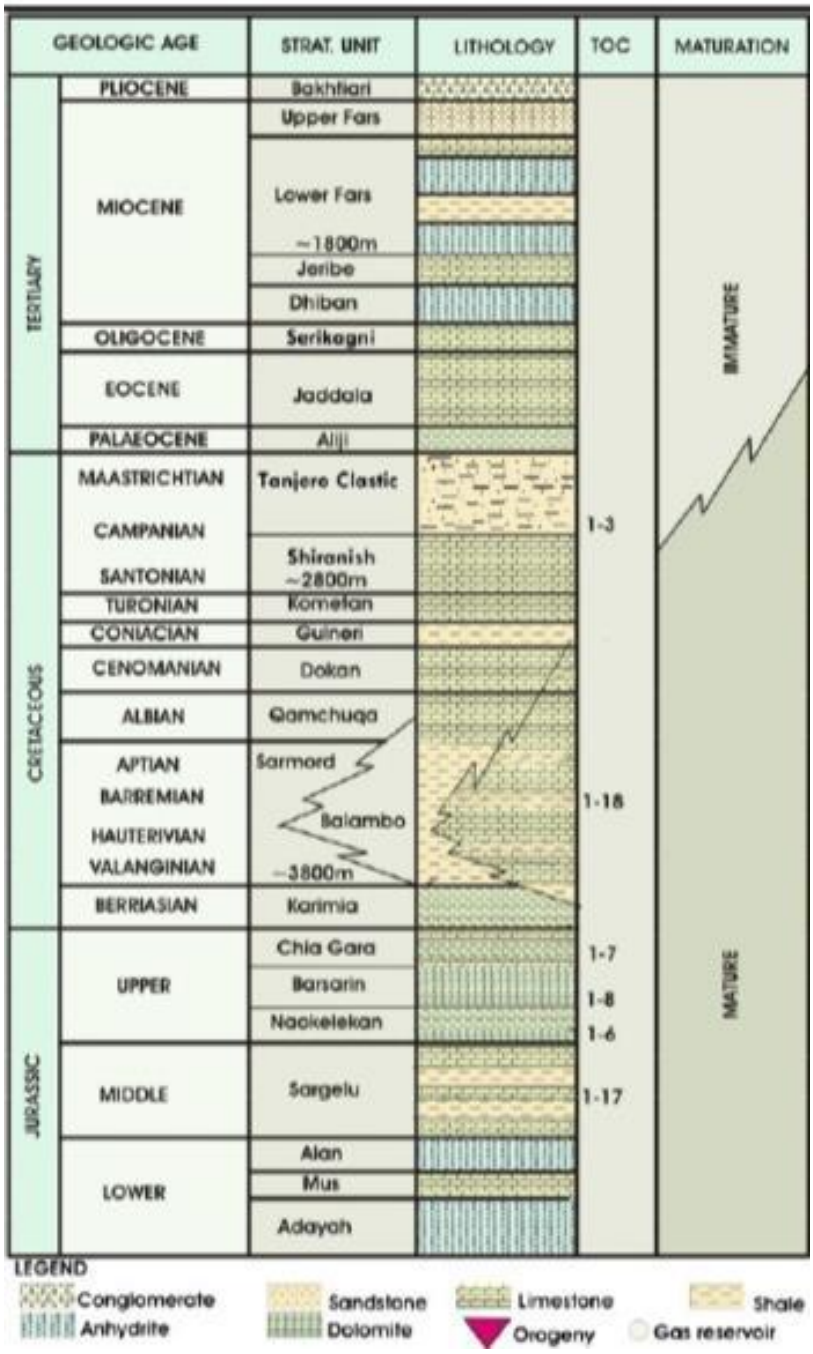


Figure 6-6: Regional Stratigraphic Column

6.1.4 Water resources

6.1.4.1 Groundwater Resources

The road passes over the Zakho Basin. The Zakho Basin stretches across the border between Iraq and Turkey (Figure 6-7). It constitutes the lower part of the Feesh Khabour River (Tigris River tributary), and is bound from the east and west by the boundary of Feesh Khabour and from north and south by two anticlines, of which one is aligned with the southern border of the river basin. In Iraq, the Zakho Basin lies at an altitude of 500-600 m asl, with the surrounding mountains rising to 1,600-1,800 m asl. The basin is underlain by thick layers of productive recent deposits. Within the boundary of the suggested delineation, the basin covers a total area of 1,960 km^2, of which 1,695 km^2 are located in Iraq and 265 km^2 in Turkey.

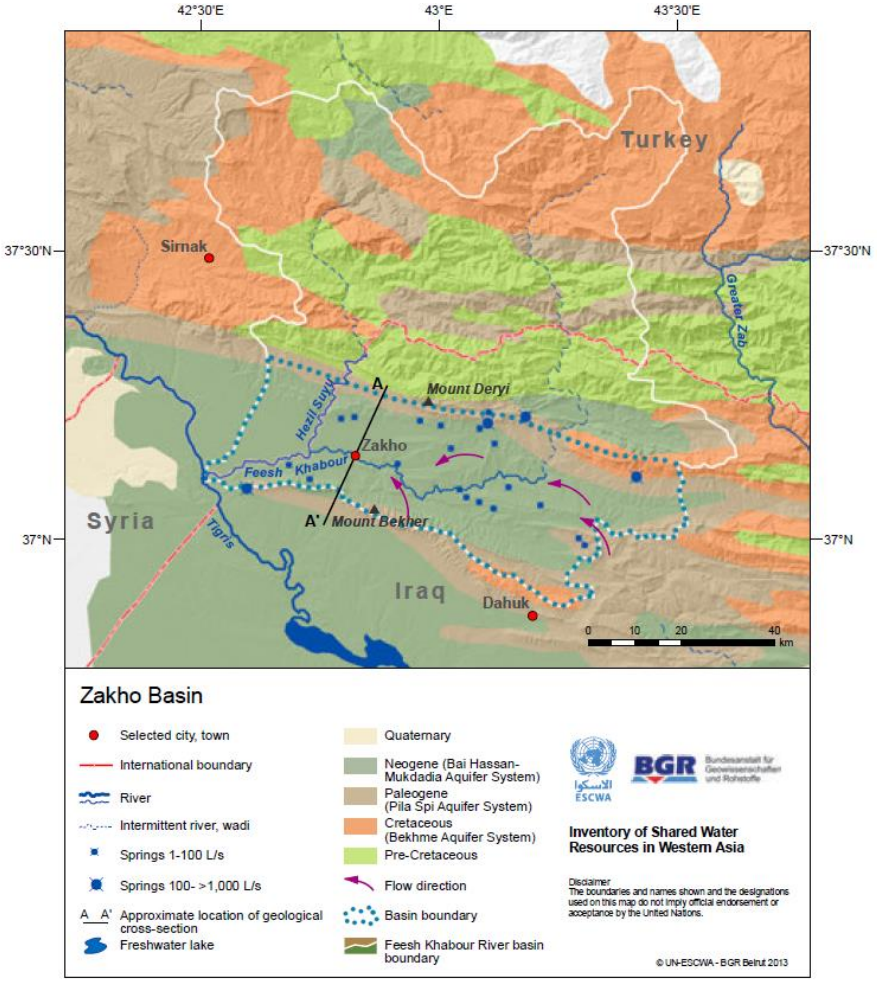


Figure 6-7: Overview Map of the Zakho Basin[8]

The upper, dominant water-bearing formations in the Iraqi part of the Zakho Basin are made up of Quaternary deposits and Neogene clastics formations of the Bai Hassan and Mukdadia Formations and to a lesser extent of Upper and Lower Fars (Injana and Fatha) Formations. They form an unconfined aquifer system with a collective flow type centered on the Khabour River. The system extends briefly across the Khabour and Hezil Rivers into Turkey, where it is bordered by a major fault in the north and obscured by younger volcanic deposits to the west of the Tigris River, northeast of Syria. The Paleogene underlies the Neogene clastics at depth and forms a second confined groundwater aquifer system with the fine clastics Gercus Formation. The older Cretaceous aquifer system, which is widely present in north-eastern Iraq, is deep under the Zakho Basin.

In Iraq, the Zakho Basin has a catchment area of about 1,107 km^2. Within the catchment, it is assumed that 31% of the average annual rainfall (707 mm) infiltrates into the ground but only 23% reaches the aquifer systems. A total of 188 MCM/yr of water (160 MCM/y in the inter-granular aquifer system and 28 MCM/y in the fissured-karstic aquifer system) enters the basin as renewable resources. A considerable amount of the recharged volume is discharged through springs, especially those issuing from the fissured-karstic aquifer. A major spring (Deraboon) issuing near the Iraqi-Turkish border at the contact between the Pila Spi Formation and the less permeable overlying Lower Fars (Fatha) Formation is reported to have a discharge of 0.83-1.13 m^3/s (see Overview Map).

Groundwater abstraction in the Iraqi part of the basin takes place mainly from the inter-granular Bai Hassan aquifer. In the early 1980s an estimated total of 24.3 MCM of good-quality (<700 mg/L TDS) water had been abstracted (9.5 MCM from deep wells and 12.3 MCM as spring discharge).

6.1.4.2 Wells

Only one well (location: N 37,02.446; E 42,37.433) exists in the close proximity to the road alignment. The well is located approximately 500 m upstream. There are no other wells in the vicinity of Segment 3 of the road. However, the limited information about wells in Duhok Governorate is available. It is estimated that are 1958 licensed wells and about 62 illegal wells in the Duhok Governorate. The city of Duhok depends on the water supply from Tigris River, but other localities in the Governorate depend to some extent on the groundwater abstraction for the water supply.

[8] Source: Compiled by ESCWA-BGR based on Aghanabati, 1993; Stevanovic and Markovic, 2004.

Generally, the wells are of 6-10 inches width, 10 – 50 m depth and yield ranging from 150 – 1,000 gallon per minute. The water is generally unsuitable for drinking without treatment (Table 6-1). Also, there are some records of the presence of the traces of heavy metals in groundwater[9].

Table 6-1: Available Chemical Characteristics of Wells in Duhok Governorate[10]

Chemical Constituent	Average Concentrations	WHO Standard for drinking purposes
pH	6.5 - 8	6.5 – 8.5
TDS (total dissolved solids)	122 - 540	120
Cl^-	0.02 – 0.06	250
NO_3^-	16 - 230	40

6.1.4.3 Surface Water Resources

Main surface water resources comprise rainfall and the seasonal run off valleys. Figure 6-8 below present the seasonal run off valleys within the Segment 3.

Figure 6-8: Seasonal Run off Valley Vicinity of Segment 3

[9] International Journal of Engineering Science Invention ISSN (Online): 2319 – 6734, ISSN (Print): 2319 – 6726 www.ijesi.org Volume 2 Issue 4 ǁ April. 2013 ǁ PP.47-56

[10] All values in ppm except of pH

Generally, all the seasonal streams drain towards the Tigris River (Figure 6-9). The drainage area is characterized as undeveloped cultivated land with the catchment slopes ranging from 0.09 to 0.15 %. The catchment area is estimated as ranging from 1, 7 to 2.1 km^2. The peak runoff for 25 year period is evaluated as approximately 1.8 - 4.3 m^3/sec.

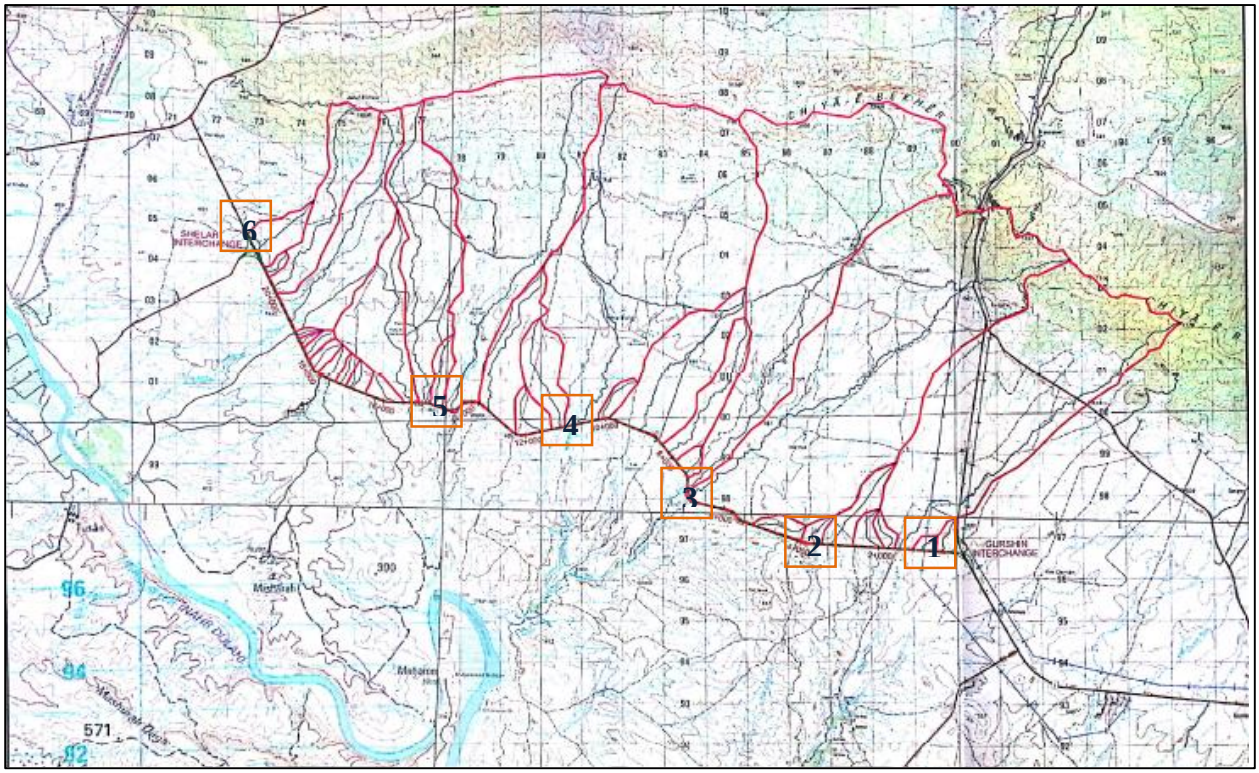


Figure 6-9: Seasonal Water Bodies in the Vicinity of Segment 3

6.1.5 Ambient Air Quality

The ambient air quality monitoring has not been performed previously in the project area, mostly due to the perception of low level of importance of such issues.

The project area has no residential settlements. The main activity in the area is the cereals cultivation with low level of use of pesticides and fertilizers. Therefore, the pollution from the operations of agricultural machinery is considered to be negligible and short term. The dust generation is mostly from plowing of fields and use of the unpaved rural roads in close proximity to the road alignment.

6.1.6 Noise

Noise is dependent on the specific equipment used and the proximity of that equipment to noise sensitive receptors. Since there are no residential communities in the vicinity of the road, and the agricultural activities are limited, noise is not considered as a significant issue.

For the purpose of this project the maximum permissible noise limits, in terms of equivalent continuous noise level dB (A), for different areas set by the Jordanian Ministry of Environment (1997) were adopted.

Table 6-2: Jordanian Standards for Maximum L_{eq} (1997)

Region	Maximum limits dB (A)	
	Day time	Night time
Urban residential	60	50
Suburban residential	55	45
Rural residential	50	40
Residential area with some workshops, simple handicrafts and commercial area in the center of the city	65	55
Industrial areas (heavy industries)	75	65
Areas of education, hospitalization and worshipping	45	35

6.2 Biological Environment

The area has been subjected to diverse human induced impacts over the millennia such as rain-fed cultivation. Therefore, natural habitats have suffered the significant level of degradation over the past several hundred years. The forest type vegetation is almost non-existent, and most of natural non-forest type vegetation is on decline.

The terrestrial ecosystem[11] within the vicinity of the Segment 3 are characterized as Middle East Steppe eco-system, the conservation status is defined as vulnerable.

6.2.1 Flora

Vegetation along the proposed road alignment reflects the Mesopotamian province of the Irano-Turanian eco-region and is characterized by the dominance of the drought-tolerant low shrubs with a variety of grasses and legumes. Herbaceous and dwarf shrub sage brush (*Artemisia* sp) communities tend to dominate in deeper, non-saline soils and often occur in association with grasses. The recorded vegetation is presented in Table 6-3, and the plant species found during the field visit are presented in Figure 6-10, Figure 6-11 and Figure 6-12.

Table 6-3: Typical Irano-Turanian Steppe Vegetation

[11] National Report on Biodiversity in Iraq. July 2010

Retama raetam	*Artemisia herba-alba*	*Ferula communis*
Noaea mucronata	*Asphadelus aestivus*	*Lepidium aucheri*
Salsola spp.	*Urginea maritima*	*Cnicus spp.*
Astragalus spinosis	*Circium alatum*	*Paronychia argentea*
Ballouta undulata	*Achillea fragrantissima*	*Hordeum bulbosum*
Thymus capitatus	*Aegilops ovata*	*Crepis aspera*

Closer to the Suhaila interchange the terrain changes and becomes rocky and steeper. The area supports oak-dominated deciduous and pistachio-almond forests amidst a diversified steppe flora. In the northern reaches of the mountain range, lower altitudes (400m to 500m) host communities dominated by *Astragalus* spp., *Salvia* spp., or others while higher up (700m to 800m) forests contain *Quercus brantii* and/or *Q. boissieri.*

Figure 6-10: Artemisia Herba-Alba

Figure 6-11: Asphodelus aestivus

Figure 6-12: Anemone coronara

6.2.2 Fauna

6.2.2.1 Birds

The area of the project is located in a general area identified as a fly-way route for migratory birds from Eastern Europe and West Siberia to Mesopotamia and Africa. The list of known bird species recorded in the area is presented in Table 6-4.

Table 6-4: Bird Species Recorded in the Vicinity of the Project[12]

Common Name	Scientific Name	Breeding Status
Lesser kestrel	*Falco naumanni*	Migrant, summer breeder
Eurasian griffon vulture	*Gyps fulvus*	Migrant, summer breeder
Egyptian Vulture	*Neophron percnopterus*	Migrant, summer breeder
Long-legged Buzzard	*Buteo rufinus*	migrant
Steppe Buzzard	*Buteo buteo vulpinus*	migrant
Iraq babbler	*Turdoides altirostris*	Resident, spring-summer breeder
See-see Partrdige	*Ammoperdix griseogularis*	resident
Red-wattled Lapwing	*Vanellus indicus*	resident
Finsch's Wheatear	*Oenanthe finschii*	Winter visitor
Graceful Prinia	*Prinia gracilis*	resident
Eastern Imperial Eagle	*Aquila heliaca*	Migrant, rare breeder
Northern Lapwing	*Vanellus vanellus*	Rare visitor
Common Cuckoo	*Cuculus canorus*	Common summer visitor
Turtle Dove	*Streptopelia turtur*	Migrant, summer breeder
Crested Lark	*Galerida crestata*	resident
Blackbird	*Turdus merula*	resident
European Bee-eater	*Merops apiaster*	Common migrant, summer breeder
Magpie	*Pica pica*	resident
Corncrake	*Crex Crex*	Passage migrant

6.2.2.2 Mammals

Large mammals that are associated with this eco-region include (Table 6-5): wolves (*Canis lupus*); Red fox (*Vulpes vulpes*); Golden jackals (*Canis aureus*); caracals (*Caracal* caracal); jungle cats (*Felis chaus*); Mongoose species (*Herpestes* sp); wildcats (*Felis silvestris*); Common otter (*Lutra lutra*); and Greater Horseshoe Bat (*Rhinolophus ferrumequinum*). Goitered gazelle (*Gazella subgutturosa*) and European badgers *(Meles meles*) can be found in more vegetated areas, and wild boar (*Sus scrofa*) can be found in reed thickets and semi-desert terrain. However, the status of these species is unknown and their presence was not recorded and is highly unlikely in the project area. The mammalian species recorded in the region include:

Table 6-5: Mammals in the Vicinity of the Project

[12] R.F. Porter et al, Birds of the Middle East, First Princeton Field Guide Edition, 2004

Scientific Name	Common Name	IUCN Status
Hemiechinus auritus	Long-eared Hedgehog	LC
Paraechinus aethiopicus	Ethiopian Hedgehog	LC
Crocidura suaveolens	Lesser white-toothed shrew	LC
Suncus murinus	Asian House Shrew	LC
Suncus etruscus	Pygmy White-toothed Shrew	LC
Otonycteris hemprichii	Desert Long-eared Bat	LC
Allactaga euphratica	Euphrates Jerboa	NT
Jaculus jaculus	Lesser Egyptian Jerboa	LC
Gerbillus mesopotamicus	Harrison's Gerbil	EN
Gerbillus cheesmani	Cheesman's Gerbil	LC
Tatera indica	Indian Gerbil	LC
Meriones crassus	Sundevall's Jird	LC
Nesokia indica	Short-tailed Bandicoot Rat	LC
Rattus rattus	Black Rat	LC
Rattus norvegicus	Brown Rat	LC

IUCN Categories: LC – Least Concern; NT – Nearly Threatened; EN - Endangered

6.2.2.3 Amphibians and Reptiles

The list of amphibian and reptile species recorded to be present in the project area is presented in Table 6-6. However, their status and actual presence in the project area is unknown.

Table 6-6: Amphibians and Reptiles Recorded in the Project Area

Common name	Scientific Name
The Green Toad	*Bufo viridis*
The Green Frog	*Pelophylax ridibunda*
Keeled Rock Gecko	*Cyrtopodion scaber*
Asia Minor Thin-toed Gecko	*Cyrtopodion heterocercum*
Doria's Thin-toed Gecko	*Stenodactylus doriae*
Branford's Rock Gecko	*Bunopus tuberculatus*
Persian Gecko	*Asaccus elisae*
Yellow-bellied House Gecko	*Hemidactylus flaviviridis*
Persian Leaf-toed Gecko	*Hemidactylus persicus*
Snake-eyed Lizard	*Ophisops elegans*
Golden Grass Mabuya	*Mabuya aurata septemtaeniata*
The Bridled Mabuya	*Trachylepis vittata*
Glossy-bellied Racer	*Platyceps ventromaculatus*
Euphrates Soft-shelled Turtle	*Rafetus euphraticus*
Desert Monitor	*Varanus griseus*

6.2.3 Seasonal Water Bodies

There are a number of seasonal run-off wadis as presented in the section 6.1.4. These wadis present the only remaining natural and semi-natural habitats in the area. The green toad and green frog species, which population is declining due to the use of agrochemicals, can be found in such habitats. These wadis also present the habitat for the riparian vegetation, which serve as shelter for smaller animals, such as reptilians and a source of food. During the migratory season, the wadis might be used as short rest stops for some migratory bird species. The riparian vegetation on the sides of wadis also provides soil erosion protection. The most commonly found plant species are presented in Table 6-7.

Table 6-7: Typical Riparian Vegetation in the Project Area

Alisma laniceolatum	*Fimbristylis sieberiana*	*Phragmites australis*
Arundo donax	*Juncus acutus*	*Polypogon monspeliensis*
Baccapa monniera	*Juncus articulates*	*Salvinia natans*
Bergia ammannioides	*Lemna perpusilla*	*Veronica beccabunga*
Cynancum acutum	*Marsilea capensis*	*Zannichellia palustris*
Cyperus rotundus	*Paspalum paspaloides*	

6.2.4 Status of Habitats

6.2.4.1 Globally, Regionally, Nationally and Local Habitats

The project area does not contain any globally important habitats or ecosystems. The local importance of the area is that it represents the Irano-Turanian steppe area in Kurdistan. The local importance of the area is that it provides the resource for the livestock grazing. Also, due to the political situation in recent decades, the area has not been properly studied and might potentially contain some floral and faunal species that have not recorded yet in the area.

6.2.4.2 Legal Status of Habitats

There are no Nature Reserves or other legally protected areas in the vicinity of the project or in a close proximity. The area is in a long distance to any sites of special ecological value. It is also distanced from “leading lines” that identify migration routes, and distant from Important Bird Areas (IBAs). The nearest IBA are located in Amadeiya, approximately 60 km to the east of the project area:

- Ser Amadiya IBA
- Dori Serguza IBA
- Benawi IBA

No conservation practices are exercised in the project area apart from the control of hunting to the extent they are controlled and monitored throughout the country.

6.2.4.3 Status of Species

The area has been used for over millennia, and agriculture and overgrazing in some cases has resulted in decline and disappearance of species. Only a few species have local, regional or international status. Species recorded as being globally and nationally significant are only listed in the highest category in which they are important.

There are no floral, amphibian or reptilian species of global importance in the project vicinity. The globally important mammalian species include the Euphrates Jerboa, defined by IUCN as nearly threatened and Harrison's Gerbil, defined as endangered. However, the habitat of this species is not located in the project area.

Bird species identified as regionally or globally important are listed in Table 6-8.

Table 6-8: Regionally and Globally Important Bird Species found in the Duhok Governorate.

