Initial Environmental Examination

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India: Himachal Pradesh Clean Energy Transmission Investment Program - Tranche 3

Prepared by Himachal Pradesh Power Transmission Corporation Limited (HPPTCL), Government of Himachal Pradesh for the Asian Development Bank.

Contents

ANNEXURES

ABBREVIATIONS

ADB	–	Asian Development Bank
ACSR	–	Aluminium Conductor Steel Reinforced
AMSL	–	Average Mean Sea Level
CEA	–	Central Electricity Authority
CPCB	–	Central Pollution Control Board, Government of India
DPR	–	Detailed Project Report
EARF	–	Environmental Assessment and Review Framework
EIA	–	Environmental Impact Assessment
EMoP	–	Environmental Monitoring Plan
EMP	–	Environmental Management Plan
EHV	–	Extra High Voltage
EPC	–	Engineering, Procurement and Construction
ESC	–	Environment and Social Cell
GHG	–	Green House Gases
GoHP	–	Government of Himachal Pradesh
GoI	–	Government of India
GRM	–	Grievance Redressal Mechanism
HPCEDIP	–	Himachal Pradesh Clean Energy Development Investment Program
HPCETIP	–	Himachal Pradesh Clean Energy Transmission Investment Program
HPSPCB	–	Himachal Pradesh State Pollution Control Board
HPPCL	–	Himachal Pradesh Power Corporation Limited
HPPTCL	–	Himachal Pradesh Power Transmission Corporation Limited
HPSEB	–	Himachal Pradesh State Electricity Board
IEE	–	Initial Environmental Examination
LILO	–	Line – in- Line- out
MFF	–	Multi-tranche Financing Facility
MOEFCC	–	Ministry of Environment, Forests& Climate Change, Government of India
PCB	–	Poly Chlorinated Biphenyl
PGCIL	–	Power Grid Corporation of India Limited
PMU	–	Project Management Unit
RoW	–	Right of Way

WEIGHTS AND MEASURES

ha (hectare)	–	10,000 sq m
km (kilometer)	–	1,000 m
kV	–	kilovolt (1,000 volts)
kW	–	kilowatt (1,000 watts)
kWh	–	kilowatt-hour
MVA	–	Megavolt-Amperes
MW	–	Mega Watt

EXECUTIVE SUMMARY

1. Himachal Pradesh is a mountainous state in northern India with a population of slightly over 6 million, has abundant water resources in the five major rivers flowing through the state from the western Himalayas. The hydropower generation potential of Himachal Pradesh is about 23,000 MW, which is about one-fourth of the total hydropower potential of India. In its Hydropower Policy (2007)[1], the Government of Himachal Pradesh (GoHP) targets its comparative advantage in hydropower with the goal to become the "hydropower state" of the country.

2. The Himachal Pradesh Clean Energy Transmission Investment Program (HPCETIP) is a $350 million multitranche financing facility (MFF) from the Asian Development Bank (ADB), which will contribute to economic development in Himachal Pradesh through expanded power supplies from clean energy sources, and support a sustainable electricity sector in the state. HPCETIP will produce the following outcomes: (i) increase availability of clean energy downstream at pooling stations for effective power evacuation in a financially sustainable manner, (ii) improve state finances and power sector financial viability from sales revenue earned from power exports, (iii) improve sector governance, (iv) improve capacity in Himachal Pradesh Power Transmission Corporation Limited (HPPTCL) for better planning, implementation and management of power evacuation infrastructure, and energy efficiency, and (v) improvement in implementation standards of environmental and social safeguards in the sector. With ADB support, the proposed program will sustain the energy sector reform agenda, and is expected to help attract other long-term financiers to the state.

3. The proposed Tranche 3 project, located in Kullu, Chamba, and Shimla districts of Himachal Pradesh, involving construction of approximately 132 km of transmission lines of various voltages 220/132/66/ and four substations of 283 MVA transformation capacity and one switching substations, consists of the following components:

- **Power transmission lines**:
  - T1 - 66 kV D/C Line from 66/22 kV GISS Nirmand to 66/220 kV Kotla (24 km) Substation.
  - T2 - 400 kV D/C (Twin MOOSE) from 400/220 kV,2x315 MVA Lahal GISS to 400 kV Chamera pooling station of PGCIL (39 km).
  - T3 - 220kVD/c Line from Mazra to 33/220 kV Karian (18 km),
  - T4 - 220 kV D/c Line (Twin Moose) from Bhajoli Holi to HEP to 400/220 kV Lahal GISS (17 km).
  - T5 - 132 kV D/C transmission line from Barsaini to Charor (34 km).
- **EHV Pooling Substations**:
  - S1 - 22/66 kV, 2x10 MVA GIS substation at Bagipul.
  - S2 - 132/220 kV,2x80/100 MVA GISS at Mazra.
  - S3 - 220 kV GIS Switching Station at Hatkoti.
  - S4 - 33/132 kV, 2x 25/ 31.5 MVA GIS substation at Barsaini.
- **Capacity Building and Training**: HPPTCL needs for capacity building and skills augmentation through training on technical aspects, study trips and exposure, project management, contracts related conflict resolution, environmental and social assessment, review and monitoring and IT related Enterprise Resource Planning (ERP) implementation shall be undertaken.

4. As per Government of India's (GoI) Environment Impact Assessment (EIA) Act 2009, Power transmission projects are not listed as environmental sensitive projects and hence no clearance is required from Himachal Pradesh State Pollution Control Board (HPSPCB) or Ministry of Environment and Forests & Climate Change (MoEFCC), GoI. Clearance from Himachal Pradesh Forest Department is required only in cases where subproject is constructed on

[1] Government of Himachal Pradesh. 2007. *Hydro Power Policy (2007).* Shimla.

forestland or requires cutting of forest trees. However, National Environmental Policy 2006 of Government of India (GoI) and Safeguard Policy Statement 2009 of ADB and procedures and guidelines thereto apply to all components/subprojects funded by ADB.

5. An Initial Environmental Examination (IEE) has been prepared for Tranche 3 subprojects funded under HPCETIP. This IEE report comprises baseline data on existing conditions on physical, ecological, economic, and social aspects, together with the anticipated environmental impacts and proposed mitigation measures. Observations were made between September 2015 to October 2016 along the proposed transmission line tower locations, as well as in and around the proposed premises for new substations. The alignment of line may slightly vary after the exact demarcation of tower locations. Field surveys were also undertaken to assess the physical and biological environment. Detailed assessment of the baseline environment was conducted for the entire route of the proposed alignments and data collection from secondary sources has been done to support the findings of the field survey. The field studies were supported by data collected from secondary sources such as internet, forest atlas and published GoI's data from 2001/2011 population census statistics data, as well as from authorities such as HPPTCL, Himachal Pradesh State Pollution Control Board (HPPCB), Forest and other Departments.

6. Some part of Barsaini substation (0.406 ha.) is located on government land. The other lands selected at Mazra (1.315 ha.), Bagipul (0.55 ha.), Hatkoti (0.76 ha.), and part of Barsaini (0.375 ha.) substations are located on private lands. These lands have been purchased at market rates and acquisition of land will not be required from the surrounding communities. For these substation lands, Table 5.3 gives the total number of trees to be felled. The larger extent of proposed transmission lines from Lahal GISS to 400 kV Chamera pooling station (39 km), Mazra to 33/220 kV Karian (18 km), Nirmand to 66/220 kV Kotla substation (24 km), Bajoli Holi to HEP to 400/220 kV Lahal (17 km), 132 kV Barsaini to Charor (34 km) will run mostly from hilltop to hilltop through cultivated lands, uncultivated lands and forestlands. These line routes have been selected with least impacts on forests trees, orchards, cultivable land and habitation. Wherever possible, the alignments have been proposed either on hilltop to hilltop routes or towers with extra heights to reduce the impacts on land underneath while maintaining the mandatory clearance as per Indian Electricity Act (Rules 77 and 80). The proposed alignments pose minimum disturbance to any reserve forests or any sanctuary and national parks in the state. However, some trees will be required to be felled that fall under the RoW for which compensatory afforestation (CA) will be done as per Forest (Conservation) Act 1980 (including its amendments) and as per HPPTCL's Environment and Social Safeguards Policy 2011 (as listed in HPPTCL website) for the transmission line. The Forest department will carry out compensatory afforestation twice the No of trees to be fallen. When the approvals are done, the details are available on MoEFCC website.

7. Environmental impacts are likely to result from the proposed project development, though impacts are manageable and can be managed cost effectively. Careful mitigation and monitoring, specific selection criteria and review/assessment procedures for all subprojects have been followed to ensure that minimal impacts take place. The detailed design would ensure that any such environmental impacts, that could not be specified or identified at this stage, are taken into account when they occur and mitigated as necessary. Those impacts can be reduced through the use of mitigation measures such as correction in work practices at the construction sites, or through the careful selection of sites and access routes. The number of trees to be felled can be significantly reduced by using flexible tower placement, conductor height, and using hilltop-to-hilltop routes. Crop damage will be evaluated during detailed survey by the Engineering, Procurement and Construction (EPC) contractor.

8. The proposed project will have a number of positive impacts and negative impacts on the

existing environment as follows:

Positive Impacts:

- The proposed project will improve operational efficiency and quality of power, reliability of the system and at the same time will reduce losses due to interconnection with HPSEBL network and hence virtual up gradation to higher voltage level and better voltage profile. Evacuation of power to both the local areas and regions outside the state will boost overall economic development of the state due to extra revenues generated by power sold outside the state due to additional power evacuation infrastructure.

Negative Impacts:

- Removal of trees for the transmission line is the main negative impact on the proposed project area, which will be compensated by the compensatory afforestation (CA) by the forest department.
- Environment pollution due to cut and fill operations, transportation of construction materials, disposal of debris, disturbance to the farming activities, nuisance from dust, noise, vehicle fumes, black smoke, and vibration due to construction activities are the short term negative impacts due to proposed project.
- Though most of the lines will pass from hilltop to hilltop, the loss of agricultural productivity due to reduction of land for agricultural and horticultural purposes will be minimal. Any loss of crop, fruit/non-fruit tree that will be felled will be compensated based on established rates by concerned Forest/Horticulture departments of GoHP.

9. Various mitigation measures to be taken prior to the project activities are listed in the project's IEE/EMP. Potential adverse environment impacts associated with transmission lines have been avoided or minimised through careful route selection. The alignment is sited away from major settlements, whenever possible, to account for future urban expansion. Reserve forests areas and thick vegetation areas are avoided. However, route alignment passes through barren lands, fruit orchards, and forests lands and avoids any national park or sanctuary. The alignments in this project will also avoid reserve forest areas as well as geologically unstable areas, which can also pose foundation related problems. Land acquisition is required for placing transmission towers on private land as per standard practise. The land shall be purchased at mutually agreed rates or even acquired as per GoHP rules. Wherever the land is not acquired, any physical damage to the crops during the construction phase of the project will be compensated at the time of damage as per GoHP rules as the impacts on agricultural/horticultural lands will be restricted to the construction phase and will be temporary in nature.

10. For some of the transmission line and substation subprojects, the substation specific topography survey and the transmission line route survey has been completed. The data regarding soil, topography, contour, land cutting and filling required, distance from water body and distance from major roads, details of forest/non-forest, fruit/non-fruit trees being affected, land details are being collected by HPPTCL. This supplementary information will be supplied for each of these subprojects by HPPTCL to ADB for prior approval before contract award in the year 2018.

11. **Associated Facilities**. There are some medium and several small and micro hydropower projects (HEPs) that will connect to these lines and substations in the future that have yet to commence construction. The project components being funded in the project, HPPTCL is not constructing any dedicated line for any particular HEP but rather a host of HEPs which are small and medium listed in Table 3.15 in various project areas. HPPTCL as a State Transmission Utility has to design networks with a principle to provide the power evacuation to an intrastate point.

Hence the each of the lines developed under the project are not dependent on one single HEP and therefore there are no associated facilities. For instance, 180MW Bajoli Holi HEP is not an associated facility to T2 and T7. The existing ones which are already evacuating on other evacuation lines and therefore HPPTCL system will only be treated as one supplementary line proving redundancy. However, HPPTCL will evaluate these projects once their details are provided by the project proponents. HPPTCL has a standard application procedure prescribed by Himachal Pradesh Energy Regulatory Commission (HPERC) making it mandatory for all associated HEPs to provide information to ensure that their facilities comply with GoI and GoHP rules for environmental and social clearances before they connect to the HPPTCL transmission system.

12. **Public Consultations**. Public consultations with the project affected communities, stakeholders, and government officers focused on existing environmental conditions around the proposed transmission lines/ substations and the potential impacts that could happen due to project implementation have been completed.

13. Since the HPCETIP does not involve activities that have significant adverse impacts, the present IEE has been prepared to determine the impact of power transmission aspects as per the environmental assessment and review framework (EARF) prepared for the MFF, ADB's Safeguard Policy Statement (SPS) 2009, and consistent with ADB's Operations Manual F1/BP and F1/OP (2013). Accordingly, the environmental classification for the Tranche 3 projects is expected to be "Environment Category B."

14. **Conclusion**. Benefits far outweigh negative impacts. Overall, the major social and environmental impacts associated with transmission projects are limited to the construction period and can be mitigated to an acceptable level by implementation of recommended measures and by best engineering and environmental practices.

1.0 INTRODUCTION

1.1 Background

1. The hydropower generation potential of Himachal Pradesh is about 27,436 MW, which is about one-fourth of the total hydropower potential of India. In its Hydropower Policy (2007), the Government of Himachal Pradesh (GoHP) targets its comparative advantage in hydropower with the goal to become the "hydropower state" of the country. The state's hydropower development includes construction of enabling infrastructure such as road access and transmission interconnections to facilitate hydropower development, and to encourage investment from the state, central government and private sectors in hydropower generation projects—the majority of which are run-off-river type. This will improve state finances from sales revenue earned from supplying surplus power to the national grid. In addition to developing its hydropower resources, Himachal Pradesh has to build out its electric transmission infrastructure so that the additional power can be efficiently transmitted within the state and exported to the national grid.

2. For improvement, strengthening of existing and building of new infrastructure for effective power evacuation, GoHP through the Government of India (GoI), had requested the Asian Development Bank (ADB) for a multi-tranche financing facility (MFF) to partly finance the power sector investment program in the state. The investment program covers investments for transmission of clean energy to National Grid of India by construction of pooling substations and EHV transmission lines. To implement this activity, GoHP has established Himachal Pradesh Power Transmission Corporation Limited (HPPTCL) vide Himachal Pradesh Government Notification Nos.: MPP-A (1)-4/2006-Loose dated 11thSeptember, 2008 as the State Transmission Utility (STU).

1.2 The Tranche 3 Project

3. The $350 million investments in the MFF will contribute to support the economic development in Himachal Pradesh through expanded power supplies from clean energy sources, and support a sustainable state electricity sector in the state. The Himachal Pradesh Clean Energy Transmission Investment Program (HPCETIP) will produce the following outcomes: (i) increase availability of clean energy downstream at pooling stations for effective power evacuation in a financially sustainable manner, (ii) improve state finances and power sector financial viability from sales revenue earned from power exports, (iii) improve sector governance, (iv) improve capacity in HPPTCL for better planning, implementation and management of power evacuation infrastructure, and energy efficiency through a better power management program, and (v) improvement in implementation standards of environmental and social safeguards in the sector. With ADB's support, the proposed program will sustain the energy sector reform agenda, and is expected to help attract other long-term financiers to the state.

4. The proposed Tranche 3 project, located in Chamba, Shimla, and Kullu districts of Himachal Pradesh, consists of the following components: Table 1.1 gives the investment component costs for Tranche 3. The following sections present each of these components.

Table 1.1: Tranche 3 Subprojects

SNo	Name of Sub Project	Cost in Million dollar
COMPONENT I.	**Bhabha Nagar PIU (Kinnaur District) subprojects**	
T1	66 kV D/C transmission line from 66/22 kV GISS Nirmandto 66/220 kV Kotla Substation.	4.67
S1	66/22 kV ,2x10 MVA GISS at Nirmand (Bagipul).	6.33
COMPONENT II.	**Chamba PIU (Chamba District) subprojects**	
T2	400kV D/C transmission line (Twin Moose) from 400/220 kV,2x315 MVA Lahal GISS to 400/220 kV Chamera Pooling station of PGCIL.	27.33

SNo	Name of Sub Project	Cost in Million dollar
S2	132/220 kV, 2x80/100 MVA GIS substation at Mazra (Distt.Chamba)	19.33
T3	220 kV D/C transmission line from 132/220 kV GISS Mazra 33/220 kV Karian	8.17
T4	220 kV D/C transmission line (Twin Moose) from Bhajoli Holi HEP to 400/220 kV Lahal GISS	9.67
COMPONENT III:	**Rohroo PIU (Shimla Districts) subprojects**	
S3	220 kV Poolingsubstation at Hatkoti	7.43
COMPONENT IV:	**Sarabhai PIU (Kullu and Mandi Districts) subprojects**	
S4	33/132 kV 2x25/31.5 MVA GIS substation at Barsaini	8.08
T5	132kV D/C transmission line from Barsainito Charor	10.67
	Sub Total for Sub-projects	**101.68**
	ERP+3% contingency	10.33
	Building auxilaries	2.34
V.	Others/Capacity Development etc.	21.65
	Total in Cost in million US Dollars	136.00

5. The Tranche 3 subprojects are estimated to cost Rs610.08 crore (including contingencies and interest during construction). HPPTCL is both the executive agency and implementation agency for the project. The Project Management Unit (PMU), headed by the Dy General Manager (Planning), has been established at corporate level located in Shimla who is assisted by corresponding personnel from various functions – Administration and Finance, Planning and Design, Procurement and contracts, Environment and Social Cell (ESC) and Project Construction. Project Implementation Units (PIUs) at divisional level are headed by Executive Engineers at four geographic locations in the state.

1.3 Scope of Work and Methodology Adopted

6. This IEE has been prepared for the Tranche 3 subprojects funded under HPCETIP. This IEE requires identification of potential environmental issues associated with the project and appropriate mitigation measures to be put in place to minimize the environmental impacts. The broad scope of the IEE is:

i) To conduct field visits to collect data relevant to the study area and also collect secondary data so as to establish the baseline environmental status of the study area;
ii) To assess the impacts on environmental attributes due to the location, design, construction and operation of the proposed Project;
iii) To prepare an Environment Management Plan (EMP) outlining the measures for mitigating the adverse environmental impacts, as well asinstitutional arrangements;
iv) To identify critical environmental parameters required to be monitored subsequent to the implementation of the proposed project;
v) To carry out consultation with local people to identify public perception regarding the project; and
vi) To establish an Environment Monitoring Plan(EMoP) for HPPTCL to submit environmental monitoring reports to ADB at regular intervals.

7. This IEE report comprises baseline data of existing conditions on physical, ecological, economic and social aspects, together with the anticipated environmental impacts and proposed mitigation measures. Observations were made along the proposed transmission line tower locations, as well as in and around the proposed premises for new substations. The alignment of transmission line may slightly vary after the exact demarcation of tower locations. Field surveys were also undertaken to assess the physical and biological environment. Detailed assessment of the baseline environment has been conducted for the entire route of the proposed alignments and data collection from secondary sources has been done to support the findings of the field survey. The field studies were supported by data collected from secondary sources such as the internet, forest atlas and published GoI's data from 2011 population census statistics data, as well as from authorities such as HPPCL, Himachal Pradesh State Pollution Control Board (HPSPCB), Forest and other departments.

8. For some transmission line and substation subprojects, the substation specific topography survey and the transmission line route survey have been completed. The data regarding soil, topography, contour, land cutting and filling required, distance from water bodies and distance from major roads, details of forest/non-forest, fruit/non-fruit trees being affected, and land details are being collected by HPPTCL. This supplementary information will be provided for each of these subprojects by HPPTCL to ADB for prior approval before contract award.

9. Public consultations with the project affected communities, stakeholders, and government officers focused on existing environmental conditions around the proposed transmission lines/substations and the potential impacts that could happen due to project implementation.

10. Since the HPCETIP does not involve activities that have significant adverse impacts, the present IEE has been developed as per ADB's Safeguard Policy Statement (SPS) 2009 and Environment Asssessment and Review Framework (EARF) for the Project. The EARF for the project remains the valid as is applicable to proposed Tranche 3 subprojects. The IEE report conforms to national environmental regulations and is also consistent with the EARF and ADB's SPS 2009. Accordingly, the environmental classification for the project is expected to be "Category B" as per ADB SPS 2009.

2.0 POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

2.1 Indian - National, Local, Other Applicable Environmental Laws, Regulations, and Standards as applicable to the project.

2.1.1 Himachal Pradesh Specific Environmental Regulatory and Policy Framework

11. As per GoI's Environment Impact Assessment (EIA) Notification 2009, Power transmission projects are not listed as environmental sensitive projects and hence no clearance is required from Himachal Pradesh State Pollution Control Board (HPSPCB) or Ministry of Environment, Forests and Climate Change (MoEFCC), GoI. Clearance from Himachal Pradesh Forest Department is required only in cases where subproject is constructed on forestland or requires cutting of forest trees. Moreover, National Environmental Policy 2006 of GoI and SPS 2009 of ADB and procedures and guidelines as listed in Annexure 1 thereto apply to all components/subprojects funded by ADB.

12. MoEFCC, GoI, vide its Notification Nos. S.O. 1533 dated September 14, 2006, reengineered the EIA process in India, also decentralized some powers, and made provision to constitute the State Level Environment Impact Assessment Authority (SEIAA) and the State Level Expert Appraisal Committee (SEAC) for performing functions under the said Notification. For the Himachal Pradesh State, the SEIAA and SEAC was constituted vide the MoEFCC, GoI, Notification Nos. S.O. 1735 (E) dated October 11, 2007; however, both SEAC and SEIAA of Himachal Pradesh were reconstituted/ re-notified on March 21, 2011 vide Nos. S.O. 608 (E). In addition, the HPSPCB's guidelines for project proponents apply to all Himachal Pradesh state projects.

13. HPPTCL has notified an "Environment and Social Safeguards Policy (ESSP) May 2011" and a "Resettlement, Relief, Rehabilitation and Compensation Policy May 2011", which includes various safeguards principles and strategies as well as outlines methods for calculation of compensation, taking into account the prevailing market prices.

2.1.2 Indian Policy, Legal, and Administrative Framework

14. The major Indian acts, rules and policies which are relevant to the project activities are: The Electricity Act (1910) & its Amendments (2004) & (2007) and the Electricity Rule (1956) & its Amendments (2000); The Indian Telegraphic Act (1885) & its Amendments (2003); The Environment Protection Act (1986); The Forest Act (1980); The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013); and The National Environment Policy (2006). Table 2.1 gives an illustrative list of acts and their applicability to the project.

Table 2.1: Indian Regulations as Applicable for the project

No	Name of Regulation	Applicability	Remark
	ENVIRONMENTAL REGULATIONS		
1	National Green Tribunal Act, 2010	Yes	
2	The Environment (Protection) Act 1986 and Environment (Protection) Rules 1986 & its amendments	Yes	Umbrella Act to the Air, Water and Noise Acts
3	The Bio-medical Waste (Management and Handling) Rules, 1998	No	

No	Name of Regulation	Applicability	Remark
4	Coastal Regulation Zone Notification, MoEFCC, (Department of Environment, Forests and Wildlife), 6th January, 2011	No	
5	The Hazardous Waste (Management, Handling and Trans-boundary Movements) rules, 2009	Yes	
6	Batteries (Management and Handling) Rules, 2001 and further amendments	Yes	
7	Ozone Depleting Substances (Regulation) Rules, 2000 as amended in 2005	Yes	
8	Forests (Conservation) Act, 1980 and Rules 1981	Yes	
9	The Wildlife (Protection) Act, 1972	Yes	
10	The Biodiversity Act, 2002	No	
11	The Air (Prevention and Control of Pollution) Act, 1981 Including Rules 1982 and 1983	Yes	
12	Noise Pollution (Regulation and Control) Rules, 2000 and the Noise Pollution (Regulation and Control) (Amendment) Rules, 2010	Yes	
13	The Water (Prevention and Control of Pollution), Act, 1974 including Rules, 1975 (as amended up to 1988)	Yes	
14	The Water (Prevention and Control of Pollution), Cess Act, 1977 including Rules 1978 and 1991	Yes	
15	The Indian Forest Act 1927	Yes	
16	The National Environmental Appellate Authority Act, 1997	No	
17	National Wetland rules GSR 252 E	No	
	REGULATIONS RELATED TO LAND AND LABOUR		
1	Building and Other Construction Workers Act 1996	Yes	Key legislations providing guidelines for onsite labour and worker management and welfare
2	Interstate Migrant Workers Act 1979	Yes	In case workers and labourers working at the project sites are migrants from other states
4	The Indian Telegraph Act, 1885	Yes	
5	Indian Treasure Trove Act, 1878 (as modified upto September 1949)	Yes	
6	The Antiquities and Art Treasures Act, 1972	Yes	
7	The Child Labour (Prohibition and Regulation) Act, 1986	Yes	
8	The Bonded Labour (Abolition) Act 1976	Yes	
9	The Trade Union Act, 1926	No	
10	Minimum Wages Act, 1948	Yes	
11	Workmen's Compensation Act, 1923	Yes	ESI Act or Workmen Compensation Act
12	The Contract Labour (Regulation & Abolition) Act, 1970 and Rules	Yes	
13	The E.P.F. and Miscellaneous Provisions act, 1952	Yes	
14	Factories Act 1948	Maybe	In-case impeleting agency more than ten full time employees during the operations phase of the project

No	Name of Regulation	Applicability	Remark
15	Employees State Insurance Act, 1948 (ESI)	Yes	ESI Act or Workmen Compensation Act applicable to the implementing agency
16	Payment of Gratuity Act, 1972	Yes	
17	Provisions of the Panchayats (Extension to the Scheduled Area) Act, 1996	Maybe	
18	The Right to Information Act, 2005	Maybe	
19	Employers' Liability Act no. 24 of 1938	Yes	
	OCCUPATIONAL HEALTH AND SAFETY		
1	The Indian Factories Act, 1948 and State Rules	No	
2	The Shops and Establishment Act and State Rules	Yes	
3	The Petroleum Act, 1934 and the Petroleum Rules	No	
4	Gas Cylinder Rules and Static and Mobile Pressure Vessels (Unfired) Rules, 1981	No	
5	National Policy on HIV/AIDS and the World of Work, Ministry of Labour and Employment, GoI.	Yes	
6	National Policy on Safety, Health and Environment at Work Place, Ministry of Labour and Employment, GoI	Yes	
7	Central Electricity Authority (Safety Requirements for Operation, Construction and Maintenance of Electric Plants and Electrical Lines) Regulations 2008	Yes	Detailed design, maintenance procedures. Details in 2.1.4
8	CGWA Notification no.21-4/Guidelines/CGWA/2009-832 dated 14th October 2009	Yes	
9	Indian Electricity Act, 2003	Yes	

2.1.3 Relevant Environment relatedActs of Government of Himachal Pradesh

A. State Government/HPPTCL Policies

15. Some of the Himachal Pradesh Government and HPPTCL's policies that are applicable to the sub-projects are:

Table 2.2: HPPTCL's Policies related to project

No.	Name of Regulation	Applicability	Remark
1	The Himachal Pradesh Hydropower Policy 2007.	No	
2	Himachal Pradesh Land Preservation Act (LPA)	Yes	Afforestation, restoration of land
3	HPPTCL Environment and Social Safeguards Policy, May 2011	Yes	Environmental guideline by company
4	Resettlement, Relief, Rehabilitation and Compensation Policy, May 2011	Yes	Social and R&R guideline by company

16. Apart from the above-mentioned regulations, GoI has also structured a number of policies that are relevant to HPPTCL'S initiatives. The key policies are provided in Table 2.3.

Table 2.3: Indian Policies related to project

No.	Name of Regulation	Applicability	Remark
ENVIRONMENT, FOREST & LAND RELATED POLICIES			
1	National Forest Policy, 1988	Yes	
2	National Environmental Policy 2006	Yes	
3	Wildlife Conservation Strategy 2002	No	

2.1.4 NationalGovernment Environment Classification

17. Under the GoI's Environment Impact Assessment (EIA) Notification 2009, the environmental classification of projects is determined by MoEFCC, GoI and there are two possible outcomes:

- **Category A**: A project is classified as Category A if it is likely to have significant negative impacts and is thus one of the types of project listed in this category in the EIA Notification. Such projects require EIA, plus Environmental Clearance (EC) from MoEFCC;

- **Category B**: A project is classified as Category B if it is likely to have fewer negative impacts and is listed in this category in the EIA Notification. These projects require EC from the State Environment Impact Assessment Authority (SEIAA), who classify the project as B1 (requiring EIA) or B2 (not requiring EIA), depending on the level of potential impacts. Projects classified as B2 require no further study.

2.2 India and Multilateral Environmental Agreements (MEAs)[2]

18. India is member of almost all major Multilateral Environmental Agreements (MEAs), under four clusters, namely the following:

A. Nature conservation;
B. Hazardous material;
C. Atmospheric emissions; and
D. Marine environment.

19. There are 20 major global MEAs, to which India is a signatory. These are listed below:

A. Nature conservation

(i) Ramsar Convention on Wetlands
(ii) CITES (Convention on International Trade in Endangered Species of Fauna and Flora)
(iii) TRAFFIC (The Wildlife Trade Monitoring Network)
(iv) CMS (Convention on the Conservation of Migratory Species)
(v) CAWT (Coalition Against Wildlife Trafficking)
(vi) CBD (Convention on Biological Diversity)
(vii) ITTC (International Tropical Timber Organisation)
(viii) UNFF (United Nations Forum on Forests)
(ix) IUCN (International Union for Conservation of Nature and Natural

[2] Source: http://www.moef.nic.in.

Resources)
(x) GTF (Global Tiger Forum)

B. Hazardous material

(i) Cartagena Protocol on Biosafety
(ii) SAICM (Strategic Approach to International Chemicals Management)
(iii) Stockholm Convention on Persistent Organic Pollutants (POPs)
(iv) Basel Convention on the Control of Trans-boundary Movement of Hazardous Waste and Their Disposal
(v) Rotterdam Convention on Prior Informed Consent (PIC) for certain Hazardous Chemicals and Pesticides in International Trade

C. Atmospheric emissions

(i) UNFCCC (United Nations Framework Convention on Climate Change)
(ii) Kyoto Protocol
(iii) UNCCD (United Nations Convention to Combat Desertification)
(iv) Montreal Protocol (on Ozone Depleting Substances)

D. Marine environment

(i) IWC (International Whaling Commission)

2.3 Technical Standards, Rules and Regulations for Indian Power Sector

20. Central Electricity Authority (CEA) is the technical agency making regulations consistent with the Electricity Act, 2003 under section 177 and carry out the provisions of the Act. The following relevant regulations are notified and published in official gazette of GoI and available in the CEA website:

a. CEA (Installation and Operation of Meters) Regulations, 2006 – Notified on 17.3.2006
b. CEA (Grid Standards for Operation & Maintenance of Transmission lines) Regulations, 2010- notified on 26.06.2010.
c. CEA (amendment to the regulations on “Installation & Operation of meters”) regulations, 2010- notified on 26.06.2010.
d. CEA (Measures relating to safety & Electric Supply) Regulations, 2010- notified on 24-09-2010.
e. CEA (Technical Standards for Construction of Electric Plants and Electric Lines) regulations, 2010-notifed on 20-08-2010
f. CEA (Safety Requirements for Construction, Operation and Maintenance of Electrical Plant and Electrical Lines) Regulations, 2011-notifed on 14-02.2011.
g. CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) – Regulations 2010.
h. CEA (Technical Standards for connectivity to the Grid) (Amendment) Regulations, 2010.

2.4 Asian Development Bank's Safeguards Policies

2.4.1 Asian Development Bank's Environment Classification

21. The ADB's SPS 2009 is applicable to all projects. These projects can be categorized as A, B, C or FI. Table 2.4 below provides a list of categorisations of the activities related to Environment, as per ADB's SPS 2009 requirements:

Table 2.4: Environment Safeguards Categorization: Definition

Category	Environment
A — Significant	Investments that anticipate significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works.
B — Less Significant	Investments with potential adverse impacts that are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be more readily designed than for Category A investments.
C — Minimal or No Impacts	Investments that have minimal or no adverse environmental impacts.
FI — Financial Intermediation	Investment of ADB funds through financial intermediaries (FI)

2.4.2 ADB Prohibited Investment Activities List (PIAL)

22. At an initial stage of identifying project activities, ADB's Prohibited Investment Activities List (described below) will apply. If the investment involves a prohibited activity, the implementing agency will not consider the investment.

23. The following types of projects do not qualify for ADB financing:

(i) production or activities involving harmful or exploitative forms of forced labour[3] or child labour;[4]

(ii) production of or trade in any product or activity deemed illegal under host country laws or regulations or international conventions and agreements or subject to international phase outs or bans, such as (a) pharmaceuticals,[5] pesticides, and herbicides,[6](b) ozone-depleting substances,[7] (c) polychlorinated biphenyls[8]and other hazardous chemicals,[9](d) wildlife or wildlife products regulated under the Convention on International Trade in Endangered Species of Wild Fauna and

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3 Forced labor means all work or services not voluntarily performed, that is, extracted from individuals under threat of force or penalty

4 Child labor means the employment of children whose age is below the host country's statutory minimum age of employment or employment of children in contravention of International Labor Organization Convention No. 138 "Minimum Age Convention" (www.ilo.org).

5 A list of pharmaceutical products subject to phaseouts or bans is available at http://www.who.int.

6 A list of pesticides and herbicides subject to phaseouts or bans is available at http://www.pic.int.

7 A list of the chemical compounds that react with and deplete stratospheric ozone resulting in the widely publicized ozone holes is listed in the Montreal Protocol, together with target reduction and phaseout dates. Information is available at http://www.unep.org/ozone/montreal.shtml.

8 A group of highly toxic chemicals, polychlorinated biphenyls are likely to be found in oil-filled electrical transformers, capacitors, and switchgear dating from 1950 to 1985.

9 A list of hazardous chemicals is available at http://www.pic.int.

Flora,[10] and (e) trans-boundary trade in waste or waste products;[11]

(iii) production of or trade in weapons and munitions, including paramilitary materials;
(iv) production of or trade in alcoholic beverages, excluding beer and wine;[12]
(v) production of or trade in tobacco;
(vi) gambling, casinos, and equivalent enterprises;
(vii) production of or trade in radioactive materials,[13] including nuclear reactors and components thereof;
(viii) production of, trade in, or use of unbonded asbestos fibers;[14]
(ix) commercial logging operations or the purchase of logging equipment for use in primary tropical moist forests or old-growth forests; and
(x) marine and coastal fishing practices, such as large-scale pelagic drift net fishing and fine mesh net fishing, harmful to vulnerable and protected species in large numbers and damaging to marine biodiversity and habitats.

2.4.3 ADB's SPS 2009 Requirements (SR1): Environment Policy

24. ADB's SPS 2009 sets out the policy objectives, scope and triggers, and principles for the environmental safeguards. To achieve the policy objectives and deliver the policy principles, ADB carries out the actions described in the "Policy Delivery Process" (subsection "B" of Section Five of the SPS 2009). To help borrowers/clients and their projects achieve the desired outcomes, ADB adopts a set of specific safeguard requirements that borrowers/clients are required to meet in addressing environmental and social impacts and risks. ADB staff, through their due diligence, review, and supervision, will ensure that borrowers/clients comply with these requirements during project preparation and implementation. These safeguard requirements are as follows:

Objectives: The objective of ADB's due diligence for the project loan is that the executing agency ensures the environmental soundness and sustainability of projects and to support the integration of environmental considerations into the project decision-making process.
Scope and Triggers: Environmental safeguards are triggered if a project is likely to have potential environmental risks and impacts.

Policy principles:

- Use screening process for each proposed project to determine the appropriate extent and type of environmental assessment so that appropriate studies are undertaken commensurate with the significance of potential impacts and risks.
- Conduct an environmental assessment for each proposed project to identify potential direct, indirect, cumulative, and induced impacts and risks to physical, biological, socioeconomic (including impacts on livelihood through environmental media, health and safety, vulnerable groups, and gender issues), and physical cultural resources in the context of the project's area of influence. Assess potential transboundary and global impacts, including climate change. Use strategic environmental assessment where appropriate.
- Examine alternatives to the project's location, design, technology, and components and

[10] A list is available at http://www.cites.org.
[11] As defined by the Basel Convention; see http://www.basel.int.
[12] This does not apply to investee companies who are not substantially involved in these activities. Not substantially involved means that the activity concerned is ancillary to an investee company's primary operations.
[13] This does not apply to the purchase of medical equipment, quality control (measurement) equipment, and any equipment for which ADB considers the radioactive source to be trivial and adequately shielded.
[14] This does not apply to the purchase and use of bonded asbestos cement sheeting where the asbestos content is less than 20%.

their potential environmental and social impacts and document the rationale for selecting the particular alternative proposed. Also consider the no project alternative.

- Avoid, and where avoidance is not possible, minimize, mitigate, and/or offset adverse impacts and enhance positive impacts by means of environmental planning and management. Prepare an environmental management plan (EMP) that includes the proposed mitigation measures, environmental monitoring and reporting requirements, related institutional or organizational arrangements, capacity development and training measures, implementation schedule, cost estimates, and performance indicators. Key considerations for EMP preparation include mitigation of potential adverse impacts to the level of no significant harm to third parties, and the polluter pays principle.
- Carry out meaningful consultation with affected people and facilitate their informed participation. Ensure women's participation in consultation. Involve stakeholders, including affected people and concerned nongovernment organizations, early in the project preparation process and ensure that their views and concerns are made known to and understood by decision makers and taken into account. Continue consultations with stakeholders throughout project implementation as necessary to address issues related to environmental assessment. Establish a grievance redress mechanism to receive and facilitate resolution of the affected people's concerns and grievances regarding the project's environmental performance.
- Disclose a draft environmental assessment (including the EMP) in a timely manner, before project appraisal, in an accessible place and in a form and language(s) understandable to affected people and other stakeholders. Disclose the final environmental assessment, and its updates if any, to affected people and other stakeholders.
- Implement the EMP and monitor its effectiveness. Document monitoring results, including the development and implementation of corrective actions, and disclose monitoring reports.
- Do not implement project activities in areas of critical habitats, unless (i) there are no measurable adverse impacts on the critical habitat that could impair its ability to function, (ii) there is no reduction in the population of any recognized endangered or critically endangered species, and (iii) any lesser impacts are mitigated. If a project is located within a legally protected area, implement additional programs to promote and enhance the conservation aims of the protected area. In an area of natural habitats, there must be no significant conversion or degradation, unless (i) alternatives are not available, (ii) the overall benefits from the project substantially outweigh the environmental costs, and (iii) any conversion or degradation is appropriately mitigated. Use a precautionary approach to the use, development, and management of renewable natural resources.
- Apply pollution prevention and control technologies and practices consistent with international good practices as reflected in internationally recognized standards such as the World Bank Group's Environmental, Health and Safety (EHS) Guidelines. Adopt cleaner production processes and good energy efficiency practices. Avoid pollution, or, when avoidance is not possible, minimize or control the intensity or load of pollutant emissions and discharges, including direct and indirect greenhouse gases emissions, waste generation, and release of hazardous materials from their production, transportation, handling, and storage. Avoid the use of hazardous materials subject to international bans or phase-outs. Purchase, use, and manage pesticides based on integrated pest management approaches and reduce reliance on synthetic chemical pesticides.
- Provide workers with safe and healthy working conditions and prevent accidents, injuries, and disease. Establish preventive and emergency preparedness and response measures

to avoid, and where avoidance is not possible, to minimize, adverse impacts and risks to the health and safety of local communities.

- Conserve physical cultural resources and avoid destroying or damaging them by using field-based surveys that employ qualified and experienced experts during environmental assessment. Provide for the use of "chance find" procedures that include a pre-approved management and conservation approach for materials that may be discovered during project implementation

2.4.4 Other documents relevant to ADB's SPS 2009

(i) World Bank Group's EHS Guidelines, 2007 which are currently under revision.
  - EHS Guidelines for Electric Power Transmission and Distribution

(ii) ADB's Environmental Safeguards: A Good Practice Sourcebook-Draft Working Document (November 2012).

(iii) International Labor Organization (ILO) Core Labor Standards.

3.0 DESCRIPTION OF THE PROJECT

3.1 Type of Project

25. The comprehensive Power System Master Plan,[15] completed in December 2010 with ADB assistance, considers transmission requirements in each of Himachal Pradesh's five major river basins where hydropower generation is either being built or planned, with an overarching objective of economic least cost development at appropriate levels of supply security and reliability. This includes overhead transmission line planning, substation equipment planning, and system integration into the National Electricity Plan.

26. Consequent to the recommendations of the master plan under HPCETIP, Gas Insulated Switchgear (GIS) pooling substation are proposed in place of conventional Air Insulated Switchgear (AIS) substations to reduce cost of development of land and civil works which forms a major part of capital cost in mountainous terrain. Power evacuation systems have been designed so that each developer is provided with two distinct points for power evacuation. This arrangement provides reliability and any fault at one point can ensure continuity of power.

27. The project also includes institutional strengthening initiatives for the state's power sector entities. Specific to transmission, this includes capacity development objectives for further corporatization of HPPTCL and installation of enterprise resource planning software, given the considerable investment plans for additional hydropower and commensurate transmission system investments in Himachal Pradesh and HPPTCL's central role in new transmission system upgrades as an STU.

3.2 Category of Project

28. The Tranche 3 components of the Himachal Pradesh Clean Energy Transmission Project include:

Table 3.1: Location of Subprojects

SNo	Name of Sub Project	District
	COMPONENT I. Bhabha Nagar PIU (Kinnaur District) subprojects	
T1	66 kV D/C transmission line from 66/22 kV GISS Nirmandto 66/220 kV Kotla Substation.	**Shimla &Kullu District**
S1	66/22 kV ,2x10 MVA GISS at Nirmand (Bagipul).	**Kulu District**
	COMPONENT II. Chamba PIU (Chamba District) subprojects	
T2	400kV D/C transmission line (Twin Moose) from 400/220 kV,2x315 MVA Lahal GISS to 400/220 kV Chamera Pooling station of PGCIL.	**Chamba District**
S2	132/220 kV, 2x80/100 MVA substation at Mazra (Distt.Chamba.	**Chamba District**
T3	220 kV D/C transmission line from 132/220 kV GISS Mazra 33/220 kV Karian	**Chamba District**
T4	220 kV D/C transmission line (Twin Moose) from Bhajoli Holi HEP to 400/220 kV Lahal GISS	**Chamba District**
	COMPONENT III: Rohroo PIU (Shimla Districts) subprojects	
S3	220 kV Pooling substation at Hatkoti	**Shimla District**
	COMPONENT IV: Sarabhai PIU (Kullu and Mandi Districts) subprojects	
S4	33/132 kV 2x25/31.5 MVA GIS substation at Barsaini	**Kullu District**
T5	132kV D/C transmission line from Barsaini to Charor	**Kullu District**

Capacity Building and Training

29. HPPTCL, established on 11 September 2008, has been hiring staff on secondment from the previously unbundled Himachal Pradesh State Electricity Board Limited (HPSEBL). Currently, 98 out of 120 new staff vacancies have been proposed to be filled by Himachal Pradesh Government to provide adequate capacity at HPPTCL to perform MFF tranches as well as its

[15] Funded under a component of TA 7181-IND: Capacity Building for Himachal Pradesh Power Sector Agencies.

regular projects.To have effective and oriented personnel, HPPTCL needs capacity building and skills augmentation through training on technical aspects, study trips and exposure, project management, contracts related conflict resolution, environmental and social assessment, review and monitoring and IT related Enterprise Resource Planning (ERP). More training modules may be added in future depending on emerging staffing situation.

3.3 Need for the Project

30. Due to the fast-emerging energy demand in the country, there is a distinct necessity for strengthening and expanding the transmission networks. Himachal Pradesh is going to be the hub of clean energy generating facilities through hydroelectric potential. As a number of new projects are planned in Pabbar, Ravi, Beas, Satluj River basins, HPPTCL is intending to construct an Integrated Transmission System in the area due to limited corridor availability and mountainous terrain constraints. This will take care of network reliability and redundancy in the system to evacuate power in case of an outage of any transmission line because of unforeseen conditions. In most cases, the circuit outage contingency is taken care of although tower outage contingency is not being met. Figure 3.1 gives the location of the transmission lines and the substations within the Himachal Pradesh state.

COMPONENT I. Bhabha Nagar PIU (Shimla District) subprojects

- **Subproject T1: 66 kV D/C transmission line from 66/22 kV GISS Nirmand to 66/220 kV Kotla Substation.**
- **Subproject S1: 66/22 kV, 2x10 MVA GISS at Nirmand (Bagipul).**

31. To evacuate overall power generated in Bagi Khud, a 22/66 kV substation is proposed to be constructed at Bagipul and it will be connected to proposed 66/220 kV substationKotla existing HPSEBL substation which will cater to 45 MW power from various HEPs of Satluj basin. Figure 3.2 gives the location of the transmission lines and substations within the district.

COMPONENT II. Chamba PIU (Chamba District) subprojects

32. Figure 3.5 gives the location of the transmission lines and substations within the district.

- **Subproject T2 - 400 kV double circuit (Twin moose) transmission line from 400/220 kV, 2x315 MVA Lahal GIS substation to 400 kV Chamera Pooling station (Rajera) of PGCIL.**

33. Approximately 480 MW to be evacuated in Ravi river basin in Bharmour area and to save the corridor, it is proposed to evacuate this power through a D/C 400 kV transmission line with twin moose conductor. Lahal substation is being constructed to evacuate 136 MW power generated from HEPs to be installed through Himurja in Bharmor, Gharola, and Holi areas of Ravi River basin. This transmission line will connect to Jalandhar via PGCIL 400 kV transmission line from Chamera PS. This will provide network reliability and redundancy in the system to evacuate power in case of outage of any transmission line because of unforeseen conditions.

- **Subproject T3 - 220 kV D/C transmission line from 132/220 kV GISS Mazra 33/220 kV Karian**

34. This project is being constructed to evacuate power from 36 MW Chanju-I, 48 MWSurgani Sundla,30 MW Devi Kothi-I, Chanju-III (42 MW), and othersmall power houseshaving a total

installed capacity of 267 MWawarded to various IPP's by Himachal Pradesh governmentt. Projects having an installed capacity of 167 MW would have been commissioned by the year 2023-24. The total power to be evacuated through this line will be about 422 MW. Asquite a number of projects are coming in Tissa area of Ravi river basin in Himachal Pradesh, therefore HPPTCL is intending to construct Integrated Transmission System in the area due to the limited corridors availability and as suchtoo many circuitscannot be constructed. Total available potential in the Tissa area is about 422 MW which will come by 13th Five Years' Plan. Out of 422 MW of power, about 330 MW will be evacuated by constructing proposed 132/220 kV Pooling substation at Mazra by LILO of both circuits of 132 kV Kurthala-Bathri D/C line and the 220 kV Mazra-Karian D/C line.

- **Subproject T4 – 220 kV transmission line from Holi Bhajoli HEP to 400 kV Lahal GISS**

35. This project is being constructed to evacuate power from 180 MW of Bajoli Holi HEP, Bara Bhangal (200 MW) and 30 MW of Small HEPs in Bharmour area awarded to various IPP's by Himachal Pradesh government. As number of projects are coming in Ravi river basin in Himachal Pradesh, HPPTCL intends to construct Integrated Transmission System in the area due to the limited corridors availability and as such too many circuits cannot be constructed. Total available potential to be evacuated through this line is about 410 MW out of which 210 MW of generation will come in 2020-21. This 210 MW of power will be evacuated by constructing proposed 220 KV Bajoli Holi HEP-Lahal P.S. Line (Twin Moose) where it will terminate at 400/220KV Lahal P.S. of HPPTCL to be further connected with 400/220 kV P.S. of PGCIL at 400 kV level. This arrangement takes care of reliability and redundancy in the system to evacuate power in case of outage of any transmission line because of unforeseen conditions.

- **Subproject S2, T3 - 132/220 kV, 2x80/100 MVA substation at Mazra**

36. This project is being constructed to evacuate power from 36 MW Chanju-I, 48 MWSurgani Sundla,30 MW Devi Kothi-I, Chanju-III (42 MW), and othersmall power houseshaving a total installed capacity of 267 MW awarded to various IPP's by Himachal Pradesh government. Projects having an installed capacity of 167 MW would have been commissioned by the year 2023-24. The total power to be evacuated through this Substation will be about 422 MW.

COMPONENT III: Rohru PIU (Shimla District) subprojects

37. The transmission of power from the Pabbar basin to the northern grid will provide a tremendous boost to the economic development of Himachal Pradesh. Figure 3.12 gives the location of transmission linesand substations within the district.

- **Subproject S3 - 220 kV GIS switching station at Hatkoti**

38. The new 220 kV switching substation will evacuate 524 MW power from the Pabbar River basin developers to the national grid through Abdullapur – Jhakri transmission line passing nearby. At 220 kV Hatkoti switching station, the envisaged 456 MW power of Pabbar basin will be pooled in by constructing two 220 kV D/C lines, one 220 kV D/C HPPCL dedicated Sawra Kuddu Hatkoti transmission line with single Zebra and 2nd 220 kV D/C HPPTCL integrated Sunda- Hatkoti transmission line with twin moose conductor to avoid running of parallel transmission line and restricting RoW. The Tangnu Romai (44 MW+6 MW Tangnu Romai SHP) and Dhamwari-Sunda (70 MW), Chirgaon-Majhgaon (60MW), Paudital Lassa (24MW) and45 MW Rupin HEPs are expected to be commissioned during the year 2020-21 and an additional 14.3

MW is expected from various SHEPs. The 111-MW Sara-Kuddu HEP shall also be finally interfaced at 220 kV S/S Hatkoti by 2019-20.

COMPONENT IV: Sarabhai PIU (Kullu Districts) subprojects

39. Figure 3.16 gives the location of the transmission lines and substation within the district.

- **Subproject T5 – 132kV D/C transmission line from Barsaini to Charor**

40. The power transmission line is being constructed to evacuate 289 MW power from HEPs in Parbati valley of Beas basin upstream of Charor.

- **Subproject S4 - 33/132 kV 2x25/31.5 MVA GIS substation at Barsaini**

41. The substationis being constructed to evacuate 289 MW power from HEPs in Parbati valley of Beas basin upstream of Charor.

3.4 Location

42. The proposed subprojects are located in different areas of the Himachal Pradesh State. Table 3.2 indicates details of the proposed subproject locations:

Table 3.2: Different locations of proposed subprojects

PIU	Sub-projects	Tehsil	District
Bhabha Nagar	S1, T1	Bagipul, Kotla	Kullu/Shimla
Chamba	S2, T2, T3, T4	Bharmour, Churah, Shahpur	Chamba
Rohru	S3	Jubbal	Shimla
Sarabhai	S4, T5	Kullu	Kullu

43. Figure 3.1 provides the general location map for all projects proposed under the loan. Figures 3.2-14 provide the topographic survey details for the transmission line showing tower locations on a 1:50,000 topographic map and the substation locations. The list of all figures is given in Table 3.3.

Table 3.3: List of Figures for Tranche 3

OVERALL HIMACHAL PRADESH STATE TRANCHE 3 PROJECTS		**Figure 3.1**
COMPONENT I.	**Bhabha Nagar PIU (Kinnaur District) subprojects**	**Figure 3.2**
S1	66/22 kV,2x10 MVA GISS at Nirmand (Bagipul).	Figure 3.3
T1	66 kV D/C transmission line from 66/22 kV GISS Nirmandto 66/220 kV Kotla Substation.	Figure 3.4
COMPONENT II.	**Chamba PIU (Chamba District) subprojects**	**Figure 3.5**
T2	400kV D/C transmission line (Twin Moose) from 400/220 kV,2x315 MVA Lahal GISS to 400/220 kV Chamera Pooling station of PGCIL.	Figure 3.6
S2	132/220 kV, 2x80/100 MVA substation at Mazra	Figure 3.7
T3	220 kV D/C transmission line from Mazra to Karian.	Figure 3.8
T4	220 kV transmission line from Holi Bhajoli to Lahal GISS	Figure 3.9
COMPONENT III:	**Rohru PIU (Shimla District) subprojects**	**Figure 3.10**
S3	220 kV GIS switching station at Hatkoti	Figure 3.11
COMPONENT IV:	**Sarabhai PIU (Kullu and Mandi Districts) subprojects**	**Figure 3.12**
S4	33/132 kV 2x25/31.5 MVA GIS substation at Barsaini	Figure 3.13
T5	132 kV line from Barsaini to Charor	Figure 3.14

44. The private portion of the Barsaini substation land has beenpurchased and the government land section has been acquired through transfer. The other substation lands are selected at Mazra and Bagipul where substations are located on private lands which have been purchased at market rates and acquired. The government land for Hatkoti Substation land has been identified and geotechnical soil studies have been conducted to determine its suitability. The Hatkoti substation land, is a government land with existing an ADB funded HEP, which will be transferred by HPPCL, a government of Himachal Pradesh enterprise. This facility will become vacant after the HEP construction is finished, and sheds will be removed by HPPCL. For these substation lands, Table 5.3 gives the total number of trees to be felled. Larger extent of proposed transmission lines will run mostly from hilltop to hilltop through cultivated lands, uncultivated lands, and forestlands. The number of trees to be felled can be significantly reduced by using flexible tower placement, conductor height, and by using hilltop-to-hilltop routes. Crop damage will be evaluated during detailed survey by the Engineering, Procurement and Construction (EPC) contractor. None of these lines passes through any sanctuary or forest reserves. However, trees will be removed from the project area for RoW as prescribed in Forest (Conservation) Act 1980 (including its amendments) and as per HPPTCL's Environment and Social Policy (2011) for the transmission lines.

45. No wildlife sanctuary, national parks or ecologically sensitive areas are present in the nearby area of the RoW as can be seen in Figure A 9 (in Annexure 9).

Figure 3.1: Overall Himachal Pradesh State Tranche 3 Projects

Figure 3.2: COMPONENT I. - Bhabha PIU (Kinnaur District) subprojects

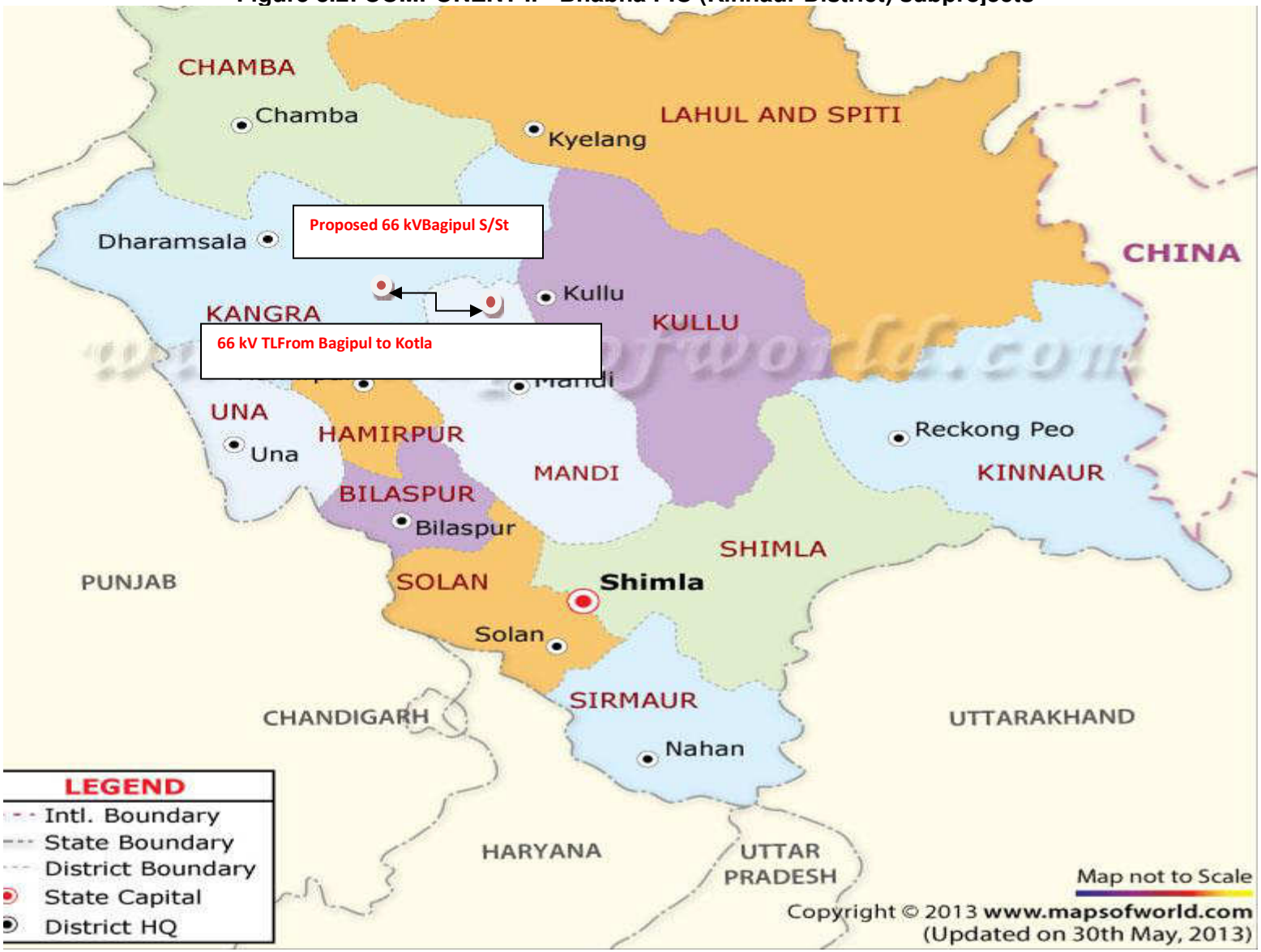


Figure 3.3a: Proposed site for Subproject S1 –22/66 kV Gas Insulated Switchgear (GIS) switching station at Bagipul

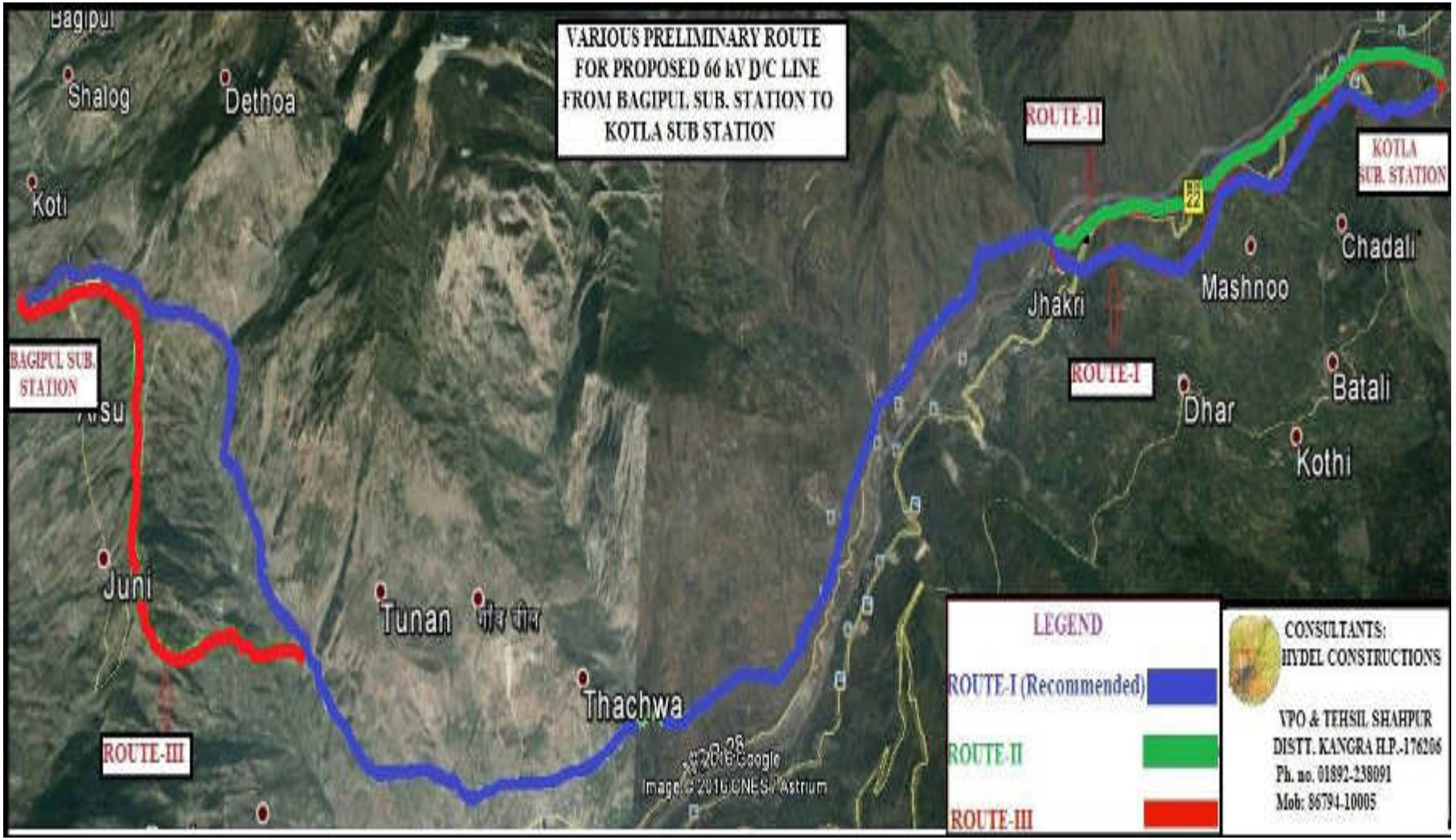


Figure 3.3b: Proposed land for Subproject S1–22/66 kV Gas Insulated Switchgear (GIS) switching station at Bagipul

Figure 3.4: Topographical survey yet to be done for T1- 66 kV double circuit (D/C) transmission line from 66 kV GIS Bagipul to Kotla substation

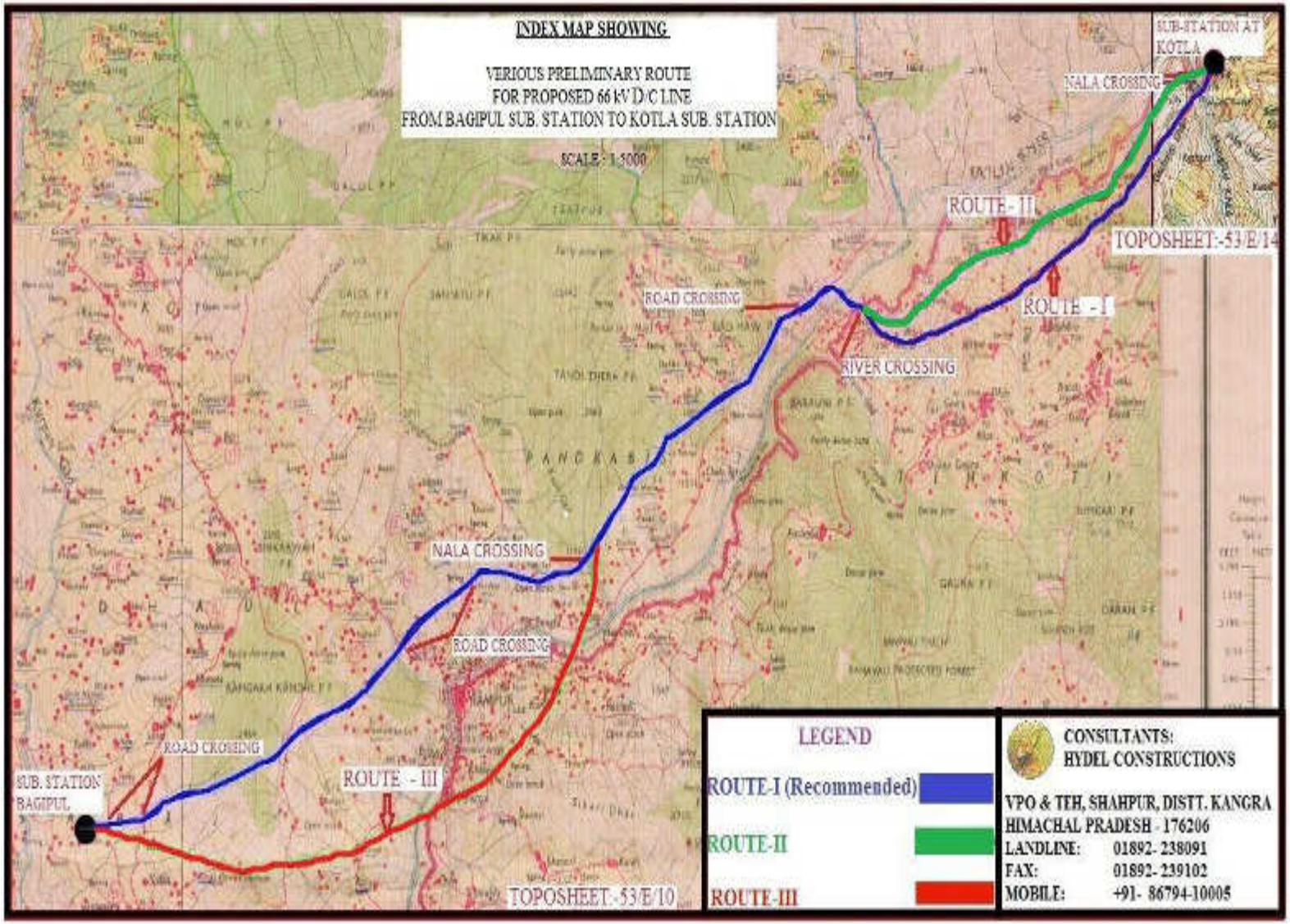


Figure 3.5: COMPONENT II. - Chamba PIU (Chamba District) subprojects

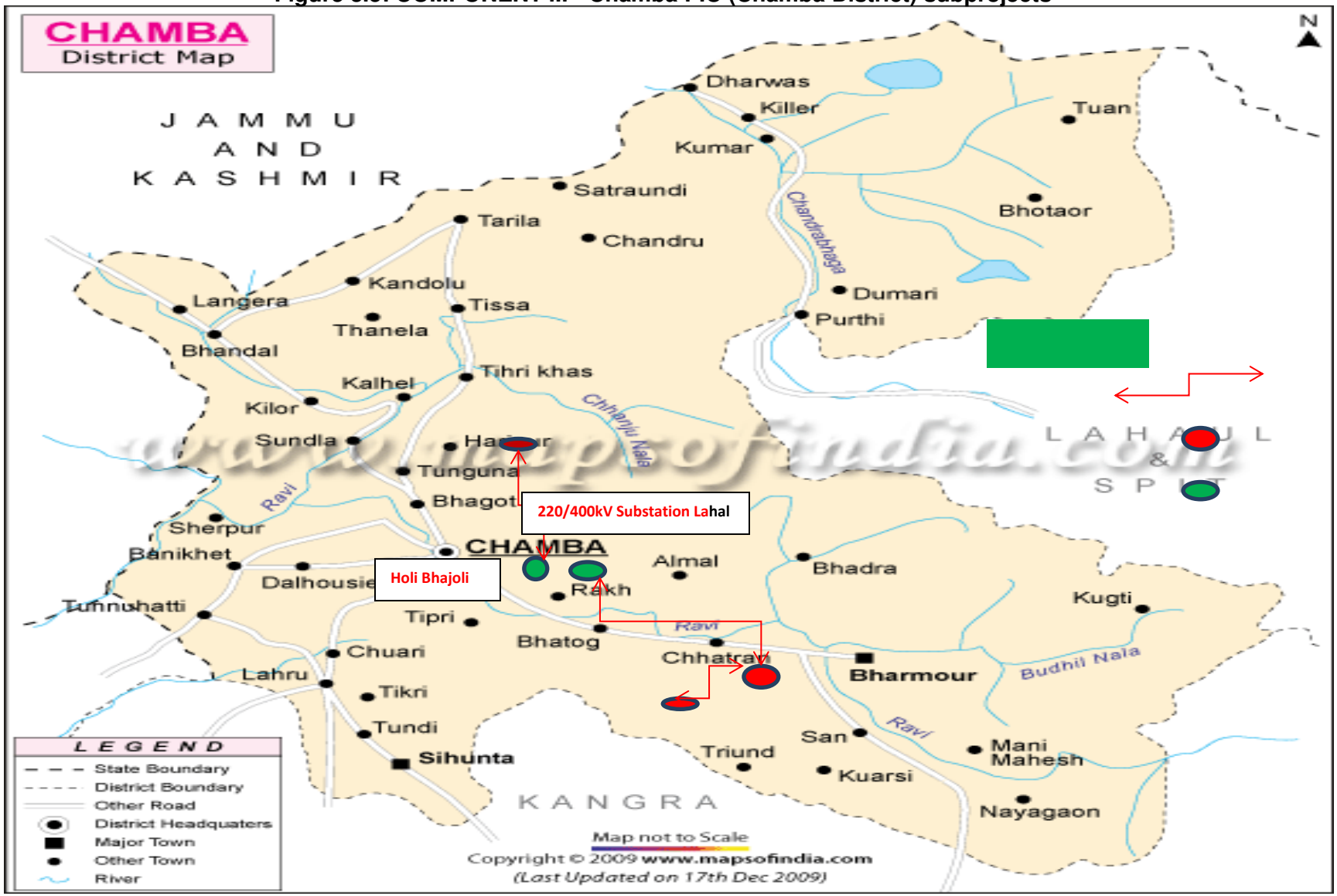
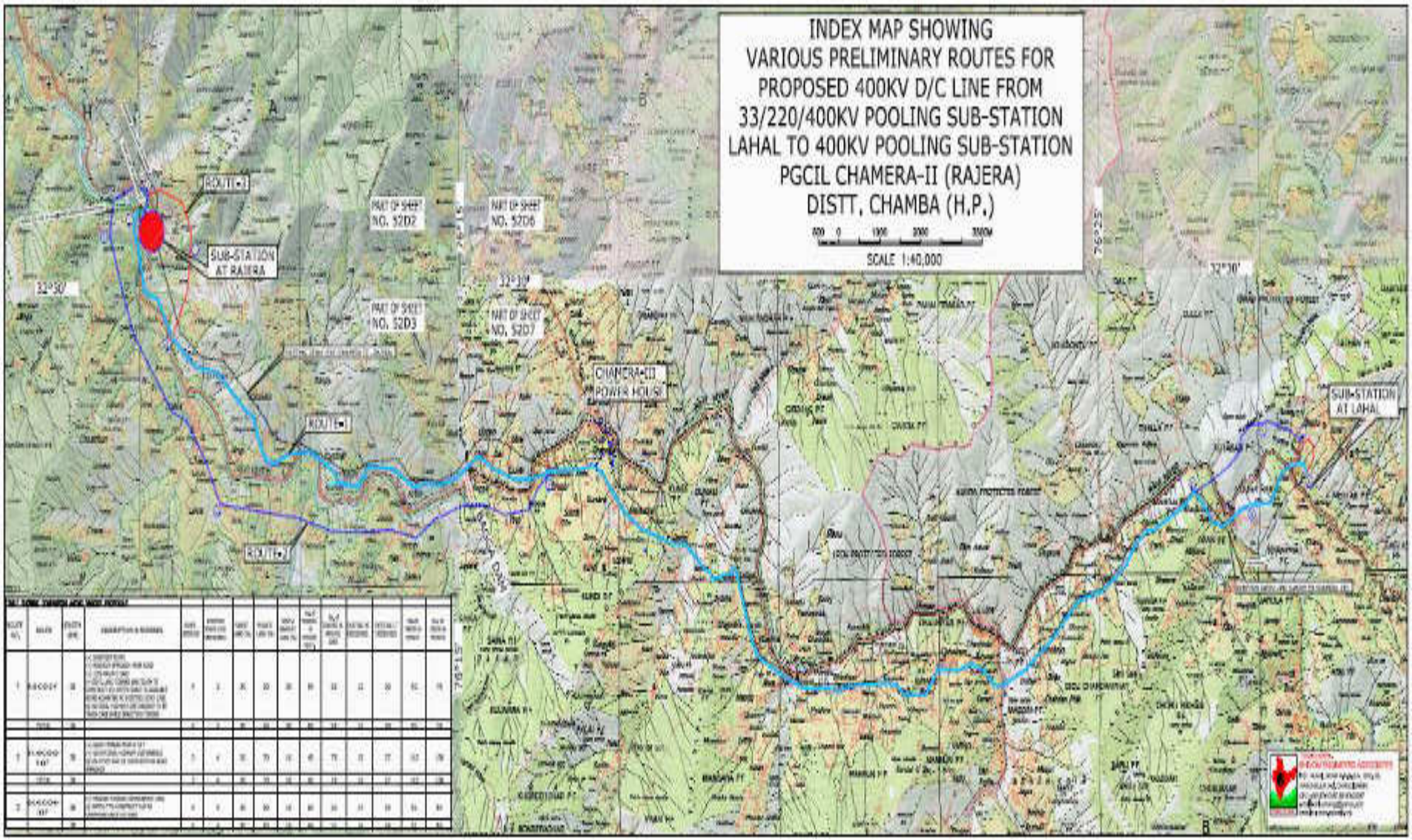


Figure 3.6: Topographical Survey Sheet (1:50,000 scale) of subproject T2 -400kV D/C transmission line (Twin Moose) from 400/220 kV,2x315 MVA Lahal GISS to 400/220 kV Chamera Pooling station of PGCIL.



