INTER-AMERICAN DEVELOPMENT BANK

PERU

CHAGLLA HYDROPOWER PROJECT

(PE-L1113)

ENVIRONMENTAL CATEGORY: A

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ENVIRONMENTAL AND SOCIAL MANAGEMENT REPORT
(ESMR)

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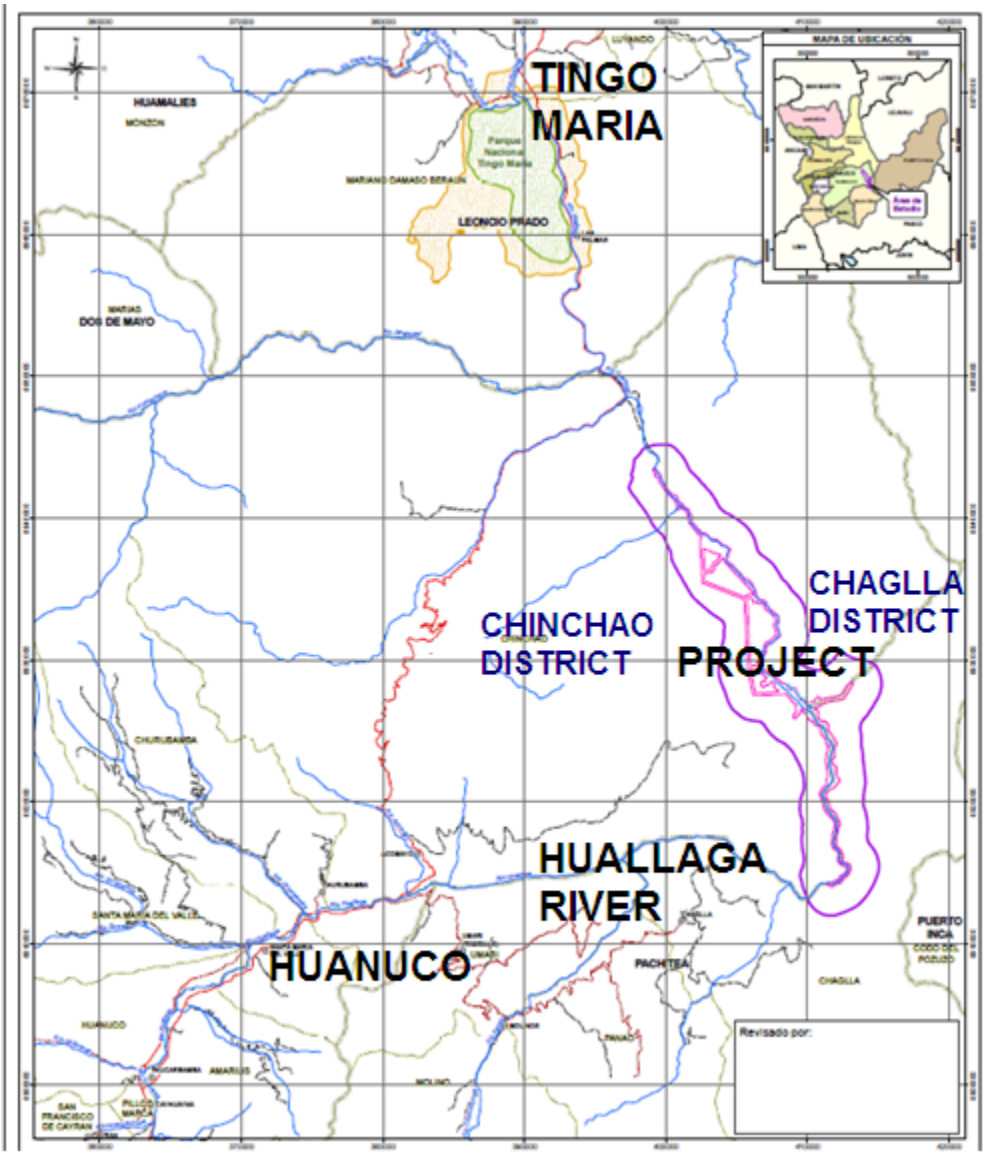
Abbreviations