Finsch's Wheatear	*Oenanthe finschii*	Winter visitor	Regionally threatened
Corncrake	*Crex Crex*	Passage migrant	Globally threatened

6.3 Baseline Socio-Economic Conditions

The baseline socio-economic conditions provide the background of the PAPs. The socio-economic survey was conducted through the series of structured interviews with PAPs with the help of the Kurdish translator and supplemented by the available statistical data. It must be noted that information available at the local level is limited, and in most cases, the statistical data is available to the whole governorate and/or sub-districts.

6.4 Macro-Economic Indicators

According to the World Bank, the Gross Domestic Product (GDP) in Iraq in 2011 estimated to mount up to 115.39 billion US dollars. The GDP value of Iraq is roughly equivalent to 0.19 % of the world economy. Kurdistan Region GDP is estimated to be 23.6 billion US dollars, which constitutes 20% of Iraq GDP. The average growth rate over 2004-2012 is 33%, which is half what is reported in Iraqi-Kurdistan during 2004-2011 (77%).

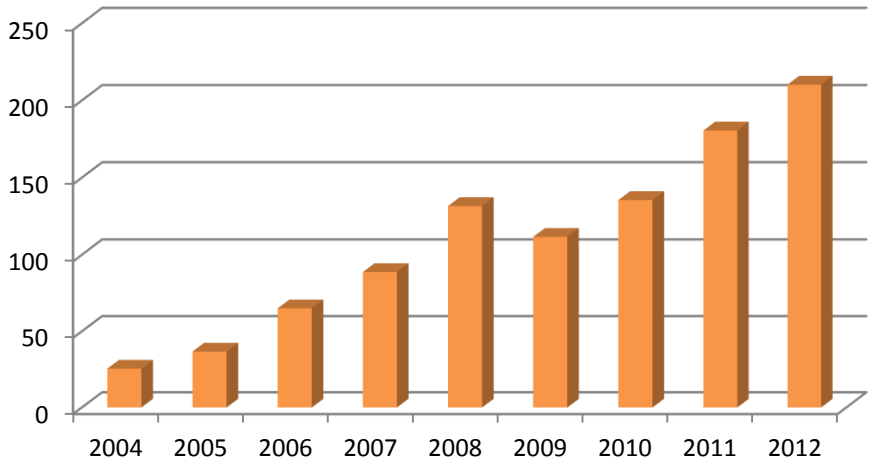


Figure 6-13: Iraq GDP in Billion US $ 2004 -2012[13]

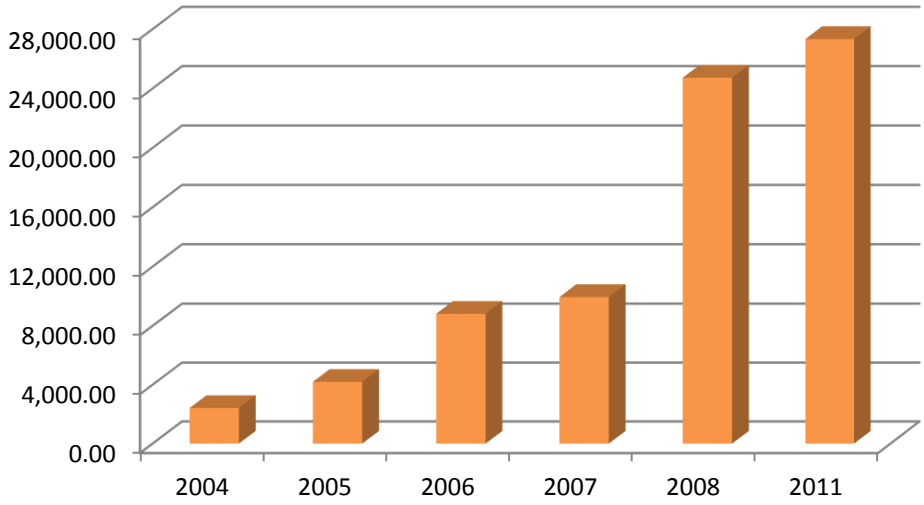


Figure 6-14: Iraqi-Kurdistan GDP (billion ID) 2004-2011[14]

Statistics of 2007 reveal that sectors' contribution rates in 2007 were as follows: transportation, telecommunications, and storage (57%); social and personal development services (22.7%); wholesale and retail (8%); tourism and hotels services (7%); Agriculture, Forestry, Fishing and

[13] Source: http://data.worldbank.org/indicator/NY.GDP.MKTP.CD| The World Bank Group

[14] Source: Regional Development Strategy for Kurdistan Region 2012-2016

Hunting (5.6%); building and construction (4%); finance and insurance (1.5%); and mining and quarries (0.1%). Services (30.1%), Public services (20.6%), Agriculture (17.5%), Trade & Aviation Service (13.5%), Mining & Manufacturing (9.4%), Construction (7.6%), Banks & Insurance (1.3%).

6.5 Demographics

6.5.1 Population Numbers

The proposed Transport Corridor traverses the Duhok Governorate. Duhok Governorate comprises 7 Districts and 29 Sub-districts. Table 6-9 presents aggregate population information for Dohuk Governorate and for each of its Districts and Sub-districts.

Table 6-9: Aggregate Population of Duhok Governorate (2009)

District	Sub-District	Population	Area (km^2)
Duhok	Duhok Center	284 040	104.1
	Mangesh	11 642	489.5
	Zawita	16 554	420.7
District Sub-total		**312 236**	**1 014**
Siemel	Batil	18 951	670.0
	Fayda	62 368	127.5
	Siemel Center	72 205	578.6
District Sub-total		**153 524**	**1 376.2**
Zakho	Batifa	20 104	522.0
	Darkar	14 998	553.2
	Rizgari	17 800	364.4
	Zakho Center	175 155	11.7
District Sub-total		**228 057**	**1 451.3**
Amedi	Amedi Center	8 705	95.1
	Bamarne	6 936	240.6
	Chamanke	4 745	436.8
	Deraluk	45 095	993.6
	KaniMasi	9 180	756.9
	Sarsng	20 715	250.6
District Sub-total		**95 376**	**2 773.6**
Shekhan	Atrush	11 902	496.2
	Baadre	13 217	124.2
	Qasrok	59 995	297.0

District	Sub-District	Population	Area (km^2)
	Shekhan Center/Esfne	21 270	179.2
	Zilkan	15 398	317.7
District Sub-total		**121 782**	**1 414.2**
Akre	Akre Center	66 346	124.5
	Bujil	17 478	286.7
	Dinarta	24 630	843.3
	Grdasin	40 345	577.5
District Sub-total		**148 799**	**1 832.1**
Bardarash	Bardarash Center	26 550	87.4
	Daratu	28 820	432.4
	Kalak	31 366	323.6
	Rofiya	29 910	306.8
District Sub-total		**116 646**	**1,150.1**
Total		**1 176 420**	**11 011.8**

The total population of Duhok Governorate is about 1,200,000 residents. However, due to the political situation in the region the area witnessed the influx of refugees, currently numbering about 1,300,000 people.

The villages adjacent to the newly proposed road date back from 1000 years ago and some people interviewed were 10th generation and still living in original housing. The central village is Kolli. Administratively Kolli represents Kani Kark, Kadia, Mazri, Khirbet Nour, Karkel, Turkshan, Kr Othman and Buraq settlements; the combined population of these villages is approximately 600 people. Merga Sor is an administrative center for the group of small settlements comprising about 600 people in the Krowin County.

Growth rate is the average annual percent change in the population, resulting from a surplus (or deficit) of births over deaths and the balance of migrants entering and leaving a country. The growth rate is a factor in determining how great a burden would be imposed on a country by the changing needs of its people for infrastructure (e.g., schools, hospitals, housing, roads), resources (e.g., food, water, electricity), and jobs. The population growth rate is estimated as 2.23 for the year 2014.

6.5.2 Age and Gender Distribution

According to the official statistics, the ratio of males to females shows a close number of the two genders (Figure 6-15).

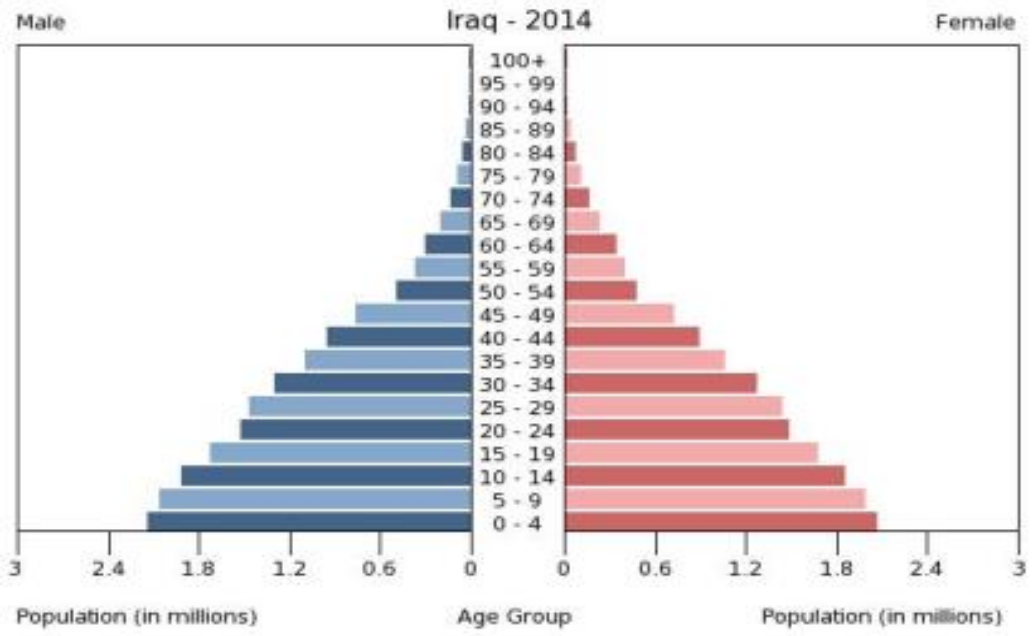


Figure 6-15: Age Pyramid in Iraq[15]

Estimates of population and gender distribution for Iraq are presented in Table 6-10.

Table 6-10: Age Distribution in Iraq (estimates for the year 2011)

Age Group	Percentage	Number	
		Male	Female
0-14 years	36.7%	6,093,069	5,878,590
15-24 years	19.6%	3,237,212	3,142,202
25-54 years	36.3%	6,032,379	5,785,967
55-64 years	3.2%	652,973	713,662
65 years and over	3.2%	487,841	561,797

The age and gender distribution of the Duhok Governorate population is presented in Table 6-11.

Table 6-11: Age Distribution in Duhok District for the Year 2009[16]

Age Group	Number	
	Male	Female

[15] https://www.cia.gov/library/publications/the-world-factbook/geos/iz.html
[16] *Settlement and household survey report, Kurdistan Region Statistics Office, 2011*

0-15 years	104 600	107 700
16-65 years	130 700	147 500
65 years and over	68 000	82 000
Total	242 100	263 400

The population in Duhok is characterized as predominantly young population. The economically active population constitutes almost half of the population. However, it must be noted, that the dependency rate is also very high, the dependency index is 84 (84 dependents per 100 of working persons).

6.5.3 Household Structure

On average the household in the study area is composed of 7.1 members with almost equal distribution between males and females of whom 2.6 are young people aged between 0 and 15 years and 3.5 are adults.

In the analysis of the demographic structure of the household the figure of the household head holds particular importance since it is the person that makes decisions and that manages the income and expenditure of the whole household. 89.8 % of the heads of the households are males and 10.2 are females.

6.5.4 Household Income and Expenditure

The households receive income from the different sources, such as wages, social benefits, property income, etc. Overall, households receive 45.3% of their income from wages and salaries; 25.0% from self-employment and employer income; 19.8% from property income; 5.2% from social payments; 4.7% from "transfers" from outside the country.

The average household income according to income source is presented in Table 6-12. The table shows, that the average household income in Duhok Governorate is slightly higher than the average for the country of Iraq.

Table 6-12: Household Income by Income Source (ID 000/month)[17]

Area	Source of Income						
	Wages and Salaries	**Self-employed and/or employer**	**Property Income**	**Social Benefits**	**Transfers**	**Total income Received**	**Total Income at Market Prices**

[17] http://cosit.gov.iq/en/rtl-support

Duhok	567.1	284.9	246.1	34.8	41.4	1,174.4	1,252.5
Iraq	388.8	214.9	170.2	44.4	40.5	858.8	952.4

It is estimated that the income from the agricultural activities (cultivation and livestock husbandry) ranges from 118,700 to 335,500 ID/months on average depending on the year and area of agricultural activity.

Additionally, under the food rationing system (Public Distribution System – PDS which replaced Food for Oil Program), each Iraqi is entitled to a monthly food basket for a nominal fee of 250 Iraqi dinars ($0.21). The food basket is distributed, and fees collected, through approximately 45,000 "food and flour agents" – FFAs – throughout Iraq. Food agents are typically local groceries. Each Iraqi within Iraq is entitled to receive the PDS ration, tied to his official residence. The PDS individual monthly ration is the following: wheat (9 kg), rice (3 kg), sugar (2 kg), tea (200 grams), vegetable oil (1.25 kilo), detergent (500 grams), pulses (250 grams), adult milk (250 grams), soap (250 grams) and infant formula (1.8 kg). This ration is estimated to supply 2,200 kcal per person per day. The cost of such food parcel estimated at approximately 25 US $ at current market prices.

Also, government subsidizes heating/cooling of the dwellings, additional electricity supply of the dwellings by distributing fuel to households.

The household expenditure comprising the main items is presented in Table 6-13.

Table 6-13: Average Household Expenditure for Duhok Governorate[18]

Item	Amount (ID 000/month)
Food	393.3
Clothing	124.8
Utilities Bills	374.4
Household Equipment	82.8
Health	33.4
Transportation	252.2
Communication	41.7
Education	33.5
Recreation	28.2
Miscellaneous	46.9
Cultural Activities	22.2
Total	1433.4

[18] http://cosit.gov.iq/en/living-conditions-statistics/surveys

The highest household expenditure is food items, followed by the utility (water, electricity, gas, sewage) bills and transportation. Clothing is also one of the major items of expenditure of the household.

6.5.5 Household Characteristics of PAPs

The team has conducted interviews with the PAPs in the project area with the help of the Kurdish translator. The interviews included the following questions:

- Size of the household;
- Number of people employed in the household;
- Number of dependents in the household;
- Household income per year;
- Contribution of the agricultural activities to the household income.

Simultaneously, the respondents were informed about the project, and their recommendations were also recorded. The main features of the PAPs households are as following:

- The household size is quite large, ranging from 6 to 9 people on average. Additionally, it is common practice that married sons with their spouses and children will continue living with the parents, contributing to the household income and expenditures.
- The family dwellings and the land it is located on are privately owned. The land used for cultivation is not located in the same place as the residency. All the PAPs consider the land used for agriculture as their property based on the tribal right of use. Some of the cadastral documents were lost during unrest of 1991, therefore, based on these two factors the PAPs are not considered as encroachers although using land without formal title deeds and/or lease agreements.
- Although land de-jure is the state property, the state recognizes tribal ownership de-facto. The land is communal, without demarcation of individual boundaries and divided into shares according to the Islamic Law of inheritance.
- Most of the households depend almost exclusively on the income from the agricultural activities.
- Most of the interviewed PAPs have a permanent place of residence in the small hamlets and villages distanced from the proposed road alignment, comprising mostly the inter-related people, like an extended family.
- PAPs own some limited number of livestock, mostly for the household consumption. Pastoral way of life is quite common. The PAPs tending the collective herds of livestock (up to 500 heads) lead semi-nomadic life, where the temporal shelter is erected following the livestock grazing pattern.

- The employment opportunities at the permanent place of residence of PAPs are very limited. Also, the settlements are quite distanced from the main urban centers.
- The access to the urban centers is inadequate. Only dirt narrow roads exist in the area.
- Large number of households is identified as vulnerable, due to the limited income and exclusive dependence on income from agriculture.

According to census survey results, a total of 46 households are likely to be affected by land acquisition, in total 375 persons will be affected, of which 58are females and 257 are children under 18 years of age.

All of the households stated to be the owners of the place of residence. Most of the households 51.2 % depend on agricultural activities as a supplementary source of income.

The area has a very specific customary land use practice: the multiple landholdings are prevalent, and can be considered as communal property without demarcation of boundaries for individual users. The boundaries are usually established by mutual agreement between multiple users. Additionally, the land is distributed into shares according to the Islamic law of inheritance. The communities reside in small hamlets, where all the population is inter-related, more of the extended family type. The majority of PAPs belong to the semi-nomadic tribe/clan of Hacan (Hasan), part of the Artoushi tribe. Traditionally, the government recognizes the tribal right of use of lands de-facto.

The summary of the social profile of the PAPs' household is presented in Table 6-14.

Table 6-14: Social Profile of PAPs

#	Place of Residence	PAP	Residence Ownership	Number of People Residing	Number of Persons Employed in the Household	Number of Dependents		Declared Income of the Head of the Household per year (US $)	Income Contribution from Agriculture	Location of Land Used or Owned	
						Female	Children (< 18 years of age)				
1	Kadia	PAP_G13_001	owned	9	1	1	7	25,000	100%	Part of plot No.75, parcel 1/1	
2	Kadia	PAP_G13_002	owned	4	1	1	2	9,600	100%	Part of plot No.75, parcel 1/1	
3	Kadia	PAP_G14_001	owned	N/A	N/A	N/A	N/A	N/A	N/A	Part of plot No.75, parcel 1/3	
4	Kadia	PAP_G14_002	owned	9	9	1	7	2,000	100%	Part of plot No.75, parcel 1/3	
5	Buraq	PAP_G6_001	owned	33	3	3	27	40,420	75%	Part of Plot No.78, parcel 1/29 &Parcel 1/30	
6	Buraq	PAP_G7_002	owned	10	2	1	7	7,600	45%	Part of Plot No.78, parcel 1/29	
7	Buraq	PAP_G6_003	owned	15	1	4	10	16,400	20%	Part of plot No.78, parcel 1/30 & Part of Parcel 1/29	
8	Buraq	PAP_G6_004	owned	14	3	3	8	16,400	20%	Part of plot No.78, parcel 1/29	
9	Buraq	PAP_G6_005	owned	12	3	2	7	10,800	25%	Part of plot No.78, parcel 1/29	
10	Buraq	PAP_G9_001	owned	7	2	1	4	7,600	27%	Part of plot No.78, parcel 1/19	

11	Buraq	PAP_G9_001	owned	12	3	3	6	13,600	12%	Part of plot No.78, parcel 1/19
12	Buraq	PAP_G6_002	owned	12	3	3	6	16 000	10 %	Part of plot No.78, parcel 1/18
13	Buraq	PAP_G7_005	owned	13	2	2	9	13,600	12%	Part of plot No.78, parcel 1/29
14	Buraq	PAP_G6_001	owned	18	2	2	14	9,200	10%	Part of plot No.78, parcel 1/18
15	Buraq	PAP_G6_003	owned	5	1	1	3	4,100	11.1%	Part of plot No.78, parcel 1/18
16	Karkel	PAP_G5_001	owned	7	1	1	5	5,600	14.5%	Part of plot No.19, parcel 6
17	Karkel	PAP_G4_001	owned	6	1	1	4	7,600	21%	Part of plot No.19, parcel 2
18	Karkel	PAP_G4_002	owned	7	2	1	5	13,600	12%	Part of plot No.19, parcel 2
19	Karkel	PAP_G4_003	Owned	8	1	1	6	8,800	18%	Part of plot No.19, parcel 2
20	Merga Sor	PAP_G2_001	Owned	8	2	1	6	12,400	13%	Part of plot No.7, parcel 2
21	Merga Sor	PAP_G2_002	owned	7	1	1	5	8,800	18%	Part of plot No.7, parcel 2
22	Merga Sor	PAP_G3_001	owned	7	1	1	5	5,200	30.5%	Part of plot No.7, parcel 1
23	Merga Sor	PAP_G3_002	Owned	5	1	1	3	2,400	< 10%	Part of plot No.7, parcel 1
24	Kolli	PAP_G12_001	Owned	6	1	1	4	2,400	< 10%	Part of plot No.76, parcel 1/5
25	Kolli	PAP_G12_002	Owned	3	1	1	1	3,600	< 10%	Part of plot No.76, parcel 1/5
26	Kolli	PAP_G12_003	Owned	7	1	1	5	3,600	< 10%	Part of plot No.76, parcel 1/5
27	Kolli	PAP_G12_004	Owned	3	1	1	1	3,600	< 10%	Part of plot No.76, parcel 1/5

28	Kolli	PAP_G12_005	Owned	5	1	1	3	3,600	< 10%	Part of plot No.76, parcel 1/5
29	Krowin	PAP_G1_001	Owned	9	1	1	7	4,800	< 10%	Part of plot No.6, parcel 2
30	Kolli	PAP_G12_006	Owned	7	1	1	5	3,600	< 10%	Part of plot No.76, parcel 1/5
31	Kolli	PAP_G12_007	Owned	5	1	I	5	3,600	< 10%	Part of plot No.76, parcel 1/5
32	Krowin	PAP_G1_002	Owned	4	1	1	2	9,600	< 10%	Part of plot No.6, parcel 2
33	Kolli	PAP_G16_001	Owned	8	1	1	6	8,000	< 10%	Part of plot No.73, parcel 1
34	Kolli	PAP_G16_002	Owned	7	1	1	5	3,600	< 10%	Part of plot No.73, parcel 1
35	Kolli	PAP_G16_003	Owned	4	1	1	2	4,800	< 10%	Part of plot No.73, parcel 1
36	Kolli	PAP_G12_008	owned	7	1	1	5	3,600	< 10%	Part of plot No.76, parcel 1/5
37	Kolli	PAP_G12_009	Owned	5	1	I	3	4,800	< 10%	Part of plot No.76, parcel 1/5
38	Kolli	PAP_G12_010	Owned	9	1	1	7	10,000	< 10%	Part of plot No.76, parcel 1/5
39	Kolli	PAP-G15_001	Owned	4	1	1	2	3,600	< 10%	Part of plot No.74, parcel 1/4
40	Kolli	PAP-G15_002	Owned	4	1	1	2	3,600	< 10%	Part of plot No.74, parcel 1/4
41	Kolli	PAP-G15_003	Owned	9	1	1	7	3,600	< 10%	Part of plot No.74, parcel 1/4
42	Kolli	PAP_G12_011	Owned	8	1	1	6	7,200	< 10%	Part of plot No.76, parcel 1/5
43	Kolli	PAP_G11_001	Owned	8	1	1	6	8,400	< 10%	Part of plot No. 76; Parcel 1/1
44	Kolli	PAP_G11_002	Owned	9	1	1	7	10,000	< 10%	Part of plot No. 76; Parcel 1/1

45	Kolli	PAP_G11_003	Owned	5	1	1	3	3,600	< 10%	Part of plot No. 76; Parcel 1/1
46	Kolli	PAP_G11_004	Owned	11	2	2	7	4,800	< 10%	Part of plot No. 76; Parcel 1/1
				375		**58**	**257**			

6.6 Employment

The unemployment rate in Duhok Governorate reaches almost 17 %, which is slightly higher than the average of the Kurdistan Region. Due to the data limitations, the only reliable available information on the unemployment is available for the year 2008 (Table 6-15).

Table 6-15: Unemployment Rate by Governorate, Area & Sex for the year 2008[19]

Governorate	Center Urban			Other Urban			Rural			Grand Total		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
Duhok	12.1	23.8	14.3	14.2	46.3	18.2	12.9	58.5	17.5	13.3	39.7	16.9
Erbil	7.0	8.4	7.2	8.2	46.8	16.0	7.7	64.8	23.9	7.5	36.0	13.2
Sulaymaniyah	6.3	24.6	10.4	9.4	33.7	13.4	7.1	23.7	11.3	7.9	27.4	11.9
Total	13.1	25.0	15.2	15.4	36.1	18.5	14.9	8.3	13.3	14.3	19.6	15.3

The employment pattern of the heads of the household is presented in Table 6-16.

Table 6-16: Employment Patterns of the Heads of the Household for Duhok Governorate for 2007[20]

Type of Employment	Percentage
Farming- Self-employed	4.2
Agricultural laborer	3.8
Skilled laborer	10.8
Non-skilled laborer	11.9
Public servant	46.9
Self-employed - Non-Farm	20.3
Others	2.1

[19] http://cosit.gov.iq/en/population-manpower-staatistics/manpower
[20] Comprehensive food security and vulnerability survey of Iraq, 2007

6.7 Infrastructure and Utilities

6.7.1 Waste Disposal

Sewage and Effluent Disposal: the main method of effluent disposal is the cesspits. Only 5.5 % of households are connected to the sewage network. The condition of the cesspits is questionable, mostly they are the earth bottomed pits and the emptying of them happens not on a regular basis. Such effluent disposal presents the health hazard due to the potential soil and groundwater contamination. The situation worsens since the collected effluent is literally dumped into the streams without any kind of treatment that join the River Tigris.

The newly built residential compounds, such as Avro City, are supplied with wastewater treatment facilities, but their capacity is sufficient only for these compounds. The city of Duhok at large has no wastewater treatment facilities whatsoever.