The final alignment of transmission line is marked in red

Figure 3.7 a: Site for S2 132/220 kV 2x80/100 MVA Pooling station (P.S.) at Mazra

Figure 3.7 b: S2-Mazra Substation Site pictures

Figure 3.7c: Location of Bay for Mazra220 kV D/CTransmission Lineat Karian (New)

Figure 3.8a: Topographic map for Line T3 - 220kV D/C transmission line from 132/220 kV GISS Mazra to 33/220 kV Karian.

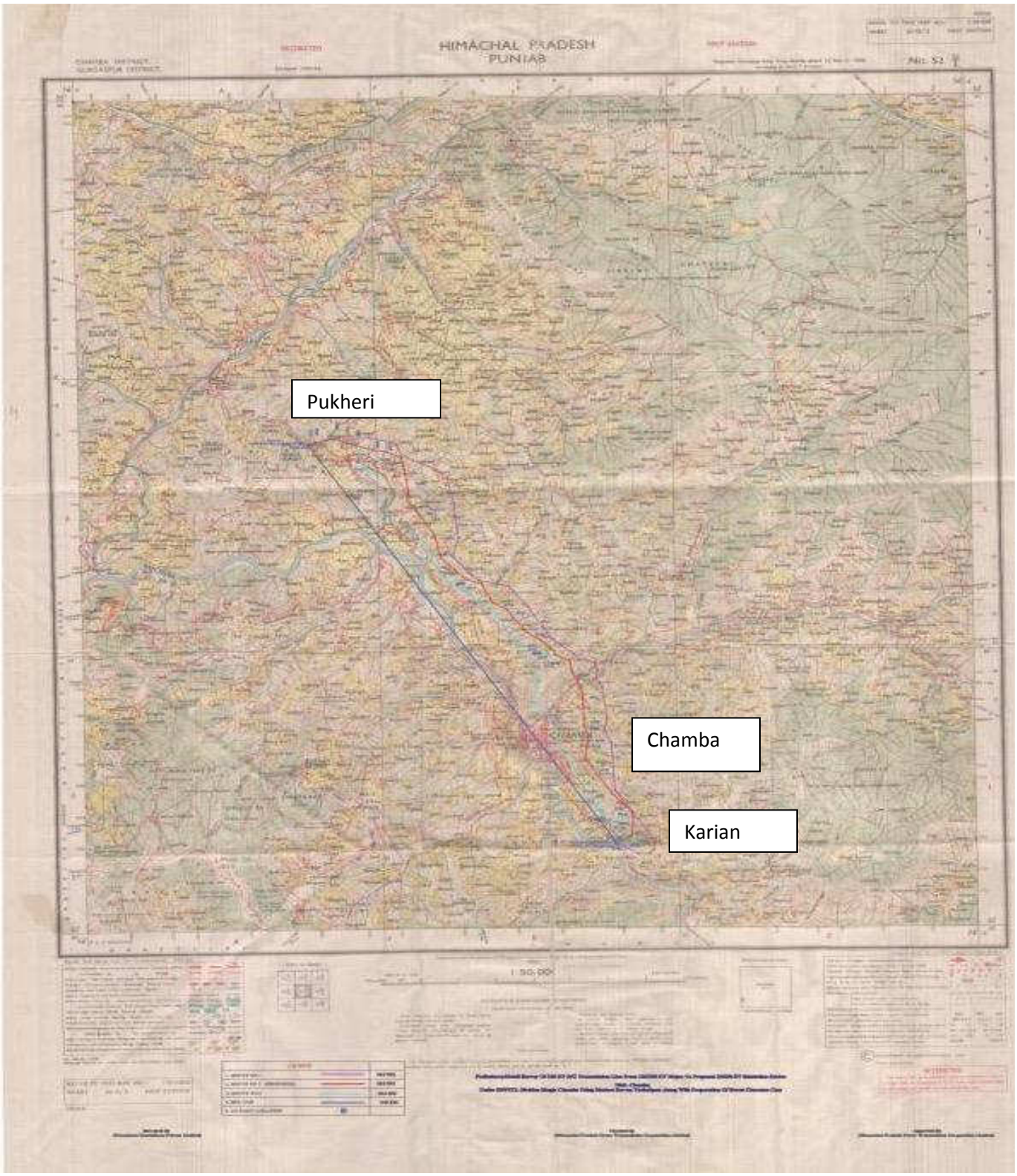


Figure 3.8b: Google earth map for Line T3 - 220kV D/C transmission line from 132/220 kV GISS Mazra to 33/220 kV Karian

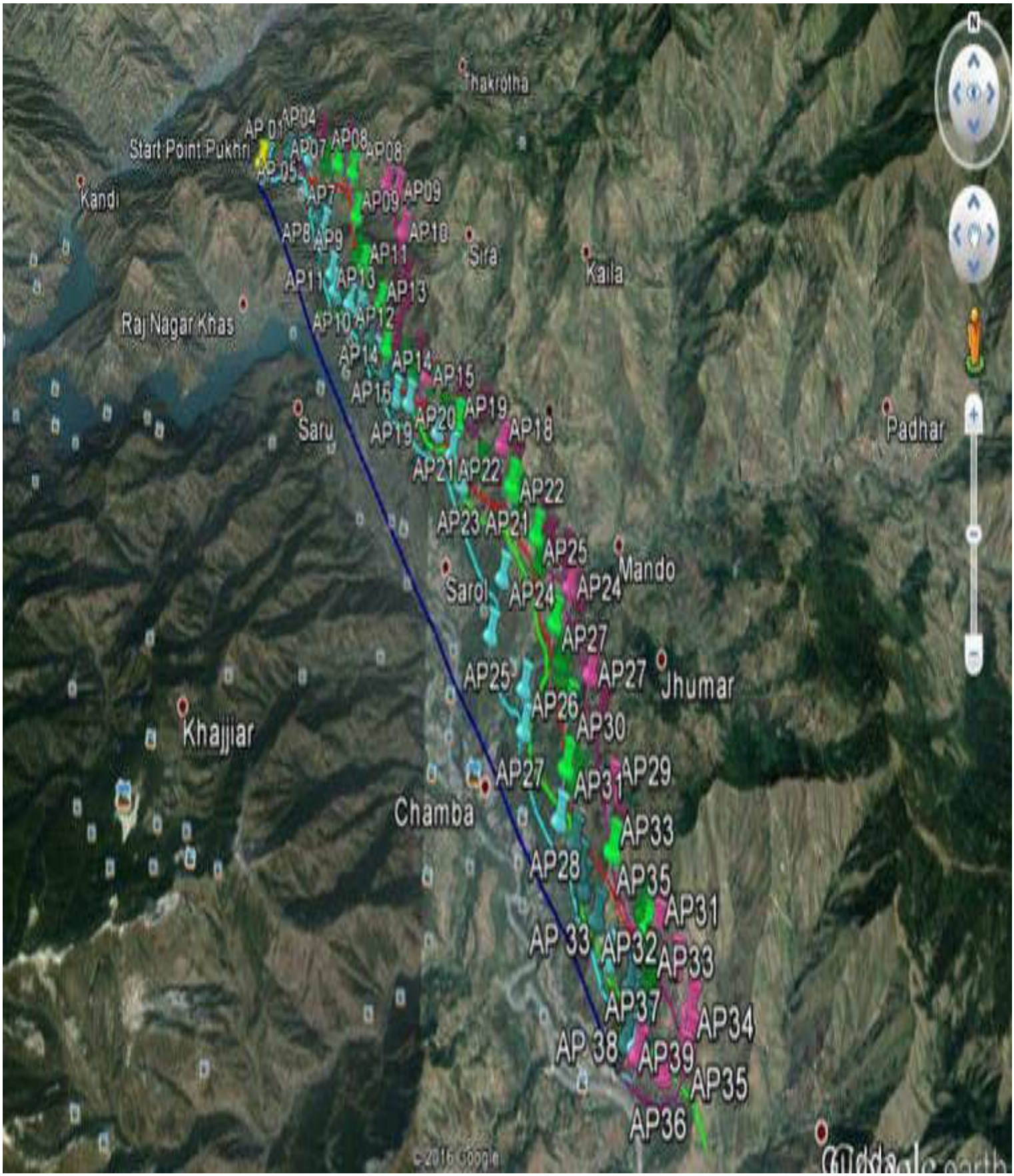


Figure 3.9a:Topograpic map of LineT4 -220kV D/C transmission line from Holi Bajoli HEP to 2x315 MVA Lahal GISS.

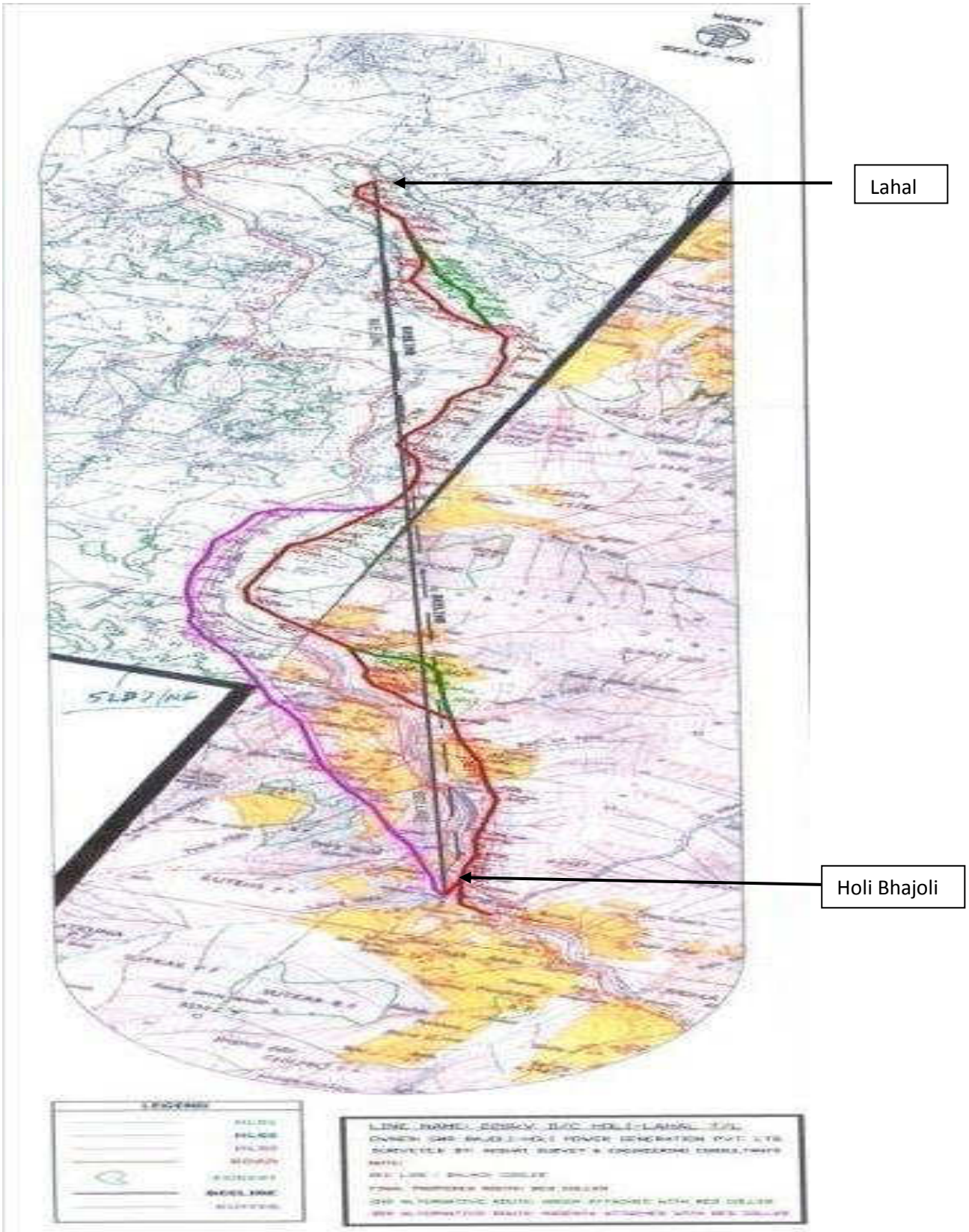


Figure 3.9b: Googlemap of LineT4 -220kV D/C transmission line from Holi Bajoli HEP to 2x315 MVA Lahal GISS.

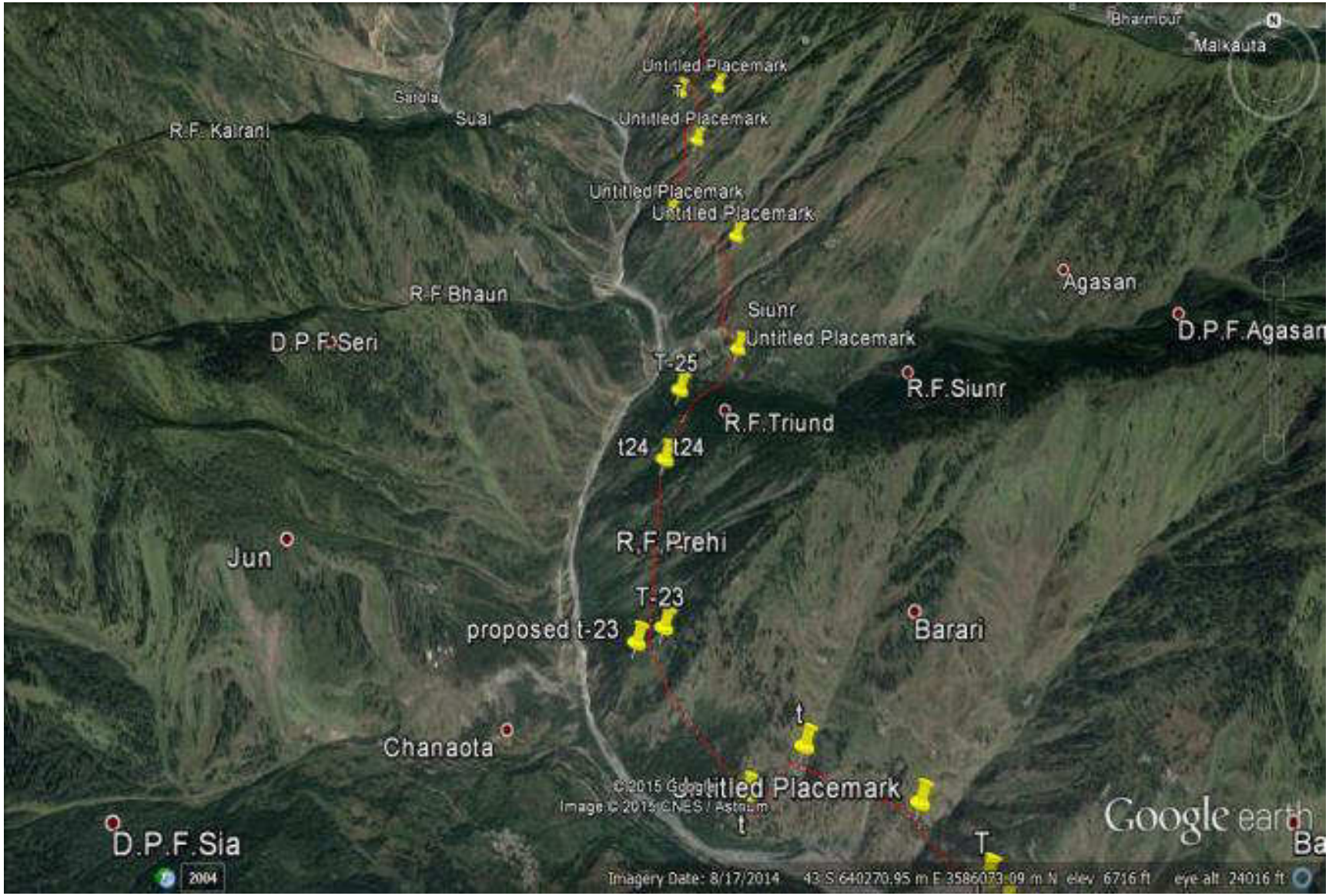


Figure 3.10: COMPONENT III: Rohru PIU (Shimla District) subprojects

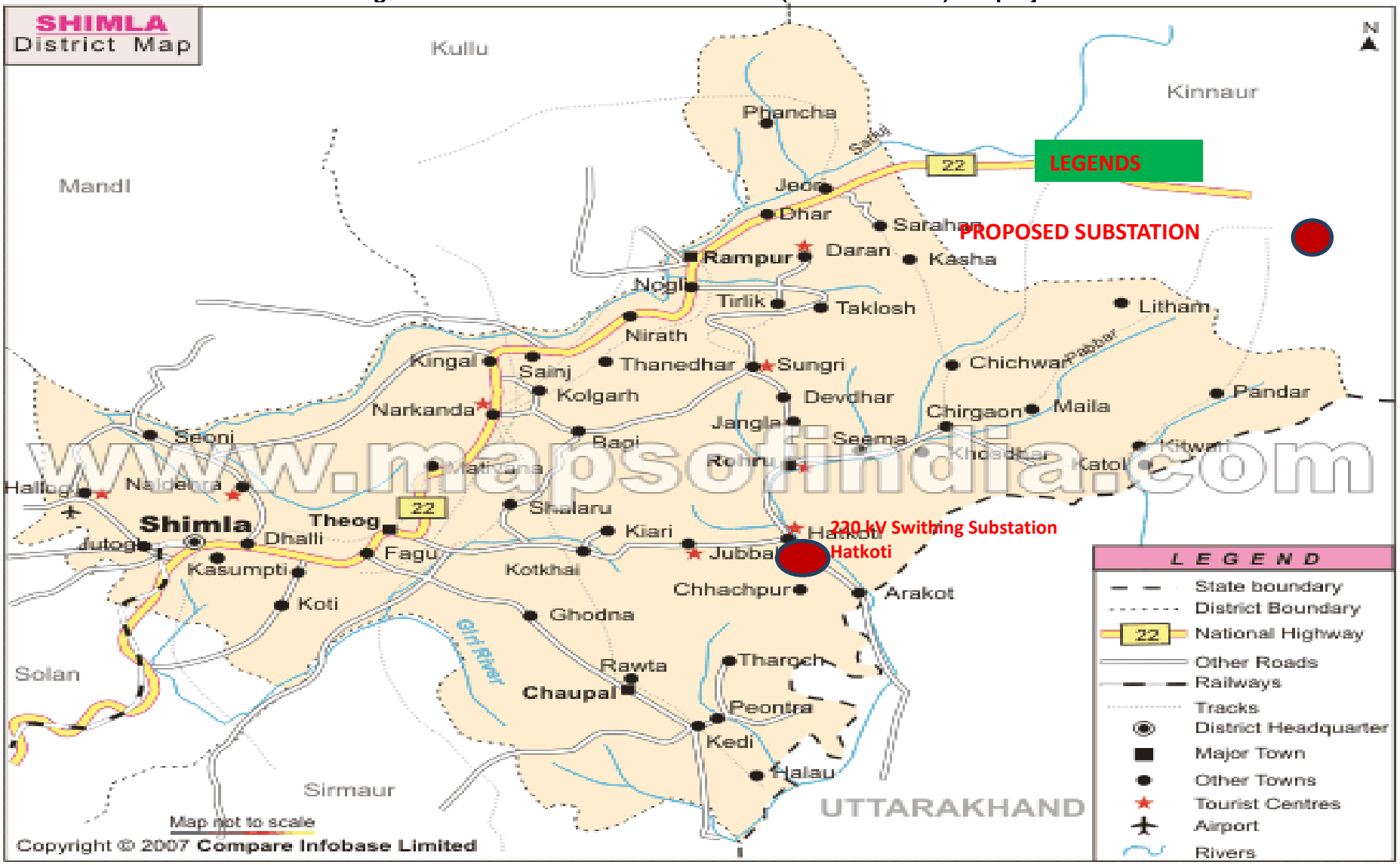


Figure 3.11a: Proposed Subproject S3 - 220 kV GIS switching station at Hatkoti (Line termination)

Figure 3.11b: Proposed Subproject S3 - 220 kV GIS switching station at Hatkoti

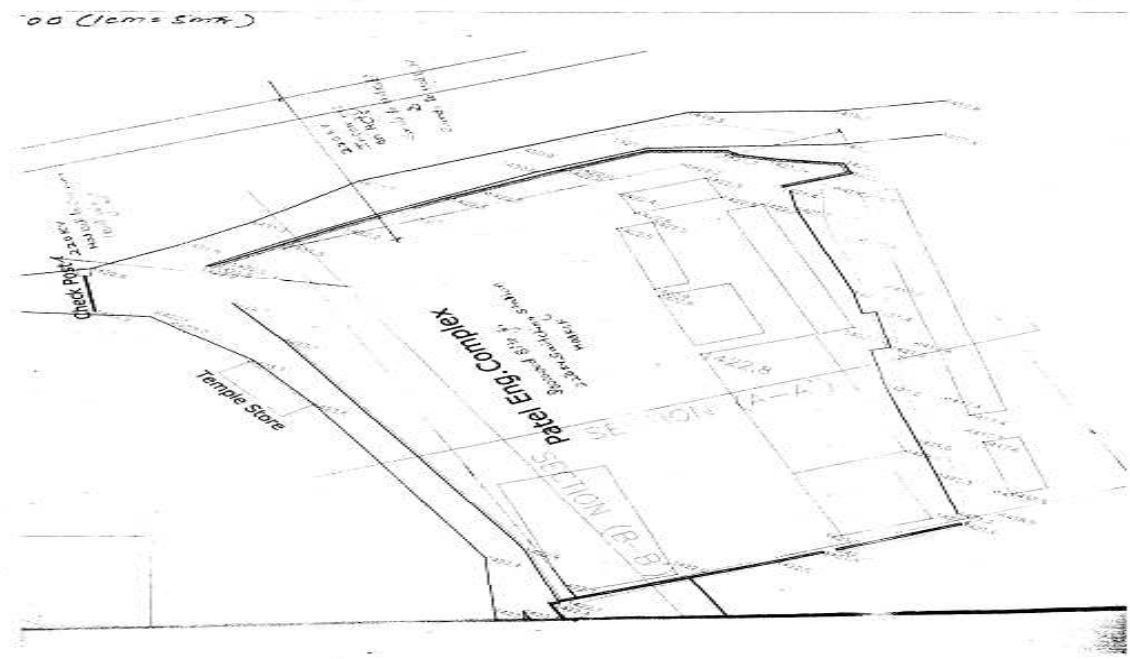
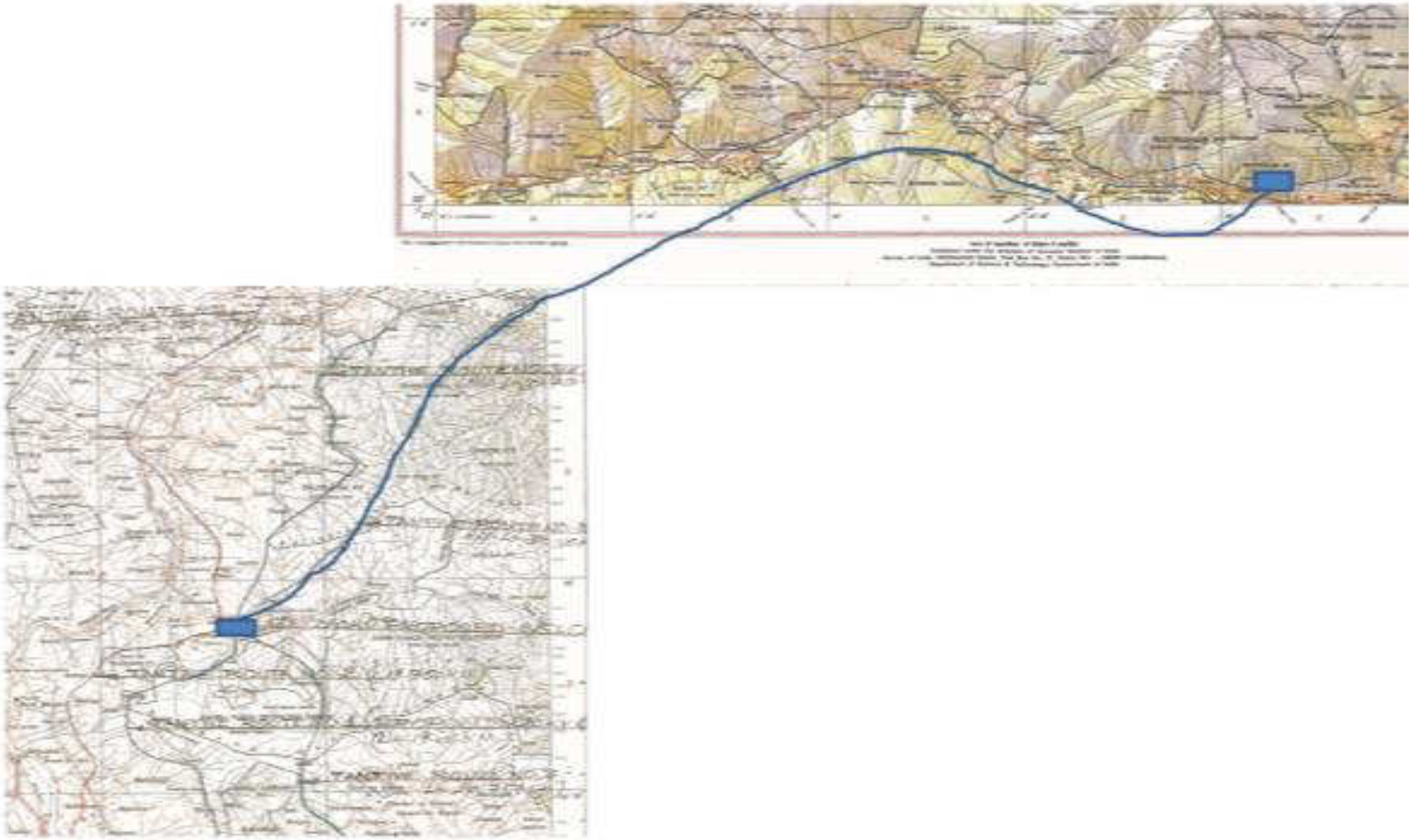


Figure 3.12: COMPONENT IV: Sarabhai PIU (Kullu Districts) subprojects

Figure 3.13: Proposed site for Subproject S4 - 33/132 kV 2x25/31.5 MVA GIS substation at Barsaini

Figure 3.14a: Topograpic map of Line 132 kV D/C line from Barsaini to Charor



3.5 Size and Magnitude of the Operation

46. Turnkey construction of the following components falls within the scope of the IEE. Details of the project components are presented below:

- The construction involves installation of different types of towers depending on the Angle of the conductor in relation to the ground level. The following tower types are used for voltage levels from 66 kV to 400 kV lines.

Table 3.4: Types of Towers used for 66 kV to 400 kV lines

Type of Tower	Angle Min (degrees)	Angle Max (degrees)	Height of tower (in meters)	Base Area (Lengthxwidth in meters)
A Type	0°	2°	31.610	6 m x 6 m
B Type	2°	15°	37.780	6 m x 6 m
C Type	15°	30°	42	9m x 9m
D Type	30°	60°	46	13 m x 13 m

- The details mentioned in Table 3.4 are for a normal tower and leg extensions are invariably used in case requisite ground clearance is not available. This also allows for reducing cutting and filling of mountainside.
- Table 3.5 gives the coordinates for substations, their altitudes and their substation land area.

Table 3.5: Details of Substation Land Area and Coordinates Under Tranche 3

No	Name of Substation	Area of Land in sq meter	Co-ordinates	Altitude in meters
1	Hatkoti substation	8,000	31°05 10.8”N and 77°44’ 52.57”E	1,422
2	Barsaini Substation	9,600	32°01’69”N and 77°26’ 55.08”E	2,300
3	Bagipul substation	5,903	31°69’29.3”N and 77°34’ 10”E	1,710
4	Mazra substation	14,158	32°38’52.5”N and 76°03’ 42.78”E	1,080

COMPONENT I. Bhabha Nagar PIU subprojects (Kullu/Shimla District)

47. The Tranche 3 subprojects of Kinnaur division are located in the Kinnaur district of Himachal Pradesh. Table 3.5 provides general information about the district.

Subproject S1 - 66 kV Gas Insulated Switchgear (GIS) switching station at Bagipul Nirmand

48. The switching substation will be envisaged with the following components:

- Bus configuration for switching substation will be double bus scheme for 66 kV levels with the provision of bus coupler with substation automation and Supervisory Control and Data Acquisition (SCADA).

- The details of the substation are listed below:

66 kV Bays		**22 kV Bays**	
Line Bays	2	Transformer Bay	3
Bus Coupler	1	Bus Sectionalize	1
Transformer Bay	2		
Bus Sectionalize	-		

- 66 kV bays for connecting individual hydro projects of IPPs with this switching station shall be provided by the IPPs as per regulatory norms.

No.	Feature	Description
1	Area of land	8272 sqm.
2	Geographical coordinates	32°38'52.5"N and 76°03' 42.78"E
3	Village / town	Village Bagi(1km)
4	Ownership of land	Private
5	Slope/Plain land	Slope
6	Kind of land	Non-Irrigated
7	River (if any)	Bagi Nala(5KM)
8	Permanent feature nearby if any	No permanent feature nearby site.
9	Distance from nearest Wildlife sanctuary/National Park	Sarahan(30km)

Subproject T1 - 66 kV double circuit (D/C) transmission line from 66 kV GIS Bagipul switching station to Kotla

49. The power transmission line is being constructed to evacuate 45 MW power generated from. Due to limited corridor and surge impedance loading consideration, the quantum of power of Nirmand valleyestimated to be of the order of 45 MW in N-1[16] contingency.

50. The inspection is carried out jointly with forest department and the forest cases are finalized. The joint inspection of the Bajoli Holi line has been completed and the number of tree to be felled is 398.

COMPONENT II. Chamba PIU (Chamba district) subprojects

51. The Tranche 3 subprojects of Chamba division are located in the Chamba district of Himachal Pradesh. Table 3.6 provides general information about the district.

Table 3.6: General profile of Chamba district

SNo.	General Information	Chamba
1.	Geographical area (sq. km)	6528
2.	ii) Administrative Divisions (2001)	10
i)	Number of Tehsil & sub-tehsils	7
ii)	Number of CD Blocks	1591
iii)	Number of Panchayats	270
iv)	Number of Villages	1118
3.	Population (2001 Census)	460,887
i)	Population Density (person/sq. km)	70.6
ii)	Rural & Urban Population (%)	7.5 and 92.5
iii)	SC & ST Population (in percent)	20.03 and 25.51
iv)	Sex Ratio (F:M)	959 :1000
4.	Average Annual Rainfall (mm)	1952

Source: Provisional census 2011 and District Statistical Abstract

Subproject S2 - 132/220 kV, 2x80/100 MVA substation at Mazra

[16] The N-1 contingency is where all loads can be restored even if any single component fails (i.e. N-1 components still available).

52. The work involves construction of 220 kV GIS switching station at Mazra, in Chamba district of Himachal Pradesh. The substation is proposed to be constructed on private land identified and acquired by HPPTCL. Salient features of the site are given below.

220 kV Bays		**132kV Bays**	
Line Bays	2	Line Bays	4
Bus Coupler	1	Transformer Bay	2
Transformer Bay	2	Bus Sectionalize	1
Bus Sectionalize	1		

No.	**Feature**	**Description**
1	Area of land	14 bhigas
2	Geographical coordinates	32°38'52.5"N and 76°03' 42.78"E
3	Village / town	Pukheri(100m)
4	Ownership of land	Private
5	Slope/Plain land	Sloped
6	Kind of land	Non Irrigirated
7	River (if any)	Baira-Siul(300m)
8	Permanent feature nearby if any	No permanent feature nearby site.
9	Distance from nearest Wildlife sanctuary/National Park	Tundah(45km)

Subproject T2 - 400 kV double circuit (D/C) transmission line on D/C towers from 220/400 kV Lahal substation to Rajera (PGCIL)Substation.

53. The transmission line will be constructed on self-supporting latticed type steel towers with single Moose conductor. Due to limited corridor and surge impedance loading consideration, the quantum of power of Bharmour, Holi and Gharola areas of Ravi basin is estimated to be of the order of 136 MW in N-1 contingency.

54. Full details of the location of the towers resulting from the surveys undertaken by HPPTCL are presented in Annexure 3 and a summary in Table 3.7.

Table 3.7: T2: Lahal-Rajera transmission line details

No.	**Detail**	**Description**
1	Line Length estimated	39 km
2	Total Tower locations	114
3	Total Nos. of River Crossing	4
4	Total Nos. of road crossings	3
5	Total Nos. of HT line crossings	3
6	Nos. of Forest trees to be felled	428
7	No of Fruit trees to be felled	2
8	Distance from nearest Wildlife Sanctuary/National Parks	18 km from Kugti Wildlife Sanctuary

Subproject T3 – 220 kV double circuit (D/C) transmission line on D/C towers from 132/220 kV Mazra substation to Karian Substation.

55. The transmission line will be constructed on self-supporting latticed type steel towers with single Zebra conductor. Due to limited corridor and surge impedance loading consideration, the quantum of power of Tissa areas of Ravi basin is estimated to be of the order of 100 MW in N-1 contingency.

Table 3.8: T3: Mazra-Karian transmission line details

No.	Feature	Description
1	Length of line estimated	18 km.
2	Nos. of Towers estimated	61(Approx).
3	Nos. of River Crossings	1
4	Nos. of Road Crossings	3
5	Nos. of Existing HT line Crossings	4
6	Nos. of Forest trees to be felled	126
7	No of Fruit trees to be felled	16
8	Distance from nearest Wildlife sanctuary/ National Park	10 km from Gumgul Siabai wildlife sanctuary.

Subproject T4 -– 220 kV double circuit (D/C) transmission line on D/C towers from Holi Bhajoli HEPto Lahal substation.

56. The transmission line will be constructed on self-supporting latticed type steel towers with single Zebra conductor. Due to limited corridor and surge impedance loading consideration, the quantum of power of Holi and Bara Bhangal areas of Ravi basin is estimated to be of the order of 200 MW in N-1 contingency.

Table 3.9: Holi Bhajoli – Lahal transmission line details

No.	Feature	Description
1	Length of line estimated	17 km.
2	Nos. of Towers estimated	61 (Approx).
3	Nos. of River Crossings	1
4	Nos. of Road Crossings	3
5	Nos. of Existing HT line Crossings	4
6	Nos. of Forest trees to be felled	135
7	No of Fruit trees to be felled	26
8	Distance from nearest Wildlife sanctuary/ National Park	22 km from Kugti wild life sanctuary

COMPONENT III: Rohru PIU (Shimla District) subprojects

57. The Tranche 3 subprojects of Rohru division are located in the Shimla district of Himachal Pradesh. Table 3.10 provides general information about the district.

Table 3.10: General Profile of Shimla Districts

No.	GENERAL INFORMATION	Shimla
1.	Geographical area (sq. km)	5,131
2.	Administrative Divisions (2001)	
i)	Number of Tehsil & sub-tehsils	12 & 5
ii)	Number of CD Blocks	9
iii)	Number of Panchayats	337
iv)	Number of Villages	2,914
3.	Population (2001 Census)	722,502
i)	Population Density (person/sq. km)	141
ii)	Rural & Urban Population (%)	77 & 23
iii)	SC & ST Population (in percent)	26 & 0.60
iv)	Sex Ratio (F:M)	896: 1000
4.	Average Annual Rainfall (mm)	1,180

Source: Provisional census 2011 and District Statistical Abstract

Subproject S3 - 220 kV GIS switching station at Hatkoti

58. The work involves construction of 220 kV GIS switching station near Hatkoti in the Shimla

district of Himachal Pradesh. The switching station is proposed to be constructed on Government land identified (belonging to HPPCL, another Himachal Pradesh government agency) and will be transferred to HPPTCL. Salient features of the site are given in Table 3.11.

Table 3.11: S3 Hatkoti substation site details

No.	Feature	Description
1	Area of land	8000 sqm
2	Geographical coordinates	31°05 10.8”N and 77°44’ 52.57”E
3	Village / town	Sairi
4	Ownership of land	HPPCL, a Himachal Pradesh Government Agency
5	Slope/Plain land	Level
6	Kind of land	Barren
7	River (if any)	Pabbar (aerial distance of 500m)
8	Permanent feature nearby if any	HPPCL Barage
9	Distance from nearest Wildlife sanctuary/National Park	15 km from Talra WLS

59. The substation site has been assessed for ground stability by Indian Institute of Technology, Roorkee, India, one of the most renowned research body for geological and soil stability analysis.

60. The substation will be envisaged with the following components:

- Bus configuration for switching substation will be double bus scheme for 220 kV levels with the provision of bus coupler with substation automation and SCADA.
- List components of substation are listed below:

Sno.	Type of Bay	Nos.
1	**220 kV Bays**	
i.	Line Bays	4
ii.	Bus Coupler	1
iii.	Bus Sectionalizer	-
iv.	Transformer Bays	-

COMPONENT IV: Sarabhai PIU (Kullu Districts) subprojects

61. The Tranche 3 subprojects of Sarabhai division are located in the Kullu district of Himachal Pradesh. Table 3.12 provides general information about the district.

Table 3.12: General Profile of Kullu district

No.	GENERAL INFORMATION	
1.	Geographical area (sq. km)	5,503
2.	Administrative Divisions (2001)	
i)	Number of Tehsil & sub-tehsils	4 & 2
ii)	Number of Blocks	5
iii)	Number of Panchayats	4
iv)	Number of Villages	172
3.	Population (2011 Census)	437,474
i)	Population Density (person/sq. km)	79
ii)	Rural & Urban Population (%)	90.57&9.43
iii)	Sex Ratio (F:M)	950: 1000
4.	Average Annual Rainfall (cm)	100 - 137

Source: Provisional census 2011 and District Statistical Abstract.

Subproject T5 - 132 kV D/C transmission line from Barsaini to 132/220 kV substation at Charor

62. Full details of the location of the towers resulting from the surveys undertaken by HPPTCL are presented in Annexure 3 and a summary in Table 3.13.

Table 3.13: T5: Barsaini – Charor transmission line details

No.	Feature	Description
1	Length of line estimated	34 km.
2	Nos. of Towers estimated	130 (Approx).
3	Nos. of River Crossings	2
4	Nos. of Road Crossings	2
5	Nos. of Existing HT line Crossings	4
6	Nos. of Forest trees to be felled	379 out of 1026
7	No of Fruit trees to be felled	200
8	Distance from nearest Wildlife sanctuary/ National Park	4 km from Great Himalayan National Park

Subproject S4 - 33/132 kV 2x25/31.5 MVA GIS substation at Barsaini

63. The work involves the construction of a 33/132 kV GIS substation near Barsaini in the Kullu district of Himachal Pradesh. The substation is proposed to be constructed on a private land identified and acquired by HPPTCL. Salient features of the site are given in Table 3.14.

Table 3.14: S4: Barsaini substation details

No.	Feature	Description
1	Area of land	9,600 sqm.
2	Geographical coordinates	32°0'26.07"N and 77°27' 1.73"E 32°0'24.08"N and 77°27' 5.68"E 32°0'20.19"N and 77°27' 3.75"E 32°0'21.99"N and 77°27' 1.20"E
3	Village / town	Tosh
4	Ownership of land	Private land/Government
5	Slope/Plain land	Slope
6	Kind of land	Agriculture
7	River (if any)	Parvati river
8	Permanent feature nearby if any	Parvati river 400 m

3.6 Associated Facilities

64. There are several small/medium HEPs that will connect to these lines and substations in future. Most of these projects are in their design stages and have not yet started construction. Before these generation projects start their construction and operation, they are required by CEA/HPERC to approach HPPTCL for grant of connectivity for power evacuation – the application as prescribed by HPERC is attached in Annexure 11 ("Procedure for Making Application for Grant of Connectivity in Intra-State Transmission System (IaSTS)" as well as posted on the HPPTCL website.

65. The project components being funded in the project, HPPTCL is not constructing any dedicated line for any particular HEP but rather a host of HEPs which are small and medium listed

in Table 3.15 in various project areas. HPPTCL as a State Transmission Utility has to design networks with a principle to provide the power evacuation to an intrastate point. Hence the each of the lines developed under the project are not dependent on one single HEP and therefore there are no associated facilities. For instance, 180MW Bajoli Holi HEP[17] is not an associated facility to T2 and T7 as shown in Table 3.15.

66. According to this, HPPTCL has made it mandatory to all HEPs to provide information to ensure that their facilities comply with GoI and GoHP rules for obtaining the mandatory Forest and Environmental clearances before they connect to the HPPTCL transmission system. The 180 MW Holi Bajoli HEP[18] has already submitted the application that contains the Forest clearance, the Environment clearance and Techno Economic Committee approvals which HPPTCL will maintain in its record for monitoring purposesunder Tranche 3. (Attached as Annexure 10). Annexure 12 contains the forest clearance obtained for the Tranche 3 Tranmission line project.

67. Table 3.15 provides list of HEPs that have been commissioned to date as well as their expected commissioning dates. The existing ones which are already evacuating on other evacuation lines and therefore HPPTCL system will only be treated as one supplementary line proving redundancy.

Table 3.15: List of HEPs connecting to Tranche-3 subprojects

No	Name of Transmission Project	Final Power Evacuation Point	Transmission Lines	Projects to Be Evacuated (MW and Year of Commissioning)
1	S1-66 kV switching station at Bagipul T1 66 kV D/C transmission line from 66 kV Bagipul Substation to Kotla.	Abdullapur (Haryana) via PGCIL Sherpa Colony 66/220/400 kV substation	66 kV D/C transmission line from 66 kV Substation Bagipul to Kotla Substation of HPSEBL.	Umli14.30(2019-20) Dewar5.00 Shreekhand8.00 Kurpan - Ii 2.00 Kurpan5.00(2019-20) Bagipul (Sarahan) 1.00 Dewar-1.00 Jaon1.00 (2019-20) Hula2.00(2019-20) Ogan1.00 (2019-20) Kurpan-Iii14.60 MW (2019-20)
2	S2-132/220 kV, 2x80/100 MVA P.S at Mazra T2-400 kV transmission line from	Karian-Jalandhar via PGCIL 400/ kV transmission line from Chamera PS	220 kV D/C Transmission line from Mazra to Karian further connected to 220/400 kV	Holi 3.00 MW (Commissioned), Chirchind 5.00 MW (Commissioned), Salun 4.50 MW (2013-14), Sup 1.00 MW (2013) Chobia – I 5.00 MW (2014), Bharmour 0.50 MW (2015), Tulang 3.00 MW (2013), Kurhed 4.50 MW (2013), Kuwarsi 5.00 MW (2014), Holi – Ii 7.00 MW (2015), Tulang-Ii 2.20 MW (2014), Kurhed-Ii 5 MW

[17] As the 180 MW HEP is not an associated facility to the lines T2 and T7, however, it is a major run-or-river Hydropower project connected to the HPPTCL system. Adequate assessment was conducted, and several site visits were conducted along with environment and social consultations done at the sites. Other relevant documents reviewed that are available with the team are: 1) Assessment Note on Location of Project Components by HPSEBL bearing Ref: HPSEBL-CE(I&P) DB-9-67/2011-4896-99 dated 22-2-2011; 2) GMR Bajoli Hydro Electric project 180 MW Catchment Area Treatment Plan 2010; 3) Executive Summary of EIA, Environmental Impact Assessment Report dated February 2010 developed by R. S. Envirolink Technologies Pvt. Ltd.; 4) Forest Clearance dated Ft.42-164/2013 dated 28th January 2013 and was passed under Section 2 of the Forest Conservation Act 1980 having MoEF approval letter no J-12011/86/2007-IA Dt 24 Jan 2011; 5) Environmental Clearance Compliance Status Report Ref GMR/Hydro/505/3341/15 to MoEFC dated 30 June 2015 regarding monitoring by ANACONLABS, Nagpur; 6) ISTS application needs to have all the relevant details which has been supplied by Bajoli Holi proponents to HPPTCL as the pre-requisite mentioned in the IEE.

[18] Several newspaper and journal clippings are available on the public hearing of the 180MW Bajoli Holi HEP. The decision of the Green tribunal is enclosed. 1) Refer the NATIONAL GREEN TRIBUNAL PRINCIPAL BENCH NEW DELHI Appeal No. 68/2913 and order dated April 24, 2014 has ruled in the favor of the 180 MW Bajoli Holi HEP. 2) Consultations conducted are included in the RP at these villages.

No	Name of Transmission Project	Final Power Evacuation Point	Transmission Lines	Projects to Be Evacuated (MW and Year of Commissioning)
	220/400 kV Lahal substation up to 400kV Chamera (Rajera)		Chamera-II of NHPC.	(2014), Siunr 1.50 MW (2012), Ghator – I 2.20 MW (2014), Chirchind-Ii 9.90 MW (2015), Samwara 2.50 MW (2014), Kunkali 4.00 MW (2014), Kuwarsi-Ii 5.00 MW (2014), Toralkundli 5.00 W (2014), Dug 1.50 MW (2014), Dera 3.00 MW (2014), Chatekanalla 5.00 MW (2014), Ghator Top 5.00 MW (2014), Kiunr 2.00 MW (2014), Sup-Ii 1.00 MW (13th Plan), Dhanco 12.00 MW (13th Plan), Cho Tanda 9.00 MW (13th Plan), And Rack 0.80 MW (2014)
3	T3-220 kV transmission line from Mazra to Karian.	Karian-Jalandhar via PGCIL 400/ kV transmission line from Chamera		Joiner-LI 9.90(2019-20) Sakti 1.00 (2019-20) Taraila-LII 5.00 (Commissioned)Chaanju-1 36.00(2024-25) Tarial (Ginni) 5.002020-21) Kamil 4.00 (2020-21) Balsio 4.95 (2020-21) Kamil-LI 5.00, Malin 2.80 (2020-21) Chanju-LII 42.00(2024-25), Joiner 3.00(2019-20)-Chanju Mehad 8.00(2020-21) Upper Joiner 12.00(2019-20) Tangerbhaled 2.00, (Arwan 5.00 2019-20) Bhararu 2.00, Mangli 3.00, Chanju-LI (2024-25),19.8 Galua 5.00 (2019-20), Dukrund 3.00(Commissioned)Makkan 1.15(2020-21) Dakrunda 0.96(2020-21) Chachul 3.00 (2020-21) Dukrunda-L Lower Makkan 5.00(2020-21), Deonthalchanju 33, Upper Makkan-LI (2020-21) 5.00(2020-21), Chonned 15.00 (2020-21), Paru Veda 1.50 (2020-21) Chonned 5.00(2020-21) Kachela 5.00 (2021-22), Kothi-L 30.00s(2020-21) Ach 7.50 (2020-21) Devi Kothi-LI 14.00(2021-22), Alwas 2.25(2020-21) Chaini Tepa 5.00 (2020-21), Mansa 2.25 (2020-21), Balsio Top 5.00, Sai Kothi-LI 16.50 (2020-21), Sai Kothi-L 15.00 (2020-21) Joiner-LI 3.00 (2020-21) **Total 422.6**
4	220 kV double circuit (D/C) transmission line on D/C towers from Holi Bhajoli HEP to Lahal substation	Lahal-Jalandhar via PGCIL 400/ kV transmission line from Chamera		Holi 3.00 MW (Commissioned), Chirchind 5.00 MW (Commissioned), Salun 4.50 MW (2013-14), Sup 1.00 MW (2013) Chobia – I 5.00 MW (2014), Bharmour 0.50 MW (2015), Tulang 3.00 MW (2013), Kurhed 4.50 MW (2013), Kuwarsi 5.00 MW (2014), Holi – Ii 7.00 MW (2015), Tulang-Ii 2.20 MW (2014), Kurhed-Ii 5 MW (2014), Siunr 1.50 MW (2012), Ghator – I 2.20 MW (2014), Chirchind-Ii 9.90 MW (2015), Samwara 2.50 MW (2014), Kunkali 4.00 MW (2014), Kuwarsi-Ii 5.00 MW (2014), Toralkundli 5.00 W (2014), Dug 1.50 MW (2014), Dera 3.00 MW (2014), Chatekanalla 5.00 MW (2014), Ghator Top 5.00 MW (2014), Kiunr 2.00 MW (2014), Sup-Ii 1.00 MW (13th Plan), Dhanco 12.00 MW (13th Plan), Cho Tanda 9.00 MW (13th Plan), and Rack 0.80 MW (2014)
5	S3-220 kV switching substation at Hatkoti	Abdullapur (Haryana) via 400KV PGCIL lines		Up Stream of Tangnu Romai 90 MW (2019 -20), Dhamwari Sunda 70 MW (20124-25), Chirgaon Majhgaon 60 MW (2026), Paudital Lassa 24 MW (2021), Sawra Kuddu 111 MW (2019), Rupin Valley 103.6 MW (2025-26), and Andhra Khad 38.2 MW (2019-20), Toss 10.00 MW (Commissioned), Jirah 4.00 MW Commissioned), Bramganga 5.00 (Commissioned), Raskat 0.80 (Commissioned)
6	S4-33/132 kV substation at Barsaini		132 kV Barsaini-Charor D/C transmission line	Jigral 4.00 MW (2020), Chakshi 2.00 MW (2012), Chakshi – II 3.00MW (13th Plan), Balargha 5.00 MW (2013), Shilla 1.80 MW (2013), Barthi 1.00 MW (2014)

No	Name of Transmission Project	Final Power Evacuation Point	Transmission Lines	Projects to Be Evacuated (MW and Year of Commissioning)
7	T5-132 kV Barsaini-Charor D/C transmission line			Jirah 3.50 MW (2019),Tauhak 4.50 MW (13th Plan), Liptungkhor 3.00 MW (2019),Piachkani 0.60 MW (13th Plan), Bakarkiara 1.10 MW (2019),Garthi-II 0.90 MW (13th Plan), Garthi-III 3.00 MW (13th Plan),Garthi 1.00 MW (13th Plan),Gathi 0.80 MW (13th Plan),Upper Jirah 1.50 MW (13th Plan),Kungti 1.00 MW (13th Plan),Nazonga 0.90 MW (13th Plan),Sarsadi 9.60 MW (2015),Parvati 14.00 MW (2019),Parbati-II 10.00 MW (2019),Sarsadi-II 9 MW (2019),Shat 3 MW (13th Plan),Sharni 9.60 MW (2017) Malana Top 5.00 MW (2018) Malana-III 30.00 MW (2019-20) MALANA-IV 10.00 MW (2021) Thuchaning 1 MW (2018) Jarihydel 5.00 (2014) Bramganga Top 5.00 (13th Plan) Jal 1.00 (13th Plan) Manikaran 0.99 (13th Plan),Raskat-II 0.40 (2018),ManikaranChoj 2.50 (2018),Raskat-II 0.40 (13th Plan),Manikaran Choj 2.50 (13th Plan)

4.0 DESCRIPTION OF ENVIRONMENT

68. Himachal Pradesh is a north Indian mountainous state. The climate of the state varies from subtropical to temperate. The total area of Himachal Pradesh is 55,663 km^2, which is 1.74% of the total area of India. The state is very rich in natural resources especially forest and water resources, as it has many permanent glaciers, dense forests, mountain peaks and a network of rivers, with the five main rivers including the - Satluj, Beas, Ravi, Chenab, and Pabbar. The outer and lesser Himalayan watersheds of the state covering 28,970 km^2 area are of great national importance, as entire northern India depends largely for water and power produced by run-of-the-river projects from this region. Himachal Pradesh extends from the Shivalik Hills in the south to the Great Himalayan ranges including a slice of the trans-Himalayas in the north.

4.1 Physical Resources

69. **Chamba district**. The Chamba district is on the east by Lahaul and Bara-Bangal area of Himachal Pradesh, on the south-east and south by the Kangra district of Himachal Pradesh and Gurdaspur district of Punjab. The district is situated between north latitude 32° 11′ 30″ and 33° 13′ 06″, and east longitude 75° 49′ 00” and 77° 03′ 30″. The area of the district is 6,528 km^2 with Chamba as its headquarters. There are 1591 villages in the district. The district has been divided into 6 sub-divisions [Chamba, Churah, Pangi, Bharmaur, Dalhousie, Chowari]. There are seven tehsils (Chamba, Churah, Salooni, Pangi, Bharmaur, Dahlhousie, Bhatiyat) and 3 sub-tehsils (Bhallai, Holi, Sihunta).

70. **Kullu district**. Kullu district is situated in the inner Himalayas between 300 51’ 00” north latitude and 770 06’ 04” east longitude. The district is bounded on the north and east by Lahaul and Spiti district; south-east by Kinnaur district; south by Shimla district; south-west and west by Mandi district and on the north-west by Kangra district. The total geographical area of the Kullu district is 5,503 km^2 which comprises of mountain peaks as high as Deo-Tibba (6,123 m) and as low as Jalori pass (3,000 m), the valleys of the Beas, the Parvati, the Sainj, the Tirthan and the valleys of Ani and Kurpan. In terms of geographical conditions, the district is mountainous cruised by rivers and valleys. The Satluj and Beas are the principal rivers with many tributaries. The altitude of the district ranges from 500 m to 5000 m amsl, but the habitation is only up to 3500 m.

71. **Shimla district.** Shimla is one of the South-eastern districts of Himachal Pradesh State

having geographical area of 5,131 km^2. The district lies between North latitude 30º45'48" to 30º43'0"and East longitude 76º59'22" to 78º18'40" and is covered by Survey of India degree-sheets 53A, 53E, 53F and 53I. The district is bounded by Mandi and Kullu in North, Kinnaur in the North-east, Sirmaur district and Solan District in the South and West respectively. District has inter-state boundary in the South - East with State of Uttrakhand. The district is well connected by rail and road network. The nearest airports are at Shimla (Jubbal Hatti) and Chandigarh.

72. **Administratively**, Shimla town is the Capital of the Himachal Pradesh State and head quarter of the Shimla district. The district comprises of seven subdivisions viz., Shimla urban, Shimla rural, Theog, Rampur, Chopal, Rohru and Dodra Kawar and has 12 Tehsils (Shimla urban, Shimla rural, Suni, Theog, Kotkhai, Rampur, Kumarsain, Chopal Rohru, Jubbal, Chirgaon, and Dodra Kawar) and 5 sub-tehsils (Junga, Nankhari, Nerwa, Cheta (Kupwi) and Tikkar). For development purpose district has been divided in to nine Community Development blocks viz., Mashobra, Theog, narkanda, Rampur, Jubbal, Rohru, Chhohara, Chopal and Basantpur, 331 gram panchayats, 2,895 inhabited villages, 257 Patwar Circles and 32 Kanungo circles. Important towns in the district are Rampur, Rohru, Jubbal, kothai, Chopal, Kumarsain, Theog, Shimla, Kasumpti, etc.

73. The population of the district is 814,010 (2011 census), of which 425,039 (52.22%) males, 388,971 (47.78%) female, sex ratio (F:M) is 915: 1000 and density of population is 159 per km^2. The rural and urban population is 612,659 (75.26%) and 201,351 (24.74%), respectively. The schedule caste and schedule tribes population in the district is 26% and 1.1%, respectively. The local inhabitants mainly depend on agriculture for their subsistence.

4.2 Atmosphere

Climate

74. There are four broad seasons. Winter normally starts from mid-November and continues till mid-March. December, January, and February are severe cold months, when the winter season is at its peak. The upper reaches, have snow and sleet while the rains are frequent in the lower areas and snow may fall as early as the beginning of October but usually the areas have snowfall from the later part of December and continues until mid March. The higher peaks experience heavier snowfall and snow melting starts from March. From mid-March to mid-May, climate in most parts of the district is at its bloom because of the spring time. The climate is comparatively hot from mid-May to mid-July and varies from semi-tropical to semi-arctic. The places situated in the lower reaches on the banks of rivers and streams are as hot as plains. Rainy season generally starts from mid-July and extends up to the mid-September. Autumn season is generally very small from mid-September to mid-November. The extended rainy season and early setting of winter are the reasons for its short duration.

75. **Kullu district** is characterized with cold dry weather and the maximum temperature varies from 15 °C in January to 32 °C in June and the minimum temperature ranges from 21 °C in July to as low as 0.7 °C. The summers are mild and winters are harsh due to snowfall on mountain ranges. The upper regions experience snow and sleet fall while rains are confined to the lower heights.

76. Throughout the year, **Shimla district** has high temperature (29°C–30°C). But the temperature goes down to 26°C from December to January.

77. **Chamba district is** located on the right bank of the Ravi river valley, built on successive

flat terraces, the town is bounded topographically by the Dhauladharand Zanskar ranges, south of the inner Himalayas. The temperatures in summer vary between 38°C (100°F) and 15°C (59 °F) and in winter: 15 °C (59°F) and 0 °C (32°F). The maximum temperature recorded in summer is 39°C (102 °F) and the minimum temperature in winter is −1°C (30 °F). Climatically March to June is said to be the best period to visit Chamba, which is a well-known hill station.

Rainfall

78. The rainfall is well distributed from January to September and other three months receive comparatively less rainfall. Maximum rainfall is received during the month of July. Less rainfall during the months of October to December adversely affects the sowing of rabi crops. Sometimes in the months of April and May, hailstorms are received which cause damage to crops, especially fruits. Heavy rains during the maturity period of rabi crops also sometimes cause damage to the crops. The sunshine hours during the months of December, January and February are much less (4.9–5.4 average hours) which further intensify the severity of cold. The natural calamities such as flash floods, cloudbursts, and droughts are common and frequent features in the district and have caused heavy losses to the farmers during the past years.

79. Besides the seasonal variations, the climate of Himachal Pradesh varies at different altitudes. The average rainfall is 1251 mm. The highest rainfall occurs in Kangra district followed by Shimla district. The west part of the Shimla district, receives very less precipitation (1,000 mm–1,500 mm) than east part of district (1,500 mm–2,000 mm). Highest precipitation is received in inter monsoon period from October to December. Average rainfall in Shimla, Chamba Kullu districts as compared to whole of Himachal Pradesh is shown in Table 4.1.

Table 4.1: Average Yearly Rainfall (in mm)

Year	Himachal Pradesh	Kinnaur	Chamba	Shimla	Kullu
2009	1,041.3	348.6	1,584	1,177.1	88.6
2010	1,000.5	310.9	706	967.4	1,215.3
2011	1,141.0	354.1	857	1,211.4	825.1
2012	907.9	269.4	1,019	825.6	1,732.5

Source: Himachal Pradesh State District statistical abstract 2014–2015.

Baseline Air Quality

80. As per primary testing of three air quality parameters, SO_2, NO_x, and RSPM were observed and value of SO_2, and NO_x are found well below the permissible limits however, value for RSPM is found below National Ambient Air Quality Standards (NAAQS) for annual and 24-hour average in Hatkoti, Barsaini, Bagipul and Mazra substations. The Standards are mentioned in section A7.2 of Annexure 7 while the baseline Information of Ambient Air Quality is attached in section A 7.2 of Annexure 7. These are measured in three different directions (120^0, 240^0, 360^0) on the date mentioned in the table.

Baseline Ambient Noise

81. The standards are mentioned in section A7.1 of Annexure 7 while the baseline Information of Ambient Noise Quality at the Hatkoti, Barsaini, Bagipul and Mazra substationsis attached in section A 7.4 of Annexure 7. These were measured in three different directions (120^0, 240^0, 360^0) on the date mentioned in the table and samples collected during daytime.

Topography and Soils

Topography

82. Topographically, the state consists of five distinct sub-regions. These are (i) valley areas with elevations up to 1,000 metres, (ii) low hills, between 1,000 and 2,000 metres, (iii) high hills which lie between 2,000 and 3,500 metres, (iv) the alpine zone with altitudes above 3,500 metres, and (v) the land of the perpetual snows. Climatically, the zones identified are the Outer Himalayas, the Inner Himalayas and the Alpine. Except a few small valleys, the Shimla district is entirely mountainous. The elevation of the district ranges from 300 to 6,000 metres. The district has a number of peaks, like Jakhoo in Shimla town, Siah near Chail, Churadhar in Chopal tehsil, Chensal in Rohru tehsil, Hatoo in Narkanda tehsil, and Shali in Seoni tehsil. Mostly the terrain is rough. The general topographical feature of the district is prevalence of interlocking spurs, narrow and steep sided valleys with high peaks and thick forest of Deodar and Kail. The soils are young and thin. However, these get heavier and comparatively acidic with an increase in altitude.

83. Some of substations are on terraced slopes due to scarcity of land. Site selection and development of layout design is such that the muck generated during construction is minimum and has been utilized in back filling and used to raise the level of approach road. A civil study is conducted to prepare a topographic report that details the cubic meter amount of cutting and cubic meter of filling are complementary and no muck disposal is required.

Soil Regimes

84. The soils of the state can broadly be divided into nine groups on the basis of their development and physico-chemical properties. These are: (i) alluvial soils, (ii) brown hill soils, (iii) brown earth soils, (iv) brown forests soils, (v) grey wooded or podzolic soils, (vi) grey brown podzolic soils, (vii) planosolic soils, (viii) humus and iron podzolic soils (ix) alpine humus mountain skeletal soils. The soil found in the districts of Mandi, Kangra, Bilaspur, Una, Solan, Hamirpur and Sirmaur is generally brown, alluvial and grey brown podzolic, Kullu and Shimla have grey wooded podzolic soils, while Kinnaur, Lahaul and Spiti and some parts of Chamba district have humus mountain skeletal soils.

Baseline Soil Quality

85. The standards are mentioned in section A7.1 of Annexure 7 while the baseline information of Ambient Noise Quality at the Hatkoti, Barsaini, Bagipul and Mazra substationsis attached in section A7.3 of Annexure 7. The results are found in permissible limit. Soil and water samples were collected and these were measured in four different locations (90^0, 120^0, 240^0, 360^0) on the date mentioned in the table.

Water Resources (Surface and Ground Water)

Surface water

86. Himachal Pradesh has snow fed perennial rivers and rivulets flowing in almost all parts of the state. Yamuna, with its important tributaries of Tons, Pabbar and Giri in the east and Satluj, Beas, Ravi and Chenab in the west flow through various parts of the Himachal Pradesh. Some of the important natural lakes worth mentioning are Khajjiar, Ghadasasu Lamba Dal, Manimahesh, Mahakali in Chamba district; Dal, Kareri in Kangra district; Rewalsar, Kumarwah, Prashar in Mandi district; Bhrigu and Dashahr in Kullu district; Chandratal and Surajtal in Lahaul and Spiti district; Chander Nan in Shimla district; and Renuka in Sirmaur district. The manmade lakes include Gobind Sagar in Bilaspur district; Pong Lake in Kangra district; Pandoh lake in Mandi

district; and Chamera lake in Chamba district.

87. The **Chamba district** is full of perennial springs, which are used for domestic, livestock, and irrigation purposes. For domestic purposes, water has been drawn at source where a rough and ready arrangement exists for filling containers, or elsewhere water channels have been dug to carry water from springhead to the village concerned. Pipelines are also being laid down thus improving the convenience and efficiency of water supply. The drinking water supply for Chamba town, which has a population of 19,933 (2011 Census), is met mainly from two nallahs, the Sarotha and Sal nallahs. The Dalhousie town is situated at an average height of 2200 m amsl. The main source of water supply to the town is from Ahla Khad, Dain Khad and Panjpulla. During the summer season, the requirement is more and the supply is less as discharge of the khads dwindle. The overall chemical quality of the water is good in the district.

88. **Shimla district** is drained by streams/rivers forming part of the drainage basins of the Satluj, the Yamuna, the Pabbar and Tons rivers. However, a major part of the district is drained by tributaries of the Satluj River. The Satluj River is the longest river traversing along the northern boundary of the area and Giri River which is the tributary of the Yamuna River originate from the eastern part and runs in the southwest direction. Whereas, tributaries of Tons River flows in the southern parts and the Pabbar River in the eastern parts of the district. In general, the density of drainage is moderate to high and is not uniform all over the district.

89. **Kullu district** is full of perennial springs, which are used for domestic, livestock, and irrigation purposes. For domestic purposes, water has been drawn at source where a rough and ready arrangement exists for filling containers, or elsewhere water channels have been dug to carry water from springhead to the village concerned. Pipelines are also being laid down thus improving the convenience and efficiency of water supply. The main source of water supply to the town is from Vyas River and its tributaries. Parwati River is another major source of water.

Ground Water

90. **Hydrogeology**. The state essentially is hilly terrain, comprising of fissured formations with a few inter- montane valleys having Quaternary alluvial fill. The sub-mountainous tract is a part of piedmont alluvial plains, which merges with Indo-Gangetic alluvium towards south west. Kandi belt and the adjoining hill slopes are underlain by boulders, gravels and clay. The unconsolidated sediments, occurring in the inter-montane valleys and in the sub-montane tracts constitute the principal ground water reservoirs. The yield of the tube wells ranges 100 to 120m^3/hr in valley fills. The yield of bore wells in hard rock is limited. The quality of ground water is generally good.

91. Richly endowed with perennial rivers that flow down steep gradients in mountain catchments, Himachal has a vast amount of water resources. These resources meet drinking water and irrigation requirements as well as supplying hydroelectric power to a large population. Drinking and irrigation requirements are also catered to by numerous springs, streams and infiltration galleries in limestone caverns. The use of ground water sources for irrigation is common in Una, Sirmaur, Solan and Kangra districts. Due to poor potentialities in hilly hard rock areas and sloping hilly terrain, groundwater development is generally low in Himachal Pradesh. However, in these areas, major water supply and sources of water are ground water based viz., perennial springs, bowries and hand pumps. Springs are tapped at the source so that the water can be supplied under gravity. All major towns and villages are supplied water from ground water sources. The ground water is distributed along structurally weak/ fractured zones, faults, and landslides zones or along the contacts of the different rock formation in the topographically favorable areas.

92. **Baseline Ground Water Quality**. The chemical quality of ground water is generally alkaline in nature and suitable for both domestic and irrigation use all over the **Shimla district**. All the parameters of ground water were found well within the permissible limit of safe drinking water as per Bureau of Indian Standard (BIS). In **Kullu district**, water samples collected from shallow as well as deep aquifers and springs for chemical analysis indicate that the chemical parameters are within the permissible limit of safe drinking water set by Bureau of Indian Standard (BIS), except hot water springs. All the parameters of hot water springs are more than permissible limit and not fit for drinking purposes. The overall quality of ground water is potable and safe for drinking purpose except hot water springs. In **Chamba district**, National Hydrograph Network Stations has not been established in the district so far. However, the water samples collected from various sources like spring and handpumps during the various hydrogeological studies revels that the overall ground water quality is good and is suitable for all type of uses.

93. The standards are mentioned in section A7.1 of Annexure 7 while the baseline Information of Ground Water Quality at the Hatkoti, Barsaini, Bagipul and Mazra substationsis attached in section A7.5 of Annexure 7. These were measured in four different locations (90˚, 120°, 240°, 360°) on the date mentioned in the tables.

Geology and Seismology

Geology

94. **Chamba district**. Chamba district is primarily a hilly district with altitudes ranging from 600 m amsl to 6,400 m amsl. Physiographically, the area forms part of middle Himalayas with high peaks ranging in height from 3,000 to 6,000 m amsl. It is a region of complex folding, which has under gone many orogeneses. The topography of the area is rugged with high mountains and deep dissected by river Ravi and its tributaries. Physiographically the district can be divided in two units-viz. (i) high hills, which cover almost entire district, (ii) few valley hills. The generalised geological succession is given in Table 4.2. The geological map is shown in Figure 4.1.

Table 4.2: The generalized geological succession of Chamba district

Age	Formation	Lithology
Pleistocene	Upper Siwaliks	Boulder conglomerate, Sandstone
Pliocene	Middle Siwaliks	Sandstone, gravel beds, clays etc.
Miocene	Lower Siwaliks	Shales, hard sandstone etc.
Triassic	Kalhel formation	Light and dark grey limestone with banks of phyllite and slate
Permian	Salooni formation	Inter bedded phyllite, light and dark grey limestone, phyllite, black carbonaceous slate with schistose quartzite and chert band
Carboniferous	Manzir formation	Pebbly phyllite, grey green slate with limestone
Lower to Middle Paleozoic	Dalhousie/Dhauladhar formation	Granite and granite gneiss
Lower Paleozoic	Chamba formation	Meta siltstones, greywackes, slates and phyllites.

Source: Ground Water Information Booklet, Chamba district, Himachal Pradesh, 2008.

95. **Shimla district.** Shimla district has high mountain ranges, hills, and narrow deep valleys with altitude ranging from 1,000 to 3,000 m above MSL. In the areas underlain by high hill ranges of Himalayas, the valleys are narrow and deep with steep slopes trending in NW-SE direction. The terrain is moderately to highly dissected with steep slopes. The altitude is higher in north-eastern parts and decreases towards south and west. The generalised geological succession is

given in Table 4.3. The geological map is shown in Figure 4.2.

Table 4.3: The generalized geological succession of Shimla district

Age / Period	Formation	Lithology
Quaternary	Alluvium	Sand with pebble and clay, medium to coarse grained sand with pebble of sandstone and lenses of clay
Proterozoic	Shimla group	Siltstone, greywacke, sandstone, quartzite, conglomerate, Shale, slate, Phyllite, dolomite and meta-volcanic
	Kulu group	Schist, quartzite, banded gneiss, carbonaceous slate, limestone etc.
	Rampur group	Phyllite, schist, quartzite, dolomite, and basic flows
	Vaikrita Group	Biotite schist with kyanite, gneiss and migmatites
	Granite of Himalayas	Granites

Source: Ground Water Information Booklet, Shimla district, Himachal Pradesh, 2008.

96. **Kullu district**. The landscape of Kullu district is mountainous imbedded with rivers and valleys. The altitude of the district ranges from 500 m to 5,000 m above the mean sea level, but the habitation is only up to 3,500 m. The district comprises of physiographic areas viz., Ujhi, Lug, Rupi, Kharahal and Seraj areas. The Seraj area is further divided into inner and outer Seraj. The inner Seraj includes Banjar block and Outer Seraj includes Ani and Nirmand blocks. Geologically the area falls in the Lesser Himalayan segment of the North-West Himalayas. The project area falls in the geological domain of Larji-Rampur tectonic window zone. The Larji-Rampur Window Zone exposes, two Granitoid Complex bodies namely (i) the Bandal Granitoid Gneisses in the north west and (ii) the Jeori Wangtu Granitoid Gneiss in the south-west. The Bandal Granaitoid Gneiss is considered equivalent to the Jeori-Wangtu Gneissic Complex on the basis of similarity in tectonic position, lithology and chronology of the rocks. The Bandal Gneisic Complex, spread over 500 sq. Broadly, the following geological sequence, which includes rocks of Precambrian to Quaternary age, is noticed in the district. The generalised geological succession is given in Table 4.4. The geological map is shown in Figure 4.3.

