ENVIRONMENTAL MANAGEMENT GUIDELINES

His Majesty's Government of Nepal

MINISTRY OF WORKS AND TRANSPORT

DEPARTMENT OF ROADS

GEO-ENVIRONMENTAL UNIT

Reprint, July 1999

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May 1997

FOREWORD

His Majesty's Government of Nepal has been giving priority to the development of roads since the beginning of planned development programmes more than 30 years ago. With this effort, the road length of the country which was only 376 km in 1951 is now more than 10,000 km.

The construction of roads in Nepal, which mostly has rugged topography dissected by north to south flowing rivers, is not merely a technical and economical challenge but also an environmental one. Although roads are meant for the economic development of the country, there are various types and degrees of environmental problems associated with their construction. These environmental problems are not only associated with the physical environment but also related to biological, social, cultural, and sometimes archaeological problems. Landslides, slope failures, soil erosion, loss of agricultural and forest land, and sedimentation into water bodies are some of the negative impacts of road construction.

The environmental policy of HMG was gazetted as the National Environmental Impact Assessment Guidelines in 1993. The final draft of the Road Sector Environmental Assessment Guidelines is already prepared and only needs HMG's formal approval to implement. With the promulgation of Environmental Law in the near future, all the development projects will be subjected to environmental screening in accordance with these guidelines. Hence, there is an urgent need for Environmental Management Guidelines to implement environmental mitigation measures in the surveying, design, construction, and maintenance and operation of road projects. To address this need, these Environmental Management Guidelines have been prepared by the Geo-Environmental Unit of the Department of Roads as part of a programme undertaken jointly by HMG and the World Bank under the Road Maintenance and Rehabilitation Project. The guidelines were formally approved by a Minister Level decision on Kartik 22, 2053 B.S.

All road managers and engineers should apply these guidelines such that the adverse environmental impacts of road construction are minimised and controlled to an acceptable level. This will contribute to the basic principle of economic development with due care for the environment we live in.

Bharati Sharma,
Director General,
Department of Roads.

May 1997

Contents

Abbreviations

DOA	Department of Archeology
DOR	Department of Roads
EAO	Environmental Assessment Officer, GEU
EIA	Environmental Impact Assessment
FIDIC	Federation Internationale des Ingenieurs - Conseils
GEU	Geo-Environmental Unit, DOR
HMG	His Majesty's Government
IEE	Initial Environmental Examination
IUCN	International Union of Conservation of Nature and Natural Resources - The World Conservation Union
MLD	Ministry of Local Development
NCS	National Conservation Strategy
NPC	National Planning Commission
PLRP	Pilot Labour-Based District Road Rehabilitation and Maintenance Programme
TOR	Terms of Reference

1 Introduction

1.1 Purpose and Scope of Guidelines

These Environmental Management Guidelines have been prepared to ensure that environmental considerations are integrated into the project survey and design, tender documents, contract documents, and project supervision and monitoring. These Guidelines are to be used in conjunction with new road construction and maintenance and rehabilitation projects. If these Guidelines are properly implemented, then the environmental impacts resulting from road construction, operation, maintenance and rehabilitation should be minimised. Ultimately, it is hoped that the Guidelines will improve road performance and reliability, increase benefits to local residents, and maximise cost effectiveness.

Prior to the implementation of these Guidelines, it is a prerequisite that the appropriate level of environmental assessment is properly undertaken. The level of environmental assessment activities and their relationship with the road project cycle are shown in Annex A.

These Guidelines are to be used by the DOR Regions, Divisions, Project Managers, consultants and contractors. Other potential users of these Guidelines include other road construction proponents such as the Nepal Electricity Authority, Royal Nepal Army, the District Development Committees, the Pilot Labour-Based District Road Rehabilitation and Maintenance Programme (PLRP) within the Ministry of Local Development, and other agencies such as municipalities and Town Development Boards.

It is intended that the concepts and procedures presented in the Environmental Management Guidelines will become part of standard operating practices for all DOR road maintenance, rehabilitation and construction activities. It is further envisioned that these Guidelines will help DOR and other road proponents in fulfilling their environmental responsibilities as explained in the **National Environmental Impact Assessment Guidelines - 1993** and the **Environmental Impact Assessment Guidelines for the Road Sector**.

To further ensure that environmental issues are adequately incorporated in project implementation, it is envisioned that the DOR Environmental Management Guidelines will eventually be included as part of the project tender documents package or in the Letter of Invitation to potential bidders.[1]

1.2 Content of Guidelines

The Environmental Management Guidelines consist of the following sections: Environmental Mitigation Measures to be incorporated into DOR projects, procedures for Public Participation, and Socio-Economic Considerations. The Environmental Mitigation Measures are broken down into 12 categories or activities and a method for implementation is given for each mitigation measure. A section on public participation suggests methods for determining how and when the public should be included in the environmental analysis. The Guidelines conclude by describing possible socio-economic impacts. For general types of socio-economic impacts, strategies are proposed for reducing or avoiding the potential negative impacts, and for maximising the beneficial impacts to local residents.

2 Environmental Mitigation Measures

Environmental mitigation measures are tool for avoiding, reducing or offsetting the potential adverse environmental impacts resulting from road activities. The environmental mitigation measures described in these Guidelines can establish a protocol for incorporating environmental concerns into the planning and construction of future road projects, including maintenance and rehabilitation activities. For each of the mitigation measures presented in these Guidelines, an implementation methodology is proposed including project design requirements, contract language, Bill of Quantities items, and supervision and monitoring requirements.

2.1 Scope

In identifying the most significant environmental mitigation measures applicable to Nepal conditions, an attempt was made to distinguish between environment-oriented actions and proven and sound road engineering practices. The environmental mitigation measures presented in these Guidelines address environmental issues that are sometimes overlooked in road construction, maintenance and rehabilitation projects. The 12 topic areas include the following:

- Quarries
- Borrow Pits
- Spoil and Construction Waste Disposal
- Work Camp Location & Operation
- Labour Camp Location & Operation
- Earthworks/Slope Stabilisation
- Use of Bitumen
- Stockpiling of Materials
- Explosive, Combustible and Toxic Materials Management
- Setting Up and Operation of Stone Crushing Plants
- Water Management
- Air & Noise Pollution

A detailed description of the 12 environmental mitigation measures is presented in Annex B. Implementation procedures are also summarised for each of the mitigation measures.

It is intended that these environmental mitigation measures be used in conjunction with good road engineering design, construction and operation practices such as the following:

⇒ road alignment selection that avoids landslide-prone and geological unstable areas, forests, prime agricultural land, sensitive ecosystems, and important cultural and religious sites;

⇒ road alignment selection that avoids large scale cutting and filling and that is based on mass balancing;

⇒ proper application, design, and construction of cut slopes using appropriate stabilising structures (breast walls, toe walls, and retaining walls);

⇒ use of bio-engineering on all exposed cut and fill slopes and on completed spoil tips to minimise subsequent erosion;

⇒ use of structurally sound earth filling practices utilising proper benching and compacting; and

⇒ provision of suitable drainage facilities utilising discharge to natural drainage channels in conjunctions with erosion protection features.

2.2 Implementation

The environmental mitigation measures are to be integrated into the project design and tender documents. Using this approach, the mitigation measures will automatically become part of the project construction and operation phase. By inciuding environmental mitigation measures in the contract or in specific items in the Bill of Quantities, monitoring and supervision of mitigation implementation will be covered under the normal engineering supervision provisions of the contract.

