Initial Environmental Examination: Drilling Works for Feasibility Study at the Dhap Dam Site

March 2013

NEP: Bagmati River Basin Improvement Project

Prepared by DHI Group for the Asian Development Bank.

CURRENCY EQUIVALENTS
as of 21 March 2013

Currency unit	–	Nepalese Rupee (NRe)
NRe1.00	=	$ 0.01149
$1.00	=	NRs87.01

Abbreviations

ADB	–	Asian Development Bank
BRBIP	–	Bagmati River Basin Improvement Project
DNPWC	–	Department of National Park and Wildlife Conservation
DSC	–	Design and Supervision Consultant
EA	–	Executing Agency
EARF	–	Environmental Assessment and Review Framework
EIA	–	Environmental Impact Assessment
EMP	–	Environmental Management Plan
EPA	–	Environment Protection Act
EPR	–	Environment Protection Rules
GoN	–	Government of Nepal
GFP	–	Grievance Focal Points
GRC	–	Grievance Redress Commission
HPCIDBC	–	High Powered Commission Integrated Development for Bagmati Civilization
IEE	–	Initial Environmental Examination
MOSTE	–	Ministry ofScience and Technology and Environment
MOFSC	–	Ministry of Forest and Soil Conservation
PES	–	Payment of Environment Services
PPTA	–	Project Preparatory Technical Assistance
REA	–	Rapid Environmental Assessment
SEA	–	Strategic Environmental Assessment
SNNP	–	Shivapuri Nagarjun National Park
SPS	–	Safeguard Policy Statement
TA	–	Technical Assistance
VDCs	–	Village Development Committees
WECS	–	Water and Energy Commission Secretariat
WUAs	–	Water User Associations

Notes

(i) The fiscal year (FY) of the Government of Nepal ends on 15 July. FY before a calendar year denotes the year in which the fiscal year ends, e.g., FY2012 ends on 15 July 2012.

(ii) In this report, "$" refers to US dollars

Table of Contents

Tables

Figures

Appendices

EXECUTIVE SUMMARY

1. Rapid increase in Kathmandu's population and related city expansion has put great pressure on the water resources of the Upper Bagmati Basin. During the dry season, around 80% of the Bagmati river flow is diverted for drinking water purposes leaving very little flow to carry waste effluents. Thus there is an urgent need to protect and enhance water resources and increase water discharge to the Bagmati, conserve terrestrial and aquatic biodiversity and to maintain and enhance the river water quality[1]. The Bagmati Action Plan activities include the protection and management of wetlands in the SNNP and construction of embankments in the Dhap to increase water recharging capacity

2. This section summarizes the findings and results of the Initial Environmental Examination (IEE) associated with the drilling works required for the preparation of the feasibility study for an increased Dhap Dam under the ADB assisted Bagmati River Basin Improvement Project (BRBIP) for improvement of river environment in the Upper Bagmati river basin.

3. The purpose of this IEE is to assess potential environmental, health, safety and social impacts of the proposed drilling work at the Dhap Dam site in the upper Nagmati River, a main tributary to the Bagmati River, to ensure compliance with ADB's Safeguard Policy Statement. A lower dam already exists at the Dhap. However, in order to increase the size of the wetland, and create storage for water that can be released during the dry season to increase the low flow in the Bagmati River downstream, an enlarged dam is envisaged to be implemented about 60m downstream of the existing Dhap Dam.

4. A separate comprehensive EIA is being prepared for the entire proposed Upper Bagmati component of the BRBIP, including the implementation of the Dhap Dam. The present IEE only covers the pre-feasibility drilling works. The IEE has been prepared based on primary data from field surveys (including consultations) carried out under the PPTA and secondary information collected from various sources.

5. There are no specific national regulations requiring an environmental impact assessment (EIA or IEE) for drilling work. However, since the work will be undertaken within the protected area on Shivapuri Nagarjun National Park, the HPCIDBC (as project executing agency) will seek clearance from the Ministry of Forestry and Soil Conservation under the National Park and Wildlife Conservation Act, 1997. The drilling works will begin only when this clearance has been received.

6. To establish the engineering feasibility (geotechnical and profile), there is need to carry out additional investigations to determine the geology and sub-surface rock conditions at the proposed site and to improve the topographic definition of the dam site and reservoir areas to bring the study and design of the dam to the required feasibility level. The pre-feasibility drilling works involve geotechnical investigations with the drilling for collecting the rock samples at four locations.

7. The drilling activities will include mobilization of one rig by road to the Dhap site, construction of drilling platforms, moving rigs to the drill sites, drilling operation, moving of drilling machines from one place to another place, testing of rock samples etc.

[1] Bagmati Action Plan (2009-2014)

8. The proposed Dhap Dam site is located at $27^0$48'493" North latitude and $85^0$27'496" East Longitude approximately 2085 m above mean sea level. The outflows from the Dhap area create the headwaters of the Nagmati. The topography in the Dhap area is relatively flat, around the wetland created by the existing, low dam.

9. Geologically the proposed site falls in the Inner Himalayan region. The dominant rocks are gneiss and magnatite with mica schist and pegmatic granite. The soils of the area range from loamy sand on the northern side to sandy loam on the southern side. The road from Mulkharka to Chisapani forms the upstream boundary of the Dhap. The wetland is surrounded by grassland/scrub at both sides, and below the existing dam is a large area with rush. Further away and downstream the area is surrounded by mostly secondary semi-dense forest.

10. The project area has a subtropical to temperate type of climate. There is a high variation in annual temperature and precipitation. The recorded maximum average temperature is 22.7^0C in mid-May/June and the minimum average temperature of 0.30^0C is recorded in December/January. The mean annual precipitation is 2727mm mostly occurring during the monsoon period.

11. The region is the origin of some of the important river systems including Bagmati, Bishnumati, Nagmati, Syalmati, Rudramati, and Yashomati, which are major watersheds. The project area is in Sundarijal catchment and drained by the Nagmati River and its tributaries. Reservoirs and ponds are mainly manmade for specific purposes such as drinking water, hydropower, and irrigation. Rivers, streams and reservoirs provide sources of drinking water for wildlife, livestock, people, irrigation and hydropower.

12. The proposed project site is located in the uppermost part of the Shivapuri Nagarjun National Park (SNNP). The vegetation of the park represents midhill flora, fauna, and ecosystems in the transition zone between sub-tropical and temperate climate, where the variations are primarily a function of the altitude. SNNP supports rich floral and faunal diversity with a number of protected species of mammals, birds, and plants.

13. The SNNP supports a large number of wildlife species. There are registered 21 species of mammals living in the SNNP out of which nine are threatened[2]. They include Pangolin (Manis spp.), leopard cat (Prionailurus bengalensis), and clouded leopard (Pardofelis nebulosa), common leopard (Penthera pardus), Langur (Semnopithecus entellus), Rhesus monkey (Macaca mulatta), Jungle cat (Felis chaus), Goral (Naemorhedus goral), and Himalayan black bear (Ursus thibetanus).

14. The SNNP is also a popular area for watching birds and butterflies. It harbours 177 species of birds of which 12 of them are considered threatened as listed in Appendix A. Herpetofauna of SNNP has not been explored. Only one species (i.e. Oligodon arnensis) of reptilia has been reported in the Park. There are more than 102 species of butterflies. SNNP is the only habitat for the relict Himalayan Dragonfly (Epiophlebia laidlawi) in Nepal.

15. In the past the area covered by the Park experienced problems of soil erosion owing to deforestation, overgrazing, and cultivation on steep slopes. The quality and quantity of water supplied from this area was also reduced. To overcome these problems, a program was initiated to protect Shivapuri as a watershed and wildlife reserve in 1975. It was declared as Nepal's 9th National Park in 2002.

[2] Shivapuri National Park Plan, 2004 (Draft)

16. The office of SNNP prepared a Management Plan to guide its operation in 2004 with the support from Nepal Trust for Nature Conservation (NTNC) and forwarded it to the Ministry of Forest and Soil Conservation for approval. However, the plan is not yet approved[3]. The Plan and other documents set the objectives of the initiative to maintain a proper balance between the natural environment and the basic needs of local people. The vision is to develop Shivapuri and Nagarjun areas as demonstration sites for multiple uses by restoring and maintaining the ecological integrity.

17. The entire Dhap area has a high ecological value. The area serves as source of water for the Nagmati River. The area accumulates the rainfall, recharges the area and consequently pours downstream. Field sampling was undertaken at proposed dam site to establish the presence of flora and fauna.

18. Regarding vegetation *Symplocos pyrifolia* (*Kharane/Kholme*), *Quercus glauca* (Phalant) and *Rhododendron arboreum* (Guras/Lali guras) were the dominant tree species found in the proposed Nagmati dam area with an average density of 152, 102 and 91 trees per hectare, respectively. *Pinus roxburghii* (Khote salla), *Lyonia ovalifolia* (Bakal pate, Phalame) and *Camellia kissi* (Chiapate, Hingua) are other species found in relative large numbers. Among the listed plant species, *Symplocos pyrifolia* is the most common and uniformly distributed plant species.

19. The area is home to highly value medicinal plants such as *Acorus calamus* (Bojho), and plants of ecological value like *Pyracantha crenulata* (Ghangaru), Berberis aristata (Chutro) etc.

20. The vegetation in the Dhap area consists of bushes and shrubs of *Berberis asiatica* (Chutro), *Pyracanta crenulata* (Ghangaru), *Edgeworthia gardneri* (Argeli), *Rubus acuminatus* (Bhalu ainselu) etc. with relatively few trees. *Symplocos sumuntia* (*Lodh*), *Lyonia ovalifolia* (Angeri) and *Daphniphyllum himalense* (Rachan) are the dominant tree species with a density of 100, 62 and 55 trees per hectare respectively. *Pyrus pashia* (Mayal), *Camellia kissi* (Chiapate, Hingua) and *Betula alnoides* (Saur) are other major associated species in the Dhap area. Among the listed species, *Symplocos sumuntia* is the most common and uniformly distributed plant species in Dhap area.