Solid waste disposal: solid waste collection from houses in residential areas in Duhok district stands at 79 %. Unfortunately, the collected solid waste is disposed in open unauthorized areas at the rate of 40.1 %. Leaching of the waste into the ground also poses the health hazard due to the potential soil and groundwater contamination. Recently, there has been an improvement in the solid waste collection on daily basis and separation at the collection stage for further recycling.

Collection of the solid waste and street cleaning in the city of Duhok has been outsourced to a private company. The company has established a recycling plant at the outskirts of the city of Duhok. However, there is no sanitary landfill, and all the materials that are for used for recycling are just disposed in a nearby valley. The site is located approximately 17km South-West of the start of the road alignment. The dumping site serves mainly the Duhok city.

Figure 6-16: Waste Disposal Site

In the areas not served by this authorized dumping site, the solid waste is disposed on ad hoc basis in the valleys close to settlements.

6.7.2 Utilities Supply

In terms of the adequacy of the infrastructure, Duhok district in Kurdistan is considered as relatively well supplied compared to the other district of Kurdistan and Iraq in whole.

Water Supply: 88 % of households in Duhok receive drinking water from the public water network. The main source of the drinking water is the treated water from the River Tigris.

Electricity: The percentages of working electricity supply system are of 70.3% in the urban areas, 89.5% in the collective towns, and 79.7% in the rural areas.

However, it must be mentioned that the electricity grid has an insufficient capacity for the grown population of the area. The electricity black-outs are a common occurrence. Therefore, it is a common practice for local residents to have a diesel fueled generator to compensate for the electricity cuts. The electricity black-outs in Duhok Governorate are reported to be from 6-15 hours per week.

6.7.3 Health Care

In the governorate of Duhok there is one hospital or health center in use for every 10,168 residents in the urban area, one for every 7,781 in the collective town, and one for every 5,421 in the rural area

In the governorate of Duhok these are the ratios between permanent population to one medical staff: 278 in the urban areas, 641 in the collective towns, and 647 in the rural centers.

The provision of hospitals, health centers, Doctors, nurses and other hospital staff cannot fill the demand, with the consistent quantity or quality that is required to grant adequate medical assistance to all the inhabitants of Northern Iraq. In particular in the rural areas and in the collective towns far from the big cities the necessity of maintenance and improvement interventions are pressing and the problems connected with the scarcity of satisfactory water, electricity and sewer systems are more urgent than elsewhere.

The number of available beds compared with the resident population is one of the significant indicators of such a structural deficiency of the health centers especially of those located in the sub-urban areas. According to the data provided by WHO, there should be 4 beds for every 1,000 people. In the governorate of Duhok there is one available bed for every 425 people in the urban centers, one for every 3,493 in the collective towns and one for every 21,682 in the rural areas.

6.7.4 Education

Education is a very important indicator of the wellbeing of the population. As a general rule people with better education are better equipped to deal with the circumstances and are capable of finding better paid skilled jobs.

The number of students exceeds the 24% of the permanent population in all four areas of the Northern Iraq. In the urban areas, the number of people attending school is about 29.8% in the district of Duhok. The ratio between number of students and permanent population reaches 26.3% in the urban areas, 24.7% in the collective towns, and 23.6% in the rural areas. In the urban centers for every 1,582 inhabitants there is a school in the governorate of Duhok.

Illiteracy rate is about 30 % in the governorate of Duhok on average among the economically active population aged between 15 to 64 years.

Table 6-17: Educational Level of Household Members >10 Years of Age

Educational Level	Percentage of Population (%)
Illiterate	30.5
Read and write	24.3
Primary School	22.9
Intermidiate School	11.1
Secondary School	5.6
Diploma after secondary school	3.2
University Degree	2.0
Post Graduate degree	0.3

6.7.5 Cultural, Religious and Historic Facilities and Amenities

The population of the Duhok is predominantly Muslim in religion, and the places of worship are available in every settlement.

It is reported that there are a number of recreational facilities operating in Duhok, such as:

- Art galleries – 10
- Cinemas – 2
- Churches – 5
- Soccer fields – 20
- Gyms – 20
- Swimming pools – 3
- Mosques – 3
- Parks – 4

Settlements in Dohuk Governorate have a long history, dating back to 8000 BC, the period of the Sumerians & Akkadians.

Dohuk's long history as a gateway to the Baghdad area and to the ancient cities in Iran has created a rich, distinctive cultural heritage. This culture is physically embodied by temples, churches, mosques, inscriptions, historic buildings, public art, historic public spaces and infrastructure.

A preliminary archaeological review was conducted for the project area in July 2013 along the entire 63 km road alignment, with specific attention being paid to Segments 2 and 3. This assessment was focused on the potential archaeological sites that might be located within a corridor of 1100 m width including the ROW of the two segments.

The main archaeological findings for the area of project activities are presented in Figure 6-17. A 1,100 m buffer zone is shown in the map, to enable the identification of significant sites (marked in black) that may be potentially impacted, in addition to other known sites that are located outside the 1,100m buffer zone.

Figure 6-17: Location Map for Known Heritage Sites Adjacent to Segment 3

6.7.6 Roads and Transportation

The length of the total primary and secondary networks, which have been surveyed in Kurdistan, is approximately 5,000km, split as shown in Table 6-18. This estimate excludes the roads under construction.

Table 6-18: Length of Transport Network in Kurdistan

Governorate	Highway (km)	Secondary (km)	Total (km)
Erbil	777.3	1124.5	**1901.7**
Duhok	559.6	852.4	**1412.0**
Sulaymaniyah	698.1	1269.4	**1967.5**
Total	**2034.9**	**3246.2**	**5281.2**

Table 6-19 shows the distributions of key attributes from the road inventory survey, in terms of the length of the road network with different characteristics, by road type and Governorate.

Table 6-19: Distribution of Road Length according to Land Use

Land Use	Duhok (km)			Erbil (km)			Sulaymaniyah (km)			Grand Total
	Highway	Secondary	Total	Highway	Secondary	Total	Highway	Secondary	Total	
Agriculture	48.2	132.2	176.9	27.5	147.1	170.2	66.0	187.4	249.8	591.5
Commerce	0.0	0.0	0.0	0.0	3.6	3.5	0.0	0.0	0.0	3.8
Industry	7.3	0.6	8.5	2.3	10.4	12.5	14.2	5.3	20.6	41.3
Residential	77.2	119.0	196.1	160.3	185.9	348.2	134.5	144.2	284.1	834.4
Vacant	426.9	593.4	1023.7	535.3	765.4	1301.1	471.7	917.2	1385.8	3706.1
Mixed use	0.0	1.2	1.1	49.8	0.0	52.8	0.0	0.0	0.0	57.9
N/A	0.0	6.0	5.7	1.9	12.1	13.5	11.6	15.3	27.3	46.2
Grand Total	559.6	852.4	1412.0	777.3	1124.5	1901.7	698.1	1269.4	1967.5	5281.2

General description of the roads network:

- Land use: a large part of the land use around the roads surveyed is vacant, which is what could be expected from inter-urban sites such as the highway and secondary roads surveyed. The second most common land use is residential, followed by agriculture.
- Road surface: the vast majority of the roads surveyed are asphalted.
- Topography: most of the terrain is characterized by "rolling", while the second most frequent topography is "mountainous".
- Road conditions: a significant proportion of the roads surveyed are in "excellent" condition. In Sulaymaniyah, approximately half of the road network is in "excellent" conditions. However, some 863 km of roads are in "critical" conditions, about half as much just in Erbil.
- Road signs: from the sites where signage has been found, the majority are in "good" conditions.
- Road markings: from the sites where markings have been found, most have been categorized as "eroded".

The provision and organization of public transport services varies widely within Kurdistan.

Table 6-20: Number of Public Transport Vehicles Operating in Duhok

Route Name	No. of Vehicles Operating at Station	
	Taxi	Bus
Duhok – Zakho	75	2
Duhok – Mosel	29	16
Duhok – Erbil	93	0
Duhok – Sarsange	13	0
Duhok – Amedi	15	0
Duhok – Mangesh	23	0
Duhok – Deraluk	17	0
Duhok – Bamarne	1	0
Total	266	18

6.8 Main Land Use Patterns

6.8.1 Agricultural Activity Pattern

Communities in the project area are developing increasingly diverse economic structure seeking to maximize the opportunities available to them from existing traditional lifestyles and the emerging mixed economy of Kurdistan. In effect they are seeking to gather the maximum benefit from their traditional ways of life and those of the urban dweller.

Notwithstanding the above, the rural communities of the project area remain predominantly agricultural and retain strong links to the land and social and economic structures of the past.

The cereals (barley and wheat) are produced at the average of 700 – 840 kg/ha sold at 800 US $ per ton.

Labor requirements in crop production are kept to a minimum. Once land is planted it is rarely tendered again until harvest. Moreover, those farming the land invariably have second jobs in the public service and army, and also keep sheep and goats for their own consumption.

These lands also play a significant role in the pastoralist economy providing grazing for the collective livestock herds. Loss of access to or non-cropping of these lands in the longer term could have a detrimental impact on local communities.

Figure 6-18 shows the parcels of land in Batil sub-district which a section of the TC passes through. Base maps were collected from Dohuk Agricultural Department.

6 – Krowin 19 – Karkel 77 – Khirbet Nour 75 – Kadia 74 – Turkshan
7 – Merga Sor 78 – Buraq 76 – Kolli 73 – Gersheen 68 - Batil
51 – Kr Othman 52 – Smail Ava

Figure 6-18: Map of Land Parcels at Project Area

The road crosses the lands that are jurisdiction of the Batil Agricultural Directorate. Most of the land areas are categorized as agricultural with the majority being rain-fed agriculture. Table 6-21 provides the breakdown of agricultural lands.

Table 6-21: Breakdown of Land Use under Batil Agricultural Department Mandate

Category	Area (Dunum)	Area (km^2)	Percentage (%)
Forests and rocky areas	68 939	172.35	31.3
Pastures	9 976	24.94	4.5
Cultivated areas	141 555	353.89	64.2
Total	**220 470**	**551.18**	**100**
Breakdown of cultivated areas			
Rain-fed cultivation (no formal lease agreements)	74 414	186.04	52.6
Irrigated cultivation (no formal lease agreements)	236	0.59	0.2
Rain-fed cultivation (formal lease agreements)	65 478	163.7	46.3
Irrigated cultivation (formal lease agreements)	276	0.69	0.2
Fruit Orchards	189	0.47	0.1
Vineyards	360	0.9	0.2
Irrigated by water channels	602	1.51	0.4
Total	**141 555**	**353.9**	**100**

6.8.2 Anticipated Development in the Area

Duhok Governorate is a highly urbanized area with approximately 70 % of the population living in cities. The population growth in Duhok center is 6.4 – 6.8 % over the past four years.

It is anticipated that by the year 2035 the population of the Governorate will increase almost by 5 %. The situation is exacerbated by the influx of refugees and IDPs due to the political situation in the region.

A Master Plan for Duhok is developed, as presented in Figure 6-19. The first stage is till the year 2017 and the second stage till the year 2035. According to the Master Plan, the expansion of the residential built up area is not envisioned in the project area.

At present, there is no specific Master Plan developed for the Siemel District. However, in the interviews with the local administration it was stated that it is envisioned that the area will stay predominantly agricultural, with a low density commercial and light industrial development along the road alignment.

Figure 6-19: Master Plan of Duhok[21]

[21] http://www.slideshare.net/waheedamustafa/urban-manegement-final

7 Project Impacts Assessment

This chapter of the ESIA report discusses the potential impacts related to the road construction and operation.

During construction phase the anticipated impacts are essentially of two types: On-Site impacts arising from the physical construction activities within the ROW and Off-Site impacts arising from the related activities undertaken elsewhere, such as construction camps, fabrication yards

7.1 Impacts Scoping

The impacts scoping was done using the Leopold Matrix. This matrix has: on the horizontal axis, the actions that cause environmental impact, and on the vertical axis, the existing environmental conditions that may be affected by those actions. This provides a format for comprehensive review of the interactions between proposed anthropogenic actions and environmental factors.

The scoping of impacts requires the definition of two aspects of each action, which may have an impact on the environment.

The first is the "magnitude" of the impact upon specific parameters of the environment. The term "magnitude" is used here in the sense of degree, extensiveness, or scale. Magnitude (in the left upper corner) is presented on scale from 1 to 10, 1 being the least and 10 being the highest.

The second is the "importance," i.e., the significance of the proposed actions on the specific environmental characteristics and conditions. Unlike magnitude of impact, which can be readily evaluated on the basis of facts, the importance of impact is generally based on a value judgment. Importance was also presented on the scale from 1 to 10 in the lower right corner. The impacts that might have indirect impacts, such as contamination of the surface water resources and soil with consequent infiltration into the underground aquifers and pollution of the groundwater resources used for drinking purposes were given higher importance value. Also, the impact on species significant on local, regional or global scale is also considered as more important. The numerical values of magnitude (quantitative) and importance (qualitative) reflect the best estimates of the impact of each action.

The impacts scoping matrix in presented in Table 7-1.

Table 7-1: Impacts Scoping and Significance Matrix

		Pre-Construction		Construction																	Operation and Maintenance				Total
	Parameter \ Project Activity	Delineation	Land Acquisition	Site Clearance	Road Resurfacing	Workforce Camp	Asphalt Plant	Equipment and Machinery Encampment	Effluent Disposal	Solid Waste Disposal	Construction Debris Disposal	Excavation	Fill	Embankment	Access Road	Culvert	Heavy Vehicles Movement	Paving	Pedestrian Crossing	Underpasses	Traffic Movement	Maintenance	Accidents	Spills and Leaks	
Physical	Topography/Landscape			5 2								6 2	6 2			6 2									23 8
	Soil				8 3	8 2	7 2	7 2	7 2	7 4	8 4	9 7	8 6	8 6	8 6	7 6	8 6	8 5	4 1	6 2	5 1	6 4	5 1	7 4	141 74
	Surface Water/Drainage			6 2	7 4	4 1	8 6	4 1	8 7	7 5	6 3	7 5	7 5	6 3	6 3	7 5	7 5	6 3	3 1	6 3	6 4	8 2	4 1	4 1	127 70
	Groundwater			5 4	5 4	5 3	5 4	4 1	7 5	7 5	7 4	5 5	4 2	3 1	7 5	7 6	4 2	4 2	1 1	5 1	4 1	5 5	3 1	6 5	103 67
	Air Quality			8 5	8 5	2 1	9 7	7 5	1 1	1 1	5 5	7 5	7 5	2 2	8 6	6 4	8 4	7 4	1 1	5 5	8 7	8 7	7 5	7 5	122 90
	Noise and Vibration			5 1	6 1	1 1	7 5	5 1	1 1	1 1	1 1	6 2	6 2	5 1	3 1	5 1	7 3	7 4	2 2	5 2	5 1	6 1	1 1	1 1	86 34
Biological	Flora			1 1	1 1	1 1	1 1	1 1	1 1	1 1	1 1	5 1	5 1	1 1	5 1	6 5	1 1	4 2	1 1	1 1	1 1	1 1	1 1	1 1	41 26
	Fauna			1 1	1 1	1 1	1 1	1 1	1 1	1 1	1 1	5 1	5 1	1 1	5 1	6 5	1 1	4 2	1 1	1 1	1 1	1 1	1 1	1 1	41 26
	Micro-habitats			5 5	5 5	1 1	4 2	5 5	6 5	6 5	6 5	7 5	7 5	4 1	6 5	9 7	5 5	5 4	4 1	7 5	3 1	5 5	2 2	5 5	107 84
	Crops		8 7	7 2	5 1	1 1	1 1	1 1	1 1	1 1	5 2	6 4	6 4	1 1	7 5	4 1	5 1	1 1	1 1	1 1	1 1	1 1	1 1	1 1	66 40
	Livestock Grazing		5 5	1 1	1 1	1 1	1 1	1 1	1 1	1 1	1 1	4 2	4 2	4 1	4 3	6 5	7 5	1 1	2 2	8 5	1 1	5 4	1 1	1 1	61 46
	Migratory Birds			2 2	2 2	2 2	2 2	2 2	2 2	2 2	2 2	2 2	2 2	2 2	2 2	2 2	2 2	2 2	2 2	2 2	2 2	2 2	2 2	2 2	42 42
	Habitats Fragmentation			5 5	5 4	3 1	2 1	3 1	5 2	5 4	5 5	6 4	6 4	4 1	7 5	5 5	3 1	3 1	1 1	5 2	1 1	5 2	1 1	5 1	85 52
Social	Land use	6 4	7 5	2 2	2 2	2 2	2 2	3 2	4 3	5 4	6 4	6 5	6 5	1 1	7 5	2 2	5 4	1 1		5 5		3 3			75 61
	Structures and Fixed Assets	5 5	7 5	5 5																					17 15
	Utilities		6 4	5 5																					11 9
	Disruption of Livelihood		7 5	4 4								7 5	5 3		8 5		5 4				5 3	6 5			47 34
	Aesthetic value			5 2								6 4	5 2												16 8
	Health and Safety			5 4	5 4	5 4	5 4	5 4	5 4	5 4	5 4	5 4	5 4	5 4	5 4	5 4	5 4	5 4	8 7	8 7	5 4	5 4	5 4	5 4	111 90
	Cultural/Historic/Religious Facilities and Amenities		1 1	1 1								1 1				1 1				1 1					5 5

The negative environmental and social impacts of the construction activities of the project are expected to be relatively minor to moderate and short-term. None of the identified negative impacts of individual construction activities was scored as particularly significant.

The project activities with the highest number of identified negative impacts are:

- Potential alteration of surface water courses.
- Increased level of soil erosion and potential soil contamination.
- Generation and disposal of construction waste;
- Operations of the construction camp.
- Physical aspect mostly affected by the project activities is air quality.
- The most sensitive ecological aspect of the receiving environment is found to be habitat fragmentation.
- The ecological aspects mostly affected by the construction of underpasses and culverts regarding riparian habitats in the vicinity of seasonal run-off valleys and remnants of natural vegetation.
- Negative social impacts of the construction phase of the project are related primarily to land acquisition of PAPs without legal rights on agricultural activities and acquisition of the total parcel of land from one business entity, which has encroaching on the ROW.
- Disturbance to business activities due to restriction of access during construction;
- Road users and labor safety.
- The social aspects related to encroachers on the ROW will be addressed through the implementation of a Resettlement Action Plan (RAP).

This chapter provides detailed description of the most significant impacts.

7.2 Anticipated Adverse Impacts during Construction Phase

7.2.1 Land Acquisition

In total of 171.18 ha of land are to be acquired permanently for the project as a 100 m ROW including the land required for the ROW, intersections, culverts and underpasses, lay-bys and servicing areas. The area is devoid of any kind of industrial, commercial and residential activities. The only land use in the area is agricultural, predominantly grazing of livestock and partially cultivation of wheat and barley. As mentioned above the land along the alignment is communal property without demarcation of borders between plots of individual land users. Table 7-2 shows PAPs grouped under 16 locations, each comprising people residing in the particular village.

The detailed breakdown of the land acquisition is presented in the Table 7-2:

Table 7-2: Land Acquisition for Segment 3: Gersheen - Suhaila Interchange[22]

#	District	Land Plot No.	Land Parcel No.	Total Land Area (m^2)	Area of Land to be Acquired	Land User	
					m^2	%	
1	Krowin	6	2	4,635,000	284,000	6.12	PAP_G1
2	Merga Sor	7	2	3,267,500	150,000	4.59	PAP_G2
3	Merga Sor	7	1	4,540,000	162,000	3.57	PAP_G3
4	Karkel	19	2	1,687,500	90,000	5.33	PAP_G4
5	Karkel	19	6	909,100	65,000	7.15	PAP_G5
6	Buraq	78	1/18	4,407,500	179,000	4.06	PAP_G6
7	Buraq	78	1/29	470,000	29,000	6.17	PAP_G7
8	Buraq	78	1/30	200,000	24,000	12.0	PAP_G8
9	Buraq	78	1/19	2,455,000	55,000	2.24	PAP_G9
10	Khirbet Nour	77	1	4,555,000	200,000	4.39	PAP_G10
11	Kolli	76	1/1	198,950	18,800	9.44	PAP_G11
12	Kolli	76	1/5	1,869,500	46,000	2.46	PAP_G12
13	Kadia	75	1/1	690,000	45,000	6.52	PAP_G13
14	Kadia	75	1/3	6,022,500	162,000	2.69	PAP_G14
15	Turkshan	74	1/4	1,634,500	130,000	7.95	PAP_G15
16	Gersheen	73	1	1,073,000	72,000	6.71	PAP_G16
Total land area to be acquired:					1 711, 800		

[22] The names of land users in the table are the names of legal entities recognized by the state.

Crop losses: The PAPs in the area have not sustained the crop losses since they were allowed to collect the standing crops prior to land acquisition. The cereals (barley and wheat) are produced at the average of 700 – 840 kg/ha[23]. The Compensation Committee estimated the crop losses on the following basis: the year following the land acquisition all lands will be planted with wheat with the production rate of 500 kg/dunum[24].

The estimate of the crop losses is about 376 tons[25] of cereals, the market value of which is approximately 800 US $ per ton.

Livestock grazing: although there are no specific designated areas for livestock grazing, land acquisition may potentially reduce the areas available for livestock grazing. This impact is estimated as minimal.

Disruption of livelihood: The land acquisition of agricultural areas although not significant might potentially be detrimental to livelihoods of PAPs due to their dependence on agriculture as a primary source of income. It is estimated that 51.2 % of PAPs depend entirely on agriculture for their income.

The impact on cultural, religious and historical sites is considered negligible, since no such sites were identified during survey to be located within the ROW.

7.2.2 Anticipated Impacts on Water Resources

Local alteration of water flow and drainage is likely to occur due to the construction of embankments and also due to the disposal of cut/debris material in rolling terrain. Temporary dislocation of existing drainage patterns is inevitable during road construction as cut and fill operations are undertaken. Adverse environmental impacts may include the following:

- Ponding, causing a threat to public health and safety, a concentration of nuisance insects and damage to surrounding soils and vegetation;
- Localized raising of water tables increasing risk of pollution of surface waters such as increased turbidity and electric conductivity;
- In extreme cases, flooding upstream of the construction activities causing damage to land, crops and property.

Water contamination is relatively minor and generally limited to areas around bitumen coating plants, fuel storage tanks and similar facilities. Main contaminants are hydrocarbons. Of potentially greater concern is the potential for spillages of chemicals and hydrocarbon products to

[23] http://www.fao.org/countryprofiles/index/en/?iso3=IRQ
[24] Iraqi Dunum – 2,500 m^2
[25] Metric tons

pollute watercourses and eventually infiltrate into the underlying aquifers, thus causing pollution of the groundwater resources. However, should pollution occur it is unlikely to be of a magnitude that will seriously affect the present land uses adjacent to the ROW.

Another potential source of pollution is disposal of the raw sewage (Faecal column and ammonia) from the construction camp directly into the water courses as it is a common practice in the area. Disposal of generated solid waste from the construction camp and construction debris on ad hoc basis as is also the common practice in the area may potentially be the source of groundwater contamination due to leaching of contaminants into the soil and eventually infiltrating into the aquifer.

7.2.3 Anticipated Impacts on Soil

Increased rates of erosion and sedimentation, especially in the vicinity of existing water courses may be the most severe impact. Increased erosion can be caused by:

- Installation of temporary discharge points in areas of substantial cut and fill;
- Clearance of the vegetation cover where exposure is over a long period and work is undertaken in rainy conditions;
- Cut and fill activities in unstable areas where the material is prone to erosion. Generally, newly cut slopes and land embankments are often very susceptible to erosion. Particular care will be required where cut operations intercept water tables, springs and other surface drainage features.
- Aggregate, fill and spoil heaps stored pending re-use and also highly susceptible to erosion due to their loose and unconsolidated nature.

As is the case with the water resources the soils in the vicinity of the ROW may be subject to pollution from accidental spillages of chemicals and hydrocarbon products and around the auxiliary facilities.

Loss of productive fertile soil is also identified as one of the moderate impacts on the soils in the area due to the excavation.

7.2.4 Damage to the Landscape

Construction sites are inherently unsightly and may impart substantial visual impact until excess soil and abandoned materials and equipment are cleared away on completion. Other temporary damage to the landscape may accrue from excessive ground clearance beyond ROW and other agreed working areas, such as borrow pits and waste disposal areas.

7.2.5 Anticipated Impacts on Biodiversity

The physical earthworks and associated noise, dust and increased human activity associated with the construction sites frequently causes a temporary reduction of biodiversity even where the range of flora and fauna are able to re-establish themselves on completion of works albeit over several breeding/growing seasons.

The impacts on flora populations are associated with vehicle movements beyond ROW and other agreed working areas, and in some cases unplanned burning. However, the impact is considered low due to the absence of threatened or endangered species and ability of self-re-vegetation. Seeds caught up in stripped topsoil may remain dormant in spoil heaps until re-spread for final landscaping.