This sub-section briefly describes how each of the 12 mitigation measures is to be implemented using the following processes or activities: Project Design, Contract Language, Bill of Quantities, Supervision, and Monitoring. Greater implementation detail is provided in Annex B.

Project Design

The road design should be based on mass balance techniques to reduce the amount of excess materials. The design should further specify bio-engineering techniques to stabilise exposed slopes and other bare areas. In hilly areas, the alignment selection and construction principles mentioned in the **Mountain Risk Engineering Handbook** (1991) should be considered.

To the extent possible, environmental mitigation measures should be integrated the design specifications and plan drawings. Quarry sites and borrow areas should be tentatively identified during the feasibility stage, confirmed in the final design, and then located on the final design drawings and maps. To reduce the requirement for stone and aggregate, locally produced construction materials, such as brick, should be used where feasible During design, the amount of excess and waste materials should be estimated, and tipping areas for the safe disposal of spoil materials should be designated on project drawings. The siting criteria mentioned in the Annex B should be used when identifying quarries, borrow pits, and spoil disposal areas.

Quarry and material site locations and spoil disposal areas shown in design documents are, however, only provided as a guide. It is the Contractor's responsibility to verify the suitability of all material sources and disposal areas, and to obtain the approval of the Engineer before opening a material site or dumping in a disposal location.

Contract Language

Clause 19.1 of the Conditions of Contract should be revised to state that *the Contractor shall comply with the environmental protection mitigation measures specified in the DOR Environmental Management Guidelines.* The Contractor should be bound by the environmental conditions contained in the contract, and final acceptance of the completed works should not occur until environmental clauses have been satisfactorily implemented.

In accordance with FIDIC provisions, Clause 14.1 should also be revised to state that *when the Contractor submits the work programme, he should also submit an environmental management implementation plan, specific to the works, that conforms to with the requirements stated in the DOR Environmental Management Guidelines. The environmental plan prepared by the Contractor shall include specific methods to be employed; location of work and labour camps; drawings indicating how storage areas and adjacent surface waters are to be protected from contamination; methods of spoil disposal; and quarry and borrow area site operation, protection and restoration procedures.*

Contract language should also be included to cover significant environmental problems that may occur during construction activities. If environmental monitoring or supervision activities (described later in this sub-section) reveal a serious existing or imminent environmental hazard, then the contract should state that the Engineer has the authority to immediately stop work in the area of concern, and to initiate remedial actions. The contract should further state that the Engineer has the authority to extend the Contractor's time and increase the cost of the contract for implementing the remedial actions (assuming that the environmental problem was not caused due to negligence or non-compliance of DOR Guidelines by the Contractor).

Bill of Quantities

Two strategies are considered for incorporating environmental mitigation measures into the Bill of Quantities. The first strategy is to inform the Contractor, in the tender instruction to bidders, to absorb the mitigation implementation costs into their rates quoted in the Bill of Quantities. For instance, under this strategy the Contractors are instructed to include the cost for implementing environmental management procedures and final restoration of quarry sites and borrow areas in their rates for supplying aggregate and stone materials to the construction site. As a further example, the Contractors are instructed to include the cost of work camp and labour camp operation and final area restoration within their labour rates. The limitation of this strategy is that the Contractors, in an attempt to be competitive, may not increase their rates to a realistic level to adequately fund environmental mitigation and protection measures.

To overcome the tendency of Contractors' unwillingness to reflect environmental costs in their labour or material charges, a second strategy employs a more explicit accounting of environmental mitigation costs. Under this strategy, a line item is presented in the Bill of Quantities explicitly describing the environmental management and restoration work to be performed. As an example, an environmental activity could read as follows: *operate, restore and renovate all quarry sites and borrow areas in accordance with the environmental mitigation measures stated in the DOR Environmental Management Guidelines (Annex B)* This strategy makes environmental mitigation more visible and accountable and will further ensure that environmental management is not lost in material supply or labour rates that do not adequately reflect realistic environmental compliance costs.

To implement this strategy, the Consultant would be required to prepare detailed technical specifications for the implementation of the environmental management requirements. It would be part of the Consultant's TOR that he would have to prepare technical specifications for the following activities, in accordance with the requirements in Annex B of the DOR Environmental Management Guidelines:

- Environmental management and restoration of quarry sites;
- Environmental management and restoration of borrow areas;
- Environmental management and restoration of work camp; and
- Environmental management and restoration of labour camp.

Each of the above activities would be included as a line item in the Bill of Quantities, and the Contractor would have to prepare a cost estimate for each item using the technical specifications prepared by the Consultant.

The Consultant would also list in the Bill of Quantities the following items for which the prospective bidder would have to include a rate:

- Disposal of *xx* m^3 of spoil and excess material in accordance with the DOR Environmental Management Guidelines;
- Planting and maintenance of *xx* m^2 of specified vegetation or trees on exposed slopes in accordance with the DOR Environmental Management Guidelines;
- Planning and maintenance of xx m^2 of trees to provide a buffer area in accordance with the DOR Environmental Management Guidelines.

Supervision

The purpose of supervision is to make sure that specific technical and environmental clauses of the contract and the DOR Environmental Management Guidelines are satisfactorily implemented. The Engineer is responsible for supervision of project activities. In particularly, supervision of environment-related activities is required for the following activities:

- location, operation, closure and restoration of quarries and borrow areas;
- location and operation of material extraction points in rivers (to ensure that local fishermen, irrigation systems, and river bed alignment will not be adversely impacted;
- disposal of spoil and excess material;
- location, operation, and closure of work/labour camps (to ensure that work and labour camp activities do not disturb or cause irritation or hardships to local residents);
- location of water disposal structures and outfalls; and

- installation of noise and air pollution control equipment on heavy equipment.

Monitoring

GEU has overall responsibility for environmental monitoring of road projects. Actual field monitoring is conducted by the Engineer, with guidance and technical support from GEU.

Monitoring is an ongoing component of the EIA process and subsequent environmental management and mitigation activities. There are basically two types of environmental monitoring: compliance and impact. **Compliance** monitoring verifies whether contract environmental clauses and the mitigation measures in the DOR Environmental Management Guidelines are properly implemented by Contractors in the field. A further purpose of monitoring is to provide advance warning of impending damage to a road section or supporting structures.

An **impact** monitoring programme is needed to confirm that the environmental mitigation measures specified in the project design, contract, and the DOR Environmental Management Guidelines have been correctly formulated. The basic purpose of monitoring is to evaluate a project's actual environmental performance compared with environmental impact predictions made when the project was in the feasibility and design stage. This type of feedback monitoring, with subsequent comparison of predicted with actual impacts, helps to identify weaknesses and deficiencies in existing mitigation measures. From an analysis of these deficiencies, the mitigation measures can be made more effective and workable. This evaluation process will strengthen the planning of future projects and improve project sustainability.

In determining the **impact** parameters to be monitored, GEU must show the monitoring is cost beneficial and not just an additional financial burden. To justify the **impact** monitoring programme, GEU should annually review monitoring data. From this review, GEU should determine the data no longer required or of use and additional parameters or modification to the existing monitoring programme.

Proposed monitoring requirements for various environmental mitigation measures are listed in Annex B.