Table 4.4: Geological succession in Kullu district

Era	Period	Formation	Description
Quaternary	Recent to sub-Recent	Alluvium; fluvial, terrace, piedmont	Sand, silt, clay, boulders, pebble and cobble etc.
Proterozoic	Neoproterozoic	Batal formation Chamba formation	Dark gray carbonaceous slates and phyllites with quartzites Slate, phyllites, siltstones and Greywacke
	Mesoproterozoic	Kullu Group	Slate, Phyllites, Quartzites and Schist
	Precambrian	Largi formation Vaikrita Group Granite & Gneiss	Slate, Phyllites and Quartzite with dolomites and conglomerates Slate, Phyllites and Quartzites Granite, schist and gneisses

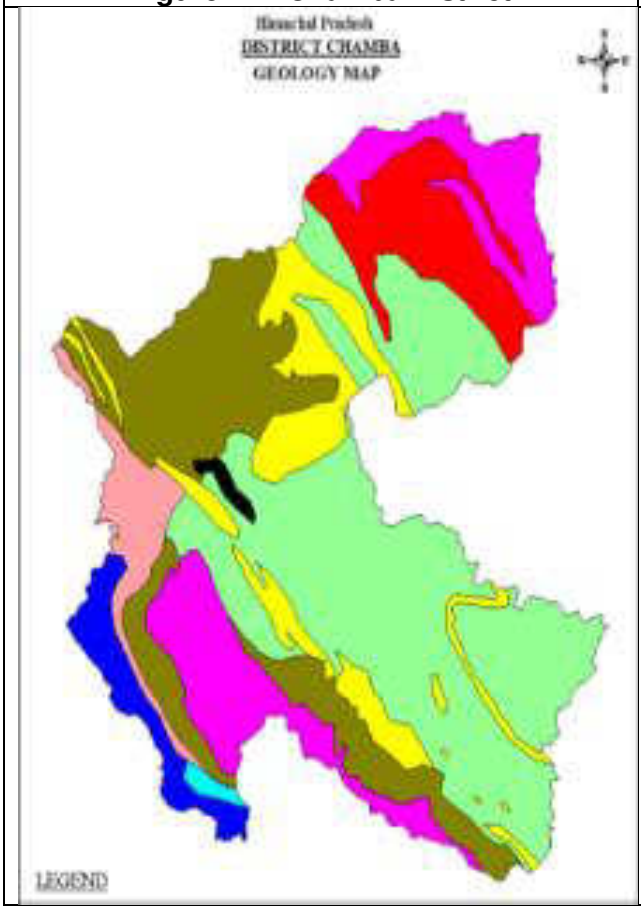
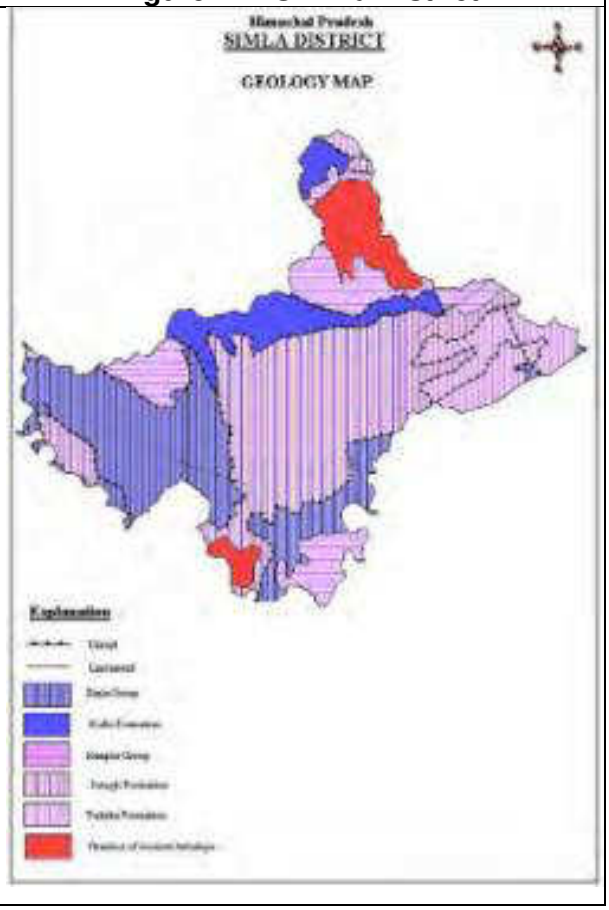
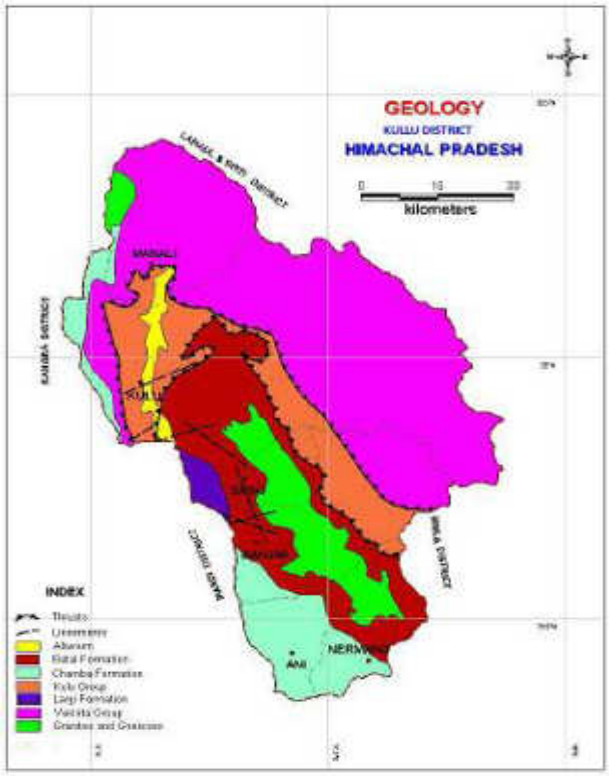
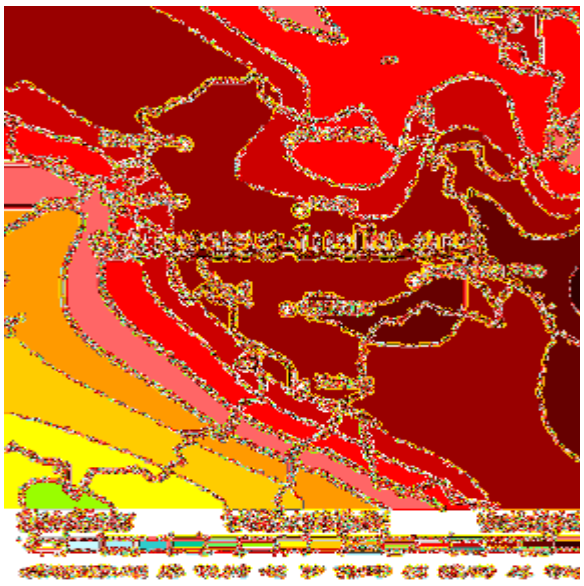
Figure 4.1: Chamba District	Figure 4.2: Shimla District
	

Figure 4.3: Kullu District





Source: Amateur Seismic Centre, Pune, 2011

Figure 4.4: Earthquake Zone of Himachal Pradesh

Seismology of the State

97. The state of Himachal Pradesh lies almost entirely in the Himalayan Mountains, and is part of the Punjab Himalayas. Due to its location, it weathers many mild earthquakes every year. Large earthquakes have occurred in all parts of Himachal Pradesh, the biggest being the Kangra Earthquake of 1905. The Himalayan Frontal Thrust, the main boundary Thrust, the Krol, the Giri, Jutogh and Nahan thrusts lie in this region. Besides that, there are scores of smaller faults, like the Kaurik Fault which triggered the 1975 earthquake. Chamba, Kullu, Kangra, Una, Hamirpur, Mandi, and Bilaspur Districts lie in Zone V. The remaining districts of Lahual and Spiti, Kinnaur, Shimla, Solan and Sirmaur lie in Zone IV therefore the HPPTCL need to take adequate measures while designing to avoid damage during earthquake. Figure 4.4 depicts the earthquake hazard risk zonation of the entire state of Himachal Pradesh. Annexure 8 gives the earthquake history of Himachal Pradesh.

98. The transmission towers and the substation sites fall in Seismic Zone IV area (High Damage Risk Zone – MSK[19] VIII) which indicates a very high damage risk zone. Therefore, HPPTCL is required to take adequate measures while erecting transmission lines to ensure least damage during earthquake. The proposed route alignment passes through Zone IV. Similarly, the proposed substations also fall in Seismic Zone – IV and therefore the HPPTCL needs to take adequate measures while designing and installation of components of subprojects to avoid damage during earthquakes. The transmission lines are lattice structure which itself bears the earthquake shocks even the factors of earthquake are considered during designing of structures.

[19] Medvedev-Sponheuer-Karnik (MSK) intensity broadly associated with the various seismic zones is VI (or less), VII, VIII and IX (and above) for Zones II, III, IV and V, respectively.

4.2 Ecological Resources

4.2.1 Terrestrial Ecology

Forest

99. In Himachal Pradesh, important species of trees such as deodar, kail, chil, oak, mohru and kharsu are found in the forests and the major forest produce are resin and medicinal herbs. The available resin in the district is being processed by two government owned resin and turpentine factories at Bilaspur and Nahan. However, the medicinal herbs are being exported in raw form out of the district. The forests in the district lie mainly in the outer Shivalik to the mid Himalayas. The soil is generally sandy loam and depth is shallow, except in the areas having vegetation where it is fairly deep. In the regions above 1,500 metres, the soil is generally deep and contains a thin layer of leaf molded species of ban, oak, chil, kail and deodar. In the lower elevation, shrub forms are found while in the higher altitude chil, deodar, kail etc. are available. In the lower ranges with warmer aspects and sharp slopes, with deep soil and favourable condition, species of mixed forest, of bamboo and shrubs are found.

100. Forests are an important resource of Himachal Pradesh. Although the area classified as "Area under Forest" is 67% of the total area of the Pradesh, yet the effective forest cover is much lower than this area, primarily because of a very large area in the state is either alpine meadows or is above the tree line. The climatic conditions prevailing in Himachal Pradesh and varying elevations are most suitable for the growth of forests. The forests provide valuable timber, medicinal herbs, raw material for industries and also provide employment and play a vital role in conserving the soil and ensure timely rains.

101. Himachal Pradesh is a predominantly mountainous state. Consequently, its climate is more congenial to forests. It comprises four forest zones—sub-tropical, sub-temperate, wet-temperate and dry-temperate.

- **Sub-tropical forests:** This zone consists of foothills and valleys up to an elevation of about 915 metres above mean sea level with a sub-tropical climate and an annual rainfall of 70 cm–100 cm, of which 75% falls during the monsoon season. The maximum temperature goes up to 40°C. It comprises dry deciduous, chir pine, sal (2,140 sq. km.) and thorny forests (43 sq. km.) mostly of *xerophytes* species.

- **Wet-temperate forests:** These extend from 1,524 to 2,472 metres above mean sea level, and have some major forests and pasturelands. The annual rainfall varies from 100 to 250 cm, with snowfall during winter, when the temperature falls to minus 10°C. During summer, the maximum temperature ranges between 15 and 20°C. These forests have been categorised as (a) lower western Himalayan temperate forests consisting of conifers, oaks and various deciduous trees and (b) western Himalayan temperate forests, which consist of firs, oaks and rhododendron species found in alpine zones.

- **Sub-temperate forests:** These forests extend from 916 metres to about 1,523 metres above mean sea level, have a mild climate and an annual rainfall of 90 to 120 cm, nearly 70% of which is received during the monsoon season. Some upper hills get mild snowfall during winter, which does not stay for long. The maximum temperature in summer remains around 30ºC. Various species of pines, oaks and

broad-leafed species grow in this zone. There are good pasturelands in this area.

- **Dry-temperate forests:** These extend to above 2,472 metres. The mean annual temperature is around 10º C and the mean annual precipitation about 25 cm, most of which is received as snow. The area contains scattered trees and bushes such as *chilgoza*, willow, *robinia*, *ailanthus*, poplars and alpine pastures interspersed with bushes such as *ephedra*.

102. The total area under forests in the three districts and the state of Himachal Pradesh is shown in Table 4.5:

Table 4.5: Forest Cover 2015

District	Geographical area Km²	Very Dense Forest Km²	Moderate Dense Forest Km²	Open Forest Km²	Total Km²	% of Geographical area
Kullu	5,503	586	785	588	1959	35.6
Chamba	6522	853	773	811	2437	37.37
Shimla	5131	739	1037	616	2392	46.62
Himachal Pradesh	55,673	3,224	6,381	5,091	14696	26.40

Source: Forest Survey of India Report, GoI – 2015.

103. The total area under forests in the **Kullu district** is 1,959 km² hectares. The entire area is divided into six forest circles, namely, Kullu, Parvati, Banjar, Ani, Wild Animals and National Park, each having 19.5, 31, 5.29, 10.8, 9.69 and 23.72% of the total forest area, respectively. Again, the forest area has been classified under three categories i.e. reserved forests, protected forests and unclassified forests. Reserve forests occupy 3.24% of the area whereas protected forests occupy 64.8% of the total area. Large scale felling of trees, forest fire, theft, and overgrazing are the major factors resulting in destruction and degradation of forests. Total value of medicinal herbs, resins and other forest products during 2002–2003 amounted to Rs6.1 million.

104. **Chamba district** The Chamba District of Himachal Pradesh is situated between 32° 10' and 33°12' N latitude, and 75°48' and 76°52' E longitude. The altitude varies between 491 and 6,234 meters above mean sea level. The north-east part of this district covers in high mountains. Chamba is the north-western district of Himachal Pradesh. The two-dimensional areas of district Chamba estimated from latitudinal and longitudinal computation from GIS software has been found to be 6,528.00 km^2 and calculated 3-D surface area is 11,674.528 km^2. A supplementary area of as high as 5,194.656 sq. km has been observed to be occurring in the district. The major part of the area under forest cover class (43%) followed by grass and shrub (19%). Only 9% of the areas have been under agriculture use. Non-vegetation/rock comprises of 14% of the total area of the district.

Flora

105. **Chamba district**. Chamba is situated high in the Himalaya, where vegetation is sparse and consists of western imalayantemperate, moist alpine scrub and dry alpine scrub. Species of medicinal importance include A*conitum heterophyllum, Jurinea macrocephala* and *Ephedra gerardiana*, Moist Deodar Forest, Western Mixed Coniferous forests and Montane broad leaf deciduous forests, alpine pastures and sub alpine grasslands.

106. **Shimla district**. The Shimla district is endowed with a variety of trees, shrubs grasses and climbers. In addition to the varieties of trees found in district Shimla mentioned above, *Pinus wallichiana* (Blue pine); *Picea smithiana* (Rai*), Abies spectabilis, Juniperus macropoda, Populus ciliata, Salix viminalis, Quercus dilata, Alnus indica*. *Cedrus deodara, Aesculus indica, Corylus colurna, Juglans regia*, *Prunus cornata*, Pinus *roxburghii* (Chil), *Quercus leucotrichophora, Rododendron arboreum, Lyonia ovalifalia, Acacia catehu, Terminalia chebula, Syzygium cumunni, Emblica officinalis, Mallotus philippinensis* and dominant shrubs comprise of *Salix, Barberis, Rosa, Viburnum, Lonicera* sp. *Carissa opaca, Carissa spinarum, Dodonea viscosa, Indegofera heterantha, Rhamnus virgate*, etc. are also found here.

107. **Kullu district**. The Kullu district is known for luscious quality of apples, apricots, cherries, plums, peaches and pears. In higher reaches where the life is harsh and difficult, the people have been mostly subsisting upon coarse grains and wild products like buckwheat and barley. Kodra, sariara, maize and dried beans have been the staple food of these people. Among the various forest trees, district is rich in alpine vegetation. The commonest trees present are pine, oak rhododendron, deodar, mohru, kharsu and wild walnut.

Fauna

108. **Chamba district**. Important animals found in the district are ibex, musk deer, snow leopard, black bear, blue sheep, himalayan tahr and royle's pika, western tragopan, koklas, monal, green backed tit, black tit, himalayan griffon, snowcock, snow pigeon. Himalayan black bear, leopard cat, common langurand yellow-throated marten, brown bear, goral, himalayan tahr, serow, and cheer pheasant. Other domestic animals like donkey, cow, goats and sheep.

109. **Shimla district**. Important animals found in the district are pig, deer, rabbit, bear, ghurral, kakar, chittal deer, sambar dear whereas birds found are, bater, dove, peacock, black francolin, yellow footed green pigeon, pigeon, jungle fowl kolsa, chakour etc.

110. **Kullu district**. In Kullu, the wild life species found sparsely include common Indian rat, wild cat, himalayan black bear, brown bear, barking deer, musk deer, goral, jackal, langoor, monkey, leopard and panther.

Wildlife Sanctuary

111. For selecting the route alignment, any wildlife travel routes have been avoided as far as possible during the field visits. In Shimla, the least distance between protected area is approximately 85 km distance between Hatkoti substation and *Rakchhamwildlife sanctuary*. In Chamba district, the least distance between protected area is a minimum of 10 km distance between the transmission project sitesand Gamgul Siyabehi Wlifelife Sanctuary and about 18–20 km from Kugti Wildlife Sanctary.In Rohru, the least distance between protected area is approximately 15 km distance between Hatkoti substation and *Talra wildlife sanctuary*. In Kullu district, the least distance between protected area is approximately 4.5 km distance between Barsani – Charor Transmission line and *Great Himalayan National Park and also Kanawar wildlife sanctuary*. Currently, the route alignment for transmission line sub-projects and substation sites has been completed at Kullu PIU. HPPTCL has finalised the final locations of towers lines in a manner that does not infringe upon the Great Himalayan National Park as well as the Manali WLS.

112. Due diligence has been conducted on the environmental sensitive areas. Table 4.6 lists are national parks, sanctuaries, or IBAs beside information section 3 for each component. The

subproject sites are away from all eco sensitive zone. As evident from Table 4.6, all subprojects including transmission lines in the Kullu, Chamba and Shimla districts will not negatively impact the flora and fauna of the area. Annexure 9 includes specific details regarding Wildlife Sanctuaries and National Park within the districts and Figure A10 shows their aerial distance from the wildlife area to the subproject site.

Table 4.6: Distance from WLS and National Parks for all Tranche 3 Subprojects

SNo	Sub-Project	Nearest Aerial Distance	Wildlife Sanctuary	Location
COMPONENT I. Bhabha Nagar PIU (Shimla/kullu District) subprojects				
1	S1 and T1	85 km	Rakchham Chitkul WLS	Sangal valley (Kinnaur)
		25 km	Great Himalayan	Kullu
		285 km	National Park	Kullu
			Manali WLS	
COMPONENT II. Chamba PIU (Chamba District) subprojects				
1.	S2 and T2	10 km	Gamgul- Siyabehi WLS	Chamba
2.	T3	18km	Kugti	Chamba
3.	T4	20 km	Kugti	Chamba
COMPONENT III: Rohru PIU (Shimla District) subprojects				
1.	S3	15 km	Talra WLS	Shimla
COMPONENT IV: Sarabhai PIU (Kullu Districts) subprojects				
1.	S4 and T5	64 km	Manali WLS	Kullu

4.3 Economic Development

Population

113. The population for the three districts and Himachal Pradesh is shown in Table 4.7

Table 4.7: Population details for Districts and Himachal Pradesh state

Description	Himachal Pradesh 2011	Kullu 2011	Chamba 2011	Shimla 2011
Actual Population	6,856,509	437,474	518,844	813,384
Male	3,473,892	224,320	260,848	424,486
Female	3,382,617	213,154	257,996	388,898
Population Growth	12.81%	14.65%	12.58%	12.58%
Area Sq. km	55,673	5,503	6,528	5,131
Density/km2	123	79	80	159
Proportion to Himachal Pradesh Population	100%	6.38%	7.57%	11.86%
Sex Ratio (Per 1000)	974	950	989	916
Child Sex Ratio (0–6 Age)	906	962	950	922
Average Literacy	83.78	80.14	73.19	84.55
Male Literacy	90.83	88.80	84.19	90.73
Female Literacy	76.6	71.01	62.14	77.80
Total Child Population (0–6 Age)	763,864	50,041	69,409	80,778
Male Population (0–6 Age)	400,681	25,504	35,591	42,018
Female Population (0–6 Age)	363,183	24,537	33,818	38,760
Literates	5,1,04506	310,487	328,940	619,427
Male Literates	2,791,542	176,552	189,641	347,013
Female Literates	2,312,964	133,935	139,299	272,414
Child Proportion (0–6 Age)	11.14	11.44%	13.38%	9.93%
Boys Proportion (0–6 Age)	11.53	11.37%	13.64%	9.90%
Girls Proportion (0–6 Age)	10.74	11.51%	13.11%	9.97%

Source: http://www.census2011.co.in/census.

Employment

114. According to the Census, 2001,[20] Himachal Pradesh has 1,963,882 main workers and 1,028,579 marginal workers in the state as per 2001 census. There are around 64.1% of the total working population of Shimla and 68.8% of Kinnaur's working population is engaged as cultivators, 2.7% and 2.3% working population of Shimla and Kinnaur district are engaged in agriculture labours works 1.2% and 1.8% are working in household industries and 32% and 31.1% are other workers. This means that there is one main worker for every 3.09 persons and one marginal worker for 5.91 persons. Combining the number of main and marginal workers, it works out that there is one worker for every 2.03 persons. Table 4.8 shows that majority of the population are workers.

Table 4.8: Population wise percentagemale and female workers in Shimla, Kullu and Chamba district

Area	Population			Total Workers (Main)			Non-Workers		
	Persons	Males	Females	Persons	Males	Females	Persons	Males	Females
Shimla	52.94	60.85	44.30	38.30	50.58	24.88	47.06	39.15	55.70
Kullu	64.45	66.01	56.07	44.27	52.81	35.22	38.55	33.99	43.30
Chamba	56.65	60.76	52.47	23.05	33.41	12.54	43.35	39.24	47.53
Himachal Pradesh	51.85	58.69	44.82	30.05	41.33	18.43	48.15	41.31	55.18

Source: Himachal Pradesh state District Statistical Abstract – year 2015.

115. The mainstay of the people of Himachal Pradesh is agriculture on which 66.71% population depends for their livelihood. The topography being mostly hilly, the type of cultivation is terraced. Close to 80% of all holdings fall in the category of small and marginal farmers. Due to ideal climate for fruit cultivation, horticulture and vegetable growing (seasonal as well as off-season), a well-diversified farm economy has developed rapidly during the past three decades. The percentage of main workers to total population is 32.31 and the percentage of cultivators to main workers is 55.45. The percentage of agricultural labourers to total workers is 1.22 as per 2001 census. Table 4.9 gives the details.

Table 4.9: No of person employed in different type of Jobs in 2011

Type of Job	Industrial and technical	Managerial Jobs	Clerical Jobs	Transport and communication jobs	Artistic job	Other skilled labour	Unskilled	Total
Kullu	5,962	172	2,524	721	1,136	140	37,714	48,369
Chamba	9,294	140	2,300	960	1,776	601	354	15,425
Shimla	6,809	979	13,396	3500	2,100	4,521	40,289	41,610

Source: Himachal Pradesh State District Statistical Abstract – year 2015.

Industries

116. Because of difficult geographical terrain and topography of the **Shimla district**, the chances to set up modern, medium and large-scale industries are quite limited. Therefore, there are only cottage and small-scale industries that rely on varied type of local raw materials, like wool, juices, fruits and wood. The cool and dust free climate of the district is also quite congenial

[20] Currently only a summary of published data for Census 2011 is available, whereas the complete set of data is available only for Census 2001. Annexure 9 has been prepared for comparison which highlights of Census 2011 data in comparison with 2001 data.

for the growth of the electronic industry in the district. There is one electronic complex operating in Shoghi. Cotton carding, threshing, fruit canning preservation, bakeries, and oil expelling are the main agro-based industries operating in the district. Earlier, wooden packaging cases, was the main wood based industry, operating in the district, but with the replacement of wooden boxes by cartons, this industry has lost its importance. However, wooden furniture, toys, sticks, and joinery are still being made in the district. Stone crushers and earthen pottery are the main mineral based industries of the district. There are number of textile based units also which are engaged in the manufacturing of hosiery products, shawls, chaddars, and fancy handicraft. Further, there are some engineering, chemical and electronic based units also operating in the district. Some of the engineering units, are producing barbed wire, wire nails, tin smithy products, steel fabrications, steel furniture, auto repairs and sewing machines and assembling. Laundry soap, detergent, bread wrapper, ink, candle making, tyre retreading are some of the chemical based units set up in the district. Electronic based products being produced in the district are video cassettes, televisions, voltage stabilizers, TV/radio repairs, and intercom.

117. In **Shimla district**, as on 31/08/2015 the registered (MSEs) industrial units Nos. were 3,660 in number. The registered medium scale units were five while there was only one registered large-scale unit. The largest number of units were set up under the industries agro processing industries and then followed by wood and wooden based, embroidery and woolen garments, paper and paper products, respectively.

118. The economy of the **Chamba district** is mostly agrarian. Main minerals found in the district are limestone and slate. Sultanpur is an industrial area of district. Table 4.10 gives the type of registered small-scale industries.

Table 4.10: Registered Small-Scale Industries in Chamba district

	Type of Industries	Number
1.	Food & Allied	477
2.	Hosiery & Textile	435
3.	Wooden Products	347
4.	Leather & Raxin Products	97
5.	Glass/Ceramics	49
6.	Mechanical & Allied	164
7.	Electronic & Electrical	137
8.	Paper & Paper Products	2
9.	Chemical & Allied	93
10.	Miscellaneous	150
11.	Total	1951

Source: Ministry of Micro, Small and Medium Enterprises (GoI) 31.03.2015.

119. In **Kullu district**, there are two medium and large scale industrial enterprises located at village Raison manufacturing natural spring water and aerated water. Total fixed capital investment in these enterprises is Rs154.94 million and providing employment to 147 persons including 21 non-himachalis. 1,817 small scale industrial enterprises (on 31.03.2011) having fixed capital investment of Rs405.465 million provide employment to 10,628 persons, out of which 123 are non-himachalis. Industrial area of Kullu district is situated in Shamshi on N.H. 21, 7 km from Kullu town towards Bhunter. The total area of this industrial area is 82.19 bighas. 43 plots, 12 sheds and 16 shops have been developed in this area. At present 39 industrial enterprises are working in this industrial area having fixed capital investment of Rs90.76 million and providing employment to 414 persons. The details of small scale industry for Kullu is given in Table 4.11.

Table 4.11: Registered Small-Scale Industries in Kullu district

TYPE OF INDUSTRY	NUMBER OF UNITS
Food & food products	301
Mineral water, Soda water	3
Cotton textile	0
Woolen, silk & artificial Thread based clothes.	727
Jute & jute based	0
Ready-made garments & embroidery	102
Wood/wooden based furniture	257
Paper & Paper products	14
Leather based	23
Chemical/Chemical based	18
Rubber, Plastic & petro based	12
Mineral based	38
Metal based (Steel Fab.) and Misc eng.	135
Engineering units	0
Electrical machinery and transport equipment (Home appliances)	5
Repairing & servicing	161
Others	141
Total	1937

Source: Ministry of Micro, Small and Medium Enterprises (GoI) 31.03.2015.

Infrastructure facilities

Rural Roads and Communication System

120. According to district profile of **Chamba district**, district has total 3,227 km of total road network out of which 2,336 km is metalled road. In **Kullu district,** total roads in the district is 1857 km out of which 128 km are double lane, 1,697 km are single lane. In Shimla District 5,327 km is the total road network. Details of road network are given in Table 4.12 below.

Table 4.12: Road Network in district

No	Road Network	Chamba District	Kullu district	Shimla district	Himachal Pradesh State
1.	Total road network	**3,227**	1,857	5,327	35,583
2.	Moterable double lane	**114 km**	128 km	339km	2,416
3.	Moterable single lane	**2,224 km**	1,697 km	4,981 km	31,499
4.	Jeepable	**244**	2	2	272
5.	Less than jeepable	**645 km per**	30 km per	5 km per	1,396

Source: Statistical Abstract of Himachal Pradesh2015 Link http://admis.hp.nic.in/.

Water Supply

121. As per planning department of Himachal Pradesh, all 16,997 villages in the state were provided with safe drinking water facility by March 1994. Availability of piped and potable water supply affects the health of people. As on December 2006, number of partially covered villages was 479 and number of fully covered villages was 6,031. None of the villages in the district remains uncovered. In addition, 938 hand pumps were functional in the district. Though the piped water supply is ensured but quality of water is still a question mark. Water borne diseases constitute single largest group of all diseases.

Electrification

122. As per the district statistical abstract, 100% rural electrification has been achieved in the Kullu, Shimla and Chamba districts.

Land Use

123. The Himachal Pradesh state is spread over deep small valleys and high elevations and cultivation is possible only in small terraces of holdings in the high hills or in the basins of streams/khads. However, in the deep valleys though very few in numbers, the cultivation is spread in a vast area. Most of the land, is either under shrub forests or greasy land with Chil, Pine trees up to the height of 1,500 metres from mean sea level and Kail, Deodar, Rai, Ban, Mauru, Rhododendrons and Kanor on the high altitude. Near the basins of rivers and khads, land is flat and fertile and the cultivation of cereals and pulses and seasonal vegetables is done extensively. Sloping areas of high altitudes are most suitable for horticulture purposes for apples, almonds, walnuts, apricots and others.

124. Prior to the coming of Tenancy and Land Reforms Act, there were three kinds of land tenure systems prevalent in the district and these were (i) Zamindari, (ii) Pattedari and (iii) Bhaichara. Zamindari system of land tenure was abolished after the introduction of Himachal Pradesh Tenancy and Land Reforms Act and most of the cultivators who were tenants of the landlords for generations became the owners of the land except in case of holdings of those land lords who were minors, widows, disabled and service personnel. Land holding in the hilly terrains, of the district are small in size, scattered and fragmented and comprise terraced fields, in major part of the cultivable area. With a view to do away with uneconomical land holdings, the GoHP has taken certain steps for the consolidation of holdings, under the Consolidation of Holding Act. Table 4.13 shows the land use pattern in Himachal Pradesh state.

Table 4.13: Land use pattern of Himachal Pradesh

No	Class	Area (km^2)	Percent
1	Forest	18,003.22	32
2	Agriculture	7,933.37	14
3	Grass/Shrub	9,482.18	17
4	Rocks/Non-vegetation	14,089.85	25
5	Snow/Clouds	3,769.54	7
6	Glaciers	1,952.27	4
7	Water body	442.42	1
	Total	55,672.95	100

Source: Statistical Abstract of Himachal Pradesh2015 Link http://admis.hp.nic.in/

125. There are lots of variations in land physiographic and agro climatic conditions in Himachal Pradesh and consequently, land use pattern varies widely from one region to another. Table 4.14 shows the land use pattern in the three districts.

Table 4.14: Land use pattern of Chamba, Kullu, Shimla districts

(All area is in ha.)

Year/District	Geographical Area by village papers	Forest land	Misc. Tree crops & Groves (Not included in net area sown)	Permanent pastures & other grazing lands	Culturable waste	Land put to non-agricultural uses	Barren and Uncult-urable	Current Fallows	Other Fallows	New area sown	Area sown more than once	Total cropped area
2010-11	4,575,638	1,125,742	64,905	1,507,522	124,121	352,667	778,525	57,497	21,294	543,365	395,260	938,625
Chamba	692,419	272,008	225	348,869	6,871	15,380	4,748	1,942	733	41,643	26,132	67,775
Kullu	64,224	2,520	3,804	3,911	1,300	7,931	3,207	2,604	462	38,485	21,112	59,597
Shimla	525,386	149,692	8,898	235,206	13,078	19,867	11,521	16,089	5,091	65,944	20,524	86,468

Source: Statistical Handbook 2015.

126. Total land requirement for Tranche 3 subprojects is given in Table 4.15.

Table 4.15: Total land* required for Tranche 3 subprojects

SNo.	Project	Feature	Total Land Area	Private Land	Government/Forest land
COMPONENT I. Bhabha Nagar PIU (Kinnaur District) subprojects					
S1	22/66 kV Gas Insulated Switchgear (GIS) Pooling station at Bagipul	Substation land	5,075 sqm	5,075 sq.m	Nil
T1	66 kV double circuit (D/C) transmission line from 66 kV GIS BagipulS substation 21 km to Kotla	RoW-18 Meter	378,000 sqm	68,000 sqm	310,000 sqm
COMPONENT II. Chamba PIU (Chamba District) subprojects					
T2	400 kV (D/C) transmission line from 220/400 kV Lahal substation upto Rajera(ChameraII)	RoW-46 Meter	1,611,610 sqm	823,452 sqm	788,158 Sqmtr
S2	132/220 kV, 2x80/100 MVA GIS substation at Mazra	Substation land	19,250sqm	19,250 sqm	Nil
T3	220 kV D/C transmission line from 132/220 kV GIS sub station Mazra to 33/220 kV Karian substation	RoW35 Meter	635,725 sqm	136,500 sqm	499,225 sqm
T4	220 kV D/C transmission line from Holi Bhajoli To Lahal.	RoW35 Meter	623,106 sqm	316,785 sqm	306,321 sqm
COMPONENT III: Rohru PIU (Shimla District) subprojects					
S3	220 kV GIS switching station at Hatkoti	Substation land			8,000 sqm.
COMPONENT IV: Sarabhai PIU (Kullu and Mandi Districts) subprojects					
T5	132 kV D/C transmission line from Barsaini to 132/220 kV substation at Charor	RoW 27 Meter	994,800 sqm.	274,260 sqm.	720,540 sqm.
S4	33/132 kV 2x25/31.5 MVA GIS substation at Barsaini	Substation land	9,600 sqm.	5,600 sqm.	4,000 sqm.

Agricultural Development/Other income sources

Agriculture

127. Horticulture and agriculture play very important roles in the economy of Himachal Pradesh. The economy of Kinnaur district is predominantly agriculture based where as large as 67.09% of the total working force is engaged in tilling the cultivable land. The space of arable land is small and the cultivation is common on narrow strips along the browse of the mountains. The crops for the most part are poor and a great scarcity of grain pervades. In times of scarcity, horse chestnuts are dried and ground into flour. The standard grains of Kinnaur are barley, phaphra (*Fagopyrum esculentum*) and ogla (*Fagopyrumemerginatum*); barley is sown in March-April and harvested in July after which the fields are prepared for the ogla and phaphra which are harvested in October. At the places where one cropping season is undertaken, the important crops grown are Ooa (*Hordeumcoeleste*), wheat, phaphra and barley which are sown in April and harvested in August-September. The other grains are bathu (*Amranthus*), cheena (*Panicummiliaceum*) and koda (*Paspalumocribiculatum*). Generally, the local millets are grown as cereals. A long and typical winter season is responsible for low production. Non-food crops do not have much of importance. Farming is dependent on irrigation and the main sources are the Kuhls (water channels) drawn from the streams fed by glaciers. Due to high profits, the people have enthusiastically taken to raising off-season vegetable crops like cabbage, peas, tomatoes, beans, seed potato and pulses. Table 4.16 shows the crop calendar.

Table 4.16: Crop calendar for Chamba, Kullu and Shimla District

SNo.	Crop	Month of sowing	Month of harvesting
1	Maize	May to June	October
2	Wheat	October to April	June /September/ October
3	Jo	October/November/May	June/July/September/October
4	Small Jo	June	September/October
5	Mash	June	October
6	Potato	April to June	October
7	Mustard	October/November	May/June
8	Pea	April/June /October	August/October/April/May
9	Rajmah	May/June	September/October

Source: District Statistical Abstract

128. As per the district agriculture plan of **Chamba district**, the farmers of the district generally take two crops per year. Maize is the main crop of the Kharif season and potato and paddy are also sown, in some areas. Wheat and barley are the major Rabi crops. The period of sowing and harvesting of crops depends on the elevations. Millets and coarse cereals like ogla, kangni, cheeney, chilai and bathu constitute important crops of the cold region of Bharmaur and Pangi where maize is not sown during the Kharif. Amongst the vegetables grown during the Kharif season are tomato, peas, potato and cabbage. Mostly these crops are grown to meet local requirements of the cultivators. Six seed multiplication farms are functioning at Bhanota, Rajpura, Bhagat, Thullet, Ahla and Dharwas.

129. The variations in the climatic conditions in the **Chamba district** present immense possibilities for the development of horticulture. The district has suitable pockets for the production of hazenut, chilgoza, apricot, walnut, peach, apple, pear, plum and mango. The apple orchards are located mainly in Churah, Bharmaur, Chamba and Pangi tehsil and salooni sub- tehsils where delicious varieties of red, royal and golden apples etc. are mostly found. Walnut is grown all over the district. Chilgoza is mostly found in Pangi area and certain pockets of Bharmaur tehsil. There

are three olive development centers in the district at Lanji, Sarol and Rajnagar. In order to meet the plant requirements of the cultivator, the department is maintaining progeny orchards and nurseries in the district. In order to provide a market for horticultural produce, the horticulture department of the state government has started fruit canning unit in the public sector at Rajpura and other such unit is functioning at Chamba in the cooperative sector.

130. According to agriculture production, the **Shimla district** can be divided into three broad regions: (i) valleys and basin areas (ii) mid hills and (iii) high hills. The low-lying areas of Rampur, Suni, Kumarsain, Jubbal and Kotkhai, Chopal, Mashobra, Theog and Rohru tehsils, are particularly suitable for the cultivation of cereal crops. In the mid hill areas of these blocks, the scope to produce vegetables, fruits and cereals is immense. The higher elevations of these blocks are suitable, for growing apples, cherry, seed potatoes, almonds and walnuts, paddy, wheat, maize, millets and pulses. Mushroom cultivation and a number of vegetables such as potatoes, peas, cauliflower are also grown in the district. Central Potato Research Institute which has a potato research station in Kufri and potato farms are functioning in Shillaru, Kharapathar, Khadrala and Dhurla.

131. One third of total fruit production of the state is coming from **Shimla district** alone. Nearly fifty per cent of total apple crop of the state is produced in Shimla district. There are two fruit research stations functioning in the districts-one at Mashobra and the other at Kotkhai. Further, there are 17 progeny orchards, 31 plant protection centres, 2 garden colonies, 1 community colony and 6 grading and packaging houses, working in the district. With a view to provide all required essential infrastructure to fruits production, government has set up four cold storage centres at Oddi, Jarol Tikkar, Rohru and Gumma, each with a capacity of one thousand tonnes. There is one canning unit also in the district.

132. Major part of **Kullu district** grows apples and other fruits which are plum, peach, apricot, pomegranates and kiwi as well as nuts, especially almonds. Table 4.17 gives the details of area in hectare under different crops.

133. Horticulture plays an important role in the economic life and prosperity of the people of **Kullu district**. Greater emphasis is being laid on this sector because the geographical features and climatic conditions prevailing in the district are ideally suited for fruit farming. Apart from apples other varieties of fruits grown in Kullu district are plum, peach, apricot, pomegranates, kiwi and nuts, especially almonds.

Table 4.17: Area of Kullu district under different crops

No	Crop	2013-14 (area in ha.)	2014-15 (area in ha.)
Agriculture			
1	Maize	16,337	20,100
2	Jo	3,801	3,801
3	Potato	1,115	1,115
4	Rise	1,498	1,200
5	Wheat	25,972	20,100
Horticulture			
6	Apple	23,180	25,624
7	Other fruits	4,066	4,066
	Total	**27,207**	**27,207**

Source: STATISTICAL Abstract of Himachal Pradesh2015 Link http://admis.hp.nic.in/.

Bee Keeping

134. Bees are very important for apple production as they help in pollination of apple crop for setting of fruits. **Shimla district** has the required flora for bees. In Kotkhai, there is one Ag-Mark laboratory engaged in processing and packaging of honey. There are seven bee keeping stations functioning in the district in Sawra, Nerva, Dodakwar, Hatkoti, Annu, Gauna and Shimla. There are more than 60 commercial private units and more than 500 small private, bee keeping units functioning in the district.

135. As per district agriculture profile of **Chamba district**, Chamba has lots of potential for bee keeping development as a potential enterprise in this district as there is sufficient flora available. In certain locations, farmers are rearing exotic (*Apis mellifera*) as well as indigenous (Apis indica) bee colonies. Both stationary and migratory bee keeping practices are adopted. In Bharmaur, high quality honey is produced due to availability of medicinal flora Chhichhari (*Plectranthrus*). Presently, bee keeping is not a specialised activity but a supplementary enterprise but with the emphasis on horticultural development, the bee keeping may gain importance to harness their complimentary benefits in pollination. With the increase in area under fruit, sufficient bee flora can be produced in flowering season. However, like sheep and goats, migratory bee keeping will be more feasible during winter if the bee colonies are shifted to other areas that time of the year.

136. As per district agriculture profile of **Kullu district**, (GoHP) Kullu has lots of potential for bee keeping development as a potential enterprise in this district as there is sufficient flora available. In certain locations, farmers are rearing exotic (*Apis mellifera*) as well as indigenous (Apis indica) bee colonies. Both stationary and migratory bee keeping practices are adopted. In Gadsa and Bhunter in Kullu, high quality honey is produced due to availability of medicinal flora Chhichhari (*Plectranthrus*). Presently, bee keeping is not a specialised activity but a supplementary enterprise but with the emphasis on horticultural development, the bee keeping may gain importance to harness their complimentary benefits in pollination. With the increase in area under fruit, sufficient bee flora can be produced in flowering season. However, like sheep and goats, migratory bee keeping will be more feasible during winter if the bee colonies are shifted to other areas that time of the year.

Animal Husbandry

137. The livestock census data in Himachal Pradesh state for the last 5 livestock census is given below inTable 4.18 which indicates that the total livestock population has declined by about 4.502 million heads between 1987 and 2012. Though the pastoral and livestock based livelihood is declining in number, the stock is improving in quality as the output is increasing:

Table 4.18: Category wise Cattle as per Livestock Census (Million)

SNo.	Category	1987	1992	1997	2003	2008	2012
1.	Cattle	22.45	21.65	21.74	21.96	22.79	21.96
2.	Buffaloes	7.95	7.04	7.48	7.73	7.62	7.16
3.	Sheep	11.14	10.79	10.80	9.06	9.01	8.04
4.	Goats	11.20	11.18	11.68	11.16	12.41	11.19
5.	Horses and Ponies	0.20	0.14	0.13	0.17	0.136	0.16
6.	Mules and Donkeys	0.31	0.24	0.26	0.33	0.26	0.30
7.	Pigs	0.18	0.07	0.07	0.03	0.02	0.05
8.	Other Livestock	0.02	0.06	0.08	0.02	0.02	0.09
	Total	**53.45**	**51.17**	**52.24**	**50.46**	**52.26**	**48.95**

Source: STATISTICAL Abstract of Himachal Pradesh2015 Link http://admis.hp.nic.in/.

138. **Chamba district** has a total of 814,232 livestock, with 210 veterinary institutions, sheep breeding farms, 1 wool analysis centre, and 47,076 poultry farms. Details of Shimla and Kullu Districts are given in Table 4.19.

Table 4.19: Status of Animal Husbandry

Category	Chamba District	Shimla District	Kullu District
Total live stock	814,232	496,729	371,734
Crossbred	27,994		
Veterinary institutions	210	313	111
Sheep breeding farm	1		
Poultry farm	47,076		
Wool analysis centre	1		
Poultry	47,076	36,778	13,634

Source: STATISTICAL Abstract of Himachal Pradesh2015 Link http://admis.hp.nic.in/.

Fisheries

139. Fishing in the state is regulated under Himachal Pradesh Fisheries Act, 1976. Satluj and tributaries of Yamuna - Giri, Pabber Tons, Ashani and Shalvi have more than 400 km length available for fishing. Some of the fish species are *Torputitora, Salmotrulta, Schyzpthorax, Fasio Salmo, Gairdineri, Gairedinerri Bagarius* and weedy fishes. Fast flowing cold water, in different rivers and khuds is quite suitable for varied species of fish in the district.

140. **Kullu district** has perennial rivers, the Beas, Solang, Manalsu, Chhaki, Parvati, Sujoin, Fozal, Garsa, Kurpan etc. The important variety of fish found in the district is Trout and Himalayan Barbel. Trout fish farms have been established at Patlikuhl, Babeli and Nagni to give a boost to this enterprise. The total fish production in the district during 2012-13 was 8560.89 metric tonnes, the value of which turned out to be Rs.18.5 million.

Mineral Development

141. As per investigation of Geological Survey of India, the minerals available in Himachal Pradesh include limestone, birytes, clays, mica, iron pyrites, salt, gypsum, slate, antimony and lead. The distribution of these minerals is scattered all over the state and includes lime stone in Bilaspur, Sirmaur and Kangra districts; salt and slates in Mandi district; gypsum in Rajban, Bharli in Sirmour district; Lahaul and Spiti and Sapatu in Solan district; byryte in Sirmour, iron ore in Mandi and Kangra; and uranium in Kullu and Hamirpur districts.

Tourism Facilities

142. **Chamba district.** The Chamba town stands on a plateau on the right bank of the Ravi river valley between Dhauladhar and Zanskar ranges south of the inner Himalayas. This town was founded by Raja Sahil Varman when he conquered the lower Rani valley from the petty chiefs called Ranas and Thakurs in the beginning of 10th Century. Important tourism places in Chamba district are Bhuri Singh Museum, Akhand Chandi Palace, Bharmour, Champavati temple, Chamunda Devi Temple, Chaugan, Dalhousie, Hari Rai Temple, Kilar (Pangi valley HQ), Laxmi Narayan Temple, Manimahesh Lake, Rang Mahal, Saho, Sui Mata Temple, Vajreshwari temple, and Chhatrari.

143. **Shimla district**. Shimla district has many places of historical, archaeological and religious

importance. Apart from Shimla town, Kufri, Naldehra, Narkanda, Rohru, Hatkoti, Kotgarh, Rampur, Sarahan are the main centres, of tourist interest. Shimla is also known for a number of fairs and festivals. Lavi fair of Rampur, which has acquired the status of international fair, is the most important and popular fair of the district. Large number of traders come all the way from other states to Rampur to buy woollen articles, dry fruits and medicinal herbs. Certain other fairs held in the district are Sippi fair of Mashobra, Barara fair of Kumarsain, Bhoj fair organized in village Guman in Rohru Tehsil, Charyoli fair held in village Bodna in Chopal tehsil, Chunehar fair of Theog tehsil, Dudhbahali fair of Rampur tehsil. In addition, Jagna Shari fair of tehsil Jubbal, Mahasu Jatar (Mahasu Village), Pathar-ka-khel fair (of Halog), Rampur-k-Jatar (village Rampuri), Rihali Fair (Suni tehsil), Rohru Fair, Sarahan Fair and Shancha fair (Village Baragaon) also take place in the district. These fairs provide not only a good platform for social and cultural integration, but also give a big boost to economic activity.

144. **Kullu valley** well connected by air and road, is situated on either side of river Beas and attracts national and international tourists. The Kullu valley runs north to south of this Beas river and is 80 km long and about 2 km at its broadest. The valley is famous for its exquisitely woven colourful handmade shawls and Kullu caps. Important tourists site in Kullu valley are Manali valley, Bajaura, Banjar, Bijli Mahadev Temple, Camping site Raison, Kasol, Katrain, Larji, Malana, Manikaran, Naggar, Raghunathji Temple, Vaishno Devi Temple and Great Himalyan National Park.

4.4 Social and Cultural Resources

Population and Community

145. According to Surveyor General of India, the total area of Himachal Pradesh is 55,673 km^2. Area-wise, Hamirpur is the smallest district of the Himachel Pradesh which covers an area of 1,118 km^2 (2.01%) and Lahaul and Spiti has the largest area of 13,835 km^2 (24.85%). The total population of Himachal Pradesh, according to 2011 census was 6,856,509, which gives a population density of 129 persons per km^2. There are wide variations in area and population of the districts and the district-wise density varies from 2 persons per km^2 in Lahaul and Spiti to 406 persons in Hamirpur district. Out of the total population, the number of males and females is 3,481,873 and 3,382,729, respectively, which means that the number of females per 1,000 males is 972. The sex ratio of females per thousand males has been rising continuously in Himachal Pradesh since 1951 census but declined from 976 in 1991 census to 968 in 2001 census. The total percentage of rural population is 90.20% of the total population residing in 17,495 inhabited villages. Himachal Pradesh has the highest percentage of rural population among all the states of the country. The scheduled caste population in the state is 1,729,252 (2011 census) which is 25.19% of the total population as per 2011 census. The scheduled tribe population which has its concentration in districts of Kinnaur and Lahaul Spiti and parts of Chamba district and scattered in other districts is 392,126, which is 5.71% of the total population. About 60% of the state's tribal population falls under the tribal sub-plan areas.

146. There are 56 urban local bodies - one nagar nigam, 20 municipal councils and 28 nagar pachayats and 7 cantonment boards, seven cantonment areas and one census town in Himachal Pradesh. The population of these urban settlements is 688,552 as per 2011 census. The largest is Shimla with a population of 201351 and the smallest is Narkanda with a population of 782.

147. In 2011, **Chamba district** had a population of 519,080 of which male and female were 261,320 and 257,760, respectively. In the 2011 census, Chamba had a population of 460,887 of which 235,218 were males.

148. The population of the **Shimla district** was 814,010 (2011 census), of which 425,039 (53%) males 388,971 (47%) female, sex ratio (F:M) is 915**:**1000 and density of population is 147 per km^2. The rural and urban population is 555,269 (77%) and 167,233 (23%), respectively. The schedule caste and scheduled tribes population in the district is 26% and 0.60% respectively. In 2001, census was not done in Kinnaur district due to occurrence of natural calamities in the year.

149. The total population of the **Kullu district** was 396,512 as per the 2011 census, which accounts for 6.38% of the state's population of which males were 203,269 and remaining 193,243 were females.

Education Facilities

150. According to 2011 census, the overall literacy percentage of Himachal Pradesh was 83.78% (90.83% for males and 76.60% for females). Comparatively, it is much higher than the all-India literacy rate, which is 65.38%. The literacy rate in Himachal Pradesh has been improving faster than the all-India figures. Himachal Pradesh is characterised by a very strong correlation between sex ratio (females per thousand and males) and literacy. Districts with higher density of female population vis-à-vis male population have high literacy rates.

151. There are 1,612 primary school and 350 secondary and 306 higher secondary schools in **Shimla district** and 189 primary schools and 38 secondary and 44 higher secondary schools in **Kinnaur district**. There are 1,115 primary school and 81 secondary and 85 high schools in **Chamba district**. The details are shown in Tables 4.20 and 4.21.

Table 4.20: Detail of School and Colleges in year 2014–15 in Shimla, Chamba and Kullu districts

S no.	Item	Shimla	Chamba	Kullu
1	Primary schools	1,605	1,158	754
2	students enrolled in Primary Schools	39,820	42,218	27,062
3	Teachers in Primary schools	3,577	2,976	1,898
4	Middle schools	343	257	127
5	students enrolled in MiddleSchools	27,078	27,772	18,278
6	Teachers in Secondary schools	4,459	2,265	1,459
7	Higher Secondary Schools	356	196	123
8	Students enrolled in Higher Secondary	39,820	33,624	24,158
9	Teachers in Higher Secondary Schools	4,926		
10	Colleges	19	9	6

Source: District Statistical Abstract 2014-15.

152. The districts have some technical and law colleges, distance learning programs and correspondence courses offered by various study centres under Open University Scheme of Indian Universities.

Table 4.21: Detail of Educational institutes and literacy in Chamba district

Degree colleges	9- Chamba, Chowari, Banikhet, Salooni, Tissa, Pangi and Bharmour.
B. Ed. College	1-Chamba
Polytechnic institutes	2- Chamba and Banikhet.
Senior secondary schools	196
High schools	85
Middle schools	257
Primary schools	1,158
Literacy rate	72.17% (2011 CENSUS)
Male literacy	82.59%
Female Literacy	61.67%

Source: District Statistical Abstract 2014-15.

153. Average literacy rate of **Kullu district** in 2011 were 80.14 compared to 72.90 of 2001, Male and female literacy were 88.80 and 71.01, respectively. For 2001 census, same figures stood at 83.98 and 60.88 in Kullu District. Total literate in Kullu District were 310,487 of which male and female were 176,552 and 133,935 respectively. In 2001, Kullu District had 239,649 in its district. The number of primary schools has increased from 425 in 1995 to 730 in 2006-07, the impact of which has been reflected by the increasing literacy rate in the district. The number of middle and high/senior secondary schools has also increased over the period. In order to provide higher educational facilities, the number of colleges has increased to four during 2006-07. The teacher-student ratio at primary level has decreased over the period and is 1:13 at present but at middle level the ratio is 1:65 which needs to be reduced by increasing the number of teachers (details in Table 4.22).

Table 4.22: Number of Recognized Schools and Colleges in Kullu District (2010-11)

Year	Primary schools	Middle schools	High / senior secondary schools	Colleges
2006-07	730	115	87	4
2007-08	741	129	104	4
2008-09	741	128	104	4
2009-10	743	128	104	4
2010-11	749	127	104	4

Source: Himachal Pradesh State District Statistical Abstract 2014-15.

Health Facilities

154. **Shimla district** has 1,645 allopathic hospitals, 92 community health centres, 116 primary health centres, and 28 civil hospitals. **Chamba district** has one civil hospital, eight community health centres, 42 primary health centres, and 176 sub centres. **Kullu district** has two civil hospitals, three community health centres, 21 primary health centres, and one Homeopathy health centre. Table 4.23 gives the details.

Table 4.23: List of Government Institutions

SNo.	Health Institution	Kinnaur	Shimla	Chamba	Kullu
1	Regional Hospitals	1	1	1	1
2	Civil Hospital	1	28	3	5
3	Community Health Centers	3	92	8	3
4	Primary Health Centers	21	116	42	21
5	Sub-Centers	31	112	176	99
6	Ayurvedic Hospitals	1	2	2	
7	Ayurvedic Dispensaries	27	147	99	

SNo.	Health Institution	Kinnaur	Shimla	Chamba	Kullu
8	Rural Centers			3	
9	Homeopathy Hospital			2	1
10	Available Beds				99

Source: Himachal Pradesh State District Statistical Abstract 2014-15

155. As per the reports of Planning Department of Himachal Pradesh, Table 4.24 shows the status of various infrastructure in the state as on 31 March 2014.

Table 4.24: Rural Infrastructure in Himachal Pradesh at the end of 31 March 2014

Nos.	Item	Unit	Position as on 31.3.2014
1	Road Length (Motorable)	km.	30,302
2.	Villages connected with Roads	No	9,243
3	Bridges	No	1,604
4	Primary Schools	No	10,751
5.	Middle Schools	Nos.	2,338
6	High Schools	Nos.	835
7	Senior Secondary Schools	Nos.	223
8	Veterinary Hospitals	Nos.	283
9.	Veterinary Dispensaries	Nos.	1,753
10.	PHC/CHC/RH/SHCs	Nos.	522
11.	Health Sub-Centres	Nos.	2,071
12.	Civil Dispensaries	Nos.	41
13	Ayurvedic Dispensaries	Nos.	1,126

Source: Himachal Pradesh State District Statistical Abstract 2014-15.

Sites of Cultural, Archaeological and Historical Significance

156. **Chamba district**. Chamba is the capital of a culturally rich ancient hill state. It has been endowed with numerous monuments of varying antiquity which include temples, palaces, stylish buildings of high aesthetic value and beautiful green spaces known as *chowgan*. The monuments like Akhand Chandi Palace, along with Zenana Palace, Lakshmi Narayan Temple, Rang Mahal and above all the majestic *chowgan* are valuable historical and cultural assets. *Akhand Chandi* and *Zenana Mahal*werebuilt by Raja Umed Singh sometime between 1748 and 1764. *Laxmi Narayan Temple, Bansigopal Temple, Sita Ram Temple, Champavati Temple, Hari Rai Temple, Vajareshwari Temple, Chamunda Devi Temple, Suhi Mata Temple, Temples of Chauntra, Kharura and Jansali Mohallas* are the other historic and cultural important places of Chamba. There is also a fair organised every year from 15th of the Chait to the first of Baisakhi which is popularly known as Sui Mata ka Mela.*Bhuri Singh Power House* is a hydel generation power house made by Mian Bhuri Singh, who became the Raja of Chamba in 1904. This was the first power house in the northern India. As such Chamba town had electricity even before Lahore.The project locations are at a considerable distance from these sites.

157. **Shimla district.** The ancient Hatkoti Temples are not within the project area. On the basis of the architectural design and style of sculpture it is believed that the Hatkoti temples belong to the Gupta period and must have been built between the 6th and 9th century A.D. At the heart of the Hatkoti valley stand the hills of Sunpuri, merging into each other, making it sacred for the localities to call it the Ardhnarishwar. Surmounting this hillock is a small temple with another finely chiseled image of Mahishasurmardini, made of stone. Small temples scattered nearby are said to have been built by the Pandavas. Once the capital of the Princely State of Bushahr, the Rampur town situated on the Hindustan Road along the banks of Satluj river has Dumgir Buddhist Temple, Padam Palace, Raghunath Temple, Ayodhya temple and Narsingh Temple. In the month of

November, the Lavi Fair is organized here. Narkanda (2708 m) has an ancient temple of Hatu Mata as well as wonderful slopes for skiing. Beyond Rampur, a small village, Sarahan provides a spectacular view of Shrikhand Mahadev (5227 m) and hiking opportunities to the nearby villages such as Ranwin and Bashal Peak. The Bhimakali temple, dedicated to Goddess Durga, where as per legend, this is where goddess Shakti destroyed the mythical demon king, Bhasmasur. At Tattapani, 51 km from Shimla, there are hot sulfurous springs as well as Shiv Goofa at Saraur (4 km). The project locations are at a considerable distance from these sites.

158. **Kullu district.** Raghunathji Temple is dedicated to the chief deity of Kullu-Raghunath Ji. Dussehra festival is held in its name. The idol is same which was used by Lord Rama himself at the time of Ashwamegh Yagya and was brought from Tretnath temple of Ayodhya. Vaishno Devi Temple, on the way to Manali 3 km from Kullu has a small cave just like Vaishno Devi Temple. Bhakhali Temple, about 10 km far from Kullu, is the adobe of Jagannathi mata, also called as Bhuweneshawari, sister of Lord Narayana. The temple is 1,500 years old. Bijli Mahadev Temple (2,435 m) on Mathan is 11 km from Kullu. Addi Brahma Temple (Khokhan) is 12 km from Kullu on a link road from Shamshi at 4 km distance from there. The temple of Aadi Brahma is in Pagoda style. Other important cultural and heritage sites of Kullu district are Bishweshwer Temple (Bajuara), Rama Temple (Manikaran), Gurudwara Shri Narayan Hari (Manikaran), http://hpkullu.nic.in/TourPilg.html - TopDhungri or Hadimba Temple, Manu Maharaj Temple (Manali-Village), http://hpkullu.nic.in/TourPilg.html - TopVashistha Rishi Temple (Manali), Rama Temple (Left Bank), http://hpkullu.nic.in/TourPilg.html - TopGauri Shankar Temple (Left Bank), Sandhya Devi Temple (Left Bank), Dashal Temple (Left Bank), http://hpkullu.nic.in/TourPilg.html - TopTripura Sundary Temple (Naggar), Guari Shankar Temple (Naggar), Murlidhar Temple (Thawa-Naggar), Vishnu Temples (Naggar), http://hpkullu.nic.in/TourPilg.html - TopShringa Rishi Temple (Banjar), Parshuram Temple (Banjar), Ambika Temple (Banjar), http://hpkullu.nic.in/TourPilg.html - TopShrikhand Mahadev (Banjar), and Dhar Deo Dhank Cave (Nirmand).The project locations are at a considerable distance from these sites.

5.0 ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

5.1 Environmental Impacts and Mitigation Measures

5.1.1 Environmental Problems Associated with Project Location and Design

160. Potential adverse environmental impacts associated with transmission lines have been avoided or minimised through careful route selection. The alignment is sited away from major settlements, whenever possible, to account for future urban expansion. Forests and vegetation areas have been avoided wherever possible; and flexible tower placement, tower design for placing conductor at height and selecting alignment that has hilltop-to-hilltop route shall be selected to minimise cutting of trees in the forest areas. Alignment in this project has avoided geologically unstable areas, which can also pose foundation related problems. Land acquisition is required for placing transmission towers on private land. However, any damage to the crops during the construction phase of the project will be compensated by HPPTCL as per its national, state, corporate and ADB's policy. Associated impacts on agricultural land will be restricted to the construction phase and will be temporary in nature. After construction, agricultural land within the transmission corridors can be used again for farming purpose of crops less than 3 m in height.

5.1.2 Environmental Impacts Associated with Pre-Construction Stage

Acquisition of Cultivable and Non-cultivable Lands

161. There may be some permanent loss of agricultural/horticultural productivity due to reduction in land availability due to acquisition of land for tower bases and substations which will have to be dealt with according to resettlement plan for the project. However, wherever only temporary loss of productivity happens, the following measures will have to be taken prior to the project activities:

- Avoid harvesting season wherever possible for the project activities,
- Ensure existing irrigation facilities are maintained in working condition,
- Protect /preserve topsoil and reinstate after construction is completed,
- Repair /reinstate damaged bunds after construction is completed, and
- Compensation for temporary loss in agricultural production.

Impacts on Temporary Use of Land

162. The mobilisation of construction equipment and construction materials will require space for storage and parking of construction vehicles and equipment, construction material storage yards, disposal sites, and labour camps for human resource to avoid environmental impacts and public inconvenience. These locations must comply with the local laws and regulations and need approval from authorities to utilise these facilities (access roads, telecommunication, and pipe borne water supply). It is important that selection of temporary lands is at least 500 m away, depending on practicability as per local site conditions from highly populated areas, water bodies, natural flow paths, agricultural lands, important ecological habitats and residential areas. Removal of trees and green cover vegetation should be minimised during preparation of facilities.

5.1.3 Environmental Problems Associated with Construction and Operation Stage

163. The project activities during construction phase will involve clearing of trees along the route alignment wherever required, excavation for installation of towers, erection of towers, civil works related to transmission line and line stringing. For substations, it will involve excavation for building and equipment foundations, civil works and erection of equipment. During the operation phase, most of the construction phase impacts will get stabilised and the impacts will be restricted only to the operation and maintenance of the project.

164. The impacts on the environment from various activities of the project can be categorised as follows:

- Impact on Physical Resources
  - Impact on Topography
  - Impact on Climate
- Impact on Environmental Resources
  - Impact on Air Quality
  - Impact on Noise Levels
  - Impact on Surface Water Quality
  - Impact on Ground Water Quality
  - Impact on Soils and Geology
- Impact on Ecological Resources
  - Terrestrial Ecology
  - Wild Life
  - Aquatic Ecology
- Impact on Human Environment
  - Health and Safety
  - Agriculture
  - Socio-economics
  - Resettlement and Rehabilitation
  - Cultural sites
  - Traffic and Transport
  - Interference with other utilities and traffic
- Waste Disposal
  - Solid waste disposal
  - Liquid waste disposal
  - Hazardous waste disposal.

165. The impacts of the project activities on various environmental attributes are discussed in subsequent sections.

Impact on Physical Resources

Impact on Topography

166. During the construction of the transmission line and substation, the topography will change due to excavation and erection of tower, fill and cut for levelling the tower erection place. The most prominent impact on the surface topography will be due to the removing of the trees at the tower erection site if required, and along the Right-of-Way (RoW). This will lead to change in the surface features only. The impact will be irreversible as the present features along the RoW will

be changed due to presence of the transmission line. Table 5.1 provides the RoW for different voltages as per handbook of Forest (Conservation) Act, 1980, Forest (Conservation) Rules, 2003 (with amendments made in 2004).

Table 5.1: Transmission Voltage (kV) Width of Right of Way (in Meters)

Transmission Voltage (kV)	Width of Right of way (Meter)
11 kV	7
33 kV	15
66 kV	18
132 kV	27
220 kV	35
400 kV S/C*	52
400 kV D/C*	46
800 kV	85

* As amended as per F. No.*-44/2011-FC (Pt) circular dated 24 Jan 2012

167. No topographical changes are envisaged during the operation phase of the transmission line and the substation. The existing access routes will be utilised during the operation and maintenance of the transmission lines.

168. Cutting and filling of topsoil will be done at substation sites; however, the total muck generate will be used entirely inside the substation land. Table 5.2 gives the volumes of cutting and filling required at each site.

Table 5.2: Cutting filling operations required at substations (in cum.)

No	Name of Substation	Cutting Quantity	Filling Quantity	Net
1	22/66 kV Substation Bagipul	18000Cum	18000Cum	Nil
2	132/220 kV SubstationMazra	32000cum	32000Cum	Nil
3	22/132 kV substation Barsaini	25000Cum	25000Cum	Nil
4	220 kV switching substation Hatkoti	14000Cum	14000Cum	Nil

Impact on Climate

169. The project area consists of both cultivated and uncultivated lands which grow predominantly single season crops during the monsoons. There will be no large-scale removal of trees/cultivation and therefore there will be no impact on the climate conditions from the proposed project both during the construction and operation phases. Since the number of trees likely to be felled are minimum and the compensatory afforestation shall be done by the Forest Department in double the area for which the case for forest diversion will be submitted as per the policy/Forest Conservation Act. Therefore, there will be minimal impact on forests – carbon sinks in the project area. However, climate change related impacts to the project elements are mentioned in climate change risk assessment in Section 7.

Impact on aesthetics of landscape

170. The transmission lines and substations do not look aesthetic with the scenic landscape of the area as these cause visual pollution in tourist areas. Therefore, HPPTCL has undertaken extensive route surveys to ensure to minimise the disturbance of the transmission lines to the area and decrease it tourist attraction by using newer techniques such as using monopole

structures instead of lattice structures for transmission.

Impact on Environmental Resources

Impact on Air Quality

171. During the construction phase, the activity would involve excavation for the tower erection, movement of vehicles carrying the construction materials along the haul roads. At majority of tower locations, movement by vehicle is not possible from approach road to construction site and the material has to be head loaded. All these activities would give rise to emission of dust particles thereby affecting air quality marginally at the site. The impact will be transitory in nature and therefore is assessed as of low significance. Covering of stockpiles, minimising double handling and drop loads as well as sprinkling of water during excavation will reduce the dust emission to a great extent. There is no movement of loose soil at base of transmission tower, however, if any loose soil is removed from substation site, it will be done using covered trucks to reduce dust.

172. The construction of transmission line and the substation will not have any negative impact on the air quality of the region during the operation phase.

Impact on Noise Levels

173. During the construction phase, the major sources of noise pollution are movement of vehicles carrying the construction material and equipment to the site. Most of the access roads along the alignment are motor able and project traffic would be negligible. The major work of the construction is expected to be carried out during the day time. Apart from vehicles bringing in materials to the nearest road, construction works for the transmission line will not require powered equipment. As such, noise emissions will be minor. As the predominant land use along most part of the alignment is agricultural/forest, there will be few residential areas exposed to noise generated during the construction phase and the noise produced during the construction period will have negligible impact on residents.

174. Following measures will help to keep noise and vibration in acceptable level during construction phase:

- Contractor shall preferably limit working time for activities that create noise within normal day hours of the public except for construction site near public sensitive receptors. Construction related activities closer to sensitive receptors have to be scheduled in coordination with the relevant authorities and community.
- Noisy equipment such as generators should be sited away from residential areas.
- Contractor and suppliers of construction materials should strictly implement noise control regulations stipulated by the Noise Pollution (Regulation and Control Rules 2000) for all construction vehicles and equipment as applicable to residential areas (55 dB/45 dB) in accordance with national standards.[21]
- At substation sites, contractor shall equip their heavy construction equipment and plants with exhaust silencers to limit the engine noise so as not to exceed 70 dB (compacters/rollers, loaders and cranes) and regularly maintain all construction vehicles and machinery that should meet the CPCB's Noise Standards.

175. During the operation phase of the project, there will be corona noise from the conductors

[21] Also in compliance with World Bank's EHS Guidelines 2007.

which will be felt only up to 15 to 30 m area (beyond any residential house etc.), hence the ambient noise level meets the CPCB standard for residential areas (55 dB(A) during daytime and 45 dB(A) during night time).

Impact on Surface Water Quality

176. The construction and operation of the transmission lines will not have any major impact on the surface and ground water quality in the area. Contamination of water bodies may result due to construction of access road to the substation site, spilling of construction materials and surface runoff from the construction site joining the water body. There may be increase in the turbidity levels temporarily where the proposed alignment is crossing a watercourse and if the surface runoff during construction meets the river. This can be avoided by careful selection of the tower site and the temporary access roads so that the surface runoff does not meet the river.

177. Proposed activities can create temporary impacts to the existing drainage system in the area including irrigation canals, natural flow paths and also earth and line drains in the agricultural fields. Thus, incorporation of following measures will minimise anticipated impact due to obstruction of natural flow paths and existing drainage:

- Provisions of temporary drainage facilities and routing ponds to the particular locations if existing drains are obstructed due to construction activities.
- Maintenance of all drainage paths by avoiding blockages at all times.
- Contractor should minimise excavation of beds of any streams, irrigation systems, and other water resources available in the project area.
- Stagnant water should be cleared by the contractor.

178. Care shall be taken to locate the temporary construction worker sheds at a substation site away from any water body. Adequate drinking water facilities, sanitary facilities and drainage in the temporary sheds of construction workers should be provided to avoid the surface water pollution. Provision of adequate[22] washing and toilet facilities should be made obligatory. This must from an integral component in the planning stage before commencement of construction activity by the contractor. Operation of transmission lines will not cause any release to the surface water bodies.

Impact on Hydrology and Water Resources

179. Water needs during construction of the project would be limited to sanitary water and minimal amounts of water for construction (such as spraying for dust prevention). There would be a negligible impact on water resources considering the abundant water resource in Himachal Pradesh. Operation of the transmission lines would neither require any water nor pollute the water resources.

Impact on Ground Water Quality

180. Ground water pollution can take place, if chemical substances and oily waste get leached by precipitation of water and percolate to the ground water table. For transmission line construction activity, no chemical substance or oil is used hence there is no impact on ground water quality. The silt discharge from the earth work around water bodies, oil, grease and fuel

[22] Toilet connected to septic tanks, washing facilities of hot and cold water, male and female, separate area for preparation of food away from toilet area, provision of gas for cooking etc.

release from the construction vehicles/equipment and spoil from construction and other construction related activities such as raw sewerage from worker accommodation sites may mix with runoff water. This situation will accentuate during the rainy season and could have a significant impact on surface and ground water. Thus, following measures will be required in order to prevent deterioration of water quality from the construction and construction related activities:

- All construction vehicles and equipment should be maintained in proper conditions without any leakages,
- EPC Contractors shall use silt traps and erosion control measures where the construction is carried out in close proximity to the water bodies to avoid entering of cement particles, rock, rubbles and waste water to the surrounding water bodies,
- Construction activities requiring digging should be preferably done in the dry season, and
- Waste oil should be collected properly and disposed to the approved recyclers.

Impact on Soil and Geology

181. Project activities including excavation, cut and fill operations, removal of trees and green cover vegetation will enhance the soil erosion during the rainy season. Removal of trees and green cover vegetation will reduce infiltration rate of rainwater. The impact on soils will be due to the soil erosion at the tower construction sites along the access routes. The excavation activity and land clearance in the erosion prone areas have to be minimised while conducting the site selection for towers. Revetment and stabilisation of tower construction sites will be done after completion of construction activity. Also increased acceleration of surface runoff will damage the topsoil. The impacts associated with excessive erosion and other civil works can be avoided or minimised by following mitigation measures:

- Maximum effort should be taken to minimise removal of trees and green cover vegetation.
- Minimise obstruction or destruction to natural drainage pattern of the surrounding area.
- Proper treatment of clearing and filling areas against flow acceleration.
- Turfing work should be taken prior to rainy season around the substation.
- Contractors shall follow proper muck disposal plan for cut and fill operation around sharp/deep slope areas.
- Piling activities will preferably be done in dry season, as the piled materials will spread all over the area and contaminate close by water bodies.
- Top soil (2-3 cm from the top of the soil), which is removed during construction from the cultivated lands must be stored separately for future utilisation of cultivated lands near tower leg locations.