21. Different species of terrestrial and epiphytic orchids (Nep: Sungava, Sunakhari, Chandigava, Bandar kera) were recorded. Orchids are considered threatened by IUCN and falls under CITES Appendix II. They are protected mainly because of the excessive collection for trade. Most common among them are *Coelogyne critsata, C. ovalifolia, Calanthe tricarinata, Spiranthes sinensis, Satyrium nepalense* etc. Aerial species are succulent in nature hence they absorbs moisture from environment and food from the host tree, whether the host tree is living or dead.

22. Altogether 20 species of birds were recorded at the Dhap site. Green wedged-tailed Pigeon, Oriental Turtle Dove, White Wagtail, Sand Martin were most commonly observed. Warblers and Barbets were the most commonly observed at the Dhap Dam site. No protected species were recorded during the bird survey.

23. Concerning wildlife, The Dhap area provides a diverse habitat which supports a variety of mammals. *Viverra zibetha* was confirmed by scat and scent, *Sus scrofa* by digging, *Munitacus muntjak* by pellets, *Prionailurus bengalensis* by scat and *Martes flavigula* by pugmark. *Lepus nigricollis, Muntiacus muntjak and Martes flavigula* were also sighted directly in the vicin-

[3] Personal communication with Mr Gopal Prakash Bhattarai, Chief Warden,Shivapuri - Nagarjuna National Park,

ity of *Dhap* area. Additionally, relic scats of *Panthera pardus* found outside transect confirmed the presence of the carnivore.

24. The total population of Sundarijal VDC is 2,631 in 2011 with male constituting 53.8% and female 46.2%. The average household size is 4.2 persons and the total household number is 621. Most of the people are Tamangs, and Buddhists predominate in the region.

25. Chisapani is the nearest settlement to the Dhap, a small town with several hotels serving trekkers towards Helambu (Langtang Range). Besides the mountain views, one of the major attractions is the Dhap area with the lake behind the existing dam. The presence of Shivapuri Nagarjun National Park also attracts visitors to Chisapani. Here, internal tourists as well as people of Kathmandu valley are attracted due to its pristine natural beauty with rivers, streams and small waterfalls.

26. The National Park staff collects an aquatic plant, locally called 'Bojho' in the Dhap area. The National Park staff is of the opinion that the plant disturbs the lake ecosystem. Therefore, they consider the collection of the plant be part of the protection and management of the Dhap wetlands. The plant is also used for herbal medicine, and constitutes a value. However, it is not allowed to take the harvested plant out of the SNNP and consequently the plants collected are destroyed by the National Park staff[4].

27. The environmental impacts anticipated from bringing in the drill rig and preparing any drilling platforms are considered to be modest and temporary. It is envisaged that only clearing of, shrubs and bushes is required.

28. A temporary camp for drilling workers will be located in one of the open areas in the Dhap site. No cutting or clearing of vegetation is necessary for the establishment of the camp. The duration of the mobilisation, drilling works, demobilisation and cutting surveys are foreseen completed within 3 months. 5 to 7 drilling staff is foreseen to occupy the camp.

29. The site-preparation activities include clearing of an 800 m long and 2 to 3 m wide strip (on average 2.5 m) from the access point on the existing road from Mulkharka to Chisapani to the drilling points at the site of the proposed new dam. This will require clearing of shrubs and bushes on approximately 2000 m^2 of land. Similarly at each drillhole, about 15 m^2 will be cleared for drilling platform, drilling equipments, drilling consumables, and storage of drillcores. In total this will require clearing of an area of 60 m^2 for four drillholes (15 x 4nos). Another 750 m^2 area (250 m long and on average 2.5 m wide strip) will be prepared for moving drillrigs from one point to another. The total area to be cleared for access and drilling points is approximately 2810 m^2.

30. Clearing of 2810 m^2 of shrubs and bushes may cause some temporary and local impacts on the ecosystem. However the degree of impairment will be low since only shrub / bushes will be cleared, Any shrubs or bushes if of special importance to birds will be identified when tracks are identified, before any clearing, under the EMP. Necessary replanting for restoring the vegetative cover in the 2810 m^2 to be cleared, will be identified in consultation with DNPWC/SNNP staff as part of the Environmental Management Plan.

31. The delineation of the access tracks and drill sites will be identified and marked under the supervision of officials from the National Park and oversight by the PPTA consultants on behalf of the project proponent (HPCIDCB) under the EMP. Further, the clearing of shrubs and

[4] Vegetation Specialist. Personal communication.

bushes will be carried out in the presence of officials from the National Park and cut shrubs and bushes will be disposed off as recommended by National Park officials.

32. Since the scope of the proposed drilling work is limited to site clearing and drilling activities, no impacts are anticipated on topography, climate or soils

33. The PPTA team on the behalf of the Project Proponent will ensure that the Contractor has a contractual obligation to adhere to an environmental management plan following GON and ADB regulations and guidelines.

34. A number of officials from various agencies, i.e., the Ministry of Forests and Soil Conservation, Department of National Parks and Wildlife Conservation, Ministry of Environment, Science and Technology, Village Development Committee members etc., were consulted during the fact finding visit. The consultations included both discussions stakeholders and discussions with village level authorities. Field visits were jointly undertaken with range officer from the Shivapuri Nagarjun National Park to identify the extent of physical activities and likely impacts to forest/vegetation, if any.

35. The environmental impacts associated with the drilling works have been assessed and described in the previous sections of this document. The findings establish that the Drilling Works will be carried out within a confined area and there will no cutting of mature trees. Clearing of bushes and grass for the access tracks for the drillrigs will be carried out in consultation with SNNP officials to avoid any adverse impacts.

36. Impacts during drilling operations such as noise, workers health and safety, waste management etc. will be taken care of by adopting mitigation measures as listed in the EMP. The EMP will be included in the drilling contractors' specifications and contract and the PPTA team on the behalf of the Project Proponent will ensure its implementation by continuous supervision and monitoring.

37. Upon completion of the works all cleared areas will be re-planted with native species and re-growth is expected to be relatively fast, and the areas will return to their present, natural condition within few years.

38. It is therefore concluded that the Drilling Works have no significant environmental impacts, and when implemented, the EMP will fully comply with ADB's SPS 2009 and Government requirements.

I. INTRODUCTION

A. Project Background

1. Rapid increase in Kathmandu's population and related city expansion has put great pressure on the water resources of the Upper Bagmati Basin. During the dry season, around 80% of the Bagmati river flow is diverted for drinking water purposes leaving very little flow to carry waste effluents. Thus there is an urgent need to protect and enhance water resources and increase water discharge to the Bagmati, conserve terrestrial and aquatic biodiversity and to maintain and enhance the river water quality[5]. The Bagmati Action Plan activities include the protection and management of wetlands in the SNNP and construction of embankments in the Dhap to increase water recharging capacity.

B. Objective and Scope of the PPTA

2. The Asian Development Bank (ADB) is supporting the Government of Nepal (GoN) to address these critical water security issues in the Bagmati River Basin by financing the preparation of the Bagmati River Basin Improvement Project (BRBIP) under a present PPTA. The Water and Energy Commission Secretariat is the Executing Agency with the High Powered Commission for Integrated Development for Bagmati Civilization (HPCIDCB). The BRBIP has been envisioned to improve water security and resilience to potential climate change impact in the Bagmati River Basin. It aims to build on the general public's desire to restore the river environment in the Kathmandu Valley and the Government's efforts to improve irrigation development and mitigate the impact of water-induced disasters in the middle and lower reaches of the Basin. The project adopts the principles of integrated water resources management (IWRM) and provides Nepal with its first opportunity to apply this key policy element since it has been adopted under the National Water Plan in 2005.

3. The key outputs of PPTA include: (i) subproject prioritization further refined to ensure maximum relevance to the project outcome and ownership; (ii) feasibility studies including, technical, economic and safeguards due diligences on the above mentioned priority subprojects.

4. Together with the Project implementation, the Project will include the following components:

(i) **Component 1**: Towards Integrated and Participatory River Basin Management aimed at supporting the GON to establish the RBO including addressing necessary regulatory changes and capacity strengthening.

(ii) **Component 2**: Improving Upper Bagmati River Environment: This component includes two sub-projects:

a. **Sub-project 2(a)**: Storage Dam sub-component - to provide adequate environmental flow Potential dams under investigation are: i) Dhap Dam (in the Bagmati headwaters), an 18 m high dam, storing 800,000 m^3 of water, sufficient to provide a dry season environmental flow of 40 l/s. ii) Nagmati Dam (located 2 km north-east of the confluence with Bagmati

[5] Bagmati Action Plan (2009-2014)

River), a 60 to 70 m high dam storing up to 9 million m^3 of water, sufficient to provide a dry season environmental flow of 400 l/s.

b. **Subproject 2(b)**: River Environment Improvement sub-component.

(iii) **Component 3**: Integrated River Training and Irrigation for Marin Khola (Stage 1): to improve water security and resilience against water-induced disasters.

C. Objective and Scope of the IEE Study

5. The objective of this Initial Environmental Examination (IEE) is to identify the impacts associated with the drilling work and geotechnical investigations required for the preparation of the feasibility study for the Dhap Dam under Component 2(a).

6. The proposed site for Dhap Dam is located within the protected area of Shivapuri Nagarjun National Park. The scope of this IEE is limited to the sites of the proposed drilling at the proposed dam site. The IEE assesses the potential environmental, health, safety and social impacts of the proposed drilling work and identifies adequate remediation actions to ensure compliance with ADB's Safeguard Policy Statement (SPS)[6].

7. A separate comprehensive EIA is being prepared for the entire Component 2 which involves both proposed dams and other proposed environmental improvement interventions in the Upper Bagmati from Sundarijal to a position approximately 1 km below Tilganga Bridge.

D. Methodology

8. The IEE has been prepared during the project preparation work in the month of November 2012. The assessments have been carried out based on primary data from field surveys conducted during the month of September, 2012. (including consultations) and secondary information collected from various sources. During the site visits, the Specialists had discussions with various stakeholders including Shivapuri Nagarjun National Park (SNNP), VDC members and local executive powers for their opinions on the proposed drilling activities. The results of the consultations as well as an evaluation of the institutional framework have been incorporated into this assessment, see Table 4-1.