3 Public Participation and Coordination with other Institutions

Public participation and inter-sectoral coordination are important and necessary components in the EIA process. An effective environmental analysis cannot be undertaken in isolation of the opinions of local people or the valuable site-specific knowledge that can be obtained from local groups, NGOs, and other institutions conducting development projects in the area. It is a requirement, under the **National Environmental Impact Assessment Guidelines - 1993**, that the public actively participate in the EIA and project planning process. The **Environmental Impact Assessment Guidelines for the Road Sector** also contains a similar section on the requirement for public involvement. Some lending and donor agencies require a public participation programme as part of the loan or grant agreement.[2]

3.1 Purpose of Public Involvement

Public participation involves a two-way flow of information. A properly formulated and well-coordinated public participation programme communicates to local residents the adverse impacts as well as the benefits resulting from road construction, maintenance, and rehabilitation. In return, the public is an important source if technical, economic and social information that is relevant to the project. The public is knowledgeable about local conditions and issues that are crucial to good project design, management, and operation. Involvement of local people is likely to result in a more sustainable project with the people feeling a sense of local ownership, social acceptability and a commitment to maintaining the road.

3.2 Procedures for Public Consultation

A public participation programme consists of identification of local groups, procedures for notification of the project, information dissemination/meetings, and consultation.

The following groups should be considered for inclusion in public participation:

local officials and members of the Village Development Committee,
local Member of Parliament
community activists,
school headmasters.
local NGOs,
community development organisations,
users' groups,
agricultural extension programmes,
community forestry organisations, and
representatives from the private sector (including businesses and professional societies).

The following discussion presents a methodology for incorporating public input to the EIA process. The public should first be notified of the proposed project during the pre-feasibility. environmental screening stage of the project cycle. At this point the GEU, as part of environmental screening, should identify the local groups for inclusion in the consultation process. GEU should then conduct meetings with appropriate groups and individuals to obtain baseline and background information that will be used in the environmental screening process. If an IEE is required, then GEU should continue the consultation to obtain the additional information needed to prepare the IEE report.

If the IEE report recommends a full EIA study, then GEU must assess the scope of the significant environmental issues and prepare a TOR for the study. At this point, the public can provide valuable assistance in identifying the most important environmental issues for inclusion in the EIA study. While assessing the scope and preparing the TOR for the EIA study, GEU should also make a plan for future public involvement in the EIA process.

When the Consultant is conducting the feasibility study, the Engineer should continue dialog with the public to obtain further information for input to the project survey and design. The Engineer should prepare a public notification of the intent and nature of the project. The public notice should also contain a name and telephone number of a DOR contact person, date

and time of DOR site visits, and the notice should specify that DOR will be available to answer questions and receive comments during the site visit.

For projects in which an EIA study is required, GEU should consult with local groups in preparation of the TOR for the EIA study. Local groups should also have access to the EIA study report and have the opportunity to comment on the content.

Often local residents have knowledge, handed down from generation to generation, of the local terrain, traditional construction practices, and geology. This knowledge is beneficial in determining road alignment, road design and in the formulation and implementation of environmental mitigation measures. Additional useful local knowledge includes information on natural resources in the area, resource management practices, cultural resources and important religious sites. More specifically, local village groups and organisations who are involved in agriculture development programmes should be consulted regarding road maintenance works, location of borrow areas, local drainage characteristics, earthwork techniques, etc. Their input could be as early as the feasibility stage regarding local conditions such as quarry and borrow areas, spoil disposal areas, and drainage characteristics.

Local residents also may also have insights and understanding regarding the nature and extent of potential environmental impacts. With this knowledge, they are in a position to help in the ranking and prioritisation of impacts, in narrowing the focus of the environmental assessment process, and in assessing the suitability and sustainability of proposed environmental mitigation measures. As the EIA process proceeds, the public should be consulted to supply input to IEE Report, the TOR for the EIA study, and review of the EIA study report.

The public consultation and review process should contribute to project transparency with respect to the local population. This transparency will help to advance project sustainability. To further project transparency and sustainability, the Engineer should, if requested, make available to representatives from key public groups the detailed project design. During construction and operation, the Engineer, with assistance from GEU, should interact with the public to receive assistance in the monitoring of the environmental mitigation measures and the monitoring of post-construction impacts. If the public is included in the pre-feasibility, feasibility, and design of the project, then they will be more likely to support the road after completion and will aid in the maintenance of the system.

The public consultation process is summarised in the following table.

Project Cycle	EIA Component	Public Participation Activity
Pre-Feasibility	Environmental Screening	GEU identifies public groups and begins initial contact with groups.
	Initial Environmental Examination (IEE)	GEU continues consultation - public provides input to IEE report.
	Scoping	GEU identifies major issues for Scoping and TOR using public input and makes plan for public involvement.
Feasibility	Environmental Impact Assessment (EIA) Study	The public reviews and comments on draft EIA study report. The public provides input to design and survey.
Detailed Survey and Design.	Integration of Environmental Mitigation Measures	Detailed design made available to the public.
Construction and Operation	Environmental Monitoring	The public provides input to post-evaluation of impacts and mitigation measures.

During the consultation process, the public must be made aware of their responsibilities to a road project. Many landslides and other disturbances to road construction and operation are the result of human activities. The activities that are detrimental to road projects, include unplanned forest clearing, extraction of rocks and other material from the road shoulder and right-of-way, encroachment and blockage of drainage system, diversion of drainage ditch flow for personal use, and terracing and cultivation of embankments As part of the consultation, the public must be advised of the road right-of-way.

A particularly sensitive public consultation issue involves the acquisition of private property. This issue may be more predominant in hilly areas where land parcels are likely to be smaller and acquisition impacts potentially greater. Land acquisition and compensation are discussed in Section 4.1.

3.3 Coordination with other Ministries and Institutions

Roads in Nepal cannot be planned designed, constructed, and operated in isolation from projects and development activities in a region. Interagency coordination is a crucial component of the EIA process since most environmental issues are inter-sectoral and sometimes regional in scope. It is therefore necessary to plan the EIA process in a way that will ensure complete coordination with other activities in the area. Activities of particular relevance include irrigation and drinking water supply projects, hydroelectric projects, and forestry development and agricultural development programmes.

Coordination can also be important because, in many cases, other projects in a region may have accumulated or developed primary data or specialised expertise that may be relevant to road alignment, EIA activities, feasibility analyses, and final decision making.

It should be the responsibility of GEU to initiate interagency coordination during the environmental screening process. For road projects, the relevant coordinating agencies and groups include the following:

National Planning Commission,
Ministry of Forests and Soil Conservation,
Ministry of Water Resources,
Ministry of Population and Environment,
Ministry of Local Development
Ministry of Agriculture
Ministry of Industry (Department of Mines and Geology),
Nepal Electricity Authority,
Multi-lateral and bi-lateral donor agencies,
National or international NGOs dealing with development projects,
University research initiatives and training programmes.

4 Socio-Economic Considerations

4.1 Land Acquisition and Compensation

The Public Road Act 2031, Section 4, stipulates that HMG Nepal can acquire public land, in accordance with other laws, for the construction and extension of public roads. In addition, Article 17(2) of the Nepal Constitution states that compensation must be given for the acquisition of personal property, and that the process of compensation is to be according to law. The applicable law is the Land Acquisition Act 2034.[3]

In fixing the road alignment, an attempt should be made to avoid areas of small land parcels, homes, shops and other structures, and to minimise the number of people who will have to be resettled. An effort should also be made to reduce the number of people who will have to be negotiated with during land compensation settlements. Some donor agencies have specific policies regarding land acquisition, compensation, and resettlement that may be applicable to DOR projects.[4]

Judgment must be used when agricultural land is utilised for road construction. Under certain conditions, the acquisition of strips of prime agricultural land from a small farm could make farming unprofitable. In these situations, a farmer may begin cultivating marginal lands to compensate for the lost land, resulting in increased erosion and less than optimum productivity.