Impact on Ecological Resources

182. Since the substation is constructed in vacant government/private land and transmission line is routed away from urban/rural areas and mostly through barren/agricultural land having very scarce scattered population, there is no displacement of people or animals. It is also not causing any disturbance to the life of people and local animals and birds movement as there are no Important Bird Areas (IBAs) in the vicinity. In transmission line construction, there is no dynamic equipment and moving machinery causing noise pollution, water and air pollution. There is no national wildlife park, wildlife sanctuary, bird sanctuary, wetland in the route alignment of the

proposed transmission line. The ecological impacts are briefly described in the following sections.

Effect on Flora and Fauna

183. Some forest and fruit trees will need to be removed from the project area for the RoW after getting prior permission from competent authorities of Forest Department (GoHP) and if required MoEFCC. According to the site assessments, none of the declared environmentally sensitive areas is located within the route alignment. As per forest department records, none of the flora and fauna that are rare, endangered, endemic or threatened are present in the project affected area. The route alignments and site selection have been done only after consulting the local forest authorities ensuring that route alignments do not interfere with known paths of migration of wildlife.

184. However, noise, vibration and emission from construction vehicles, equipment will occur during pre-construction and construction stages in temporary manner. The impacts related to above activities can be mitigated through following measures:[23]

- Strict attention on worker force regarding disturbance to surrounding habitats, flora and fauna including hunting of animals and fishing in water bodies,
- Selection of approved locations for material storage yards and labour camps away from the environmental sensitive areas, and
- Prevent entering of construction waste (cement particles, rock, rubbles and waste water) and sanitary waste to the surrounding water bodies.

Impact on Terrestrial Ecology

185. There is no sensitive ecological area / protected forest area such as national wildlife park, wildlife sanctuary, IBAs or any bird sanctuary crossing the proposed route alignment. The removal of herbaceous vegetation from the soil and loosening of the top soil generally causes soil erosion. However, such impacts would be primarily confined to the project site during initial periods of the construction phase and would be minimised through adoption of mitigation measures like paving and surface treatment and water sprinkling.

Removal of Trees

186. The project may require some fruit/non-fruit trees to be removed during the construction activities. Table 5.3 gives the list of trees to be felled for Tranche 3 subprojects. The initial construction works along the alignment involving land clearance, cutting, filling, and levelling that may cause loss of vegetation. This will be an irreversible impact. Care has been taken to avoid the thick plantations/vegetation as far as possible and tower locations are selected mostly in plain cultivable fields where the vegetation is thin. This will minimise tree losses. Compensation will be paid to tree owners in the private areas as per GoHP rules. Where the clearing of fields and forest area is unavoidable along the route alignment, the compensatory afforestation will be required for forest areas for which clearance will be obtained from the appropriate authority of the forest department; and for fruit and non-fruit trees in the fields, the amount for compensation for fields will be paid directly to the farmers.

[23] The compliance to the above shall be resonsibility on the contractor as per contract provisions. Any violations reported by the public shall be dealt as per provisions of the law.

Table 5.3: Total Number of Trees to be felled for Tranche 3 subprojects

Sub-Project	Details	Private Land		Forest Land
		Total number of fruit trees to be felled	Total number of non-fruit trees to be felled	Total number of forest trees to be felled
COMPONENT I. Bhabha Nagar PIU (Kinnaur District) subprojects				
S1	66 kV Gas Insulated Switchgear (GIS) switching station at Bagipul	40	25	10
T1	66 kV double circuit (D/C) transmission line from 66 kV GIS Bagipul s station to Kotlao substation	20	69	164
COMPONENT II. Chamba PIU (Chamba District) subprojects				
T2	Lahal-Rajera transmission line details	2	428	428
S3	132/220 kV, 2x80/100 MVA substation at Mazra			
T3	Mazra-Kariantransmission line details	Nil	26	6
T4	220 kV double circuit (D/C) transmission line on D/C towers from Holi Bhajoli to Lahal substation	26	135	135
COMPONENT III: Rohru PIU (Shimla District) subprojects				
S3	220 kV GIS switching station at Hatkoti	Nil	Nil	Nil
COMPONENT IV: Sarabhai PIU (Kullu and Mandi Districts) subprojects				
T5	132 kV D/C transmission line from Barsaini to 132/220 kV substation at Charor	200	1026	379
S4	33/132 kV 2x25/31.5 MVA GIS substation at Barsaini	120	100	Nil

Effect on Local Road Network

187. Transformers, tower material, substation equipment, iron bars, concrete materials, piling equipment, will be transported through the provincial and local road network to the project site. Transporting of large quantities of materials using heavy vehicles could exceed the carrying capacity of the road. This would lead to physical damages to local road network. Thus, it will be necessary to obtain consent from Public Works Department (PWD) or National Highway Authority to use local/national highway roads prior to transportation. Also, the contractor should properly maintain all road sections, which will be utilised for the construction related activities. Speed limits should be posted and adhered to by construction vehicles. Aggregates (e.g., sand, gravel, rock) that are transported by trucks should be covered to avoid nuisance to road users.

188. The access road to the substation land from the nearest road head will be constructed. For transmission line, no road is likely to be constructed and existing village roads, footpaths have to be used as no movement of mechanised machinery will be done. The tower line material will be transported up to the nearest road head and thereby taken to tower site manually. The local community cannot encroach along the transmission line routes, as encroachment of any forestland is punishable by law.

Disposal of Debris

189. As a result of construction related activities, top soil and debris will be generated during the construction stage of which some may be left over for disposal. Improper disposal of the debris

will have an impact on the surrounding ecology, public health and scenic beauty. The following measures will minimise the impacts associated with disposal of debris:

- Spoil materials (soil, sand, rock etc.) generated from construction activities shall be used wherever possible for site levelling, back–filling, etc.
- Preparation of a Disposal Management Plan for the project and selection of the solid waste and hazardous waste disposal site to engineered landfill. Prior approval should be obtained for such dumping grounds/land fill sites from relevant local authorities. For topsoil, the EPC contractor must exclude locations, which are closer to residential, commercial and public sensitive areas. Inert spoil (any waste concrete, if any) from the site will be disposed of as per directions of the local statutory body in the area.
- Dumped materials will interfere with the drainage pattern of the area, any water bodies, agricultural lands, marshlands and down slope or any environmental sensitive areas if not planned properly. The materials have to be dumped at sites marked by the concerned authorities such as Forest, Roads, or Panchayats (local community) by the contractor as per contract provisions.

190. During operation phase, the corridor along the alignment will be chopped of vegetation and lopping of trees will be done for maintenance purpose. This will also reduce the chances of fires due to electric sparks.

Wild Life

191. The primary project area - route alignments and site selection have been done in consultation with the forest authorities ensuring that route alignments do not interfere with known paths of migration of wildlife. There will be no impact on any secondary area as the route alignments are planned that they cross only un-habitated areas – both human and wildlife area. The forest diversion case prepared for each transmission line is cleared by the Forest Department, GoHP followed by several levels of MoEFCC as required under Forest Conservation Act. Annexure 12 contains the forest clearance obtained for Tranche 3 transmission line project.

192. The subproject within four PIUs are located at least a minimum of 5-10 km aerial distance away from any wildlife sanctuary and national parks listed in Annexure 9. The transmission lines will traverse at a sufficient distance from any reserved forest area and will not negatively impact the flora and fauna of the area.

Impact on Aquatic Ecology

193. The proposed transmission lines would cross over the rivers and small streams which are usually perennial in nature. No significant impacts on aquatic ecology of the river are envisaged, as there will be careful selection of the construction time and tower sites near the river, to avoid river pollution and disturbance to the aquatic fauna of the area during the monsoon period. Since the towers for the power evacuation lines (T2-T5) are usually hilltop to hilltop and valleys are quite steep, there will be no towers inside the river bed.

Impact on Human Environment

Health and Safety

194. Health and safety impacts will be in terms of risk of accidents and exposure to electromagnetic fields along the alignment. Accidents may be caused due to electro-cutting, lightning, fires and explosions. To avoid this, houses will not be allowed within the RoW of the project. During the design, the transmission line and substation equipment will be rated to ensure EMF is within the permissible limits specified in the EHS guidelines. The EPC contractor shall provide necessary training regarding safety aspects to its personnel working at the line as well as provide personal protective equipment like safety gloves, helmet, mufflers, etc. during the construction period and during the maintenance work. First aid facilities will be made available with the labour gangs and ambulance/doctors on call from nearby towns when necessary. Workers are covered by a statutory workmen compensation as per GoI laws by the contractor.

195. Project activities may create accidental damage to general public and the construction workers. Therefore, contractors should take necessary action to enhance personal and public safety during construction through following measures:

- Prepare health and safety risk assessment, and develop a health and safety plan which will conform to EHS guidelines.
- Organise awareness programs relevant to personal safety of the workers and general public in the area.
- Installation of warning signs on particular locations such as transverse points of local road network near the underground transmission lines trenches.
- Provide protective safety belts, footwear, helmets, goggles, eye-shields and clothes to workers, depending on their duty.
- Arrangement of proper first aid unit and transport facilities to take injured people to the hospitals.
- Workers should be covered by the statutory Workmen Compensation as per GOI laws by the contractor.
- To minimize the risk of public and worker injury appropriate GoI regulations on Occupational, Safety, and Community Health must be applied or the IFC/World Bank EHS Guidelines (2007) that govern the safe and orderly operation of civil works should be followed.
- Prevent public access to the transmission tower during construction or substation property with effective fencing, and clear signage indicating the dangers of the different facilities. The public should be kept clear of all equipment maintenance areas.

Agriculture

196. Permanent and temporary loss of agricultural land will occur due to tower location in the agricultural field and loss of crop for access routes. As per standard Himachal Pradesh policy, land will be acquired for each tower erection, besides private land required for substations. As far as possible, the prime agricultural land will be avoided and construction will be done after crop harvesting. HPPTCL has formulated a comprehensive Resettlement, Relief, Rehabilitation and Compensation (RRRC) Policy to address the issue.

Socio-Economics

197. Construction of transmission lines will generate local employment, as a number of unskilled labours (men/women) will be required at the time of construction activities. Local employment during this period will increase socio-economic standards of the residents of the project area.

Temporary Outage of the Electricity

198. Temporary disconnection of power supplies will occur during the construction activities. Thus, the general public and commercial/industrial places, which are located in project-affected area, will face inconvenience for short periods of time. Thus, the following measures will have to be taken:

- Advance notice to the public about the time and the duration of the utility disruption, and
- Restore the utilities immediately to overcome public inconvenience.

Resettlement and Rehabilitation

199. For the construction of transmission lines and seven substations, purchase of a private land is required. The detail of resettlement and rehabilitation involved in the project are given in the Resettlement Planning document prepared separately for Tranche 3.

Cultural sites

200. There are no important archaeological, historical or cultural sites along the route alignment, hence no impact on these sites is envisaged. In case archaeological features are discovered during excavation/construction works, GoI's regulations shall apply and will be observed by contractors.

Traffic and Transport

201. During the construction phase, traffic disturbance needs to be minimised by avoiding high-density areas, using proper traffic signs, ensuring proper access roads and avoiding road blockage. The EPC contractor shall prepare a traffic management plan before the start of construction.

Interference with Other Utilities and Traffic

202. A standing committee, Power Telecom Co-ordination Committee (PTCC), has been constituted by GoI to plan and implement the mitigating measures for the induced voltage, which may occur nearby telecom circuits and suggest necessary protection measures to be adopted. The committee suggests measures like rerouting of the telecom circuits, conversion of overhead telecom circuits into cables etc. to minimize the interference. It is mandatory for HPPTCL to seek clearance prior to construction from telecom authorities and wherever necessary from aviation authorities that are likely to be affected by the construction of underground transmission lines. The exact cost to mitigate the impacts of induction in neighbouring telecom circuits would vary from case to case. In general, the system is planned and executed in such a way that adequate clearance is maintained between transmission lines and the railways, civil aviation and defence installations as per mandatory provisions. If the transmission lines will pass nearby any proposed

or existing airport, it has to maintain a specific distance and the towers beyond specified height are painted in alternate orange and white stripes for easy visibility and warning lights are placed on the top of these towers.

Waste Disposal

Solid Scrap Waste Disposal

203. Solid scrap waste at the location of the tower erection site will mostly include metal scraps and wooden packing material. Waste will be minimised and recycled wherever possible. Final wastes will be collected and disposed off to recyclers in compliance with applicable GoI/GoHP regulations and rules by the contractor.

Sanitary Waste Disposal at Construction Sites and Labour Camps

204. Any labour camps at the site of tower erection will be day-time and temporary in nature and the human excreta will not be significant to cause contamination of ground water and therefore may be provided with soak pits. Those places where most labour will be staying will be near hamlets which shall use the community services for solid waste, water and sanitation. Adequate drinking water facilities, sanitary facilities and drainage in the temporary sheds of the construction workers should be provided with septic tanks to avoid the surface water pollution. Provision of adequate toilets connected to septic tanks, washing facilities of hot and cold water, male and female, separate area for preparation of food away from toilet area, provision of gas for cooking, etc. must be made obligatory. This should from an integral component in the planning stage before commencement of construction activity.

205. There will be proper solid waste disposal procedure to enhance sanitation of workers who stay in camps/rented houses. Thus, possibilities of infecting water-borne diseases or vector borne diseases (parasitic infections) will be eliminated by adopting proper solid waste disposal procedure. Unacceptable solid waste disposal practices such as open dumping of solid waste and poor sanitation facilities will lead to pollution of surrounding environment, contamination of water bodies and increase adverse impact to the aquatic; terrestrial lives and general public inhabited in the area. Surroundings of labour camps, garbage disposal sites and material storage yards provide favourable habitats for vectors of diseases such as mosquitoes, rats and flies.

206. The following measures are needed to protect and enhance the quality of environment during the construction stage:

- A better way to overcome garbage disposal as mentioned above is by reducing reliance on huge labour camps, thus the selection of majority of skilled and unskilled workers from the project influence area will be a proper measure in this regard.
- Provision of solid waste disposal, sanitation and sewage facilities at all substation sites for the construction/labour camps to avoid or minimise health hazards and environmental pollution.
- The contractor will handle and manage waste generated from the construction/labour camps without contamination to natural environment and it will reduce risk to general public who stay close to substation sites. Also, the contractor should be responsible for enhancing the quality of the environment.
- Adequate supply of hot and cold water should be provided to the urinals, toilets

and wash rooms of the workers' accommodation at substation sites.

- The contractor should provide garbage bins in all workers' accommodation and construction sites, for dumping wastes regularly in a hygienic manner with the help of Public Health Inspector (PHI) in the area.

Liquid Waste Disposal

207. There will be no oil or chemical waste generated during the construction of transmission line, hence no mitigation is required. For substations, the transformer oil is the main constituent of the liquid stored. The transformer oil shall be stored as per IS -1866/2000[24] and IEC-60422/1998[25] codes and any waste oil shall be disposed as per Hazardous Waste (Management, Handling, Trans-boundary Movement) Rules 2009 and any waste oil removed from transformer will be sold to government approved recycler and will not be disposed off in the ground or any rivulet/stream as per EMP.

208. Environmental impacts identified during construction are limited in magnitude and are temporary. The scale of the works is relatively minor and the project areas proximity to the work force means that very small construction camps comprising 4-5 persons are required for transmission lines whereas for substation sites, there will be larger labour camps comprising of upto 20-25 persons.

209. Fuel and other lubricants will need to be stored at the construction sites. Best industry practice will be required to ensure that accidental spills and discharge to the soil and aquatic environments are prevented. Any fuel (including drums and tanks, if any) should be placed at least 50 m away from waterways and no equipment is to be refueled within this distance.

210. Only trained personnel will handle fuel and lubricants. In addition, machinery should be properly maintained and waste oil and oil filters must be disposed of to meet the best industry practice. This will be the EPC contractor's responsibility.

211. At the completion of work, the contractor will be required to rehabilitate and clean up of all work sites. This includes repairing damage to pavements, roads, and drainage systems. All waste is to be removed from the sites. The contractor and the HPPTCL will be responsible for implementing this requirement.

Hazardous Waste Disposal

212. Generation of hazardous waste is not expected during transmission line construction.

5.1.4 Environmental Impacts Associated with Operations and Maintenance Stage

213. Once transmission lines and sub-stations are fully erected, fencing, and danger signs must be installed at each that clearly identify and warn of the dangers of climbing onto an operational substation or operational tower line. A signage that meets the IEEE[26] standards will need to be placed on all overhead power lines warning of the electrical hazards. The EPC contractor will also need to advise the community about the location and associated dangers of the same.

[24] Code of Practice for Electrical Maintenance and supervision of Mineral Insulating oil in equipment.
[25] Supervision and maintenance guide for mineral insulating oils in electrical equipment.
[26] Institute of Electrical and Electronics Engineers.

Electric Shock

214. This may lead to death or injury to the workers and public in the area. This can be minimised or avoided by:

- Security fences around substation.
- Establishment of warning signs.
- Careful design using appropriate measures such as effective earthing at towers to minimise electric shocks/hazards.

Noise Generation

215. During the operation phase of the project, there may be corona noise from the conductors which will be felt only up to 15 to 30 m area, hence the ambient noise level will meet the CPCB standard for residential areas (55 dB(A) during daytime and 45 dB(A) during night time).

216. Nuisance to the community around the substation site can occur during the project construction and operations stage. Although, there are no villages in their vicinity of 100 m, HPPTCL may provide appropriate noise barriers if required and deemed essential.

Maintenance of Transmission line and Substation

217. Possible exposure to electromagnetic interference could occur during these activities. Design of transmission line should comply with the limits of electromagnetic interference from overhead power linesin accordance with best international praticses.

Oil Spillage

218. Contamination of water on land/near bodies of water by the transformer oil can occur during operation due to leakage or accident. Substation transformers are normally located within secure and impervious areas with a storage capacity of 110% spare oil. Also, proper drainage facilities will be constructed during the construction stage to avoid overflow or contamination with natural flow paths especially during the rainy season. HPPTCL will maintain account of the oil usage, using technical methods and procedures for oil monitoring mechanism, and will have mitigation plan for any oil spillage. Storage of bulk fuel should be on covered concrete pads away from the public and worker camp. Fuel storage areas and tanks must be clearly marked, protected and lighted. Contractors should be required to have an emergency plan to handle fuel and oil spillage. As required by law, HPPTCL has procedures for disposal of waste oil to approved recyclers.

Sulphur Hexa fluoride (SF_6) Leakage[27]

219. SF_6 is a non-toxic greenhouse gas used as a dielectric in circuit breakers, switch gear, and other electrical equipment. Very high-grade sealing system and erection methodology is followed to keep the loss of SF_6 within 0.1% every year. SF_6 handling is part of each contract technical specifications, and required design and routine test are done after manufacturing of the circuit breaker and gas insulated switchgear. SF_6 handling system for evacuation and storage is always used for the maintenance of the circuit breaker and gas insulated switchgear. SF_6 leakage

[27] Level of SF6 leakage are covered by IEEE C37.122

records will be maintained in each substation. This allows tracking of any release of SF_6 to the atmosphere.

6.0 ANALYSIS OF ALTERNATIVES

6.1 HPPTCL's Approach for Route Selection

220. As per its Environment and Social Safeguards Policy (ESSP), May 2011, HPPTCL shall adopt a proactive route alignment approach. Preliminary route selection for transmission lines shall be done by HPPTCL based on walk over surveys, usage of tools such as the forest atlas, revenue papers and 1:50,000 topographical maps of the area from Survey of India. It shall strive to move towards using modern tools like Geographical Information System (GIS)/Global Positioning System (GPS) for a precision in route alignment with the larger picture in view while finalizing the route.

i. During route alignment, all possible efforts shall be made to avoid forest areas or to keep it to the barest minimum. Whenever it becomes unavoidable due to the geography of the terrain or heavy cost involved in avoiding it, different alternative options shall be considered to minimize the requirement of forest area. The selected route shall be easily accessible in dry, rainy and winter (snow) seasons for maintenance purposes. The sites are selected where the snow is minimum and far from Avalanche zone.

ii. At the planning stage itself, one of the factors that govern the establishment of the transmission line is the infringement of populated/forest/cultivated area and scarce land. Wherever such infringements are substantial, different alternative options are to be considered.

Methodology for Selection of Route: Environmental View

221. Route selection among alternatives considers environmental parameters, availability of logistics support during construction, operation and maintenance of transmission lines and specific geographical condition to construct the lines along most feasible routes that were identified are based on the relevant topographic maps and walkover surveys.

222. For selection of the optimum route/site, the following points are taken into consideration by HPPTCL as per its ESSP May 2011:

i. The transmission line avoids environmentally sensitive areas, eco sensitive zones, forests, sanctuaries national parks, biosphere reserves.
ii. The transmission line route impacts minimally on natural resources to accomplish this, route selection of transmission line is undertaken in close consultation with representation of the state Forest, Environment, and Revenue Departments. Site-specific alterations are made to avoid environmentally sensitive areas and settlements at execution stage.
iii. The proposed transmission line bypasses human habitation by a safe distance.
iv. No monuments of cultural, archaeological or historical significance are affected.
v. The proposed transmission line does not adversely impact any local community assets such as playground, hospitals, schools, places of worship etc.
vi. The proposed route of transmission line does not create any threat to the survival of any community with special reference to tribal community.
vii. Avoidance of mining protected and reserved forest, archaeological and other sensitive areas unstable ground feature, marshy low-lying areas, river beds and

earth slip zones.

viii. Minimizing number of crossing of major rivers/railway lines, national and state highways, overhead EHV power line, number of towers and communication lines.

ix. Routing is kept away from large habitations, densely populated areas, animal / bird sanctuaries, and utility pipelines to the extent possible and avoid areas reserved for planned and future development.

x. Restricted areas such as civil and military installations and airfields have been avoided.

xi. As a principle, all project components are generally sited atleast 50 m away from settlements, whenever possible, to account for future expansion, and water bodies.

xii. To minimize adverse impacts on natural habitats, human habitations efforts will be made to locate majority of substations/towers on barren, waste, or fallow agricultural lands.

223. In addition, HPPTCL shall follow the principle of avoidance by avoiding the forestland unless it is inescapable and in such instances, it shall obtain prior clearance from competent authorities. It shall abide by the relevant guidelines of state and central goverment, including the directions of the Supreme Court from time to time.

6.2 Alternatives for Subproject Components

6.2.1 Transmission Lines

224. In order to achieve this, HPPTCL has undertaken route selection for transmission lines in close consultation with representatives from Land Acquisition, Departments of Forest, Department of Wildlife Conservation and the local community. Although under the national law, HPPTCL has the RoW, yet it considers alternative alignments during site selection, with minor alterations to avoid environmentally sensitive areas and settlements at the implementation stage. As per ESSP May 2011, HPPTCL shall follow the following guidelines:

i. Alternative routes shall be studied in detail using a set of techno-economical, environmental, ecological and social impact parameters to arrive at the most optimally suitable alignment that is technically feasible, economically viable, socially just and environmentally safe.

ii. A maximum width of RoW for transmission lines on forestland and minimum clearances between conductors (depending on specific voltage) and trees to be adhered in route selection.

iii. HPPTCL shall attempt at reducing the number of trees affected and width of the RoW etc. through adoption of appropriate technological option like construction of narrow base towers, towers with extension, compact towers, multi-circuits, and monopole towers and/or innovating upon standard procedures. Specially designed high towers shall be used for reducing impact on trees, orchards wildlife and crossing wetlands, riverbeds.

iv. Tower sites shall preferably, as far as technically feasible and permitted by the safety parameters mandatory under Indian Electricity Act Rules 77 and 80 regarding clearances from ground and buildings respectively (See Annexure 1). The towers may be located on mountain ridges to save trees in the RoW below the conductors on the valley side between two successive towers.

v. All efforts to minimize the involvement of trees falling in RoW shall be made. HPPTCL shall minimize number of trees required to be felled even if their costs have been paid. Pruning of trees will be done wherever required instead of heavy

lopping or felling.

vi. To minimize damage to the environment HPPTCL shall use manual stringing in thick forest and on slopes wherever possible.
vii. Transmission line design shall comply with the limits of electromagnetic interference from overhead power lines.
viii. Visible pathways along the transmission line alignment shall be maintained for patrolling and maintenance purposes.
ix. For aviation safety, in addition to putting visible signs along the conductors and on the towers, the route alignment would be shared with the nearest airport or nearest office of the Airports Authority.
x. In addition, care is also taken to avoid/minimise protected parks/forests, bird sanctuaries and any other forest area rich in wild life.

6.2.2 GIS Substations

225. For the selection of appropriate site for substation, the following points are taken into consideration:

i) Site selection should consider seismicity and geography of the local area; the area should not be prone to landslide or be unstable.
ii) Construction activities do not adversely affect the population living near the proposed substations and does not create any threat to the survival of any community with special reference to tribal community etc.
iii) The location of substation does not affect any monument of cultural or historical importance.
iv) No resettlement of households by the substation site, no loss of livelihoods, siting of transformers away from schools, hospitals and other sensitive receptors, with due consultation with the community and local government units concerned.
v) Transformers and other equipment specifications compliant with GoI rules/regulations andInternational Electro-Technical Commission (IEC) standards shall be followed.
vi) Construction techniques and machinery selection shall be made with a view to minimize ground disturbance.
vii) While planning for substations, drainage lines shall also be marked and studied to avoid seepage/leakages and pollution of water sources and springs etc.
viii) Substation location/design to ensure that noise will not be a nuisance to neighbouring properties. Provision of noise barriers near substation sites, if needed, will be made.
ix) Substation design will comply with the limits of electromagnetic interference within floor area. Security fences will be erected around substations. Warning signs shall be displayed.
x) HPPTCL shall adopt good practices and shall always strive for a high standard of house-keeping for its substations and ancillary facilities.
xi) HPPTCL shall incorporate the best technical practices to deal with environmental issues in its working.
xii) Design of substations shall be made so as to include modern fire control systems/firewalls. Provision of firefighting equipment would be made to be located close to transformers, switchgears etc.

226. Keeping the above in mind, various alignments of each transmission lines were considered. All alternatives were studied by HPPTCL officials before being proposed to ADB for

funding to arrive at the most optimum route which can be taken up for detailed survey and assessment of environmental and social impacts. Annexure 2 gives the alternative analysis for the GIS substations and Annexure 3 gives an illustrative evaluation analysis of the alternative transmission line alignments for the proposed subprojects. Annexure 4 gives the inventorisation along the proposed transmission lines. Table 6.1 below gives the summary of the final evaluation of each substation site / transmission line alignment selection.

Table 6.1: Summary of final alternative taken for sub-project consideration

SN	Project Component	Alternative Chosen*	Reason
COMPONENT I. Bhabha Nagar PIU (Kinnaur District) subprojects			
S1	66 kV Gas Insulated Switchgear (GIS) switching station at Bagipul	Site A: HPPTCL land 5,075 sq near Bagipul village	Barren in nature, Lesser number of trees to be felled and away from population.
T1	66 kV double circuit (D/C) transmission line from 66 kV GIS Bagipul to Kotla substation	tentative line length 21kM	Least number of trees to be felled as compared to other routes and least forest land involvement.
COMPONENT II. Chamba PIU (Chamba District) subprojects			
T2	400kV D/C transmission line (Twin Moose) from 400/220 kV,2x315 MVA Lahal GISS to 400/220 kV Chamera Pooling station of PGCIL.	T2 Route A line length 34 kM	Least number of trees to be felled as compared to other routes and least forest land involvement.
S2	132/220 kV, 2x80/100 MVA substation at Mazra (Distt.Chamba).	S2	Barren in nature, Lesser number of trees to be felled and away from population.
T3	220 kV D/C transmission line from132/220 kV GISS Mazra 33/220 kV Karian	T3 Route A line length 21kM	Least number of trees to be felled as compared to other routes and least forest land involvement.
T4	220 kV D/C transmission line (Twin Moose) from Bhajoli Holi HEP to 400/220 kV Lahal GISS	T4 Route A line length 14kM	Least number of trees to be felled as compared to other routes and least forest land involvement.
COMPONENT III: Rohru PIU (Shimla District) subprojects			
S3	220 kV GIS switching station at Hatkoti	Site: Government. land near HPPCL dam site, 8,000sqm.	Avoids the archeologically significant area. No reserve forest areas and no houses nearby. No forest trees are involved. The minimum land acquisition for road as road is already there at site only widening is required. The Archeological site is near S3 but it is 300 Meters aerial distance whereas regulatory permission from archeological department is required if it falls within 200 meter.
COMPONENT IV: Sarabhai PIU (Kullu and Mandi Districts) subprojects			
T5	132 kV D/C transmission line from Barsaini to 132/220 kV substation at Charor	Route A, 38.7 km	Less tree cutting, minimum length of transmission line through inaccessible terrain.
S4	33/132 kV 2x25/31.5 MVA GIS substation at Barsaini	Site A: Private land area - 9,600 sqm.	Single owner and lesser number of trees to be felled and the location will reduce the mesh of low voltage transmission lines from IPP's.

6.2.3 Reasons for the final selection

227. Considering the reasons listed above, the proposed substation sites were deemed the best suitable. The alternatives (as shown in Annexure 2) for each substation site were studied by the HPPTCL officials before being proposed to ADB for funding to arrive at most optimum site. These are all Gas Insulated Switchgear (GIS) Stations and all equipment except transformers and reactors if any, shall be housed in GIS buildings. The clearance as earlier shall be mentioned as per Indian Electricity Act (Rules 77 and 80) are being met. HPPTCL is in the process of collecting additional information and has taken up substation sites for detailed survey. These selected options mostly involve no population at the site, lesser cultivated area and minimum acquisition problems and therefore selected for detailed survey as final sites.

228. Considering the selection criteria listed earlier, three transmission line alignments for each subproject were considered. As such these three alternatives (as shown in Annexure 3) were studied by the HPPTCL officials before being proposed to ADB for funding to arrive at most optimum route which will be taken up for detailed survey and assessment of environmental and social impacts. The proposed routes were deemed the best suitable as these involved lesser populated areas, uncultivated areas and minimum RoW problems, hence selected for detailed surveys. These line routes have been selected with least impacts on forests, trees cultivable land and habitation. Wherever possible, the alignments have been proposed either on hilltop-to-hilltop routes or towers with extra heights to reduce the impacts on land underneath while maintaining the mandatory clearance as per Indian Electricity Act (Rules 77 and 80). The proposed alignments pose minimum disturbance to any reserve forests or any sanctuary and national parks in the state.

6.2.4 Distance from Sensitive Receptors

229. The distance from various receptors is give in Table 6.2 below:

Table 6.2: Approximate distance of Tranche-3 subprojects from sensitive receptors

SN o.	Name of Subproject	Primary School	Secondary School	Temple	Primary Clinic (PHC)	Main Hospital	Population/ Inhabitant (in pockets)	Metal access path to the Site
COMPONENT I. Bhabha Nagar PIU (Kinnaur District) subprojects								
S1	66 kV Gas Insulated Switchgear (GIS) pooling station at Bagipul	1 km	2 km	1.8 km from Bagipul village temple	6 km	17 km at Rampur	200 m, 550 persons (100 households)	5km from National Highway
T1	66 kV double circuit (D/C) transmission line from 66 kV GIS Bagipul to Kotlasubstation	800 m from Zanakpuri site	2 km	800 m from Chaugaon/1.8 km from village temple	700 m Chaugaon	500 m Tapri (JP village) 2 km	200 m (500 Zanakpuri, 1500 Chaugaon)	1 km from National Highway
COMPONENT II. Chamba PIU (Chamba District) subprojects								
T2	400 kV D/C transmission line from 33/220 kV Lahal to Rajera(Chamera)	200m	10 km Bharmor	10 km Bharmor	10 km Bharmor	65 km Chamba	200 m (800 scattered households)	100 m from Chamba - Bharmor Road
S2	132/220 kV, 2x80/100 MVA GIS substation at Mazra	1 km	18 km Nilwa	4.5 km	12 km	95 km	150 m (50 persons Nilwa)	4.5 km
T3	220kV D/C transmission	1.2 km	12 km	5 km	12 km	87 km	100 m (50	4.5 km

	line from Mazra to 33/220 kV Kariansubstation						persons)	
T4	220 kVD/C transmiaaion line from Holi Bhajoli to Lahal)	1 km	500 m	1 km	1 km	6 km	NIL	50 m from National Highway
COMPONENT III:	**Rohru PIU (Shimla District) subprojects**							
S3	220 kV GIS switching station at Hatkoti	700 m Sari	700 m Sari	150 Hatkoti	2 km Sarswati Nagar	15 km Rohru	300 m (70 persons-Hatkoti	200 m Hatkoti Rohroo Road
COMPONENT IV:	**Sarabhai PIU (Kullu and Mandi Districts) subprojects**							
T5	132 kV D/C transmission line from Barsaini to 132/220 kV substation at Charor	Manikaran 500m	Manikaran 500 m	Manikaran 500 m	Manikaran 500 m	Kullu	4 km (100 persons Tosh)	4 km Tosh
S4	33/132 kV 2x25/31.5 MVA GIS substation at Barsaini	2.5 km Barsaini	2.5 km Barsaini	Balarg 3 km	Barsaini 2.5 km	Kullu 64 km	2.5 km Barsaini (300 persons)	2.5 km Barsaini

Reserve Forest/Protected Areas/National Park/Sanctuary

230. Any subproject component is not passing by or located near the reserve forest or protected forest area, national park of sanctuary area. Table 4.6 (appended earlier) gives the details about national parks and sanctuary.

7.0 ENVIRONMENTAL MANAGEMENT PLAN

7.1 Mitigation

7.1.1 Climate Risks Adaptation Measures

231. Power transmission networks are the most vulnerable to snow storms and extreme weather events. Improving the overall condition and efficiency of the power delivery system can improve the resiliency of the system, and help hasten recovery from weather-related outages. Substations are extremely vulnerable to flash flood/land slide risks and therefore must be designed to overcome these risks.

232. The following measures will be considered to adapt to extreme weather events and climate variability.

- Flood protection/land slide protection will be considered for all towers and substations. Extreme rainfall events have been observed to be increasing in the recent decades. The design flood/landslides will be based on projected worst-case climate scenarios.
- All transmission lines will be built to withstand strong winds. Resources will be allocated to emergency planning and restoration.
- Cold temperatures will affect overhead transmission lines. A minimum overhead clearance of transmission lines shall be maintained for safety. For proper transmission of power in overhead transmission lines, temperature control and sag monitoring are the two major parameters to be kept in mind.

7.1.2 Environmental Management Plan

233. Based on the environmental assessment of the project activities, an Environment Management Plan (EMP) has been developed for the project to mitigate any adverse environmental impacts. The EMP discusses anticipated impacts, mitigation measures, monitoring requirements and responsible authorities to implement the EMP with respect to the following stages: (i) pre-construction, (ii) construction, and (iii) operation and maintenance. Detailed, site-specific mitigation measures and monitoring plans were developed and will be implemented during the project implementation phase.

234. The EMP for the project is attached as Annexure 2, which identifies feasible and cost-effective measures to be taken to reduce potential significant, adverse, impacts to acceptable levels. Here, proper mitigation measures are proposed for each potential impact, including details on responsible parties for implementation of mitigation measures and supervision.

Environmental Impact Matrix

235. The environmental impacts management matrix has been prepared for the project that discusses the anticipated impacts, monitoring requirements, and development of mitigation measures with respect to the following stages: (i) pre-construction, (ii) construction, and (iii) operation and maintenance. Detailed, site-specific mitigation measures and monitoring plans were developed and will be implemented during the project implementation phase. A summary environmental impact matrix and the mitigation measures are mentioned in Table 7.1.

Table 7.1: Environmental Impact Matrix

Sl. Nº	Environmental attribute	Potential impacts	Nature of impact	Magnitude of impacts			Mitigation measures	Implementation and Monitoring
				Low	Medium	High		
A.	**Physical Resources**							
1.	Topography	Change in the surface features and present aesthetics due to the construction of the project.	Direct/Local/ irreversible		X		The surface soil will be restored to normal slope after tower erection. If there is any excess soil, it shall be disposed off at suitable location. Any loss of vegetation will be attended by HPPTCL as per existing GoHP norms Within the substation, the excess soil will be disposed off in consultation as per EMP. The compensatory afforestation of equivalent area of forestland in RoW will be undertaken by the Forest Department to compensate for the loss on HPPTCL expenses to minimise the impact of loss of vegetation as per existing norms under the Forest (Conservation) Act 2002.	During construction activity
2.	Climate	No impact on the climatic conditions	Direct/Local/ irreversible	X			No impact on the climatic conditions, hence no mitigation is required	
		Monitoring of SF6 gas from Electrical Substations	Direct/Local/ irreversible	X			Proper record of all SF6 leakages in substations kept for record	During construction and operation
B.	**Environmental Resources**							
1.	Air Quality	Project will have marginal impact on air quality during the construction period due to increase in the dust emission.	Direct/Local/ reversible	X			Water sprinkling at construction site, limited bare soils, maintenance of vehicles.	During construction activity
2.	Noise	Noise due to general construction activities.	Direct/Local/ reversible	X			Restriction of noise generating activities at night and use of personal protective equipment like ear plugs, mufflers.	During construction activity
		Noise arising from corona noise from conductors	Direct/Local/ reversible	X			Monitoring of possible corona noise to identify and correct problems.	During operational phase
3.	Surface and Ground Water quality	Runoff from the construction site	Direct/Local/ reversible	X			Careful sitting of towers, and access roads.	Before and during construction activity
		Domestic wastewater from construction sites	Direct/Local/ reversible	X			For transmission line, domestic wastewater treatment may be done by digging small ditches for waste water and then covering it with top soil once the construction team moves to next location. For substation site, the contractor shall provide soak pits for construction workers at the site.	During construction and operation
4.	Soils and Geology	Soil erosion due to tower erection and clearing of vegetation in the RoW and access roads.	Direct/Local/ reversible		X		Avoiding sites, which are prone to soil erosion. Levelling of tower construction sites. Use of few access roads. Rehabilitation and stabilisation of disturbed land at the substations.	During and after the construction activity
		Damage due to seismic activity	Direct/regional/ reversible	X			Site selection and proper tower foundation design considering the geological conditions and seismicity of the area.	Before the construction activity.
C.	**Ecological Resources**							
1.	Terrestrial Ecology	Loss of vegetation	Direct/Local/ reversible		X		Location of towers on non-cultivable land area. Selection of few access roads. Compensation for crop and trees to villagers. The tree planting for forest	Before the construction phase

Sl. №	Environmental attribute	Potential impacts	Nature of impact	Magnitude of impacts			Mitigation measures	Implementation and Monitoring
				Low	Medium	High		
							land diverted to non-forest and trees felled will be done by the forest department and paid by HPPTCL	
2.	Terrestrial Fauna	Disturbance to the local fauna during construction	Direct/Local/ reversible	X			Wildlife routes and their habitats have been avoided as far as possible during the route selection. Minimise encroachments, and indirect impacts.	Before and during construction phase
	Avifauna	Disturbance to the local fauna during operation	Direct/Local/ reversible	X			Monitoring of transmission line especially for bird strikes during the operation and use of deflectors if required. HPPTCL will conduct the study and decide their placements.	During operation phase
3.	Aquatic Ecology	No significant impacts envisaged	Direct/Local/ reversible	X			Disposal of construction waste and other waste to avoid polluting the river and streams	Before and during construction phase
D.	**Human Environment**							
1	Health and Safety	Fires, explosion and other accidents at the route alignment of transmission line.	Direct/Local	X			Use of personal protective equipment during construction. By lopping and chopping of trees fire hazards will be minimised during maintenance period. Regular inspection of lines for faults prone to accidents.	During construction and operation phase
		working at height and working with electricity	Direct/Local	X			Adequate training. More detailed occupational safety standards in the contract award documents.	During construction and operation phase
		Exposure to electromagnetic fields	Direct/Local/ continuous	X			Alignment route away from the settlement. No houses in the immediate vicinity will be allowed in the RoW of the alignment. No further mitigation required.	Before and after the construction phase.
2.	Agriculture	Permanent and temporary loss of agriculture land due to tower erection and due to access routes.	Direct/Local/ reversible	X			Avoid prime agriculture land. Assessment of land required and compensation. Construction activity after crop harvesting and selection of few access routes.	Before and during construction phase.
3.	Socio-economics	Beneficial impacts job opportunities during construction phase	Direct/regional		X		Unskilled labour and indirect benefits. Overall economic growth of the region.	During operational phase
4.	Resettlement	Resettlement of any house falling along the RoW.	Direct/Local/ reversible	X			Route alignment is selected in such a way that there is no resettlement issue.	Before the construction phase.
5.	Cultural sites	No archaeological, historical or cultural important sites are affected by the construction of the lines.	Direct/Local/ reversible	X			No archaeological, historical or cultural important sites are affected.	--
6.	Traffic and Transportation	Traffic congestion due to movement of construction vehicles	Direct/Local/ reversible	X			Proper traffic signs at the construction site, ensuring availability and maintenance of proper access roads	During construction phase
7.	Solid Waste Generation	Probability of Surface and ground water pollution	indirect/Local/ reversible	X			Minimisation, reuse and recycle whenever possible. Final wastes to be collected and disposed off in compliance with applicable regulations and rules.	During operation phase

7.1.2 Critical Environmental Review Criteria

(i) Loss of irreplaceable resources

236. The transmission projects will involve large-scale excavation and land willbe lost to the extent of area covered under each tower foundation. The rest of the area under the tower will continue to be used by the landowner. Forest cover felled in the RoW is allowed to regenerate with dwarf species or non-timber forest product (NTFP) after construction work is over. The compensatory afforestation to the extent of twice the area of forestland used would be undertaken as per MoEFCC regulations. The EMP includes compensation for the loss by minimising the impact of loss of vegetation as per existing rules of GoHP and MoEFCC. Thus, there will be no net “Biodiversity Loss” due to project implementation due to felling of trees.

(ii) Accelerated use of resources for short-term gains

237. The project will not use any natural resources occurring in the area that is used by local communities during construction, operation, and maintenance phases. Construction materials such as tower parts and cement shall come from factories while the excavated soil shall be used for backfilling and revetment to restore the surface. Thus, the project shall not cause any accelerated use of resources for short-term gains.

(iii) Endangering of species

238. No endangered species of flora and fauna have been reported in IUCN Red List have been found/reported in the project area as well as in the affected forest thus there seems to be no possibility of endangering/causing extinction of any species.

(iv) Promoting undesirable rural-to urban migration

239. The project will not cause any submergence or loss of land holdings that normally trigger involuntary migration. It also does not involve acquisition to the extent of any person becoming landless. Hence, there is no possibility of causing of rural to urban migration.

(v) Increase in affluent/poor income gap

240. The project will increase the availability and reliability of power in state. It is well known that power is a key input to the economic development of any area. Past experience indicates that economic development leads to generation of more jobs which in turn should raise the living standards of poor. Thus, the project is expected to contribute in reduction of affluent/poor income gap by providing opportunities for employment and rural based economic activities.

7.1.3 Disaster Management, Health and Safety

Disaster Management

241. The districts which fall in high earthquake vulnerability are Chamba, Kullu, Kinnaur and part of Kangra and Shimla districts, whereas the moderate and low vulnerable districts are Una, Bilaspur, Sirmour and Solan, Shimla and Lahaul and Spiti districts, respectively. Landslide vulnerability in the case of Chamba, Kullu, Kinnaur and part of Kangra and Shimla districts are high, followed by Kangra, Mandi, Bilaspur, Shimla,Sirmour and Lahaul and Spiti districts falling in moderate vulnerable category. The avalanche hazard vulnerability map suggests that the districts

of Lahaul and Spiti and Kinnaur are very highly vulnerable, followed by Chamba, Kullu and part of Kangra and Shimla as moderately vulnerable areas whereas the remaining districts fall in the category where avalanche hazards are nil. The flood hazard vulnerability map indicates that the areas falling in the districts of Chamba, Kullu, Una and Kinnaur fall in highly vulnerable districts whereas the Lahaul and Spiti, Mandi, Shimla, Kangra, Hamirpur, Bilaspur, Solan and Sirmour fall in moderate and low vulnerability areas.

242. Himachal Pradesh State has a Disaster Management Cell working under the Department of Revenue. The project components will be designed to take note of designing related issues identified in the climate change risk assessment discussed in Section 7.1 above.

Health and Safety Management

Health and Safety Issues

243. To avoid/minimize inherent risks during construction, operation and maintenance, HPPTCL has formulated "Environment and Social Safeguards Policy (ESSP) in May 2011." This policy has laid down safety guidelines for EHV substations and lines in operations and maintenance (O&M) and construction areas.

244. HPPTCL will follow national and international[28] Environment, Health and Safety Procedure for EHV sub-stations and lines in Operations and Maintenance (O&M) period. Power evacuation system has been designed so that each developer is provided with two distinct points for power evacuation. This arrangement provides reliability and any fault at one point can ensure continuity of power. All power producing elements shall be solidly connected to earth to ensure the safety of operating personnel. Some other implications and mitigations from safety point of view are listed in Table 7.2 below

Table 7.2: Safety Implication and Mitigation

No.	Implication	Mitigation
1	Electromagnetic effect	Adequate horizontal and vertical clearances are provided as per Indian Electricity Act rules. Design parameters of equipment to ensure low EMF.
2	Mechanical	Factor of safety in tower structure, conductor and insulator is provided
3	Lightning stroke	Each tower is provided with ground wire and earthed. Earthing system for permissible step and touch potential in substation design.
4	Ground clearance infringement	No construction is permitted. Land is not allowed to be converted to non-agriculture use. However, there is no restriction on movement of people

7.2 Monitoring

7.2.1 Environmental Monitoring Plan (EMoP)

245. During the construction and operation phase of this project, the monitoring of the environmental aspects shall be done at the transmission line by the PMU. The mitigation measures suggested in the IEE require monitoring of environmental parameters during construction and operational phases of the project. The monitoring of the environmental aspects shall be ensured by the Environment and Social Cell of HPPTCL. During the construction phase, the contractor should ensure that activities like handling of earth works clearing work, access road construction, putting proper traffic signals are done properly to have minimum impact. This in turn

[28] World Bank EHS guidelines.

should be monitored by the Project Head of the individual transmission line/substation project. The Environmental and Social Cell (ESC) will ensure that site engineers and contractors adhere and comply with all measures and procedures identified in the EMP. The PIU will supervise the contractor.

246. Activities to be monitored include: all planning, coordination and management activities related to the implementation of safeguard issues; the identification of corrective and preventive actions; records of health and safety matters and training activities; worker and community near misses, minor, lost days, fatal accidents during construction and operation with a target of zero incident; consultations with project affected people (as and when needed, particularly during the implementation); feedback, trouble shooting and project related grievances; preparation of progress and monitoring reports as required by the ADB; and verifying the projects overall compliance with safeguard measures and its progress towards achieving the intended loan outcomes. Other environmental good practices include sanitary waste management, noise abatement, maintaining hygienic conditions, maintenance of fire and safety equipment.

Environmental Parameters to be monitored

247. To ensure that the project will not generate negative impacts to the overall environment quality, monitoring of environmental parameter has to be performed by HPPTCL/Contractor as per contract provisions. The monitoring activities of the project include site supervision, verification of permits, monitoring of water quality, soil, noise and air. Monitoring of the quality of water, soil, air and noise during the construction stage is the responsibility of the contractor by the approved government agency. The measurement of environmental parameters and its periodicity for the pProject is summarised in Annexure 6.

Reporting

248. Mitigation measures related to construction, as specified in the EMP, will be incorporated into civil works contracts, and their implementation will be the primary responsibility of the contractors. In addition, contractors will be required to submit monthly progress reports on the implementation of EMP measures to PIU/PMU. The PMU and the HPPTCL will report on progress achieved against the EMP activities and milestones on a half-yearly basis to ADB. Progress reports will include a description of implementable activities and their status; identify the responsible parties involved in their implementation; and provide project management schedules and timeframes for doing so, along with their associated costs.

249. The ESC, after interaction with project managers of PIUs, will prepare and submit the environmental monitoring reports to ADB twice a year during the construction stage, and once a year during the operation stage. This report will include the implementation of EMP, the results of environmental monitoring to demonstrate that sound environmental management practices are applied, and the set environmental targets are achieved. The environmental monitoring reports will be submitted by the PIU to the PMU. ADB will continue to monitor project compliance with ADB's safeguard policy and requirements on an on-going basis throughout the duration of the project.

Environmental Management Plan Budget Costs

250. Compliance with the EMP has been prepared based upon optimum and reasonable costs that are derived upon minimisation of mitigation measures on a "least-cost" basis. Without such

expenditures, the project might generate significant environmental impacts, causing the biophysical environment in the area to deteriorate and indirectly depressing the economies of local communities. The main benefits of the mitigation plan are (i) ensuring that environmental standards are met during design, construction, and operation of the project; and (ii) providing offsets to negate project impacts especially ecological impacts.

251. From the total project cost of $132 million (including IDC and contingencies), $3 million has been included as the Environmental Mitigation (which includes EMP costs) as shown in Table 7.3. The compliance costs for minimisation of mitigation measures for the EMP has been derived based on optimum and “least-cost” basis. Typically, the EMP costs will include:

i. cost of compensatory afforestation
ii. Net Present Value (NPV) of forest land
iii. PTCC cost
iv. cost for implementation of environmental mitigation measures
v. cost towards monitoring costs, independent audit costs for the project

Table 7.3: Estimated Environmental Costs for Implementation

S.Nº	Environmental Cost Elements	Costs in INR (million)*
A.	Design and Pre-Construction Stage	
1	Cost of compensatory afforestation, Net Present Value (NPV) of forest land	2.2
2.	PTCC* of Transmission line 765/400/220/132 kV (130 km@INR50,000/km)	0.1
B.	Construction Stage	
1	Estimated Cost towards EMP (Contractors cost)	0.4
2	EMP implementation Monitoring	0.2
3	Training in Environmental monitoring/Medical camps for workmen and society including checkups of Sexually Transmitted Infections (STI) and Sexually Transmitted Diseases (STD) including HIV/AIDS and health awareness program on regular basis	0.1
	Total	**3.0**

* Fixed charge for Power and Telecommunication Coordination Committee.

7.3 Institutional arrangements

7.3.1 Implementation Plan

252. The proposed project involves construction of approximately 132 km of transmission lines of various voltages 220/132/66/ and four substations of 283 MVA transformation capacity and one switching substation. The construction of substations involves private land purchase option or land acquisition in Barsaini, Mazra and Bagipul and Hatkoti land belongs to HPPCL, a Himachal Pradesh government company.

253. For construction of transmission lines, the project will involve survey work, forest work and clearance, design and engineering of plant equipment, floating tenders for procurement, civil works related to 220/132/66/ kV lines and 220/132/66/kV GIS substations testing and commissioning. Total project work is expected to be completed in 48 months. The total project cost including interest during construction (IDC) and contingencies is $128 million. The total cost for the construction of transmission system strengthening in Bhabha Nagar is $11 million,

Chamba PIU's GSS's and associated transmission lines is $64.5 million; and for Sarabhai PIU's GSS and associated transmission lines is $18.75 million, Rohru PIU Construction of 220/132/66/33 kV GSS and associated transmission line is $7.43 million and the capacity building/IT/training etc. comes to $3.4 million.

254. The overall project implementation schedule for Tranche 3 is detailed in Table 7.4.

255. Implementation arrangements specify the implementation schedule showing phasing and coordination with overall project implementation; describes institutional or organizational arrangements, namely, who is responsible for carrying out the mitigation and monitoring measures, which must include one or more of the following additional topics to strengthen environmental management capability: technical assistance programs, training programs, procurement of equipment and supplies related to environmental management and monitoring, and organizational changes; and estimates capital and recurrent costs and describes sources of funds for implementing the EMP.

Table 7.4: Overall Project Implementation Schedule

Activity	2017 J	F	M	A	M	J	J	A	S	O	N	D	2018 J	F	M	A	M	J	J	A	S	O	N	D	2019 J	F	M	A	M	J	J	A	S	O	N	D	2020 J	F	M	A	M	J	J	A	S	O	N	D	2021 J	F	M	A	M	J	J	A	S	O	N	D
Loan Approval								x																																																			
Loan Effectivity									x																																																			
Output 1: Construction of Power Transmission Lines																																																												
Activity 1.1: Construction of Transmission line																																																												
Appointment of Implementation Contractors																																																												
Design, Equipment Procurement/Supply																																																												
Construction & Commissioning																																																												
Output 2: Construction of pooling stations																																																												
Activity 2.1: Construction of Substations																																																												
Appointment of Implementation Contractors																																																												
Design, Equipment Procurement/Supply																																																												
Construction & Commissioning																																																												
Output 3: Capacity building																																																												
Activity 3.1: Training and Study tours																																																												
Activity 3.2: ERP and IT facilities																																																											
A. MANAGEMENT ACTIVITIES																																																											
EMP Activities																																																												
Forest and crop compensation																																																											
Land Requirement																																																											
Resettlement Plan																																																											
Mid Term Review																													X																																
Project Completion Report																																																												X

LEGEND

	Continuous Activity
	Intermittent Activity

7.3.2 Implementation Arrangements

256. HPPTCL is a state power transmission utility (STU) licensed to operate in the state of Himachal Pradesh. HPPTCL is both the executing agency and implementation agency for the project.

Project Management Unit

257. The Project Management Unit (PMU) at corporate level is headed by Director, Projects and coordinated by Dy General Manager (Planning) who will be assisted by corresponding personnel from various functions – Administration and Finance, Projects Planning and Design, Procurement and contracts, Environment Cell and Projects Construction. Project Implementation Units (PIUs) at divisional level of the project construction unit are headed by Executive Engineers at four locations – Chamba, Kullu, Shimla and Bhabanagar pISs. The PMU structure is shown in Figure 7.1.

258. The ESC at the corporate level monitors the policy and implementation related environmental impacts of all projects of HPPTCL. The Environmental Officer in the ESC assists PIUs in all environmental aspects of the projects in compliance with HPPTCL's Environment and Social Safeguards Policy, May 2011. ESC is also responsible for the implementation of EMP for all the subprojects funded by ADB. As per ADB's SPS 2009, PMU and ESC are required to conduct regular monitoring of environmental compliance of each subproject funded by ADB to ensure compliance with loan covenants.

259. The implementation of the EMP during the construction phase is the responsibility of the contractor. The PMU is responsible for ensuring all measures suggested in the EMP which are included in the design and bid documents. The PIU, in coordination with the ESC, is also responsible for monitoring and enforcement of the EMP during construction.

260. The duties of the ESC at corporate level are:

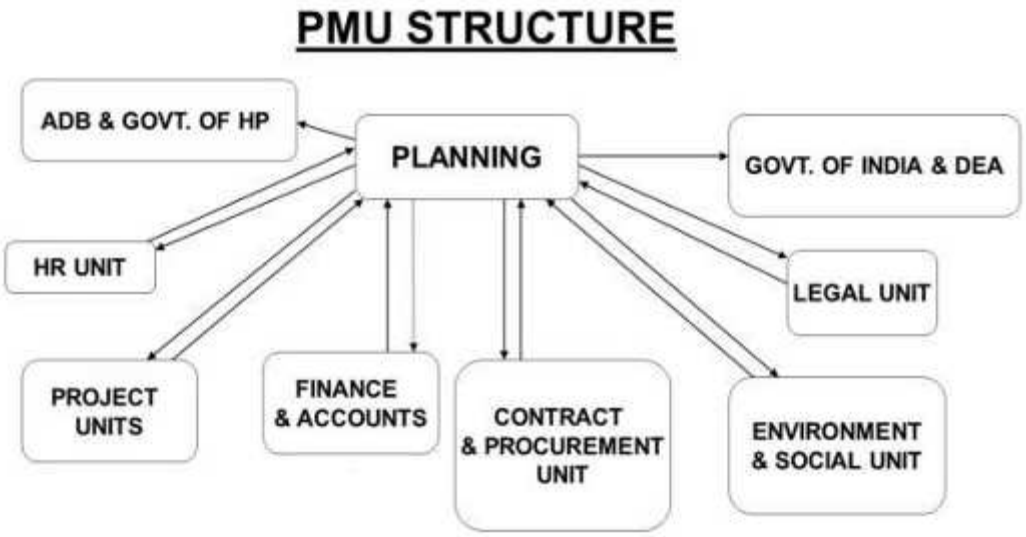
- Monitor the implementation of mitigation measures during construction and operation phases of the project.
- Compile comprehensive periodic environmental monitoringreports for various projects to ADB and submit to ADB.
- Advise and coordinate field units' activity towards effective environment management.
- Liaise with the Ministry of Power, CEA, MoEFCC, GoHP and state agencies such as HPPCL, HPPCB, Himachal Pradesh Forest Department and seek their help to solve the environment related issues of the project implementation.
- Advise project planning/design cells on environmental and social issues while route selection of the alignment at the planning/design stage to avoid negative environmental impacts. Similarly advise for inclusion of environment safeguard provisions in contract documents.
- Advise PIU on training and awareness raising for environmental and social issues to the project/contract staff.

261. The duties of the ESC at site level are:

- Implement the environment policy guidelines and environmental good practices at the sites.
- Advise and coordinate the contractor(s) activity towards effective environment management.
- Liaise with the local officers of forest department, HPPCB and seek help of their officers in resolving environment monitoring related issues, wherever applicable.
- Carry out environmental survey to avoid negative environmental impacts.
- Make the contractor staff aware of environmental and social issues so that EMP could be managed effectively.
- Prepare periodic environmental monitoring report for the PIU specific project and submit to PMU.

262. The PMU is responsible for processing and implementing all subproject(s). Subprojects are monitored by qualified technical staff (e.g. design and technical reports, feasibility studies, environmental and/or social assessments, and associated EMP and budgets), who also ensure and monitor compliance with ADB and Government safeguard requirements. Summary appraisal reports will be submitted by PMU to ADB subsequent to obtaining the HPPTCL's approval and clearance(s) from the GoHP.

Figure 7.1: PMU Structure



Project Implementation Units (PIU)

263. The PMU shall implement the ADB loan at the corporate level and the PMU will be supported for implementation activities through the field offices/Project Implementing Units (PIUs). The PIU/Project Head will be assisted by the EPC Contractor. The PIUs will have overall responsibility in managing site activities. HPPTCL will ensure that the contractor engaged for each subproject is involved in EMP monitoring and implementation.

264. The PIUs will include experienced staff and, headed by senior officers, will undertake day-

to-day project planning and implementation activities and manage the site activities. The PIUs will be responsible for overall project planning and implementation, including procurement, accounting, quality assurance, social and environmental issues and coordination with concerned agencies. For management of the EMP, the PIU will conduct overall coordination, preparation, planning, implementation, and financing of all field level activities.

Consultants, Construction Contractors, Equipment Suppliers, and Other Service Providers

265. HPPTCL will ensure that contractors engaged for each sub-project are engaged in regular EMP monitoring and implementation. EPC contractors will have primary responsibility for environmental and social management, and workers' health and safety at sub-project construction sites under their control. They will be required to adhere to all national and state level environmental, health, and safety (EHS) guidelines and implement relevant sub-project environmental and social management measures prior to and during construction. The EPC contractor shall implement an Emergency response system for any medical emergency or any unforeseen circumstances (eg. earthquake, flooding, etc.) during construction. The same system shall be continued by the Operations and Maintenance operator.

266. Further details on agencies responsible for EMP implementation activities are shown in Table 7.5.

Table 7.5: Institutional Roles and Responsibilities for EMP Implementation Activities

Activity	Responsible Agency
Sub-project Initiation Stage	
Assign PIUs for each subproject	PMU
Clearances/approvals from relevant GoI/GoHP agencies-forest, roads, rivers, railways, telecom etc.	PMU
Disclosure of subproject EMP details on RVPN website	PMU-ESC
Grievances Redressal	PMU/Sub - Divisional Administration, ESC
Updating of EMP mitigation measures based on discussions	PMU – ESC
EMP Implementation Stage	
Meetings at community/household level with APs	PIU/Contractor
Implementation of proposed EMP mitigation measures	PIU/Contractor
Consultations with APs during EMP mitigation measures implementation	PIU/Contractor
Internal monitoring	PMU
Training	External Experts/ADB

ADB = Asian Development Bank; AP = affected persons; EA = executing agency; EMP = Environmental Management Plan; ESC = Environment and Social Cell; PIU = Project Implementation Unit; PMU = Project Management Unit.

Asian Development Bank

267. ADB will review the semi-annual environmental mornitoring reports submitted by the executing agency during project.

8.0 PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

8.1 Information Disclosure

268. HPPTCL will submit to ADB the following documents for disclosure in ADB's website:

(i) Environment Assessment and Review Framework Document (EARF) update, if any, and the final IEE;
(ii) a new or updated IEE and corrective action plan prepared during project implementation, if any; and
(iii) the environmental monitoring reports.

269. After finalization of IEE, HPPTCL will provide relevant environmental information, including information from the above documents in a timely manner, in an accessible place and in a form and local language(s) understandable to affected people and other stakeholders in accordance with the ADB SPS 2009 and Public Communications Policy 2011. For illiterate people, other suitable communication methods will be used.

270. IEE results will also be communicated to the local community before commencement of construction through posting on the website of HPPTCL, as well as providing a mechanism for the receipt of comments.

8.2 Consultation and Participation

271. During the project formulation stage, HPPTCL conducted a project scoping exercise and reconnaissance survey of the proposed system. Accordingly, during public consultation sessions, considerable dialogue had been held between HPPTCL representatives, individuals, and groups from the community to make them aware of the proposed project.

272. The project-affected community residing beside the proposed transmission line has already gained a reasonable knowledge about the potential grievances, which may arise in the future. The community was also informed about the Grievance Redressal Mechanism (GRM), to be followed by HPPTCL as per procedure described in EARF and Environmental and Social Safeguards Policy May 2011 for making complaints, including the place and the responsible person to contact in this regard.

273. HPPTCL and the consultant team have carried out meaningful consultations with affected people and other concerned stakeholders, including civil society, and facilitated their informed participation. This consultation process, which began at the project preparation stage, will be carried out by PIU on an on-going basis throughout the project cycle.

274. Any periodic consultations undertaken by the PIU during the course of construction (i) will provide timely disclosure of relevant information that is understandable and readily accessible to groups and individuals, especially women; (ii) will be undertaken in an atmosphere free of intimidation or coercion; (iii) will be gender inclusive and responsive, and tailored to the needs of disadvantaged and vulnerable groups; and (iv) shall enable the incorporation of all relevant views of affected people and other stakeholders into decision making, such as project design, mitigation measures, the sharing of development benefits and opportunities, and implementation issues. This periodic consultation process and will be documented and reflected in each periodic environmental monitoring report.

8.3 Consultation Details

275. Public consultations were conducted in the project-affected area up to October 2016. The community aired their opinions freely on the project, its impact, and suggestions for mitigating adverse impacts. People participated in voluntary public consultation sessions to express their views about the proposed project. Table 8.1 indicates a summary of public consultations conducted during the field survey. The detailed list of public consultations is in Annexure 8. The transcript of these discussions will help HPPTCL and the EPC contractor in conducting a proper needs assessment to ensure that the issues raised by people are addressed appropriately.

Table 8.1: Public Consultation

No.	Name of the Component/ subproject	Name of the Village	Distance from Project Location	Issues raised by the participants
COMPONENT I. Bhabha Nagar PIU (Kinnaur District) subprojects				
S1	66 kV Gas Insulated Switchgear (GIS) switching station atBagipulTranche 3	Bagipul	400m	• People requested for Jobs during and after the implementation of project if possible • Roads need to be improved. • Available streetlights be made in the village. • Continuous consultation with villagers need to be carried out throughout construction • Most of the substation land is agricultural and unused and people were happy to provide the land to HPPTCL through mutual negotiation. People said that compensation money would be used for development of smallscale business activities.
T1	66 kV double circuit (D/C) transmission line from 66 kV GIS BagiplSubstation to Kotla substation	Bagipul	300m	• People requested for Jobs during the implementation of project if possible • Demand of 24 hours power supply if possible. • People requested that utility vehicle may be hired by HPPTCL from the village which will be used during and after the implementation • Prior notice shall be provided to the villages before the start of construction. • People acknowledged that no such severe adverse impacts are foreseen as the line will pass through forest land.
COMPONENT II. Chamba PIU (Chamba District) subprojects				
T2 S2 T3 T4	400 kV double circuit DS/C) transmission line from 220/400 kV Lahal substation to Rajera(Chamera-II) Substation). 132/220 kV 2x80/100 MVA substation at Mazra 220 kV D/C Transmission line from Mazra to Karian.	Kariayan, Rundega Luddu, Kathana, Kakiyan, Uteep, Mando, Kamaharka, Uteep Jangal Gaila Bhatka Jangal, Dharunda, Thakrota, Jhulara		• Prior notice to the affected farmer shall be given and consultations shall be continued during the entire phase of construction. • People requested for Jobs during and after the implementation of project if possible. • Local labour shall be employed to the extent possible by the contractor. • Any damage to local area during construction by movement of vehicles shall be restored post construction. • At Mazra, local People welcome the proposed project because their land was useless from last 15 years. Land is outside the village and

No.	Name of the Component/ subproject	Name of the Village	Distance from Project Location	Issues raised by the participants
	220 kV transmission line from Holi Bhajoli to Lahal.	Sapdah, Balohad, Masroond, Kathwari Bhari Nanu Sungal Sudi Nandrela, Nihuin, Ghargran Bhera, Salah, Moharhi Kandla, Kuthar, Mauwa		wild animals always damage the crops.
COMPONENT III: Rohru PIU (Shimla District) subprojects				
S3	220 kV GIS switching station at Hatkoti	SARI	300m	• The land identified is owned by HPPCL which will be transferred in the name of HPPTCL. Both the companies are government owned company. • People expect maximum benefits in terms of employment during construction. • Corporation should provide some additional benefits in terms of development work as part of corporate responsibility in terms of better water supply and rehabilitation of existing roads etc. • RoW and the height of the line from the ground should be adequate.
COMPONENT IV: Sarabhai PIU (Kullu Districts) subprojects				
T5	132 kV D/C transmission line from Barsaini to 132/220 kV substation at Charor	Manikaran, Pini, Shoshan Zari, Shath, Kashwari, Silihar	2,500m	• People are generally cooperative about the project. • Fair compensation is expected. • Temporary jobs expected during construction. • All the affected Panchayats should be given additional grants for development of work in the village. • People should be given prior notice to harvest their crops. • Construction schedule should be chosen during the off season to avoid lesser damage in standing crop.
S4	33/132 kV 2x25/31.5 MVA GIS substation at Barsaini	BARSAINI	2500m	• Good compensation for the land. • Roads will be improved. • People requested that jobs should be given to the affected people on priority. • People feel that power supply will be improved in the local area.

Consultation Findings

276. Incorporation of environmental concerns of Affected Persons (APs) through public consultation will help avoid or minimise conflict situations and enable them to provide meaningful inputs into the project design and implementation process. Consultations and group discussions were carried out along the project sites by the project safeguard consultants between September 2015–October 2016. Discussions were carried out in almost all villages within 500 m vicinity of the alignment of transmission lines and at proposed substation sites in all the PIUs. Annexure 8 lists the detailed public consultations during the field survey of the team.

277. As part of the social assessment, approximately 246 households have been surveyed where the heads of the households were interviewed to collect the data from March to October 2016. Additionally, social and environmental experts from the consultant team carried out various informal consultations during the site assessment with concerned village heads and local people at various villages. The summary of people's perception of the project during the consultation is presented in Annexure 8. Tables A8.1-5 (in Annexure 8) lists villages where the consultations were held and their photographs respectively in the Chamba, Kullu, and Shimla Districts. Table A8.6 gives the general perception for all the Tranche 3 subprojects.

9.0 GRIEVANCE REDRESS MECHANISM

9.1 Potential Grievance Channels (Framework)

278. HPPTCL disclosed the project plans during public consultation sessions as well as made them aware of their rights, effects on area, and the action to be taken to mitigate the impact as part of their "Environment and Social Safeguards Policy 2011 and the Resettlement, Relief, Rehabilitation and Compensation Policy 2011". The Environmental and Social staff held discussions with groups and individuals to make them aware of the compensation procedures, impacts of lines, as well as proposed project timelines. This exercise shall continue during and after the construction of the subproject. Thus, the project-affected community residing beside the proposed transmission line has gained a reasonable knowledge about the potential grievances, which will arise in the future.

9.2 Time Frame

279. A community awareness programme must be conducted one month prior to construction by the concerned PIUs of HPPTCL regarding the scope of the project, procedure of construction activities, utility of resources, identified impacts and mitigation measures. These awareness programmes will help the community to resolve problems, and clarify their distrusts related to the proposed project at initial stage.

280. The community should be informed about the Grievance Redress Mechanism (GRM), which is already established as per HPPTCL and GoHP procedure for making complaints, including the place and the responsible person to contact in practical way in this regard. Almost all the stakeholders related to the GRM will also be aware of the established grievance process, the requirement of grievance mechanism, goals, benefits, relevant laws and regulations, etc.

9.3 The Grievance Redress Mechanism

281. Through its Environment and Social Safeguards Policy,[29] HPPTCL has established a Grievance Redress Mechanism (GRM) having suitable grievance redress procedure for the project affected persons (APs). The GRM would address APs' concerns and complaints promptly, using an understandable and transparent process that is gender responsive, culturally appropriate, and readily accessible to the APs at no cost. This GRM consists of a Grievance Redress Committee (GRC) led by a Project Head. Grievance can be received at HPPTCL in any forms through verbal, telephone or written as deemed necessary by the APs. The committee consists of the constitution listed in Table 9.1:

Table 9.1: Constitution of Grievance Redress Committee

1	Project Head (ADB Projects)
2	Sub District Magistrate or nominee of SDM/Land acquisition officer or nominee (patwari etc.)
3	Representative of local Panchayat/ NGO
4	Representative of EPC contractor
5	Project Environment/RR staff

[29] Finalized in May 2011.