DHI	Danish Hydraulic Institute
ECR	Environment and Community Relations
EGH	Empresa de Generación Huallaga
EIA	Environmental Impact Assessment
EPC	Engineering, Procurement and Construction
ESMP	Environmental and Social Management Plan
FSL	Full Supply Level
GHG	Greenhouse Gases
IBA	Important Bird Area
ICIM	Independent Consultation and Investigation Mechanism
ICOLD	International Commission on Large Dams
IFIM	In-stream Flow Incremental Methodology
ITCZ	Inter-Tropical Convergence Zone
IUCN	International Union for Conservation of Nature
MINEM	Ministry of Energy and Mines
OPIC	Odebrecht Perú Ingeniería y Construcción
PCA	Priority Conservation Area
PHABSIM	Physical Habitat Simulation System Model
RAP	Resettlement Action Plan
SEIN	Sistema Eléctrico Interconectado Nacional
SINANDE	Servicio Nacional de Áreas Naturales Protegidas por el Estado
USAID	United States Agency for International Development

1. INTRODUCTION

1. ***Overview of the Operation.*** The Chaglla Hydroelectric Project in Peru (the "Project") consists in the construction and operation of a dam and 406 MW hydroelectric power plant on the Huallaga River, in the Chaglla and Chinchao districts of the department of Huánuco, Peru. The main components of the Project will be constructed between 800 and 1,000 m above sea level on the left bank of the Huallaga River, on the territory of the rural community of Pillao. The Project is developed by *Empresa de Generación Huallaga* ("EGH" or the "Borrower"), a subsidiary of the Odebrecht group incorporated under Peruvian law. Project construction of the Chaglla hydropower plant is estimated to begin in June 2011. The plant is expected to be commissioned in January 2016, at a gross production rate around 2,545 GWh annually.