Local residents usually do not expect any type of compensation for private land used for district roads built by the District Development Committees, using development funds allocated to the district. Residents know that the districts have insufficient funds for compensation and usually feel that access to and use of the road is adequate compensation.

In the long term, a monitoring programme should be initiated to assess the impacts of cash compensation programmes. Cash compensation alone, without supplementary benefits, may ultimately result in increased poverty for some residents and subsequent environmental degradation, a situation that would be ultimately counterproductive.

4.2 Economic Impacts

The establishment of new markets for local agricultural production and cottage industries is a positive economic benefit that is expected to result from road projects. In addition, increased availability to external inputs (such as fertiliser, improved technology, and food supplies) further helps to bolster production, diversify production, and increase the nutritional health of the community. To maximise these economic benefits, new development programmes and agricultural extension programmes usually need to be developed to help farmers and other local businesses take full advantage of new market possibilities.

However, there can be negative economic side effects, resulting from road construction that may require mitigation. Negative impacts include increased local production that does not take into account the extraction/replenishment limitations of local natural resource systems. For instance, a local planning system with an environmental focus is needed to make sure that increased productivity and new supporting industries, such as agricultural processing, do not excessively consume natural resources or discharge waste products beyond the local assimilative capacity of the environment.

Local planning is also needed to manage the influx of voluntary migrants who come to take advantage of new markets and economic opportunities. Services such as tea stalls, lodges, and merchandise stores will need to be provided to the growing population. In addition, the local infrastructure, including water and sanitation facilities, will need to be improved or expanded.

Further consequences of new road construction are rising land prices and possibly newcomers from outside will be engaged in land speculation, illegal logging and mining, hunting, and poaching. There will be additional pressure through tourism. As a result of these types of activities, the already economically depressed segment of the population may become more disadvantaged as they compete for increasingly scarce resources. Also, some traditional employment sectors, such as portering, can be adversely affected by the road. To mitigate these situations, one option could be occupational training programmes to aid people who may be made worse off by the changing development scenario. For instance, occupational retraining programmes for porters can be initiated if the road project does not generate

portering jobs in adjacent hauling corridors. However, the options of mitigation can be identified during the EIA process.

Local environmental management plans can serve to mitigate unplanned urban development and the negative impacts previously mentioned. A programme to develop and implement a national system on environmental planning has been ongoing for several years in Nepal. This programme is based on community participation and inter-sectoral coordination. Model environmental plans have already been developed at the village level in two districts in Nepal. In addition to the model plans, a planning methodology has been established as well as a procedure for replication in other districts. The plans are inter-sectoral and take into account the various development programmes in the area being undertaken by sectoral ministries. Specific outputs from this planning programme include Local Environmental Planning Process Guidelines and Village Environmental Plan Format Guidelines.[5] It is foreseen that these guidelines and the implementation of local environmental plans can be used to mitigate adverse socio-economic impacts that may be identified during the EIA process.

4.3 Cultural Heritage

Known cultural heritage sites should be avoided during the road alignment process and when locating quarries and material borrow areas. A new road located near a cultural or archaeological site may facilitate access and threaten the sustainability of the site.

The Cultural Heritage Conservation Programme, under the NPC/IUCN NCS Implementation Project, has compiled an inventory of 1600 important natural and cultural heritage sites in Nepal, outside the Kathmandu Valley. Awareness of these cultural heritage sites is necessary during the EIA process for roads. GEU should consult the inventory in Nepal during the environmental screening process.[6]

Cultural heritage conservation guidelines for Nepal have been prepared. When it is not feasible to align roads away from sensitive heritage sites, then the conservation guidelines can be used to formulate an environmental mitigation plan to ensure continued sustainability of the site. These plans are also based on strong community involvement and inter-sectoral cooperation. Model conservation management plans for demonstration sites in Nepal have been developed.

The Department of Archaeology (DOA) is the government agency in charge of cultural heritage conservation. The Nepal Heritage Society can also supply information on this topic.

If previously unknown archaeological finds are discovered by chance as a result of road construction activities, then a plan of action is required. The plan can consist of the following activities:

- notify DOA of the find,
- temporarily stop work in the immediate area of the find,
- request DOA to do site inspection,
- set up mutual agreement with DOA for schedule to resume work.

Chance find procedures are usually included in road construction and maintenance contracts, under the Conditions of Contract, section 27.1 - fossils. In this section, it is usually stated that all archaeological items discovered during construction become the property of the Employer, and that the Contractor must immediately notify the Engineer and take precautions to protect the finds. If protection of the find and further excavation is required, then the Engineer has the power to extend the Contractor's time and increase cost to contract. Strict supervision by the Engineer is required after a significant archaeological find.

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[1] Bidding documents for large scale contracts normally contain the following sections:

Section 1. - Invitation for Bids;
Section 2. - Instruction to Bidders;
Section 3. - Bidding Data;
Section 4. - Conditions of Contract;
Section 5. - Specifications;
Section 6. - Form of Bid, Appendix to Bid, and Bid Security;
Section 7. - Bill of Quantities;
Section 8. - Form of Agreement, Forms of Performance Security, and Advance Payment Bank Guarantee;
Section 9. - Drawings; and
Section 10. - Postqualification.

It is envisioned that an additional section could be added entitled Section 11. - DOR Environmental Management Guidelines.

[2] Under the World Bank's Operational Directive 4.01 on Environmental Assessment, it is required that local public groups and NGOs be consulted as part of the EIA process. This requirement is mainly applicable to projects falling under Category A for which a full environmental assessment is required. However, the Bank's Operational Directive does recommend that public consultation should be extended to Category B projects that have relatively lesser environmental consequences. The Bank further views information disclosure as part of the public consultation process.

[3] In theory, compensation should be given for land including all buildings and structures, trees, crops, and estimate of future loss of income from crops and harvesting of fruit trees. Lost income potential should also be compensated. Compensated residents should be at least economically the same, or hopefully better, than before the project was initiated. For some donor-sponsored projects, the land value can be determined through public consultation meetings where a consensus is derived regarding market value of the land. These types of meetings were held during the EIA study for the Kali Gandaki "A" Hydroelectric project.

There are sometimes problems associated with cash compensation schemes. Cash compensation may be insufficient compared to steeply rising local market land prices caused by the road project, particularly if the person has to be resettled and wants to remain in the same area. From the Kali Gandaki "A" Hydroelectric EIA, it was learned that most people desired cash compensation and to somehow directly benefit from the project.

[4] The World Bank has established a policy that a road project should be designed to avoid involuntary resettlement of indigenous or ethnic minority groups. The environmental assessment for projects involving these groups should specifically address the significant impacts on these groups. Where avoidance is not possible or feasible, it is the Bank's policy that a resettlement plan be implemented for these groups. The aim of the resettlement plan is to ensure that these groups, which may be vulnerable to the economic stresses of relocation and rapid change, will not be made worse off by relocation. the concern is that if these groups are further economically disadvantaged, there is the possibility that they will engage in inappropriate income generation activities that will result in environmental degradation.