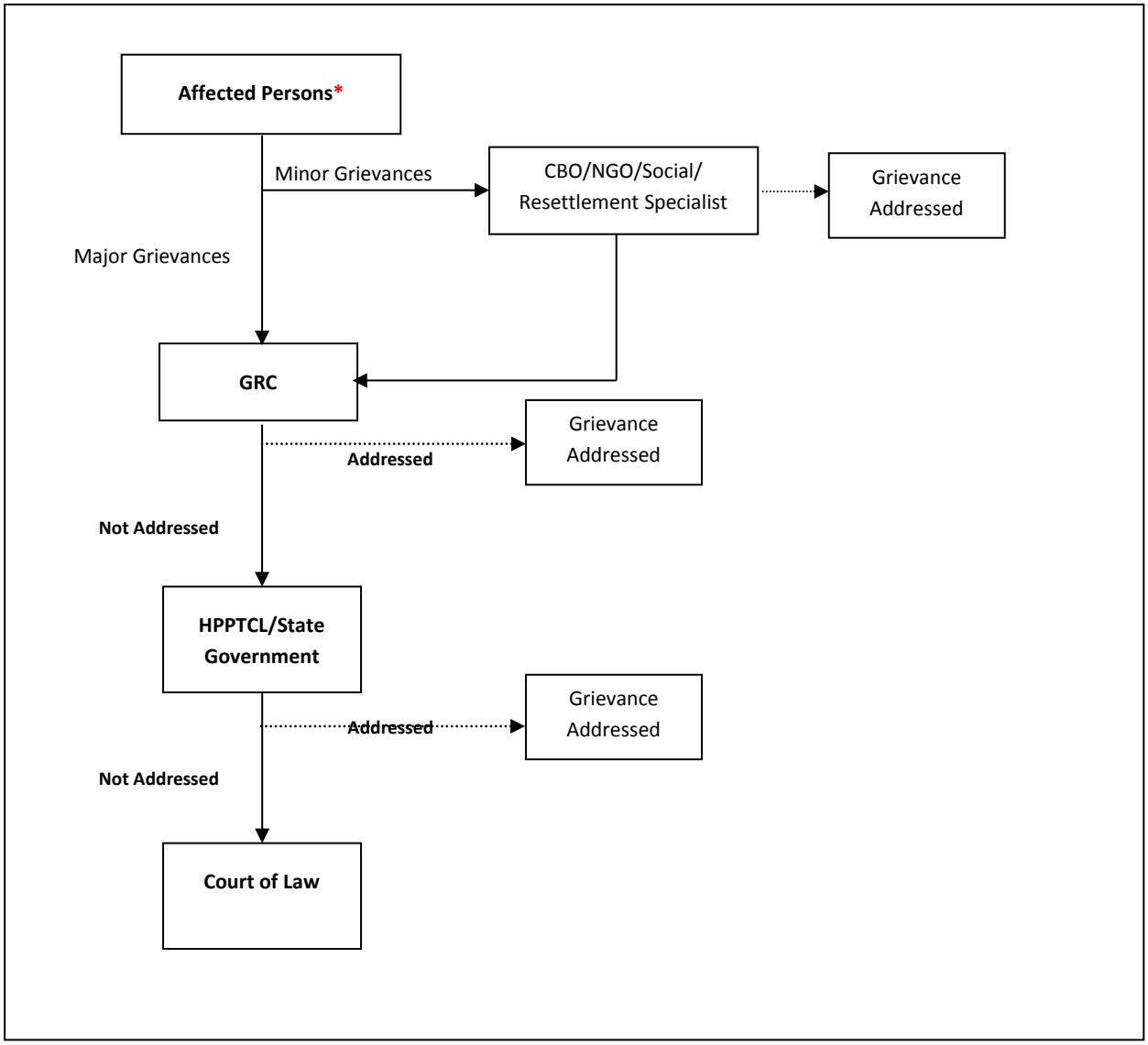
282. Environmental grievances will be handled in accordance to the project's GRM. Open and transparent dialogue will be maintained with project APs as and when needed, in compliance with ADB's SPS 2009. This GRM will provide an effective approach for resolution of complaints and issues of the affected person/community. Project Management Unit (PMU) shall formulate procedures for implementing the GRM. The PIU shall undertake GRM's initiatives that include procedures of taking/recording complaints, handling on-the-spot resolution of minor problems, taking care of complainants and provisions of responses to distressed stakeholders, etc. paying particular attention to the impacts on vulnerable groups.

283. Field level grievances will be addressed through the Grievance Redress Committees (GRC) to be formally constituted at each PIU, and the nodal environment officer of the PMU would be responsible for the management of complaints pertaining to environmental aspects. The GRC would comprise of representatives from the PIU, PMU, local administration, and local residents. A gender balance would be ensured. A complaint register would be maintained at each site for a subproject. The GRCs will be formally notified and established at the project sites, and will function as open forums for hearing complaints and exploring quick resolutions to resolving conflicts. A suitable outreach program would be carried out for local residents to be aware of the presence of such GRM such as notices in the local urban body offices; project sign board providing names and contact details of persons with whom complaints could be lodged, etc. Ideally, the local residents would be encouraged to discuss their grievances with the contractors. If the contractors fail to resolve the issue within two weeks, then the PIU would escalate the issue to GRC for resolution. HPPTCL follows its policy "Environmental and Social Safeguards Policy May 2011" that has a set of procedures approved since Tranche 1, by ADB and HP govt.

284. Grievances of APs will then be brought to the attention of the Project Head of the PIU. Grievances not redressed by the PIU will be brought to the Grievance Redress Committee (GRC) set up to monitor subproject Implementation for each subproject affected area. Each GRC meeting will record its deliberations and inform the concerned parties of a resolution within three weeks of its findings and recommendations. The GRC will resolve grievances within a maximum time limit of three months of receiving the complaint. Communities will be informed about the GRC through the outreach mechanism of the executing agency. The PIU will keep records of all grievances received including: contact details of complainant, date that the complaint was received, nature of grievance, agreed corrective actions, the dates these were affected, and the final outcome.

285. The proposed mechanism does not impede access to the country's judicial or administrative remedies. The APs have the right to refer the grievances to appropriate courts of law if not satisfied with the redress at any stage of the process. The flow chart showing the GRM is presented in Figure 9.1.

Figure 9.1: Process of Grievance Redressal Mechanism



(*) Affected Persons can approach the court of law at time during the grievance redressal process.

10.0 CONCLUSION AND RECOMMENDATIONS

286. Environmental impacts likely to result from the proposed transmission system development are manageable and can be managed cost effectively. Careful mitigation and monitoring, specific selection criteria and review/assessment procedures for subprojects have been specified to ensure that minimal impacts take place. The detailed design would ensure inclusion of any such environmental impacts that could not be specified or identified at this stage are taken into account and mitigated where necessary. Those impacts can be reduced through the use of proper mitigation measures listed in the EMP. The EPC contract will incorporate applicable environmental measures identified in IEE and EMP.

287. The proposed project will have a number of positive and negative impacts to the existing environment as follows:

- The state government will benefit largely from the large volumes for exportable surplus of power. Local people will benefit due to improvement in quality and reliability of the electricity supply as well as funds that will flow into the area to provide them with better roads, health facilities due to higher allocations to the Local Area Development Funds from generation projects to the district. Improvement in lifestyles of local people shall be the main positive impact of this project.

- The removal of fruit and non-fruit trees for the transmission line and substations will be the main negative impact to the proposed project area. However, the compensation for crop and trees shall be made as per HPPTCL's Resettlement, Relief, Rehabilitation and Compensation Policy May 2011. Compensatory afforestation shall be carried out wherever forest land is used.

- Environment pollution due to cut and fill operations, transportation of construction materials, disposal of debris, disturbance to the farming activities, nuisance from dust, noise, vehicle fumes, black smoke, vibration as well as silt runoff due to construction activities are the short term negative impacts due to the proposed project.

288. Primary data for environmental baseline information of water, air and noise/vibration at substations located in Chamba, Kullu and Shimla district have been collected with respect to substation locations. These baseline parameters shall be used to monitor changes in the quality of water, air, soil and noise during the construction and operation periods at these sites.

289. Mazra, Bagipul and Barsaini GIS substation lands will need to be purchased from private persons at prices based on market rates. The Hatkoti substation land, is a government land with existing an ADB funded HEP, which will be transferred by HPPCL, a government of Himachal Pradesh enterprise. This facility will become vacant after the HEP construction is finished, and sheds will be removed by HPPCL. Since, road connectivity is of primary importance to the proposed substation land - Hatkoti, Mazra, Bagipul and Barsaini substation lands are being procured nearest to the road head. For Hatkoti, Mazra, Bagipul and Barsaini substation lands, which are barren, there will be no need to remove trees for the construction of a new substation. A larger extent of the proposed transmission line runs through orchards, cultivated/uncultivated, as well as forestlands. Any dense forest areas have been avoided by design. None of the lines pass through any human settlement, national park or sanctuary. No endangered or protected

species of flora or fauna are reported at any of the subproject sites.

290. A proper GRM will be implemented by HPPTCL to overcome public inconvenience during the proposed project activities.

291. Public consultations have been conducted along the transmission corridor. The results indicate broad support for the project based on perceived economic and social benefits.

292. An environmental impact analysis has been done with various criteria like demographic factors, climate and natural habitat, community and employee health and safety, etc. Based on the analysis, it is found that there is no adverse impact on the migration of habitat, any natural existing land resources and affect in the regular life of people. The environmental impact associated with the transmission line project is limited to the extent of construction phase and can be mitigated through a set of recommended measures and adequate provision for environment and social impact which cover monitoring, measuring and mitigation.

293. Most impacts are expected to occur during the construction phase and are considered to be temporary in nature. The transmission corridor was carefully selected after undergoing an options assessment. This enabled the RoW alignment to bypass any reserve forest area, villages and water supplies and resources. The main project impacts are associated with cutting of orchards, forest trees, and waste management (excavation of topsoil).

294. The IEE performed is adequate for purposes of project implementation. Based on the environmental assessment and surveys conducted for the project, the potential adverse environmental impacts can be mitigated to an acceptable level by adequate implementation of the mitigation measures identified in the EMP. Adequate provisions are being made in the project to cover the environmental mitigation and monitoring requirements, and their associated costs.

295. The potential impacts, as specified in the IEE for the construction and operation of transmission sub-component as a whole, indicate that the project is expected to be classified as a Category “B” in accordance with ADB’s SPS 2009 and MoEFCC Guidelines of GoI. Thus, the IEE report has been prepared for the project to address the potential environmental impacts.

ANNEXURES

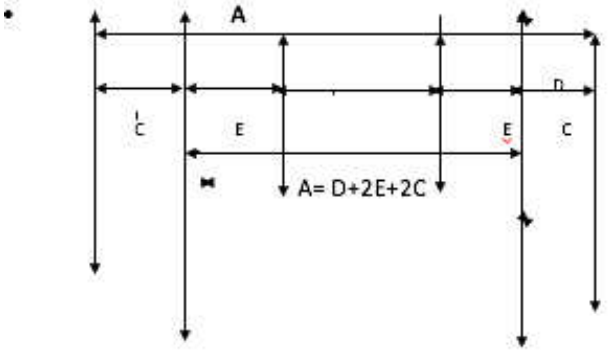
Annexure 1: Safe Distances as per Electricity Act

Voltage	Mandatory clearance as per I.E Rule 77
66 kV	6.1 meters
132 kV	6.7 meters
220 kV	7.0meters
400 kV	8. 8 meters

ROW WIDTH FORVALLEYS

HPPTCL is following the Electrical Rules 77and 80 which is strictly followed and as per guidelines. Therefore, it meets all national and international standards.

- The maximum permissible ROW **"A"** is worked out taking into consideration "'D'"
- (Conductor to conductor distance) + "E" (Effect of conductor swing under windy condition , length of insulator string and the conductor sag)+ **"C"** (Mandatory clearances from the trees as per Indian Electricity Rules).
- **ROW A = D+2E+2C**
- **conductor shall be at significant height when the towers are erected on very high levels as compared land underneath.**



ROW A = D+2E+2C

ROW WIDTH FOR LEVELLED LAND AND AT TOWER LOCATION

Supply voltage	No of circuits	Maximum ROW As per guidelines	Minimum ROW **''A"**	MinimumROW under conductor in valleys ** "**B**"=D+3	Conductor to Conductor Distance **''D"**	Effect ofConductor Swing & Sag **##"E"**	Distance on either side of the extreme end conductor. (To be only considered inareas under valleys)	Clearance from conductor to tree. As per Indian Electricity rules **"C"**
400 kV	Double ckt.	46m	30 m	20 m	16.40m	1.3m	1.5m	5.5m
220 kV	Double ckt.	35m	22m	15 m	10.4m	1m	1.5m	4.6m

132 kV	Double ckt.	27m	19m	13 m	9.2m	0.61m	1.5m	4m
66 kV	Double ckt.	18m	12m	7.0 m	3.78m	0.56m	1.5m	3.4m
33 kV	Double Ckt	15m	9m	6.0 m	2.6m	0.4m	1.5m	2.8m

CENTRAL ELECTRICITY AUTHORITY

NOTIFICATION

New Delhi, the 20th September, 2010

No. CEI/1/59/CEA/El.—In exercise of the powers conferred by section 177 of the Electricity Act, 2003 (36 of 2003); the Central Electricity Authority hereby makes the following regulations for Measures relating to Safety and Electric Supply, namely:-

Chapter I

1. **Short title and Commencement.-** (1) These regulations may be called the Central Electricity Authority (Measures relating to Safety and Electric Supply) Regulations, 2010.

(2) They shall come into force on the date of their final publication in the Official Gazette.

2. **Definitions.-** (1) In these regulations, unless the context otherwise requires,

(a) "Act" means the Electricity Act,2003;

(b) "accessible" means within physical reach without the use of any appliance or special effort;

(c) "ampere" means a unit of electric current and is a constant current which, flowing in two parallel straight conductors of infinite length of negligible cross section and placed at a distance of one meter apart in a vacuum will produce a force of $2x10^{-7}$ Newton per meter length between the conductors;

(d) "apparatus "means electrical apparatus and includes all machines, fittings, accessories and appliances in which conductors are used;

(e) "bare" means not covered with insulating materials;

(f) "cable" means a length of insulated single conductor(solid or stranded) or of two or more such conductors each provided with its own insulation, which are laid up together. Such insulated conductor or conductors may or may not be provided with an overall mechanical protective covering;

(g) "circuit" means an arrangement of conductor or conductors for the purpose of conveying electricity and forming a system or a branch of a system;

(h) "circuit breaker" means a device, capable of making and breaking the circuit under all conditions, and unless otherwise specified, so designed as to break the current automatically under abnormal conditions;

(i) "concentric cable" means a composite cable comprising an inner conductor which is insulated and one or more outer conductors which are

Annexure 2: Alternative Site Analysis for Grid Substations

COMPONENT I: PIU Bhabanagar (District Shimla) subprojects
S1 - 66 kV GIS station at Bagipul

SNo	Description	Site – A	Site - B	Site - C
1.	Substation details	Above Nirmand Bagi pul Road	BelowNirmand Bagi pul Road	near power project
1a	Area (dimensions)	5058 sqm.	5264 sqm.	8272 sqm.
1b	Geographical coordinates	74°39'61" N, 34° 86' 69.6E	74°31'97 N,34° 88'68.7"E	74°35'72N, 34° 89'85.6"E
1c	Slope/Plain Land	Plain	Sloping	Sloping
1d	Amount of land cutting required	Cutting/filling etc.1500 CMT approx.	Cutting/filling etc.2500 CMT approx	Cutting/filling etc. 3000 CMT approx.
2	Number of transformers	1	1	1
3	Number of Bays	4	4	4
4	Size/ type of oil sump			
5	Ownership of land (Private / Forest/ Other Government Department/ Other) - Private - Government	Private	Private	Private
6	Private land (in Bighas)			
	(i) Agriculture:- a. Irrigated b. Non-irrigated	Non-Irrigated	Non-Irrigated	Non-Irrigated
	(ii) Non-Agriculture/ Private waste land / banjar.			
	(iii) House or Building: a. Residential b. Non-Residential	No Building exists	No Building exists	No Building exists
7.a	Distance from Nearest River	5KM Bagi Nallah	4.5kMtrs Bagi Nallah	Bagipul 2.km
7.b	Distance from Nearest National / State Highway	Shimla R State Highway 20kM	Shimla Rohru State Highway 20km	Shimla Rohru State Highway 22 Km
7.c	Distance from Nearest Forest Area	1Km	1.2Km	3Km
7.b	Distance from Nearest Village / town	Village Bagi	Village Bagi	Village Bagi-1Km
7.e	Distance from Nearest Market/Area of Economic Activity	Nirmand-11KM	Nirmand -11	Nirmand-13
8.	Land Strata- geology	Rocky/Slopy	Rocky/Slopy	Rocky/Slopy
9.	Road accessibility	No	No	No
10.	EHV line Passing Near By (Distance)	Nil	Nil	Nil
11.	HT line Passing Near By (Distance)	Nil	Nil	Nil
12.	Telephone line Passing Near By (Distance)	Nil	Nil	Nil
13.	National / State Highway Passing Near By (Distance)	Shimla Kaurik 20Km	20Km	24Km
14.	Distance from Interstate / International Boundaries	200Km Kaurik	200Km Kaurik	204Km
15.	Nos. of Forest Trees:- a. Trees to be felled b. Trees to be lopped	45 nos.	60	10 nos.
16.	Nos. of private trees			
	(i) Fruit Trees: a. Trees to be felled b. Trees to be lopped	40 22.	25	nill. 8 nos.
	(ii) Non-Fruit Trees: a. Trees to be felled b. Trees to be lopped	Nil	Nil	Nil
17.	Distance from snow area	Snow Area	Snow Area	Snow Area
18.	Distance from un cultivated area	Nil	Nil	Nil
19.	Altitude of substation	1744 msl	1624	1610 msl
20.	Nearest distance from Airport	150km	150km	150km
21.	Distance from nearest religious or Archaeological sites	Templetiuni near Bagipul 22Km		
22.	Name of villages involved/Name of District	Bagipul Dist. Kullu	Bagipul Dist. Kullu	Bagipul Dist. Kullu
23.	Land to be permanently acquired: a. Area (in ha) Cost	5058 sqm. NA	5264 sqm. NA	8272 sqm. NA
	Alternative Selected			Selected - Avoids the archeologically significant area. No reserve forest areas and no houses nearby, minimum number of fruit trees and no forest trees involved. The minimum land acquisition for road construction involved.
	Alternative Selected			Selected - No reserve forest areas. Optimal distance from the IPP's hence will reduce the mesh of transmission lines.

COMPONENT II: Chamba PIU (ChambaDistrict) subprojects
S2 – 132/220kV GIS station at Mazra

S. No	Description	Site – 1	Site - 11	Site - 111
1.	**Substation details**	Pukheri	Mazra	Mazra
1a	Area (dimensions)	14 bighas	16 Bighas	18 Bighas
1b	Geographical coordinates	Lati:32°-41.444'(N) Long: 76°-64.319'(E)	Lati: 32°-4.553'(N) Long: 76°-2.78'(E)	Lati: 32°-41.72'(N) Long: 76°-0.4.30'(E)
1c	Slope/Plain Land	Sloped	Sloped	Sloped
1d	Amount of land cutting required	2000 cum	2500 cum	2500cum
2	Number of transformers	2 Nos	2 Nos	2 Nos
3	Number of Bays	220 kV:-2Nos 132 kV:-4 Nos.	220 kV:-2Nos 132 kV:-4 Nos.	220 kV:-2Nos 132 kV:-4Nos.
4	Size/ type of oil sump			
5	Ownership of land (Private / Forest/ Other Government Department/ Other) - Private - Government	Private	Private	Private
6	Private land (in Bighas)	14 bighas	16 Bighas	18 Bighas
	(i) Agriculture:- c. Irrigated d. Non-irrigated	14 bighasNon-Irrigated	16 bighas Non-Irrigated	18 bighasNon-Irrigated
	(ii) Non-Agriculture/ Private waste land / banjar.	Nil	Nil	Nil
	(iii) House or Building: c. Residential d. Non-Residential	Nil	Nil	Nil
7.a	Distance from Nearest River	Baira- Siul (300 mtrs)	Baira- Siul (250 mtrs)	Baira –Suil (300 mtrs)
7.b	Distance from Nearest National / State Highway	SH (300 mtrs)	SH (500 mtrs)	SH (250 mtrs)
7.c	Distance from Nearest Forest Area	Nil	Nil	Nil
7.b	Distance from Nearest Village / town	Pukheri(100 mtrs)	Mazra(450 mtrs)	Mazra (300 mtrs)
7.e	Distance from Nearest Market/Area of Economic Activity	Pukhari (100 Kms)	Mazra(450 mtrs)12.450 Kms)	Mazra (300 mtrs
8.	Land Strata- geology	Sandy Loam with Quartzite origin	Sandy Loam with Quartzite origin	Sandy Loam with Quartzite origin
9.	Road accessibility	Yes	Yes	Yes
10.	EHV line Passing Near By (Distance)	220 kV T/L Kurthla-Bathri(3KM mtrs)	220 kV T/L Kurthla-Bathri (3.5K mtrs)	220 kV T/L Kurthla-Bathri (3.6K mtrs)
11.	HT line Passing Near By (Distance)	100 mtrs	150 mtr	100 mtrs
12.	Telephone line Passing Near By (Distance)	Nil	Nil	Nil
13.	National / State Highway Passing Near By (Distance)	120 & 0.300 Kms	120 & 0.500 Kms	120 & 0.250 Kms
14.	Distance from Interstate / International Boundaries	75 Kms from Punjab Boundary	85 Kms from Punjab Boundary	85 Kms from Punjab Boundary
15.	Nos. of Forest Trees:- c. Trees to be felled d. Trees to be lopped	Nil	Nil	Nil
16.	Nos. of private trees			
	(iii) Fruit Trees: c. Trees to be felled d. Trees to be lopped	10 Nos 10 nos -	12 nos 12 nos -	2 nos 2 nos. -
	(iv) Non-Fruit Trees: c. Trees to be felled d. Trees to be lopped	10 nos 10 nos	14 nos 14 nos.	10 nos 10 nos.
17.	Distance from snow area	30 Kms	35 Kms	40 Kms
18.	Distance from un cultivated area	Nil	Nil	Nil

S. No	Description	Site – 1	Site - 11	Site - 111
19.	Altitude of substation	Altitude:790mtr (Approx)	Altitude: 807mtr (Approx)	Altitude:785mtr (Approx)
20.	Nearest distance from Airport	200 Kms	200 Kms	200 Kms
21.	Distance from nearest religious or Archaeological sites	15 Kms	15 Kms	15 Kms
22.	Name of villages involved/Name of District	Pukheri(Chamba)	Mazra (Chamba)	Mazra (Chamba)
23.	Land to be permanently acquired: b. Area (in ha) c. Cost	14 bighas 1.456704 ha Rs 1260 lacs	16 Bighas 1.375776 ha Rs 1190 lacs	18 Bighas 1.61856 ha Rs1400 lacs
	Alternative Selected	Selected - No reserve forest areas. Optimal distance from the IPP's hence will reduce the mesh of transmission lines.		

COMPONENT III: Rohru PIU (Shimla District) subprojects
S3 - 220 kV GIS switching station at Hatkoti

SNo	Description	Site - A	Site - B	Site - C
1.	Substation details	Near HPPCL Barrage in Mohal Sari, Tehsil Jubbal, District Shimla (Himachal Pradesh)	Below Patsari Khara Pather Link Road Sari, Mohal Sari, Tehsil Jubbal, District Shimla (Himachal Pradesh)	Above Patsari Khara Pather Link Road Sari, Mohal Sari, Tehsil Jubbal, District Shimla (Himachal Pradesh)
1a	Area (dimensions)	8000 sqm.	14300 sqm.	14400 sqm.
1b	Geographical coordinates	31°08'04" N, 77° 44' 25.3"E	31°08'06" N, 77° 44'32.2"E	31°08' N, 77° 44'"E
1c	Slope/Plain Land	Sloping	Sloping	Sloping
1d	Amount of land cutting required	Cutting/filling etc. 3500 CMT approx.	Cutting/filling etc. 500 CMT approx	Cutting/filling etc. 1000 CMT approx.
2	Number of transformers	2	2	2
3	Number of Bays	4	4	4
4	Size/ type of oil sump			
5	Ownership of land (Private / Forest/ Other Government Department/ Other) - Private - Government	HPPCL - 0.91.45 ha.(9.3 Bigha)	i) 01.43.28 ha.(19.1Bigha)	i) 1.19.55 ha.(15.18Bigha) ii) 0.19.00 ha.(2.10Bigha)
6	Private land (in Bighas)			
	(i) Agriculture:- e. Irrigated f. Non-irrigated	Non-Irrigated	Non-Irrigated	Non-Irrigated
	(ii) Non-Agriculture/ Private waste land / banjar.			
	(iii) House or Building: e. Residential f. Non-Residential	No Building exists	No Building exists	No Building exists
7.a	Distance from Nearest River	Pabbar 1.7km	Pabbar 0.8km	Pabbar 2.2km
7.b	Distance from Nearest National / State Highway	Shimla Rohru State Highway 1.5km	Shimla Rohru State Highway 3km	Shimla Rohru State Highway 3.5km
7.c	Distance from Nearest Forest Area	Government area involved	Government area involved(only for approach road)	Nil
7.b	Distance from Nearest Village / town	Village Hatkoti- 0.7Km Town Jubbal- 13km Rohru -12km	Village Hatkoti- 0.8Km Town Jubbal- 14km Rohru- 12km	Village Hatkoti- 2Km Town Jubbal- 12km Rohru- 13km
7.e	Distance from Nearest Market/Area of Economic Activity	Jubbal- 13km Sawra-4km Rohru-12km	Jubbal- 14km Sawra-10km Rohru-12km	Jubbal- 12km Sawra-11km Rohru-13km
8.	Land Strata- geology	Sandy	Rocky/Slopy	Rocky/Slopy
9.	Road accessibility	Yes	Yes	Yes
10.	EHV line Passing Near By (Distance)	Nil	Nil	Nil
11.	HT line Passing Near By (Distance)	Nil	Nil	Nil
12.	Telephone line Passing Near By (Distance)	Nil	Nil	Nil
13.	National / State Highway Passing Near By (Distance)	Khara Pathhar – Hatkoti road		Khara Pathhar – Hatkoti road
14.	Distance from Interstate / International Boundaries	Interstate Uttrakhand Kuddu (Snail 20km	Interstate Uttrakhand Kuddu (Snail) 26 km	Interstate Uttrakhand Kuddu (Snail) 27km

SNo	Description	Site - A	Site - B	Site - C
15.	Nos. of Forest Trees:- e. Trees to be felled f. Trees to be lopped	Nil	Nil	10 nos.
16.	Nos. of private trees			
	(v) Fruit Trees: e. Trees to be felled f. Trees to be lopped	Nil Nil.	2 nos. Nil	85 nos. 8 nos.
	(vi) Non-Fruit Trees: e. Trees to be felled f. Trees to be lopped	Nil	Nil	Nil
17.	Distance from snow area	5kM	Snow Area	Snow Area
18.	Distance from un cultivated area	Nil	Nil	Nil
19.	Altitude of substation	1528 msl	1590.92 msl	1610 msl
20.	Nearest distance from Airport	150km	150km	150km
21.	Distance from nearest religious or Archaeological sites	Temple Hatkoti-1.5 km (Approx) Radhsoami Satsang Bhawan 0.03km (Approx)	Temple Hatkoti-0.7 km (Approx), Radhsoami Satsang Bhawan 0.15km (Approx)	Temple Hatkoti-1.5 km (Approx.)
22.	Name of villages involved/Name of District			
23.	Land to be permanently acquired: d. Area (in ha) e. Cost	8000 sqm. Rs.4.07Cr.	14300 sqm. Rs.1.43Cr.	14400 sqm. Say Rs.2.52Cr.
	Alternative Selected			Selected - Avoids the archeologically significant area. No reserve forest areas and no houses nearby, minimum number of fruit trees and no forest trees involved. The minimum land acquisition for road construction involved.
	Alternative Selected	Selected - No reserve forest areas. Optimal distance from the IPP's hence will reduce the mesh of transmission lines.		

COMPONENT IV: Sarabhai PIU (Kullu Districts) subprojects
S4 - 33/132 kV 2x25/31.5 MVA GIS substation at Barsaini

SNo	Description	Site – A	Site - B	Site - C
1.	Substation details	Private land	NHPC land Near HPSEBL 33 kV S/Stn	Forest land at Barsaini
1a	Area (dimensions)	9600 sqm.	3760 sqm.	9024 sqm.
1b	Geographical coordinates	32° 0'1.69"N, 77°26'55.08"E	32° 0'2.09"N, 77°26'51.64"E	31°59'53.54"N, 77°26'46.26"E
1c	Slope/Plain land	Slope	Slope	Slope
1d	Amount of land cutting required	5000 cu.m	4500 cu.m	4800 cu.m
2	Number of transformers	2 no	2 no	2 no
3	Number of Bays	2 no 132 kV bays	2 no 132 kV bays	2 no 132 kV bays
4	Size/ type of oil sump	40,000 ltr, underground	40,000 ltr, underground	40,000 ltr, underground
5	Ownership of land (Private / Forest/ Other Government Department/ Other)	Private land	NHPC	Government/ Forest
6	Private land (in Bighas)	4888 sqm.		
	(i) Agriculture:- a. Irrigated b. Non-irrigated	Non-irrigated		
	(ii) Non-Agriculture/ Private waste land / banjar.			
	(iii) House or Building: a. Residential b. Non-Residential			
7.a	Distance from Nearest River	Parvati/ 400 m	Parvati/ 800 m	Parvati/ 800 m
7.b	Distance from Nearest National / State Highway	800 m	1000m	1200 m
7.c	Distance from Nearest Forest Area	600 m	400 m	400 m
7.b	Distance from Nearest Village / town	150 m		
7.e	Distance from Nearest Market/Area of Economic Activity	2 km	1.5 km	3 km
8.	Land Strata- geology	Cohesive Soil/ soft Rock	Cohesive Soil/ soft Rock	Cohesive Soil/ soft Rock
9.	Road accessibility	Accessible by Road	Accessible by Road	Accessible by Road
10.	EHV line Passing Near By (Distance)	Nil	Nil	Nil
11.	HT line Passing Near By (Distance)	33 kV Tosh to Barsaini line/ 150 m	33 kV Tosh to Barsaini line/ 250 m	33 kV Tosh to Barsaini line/ 1000 m
12.	Telephone line Passing Near By (Distance)	Nil	Nil	Nil
13.	National / State Highway Passing Near By	Bhunter to Barsaini	Bhunter to Barsaini	Bhunter to Barsaini Highway. /

SNo	Description	Site – A	Site - B	Site - C
	(Distance)	Highway. / 800 m	Highway. / 1000 m	1200 m
14.	Distance from Interstate / International Boundaries	J & K Border 445 km	444 km J & K Border	438 km J & K Border
15.	Nos. of Forest Trees:- a. Trees to be felled b. Trees to be lopped	Nil		200
16.	Nos. of private trees			
	(i) Fruit Trees: a. Trees to be felled b. Trees to be lopped	120	100	
	(ii) Non-Fruit Trees: a. Trees to be felled b. Trees to be lopped	100	100	
17.	Distance from snow area	Snow Zone	Snow Zone	Snow Zone
18.	Distance from un cultivated area	200m	200m	500m
19.	Altitude of substation	2267 m	2275 m	2145 m
20.	Nearest distance from Airport	51 km	50 km	46 km
21.	Distance from nearest religious or Archaeological sites	Manikaran 17 km	Manikaran 16 km	Manikaran 12 km
22.	Name of villages involved/Name of District	Revenue Village Manikaran/ Distt. Kullu	Revenue Village Manikaran/ Distt. Kullu	Revenue Village Manikaran/ Distt. Kullu
23.	Land to be permanently acquired: a. Area (in ha) b. Cost	9600 sqm.	3760 sqm.	9024 sqm.
	Alternative Selected	Selected- Single owner and lesser number of trees to be felled and the location will reduce the mesh of low voltage transmission lines from IPP's.		

Annexure 3: Alternative Route Analysis for Transmission Lines

COMPONENT I. Bhabha Nagar PIU (Kinnaur District) subprojects
T1-66 kV D/C transmission Line from Bagipul to Kotla

Sno.	Description	Route A (Red)	Route B (Blue)	Route C (Green)
1	Approximate line length in km	24.7	35.00	28.00
2	River/Nalla Crossing	4	6	7
3	Government/Forest area involvement			
	i) Nos. of towers	69	88	90
	ii).Approximate Length (in km)	24.7	35	28
	iii)18 mtr ROW Approximate area (in hectares)			
4	NonForest/Pvt area involvement			
	i.)Nos. of towers	50	52	52
	ii).Approximate Length (in km)	16.169	18.568	18.582
	iii)46 mtr ROW Approximate area (in hectares)	28.8039	30.5181	29.5463
	iv) wild life sanctuary/ National park (in ha.)	N/A	N/A	N/A
	v) Approximate distance from nearest wild life sanctuary	15 Km (Tundah wild life)	15 Km (Tundah wild life)	15 Km (Tundah wild life)
5	Development of Tower site	40	59	94
a	Number of Towers	114	120	116
b	Number of Gantries	2	2	2
c	Land to be acquired for Tower base (in ha.) bench20.00X 20.00 normal	5.2	6.96	6.86
6	**Land strata of Tower Location**			
	Non-Cohesive	20%	40%	47%
	Cohesive	40%	23%	23%
	Soft rock	19%	19%	19%
	Hard rock	31%	16%	21%
7	Road accessibility in km (Average lead from road to proposed line route.)	2.00	3.00	3.50
8	Approximate Private land involvement in hectares for the line.			
	i. Agricultural (in ha.)			
	Cultivated a. Irrigated b. Non-irrigated	24.07	30.5181	29.5463
	ii. Un Cultivated	0	0	0
	iii. House or Building			
	a. Residential b. Non-residential	1	1	2
9	Approximate EHV line crossing in no.	2	4	7
10	H T / 11kV line crossing in Approximate Nos.	4	4	4
11	Road crossing in Approximate Nos.	4	4	4
12	National /State crossing in Approximate Nos.	0	0	0
13	Telephone line crossing in Approximate Nos.	0	0	0
14	length of route / line passing in the territory of other state	0	0	0
15	Approximate Nos. of Trees in Forest land			
	Cutting	245	275	266
	Non-cutting	0	0	0
16	Approximate Nos. of Private Trees in line route			
	i. fruit trees	35	87	37
	Cutting Non-cutting	15 20	45 42	16 21
	ii. non-fruit trees	43	49	47
	Cutting Non-cutting	20 23	35 14	23 24
17	Approximate Length of line route in snow zone area (in km) Nos. of towers	19 65	19 65	20 67
18	Approximate Length of line route in non-snow zone area (in km) Nos. of towers	15.457 39	20 55	18 49
19	Approximate Length of line route in cultivated area (in km) Nos. of towers	10 29	25 40	18 42
20	Approximate Length of line route in Un-cultivated area (in km) Nos. of towers	14 10	10 10	10 10
22	Highest Approximate altitude in route the line (in metres)		1950	1950
23	Approximate distance from Nearest Airport	185 Kms (Shimlal)	185 Kms(Shimla)	185 Kms (Shimla)
24	Approximate distance from Nearest Religious / archaeological sites	12 Kms	8 Kms	8 Kms
25	Name of District	Kullu/Shimla	Kullu/Shimla	Kullu/Shimla

Sno.	Description	Route A (Red)	Route B (Blue)	Route C (Green)
26	Land to be permanently acquired for revetment of tower base: Area (in ha.) Cost.			
	Alternative Selected	Selected- Less tree cutting, minimum length of transmission line through inaccessible terrain.		

COMPONENT II. Chamba PIU (Chamba District) subprojects
T2 - 400 kV D/C transmission line from Lahal GSS to Rajera GSS

Sno.	Description	Route A (Red)	Route B (Blue)	Route C (Green)
1	Approximate line length in km	34.457	39.00	38.00
2	River/Nalla Crossing	4	2	4
3	Government/Forest area involvement			
	i) Nos. of towers	64	66	64
	ii).Approximate Length (in km)	18.288	20.432	19.418
	iii) 46 mtr ROW Approximate area (in hectares)	77.542	80.422	79.325
4	NonForest/Pvt area involvement			
	i.)Nos. of towers	50	52	52
	ii).Approximate Length (in km)	16.169	18.568	18.582
	iii)46 mtr ROW Approximate area (in hectares)	28.8039	30.5181	29.5463
	iv) wild life sanctuary/ National park (in ha.)	N/A	N/A	N/A
	v) Approximate distance from nearest wild life sanctuary	15 Km (Tundah wild life)	15 Km (Tundah wild life)	15 Km (Tundah wild life)
5	Development of Tower site	64	59	94
a	Number of Towers	114	120	116
b	Number of Gantries	2	2	2
c	Land to be acquired for Tower base (in ha.) bench20.00X 20.00 normal	5.2	6.96	6.86
6	**Land strata of Tower Location**			
	Non-Cohesive	20%	40%	47%
	Cohesive	40%	23%	23%
	Soft rock	19%	19%	19%
	Hard rock	31%	16%	21%
7	Road accessibility in km (Average lead from road to proposed line route.)	2.00	3.00	3.50
8	Approximate Private land involvement in hectares for the line.			
	i. Agricultural (in ha.)			
	Cultivated c. Irrigated d. Non-irrigated	28.8039	30.5181	29.5463
	ii. Un Cultivated	0	0	0
	iii. House or Building			
	c. Residential d. Non-residential	1	1	2
9	Approximate EHV line crossing in no.	2	4	7
10	H T / 11kV line crossing in Approximate Nos.	4	4	4
11	Road crossing in Approximate Nos.	4	4	4
12	National /State crossing in Approximate Nos.	0	0	0
13	Telephone line crossing in Approximate Nos.	0	0	0
14	length of route / line passing in the territory of other state	0	0	0
15	Approximate Nos. of Trees in Forest land			
	Cutting	245	275	266
	Non-cutting	0	0	0
16	Approximate Nos. of Private Trees in line route			
	i. fruit trees	35	87	37
	Cutting Non-cutting	15 20	45 42	16 21
	ii. non-fruit trees	43	49	47
	Cutting Non-cutting	20 23	35 14	23 24
17	Approximate Length of line route in snow zone area (in km) Nos. of towers	19 65	19 65	20 67
18	Approximate Length of line route in non-snow zone area (in km) Nos. of towers	15.457 39	20 55	18 49
19	Approximate Length of line route in cultivated area (in km)	13.169 40	14.568 42	14.582 42

Sno.	Description	Route A (Red)	Route B (Blue)	Route C (Green)
	Nos. of towers			
20	Approximate Length of line route in Un-cultivated area (in km) Nos. of towers	3 10	4 10	4 10
22	Highest Approximate altitude in route the line (in metres)	1700	1950	1950
23	Approximate distance from Nearest Airport	185 Kms (Gaggal)	185 Kms (Gaggal)	185 Kms (Gaggal)
24	Approximate distance from Nearest Religious / archaeological sites	8 Kms	8 Kms	8 Kms
25	Name of District	Chamba	Chamba	Chamba
26	Land to be permanently acquired for revetment of tower base: Area (in ha.) Cost.			
	Alternative Selected	Selected- Less tree cutting, minimum length of transmission line through inaccessible terrain.		

T4-220 kV D/C transmission line (Twin Moose) from BhajoliHoli HEP to 400/220 kV Lahal GISS

Sno.	Description	Route A (Red)	Route B (Blue)	Route C (Green)
1	Approximate line length in km	17.803	22.940	23.304
2	River/Nalla Crossing	1/10	1/11	1/14
3	Government/Forest area involvement			
	i) Nos. of towers	39	40	42
	ii).Approximate Length (in km)	8.752	11.643	13.070
	iii)mtr ROW Approximate area (in hectares)	30.6321	40.7505	45.745
4	NonForest/Pvt area involvement			
	i.)Nos. of towers	22	25	25
	ii).Approximate Length (in km)	8.664	11.297	10.234
	iii)mtr ROW Approximate area (in hectares)	30.6321	40.7505	45.745
	iv) wild life sanctuary/ National park (in Ha)	Nil	Nil	Nil
	v) Approximate distance from nearest wild life sanctuary	20 KM Kugti Sanctuary	20 KM Kugti Sanctuary	20 KM Kugti Sanctuary
5	Development of Tower site	61	65	67
A	Number of Towers	61	65	67
B	Number of Gantries	2	2	2
C	Land to be acquired for Tower base (in Ha) benchX Normal	1.3725 HA	1.4625 Ha	1.5075 Ha
6	Land strata of Tower Location			
	Non-Cohesive	22	24	20
	Cohesive	16	18	22
	Soft rock	14	3	5
	Hard rock	9	20	20
7	Road accessibility in km (Average lead from road to proposed line route.)	3	4.5	5.1
8	Approximate Private land involvement in hectares for the line	31.6785	32.8776	32.9775
	i. Agricultural (in Ha)			
	Cultivated e. Irrigated f. Non-irrigated	 50%	 50%	 50%
	ii. Un Cultivated	50%	50%	50%
	iii. House or Building	-	-	-
	e. Residential f. Non-residential	- NIL	- NIL	- NIL
9	Approximate EHV line crossing in no.	NIL	NIL	NIL
10	H T / 11kV line crossing in Approximate Nos.	12 TIMES	12 TIMES	13 TIMES
11	Road crossing in Approximate Nos.	4 TIMES	3 TIMES	4 TIMES
12	National /State crossing in Approximate Nos.	NIL	NIL	NIL
13	Telephone line crossing in Approximate Nos.	1 TIMES	1 TIMES	1 TIMES
14	length of route / line passing in the territory of other state	NIL	NIL	NIL
15	Approximate Nos. of Trees in Forest land			
	Cutting	135	201	262
	Non-cutting	-	_	-
16	Approximate Nos. of Private Trees in line route			
	i. fruit trees			

Sno.	Description	Route A (Red)	Route B (Blue)	Route C (Green)
	Cutting Non-cutting	34 -	39 -	46 -
	ii. non-fruit trees			
	Cutting Non-cutting	7 -	15 -	19 -
17	Approximate Length of line route in snow zone area (in km) Nos. of towers	17.803 61	22.940 65	23.304 67
18	Approximate Length of line route in non-snow zone area (in km) Nos. of towers	NIL	NIL	NIL
19	Approximate Length of line route in cultivated area (in km) Nos. of towers	4.525	5.82	1.5
20	Approximate Length of line route in Un-cultivated area (in km) Nos. of towers	4.525	5.82	5.117
22	Highest Approximate altitude in route the line (in metres)	2390	2450	2500
23	Approximate distance from Nearest Airport	KANGRA 238 KM	KANGRA 238 KM	KANGRA 238 KM
24	Distance from nearest religious tourist or Archaeological sites	10 KM	10 KM	10 KM
25	Name of villages involved/Name of District	CHAMBA	CHAMBA	CHAMBA
26	Land to be permanently acquired for revetment of tower base: Area (in ha.)	1.3725 HA	1.4625 Ha	1.5075 Ha
	Alternative Selected	SELECTED-.		

220kV D/C Transmission Line From 132/220 kV Majra To Proposed 33/220 kVsubstation Karian In Dist. Chamba

Sr.No.	Description	Route-1(Magenta)	Route-2(Red)	Route 3(Cyan)
1	Approximate line lenth in kms.	20	17.9	17.32
2	River/Nala Crossing	4-Nala	4-Nala	4-Nala
3	Forest area Involvement			
	i) Approximate GLKM	15.429	14	13.057
	ii) 35mtr RoW Area (in Ha)	54	49	45.7
	iii) Wild Life Sanctuary /National Park (in Ha)	0	0	0
	iv) Approximate Distance from Nearest Wild Life Sanctuary	kalatop (12km)	kalatop (12km)	kalatop (12km)
4	Devolopment of Tower Site			
	i) Number of Towers	39	41	40
	ii) Number of Gantries	2	1	2
	iii) Land to Be Acquired for Tower Base (in Ha) Bench-15x15 m Considering Normal Tower	0.8775	0.9225	0.9
5	Land Status of Tower Location			
	i) Soil	8	8	5
	ii) Rock	31	33	35
6	Road Accessbility in GLK (Avearage Lead from Road to Proposed line Route)	2.0 km	1.0 km	0.7 km
7	Approximate Private Land Involvement in Hectare for The Line			
	i) Aggriculture (in Ha & KM)			
	a) Cultivated	16 (4.571km)	13.65 (3.9km)	18 (5.143km)
	b) Irrigated	Nill	Nill	Nill
	c) Non-Irrigated			
	ii) Un Cultivated/Government/Forest Land (in Ha/km)	54 (15.429km)	49 (14km)	45.7 (13.057km)
	iii) House or Building	Nill	Nill	Nill
	a) Residential	Nill	Nill	Nill
	b) Non-Residential	Nill	Nill	Nill
8	Approximate EHV Line In X-ing in numbers	2	1	2
9	HT/11Kv Line X-ing in Approximate Number	18	16	23
10	Road X-ing In Approximate number	6	18	23
11	NH/SH X-ing in Approximate Number	0	2	6
12	Telecomunication Line X-ing In Approximate Number	Nill	Nill	Nill
13	Length of Route / Line Passing in the Territory of Other State	Nill	Nill	Nill
14	Approximate Number of Trees in Forest Land	316	248	343
	i) Fruit Trees	50	25	67
	a) Felling	16	10	23
	b) Non-Felling	34	15	44
	ii) Non-Fruit Trees	266	223	276
	a) Felling	126	120	137
	b) Non-Felling	140	103	139
15	Approximate Number of Trees in Private Land	66	57	90

	i) Fruit Trees	6	10	20
	a) Felling	4	6	15
	b) Non-Felling	2	4	5
	ii) Non-Fruit Trees	60	47	70
	a) Felling	20	35	30
	b) Non-Felling	40	12	40
16	Approximate Length of Line Route in Snow Zone Area (in KM)	Nill	Nill	Nill
17	Approximate Length of Line Route in Non-Snow Zone Area (in Ha/km)	70 (20km)	62.65 (17.9km)	60.627(17.322km)
18	Approximate Length of Route in Cultivated Area (in Ha)	16 (4.571km)	13.65 (3.9km)	18 (5.143km)
19	Approximate Length of Line Route in Un-Cultivated Area (in Ha/km)	54 (15.429km)	49 (14km)	45.7 (13.057km)
20	Approximate Length of Line Route in Government/Shamlat/forest Area (in Km)	15.429km	14km	13.057km
21	Highest Approximate Altitude in route (in Meters)	1328	1630	1676
22	Approximate Distance of Nearest Airport	120.0km	120.0km	120.0km
23	Approximate Distance from Nearest Religious/ Archaeological Sites	50.0km	50.0km	50.0km
24	Name of Disttrict	Chamba	Chamba	Chamba
25	Land to Be Permanantly Acquired (For Towers) Area (in Ha)	1.305	1.17	1.18

Component IV: Sarabhai PIU (Kullu and Mandi Districts)

T5 - 132 kV D/C transmission line from Barsaini to 132/220 kV substation at Charor

Sno.	Description	Route A (Red)	Route B (Blue)	Route C (Green)
1	Approximate line length in km	38.700	39.346	40.290
2	River/Nalla Crossing	1/7	1/7	1/7
3	Government area involvement			
	i) Nos. of towers			
	ii).Approximate Length (in km)			
	iii) 35 mtr ROW Approximate area (in hectares)			
4	Forest area involvement			
	i.)Nos. of towers			
	ii).Approximate Length (in km)	2.75	9.40	15.00
	iii)35 mtr RoW Approximate area (in hectares)	96.25	329	525
	iv) wild life sanctuary/ National park (in ha.)	N/A	N/A	N/A
	v) Approximate distance from nearest wild life sanctuary	N/A	N/A	N/A
5	Development of Tower site			
a	Number of Towers	130	149	171
b	Number of Gantries	2	2	2
c	Land to be acquired for Tower base (in ha.) bench20.00X 20.00 normal	5.2	6.96	6.86
6	**Land strata of Tower Location**			
	Non-Cohesive	20%	40%	47%
	Cohesive	40%	23%	23%
	Soft rock	19%	19%	19%
	Hard rock	31%	16%	21%
7	Road accessibility in km (Average lead from road to proposed line route.)	0.43	0.61	0.98
8	Approximate Private land involvement in hectares for the line.			
	i. Agricultural (in ha.)			
	Cultivated g. Irrigated h. Non-irrigated	32 0	41 0 6.06	49 0 7.01
	ii. Un Cultivated	5.00	6.06	7.01
	iii. House or Building			
	g. Residential h. Non-residential			
9	Approximate EHV line crossing in no.	2	4	7
10	H T / 11kV line crossing in Approximate Nos.	4	4	4
11	Road crossing in Approximate Nos.	2	0	0
12	National /State crossing in Approximate Nos.	0	0	0
13	Telephone line crossing in Approximate Nos.	0	0	0
14	length of route / line passing in the territory of other state	0	0	0
15	Approximate Nos. of Trees in Forest land			
	Cutting	3200	4800	5600
	Non-cutting	4000	4500	5000
16	Approximate Nos. of Private Trees in line route			
	i. fruit trees			
	Cutting Non-cutting	486 112	598 89	587 99
	ii. non-fruit trees			
	Cutting Non-cutting	11 23	45 78	23 112
17	Approximate Length of line route in snow zone area (in km) Nos. of towers	80%	85%	100%

Sno.	Description	Route A (Red)	Route B (Blue)	Route C (Green)
18	Approximate Length of line route in non-snow zone area (in km) Nos. of towers	20%	15%	0%
19	Approximate Length of line route in cultivated area (in km) Nos. of towers			
20	Approximate Length of line route in Un-cultivated area (in km) Nos. of towers			
22	Highest Approximate altitude in route the line (in metres)	2305	2345	2360
23	Approximate distance from Nearest Airport	55oo	6000	6550
24	Approximate distance from Nearest Religious / archaeological sites	300	400	478
25	Name of District	Kulu	Kulu	Kulu
26	Land to be permanently acquired for revetment of tower base: Area (in ha.) Cost.			
	Alternative Selected	Selected- Less tree cutting, minimum length of transmission line through inaccessible terrain.		

Annexure 4: Inventorisation along the Transmission Lines

Component I Babhanagar (PIU) Shimla District subproject
T1: 66 kV Baipur Nirmand transmission line
Bagipul – Nirmand Transmission Line Details

SNo.	Tower No.	Section Length (M.)	Latitude	Longitude	Area under the RoW (in M²)	Name of Village/Tehsil/District	Distance of transmission line from nearby village (m)	Ownership of Land (Private, Govt. Forest)/ Use of Land	Use of land (cultivation, plantation/barren)	Name of Crops	Number of trees under cutting/trimming	Types (Names) of Trees cut
1	2	3	4	5	6	7	8	9	10	11	12	13
1	T-1		31°29'19.98"N	77°34'10.32"E	27mtr	Arsu/Nirmand/Shimla	1400mtr	Pvt	cultivation		5	Apple
		77.24										
2	T-2		31°29'19.56"N	77°34'13.20"E	27mtr	Arsu/Nirmand/Shimla	1400mtr	Pvt	cultivation		2	Khumani
		115.21										
3	T-3		31°29'20.57"N	77°34'17.37"E	27mtr	Arsu/Nirmand/Shimla	1300mtr	Pvt	cultivation		Nil	
		374.14										
4	T-4		31°29'19.31"N	77°34'31.47"E	27mtr	Arsu/Nirmand/Shimla	1200mtr	Pvt	cultivation		Nil	
		106.21										
5	T-5		31°29'18.71"N	77°34'35.39"E	27mtr	Arsu/Nirmand/Shimla	900mtr	Pvt	plantation		Nil	
		172.24										
6	T-6		31°29'17.24"N	77°34'44.14"E	27mtr	Arsu/Nirmand/Shimla	650mtr	Pvt	plantation		6	Apple
		634.18										
7	T-7		31°29'12.24"N	77°35'4.92"E	27mtr	Arsu/Nirmand/Shimla	600mtr	Pvt	plantation		2	Apple
		147.85										
8	T-8		31°29'11.10"N	77°35'10.26"E	27mtr	Arsu/Nirmand/Shimla	640mtr	Pvt	plantation		4	Apple
		414.25										
9	T-9		31°29'5.94"N	77°35'24.66"E	27mtr	Arsu/Nirmand/Shimla	540mtr	Pvt	plantation		Nil	
		116.52										
10	T-10		31°29'4.32"N	77°35'28.56"E	27mtr	Arsu/Nirmand/Shimla	450mtr	Pvt	plantation			
		142.958										
11	T-11		31°29'2.88"N	77°35'33.66"E	27mtr	Arsu/Nirmand/Shimla	650mtr	Pvt	plantation		4	Apple
		182.24										
12	T-12		31°29'2.10"N	77°35'40.44"E	27mtr	Arsu/Nirmand/Shimla	680mtr	Pvt	plantation		3	Apple
		465.24										
13	T-13		31°28'58.44"N	77°35'57.42"E	27mtr	Damedi/Nirmand/Shimla	850mtr	Pvt	plantation		Nil	
		339.24										
14	T-14		31°28'49.15"N	77°36'4.21"E	27mtr	Damedi/Nirmand/Shimla	900mtr	Govt	barren		7	Apple
		203.76										
15	T-15		31°28'42.65"N	77°36'5.02"E	27mtr	Damedi/Nirmand/Shimla	1000mtr	Govt	barren		Nil	
		99.57										
16	T-16		31°28'39.54"N	77°36'5.70"E	27mtr	Damedi/Nirmand/Shimla	1150mtr	Govt	barren		12	Chil (Forest)
		333.78										
17	T-17		31°28'30.30"N	77°36'12.12"E	27mtr	Prantala/Nirmand/Shimla	1230mtr	Govt	barren		Nil	
		192.78										
18	T-18		31°28'24.66"N	77°36'15.12"E	27mtr	Damedi/Nirmand/Shimla	1450mtr	Govt	barren		Nil	
		227.24										
19	T-19		31°28'22.71"N	77°36'16.79"E	27mtr	Damedi/Nirmand/Shimla	1530mtr	Pvt	cultivation		NIL	

SNo.	Tower No.	Section Length (M.)	Latitude	Longitude	Area under the RoW (in M²)	Name of Village/Tehsil/District	Distance of transmission line from nearby village (m)	Ownership of Land (Private, Govt. Forest)/ Use of Land	Use of land (cultivation, plantation/barren)	Name of Crops	Number of trees under cutting/trimming	Types (Names) of Trees cut
1	2	3	4	5	6	7	8	9	10	11	12	13
		765.24										
20	T-20		31°27'58.68"N	77°36'37.02"E	27mtr	Damedi/Nirmand/Shimla	1650mtr	Pvt	cultivation		NIL	
		463.25										
21	T-21		31°27'49.44"N	77°36'50.88"E	27mtr	Damedi/Nirmand/Shimla	1860mtr	Govt	barren		NIL	
		241.258										
22	T-22		31°27'42.72"N	77°36'55.62"E	27mtr	Prantala/Nirmand/Shimla	2000mtr	Govt	barren		NIL	
		327.24										
23	T-23		31°27'32.88"N	77°37'0.30"E	27mtr	Damedi/Nirmand/Shimla	2353mtr	Govt	barren		NIL	
		257.21										
24	T-24		31°27'28.14"N	77°37'8.22"E	27mtr	Damedi/Nirmand/Shimla	2780mtr	Govt	barren		4	Apple
		356.24										
25	T-25		31°27'21.54"N	77°37'19.32"E	27mtr	Prantala/Nirmand/Shimla	2750mtr	Govt	barren		NIL	
		195.24										
26	T-26		31°27'21.72"N	77°37'22.73"E	27mtr	Prantala/Nirmand/Shimla	2790mtr	Govt	barren		NIL	
		430.78										
27	T-27		31°27'24.90"N	77°37'38.52"E	27mtr	Jagatkhana/Nirmand/Shimla	3100mtr	Govt	barren		NIL	
		450.25										
28	T-28		31°27'28.50"N	77°37'55.02"E	27mtr	Jagatkhana/Nirmand/Shimla	3250mtr	Govt	barren		NIL	
		153.89										
29	T-29		31°27'29.22"N	77°38'0.78"E	27mtr	Jagatkhana/Nirmand/Shimla	3550mtr	Pvt	cultivation		NIL	
		531.78										
30	T-30		31°27'30.78"N	77°38'20.82"E	27mtr	Jagatkhana/Nirmand/Shimla	3600mtr	Pvt	cultivation		NIL	
		105.87										
31	T-31		31°27'31.08"N	77°38'24.72"E	27mtr	Jagatkhana/Nirmand/Shimla	3743mtr	Pvt	cultivation		NIL	
		769.26										
32	T-32		31°27'36.90"N	77°38'53.04"E	27mtr	Jagatkhana/Nirmand/Shimla	4300mtr	Pvt	cultivation		NIL	
		192.84										
33	T-33		31°27'40.38"N	77°38'59.04"E	27mtr	Jagatkhana/Nirmand/Shimla	4450mtr	Pvt	cultivation		NIL	
		611.48										
34	T-34		31°27'44.58"N	77°39'21.66"E	27mtr	Tunar/Nirmand/Shimla	4956mtr	Pvt	cultivation		NIL	
		462.14										
35	T-35		31°27'52.92"N	77°39'36.24"E	27mtr	Tunar/Nirmand/Shimla	5320mtr	Pvt	cultivation		NIL	
		521.87										
36	T-36		31°27'59.41"N	77°39'51.70"E	27mtr	Tunar/Nirmand/Shimla	5462mtr	Pvt	cultivation		NIL	
		137.25										
37	T-37		31°28'1.44"N	77°39'59.10"E	27mtr	Tunar/Nirmand/Shimla	5842mtr	Pvt	cultivation		NIL	
		308.54										
38	T-38		31°28'5.46"N	77°40'9.78"E	27mtr	Tunar/Nirmand/Shimla	5989mtr	Pvt	cultivation		NIL	
		184.25										
39	T-39		31°28'9.66"N	77°40'14.76"E	27mtr	Tunar/Nirmand/Shimla	6189mtr	Pvt	cultivation		NIL	
		230.14										
40	T-40		31°28'13.92"N	77°40'20.76"E	27mtr	Tunar/Nirmand/Shimla	6357mtr	Pvt	cultivation		NIL	
		222.41										
41	T-41		31°28'20.76"N	77°40'25.74"E	27mtr	Tunar/Nirmand/Shimla	6596mtr	Pvt	cultivation		NIL	

SNo.	Tower No.	Section Length (M.)	Latitude	Longitude	Area under the RoW (in M²)	Name of Village/Tehsil/District	Distance of transmission line from nearby village (m)	Ownership of Land (Private, Govt. Forest)/ Use of Land	Use of land (cultivation, plantation/barren)	Name of Crops	Number of trees under cutting/trimming	Types (Names) of Trees cut
1	2	3	4	5	6	7	8	9	10	11	12	13
		296.54										
42	T-42		31°28'28.32"N	77°40'32.70"E	27mtr	Tunar/Nirmand/Shimla	6700mtr	Pvt	cultivation		NIL	
		409.56										
43	T-43		31°28'40.08"N	77°40'39.96"E	27mtr	Badari.Nirmand/Shimla	7320mtr	Govt	barren		NIL	
		646.84										
44	T-44		31°28'59.70"N	77°40'48.60"E	27mtr	Badari.Nirmand/Shimla	7861mtr	Govt	barren		NIL	
		584.45										
45	T-45		31°29'15.18"N	77°41'1.38"E	27mtr	Badari.Nirmand/Shimla	8100mtr	Govt	barren		NIL	
		220.98										
46	T-46		31°29'19.80"N	77°41'7.74"E	27mtr	Badari.Nirmand/Shimla	8456mtr	Govt	barren		NIL	
		338.24										
47	T-47		31°29'29.64"N	77°41'13.44"E	27mtr	Badari.Nirmand/Shimla	8862mtr	Govt	barren		NIL	
		451.25										
48	T-48		31°29'37.86"N	77°41'27.60"E	27mtr	Badari.Nirmand/Shimla	9958mtr	Govt	barren		NIL	
		164.86										
49	T-49		31°29'39.42"N	77°41'33.54"E	27mtr	Badari.Nirmand/Shimla	10059mtr	Govt	barren		NIL	
		141.14										
50	T-50		31°29'40.50"N	77°41'38.76"E	27mtr	Badari.Nirmand/Shimla	11468mtr	Govt	barren		NIL	
		786.54										
51	T-51		31°29'56.34"N	77°42'2.10"E	27mtr	Badari.Nirmand/Shimla	12968mtr	Govt	barren		NIL	
		285.26										
52	T-52		31°30'0.06"N	77°42'12.00"E	27mtr	Badari.Nirmand/Shimla	14052mtr	Govt	barren		NIL	
		162.75										
53	T-53		31°30'2.94"N	77°42'17.16"E	27mtr	Badari.Nirmand/Shimla	14558mtr	Govt	barren		NIL	
		555.48										
54	T-54		31°30'8.40"N	77°42'37.20"E	27mtr	Jhakri/Rampur/Shimla	25056mtr	Govt	barren		NIL	
		392.48										
55	T-55		31°30'9.42"N	77°42'52.02"E	27mtr	Jhakri/Rampur/Shimla	280542mtr	Govt	barren		NIL	
		462.89										
56	T-56		31°30'11.16"N	77°43'10.56"E	27mtr	Jhakri/Rampur/Shimla	338058mtr	Govt	barren		NIL	
		840.36										
57	T-57		31°30'17.88"N	77°43'41.40"E	27mtr	Jhakri/Rampur/Shimla	340256mtr	Govt	barren		NIL	
		112.47										
58	T-58		31°30'20.40"N	77°43'44.46"E	27mtr	Jhakri/Rampur/Shimla	350689mtr	Govt	barren		NIL	
		136.24										
59	T-59		31°30'23.10"N	77°43'48.54"E	27mtr	Jhakri/Rampur/Shimla	370253mtr	Govt	barren			
		356.14									40	Chil
60	T-60		31°30'26.34"N	77°44'1.50"E	27mtr	Ratanpur/Rampur/Shimla	380256mtr	Govt	barren			
		238.47									20	Chil
61	T-60A		31°30'28.38"N	77°44'10.20"E	27mtr	Ratanpur/Rampur/Shimla	410163mtr	Govt	barren			
		670.25									15	Chil
62	T-61		31°30'39.17"N	77°44'41.37"E	27mtr	Ratanpur/Rampur/Shimla	440112mtr	Govt	barren			
		590.84										
63	T-62		31°30'42.18"N	77°44'54.96"E	27mtr	Ratanpur/Rampur/Shimla	450125mtr	Govt	barren			
		223.14										

SNo.	Tower No.	Section Length (M.)	Latitude	Longitude	Area under the RoW (in M²)	Name of Village/Tehsil/District	Distance of transmission line from nearby village (m)	Ownership of Land (Private, Govt. Forest)/ Use of Land	Use of land (cultivation, plantation/barren)	Name of Crops	Number of trees under cutting/trimming	Types (Names) of Trees cut
1	2	3	4	5	6	7	8	9	10	11	12	13
64	T-63		31°30'46.56"N	77°45'1.68"E	27mtr	Ratanpur/Rampur/Shimla	470250mtr	Govt	barren			
		159.41										
65	T-64		31°30'49.62"N	77°45'6.54"E	27mtr	Ratanpur/Rampur/Shimla	520145mtr	Govt	barren			
		113.89										
66	T-65		31°30'51.66"N	77°45'10.14"E	27mtr	Ratanpur/Rampur/Shimla	570954mtr	Govt	barren			
		954.21										
67	T-66		31°30'58.74"N	77°45'45.36"E	27mtr	Kotala/Rampur/Shimla	690851mtr	Govt	barren			
		224.98										
68	T-67		31°30'56.22"N	77°45'53.34"E	27mtr	Kotala/Rampur/Shimla	740419mtr	Govt	barren		4	Apple

Component II Chamba PIU (Chamba District) subprojects

T2: Mazra-KarianTransmission Line Details

SNo.	Tower No.	Section Length (M.)	northing	easting	Area under the ROW	Name of Village/Tehsil/District	Distance of transmission line from nearby village (m)	Ownership of land (private, Govt. Forest)/ Use of Land	Use of land (cultivation, plantation/barren)	Name of Crops	Number of trees under cutting/trimming	Types (Names) of Trees cut
1	2	3	4	5	6	7	8	9	10	11	12	13
1	gantry	0	3612479	599959		Pukhari/Chamba/Chamba	1km	hpptcl	barren	nil	0	
		39.313			1376							
2	D/E		599980	3612512	0	Phukhari	1km	hpptcl	barren	nil	0	
		85.778			3002.2							
3	AP-1		600005	3612594	0	Phukhari	1km	govt.	Gov/Forest Area		0	
		89.35			3127.3							
4	AP-2		600086	3612631	0	Phukhari		pvt.	Cultivation	maize and wheat	1	chell
		503.91			17637							
5	AP-3		600572	3612767	0	Phukhari	300m	pvt.	Cultivation	maize and wheat	0	
		334.83			11719							
6	AP-4		600870	3612616	0	Bhatka	250m	govt.	Gov/Forest Area		2	chell, dhaman
		281.93			9867.4							
7	AP-5		601146	6312557	0	Bhatka	300m	pvt.	Cultivation	maize and wheat	3	chell, bann
		460.75			16126							
8	AP-6		601559	3612351	0	Bhatka	3km	govt.	Gov/Forest Area		0	
		332.98			11654							
9	AP-7		601891	3612327	0	Tikari	800m	govt.	Gov/Forest Area		0	
		431.87			15115							
10	AP-8		602272	3612124	0	Tikari	1km	pvt.	Cultivation	maize and wheat	0	
		104			3640							
11	(8/1)				0		900m	govt.	Gov/Forest Area		0	
		649.74			22741	Shakti Dera						

SNo.	Tower No.	Section Length (M.)	northing	easting	Area under the ROW	Name of Village/Tehsil/District	Distance of transmission line from nearby village (m)	Ownership of land (private, Govt. Forest)/ Use of Land	Use of land (cultivation, plantation/barren)	Name of Crops	Number of trees under cutting/trimming	Types (Names) of Trees cut
1	2	3	4	5	6	7	8	9	10	11	12	13
12	AP-9		602428	3611387	0		1km	govt.	Gov/Forest Area		12	chell, ban
		527			18445							
13	(9/1)				0		1.5km	govt.	Gov/Forest Area		0	
		182.75			6396.2							
14	AP-10		602467	3610678	0	Bagodi	850m	govt.	Gov/Forest Area		0	
		381.95			13368							
15	AP-11		602686	3610365	0	Bagodi	450m	govt.	Gov/Forest Area		0	
		233			8154.9							
16	AP-12		602813	3610169	0	Bagodi	200m	govt.	Gov/Forest Area		0	
		710.29			24860							
17	AP-13		603161	3609550	0	Tharoi	500m	pvt.	Cultivation	maize and wheat	3	chell, kainth
		8E+06			3E+08							
18	AP-14		603330	3608779	0	Dhar	600m	pvt.	Cultivation	maize and wheat	0	
		608.34			21292							
19	AP-15		603754	3608343	0	Dhar	1km	govt.	Gov/Forest Area		0	
		382.95			13403							
20	AP-16		604011	3608059	0	Dhar	500m	govt.	Gov/Forest Area		0	
		289.11			10119							
21	AP-17		604286	3607970	0	Dhar	400m	pvt.	Cultivation	maize and wheat	4	chell, dhaman
		150			5250							
22	17/1				0		550m	govt.	Gov/Forest Area		4	chell, bann
		660.24			23108							
23	AP/18		604722	3607287	0	Sal	320m	govt.	Gov/Forest Area		1	Chell
		260			9100							
24	18/1				0		150m	pvt.	Cultivation		3	Chell
		117.64			4117.3							
25	AP-19		605039	36070852	0	Sal	100m	pvt.	Cultivation	maize and wheat	0	
		857.76			30022							
26	AP-20		605522	3606373	0	Nanu	80m	pvt.	Cultivation	maize and wheat	2	Chell
		743			26005							
27	20/1				0		220m	govt.	Gov/Forest Area		3	Chell
		104.21			3647.5							
28	AP-21		606173	3605831	0	Sudi	145m	pvt.	Cultivation		0	
		105			3675							
29	21/1				0		105m	pvt.	Cultivation	maize and wheat	0	
		166.24			5818.5							
30	AP 22		60443	3605865	0	Sudi	230m	govt.	Gov/Forest Area		1	Chell
		108.56			3799.6							
31	AP 23		606499	3605712	0	Sudi	210m	govt.	Gov/Forest Area		1	Chell
		285.47			9991.3							
32	AP 24		606600	3605445	0	Bannu	240m	govt.	Gov/Forest Area		0	
		139.89			4896							
33	AP 25		606716	3605372	0	Bannu	290m	govt.	Gov/Forest Area		0	
		352.72			12345							

SNo.	Tower No.	Section Length (M.)	northing	easting	Area under the ROW	Name of Village/Tehsil/District	Distance of transmission line from nearby village (m)	Ownership of land (private, Govt. Forest)/ Use of Land	Use of land (cultivation, plantation/barren)	Name of Crops	Number of trees under cutting/trimming	Types (Names) of Trees cut
1	2	3	4	5	6	7	8	9	10	11	12	13
34	AP 26		606764	3605022	0	Bannu	505m	govt.	Gov/Forest Area		0	
		1000.2			35007							
35	AP 27		607138	3604094	0	Baridhera	209m	govt.	Gov/Forest Area		10	Chell
		660.08			23103							
36	AP 28		607079	3603437	0	Bhalotha	300m	pvt.	Cultivation		2	Chell
		234.53			8208.6							
37	AP 29		607032	3603207	0	Bhalotha	260m	govt.	Gov/Forest Area		6	chell, bann. kaninth
		421.47			14751							
38	AP 30		607149	3602802	0	Bhalotha	430m	govt.	Gov/Forest Area		11	chell, dhaman
		730.18			25556							
38	AP 31		607110	3602073	0	Kathanna	250m	govt.	Gov/Forest Area		0	
		303.18			10611							
39	AP 32		607288	3601828	0	Luddu	150m	govt.	Gov/Forest Area		0	
		550			19250							
40	32/1				0		500m	govt.	Gov/Forest Area		0	
		509.53			17833							
41	AP 33		607837	3600348	0	Lilianu	300m	govt.	Gov/Forest Area		0	
		759.68			26589							
42	AP 34		608335	3600348	0	Gagara	240m	pvt.	Cultivation		0	
		185.25			6483.9							
43	AP 35		608376	3600167	0	Zilo	850m	govt.	Gov/Forest Area		0	
		168			5880							
44	35/1				0	Zilo	764m	govt.	Gov/Forest Area		0	
		140			4899.8							
45	AP 36		608369	3599859	0	Zilo	500m	govt.	Gov/Forest Area		5	
		289.95			10148							
46	AP 36A		608359	3599570	0	Zilo	300m	pvt.	Cultivation	maize and wheat	0	
		23.38			818.3							
47	DE3/AP 37		608346	3599550	0	Zilo	270m	pvt.	Cultivation	maize and wheat	0	
		44.042			1541.5							
48	GE 1				0			govt.	Gov/Forest Area			
		40			1400							
49	GE 2				0			govt.	Gov/Forest Area			
		55.049			1926.7							
50	DE 2/AP 38		608243	3599456	0	Zilo	200m	govt.	Gov/Forest Area		0	
		203.65			7127.9							
51	AP 39		608101	3599310	0	Zilo	267m	pvt.	Cultivation	maize and wheat	1	chell
		152.97			5354.1							
52	D/E		607950	3599307	0	Zilo	300m	hppcl	barren		0	
		61.995			2169.8							
53	gantry		607894	3599352	0	Zilo	310m	hpptcl	barren		0	

T3: Lahal-Rajera Transmission Line Details

SNo.	Tower No.	Section Length (M.)	Latitude	Longitude	Area under the ROW (in M²)	Name of Village/Tehsil/District	Distance of transmission line from nearby village (m)	Ownership of land (private, Govt. Forest)/ Use of Land	Use of land (cultivation, plantation/barren)	Name of Crops	Number of trees under cutting/trimming	Types (Names) Of Trees Cut
1	2	3	4	5	6	7	8	9	10	11	12	13
1	T1		322824.0281N	762812.1009E		Lahal	200	HPPTCL	-	-	NIL	
		392.38			18049.48							
2	T2		322835.6965N	762818.1340E		Seerad	600	Pvt	Cultivation	Wheat, Maze, Rajmah, Mah	3	Kau
		91.55			4211.3							
3	T3		322838.2421N	76 28 16.3233E		Seerad	500	Govt. Forest	Gov/Forest Area	_	_	Cheel, Deodar, Kail, Chilzoga,
		140.69			6471.74							
4	T3A		322839.5030N	76 28 11.1436E		Seerad	600	Pvt	Cultivation	Wheat, Maze, Rajmah, Mah	1	Kau
		621.19			28574.74							
5	T4		322828.8136N	76 27 50.9665E		Lahal	350	Govt. Forest	Gov/Forest Area	_	_	_
		101.11			4651.06							
6	T5		322830.2239N	76 27 47.4694E		Lahal	500	Govt. Forest	-do-	_	_	_
		82.64			3801.44							
7	T6		322829.9574N	76 27 44.3197E		Khani	2000	Govt. Forest	-do-	_	_	_
		680.65			31309.9							
8	T7		322813.3571N	76 27 27.1101E		Khani	2200	Govt. Forest	-do-	_	_	_
		281.62			12954.52							
9	T8		322811.8296N	76 27 16.4755E		Khani	2400	Govt. Forest	-do-	_	_	-
		715.14			32896.44							
10	T9		322759.8811N	76 26 52.9902E		Sulakhar	270	Govt. Forest	-do-	_		Cheel, Deodar, Kail, Chilzoga,
		34.95			1607.7							
11	T10		32 27 59.8879N	76 26 51.6515E		Sulakhar	330	Govt. Forest	-do-	_		Cheel, Deodar, Kail, Chilzoga,
		269.22			12384.12							
12	T11		32 28 3.7515N	76 26 42.4022E		Sulakhar	450	Pvt	Cultivation	Wheat, Maze, Rajmah, Mah	1 (in RoW)	
		229.83			10572.18							
13	T12		32 28 9.1848N	76 26 36.3685E		Sulakhar	700	Govt. Forest	Gov/Forest Area	_		Cheel, Deodar, Kail, Chilzoga,
		193.69			8909.74							
14	T13		32 28 12.5953N	76 26 30.1357E		Sulakhar	900	Govt. Forest	-do-	_		Cheel, Deodar, Kail, Chilzoga,
		343.37			15795.02							
15	T14		32 28 9.7120N	76 26 17.4317E		Hatt	1000	Govt. Forest	-do-	_		Cheel, Deodar, Kail, Chilzoga, Ban
		444.73			20457.58							
16	T16		32 28 4.2062N	76 26 1.6850E		Hatt	300	Pvt	Cultivation	Wheat, Maze, Rajmah, Mah	NIL	