2. OPERATION DESCRIPTION

2. The Project includes three main components: the Hydropower Facility, the Transmission Line and the Access Roads.

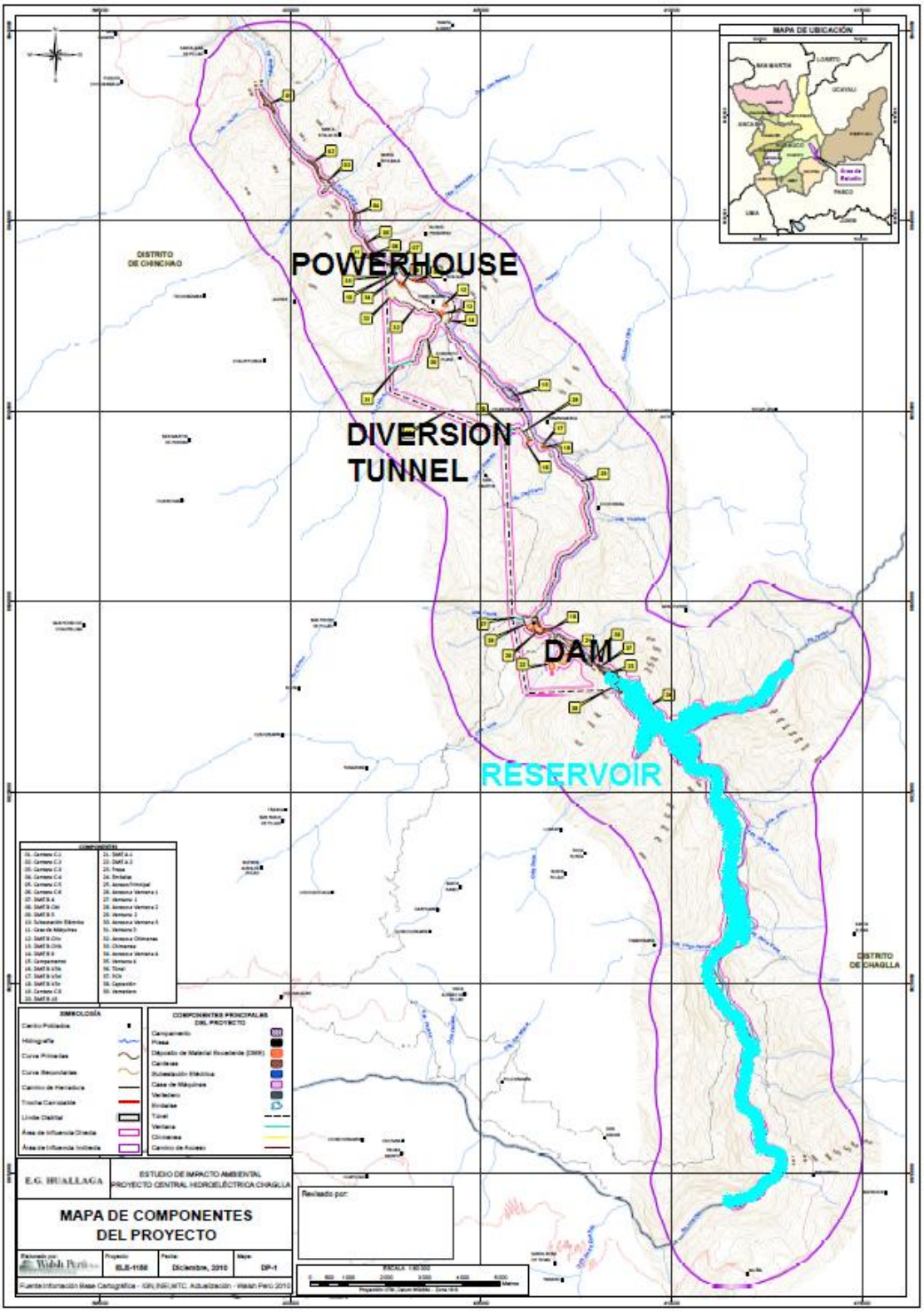
3. ***Hydropower Facility.*** The Hydropower Facility includes: a 199-meter-high dam on the Huallaga River, which will impound a 4.66 km^2 reservoir upstream of the dam; a water intake located on the left bank of the Huallaga River, adjacent to the dam spillway, and connected to a 15,615-meter-long derivation tunnel; a powerhouse located about 15.5 km downstream of the dam on the left bank of the Huallaga River and housing two Francis turbines of 200 MW generation capacity each; and a 220-kV electrical substation. The facility also includes a smaller powerhouse located directly at the bottom of the dam and housing a 6.00 MW Francis turbine, which will use release of the minimum flow to generate power. When the facility operates, water used for power generation will flow through the water intake and derivation tunnel from the dam to the main powerhouse, and thereby divert water around an approximately 15.5-km-long reach of the Huallaga River (i.e., the dewatered reach).

4. The ***Concrete-Faced Rock Fill dam*** will be constructed in a gorge of the Huallaga River. Dam width will be about 36 m at the level of its foundations, and the dam crest will reach a width of 274 m at an elevation of 1,199 m above sea level. Its construction will require the erection of two temporary earth coffer dams upstream and downstream, and the excavation of a 1,126-meter-long diversion tunnel on the left bank of the river. The dam includes a spillway consisting of three tunnels also excavated on the left bank of the river at different elevations, and with a 3,621 m^3/s discharge capacity corresponding to the maximum flow estimated to occur within a 10,000-year period.

5. The ***reservoir*** is estimated to have a storage capacity of 375million cubic meters at full supply level (FSL). Its 4.66 km2 area at FSL will extend about 17.3 km upstream within the Huallaga River gorges, and along 4 km of one of the tributary, the Tambo River. In the wet season water inflows are on average greater than the design flow, and the Project will operate as a run-of-the-river hydropower facility (no seasonal storage capacity), i.e. at any moment the flow downstream of the powerhouse will be approximately equal to the flow entering the reservoir and the reservoir level will remain relatively constant. In dry season however, it is expected that the Project will sometimes operate in daily peaking mode, i.e. water will be released through the turbines to generate power only during a few hours each day. When the facility operates in this mode, although it is not anticipated that the reservoir level would change significantly, flows discharged back into the river at the powerhouse may vary substantially throughout the day.