The World Bank publications such as *Environmental Assessment Sourcebook; Environmental Evaluation and Road Infrastructure- Practical Guide; Road Maintenance and the Environment (Contracting out Road*

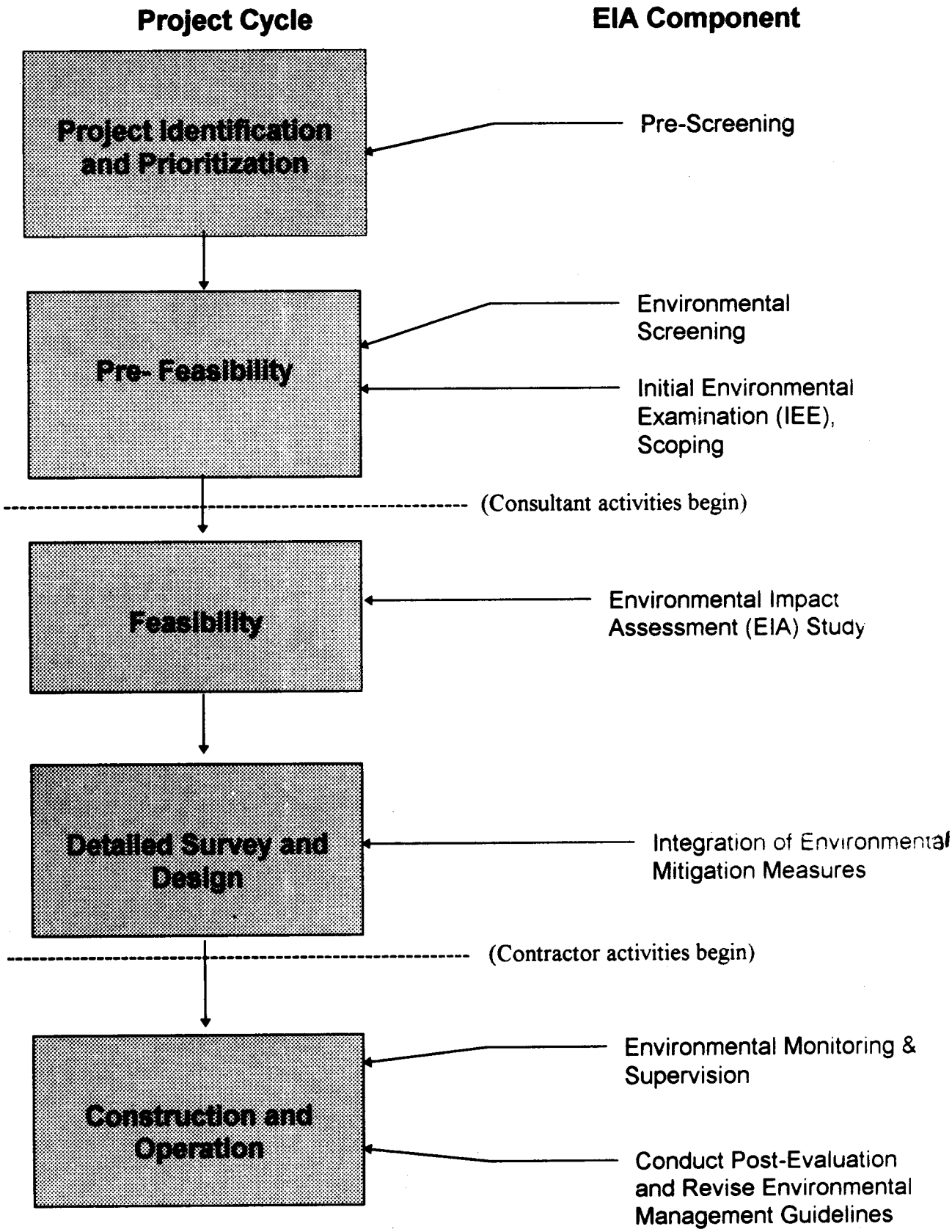
Maintenance Activities: Volume V), Guidance for Taking care of environment when Preparing and Carrying out Road Maintenance Activities; Road and the Environment Handbook can be referred.

[5] The final environmental planning guidelines are to be released by the Ministry of Population and Environment (MOPE).

[6] The registry of cultural heritage sites has not yet been released, pending further DOA policy on how to disclose the registry list to the public.

Annex A

Integration of EIA in the Project Cycle Highways and Feeder Roads



Annex B

Environmental Mitigation Measures

for Road Construction, Maintenance and Rehabilitation Projects

Contents:

Topic: Quarries

Activity:	Identification, operation and closure of sites for the extraction of stone and aggregates. Extraction of rocks and material from river beds.

Potential Impact:	Disruption of natural land contours and vegetation resulting in accelerated erosion, landslides, disturbance in natural drainage patterns, siltation of surface waters, and water pollution. General scouring of river beds resulting in endangerment of bridges and continuous degradation of the river regime.

Environmental Mitigation Measure	
Requirements:	Quarry site locations shown in design documents are provided only as a guide. It is the Contractor's responsibility to verify the suitability of all material sources, and to obtain the approval of the Engineer. Quarry sites are to be located away from population centers, drinking water intakes and streams, cultivable lands, and natural drainage systems. Quarries shall be located in structurally stable areas even if some distance from construction activities. (In the long term, unsound quarries can promote slides and further aggravate maintenance and traffic flow resulting in higher overall costs.) The clearing of trees and other desirable vegetation shall be discouraged. Stripped material shall be stored so as to not disrupt natural drainage and shall be protected to prevent erosion and migration of soil particles into surface waters. Temporary ditches and/or settling basins shall be dug to collect runoff water and to prevent erosion and contamination of surface water. The undesirable ponding of water shall be prevented through temporary drains discharging to natural drainage channels. The site is to be restored after construction activities have ceased. The site shall be left in a stable condition, without steep slopes. Stripped material shall be spread to stable contours in order to promote percolation and re-growth of natural vegetation and natural drainage. The site shall be drained, and no standing water shall remain. Land utilised for river bed extraction and quarry site access roads shall also be restored. Exposed areas shall be planted with suitable vegetation at the earliest opportunity, and the Contractor shall follow the recommendations specified in the DOR publication entitled *Vegetation Structures for Stabilising Highway Slopes - A Manual for Nepal* and subsequent GEU publications on bio-engineering. Site restoration work shall be conducted before spreading equipment is allowed to leave the site. The Engineer shall report in writing that the necessary environmental restoration work has been adequately performed before acceptance of the works. Continued...

	Extraction of rocks, gravel and sand from small rivers or streams shall be discouraged. If extraction is necessary, then the extraction points shall be spread out along the length of the river to minimise disruption in river flow and to prevent instability to embankments. Extraction points shall not be near bridges or river training structures. The depth of material removal at any one location shall be limited, and extraction areas shall be selected where there is little fine material to be carried downstream. Local residents and water users shall be consulted to ensure that irrigation intakes, bunds and local fishing are not adversely impacted.
Implementation:	
Project Design	Using the siting criteria specified under Requirements above, the Consultant shall designate quarry locations in the design specifications and on plan drawings. If additional quarries are required after construction is started, then the Contractor shall use the above criteria to select new quarry sites, with written approval of the Engineer.
Contract Clause	The Contractor shall comply with the environmental mitigation measures specified in the DOR Environmental Management Guidelines.
Bill of Quantities	The cost of compliance with the above Requirements shall be included in the Contractor's rate for supplying materials; or priced in a separate Environmental Management and Restoration (Quarries) line item. For this line item, the Consultant will prepare technical specifications for which the Contractor will include a cost estimate.
Supervision Note	The Engineer shall make sure that quarries are operated and closed according to the Requirements. The Engineer shall also ensure that local residents are consulted if rocks are extracted from river beds.
Monitoring	The Engineer shall monitor the following parameters and indicators:

Parameter	Indicator
Implementation of erosion control.	No evidence of water ponding or presence of fresh gullies. No increased visual turbidity of surface waters.
Proper site closure.	Natural contours and vegetation are restored. Engineer's report testifying to completion of restoration work.