E. Structure of the Report

9. This IEE report is structured (below) in compliance with the outline prescribed in Annexure 1 (Safeguard Requirements 1: Environment) of ADB's Safeguard Policy Statement.

Section 1: Introduction
Section 2: Policy, Legal, and Administrative Framework
Section 3: Description of the Project
Section 4: Description of the Environment
Section 5: Anticipated Environmental Impacts and Mitigation Measures
Section 6: Information Disclosure, Consultation, and Participation
Section 7: Grievance Redress Mechanism
Section 8: Environmental Management Plan, and
Section 9: Conclusion and Recommendations.

[6] ADB Safeguard Policy Statement, June 2009

II. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

A. Government of Nepal Environmental Laws and Regulations

10. The Government of Nepal (GON) has a well-established legal framework for environmental assessment of infrastructure development projects. A number of laws have been passed, dating from the Aquatic Life Protection Act of 1961 to the present. Foremost of these which are relevant to the proposed BRBIP project are the Environment Protection Act (EPA) of 1997 and the Environment Protection Rules (EPR) also of 1997 and with Amendments in 2007.

11. The EPA and EPR are the key legal provisions governing the environmental safeguards in Nepal. Section 3 of the EPA mandates project developers to carry out environmental assessment of projects at the level of IEE or EIA. It prohibits the implementation of any project without receiving environmental clearance from the GON in the form of approved EIA or an IEE reports. Rules 2 and 3 of the EPR requires a project developer to carry out IEE or EIA for the type and size of projects as listed in the Schedule 1 or 2, respectively.

12. The most relevant national policies, acts and guidelines of the GON concerning environmental safeguards, which are relevant to the proposed drilling work, are discussed in subsequent paragraphs.

13. **National Park and Wildlife Conservation Act, 1973, GON:** It addresses the conservation of ecologically valuable areas and indigenous wildlife. The Act prohibits trespassing in park areas, prohibits wildlife hunting, construction works in the park area, damage to plant and animal, construction of huts and houses in park area without permission of authorized persons. It lists 26 species of mammals, 9 species of birds, and 3 species of reptile as protected wildlife. Since the proposed drilling work will be carried our within SNNP, clearance from Department of National Park and Wildlife Conservation within the Ministry of Forests and Soil Conservation is required.

14. **Environmental Protection Act, 1997, GON :** It stipulates that any development project, before implementation, shall pass through an environmental assessment, which may be either Initial Environmental Examination (IEE) or Environmental Impact Assessment (EIA). Approval of the reports and environment clearance will be provided by a competent government agency as identified by the Act. The Act restricts polluting activities and authorizes government for monitoring and enforcement. The Act has provision of compensation to affected parties from environmental impacts and punishment to polluters. Environmental Protection Rule (EPR) 1997 (amendment, 2007), GON : It provides various step-wise requirements to be followed while conducting EIA and IEE studies. The rules also oblige the Proponent to timely consult and inform the public on the contents of the proposal and EIA and IEE studies.

15. **Forest Act, 1993 (amendment, 2007), GON:** This Act requires decision makers to take account of all forest values, including environmental services and biodiversity, not just the production of timber and other commodities. It includes several provisions to ensure development, conservation, management, and sustainable use of forest resources based on appropriate planning.

16. **Forest Rules, 1995, GON:** These rules elaborate legal measures for the conservation of forests and wildlife. Tree cutting clearance is required from Department of Forest. Expenses incurred for cutting trees and transportation is to be borne by the infrastructure developer. As per the Section 5 of the Working Guidelines for Use of Forest Land for Other Purposes, 2006, if a

commercial project requires cutting of trees having girth size of more than 10 cm, then the project proponent is required to plant 25 trees for each tree cut including the provision of 5 year maintenance as compensatory afforestation.

17. **National Environmental Impact Assessment Guidelines, 1993, GON:** These guidelines provides guidance to project proponent on integrating environmental mitigation measures, particularly on the management of quarries, borrow pits, stockpiling of materials and spoil disposal, operation of the work camps, earthworks and slope stabilization, location of stone crushing plants, etc.

18. **Manual for Preparing Initial Environmental Examination (IEE) Report for Hydropower Projects.** Department of Electricity Development, HMG Nepal, in collaboration with United States Agency for International Development and International Resources Group, has prepared a series of manuals to help a proponent to prepare EIA documents within the framework of existing rules and regulations. These guidelines are recommendations rather than mandates.

B. ADB's Environmental Safeguard Requirements and Policies

19. This IEE is carried out in compliance with ADB's SPS to ensure that potential adverse environmental impacts are identified, avoided where possible and managed or addressed.

20. ADB categorizes projects into categories A, B, C, and FI according to the significance of likely impacts. Based on the ADB's SPS, the activities proposed for the drilling work is categorized as category B, based on the most sensitive component. Category B projects are judged to have some adverse impacts, but to a lesser degree and/or significance than category A projects.

21. An initial environmental examination (IEE) is required to determine whether or not significant environmental impacts warranting an EIA are likely. If an EIA is not needed, the IEE is regarded as the final environmental assessment report. Accordingly this IEE is prepared to meet the requirements of the ADB's SPS. A separate detailed EIA is being prepared for the proposed dams and associated infrastructure.

C. Institutions

22. The principal national agency charged with environmental protection is the Ministry of Science and Technology and Environment. The role of MOEST is to protect the environment and promote sustainable development. The environmental assessment for development projects is also approved by MOEST. It is also the agency required to respond to any complaints from the public about environmental issues.

23. The Department of National Park and Wildlife Conservation (DNPWC) within Ministry of Forests and Soil Conservation (MOFSC) is responsible for conservation and management of protected areas including National Parks in the country. The Chief Warden of the Shivapuri National Park has wide powers to give permission for activities to be carried out in the national park. In the event that the drilling and surveys do not require cutting of trees having girth size of more than 10 cm, the Chief Warden can give the permission directly.

III. DESCRIPTION OF THE PROPOSED DRILLING WORK

A. Need for the Drilling Work

24. The Government of Nepal, with the financial support from ADB, has envisaged carrying out project preparation and feasibility study for the improvement of the Bagmati River to address water security issues in the Bagmati River Basin. As part of project preparation, the PPTA consultant has carried out initial assessments and identified a potential favourable site for a larger dam replacing the existing, low dam at the Dhap site in the headwaters of the Nagmati River, a major tributary to the Bagmati River. To establish the engineering feasibility, there is need to carry out drilling and geo-technical investigations to determine the geology and sub-surface rock conditions at the proposed Dhap Dam site. Therefore, the geotechnical investigation (drilling) has to be carried out to bring the study and design of the dam to the required feasibility level.

B. Drilling Work

25. Drilling for collecting the rock samples will be carried out at 4 locations with an anticipated depth of the drill holes of 15-16m.

C. Proposed Dam Site Location and Features

26. The Dhap area is located at $27^0$48'493" North latitude and $85^0$27'496" East Longitude approximately 2085 m above mean sea level. The outflows from the Dhap area creates the headwaters of the Nagmati. The topography in the Dhap area is relatively flat, around the wetland created by the existing, low dam. Figure 3-1 shows the location map.

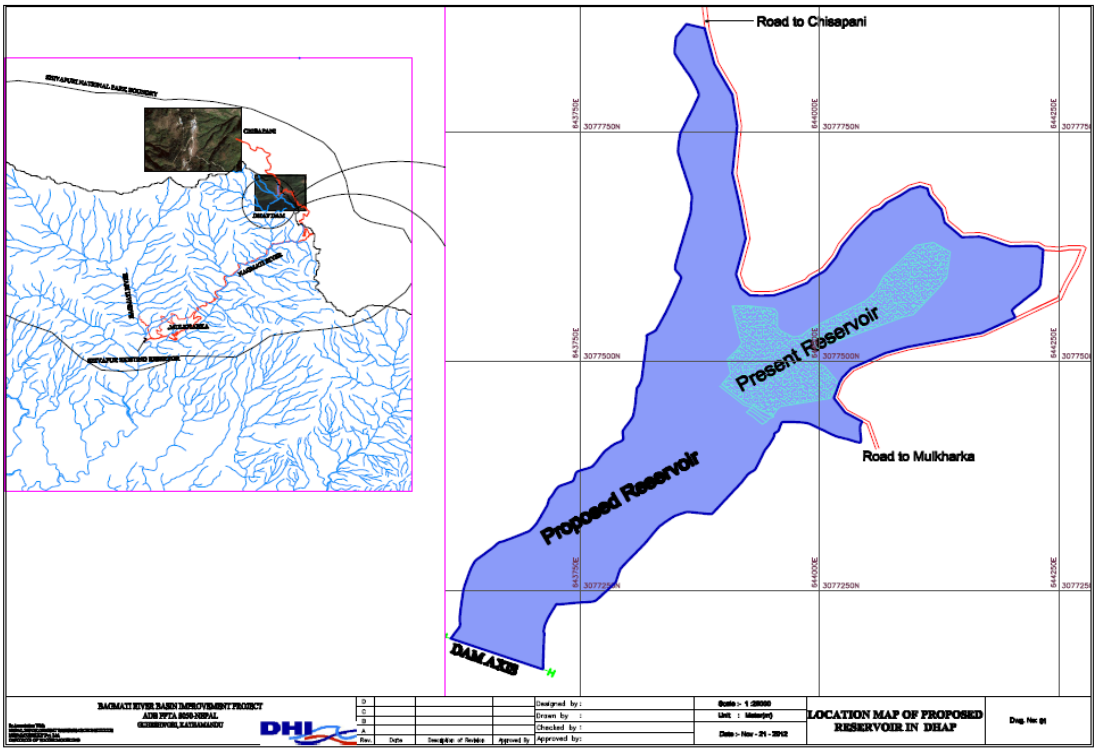

Figure 3-1 Location Map of the Proposed Dhap Dam Site

27. The proposed site for new Dhap Dam is approximately 60 m downstream of the existing, low dam. The Dhap area is bordered by the road from Mulkharka to Chisapani to the north. The Dhap wetland is surrounded by grassland/scrub to the west and east, and below the existing dam is a large area with rush. Further away and downstream the area is surrounded by mostly secondary semi-dense forest.