The impacts on fauna are estimated as more severe than on flora, in a range of moderate to high due to the fact that faunal species are less resistant to permanent derogation. Fauna may suffer reduction in biodiversity through destruction of dens, burrows and nests, clearance of feeding grounds, increased traffic kills and possible illegal hunting by off-duty construction workers. Especially sensitive to this kind of impact are migratory birds.

The disruption of wildlife movement and foraging patterns are also anticipated during construction phase.

Although the project area is used for agricultural activities for a long period of time, there is a possibility of habitat fragmentation of the remnants of natural and semi-natural habitats, which eventually might lead to decline in biodiversity in flora and fauna. However, this impact is considered as relatively low.

7.2.6 Anticipated Impacts on Air Quality

Dust is likely to have a rather more serious impact than emission gases during the construction stage due to the large volumes of excavation and earth moving with heavy equipment in mostly dry conditions. Other dust generating construction activities include stone crushing operations, handling and storage of sand and aggregates in the asphalt plants, concrete mixing plants and due to the movement of aggregates. The impacts of dust will be mostly concentrated within the construction sites and stone crushing sites. The impact of dust will spread downwind of the site for a considerable distance of up to 1000 m on windy days.

Another factor that will impact the air quality will be the exhaust emissions of the construction machinery and auxiliary vehicles movement. During the construction stage, negative impacts on air quality will be temporary and will affect the health of construction workers. However, since the new road alignment was defined to avoid proximity to settlements as much as possible, there are relatively few sensitive receptors close to the road alignment or within direct impact area.

7.2.7 Noise Impacts

According to the Environmental Protection Agency (EPA) standards, the maximum acceptable L_{eq} are summarized in Table 7-3. The maximum permissible noise limits, in terms of equivalent continuous noise level dB (A), for different areas set by the Jordanian Ministry of Environment (1997) are presented in section 6.1.6.

Table 7-3: EPA Maximum Acceptable L_{eq} (2005)

Location	Effects	Maximum L_{eq}	Day time
Bedroom	Sleep disturbance annoyance	30	Night
Living room	Annoyance, speech interference	50	Day
Outdoor classroom	Moderate-serious annoyance	50-55	Day
Outdoor living area	Sleep disturbance, with open windows	42	Night
School classroom	Speech interference, communication disturbance	35	Day
Hospitals patient room	Speech interference, communication disturbance	30-35	Night and day

During the construction phase there will be unavoidable noise and vibration generation due to the operation of various types of equipment, and due to rock blasting at certain locations. The typical noise levels, in dB(A) at 5m, 20m, and 50 m distance from the noise source, associated with the corresponding construction equipment are presented in Table 7-4. Table 7-5 summarizes noise levels from the equipment expected with the various types of activities at different construction stages.

Table 7-4: Noise Emission Levels dB(A)

Type	**Distance between Equipment and Recipient**		
	5m	**20m**	**50m**
Loader	90	78	70
Grader	90	78	70
Vibration Roller	86	74	66
Bulldozer	86	74	66
Sprayer	87	75	67
Generator	98	86	78
Impact drill	87	75	67
Impact piling	112	100	92

Type	Distance between Equipment and Recipient		
	5m	20m	50m
Concrete mixer	91	79	71
Concrete pump	85	70	62
Pneumatic hammer	84	86	78

Table 7-5: Noise Emission Levels dB(A) of Construction Equipment

Clearing		Structure Construction	
Bulldozer	80	Crane	75-77
Front End Loader	72-84	Welding Generator	71-82
Jack Hammer	81-98	Concrete Mixer	74-88
Crane with Ball	75-87	Concrete Pump	81-84
		Concrete Vibrator	76
Excavation & Earth Moving		Air Compressor	74-87
Bulldozer	80	Pneumatic Tools	81-98
Backhoe	72-93	Bulldozer	80
Front End Loader	72-84	Cement and Dump Trucks	83094
Dump truck	83-94	Front End Loader	72-84
Jack Hammer	81-98	Dump truck	83-94
Scraper	80-93	Paver	86-88
Grading and Compacting		**Landscaping & Clean-Up**	
Grader	80-93	Bulldozer	80

It is therefore expected that during the construction stages the noise levels will be exceeding the EPA standards. However, since the construction stage is temporary and the nearest residents live at a distance of nearly 2 km from the alignment, noise would not be a major deterrent for the project.

7.2.8 Waste Generation

During construction phase the main sources of liquid waste generation are:

- Sewage from offices, accommodation blocks and canteens;
- Wastewater containing high suspended solids;
- Oil residues and industrial fluids from washing of plant and vehicles;
- Waste oil, grease and de-greasing solvents from vehicle and plant servicing.

Oil residues, chemical fluids, waste oil and solvents are considered hazardous waste. Volume of hazardous waste is considered to be small and limited to servicing of vehicles and machines.

The main sources of solid waste are:

- Construction debris such as discarded materials from road resurfacing, unused excavated aggregate materials;
- Residential containing organic waste from construction camps (approximately1.5 kg/person/day);
- Paper, discarded packaging and crates, redundant plant, used tyres and broken or failed concrete products.

The main impact of the inadequate waste disposal is potential contamination of soil and surface water resources, eventually infiltrating to groundwater resources.

7.2.9 Construction Camp Impacts

The camp is located on the vacant public property land in agreement with the local beneficiaries. The construction camp has a number of facilities that if not adequately managed might potentially be detrimental to the environment. The impacts of the construction camp are considered as moderate and limited in magnitude and duration. The construction camp activities, which can cause an impact are:

- Housing of construction crew and canteen;
- Storage of construction materials;
- Parking lot and maintenance area for the construction machinery and equipment;
- Septic tank for the housing and canteen and disposal of effluent;
- Accidental spillage of hazardous materials;
- Accumulation of discarded and excessive materials;
- Accumulation of construction debris and residential solid waste.

The most significant impact of the construction camp is potential soil contamination and consequent contamination of shallow aquifer.

7.2.10 Resources Use

Significant granular material will be used in the project for road sub-base and as primary constituent of concrete. The estimated quantities are presented in the Annex 1. The contractor will purchase the materials from the existing quarries located close to the Tigris River, approximately 20 km west from the road alignment. The main risks associated with haulage of the materials.

- Increased heavy vehicular traffic on certain sections of the existing primary network and some local roads;
- The increase in HGV turning movements and the implications for the free flow of the existing traffic;
- Foreign matter such as mud and loose chippings being deposited on roads.

As has been mentioned previously the project will require substantial amounts of water for the provision of the water supply to the construction camp and yards as well as for the compaction of the fill. It is envisioned that the water supply will be provided from the existing privately owned wells. The water haulage will mostly create the impact in terms of the vehicle movements similar to the haulage of materials from the borrow pits and quarries.

7.2.11 Impacts on Cultural, Religious and Historic Heritage Sites

During the survey stage, no cultural, religious or historic heritage sites were identified in the vicinity of the project, as shown in the map in section 6.6.5. However, during the construction phase the chance find is possible. In such case, the procedure for dealing with such cases should be applied.

7.2.12 Public Safety

The risk to public safety posed by the construction activities will be substantial. Areas of most danger to public include:

- Locations where heavy plant and heavy equipment are moving in and out of contractor's yards;
- The sites of excavation, particularly before they are stabilized;
- Locations where heavy plant and equipment are moving around interchange and road crossing sites;
- At storage areas for construction materials, fuel and surplus spoil.

There will be also increased risk of traffic accidents where diversions from established routes are imposed or altered without adequate warning. There is also the probability for unauthorized use of the ROW for local access and at night.

7.2.13 Worker's Safety

All construction sites are inherently unsafe. The substantial risks to public safety as discussed above are limited by occasional and casual acquaintance the public will generally have with the proposed construction activity. For those employed on the project the risks are more varied and omnipresent.

However, if the risks to workers on construction sites are well understood and documented and internationally accepted Health and Safety procedures are followed, they are easily minimized.

7.2.14 Disturbance to Local Settings

During the construction phase it is anticipated that there would be some disturbance to local settings, such as:

- Interrupted provision of public utilities and services;
- Restriction of movement of livestock which is normally wonders freely over the area;
- Difficulties and extended time to travel to access urban centers and medical centers;
- Disruption of the food assistance delivery services due to the restriction of access during certain periods.

7.3 Anticipated Adverse Impacts during Operational and Maintenance Phase

This section of this chapter discusses the potential traffic-related environmental impacts that may accrue during the operation and maintenance of the road.

7.3.1 Air Quality

The degradation of ambient air quality might have a detrimental effect on human health affecting respiratory, cardiovascular and nervous systems. However, it must be noted, that there are no residential settlements in the vicinity of the road alignment of Segment 3.

Environmental effects of the vehicle emissions include acidification of soil and surface waters, adverse effects on crops and animal species, and damage to buildings and structures.

During the operational phase the main impacts on the ambient air quality are expected to be from the traffic using the road. Traffic types include short distance trips, long distance traveling and goods transportation with cars, public transport vehicles and small, large and heavy trucks.

The air pollution model MOVES (Motor Vehicle Emission Simulator) has been proposed for estimating anticipated air emissions from mobile sources during the operation of the highway. MOVES was developed by the USA Environmental Protection Agency to cover wide range of vehicles. The software has a huge capability of estimating emission for different scales (country, governorate, and small areas).

MOVES was used for predicting emission for the Segment 3 of the Road no. 2.

The following type of input data were needed for the model

1- Geographical descriptions
2- Traffic data
3- Fuel type
4- Components of the vehicles fleet
5- Age and distribution of the vehicles age.
6- Climate data

The following data were obtained from the traffic study:

Table 7-6: Traffic Data

Travel Direction	Passenger Car	Pickup	Light Vehicle	Bus	2-axle	3-axle	>=4 axle	Total

In 2013	1,218 (26%)	562 (12%)	141 (3%)	47 (1%)	141 (3%)	281 (6%)	2,295 (49%)	**4,684**

MOVES used different nomenclature than names mentioned in the traffic study. Therefore, vehicle matching was performed between the traffic study and MOVES vehicles types:

Table 7-7: Vehicle Types

Traffic study name	MOVES name
Passenger cars	Passenger cars
Pickup	Passenger trucks
Light vehicle	Light commercial trucks
Buses	Intercity buses
2-axle	Single-unit short-haul truck
3-axle	Single-unit long-haul truck
4-axle and more	Combination long-haul truck

Scenario 1: Peak Hour Traffic

Emissions during the peak hours are considered the highest. Therefore, peak hour traffic was calculated using a transformation factor applied on the Average Annual Daily Traffic (AADT). A factor of 20% was chosen. Emission results from MOVES are shown below.

Table 7-8: Scenario 1

Source	CO (g/mi)		Formaldehyde (g/mi)		NOX (g/mi)		PM (g/mi)	
	Model Output	EPA Emissions Standard	Model Output	EPA Emissions Standard	Model Output	EPA Emissions Standard	Model Output	EPA Emissions Standard
Passenger Car	17.186	3.4	0.002	0.015	1.039	0.4	0.005	0.04
Passenger Truck	1.123	4,2	0.000	0.018	2.553	0.4	0.068	0.08
Light Commercial Trucks	1.333	1.7	0.022	0.022	3.267	0.8	0.089	0.08
Intercity Bus	2.240	2.2	0.039	0.027	11.504	3.8	0.234	0.5
Single-unit Short-Haul Truck	1.935	2.5	0.037	0.022	11.185	3.8	0.141	0.5
Single-Unit Long Haul Truck	1.933	6.4	0.035	0.035	11.170	3.8	0.136	0.5

Combination Long Haul Truck	2.219	6.8	0.037	0.035	11.471	3.8	0.271	0.5
LDV Standards	4.4	4.4	0.018	0.027	0.3	3.8	0.04	0.5
HDV Standards	7.3	7.3	0.032	0.035	0.2	1.5	0.02	0.5
Aggregate	39.669	40.7	0.222	0.236	52.689	22.1	1.004	3.2

LDV: Light duty vehicles; HDV: Heavy duty vehicles.

Results show that passenger cars will exceed EPA standards for CO and NOx emissions and comply with the standards for particulate matter and formaldehyde. On the other hand, trucks and other vehicle that runs on diesel will exceed the NOx and PM standards and comply with CO standards and slightly exceeded it for Formaldehyde.

Scenario 2: forecasted traffic for 2035

In this scenario, emissions were estimated based on a projected increase of 100% in traffic volumes. Results from MOVES for this scenario came out as follows:

Table 7-9: Scenario 2

Source	CO (g/mi)		Formaldehyde (g/mi)		NOX (g/mi)		PM (g/mi)	
	Model Output	EPA Emissions Standard	Model Output	EPA Emissions Standard	Model Output	EPA Emissions Standard	Model Output	EPA Emissions Standard
Passenger Car	17.184	3.4	0.002	0.015	1.457	0.4	0.005	0.04
Passenger Truck	1.135	4,2	0.013	0.018	3.806	0.4	0.065	0.08
Light Commercial Trucks	1.339	1.7	0.017	0.022	4.943	0.8	0.101	0.08
Intercity Bus	2.239	2.2	0.038	0.027	18.799	3.8	0.236	0.5
Single-unit Short-Haul Truck	1.933	2.5	0.037	0.022	18.706	3.8	0.139	0.5
Single-Unit Long Haul Truck	1.932	6.4	0.036	0.035	18.697	3.8	0.136	0.5
Combination Long Haul Truck	2.219	6.8	0.037	0.035	18.790	3.8	0.271	0.5
LDV Standards	4.4	4.4	0.018	0.027	0.3	3.8	0.04	0.5

HDV Standards	7.3	7.3	0.032	0.035	0.3	1.5	0.04	0.5
Aggregate	39.681	40.7	0.23	0.236	85.798	22.1	1.033	3.2

The results indicate similar results to the results from peak hour traffic. CO and NOx from passenger cars are expected to exceed the EPA standards while Formaldehyde and PM are expected to comply with the results. For heavy duty vehicles, CO emissions are expected to comply while Formaldehyde, NOx and particulate matter are expected to exceed it.

Scenario 3: Worst case

Simulation was conducted for the worst traffic and weather conditions. Vehicles are assumed to be in a status of extended idle condition with a very low cruising speed. In addition, poor weather conditions were assumed. Results from MOVES came as follows:

Table 7-10: Scenario 3

Source	CO (g/mi)		Formaldehyde (g/mi)		NOX (g/mi)		PM (g/mi)	
	Model Output	EPA Emissions Standard		EPA Emissions Standard	Model Output	EPA Emissions Standard	Model Output	EPA Emissions Standard
Passenger Car	111.700	3.4	0.011	0.015	9.474	0.4	0.014	0.04
Passenger Truck	7.360	4,2	0.080	0.018	24.512	0.4	0.208	0.08
Light Commercial Trucks	8.695	1.7	0.116	0.022	32.126	0.8	0.295	0.08
Intercity Bus	14.540	2.2	0.243	0.027	122.030	3.8	0.699	0.5
Single-unit Short-Haul Truck	12.568	2.5	0.234	0.022	121.611	3.8	0.437	0.5
Single-Unit Long Haul Truck	12.561	6.4	0.233	0.035	121.545	3.8	0.412	0.5
Combination Long Haul Truck	14.423	6.8	0.243	0.035	122.135	3.8	0.747	0.5
LDV Standards	4.4	4.4	0.018	0.027	0.3	3.8	0.04	0.5
HDV Standards	7.3	7.3	0.032	0.035	0.2	1.5	0.04	0.5
Aggregate	193.547	40.7	1.21	0.236	553.933	22.1	2.892	3.2

Results indicate significant limits exceeding under such an extreme conditions. Formaldehyde and PM will remain within limits for passenger cars, and carbon monoxide (CO) will be under limits for heavy duty trucks.

Current information indicates that the closest village and inhabited areas are at least 3 km away from the project. Such distance should be enough to disperse emissions from vehicle and have near no harm on the village. However, close habitats may be affected.

7.3.2 Noise and Vibration

In Duhok, there was no available database of historic traffic noise data on major highways. Since noise level measurements were not available, and in order to estimate the expected noise levels upon the operation of segment 3, a noise prediction model was used. The input of the model included Duhok climatic data as well as the projected traffic data. The traffic data included vehicle classification, speed of vehicles, as well as pavement surface conditions and characteristics.

Temperature is important since it affects the speed of sound. Heat, like sound, is a form of kinetic energy. Molecules at higher temperatures have more energy, thus they can vibrate faster. Since the molecules vibrate faster, sound waves can travel more quickly. In Duhok, mean minimum temperatures measured between 2003-2012 in January (3.44°C) and the highest monthly average temperature in July (41.4 °C). The average temperature for the ten years period was 20.75 °C.

The speed of sound is also affected by other factors such as humidity and air pressure. The prevailing wind direction at the project area is South-East and sometimes tends to South- West and North-West. Wind speed is generally of light to moderate value with wind speeds between 0.74m/s at times in November and 1.20m/s at other times April to July.

The output of the model was L_{eq} of 56 dB(A) and 49 dB(A) during the day and night, respectively. It is worth noting that the right-of-way of the highway is 100m, and closest recipients are within at least 3 km from the highway alignment. The noise level at this distance is expected to be 40 dB(A) and 32 dB(A) during the day and night, respectively. These levels are acceptable and within the EPA standards. In conclusion, noise would not be considered a major environmental impact of the project.

Vibration due to traffic takes the form of a low frequency disturbance that produces physical movement in buildings and their occupants that can be transmitted through the air or the ground. The frequency of air born traffic vibration is typically less than 200 Hertz, with the dominant frequencies 50 – 100 Hz. Ground born vibration produced by interaction between wheels and the road surface is typically of lower frequency, 8 – 20 Hz. Poor road condition is the prime factor in determining the susceptibility of buildings to traffic vibration which will not apply to the newly constructed road.

The UK's Department of Transport recommends assessments of impacts due to increased vibration use the same indicators used for assessment of noise. In the absence of any other standard, analysis in respect of the Segment 3 has followed this approach. Vibration impacts are therefore assumed to be identical to those from noise and thus equally limited.

7.3.3 Impacts on Water Resources

All watercourses in the region are seasonal and there is little potential for pollution since contaminants will be dispersed or captured between flow events. An average annual daily traffic flow is estimated well below 20,000 vehicles/day threshold for significant highway pollution from normal runoff following rainfall events.

Water levels and the nature of geological strata in the project area do not promote contamination of groundwater by normal runoff. Water resources and soil contamination is probable due to accidental spills of hazardous materials.

There is a minor risk of flooding of the drainage channels and alteration of discharge patterns.

7.3.4 Impacts on Biodiversity

Physical separation by road structure will potentially have the following impacts:

- Habitat fragmentation
- Incidents of road kill of wild animals

These impacts are anticipated to be low due to the fact that the area has been developed for millennia and there are only few remnants of natural habitat. Also, there are no habitats of specific importance in the project area.

As far as the birds population, there are two local bird species listed in the IUCN Red List: Finsch's Wheatear (*Oenanthe finschii*) – winter visitor, and Corn crake (*Crex Crex*) – passage migrant. Both species are listed as being of least concern due to their large population elsewhere. The habitat for the Corn crake is high grass – hence it is extremely unlikely that this species is found in the vicinity of the project, which is heavily used for agriculture. The Finsch's Wheatear feeds on insects. Its population may be disturbed by elevated noise levels.

7.3.5 Public Safety

The major concerns for public safety during the operational stage are:

- Traffic accidents: the majority of accidents are caused by driver error or the actions of the pedestrians and relatively few by the road infrastructure, there is nevertheless a relationship between accidents and design weaknesses, poor road information and similar factors. The

use of appropriate design standards and signage will ensure the required standard of safety is met.

- The transport of hazardous materials poses a potential risk to people and the environment in the event of the accident. Specific emergency response procedures need to be developed for effectively dealing with accidents involving potentially hazardous materials.
- Potential for accidents involving pedestrians and livestock

7.3.6 Landscape Maintenance

The main cause of concern in respect of the maintenance of the landscape planting is the use of chemical fertilizers, pesticides and herbicides, causing damage to flora and fauna, and to the public and to maintenance workers. However, the impacts of landscape maintenance are expected to be low.

7.3.7 Highway Maintenance

Two primary sources of potentially adverse impacts arising from highway maintenance are waste disposal and accidents involving maintenance workers and/or traffic flow modifications during road maintenance.

The potential in respect of waste disposal is primarily due to the often heavily contaminated material removed during drain clearance operations, which will need to be disposed of appropriately.

The risk of accidents can be greatly reduced by effective planning of activities, including adequate use of warning signs and site supervision.

7.4 Potential Benefits/Positive Impacts

Among the benefits to the population and businesses of the area are:

- Ease of access: currently the area is not serviced by healthcare and educational facilities and access to the main urban centers is restricted due to the condition of the road. Road upgrading will improve the access to the urban centers.
- Business Development Opportunities/Secondary Induced Development: rest houses and coffee shops could be established along the road targeting the drivers going through the area.
- Employment Opportunities: the residents of the area will have improved employment opportunities, being employed during construction phase and later during operational road maintenance.
- Increase of the privately owned real estate value.

In addition, induced development is expected to generate significant benefits in the following areas:

- Improved road safety
- Improved infrastructure facilities, including improved sewerage system, water and electricity supply;
- Stimulate investment and industrial expansion;
- Provision of the underpasses for livestock movements;
- Landscape enhancement through planting of trees along the road alignment.
- The newly proposed road will offer a conduit between the newly commenced Duhok International Airport, Southern Kurdistan, the broader Iraq community, and Turkey.
- Economic benefits in terms of reduced time to travel and consequently reduction of fuel consumption.

7.5 Indirect and Cumulative Impacts

Generally, new roadways encourage new or additional development, in large part, because of the improvements in accessibility they provide. The induced development is viewed as positive impact in terms of economic growth; however, the induced development can potentially have negative environmental impacts.

7.5.1 Indirect Impacts

Indirect impacts are defined as "caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable".

The construction activities such as transportation of materials, excavation, fill, clearance contribute to dust generation and vehicle and equipment emissions which settle on soils and in run off during dry season consequently contributing to the transport of sediments and pollutants to the main water bodies and infiltration into the shallow aquifer.

Inadequate waste management and accidental spills of hazardous materials could potentially have an impact on the groundwater quality. The impact is exacerbated by inadequate waste management practices in the project area.

Difference in land use is equivalent to the direct project impacts; thus, the indirect land use impacts are negligible in terms of total area and involve minor changes in agricultural patterns. The induced development might potentially involve change from agricultural to low density commercial/industrial development.

Road construction and operation might have a minor impact on permanent vegetated habitat loss.

7.5.2 Cumulative Impacts

Cumulative impact is defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions".

The main causes of the cumulative impacts are:

- Increase of impervious surfaces: road pavement and increase in built up area due to the induced development;
- Increase of traffic flow;
- Dramatic increase of population, in addition to the population growth in the area there is a significant influx of refugees and IDPs.

The main cumulative impacts are:

- Increases in impervious surface have a direct effect on water storage and flow in a watershed. As the amount of impervious surface increases, runoff increases in velocity, quantity, temperature, and pollution load. In addition, impervious surfaces prevent natural pollutant filtering by preventing percolation. Impacts in one area can potentially have a water quality effect downstream.
- Land use and farmland conversion: induced development will contribute to the change of agricultural land use to the low density commercial/industrial mix alongside the road alignment.
- Incremental effect of construction waste disposal on waste management in the area.
- Incremental impact of habitat fragmentation.

7.6 Irreversible Impacts

Irreversible impacts are defined as "Uses of nonrenewable resources during the initial and continued phases of the project may be irreversible since a large commitment of such resources makes removal or use thereafter unlikely. Primary impacts and, particularly, secondary impacts (such as highway improvements which provide access to a previously inaccessible area) generally commit future generations to similar uses. Also irreversible damage can result from environmental accidents associated with the project".

Nonrenewable resources generally include biological habitat, agricultural land, mineral deposits, water, and some energy sources.

Growth inducing effects of the proposed project at the local level could result in long-term commitment of resources to urban development.

Relatively minor impacts would occur to previously disturbed habitats, non-native vegetation communities and agricultural lands. These environmental changes are considered irreversible, but not significant.

The approved alignment alternative would result in the permanent acquisition of approximately 250 ha of agricultural lands. Within the acquired lands there are relatively small remnants of natural and semi-natural habitats. Additionally, the long-term use of the road will have the impact on air quality and noise.

The irreversible impacts are considered minor and include:

- Change of land use pattern;
- Habitat fragmentation;
- Impact on air quality and noise.

7.7 Alternatives Evaluation

As stated in the TOR for the project there would be no alternative road alignments and major changes to the proposed design. The evaluation of alternatives was done by comparison of the discussed in Chapter 2 proposed development alternatives. The criteria developed for the alternatives evaluation are based on the impacts' severity (Table 7-11).