Topic: Borrow Pits

Activity:	Identification, operation and closure of sites for the extraction of loose material other than stone.

Potential Impact:	Disruption of natural land contours and vegetation resulting in accelerated erosion, disturbance in natural drainage patterns, ponding and water logging, and water pollution.

Environmental Mitigation Measure	
Requirements:	Materials locations shown in design documents are provided only as a guide. It is the Contractor's responsibility to verify the suitability of all material sources, and to obtain the approval of the Engineer. Pits shall not be located in natural or designed drainage areas. The surface area of borrow pits shall be minimised. The clearing of trees and other desirable vegetation shall be discouraged. Stripped material shall be stored so as to not disrupt natural drainage and shall be protected so as to not be eroded into surface waters. Topsoil shall be stored in specific piles, and the utilisation of excess topsoil shall be discussed with local residents. The ponding of surface water shall be prevented through adequate drainage. The site is to be restored after construction activities have ceased. The site shall be left in a stable condition, without steep slopes. Stripped material shall be spread to stable contours to promote natural percolation, re-growth of natural vegetation and natural drainage. In the Terai, used borrow areas shall be restored with adequate slope and cross drains at regular intervals to facilitate drainage. Exposed areas shall be planted with suitable vegetation at the earliest opportunity, and the Contractor shall follow the recommendations specified in the DOR publication entitled *Vegetation Structures for Stabilising Highway Slopes - A Manual for Nepal* and all subsequent GEU publications on bio-engineering. Site restoration work shall be conducted before spreading equipment is allowed to leave the site. The Engineer shall report in writing that the necessary environmental restoration work has been adequately performed before acceptance of the works. If trees or vegetation has to be removed, then the cost of replanting and maintenance for a 12-month period shall be included in the Bill of Quantities. The Contractor must provide a full-time watchman on-site during this period. As an alternative, the contract for replanting and maintaining the trees or vegetation can be awarded to local people or an NGO. Continued.....

Implementation:	
Project Design	Using the siting criteria specified under Requirements above, the Consultant shall specify borrow pit locations in the design specifications and on plan drawings. If additional borrow pits are required after construction is started, then the Contractor shall use the above criteria to select new pits, with written approval of the Engineer.
Contract Clause	The Contractor shall comply with the environmental mitigation measures specified in the DOR Environmental Management Guidelines.
Bill of Quantities	The cost of compliance with the above Requirements shall be included in the Contractor's rate for supplying materials; or priced in a separate Environmental Management and Restoration (Borrow Pits) line item. For this line item, the Consultant will prepare technical specifications for which the Contractor will include a cost estimate.
Supervision Note	The Engineer shall ensure that the borrow pits are operated and closed according to the Requirements.
Monitoring	The Engineer shall monitor the following parameters and indicators:

Parameter	**Indicator**
Implementation of erosion control.	No evidence of water ponding of water or presence of fresh gullies. No increased visual turbidity of surface waters.
Proper site closure.	Natural contours and vegetation are restored. Engineer's report testifying to completion of restoration work.

Topic: Spoil and Construction Waste Disposal

Activity:	Disposal of surplus construction material, cut material, drainage cleaning debris, and landslide mass.

Potential Impact:	Scouring of valleyside slopes resulting in landslides, smothering and removal of trees, vegetation and topsoil; promotion of erosion and slope instability, destruction of private property, crops, and irrigation systems, disruption of natural drainage systems and surface water pollution.

Environmental Mitigation Measure	
Requirements:	The first priority shall be to reuse excess material in the construction works. Discarded materials that cannot be used in construction and fill may, if suitable, be used for bio-engineering measures. All other excess material shall be disposed of in locations or landfills that will not promote instability and result in destruction of property, vegetation, irrigation and drinking water supply systems. Extreme care shall be taken to avoid disposal near wetlands or in areas that will inconvenience or deprive local residents of their livelihood. Acidic and saline spoil shall not be spread onto agricultural land. Spoil material may be discharged to a landfill that is constructed using a series of small spoil benches to prevent slope overloading. If feasible, spoil material may be disposed of in an abandoned quarry or borrow pit as means to help restore original contours. Exposed areas shall be planted with suitable vegetation at the earliest opportunity, and the Contractor shall follow the recommendations specified in the DOR publication entitled *Vegetation Structures for Stabilising Highway Slopes - A Manual for Nepal* and all subsequent GEU publications on bio-engineering Continued.....

Implementation:		
Project Design	Mass balance techniques shall be employed in designing cut and fill along road alignment. Safe tipping areas for surplus mass, even after employing mass balance techniques, shall be identified in the project design specifications and plan drawings.	
Contract Clause	The Contractor shall comply with the environmental mitigation measures specified in the DOR Environmental Management Guidelines.	
Bill of Quantities	A separate line item shall be included for excavation and environmentally safe disposal of xx m^3 of spoil and excess material resulting from excavation of new earthen drains and filled up existing drains and culverts, and from clearing of landslide debris.	
Supervision Note	It shall be the responsibility of the Engineer to identify environmentally safe tipping areas, in addition to those specified in the project design specifications. The Engineer shall consult with local residents when identifying new tipping areas. The Engineer shall also ensure that the Contractor and construction work force are aware of and comply with the spoil disposal restrictions.	
Monitoring	The Engineer shall monitor the following parameters and indicators:	
	Parameter	**Indicator**
	Stability of spoil area	Presence of slides, scouring, erosion, or destruction of property on the valleyside, disruption of water supply and irrigation systems. Complaints from local residents.
	Vegetative cover is maintained.	Survival rate of plants. Watchman on site.

Topic: Work Camp Location & Operation

Activity:	Location, operation, and closure of work camps and shops.

Potential Impact:	Temporary air and noise pollution from machine operation, water pollution from storage and use of fuel, oils, solvents, and lubricants.

Environmental Mitigation Measure	
Requirements:	The Contractor shall consult with the Engineer before locating project offices, sheds, and construction plants. Camps shall not be located near settlements or near drinking water supply intakes. No trees shall be cut and removal of vegetation shall be minimised. Water and pit latrine facilities shall be provided for employees. Used oil and lubricants shall be recovered and reused or removed from the site by the Contractor. Explosives, oil, petrol, and grease shall be managed according the Explosives Management provisions of these guidelines. Solid waste shall be managed according to the following preference hierarchy: recycling, burial, or burning. When feasible, local residents shall be encouraged to scavenger non- hazardous solid wastes that are no longer usable to the project. At conclusion of the project, all wreckage, rubbish, or temporary works that are no longer required shall be removed or given to local residents. All temporary structures, including office buildings, shelters, and latrines, shall be removed to prevent encroachment within the road right-of-way. The site shall be restored to near natural or stable conditions. Exposed areas shall be planted with suitable vegetation, and the Contractor shall follow the recommendations specified in the DOR publication entitled *Vegetation Structures for Stabilising Highway Slopes - A Manual for Nepal* and all subsequent GEU publications on bio-engineering. The Engineer shall report in writing that the camp has been vacated and restored to pre-project conditions before acceptance of the works. Continued.....