28. The site is located in the protected forests of the Shivapuri Nagarjun National Park, Sundarijal range. The Dhap site is accessible from the existing road from Mulkharka to Chisapani.

D. Project Activities and Details

29. Mobilization of one rig by road to the Dhap site, preparation of drilling platforms, moving rig to the drill sites, drilling operation, moving of drilling machine from one place to another place, obtaining of rock samples etc.

1. Access to the Area

30. The existing road from Mulkharka to Chisapani running just north of the Dhap area provides access for the drill rig operator. At the Dhap site itself there is relatively easy access to the drilling positions. There is no need to cut any trees or higher vegetation.

2. Workers Camp

31. A workers camp will be established in one of the existing open areas in the vicinity of the Dhap site. The site will be decided in consultation with the National Park staff. While workers for transporting equipment, assisting in drilling etc. are expected to be hired from nearby villages. The duration of clearing of vegetation, mobilisation, drilling and demobilisation is expected to be carried out over a 2,5 month period. 5 to 7 drilling staff is foreseen to occupy the camp.

E. Implementation Schedule

32. Drilling at each site will occupy a period of approx. 5 – 10 days. From the start of drilling to final reporting of the drilling and testing work is likely to take about 3 months The expected start of mobilisation is by early December 2012.

IV. DESCRIPTION OF THE ENVIRONMENT

A. Physical Resources

33. **Topography, Geology and Soil:** The proposed Dhap Dam site is located $27^0$48’493” North latitude and $85^0$27’496” East Longitude approximately 2085m above mean sea level. . The topography in the Dhap area is relatively flat, around the wetland created by the existing, low dam.

34. Geologically the proposed site falls in the Inner Himalayan region. The dominant rocks are gneiss and magnatite with mica schist and pegmatic granite. The soils of the area range from loamy sand on the northern side to sandy loam on the southern slope. Because of the steep topography and the nature of soil, soil erosion is very common.

35. Land use. The road from Mulkharka to Chisapani forms the upstream boundary of the Dhap. The wetland is surrounded by grassland/scrub at both sides, and below the existing dam is a large area with rush. Further away and downstream the area is surrounded by mostly secondary semi-dense forest.

36. **Climate:** The project area has a subtropical to temperate type of climate. There is a high variation in annual temperature and precipitation. The recorded maximum average temperature is 22.7^0C in mid-May/June and the minimum average temperature of 0.30^0C is recorded in December/January. The mean annual precipitation is 2727mm mostly occurring during the monsoon period.

37. **Water Resources:** The region is the origin of some of the important river systems including Bagmati, Bishnumati, Nagmati, Syalmati, Rudramati, and Yashomati, which are major watersheds. The outflows from the Dhap area creates the headwaters of the Bagmati.

B. Ecological Resources

38. **Flora and Forests:** The proposed project site is located within the Shivapuri Nagarjun National Park (SNNP). The vegetation of the park represents midhill flora, fauna, and ecosystems in the transition zone between sub-tropical and temperate climate, where the variations is primarily a function of the altitude. SNNP supports rich floral and faunal diversity with a number of protected species of mammals, birds, and plants.

39. The floral diversity is quite high in the park due to its location, altitude, and climatic variations. There are more than 2,122 species of flora and 16 of them are endemic flowering plants. About 129 species of mushroom including Lactarius pleusitides have been identified in the park. Table 4-1presents the Forest Habitats and Altitudinal distribution of Flora and Fauna in the park area.

Table 4-1: Forest Habitats and Latitudinal distribution of Flora and Fauna

Forest type or Habitat	Altitude (m)	Flora	Fauna
Ever green mixed broad-leaved forest	1000-1500	Schima wallichii Castonopsis indica Alnus nepalensis Anthosaphalus cadamba Prunus cerasoides	Wild boar (Sus scrofa) Barking deer (Muntiacus muntijak) Rhesus monkey (Macaca mulatta) Langur (Semnopithecus entellus) Indian hare (Lepus nigricollis)
Chir pine forest	1000-1600	Pinus roxburghii Castonopsis indica Myrica esculenta Pyrus pashia	Same as above.
Upper mixed hardwood forest	1500-2700	Acer. Aesculus Juglans regia. Betula, Fraxinus sp. Alnus nepalensis Salix sp. Quercus sp. Celtis sp.	Himalayan goral (Nemorhaedus goral) Himalayan black bear (Ursus thibetanus) Yello-throated marten (Martes flavigula) Wild boar (Sus scrofa)
Oak-	2300-	Quescus semacarpi-	Wild boar (Sus scrofa)

Rhododendron forest	2700	folia Eurya acuminata Ilex dipyrens Michelia champaca Rhododendron arboreum Symplocos sp.	Barking deer (Muntiacus muntijak) Porpucine (Hystrix indica)

Source: Shivapuri National Park Management Plan, 2004 (draft).

40. Forests are one of the major natural resources of the National Park covering more than 70% of the park area. As detailed in the table, the Park has four types of forests which are distributed along the altitudinal gradients.

41. **Fauna and Wildlife:** The SNNP supports a large number of wildlife species (Table 4-1). There are registered 21 species of mammals living in the SNNP out of which nine are threatened[7]. They include Pangolin (Manis spp.), leopard cat (Prionailurus bengalensis), and clouded leopard (Pardofelis nebulosa), common leopard (Penthera pardus), Langur (Semnopithecus entellus), Rhesus monkey (Macaca mulatta), Jungle cat (Felis chaus), Goral (Naemorhedus goral), and Himalayan black bear (Ursus thibetanus).

42. The SNNP is also one of the most popular areas for watching birds and butterflies. It harbours 177 species of birds of which 12 of them are considered as listed in Appendix A. Herpetofauna of SNNP has not been explored. Only one species (i.e. Oligodon arnensis) of reptilia has been reported in the Park. There are more than 102 species of butterflies. SNNP is the only habitat for the relict Himalayan Dragonfly (Epiophlebia laidlawi) in Nepal. The overall status of various flora and faunal species found in the SNNP is presented in Table 4-2 below.

Table 4-2: Status of Species in SNNP

Group	Total Number of Species	Status
Mammals	21	Protected, Threatened (9)[1]
Birds	177	Threatened (12)[2]
Herpentofauna	1	DNA[1]
Butterflies	102	Endemic, susceptible species[1]
Plants	2122	Endemic (16) flowering[1]
Mushrooms	129	One species new to science[1]

Source: [1]Shivapuri National Park Management Plan, 2004 (Draft). [2]IUCN

43. The Park area experienced problems of soil erosion owing to deforestation, overgrazing, and cultivation on steep slopes in the past. The quality and quantity of water supplied from this area was also reduced. To overcome these problems, a program was initiated to protect Shivapuri as a watershed and wildlife reserve in 1975. It was declared as Nepal's 9th National Park in 2002.

44. The office of SNNP forwarded a draft of a Management Plan in 2004 with the support from Nepal Trust for Nature Conservation and forwarded this to the Ministry of Forest and Soil Conservation for approval. However, the plan is not yet approved. The Plan and other documents sets the objectives of the initiative to maintain a proper balance between the natural

[7] Shivapuri National Park Plan, 2004 (Draft)

environment and the basic needs of local people. The vision is to develop Shivapuri and Nagarjun areas as demonstration sites for multiple uses by restoring and maintaining the ecological integrity.

45. **Flora and Fauna at the proposed Dhap Dam Site:** The entire Dhap area has a high ecological value. The area serves as source of water for the Nagmati River. The area accumulates the rainfall, recharges the area and consequently pours downstream. Field sampling was undertaken at proposed dam site to establish the presence of flora and fauna, see Figure 3-1.

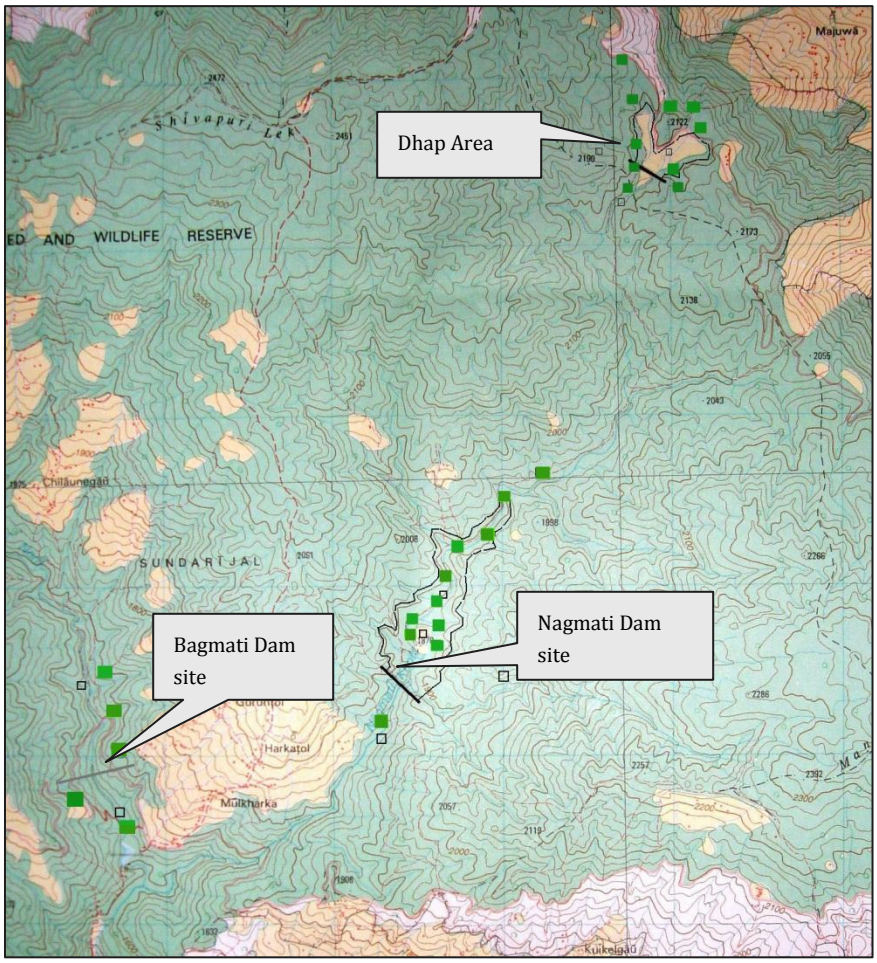

Figure IV-1: Sites for vegetation surveys

46. **Vegetation.** The area is home to highly value medicinal plants such as *Acorus calamus* (Bojho), and plants of ecological value like *Pyracantha crenulata* (Ghangaru), Berberis aristata (Chutro) etc.