Table 7-11: Criteria for Impacts Evaluation

Severity of Impact	Value
Minor negative	-1
Minor positive	1
Moderate negative	-2
Moderate positive	2
High negative	-3
High positive	3
Negligible or no change to existing situation	0

Alternatives evaluation in terms of the anticipated impacts on the different environmental and socio-economic parameters is presented

Table 7-12

Table 7-12: Alternatives Evaluation

Parameter	Key Issue	Alternative 1	Alternative 2	Alternative 3	Alternative 4 (Selected by GDRB)
Physical Environment	Noise	-2	-2	-1	0
	Dust and Emissions	-3	-2	-2	-1
	Landscape	-3	-3	-3	-2
	Water resources	-3	-3	-3	-3
Biological Environment	Pressure on flora and fauna	-1	-1	-2	-2
	Habitat fragmentation	0	-1	-1	-1
Socio-Economic Environment and Settings	Land acquisition	-3	-3	-2	-1
	Employment opportunities	2	2	2	1
	Services/Utilities	2	2	2	2
	Accessibility	3	3	3	3
	Secondary induced development	2	2	2	2
	Economic benefits (reduced time to travel)	3	3	3	3
Cultural, religious, historic sites	Potential destruction of archeological sites	0	0	0	0
Health and safety	Traffic accidents	-1	-1	-1	0
Total Aggregate		**-4**	**-4**	**-3**	**1**

The proposed development will potentially have negative impacts during construction phase, which are limited in the magnitude and duration. However, the benefits of the road expansion in terms of the secondary induced development, improved accessibility and improved public health and safety outweigh the negative project impacts.

Alternatives 1, 2 and 3 will not provide additional socio-economic benefits or at a very minimal level, and potentially detrimental to public safety due to the number of road accidents as a result of inadequate road condition. Also, the requirements for land acquisition in these areas are much higher.

In terms of impacts on the environment they are almost the same for all alternatives. The impacts of noise and air pollution for the chosen Alternative 4 is expected to be much less than for the other alternatives due to its distance to the residential areas.

The impacts on biological environment, especially on habitat fragmentation, are potentially more severe for the Alternative 4 due to the presence of natural habitats.

8 Mitigation Measures

8.1 Construction Impacts Mitigation

The majority of the identified construction-related impacts is temporary and can be mitigated through good construction practice and effective site supervision.

8.1.1 Mitigation of Land Acquisition Impacts

The exact procedures for mitigation of land acquisition impacts are described in detail in the RAP report. The summary of mitigation measures is:

- Cash compensation for the loss of crops;
- Transitional assistance for livelihood restoration.

It must be noted that at the time of the preparation of this report, the Compensation Committee has finalized land, property and assets valuation and already finalized the cash compensation amounts for each individual PAP.

The total cash compensation offered to PAPs equals cost of crops that could have been planted the year following the land acquisition is 300,960,000 IDs equivalent to 245,680 US $.

The table of cash payments to PAPs is presented in Table 8-1:

Table 8-1: Summary of Cash Compensations

#	District	Land Plot No.	Land Parcel No.	Total Land Area (m^2)	Area of Land to be Acquired	Crop	Compensation rate (ID/ton)	Crop Quantity (kg)	Land User	Cash Compensation (ID)	
					m^2	%					USD
1	Krowin	6	2	4,635,000	284,000	6.12	wheat	800,000	56,800	PAP_G1	45,440,000
2	Merga Sor	7	2	3,267,500	150,000	4.59	wheat	800,000	30,000	PAP_G2	24,000,000
3	Merga Sor	7	1	4,540,000	162,000	3.57	wheat	800,000	32,250	PAP_G3	25,920,000
4	Karkel	19	2	1,687,500	90,000	5.33	wheat	800,000	18,000	PAP_G4	14,400,000
5	Karkel	19	6	909,100	65,000	7.15	wheat	800,000	13,000	PAP_G5	10,400,000
6	Buraq	78	1/18	4,407,500	179,000	4.06	wheat	800,000	35,800	PAP_G6	28,640,000
7	Buraq	78	1/29	470,000	29,000	6.17	wheat	800,000	5,800	PAP_G7	4,640,000
8	Buraq	78	1/30	200,000	24,000	12.0	wheat	800,000	4,800	PAP_G8	3,840,000
9	Buraq	78	1/19	2,455,000	55,000	2.24	wheat	800,000	11,000	PAP_G9	8,800,000
10	Khirbet Nour	77	1	4,555,000	200,000	4.39	wheat	800,000	40,000	PAP_G10	32,000,000
11	Kolli	76	1/1	198,950	18,800	9.44	wheat	800,000	37,600	PAP_G11	30,080,000
12	Kolli	76	1/5	1,869,500	46,000	2.46	wheat	800,000	9,200	PAP_G12	7,360,000
13	Kadia	75	1/1	690,000	45,000	6.52	wheat	800,000	9,000	PAP_G13	7,200,000
14	Kadia	75	1/3	6,022,500	162,000	2.69	wheat	800,000	32,400	PAP_G14	25,920,000
15	Turkshan	74	1/4	1,634,500	130,000	7.95	wheat	800,000	26,000	PAP_G15	20,800,000
16	Gersheen	73	1	1,073,000	72,000	6.71	wheat	800 000	14,400	PAP_G16	11,520,000
TOTAL CASH COMPENSATION:											300 960,000

8.1.2 Damage to Landscape

The contractor shall exercise care to preserve natural landscape and conduct their operations so as to prevent any unnecessary destruction, scarring or defacing of the natural surroundings in the vicinity of works:

- All trees, native shrubbery and vegetation should be preserved and protected from damage by equipment and operation, except where clearing is required for works;
- Movement of crews and equipment should avoid damage to property, productive lands and known sites of historical and archeological importance;
- In case where the excessive destruction of landscape, natural vegetation or productive lands has occurred, the contractor is responsible for correcting at his own expense.
- Upon completion of the works, all surplus equipment and materials to be removed and all work areas smoothed and graded to conform to the natural appearance of the surrounding landscape.

8.1.3 Mitigation of Impacts on Water resources

The contractor shall comply with all applicable regulations concerning the control and abatement of water pollution. All activities shall be performed in a manner that will prevent the entry or accidental spillage of solid matter, contaminants, debris into watercourses.

- Vehicle used during construction/ maintenance phases should be well maintained to reduce emissions, be free of leaking fluids and be covered to reduce/prevent spills;
- Prevent placement of excavated materials and debris in areas of run-off routes;
- Provision of adequate size culverts;
- Removing or minimizing side casts;
- Applying upgraded surfacing
- Allowing time restrictions during rain events;
- Disconnecting road sediment sources to watercourses through use of rolling dips, water weirs and filter strips;
- Use of sufficient drainage structures to minimize run-off in inside ditches;
- Adequate storage and disposal of solid and liquid waste;
- Heaps and stockpiles of aggregate, fill and spoil should be located at sites that do not permit direct runoff into watercourses and are on land sloping at less than 1.5 %.
- In the event of accidental spill or contamination, the contractor shall immediately inform the GDRB. Any remedial works shall be undertaken a matter of urgency by the contractor. Failure to notify of such spills will be considered a Breach of Contract.
- Avoid storage of surplus materials on site and provide for regular disposal of all surplus materials.

8.1.4 Mitigation of Impacts on Soil

In order to minimize the soil erosion and contamination the following mitigation measures are proposed:

- Placement of drains to avoid cascading;
- Localized lining of receiving channels;
- Construction of sufficient discharge points;
- Avoid site clearance well in advance of construction. Maximum permitted elapsed time between site clearance and the initiation of construction should be 3 weeks.

In order to minimize the loss of the topsoil, the clearance procedures that separate topsoil, transport and store topsoil and possible transport to the re-use site should be adopted.

In order to avoid the soil contamination the same measures as for prevention of water contamination are to be applied as specified in section 8.1.3.

8.1.5 Mitigation of Impacts on Biodiversity

To minimize damage to the biodiversity a package of measures is required:

- Provision of safe conduits, such as underpasses for livestock and wildlife crossing;
- Reduce noise levels by regular maintenance of construction machines and equipment;
- Keeping run-off valleys clear for passages of animals;
- Avoid the movement of construction traffic at night;
- Limit construction noise and vibrations to day time hours;
- Confine traffic to defined routes;
- Using only defined and approved liquid and solid waste disposal sites;
- Extracting gravel and other materials only from approved sites;
- Providing training to the construction crew on the impact of disturbance and damage to habitats;
- Providing the crew and the construction camp with the fuel for heating and cooking to avoid their use of lighting of fires for such purposes.

8.1.6 Abatement of Noise

Noise from construction activities will primarily be derived from the operation of plant and equipment:

- The contractor shall ensure all his equipment is fitted with noise muffing devices;
- Ensure plant operated intermittently is shut down or throttled down during idle periods
- Any piling operations should be restricted to the hours 08.00 – 19.00 and not undertaken during public and religious holidays;
- All operations other than piling shall be restricted to the hours of 07.00 – 20.00

8.1.7 Abatement of Air Pollution

In the conduct of construction activities and the operation of equipment, all practical methods and devices to control, prevent and otherwise minimize atmospheric emissions should be utilized:

- The methods of handling cement and pozzoloid should include means of eliminating atmospheric discharges;
- Proper and adequate maintenance of vehicles and equipment to ensure there are no excessive exhaust emissions;
- Burning of materials from clearance of trees, bushes and other combustible matter should be prohibited;
- Ensure the plant operating intermittently is shut down during idle periods

Specific dust suppression measures include:

- Water spraying of sites and not paved access roads;
- Damping down of sites and not paved access roads;
- Provision of water troughs at entry and exit points to prevent carryover of dust emissions from sites;
- Establishing speed restrictions for all vehicles operating within sites and on unsurfaced access roads;
- Covering all vehicles transporting materials likely to give off excessive dust.

8.1.8 Waste Management

Solid waste generated during construction activities consists of the construction debris, and the waste generated at construction camps. The solid waste should be transported to the existing landfill with an agreement of the landfill operators or otherwise, with the approval of the relevant authorities organize the burial site. Borrow pits and un-operational quarries could also be used for such purposes, provided that they pose no threat to the groundwater resources.

Hazardous wastes are expected to be generated in small quantities primarily from servicing and refueling of vehicles and construction machines. Oil residues, chemical fluids, waste oil and solvents should be temporarily stored in sealed containers and placed on paved base with a sump, prior to final disposal.

Sewage generation and discharge is a concern. The main source of sewage generation is the construction camp. Therefore, it is proposed:

- Location of the camp outside known aquifer recharge zones;
- Provision of adequate infrastructure (septic tank) for sewage collection;
- Regular disposal of sewage: the problem is exacerbated by the absence of treatment facilities in the Duhok Governorate as whole; therefore, one of the solutions will be to discharge the sewage in the existing landfill site.

8.1.9 Mitigation of Construction Camp Impacts

As described above, the construction camp could pose a threat to environment in the project area. The following mitigation is suggested:

- Location of the camp outside known aquifer recharge zones;
- Provision of adequate infrastructure for effluent collection;
- Regular disposal of effluent;
- Regular disposal of solid waste;
- Provision of collection pits for collection of used machinery oils;
- Adequate vehicle maintenance;
- Transporting wastes to the designated disposal sites.

8.1.10 Management of Borrow Pits

Licensing should be arranged with the relevant authorities in case the aggregate materials are not supplied by the third party and the contractor will need to establish new borrow pits. The mitigation measures include:

- Enclosure of crushers and screens where necessary;
- Dust filters where appropriate;
- Good quarry road surfaces;
- Water spraying of conveyors, stockpiles, roads;
- Berms and vegetation to minimize soil blow-off;
- Wheel wash for road traffic.

Reinstatement and after-use are an integral part of the site management process. A restoration plan should be drawn-up by the developer of the existing operation to ensure that where practicable, progressive or phased reinstatement is carried out. Final reinstatement is initiated when extraction is completed.

8.1.11 Mitigation of Construction Materials Transporting

The aggregate materials for the road construction is available from the existing quarries located near the Tigris river, approximately 30 km west of the alignment. The minor environmental impact is associated mainly with transporting of the materials.

The mitigation measures include:

- Establishing speed restrictions for all vehicles operating within sites and on unsurfaced access roads;
- Covering all vehicles transporting materials likely to give off excessive dust.

8.1.12 Mitigation of Impact on Cultural Resources

Chance find procedures will be applied as follows:

- Stop the construction activities in the area of the chance find.
- Delineate the discovered site or area.
- Secure the site to prevent any damage or loss of removable objects. In cases of removable antiquities or sensitive remains, a night guard shall be present until the responsible local authorities and the Ministry of Culture take over.
- Notify the supervisory Engineer who in turn will notify the responsible local authorities and the Ministry of Culture immediately (within 24 hours or less).
- Responsible local authorities and the Ministry of Culture would be in charge of protecting and preserving the site before deciding on subsequent appropriate procedures. This would require a preliminary evaluation of the findings to be performed by the archeologists from the Dohuk Department of Antiquities (DDA) and the Ministry of Culture (within 72 hours). The significance and importance of the findings should be assessed according to the various criteria relevant to cultural heritage; those include the aesthetic, historic, scientific or research, social and economic values.
- Decisions on how to handle the finding shall be taken by the responsible authorities from the DDA and the Ministry of Culture. This could include changes in the layout (such as when finding an irremovable remain of cultural or archeological importance) conservation, preservation, restoration and salvage.
- Implementation for the authority decision concerning the management of the finding shall be communicated in writing by the Ministry of Culture.
- Construction work could resume only after permission is given from the responsible local authorities and the Ministry of Culture concerning safeguard of the heritage.

These procedures must be referred to as standard provisions in construction contracts, when applicable. During project supervision, the Site Engineer shall monitor the above regulations relating to the treatment of any chance find encountered are observed.

8.1.13 Mitigation of Traffic Impacts

Mitigation of the impacts likely to accrue from construction traffic should primarily take three forms:

- Access control: will require restriction of turning movements to approved access points to and from existing highways and if necessary, improvements of the existing junctions to reduce potential for accidents. Restriction on timing of use may also be necessary, with construction traffic prohibited outside specified, supervised hours.

- Road clearing measures will be required to ensure major carriageways are kept in a safe condition, with oil, mud and other material removed regularly.
- Timing restrictions for transportation of abnormal loads.

8.1.14 Public Safety

For mitigation of impacts on public safety the following mitigation measures are proposed:

- All construction vehicles shall be appropriately marked and carry adequate visual and audio warning systems;
- Speed limitations on the work site vehicles;
- Adequate signage should be provided for motorists and pedestrians;
- Designate clearly marked areas for livestock crossing.

8.1.15 Workers Safety

The procedures for workers safety are well established and the contractor will be obliged contractually to follow them. Additionally:

- Provide training on First Aid Procedures
- Provide training on potential risks and hazards of construction;
- Provide the PPE and enforce its use.

8.1.16 Mitigation of the Impacts on Local Settings

Temporary restriction of access to the public utilities and services, impeded access to business activities and so on is unavoidable during the construction phase. The mitigation measures incorporate warning of the public of the planned activities so that can arrange their timing and routes and to restore access in the shortest time possible.

8.2 Operational and Maintenance Impacts Mitigation

8.2.1 Mitigation of Impacts on Water Resources and Soil

It is anticipated that during operational phase the impacts on water resources and soil will be minimal. However, the blockage of the drainage systems and accidental spills of hazardous materials could prove to be detrimental. The main mitigation measures are:

- Maintaining the roads culverts and drainage systems;
- In case of the accidents involving the spill of hazardous chemicals and vehicle fuel, apply emergency measures for neutralization of chemicals and if necessary remove and replace the contaminated soil to the extent possible in liaison with the Civil Defense Department.

8.2.2 Mitigation of Impacts on Biodiversity

The habitat fragmentation by the motorway is unavoidable due to the presence of the road as physical barrier. However, the impacts for migrating animals will be minimized by provision of culverts that enable crossing of livestock and wild animals. Four underpasses (culverts) are design for animal crossing. Their size (12m/5,4m) is more than sufficient for crossing by livestock (sheep, goats and cattle), and Goitered gazelle sporadically found in the project area (the height of Goitered gazelle does not exceed 1,5 m). Location of the underpasses was selected based on the animal footpaths patterns. In addition, wild animals can cross down the wadis under the motorway bridges. The GDRB must make sure that the provided underpasses/culverts are in serviceable conditions and clear of accrued debris, especially during the winter rain season.

8.2.3 Mitigation of Noise

At present, due to the fact that there are no receptors in close proximity to the road, and the noise level reaching residential areas is way below acceptable limits, there are no specific mitigation measures are required for noise abatement. However, in case in the future there would be residential settlements along the road, the sound barriers should be considered.

8.2.4 Mitigation of Impacts on Air Quality

In order to minimize the impacts of the traffic on the surroundings the trees and bushes forming the so called “green belt” should be planted on the road sides at a distance that would not create visual obstruction of signs and other roadway users, sight distance obstructions (at intersections, driveways, and curves), and an overhead hazard to large trucks. In order to avoid potential visual obstruction height restrictions on objects in the sight triangle, such as "no objects permitted between 30 and 96 inches above the ground” should be considered.

Also, at the national policy level the following measures should be considered:

- Introduction of regular vehicle testing;
- Incentive taxation for non-pollution vehicles;
- Tax incentives for use of cleaner fuels;
- Promotion of higher vehicle occupancies by vehicle sharing.

The air quality monitoring program should encompass the following components:

- Monitoring parameters which should reflect the pollutants of concern;
- Monitoring type and frequency;
- Monitoring locations (off-site or fence line) based on the results of scientific methods and mathematical models;
- Sampling and analysis methods should apply national or international methods and standards for sample collection and analysis by entities certified for this purpose;
- Control measures for curtailing vehicular air pollution such as:

- Apply the emission standards on the quantity or concentration of pollutants that discharged from vehicles;
- Apply standards that specify fuel quality for motor vehicles;
- Requirements to use a certain technology designed to reduce vehicle emissions
- Traffic restrictions.

8.2.5 Mitigation of Landscape Maintenance Impacts

The mitigation measures include:

- Effective advance warning signs;
- Effective material handling, storage and use;
- Site supervision.

8.2.6 Mitigation of Potential Impacts on Public Safety

Some of the road safety concerns are incorporated into the design, such as:

- Provision of a median concrete barrier, a New Jersey barrier that will run the full length of the road mainline;
- Provision of street lighting to reduce accidents at night and at times of reduced visibility;
- Provision of directional and warning road signage;
- Provision of the underpass for livestock crossing.

Additionally, the enforcement of proper road behavior will be required, which should be implemented by the traffic police.

8.3 Residual Post-Mitigation Impacts

Residual impacts are defined as the adverse effects that remain or are predicted to remain after all mitigation measures are applied. It is envisioned that the residual impacts will be minor and short-term during the construction phase.

8.3.1 Landscape and Visual Impact

The proposed road development by means of its very presence will have the permanent effect and consequently residual impact on the landscape within its immediate corridor. However, with application of the mitigation measures for landscape resoration the road will be integrated within landscape settings in the longer-term.

8.3.2 Ecology

The loss and fragmentation of habitats are unavoidable during road construction and have more or less permanent character, and consequently even with the application of mitigation measures will still be present. However, due to intensive agricultural development of the area there are practically

no natural habitats left, and therefore, the impact is estimated as minor. Landscaping and re-vegetation will provide ecological continuity further facilitated by provision of mammal underpasses.

8.3.3 Soils and geology

In general, the residual impacts on soils are considered negligible with mitigation measures in place and do not require additional mitigation measures. Groundwater seepages may result in erosion and instability of slope over time. The significance of this residual impact is considered negligible.

8.3.4 Water Resources

The mitigation measures related to potential groundwater contamination will ensure that the risk of groundwater contamination is minimized. No residual impacts on groundwater are anticipated.

With mitigation measures in place related to surface water resources, the impacts on catchment areas, status of receiving surface waters, flood risk due to increased runoff, the residual impacts on surface water resources are considered negligible.

8.3.5 Air Quality

The impacts of the road construction on air quality are short-term and with the implementation of mitigation measures are envisioned to be moderate. During operation phase, the air pollution from transport emissions is permanent. However, due to the absence of residential areas it is considered as minor. No additional mitigation measures are required.

9 Environmental and Social Management Plan

Summaries of the Environmental and Social Management Plan (ESMP) for both construction and operational phases of the Project are presented in Table 9-3 and Table 9-4. The ESMP contains interlinked impacts, project activities, mitigation measures, monitoring, and estimated costs of mitigation and monitoring. ESMP monitoring is presented as monitoring parameters, frequency of monitoring and monitoring responsibilities.

In addition to the ESMP, a Resettlement Action Plan (RAP) has also been prepared to ensure appropriate approach for involuntary resettlement of Project Affected People (PAP).

Part of the mitigation measures included into the Environmental Management Plan are imbedded into the project design and therefore do not require additional investment. These are:

- Provision of the adequate drainage system during both construction and operational phases;
- Provision of the PPE for working personnel (responsibility of the contractor);
- Provision of warning signs for public safety;
- Provision of pathways for wildlife and livestock;
- Provision of safe crossings for pedestrians;
- Provision of waste collection and disposal.

The estimated costs of mitigation measures during the construction phase of the project reach nearly 7,312,500 US $ (majority of costs related to construction of culverts and underpasses). The mitigation measures during the operational phase of the project are limited to standard maintenance activities. Therefore, they are not specifically costed.

The ESMP monitoring costs during the construction phase are estimated at 110,500 US $. They consist of the cost of environmental monitoring specialist, and the cost of tests (see Table 9-1).

Table 9-1: Monitoring Budget for Construction Phase

#	Item	Unit	Number of Units	Cost per Unit (US $)	Total (US $)
1	Water Quality Tests	Test	12	500	6,000
2	Soil Quality Tests	Test	3	500	1,500
3	Environmental Monitor	Man month	16	6,000	96,000
4	Noise level equipment	Noise meter	2	500	1,000
5	Air quality monitoring	Tests	2	3,000	6,000
6	**Total**				**110,500**

The responsibilities for safeguards monitoring during the construction phase of the project lie primarily with the Supervision Engineer and the Contractor.

The annual cost of monitoring during the operational phase is estimated at 14,800 US $ (see Table 9-2). The cost include 3,800 US $ for testing, and 12,000 US $ cost of full time equivalent environmental monitor input.

The responsibilities for safeguards monitoring during the operation phase of the project lie with the GDRB.

Table 9-2: Monitoring Budget per Year – Operational Phase

#	Item	Unit	Number of Units	Cost per Unit (US $)	Total (US $)
1	Water Quality Tests	Test	1	500	500
2	Soil Quality Tests	Test	1	300	300
3	Environmental Monitor	Man month	2	6,000	12,000
4	Air quality monitoring	Test	1	2,000	3,000
5	**Total**				**14,800**

Table 9-3: ESMP - Construction Phase

Parameter	Impacts	Activities	Mitigation Measures	Monitoring Parameters	Monitoring Frequency	Monitoring Responsibility	Cost of Mitigation	Cost of Monitoring
Land Acquisition	Loss of crops (approximately 376 tons of cereals and few almond trees).	Expansion of the ROW. Land acquisition for underpasses, intersections, lay-bys, culverts.	Compensation for crops value for the year after acquisition	• Compliance with the land acquisition plan and disbursement of compensation. • Any unanticipated impacts and resolving the issues. • Sufficiency and adequacy of the compensation budget. • Adequacy of contingency measures. • Resolving grievance issues. • Consultation and information disclosure.	First three months – once a week. Following four months – bi-weekly. The rest of construction period – monthly.	PMT at GDRB. Compensation Committee.	Market value at the time of survey – 245,000 US $	No additional cost.
	Loss of agricultural land 1,711, 800 m^2		No monetary compensation – the land is state owned.					
	Livelihood disruption.		Monetary compensation for loss of crops. At 800 US $ per ton for the year after land acquisition. Additional financial assistance to vulnerable PAPs.				Individual financial assistance (to be reviewed case by case by GDRB).	

Parameter	Impacts	Activities	Mitigation Measures	Monitoring Parameters	Monitoring Frequency	Monitoring Responsibility	Cost of Mitigation	Cost of Monitoring
Water Resources	Local alteration of water flow and drainage at locations (location of seasonal water bodies is shown in Figure 6-9).	• Excavation. • Disposal of construction debris in surface water courses. • Uncontrolled run-off in ditches.	• Placement of excavated material and debris should be avoided in the areas of the runoff routes. • Provision of adequate size culverts. • Disconnecting road sediment sources from watercourses through use of rolling dips, water weirs and filter strips. • Use of drainage structures to minimize run-off inside ditches.	• Storage of excavated materials, compliance of culverts with design, photographic evidence, logbook inspections. • Changes to water courses.	Bi-weekly during rainy season.	Contractor – internal monitoring. Supervision Engineer.	Estimate of 7,057,500.00 US$ for culverts and underpasses construction.	Part of environmental monitoring costs of the Supervision Engineer.
	Potential contamination of surface water. (in locations specified in the	• Leakage of hazardous fluids from construction machinery.	• Vehicle used during construction/ maintenance phases should be well maintained to	Conditions of vehicles, inspections of spillages, logbook records,	One time prior to construction to establish baseline; One time during construction during rainy season down	Contractor – internal monitoring. Supervision Engineer.	No extra cost	500 US $ per test, minimum 12 water quality tests – 6,000 US $

Parameter	Impacts	Activities	Mitigation Measures	Monitoring Parameters	Monitoring Frequency	Monitoring Responsibility	Cost of Mitigation	Cost of Monitoring
	hydrological map.	• Accidental spills of oils and petrol. • Wash off of construction materials during rain events. • Inadequate storage of construction materials. • Inadequate disposal of liquid and solid waste at construction camp site.	reduce emissions, be free of leaking fluids and be covered to reduce/prevent spills. • Removing or minimizing side casts. • Applying upgraded surfacing. • Allowing time restrictions during rain events. • Heaps and stockpiles of aggregate, fill and spoil should be located at sites that do not permit direct runoff into watercourses and are on land sloping of less than 1.5 %. • Avoid storage of surplus materials on site and provide	photographic evidence. Water quality testing: pH, Turbidity, Electrical Conductivity (EC), Color, Total Suspended Solids (TSS), Total Dissolved Solids (TDS), Chemical Oxygen Demand (COD), Biological Oxygen Demand (BOD), Polychlorinated Biphenyls (PCBs).	the temporary storage and handling areas of fuel and liquid waste.			