Implementation	
Project Design:	----
Contract Clause	The Contractor shall comply with the environmental mitigation measures specified in the DOR Environmental Management Guidelines.
Bill of Quantities	The cost of complying with the above Requirements shall be at the Contractor's own expense and should be included in the daywork rates for labour; or priced in a separate Environmental Management and Restoration (Work Camp) line item. For this line item, the Consultant will prepare technical specifications for which the Contractor will include a cost estimate.
Supervision Note	The Engineer shall ensure that good relations are maintained between workers and local residents, and shall mediate disputes. The Engineer shall ensure that the Contractor removes all installations and surplus materials, leaves the work site in a clean condition, and restores areas damaged by asphalt mixing.
Monitoring	The Engineer shall monitor the following parameters and indicators:

Parameter	Indicator
Provision of water and sanitation facilities.	Latrines constructed; no disruption in local water supplies.
Proper site closure.	Timely and effective waste disposal.
	Replantation of the site.
	Natural contours and site appearance restored. Engineer's report testifying restoration of site.

Topic: Labour Camp Location & Management

Activity:	Location, management, and closure of labour camps.

Potential Impact:	Introduction of external labour force resulting in social conflicts, deforestation, competition for scarce natural resources and food supplies; pollution of surface and ground waters from unsanitary waste disposal practices.

Environmental Mitigation Measure	
Requirements:	Camps shall not be located near settlements or near drinking water supply intakes or to negatively impact local residents' access to drinking water. Camps shall not be located in the vicinity of landslides and flood plains. The camp shall be operated within a self-sufficient infrastructure. No trees shall be cut for fuelwood, and removal of vegetation shall be minimised. To prevent local inflation and the use of local fuelwood supplies, critical food items and alternate fuel for cooking shall be provided by the Contractor. (Local people should be given the option to sell surplus food and fuelwood to the Contractor if these items are in surplus and if the extraction of these resources is sustainable during the period of the project.) The Contractor shall prohibit employees from poaching wildlife and cutting trees. The Contractor will be responsible for the action of their workers. Water and sanitation facilities shall be provided for employees. In water deficient areas, the Contractor shall haul water from a source outside the area. Solid waste shall be managed according to the following preference hierarchy: recycling, burial, or burning. The Contractor shall recruit, to the maximum possible extent, local persons for the labour force, and shall provide appropriate training where necessary. At conclusion of work, all wreckage, rubbish, or temporary works shall be removed or donated to local residents. All temporary structures, including sleeping quarters, cooking and food storage structures, and latrines, shall be removed to prevent encroachment within the road right-of-way. The site shall be restored to near natural or stable conditions. The Engineer shall report in writing that the camp has been vacated and restored to pre-project conditions. Continued.....

Implementation:		
Project Design	----	
Contract Clause	A contract clause shall comply with the environmental mitigation measures specified in the DOR Environmental Management Guidelines.	
Bill of Quantities	The cost of complying with the above Requirements shall be at the Contractor's own expense and should be included in the daywork rates for labour; or priced in a separate Environmental Management and Restoration (Labour Camp) line item. For this line item, the Consultant will prepare technical specifications for which the Contractor will include a cost estimate.	
Supervision Note	The Engineer shall ensure that good relations are maintained between workers and local residents, and shall mediate disputes.	
Monitoring	The Engineer shall monitor the following parameters and indicators:	
	Parameter	**Indicator**
	Camp is self-sufficient in food, water, and fuel.	No complaints from local residents. Local prices remain stable.
	Provision of water and sanitation facilities.	No disruption in local water supplies.
	Proper site closure.	Timely and effective waste disposal.
		Replantation of the sites.
		Natural contours and appearance restored. Engineer's report testifying restoration of site.

Topic: Earthworks/Slope Stabilisation

Activity:	Cut and fill operations.

Potential Impact:	Accelerated erosion resulting in slope instability, landslides, destruction of vegetation and property, siltation of surface waters, and water pollution.

Environmental Mitigation Measure	
Requirements:	Exposed slopes shall be protected using conventional civil engineering structures in conjunction with bio-engineering techniques. Slopes shall be planted with appropriate vegetation as soon as possible using previously stockpiled topsoil. The planting on slopes shall follow recommendations specified in the DOR publication entitled *Vegetation Structures for Stabilising Highway Slopes - A Manual for Nepal* and all subsequent GEU publications on bio-engineering. In the short-term, all areas susceptible to erosion shall be protected by either temporary or permanent drainage works. Measures shall be taken to prevent ponding of surface water and scouring of slopes. Newly eroded channels shall be backfilled and restored to natural contours.
Implementation:	
Project Design	Exposed slopes to be stabilised by bio-engineering techniques shall be specified in the design specifications and plan drawings.
Contract Clause	The Contractor shall comply with the environmental mitigation measures specified in the DOR Environmental Management Guidelines and in the DOR publication entitled *Vegetation Structures for Stabilising Highway Slopes - A Manual for Nepal.*
Bill of Quantities	The surface area (*xx* m^2) of exposed slopes to be stabilised and the types of vegetation to be planted shall be listed. It shall be stated that the plantations shall be maintained for a period of 12 months including watering. An additional listing shall state that the Contractor shall provide watchmen to be on site full-time to protect the plantations. As an alternative, the contract for replanting and maintaining the trees or vegetation can be awarded to local people or an NGO.
Supervision Note	
Monitoring	The Engineer shall monitor the following parameters and indicators: **Parameter**: Vegetative cover is maintained. **Indicator**: Adequacy, quality and specifications of planting. Survival rate of plants .

Topic: Use of Bitumen

Activity:	Preparation and application of bitumen compound to road surfaces.

Potential Impact:	Deforestation resulting from use of fuelwood to heat bitumen; release of bitumen into the environment (runoff of bitumen into surface waters).

Environmental Mitigation Measure	
Requirements:	The Contractor shall use bitumen emulsion where feasible. In hilly areas with steep road gradients, cut-back bitumen shall be used. Use of fuelwood for heating bitumen shall be discouraged. Where heating is required, bitumen heaters shall be used, fueled by either kerosene, diesel or gas. Bitumen shall not be applied during strong winds and rainy periods, or if rain is likely. No bituminous material shall be discharged into side drains. Nearby trees, vegetation, and private property shall be protected during bitumen spraying work. Bitumen drums shall be stored in designated locations and not scattered along the road.
Implementation:	
Project Design	----
Contract Clause	The Contractor shall comply with the environmental mitigation measures specified in the DOR Environmental Management Guidelines.
Bill of Quantities	Bitumen emulsion shall be specified in the materials to be supplied by the Contractor.
Supervision Note	----
Monitoring	The Engineer shall monitor the following parameters and indicators: **Parameter**: Compliance with requirements. — **Indicator**: No use of fuelwood, except where the use is sustainable. Site cleanup and waste disposal

Topic: Stockpiling of Materials

Activity:	Storage of topsoil, fill material, gravel, and aggregate.

Potential Impact:	Siltation and pollution of surface water resulting from uncontrolled runoff from storage piles, disturbance to private property.