47. The vegetation in the Dhap area consists of bushes and shrubs of *Berberis asiatica* (Chutro), *Pyracanta crenulata* (Ghangaru), *Edgeworthia gardneri* (Argeli), *Rubus acuminatus* (Bhalu ainselu) etc. with relatively few trees. *Symplocos sumuntia* (*Lodh*), *Lyonia ovalifolia* (Angeri) and *Daphniphyllum himalense* (Rachan) are the dominant tree species with a density of 100, 62 and 55 trees per hectare respectively. *Pyrus pashia* (Mayal), *Camellia kissi* (Chiapate, Hingua) and *Betula alnoides* (Saur) are other major associated species in the Dhap area.

Among the listed species, *Symplocos sumuntia* is the most common and uniformly distributed plant species in Dhap area (Table 4-3).

Table 4-3: Population parameters of major trees in proposed Dhap dam site

SN	Scientific name	Den-sity	Relative Density	Fre-quency	Relative Frequency
1	*Symplocos sumuntia*	100	22.60	100	13.70
2	*Lyonia ovalifolia*	62.5	14.12	60	8.22
3	*Daphniphyllum hi-malense*	55	12.43	90	12.33
4	*Pyrus pashia*	45	10.17	100	13.70
5	*Camellia kissi*	42.5	9.60	70	9.59
6	*Betula alnoides*	42.5	9.60	50	6.85
7	*Quercus glauca*	22.5	5.08	50	6.85
8	*Rhododendron arbore-tum*	15	3.39	40	5.48

48. Different species of terrestrial and epiphytic orchids (Nep: Sungava, Sunakhari, Chandi-gava, Bandar kera) were recorded. Orchids are considered threatened by IUCN and falls under CITES Appendix II. They are protected mainly because of the excessive collection for trade. Most common among them are *Coelogyne critsata, C. ovalifolia, Calanthe tricarinata, Spi-ranthes sinensis, Satyrium nepalense* etc. Aerial species are succulent in nature hence they ab-sorbs moisture from environment and food from the host tree, whether the host tree is living or dead. Epiphytic orchids were recorded from the Nagmati as well as Dhap sites.

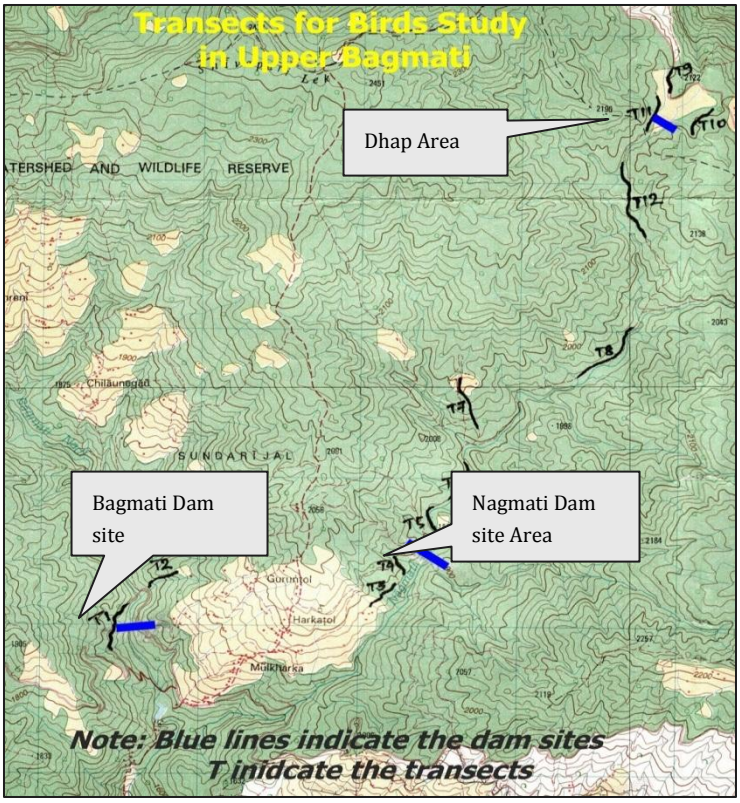

Figure 4-2 Transects for bird surveys.

Table 4-4 List of Birds Recorded at the Dhap Dam Site

S.N.	English name	Scientific Name
1	Blue Throated Barbet	*Megalaima asiatica*
2	Common Hoopoe	*Upupa epops*
3	Golden Throated Barbet	*Megalaima franklinii*
4	Great Barbet	*Megalaima virens*
5	Green-backed Tit	*Parus monticolus*
6	Grey Bushchat	*Saxicola ferrea*
7	Grey-hooded Warbler	*Seicercus xanthoschistos*
8	Himalayan Bulbul	*Pycnonotus leucogenys*
9	Himalayan Swiftlet	*Collocalia brevirostris*
10	Oriental Turtle Dove	*Streptopilia orientalis*
11	Red-vented Bulbul	*Pycnonotus cafer*
12	Rufous Sibia	*Heterophasia capistrata*
13	Rufous-bellied Niltava	*Niltava sundara*
14	Scaly Laughingthrush	*Garrulax subunicolor*

15	Striated Laughingthrush	*Garrulax striatus*
16	Verditer Flycatcher	*Eumyias thalassina*
17	Wedge-tailed Green Pigeon	*Treron sphenura*
18	White-tailed Nuthatch	*Sitta himalayensis*
19	White-throated Laughingthrush	*Garrulax albogularis*
20	Yellow-billed Blue Magpie	*Urocissa flavirostris*

49. Altogether 20 species of birds were recorded at the Dhap site during the survey in September 2012 (Table 4-4) Warblers and Barbets were the most commonly observed.

50. The 12 protected bird species recorded in the SNNP are listed in Appendix A. None of these were recorded during the bird survey. Out of the 12 protected species, it cannot be excluded that the Saker Falcon, Grey-sided Laughingthrush and Blue-winged Laughingthrush may occur in the forest and open areas around the site. The Saker Falcon occupies open country, while the Grey-sided Laughingthrush and Blue-winged Laughingthrush occupy forest and bush, feeding on insects and fruits.

51. The survey results for the wildlife are given in Table 4-5. *The Dhap* area provides a diverse habitat which supports a variety of mammals. *Viverra zibetha* was confirmed by scat and scent, *Sus scrofa* by digging, *Munitacus muntjak* by pellets, *Prionailurus bengalensis* by scat and *Martes flavigula* by pugmark. *Lepus nigricollis, Muntiacus muntjak and Martes flavigula* were also sighted directly in the vicinity of *Dhap* area. Additionally, relic scats of *Panthera pardus* found outside transect confirmed the presence of the carnivore.

Table 4-5 Wildlife of Dhap Area

Mammal	Sign	Crown Cover	Dominant Trees	Distance from Water
Viverra zibetha	Scat	1%	*Lyonia ovalifolia, Pyrus pashia, Berberis aristata, Daphniphyllum sps*	25 m
	Scent	73%	do	5 m
Sus scrofa	Digging	47%	do	35 m
	Digging	48%	do	35 m
	Digging	81%	do	1 m
Munitacus muntjak	Pellet	25%	do	5 m
	Sight	-	-	-
Martes flavigula	Pug mark	25%	do	5 m
	Sight	25%	do	5 m
P.bengal-ensis	Scat	2%	*Alnus nepalensis, Rhododendron arboreum, Lyonia ovalifolia, Berberis aristata,* etc.	< 1 m
Panthera pardus	Scat	8%	*Daphniphyllum sp, Pyrus pashia, Alnus nepalensis*	100 m
Lepus nigricollis	Sight	20%	*Daphniphyllum sp, Pyrus pashia*	5 m

52. None of the three animals recorded during the wildlife survey are listed in the IUCN List of Threatened species for Nepal[8].

C. Socio-economic Resources

53. Agriculture accounts for 35% of Nepal's national Gross Domestic Product (GDP), industry 15% and services (including tourism) the remaining 50%. GDP growth was 3.5% in 2011 and the economy grew by an annual average of 3.4% during the past five years which was led by growth in the service sector by 6% annually, whilst growth in the agriculture sector was only 2.6%. Per capita income was $642 in 2011 and has grown annually by 10.5% during the past five years. In 2011 the Human Development Index (HDI) of Nepal was 0.458, placing it at 157th position in the world.

54. According to the 2011 population census, in Kathmandu district (noting that the project is located in Sundarijal VCD of Kathmandu district), 9 VDCs and Kathmandu metropolitan together have a total population of 1,163,785. Females constitute 47.4% and males constitute 52.6%. The average household size is 3.7 persons. Of the total population 86.5% is urban (Kathmandu metropolitan) and 13.5% rural. The household size in the urban area is slightly lower (3.6 persons).

55. The total population of the Sundarijal VDC where the dam site is situated is 2,631 in 2011. The settlement closest to the Dhap Dam site is Chisapani in Nuwakot district, about 2 km from the dam site. There are 621 households in the Sundarijal VDC with males constituting 53.8% and females 46.2%. The average household size is 4.2 persons.

56. Almost 90% of the Sundarijal VDC comes under the upstream areas where the Tamang communities predominate. They grow millet and maize in the upstream areas. However, some vegetables and barley are also cultivated. Most of them are engaged in hoarding livestock while some are seen to be involved in small business like shops and hotels. In the downstream areas, wheat, barley, maze, potato, vegetables and millet are grown. The majority of the people are Chhetriyas, Brahmins, and Newars. Some of them are involved in governmental and non-governmental services while most of them are involved in agriculture and business.