6. The main ***water intake*** will be excavated close to the dam on the left bank between the elevations 1,180 and 1,199 meters above sea level. The 8-m diameter derivation tunnel connecting the water intake and the powerhouse will be excavated through perforation and explosives with access provided by four adit tunnels along its 15.6 km span. The ***powerhouse*** will be excavated at an elevation of 803.90 meters above sea level, and mostly underground. The electrical ***substation*** will be installed on a naturally flat 1-ha area above the powerhouse,

at an elevation between 900 and 925 m above sea level, and will be connected to the powerhouse through two 300 meters-long single circuit 220-kV transmission lines.



7. ***Small powerhouse.*** . The water intake for the release of the ecological flow will be excavated on the left bank, close to spillway tunnels, at an elevation between 1,190.30 m and 1,199 m above sea level. Through a 1.20-m diameter intake, the ecological flow is then led to the small 6.00 MW powerhouse located at the bottom of the dam, and the discharged into the Huallaga River just downstream of the dam. A bypass system will enable the discharge of the ecological flow back into the river without generating power, for instance in case of maintenance of the turbine. The small powerhouse will connect to the existing Tingo Maria – Huanuco transmission line through the new 26-km long 34.5 kV line that will be initially constructed to supply power to construction works.

8. ***Main Transmission Line.*** From the onsite electrical substation, a 137-km-long, 220-kV transmission line will connect the Project with the Peruvian national grid (*Sistema Electrico Interconectado Nacional-SEIN*) at the Paragsha substation near Cerro de Pasco. The right of way for the line will be 25 meters. The alignment of the transmission line has not been finalized yet, and four main routing options are still being analyzed.

9. ***Access Roads.*** The main new 23-km access road will be constructed mostly on the left bank along the Huallaga River coming from downstream (i.e. from the direction of Tingo-Maria) until reaching the dam site (see map #2 in Annex). In addition several shorter access roads will be built connecting the main construction sites with the main access road.

10. ***Banks of construction materials and spoils disposal sites.*** Construction materials (e..g. sand, gravels) for the access road and the hydropower facility will be sourced mostly from the Huallaga River downstream of the dam. Total area used for sourcing construction materials is expected to be around 13 hectares. Twelve spoils disposal sites, located on the left bank of the River, will comprise a total area of about 43 hectares.

11. ***Construction camp and workforce.*** The construction camp will be installed at kilometer 12 of the main access road. It will accommodate a workforce of up to 1,500 workers at the peak of the construction activities. It is estimated that about 80 % of the workforce would be local unskilled workers mostly coming from the districts of Chaglla and Chinchao. During operation, it is expected that the Project will require about 300 permanent workers.

12. ***EIA studies.*** Two Environmental Impact Assessment studies were completed for the project, one in 2008 and the second – required due to changes in the Project's location and design – in 2010. The project environmental and social assessments started in 2007 when EGH contracted the consulting firm Minpetel S.A. to prepare the first Environmental Impact Assessment study, which was approved by the environmental authority (*Dirección General de Asuntos Ambientales*) at the Ministry of Energy and Mines (MINEM) in July 2009[1]. Subsequent to the approval of the EIA, additional studies were conducted to refine the engineering design, including a more detailed hydrologic analysis conducted by the Danish Hydraulic Institute (DHI). Such studies revealed the opportunity to move the dam about 28

[1] http://www.minem.gob.pe/minem/archivos/file/DGGAE/ARCHIVOS/estudios/RESOLUCIONES/267-2009-MEM-AAE.pdf

km downstream in order to optimize the project design and to reduce hydrologic risks. A revised Environmental Impact Assessment study[2] (the "EIA") was carried out in 2010 by Walsh Peru S.A. on the basis of the new Project's design and location. The revised EIA has been approved by MINEM on April 11th, 2011. In addition to the revised EIA, EGH have carried out additional environmental and social studies and surveys, which are presented in a supplementary information package[3].