SNo.	Tower No.	Section Length (M.)	Latitude	Longitude	Area under the ROW (in M²)	Name of Village/Tehsil/District	Distance of transmission line from nearby village (m)	Ownership of land (private, Govt. Forest)/ Use of Land	Use of land (cultivation, plantation/barren)	Name of Crops	Number of trees under cutting/trimming	Types (Names) Of Trees Cut
1	2	3	4	5	6	7	8	9	10	11	12	13
		469.68			21605.28							
17	T17		32 28 1.1050N	76 25 44.0721E		Hatt	2000	Govt. Forest	Gov/Forest Area	_		Ban,Kail,Cheel
		394.00			18124							
18	T18		32 27 54.1336N	76 25 31.4196E		Hatt	2200	Govt. Forest	-do-	_		Ban,Kail,Cheel
		313.32			14412.72							
19	T19		32 27 45.8844N	76 25 24.3968E		Hatt	1500	Govt. Forest	-do-	_		Ban,Kail,Cheel
		89.08			4097.68							
20	T20		32 27 43.7590N	76 25 22.0828E		Hatt	800	Govt. Forest	-do-	_		Ban,Kail,Cheel,
		632.11			29077.06							
21	T21		32 27 32.4730N	76 25 1.8634E		Hatt	35	Pvt	cultivation	Wheat,Maze, Rajmah,Mah	NIL	
		655.03			30131.38							
22	T22		32 27 27.3375N	76 24 37.5202E		Guraith	110	Pvt	Cultivation	-do-	NIL	
		369.96			17018.16							
23	T23		32 27 19.4754N	76 24 26.8086E		Guraith	400	Pvt	Cultivation	-do-	NIL	
		391.75			18020.5							
24	T24		32 27 11.1133N	76 24 15.5039E		Guraith	450	Pvt	Cultivation	-do-	NIL	
		493.13			22683.98							
25	T25		32 27 1.6730N	76 24 0.2514E		Guraith	500	Govt. Forest	Gov/Forest Area	_		Ban,Kail
		415.53			19114.38							
26	T26		32 26 57.1059N	76 23 45.2790E		Guraith	980	Govt. Forest	-do-	_		Ban,Kail
		643.80			29614.8							
27	T28		32 26 48.6525N	76 23 22.7320E		Galthan	300	Govt. Forest	-do-	_		Ban,Kail
		360.29			16573.34							
28	T29		32 26 52.8489N	76 23 9.8538E		Galthan	440	Pvt	cultivation	Wheat,Maze, Rajmah,Mah	NIL	
		383.02			17618.92							
29	T30		322649.2391N	76 22 55.8184E		Massu	300	Pvt	Cultivation	-do-	8 (7 nos. in RoW)	Pine
		247.72			11395.12							
30	T31		32 26 45.5667N	76 22 47.3793E		Massu	250	Pvt	Plantation	_	8	Deodar,Apple
		379.51			17457.46							
31	T32		32 26 44.1015N	76 22 32.9503E		Massu	300	Pvt	Cultivation	Wheat,Maje Rajmah,Mah	8 (6 nos. in RoW)	Deodar,Kainth,Dhaman
		272.24			12523.04							
32	T33		32 26 45.0629N	76 22 22.5877E		Massu	200	Pvt	Cultivation	-do-	11	Apple
		155.98			7175.08							
33	T34		32 26 44.7764N	76 22 16.6247E		Massu	320	Pvt	Cultivation	-do-	NIL	
		151.65			6975.9							
34	T35		32 26 44.7944N	76 22 10.8178E		Massu	410	Pvt	Cultivation	-do-	NIL	

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1	2	3	4	5	6	7	8	9	10	11	12	13
		61.25			2817.5							
35	T36		32 26 45.0289N	76 22 8.4886E		Massu	600	Pvt	Cultivation	-do-	NIL	
		408.16			18775.36							
36	T36A		32 26 43.0957N	76 21 53.0265E		Maror	320	Pvt	Cultivation	-do-	6	Kainth, Pine
		114.86			5283.56							
37	T37		32 26 44.9260N	76 21 49.1944E		Maror	550	Pvt	Cultivation	-do-	NIL	
		286.96			13200.16							
38	T38		32 26 41.8640N	76 21 38.8166E		Maror	620	Pvt	Plantation	_	8	Apple
		313.31			14412.26							
39	T39		32 26 41.2855N	76 21 26.8389E		Maror	250	Pvt	Cultivation	Wheat,Maje Rajmah,Mah	5	Dhaman, Kau
		357.45			16442.7							
40	T40		32 26 41.2273N	76 21 13.1517E		Maror	260	Pvt	Plantation	_	8	Apple
		240.33			11055.18							
41	T41		32 26 42.0780N	76 21 4.0038E		Bhadur	230	Pvt	Cultivation	Wheat,Maje Rajmah,Mah	1	
		153.52			7061.92							
42	T42		32 26 44.2145N	76 20 58.6924E		Bhadur	260	Pvt	Cultivation	-do-	2 (1 nos. in RoW)	
		145.36			6686.56							
43	T43		32 26 45.7134N	76 20 53.4145E		Piyura	370	Pvt	Cultivation	-do-	NIL	
		434.66			19994.36							
44	T44		32 26 45.7905N	76 20 36.7705E		Piyura	240	Pvt	Cultivation	-do-	NIL	
		414.04			19045.84							
45	T45		32 26 43.7003N	76 20 21.1088E		Piyura	410	Govt. Forest	Gov/Forest Area	_		
		397.43			18281.78							
46	T45A		32 26 44.0207N	76 20 5.8950E		Gahera	110	Govt. Forest	-do-	_		
		289.24			13305.04							
47	T46		32 26 49.9311N	76 19 57.2878E		Gahera	160	Pvt	Cultivation	Wheat,Maze, Rajmah,Mah	4	Apple,Kainth, Dhaman
		168.05			7730.3							
48	T47A		32 26 54.4386N	76 19 53.6610E		Gahera	240	Pvt	Plantation	_	5	Apple
		126.72			5829.12							
49	T47		32 26 56.2208N	76 19 49.2871E		Gahera	415	Pvt	Cultivation	Wheat,Maje Rajmah,Mah	NIL	
		518.54			23852.84							
50	T48		32 27 5.8203N	76 19 32.9736E		Ladda	155	Pvt	Cultivation	-do-	NIL	
		205.21			9439.66							
51	T49		32 27 11.1997N	76 19 28.3366E		Ladda	264	Pvt	Cultivation	-do-	NIL	
		149.46			6875.16							
52	T50		32 27 15.8386N	76 19 26.6556E		Ladda	205	Pvt	Cultivation	-do-	NIL	
		91.07			4189.22							
53	T50A		32 27 17.4789N	76 19 23.7538E		Ladda	165	Pvt	Cultivation	-do-	4	
		124.98			5749.08							
54	T51		32 27 19.5488N	76 19 19.6370E		Ladda	105	Pvt	Cultivation	-do-	NIL	

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1	2	3	4	5	6	7	8	9	10	11	12	13
		250.00			11500							
55	T52		32 27 24.2895N	76 19 11.8654E		Ladda	170	Pvt	Cultivation	-do-	NIL	
		147.77			6797.42							
56	T53		32 27 28.8798N	76 19 10.2181E		Ladda	41	Pvt	Cultivation	-do-	2 (in RoW)	
		76.08			3499.68							
57	T54		32 27 31.3445N	76 19 10.0209E		Ladda	165	Govt. Forest	Gov/Forest Area	_	NIL	
		264.84			12182.64							
58	T55		32 27 38.9839N	76 19 5.3639E		Ladda	620	Govt. Forest	-do-	_	NIL	
		91.10			4190.6							
59	T56		32 27 40.8938N	76 19 2.6995E		Sukral	105	Pvt	Cultivation	Wheat,Maze, Rajmah,Mah	NIL	
		165.65			7619.9							
60	T56A		32 27 42.7411N	76 18 56.7411E		Sukral	145	Govt. Forest	Gov/Forest Area	_		Kail,Cheel
		183.49			8440.54							
61	T57		32 27 45.9411N	76 18 50.8131E		Sukral	200	Pvt	Cultivation	Wheat,Maze, Rajmah,Mah	NIL	
		730.90			33621.4							
62	T58		32 27 58.3584N	76 18 26.9568E		Tur	310	Govt. Forest	Gov/Forest Area	_		
		214.03			9845.38							
63	T59		32 27 57.9693N	76 18 18.7722E		Tur	245	Pvt	Cultivation	Wheat,Maze, Rajmah,Mah	NIL	
		164.35			7560.1							
64	T60		32 27 58.7658N	76 18 12.5479E		Tur	130	Pvt	Cultivation	-do-	2 (1 nos. ROW)	
		72.99			3357.54							
65	T61		32 28 0.4921N	76 18 10.6325E		Lothal	230	Govt. Forest	Gov/Forest Area	_		
		281.29			12939.34							
66	T62		32 28 4.3361N	76 18 0.8594E		Lothal	410	Govt. Forest	-do-	_		
		304.27			13996.42							
67	T63		32 28 10.8493N	76 17 52.0963E		Lothal	165	Pvt	Cultivation	Wheat,Maze, Rajmah,Mah	1 (in RoW)	Kail
		226.85			10435.1							
68	T64		32 28 13.5118N	76 17 43.9946E		Lothal	120	Pvt	Cultivation	-do-	1	Akhrot
		311.27			14318.42							
69	T65		32 28 15.6622N	76 17 32.3449E		Lothal	230	Pvt	Cultivation	-do-	4	Faguda
		382.76			17606.96							
70	T66		32 28 21.7297N	76 17 19.5497E		Majatta	225	Govt. Forest	Gov/Forest Area	_		
		172.63			7940.98							
71	T67		32 28 26.8023N	76 17 16.7363E		Majatta	125	Pvt	Cultivation	Wheat,Maze, Rajmah,Mah	1	Malbury

SNo.	Tower No.	Section Length (M.)	Latitude	Longitude	Area under the ROW (in M²)	Name of Village/Tehsil/District	Distance of transmission line from nearby village (m)	Ownership of land (private, Govt. Forest)/ Use of Land	Use of land (cultivation, plantation/barren)	Name of Crops	Number of trees under cutting/trimming	Types (Names) Of Trees Cut
1	2	3	4	5	6	7	8	9	10	11	12	13
		204.68			9415.28							
72	T68		32 28 33.0213N	76 17 13.9712E		Majatta	235	Pvt	Cultivation	-do-	6	Kainth
		315.08			14493.68							
73	T69		32 28 37.4691N	76 17 3.1019E		Majatta	122	Pvt	Cultivation	-do-	2	Kail
		369.16			16974736							
74	T70		32 28 36.7243N	76 16 48.9881E		Majatta	550	Govt. Forest	Gov/Forest Area	_		
		376.86			17335.56							
75	T71		32 28 36.4853N	76 16 34.5549E		Majatta	164	Pvt	Cultivation	Wheat,Maze, Rajmah,Mah	1	Dadu
		556.49			25598.54							
76	T73		32 28 34.4333N	76 16 13.3760E		Majatta	275	Govt. Forest	Gov/Forest Area	_		
		531.84			24464.64							
77	T74		32 28 31.1104N	76 15 53.3841E		Gurad	312	Pvt	Cultivation	Wheat,Maze, Rajmah,Mah	2	Kainth
		117.74			5416.04							
78	T74A		32 28 31.8497N	76 15 48.9592E		Gurad	264	Pvt	Cultivation	-do-	2	Kail
		366.65			16865.9							
79	T75		32 28 36.1647N	76 15 35.8691E		Gurad	222	Pvt	Cultivation	-do-	1 (in RoW)	
		738.17			33955.82							
80	T76		32 28 38.9220N	76 15 7.7802E		Gurad	623	Govt. Forest	Gov/Forest Area	_		
		349.05			16056.3							
81	T77		32 28 35.4022N	76 14 55.0707E		Gurad	321	Govt. Forest	Gov/Forest Area	_		
		339.84			15632.64							
82	T78		32 28 31.2109N	76 14 43.0283E		Gurad	462	Govt. Forest	-do-	_		
		134.38			6181.48							
83	T79		32 28 29.8675N	76 14 38.1310E		Gurad	660	Govt. Forest	-do-	_		
		394.38			18141.48							
84	T80		32 28 28.8577N	76 14 23.0710E		Gurad	1250	Govt. Forest	-do-	_		
		254.47			11705.62							
85	T81		32 28 26.3161N	76 14 13.7961E		Rakh	213	Govt. Forest	-do-	_		
		188.58			8674.68							
86	T82		32 28 30.3307N	76 14 8.3414E		Rakh	325	Govt. Forest	-do-	_		
		397.52			18285.92							
87	T83		32 28 36.5172N	76 13 54.9768E		Rakh	645	Govt. Forest	-do-	_		
		587.21			27011.66							
88	T84		32 28 35.6455N	76 13 32.5063E		Rakh	241	Govt. Forest	-do-	_		

SNo.	Tower No.	Section Length (M.)	Latitude	Longitude	Area under the ROW (in M²)	Name of Village/Tehsil/District	Distance of transmission line from nearby village (m)	Ownership of land (private, Govt. Forest)/ Use of Land	Use of land (cultivation, plantation/barren)	Name of Crops	Number of trees under cutting/trimming	Types (Names) Of Trees Cut
1	2	3	4	5	6	7	8	9	10	11	12	13
		390.77			17975.42							
89	T85		32 28 27.5970N	76 13 20.9344E		Rakh	326	Govt. Forest	-do-	_		
		412.95			18995.7							
90	T85A		32 28 30.5873N	76 13 5.5146E		Rakh	215	Govt. Forest	-do-	_		
		120.02			5520.92							
91	T86		32 28 30.8128N	76 13 0.9250E		Rakh	246	Pvt	Cultivation	Wheat,Maze, Rajmah,Mah	3 (in RoW)	
		113.51			5221.46							
92	T87		32 28 34.0530N	76 12 58.8527E		Rakh	345	Govt. Forest	Gov/Forest Area	_		
		1034.68			47595.28							
93	T90		32 28 43.7426N	76 12 20.9013E		Janghi	274	Pvt	Cultivation	Wheat,Maze, Rajmah,Mah	NIL	
		142.44			6552.24							
94	T91		32 28 42.0397N	76 12 15.8281E		Janghi	211	Pvt	Cultivation	-do-	5	Dhaman,Kainth
		217.55			10007.3							
95	T92		32 28 40.5039N	76 12 7.6935E		Janghi	156	Pvt	Cultivation	-do-	3 (2 nos. in RoW)	Dhura
		169.77			7809.42							
96	T93		32 28 42.4623N	76 12 1.6145E		Janghi	326	Pvt	Cultivation	-do-	NIL	
		347.88			16002.48							
97	T94		32 28 51.2185N	76 11 53.1952E		Janghi	614	Pvt	Cultivation	-do-	9 (4 nos. in RoW)	Dhaman,Kainth
		461.35			21222.1							
98	T95		32 29 3.4901N	76 11 43.0584E		Janghi	826	Govt. Forest	Gov/Forest Area	_		
		248.68			11439.28							
99	T95A		32 29 8.2753N	76 11 35.3846E		Janghi	1650	Govt. Forest	-do-	_		
		174.71			8036.66							
100	T96		32 29 13.5167N	76 11 32.8238E		Janghi	1700	Govt. Forest	-do-	_		
		704.30			32397.8							
101	T97		32 29 28.1095N	76 11 12.0481E		Kuranh	328	Govt. Forest	-do-	_		
		474.90			21845.4							
102	T98		32 29 28.4933N	76 10 53.8589E		Kuranh	365	Govt. Forest	-do-	_		
		117.19			5390.74							
103	T99		32 29 31.5542N	76 10 51.1912E		Kuranh	416	Govt. Forest	-do-	_		
		602.70			27724.2							
104	T100		32 29 43.4708N	76 10 32.8736E		Gagla	367	Govt. Forest	-do-	_		
		697.28			32074.88							
105	T101		32 30 2.7680N	76 10 18.8989E		Kuranh	700	Govt.	-do-	_		

SNo.	Tower No.	Section Length (M.)	Latitude	Longitude	Area under the ROW (in M²)	Name of Village/Tehsil/District	Distance of transmission line from nearby village (m)	Ownership of land (private, Govt. Forest)/ Use of Land	Use of land (cultivation, plantation/barren)	Name of Crops	Number of trees under cutting/trimming	Types (Names) Of Trees Cut
1	2	3	4	5	6	7	8	9	10	11	12	13
								Forest				
		310.59			14287.14							
106	T102		32 30 6.6264N	76 10 7.9035E		Kuranh	870	Govt. Forest	-do-	_		
		755.84			34768.64							
107	T103		32 30 30.7129N	76 10 2.3439E		Valley	120	Pvt	Cultivation	Wheat,Maze, Rajmah,Mah	2 (in RoW)	Kainth,Dhaman
		89.73			4127.58							
108	T104		32 30 32.7927N	76 95 9.9358E		Valley	45	Pvt	Cultivation	-do-	NIL	
		118.75			5462.5						3	Kainth
109	T104A		32 30 36.4265N	76 95 8.4142E		Valley	155	Pvt	Cultivation	-do-	12 (8 in RoW)	Kainth, Dhaman
		123.57			5684.22							
110	T105		32 30 40.2081N	76 95 6.8307E		Valley	88	Pvt	Cultivation	-do-	3	Kainth,Dhaman
		204.06			9386.76							
111	T106		32 30 45.7545N	76 10 1.1089E		Valley	450	Pvt	Cultivation	-do-	13 (5 nos. in RoW)	Ban,Dhura
		53.49			2460.54							
112	G1		32 30 45.6763N	76 10 3.1568E		Valley	512	Govt. Forest	Gov/Forest Area	_		
		107.65			4951.9							
113	T107		32 30 45.0621N	76 10 7.2181E		Rajera	1450	Govt. Forest	-do-	_		
		41.95			1929.7							
114	T108		32 30 44.4517N	76 10 8.6550E		Rajera	1210	Govt. Forest	-do-	_		

T4: HoliBhajoli -Lahal Transmission Line Details

220kv D/Ctransmission Line from Bajoli-Holi HEPto proposed 33/220/400 Kv Gis Sub Station Lahal, Chamba (H.P)

SNo.	Tower No.	Section Length (M.)	Latitude	Longitude	Area under the ROW (in M²)	Name of Village/Tehsil /District	Distance of transmission line from nearby village (m)	Ownership of land (private, Govt. Forest)/ Use of Land	Use of land (cultivation, plantation/barren)	Name of Crops	Number of trees under cutting/trimming	Types (Names) of Trees cut
1	2	3	4	5	6	7	8	9	10	11	12	13
1	T-1		32 20 31.8	76 32 02.7		Key Nala		Pvt.	Barren		Nil	
		487.00			17045							
2	T-2		32 20 44.4	76 32 02.7		Loon	250	Pvt.	Cultivation	Maje,Rajmah, Wheat,Mah	Nil	
		250.00			8750							
3	T-3		32 20 51.9	76 32 00.5		Loon	520	Govt. Forest	Gov/forest area	_		
		174.00			6090							
4	T-4		32 20 57.8	76 32 01.2		Loon	840	Govt. Forest	-do-	_		
		140.00			4900							
5	T-5		32 21 01.8	76 32 00.3		Loon	900	Govt. Forest	-do-	_		
		313.00			10955							

SNo.	Tower No.	Section Length (M.)	Latitude	Longitude	Area under the ROW (in M²)	Name of Village/Tehsil /District	Distance of transmission line from nearby village (m)	Ownership of land (private, Govt. Forest)/ Use of Land	Use of land (cultivation, plantation/barren)	Name of Crops	Number of trees under cutting/trimming	Types (Names) of Trees cut
1	2	3	4	5	6	7	8	9	10	11	12	13
6	T-6		32 21 11.5	76 31 55.6		Loon	940	Govt. Forest	-do-	_		
		142.00			4970							
7	T-7		32 21 16.1	76 31 54.7		Batada	420	Govt. Forest	-do-	_		
		749.00			26215							
8	T-8		32 21 40.4	76 31 50.8		Batada	300	Govt. Forest	-do-	_		
		293.00			10255							
9	T-9		32 21 47.2	76 31 44.9		Batada	210	Govt. Forest	-do-	_		
		331.00			11585							
10	T-10		32 21 57.1	76 31 37.5		Batada	600	Govt. Forest	-do-	_		
		225.00			7875							
11	T-11		32 22 03.7	76 31 33.7		Batada	125	Govt. Forest	Gov/forest area	_		
		521.00			18235							
12	T-12		32 22 16.9	76 31 21.2		Jeena	230	Govt. Forest	-do-	_		
		429.00			15015							
13	T-13		32 22 28.9	76 31 11.8		Shah	315	Govt. Forest	-do-	_		
		513.00			17955							
14	T-14		32 22 34.8	76 30 53.9		Shah	450	Pvt.	Cultivation	Maje,Rajmah, Wheat,Mah	Nil	
		272.00			9520							
15	T-15		32 22 39.5	76 30 45.1		Gwar	301	Pvt.	Cultivation	-do-	Nil	
		297.00			10395							
16	T-16		32 22 44.4	76 30 35.1		Shah	225	Pvt.	Cultivation	-do-	Nil	
		148.00			5180							
17	T-17		32 22 47.6	76 30 31.0		Sua	99	Govt. Forest	Gov/forest area	_		
		112.00			3920							
18	T-18		32 22 51.0	76 30 28.6		Sua	114	Govt. Forest	-do-	_		
		538.00			18830							
19	T-19		32 23 05.3	76 30 16.6		Machheter	431	Govt. Forest	-do-	_		
		620.00			21700							
20	T-20		32 23 12.5	76 29 54.7		Machheter	650	Govt. Forest	-do-	_		
		212.00			7420							
21	T-21		32 23 06.2	76 29 47.9		Machetter	612	Govt. Forest	-do-	_		
		531.00			18585							
22	T-22		32 23 24.7	76 29 30.3		Praie	812	Govt. Forest	Gov/forest area	_		
		281.00			9835							
23	T-23		32 23 33.0	76 29 26.1		Praie	940	Govt. Forest	-do-	_		
		977.00			34195							
24	T-24		32 24 04.3	76 29 28.5		Praie	1050	Govt. Forest	-do-	_		
		139.00			4865							
25	T-25		32 24 09.0	76 29 30.9		Praie	1500	Govt. Forest	-do-	_		
		225.00			7875							
26	T-26		32 24 15.1	76 29 34.1		Praie	2000	Govt. Forest	-do-	_		
		159.00			5565							
27	T-27		32 24 20.7	76 29 36.5		Praie	943	Govt. Forest	-do-	_		
		798.00			27930							
28	T-29		32 24 44.14	76 29 48.58		Praie	215	Pvt.	Cultivation	Maje,Rajmah, Wheat,Mah	1	Cheel

SNo.	Tower No.	Section Length (M.)	Latitude	Longitude	Area under the ROW (in M²)	Name of Village/Tehsil /District	Distance of transmission line from nearby village (m)	Ownership of land (private, Govt. Forest)/ Use of Land	Use of land (cultivation, plantation/barren)	Name of Crops	Number of trees under cutting/trimming	Types (Names) of Trees cut
1	2	3	4	5	6	7	8	9	10	11	12	13
		217.00			7595							
29	T-30		32 24 50.38	76 29 45.32		Praie	560	Pvt.	Cultivation	Maje,Rajmah, Wheat,Mah	1	Ban
		311.00			10885							
30	T-31		32 24 59.66	76 29 46.28		Praie	600	Govt. Forest	Gov/forest area	_		
		268.00			9380							
31	T-32		32 25 09.21	76 29 46.51		Praie	750	Govt. Forest	-do-	_		
		261.00			9135							
32	T-33		32 25 15.11	76 229 43.09		Praie	450	Govt. Forest	Gov/forest area	_		
		233.00			8155							
33	T-34		32 25 21.60	76 29 35.24		Raten	550	Govt. Forest	-do-	_		
		106.00			3710							
34	T-35		32 25 23.46	76 29 31.79		Raten	400	Govt. Forest	-do-	_		
		242.00			8470							
35	T-36		32 25 31.05	76 29 31.05		Raten	310	Govt. Forest	-do-	_		
		384.00			13440							
36	T-37		32 25 43.01	76 29 36.00		Raten	500	Govt. Forest	-do-	_		
		301.00			10535							
37	T-38		32 25 52.07	76 29 36.00		Raten	412	Govt. Forest	-do-	_		
		238.00			8330							
38	T-39		32 25 59.09	76 29 40.3		Raten	223	Govt. Forest	-do-	_		
		242.00			8470							
39	T-40		32 26 07.06	76 29 38.02		Garima	120	Govt. Forest	-do-	_		
		209.00			7315							
40	T-41		32 26 13.00	76 29 42.04		Garima	320	Govt. Forest	-do-	_		
		259.00			9065							
41	T-42		32 26 21.03	76 29 42.00		Garima	175	Govt. Forest	-do-	_		
		347.00			12145							
42	T-43		32 26 32.07	76 29 40.04		Garima	360	Govt. Forest	-do-	_		
		157.00			5495							
43	T-44		33 26 36.9	76 229 37.01		Garima	520	Govt. Forest	Gov/forest area	_		
		206.00			7210							
44	T-45		32 26 42.66	76 29 33.23		Garima	400	Govt. Forest	-do-	_		
		302.00			10570							
45	T-46		32 26 50.76	76 29 25.91		Bihat	200	Govt. Forest	-do-	_		
		78.00			2730							
46	T-47		32 26 50.56	76 29 23.52		Bihat	435	Govt. Forest	-do-	_		
		348.00			12180							
47	T-48		32 26 55.02	76 29 11.05		Khani	541	Pvt.	Plantation	_	5	Apple
		201.00			7035							
48	T-49		32 26 59.01	76 29 05.98		Khani	432	Pvt.	Plantation	_	6	Apple
		167.00			5845							
49	T-50		32 27 02.06	76 29 01.48		Khani	190	Pvt.	Plantation	_	6	Apple
		240.00			8400							
50	T-51		32 27 07.08	76 28 54.00		Khani	154	Pvt.	Plantation	_	4	Ban
		280.00			9800							
51	T-52		32 27 14.02	76 28 46.00		Khani	145	Pvt.	Cultivation	_	6	apple
		314.00			10990							

SNo.	Tower No.	Section Length (M.)	Latitude	Longitude	Area under the ROW (in M²)	Name of Village/Tehsil /District	Distance of transmission line from nearby village (m)	Ownership of land (private, Govt. Forest)/ Use of Land	Use of land (cultivation, plantation/barren)	Name of Crops	Number of trees under cutting/trimming	Types (Names) of Trees cut
1	2	3	4	5	6	7	8	9	10	11	12	13
52	T-53		32 27 24.04	76 28 45.05		Khani	99	Pvt.	Plantation	_	6	Akhrot, Apple
		157.00			5495							
53	T-54		32 27 29.02	76 28 43.04		Khani	145	Pvt.	Cultivation	Maje,Rajmah, Mah,Wheat	1	Ban
		430.00			15050							
54	T-55		32 27 40.03	76 28 34.08		Khani	250	Pvt.	Cultivation	-do-	3	Akhrot
		261.00			9135							
55	T-56		32 27 47.08	76 28 28.06		Khani	320	Pvt.	Cultivation	-do-	_	_
		174.00			6090							
56	T-57		32 27 53.01	76 28 25.02		Lahal	150	Pvt.	Cultivation	-do-	_	_
		401.00			14035							
57	T-58		32 27 59.07	76 28 12.02		Lahal	123	Pvt.	Cultivation	-do-	_	_
		280.00			9800							
58	T-59		32 28 04.00	76 28 00.04		Lahal	124	Pvt.	Cultivation	-do-	2	Apple
		186.00			6510							
59	T-60		32 28 10.40	76 28 00.18		Lahal	160	Pvt.	Cultivation	-do-	-	-
		187.00			6545							
60	T-61		32 28 13.47	76 28 04.96		Lahal	175	Pvt.	Cultivation	-do-		

T5 - 132 kV D/C transmission line from Barsaini to 132/220 kV substation at Charor

SNo.	Tower No.	Section Length (M.)	Latitude	Longitude	Area under the ROW (in M²)	Name of Village/Tehsil/District	Distance of transmission line from nearby village (m)	Ownership of land (private, Govt. Forest)/ Use of Land	Use of land (cultivation, plantation/barren)	Name of Crops	Number of treesto beretained	Types (Names) of Trees cut
1	2	3	4	5	6	7	8	9	10	11	12	13
1	T-1					Barshani	1000m	forest				
		254.62			6847	Barshani	500-1000m				-	-
2	T-2		32.0032393	77.45113093	99 pvt	Barshani	500-1000m	Private	Banjar	-	-	
		109.89			2876	Barshani	500-1000m					6 (Kail)
3	T-3		32.002432	77.44943422	99Govt	Barshani	500-1000m	Forest			-	
		79.20			2044	Barshani	500-1000m					1(Kail)
4	T-4		32.00221	77.448638	99Govt	Barshani	500-1000m	Forest			-	
		63.47			1552	Barshani	500-1000m					1(Kail)
5	T-5		32.0022929	77.447973	99Govt	Barshani	500-1000m	Forest			-	-
		230.75			6147	Barshani	500-1000m					
6	T-5A		32.002447	77.445456	99 pvt	Barshani	500-1000m	private	Plantation	Apple	-	-
		322.51			8631	Barshani	500-1000m					
7	T-6		320025042	77.442125	99 pvt	Barshani	500-1000m	private	Plantation	Apple/Pears	-	-
		471.54			12666	Barshani	500-1000m					
8	T-7		32.00278919	77.437147	99 Govt	Barshani	500 mtr	Forest			-	-
		428.36			11496	Barshani	500mtr					
9	T-8		32.00245323	77.43263227	99 pvt	Barshani	500-1000m	private	Plantation	Apple/Pears	-	-
		239.10			6373	Barshani	500-1000m					
10	T-9		32.00201127	77.43015623	99 pvt	Barshani	500-1000m	private	Plantation	Apple/Pears	-	-

SNo.	Tower No.	Section Length (M.)	Latitude	Longitude	Area under the ROW (in M²)	Name of Village/Tehsil/District	Distance of transmission line from nearby village (m)	Ownership of land (private, Govt. Forest)/ Use of Land	Use of land (cultivation, plantation/barren)	Name of Crops	Number of treesto beretained	Types (Names) of Trees cut
1	2	3	4	5	6	7	8	9	10	11	12	13
		293.00			7832	Barshani	500-1000m					
11	T-10		32.00208278	77.42705736	99 Govt	Barshani	500-1000m				-	-
		197.96			5260	Tahuk	2500 m					1(Kail)
12	T-11		32.00224782	77.4249719	99 Govt	Tahuk	400-2500m					
		160.75			4253	Tahuk	400-2500m					
13	T-12		32.00246979	77.42329121	99 pvt	Tahuk	400-2500m	private	Plantation	Apple/Pears		
		176.77			4686	Tahuk	400-2500m					
14	T-13		32.00266856	77.42143551	99 pvt	Tahuk	400-2500m	private	Plantation	Apple/Pears		
		133.03			3503	Tahuk	400-2500m					
15	T-14		32.00294216	77.42006509	99 pvt	Tahuk	400-2500m	private	Plantation	Apple/Pears		
		301.18			8055	Tahuk	400-2500m					
16	T-15		32.00379855	77.41704106	99 Govt	Tahuk	400-2500m					
		83.30			2157	Tahuk	400-2500m					
17	T-16		32.00403102	77.41620296	99 pvt	Tahuk	400-2500m	private	Plantation	Apple/Pears		
		123.40			3241	Tahuk	400-2500m					2(Rai,Kail)
18	T-17		32.00410479	77.41490013	99 Govt	Tahuk	400-2500m					
		319.46			8508	Tahuk	400-2500m				1(Rai)	2(Rai,Kail)
19	T-18		32.00496449	77.41167404	99 Govt	Tahuk	400-2500m					
		433.84			11646	Tahuk	400-2500m				3(Rai,Kail)	-
20	T-19		32.00580883	77.40719183	99 pvt	Tahuk	400-2500m	private	Plantation	Apple/Pears		
		230.87			6131	Tahuk	400-2500m					2(Kail)
21	T-20		32.00582702	77.40474912	99 pvt	Tahuk	400-2500m	private	Plantation	Apple/Pears		
		132.09			3477	Tahuk	400-2500m					
22	T-21		32.0058758	77.40335263	99 Govt	Tahuk	400-2500m					
		306.65			8201	Tahuk	400-2500m				10(Kail)	2(Kail)
23	T-22		32.00548879	77.40013993	99 pvt	Tahuk	400-2500m	private	Plantation	Apple/Pears		
		80.16			2071	Tahuk	400-2500m					
24	T-23		32.0053443	77.39930884	99 pvt	Tahuk	400-2500m	private	Plantation	Apple/Pears		
		258.43			6898	Tahuk	400-2500m				6(Robinia)	
25	T-24		32.0050598	77.39659493	99 Govt	Tahuk	400-2500m					
		130.62			3437	Tahuk	400-2500m				18(Kail,Robinia)	3(Robinia)
26	T-25		32.00522179	77.39522595	99 Govt	Tahuk	400-2500m					
		310.63			8319	Tahuk	400-2500m					2(Kail)
27	T-26		32.00548004	77.39195319	99 Govt	Tahuk	400-2500m					
		74.43			1899	Tahuk	400-2500m					2(Deodar,Kail)
28	T-27		32.00562026	77.39118299	99 Govt	Tahuk	400-2500m					
		460.94			12378	Tahuk	400-2500m				21(Deodar,Kail)	4(Kail)
29	T-28		32.00728738	77.38671541	99 pvt	Tahuk	400mtr	private	Plantation	Apple/Pears		
		75.41			1943	Tahuk	400-2500m					
30	T-29		32.00746835	77.38594623	99 Govt	Tahuk	400-2500m					
		456.63			12263	Uch	1000 m					
31	T-30		32.00885651	77.38139737	99 pvt	Uch	600-1000m	private	Banjar			
		536.81			14432	Uch	600-1000m					
32	T-31		32.01082568	77.37620849	99 pvt	Uch	600m	private	Banjar			
		303.67			8121	Uch	600-1000m				27(Kail,Popupal, Walnut)	6(Kail,Robinia)
33	T-32		32.01224884	77.37346329	99 Govt	Uch	600-1000m					
		149.29			3937	Uch	600-1000m					5(Kail,Rai)

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1	2	3	4	5	6	7	8	9	10	11	12	13
34	T-33		32.01326505	77.37242732	99 Govt	Uch	600-1000m					
		536.33			13808	Rasket	1000 m				28(Deodar,Rai, Kail,Popular,Chil)	3(Deodar,Rai)
35	T-34		32.01790216	77.37081761	99 Govt	Rasket	450-1000m					
		109.00			2861	Rasket	450-1000m					10(Kail)
36	T-35		32.01859038	77.36999418	99 Govt	Rasket	450m					
		710.45			19135	Rasket	450-1000m				12(Kail)	2(Kail)
37	T-36		32.02167263	77.36340329	99 pvt	Kiyani	250 mtr	private	Plantation	Apple/Pears		
		231.19			6158	Kiyani	250-1000m				1(Kail)	
38	T-37		32.02291599	77.36143951	99 Govt	Kiyani	250-1000m					
		150.40			3971	Kiyani	250-1000m				5(Kaiil)	1(Kail)
39	T-38		32.02363151	77.36008743	99 pvt	Kiyani	250-1000m	private	Plantation	Apple/Pears		
		96.55			2515	Kiyani	250-1000m					
40	T-39		32.02417055	77.35928508	99 pvt	Kiyani	250-1000m	private	Plantation	Apple/Pears		
		210.44			5599	Kiyan	1000m					
41	T-40		32.02531736	77.35751072	99 pvt	Shangna	1000 m	private	Plantation	Apple/Pears		
		152.13			4020	Shangna	200-1000m					
42	T-41		32.02626762	77.35634962	99 pvt	Shangna	200 mtr	private	Plantation	Apple/Pears		
		516.41			13881	Manikaran	1000m				5(Kail)	
43	T-42		32.02769464	77.35114709	99 Govt	Manikaran	500-1000m					
		269.62			7205	Manikaran	500-1000m				4(Kail)	
44	T-43		32.0287756	77.34859116	99 Govt	Manikaran	500 m					
		371.60			9972	Manikaran	500-1000m				1(kail)	
45	T-44		32.0296511	77.34479484	99 Govt	Manikaran	500-1000m					
		405.50			10879	Manikaran	500-1000m				18(Kail,Robinia)	
46	T-45		32.0280149	77.34095678	99 Govt	Manikaran	500-1000m					
		328.15			8781	Manikaran	500-1000m				11(Kail)	
47	T-46		32.0251216	77.34023055	99 Govt	Manikaran	500-1000m					
		216.60			5782	Gunje	1000 m					1(Kail)
48	T-47		32.0239334	77.33841132	99 Govt	Gunje	800-1000m					
		109.05			2852	Gunje	800-1000m					5(Kail)
49	T-48		32.0226071	77.33713783	99 Govt	Gunje	800 m					
		70.14			1799	Chhalal	450-750m					2(Kail)
50	T-49		32.0219763	77.33708498	99 pvt	Chhalal	450-750 m	private	Plantation	Apple/Pears		
		204.47			5437	Chhalal	450-750m					
51	T-50		32.0214086	77.33502624	99 Govt	Chhalal	450 m					
		114.18			3001	Chhalal	450-750m				7(Chil,Robinia,Kail	2(Kail,Chil)
52	T-51		32.0209808	77.33392713	99 pvt	Chhalal	450-750m	private	Plantation	Apple/Pears		
		396.36			10632	Chhalal	450-750m				19(Kail,Chil)	7 (Kail,Khirk, Robinia)
53	T-52		32.0199188	77.32992196	99 Govt	Chhalal	750m					
		347.61			9312	Katagla	4500 m				6(Chil, Kail)	2(Chil, Kail)
54	T-53		32.0177967	77.32721484	99 pvt	Katagla	200-4500m	private	Plantation	Apple/Pears		
		164.87			4365	Katagla	200-4500m					
55	T-54		32.0165771	77.32621721	99 Govt	Katagla	200-4500m					
		227.07			6048	Katagla	200-4500m					5(Deodar,Kail)

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1	2	3	4	5	6	7	8	9	10	11	12	13
56	T-55		32.0162398	77.32384701	99 Govt	Katagla	200-4500m					
		201.42			5359	Katagla	200-4500m					12(Deo,Kail,Chil)
57	T-56		32.0150930	77.32219424	99 Govt	Katagla	200-4500m					
		266.53			7128	Katagla	200-4500m					44(Deodar,Kail, Chil)
58	T-57		32.0140851	77.31963381	99 Govt	Katagla	200-4500m					
		338.29			9050	Katagla	200-4500m				26(Deo,Kail,Chil)	36(Deo,Kail,Chil)
59	T-58		32.0129218	77.31632446	99 Govt	Katagla	200-4500m					
		168.66			4475	Katagla	200-4500m				11(Deo,Kail, Chil)	5(Deo,Kail,Chil)
60	T-59		32.0122809	77.31470599	99 Govt	Katagla	200-4500m					
		343.42			9207	Katagla	200-4500m				13(Deodar,Chil)	2(Deodar,Chil)
61	T-60		32.0118379	77.31110924	99 pvt	Katagla	200-4500m	private	Plantation	Apple/Pears		
		171.30			4542	Katagla	200-4500m					1(Chil)
62	T-61		32.0111957	77.30945719	99 Govt	Katagla	200-4500m					
		114.12			3284	Katagla	200-4500m				6 (Chil)	9(Chil)
63	T-62		32.0112377	77.30825379	99 Govt	Katagla	200-4500m					
		161.85			4283	Katagla	200-4500m					35(Chil)
64	T-63		32.01197706	77.30677719	99 Govt	Katagla	200-4500m					
		156.71			4129	Katagla	200-4500m					4(Chil)
65	T-64		32.01228144	77.30515775	99 Govt	Katagla	200-4500m					
		333.30			8931	Katagla	200-4500m					2(Chil)
66	T-65		32.01200389	77.3016458	99 pvt	Katagla	200-4500m	private	Plantation	Apple/Pears		
		81.46			2115	Katagla	200-4500m					
67	T-66		32.01150225	77.30101612	99 pvt	Katagla	200-4500m	private	Plantation	Apple/Pears		
		172.09			4576	Katagla	200-4500m					
68	T-67		32.01116202	77.29923936	99 pvt	Katagla	200-4500m	private	Plantation	Apple/Pears		
		283.62			7579	Katagla	200-4500m					
69	T-68		32.01220991	77.29650163	99 pvt	Katagla	200-4500m	private	Plantation	Apple/Pears		
		155.31			4106	Katagla	200-4500m				12(Chil)	
70	T-69		32.01209532	77.29486363	99 Govt	Katagla	200-4500m					
		98.65			2553	Katagla	200-4500m				1(Chil)	12(Chil)
71	T-70		32.01221496	77.29382922	99 Govt	Katagla	200-4500m					
		499.68			13431	Katagla	200-4500m				10(Chil)	6(Chil)
72	T-71		32.01009823	77.28916142	99 Govt	Katagla	200 mtr					
		110.89			2912	Katagla	200-4500m					
73	T-72		32.00963529	77.28812148	99 pvt	Katagla	200-4500m	private	Plantation	Apple/Pears		
		130.66			3458	Katagla	200-4500m					
74	T-73		32.00919639	77.28683826	99 pvt	Katagla	200-4500m	private	Plantation	Apple/Pears		
		306.32			8147	Katagla	200-4500m					
75	T-74		32.00923057	77.28359706	99 Govt	Katagla	200-4500m					
		684.61			18429	Katagla	200-4500m				53(Chil)	
76	T-75		32.00788862	77.27652586	99 Govt	Katagla	200-4500m					
		478.62			12876	Katagla	200-4500m				8(Chil)	6(Chil)
77	T-76		32.00733703	77.27150272	99 Govt	Katagla	200-4500m					
		116.57			3091	Katagla	200-4500m				3(Kosh,Chil)	1(Chil)
78	T-77		32.0069108	77.27037514	99 Govt	Katagla	200-4500m					
		181.68			4147	Katagla	200-4500m				4(Chil)	
79	T-78		32.00632312	77.26858061	99 Govt	Katagla	200-4500m					

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1	2	3	4	5	6	7	8	9	10	11	12	13
		133.53			3514	Katagla	200-4500m				19(Chil)	6(Chil)
80	T-79		32.00603583	77.26720841	99 Govt	Katagla	200-4500m					
		332.42			8899	Katagla	200-4500m				2(Chil)	3(Chil)
81	T-80		32.00638001	77.2637141	99 Govt	Katagla	200-4500m					
		278.22			7435	Katagla	200-4500m				5(Chil)	21(Chil)
82	T-81		32.00662671	77.2607843	99 Govt	Katagla	200-4500m					
		239.66			6391	Katagla	200-4500m				4(Chil)	10(Chil)
83	T-82		32.00630068	77.25827729	99 Govt	Katagla	200-4500m					
		82.50			2134	Katagla	200-4500m				4(Chil)	4(Chil)
84	T-82A		32.00594121	77.25751303	99 pvt	Katagla	200-4500m	private	Plantation	Apple/Pears		
		203.85			5418	Chauki	1000m				7(Chil)	4(Chil)
85	T-83		32.00590948	77.2553563	99 Govt	Chauki	100-1000 m					
		104.76			2745	Chauki	100-1000 m					4(Chil)
86	T-84		32.00629486	77.25434425	99 Govt	Chauki	100-1000 m					
		281.91			7550	Chauki	100-1000 m				6(Chil)	1(Chil)
87	T-85		32.0070432	77.25149328	99 Govt	Chauki	100-1000 m					
		395.09			10587	Chauki	100-1000 m				6(Chil)	1(Chil)
88	T-86		32.00798781	77.24746214	99 Govt	Chauki	100-1000 m					
		111.67			2924	Chauki	100-1000 m					
89	T-87		32.00807818	77.24628517	99 pvt	Chauki	100 mtr (Minimum)	private	Plantation	Apple/Pears		
		53.95			1363	Chauki	100-1000 m					
90	T-88		32.00825858	77.24575498	99 pvt	Chauki	100-1000 m	private	Plantation	Apple/Pears		
		176.20			4671	Chauki	100-1000 m					
91	T-89		32.00865184	77.24394845	99 Govt	Chauki	100-1000 m					
		623.94			16796	Pehal	500m				8(Chil)	2(Devidyir,Kail)
92	T-90		32.0078539	77.23741259	99 Govt	Pehal	100-500m					
		181.31			4809	Pehal	100-500m					
93	T-91		32.00671791	77.23603288	99 pvt	Pehal	105 mtr	private	Plantation	Apple/Pears		
		199.73			5315	Pehal	100-500m					
94	T-92		32.0066477	77.23392101	99 pvt	Pehal	100-500m	private	Plantation	Apple/Pears		
		549.99			14789	Valadi	1000m				10(Chil,Kail)	3(Chil)
95	T-93		32.00363124	77.22930152	99 Govt	Valadi	300-1000m					
		295.65			7897	Valadi	300-1000m					2(Chil)
96	T-94		32.0017014	77.22714319	99 Govt	Valadi	300 m					
		217.46			5782	Valadi	300-1000m				10(Chil)	
97	T-95		32.0001069	77.22580404	99 Govt	Valadi	300-1000m					
		241.67			6436	Valadi	300-1000m				17(Chil)	
98	T-96		31.99827988	77.22441033	99 Govt	Valadi	300-1000m					
		191.61			5090	Pini	2000 m				6(Chil)	3(Chil)
99	T-97		31.99666419	77.2236922	99 Govt	Pini	200-2000m					
		115.87			3053	Pini	200-2000m				4(Chil)	2(Chil)
100	T-98		31.995971	77.22276	99 Govt	Pini	200-2000m					
		226.40			6051	Pini	200-2000m				5(Chil)	
101	T-99		31.994318	77.221365	99 Govt	Pini	200-2000m					
		240.69			6436	Pini	200-2000m					
102	T-100		31.99217	77.220985	99 Govt	Pini	200-2000m					

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1	2	3	4	5	6	7	8	9	10	11	12	13
		122.06			3207	Pini	200-2000m					
103	T-101		31.991117	77.221352	99 Govt	Pini	200-2000m					
		200.74			5321	Pini	200-2000m					
104	T-102		31.989845	77.219839	99 Govt	Pini	200-2000m					
		230.87			6167	Pini	200-2000m					
105	T-103		31.98858	77.217904	99 Govt	Pini	200-2000m					
		925.00			24926	Pini	200-2000m				12(Kail, Deodar)	7(Kail)
106	T-104		31.98385	77.209843	99 Govt	Pini	200-2000m					
		111.17			2899	Pini	200-2000m				4(Kail)	2(Kail)
107	T-105		31.983345	77.208826	99 Govt	Pini	200-2000m					
		233.12			6205	Pini	200-2000m				2(Kail)	
108	T-106		31.98162	77.207409	99 Govt	Pini	200-2000m					
		449.73			12086	Pini	200-2000m				5(Chil)	
109	T-107		31.978164	77.204935	99 Govt	Pini	200-2000m					
		101.24			2630	Pini	200-2000m				4(Chil)	2(Chil)
110	T-108		31.977335	77.205391	99 Govt	Pini	200-2000m					
		101.05			2630	Pini	200-2000m				5(Chil)	1(Chil)
111	T-109		31.976504	77.204948	99 Govt	Pini	200-2000m					
		639.52			17222	Pini	200-2000m					
112	T-110		31.973985	77.198868	99 pvt	Pini	200-2000m	private	Plantation	Apple/Pears		
		194.44			5167	Pini	200-2000m					
113	T-111		31.973405	77.196928	99 pvt	Pini	200 mtr	private	Plantation	Apple/Pears		
		508.38			13664	Banasha	1000m					
114	T-112		31.96908	77.195132	99 pvt	Banasha	110-1000m	private	Plantation	Apple/Pears		
		156.21			4129	Banasha	110-1000m					
115	T-113		31.967736	77.194656	99 pvt	Banasha	110 mtr	private	Plantation	Apple/Pears		
		158.48			4190	Banasha	110-1000m					
116	T-114		31.96644	77.193937	99 Govt	Banasha	110-1000m					
		57.21			1389	Banasha	110-1000m					
117	T-115		31.965985	77.193652	99 Govt	Banasha	110-1000m					
		163.47			4321	Dhanali	500-1000m					
118	T-116		31.964868	77.192525	99 Govt	Dhanali	500-1000m					
		157.65			4168	Dhanali	500-1000m					
119	T-117		31.963851	77.191358	99 Govt	Dhanali	500-1000m					
		97.98			2553	Dhanali	500-1000m					
120	T-118		31.96348	77.190418	99 Govt	Dhanali	500m					
		473.61			12734	Dhanali	500-1000m				3(Kosh)	1(Chil)
121	T-119		31.960613	77.186711	99 Govt	Dhanali	500-1000m					
		143.23			3783	Dhanali	500-1000m					
122	T-120		31.960105	77.185313	99 Govt	Dhanali	500-1000m					
		390.36			10472	Sauhat	500-1000m				3(Kosh)	
123	T-121		31.959471	77.181257	99 Govt	Sauhat	500-1000m					
		195.86			5205	Sauhat	500-1000m					
124	T-122		31.958077	77.179976	99 Govt	Sauhat	500-1000m					
		512.19			13767	Tipiri	800m					
125	T-123		31.95532	77.175626	99 Govt	Tipiri	130-800m					
		201.99			5369	Tipiri	130-800m				4(Kail)	
126	T-124		31.953862	77.174354	99 Govt	Tipiri	130-800m					

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1	2	3	4	5	6	7	8	9	10	11	12	13
		464.68			12479	Tipiri	130-800m					
127	T-125		31.949807	77.173127	99 Govt	Tipiri	130 mtr					
		527.21			14160	Sarsadi	1100m				9(Kosh)	3(Kosh)
128	T-126		31.945621	77.175789	99 Govt	Sarsadi	300-1100 m					
		175.60			4858	Sarsadi	300-1100 m					
129	T-127		31.944149	77.176452	99 pvt	Sarsadi	300mtr	private	Plantation	Apple/Pears		
		555.09			14928	Sarsadi	300-1100 m				3(Kail)	2(Kail)
130	T-128		31.939174	77.175732	99 Govt	Sarsadi	300-1100 m					
		428.16			11513	Dhanogi					10(Kosh)	
131	T-129		31.935933	77.173276	99 Govt	Dhanogi	1000 mtr					
		182.65			4861	Dhanogi	250-1000m				7(Kosh,Robinia,Chil)	
132	T-130		31.934371	77.173884	99 Govt	Dhanogi	250-1000m					
		252.60			6743	Dhanogi	250-1000m				2(Chil)	
133	T-131		31.932127	77.174329	99 Govt	Dhanogi	250-1000m					
		419.24			11242	Dhanogi	250-1000m				6(Chil)	
134	T-132		31.928515	77.17565	99 Govt	Dhanogi	250 m					
		357.61			9588	Dhanogi	250-1000m					10(Chil)
135	T-133		31.925472	77.1769	99 Govt	Dhanogi	250-1000m					
		196.01			5205	Dhanogi	250-1000m				3(Chil)	1(Chil)
136	T-134		31.924105	77.178211	99 Govt	Dhanogi	250-1000m					
		910.30			24540	Fagu	1200 m				11(Chil)	1(Chil)
137	T-135		31.916477	77.181774	99 Govt	Fagu	500					
		574.50			15454	Chhoror	1000m				5(Chil)	5(Chil)
138	T-136		31.911305	77.182054	99 pvt	Chhoror	700mtr	private	Plantation	Apple/Pears		
		120.15			3154	Chhoror	400-1000m				-	-
139	T-137		31.910224	77.181933	99 pvt	Chhoror	400-1000m	private	Plantation	Apple/Pears		
		69.63			1787	Chhoror	400-1000m				-	-
140	T-138		31.909643	77.181666	99 pvt	Chhoror	400 mtr	private	Plantation	Apple/Pears		
		60.92			1550	Chhoror					-	-

Annexure 5: Environmental Management Plan

Project Activity	Potential Environmental Impact	Mitigation Action	Parameters to be Monitored	Standards/ Measurement/ Frequency	Institutional Responsibility	Implementation Schedule
PRE-CONSTRUCTION PHASE						
A Physical Resources						
Equipment specifications and design parameters	Release of chemicals and harmful gases in receptors (air, water, land)	PCBs, Chlorofluorocarbons (CFCs), including halons not used in transformers, or any other equipment.	Transformers and other equipment specifications compliant with GoI rules/regulations & (International Electro-Technical Commission) IEC standards	Exclusion of PCBs, CFCs stated in tender documents - Once.	HPPTCL	Detailed design
B Environment Resources						
Location of land for substations/transmission towers	Impact to the existing environment	Construction facilities should be placed at more than 100 m from water bodies, natural flow paths, important ecological habitats and residential areas	Water and Air Quality	Air quality Standards and Water Quality standards – Once	HPPTCL	Detailed design
Substation location and design	Noise generation Exposure to noise, Nuisance to neighbouring properties	Substation location/designed to ensure noise will not be a nuisance to neighbouring properties.	Expected noise emissions based on substation design, noise levels	Noise control regulations Noise levels to be specified in tender documents-Once	HPPTCL	Detailed design
Location of transmission towers and transmission line alignment and design	Impact on water bodies / land/ residences	Consideration of site location to avoid water bodies or agricultural land/orchards as much as possible. Careful site selection to avoid existing settlements	Site location, transmission line alignment selection (distance to dwelling, water and/or agricultural land)	Consultation with local authorities and land owners, water quality standards-Once	HPPTCL	Part of detailed project siting and survey and design
Interference with drainage patterns/Irrigation channels	Temporary flooding hazards/loss of agricultural production	Appropriate siting of towers to avoid channel interference	Site location and transmission line alignment selection	Consultation with local authorities and design engineers – Once	HPPTCL	Detailed alignment survey and design
C Ecological Resources						
Encroachment into precious ecological areas	Loss of precious ecological values/ damage to precious species	Avoid encroachment by careful site and alignment selection and reconnaissance before final siting of facilities.	Floral and faunal habitats loss	Enumeration of flora and fauna at site - Once	ESC of HPPTCL	Detailed design
Cutting of Trees	Loss of trees along the RoW	The number of trees can be minimised by using flexible tower placement, conductor heightening, and selecting hilltop to hilltop	Trees loss	Tree Enumeration by EPC and forest department-Once	ESC of HPPTCL	Detailed Design and Planning

Project Activity	Potential Environmental Impact	Mitigation Action	Parameters to be Monitored	Standards/ Measurement/ Frequency	Institutional Responsibility	Implementation Schedule
		route				stage
D Human Environment						
Involuntary resettlement or land acquisition	Loss of lands and structures	Compensation paid for temporary/ permanent loss of productive land	Public complaints	Rates paid as per the Resettlement plan/Frame work for the project – Once	ESC of HPPTCL	Prior to construction phase
Encroachment into farmland	Loss of agricultural productivity	Avoid siting towers on farmland/orchards wherever possible	Tower location and transmission line alignment selection Statutory approvals for tree trimming /removal from Horticulture department	Consultation with local authorities and design engineers - Once	ESC of HPPTCL	Part of detailed alignment survey and design
Location and design of Substation	Disturbance to adjacent lands and the people due to cut and fill operations	Maintain adequate[30] clearance, construction of retaining structures, minimise cut and fill operations adjoining the dwellings	Transformers and specifications and compliance with setback distances ("as-built" diagrams)	Technical specification- Once Measure setback distances to nearest house structures – Once	HPPTCL	Detailed design
Location of transmission towers and transmission line alignment and design	Exposure to Electromagnetic Fields (EMF) and other safety related risks	Setback of dwellings to overhead line route designed in accordance with Indian Electricity Act (Rule 77 & 80) for each permitted level of power frequency and its proper supervision at each tower site.	Tower location and transmission line alignment selection with respect to nearest dwellings – Once	Setback distances to nearest houses, clearance of conductor from ground – Once	HPPTCL	Part of tower siting survey and detailed alignment survey and design
Explosions/Fire	Hazards to life	Design of substations to include fire control systems/firewalls. Provision of fire fighting equipment to be located close to transformers, switchgear	Substation design compliance with fire prevention and control codes	Tender document to mention detailed specifications – Once	HPPTCL	Part of detailed substation layout and design /drawings
CONSTRUCTION PHASE						
A Physical Resources						
Site clearance	Soil erosion and surface runoff	Construction near seasonal rivers, erosion and flood-prone areas should be restricted to the non-rainy season. Provision and maintenance of drains and retention ponds. Treat clearing and filling areas against flow	Soil erosion	Visual inspection (Turbidity and sedimentation) – Once	Contractor through contract provisions under supervision of HPPTCL	Construction period

[30]According to Central Electricity Authority (Safety Requirements for Operation, Construction and Maintenance of Electric Plants and Electrical Lines) Regulations 2008

Project Activity	Potential Environmental Impact	Mitigation Action	Parameters to be Monitored	Standards/ Measurement/ Frequency	Institutional Responsibility	Implementation Schedule
		acceleration and construction work should be carefully designed to minimise obstruction or destruction to natural drainage.				
Removal of disturbance to public utility services-Water supply, sanitation	Public inconvenience	Advance notice to the public about the time and the duration of the utility disruption. Use of well trained and experienced machinery operators to reduce accidental damage to the public utilities - pipelines Restore the utilities immediately to overcome public inconvenience	Disruption to other commercial and public activities/public complaints	Visual inspection and consultations. Technical specification – per public complaint – Once each time	HPPTCL and Contractor through contract provisions	Throughout construction period
Equipment layout and installation	SF_6 leakage during storage and erection of Switchgear	Record of all substation switchgear, cylinders located within secure casings	Switchgear casings and substation bounded area.	As per (International Electro-Technical Commission) IEC standards - Once per year	HPPTCL, Contractor through contract provisions	Throughout construction/erection period
Surplus earthwork/soil	Runoff to cause water pollution, solid waste disposal	Excess fill from tower foundation excavation to be reused on site or disposed of next to roads or around houses, in agreement with the local community or landowners.	Location and amount (m^3) of fill disposal Soil disposal locations and volume (m^3)	Appropriate fill disposal and dispersal locations – half yearly	Contractor through contract provisions under supervision of HPPTCL	Construction period
B Environment Resources						
Equipment layout and installation	Noise and vibrations	Selection of construction techniques and machinery to minimise ground disturbance.	Construction techniques and machinery	Minimal ground disturbance - Monthly	Contractor through contract provisions under supervision of ESC, HPPTCL	Construction period
Substation construction	Loss of soil	Cutting and filling for the substation foundations obtained by creating or improving local drainage system.	Borrow area siting (area of site in m^2 and estimated volume in m3)	CPCB norms - Quarterly	Contractor through contract provisions under supervision of ESC, HPPTCL	Construction period
	Water pollution	Minimize construction activities involving significant ground disturbance (i.e. substation land forming) during the monsoon season. Provide drains and retention ponds if required.	Water Quality (pH, BOD/COD, suspended solids, other) during major earthworks	GoI water quality standards – six monthly	Contractor through contract provisions under supervision of ESC, HPPTCL	Construction period

Project Activity	Potential Environmental Impact	Mitigation Action	Parameters to be Monitored	Standards/ Measurement/ Frequency	Institutional Responsibility	Implementation Schedule
Provision of facilities for construction workers	Contamination of receptors (land, water, air)	Construction workforce facilities to include proper sanitation (soak pits/septic tanks), water supply and waste disposal facilities.	Amenities for Workforce.	Presence of proper sanitation, water supply and waste disposal facilities - Visual inspection (Continuous)	Contractor through contract provisions under supervision of HPPTCL	Construction period
Mechanised construction	Noise, vibration and operator safety, efficient operation Noise, vibration, equipment wear and tear	Construction equipment to be well maintained. Construction techniques and Machinery selection to minimize ground disturbance. Proper maintenance and tUrning off plant not in use.	Construction techniques and equipment - estimated noise emissions and operating schedules	Technical specifications, safety regulations, Noise control regulations - Half yearly	Contractor through contract provisions under supervision of HPPTCL	Construction period
Construction of roads for accessibility to substations	Increase in airborne dust particles Increased land requirement for temporary accessibility	Existing roads and tracks used for construction and maintenance access to the site wherever possible. Use of access ways restricted to a minimum of single carriageway width.	Access roads, routes (length and width of access roads)	Use of established roads wherever possible Access restricted to a minimum of single carriageway width- Once	Contractor through contract provisions under supervision of HPPTCL	Construction period
C Ecological Resources						
Site clearance	Vegetation	Marking of vegetation to be removed prior to clearance, and strict control on clearing activities to ensure minimal clearance.	Vegetation marking and clearance control (area in m^2)	Clearance strictly limited to target vegetation-Once	Contractor through contract provisions under supervision of HPPTCL	Construction period
Trimming/cutting of trees within RoW	Loss of vegetation and deforestation	Trees that can survive cutting should be pruned. Felled trees and other cleared or pruned vegetation to be disposed off by authorised agents/forest department.	Species-specific tree retention as approved by statutory authorities (average and maximum tree height at maturity, in metres) Disposal of cleared vegetation as approved by the statutory authorities (area cleared in m^2)	Presence of target species in RoW following vegetation clearance – Once.	HPPTCL, Contractor through contract provisions under supervision of forest department	Construction period
Wood/ vegetation	Loss of vegetation and deforestation	Construction workers prohibited from harvesting wood in the project area during	Illegal wood/vegetation harvesting (area in m^2,	Complaints by local people or other	HPPTCL, Contractor	Construction period

Project Activity	Potential Environmental Impact	Mitigation Action	Parameters to be Monitored	Standards/ Measurement/ Frequency	Institutional Responsibility	Implementation Schedule
harvesting, cut and fill operations	Effect on fauna	their employment. Prevent work force from disturbing the flora, fauna including hunting of animals and fishing in water bodies. Proper awareness programme regarding conservation of flora, fauna including ground vegetation to all workers.	number of incidents reported) Habitat loss	evidence of illegal harvesting – Once Complaints by local people or other evidence of illegal hunting - Once	through contract provisions.	Construction period
D Human Environment						
Construction schedules for substation	Noise nuisance to neighbouring properties	Minimize construction activities undertaken during the night and local communities informed of the construction schedule.	Timing of construction (noise emissions, dBA)	Construction as per Scheduled timings only	HPPTCL, Contractor through contract provisions	Construction period
Acquisition of cultivable lands	Loss of agricultural productivity	Avoid faming/harvesting season for field crops wherever possible for the project activities. Ensure existing irrigation facilities are maintained in working condition Protect /preserve topsoil and reinstate after construction completed Repair /reinstate damaged bunds etc. after construction completed Compensation for temporary loss in agricultural production	Land area of agriculture loss Usage of existing utilities Status of facilities (earthwork in m3) Implementation of crop compensation (amount paid, dates, etc.)	Loss of crops-work in post harvest period but before next crop – Once per site	HPPTCL, Contractor through contract provisions	Throughout construction period
Temporary use of land	Losses to neighbouring land uses/ values	Contract clauses specifying careful construction practices. As much as possible existing access ways will be used. Productive land will be reinstated following completion of construction Compensation will be paid for loss of production, if any.	Contract clauses Design basis and layout. Reinstatement of land status (area affected, m^2). Implementation of Tree/Crop compensation (amount paid).	Incorporating good construction management, design engineering practices - Once. Consultation with affected parties immediately after completion of construction and after the first harvest – Once.	Contractor through contract provisions under supervision of HPPTCL	Construction period

Project Activity	Potential Environmental Impact	Mitigation Action	Parameters to be Monitored	Standards/ Measurement/ Frequency	Institutional Responsibility	Implementation Schedule
In case of chance find of cultural artifacts and property/archaeological features	Loss/theft of precious archeological item uncovererd in digging at sites.	In case of chance find of cultural artifacts and property/archaeological features	Chance find	GOI's Treasure and Trove Act. - Continous	Contractor through contract provisions under supervision of HPPTCL	Construction period
Transportation and storage of materials	Nuisance to the general public	Transport loading and unloading of construction materials should no cause nuisance to the people by way of noise, vibration and dust Avoid storage of construction materials beside the road, around water bodies, residential or public sensitive locations Construction materials should be stored in covered areas to ensure protection from dust, emissions and such materials should be bundled in environment friendly and nuisance free manner	Water and Air Quality	CPCB Emission standards and Water Quality standards - Half yearly	Contractor through contract provisions under supervision of HPPTCL	Construction period
Temporary outage of the electricity	Loss of power supply to the local community when distribution lines crossing the new transmission line are switched off	Advance notice to the public about the time and the duration of the utility disruption Restore the utilities immediately to overcome public inconvenience	Disruption of power supply to houses and commercial premises.	Regular monitoring during the period of construction - At each public complaint.	Contractor through contract provisions under supervision of HPPTCL,	Throughout the construction period
Health and safety	Injury and sickness of workers and members of the public	Contract provisions specifying minimum requirements for construction camps Contractor to prepare and implement a health and safety plan and provide workers with required PPE and health and safety measures. Contractor to prepare EmergencyResponse Plan. Availability ofambulance or medical facility atwork site both for workers andpublic should be kept by contractor Contractor to arrange for health and safety awareness programmes including on AIDS and sexually transmitted diseases (STD).	Contract clauses (number of incidents and total lost-work days caused by injuries and sickness) Contract Clauses	HPPTCL and ADB Health and safety standards - Monthly National Disaster Management	Contractor through contract provisions under supervision of HPPTCL	Construction period

Project Activity	Potential Environmental Impact	Mitigation Action	Parameters to be Monitored	Standards/ Measurement/ Frequency	Institutional Responsibility	Implementation Schedule
			Contract Clauses	Half Yearly		
Capacity Building	Improve standards of implementation and monitoring	Training of HPPTCL staff	Training schedules	Number of training program - Yearly	HPPTCL- ESC	Construction period
OPERATION AND MAINTENANCE PHASE						
A Physical Resources						
Operation of Switchgear	Leakage of SF6 gas	Record of all substation switchgear located within secure casings	Switchgear casings and substation boundary	Ozone Depleting substances – Monthly	HPPTCL	Throughout the operation
		Training of personnel in storage, recording and operational characteristics of SF6	Substation	Half yearly	HPPTCL	Throughout the operations
B Environmental Resources						
Soil Erosion at tower base of transmission line	Removal of top soil	Planting of buffer zone species suitable for hilly terrain	Turbidity of water (Visual Inspection)	Visual inspection (Turbidity and sedimentation)- Quarterly	HPPTCL	Throughout the operations
Oil spillage	Contamination of land/nearby water bodies	Substation transformers located within secure and impervious bundled areas with a storage capacity of at least 100% of the capacity of oil in transformers and associated reserve tanks.	Substation bounding ("as-built" diagrams)	Hazardous Waste (Management, handling, Trans-boundary Movement) Rules 2009 - Monthly	HPPTCL	Throughout the operation
C Ecological Recourses						
Trimming/cutting of trees within RoW	Fire hazards	Trees allowed growing up to a height within the RoW by maintaining adequate clearance between the top of tree and the conductor as per the regulations. Regular pruning is required.	Species-specific tree retention as approved by statutory authorities (average and maximum tree height at maturity, in metres	Presence of target species in RoW following vegetation clearance) - Quarterly.	HPPTCL, with forest department	Construction period
D Human Environment						
Maintenance of Transmission line	Exposure to electromagnetic interference	Transmission line design to comply with the limits of electromagnetic interference from overhead power lines	Required ground clearance (metres).	EHS Exposure on EMF – Annual	HPPTCL	Throughout the operations
Substation maintenance	Exposure to electromagnetic interference	Substation design to comply with the limits of electromagnetic interference within floor area	Required noise vibrations levels	Technical specifications – on public complaint	HPPTCL	Throughout the operations
Noise generation	Nuisance to the community around the site	Provision of noise barriers near substationsites if needed during operations	Noise level	Noise level (dbA)- Once a year	HPPTCL	Throughout the operations
Electric shock	Death or injury to the workers and public	Security fences around substation Establishment of warning signs	Proper maintenance of fences and sign boards	Periodic maintenance	HPPTCL	Throughout the operations

Project Activity	Potential Environmental Impact	Mitigation Action	Parameters to be Monitored	Standards/ Measurement/ Frequency	Institutional Responsibility	Implementation Schedule
		Careful design using appropriate technologies to minimise hazards inside substation and awareness raising programmes	Usage of appropriate earthing/instumentation (lost work days due to illness and injuries)	Number of programmes and percent of staff/ workers covered		
Training for Electric safety	Raising awareness for electrical safety measures	Training of HPPTCL personnel.	Training schedules	Number of training program - Yearly	HPPTCL-ESC	Operations

ESC –Environment & Social Cell of HPPTCL

Annexure 6: Measurement of Environmental Parameters & Periodicity

Environmental component	Project stage	Parameters to be monitored	Location	Frequency	Standards	Rate (Rs.)	Implementation	Supervision
1.Air Quality	A. Pre-construction stage (The project once assigned to contractor)	PM_{10}, $PM_{2.5}$, SO_2, NO_x, SPM, CO along with Meteorological data-temperature Humidity, wind speed, wind direction	Inside and outside (0.5 km) of the proposed substation	One time	National Air quality standards of CPCB	Per sample Rs. 24,000	Contractor by CPCB approved laboratory	Contractor/ PMU
	B. Construction Stage	PM_{10}, $PM_{2.5}$, SO_2, NO_x, SPM, CO along with Meteorological data-temperature Humidity, wind speed, wind direction	Inside and outside (0.5 km) of the proposed substation	Two times/ year	National Air quality standards of CPCB	Per sample Rs. 24,000	Contractor by CPCB approved laboratory	Contractor/ PMU
	C. Operation Stage	PM_{10}, $PM_{2.5}$, SO_2, NO_x, SPM, CO along with Meteorological data-temperature Humidity, wind speed, wind direction	Inside and outside (0.5 km) of the proposed substation	One time	National Air quality standards of CPCB	Per sample Rs. 24,000	Contractor by CPCB approved laboratory	PMU
2.Water Quality	A. Pre-construction stage (The project once assigned to contractor)	EC, TSS, DO, BOD, PH Oil and grease, Pb,	Nearest downstream spring/handpump wells (2 wells) around the substation	One time	National drinking water standards of CPCB	Per sample Rs. 1,500	Contractor by CPCB approved laboratory	Contractor/ PMU
	B. Construction Stage	EC, TSS, DO, BOD, PH, Oil and grease, Pb	Nearest downstream spring/handpump wells (2 wells) around the substation	Three times/year	National drinking water standards of CPCB	Per sample Rs. 1,500	Contractor by CPCB approved laboratory	Contractor/ PMU
	C. Operation Stage	EC, TSS, DO, BOD, PH Oil and grease, Pb	Nearest downstream spring/handpump wells (2 wells) around the substation	Yearly	National drinking water standards of CPCB	Per sample Rs. 1,500	Contractor by CPCB approved laboratory	PMU
3.Noise/ Vibration	A. Pre-construction stage (The project once assigned to contractor)	Noise level (dB level)	Inside and outside (0.25 km) of the proposed substation	A single time	WHO standards	Per sample Rs. 24,000	Contractor by CPCB approved laboratory	Contractor/ PMU

Environmental component	Project stage	Parameters to be monitored	Location	Frequency	Standards	Rate (Rs.)	Implementation	Supervision
	B. Construction Stage	Noise level (dB level)	Inside and outside (0.25 km) of the proposed substation	2 times/ year	CPCB standards for Noise and vibrations	Per sample Rs. 24,000	Contractor by CPCB approved laboratory	Contractor/ PMU
	C. Operation Stage	Noise level (dB level)	Inside and outside (0.25 km) of the proposed substation	Yearly	CPCB standards for Noise and vibrations	Per sample Rs. 24,000	Contractor by CPCB approved laboratory	PMU
4. Soil	A. Pre-construction stage (The project after assign to contractor	PH, Sulfate (SO_3), Chloride, ORP, water Soluble salts EC, Organic Matter, Moisture Content	Inside and outside (just close to the proposed site, 2 locations) of the proposed substation	A single time	Technical specifications	Per sample Rs. 4,500	Contractor by CPCB approved laboratory	Contractor/ PMU
	B. Construction Stage	PH, Sulfate (SO_3), Chloride, ORP, water Soluble salts EC, Organic Matter, Moisture Content	Inside and outside (just close to the proposed site, 2 locations) of the proposed substation	Two times/ year	Technical specifications	Per sample Rs. 4,500	Contractor by CPCB approved laboratory	Contractor/ PMU
	C. Operation Stage	PH, Sulfate (SO_3), Chloride, ORP, water Soluble salts EC, Organic Matter, Moisture Content	Inside and outside (just close to the proposed site, 2 locations) of the proposed substation	A single time	Technical specifications	Per sample Rs. 4,500	Contractor by CPCB approved laboratory	PMU

ESC –Environment & Social Cell of HPPTCL

Abbreviations:
SO_2- -Sulphur Dioxide; NO_2- - Nitrogen Dioxide; CO- Carbon Monoxide; EC – Electric Conductivity;
Pb – Lead; $PM_{2.5}$ - Particulate Matter <2.5µm; PM_{10} - Particulate Matter <10µm; TSPM- Total Suspended Particulate Matter;
EC - Electrical Conductivity; DO - Dissolved Oxygen; TSS - Total Suspended Solids;
BOD - Biological Oxygen Demand; NAAQS - National Ambient Air Quality Standards;
NWQS - National Water Quality Standards; HPPTCL – Himachal Pradesh Power Transmission Corporation Limited;
ORP – Oxidation Reduction Potential
Notes: Transport/Accommodation & Sample collection cost, VAT are not included for the EMoP.
Source for Rates: MoEFCC (CPCB) New Delhi, Notification Dated 15 June 2008
Nearest Board's Laboratory: Central Laboratory, H. P. State Environment Protection & Pollution Control Board, SCF 6, 7, 8, Sector-IV, Parwanoo, District. Solan-173 220, Himachal Pradesh

Annexure 7: Baseline Environment Monitoring for Air, Water, Noise and Soil Sampling for Tranche 3 Subprojects

A7.1 Standards

Water Quality Protocols (Central Pollution Control Board, GOI)

Table 1 Parameters of analysis for groundwater samples

Type of station	Frequency	Parameter
Baseline	Once every year, (pre-monsoon, May-June)	Temp, EC, pH, $NO_2^- + NO_3^-$, total P, K^+, Na^+, Ca^{++}, Mg^{++}, CO_3^{--}, HCO_3^-, Cl^-, SO_4^{--}, COD, SiO_2, F, B.
Trend	Four times every year, (pre-monsoon, May-June & after intervals of 3 months)	Temp, EC, pH, $NO_2^- + NO_3^-$, total P, Cl^-, COD.
Trend–cum–surveillance – ***Fluoride*** – ***Iron*** – ***Industrial, mining*** – ***Salinity due to irrigation, natural contribution or sea water intrusion*** – ***Urban pollution***	Minimum four times a year (as above), higher frequency if dictated by importance of water use	According to the problem under surveillance (e.g. Heavy metals in mining areas) F^- Fe As, Cd, Hg, Zn Na^+, K^+, Ca^{++}, Mg^{++}, CO_3^{--}, HCO_3^-, Cl^-, SO_4^{--} Total and faecal coliforms

Table 2 Parameters of analysis for surface water samples[a]

Parameter Group	Initially	Baseline	Trend
General	Temp, EC, pH, DO,TDS	Temp, EC, pH, DO,TDS	Temp, EC, pH, DO
Nutrients	NH_3-N, $NO_2 + NO_3$, total P	NH_3-N, $NO_2 + NO_3$, total P	NH_3-N, $NO_2 + NO_3$, total P
Organic matter	BOD, COD	None	BOD, COD
Major ions	Ca^{++}, Mg^{++}, K^+, Na^+, CO_3^{--}, HCO_3^-, Cl^-, SO_4^{--}	Ca^{++}, Mg^{++}, K^+, Na^+, CO_3^{--}, HCO_3^-, Cl^-, SO_4^{--}	Cl^-
Other inorganics	None	None	None
Metals	None	None	None
Organics	None	None	None
Microbiological[b]	Total coliforms	None	Total and faecal coliforms
Biological	None	None	None

a- based on 'Surface Water Quality Network Design, Guidelines and an Example', June 1997
b- depending on workload, analysis frequency may be reduced upto 2 samples per year

Table 3: Drinking Water standards

Parameter	Standard Drinking Water Specification as per IS –10500:1991 as amendment up to 3 July 2010		Protocol (Test Method)
	Desirable Limit	Permissible Limit in absence of alternate source	
Essential CharacteristicsPhysical Parameter			
Color, Hazen Units	5	25	IS: 3025 Part 4 - 1983
Odour	Unobjectionable	-	IS: 3025 Part 5 - 1983
Taste	Agreeable	-	IS: 3025 Part 7,8 -1984
Turbidity, NTU	5	10	IS: 3025 Part 10 - 1984
pH	6.5 – 8.5	-	IS: 3025 Part 11 - 1984
Essential Characteristics-Chemical Parameters			
Total Hardness as $CaCO_3$	300 Mg / L	600 Mg / L	IS: 3025 Part 21 - 1983
Iron as Fe	0.3 Mg / L	1.0 Mg / L	IS: 3025 Part 53 - 2003
Chloride as Cl	250 Mg / L	1000 Mg / L	IS: 3025 Part 32 - 1988
Residual Free Chlorine	0.2 Mg / L	-	IS: 3025 Part 26 - 1986
Desirable Characteristics-Chemical Parameters			
Dissolved Solids	500 Mg / L	2000 Mg / L	IS: 3025 Part 16 - 1984
Calcium as Ca	75 Mg / L	200 Mg / L	IS: 3025 Part 40 - 1991
Magnesium as Mg	30 Mg / L	100 Mg / L	IS: 3025 Part 46 - 1994
Copper as Cu	0.05 Mg / L	1.5 Mg / L	IS: 3025 Part 42 - 1992
Manganese as Mn	0.1 Mg / L	0.3 Mg / L	IS: 3025 Part 59 - 2006
Sulphate as SO_4	200 Mg / L	400 Mg / L	IS: 3025 Part 24 - 1986
Nitrate as NO_3	45 Mg / L	No relaxation	IS: 3025 Part 34 - 1988
Fluoride as F	1.0 Mg / L	1.5 Mg / L	IS: 3025 Part 60 - 2008
Phenolic Compounds as C_6H_5OH	0.001 Mg / L	0.002 Mg / L	IS: 3025 Part 43 - 1991
Mercury as Hg	0.001 Mg / L	No relaxation	IS: 3025 Part 48 - 1994
Cadmium as Cd	0.01 Mg / L	No relaxation	IS: 3025 Part 41 - 1992
Selenium as Se	0.01 Mg / L	No relaxation	IS: 3025 Part 56 - 2003
Arsenic as As	0.05 Mg / L	No relaxation	IS: 3025 Part 37 - 1998
Cyanide as CN	0.05 Mg / L	No relaxation	IS: 3025 Part 27 - 1986
Lead as Pb	0.05 Mg / L	No relaxation	IS: 3025 Part 47 - 1994
Zinc as Zn	5 Mg / L	15 Mg / L	IS: 3025 Part 49 - 1994
Anionic Detergents as MBAS	0.2 Mg / L	1.0 Mg / L	APHA 5540 C
Chromium as Cr^{+6}	0.05 Mg / L	No relaxation	IS: 3025 Part 52 - 2003
Mineral Oil	0.01 Mg / L	0.03 Mg / L	IS: 3025 Part 39 - 1991
Alkalinity	200 Mg / L	600 Mg / L	IS: 3025 Part 23 - 1986
Aluminum as Al	0.03 Mg / L	0.2 Mg / L	IS: 3025 Part 55 - 2003
Boron as B	1 Mg / L	5 Mg / L	IS: 3025 Part 57 - 2005
Bacteriological Characteristics			
Coliform Organisms	10 CFU	10 CFU	IS: 1622 - 1981
E. Coli	Absent	Absent	IS: 1622 - 1981

Table 4: Ambient Air Quality Standards in respect of Noise

Area Code	Category of Area/Zone	Limits in dB(A) Leq *	
		Day Time	Night Time
(A)	Industrial area	75	70
(B)	Commercial area	65	55
(C)	Residential area	55	45
(D)	Silence Zone	50	40

Note

1. Day time shall mean from 6.00 a.m. to 10.00 p.m.
2. Night time shall mean from 10.00 p.m. to 6.00 a.m.
3. Silence zone is defined as an area comprising not less than 100 metres around hospitals, educational institutions and courts. The silence zones are zones which are declared as such by the competent authority.
4. Mixed categories of areas may be declared as one of the four above mentioned categories by the competent authority.