57. 'Sundarimai Mandir (Temple)', Ganesh Mandir and Krishna Mandir are the main cultural sites in the Sundarijal VCD. People from Kathmandu and other places go to Sundarijal for visiting these temples. All the Hindu and Buddhist festivals are celebrated. Additionally, during the month of July, 'Dashahara' fate/festival is celebrated at the spots near waterfalls and rivers near the temples.

58. Chisapani in the Nuwakot district is the nearest settlement to the Dhap, a small town approximately 2 km away with several hotels serving trekkers towards Helambu (Langtang Range). Besides the mountain views, one of the major attractions is the Dhap area with the lake behind the existing dam. The presence of Shivapuri Nagarjun National Park also attracts visitors. Here, internal tourists as well as people of Kathmandu valley are attracted due to its pristine natural beauty with rivers, streams and small waterfalls.

59. The National Park staff collects an aquatic plant, locally called 'Bojho' in the Dhap area. The National Park staff is of the opinion that the plant disturbs the lake ecosystem. Therefore, they consider the collection of the plant be part of the protection and management of the Dhap

[8] http://biodiversityofnepal.icimod.org/ProtectedAreas/Redbook.asp -OR - http://www.forestrynepal.org/wiki/332

wetlands. The plant is also used for herbal medicine, and constitutes a value. However, it is not allowed to take the harvested plant out of the SNNP and consequently the plants collected are destroyed by the National Park staff[9].

V. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

A. Impacts and Mitigation Measures Due to Location and Design Site Preparation

60. The impacts of the proposed drilling work will not be very significant as it would be carried out in a confined area and paying close attention to minimising impacts. Selection of alignment of access track would be done to avoid any cutting of trees. A temporary camp for drilling workers should be located in an open area away from any dense forests with 5-7 workers staying there.

61. The PPTA Team on behalf of the project proponent will ensure that the Contractor has a contractual obligation to adhere to an environmental management plan following GON and ADB regulations and guidelines. PPTA staff along with The Natural Parks staff will oversee that the Contractors implement and follows the EMP.

B. Impacts and Mitigation Measures Due to Site-Preparation activities

62. The environmental impacts anticipated from bringing in the drill rig and preparing any drilling platforms are considered to be modest and temporary. It is envisaged that only clearing of, shrubs and bushes is required.

63. The site-preparation activities include clearing of 800 m long and 2 to 3 m wide strip (on average 2.5 m) from the access point on existing road from Mulkharka to Chisapani to the drilling points at the site of the proposed new dam. This will require clearing of shrubs and bushes on approximately 2000 m^2 of land. Similarly at each drillhole, about 15 m^2 will be cleared for drilling platform, drilling equipments, drilling consumables, and storage of drillcores. In total this will require clearing of an area of 60 m^2 for four drillholes (15 x 4nos). Another 750 m^2 area (250 m long and on average 2.5 m wide strip) will be prepared for moving drillrigs from one point to another. The total area to be cleared for access and drilling points is approximately 2810 m^2.

64. Clearing of 2810 m^2 of shrubs and bushes may cause some temporary and local impacts on the ecosystem. However the degree of impairment will be low since only shrub / bushes will be cleared, Any shrubs or bushes if of special importance to birds will be identified when tracks are identified, before any clearing, under the EMP. Necessary replanting for restoring the vegetative cover in the 2810 m^2 to be cleared, will be identified in consultation with DNPWC/SNNP staff by a vegetation expert under the PPTA as part of the Environmental Management Plan. Replanting will be done with a three times higher density to allow for survival.

65. The delineation of the access tracks and drill sites will be identified and marked under the supervision of officials from the National Park and oversight by the PPTA team on the behalf of the Project Proponent under the EMP. Further, the clearing of shrubs and bushes will be carried out in the presence of officials from the National Park and cut shrubs and bushes will be disposed off as recommended by National Park officials.

[9] Vegetation Specialist. Personal communication.

66. Since the scope of the proposed drilling work is limited to site clearing and drilling activities, no impacts are anticipated on topography, climate or soils

C. Impacts and Mitigation Measures Due to Drilling Activities

67. **Flora:** Care must be exercised to avoid any significant damage or loss to flora and fauna. To achieve this, the contractor will be required to implement following mitigating measures:

(i) Existing vegetation including shrubs and grasses along the tracks for moving the drill rig in the Dhap (except directly under the line of transport) should not be disturbed.
(ii) Any cutting of trees and vegetation is strictly forbidden outside the sites and track designated for clearance. The sites and tracks designated for clearance will be identified by the National Park staff that will oversee the clearance works in co-operation with the PPTA team on the behalf of the Project Proponent.

68. **Fauna:** Some disturbance to the wildlife is expected during the works. In order to minimise the impact, any movement outside the designated sites, tracks etc. is strictly forbidden. Any poaching and hunting are forbidden as well. Noise from the drilling operations to be reduced to the lowest possible level. Noise level measurements will be carried out under the EMP. Corrective measures such as implementation of noise screens will be provided, if necessary.

69. Some disturbance to birds is expected during the works. In order to avoid any direct impacts, when the siting of access tracks is done, a bird expert hired by the PPTA under the EMP will inspect the siting in order to check no nesting birds will be affected.

70. **Waste and wastewater:** Short-term adverse impacts from waste and wastewater on soil and water anticipated from the drilling works, if not addressed by the Environmental Management Plan, may originate from: spillage of oils, handling and storage of drilling mud, wastewater from workers camps etc. The anticipated impacts and mitigation measures are discussed in subsequent sections.

71. **Workers Camps:** Establishment and operation of a workers camp at the site could cause temporary adverse impacts on flora and fauna as well as on the health of the workers. The following measures will be adopted and applied for construction and removal of the camps.

(i) Permission for camp areas must be obtained in writing from the National Park authorities.
(ii) Suitable latrines and other sanitary arrangements at the camps and sites where work is in progress should be availed to the personnel.
(iii) Access tracks and the camp area as well as drilling sites should be sited to cause minimum disturbance. Kerosene should be used for cooking.
(iv) Movement of personnel should be restricted within workers camps, access tracks, drilling sites.
(v) Poaching and hunting of wild animals should be strictly prohibited. Contract agreements should specify heavy penalties for illegal hunting, trapping and wildlife trading. No permanent structures should be built at the camp, and the camp site to be cleared and cleaned free of all debris, waste and hydrocarbons at end of the works under inspection by the National Park authorities.

(vi) All rubbish (except for oils and other mechanical or chemical waste) should be buried or removed. Organic waste shall be buried. Non-organic waste shall be removed.
(vii) Waste oils, chemicals and mechanical waste should be stored and removed by a registered waste handling company.

72. **Drilling Sites:** Some impacts from drilling waste and other wastes generated during the drilling activities are anticipated. The contractor will be required to implement the following measures to control drilling sites:

(i) Each drilling site should be completely cleared of all waste after use. Drilling waste (chippings and mud) will be buried. Rubbish, waste oil and chemicals should be returned for disposal as outlined in the Workers Camp section (viii) above.
(ii) Waste and drilled material should not be disposed in the river water.
(iii) No spillage of oils or fuels should occur. In order to reduce and control any spillage, stocks of sawdust should be placed at strategic points in the working areas, to be poured immediately onto any spill. In the event, the sawdust will have to be removed and deposited by a registered waste handling company.
(iv) On completion of each drillhole the site must be left clean and free from all debris, hydrocarbons and waste, and the drillhole capped to the satisfaction of the PPTA Consultant and Shivapuri National park authorities.

73. **Drilling Operation:** Potential adverse impacts are anticipated due to noise generated from operations of drills. The following measures will be implemented to control adverse impacts from drilling operations.

(i) Drilling operations shall be carried out only during the day time to minimize adverse impacts on wildlife in the forest area.
(ii) The Contractor should have certificates from the manufacturer for type approval and conformity of production for Diesel Generator (DG) set/s.
(iii) For DG sets of capacity up to 1000 kVA, the noise level at 1 m from the enclosure surface shall not exceed 75 dB (A).
(iv) Workers shall be provided with personnel protective equipments (i.e. helmet, safety shoes, ear muffler and air mask) and their use should be strictly enforced.

74. **Human Relations**: The following activities must be taken care of to avoid any unexpected impacts during the project activities:

(i) Wildlife, people, water, land and livestock must be respected.
(ii) Necessary permission to enter the Park must be sought from the National Park authorities. Work should be done with minimal damage to trees.
(iii) All conflicts / disagreements and any agreements, no matter how trivial, must be logged and dated, with details of persons involved and subject matter, in a book for this purpose at the workers camp, as part of the Grievance Redress Mechanism to be implemented under the EMP.

VI. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

75. As part of initial environmental examination, stakeholder and community consultations were carried out during field visits. The consultations included discussions with stakeholders and village level authorities. The details of such consultations carried out during field visits are presented in Table 6.1.

76. Field visits were jointly undertaken with Range Officer from the Shivapuri Nagarjun National Park to identify the extent of physical activities and likely impacts to forest/vegetation, if any.

77. Also, a number of officials from various agencies, i.e., the Ministry of Forests and Soil Conservation, Department of National Parks and Wildlife Conservation, Ministry of Environment, Science and Technology, Village Development Committee members etc., have been consulted during the ADB visit.

78. Consultations will continue at next stages i.e. during preparation of the detailed environmental impact assessment (EIA), for the final feasibility study for the environmental interventions in the Upper Bagmati. Some of the issues raised by the villagers are relevant to the feasibility study and not on drilling works and will be dealt with in the EIA.