Parameter	Impacts	Activities	Mitigation Measures	Monitoring Parameters	Monitoring Frequency	Monitoring Responsibility	Cost of Mitigation	Cost of Monitoring
			for regular disposal of all surplus materials. • Emergency response for accidental spills of hazardous materials.					
Soils	Soil erosion (along the road alignment).	• Site clearance. • Excavation/Cut operations. • Inadequate drainage.	• Placement of drains to avoid cascading. • Localized lining of receiving channels. • Construction of sufficient discharge points. • Avoid site clearance well in advance of construction. • Reinstatement and after-use.	• Conditions of natural drainage systems and/or additional drainage channels. • Photographic evidence.	Bi-weekly during the rainy season, and after sporadic rains. Duration between the time of site clearance and start of construction activities not to exceed three weeks.	Contractor – internal monitoring. Supervision Engineer.	Cost of drainage systems (as specified above).	Part of environmental monitoring costs of the Supervision Engineer.
	Soil Contamination near the temporary storage site of	• Accidental spills of hazardous materials.	Same measures as for prevention of surface water contamination.	Presence of spillages, logbook records, photographic evidence.	Soil tests immediately after any spillages of fuel and liquid waste;	Supervision Engineer. Directorate of MAW of Duhok.	No extra costs	Part of environmental monitoring costs of the

Parameter	Impacts	Activities	Mitigation Measures	Monitoring Parameters	Monitoring Frequency	Monitoring Responsibility	Cost of Mitigation	Cost of Monitoring
	fuel and liquid waste, and near the construction camp.	• Leakage from construction machinery and stored construction materials. • Inadequate disposal of liquid and solid waste at construction camp.		Soil testing: pH, temperature, organic content, poly-aromatic hydrocarbons (PAHs); Faecal coliforms and Total coliforms.	One random soil test after completion of works at locations of temporary storage of fuel and waste.			Supervision Engineer Soil tests: 1,500 US $ total.
	Loss of productive fertile soil (along the road alignment).	• Site clearance. • Excavation.	• Clearance procedures that separate topsoil. • Transport and store topsoil and possible transport to the re-use site should be adopted.	Handling of the top soil.	Monthly	Supervision Engineer.	No extra cost	Part of environmental monitoring costs of the Supervision Engineer.
Ecology and Bio-Diversity	Habitat fragmentation	• Site clearance. Landscape alteration. • Inadequate disposal of solid waste and	• Provision of underpasses for wild animals. • Avoid works on or near watercourses during rainy seasons. • Using only defined and	• Habitat disruption due to construction activities. • Number of animal kills.	Bi-weekly	Contractor – internal monitoring. Supervision Engineer.	Costs of 4 underpasses for animal crossings are included in the costs of drainage culverts.	Part of environmental monitoring costs of the Supervision Engineer.

Parameter	Impacts	Activities	Mitigation Measures	Monitoring Parameters	Monitoring Frequency	Monitoring Responsibility	Cost of Mitigation	Cost of Monitoring
		construction debris. • Aggregate extraction.	approved liquid and solid waste disposal sites. • Extracting gravel and other materials only from approved sites.	• Provision of training for the workers on habitat fragmentation. • Site restoration after work completion. • Photographic evidence.		Directorate of Environment of Duhok.	No other costs	
	Loss of flora species.	• Vehicle movements beyond ROW. • Cutting down the trees and bushes to be used for fuel and burning.	• Providing the crew and the construction camp with the fuel for heating and cooking to avoid their use of lighting of fires for such purposes. • Confine traffic to defined routes.					
	Loss of fauna species.	• Destruction of dens, burrows and nests, clearance of feeding grounds. • Increased traffic kills; • Possible illegal hunting by off-duty	• Limiting construction noise and vibration to day time hours. • Provision of four underpasses for wild animals and livestock. • Training for construction crew on the impact of disturbance and					

Parameter	Impacts	Activities	Mitigation Measures	Monitoring Parameters	Monitoring Frequency	Monitoring Responsibility	Cost of Mitigation	Cost of Monitoring
		construction workers.	damage to habitats. • Avoid works along watercourses during rainy seasons.					
Ambient Air Quality	Dust generation	• Movement of vehicles on unpaved surfaces. • Excavation; • Transporting of cut materials and aggregate materials. • Borrow pits.	• Water spraying of sites and not paved access roads. • Water troughs at entry and exit points to prevent carryover of dust emissions from sites. • Establishing speed restrictions for all vehicles. • Covering all vehicles transporting materials likely to give off excessive dust. • Construction sequencing and disturbing only small areas at a time.	• Dust abatement approach, photographic evidence. • Air quality parameters: PM10, PM2.5, SO2, NOx, CO, Ozone and HC. •	Air quality testing: - One time prior to construction to establish the baseline; - One time during construction during the dry season. Weekly monitoring of implementing of dust abatement measures	Contractor – internal monitoring. Supervision Engineer.	Cost of regular vehicles maintenance Cost of water spraying of unpaved surfaces	Part of environmental monitoring costs of the Supervision Engineer. Air quality testing – 6,000 US $

Parameter	Impacts	Activities	Mitigation Measures	Monitoring Parameters	Monitoring Frequency	Monitoring Responsibility	Cost of Mitigation	Cost of Monitoring
	Air pollution from emissions	• Inadequate condition of construction machinery and vehicles. • Burning of combustible materials. • Burning of the vegetation from clearance.	• Proper and adequate maintenance of vehicles and equipment to ensure there are no excessive exhaust emissions. • Burning of materials from clearance of trees, bushes and other combustible matter should be prohibited. • Ensure the machinery operating intermittently is shut down during idle periods.					

Parameter	Impacts	Activities	Mitigation Measures	Monitoring Parameters	Monitoring Frequency	Monitoring Responsibility	Cost of Mitigation	Cost of Monitoring
Noise and Vibration	Increased noise levels that are potentially detrimental to human health.	Operating of construction machinery and equipment.	• The contractor shall ensure all his equipment is fitted with noise muffing devices. • Ensure machinery operated intermittently is shut down or throttled down during idle periods. • Time restrictions of activities to the day-time working hours. • Provision of PPE.	• Level of occupational noise. • Operating conditions of vehicles and machines. • Use of muffling and switching off machines during idle periods. • Use of protective gear. • Logbook records, records of complaints by local residents.	Bi-weekly	Contractor – internal monitoring. Supervision Engineer.	Cost of PPE	Part of environmental monitoring costs of the Supervision Engineer. 1,000 US $ for noise tests.

Parameter	Impacts	Activities	Mitigation Measures	Monitoring Parameters	Monitoring Frequency	Monitoring Responsibility	Cost of Mitigation	Cost of Monitoring
Construction Camp	Potential soil contamination and consequent contamination of shallow aquifer.	• Storage of construction materials. • Inadequate disposal of discarded and surplus materials. • Inadequate disposal of construction debris. • Spillage of machinery oils. • Leakage of domestic effluent from septic tank.	• Location of the camp outside known aquifer recharge zones. • Provision of septic tank for sewage collection and temporary storage. • Provision of adequate infrastructure for effluent collection. • Regular disposal of effluent. • Regular disposal of solid waste. • Provision of collection pits for collection of used machinery oils. • Adequate vehicle maintenance. • Transporting wastes to the designated disposal sites.	• Disposal method of effluent and solid waste. • Approach to storage of construction materials. • Vehicle maintenance. • Contaminants in soil as specified above. • Logbook records, photographic evidence.	Bi-weekly auditing	Contractor – internal monitoring. Supervision Engineer.	No additional costs.	Part of environmental monitoring costs of the Supervision Engineer.

Parameter	Impacts	Activities	Mitigation Measures	Monitoring Parameters	Monitoring Frequency	Monitoring Responsibility	Cost of Mitigation	Cost of Monitoring
Waste Management	Potential soil contamination and consequent contamination of shallow aquifer.	<u>Liquid waste:</u> • Effluent from construction camp. • Oils, industrial effluents, grease and de-greasing solvents. <u>Solid Waste:</u> • Construction debris. • Discarded and surplus construction activities.	• Hazardous liquid and solid waste should be stored in sealed containers. • Regular disposal of liquid and solid waste at designated sites. • Avoid placing of construction camp and construction material storage areas in proximity to the aquifer recharge areas.	• Approach to temporary storage of benign construction waste prior to final disposal. • Use of designated waste disposal sites. • Photographic evidence.	Weekly	Supervision Engineer.	Cost of transporting the waste.	Part of environmental monitoring costs of the Supervision Engineer.

Public Health and Safety	Increased risk of accidents	• Movement of construction machinery. • Movement of transporting vehicles. • Borrow pits.	• All construction vehicles marked and carry adequate visual and audio warning systems. • Speed limitations on the work site vehicles. • Adequate signage for motorists and pedestrians. • Designate clearly marked areas for livestock crossing. • Mark and fence the areas of active borrow pits. • Provision of barriers at construction sites. • Access points to and from existing highways. • Construction traffic prohibited outside specified, supervised hours.	Presence of fencing/barriers and warning signs, and traffic speed limitations, photographic evidence.	Bi-weekly	Contractor – internal monitoring. Supervision Engineer. Traffic Department of Duhok.	Cost of provision of warning signs and fencing.	Part of environmental monitoring costs of the Supervision Engineer.

Parameter	Impacts	Activities	Mitigation Measures	Monitoring Parameters	Monitoring Frequency	Monitoring Responsibility	Cost of Mitigation	Cost of Monitoring
			• Timing restrictions for transportation of abnormal loads. • Provision of safe crossings for pedestrians and livestock					
	Health hazards for construction workers.	• Operating the equipment. • Noise and dust generation from construction equipment. • Vehicles movement.	• Provide training on First Aid Procedures. • Provide training on potential risks and hazards of construction. • Provide the PPE and enforce its use. • Provide warning signs.	• Use of PPE and presence of warning signs. • Application of noise abatement and dust abatement measures. • Logbook records.	Weekly	Contractor – internal monitoring. Supervision Engineer.	Cost of PPE Cost of dust abatement measures. Regular cost of vehicles and equipment maintenance.	Part of environmental monitoring costs of the Supervision Engineer.

Disruption of Local Settings	Visual and Aesthetic Impact.	• Landscape damage due to the piles of excavated materials, construction debris and discarded materials. • Clearance and trees and shrubs removal.	• All trees, native shrubbery and vegetation should be preserved and protected from damage. • Movement of crews and equipment should avoid damage to property, productive lands and known sites of historical and archeological importance. • Upon completion of the works, all surplus equipment and materials to be removed and all work areas smoothed and graded to conform to the natural appearance of the surrounding landscape.	• Approach to landscape restoration. • Photographic evidence.	Monthly	Contractor – internal monitoring. Supervision Engineer.	Cost of entry/exit ramps.	Part of environmental monitoring costs of the Supervision Engineer.

Parameter	Impacts	Activities	Mitigation Measures	Monitoring Parameters	Monitoring Frequency	Monitoring Responsibility	Cost of Mitigation	Cost of Monitoring
Heritage sites	Accidental damage to the sites of historical, cultural and religious significance.	• Excavation. • Borrow pits.	In case of a chance find the cultural resources procedures should be applied.	Inspection for presence of artifacts in excavated material, logbook records, photographic evidence.	Bi-monthly	Contractor – internal monitoring. Supervision Engineer. GDRB. Directorate of Antiquities.	N/A	Part of environmental monitoring costs of the Supervision Engineer.
Estimated additional costs:							**7,313,500** US$	**110,500** US $ (14,500 US $ plus 96,000 US $: full time input of environmental monitor)

Table 9-4: ESMP – Operational Phase

Parameter	Impacts	Activities	Mitigation Measures	Monitoring Parameters	Monitoring Frequency	Monitoring Responsibility	Annual Cost of Mitigation	Annual Cost of Monitoring
Water resources	• Flooding of drainage channels and alteration of discharge patterns. • Water resources contamination.	• Blockage of drainage systems and culverts due to the accumulation of debris. • Accidental spillage of hazardous materials. • Road maintenance.	• Regular cleaning of roadsides. • Clearing of debris after the raining season. • Emergency response for accidental spills. • Regular maintenance of culverts and drainage channels.	• Conditions of the drainage channels and culverts, photo evidence Water quality testing: pH, Turbidity, Electrical Conductivity (EC), Chemical Oxygen Demand (COD), Biological Oxygen Demand (BOD), Hydrocarbons (HC).	Surveillance: • Bi-weekly during the rainy season • Monthly during the dry season. Water testing Once per year during rainy season.	GDRB	Cost of regular cleaning and maintenance.	500 US $ for testing No additional cost of environmental monitoring.
Soils	• Soil erosion. • Soil contamination	• Alteration of water courses due to debris accumulation. • Accidental spills of hazardous materials. • Accumulation of pollutants from traffic emissions. • Road maintenance.	• Same measures to be applied as for the mitigation of impacts on water resources. • Additionally, provision of protective zone of vegetation.	Conditions of the drainage channels and culverts (clear of debris). Soil testing: pH, temperature, organic content, poly-aromatic hydrocarbons (PAHs).	Surveillance: • Bi-weekly during the rainy season • Monthly during the dry season. Soil testing Once per year during rainy season.	GDRB	• Cost of regular cleaning and maintenance • Cost of maintenance of trees.	300 US $ for soil testing No additional cost of environmental monitoring.

Parameter	Impacts	Activities	Mitigation Measures	Monitoring Parameters	Monitoring Frequency	Monitoring Responsibility	Annual Cost of Mitigation	Annual Cost of Monitoring
Bio-diversity	Habitat fragmentation Incidents of road kill of wild animals.	Fencing and motorway operation.	Ensure the culverts and underpasses are clear.	Condition of culverts and underpasses, photographic evidence.	Monthly	GDRB	Cost of regular cleaning and maintenance.	No additional cost of environmental monitoring.
Ambient Air Quality	Air pollution	• Traffic movement. • Traffic congestion due to accidents. • Transporting of the dust generating materials.	• Provision of row of trees alongside of the road alignment. • Ensure all the dust generating materials are transported by covered vehicles. • Monitor vehicles condition.	• Air quality parameters: PM10, PM2.5, SO2, NOx, CO, Ozone and HC.	Once a year – air quality testing Regular monitoring of traffic movement.	Air quality monitoring – GDRB. Regulating vehicles movement – traffic police.	Cost of maintenance of trees.	3,000 US $ for air quality testing.
Public Health and safety	Risk of accidents related to traffic	Traffic movement.	• Provision and maintenance of a median concrete barrier, a New Jersey barrier or guardrail along the road alignment. • Maintenance of street lighting to reduce accidents at night and at times of reduced visibility.	• Condition of road signage and markings. • Adequate lighting of the road. • Regular maintenance of pedestrian crossings and livestock underpasses. • Photographic evidence.	Monthly	GDRB Traffic Police	Cost of maintenance.	No additional costs of environmental monitoring.

Parameter	Impacts	Activities	Mitigation Measures	Monitoring Parameters	Monitoring Frequency	Monitoring Responsibility	Annual Cost of Mitigation	Annual Cost of Monitoring
			• Maintenance of directional and warning road signage. • Maintenance of the underpass for livestock crossing. • Maintenance of guardrails barriers on curves and intersections.					
Landscape maintenance	• Soil pollution • Traffic accidents	• Use of chemicals for landscape maintenance. • Highway maintenance.	• Effective advance warning signs. • Effective material handling, storage and use. • Provision and maintenance of fencing in high risk areas. • Site supervision.	• Condition of road signage and markings. • Adequate lighting of the road. • Handling of materials. • Photographic evidence.	Weekly during maintenance.	GDRB	Cost of maintenance	No additional cost of environmental monitoring.
Estimated additional annual costs:							Regular maintenance costs	**15,800 US $** (3,800 US$ for tests plus 12,000 US $: 2 months input of environmental monitor)

9.1 Environmental Management Procedures

The procedures listed below are designed to provide proactive systematic approach to for managing the potential environmental consequences and impacts of implementation of the project.

Planning: determines the environmental aspects and impacts of the work conducted throughout the implementation of the project to control and reduce, where possible, the impacts associated with the identified aspects. Environmental aspects are identified by reviewing all project activities, and assessing the possibility each of them have for an environmental impact and recognizing that certain environmental aspects are the subject of certain legal or other requirements. Objectives and targets are set by considering, in part, the legal and other requirements, the views of interested parties, as well as, technological, financial and other operational considerations. This ensures that objectives and targets are robust, that they respond to legitimate concerns.

Monitoring and Evaluation: includes defining roles and responsibilities for each task as well as performance indicators and milestones for completion, including timeframes and frequency of monitoring and evaluation through the implementation of the project.

Reporting: Regular reporting on the status of identified environmental aspects and compliance of implementation with the proposed mitigation measures.

Training, Awareness, and Competence: requires two types of training: general awareness, and competence training. General awareness training for all employees focuses on the importance of the environmental policy, the role of employees, and the potential consequences of failing to provide environmental care. Competence training is prescribed for employees that work in proximity to significant environmental aspects and focuses on the possible significant impacts of those aspects, their specific roles and responsibilities, the objectives and targets for those aspects, and the operational controls in place to avert the actualization of the potential impacts.

Communication: ensures effective integrated environmental management demands effective communications to coordinate staff internally and to liaise with external stakeholders

Emergency Preparedness and Response: despite best efforts there is the possibility of unpredictable accidents and emergencies. It is necessary that measures to be included in the plan to address the environmental consequences of such occurrences. It is expected that such measures work to control and mitigate those possible environmental consequences.

Corrective actions: Upon identification of deviation from the recommended mitigation measures and/or non-compliance with regulations and recommendations the action request should be issued and immediate corrective actions implemented.

9.2 Environmental Monitoring

Monitoring of the Project activities with the ESMP will be conducted primarily by the Contractor and the GDRB (as presented in the ESMP summary Table 9-3and Table 9-4). The proposed diagram of ESMP monitoring is presented in Figure 9-1.

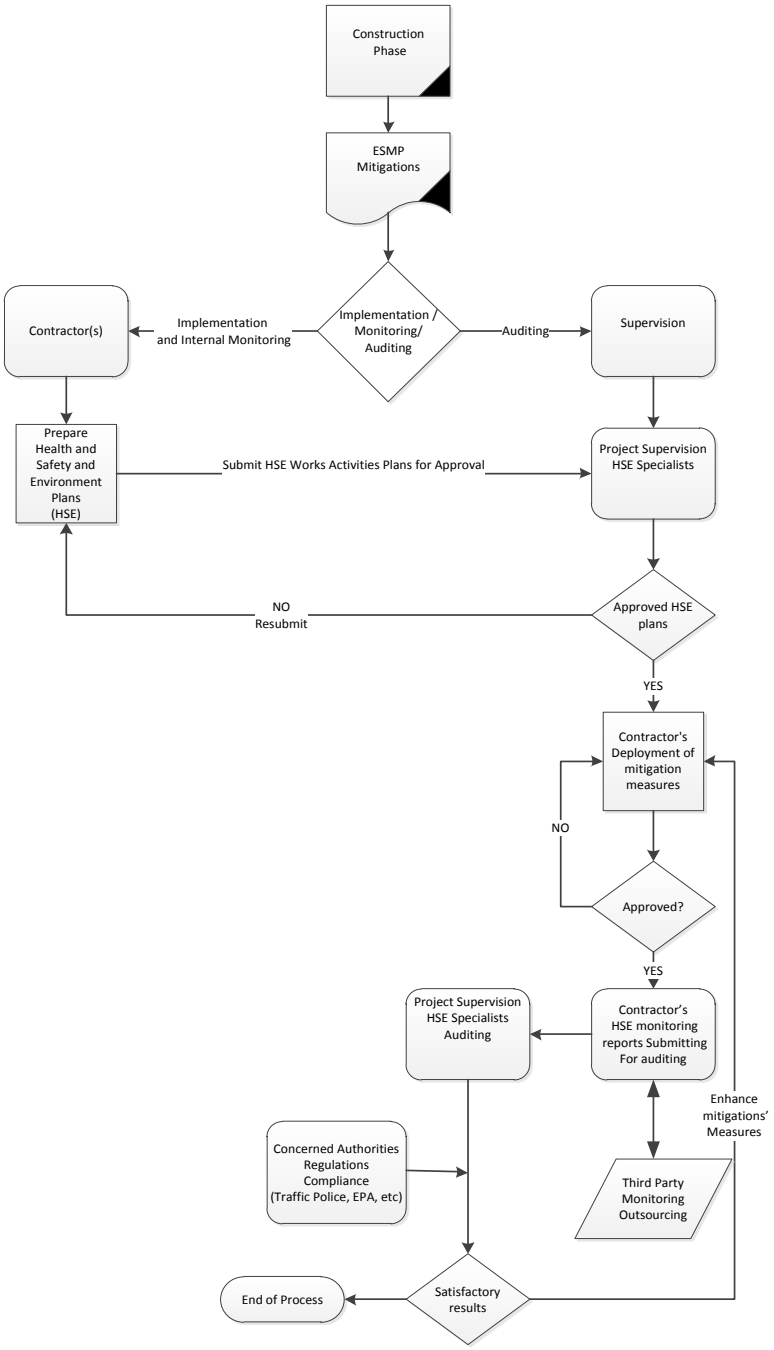


Figure 9-1: Diagram of Environmental Monitoring during Construction Phase

Monitoring will be conducted at two levels:

Internal monitoring will be provided by the HSE expert from contractor's side. The responsibilities will include:

- Preparation of the detailed monitoring plan;
- Conducting water quality, soil quality and air quality tests;
- Conducting monitoring according to the prepared monitoring plan;
- Reporting

External monitoring will be provided by the independent environmental expert reporting directly to DGRB. The results of monitoring will be disseminated amongst the concerned stakeholders.