Environmental Mitigation Measure	
Requirements:	Stockpiling of earth fill shall in most cases not be permitted during the rainy season unless covered by a suitable material. Stripped material shall not be stored where natural drainage will be disrupted. Protection of materials from erosion prior rainy season. Storage on private property will be allowed only if written permission is obtained from the owner or authorised lessee.
Implementation:	
Project Design	----
Contract Clause	The Contractor shall comply with the environmental mitigation measures specified in the DOR Environmental Management Guidelines.
Bill of Quantities	The cost of compliance with the above Requirements shall be at the Contractor's own expense and should be included in the Contractor's rate for supplying materials.
Supervision Note	----
Monitoring	The Engineer shall monitor the following parameters and indicators: **Parameter** — **Indicator** Compliance with requirements. — Trenches and ponds are constructed. Local surface waters are protected. — Sufficient protection measures are provided against washouts. No increased visual turbidity of surface waters.

Topic: Explosive, Combustible and Toxic Materials Management

Activity:	Storage and use of explosives, petrol, diesel, oil and lubricants, bitumen, and solvents. Disposal of used oil, lubricants and solvents.

Potential Impact:	Fire and explosion hazard. Ground and surface water pollution resulting from runoff and migration from spills/leaks and improperly discarded used oils and lubricants.

Environmental Mitigation Measure		
Requirements:	Hazardous materials shall not be stored near surface waters. All used lubricants and oils shall be collected and recycled or disposed off site. Plastic sheeting shall be placed under hazardous material storage areas to collect and retain leaks and spills. Contaminated runoff from storage areas shall be captured in ditches or ponds with an oil trap at the outlet. Contaminated and worn plastic sheeting shall be packed into drums and disposed off site. Explosives shall be used as per the prevailing HMG regulations.	
Implementation:		
Project Design	----	
Contract Clause	The Contractor shall comply with the environmental mitigation measures specified in the DOR Environmental Management Guidelines.	
Bill of Quantities	The cost of complying with the above Requirements shall be at the Contractor's own expense and should be included in the Contractor's rate for supplying materials.	
Supervision Note	----	
Monitoring	The Engineer shall monitor the following parameters and indicators:	
	Parameter Compliance with requirements.	**Indicator** Hazardous materials management procedures implemented. No visible puddles of oil or oil contaminated soil.

Topic: Stone Crushing Plant

Activity:	Setting up and operation of a stone crushing plant.

Potential Impact:	Excessive noise and disturbance to local residents resulting from stone crushing. Damage to local crops and surface waters from dust emissions.

Environmental Mitigation Measure		
Requirements:	Stone crushing plants shall be located away from population centers, drinking water intakes, cultivable lands, and sensitive ecosystems. Stone crushing equipment shall be fitted with approved dust control devices and operated in accordance with manufacturer's specifications. The equipment shall only be operated during the day time.	
Implementation:		
Project Design	----	
Contract Clause	The Contractor shall comply with the environmental mitigation measures specified in the DOR Environmental Management Guidelines.	
Bill of Quantities	The cost of complying with the above Requirements shall be at the Contractor's own expense and should be included in the Contractor's rate for supplying materials.	
Supervision Note	The Engineer shall ensure that dust control equipment is operating properly.	
Monitoring	**Parameter** Noise level Compliance with air pollution requirements	**Indicator** Complaints from local residents Dust control equipment is being utilised.

Topic: Water Management

Activity:	Disposal of water from road drainage systems.

Potential Impact:	Discharge of large quantities of high velocity water to natural drainage channels and gullies resulting in overloading of natural drainage capacity; creation of severe erosion, new gullies, and slope instability, and sedimentation of surface waters; and destruction of vegetation, agricultural lands, and forests.

Environmental Mitigation Measure	
Requirements:	The hydraulic energy of drainage is to be dissipated before discharging to natural water course. The hydraulic energy shall be reduced through cascades, steps, energy dissipaters, and check dams. Check dams are to be constructed as far down the gullies as necessary to avoid depth and side erosion of river beds. The public shall be consulted regarding location of drainage outfalls. In mountain areas, the valleyside residents shall be consulted. In the Terai, the affected landowners shall be consulted.
Implementation:	
Project Design	Using the criteria specified under Requirements above, the Consultant shall prepare designs, drawings, and cost estimates for dissipating the energy of drainage water at specific sites.
Contract Clause	The Contractor shall comply with the environmental mitigation measures specified in the DOR Environmental Management Guidelines.
Bill of Quantities	The physical works for dissipating the energy of drainage shall be listed as per the design and drawings. The Contractor shall submit an estimate for constructing the works.
Supervision Note	The Engineer shall ensure that water management works are constructed according to the design specifications, and that the public is consulted during the planning of drainage outfalls and uphill cutoff drains.
Monitoring	The Engineer shall monitor the following parameters and indicators:

Parameter	**Indicator**
Effectiveness of water management measures.	No evidence of fresh surface erosion or presence of new gullies on the valleyside. No increased visual turbidity of surface waters. No evidence of loss of agricultural land and forests. No complaints from landowners. No slope failures on the road corridor.

Topic: Air & Noise Pollution

Activity:	Operation of construction equipment, and transport and stockpiling of soil and sand. Blasting at quarry sites.

Potential Impact:	Emissions of air pollutants including particulates, hydrocarbons, nitrogen oxides, carbon monoxide, and sulfur dioxide resulting in human health hazards and destruction of vegetation. High concentration of airborne dust resulting in deposition and possible damage to vegetation, crops, and water resources. Excessive noise resulting in disruption in livestock and wildlife breeding, and annoyance and potential hazard to human populations.

Environmental Mitigation Measure	
Requirements :	All heavy equipment and machinery shall be fitted with air pollution control and noise dampening devices that are operating correctly. Stockpiled sand and soil shall be slightly wetted before loading, particularly in windy conditions. Vehicles transporting sand and soil shall be covered with a tarpaulin. Dirt and gravel roads through residential areas shall either be black-topped or surfaced with bamboo-reinforced concrete. Blasting and the operation of heavy equipment shall be conducted only in daylight hours. Vegetative buffer zones shall be used to protect sensitive water resources from road activities. The planting of buffer areas shall follow procedures specified in the DOR publication entitled *Vegetation Structures for Stabilising Highway Slopes -- A Manual for Nepal* and all subsequent GEU publications on bio-engineering. Continued.....

Implementation:	
Project Design	----
Contract Clause	The Contractor shall comply with the environmental mitigation measures specified in the DOR Environmental Management Guidelines.
Bill of Quantities	The cost of complying with the heavy equipment noise and air pollution control, blasting, and dust control (storage and hauling) Requirements shall be at the Contractor's own expense and should be included in the Contractor's rate for supplying materials. The surface area (*xx* m^2) of the buffer area and the types of vegetation to be planted shall be listed. It shall be stated that the plantations shall be maintained for a period of 12 months including watering. An additional listing shall state that the Contractor shall provide watchmen to be on site full-time to protect the plantations. As an alternative, the contract for replanting and maintaining the trees or vegetation can be awarded to local people or an NGO. The surface area (*xx* m^2) of road black-topping or bamboo-reinforced concrete through inhabited areas shall be listed.
Supervision Note	The Engineer shall ensure that pollution control equipment is installed on all equipment and operating properly. This supervision will generally be done by concerned Divisional Offices of the DOR.
Monitoring	The Engineer shall monitor the following parameters and indicators: **Parameter** — **Indicator** Compliance with requirements. — Air pollution control equipment installed on equipment. No excess dust deposition on crops and vegetation. No complaints from local residents. Vegetative buffer zone is maintained — Survival rate of plants, and watchman on site.