Table 6-1: List of Stakeholders / Communities Consulted

Name and Designation	Organization and Date	Issues Discussed	Comments on the issue
Mr.Gopal Prakash Shivakoti, Warden	Shivapuri and Nagarjun National Park (SNNP), August 09, 2012.	• Survey permission and procedure essential to carry out activities in the park • Secondary Information regarding the park	• As per the Rules, necessary actions are included in EMP • The information collected will be included in EIA reports
Mr. Ram Chandra Khatiwada, Asst. Conservation Officer Mr.Nawa Raj Baral, Engineer	Shivapuri and Nagarjun National Park (SNNP), September 13, 2012	• Is the Dams construction activity a national priority project? • Chances of habitat fragmentation • Procedure to be followed while clearing trees in the park • Compensatory plantation at the ratio of 1:25 • Large scale infrastructure is not a priority of the National Park • Mitigation measures may take a big	• The issue of national priority project is forwarded to the technical and institutional experts • Environmental issues falling under the scope of the drilling are covered in EMP • The issues of PES and EIA of the road will be covered in EIA to be conducted for the construction of the reservoir.

		share of the project • Payment of Environmental Services (PES) • EIA of road passing through the Park	
Ms. Madhu Devi Ghimire, Head	EIA Section, Ministry of Forest and Soil Conservation, Sept 14, 2012	• Mandatory Provision of getting approval from MOFSC for EIA study for any intervention in the Park • Govt. of Nepal (Minister or Cabinet level) approval essential for cutting the trees in the park • In the past, the Govt. has permitted to cut the trees in the park for national priority projects only after EIA approval • Is the Dam construction activity a national priority project?	• Request for EIA study as per the Government rules has been sent to MOFSC • The issue of national priority project is forwarded to the technical and institutional experts
Mr. Shiva Lal Gaire, Ranger	Shivapuri Nagarjun National Park, September 15, 2012	• Possibilities of lowering the rig in the river without cutting the trees • Possibilities of carrying out the topographic survey without cutting the trees.	• As part of the EMP, track for moving rigs and lines for topographic surveys will be identified, avoiding cutting any trees. •
Mr.Nima Sherpa, Ex. Chairperson	Sundarijal VDC, September 15, 2012	• Employment of the locals during survey, construction and operation of the dams • Upgrading of the existing road for the purpose of serving the project as an access road • Benefits to the local communities as of the construction of the project	• The issues raised will be covered in the EIA study to be conducted for the construction of the reservoir.

About 60 participants	Mulkharka Village, Sundarijal VDC, Sept 22, 2012	• Resettlement of the Households currently living inside the Park • Employment to the locals if Govt. decides to not relocate them • Contamination of drinking water supplied to Kathmandu due to the settlements in the park • Open defecation in the Park • Household wastewater treatment of the communities in the park • Employment to the locals during project construction and operation • Consideration of alternatives (several low height dams vs. a single tall dam) • Disclosure of risk mitigation plan in case of dam failure • Rehabilitation and upgrading of the local road • Technical team must discuss the alternatives and technical details with the public prior finalising the design • On what basis the projects components particularly in the Sundarijal-Tilganga stretch were selected? • Payment of environmental Services • Misleading information in the media regarding the project	• Issues raised such as resettlement of Households and contamination of drinking water is not a direct result of the BRBIP. Neither resettlement of households in the park or contamination of drinking water from these households will be affected by the BRBIP. However, they will be forwarded to the Government authority in appropriate meetings. • Requirements for local employment during construction and operation will form part of the Project Administration Manual prepared under the PPTA. A Risk Mitigation Plan will be prepared based on the results of the Dam Break Analyses under the PPTA, and implemented under the Dam project. • Environmental issues falling beyond the scope of the drilling work will be addressed thoroughly in the EIA to be conducted for the construction of the reservoir study. • The issues on information dissemination and communication are included in the Communica-

		• Little or no communication to the public regarding the preparation of the project	tion Strategi. As part of the EIA process a range of stakeholders consultations are held.

79. The IEE report will be disclosed in the English and local language in the office of HPCIDBC. The report will also be made available to interested parties on request from office of HPCIDBC. The IEE report will also be placed on ADB's website.

VII. GRIEVANCE REDRESS MECHANISM

80. The process for resolving complaints that may arise in the project will be handled by a grievance redress mechanism. Any local stakeholder, feeling that adverse and material harm is caused by the Project, may co**n**tact village community development leaders from the Village Development Committee, that would then forward the complaint to HPCIDCB and National Parks, or the stakeholder may contact the social department of HPCIDBC or National Parks, directly.

81. When obtaining the information from the complainant social department of HPCIDCB will register the complaint with the assistance of the PPTA team on the behalf of the Project Proponent, and initially seek to identify the source of the problem and inform the HPCIDCB operation division and National Parks. When the operation division/PPTA receives the information, they will clarify if the complaint is caused by the drilling works.

82. In case of complaints related to air, noise, soil or water quality pollution, measurements will be carried out to verify any impacts and/or damage.

83. Once verified that the problem/complaint is well founded and due to drilling works, HPCIDBC will together with the PPTA team on the behalf of the Project Proponent and the Contractor take the necessary corrective actions. If necessary, the EMP will be updated in order to avoid similar problems, afterwards.

84. The HPCIDBC social department will inform and update the complainant about the progress of grievance mitigation within 24 hours for urgent issues and 7 days for non-urgent issues.

85. The HPCIDCB social department will provide monthly reports of any complaint registered, and how it has been dealt with to the Park Authorities, the PPTA and the HPCIDCB management.

VIII. ENVIRONMENTAL MANAGEMENT PLAN

A. General

86. The Contractor shall take all reasonable steps to protect the environment and to prevent environmental damage and public nuisance resulting **f**rom construction activities.

87. The Contractor shall comply with all statutory requirements, environmental regulations and environmental quality standards, as stated in the Government of Nepal Environmental Laws and Regulations, see Section 2.1.

88. Permission for drilling sites and camp areas must be obtained in writing from DNPWC.

89. Necessary permission for personnel to enter the Park must be sought from DNPWC.

90. The Contractor shall bear all costs associated with environmental pollution avoidance and environmental mitigation, including any clean-up operations if necessary.

B. Cutting of Vegetation

91. No cutting of vegetation, except for the clearance of bushes access tracks for the drillrigs and clearance of drill sites (no trees to be cut).

92. The Contractor shall under the supervision of the Shivapuri National Park staff and the PPTA consultant identify and mark the borders of the access tracks and drill sites (with no trees having a diameter of more than 10cm to be found within these borders. If any trees with a diameter larger than 10 cm they should be left un-touched.

93. No cutting of vegetation is allowed outside the marked borders of the access tracks and drill sites.

94. The use of firewood is strictly prohibited. Kerosene should be used for cooking.

C. Wildlife

95. Poaching and hunting of wildlife is strictly prohibited.

96. Movement of personnel should be restricted to a minimum to cause as little disturbance to wildlife as possible.

97. Access tracks should be sited to cause minimum disturbance.

D. Pollution from Wastes

98. The Contractor shall maintain all drilling sites in a clean and safe condition and provide and maintain appropriate facilities for temporary storage of all wastes before transportation and disposal.

99. The Contractor shall organise disposal of all rubbish, waste oils, chemicals and mechanical waste generated during drilling works in an environmentally acceptable manner. The waste produced will be managed by a private solid waste management company registered with GON and who are permitted to undertake waste management work. Solid waste will be disposed it to the designated solid waste management landfill site i.e. Sisdol Landfill site. Health and safety

100. Provision of suitable latrines and other adequate sanitation facilities at the labour camp and on drilling site.

101. Disposal from all sanitary systems should be undertaken to avoid causing environmental pollution. Wastewater should be routed through suitable designed soak aways, without contaminating either ground or surface water or causing a health risk.

102. Provision of an adequate supply of water for drinking and washing purposes for all site personnel, including all workers, as appropriate. Drinking water quality should comply with GoN Standards and WHO guideline values.

103. Workers shall be provided with personnel protective equipment (e.g. helmet, safety shoe, ear muffs and air masks) and their use should be strictly enforced.

104. Cooking at site will be done using kerosene stoves. Adequate fire fighting equipment shall be available in the workers camp.

E. Noise

105. The Drilling Contractor should have certificates from manufacturer for type approval and conformity of production for Diesel Generator set(s).

106. For Diesel Generator sets up to 1000kVA, the noise level a 1 m from the enclosure surface shall not exceed 75 dB (A). As part of the EMP noise measurements will be carried out regularly. If and when necessary, corrective measures, such as noise screens shall be implemented.

107. Avoid any unnecessary noise during mobilisation, drilling and de-mobilisation.

108. Maintain of all transport vehicles and drillrigs to a high standard, in accordance with manufacturers maintenance procedures.

F. Air Quality and Dust

109. Minimisation of dust nuisance by regular watering of any access tracks, bare soil, sand and other areas, as appropriate and as determined by weather conditions.

G. Post Drilling Works Mitigation Measures

110. At the conclusion of the drilling and testing work on each drillhole, the drillhole shall be marked and capped with a lockable steel cover grouted into the top of the hole to prevent ingress of surface water

111. No permanent structures are to be built at camps and drilling sites.

112. At the end of the contract, drillrig sites and camp sites should be removed and the sites cleared and cleaned free of all debris, waste and hydrocarbons. National Park authorities should inspect the cleared site.

113. The major adverse effects of the drilling works are clearing of vegetative cover for access tracks. When tracks for vegetative clearing are identified, a bird specialist will under the EMP check that no nesting habitats for any threatened species are affected..

114. The areas cleared for drilling will be rehabilitated through re-planting of the same type of vegetation and with the same density as found naturally at the site.