*dB(A) Leq denotes the time weighted average of the level of sound in decibels on scale A which is relatable to human hearing.

A "decibel" is a unit in which noise is measured.

"A", in dB(A) Leq, denotes the frequency weighting in the measurement of noise and corresponds to frequency response characteristics of the human ear.

Leq: It is an energy mean of the noise level, over a specified period.

Source: Ministry of Environment and Forests Notification, New Delhi, the 14 February 2000 S.O. 123(E)

A7.2 Baseline Ambient Air Samples Analysis Report

Table 5: Air Quality sample of Bagipul Substation (06-08-2016)

No.	Name of the parameter	Standard limit	Results 120^0	Results 240^0	Results 360^0
1.	SPM	80	51.7	58.4	62.5
2.	PM10 (µg/m3)	100	21.5	27.9	32.2
3.	PM2.5 (µg/m3)	60	30.2	30.5	30.3
4.	SO2 (µg/m3)	80	4.55	4.55	5.10
5.	NOx (µg/m3)	80	2.45	2.20	4.40
6.	NH3 (µg/m3)	400	26.80	25.65	27.50
7.	CO (mg/m3)	4	1.35	1.25	1.45
8.	O3 (µg/m3)	*180*	N.D	N.D	N.D
9.	C6H6 (µg/m3)	5	N.D	N.D	N.D
10.	Benzo(a)Pyrene (ng/m3)	1	N.D	N.D	N.D
11.	Pb (µg/m3)	1	N.D	N.D	N.D
12.	As (ng/m3)	6	N.D	N.D	N.D
13.	Ni (ng/m3)	20	N.D	N.D	N.D

Table 6: Air Quality sample of 33/132 kV substation, Barsaini substation (14-11-2016)

No.	Name of the parameter	Standard limit	Results 120^0	Results 240^0	Results 360^0
1.	SPM	80	59.9	60.4	64.5
2.	PM10 (µg/m3)	100	32.3	29.2	32.2
3.	PM2.5 (µg/m3)	60	27.6	31.2	32.3
4.	SO2 (µg/m3)	80	4.45	4.50	4.95
5.	NOx (µg/m3)	80	2.60	2.18	4.20
6.	NH3 (µg/m3)	400	27.50	24.60	28.35
7.	CO (mg/m3)	4	1.50	1.28	1.25
8.	O3 (µg/m3)	180	N.D	N.D	N.D
9.	C6H6 (µg/m3)	5	N.D	N.D	N.D
10.	Benzo(a)Pyrene (ng/m3)	1	N.D	N.D	N.D
11.	Pb (µg/m3)	1	N.D	N.D	N.D
12.	As (ng/m3)	6	N.D	N.D	N.D
13.	Ni (ng/m3)	20	N.D	N.D	N.D

Table 7: Air Quality sample of 220 Switching Sub-Station, Hatkoti, Himachal Pradesh (dated 12-11-2016)

No.	Name of the parameter	Standard limit	Results 120^0	Results 240^0	Results 360^0
1.	SPM	80	60.5	56.6	50.9
2.	PM10 (µg/m3)	100	30.9	30.3	35.5
3.	PM2.5 (µg/m3)	60	29.6	26.3	15.4
4.	SO2 (µg/m3)	80	2.0	3.56	3.00
5.	NOx (µg/m3)	80	3.75	4.20	4.88
6.	NH3 (µg/m3)	400	28.70	33.1	26.90
7.	CO (mg/m3)	4	1.41	2.11	1.21
8.	O3 (µg/m3)	180	N.D	N.D	N.D
9.	C6H6 (µg/m3)	5	N.D	N.D	N.D
10.	Benzo(a) Pyrene (ng/m3)	1	N.D	N.D	N.D
11.	Pb (µg/m3)	1	N.D	N.D	N.D
12.	As (ng/m3)	6	N.D	N.D	N.D
13.	Ni (ng/m3)	20	N.D	N.D	N.D

* N.D. (Not Detected)

Table 8: 132/220 kV Mazra Substation Dated: 30-05-2016

No.	Name of the parameter	Standard limit	Results 120^0	Results 240^0	Results 360^0
1.	SPM	80	59.9	60.4	64.5
2.	PM10 (µg/m3)	100	32.3	29.2	32.2
3.	PM2.5 (µg/m3)	60	27.6	31.2	32.3
4.	SO2 (µg/m3)	80	4.45	4.50	4.95
5.	NOx (µg/m3)	80	2.60	2.18	4.20
6.	NH3 (µg/m3)	400	27.50	24.60	28.35
7.	CO (mg/m3)	4	1.50	1.28	1.25
8.	O3 (µg/m3)	180	N.D	N.D	N.D
9.	C6H6 (µg/m3)	5	N.D	N.D	N.D
10.	Benzo(a)Pyrene (ng/m3)	1	N.D	N.D	N.D
11.	Pb (µg/m3)	1	N.D	N.D	N.D
12.	As (ng/m3)	6	N.D	N.D	N.D
13.	Ni (ng/m3)	20		N.D	N.D

* N.D. (Not Detected)

A7.3 Soil Analysis Report

Table 9: Mazra Substation (30-05-2016)

No.	Test parameter	Units	Results 90º	Results 180º	Results 270º	Results 360º
1.	pH	-	6.5	6.7	6.4	6.7
2.	EC	dS/m	22.9	25.80	30.50	25.80
3.	TDS	mg/l	14.89	16.77	19.83	16.77
4.	SiO2	%	40.03	62.32	59.64	62.32
5.	Al2O3	%	10.31	18.96	18.02	18.96
6.	Fe203	%	1.52	3.06	2.79	3.06
7.	Na2O	%	1.80	3.65	5.91	3.65
8.	K2O	%	0.54	5.40	5.90	5.40
9.	CaO	%	0.75	1.23	0.98	1.23
10.	MgO	%	0.25	1.41	0.17	1.41
11.	P2O5	%	0.79	0.66	1.31	0.66
12.	TiO2	%	0.76	0.59	0.81	0.59

Table 10: Hatkoti (12-11-2016)

No.	Test parameter	Units	Results 90º	Results 180º	Results 270º	Results 360º
1.	pH	-	7.1	6.9	7.35	7.13
2.	EC	dS/m	23.10	23.3	24.90	24.70
3.	TDS	mg/l	25.18	13.26	13.86	13.48
4.	SiO2	%	67.30	67.85	68.41	68.13
5.	Al2O3	%	17.98	14.19	14.81	14.43
6.	Fe203	%	2.19	1.31	2.02	1.64
7.	Na2O	%	3.60	4.40	5.10	4.72
8.	K2O	%	4.32	0.71	1.36	0.98
9.	CaO	%	1.03	0.66	1.31	0.93
10.	MgO	%	0.96	0.59	1.14	0.76
11.	P2O5	%	0.78	0.23	0.83	0.45
12.	TiO2	%	0.80	0.54	1.25	0.87

Table 11: Bagipul GSS 06-08-2016

No.	Test parameter	Units	Results 90º	Results 180º	Results 270º	Results 360º
1.	pH	-	7.0	6.8	7.3	7.5
2.	EC	dS/m	34.4	50.30	21.9	38.70
3.	TDS	mg/l	22.36	32.69	14.23	25.16
4.	SiO2	%	69.14	68.93	71.20	67.28
5.	Al2O3	%	19.28	19.91	20.29	17.89
6.	Fe203	%	3.15	3.55	1.21	2.18
7.	Na2O	%	2.06	2.50	1.90	3.50
8.	K2O	%	1.60	0.98	4.60	4.30
9.	CaO	%	0.39	2.40	2.00	1.01
10.	MgO	%	0.71	0.81	1.90	0.92
11.	P2O5	%	2.01	0.79	0.55	0.76
12.	TiO2	%	0.35	0.68	0.68	0.74

Table 12: Barsaini GSS (14-11-2016)

No.	Test parameter	Units	Results 90º	Results 180º	Results 270º	Results 360º
1.	pH	-	6.5	6.7	6.4	7.1
2.	EC	dS/m	22.9	25.80	30.50	24.60
3.	TDS	mg/l	14.89	16.77	19.83	16.77
4.	SiO2	%	40.03	62.32	59.64	62.32
5.	Al2O3	%	10.31	18.96	18.02	18.96
6.	Fe203	%	1.52	3.06	2.79	3.06
7.	Na2O	%	1.80	3.65	5.91	3.65
8.	K2O	%	0.54	5.40	5.90	5.40
9.	CaO	%	0.75	1.23	0.98	1.23
10.	MgO	%	0.25	1.41	0.17	1.41
11.	P2O5	%	0.79	0.66	1.31	0.66
12.	TiO2	%	0.76	0.59	0.81	0.59

A7.4 Ambient Noise Quality

Table 13: 33/132 KV Sub-Station, Barsaini (14-11-2016), Himachal Pradesh

Location of Sound	Average Slow Response dB (A)	Average FastResponse dB (A)
(120o at the boundary)	51.3	56.8
240o at the boundary)	51.1	54.6
(360o at the boundary)	35.1	40.3

Table 14: 220 kV Switching substation, Hatkoti (12-11-2016), Himachal Pradesh

Location of Sound	Average Slow Response dB (A)	Average Fast Response dB (A)
(120o at the boundary)	49.9	54.4
(240o at the boundary)	51.5	55.0
(360o at the boundary)	34.6	39.8

Table 15: 132/220 KV substation, Mazra (30-05-2016), Himachal Pradesh

Location of Sound	Average Slow Response dB (A)	Average Fast Response dB (A)
(120o at the boundary)	48.1	52.6
(240o at the boundary)	46.1	50.6
(360o at the boundary)	36.5	41.0

Table 16: 132/220 KV substation, Bagipul (06-08-2016), Himachal Pradesh

Location of Sound	Average Slow Response dB (A)	Average Fast Response dB (A)
(120o at the boundary)	49.3	53.8
(240o at the boundary)	47.2	51.7
(360o at the boundary)	32.7	37.0

A7.5 Ground/ Surface Water Analysis Report

Table 17: Mazra Substation Dated: 30-05-2016

No.	Name of the parameter	Units	Requirement		Results			
			Acceptable limit	Permissible limit in absence of alternative source	90^0	180^0	270^0	360^0
1.	Color	NTU	5	15	0.13	0.12	0.11	1
2.	Hardness as $CaCO_3$	mg/L	200	600	52.04	54.23	51.20	51.52
3.	Odor	-	Odorless	Odorless				
4.	TDS	mg/L	500	2000	52.30	54.25	51.22	51.45
5.	Turbidity	NTU	1	5	0.13	0.13	0.11	1
6.	Cyanide as CN	mg/L	0.05	No Relaxation	N/D	N/D	N/D	N/D
7.	Chloride as Cl	mg/L	250	1000	15.45	15.20	15.27	16.25
8.	Flouride as F	mg/L	1.0	1.5	0.50	0.25	0.30	0.35
9.	Nitrate as NO_3	mg/L	45	No Relaxation	0.75	0.45	0.50	0.55
10.	pH	-	6.5-8.5	No Relaxation	7.1	7.2	7.25	6.9
11.	Sulphate as SO_4	mg/L	200	400	N/D	N/D	N/D	N/D
12.	Phenolic Compounds as C_6H_5OH	mg/L	0.001	0.002	N/D	N/D	N/D	N/D
13.	Arsenic as As	mg/L	0.01	0.05	N/D	N/D	N/D	N/D
14.	Copper as Cu	mg/L	0.05	1.5	N/D	N/D	N/D	N/D
15.	Cadmium	mg/L	0.003	No Relaxation	N/D	N/D	N/D	N/D
16.	Iron as Fe	mg/L	0.3	No Relaxation	N/D	N/D	N/D	N/D
17.	Lead as Pb	mg/L	0.01	No Relaxation	N/D	N/D	N/D	N/D
18	Calcium as Ca^{2+}	mg/L	75	200	34.30	32.52	32.25	36.40
19.	Magnesium as Mg^{2+}	mg/L	30	100	5.18	3.15	3.15	3.85
20.	Manganese as Mn	mg/L	0.1	0.3	N/D	N/D	N/D	N/D
21.	Mercury as Hg	mg/L	0.001	No Relaxation	N/D	N/D	N/D	N/D
22.	Selenium as Se	mg/L	0.01	No Relaxation	N/D	N/D	N/D	N/D
23.	Zinc as Zn	mg/L	5	15	N/D	N/D	N/D	N/D
24.	Total Coliforms	mg/L	Absent	-	Absent	Absent	Absent	Absent
25.	Chromium as Cr	mg/L	0.05	No Relaxation	N/D	N/D	N/D	N/D
26.	COD		No guidelines	-	27.70	28.05	28.16	28.10
27.	BOD	mg/l	-	2	1.25	1.15	1.20	1.22
28.	DO	mg/l	-	6	2	1.77	1.98	2
29.	Electrical Conductivity	µS/cm	750	0-2000	22.95	23.75	24.65	24.85

Table 18: Barsaini SubstationDated: 15-11-2016

No.	Name of the parameter	Units	Requirement		Results			
			Acceptable limit	Permissible limit in absence of alternative source	90^0	180^0	270^0	360^0
1.	Color	NTU	5	15	0.1	0.1	0.02	0.2
2.	Hardness as $CaCO_3$	mg/L	200	600	55.06	55.03	51.45	55.03
3.	Odor	-	Odorless	Odorless				
4.	TDS	mg/L	500	2000	52.29	52.25	51.30	54.10
5.	Turbidity	NTU	1	5	0.1	0.1	0.2	0.13
6.	Cyanide as CN	mg/L	0.05	No Relaxation	N/D	N/D	N/D	N/D
7.	Chloride as Cl	mg/L	250	1000	15.71	15.70	15.85	15.35
8.	Flouride as F	mg/L	1.0	1.5	0.60	0.58	0.80	0.65
9.	Nitrate as NO_3	mg/L	45	No Relaxation	0.90	0.88	0.89	0.77
10.	pH	-	6.5-8.5	No Relaxation	7.6	7.35	7.55	7.7
11.	Sulphate as SO_4	mg/L	200	400	10.79	10.58	11.23	10.58
12.	Phenolic Compounds as C6H5 OH	mg/L	0.001	0.002	N/D	N/D	N/D	N/D
13.	Arsenic as As	mg/L	0.01	0.05	N/D	N/D	N/D	N/D
14.	Copper as Cu	mg/L	0.05	1.5	N/D	N/D	N/D	N/D
15.	Cadmium	mg/L	0.003	No Relaxation	N/D	N/D	N/D	N/D
16.	Iron as Fe	mg/L	0.3	No Relaxation	N/D	N/D	N/D	N/D
17.	Lead as Pb	mg/L	0.01	No Relaxation	N/D	N/D	N/D	N/D
18	Calcium as Ca^{2+}	mg/L	75	200	35.16	34.16	31.88	34.14
19.	Magnesium as Mg^{2+}	mg/L	30	100	5.08	5.08	5.45	5.10
20.	Manganese as Mn	mg/L	0.1	0.3	N/D	N/D	N/D	N/D
21.	Mercury as Hg	mg/L	0.001	No Relaxation	N/D	N/D	N/D	N/D
22.	Selenium as Se	mg/L	0.01	No Relaxation	N/D	N/D	N/D	N/D
23.	Zinc as Zn	mg/L	5	15	N/D	N/D	N/D	N/D
24.	Total Coliforms	mg/L	Absent	-	Absent	Absent	Absent	Absent
25.	Chromium as Cr	mg/L	0.05	No Relaxation	N/D	N/D	N/D	N/D
26.	COD		-	-	28.0	27.7	25.8	27.5
27.	BOD	mg/l	-	2	1.27	1.47	1.20	1.15
28.	DO	mg/l	-	6	2.0	2.0		1.15
29.	Electrical Conductivity	µS/cm	750	0-2000	22.19	24.7	22.19	25.10

Table 19: Hatkoti Substation Dated: 14-11-2016

No.	Name of the parameter	Units	Requirement		Results			
			Acceptable limit	Permissible limit in absence of alternative source	900	1800	2700	3600
1.	Color	NTU	5	15	0.1	0.1	0.03	0.2
2.	Hardness as $CaCO_3$	mg/L	200	600	55.03	55.04	51.45	55.03
3.	Odor	-	Odorless	Odorless				
4.	TDS	mg/L	500	2000	52.25	52.26	51.30	54.10
5.	Turbidity	NTU	1	5	0.1	0.1	0.8	0.13
6.	Cyanide as CN	mg/L	0.05	No Relaxation	N/D	N/D	N/D	N/D
7.	Chloride as Cl	mg/L	250	1000	15.71	15.74	15.85	15.45
8.	Flouride as F	mg/L	1.0	1.5	0.59	0.54	0.80	0.66
9.	Nitrate as NO_3	mg/L	45	No Relaxation	0.89	0.85	0.89	0.75
10.	pH	-	6.5-8.5	No Relaxation	7.1	6.91	7.55	7.9
11.	Sulphate as SO_4	mg/L	200	400	10.79	10.80	11.23	10.60
12.	Phenolic Compounds as C6H5 OH	mg/L	0.001	0.002	N/D	N/D	N/D	N/D
13.	Arsenic as As	mg/L	0.01	0.05	N/D	N/D	N/D	N/D
14.	Copper as Cu	mg/L	0.05	1.5	N/D	N/D	N/D	N/D
15.	Cadmium	mg/L	0.003	No Relaxation	N/D	N/D	N/D	N/D
16.	Iron as Fe	mg/L	0.3	No Relaxation	N/D	N/D	N/D	N/D
17.	Lead as Pb	mg/L	0.01	No Relaxation	N/D	N/D	N/D	N/D
18	Calcium as Ca^{2+}	mg/L	75	200	34.16	34.20	31.88	34.15
19.	Magnesium as Mg^{2+}	mg/L	30	100	5.08	5.09	5.45	5.05
20.	Manganese as Mn	mg/L	0.1	0.3	N/D	N/D	N/D	N/D
21.	Mercury as Hg	mg/L	0.001	No Relaxation	N/D	N/D	N/D	N/D
22.	Selenium as Se	mg/L	0.01	No Relaxation	N/D	N/D	N/D	N/D
23.	Zinc as Zn	mg/L	5	15	N/D	N/D	N/D	N/D
24.	Total Coliforms	mg/L	Absent	-	Absent	Absent	Absent	Absent
25.	Chromium as Cr	mg/L	0.05	No Relaxation	N/D	N/D	N/D	N/D
26.	COD	-	-	27.9	27.9	25.8	27.7	
27.	BOD	mg/l	-	2	1.27	1.27	1.20	1.22
28.	DO	mg/l	-	6	2.0	2.0	1.97	1.18
29.	Electrical Conductivity	µS/cm	750	0-2000	22.09	23.7	22.19	23.7

Table 20: 22/66 KV substation, Bagipul, Himachal Pradesh (06-08-2016)

No.	Name of the parameter	Units	Requirement		Results			
			Acceptable limit	Permissible limit in absence of alternative source	900	1800	2700	3600
1.	Color	NTU	5	15	0.11	1.05	0.11	1
2.	Hardness as $CaCO_3$	mg/L	200	600	55.15	53.43	51.20	56.15
3.	Odor	-	Odorless	Odorless				
4.	TDS	mg/L	500	2000	55.20	53.40	51.22	56.20
5.	Turbidity	NTU	1	5	0.11	0.1	0.11	0.74
6.	Cyanide as CN	mg/L	0.05	No Relaxation	N/D	N/D	N/D	N/D
7.	Chloride as Cl	mg/L	250	1000	15.40	15.80	15.27	15.95
8.	Flouride as F	mg/L	1.0	1.5	0.52	0.20	0.30	0.65
9.	Nitrate as NO_3	mg/L	45	No Relaxation	0.72	4.25	0.50	0.75
10.	pH	-	6.5-8.5	No Relaxation	6.9	7.1	7.25	7.2
11.	Sulphate as SO_4	mg/L	200	400	N/D	N/D	N/D	N/D
12.	Phenolic Compounds as C6H5 OH	mg/L	0.001	0.002	N/D	N/D	N/D	N/D
13.	Arsenic as As	mg/L	0.01	0.05	N/D	N/D	N/D	N/D
14.	Copper as Cu	mg/L	0.05	1.5	N/D	N/D	N/D	N/D
15.	Cadmium	mg/L	0.003	No Relaxation	N/D	N/D	N/D	N/D
16.	Iron as Fe	mg/L	0.3	No Relaxation	N/D	N/D	N/D	N/D
17.	Lead as Pb	mg/L	0.01	No Relaxation	N/D	N/D	N/D	N/D
18	Calcium as Ca^{2+}	mg/L	75	200	34.55	31.60	32.25	36.80
19.	Magnesium as Mg^{2+}	mg/L	30	100	5.15	4.10	3.15	4.20
20.	Manganese as Mn	mg/L	0.1	0.3	N/D	N/D	N/D	N/D
21.	Mercury as Hg	mg/L	0.001	No Relaxation	N/D	N/D	N/D	N/D
22.	Selenium as Se	mg/L	0.01	No Relaxation	N/D	N/D	N/D	N/D
23.	Zinc as Zn	mg/L	5	15	N/D	N/D	N/D	N/D
24.	Total Coliforms	mg/L	Absent	-	Absent	Absent	Absent	Absent
25.	Chromium as Cr	mg/L	0.05	No Relaxation	N/D	N/D	N/D	N/D
26.	COD	No guidelines	-	27.85	28.25	28.16	28.18	

27.	BOD	mg/l	-	2	1.28	1.17	1.20	1.11
28.	DO	mg/l	-	6	1.90	1.87	1.95	1.99
29.	Electrical Conductivity	µS/cm	750	0-2000	23.65	24.65	24.65	24.95

Annexure 8: Details of Public Consultations

HPPTCL has conducted only women specific focus groups during formal surveys for social consultations.

A8.I Village wise List of the participants and their occupation are given in Tables A8.1-5 below.

COMPONENT I. Bhabha Nagar PIU (Shimla District) subprojects

Table A8.1 Consultation at Subproject S1 &T1

SNo	Village	Panchayat	Districts	Distance from the District Head Quarters	Number of Participants
1	Darmat, Bagipul	Kharga	Kullu	180 km	9
2.	Khasholi, Bagipul	Bari	Kullu	180 km	12

SNo	Name of the Participants	Occupation
Name of the Village: Darmat		
1	Mr. Padam Singh	Agriculture
2	Mr. Krishan Kaith	Service
3	Mr. Amit Kaith	Student
4	Mr Somatu ram	Agriculture
5	Mr. Ram Lal	Labour Job
6	Mr. Sher Singh	Student
7	Mr. Kamal Kumar	Agriculture
8	Mr. Paras Ram	Agriculture
9	Mr. Dharampal	Labour Job
Name of the Village: Khasholi		
1	Mr. Tej Ram	Agriculture
2	Mr. Tirath Ram	Service
3	Mr. Askhay Kumar	Student
4	Mr.Kamalu Ram	Agriculture
5	Mr. Sundar Lal	Agriculture
6	Mr. Bodh Ram	Agriculture
7	Mr. Seva Ram	Agriculture
8	Om Prakash	Student
9	Mrs. Chinta Devi	Agriculture
10	Ms Vidya Devi	Student
11	Mrs. Bodhi Devi	Agriculture
12	Anjana Devi	Student

COMPONENT II. Chamba PIU (Chamba District) subprojects

Table A8.2: Consultation at Subproject T2 –400kV transmission line from Lahal to Rajera

SNo	Village	Panchayat	Districts	Distance from the District Head Quarters	Number of Participants
1	Lahal	Khanni	Chamba	64 km	14

SNo	Name of the Participants	Occupation
Name of the Village:		
1	Mr. Babu Ram	Ward Member
2	Mr. Barfi Ram	Shop Keeper
3	Mr. Gyan Singh	Government Job
4	Mr. Madhoo Ram	Government Job
5	Mr. Raghu Ram	Labour Job
6	Mr. Bharat Ram	Labour Job
7	Mr. Jagat Ram	Agriculture
8	Mr. Shakti Prasad	Agriculture
9	Mr. Anil Kumar	Labour Job
10	Mr. Shyam Lal	Unemployed
11	Mr. Kashi Ram	Government Job
12	Mr. Dimple Kumar	Student
13	Mr. Kartar Singh	Unemployed
14	Mr. Suresh Kumar	Unemployed

Consultation at Subproject S2- Mazra Land purchased by HPPTCL.

Table A8.3: Consultation at Subproject S2 –132/220 kV Mazra substation
Consultation Subproject T4: Mazra Karian Line

SNo	Village	Panchayat	Districts	Distance from the District Head Quarters	Number of Participants
1	Jillo	Mazra	Chamba	64 km	8

SNo	Name of the Participants	Occupation
Name of the Village: Jillo		
1	Hem Raj	Agriculture Labor
2	Karam Chand	Carpenter
3	Madan	Carpenter
4	Baldev Singh	Agriculture
5	Devinder	Labor
6	Man Singh	Labor
7	Om Prakash	Agriculture Labor
8	Pawan Kumar	Student

SNo	Name of the Participants	Occupation
Name of the Village: Jillo		

SNo	Name of the Participants	Occupation
1	Pratap Singh	Business
2	Paras Ram	Agriculture
3	Kishari Lal	Agriculture
4	Rohit Kumar	Agriculture
5	Subhash Chandra	Business
6	Dharpal Singh	Business
7	Chet Singh	Agriculture
8	Jogender Pal	Service
9	Prem Lal	Agriculture

COMPONENT III. Rhoroo PIU (Shimla District) subprojects
Consultation at Subproject S3- Hatkoti switching station (Not required being Govt.Land

COMPONENT IV: Sarabhai PIU (Kullu and Mandi Districts) subprojects

Table A8.4: List of Participants for Consultation for Subproject T5 - 132 kV D/C transmission line from Barsaini to 132/220 kV substation at Charor

SNo	Village	Panchayat	Districts	Distance from the District Head Quarters	Number of Participants
1	Chharor	Chhorar	Kullu	17 km	13
2	Barsaini	Barsaini	Kullu	60km	10
3	Manikaran	Manikaran	Kullu	50 km	10
4	Kasol	Kasol	Kullu	48 km	09

Table A8.5: List of Participants for Consultation for Subproject S4 - 33/132 kV 2x25/31.5 MVA GIS substation at Barsaini

SNo	Village	Panchayat	Districts	Distance from the District Head Quarters	Number of Participants
1	Barsaini	Barsaini	Kullu	75	10

SNo	Name of the Participants	Occupation
Name of the Village: BARSAINI		
1.	Mr. Atma Ram	Agriculture
2.	Mr. Puran Chand	Sarpanch
3.	Mr. Nupi Devi	Member
4.	Mr. Dinu Ram	Agriculture
5.	Mr. Gyan Chand	Job
6.	Mr. Suraj Mal	Agriculture
7.	Mr. Aan Singh	Agriculture
8.	Mr. Dilip Singh	Agriculture
9.	Mr. Ludar Chand	Agriculture
10	Mr. Puran Chand	Agriculture

A8.II General Perception and Summary of Consultations are given in Table A8.13 below.

Table A8.6: Summary of Consultations

Issues Discussed	People's Views and perception
General Perception about Project	Almost all the villages reported that people are aware about the project. However, people at Barsaini village were hesitant sacrifice their land for this project without adequate compensation. Now the adequate land has been provided and land has been acquired. People in general felt that roads and electricity will improve with the initiation of this project. Furthermore, the villagers of Bagipul, Kotla, Mazra, Karian, Barsaini, Hatkoti, Holi Bhajoli people believe that project will improve the electricity in the village. Similarly, the people of Bagipul, at Lahal substation stated that they will provide support if their demands of good compensation and permanent jobs in the project is promised.
Support of local people for proposed project	People at most of the villages unequivocally agreed that they will support the project.
Critical issue and concern by the local people for the project	Majority of people did not mention about any critical issues related to the project. People at Lahal, Bhajoli Holi, Bagipul, Kotla, Hatkoti doubted that the project might reduce the availability of electricity in the village due to export (transmission to the grid) of electricity.
Criteria liked to see during project design, operation stage and construction	Adequate safety measures are needed to be taken during construction and post construction.
Employment potential in the project	Most of the villages want that the project should offer labour jobs during and after the implementation of the project. Moreover, majority of villages perceive that the youths are educated and they will get jobs during construction and after the construction of the project. Similarly, most of the villages opined that they have utility vehicles and the project should use this during and after the implementation of project. The villagers of Thiyara under Chambi substation opined that some of the youths are diploma holders in electric jobs and the project should employ them.
Ethnic Minorities	Projects under Chamba district is declared as tribal area. Zanakpuri under Lahal and Holi bhajoli.
No of shops/commercial establishments	No large scale commercial activities are found in the villages except few small shops in each village. Commercial activities in the form of different types of shops are present in 3 villages. 70 to 100 shops (the maximum number) fall within the Hatkoti village which is having 40 to 50 shops followed by Mazra under Mazrasubstation. Similarly, in Kotla village under Kotla substation there are about 25-30 shops at Jeori. Mazra, Hatkoti, Bagipul, and Barsainiare also large villages having 250 to 400 households. In Lahal, Holi, Karian village commercial establishments are moderately present and number varies between 10 to 15 shops. All other villages have at least 4 to 10 shops. Holivillage does not have any commercial establishment.
Number of industrial units	In the subproject area, large industries are not present. Very few small scale industrial units and cottage industries are seen. In 9 villages covered there are no industrial units or cottage industries.

Issues Discussed	People's Views and perception
	However, Lahal and Karian have some small scale and cottage industries. In Lahal, there is 1wool weaving unit, 2 oil refining units, 2 wood cutting units and 1 at Lahal and Hatko furniiture shop. Similarly, in Kotla there is 1 cottage industry making shawls and 3 wood cutting units. Likewise, there are 2 flour mills in Barsaini. In the village Hatkoti, an applefactory is there 5 km away from the village.
Socio economic standing: land use, cropping pattern	Invariably agriculture and horticulture are dominant occupation of the subproject area in all the villages. Similarly, agriculture, labour and services are major occupations in the villages. In 10 villages, agriculture is at least one of the major occupations. Similarly, in 9 villages horticulture is one of the main occupations. Likewise, in 5 villages, both agriculture and horticulture are major economic activities. Floriculture is one of the occupations of villagers in Banjal. White collar jobs in government and private sectors was a major occupation in 5 villages. In agriculture, wheat and maize are major crops cultivated and followed by rice, vegetables, pulses (like kidney beans) is being cultivated in the villages. The cost of maize is Rs 1500/- per quintal, wheat is Rs. 1500 to Rs.1800/- per quintal and rice is Rs. 1800/- per quintal in the subproject area. Apple, Plum, Pomegranate, Pear, Naspati, Apricot, and Mango are some of the horticultural produce of the area. In the project area, 6 villages have small farmers who had land possession in the range of 5 to 20 Bigha, whereas in 4 villages had big farmers whose average land possession ranged from 70 to 100 Bigha.
Sources of irrigation	Almost all the villages rely on natural resources like rainwater and spring for irrigation. Only 2 of the villages, Pukheri, Hatkoti, have access to canal water for irrigation.
Access to Forest Land and Use	Bagipul and Hatkoti are the two villages those don't have access to forest in their areas. All other villages have access to forestland and mainly use forest produce for fodder for the animals.
Sources of power supply	All the areas covered during consultation admitted of getting power from the government sources.
Sources of electricity	Similarly, the source of electricity is the government grid for all the areas covered.
Average amount of electricity used by per household	The average unit varies in the range of 5 to 8 units per households per day.
Unit Rate	All the villagers reported that they spend in the range of Rs. 0.70 to Rs. 1.50 only per unit consumption of electricity.
Average total monthly expenditure per household on grid electricity	The average monthly bill varies between the range of Rs. 175/- to Rs. 275/- per month as reported by all the households.
Other non-grid electricity to use in your village and expenditure	Nothing
Source of drinking water	For drinking water, most villages have multiple sources. Majority, about 14, villages use natural water mostly spring water for drinking purpose, besides other sources. Similarly, the government supply of IPH water is used by 14 villages. In Lahal, there is a water tank in the village. Similarly, in Hatkoti, Barsaini,

Issues Discussed	People's Views and perception
	and Kotla villages, the villagers also use water from I&PH Tanks for drinking purpose.
Loss of residential / commercial structures, if any due to the project	No loss of structures or buildings anticipated.
Loss of community life like any Market Places or community activities to be affected	Nothing was reported in terms of loss of community property.
Shortage of water for human consumption, irrigation, and other downstream uses	There is no shortage of water for human consumption. However, the villagers of Lahal reported that there is shortage of water for irrigation.
Negative impact on food grain, availability /land use	There is no perceived negative impact on food grain but in Barsaini, Holi, Lahal and Hatkoti the villagers felt that there might be crop related losses during the time of construction of the project.
Will project cause landslides or soil erosion	Majority of the villages covered denied that the project will cause any landslides or soil erosion,
Will project cause widespread imbalance	None reported by all the villages.
Will project cause health and safety issues	Only one village Pukherifeel that the project may cause health problems.
Resettlement and land acquisition	People expect minor land acquisition which can still be managed with proper compensation. HPPTCL pays compensation to land owners as per land acquisition Act
Protected areas	No such protected area has been reported
Health status	There is no evidence of any health-related problems in the sub project area. All villages reported that people are healthy. In 10 villages, a primary health centre is available. In 2 villages, ayurvedic dispensary is also available along with primary health centre. In other villages, a hospital is accessible within a distance of 5 to 19 km. Few villages reported that people are aware of HIV/AIDS and about sexually transmitted diseases.
Will project setting change migration pattern of animals	None reported by all the villages.
Will project site adversely impact the water and soil	None reported by all the villages.
Educational status	Most of the villages have literacy rate of 85 %. In only 2 villages, the literacy rate is about 75 % to 80 %.
Employment status	Invariably agriculture and horticulture are dominant occupation of the subproject area in all the villages. In 10 villages, agriculture is one of the major occupations. Similarly, in 9 villages, horticulture is one of the main occupations. Majority about 80 % of the population are engaged in agriculture. Likewise, in 5 villages both agriculture and horticulture are major economic activities. White-collar jobs both in government and private sectors are major occupations in 5 villages. In these villages about 25 % of the households are in white collar jobs. In Bagipul, Lahal, Mazra village about 50 % of the households are depending on labour work. In Hatkoti, 20 % of the populations are unemployed.
Migration pattern	All the villages reported of "in" migration. There is no "out"

Issues Discussed	People's Views and perception
	migration.
Type of compensation expected	All the villages expect cash compensation
Perceived benefits from project	Villagers perceive that roads and street light might improve due to the project. Majority villages feel that there will be job opportunities will improve for the people. Similarly, the villagers also perceive that they will get labour jobs during and after implementation of project. Some of the villages feel that utility vehicle will be used during and after the implementation of project.
Perceived loss	Most of the villages fear that they willlose minimumland in case of transmission lines and substantial land in case of substation.
Other organizations active in the area	In all the villages Mahila Mandal (women groups) are present. Few of the villages have Yuvak Mandal (youth groups). There are about 6 organisations.
Village Committee	In all the villages, the decisions are taken by gram Panchayat and Gramsabha held on any critical and community related issues. All the Panchayat members and Sarpanch actively participate to take a decision on any community related issues.
Other issuers	In most villages, people welcomed the project and agreed to cooperate during the implementation of project. Some of the villages demand that power should be available for 24 hours. As discussed, the villagers of Chharor are against the project. The villagers of Lahal need primary health care centre and a high school in their village.
Usefulness of consultation	All the villagers admitted that the consultation is useful, and happy as they got an opportunity to share their views before the government officials.
Involvement of people in implementation	All the participants during the consultation admitted that the local people will provide full cooperation and involvement for the implementation of the project. As discussed, the villagers of Charor, Barsaini and Hatkoti are against the project.

This general perception document is common with the Resettlement Planning document prepared for the project.

A8.III Some Photographs of Public Consultations

Public Consultation near Barsaini Charor line

Consultation at Charor substation land

	
Location for Terminal Bay at Charor GSS for Barsaini Charor line	Barsaini GSS land
	
Line route hilly terrain for Barsaini-Charor line	Consultation at Lahal Budhil line route
	
Lahal 400/220 kV GSS bay area for Lahal Budhil and Lahal Rajera line	Hilltop to Hill top tower stringing to avoid houses etc.

	
Consultation at Lahal Budhil route	Discussions with shopkeepers on Nirmand-Kotla line
	
River crossing Nirman Kotla line	Connecting bay area for Nirmand Kotla line (outside the wall)
	
Apple orchards and villages avoided in the Nirmand Kotla line	Nirmand GSS location discussion with owner

Mazra Substation land

Mazra Karian Line route parallel to another transmission line (hilltop-hilltop)

Tower location (sample)

Land loser consultation at Lahal Rajera line

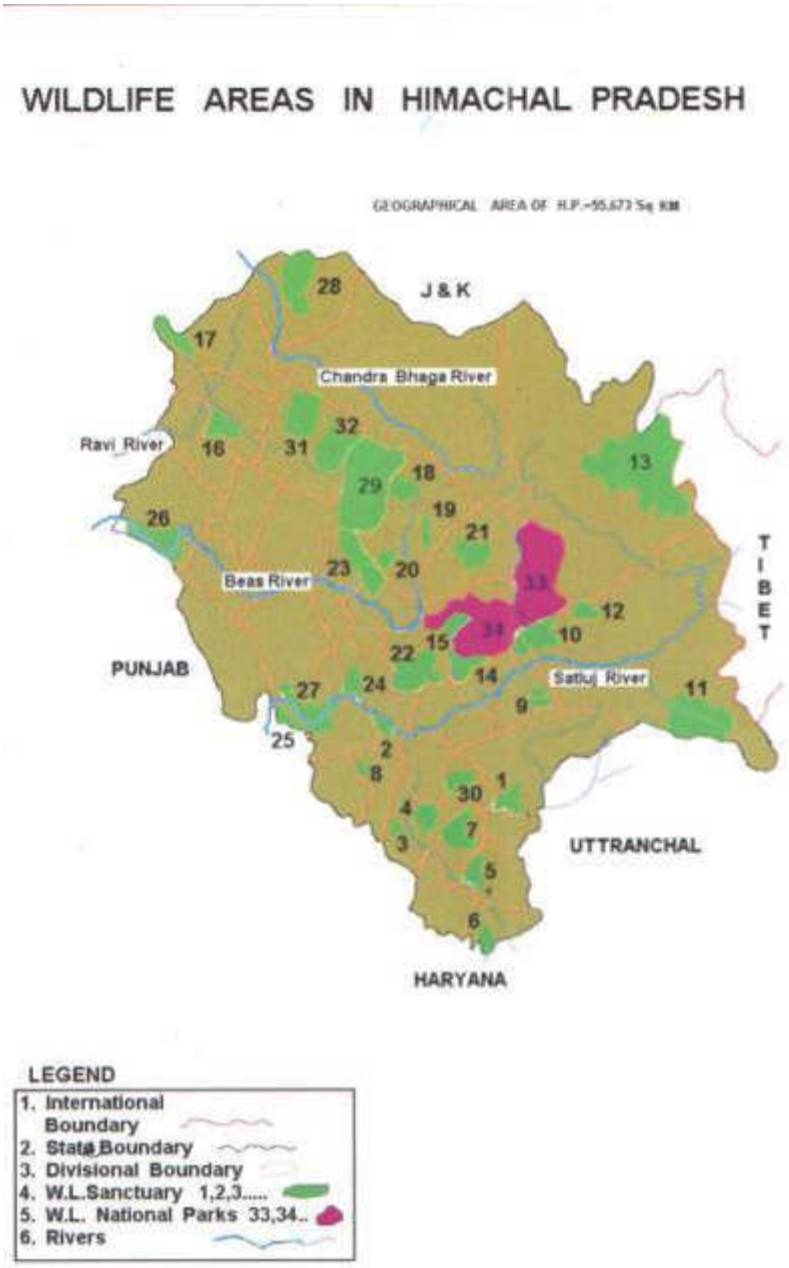
Public Consultation near Rajera for Lahal Rajera line

	
Public consultation near Lahal GSS	Public consultation Lahal Rajera line
	
Public consutation	Public consultations
	
	Remote area access near Rajera village

	
Consultation Lahal Rajera line	Public Consultation at Lahal Rajera line
	
Bay location at PGCIL Rajera GSS	

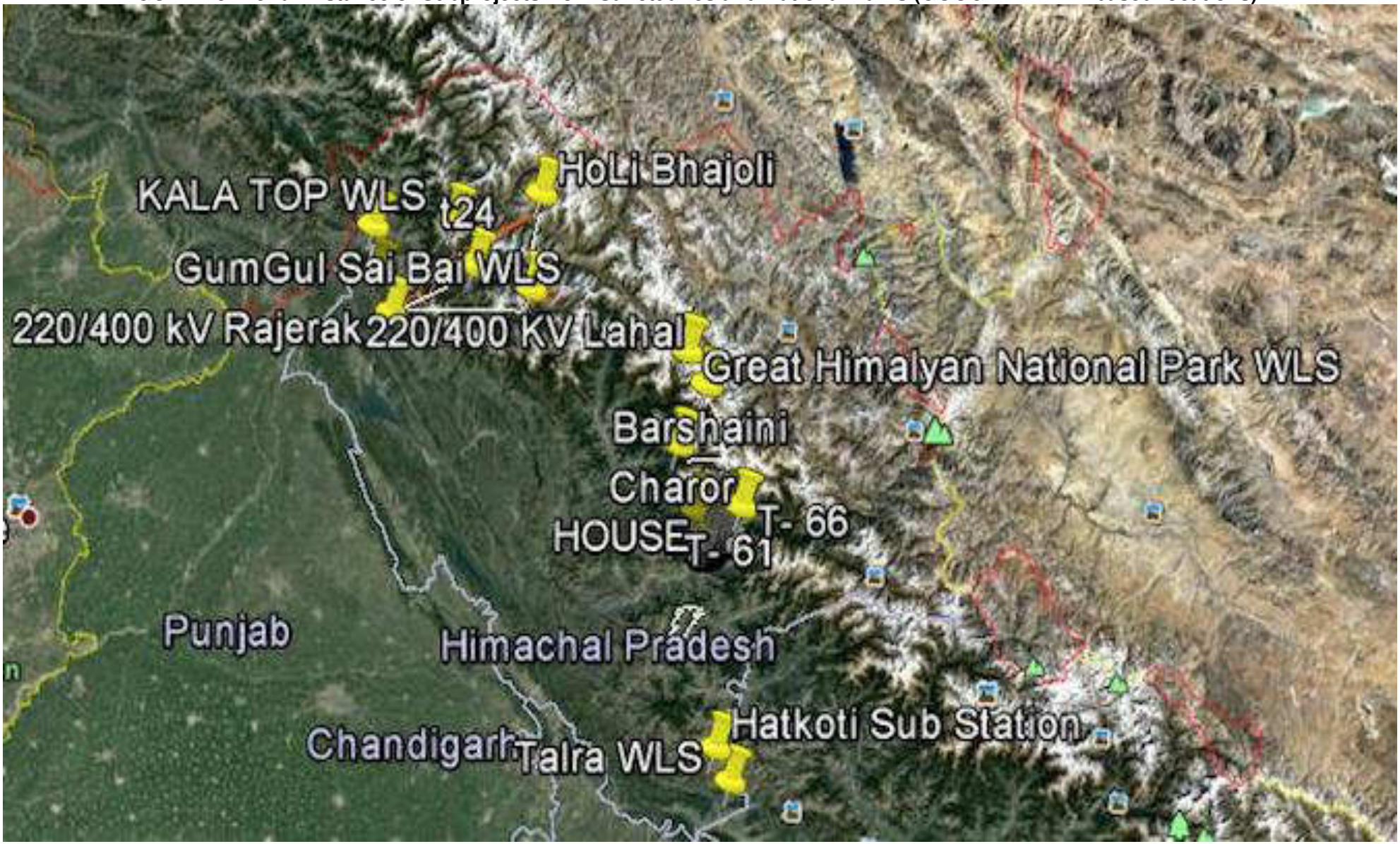
Annexure 9: National Parks and Sanctuaries in Himachal Pradesh

Source of the following information is the publication by Wildlife Wing, Himachal Pradesh Forest Department: “Enchanting Himalayas, a guide to national parks and wildlife sanctuaries of Himachal Pradesh” dated October 2004



Sr. No.	Name WL Area	Arae in Sq. KM
1.	Talra wls	40
2.	Majathal wls	57.55
3.	Shilli wls	2
4.	Chail wls	109
5.	Renuka wls	4
6.	Simbalbara wls	19
7.	Churdhar wls	66
8.	Darlaghat wls	6
9.	Daranghati wls	167
10.	Rupi Bhaba wls	738
11.	Rakchham Chitkul wls	304
12.	Lippa Asrang wls	349
13.	Kibber wls	1400
14.	Tirthan wls	61
15.	Sainj	90
16.	Kalatop Khajjiar wls	69
17.	Gamgulm Siyabehi wls	109
18.	Manali wls	32
19.	Kias wls	14
20.	Khokhan wls	14
21.	Kanawar wls	61
22.	Shikari Devi wls	72
23.	Nargu wls	278
24.	Bandli wls	41
25.	Naina Devi wls	123
26.	Pong Dam wls	307
27.	Govind Sagar wls	100
28.	Sechu Tuan Nala wls	103
29.	Dhauladhar wls	944
30.	Shimla water catchment wls	10
31.	Tundah wls	64
32.	Kugti wls	379
	Total Area = of WLS	6132 .55 A
33.	Pin Valley N.Park	675
34.	GHN Park	765
	Total Area of N.Parks =	1440 B
	Grand Total Area of WL A+B =	7572.55

FIGURE A9: Aerial Distance of Subprojects from Sanctuaries and National Parks (GOOGLE EARTH based locations)



COMPONENT I. Bhabha Nagar PIU (Kinnaur District) subprojects

9.I.1 Rupi Bhabha Wildlife Sanctuary

Year of establishment: 1982
Year of final Notification: (Section 26 of WPA, 1972): 1999. Notification No. FFE-B-F(6)-2/99 dated 23.10.99.
Area: 738 sq km
Geographical location: District Kinnaur, 31°30'00' to 31°47'06" N; 77°45'06" to 78°09'00"E
Altitude: 900 to 5,600m.
Climate: Rainfall- 45 mm; Temperature: -10 to 30°C.
Vegetation: Pine Forests, Forest Pastures, Rivers, Alpine and sub alpine grasslands, Montane broad leaved deciduous forests and mixed broadleaved- coniferous forests.
Reported Fauna: Brown Bear, Black Bear, Barking Deer, Musk deer, Red fox, Goral, Ibex, Leopard, Snow Leopard, Serow, Blue Sheep and Himalayan Tahr, Western Tragopan, Cheer, Koklas, Monal, Blue-throated Flycatcher, White-throated Tit, White-cheeked Tit, Orange Bullfinch, Hill Partridge, Speckled Wood-pigeon. Himalayan Woodpecker
Census Figures: (2001-2002) Goral (18), Bharal (33), Monal (229), Kaleej (55), Western Tragopan (9), Koklas (70).
Conservation Issues and Land Use: Livelihoods of local villagers of 15 villages inside the sanctuary and shepherds related to the Sanctuary. The north of the sanctuary is covered by glaciers. The Great Himalayan National Park and the Pin Valley National Park are located on its western and northern boundaries respectively.
Eco-tourism spots: Rupi, Bara Khamba, Chotta Khamba.
Eco-treks: Chaura-Rupi Wangshangling - 60km, Bara Khamba - Kumrang-Wangshangling- 40 km, Chota Khamba-Rupi-Jaghori-Phancha-60 km, Wangtoo-Katgaon-Kafnoo-Muling-Tarikhanga-Sagnam-65km.

9.I.2 Rakchham Chitkul Wildlife Sanctuary

Year of establishment: 1989
Year of final Notification: (Section 26 of WPA, 1972): Notification No. FFE-B-F(6)-2/99 dated 7.9.2001.
Area: 304 sq km
Geographical location: District Kinnaur, 31°10’20” to 31°25’05” N 78°15’10” to 78°20’00”E
Altitude: 2,800 to4,900 m.
Climate: Rainfall- 460 mm; Temperature: -10 to 15°C.
Vegetation: Forests of Deodar, Kail, Chilgoza and Board-leaved species on lower altitudes (2,000m and above); and Fir-Spruce combination with Bamboo-dominated undergrowth on higher altitude (2,800 m and above). The alpine zone starts above 2800 m altitude. The alpine area of sanctuary has a rich growth of medicinal herbs.
Reported Fauna: Musk Deer, Serow, Himalayan Tahr, Bharal, Ghoral, Leopard, and Snow Leopard, Monal, Koklas and White Crested Kaleej and Western Tragopan are found in their eastern most limits in this sanctuary.
Census Figures: (1999-2000) Goral (6), Bharal (7). Leopard (3), Monal (67), Kaleej (25), Western Tragopan (9), Koklas (43).
Conservation Issues and Land Use: This sanctuary is known for its vast pasture areas. Local livelihoods from the forests in the sanctuary are main conservation issue.
Eco-tourism Spots: Chhitkul, Rangthang Pass, Lalanti Pass and Sangla.
Eco-treks: Chhitkul-Dumti-25 km, Dumti-Rangthang Pass-45 km, Rangthang Pass-Neartall-59 km, Chhikul-Lalanti Pass km, Lalanti Pass-Thangi-45 km.

9.I.3 Lippa Asrang Wildlife Sanctuary

Year of establishment: 1962
Year of final Notification: (Section 26 of WPA, 1972): Notification No. FFE-B-F(6)-2/99 dated 7.9.99.
Area: 349 sq km
Geographical location: District Kinnaur, 31°44' 15" - 31°44'18" N-78°08'00" - 78°17'38" E
Altitude: 4,000 to 5,000m
Climate: Rainfall-220mm; Temperature: -10 to 15°C
Vegetation: Himalayan Dry Temperate Forest, Alpine Arid Pastures, Alpine Dry Scrub includes Kharsu oak, dry broadleaved and scanty coniferous trees.
Reported Fauna: Musk deer, Ibex, Leopard, Himalayan Black Bear, Brown Bear, Musk Deer, Goral, Blue Sheep, Chukor, and Yellow Billed Chough, Snow Cock, Lammergeyer, Griffon, Chestnut bellied Nuthatch
Census Figures: (1999-2000) Bharal (7), Ibex (87), Musk Deer (4), Black Bear (4), Snow Cock (42).
Conservation Issues and Land Use: Livelihoods of local villagers of one village with in sanctuary and graziers dependent on the sanctuary.
Eco-tourism Spots: Lipu Kanda (above 14000 feet), Poram kanda (12500 feet)
Eco-treks: Asrang- Poram Kanda-12 km, Poram Dogri-Lalsa-6 km, Lalsa- Spiti-26 km,

COMPONENT II. Chamba PIU (Chamba District) subprojects

9.II.1 Gamgul Siahbehi Wildlife Sanctuary

Year of establishment: 1974.
Year of final Notification: (Section 26 of WPA, 1972): Notification No. FFE-B-F(6)-4/99 dated 23.10.99.
Area:109 sq km
Geographical location: District Chamba, 75°52'-75°57' E - 32°49'-32°52' N.
Altitude: 1,800 to 4,000 m.
Climate: Rainfall-1, 150mm; Temperature: -10 to 35°C
Vegetation: Moist Deodar forests, Westem Mixed Coniferous Forests and Alpine pastures.
Reported Fauna: Gamgul Siahbehi Sanctuary is considered one of the most important sanctuaries. Other important mammals comprise of Common Langur, Rhesus Macaque Himalayan Black Bear, Brown Bear, Fox, Himalayan Weasel, Jungle Cat, Leopard Cat, Leopard, Jackal, Goral, Yellow-throated Marten, Royle's Pika, Himalayan Palm Civet, Indian Muntjac, Musk Deer, Serow, Himalayan Tahr, Indian Porcupine and Common Giant Flying Squirrel. Western Tragopan, Cheer, Koklas, Himalayan Monal, Variegated Laughing thrush, White-browed Blue Flycatcher, Rufous-bellied Niltava, Yellow-bra ved Ground Warbler, Large-billed Leaf-Warbler, Large-crowned Leaf-Warbler, Green-backed Tit, Spot-winged Crested Tit, Rufous-bellied Crested Tit, Himalayan Tree creeper, Black-and-Yellow Grosbeak, Griffon Vulture, Himalayan Slaty-headed Parakeet, White-cheeked Bulbul, Black Bulbul, Red-headed Tit.
Census Figure (2003-04): Musk Deer (3), Goral (18), Black bear (7), Leopard (4), Brown Bear (4), Monal (160), Koklas (120), Kaleej (100).
Conservation Issues and Land Use: Three villages exist inside the Sanctuary and the peripheral areas have 55 villages. They exercise a tremendous biotic pressure on the WLS.
Eco-tourism Spots: Thathi Dhar, Sonu Tith, Galu di Mandi, Gamgul, Siyabehi.
Eco-treks: Dadroh-Doda-Mandyal-10 km, Mandyal-Sonu Tith-Galu-15 km, Dada- andyal-Thath Dhar-Kalethar-10 km, Maklunda-Bhith- 10 km, Maklunda-Galu di Mandi-·10 km.

9.II.2 Kalatop Khajjiar Wildlife Sanctuary

Year of establishment: 1949
Year of final Notification: (Section 26 of WPA, 1972): Notification No. FFE-B-F(6)-7/99 dated 23.10.99.
Area: 69 sq km.
Geographical location: District Chamba, 32°02' to 32°04 N- 76°01' to 76°06E
Altitude: 1185 to 2768 m.
Climate: Rainfall -1150 to 2,700m; Temperature: 10 to 35° C
Vegetation: Deodar and Kail Forests mixed with firs and spruce, montane broadleaved, deciduous forests, sub alpine grasslands.
Reported Fauna: Common Langur, Leopard, Giant Indian Flying Squirrel and Indian Porcupine, Indian Muntjac, Goral, Himalayan Black Bear, Leopard Cat, Jackal, Himalayan Musk Deer and Serow. Some 117 species of birds were recorded. Koklas and Kaleej are both numerous. A single Cheer Pheasant was recorded in the lowest part of the sanctuary and Himalayan Monal reportedly visits in winter.
Census Figures (2003-04): Goral (1340, Barking Deer (50), Black Bear (11), Leopard (6), Cheer (9150), Kaleej (200).
Conservation Issues and Land Use: Livelihoods of local villagers and graziers of 15 villages existing inside the Sanctuary and 35 villages of periphery dependent on the sanctuary.
Eco-tourism Spots: Khajjiar lake
Eco-treks: Kalatop- Khajjiar-12 km, Khajjiar-Mandrani-3 km, Lakkar mandi-Palwani Mata-Jot-14 km.

9.II.3 Kugti Wildlife Sanctuary

Year of establishment: 1974
Year of final Notification: (Section 26 of WPA, 1972): Notification No. FFE-B-F(6)-2/99 dated 23.10.99.
Area: 379 sq km.
Geographical location: District Chamba, 76°44' - 76°53' E - 32°25' - 32°55' N
Altitude: 2,250 to 6,000m
Climate: Rainfall- 500mm; Temperature: -10 to 25°C
Vegetation: Moist Deodar Forest, Western Mixed Coniferous forests and Montane broad leaf deciduous forests, Alpine pastures and sub alpine grasslands
Reported Fauna: Himalayan Black Bear, Leopard Cat, Leopard, Common Langur and Yellow-throated Marten, Brown Bear, Goral, Himalayan Tahr, Serow, Ibex, Cheer Pheasant has been recorded on the north side of Budhil Nala, but not within the sanctuary itself.Western Tragopan is reported by local people to be present.
Conservation Issues and Land Use: Livelihoods of 2 villages and 10 thatches inside the Sanctuary and 9 villages in the surrounding areas depend on the sanctuary. It is connected to the west by a forest corridor to the Tundah Sanctuary.
Eco-tourism Spots: Mani Mahesh, Dharol, Kelong (Kartik Swami Temple), Kugti, Dhalotu.
Eco-treks: Hadsar-Deoshah road-13 km, Hadsar-Kugti-Halesh-25 km, Hadsar-Kugti-Dhalotudhar- Manimahesh-30 km, Hadsar-Goru Ban-6 km, Hadsar-Kinnaur Dhar-22 km.

9.II.4 Sechu Tuan Nala Wildlife Sanctuary

Year of establishment: 1974
Year of final Notification: (Section 26 of WPA, 1972): 1999: Notification No. FFE-B-F(6)-3/99 dated 1.11.99.
Area: 103 sq km
Geographical location: District Chamba, 30°15'- 32° 00' N - 76°20' -77°00' E
Altitude: 2,500 to 6,000 m
Climate: Rainfall- 500 mm; Temperature: -20 to 30°C
Vegetation: Forest types include Western Himalayan temperate, moist alpine scrub and dry alpine scrub. Species of medicinal importance include Aconitum heterophyllum, Jurinea macrocephala and Ephedra gerardiana.
Reported Fauna: Ibex, Musk deer, Snow leopard, Black Bear, Brown Bear, Musk Deer, Goral, Ibex, Serow, Blue Sheep, Himalayan Tahr and Royle's Pika, Western Tragopan, Koklas, Monal, Green Backed Tit, Black tit, Himalayan Griffon, Snowcock, Snow Pigeon.
Conservation Issues and Land Use: Livelihoods of local villagers and graziers are dependent upon the natural resources of the sanctuary.
Eco-tourism Spots: Chasak Bhatori, Tarun Nallah, Harbi Dhar, Topiun Pass, Jarnmu Nallah, Hindu and Buddhist temples at Bhat, Tuan, Hilu, Chrroti and Kalichor.
Eco-treks: Thuan-Jarnmu Nallah-9 km, Thuan-Topuin Nallah Pass-25 km, Udren Nallah-Topiun-13 km, Saichu-Harbi Dhar-7 km, Saich-Chask Dhar-11 km.

9.II.5 Tundah Wildlife Sanctuary

Year of establishment: 1962
Year of final Notification: (Section 26 of WPA, 1972): 1999: Notification No. FFE-B-F(6)-5/99 dated 23.10.99.
Area: 64 sq km.
Geographical location: District Chamba, 32°27'00" to 32°40'00" N- 76°27'00" to 76°37'00"E.
Altitude: 2,100 to 5,500m.
Climate: Rainfall-: 800mm; Temperature: -10 to 30° C
Vegetation: Moist deodar forests, mixed coniferous forests, alpine pastures.
Reported Fauna: Brown Bear, Goral, Himalayan Tahr, Serow, Ibex, Black Bear, Leopard Cat, Leopard, Common Langur, Yellow-throated Marten, Monal, Western Trgopan, Flycathers and Thrushes.
Conservation Issues and Land Use: Livelihoods of local villagers of 4 villages, eight Gujjar settlements and graziers are dependent upon the natural resources of the sanctuary.
Eco-tourism Spots: Harchu, Bargan, Tunda, Mumbari Dhar, Silpadi Dhar.
Eco-treks: Durgati-Tundah-Silparidhar via Mumbaridhar-24 km, Harchu-Bargran-Bhadra-15 km, Dugati-Silpari-Banni-22 km, Durgati-Banni-Bhadra-28 km, Harch-Bhadra-Digola-23 km.

9.II.6 Pong Dam Lake Wildlife Sanctuary

Year of establishment: 1983
Year of final Notification: (Section 26 of WPA, 1972): 1999. Notification No. FFE-B-F(6)-8/99 dated 23.10.99.
Area: 307 sq km.
Geographical location: District Kangra, 31°50' - 32°07' N - 75°58'-76°25' E
Altitude: 335 m to 436 m.
Climate: Rainfall-.1780mm; Temperature: 5.6 to 44.3°C
Vegetation: Subtropical Pine forests. There is a little submerged aquatic vegetation. The

shoreline does not support much emergent vegetation due to the pronounced seasonal changes in water level. The surrounding hillsides still support some mixed deciduous and Chir Pine Pinus roxburghii forests.
Reported Fauna: Indian Wild Boar; Barking Deer; Blue bull; Indian Red Hare.Migratory water birds; Rednecked grebe. Indian Skimmer, Black Stork, White-rumped Vulture on one carcass, Himalayan Long-billed Vulture, Eurasian Griffon, Imperial Eagle, Ferruginous Pochard, Ruddy-breasted Crake, Water Rail, Yellow-wattled Lapwing, White-tailed Stonechat, Brook's Warbler, Sand Martin, Barred Buttonquail, Common Quail, Rufous-tailed Shrike, Indian Peafowl. A total of 228 species recorded, around Jawali and Shivalikh hills northeast of Jawali and 180 species at Shanehar barrage area. Large population of Bar Headed Geese visits the lake every year.
Census Figures: Common pocchard (5200), Bar Heeded. Geese (28000), Pintails (28000), Gadwall (3600).Cormorants (14300), Mallards (3800) and many rare winter birds.
Eco-tourism Spots: Bari, Nagrota Suriyan, Rancer Island, Pong Dam, Gaglara.
Eco-treks: Dhameta-Karu Island-5 km, Rajiv Gandhi Nature Park-Guglara-5 km, Dehra-Bangoli Koriyan-5 km, Jawali-Mastgarh Forests-15 km, Nagrota Suriyan-Masroor Temple-15 km.
Conservation Issues and Land Use: Sanctuary is uninhabited, but livelihoods of local 128 villagers and fishermen dependent on the Lake water.