Annexes

Annex 1: Materials and Works Cost Breakdown

Table B1: Earthwork Cost Breakdown

Spec. No.	Item No.	Item Description	Unit	Quantity Number	Unit Rate (USD) Number	Total (USD)
R5 17	1.01	Excavation.	Cu.m.	2,800,000	2.5	7,000,000
R5 17	1.02	Embankment in Place	Cu.m.	2,050,000	5	10,250,000
Earthwork Summary						**17,250,000**

Cu.m. Cubic Meter

Table B2: Bases and Pavement Cost Breakdown

Spec. No.	Item No.	Item Description	Unit	Quantity Number	Unit Rate (USD) Number	Total (USD)
R6 14	2.01	Granular Sub-base Course (Type B)	Cu.m.	391,300	15	5,869,500
R7 14	2.02	Aggregate Base Course(crushed limestone or crushed gravel)	Cu.m.	221,340	17	3,762,780
R8A 11	2.03	Bituminous Prime Coat MC-70.	Ton	2,686	735.0	1,974,210
R9 17	2.04	Bituminous Binder Course (8.0cm compacted thickness)	Sq.m.	1,790,710	10	17,907,100
R8B 11	2.05	Bituminous Tack Coat RC-250.	Ton	680	730.0	496,400
R9 17	2.06	Polymer modified asphalt Wearing Course (6.0cm compacted thickness)	Sq.m.	680,235	11	7,482,585
Bases and Pavement summary						***37,492,575***

Cu.m. Cubic Meter Sq. m Square Mater

Table B3: Miscellaneous Cost Breakdown

Spec. No.	Item No.	Item Description	Unit	Quantity Number	Unit Rate (USD) Number	Total (USD)
R11A 07	3.01	Precast Concrete Curb (Curb Stone).	L.M	13,260	17	225,420
	3.02	New Jersy Barrier.	L.M	25,000	200	5,000,000
R15 17	3.03	Small signs including post (Triangular shape, circular shape, Rectangular and Octagonal shape signs). (area< 1 Sq.m.).	No.	30	140	4,200
R15 17	3.04	Large Ground Mounted Signs. (Exceeding 1 Sq.m. area).	No.	24	320	7,680
R16 07	3.05	Painted pavement lines marking - 15 cm wide, white.	L.M	40,196	1.5	60,293
R16 07	3.06	Painted pavement lines marking - 15 cm wide, yellow .	L.M	128,178	1.5	192,267
R16 07	3.07	Painted pavement marking - for pedestrian crossing , stop lines and yield lines (Class A).	L.M	3,000	1.5	4,500
R16 07	4.08	Painted Pavement Marking for hatching - yellow.	Sq.m.	2,000	7	14,000
R16 07	3.09	Direction Arrows.	No.	125	50	6,250
R16 07	3.10	Pavement Studs (Reflective Surface).	No.	10,727	7	75,089
R14 14	3.11	Steel Guardrail.	L.M	8,207	50	410,350
Miscellaneous summary						***6,000,049***

L.M. Linear Meter No. Number Sq. m Square Mater

Table B4: Drainage Structure Cost Breakdown

Spec. No.	Item No.	Item Description	Unit	Quantity Number	Unit Rate (USD) Number	Total (USD)
		CULVERTS				
	4.01	**Construction of Culverts**				
		Construction of concrete box reinforced culverts. Works include extension of existing culverts, if any, demolishing existing aprons for some culverts and construction of new culverts which includes, construction of drop inlets (in six locations), head walls, end walls, and wing walls, and construction of concrete aprons and flexible aprons according to drawings or as directed by the Engineer.				
B8 27	a-	Reinforced concrete as specified on the drawings for the relevant reinforced structures.	Cu.m	9855	250	2,463,750
B8 27	b-	Plain concrete, such as mass concrete, blinding ... etc.	Cu.m	799	120	95,923
B7 06	c-	Reinforcement for box culverts and drop inlets as per drawings	Ton	1,479	1,250	1,848,365
	4.02	Excavation and backfilling required for the Construction of reinforced concrete box culverts, reinforced concrete pipe culverts and the preparation of all types of side ditches and wadi training along water outflow of culverts.	Cu.m	31,880	13	414,440
	4.03	Pipe Culvert including reinforcement (m)	L.M	878	430	377540
	4.04	Protection works according to drawings and directions of Engineer	L.S	-	-	1,500,000
Drainage Structure summary						**6,700,018**

L.S. Lump Sum Cu.m. Cubic Meter

Table B5: Gersheen Interchange Bridge Cost Breakdown

Spec. No.	Item No.	Item Description	Unit	Quantity Number	Unit Rate (USD) Number	Total (USD)
R5 17	5.01	Structural Excavation for Bridge works	Cu.m	3,600	11	39,600
B8 27	5.02	Provide and Place Plain & Blinding Concrete of Group Dy/37.5	Cu.m.	150	110	16,500
B8 27	5.03	Provide and Place Concrete of Group C/20 for Top Slab, Diaphragms and Concrete Parapets.	Cu.m.	1,000	250	250,000
B8 27	5.04	Provide and Place Concrete of Group C/20 for Abutments, Bents, Approach Slabs and Ear Walls.	Cu.m.	3,000	200	600,000
B8 27	5.05	Precast Panels.	No.	1,809	70	126,630
B8 27	5.06	Provide and Place Concrete of Group B/20 for the Prefabricated Post-Tensioned Concrete girders	Cu.m	790	250	197,500
B7 06	5.07	Provide and Place Steel Reinforcement Grade 460/425 For all Bridge Elements	Ton	720	1,250	900,000
B9 18	5.08	Provide and Place Pre-stressing Steel for the Prefabricated Post-Tensioned Concrete Girders.	Ton	50	4,200	210,000
B11 10	5.09	Provide and Place Water Proffing bitumen Paint where Required and as Directed by the Engineer	Sq.m.	3,220	5	16,100
B13 12	5.10	Provide and Place Approved Movable Elastomeric Bearing Pad.	No.	116	850	98,600
B13 12	5.11	Provide and Place Approved Fixed Elastomeric Bearing Pad.	No.	58	850	49,300
B15 05	5.12	Bridge Expansion Joint	L.m	102	550	56,100
		Piles:				
B4 09	5.13	Provision of Cast-in-Place Concrete Piling for Piles Diameter of (1)m.	L.m	1,920	400	768,000
B4 09	5.14	Pile Load Testing.	L.S.	1	35,000	35,000
		Reinforced Soil Wall:				
R5 17	5.15	Structural Excavation for Footing.	Cu.m.	630	10	6,300
	5.16	Backfilling including Geogrid.	Cu.m.	3,160	20	63,200

B8 27	5.17	Concrete Class Dy/37.5 in Blinding for Footing.	Cu.m.	5	110	550
B8 27	5.18	Concrete Class C/20 for Footing and Concrete Plinth.	Cu.m.	24	220	5,280
	5.19	Facing Panels class C/20 including Reinforcement and Polymeric Strips.	Sq.m	490	100	49,000
B7 06	5.20	High tensile steel bar reinforcement grade 460/425 for Concrete plinth and Footing.	Ton	3.5	1,250	4,375
Gurshin Interchange Bridge summary						**3,492,035**

L.S. Lump Sum Cu.m. Cubic Meter No. Number Sq. m Square Mater

Table B6: Shela Interchange Bridge Cost Breakdown

Spec. No.	Item No.	Item Description	Unit	Quantity Number	Unit Rate (USD) Number	Total (USD)
R5 17	6.01	Structural Excavation for Bridge works	Cu.m.	4,500	11	49,500
B8 27	6.02	Provide and Place Plain & Blinding Concrete of Group Dy/37.5	Cu.m.	170	110	18,700
B8 27	6.03	Provide and Place Concrete of Group C/20 for Top Slab, Diaphragms and Concrete Parapets.	Cu.m.	1,050	250	262,500
B8 27	6.04	Provide and Place Concrete of Group C/20 for Abutments, Bents, Approach Slabs and Ear Walls.	Cu.m.	3,300	200	660,000
B8 27	6.05	Precast Panels.	No.	1,857	70	129,990
B8 27	6.06	Provide and Place Concrete of Group B/20 for the Prefabricated Post-Tensioned Concrete girders	Cu.m	790	250	197,500
B7 06	6.07	Provide and Place Steel Reinforcement Grade 460/425 For all Bridge Elements	Ton	780	1,250	975,000
B9 18	6.08	Provide and Place Pre-stressing Steel for the Prefabricated Post-Tensioned Concrete Girders.	Ton	50	4,200	210,000
B11 10	6.09	Provide and Place Water Proffing bitumen Paint where Required and as Directed by the Engineer	Sq.m.	3,220	5	16,100
B13 12	6.10	Provide and Place Approved Movable Elastomeric Bearing Pad.	No.	116	850	98,600

B13 12	6.11	Provide and Place Approved Fixed Elastomeric Bearing Pad.	No.	58	850	49,300
B15 05	6.12	Bridge Expansion Joint	L.m	108	550	59,400
		Piles:				
B4 09	6.13	Provision of Cast-in-Place Concrete Piling for Piles Diameter of (1)m.	L.m	2,000	400	800,000
B4 09	6.14	Pile Load Testing.	L.S.	1	35,000	35,000
		Reinforced Soil Wall:				
R5 17	6.15	Structural Excavation for Footing.	Cu.m.	650	10	6,500
	6.16	Backfilling including Georgic.	Cu.m.	3,138	20	62,760
B8 27	6.17	Concrete Class Dy/37.5 in Blinding for Footing.	Cu.m.	5	110	550
B8 27	6.18	Concrete Class C/20 for Footing and Concrete Plinth.	Cu.m.	24	220	5,280
	6.19	Facing Panels class C/20 including Reinforcement and Polymeric Strips.	Sq.m	490	100	49,000
B7 06	6.20	High tensile steel bar reinfocement grade 460/425 for Concrete plinth and Footing.	Ton	3.5	1,250	4,375
Shela Interchange Bridge- summary						**3,690,055**

L.S. Lump Sum Cu.m. Cubic Meter No. Number Sq. m Square Mater

Table B7: Crossing at Station (7+100) Cost Breakdown

Spec. No.	Item No.	Item Description	Unit	Quantity Number	Unit Rate (USD) Number	Total (USD)
R5 17	7.01	Structural Excavation for Underpass	Cu.m	2,600	11.00	28,600.0
B8 27	7.02	Provide and Place Plain & blinding Concrete of Group Dy/37.5 for Underpass	Cu.m	100	110.00	11,000.0
B8 27	7.03	Provide and Place Concrete of Group C/20 for all Underpass Works Including Deck Slab, Walls, Foundations, Parapets and Approach Slabs.	Cu.m	1,500	250.00	375,000.0
B8 27	7.04	Provide and Place Lightweight Aggregate Concrete Over Underpass Deck Slab as per Drawings.	Cu.m	250	110.00	27,500.0

B7 06	7.05	Provide and Place Steel Reinforcement of Grade 460/425 for all Underpass Works	Ton	300	1,250.00	375,000.0
B11 10	7.06	Provide and Place Waterproofing Bitumen Paint where Required for the Underpass and as Directed by the Engineer.	Sq.m	1,500	5.00	7,500.0
R5 17	7.07	Structural Excavation for Wingwalls	Cu.m	750	11.00	8,250.0
B8 27	7.08	Provide and Place Plain & blinding concrete of Group Dy/37.5 for Wingwalls	Cu.m	75	110.00	8,250.0
B8 27	7.09	Provide and Place Concrete of Group C/20 for Wingwalls	Cu.m	800	220.00	176,000.0
B7 06	7.10	Provide and Place Steel Reinforcement of Grade 460/425 for Wingwalls	Ton	180	1,250.00	225,000.0
B11 10	7.11	Provide and Place Waterproofing bitumen Paint where Required for the Wingwalls and as Directed by the Engineer.	Sq.m	2,000	5.00	10,000.0
Crossing at Station (7+100)						**1,252,100.0**

Cu.m. Cubic Meter Sq. m Square Mater

Table B8: Crossing at Station (11+500) Cost Breakdown

Spec. No.	Item No.	Item Description	Unit	Quantity Number	Unit Rate (USD) Number	Total (USD)
R5 17	8.01	Structural Excavation for Underpass	Cu.m	3,500	11.00	38,500.0
B8 27	8.02	Provide and Place Plain & blinding Concrete of Group Dy/37.5 for Underpass	Cu.m	100	110.00	11,000.0
B8 27	8.03	Provide and Place Concrete of Group C/20 for all Underpass Works Including Deck Slab, Walls, Foundations, Parapets and Approach Slabs.	Cu.m	1,500	250.00	375,000.0
B8 27	8.04	Provide and Place Lightweight Aggregate Concrete Over Underpass Deck Slab as per Drawings.	Cu.m	250	110.00	27,500.0
B7 06	8.05	Provide and Place Steel Reinforcement of Grade 460/425 for all Underpass Works	Ton	300	1,250.00	375,000.0
B11 10	8.06	Provide and Place Waterproofing Bitumen Paint where Required for the Underpass and as Directed by the Engineer.	Sq.m	1,500	5.00	7,500.0
R5 17	8.07	Structural Excavation for Wingwalls	Cu.m	750	11.00	8,250.0
B8 27	8.08	Provide and Place Plain & blinding concrete of Group Dy/37.5 for Wingwalls	Cu.m	75	110.00	8,250.0
B8 27	8.09	Provide and Place Concrete of Group C/20 for Wingwalls	Cu.m	800	220.00	176,000.0
B7 06	8.10	Provide and Place Steel Reinforcement of Grade 460/425 for Wingwalls	Ton	180	1,250.00	225,000.0
B11 10	8.11	Provide and Place Waterproofing bitumen Paint where Required for the Wingwalls and as Directed by the Engineer.	Sq.m	2,000	5.00	10,000.0
Crossing at Station (11+500)						**1,262,000.0**

Cu.m. Cubic Meter Sq. m Square Mater

Table B9: Crossing at Station (15+900) Cost Breakdown

Spec. No.	Item No.	Item Description	Unit	Quantity Number	Unit Rate (USD) Number	Total (USD)
R5 17	9.01	Structural Excavation for Underpass	Cu.m	3,000	11.00	33,000.0
B8 27	9.02	Provide and Place Plain & blinding Concrete of Group Dy/37.5 for Underpass	Cu.m	100	110.00	11,000.0
B8 27	903	Provide and Place Concrete of Group C/20 for all Underpass Works Including Deck Slab, Walls, Foundations, Parapets and Approach Slabs.	Cu.m	1,500	250.00	375,000.0
B8 27	9.04	Provide and Place Lightweight Aggregate Concrete Over Underpass Deck Slab as per Drawings.	Cu.m	250	110.00	27,500.0
B7 06	9.05	Provide and Place Steel Reinforcement of Grade 460/425 for all Underpass Works	Ton	300	1,250.00	375,000.0
B11 10	9.06	Provide and Place Waterproofing Bitumen Paint where Required for the Underpass and as Directed by the Engineer.	Sq.m	1,500	5.00	7,500.0
R5 17	9.07	Structural Excavation for Wingwalls	Cu.m	750	11.00	8,250.0
B8 27	9.08	Provide and Place Plain & blinding concrete of Group Dy/37.5 for Wingwalls	Cu.m	75	110.00	8,250.0
B8 27	9.09	Provide and Place Concrete of Group C/20 for Wingwalls	Cu.m	800	220.00	176,000.0
B7 06	9.10	Provide and Place Steel Reinforcement of Grade 460/425 for Wingwalls	Ton	180	1,250.00	225,000.0
B11 10	9.11	Provide and Place Waterproofing bitumen Paint where Required for the Wingwalls and as Directed by the Engineer.	Sq.m	2,000	5.00	10,000.0
Crossing at Station (15+990)						**1,256,500.0**

Cu.m. Cubic Meter Sq. m Square Mater

Table B10: Crossing at Station (18+440) Cost Breakdown

Spec. No.	Item No.	Item Description	Unit	Quantity Number	Unit Rate (USD) Number	Total (USD)
R5 17		Structural Excavation for Underpass	Cu.m	2,000	11.00	22,000.0
B8 27	10.02	Provide and Place Plain & blinding Concrete of Group Dy/37.5 for Underpass	Cu.m	50	110.00	5,500.0
B8 27	10.03	Provide and Place Concrete of Group C/20 for all Underpass Works Including Deck Slab, Walls, Foundations, Parapets and Approach Slabs.	Cu.m	500	250.00	125,000.0
B8 27	10.04	Provide and Place Lightweight Aggregate Concrete Over Underpass Deck Slab as per Drawings.	Cu.m	75	110.00	8,250.0
B7 06	10.05	Provide and Place Steel Reinforcement of Grade 460/425 for all Underpass Works	Ton	90	1,250.00	112,500.0
B11 10	10.06	Provide and Place Waterproofing Bitumen Paint where Required for the Underpass and as Directed by the Engineer.	Sq.m	750	5.00	3,750.0
R5 17	10.07	Structural Excavation for Wingwalls	Cu.m	600	11.00	6,600.0
B8 27	10.08	Provide and Place Plain & blinding concrete of Group Dy/37.5 for Wingwalls	Cu.m	40	110.00	4,400.0
B8 27	10.09	Provide and Place Concrete of Group C/20 for Wingwalls	Cu.m	500	220.00	110,000.0
B7 06	10.10	Provide and Place Steel Reinforcement of Grade 460/425 for Wingwalls	Ton	80	1,250.00	100,000.0
B11 10	10.11	Provide and Place Waterproofing bitumen Paint where Required for the Wingwalls and as Directed by the Engineer.	Sq.m	500.00	5.00	2500.00
Crossing at Station (18+440)						**500,500.0**

Cu.m. Cubic Meter Sq. m Square Mater

Table B11: Underpass 1- Ramp 2 Cost Breakdown

Spec. No.	Item No.	Item Description	Unit	Quantity Number	Unit Rate (USD) Number	Total (USD)
R5 17	11.01	Structural Excavation for Underpass	Cu.m	1,600	11.00	17,600.0
B8 27	11.02	Provide and Place Plain & blinding Concrete of Group Dy/37.5 for Underpass	Cu.m	75	110.00	8,250.0
B8 27	11.03	Provide and Place Concrete of Group C/20 for all Underpass Works Including Deck Slab, Walls, Foundations, Parapets and Approach Slabs.	Cu.m	1,570	250.00	392,500.0
B8 27	11.04	Provide and Place Lightweight Aggregate Concrete Over Underpass Deck Slab as per Drawings.	Cu.m	120	110.00	13,200.0
B7 06	11.05	Provide and Place Steel Reinforcement of Grade 460/425 for all Underpass Works	Ton	260	1,250.00	325,000.0
B11 10	11.06	Provide and Place Waterproofing Bitumen Paint where Required for the Underpass and as Directed by the Engineer.	Sq.m	2,100	5.00	10,500.0
R5 17	11.07	Structural Excavation for Wingwalls	Cu.m	700	12.00	8,400.0
B8 27	11.08	Provide and Place Plain & blinding concrete of Group Dy/37.5 for Wingwalls	Cu.m	25	110.00	2,750.0
B8 27	11.09	Provide and Place Concrete of Group C/20 for Wingwalls	Cu.m	400	220.00	88,000.0
B7 06	11.10	Provide and Place Steel Reinforcement of Grade 460/425 for Wingwalls	Ton	60	1,250.00	75,000.0
B11 10	11.11	Provide and Place Waterproofing bitumen Paint where Required for	Sq.m	800	5.00	4,000.0

		the Wingwalls and as Directed by the Engineer.				
Underpass 1- Ramp 2 Summary						**945,200.0**

Cu.m. Cubic Meter Sq. m Square Mater

Table B12: Underpass 2- Ramp 2 Cost Breakdown

Spec. No.	Item No.	Item Description	Unit	Quantity Number	Unit Rate (USD) Number	Total (USD)
R5 17	12.01	Structural Excavation for Underpass	Cu.m	1,800	11.00	19,800.0
B8 27	12.02	Provide and Place Plain & blinding Concrete of Group Dy/37.5 for Underpass	Cu.m	85	110.00	9,350.0
B8 27	12.03	Provide and Place Concrete of Group C/20 for all Underpass Works Including Deck Slab, Walls, Foundations, Parapets and Approach Slabs.	Cu.m	1,665	250.00	416,250.0
B8 27	12.04	Provide and Place Lightweight Aggregate Concrete Over Underpass Deck Slab as per Drawings.	Cu.m	125	110.00	13,750.0
B7 06	12.05	Provide and Place Steel Reinforcement of Grade 460/425 for all Underpass Works	Ton	275	1,250.00	343,750.0
B11 10	12.06	Provide and Place Waterproofing Bitumen Paint where Required for the Underpass and as Directed by the Engineer.	Sq.m	2,300	5.00	11,500.0
R5 17	12.07	Structural Excavation for Wingwalls	Cu.m	700	12.00	8,400.0
B8 27	12.08	Provide and Place Plain & blinding concrete of Group Dy/37.5 for Wingwalls	Cu.m	25	110.00	2,750.0
B8 27	12.09	Provide and Place Concrete of Group C/20 for Wingwalls	Cu.m	400	220.00	88,000.0

B7 06	12.10	Provide and Place Steel Reinforcement of Grade 460/425 for Wingwalls	Ton	65	1,250.00	81,250.0
B11 10	12.11	Provide and Place Waterproofing bitumen Paint where Required for the Wingwalls and as Directed by the Engineer.	Sq.m	800	5.00	4,000.0
Underpass 2- Ramp 2 Summary						**998,800.0**

Cu.m. Cubic Meter Sq. m Square Mater

Table B13: Underpass 1- Ramp 6 Cost Breakdown

Spec. No.	Item No.	Item Description	Unit	Quantity Number	Unit Rate (USD) Number	Total (USD)
R5 17	13.01	Structural Excavation for Underpass	Cu.m	1,500	11.00	16,500.0
B8 27	13.02	Provide and Place Plain & blinding Concrete of Group Dy/37.5 for Underpass	Cu.m	70	110.00	7,700.0
B8 27	13.03	Provide and Place Concrete of Group C/20 for all Underpass Works Including Deck Slab, Walls, Foundations, Parapets and Approach Slabs.	Cu.m	1,500	250.00	375,000.0
B8 27	13.04	Provide and Place Lightweight Aggregate Concrete Over Underpass Deck Slab as per Drawings.	Cu.m	120	110.00	13,200.0
B7 06	13.05	Provide and Place Steel Reinforcement of Grade 460/425 for all Underpass Works	Ton	220	1,250.00	275,000.0
B11 10	13.06	Provide and Place Waterproofing Bitumen Paint where Required for the Underpass and as Directed by the Engineer.	Sq.m	2,000	5.00	10,000.0
R5 17	13.07	Structural Excavation for Wingwalls	Cu.m	600	12.00	7,200.0

B8 27	13.08	Provide and Place Plain & blinding concrete of Group Dy/37.5 for Wingwalls	Cu.m	25	110.00	2,750.0
B8 27	13.09	Provide and Place Concrete of Group C/20 for Wingwalls	Cu.m	352	220.00	77,440.0
B7 06	13.10	Provide and Place Steel Reinforcement of Grade 460/425 for Wingwalls	Ton	60	1,250.00	75,000.0
B11 10	13.11	Provide and Place Waterproofing bitumen Paint where Required for the Wingwalls and as Directed by the Engineer.	Sq.m	850	5.00	4,250.0
Underpass 1- Ramp 6 Summary						**864,040.0**

Cu.m. Cubic Meter Sq. m Square Mater

Table B14: Underpass 2 - Ramp 6 Cost Breakdown

Spec. No.	Item No.	Item Description	Unit	Quantity Number	Unit Rate (USD) Number	Total (USD)
R5 17	14.01	Structural Excavation for Underpass	Cu. m	1,800	11.00	19,800.0
B8 27	14.02	Provide and Place Plain & blinding Concrete of Group Dy/37.5 for Underpass	Cu. m	75	110.00	8,250.0
B8 27	14.03	Provide and Place Concrete of Group C/20 for all Underpass Works Including Deck Slab, Walls, Foundations, Parapets and Approach Slabs.	Cu. m	1,725	250.00	431,250.0
B8 27	14.04	Provide and Place Lightweight Aggregate Concrete Over Underpass Deck Slab as per Drawings.	Cu. m	120	110.00	13,200.0

B7 06	14.05	Provide and Place Steel Reinforcement of Grade 460/425 for all Underpass Works	Ton	252	1,250.00	315,000.0
B11 10	14.06	Provide and Place Waterproofing Bitumen Paint where Required for the Underpass and as Directed by the Engineer.	Sq. m	2,200	5.00	11,000.0
R5 17	14.07	Structural Excavation for Wingwalls	Cu. m	700	12.00	8,400.0
B8 27	14.08	Provide and Place Plain & blinding concrete of Group Dy/37.5 for Wingwalls	Cu. m	30	110.00	3,300.0
B8 27	14.09	Provide and Place Concrete of Group C/20 for Wingwalls	Cu. m	430	220.00	94,600.0
B7 06	14.10	Provide and Place Steel Reinforcement of Grade 460/425 for Wingwalls	Ton	65	1,250.00	81,250.0
B11 10	14.11	Provide and Place Waterproofing bitumen Paint where Required for the Wingwalls and as Directed by the Engineer.	Sq. m	800	5.00	4,000.0
Underpass 2 Ramp 6 Summary						**990,050.0**

Cu.m. Cubic Meter Sq. m Square Mater

Table B15: Electrical Work Cost Breakdown

Spec. No.	Item No.	Item Description	Unit	Quantity Number	Unit Rate (USD) Number	Total (USD)
		POWER SUBSTATION				
	15.01	11/0.38 kV, 250 kVA, dry type outdoor package type power substation including transformer, ring main unit (RMU) and low voltage compartment	No.	12	20,000	240,000
		Feeder Pillars				
I1 04	15.02	F.P	No.	16	6,000	96,000
		STREET LIGHTING UNITS				
		S&I the following lighting units				
I1 05&I109 &I1 07	15.03	12m high single arm street lighting pole with 250w high pressure sodium lamp, IP65	No.	273	1,000	273,000
I1 05&I109 &I1 07	15.04	12m high double arm street lighting pole with 250w high pressure sodium lamp, IP65	No.	458	1,500	687,000
I1 05&I109 &I1 07	15.05	Tunnel lighting luminaire with 70W high pressure sodium lamp, IP66	No.	32	500	16,000
I1 05&I109 &I1 07	15.06	30m high mast with 1000W high pressure sodium flood lights, mobile head frame and motorized portable maneuvering unit, IP65	No.	8	60,000	480,000
		Cables				
		S&I the following cables				
I1 08	15.07	30,000 meter of Armoured Cables	L.S.	L.S.	L.S.	750,000
		S&I the following Trenshes				
I1 10	15.08	2X100mm uPVC Conduits with concrete encasement	L.S.	L.S.	L.S.	200,000
Electrical Works Summary						**2,742,000**

L.S. Lump Sum **No. Number**

Annex 2: EPA Emissions Standards

Light Duty Vehicles Emission Standards

	Vehicle Type	Emission Category	Vehicle Useful Life												
			5 Years / 50,000 Miles						10 Years / 100,000 Miles						
			NMHC [a] (g/mi)	NMOG (g/mi)	COb, [c]	NOxd (g/mi)	PM (g/mi)	HCHO (g/mi)	THC[c, e, f] (g/mi)	NMHCa (g/mi)	NMOG (g/mi)	COg (g/mi)	NOx (g/mi)	PM (g/mi)	HCHO (g/mi)
Federal [h, i, j]	LDT3	Tier 0	-	-	-	-	-	-	0.8	0.67k	-	10	1.7	0.26l	-
		Tier 1	0.32	-	4.4	0.7	-	-	0.8	0.46	-	6.4	0.98	0.1	-
	LDT4	Tier 0	-	-	-	-	-	-	0.8	0.67k	-	10	1.7	0.13l	-
		Tier 1	0.39	-	5	1.1	-	-	0.8	0.56	-	7.3	1.53	0.12	-
Federal Clean Fuel Vehicle (CFV) Program [h, i]	LDT3 0-3750 ALVW	LEV	-	0.125n	3.4	0.4	-	0.015	-	-	0.180n	5	0.6	0.08o	0.022
		ILEVm	-	0.125	3.4	0.2	-	0.015	-	-	0.180	5	0.3	0.08o	0.022
		ULEV	-	0.075n	1.7	0.2	-	0.008	-	-	0.107n	2.5	0.3	0.04o	0.012
	LDT3 3751-5750 ALVW	LEV	-	0.160n	4.4	0.7	-	0.018	-	-	0.230n	6.4	1.0	0.10o	0.027
		ILEVm	-	0.160	4.4	0.4	-	0.018	-	-	0.230	6.4	0.5	0.10o	0.027
		ULEV	-	0.100n	2.2	0.4	-	0.009	-	-	0.143n	3.2	0.5	0.10o	0.013
	LDT4 5751-8500 ALVW	LEV	-	0.195n	5	1.1	-	0.022	-	-	0.280n	7.3	1.5	0.12o	0.032
		ILEVm	-	0.195	5	0.6	-	0.022	-	-	0.280	7.3	0.8	0.12o	0.032
		ULEV	-	0.117n	2.5	0.6	-	0.011	-	-	0.167n	3.7	0.8	0.06o	0.016

LDT: Light duty vehicle

LEV: low emission vehicle

ILEV: Inherently low emission vehicles

ULEV: ultra low emission vehicles.