Summary of Mitigation and Enhancement Measures

Work activity /stage	Potential impact	Proposed mitigation measure	Responsible for implementation of mitigation measures	Responsible for supervision and oversight.
Identification of access tracks for drilling, siting of workers camp.	Cutting of vegetation, disturbance of wildlife, risk of forest fire.	Siting of all access tracks and workers camp under supervision by National Park staff. Workers camp to be sited close to the existing road and away from any forest vegetation.	Contractor	PPTA team and SNNP officials
Debris and wastewater generated due to drilling works	Pollution of soil and water bodies due to disposal of waste material.	Provision of adequate drainage system including controlled collection and preliminary treatment of wastewater through the provision of latrines and disinfection of these. Maintain all sites in a clean and safe condition. Safe disposal of all solid wastes outside the National Park	Contractor	PPTA team
Movement and operation of drill rigs	Noise and disturbance of wildlife from operation and movement of drill rigs	Drilling techniques selection and drillrig maintenance to minimize noise levels from all operations - Diesel Generator noise level at 1 m from the enclosure surface not to exceed 75 dB(A). Noise measurements will be carried out regularly. If and when necessary, corrective measures, such as noise screens shall be implemented. Minimise dust by regular watering of all stockpiles, access tracks, bare soil etc.	Contractor	PPTA team

Work activity /stage	Potential impact	Proposed mitigation measure	Responsible for implementation of mitigation measures	Responsible for supervision and oversight.
Access tracks and movement of personnel	Noise and disturbance to wildlife	Access tracks to be sited to cause minimum disturbance Restriction of movement of personnel to a minimum Permission of each staff access to the site to be sought from the SNNP.	PPTA and Contractor	SNNP
Cutting of trees and clearing / trimming of trees and vegetative cover	Loss of trees and vegetative covers/loss of potential nesting habitats	- Siting of tracks for movement of drill rigs to minimize disturbance to vegetation. - Siting of workers camp next to the existing road to minimize any disturbance. Any tree having a diameter more than 10 cm is to be left undisturbed. A bird and vegetation specialist will inspect siting of tracks before any cutting of tracks, to ensure no trees of having a diameter of more than 10cm is cut, and no nesting of birds is affected. - No permanent structures to be constructed - Replanting of same type of vegetation and with three times the density as found naturally at the site - Prohibiting any felling of any vegetation and trees by workers Use of firewood prohibited. Kerosene to be used for cooking	Contractor and PPTA team	SNNP
Personnel's Occupational	Impacts on workers' health	- Provide Safety Manual - Provide Safety Plan	Contractor	PPTA team

Work activity /stage	Potential impact	Proposed mitigation measure	Responsible for implementation of mitigation measures	Responsible for supervision and oversight.
Health and Safety	during transport of, and working with drillrigs	- Provide protection gear and strictly enforce use - Supervision and Inspection - Protection gears - Provide safe supply of water - Provide adequate sanitation facilities		
Dismantling of drilling holes	Ingress of surface water into boreholes	- At the conclusion of each borehole to be capped	Contractor	PPTA team
De-mobilisation	Soil and water contamination from wastes	- All sites, access tracks etc. to be cleared of all wastes and wastes to be disposed of - Re-planting of cleared sites, access tracks etc.	Contractor	PPTA team and SNNP officials
Rehabilitation	Soil erosion. Loss of habitat	- Re-planting of cleared sites, access tracks etc.	Contractor	SNNP/PPTA team and SNNP officials

H. Monitoring and Reporting

115. Throughout the mobilisation, carrying out the Drilling Works and during demobilisation, the PPTA team on the behalf of the Project Proponent will monitor the progress and impacts of the Works.

116. In consultation with National Park Authorities and HPCIDCB, the PPTA consultant will establish a system for preparing monthly reports on safeguards performance monitoring, issues resolution, and corrective action plans. These reports will be submitted to ADB, WECS and SNNP.

117. All conflicts / disagreements and agreements, no matter how trivial, must be logged and dated, with details of the persons involved and subject matter, by the Contractor at site, by the PPTA Consultant when monitoring the adherence by the Contractor to the EMP, or by HPCIDCB if receiving complaints etc.

Summary of Monitoring and Reporting

Environmental Features	Aspect to be Monitored	Time and Frequency of Monitoring and Reporting	Responsible party (Implementation/ Supervision)
Physical Works Progress	Handling of drilling mud, waste.	Project site Bi - Weekly	Drilling Contractor & PPTA Consultant
Occupational Health and Safety	Water supply and sanitation. Implementation of worker's safety measures	Project site Bi - Weekly	Drilling Contractor & PPTA Consultant

I. Implementation Arrangements

118. The main institutions that will be involved in environmental management activities are the HPCIDBC as the implementing agency, the Department of National Park and Wildlife Conservation, the PPTA Consultant as overseeing agency, and Drilling and Surveying Contractors.

119. The PPTA consultant, in coordination with officials from SNNP, will ensure that all work is being carried out as per the EMP included in the contract conditions. Contractors will be responsible for implementing the environmental management plan and will report to the PPTA consultant.

J. Budget

120. A budget for the implementation of the EMP is provided in Appendix B.

IX. CONCLUSION AND RECOMMENDATIONS

121. The environmental impacts associated with the proposed drilling works have been assessed and described in the previous sections of this document. The findings establish that the Drilling Works will be carried out within a confined area and there will no cutting of mature trees. Clearing of bushes and grass for the access tracks for the drillrigs will be carried out in consultation with SNNP officials to avoid any adverse impacts.

122. Impacts during drilling operations such as noise, workers health and safety, waste management etc. will be taken care of by adopting mitigation measures as listed in the EMP. The EMP will be included in the drilling contractors' specifications and contract and the PPTA consultant will ensure its implementation by continuous supervision and monitoring.

123. Upon completion of the works all cleared areas will be re-planted and re-growth is expected to be relatively fast, and the areas will return to their present, natural condition within few years.

124. It is therefore concluded that the Drilling Works have no significant environmental impacts, and when implemented, the EMP will fully comply with ADB's SPS 2009 and Government requirements.

Appendix A: Screening of Protected Bird Species recorded in SNNP with respect to their possible presence in or in the vicinity of the Dhap Dam site.

SN	Bird Species	Status	Likely in SNNP (BCN and DNPWC 2011) (SNP and BCN 2007)	Season	Habitat	Nesting Season	Food	Likely at Dhap Site
1	Hodgson's Bushchat (Saxicola insignis)	Vulnerable (IUCN 2012) and Endangered nationally (BCN and DNPWC 2011)	Yes	Winter visitor for Nepal	Grass land, tall grass and Reeds nearby river	June	Insects and fruits	Least possibility (only single unusual record from Chisapani area which is aerially 2 km far from Dhap
2	Saker Falcon (Falco cherrug)	Endangered (IUCN 2012)	Yes	Wintering and passage migrants	Open country	NA	Dove, pigeon,, insects, rodents	Possible
3	White-rumped Vulture (Gyps bengalensis)	Critically Endangered (IUCN 2012, BCN and DNPWC 2011)	Yes	Residential (All year)	Open country, Tall tree and human habitation	Oct- April	Scavenger	Least possibility
4	Grey-sided Laughingthrush (Garrulax caerulatus)	Vulnerable nationally (BCN and DNPWC 2011) Globally Least Concern (IUCN 2012)	Yes	Residential (All year)	Forest and bush	NA	Insects, fruits	Possible
5	Blue-winged Laughingthrush (Garrulax squamatus)	Vulnerable nationally (BCN and DNPWC 2011 and Least Concern (IUCN 2012)	Yes	Residential (All year)	Forest and bush	NA	Insects, fruits	Possible
6	White-tailed Stonechat (Saxicola leucurus)	Vulnerable Nationally (BCN and DNPWC 2011) and Least	Yes (Field survey 2012	Residential (All year)	Grass land	NA	Insects, fruits	Least Possibility (It is recorded

		Concern (IUCN 2012)						at downstream which is aerially 2 km far from Dhap
7	Brown Wood Owl (Strix leptogrammica)	Vulnerable Nationally (BCN and DNPWC 2011) and Least Concern (IUCN 2012)	Yes	Residential (All year)	Primary Forest	NA	Rodents, birds and reptiles	Least Possibility
8	Spot-bellied Eagle Owl (Bubo nepalensis)	Nationally Endangered (BCN and DNPWC 2011) Least Concern (IUCN 2012)	Yes	Residential (All year)	Primary Forest	Dec-March	Rodents, birds and reptiles	Least Possibility
9	Lammergeier Vulture *(Gypaetus barbatus)*	Vulnerable Nationally (BCN and DNPWC 2011) and Least Concern (IUCN 2012)	Yes	Residential (All year)	Open country and cliff	NA	Scavenger	Least Possibility
10	Egyptian Vulture *(Neophron percnopterus)*	Vulnerable Nationally (BCN and DNPWC 2011) and Endangered (IUCN 2012)	Yes	Residential (All year)	Open country and cliff	NA	Scavenger	Least Possibility
11	Himalayan Griffon *(Gyps himalayensis)*	Vulnerable Nationally (BCN and DNPWC 2011) and Least Concern (IUCN 2012)	Yes	Residential (All year)	Open country and cliff	NA	Scavenger	Least Possibility
12	Cinereous Vulture *(Aegypius monachus)*	Near Threatened (IUCN 2012) and Nationally Endangered (BCN and DNPWC 2011)	Yes	Uncommon winter visitor	Open country	NA	Scavenger	Least Possibility

References:

IUCN 2012. IUCN Red List of Threatened Species. Version 2012.2. <www.iucnredlist.org>. Downloaded on 17 November 2012.

BCN and DNPWC (2011) *The State of Nepal's Birds 2010*. Kathmandu: Bird Conservation Nepal and Department of National Parks and Wildlife Conservation.

NA: Information on nesting not available because of lack of studies of the birds species in Nepal. However, most birds in Nepal have a nesting season from March to June.

Appendix B: Cost quotation for the Environmental Management Plan implementation for the oversight of drilling at the Dhap Dam site in the Upper Nagmati area.

Table 1: Quotation

Name of the activity	Unit	Field Rate (Rs)	Qnty	Total (Rs)
A. Remuneration and DSA				
A.1 Wild Life Expert	days	7200	4	28.800
A.2 Birds Expert	days	7200	4	28.800
A.3 Vegetation Expert	days	7200	4	28.800
A.4 Vegetation Technician	days	3600	4	14.400
A.5 Noise Sampling Technician	days	3000	4	12,000
A.6 Site survey Technician	days	3000	4	12,000
A.7 Environment Specialist[10]	days	16800	8	134,400
B. Sampling and Analysis Cost				
B.1 Water Analysis (If and when required)	samples	3300	4	13,200
B.2 Soil sample analysis (If and when required)	samples	1650	8	13,200
B.3 Air sample analysis (If and when required).	samples	15000	2	30,000
B.4 Noise Sampling instrument hiring	samples	1200	4	4.800
C. Vehicle Hiring	days	4	5000	20,000
D. Per Diem to National Park staff	days	30	1000	30,000
			Total	**370.400**

[10] Extension of Local Environment Specialist