9.II.7 Dhauladhar Wildlife Sanctuary

Year of establishment: 1994.
Year of final Notification: (Section 26 of WPA, 1972): Notification No. FFE-B-F(6)-9/99 dated. 1.11.99
Area: 944 sq. km.
Geographical location: District Kangra, 32°3'00" to 32°28'00" N; 76°43'00" to 77°6'00"E.
Altitude: 2,000 to 4,800m.
Climate: Rainfall-2,500mm; Temperature: 8 to 25°C
Vegetation: Western mixed coniferous forest with deodar, fir, spruce and blue pine, oaks and alpine pastures.
Reported Fauna: Musk Deer, Himalayan Black Beer, Serow, Himalayan Weasel, Yellow - throated, Himalayan Palm Civet, Cheer Pheasant, Western Tragopan, Speckled Wood-pigeon, Himalayan Woodpecker, Gold-billed Magpie, Himalayan Tree Creeper, Himalayan Slaty headed Parakeet, Himalayan Tree Pie, White cheeked Bulbul, Black Bulbul.
Eco-tourism Spots: Billing (for hang and Para Gliding). Multan- Barot (for Trout fishing), Thamsar pass and Thamsar lake
Eco-treks: Bir-Billing-Raj Gundha-26 km, Raj Gundha- Palachal- Panhartu-16 km, Panhartu-Thamsar Maeh- Udak- Bara Bhangal-19km, Bara Bhangal-Khanar-Dharari-Naya gran-42km, Bara Bhangal-Kalihni Pass-45km, Bara Bhangal-Mani Mahesh Lake- 45 km, Bara Banghal- Kugti Pass-53 km, Bara Banghal- Lahaul-45 km.
Conservation Issues and Land Use:A number of villages inside the WLS depend on the natural resources of the WLS.

COMPONENT III: Rohru PIU (Shimla District) subprojects

9.III.1 Churdhar Wildlife Sanctuary

Year of establishment: 1985
Year of final Notification: (Section 26 of WPA, 1972): Notification No. FFE-B-F (6)-28/99 dated. 1.11.99.
Area: 66 sq km.
Geographical location: District Shimla, 30°48' 37" - 30°54' 39" N, 77°23' 32" - 77°29' 49" E

Altitude: 2,000 to 3,650m
Climate: Rainfall-1500mm; Temperature: 5 to 20°C.
Vegetation: Forest types include Western mixed coniferous, Kharsu Oak and alpine pastures. Forests of Deodar, Oak and other species
Reported Fauna: Common Langur, Rhesus Macaque, Leopard, Himalayan Black Bear, Wild Boar, Indian Muntjac, Musk Deer, Goral, Royle's Pika, Indian Porcupine, Koklas Pheasant, Himalayan Monal, Variegated Laughing thrush, Chestnut-tailed Minla, Grey-crested Tit, Black-crested Tit, Whitetailed Nuthatch, Himalayan Green Finch, Red-headed Bullfinch, Brown Bull finch.
Census Figures: (1999-2000) Goral (68), Indian Munljac (76), Leopard (8), Black Bear (16), Koklas (169), Monal(187), Red Jungle Fowl(202).
Conservation Issues and Land Use: Residents of 23 villages have rights to agriculture, extraction of timber, fuelwood and minor forest produce, grazing and collection of fodder. Gujjars are given permits for grazing and periodically bring large numbers of livestock into the sanctuary and six temporary camps are located within the WLS.
Eco-tourism Spots: Churdhar Temple (Shiv Mahadev)
Eco-treks: Nohra-Churdhar-18 km, Chouras- Tissri-11 km, Dopti-Churdhar-16 km, Pulbahal-Dopti-8 km, Chhogtali- Tissri-9 km.

9.III.2 Daranghati Wildlife Sanctuary

Year of establishment: 1962
Year of final Notification (Section 26 of WPA, 1972): Notification No. FFE-B-F(6)-22/99 dated. 23.10.99.
Area: 167sq km
Geographical location: District Shimla, 77°47'-77°51 'E - 31°22'-31°28' N.
Altitude: 2100-3315m
Climate: Rainfall-.750 mm; Temperature: -8 to 17°C
Vegetation: Ban Oak forests; Moist Deodar forest; Kharsu Oak forest; Himalayan Sub Alpine Fir forests. Western mixed coniferous forest occurs on northern and eastern slopes above 2,000 m. Main species are blue pine, silver Fir and Spruce with Cedar on well-drained sites and Rhododendrons.
Reported Fauna: Musk Deer, Himalayan Black Beer, Serow, Himalayan Tahr, Blue Sheep, Red Fox, Himalayan Weasel, Yellow-throated, Himalayan Palm Civet and Jungle Cat, Western Tragopan, Cheer Pheasant, Koklas, White crested Kaleej, Monal, Himalayan Slaty headed Parakeet, Himalayan Tree Pie, White cheeked Bulbul, Black Bulbul, Rusty-cheeked Scimitar-babbler.
Census Figures: (2003-04) Goral (5), Musk Deer (2), Western Tragopan (25), Koklas (133), Monal (144), Himalayan Tahr (2).
Eco-tourism Spots: Welnu Tibba, Sharnal, Dofda, Sharaikoti temple,Devtapani.
Eco-treks: Kimoo-Rumpu Rashi Thach-20 km, Dofda-Daran-Morya-Thach-Babala-Shama-38km, Dhandol-Sharnal-Devtapani-35 km, Thaklech-Darkali-Sharnal-Jangdhar-55 km.
Conservation Issues and Land Use: Two villages exist inside the Sanctuary and the peripheral areas have 26 villages. Nomadic Gujjars have grazing permits. Over 7,500 cattle, sheep and goats graze inside the Sanctuary of which 5,000 are from local villages.

9.III.3 Shimla Water Catchment Sanctuary

Year of establishment: 1958
Year of final Notification: (Section 26 of WPA, 1972): 1999: Notification No. FFE-B-F(6)-20/99 dated 23.10.99.

Area: 10 sq km.
Geographical location: District Shimla, 31°05'12" to 31°07'11" N- 77°12'54" to 77°16'04"E
Altitude: 1500 to 3,300m.
Climate: Rainfall-900mm; Temperature: -10 to 30°C
Vegetation: The entire sanctuary is forested, mostly of temperate coniferous forest. Deodar is predominant (69%) and mixed with Ban oak (11 % for Quercus spp.) and chir pine (2%) at lower altitudes, and fir (13%), blue pine (4%), Moru oak and spruce at higher altitudes. Shrub and ground layers are generally well developed, with shrubs forming over 50%. Ground vegetation is mainly grasses, but includes a variety of ferns and herbs.
Reported Fauna: Rhesus Macaque, Common Langur, Yellow-throated Marten, Leopard, Indian Muntjac, Goral and Porcupine, Flying Squirrel, Cheer Pheasant, Speckled Wood-pigeon, Himalayan Woodpecker, Gold-billed Magpie, Black-crested Tit, Green Backed Tit. Musk Deer, reported by local people to have existed in the past, may now be locally extinct. Highest density of Koklas pheasant 24 pairs per sq km. The population of Kaleej Pheasant also appears to be large.
Eco-tourism Spots: Sihog
Eco-treks: Chharbara via Wild flower Hall Kufri to Sihog-9 km, Dhalli to Sihog -7 km
Conservation Issues and Land Use: Shimla Water Catchment Area is un-inhabited sanctuary and has been totally protected ever since its reservation. It may represent the only remaining example of undisturbed middle-altitude forest in the front ranges of the Western Himalaya and is the main catchment area upon which Shimla depends for its water supply. Livelihoods of local villagers and graziers are dependent upon the natural resources of the sanctuary.

9.III.4 Talra Wildlife Sanctuary

Year of establishment: 1962
Year of final Notification: (Section 26 of WPA, 1972): 1999: Notification No. FFE-B-F(6)-21/99 dated 1.11.99.
Area: 40 sq. km.
Geographical location: District Shimla, 30°57'46" - 31°03'19" N- 77°43'30" -77°48'21" E
Altitude: 1,500 to 3,300m.
Climate: Rainfall-900mm; Temperature: -10 to 30°C
Vegetation: Deodar forests in lower portions with dense Fir and Spruce in upper portions. Dense Kharsu Oak forest in the upper part of the Sanctuary
Reported Fauna: Goral, Langur, Leopard, Barking Deer. Sambhar has been reported by the villagers in this sanctuary. Monal, Koklas Pheasant, Speckled Wood-pigeon, Himalayan Woodpecker, Goldbilled Magpie, Black-crested Tit, Green Backed Tit
Census Figures: (2002-03) Goral (53), Indian Muntjac (17), Leopard (22), Leopard Cat (13), Black Bear (9) Jackal (44), Kalij (126), Koklas (124), Monal (27) Red Jungle Fowl (163), Black Partridge (17).
Conservation Issues and Land Use: This sanctuary has history of commercial logging operations in 1970s. However, the area has been successfully regenerated. Livelihoods of local villagers of one village inside the sanctuary and 7 villages in the surrounding area and graziers are dependent upon the natural resources of the sanctuary.
Eco-tourism Spots: Talra Thach, Kastha Top, Kanger.
Eco-treks: Shashn-Talra-16 km, Chajpur-Talra-12 km, Gurar-Talra-16 km, Panju-Talra-8 km.

COMPONENT IV: Sarabhai PIU (Kullu and Mandi Districts) subprojects

9.IV.1 Great Himalayan National Park

Year of establishment: May 1994
Year of final Notification: (Section 26 of Wildlife Protection Act (WPA), 1972): Notification No. FFE-B-F(6)-2/99 dated 28.5.99.
Area: Great Himalayan National Park: 754.4 sq km; Eco zone: 265.6 sq km.
Geographical location: District Kullu, 31°38'28" to 31°54'58"N: 77°20'11" to 77°45'52"E.
Altitude: 1500 to 5800m.
Climate: Rainfall-1,500mm; Temperature: 0.6 to 29°C
Vegetation: The Park has forests of subtropical chir pine, coniferous and mixed deciduous woods of the temperate zone with green and white oaks, horse chestnuts and walnuts amidst tall deodar, blue pines and rhododendrons. Above 3,000-3,500m is sub-alpine zone, alpine meadows, splashed with a great variety of tiny flowers and medicinal herbs.
Reported Fauna: Serow, Himalayan Tahr, Goral, Blue Sheep, Indian Pika, Giant Indian Flying Squirrel, Himalayan Black Bear, Himalayan Brown Bear, Leopard, Snow Leopard, Red Fox, Himalayan Palm Civet, Yellow-throated Marten and the vulnerable Musk Deer.Two hundred and three bird species have been recorded from the Park: the spectacular Pheasants are among the most important. GHNP is one of the two National Parks in the world with a population of the endangered Westem Tragopan. The Chir Pheasant is present on the steep, south-facing grassy slopes. Monal and Koklas are abundant in the temperate forests while Kaleej occurs in small numbers below 2,000 m.
Census Figures: (2002) Leopard (3), Black Bear (15), Brown Bear (9). Musk Deer (7), Goral (64), Himalayan Tahr (8), Bharal (35), Monal (43), Western Tragopan (11), Koklas (23), Kaleej (24), Snow Leopard (2).
Conservation Issues & Land Use: There is no human and cattle population in the Park. After final notification in 1999, the Park management has initiated work of organizing the women of the poor households who depend upon the Park resources through setting up of women's saving and credit groups.
Eco-tourism Spots: GHNP Kullu has 4 main valleys: Tirthan, Sainj, Jeewanal and Parvati. There are a number of thatches inside the Park.
Eco-treks: Shakti-Dhel-Lapah, Gushani-Shilt & back, Manikaran-Mantlai-Pin Parvati Pass-Sognam-Kaza, Neuli-Manu Temple-Guddani Nalah & back, Gushaini Rolla & back,

9.IV.2 Kais Wildlife Sanctuary

Year of establishment: 1954:
Year of final Notification: (Section 26 of WPA, 1972) Notification No. 70 GP-53/97 dt. 28.02.54.
Area: 14 sq km
Geographical' location: District Kullu, 77°09'-77°12' E - 31°59'- 32°03' N
Altitude: 2,800 to 3,680m.
Climate: Rainfall - 1,000 mm; Temperature: -5to 30°C
Vegetation: Pine Forests, Forest Pastures, Alpine and sub alpine grasslands. Maple, Fir; Ash, Deodar, Poplar, fir and Walnut.Fir and Spruce, with some Oaks and Deodar forests predominate at lower altitudes, above which are Birch-rhododendron scrub forests.
Reported Fauna: Common Langur, Himalayan Black Bear, Brown Bear, Leopard, Himalayan Monal, Kalij and Koklas. Chukor Partridge is also present. Cheer and Western Tragopan are also reported.
Conservation Issues and Land Use: Livelihoods of local villagers and graziers; There are no villages inside the sanctuary.

Eco-tourism Spots: Matan Thach, Phuta sar.
Eco-treks: Matan Thach-Naggar via Chanderkhani- 30 km.

9.IV.3 Kanawar Wildlife Sanctuary

Year of establishment: 1954
Year of final Notification: (Section 26 of WPA, 1972): Notification No. 70 GP-53/97 dt. 28.2.54.
Area: 61 sq km
Geographical location: District Kullu, 77°17'-77°23'E - 31°55'-32°01'N
Altitude: 1,800 to 4,800 m.
Climate: Rainfall-1,000mm; Temperature: -10 to 25°C
Vegetation: Deodar and Pine Forests, Montane broad leaved deciduous, Alpine and sub alpine grasslands. Cypresses have been introduced.
Reported Fauna: Common Langur, Rhesus Macaque, Himalayan Black, Brown Bear, Jungle Cat, Leopard Cat, Leopard, Jackal, Yellow-throated Marten, Himalayan Palm, easel, Fox, Goral, Indian Muntjac, Musk Deer, Royle's Pika, Indian Parrot and Common Giant Flying Squirrel Tragopan. Cheer, Monal, White crested Kaleej pheasants are also reported.
Census Figures: (2003-04) Goral (61), Barking Deer (14), Western Tragopan (4), Kaleej (90), Monal (960), Koklas (166), Snow Pigeon (2005)
Eco-tourism Spots: Kasol, Grahan, Mathinala, Luripat.
Eco-treks: Kasol-Luripat-10 km, Kasol-Mathinala -8 km, Kasol-Pulga-38 km.

9.IV.4 Khokhan Wildlife Sanctuary

Year of establishment: 1954
Year of final Notification: (Section 26 of WPA, 1972): Notification No. 70 GP-53/97dt. 28.2.54.
Area: 14 sq. km.
Geographical location: District Kullu, 31°50'10" to 31°53'24" N - 77°03'21" to 77°06'55"E.
Altitude: 1500 to 2787m.
Climate: Rainfall-850mm; Temperature: -5 to 28°C
Vegetation: Mainly moist temperate Deodar forests mixed with Kail, fir and spruce in higher reaches, alpine meadows at the top.
Reported Fauna: Musk Deer, Tahr, Goral, Leopard, Weasel Himalayan, Koklas, Monal, Western Tragopan.
Census Figures: (2002-03) Goral (7), Barking Deer (4), Koklas (40), Kaleej (65), Monal (17), Peafowl (10), Chukor (32), Leopard (1), Red Jungle Fowl (3).
Conservation Issues and Land Use: Livelihoods of people of 28 villages inside the sanctuary are dependent upon the sanctuary.
Eco-tourism Spots: Nagni, Mujag Thach.
Eco-treks: Dohra nal-Mujag via Lot-16 km, Kandi-Mujag thach-Nagni-Dohranal-18 km.

9.IV.5 Manali Wildlife Sanctuary

Year of establishment: 1954
Year of final Notification: (Section 26 of WPA, 1972): Notification No. 70 GP-53/97dt. 28.2.54.
Area: 32 sq km
Geographical location: District-Kullu, 32°13'- 32°15' N - 77°05'-77°10' E.
Altitude: 2,200 to 5,100m.
Climate: Rainfall-1080 mm
Vegetation: Coniferous forest (up to 2,500m) dominated by Deodar and Blue Pine (Kail) in the lower Manalsu Valley, dense Oak forests at higher altitudes (2,300 to 3,200m). Near and above

tree line Junipers and Rhododendrons occur as scrub forests. The herb communities of the alpine pastures are often dominated by Nitrophilous species, such as Bistorta spp. and Rumex nepalensis.
Reported Fauna: Musk deer, Ibex, Black Bear, Leopard, Occasional snow leopard, Brown Bear, Jungle Cat, Himalayan Palm Civet, Yellow-throated Marten, Indian Muntjac and Serow. Species diversity for pheasants is high, with Western Tragopan, Himalayan Monal, and Koklas present in low numbers. This area is relatively rich in raptors, both in terms of species abundance and population sizes.
Census Figures: (2002-03) Langoor (1 02), Barking Deer (6), Jackal (3), Kaleej (5), Monal (87), Koklas(22).
Conservation Issues and Land Use: There are no villages within the sanctuary. During the summer six settlements are temporarily occupied by pastoralists. People from nearby villages depend on natural resources of the sanctuary for their livelihoods.
Eco-tourism Spots: Manali, Gulamalang, Quakta Kut, Lambadug.
Eco-treks: Old Manali-Quakta Kut- 10 km, Dhugri-Dorni via Lambadug- 22 km.

9.IV.6 Sainj Wildlife Sanctuary

Year of establishment: 1994
Year of final Notification: (Section 26 of WPA, 1972): Notification No. FFE-B-F(6)-15/99 dated 23.10.99.
Area: 90 sq km.
Geographical location: District Kullu, 77°27'-77°37' E - 31°34'- 31°39' N
Altitude: 2,100 - 4,600 m
Climate: Rainfall-1,500mm; Temperature: -5to 30° C
Vegetation: Ban Oak forest; Moist deodar forest; Mixed coniferous forest; Kharsu Oak forest and Alpine and sub alpine grasslands.
Reported Fauna: Snow Leopard, Himalayan Tahir, Musk Deer, Brown Bear, Black Bear, Western Tragopan, Cheer, Kaleej, Koklas and White-cheeked Tit. A list of 203 birds is there for the Great Himalayan National Park Conservation Area, of which the Sainj Sanctuary is a part.
Census Figures: Black Bear (21), Brown Bear (2), Musk Deer (19), Goral (18), Bharal (31), Monal (12), Western Tragopan (3), Koklas (9), Kalij (10).
Conservation Issues and Land Use: Livelihood of local villagers of three villages in the sanctuary and graziers are dependant upon the natural resources of the sanctuary.
Eco-tourism Spots: Phulech Thach, Galiyad and Mashiyar Villages
Eco Treks: Shurikhand Mhadev through WLS.

9.IV.7 Tirthan Wildlife Sanctuary

Year of establishment: 1976
Year of final Notification: (Section 26 of WPA, 1972): 1999: Notification.No. FFE-B-F(6)-14/99 dated 1.11.99.
Area: 61 sq km
Geographical location: District Kullu, 77°27'-77°37' E - 31°34'- 31°39' N.
Altitude: 2,100-4,800 m
Climate: Rainfall-1,500 mm; Temperature: -5to 30°C
Vegetation: Ban Oak forest; Moist deodar forest; Mixed coniferous forest, Kharsu Oak forest and Alpine and sub alpine grasslands.
Reported Fauna: Snow Leopard, Himalayan Tahr, Musk Deer, Himalayan Brown Bear and Black Bear, Western Tragopan, Cheer, Kaleej, Koklas and Himalayan birds is there for the Great Himalayan National Park Conservation Area of which the Tirthan Sanctuary is a part.

Census Figures: Black Bear (21), Barking Deer (2), Goral (23), Monal (28), Koklas (30), Kaleej (23).
Conservation Issues and Land Use: Livelihoods of local villagers and graziers are dependent upon the natural resources of the sanctuary.
Eco-tourism Spots: Shakti Village, Rakti Sar, Satogani Thach, Marore, Parkachi Thach.
Eco-treks: Gushaini-Rolla-10 km, Rolla-Nada Thach-Majhoni- Tirath-4 km.

Annexure 10: EIA clearances for Bajoli Holi 180MW HEP and an Open Access Applicant for Tranche 3 project

GMR Bajoli Holi Hydropower Private Limited

GMR

Corporate Office:
IBC Knowledge Park, Phase2, D Block
10th Floor, Bannerghatta Road,
Bangalore 560029
+91 80 40432000
+91 80 40432333
www.gmrgroup.in

Ref : GBHHPL/CON/11-12/01
Date: 19.09.2011

To,
General Manager (C&R)
H.P. Power Transmission Corporation Limited
Barowalias house Khalini Shimla-2
Himachal Pradesh.

Dear Sir,

Sub: Application for Grant of Connectivity for GMR Bajoli Holi Hydro Power Generation Plant – reg.

This is with reference to the power evacuation of upcoming GMR Bajoli Holi Hydro Power Generation Plant in Himachal Pradesh. As per the HPERC Regulations 2010 on Grant of Connectivity, we are hereby submitting the application for grant of connectivity from (3 X 60 MW) GMR Bajoli Holi Hydro Power Generation Plant to STU pooling station along with the other required information and documents.

Also find enclosed Demand draft of Rs.6 lacs (bearing no. 003060 dated 15.09.2011) towards the application fees as mentioned in your detailed procedure for obtaining Grant of Connectivity.

In this regard, we request you to process our application for grant of Connectivity.

Kindly acknowledge the receipt of the same.

Thanking you.

For **GMR Bajoli Holi Hydropower Private Limited**

(S.N.Sunkari)
General Manager - Transmission

M.D.
Dir (Plg. & C)
Dir (Proj.)
G.M. (Proj.)
Mgr (P&A)
Sr. A.O.

Encl: 1. Affidavit Format Con-1
2. Application for grant of connectivity Format Con-2
3. Demand Draft no. 002932 dated 20.08.2011
4. Documentary evidence for all the clearances and approvals received for the subject project.

Regd. Office:
Kothi House, Village Kuleth,
Sub Tehsil Holi, Tehsil Bharmour,
Chamba 176309, Himachal Pradesh

No.J-12011/86/2007-IA.I
Government of India
Ministry of Environment and Forests

Paryavaran Bhawan,
CGO Complex,
Lodhi Road
New Delhi -110 003

Date; 24th January, 2011

President (Hydro)
GMR Bajoli Holi Hydropower Private Limited,
Old udaan Bhawan
2nd Floor, Terminal 1
I G I airport, palam
New delhi-110037

Subject –Bajoli Holi Hydroelectric Project (180 MW) in Himachal Pradesh – Environment clearance reg.

Sir,

This has reference to your letter No. GMR / Hydro / 501/1248 /10 dated 22-11-2010 and subsequent letters dated 21.12.2010, 05.01.2011, and 12.1.11 on the above mentioned subject.

2. The project envisages construction of a concrete gravity dam of 66.0 m height from foundation level across Ravi river near village Bajoli and surface power house near village Holi in Chamba district for generation of 180 MW electricity. This is run off the river scheme. The length of the HRT is 15.56 km. The length of reservoir is 2.42 km. FRL is 2018.25 m and MDDL is 2012.00 m. Live storage is 0.92 MCM. The total land requirement for the project is 85.70 ha. Out of which 75.23 ha is forest land, 0.90 ha horticultural land and 9.57 ha is private land. In all there are 288 project affected families (PAFs) whose land is likely to be acquired permanently and 2 PAFs who will lose land as well as house. The rehabilitation & resettlement of project affected persons will be implemented as per NRRP, 2007.

3. The above referred proposal was considered by the Expert Appraisal Committee for River Valley & Hydroelectric Projects at its meeting held on 20th & 21st December 2010.

4. The Ministry of Environment and Forests hereby accords environmental clearance as per the provisions of Environmental Impact Assessment Notification, 2006 subject to strict compliance of the terms and conditions as follows:

Part A: Specific Conditions

(i) Catchment Area Treatment Plan as has been proposed should be completed in 5 years. The plan is given below:

Year wise target (physical) for Catchment Area Treatment Plan

Measures	Year I	Year II	Year III	Year IV	Year V	Total
	Physical	Physical	Physical	Physical	Physical	Physical
Biological measures						
Enrichment Plantations	200 ha	200 ha	200 ha	200 ha	67 ha	867 ha
Afforestation	200 ha	200 ha	200 ha	200 ha	49 ha	849 ha
Maintenance of afforestation	400 ha	400 ha	400 ha	400 ha	116 ha	1715 ha
Pasture Development	300 ha	300 ha	300 ha	300 ha	249 ha	1449 ha
Nursery development	10 no.	10 no.	-	-	-	20 no.
Maintenance of Nursery	-	-	-			
Vegetative fencing	5 km	5 km	5 km	5 km	5 km	25.0 km
Watch and ward	-	-	-	-	-	-
Engineering Measures						
Contour Bunding	140 ha	125 ha	125 ha	125 ha	125	640.0 ha
Check Dams	20 no.	20 no.	20 no.	20 no.	20 no.	100 no.

(ii) Prior approval under Forest (Conservation) Act, 1980 for diversion of forest land should be taken. No physical work will be initiated without forest clearance for this project.

(iii) In all there are 288 project affected families (PAFs) whose land is likely to be acquired permanently and 2 PAFs who will lose land as well as house. The rehabilitation & resettlement of project affected persons should be completed before commissioning of the project.

(iv) The following commitments made during the public hearing should be fulfilled:-

a) Appointment of two numbers of MD doctors and one of them shall be lady doctor. Both these doctors are to be on the pay rolls of the company.

b) Training to the 120 Nos of the local youths for the ITI course.
c) Strengthing of the existing Holi-Nayaram road, once the same is handed over to GMR after necessary clearance.

(v) Environmental flow should be 20% of the average lean season flow of 90% dependable year for four consecutive leanest months.

(vi) Biodiversity conservation & management plan as proposed in the EMP should be implemented in totality. From the study area 272 flowering plant species were recorded qwhich include 28 trees, 48 shrubs, 10 climbers and 186 herbs. However listing of bryophytes / teridophytes has not been done. This may be done and submitted within three months.

(vii) Fishery conservation & Management plan as proposed in the EMP should be undertaken in consultation with the Fisheries department, Government of Himachal Pradesh. The up gradation of existing facilities of fish firm at Holi in Chamba district should also be done to meet the demand of fish seeds.

(viii) All the equipments which are likely to generate high noise levels are to be fully mollified (noise reduction measures).

(ix) Consolidation and compilation of the muck should be carried-out in the muck dumping sites and the dumping sites should be above high flood level. The proposed plan envisages generation of total volume of Muck as 21.64 lakh cum(including 40 % swell factor). Out of which about 9.32 lacs cum of muck will be ytilised as construction material for various project components and 12.32 lacs cum of muck will be disposed off at pre designated seven number of disposal sites.

(x) Green belt development is proposed around project areas, reservoir periphery (12.00 ha) road side (13.8 nkm) and other components. The average width of the green belt around reservoir rim will be around 40 m varying from about 15 m at places to 120 m or as physiographic and land features allow. The allocated amount of R.s. 9.28 lakhs for green belt development should strictly be used for the purpose.

(xi) The environment clearance does not necessarily imply that forestry clearance shall be granted to the project and that the proposals for the forestry clearances shall be considered by respective authorities on their merit. The investment made in the project, if any, based on environmental clearance so granted, shall be entirely at the cost and risk of the project proponent

Part-B: General Conditions

(i) Adequate free fuel arrangement should be made for the labour force engaged in the construction work at project cost so that indiscriminate felling of trees is prevented.

(ii) Fuel depot may be opened at the site to provide the fuel (kerosene/wood/LPG). Medical facilities as well as recreational facilities should also be provided to the labourers.

(iii) All the labourers to be engaged for construction works should be thoroughly examined by health personnel and adequately treated before issuing them work permit.

(iv) Restoration of construction area including dumping site of excavated materials should be ensured by leveling, filling up of burrow pits, landscaping etc. The area should be properly treated with suitable plantation.

(v) Financial provision should be made in the total budget of the project for implementation of the above suggested safeguard measures.

(vi) Six monthly monitoring reports should be submitted to the Ministry and its Regional Office, Chandigarh for review.

(vii) Officials from Regional Office MOEF, Chandigarh who would be monitoring the implementation of environmental safeguards should be given full cooperation, facilities and documents / data by the project proponents during their inspection.

5. The responsibility of implementation of environmental safeguards rests fully with the M/s GMR Bajoli Holi Hydro Power Pvt. Ltd. & Government of Himachal Pradesh.

6. The total amount of Rs. 15603.28 Lakhs kept in the budgetary provisions for implementation of environmental management plan should be strictly adhered and not to be diverted for any other purpose.

7. In case of change in the scope of the project, project would require a fresh appraisal.

8. The Ministry reserves the right to add additional safeguard measures subsequently, if found necessary and to take action including revoking of the clearance under the provisions of the Environment (Protection) Act, 1986, to ensure effective implementation of the suggested safeguard measures in a time-bound and satisfactory manner.

9. This clearance letter is valid for a period of 10 years from the date of issue of this letter for commencement of construction work.

11. A copy of the clearance letter shall be sent by the proponent to concerned Panchayat, Zilla Parishad/ Municipal Corporation, Urban local body and the local NGO, if any, from whom suggestions/ representations, if any, were received while processing the proposal. The clearance letter shall also be put on the website of the Company by the proponent.

12. The proponent should advertise at least in two local newspapers widely circulated in the region around the project, one of which shall be in the vernacular language of the locality concerned informing that the project has been accorded environmental clearance and copies of clearance letter are available with the State Pollution Control Board/Committee and may also be seen at Website of the Ministry of Environment and Forests at http://www.envfor.nic.in.

13. The project proponent shall also submit six monthly reports on the status of compliance of the stipulated EC conditions including results of monitored data (both in hard copies as well as by e-mail) to the respective Regional office of MoEF, the respective Office of CPCB and the SPCB.

Yours faithfully,

(Dr. S. Bhowmik)
Additional Director &
Member Secretary,EAC

Copy to:-

1. Secretary. Ministry of Power, Shram Shakti, Bhawan, Rafi Marg, New Delhi-1.
2. The Adviser (Power), Planning Commission, Yojna Bhawan, New Delhi-1.
3. Principal Secretary (MPP & Power), Government of Himachal Pradesh, Shimla
4. The Secretary, Department of Environment, Government of Himachal Pradesh, Shimla.
5. The Chief Engineer, Project Appraisal Directorate, Central Electricity Authority, Sewa Bhawan, R.K. Puram, New Delhi-110066.
6. The Regional Office, Ministry of Environment & Forests, Chandigarh
7. Member Secretary, Himachal Pradesh State Pollution Control Board, Phase-III, Him Parivesh, New Shimla – 171 009
8. DG (FC), MoEF, New Delhi
9. ADG (WL),MoEF, New Delhi
10. EI- Division, Ministry of Environment & Forests, New Delhi-110003.
11. Guard file.

(Dr. S. Bhowmik)
Additional Director &
Member Secretary of EAC

F. No. 8-43/2011-FC
Government of India
Ministry of Environment & Forests
(FC Division)

Paryavaran Bhawan,
C.G.O Complex, Lodhi Road,
New Delhi - 110510.
Dated: 8th July, 2011

To

The Principal Secretary (Forests),
Government of Himachal Pradesh,
Shimla.

Sub: Diversion of 75.304 Ha of forest land for implementation of 180 MW Bajoli Hydro Electric Project in favour of M/s GMR Bajoli Holi Hydro Power Pvt. Limited in Bharmour Forest Division in Chamba District of Himachal Pradesh.

Sir,

I am directed to refer to the State Government's letter no. Ft.48-2232/2011 (FCA) dated 16.03.2011 on the subject mentioned above seeking prior approval of the Central Government under section-2 of the Forest (Conservation) Act, 1980, and to say that the proposal has been examined by the Forest Advisory Committee constituted by the Central Government under section-3 of the said Act.

After careful examination of the proposal of the State Government, the Central Government hereby conveys the stage-I approval for diversion of 75.304 Ha of forest land for implementation of 180 MW Bajoli Hydro Electric Project in favour of M/s GMR Bajoli Holi Hydro Power Pvt. Limited in Bharmour Forest Division in Chamba District of Himachal Pradesh subject to fulfillment of the following conditions -

1. i. The Compensatory Afforestation (CA) will be raised and maintained over double the area proposed for diversion in a degraded forest land at the cost of User Agency.

   ii. The area identified for Compensatory Afforestation shall be clearly depicted on SOI toposheet of 1:50,000 scale.

   iii. The User Agency shall transfer the cost (incorporating the current wage structure) of raising and maintaining Compensatory Afforestation to the State Forest Department.

   iv. For Compensatory Afforestation the area should not be the fragmented, it should be a contiguous patch for effective monitoring and protection.

2. The State Government shall charge the Net Present Value of the forest area diverted under this proposal from the User Agency as per the Judgement of the Hon'ble Supreme Court of India dated 28.03.2008 & 09.05.2008 in IA No. 566 in WP (C) No. 202/1995 and as per the guidelines issued by this Ministry vide letter No. 5-3/2007-FC dated 05.02.2009 in this regard.

3. The User Agency shall furnish an undertaking to pay the additional NPV, if so

determined, as per the final decision of Hon'ble Supreme Court of India.

4. All the funds received from the User Agency under the project shall be transferred to Ad-hoc CAMPA in account number **CAF SB01025210** of Corporation Bank, Block-11, CGO Complex, Phase-1, Lodhi Road, New Delhi - 110 003.

5. A cumulative study may be carried out by the State Government on behest of all project proponents on Ravi River to assess the impact on landscape in general, and wildlife and ecological aspects in specific before the final sanction is accorded. The FAC seeks special emphasis on the issues of forest fragmentation and landscape level changes due to direct and indirect impact of the project. The study should take into account on micro-hydel projects, existing and proposed in the project basin may be provided with maps.

6. R&R policy submitted by the project proponent should be fully in consonance with the National Draft R&R policy 2007.

7. The State Government shall ensure that minimum flow at all time as per the recommendation of cumulative impact assessment study.

8. The user agency shall set up Ecological Monitoring Unit to monitor the impact of the project on flora and fauna of the area.

9. The user agency shall keep the effect of camping labourers on the flora and fauna during the construction phase of 48 months at minimum by providing alternate fuel for cooking and heating.

10. The entire reservoir created due to submergence shall be declared Reserve Forest under Indian Forest Act, 1927. However, regulated fishing shall be allowed.

11. Catchment Area Treatment Plan should be implemented at the project cost under the supervision of the State Government.

12. Green belt of adequate width shall be raised by the user agency around the reservoir at the cost of the project.

13. The user agency shall carry out muck disposal at pre-designated sites in such a manner so as to avoid its rolling down.

14. The dumping area for muck disposal shall be stabilized and reclaimed by planting suitable species by the user agency at the cost of project under the supervision of State Forest Department. Retaining walls and terracing shall be carried out to hold the dumping material in place. Stabilization and reclamation of such dumping sites shall be completed before handing over the same to the State Forest Department in a time bound manner as per Plan.

15. The User agency to consult other companies having experience in construction of roads in hilly areas such as BRO to avoid frequent road blockade due to land slides etc and shall provide breast walls and retaining walls wherever necessary.

16. The user agency will obtain the clearance under the provisions of ST&OTFD

(Recognition of Forest Rights) Act, 2006 before the final approval and will submit certificate towards the settlement of all claims and rights over the proposed forest land under the Act along with the as per the advisory dated 03.08.2009 issued by MoEF.

17. Other standard conditions as applicable to proposals relating to Hydro Electric Projects will be applicable in this case also.

18. As an additional condition, the project proponent will bear the cost of regenerating an equivalent amount of open, degraded forest.

After receipt of the compliance report on fulfillment of the conditions mentioned above, the Central Government shall consider the handing over of forest land for non-forestry purposes under section-2 of the Forest (Conservation) Act, 1980.

Yours faithfully,

(H.C.Chaudhary)
Assistant Inspector General of Forests

Copy to:-

1. The Principal Chief Conservator of Forests, Himachal Pradesh, Shimla.
2. The Nodal Officer (FCA), Forest Department, Himachal Pradesh, Shimla.
3. The Conservator of Forests (Central), Northern Regional Office, Chandigarh.
4. User Agency.
5. Monitoring Cell of FC Section.
6. Guard File.

(H.C.Chaudhary)
Assistant Inspector General of Forests

HIMACHAL PRADESH
IPH DEPARTMENT

No. EE-IPH-CBA-WA-NOC- Bajoli Holi/09- 3673-78 Dated:- 25-6-11

To

M/S GMR Bajoli Holi Hydro Power Pvt. Ltd.
Karthik House,Village kuleth ,Sub-Tehsil Holi.
Tehsil Bharmour Distt. Chamba.

Subject:- Regarding issuing of No objection Certificate for the construction of Bajoli Holi HEP(180 MW) for M/S GMR Hydro Electric Project Ishwar Nagar New Delhi.

As per approval of the worthy Superintending Engineer IPH Circle Chamba vide his office letter No.SE-IPH-CBA-WS-WA-V-NOC- Bajoli Holi/2011-3687-90 dated 28.3.2011, this department has no objection for the construction of subject cited hydro Electric Power Project, but the firm shall adhere to the terms and conditions No.1 to 10 as mentioned below:-

1. The firm shall enter into legal agreement with the department in this respect.
2. The Chief Engineer I&PH Department Dharamshala Zone) Dharamshala shall be the sole adjudicator of any dispute arising during construction as well as subsequently and his decision shall be binding on all the parties.
3. In case, there is any scarcity of water due to drought or any reason, the requirement of department shall have precedence over the requirement of this project.
4. The firm shall ensure that the quantum of minimum flow of water to be released and maintained through out the year immediately downstream of the diversion site is a flow/cusec value of no less than 15% of the inflow observed in the main river water body whose water is being harnessed by this project. The firm shall also ensure adequate minimum environmental flow in the river below the diversion site to take care of aquatic life & ecology of the area.
5. **The firm shall rehabilitate /repair /compensate for the IPH assets/water resource** as well as Private Kuhls/Irrigation Schemes/Water Supply Schemes in case these are damaged or adversely affected due to construction of the project.

6. In addition to IPH Department requirement, the firm will also satisfy the requirement of private users if any.

7. If any water supply scheme or irrigation scheme is submerged/disturbed due to construction of this project U/S or D/S the project Authority will have to deposit the original cost of the scheme including its remodeling/restoration/Augmentation with IPH Department in advance before start of Bajoli Holi project and also pay the compensation claim for that as per estimate sanctioned by the department.

8. The department will have liberty to draw water from River Ravi (upstream and down stream) for construction of any water supply and irrigation scheme as and when required in future and if any scheme's source of water up and down stream the HEP get affected the executing agency will have to deposit the original cost of the scheme including its remodeling and restoration, augmentation cost, as the case may be with the department in advance and also pay the additional compensation claim for that as per estimate sanctioned by the department so as to make these facilities available to inhabitants of affected area for which the company will have no objection.

9. The present and future quantity of water for any new proposed WSS and Irrigation schemes will be tapped by the department from River Ravi up stream of the intake of the Hydro Electric Project and additional water requirement of the department will have precedence over the requirement of the proposed project. The IXPH Department reserve the right to draw as much quantity of water as required from River Ravi for preparing any new schemes.

10. The firm shall ensure for necessary infrastructure and protection work etc. needed at any stage of time to ensure the required quantity of water for any new schemes constructed by the department from River Ravi for future requirement.

11. All the documents such as resolution of concerned panchayat, MOU between Govt. of HP and of M/S GMR Hydro Electric Project, Tehsil Nagar, New Delhi have to be supplied shown by the firms in original at any stage of time.

12. The IXPH Department will not give drinking water from existing water supply scheme of this department for drinking requirement and other activities related with the project.

13. Permission to make alternative arrangement for water supply will be given subject to the condition that the arrangement will not affect adversely the existing water supply source being used by IPH department. It should be located at a sufficient distance from the existing water source in use by this department & down stream

of any existing tapped surface water sources. Moreover it will require approval of Gram Sabha of concerned Gram Panchayat.

14. Since the Bajoli Holi, HEP also involves construction of tunnel, therefore, during the process of tunneling and other construction activities of Hydro Electric Project, if any, spring source, ground water resource & surface source may gets effected as intimated by Sr. Hydrogeologist, report vide his office letter No.IPH-GWO-F-32/2010-2284-85 dated 26.2.2010, then the firm has to make permanent arrangement for the effected habitants for their drinking/irrigation water needs before restarting of the tunneling and construction process. Also till permanent arrangement is made for the above said purpose, immediate temporary arrangements of drinking water has to be made by the firm.

15. The firm shall ensure that it will fulfill/satisfy all the conditions, if any, contained in Gram Sabha resolutions of Panchayat(i.e 1. GP Deol, 2.GP Bajol 3.GP Nayagram, 4. G.P Kuleth, 5. GP Holi).

16. In the event of violation of any of the aforesaid terms and conditions of the NOC by the firm the NOC shall be treated as cancelled.

DA: Nil

Executive Engineer
IPH Division Chamba

Copy to the Principal Secretary (IPH) to the Govt. of Himachal Pradesh Shimla -2 with reference to Superintending Engineer IPH Circle Chamba office letter No. 3687-90 dated 28.3.2011 for information please.

Copy to the Engineer in Chief IPH Department, H.Q. Club Shimla-2 for information please.

Copy is forwarded to the Chief Engineer (N), I&PH Department Dharamshala for information please.

Copy to the Superintending Engineer IPH Circle Chamba for kind information with reference to his office letter referred to above.

Copy to the Assistant Engineer IPH Sub-Division Bharmour Chamba for information.

DA:Nil

Executive Engineer
IPH Division Chamba

Annexure 11: Application for Connectivity for Associated Hydropower Projects to HPPTCL system

(Text Taken from HPPTCL Website: www.hpptcl.gov.in)

HPPTCL

H.P. Power Transmission Corporation Limited
(A State Government Undertaking)
Barowalias House, Khalini, Shimla-171002
(Telefax: 0177-2626284

Procedure for Making Application for Grant of Long Term Open Access

PROCEDURE FOR MAKING APPLICATION FOR GRANT OF CONNECTIVITY IN INTRA-STATE TRANSMISSION SYSTEM (IaSTS)

PROCEDURE FOR MAKING APPLICATION FOR GRANT OF CONNECTIVITY IN IaSTS

1 OUTLINE

1.1 This Procedure is in accordance with the various provisions of the "H.P. State Electricity Regulatory Commission (Grant of Connectivity, Long-term Access and Medium-term Open Access in intra-state Transmission and related matters) Regulations, 2010, here in after referred to as "the Regulations". All applicants shall abide by the provisions of the Regulations.

1.2 This Procedure shall apply to the Applications made for Grant of Connectivity to the transmission lines or associated facilities of the Intra-State transmission system (IaSTS), received by the State Transmission Utility (STU) on or after the date notified by the Commission of coming into force of the Regulations.

1.3 Application for grant of connectivity can be made by:

1.3.1 A Generating station of installed capacity **2 MW** and above, including a captive generating plant of exportable capacity of **2 MW** and above.

1.3.2 A bulk consumer who intends to avail supply of a minimum load of **2 MW** from the Intra-State Transmission System.

1.4 The applicant (Generator/bulk consumer) aTeady connected to grid or state grid or for which connectivity is aTeady granted under the present arrangement, shall not be allowed to apply for additional connectivity for the same capacity. In case of extension of capacity of generator or bulk consumer, however, it shall be required to make application for connectivity as per the provisions of these procedures.

1.5 The nodal agency for grant of Connectivity, Long-term access and Medium-term open access to the intra-state transmission system shall be the STU i.e. HPPTCL (H. P. POWER

TRANSMISSION CORPORATION LTD. Barowalias House Khalini Shimla-2).

1.6 Applicant granted "Connectivity" will be required to sign "Connection Agreement" with STU prior to the physical inter-connection. In case the connectivity is granted to the laSTS of an intra -State transmission licensee/Distribution licensee other than the STU, a tripartite Agreement shall be signed between the applicant, the State Transmission Utility and such Intra-State transmission licensee/ Distribution licensee,in line with the provisions of the Regulations. After signing of the Agreement, STU will provide a copy of the same to the concerned SLDC.

1.7 The scheduling jurisdiction and procedure, metering, energy accounting and accounting of Unscheduled Interchange (UI) charges would be as per the relevant HPERC Regulations and the State Grid Code/Indian Electricity Grid Code, as amended from time to time.

1.8 The applicant shall have to comply with the provisions of the Regulations, concerned with the MTOA & LTOA framed by HPERC/CERC from time to time and their amendments.

1.9 **Joint Mode Evacuation: -** The Application of IPP's who construct their projects in the same zone can also apply for connectivity jointly. The IPP's has to const. their own pooling station a/w dedicated feeder up to the inter-connection points or up to the point allotted by the STU/Distribution licensee as mutually agreed. The contract Agreement shall be signed by the STU and the nominated member /authorized person of the IPP's. The other guide lines as per HPERC (Power Procurement from Renewable Sources and Co-generation by distribution Licensee Regulation, 2007 /CERC issued time to time shall be followed.

2. INFORMATION REQUIRED TO BE SUBMITTED WITH THE APPLICATION FOR CONNECTIVITY BY GENERATING STATION.

2.1 In order to assess preparedness of applicant making application for the connectivity to the laSTS, an applicant is required to submit along with its application, documents in support of having initiated specific actions for project preparatory activities in respect of matters mentioned in (i) to (vi) below.

i) **Site identification and land acquisition:** The applicant shall inform land required for the generation project along with extent to which the same have been acquired and taken possession of. The "Requirement" of land would be considered as indicated in the proposal filed with the competent authority for seeking environmental clearances. In case of land to be acquired under the **Land Acquisition Act 1894, the applicant shall submit copy of notification issued for such land under Section - 4 of the Land Acquisition Act 1894** In all other cases, the applicant shall fUrnish documentary evidence in the form of certificate by concerned and competent revenue / registration authority for the acquisition / ownership / vesting of the land.

ii) **Environmental clearance for the power station:** The applicant shall have to inform status on submission of requisite proposal, for the environmental clearance, to the concerned administrative authority (first level submission).

iii) **Forest Clearance (if applicable) of the land for the power station:** The applicant shall have to inform status on submission of requisite proposal, for the forest clearance, to the concerned administrative authority (first level submission).

iv) **Fuel Arrangements:** Details on fuel arrangements shall have to be informed for the quantity of fuel required to generate power from the power station for the total installed capacity intended for connectivity.

v) **Water linkage:** The applicant shall inform the status of approval from the concerned irrigation department or any other relevant authority for the quantity of water required for the power station. These evidences shall be supported by a sworn affidavit by the generation project developer as per the format given at **"FORMAT-CONNECTIVITY-1".**

vi) **Other Statutory clearance:-** The Applicant shall also provide the necessary approvals from the concerned Deptt/local authorities as applicable:-

a) Forest clearance form Forest Department.
b) TEC clearances from Energy Directorate
c) CEA clearance
d) NOC from local authorities /Panchayat/IPH/B&R Deptt.
e) Government Clearance for muck disposal
f) Wild life clearances
g) Aviation clearance
h) Others, if any as applicable or as decided by the STU

3. SUBMISSION OF APPLICATION

3.1 The application for Grant of Connectivity to laSTS should be submitted in a sealed envelope with "Application for Grant of Connectivity" clearly marked on the envelope. The application shall be addressed to:

The General Manger (Planning & Contract)
H. P. Power Transmission Corporation Limited
Barowalias house Khalini Shimla-2
Himachal Pradesh Ph. No. 0177-2620227
Fax: 0177 — 2626284

3.2 The application for Grant of Connectivity to laSTS shall be made as per the application format for connectivity and shall contain details such as, geographical location of the generation project, unit-wise commissioning schedule, etc. **[FORMAT-CONNECTIVITY-2:** Application shall be accompanied by a non-refundable fee as specified in the Regulations i.e.

3.3 "Application for Grant of Connectivity"

Sr. No.	Quantum of Power to be injected/off taken into/from State Transmission system	Application Fees (Rs. Lakhs) Non-refundable
1	2 MW to 5 MW	2.00
2	More Than 5MW and up to 10 MW	4.00
3	More Than 10 MW and above.	6.00

3.4 Application fees are to be paid through Demand Draft or directly credited to H. P. POWER TRANSMISSION CORPORATION LTD. Account electronically through RTGS (Real-time gross settlement) as per details given below:

a) Payee : H. P. Power Transmission Corp. Ltd. Shimla-2
b) Name of Bank : State Bank of India, Shimla.

c) Branch : New Shimla-2.
d) IFSC : SBIN0004122
e) A/c No. : MCA 30731547992

Provided that proof of payment directly credited to above H. P. POWER TRANSMISSION CORPORATION LTD. account must be attached with the application.

3.5 All applications received during the month shall be treated to have been made concurrently.

3.6 An incomplete Application, and/or an Application not found to be in conformity with these Procedures and Regulations, shall be rejected.

4. CHANGES TO THE APPLICATION ALREADY MADE

4.1 Any material change in the location of the generation project/drawl point or change(by more than **2 MW)** in the quantum of power to be interchanged with the intra-State transmission system shall require filing of fresh application along with applicable fees and the already filed application shall be considered disposed and application fee shall be forfeited.

4.2 If any applicant has aTeady been granted connectivity but the process of construction by the STU or intra-state licensee other than the STU has not yet started and the applicant subsequently applies afresh with material changes or change by more than **2 MW** in the quantum of power to be interchanged as provided above in para 4.1, then the aTeady granted connectivity shall stand cancelled.

4.3 Application for any minor changes, i.e. material change in location or change in installed capacity of **2 MW** shall have to be submitted in the same application format **[FORMAT-CONNECTIVITY -2**: "Application for Grant of Connectivity"]

5. GRANT OF CONNECTIVITY

5.1 On receipt of the application, the STU shall, in consultation and through coordination with other agencies involved in Intra-State transmission system to be used, including Distribution Licensee/CTU or other transmission licensees , STU shall process the application and carry out, as the case may be the necessary inter-connection study as specified in the Central Electricity Authority Technical Standards for Connectivity to the Grid) Regulations, 2007 or the Himachal Pradesh Electricity Distribution code 2009/ the Grid code, 2008.

5.2 The intimation for grant of connectivity shall be communicated to the applicant within **60 days** from last day of the month in which the application has been received as per **FORMAT-CONNECTIVITY -3.**

5.3 Applicant given intimation for Connectivity to the grid shall have to fUrnish additional details to STU for signing of **"Connection Agreement"** as per format given at **FORMAT-CONNECTIVITY -4,** These details are to be fUrnished to STU at least **2 (two) years** prior to physical interconnection, unless otherwise indicated by STU. The Applicants are, however advised to fUrnish such details as early as possible for enabling them to have lead time for any type of access.

5.4 The STU will process the above information and will intimate the Connection details as per format given at **FORMAT-CONNECTIVITY -5.** Pursuant to such Connection details, the

applicant shall have to sign "Connection Agreement" with STU prior to the physical inter-connection as per format given at **"FORMAT-CONNECTIVITY -6".** In case the connectivity is granted to the laSTS of an Intra-State transmission licensee other than the STU, a **tripartite agreement** shall be signed between the applicant, the State Transmission Utility and such intra-State transmission licensee, in line with the provisions of the Regulations. After signing of the Agreement, STU will provide a copy of the same to the concerned SLDC.

6. INTERCHANGE OF POWER WITH THE INTRA STATE TRANSMISSION SYSTEM

6.1. The grant of connectivity shall not entitle an applicant to interchange any power with the grid unless it obtains long-term access, medium-term open access or short-term open access.

6.2. However, generating station, including captive generating plant, which has been granted connectivity to the grid shall be allowed with the consent of SLDC/Distribution Licensee to undertake interchange of power including drawl of power for commissioning activities and injection of infirm power in to the grid during full load testing before being put into commercial operation, even before availing any type of open access, after obtaining permission of the concerned State Load Dispatch Centre., which shall keep grid security in view while granting such permission. This infirm power from a generating station or a unit thereof, other than those based on non-conventional energy sources, the tariff of which is determined by the State Electricity Regulatory Commission, will be governed by the H.P. State Electricity Regulatory Commission (Terms and Conditions for determination of Transmission Tariff) Regulations, 2007. The power injected into the grid from other generating stations during such testing shall also be charged at UI rates.

6.3. The Generating Station including Captive Generating Station shall submit likely date of synchronization, likely quantum and period of injection of infirm power before being put into commercial operation to the concerned SLDC at least one month in advance.

7. CONSTRUCTION OF DEDICATED TRANSMISSION SYSTEM

7.1. An applicant may be required by the STU to construct a dedicated system to the point of **Inter-connection** to enable connectivity to the grid which shall be owned operated and maintained by the applicant.

7.2. However, a thermal generating station of **250 MW** and above and a hydro generating station of **100 MW** and above, other than a captive generating plant, shall not be required to construct a dedicated line to the point of connection and such stations shall be taken into account for coordinated transmission planning by the STU and CEA.

7.3. In all the cases where dedicated transmission system up to point of connection is to be undertaken by STU / Intra-State Transmission licensee, the applicant after grant of connectivity shall sign transmission agreement as per the format given at **FORMATCON-8** within **one month** of the grant of connectivity. Further applicant shall fUrnish Bank Guarantee (BG) for the amount EITHER (a) at the rate of **Rs. 2 Lakhs/MW** (or such amount as amended from time to time, with the approval of the Commission) if the connectivity requires transmission lines up to **20 km** OR (b) at the rate of Rs. **5 lakhs/MW** (or amount as amended from time to time in the Regulations if the connectivity requires transmission lines more than **20 km.** The BG as per format given at **"FORMAT-CONNECTIVITY -7"** should be made in favour of STU / Transmission licensee within one month of signing of transmission agreement with validity up to commissioning of above transmission system. In case application for Grant of Connectivity and Grant of Long Term Access

are made concurrently or after a time gap, then the requirement of submission of above BG should be read in conjunction with the clause for Bank Guarantee of Rs. **5 lakhs/MW** for construction/augmentation of transmission system under "Procedure for Grant of Long Term Access". In such cases the total BG required to be submitted for both the construction of dedicated line as well as for augmentation of transmission system together, at any time, shall not exceed Rs. **5 Lakhs/MW.** The time frame for commissioning of above dedicated transmission system from the signing of Bulk Power Transmission Agreement (BPTA Owould be **9 months** plus the time lines as specified by HPERC in tariff regulations or actual date of commissioning desired by the applicant and agreed to by the STU, whichever is earlier. If the applicant is not able to complete the process which is beyond the control of the company or the applicant or Intra-State transmission licensee/Distribution licensee as the case may be, which could not be foreseen or with a reasonable amount of diligence could not have been foreseen and which substantially affects the performance of the agreement. Force Majeure events would include:

- Natural phenomenon including but not limited to floods, droughts, earthquake and epidemics;
- war (whether declared or undeclared), invasion, armed conflict or act of foreign enemy in each case involving or directly affecting India, revaluation, riot, insurrection or other civil commotion, act of terrorism or sabotage in each case within India;
- Nuclear explosion, radioactive or chemical contamination or ionizing radiation directly affecting the generation station, captive generating plant or bulk consumer, Intra-State transmission system of the STU or Intra -State Transmission licensee / Distribution licensee other than STU, or any facility or system that is integral to and substantial for the performance of this agreement.
- Any event or circumstances of nature analogues to any events set forth above within India.
- Provided either party shall within fifteen (15) days from the occurrence of such a Force Majeure event notify the other in writing of such cause(s).

Neither of the parties shall be liable for delays in performing obligations on account of any force majeure causes as referred to and/or defined above.

7.4. If dedicated line is to be constructed and terminated by the applicant as per the Connection Agreement, the modifications at the Inter- connection point required to be under taken by STU/Distribution Licensee would be undertaken on deposit of estimated cost by applicant. In this case there shall be no requirement of BG.

7.5. Provided further that if the dedicated transmission system is also used by any other user(s) at a later date, then the transmission charges for above dedicated transmission system would be shared in proportion to the quantum of power injected by respective user into the grid, as per the system in vogue at that time.

8. GENERAL

8.1. The applicant shall keep the STU/nodal agency and HPSLDC indemnified at all times and shall undertake to indemnify, defend and keep the nodal agency, SLDC harmless from any and all damages, losses, claims and actions including those relating to injury to or death of any person or damage to property, demands, suits, recoveries, costs and expenses, court costs, attorney fees, and all other obligations by or to third parties, arising out of or resulting from such grant of connectivity.

8.2. All costs/expenses/charges associated with the application, including bank draft, bank guarantee etc. shall be borne by the applicant.

8.3. The applicant shall abide by the provisions of the Electricity Act, 2003, the HPERC Regulations/Central Electricity Authority Technical standards for connectivity to grid regulation, 2007 or H.P. Electricity Distribution Code, 2009 and Grid Code, 2008 /Indian Electricity Grid Code, as amended from time to time.

8.4. This procedure aims at easy and pragmatic disposal of applications made for Connectivity to laSTS. However, some teething problems may still be experienced. The various implications would be known only after practical experience is gained by way of implementing these procedures. In order to resolve the same, this procedure shall be reviewed or revised by the Nodal agency with prior approval of HPERC.

8.5. All complaints regarding unfair practices, delays, discrimination, and lack of information, supply of wrong information or any other matter related to grant of connectivity to laSTS shall be directed to HPERC for redressal.

Annexure 12: Forest Clearances for Tranche 3 Transmission Line projects awarded to HPPTCL

12.1: 220 kV D/C Transmission Line Holi Bajoli to GIS Pooling Station at Lahal

भारत सरकार
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय
क्षेत्रीय कार्यालय (उत्तर–मध्य क्षेत्र)
25 सुभाष रोड, देहरादून–248001
दूरभाष 0135–2650809
फैक्स–0135–2653010
ईमेल - moef.ddn@gov.in

GOVERNMENT OF INDIA
MINISTRY OF ENVIRONMENT, FOREST & CLIMATE CHANGE
REGIONAL OFFICE (NORTH CENTRAL ZONE
25 SUBHASH ROAD, DEHRADUN-248001
PHONE- 0135-2650809
FAX- 0135-2653010
Email- moef.ddn@gov.in

पत्र सं0 08बी/एच.पी./04/86/2017/1114 दिनांक 26/09/2017

सेवा में,

अतिरिक्त मुख्य सचिव (वन)
हिमाचल प्रदेश सरकार,
आइसडेहल बिल्डिंग, शिमला।

विषय : Diversion of 30.6321 ha of forest land for the construction of 220 KV D/C Transmission Line from Holi Bajoli HEP to 33/220/400 KV, GIS Pooling Sub Station Lahal at Bharmour in favour of HP Power Transmission Corporation Limited, within the jurisdiction of Bharmour Forest Division and District Chamba, H.P.

सन्दर्भ : नोडल अधिकारी एवम् प्रधान मुख्य वन संरक्षक (एफ.सी.ए.), हि0प्र0 के पत्रांक एफ.टी. 48–3166/2015 (एफ.सी.ए.) दिनांक 12.07.2017.

महोदय,

उपरोक्त विषय पर ऑनलाइन प्रस्ताव संख्या– FP/HP/Trans/14716/2015 तथा नोडल अधिकारी एवम् प्रधान मुख्य वन संरक्षक (एफ.सी.ए.), हि0प्र0 के संदर्भित पत्र का अवलोकन करने का कष्ट करें जिसके द्वारा विषयांकित प्रस्ताव पर केन्द्र सरकार से वन (संरक्षण) अधिनियम, 1980 की धारा–2 के तहत स्वीकृति मांगी थी।

इस विषय में मुझे यह सूचित करने का निर्देश हुआ है कि प्रश्नगत प्रकरण पर समय–समय पर राज्य सरकार से आवश्यक जानकारियां/दस्तावेज मंगवाये जाते रहे हैं, जिनके प्राप्त होने के उपरान्त तथा प्रस्ताव पर Regional Empowered Committee (REC) की दिनांक 23, सितंबर 2017 को हुई बैठक में संस्तुति होने के उपरान्त केन्द्र सरकार **Diversion of 30.6321 ha of forest land for the construction of 220 KV D/C Transmission Line from Holi Bajoli HEP to 33/220/400 KV, GIS Pooling Sub Station Lahal at Bharmour in favour of HP Power Transmission Corporation Limited, within the jurisdiction of Bharmour Forest Division and District Chamba, H.P** हेतु **सैद्धान्तिक स्वीकृति** निम्नलिखित शर्तों पर प्रदान करती है:–

1. वन विभाग द्वारा प्रस्तावित वन भूमि के दुगुने वन भूमि पर अर्थात् 61.56 हे0 (Khani Phat -11.50 ha + Dhrun - 10.00 ha + Ratten -10.10 ha + Mehtra -9.98 ha + Khni Phat -10.00 ha + Gagalas PF -10.00 ha) in Bharmour range पर प्रतिपूरक वृक्षारोपण एवं उसके 07–10 वर्षों तक रखरखाव हेतु (वर्तमान दरों को समाहित करते हुए यथासंशोधित) प्रयोक्ता अभिकरण से आवश्यक धनराशि जमा कराई जायेगी।
2. प्रतिपूरक वृक्षारोपण में कम से कम 40% पौधे ओक प्रजाति के लगाए जाएंगे।
3. प्रयोक्ता अभिकरण द्वारा भारत सरकार के पत्र संख्या 5–3/2007–एफ.सी. दिनांक 05.02.2009 के तहत दिये गये आदेशानुसार शुद्ध वर्तमान मूल्य (एन.पी.वी.) की निर्धारित राशि जमा की जायेगी।
4. शुद्ध वर्तमान मूल्य की दर में अगर बढ़ोतरी होती है, तो बढ़ी हुई दर के अनुसार अतिरिक्त धनराशि प्रयोक्ता अभिकरण द्वारा जमा की जायेगी। इस आशय की प्रयोक्ता अभिकरण द्वारा वचन बद्धता प्रस्तुत की जाए।
5. प्रयोक्ता अभिकरण द्वारा प्रस्तावित ट्रांसमीशन लाईन के नीचे, RoW के अंदर जहाँ–जहाँ संभव हो, वहाँ पौधों (मुख्यत औषधीय पौधों) के रोपण एवम् 7–10 वर्षों तक रख–रखाव हेतु आवश्यक धनराशि (वर्तमान दरों को समाहित करते हुए यथासंशोधित) जमा की जाएगी। इस कार्य के लिए वन विभाग द्वारा तैयार की गई वृक्षारोपण योजना एवम् प्राक्कलन, जिसके आधार पर प्रयोक्ता अभिकरण से राशि प्राप्त की जाएगी, की एक प्रति रिकार्ड हेतु इस कार्यालय को प्रेषित की जाएगी।
6. प्रयोक्ता अभिकरण द्वारा भारत सरकार पत्र संख्या 5–3/2007–एफ.सी. दिनांक 05.02.2009 के तहत दिये गये आदेशानुसार शुद्ध वर्तमान मूल्य (एन.पी.वी.) तथा दूसरी सभी निधियां प्रतिपूर्ति वृक्षारोपण निधि प्रबन्धन तथा योजना प्राधिकरण (CAMPA) के तदर्थ निकाय खाते में **Online Portal के माध्यम द्वारा जो चालान Generate होता है उसी के माध्यम से किया जाना आवश्यक है**, जिसकी सूचना इस कार्यालय को प्रेषित की जाए।

कमलप्रीत
25/9/17

उपरोक्त सभी शर्तों की पूर्ण एवं बिन्दुवार सुस्पष्ट परिपालन आख्या प्राप्त होने पर ही वन (संरक्षण), अधिनियम, 1980 के तहत विधिवत स्वीकृति जारी की जायेगी। कृपया अपूर्ण परिपालना आख्या इस कार्यालय को प्रेषित न की जाये। राज्य सरकार द्वारा विधिवत् स्वीकृति तथा प्रयोक्ता अभिकरण को वन भूमि हस्तान्तरण की कार्यवाही तब तक नही की जायेगी जब तक वन भूमि हस्तान्तरण की विधिवत् स्वीकृति भारत सरकार द्वारा जारी नहीं की जाती।

राज्य सरकार द्वारा सैद्धान्तिक स्वीकृति की अनुपालन आख्या प्राप्त होने के पश्चात् विधिवत् स्वीकृति अन्य आवश्यक शर्तो सहित निम्नलिखित शर्तो के साथ प्रदान की जायेगी:-

1. वन भूमि की विधिक परिस्थिति नही बदली जाएगी।
2. प्रतिपूर्ति पौधारोपण प्रस्ताव के अनुसार 61.56 है0 प्रतिपूर्ति पौधारोपण (Khani Phat -11.50 ha + Dhrun -10.00 ha + Ratten -10.10 ha + Mehtra -9.98 ha + Khni Phat -10.00 ha + Gagalas PF -10.00 ha) in Bharmour range एवं ट्रांसमिशन लाइन के नीचे बौने पौधे (मुख्यत: औषधीय पौधे) पौधारोपण इस पत्र के जारी होने की तिथि से एक से दो वर्षो के अन्दर पूर्ण किया जाना चाहिए।
3. Below each conductor or conductor bundle, 3m width clearance would be permitted for stringing purpose within the approved RoW.
4. The trees on such strips would have to be felled but after stringing work is completed, natural regeneration will be allowed to come up. Felling/pollarding/pruning of trees will be done with the permission of the local forest officer, wherever necessary, to maintain the electrical clearance. One outer strip shall be left clear to permit maintenance of the transmission line.
5. During construction of transmission line, pollarding/pruning of trees located outside the above width of the strips, whose branches/parts infringe with conductor stringing, shall be permitted to the extent necessary, as may be decided by local forest officer.
6. Pruning of trees for taking construction/stringing equipments through existing approach/access routes in forest areas shall also be permitted to the extent necessary, as may be decided by local forest officer. Construction of new approach/access route will however, require prior approval under the Act.
7. In the remaining width of right of way trees will be felled or lopped within the RoW to the extent required, for preventing electrical hazards by maintaining minimum clearance between conductor and trees as follows: 4.00 m for 220 KV.
8. In the case of transmission lines to be constructed in hilly areas, where adequate clearance is already available, trees will not be cut except those minimum required to be cut for stringing of conductors.
9. एन.पी.वी. की दरो मे अगर बढोतरी होती है तो प्रयोक्ता अभिकरण बढी दरो पर एन.पी.वी. देने के लिए बाध्य होगा।
10. प्रयोक्ता अभिकरण द्वारा प्रस्तावित वन क्षेत्र के आस-पास मजदूरों/स्टॉफ के लिये किसी भी प्रकार का लेबर कैम्प नही लगाया जायेगा।
11. प्रयोक्ता अभिकरण के द्वारा निर्माण कार्य के दौरान स्थल पर कार्यरत मजदूरो एवं स्टॉफ के लिये रसोई गैस/कैरोसिन तेल की आपूर्ति की जायेगी, जिससे निकटवर्ती वनो को क्षति न पहुँचे।
12. परियोजना के निर्माण व रख-रखाव के दौरान आस-पास के क्षेत्र की वनस्पतियों एवं जीव-जन्तुओ को किसी प्रकार की क्षति नही पहुचायी जायेगी।
13. वन भूमि का प्रयोग प्रस्ताव मे दर्शाये गये उद्देश्य के अलावा अन्य किसी उद्देश्य के लिए नही किया जायेगा।
14. कम से कम वृक्षो का कटान/पातन किया जाएगा, जिनकी संख्या प्रस्ताव के अनुसार 135 trees से अधिक न हो।
15. प्रयोक्ता अभिकरण वन विभाग की देख-रेख मे प्रत्यावर्तित भूमि का RCC Pillar लगाकर सीमांकन करेगा जिन पर Pillar no., Forward तथा Back bearing तथा distance between pillars भी अंकित किया जाएगा।

Amandeep
25/05/17

16. परियोजना निर्माण से उत्सर्जित मलवे का निस्तारण प्रयोक्ता अभिकरण द्वारा प्रस्तुत मलवा निस्तारण योजना के अनुसार प्रभागीय वनाधिकारी की देख–रेख में किया जाएगा एवं निर्दिष्ट स्थानों के अलावा अन्यत्र मलवा नहीं फेंका जाएगा।

17. यदि कोई अन्य सम्बन्धित अधिनियम/अनुच्छेद/नियम/न्यायालय आदेश/अनुदेश आदि इस प्रस्ताव पर लागू होते है तो उनके अधीन जरूरी अनुमति लेना राज्य सरकार/प्रयोक्त एजेंसी की जिम्मेवारी होगी।

18. ऐसी कोई भी अन्य शर्त जो भारत सरकार भविष्य में पर्यावरण, वन एवम् वन्य जीवो के संरक्षण हेतु आवश्यक समझे।

यदि विधिवत् स्वीकृति में दी गई शर्तों का संतोषजनक अनुपालन नहीं किया जाता है तो स्वीकृति को तत्काल प्रभाव से निरस्त किया जा सकता है।

भवदीया,

(कमल प्रीत)
वन संरक्षक

प्रतिलिपि सूचनार्थ एवं आवश्यक कार्यवाही हेतु प्रेषित:

1. अपर वन महानिदेशक (एफ०सी०), पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय, इन्दिरा पर्यावरण भवन, जोरबाग रोड, अलीगंज, नई दिल्ली।
2. नोडल अधिकारी एवं अपर प्रधान मुख्य वन संरक्षक (एफ.सी.ए) हिमाचल प्रदेश सरकार, वन विभाग, टाईप, शिमला।
3. आदेश पत्रावली।

(कमल प्रीत)
वन संरक्षक

12.2: 400 kV D/C Transmission Line GIS Pooling Station at Lahal to PGCIL Pooling Station at Rajera (Chamera II)

MINUTES OF THE 22nd MEETING OF THE REGIONAL EMPOWERED COMMITTEE (REC) OF REGIONAL OFFICE, NORTH CENTRAL ZONE, DEHRADUN HELD ON 21st NOVEMBER, 2017

The 22nd meeting of the Regional Empowered Committee (REC) of the Regional Office, North Central Zone, Dehradun was held on 21st November, 2017 at Regional Office, Dehradun under the Chairmanship of Shri Ajay Kumar, Addl. PCCF, Regional Office, Dehradun.

Following official/non-official members & the special invitees were present in the meeting.

S.No.	Name	Designation
1.	Shri Ajay Kumar, Addl. PCCF, R.O., Dehradun	Chairman
2.	Shri Parveen Thapliyal, IFS (Retd.)	Non-official Member
3.	Dr. G.S. Rawat, IFS (Retd.)	Non-official Member
4.	Dr. S. P. Singh	Non-official Member
5.	Ms. Kamal Preet, CF, R.O., Dehradun	Member
6.	Shri. M. S. Negi, CF, R.O., Dehradun	Special Invitee
7.	Shri. Vinod Singhal, Addl.PCCF & N.O., Uttarakhand	Special Invitee
8.	Shri. Satish Gupta, DCF (FCA), H.P.	Special Invitee
9.	Representatives of the User Agencies	

1 |

The following proposals seeking diversion of forest land for non-forest purposes pertaining to Himachal Pradesh and Uttarakhand were discussed in detail and the case wise decision taken by REC is as under :-

HIMACHAL PRADESH

Agenda No. 1: Diversion of 78.8158 ha of forest land for the construction of 400 KV D/C Transmission Line from 33/220/400 KV GIS pooling substation Lahal to 400 KV PGCIL pooling substation Chamera-II (Rajera in Distt. Chamba) in favour of HPPTCL within the jurisdiction of Bharmour and Chamba Forest Division, Distt. Chamba, Himachal Pradesh. (Online Proposal No.- FP/HP/TRANS/17432/2016)

Regional Empowered Committee discussed the proposal seeking diversion of 78.8158 ha of forest land for construction of 400 KV D/C Transmission Line from 33/220/400 KV GIS pooling substation Lahal to 400 KV PGCIL pooling substation Chamera-II (Rajera in Distt. Chamba). The committee noted that 428 (Bharmour Forest Division- 183 trees and Chamba Forest Division- 245 trees) trees are proposed to be felled in the project) and that the forest land proposed for diversion is not a part of any Protected Area and no rare and endangered species of flora and fauna have been reported.

The committee was apprised that the case was earlier discussed in REC meeting held on 30.10.2017 and was deferred for want of documents requested vide online quarry dated 18.10.2017 of the Regional Office. The documents have since been submitted by the state government except those pertaining to FRA and corrected area for CA without VDF/MDF. On DSS for revised area proposed for CA by the state government, it is observed that in Chamba forest division, 09 ha area is having VDF and another 5 ha area comes under MDF which is not suitable for CA. The representative of the user agency attending the meeting submitted a copy of the letter from DFO Chamba, stating the status of vegetation density in the area proposed for CA. The representative of the Nodal Officer, Shimla was informed that the same may be forwarded to the Regional Office alongwith comments.

After detailed discussion on various aspects of the proposal, the committee decided to approve the proposal 'in-principle' subject to submission of following documents information clarifications:

1. *The State Government will submit the FRA certificate in original alongwith all annexures as per prescribed formate and also upload the same online.*
2. *The State Government will submit revised CA area without having VDF MDF.*