13. ***Analysis of Alternatives – Power Generation Options.*** The Peruvian electricity sector shows a sustained increase in the demand for electricity, with a gradual decline in the share of hydropower in favor of thermal generation using natural gas. Between 2004 and 2009 demand grew by an average of 8% a year, primarily because of mining and manufacturing activity. Growth is projected at between 6.1% and 8.5% to 2017, according to different scenarios considered by the Ministry of Energy and Mines (MINEM). In 2008, hydropower has accounted for 45% of electricity generation capacity, and thermal power for 55%, based primarily on natural gas. The share of hydropower has declined from 91% in 1996 to 45% in 2008, while that of thermal power has risen, particularly with the supply of gas from Camisea. According to a preliminary assessment of energy balance in Peru undertaken in the context of the IDB's Operation PE-L1055: Development of a New Sustainable Energy Matrix Program II[4], the reference scenario for power generation expansion on a least-cost basis for a 10-year horizon (2009-2010) includes an additional capacity of approximately 4,700 MW, comprising 1,570 MW for hydropower and 2,130 MW for gas power plants (gas turbines, and combined cycle). Within the various projects identified to accommodate possibly such increase in hydropower generation capacity, the Chaglla Hydropower Project ranks among the best alternatives from an environmental and social perspective due to its characteristics (run-of-the-river, high power density ratio of 87 W/m^2, no communities to be displaced in the reservoir area, use of natural gorges, location in the upstream section of the river basin).

14. ***Analysis of Alternatives – Project Location and Design.*** The Chaglla Hydroelectric Power Plant was first identified as a possible hydropower project in a feasibility study elaborated by Lavalin in 1993, and approved by ELECTROPERU S.A. in April 1994. The basic design proposed at this initial stage included a 600 MW plant, a 106m-high dam located just downstream of the confluence of the Huallaga and Panao Rivers with a diversion tunnel of 21.4 km; a 306-km long 220kV transmission line; incorporation of flows from the Panao, Tongorín, Chimao and Achupampa Rivers through diversions. This initial design was further refined by EGH in 2006-2008: the Project's preliminary design, on the basis of which the first EIA study was developed, consisted of a 144-m high dam located about 28 km upstream of the current proposed dam site, with a crest elevation at 1,430 m above sea level; a 10-km long derivation tunnel leading to a 360 MW powerhouse connected to the national grid through a 137-km long 220 kV transmission line. Project design and location were further changed in 2010 after a more detailed feasibility and hydrologic analysis conducted were completed. This analysis found in particular that the excavation of the derivation tunnel could

[2] Available on IDB's website at: http://www.iadb.org/en/projects/project,1303.html?id=PE-L1113

[3] The Supplementary Information Package for Lenders is available on IDB's website at the above-mentioned address.

[4] http://www.iadb.org/en/projects/project,1303.html?id=PE-L1055

have been compromised by possible rock bursting caused by the significant volume of materials above the tunnel (some sections would have been located at a depth of 1,800 m under mountain top). It was also decided to move the reservoir downstream to increase the catchment area and therefore to reduce hydrological risks. Several configurations in terms of dam location and height were explored. Final dam location was selected at an intermediate position between the eastern fringe of the Peruvian Yungas eco-region and Tingo Maria National Park. Final dam height was selected as a trade-off between reservoir area and length of the derivation tunnel. Due to site topography, any decrease in dam height would require an extension of the derivation tunnel to maintain the same head and power generation capacity, and therefore increasing the dewatered section of the Huallaga River, while not reducing in the same proportion the area of the reservoir.

15. The table below compares key parameters between the preliminary (2008 EIA) and final (2010 EIA) Project design. From an environmental and social perspective, although the reservoir area was smaller in the preliminary design, the bypass section of the Huallaga River was significantly longer. Overall there does not seem to be other technically feasible alternatives[5] in terms of Project design that would have reduced substantially its potential adverse environmental and social impacts for an equivalent power generation capacity.