Notes:

Tests Covered: Federal Test Procedure (FTP), cold carbon monoxide (CO), highway, and idle

Effective Model Year: 1981 - 1993, Tier 0

1994 - 1999, Tier 1

1999 - Present, CFV

a Total hydrocarbon equivalent (THCE) for Tier 0 methanol vehicles, non-methane hydrocarbon equivalent (NMHCE) for other alcohol vehicles.

b Cold CO emissions for gasoline fueled vehicles shall not exceed 10.0 grams per mile (g/mi) (light-duty vehicle, light-duty truck 1 [LDT1], LDT2) or 12.5 g/mi (LDT3 & LDT4) at 50,000 miles.

c Certification short test (CST) emissions from gasoline vehicles shall not exceed 100 parts per million HC or 0.50 percent exhaust gas CO at idle and 2500 revolutions per minute at 4,000 miles; compliance statement allowed in lieu of actual test data.

d Does not apply to diesel-fueled vehicles.

e THCE for methanol vehicles.

f Does not apply to compressed natural gas (CNG) vehicles.

g Idle CO emissions from gasoline, methanol, CNG and liquefied petroleum gas trucks shall not exceed 0.50 percent exhaust gas at 120,000 miles or 11 years; compliance statement allowed in lieu of actual test data.

h Federal On-board diagnostics system required beginning with 1994 model year vehicles.

i Tier 1, National Low Emissions Vehicle (NLEV) & CFV vehicles must meet Tier 1 emissions standards at high altitude; Tier 0 vehicles must meet special high altitude standards; compliance statement allowed in lieu of actual test data.

j Tier 0 and Tier 1 emission standards do not apply to ethanol vehicles.

k CNG vehicles only.

l Diesel-fueled vehicles only.

m Special evaporative requirements apply (5.0 grams maximum with the evaporative system disconnected).

n Special non-methane organic gas (NMOG) standards apply to dual and flexible fuel vehicles.

- Diesel-fueled vehicles only.

	Vehicle Type	Emissions Category	Useful Life Standard	Test Weight (lbs)	NMOG (g/mi)	NOx (g/mi)	CO (g/mi)	Formaldehyde (g/mi)	PM (g/mi)[b]
Federal	LDVs	TLEV	Intermediate	All	0.125	0.4	3.4	0.015	-
		LEV			0.075c	0.2	3.4c	0.015c	-
		ULEV			0.040	0.2[c]	1.7	0.008	-
		TLEV	Full		0.156	0.6	4.2	0.018	0.08
		LEV			0.090[c]	0.3	4.2c	0.018	0.08[c]
		ULEV			0.055	0.3[c]	2.1	0.011	0.04
	LLDTs	TLEV	Intermediate	0-3750 LVW	0.0125	0.4	3.4	0.015	-
		LEV			0.075[c]	0.2	3.4c	0.015[c]	-
		ULEV			0.040	0.2[c]	1.7	0.008	-
		TLEV		3751-5750 LVW	0.160	0.7	4.4	0.018c	-
		LEV			0.100[c]	0.4	4.4c	0.018[c]	-

		ULEV			0.050	0.4[c]	2.2	0.009	-
		TLEV	Full	0-3750 LVW	0.156	0.6	4.2	0.018	0.08
		LEV			0.090[c]	0.3	4.2c	0.018[c]	0.08[c]
		ULEV			0.055	0.3[c]	2.1	0.011	0.04
		TLEV		3751-5750 LVW	0.200	0.9	5.5	0.023	0.08
		LEV			0.130[c]	0.5	5.5c	0.023[c]	0.08[c]
		ULEV			0.070	0.5[c]	2.8	0.013	0.04
	HLDTs	LEV	Intermediate	0-3750 LVW	0.125[c]	0.4[d]	3.4c	0.015[c]	-
		ULEV		ALVW	0.075	0.2[c, d]	1.7	0.008	-
		LEV		3751-5750	0.160[c]	0.7[d]	4.4c	0.018[c]	-
		ULEV		ALVW	0.100	0.4[c, d]	2.2	0.009	-
		LEV		5751+	0.195[c]	1.1[d]	5.0c	0.022[c]	-
		ULEV		ALVW	0.117	0.6[c, d]	2.5	0.011	-
		LEV	Full	0-3750 LVW	0.180[c]	0.6	5.0c	0.022[c]	0.08[c]
		ULEV		ALVW	0.107	0.3[c]	2.5	0.012	0.04
		LEV		3751-5750	0.230[c]	1.0	6.4c	0.027[c]	0.10[c]
		ULEV		ALVW	0.143	0.5[c]	3.2	0.013	0.05
		LEV		5751+	0.280[c]	1.5	7.3c	0.032[c]	0.12[c]
		ULEV		ALVW	0.167	0.8[c]	3.7	0.016	0.06

LDT: Light duty vehicle

LEV: low emission vehicle

ILEV: Inherently low emission vehicles

TLEV: transitional low emission vehicles

ULEV: ultra low emission vehicles.

a These standards have in effect been superseded by newer, more stringent standards in 40 Code of Federal Regulations (CFR) Part 86.

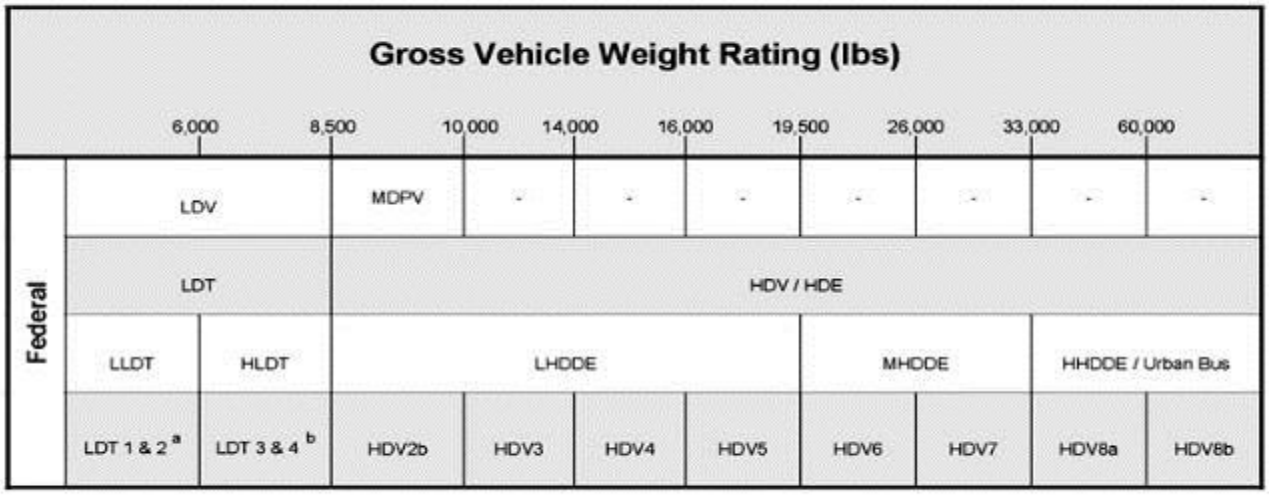
c Applies to Inherently Low Emission Vehicles.

d Does not apply to diesel vehicles.

Heavy-Duty Highway Engine -- Clean Fuel Fleet Exhaust Emission Standards

	Emissions Category	NMHC+NOx (g/bhp-hr)	CO (g/bhp-hr)	PM (g/bhp-hr)	Formaldehyde (g/bhp-hr)
Federal	LEV (Federal Fuel)	3.8	b	b	b
	LEV (California Fuel)	3.5	b	b	b
	ILEV	2.5	14.4	0.10	0.05
	ULEV	2.5	7.2	0.05	0.025
	ZEV	0	0	0	0

LDT: Light duty vehicle
LEV: low emission vehicle
ILEV: Inherently low emission vehicles
ULEV: ultra low emission vehicles.
ZEV: zero emission vehicles



Vehicle weight classifications

a Light-duty truck (LDT) 1 if loaded vehicle weight (LVW) = 3,750; LDT 2 if LVW > 3,750
b LDT 3 if adjusted loaded vehicle weight (ALVW) = 5,750; LDGT 4 if ALVW > 5,750
LHDDE: light heavy duty diesel engine
MHDDE: Medium heavy duty diesel engine
HHDDE: heavy heavy-duty diesel engine
MDPV: medium duty passenger vehicles.

Annex 3: List of Attendees of the First Consultation Session

#	Name	Organization
1	Khaled Yassin	Dohuk Municipality
2	Samr Khaled	Dohuk Municipality
3	Mohammad Ahmad	Farmer
4	Mohammad Yousef	Mukhtar of Mazri
5	Hazem Ghazi	Mukhtar of Rizgari
6	Hadija Lak	GDRB
7	Mulla Said	Farmer
8	Norad Khaled	GDRB
9	Diwalli Mohammad	GDRB
10	Caroline Winter	World Bank
11	Mayada Zaki	Department of Antiquities, Dohuk
12	Jwan Jamil Omar	Department of Antiquities, Dohuk
13	Bawer Hussein	GDRB
14	Younis Ali	Environmental Directorate of Dohuk
15	Fuad Sadiq	Farmer
16	Bartlan Abdel Jabbar	Farmer
17	Nawar Bin Taher	Farmer
18	Hanat Ahmad Hussein	Farmer
19	Ismail Khomoza	Mukhtar of Kadia
20	Shaker Abed Abdo	Mukhtar of Kani Kark
21	Foubat Abdo Bintu	Mukhtar of Krowin
22	Rami Hrand	Ibrahim Khalil Municipality
23	Mushir Ahmad	Zakho University
24	Mazen Said	Zakho University
25	Dilshad Rasheed	Zakho University
26	Walid Suleiman	Directorate of Agriculture of Batil
27	Abdel Razaq Suleiman	Directorate of Agriculture of Batil
28	Mohammad Zakari	GDRB
29	Shukri Omar	Department of Statistics of Dohuk
30	Nama'a Said	Investment Board of Dohuk
31	Huzam Mustafa	Department of Health of Dohuk
32	Amal Juma'a	Department of Health of Dohuk
33	Rabia Saadallah	Dohuk University

#	Name	Organization
34	Rashid Haji	Farmer
35	Salem Smou	Kalek Complex
36	Fadel Saleh	Bawarda Complex
37	Aveen Shukri	Farmer
38	Mohammad Hasan	Farmer
39	Salah Ali	Farmer
40	Bilind Kamil	Arabtech Jardaneh Company
41	Haitham Ali	Arabtech Jardaneh Company
42	Adham Abeidat	Arabtech Jardaneh Company
43	Iyad Ashoub	Arabtech Jardaneh Company
44	Khaled Nassar	Arabtech Jardaneh Company
45	Khalil Ankar	Arabtech Jardaneh Company

سمينارا رێڤەبەريا گشتى يا ريك و پرا لسەر پروژێ – دوريانا گرشين – دوريانا سحيله

الجلسة التشاورية المتعلقة بأعمال مشروع إنشاء طريق – ابراهيم الخليل/ديره بون/كرشين/سيميل

الأربعاء 17 تموز 2013

ژمارە	ناف	جهێ كارى	ژمارە موبايل	ناف و نيشان	ئيمزا
الرقم	الإسم	المؤسسة	رقم الهاتف	العنوان/ البريد الإلكتروني	التوقيع
No.	Name	Organization	Telephone No.	Address / email	Signature
1	خالد سليمان ياسين	بلديات دهوك	0750 4558772	khalid_Rekan@yahoo	
2	[illegible]	[illegible]	0750 450 55 11	Samir Sedly@yahoo.com	
3	[illegible]	[illegible]	[illegible]		
4	[illegible]	[illegible]	[illegible]		
5	[illegible]	[illegible]	[illegible]		
6	[illegible]	[illegible]	[illegible]	Abd.duhok@yahoo.com	
7	[illegible]	[illegible]	[illegible]		
8	[illegible]	المديرية العامة للطرق	[illegible]	[illegible]@yahoo.com	
9	[illegible]	[illegible]	[illegible]		
10					
11	Carolyn Winter	World Bank		[illegible]	

الجلسة التشاورية المتعلقة بأعمال مشروع إنشاء طريق – ابراهيم الخليل/ديره بون/كرشين/سيميل

الأربعاء 17 تموز 2013

No.	Name	Organization	Telephone No.	Address / email	Signature
الرقم	الإسم	المؤسسة	رقم الهاتف	العنوان/ البريد الإلكتروني	التوقيع
1					
2					
3					
4					
5					
6					
7					
8					
9				haval-upe@yahoo.com	
10					
11					
12					

الرقم	الإسم	المؤسسة	رقم الهاتف	العنوان/ البريد الإلكتروني	التوقيع
No.	Name	Organization	Telephone No.	Address / email	Signature
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					

24

الجلسه التشاوريه المتعلقه باعمال مشروع إنشاء طريق – ابراهيم الخليل/ديره بون/كرشين/سيميل

الأربعاء 17 تموز 2013

ژمارە	ناو	جێی کاری	ژمارە مۆبایل	ناو و نیشان	ئیمزا
الرقم	الإسم	المؤسسة	رقم الهاتف	العنوان/ البريد الإلكتروني	التوقيع
No.	Name	Organization	Telephone No.	Address / email	Signature
1	بشير سليمان حمي	[illegible]	٤٥٠٩٢٩٧		
2	سالم محمد سمو	مجمع كيلك	٤٧٢٨٥٢٤		
3	عادل سليم صالح	مجمع بادردە	٤٧١٤٠٥٩		
4	افين شكري محمود	[illegible]	٠٧٥٠٦٠١٣١١٨		
5	محمد سليم حسن	رئيس نقابة النقل	٠٧٥٠٨٧٧٧٤٠٩		
6	صلاح عبد الكريم صالح	[illegible]	٠٧٥٠٤٥٨٢٧١٤	salahaali17@_	
7	بلند فاروق خاصين	ارابتك جردانة	٠٧٥٠٤٤٩٩٩٨٤	Rande_amed: [illegible]	
8	هيثم علي	ارابتك جردانة	+962789733765	—	
9	أيمن عبدات	ارابتك جردانة	+962772500295	—	
10	ايار ميقوت	//			
11	خالد نصار				
12	[illegible]	[illegible]	+964 750 930 9108	khalil_alan[illegible] AJ-Group.com	

Annex 4: List of Attendees of the Second Consultation Session

Name	Name of the Organization	Job Title/Position
Abdullah Smu	Roads - Duhuk	In charge of Surveillance dept. Duhuk
Mazen Mohammad Said	Fayfam Samil Province	Fayfam
Warshin Salman Mohammad Taher	Duhuk Governorate-Directorate of Nasser Batil	Directorate of Nasser Batil
Shawkat Muhsen Abdelkarim	N/A	Qadya village
Iyad Hussein Abdelkarim	N/A	Land owner
Walid Arab Suleiman	Batil Agric. Division	Agricultural Engineer
Bazar Hasan Sharaf	General Directorate of Municipalities in Duhuk Governorate	Chief engineer, head of maintenance dept.
Mohammad Taher Saleh		Land owner
Majid Ali Taha	General Directorate of Municipalities in Duhuk Governorate	Chief of Supervision dept. in Municipalities of Duhuk Governorate
Jalal Musa Ali	مرور دهوك Traffic Police	Director of traffic dept. in Semel
Subhi Kadir Masuud	Siil agricultural directorate	Agricultural Director of Semel
Dr. Rabii Ismat Saad Allah	Agriculture and forestry faculty-Duhuk University	Deputy Rector
Saleh Yunus Saleh	Duhuk Traffic	Traffic officer Semel
Issa Suleiman Issa		Head of Union of Labor Unions - Duhuk

Name	Name of the Organization	Job Title/Position
Ethil Ibrahim Abdallah	Duhuk Archeological Directorate	Duhuk Archeological Inspection
Yihya Mohammad Salim Hassan	Transport Assoc. Duhuk	Director of Transport Assoc.
Fuad Hamad Saleh	Transport Assoc. Duhuk	Senior technical supervisor
Masud Abdelaziz Bazkar	Mokhnaz	
Jamil Jassem Ahmad	General Directorate of Investment Duhuk	Executive Director
Rami Subhi Hurmuz	Mayor of Ibrahim Alkhalil Munic.	Civil Engineer
Mohammad Abderkarim Gengiz	Mukhtar Brafia Village	Mukhtar
Izzat Khorsheed Rasheed	General Directorate of Duhuk Municipalities	Chief of evaluation and inspection in General diroctorate
Mohammad Zakari Ramadan	GDRB-Duhuk	Engineer
Hazem Pamir Loz	Duhuk Farmers Union	Member of farmers Union Duhuk
Manna Hussein Mustafa		Mukhtar of Turkistan
Giurumescu Vasile Sebastian	network telecom	OSP.SUPERVISOR
Shafeeq Sulamain Tawfeeq	network telecom	Duhok USP Manager
Yunus Ahmad Ali	Farsheen Organization for Environmental Protection	Executive Director of Organization
Idris Majid Kareem	Duhuk Environmental Dept.	Dept. Head

ت	ناڤ	جهی کاریٚ	توقيع وتلفون یان ئیمیل
١-	ئاشيل ابراهيم عبدالله	مديرية آثار دهوك	07504186128 abn-al-RaFidengo
٢-	محمد محمد سليم حسن	رئيس نقابة النقل	07504747409
٣-	عيسى سليمان عيسى	رئيس اتحاد نقابات العمال محافظة دهوك	0750-4545047
٤	دارا شين سلام	مدير نا ميديا [illegible]	[illegible]
٥-	نازن محمد سعيد	قاقتار [illegible]	
٦-	د. ربيع [illegible]	فاكولتة زراعة و [illegible] جامعة دهوك	[illegible]
٧-	اياد حسين عبد الكريم	سوپەرمارکێت [illegible]	[illegible]
٨-	وليد عمر سليمان	بەرێوەبەری [illegible]	[illegible]
٩-	ماجد علي حمه	ڕێڤەبەریا گشتی یا بازرگانیێ بارێزگەها دهوکێ	[illegible]
١٠	جابر معاذ شعبان	ڕێڤەبەریا گومرکا دهوکێ	[illegible]
١١	عزت خورشید رشید	ڕێڤەبەریا گشتی یا بازرگانیێ بارێزگەها دهوکێ	[illegible]
١٢	ابراهیم حسن شرف	ڕێڤەبەریا گشتی یا بازرگانیێ بارێزگەها دهوکێ	[illegible]

00964750735 0191	رئاسة بلدية ابراهيم كليل	رامي صالح حرفر	١٣
jamil_jassim@yahoo.com ٠٧٥٠٤٥٠١٦٤٨	المديرية العامة للاستثمار في دهوك	جميل جاسم احمد	١٤
07504406588	شركة نوروز ستليكوم	شفيق سليمان توفيق	١٥
0662610229	= = =	GIURUMESCU VASILE SEBASTIAN	16
4744935	منظمة فرشين لحماية البيئة زاخو	يوسف احمد	17
0750 450 5664	فه رمانگه‌ی ژینگه‌ی دهۆك	ادريس عبد المجيد كريم	18
٧٥٠ ٤٥٠١٤٧٩٤	رێبه‌ری [illegible] دهۆك	خوا [illegible]	19
	رێبه‌ری [illegible]	حسين ابراهيم صالح	٢٠
Rbd.duhok@yahoo.com 07504588584	[illegible] دهۆك	خديجة محمد [illegible]	٢١
٤٦٩٥٠٧٢	مرور دهوك	جلال محمد [illegible]	٢٢
٧٥٠ ٤٤١ ٦٦	مرور دهوك	حاجي يونس صالح	٢٣
	مسعود عبد العزيز [illegible] / موختار [illegible]		٢٤
	موختار [illegible]	فتاح حسن [illegible]	٢٥

	جاشنير [illegible]	محمد عبدالكاظم [illegible]	٢٦
٤٦٦٧٧٤٥	مدير زراعة [illegible]	[illegible] قادر مسعود	٢٧
[illegible]	مختار قادية	شوكت محسن عبدالكريم	٢٨
[illegible]	مختار كوخي	محمد [illegible] صالح	٢٩
[illegible]	اتحاد فلاحين دهوك	[illegible]	٣٠
07504455494	المديرية العامة للأوقاف [illegible]	محمد زكريا رمضان	٣١
07504460364	مديرية دائرة الجسور	[illegible]	٣٢
07504687993	مديرية طرق وجسور دهوك	[illegible]	٣٣
	PMC	[illegible]	٣٤
	PMC	Tatyana Gorskaya	٣٥
	PMC	[illegible]	٣٦
	P.M.C	عبدالستار [illegible]	
	PMC		

Annex 5: Second Consultation Session Questionnaire

Segment 3: Consultation Session

#	Question	Response		
1. Personal Info				
1	Name			
2	Name of Organization			
3	Position/Job Title			
4	Member of NGO or any other association	Yes	No	If Yes, please specify
5	Contact Info	Phone #		E-mail
2. Knowledge about the Project				
6	Have you had any previous knowledge about the road construction?	Yes		No
7	Please specify where did you get the information about the road construction from?			
8	Did you have any knowledge about the road alignment?	Yes		No
9	Do you think the road alignment is suitable and appropriate?	Yes	No	If no, please, specify why
10	Do you have any suggestions about the road alignment? Please elaborate			

3. Main Environmental Issues

#	Question	Response	
11	What do you consider to be the most significant environmental issues in related to the road construction and operations	Air pollution	
		Soil/ Groundwater contamination from inadequate solid waste disposal	
		Soil/ Groundwater contamination from inadequate liquid waste disposal	
		Land acquisition	
		Safety of local communities due to the machinery and traffic	
		Difficulties in accessing of pastures and cultivation areas	
		Aesthetic impact due to excavation	
		Other (please specify)	
12	What activities do you consider as most damaging to the environment?	Excavation	
		Unauthorized disposal of the effluent	
		Unauthorized disposal of the solid waste	
		Heavy traffic movement	
		Traffic emissions	
		Loss of land and properties	
		Other (please specify)	

#	Question	Positive	Negative	Don't know
13	What in your opinion is the impact of the road construction on the land/property value?			

14	What in your opinion is the effect of the road construction on accessibility to health care services, educational, cultural, etc. services?	Positive	Negative	Don't know
15	Were you informed about the possibility of land acquisition for the project?	Yes	No	Not interested
16	Were you informed about the compensation for land acquisition?	Yes	No	Not interested
17	What in your opinion is the impact of the road construction on accessibility to water resources and other resources?	Positive	Negative	Don't know
18	What in your opinion are the benefits of the road construction?	Improved access to different facilities and services		
		Possibility of reaching the markets		
		Possibility to develop businesses next to the road		
		Improved water supply		
		Improved supply of the food items		
		Reduced time of travel		
		Improved safety of travel		
		Improved safety for pedestrian crossing		
		Improved crossings for livestock		
		Other (please specify)		
19	Role of institutions involved in the road management?	Not Important	Important	Don't know
	Directorate of Roads and Bridges			

	Ministry of Environment			
	Ministry of Agriculture and Water			
	Ministry of Finance			
	Governor's Office			
	Municipality			

4. Suggestions and Recommendations

Annex 6: References

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