Comparison of key parameters between preliminary and final Project design

	Preliminary Design (2008 EIA)	**Final Design**
Dam height	144 m	199 m
Installed Power Capacity	360 MW	406 MW
Expected annual power generation	2,250 GWh	2,545 GWh
Reservoir Area (FSL)/ length	1.14 km^2/ 6.5 km	4.66 km^2 / 17.3 km
Diversion tunnel length (dam – powerhouse)	10,000 m	15,615 m
Length of dewatered section of the Huallaga River	26.5 km	15.5 km
Length of the 220 kV transmission line	137 km	135 km
Length of the main access road	50 km	25 km

16. ***Analysis of Alternatives – Transmission Line[6].*** Alternatives in terms of connections to three possible existing substations (Tajish, Paragsha, and Conococha) were explored, all of them crossing the eastern slope of the cordillera. Options to connect the Project to the national grid through the Tajish and Conococha substations were discarded for technical feasibility and costs (length) reasons. Four alternatives are currently being considered in terms of routing the transmission line from the powerhouse to the Paragsha substation. Three of them are crossing the south of the Monzón-Carpish Priority Conservation Area (PCA); the fourth routing option, which is avoiding the PCA, is likely to be discarded due to its extra-length.

[5] See "Memoria Descriptiva del Estudio de Alternativas" in the Supplementary Information Package for Lenders.

[6] See "Análisis preliminar de aspectos ambientales del trazo de la línea de transmisión Chaglla – Paragsha" in the Supplementary Information Package for Lenders.

3. ENVIRONMENTAL AND SOCIAL CONDITIONS

17. ***General Setting.*** The Project is located on the eastern slope of the central Peruvian Andes, in the Amazon River basin, on the fringe of the Peruvian Yungas[7]. The Monzon-Carpish area in the upper Huallaga River basin, above the Project, has been identified as a priority area for biodiversity conservation[8].

18. The Huallaga River basin extends along the central region of Peru, to the east of the central cordillera. The average elevation of the basin is 3,750 meters above sea level with the highest peak, Santa Rosa, at 5,706 meters above sea level. The Huallaga River basin is asymmetric with flows from south to north. The major tributary feeding the river is the Huertas River (with a drainage area of 2,150 km2), near the town of Ambo. The Huallaga River joins the Marañón River to form the largest tributary feeding the Amazon River. Upstream of the proposed dam location, the river basin consists of over 500 lakes, mostly very small and of glacial origin, and 15 snow-covered peaks.

19. ***Definition of the Project's areas of influence.*** The Project's direct area of influence is the area which will be directly impacted by Project's construction and operation. This area includes the reservoir; the section of the River Huallaga between the dam and the powerhouse, which will experience reduced flows, and the section downstream of the powerhouse that may be affected by changes in flow patterns (peaking mode in dry season) and water quality; and the areas where the physical works will take place, including the dam, powerhouse, access road, transmission line, construction camp, banks of construction materials and spoils disposal sites. Except for the transmission line, the Project's direct area of influence includes mostly the Huallaga River corridor, between elevations 800 and 1,200 m above sea level. The Project's indirect area of influence includes in addition the rural communities in the districts of Chaglla and Chinchao that may be indirectly affected by the Project's construction and operation.

3.1 Physical conditions

20. ***Topography.*** In the Project's area of influence the Huallaga River is flowing from South to North in a deeply incised valley, some 1,000 meters deep. Above the city of Tingo Maria, about 30 km downstream of the dam site, the Huallaga River channel widens and remains then wide until its confluence with the Marañón River, about 500 km north of the Project's site.

21. ***Hydrology.*** The catchment area of the Huallaga River at the dam site is approximately 7,150 km^2, and the average annual flow is estimated to be about147 m^3/s. The River flows experience strong seasonality (see Chart #1 below), with 6 months recording an average monthly flow higher than 150 m^3/s (November – April) and 4 months with average monthly

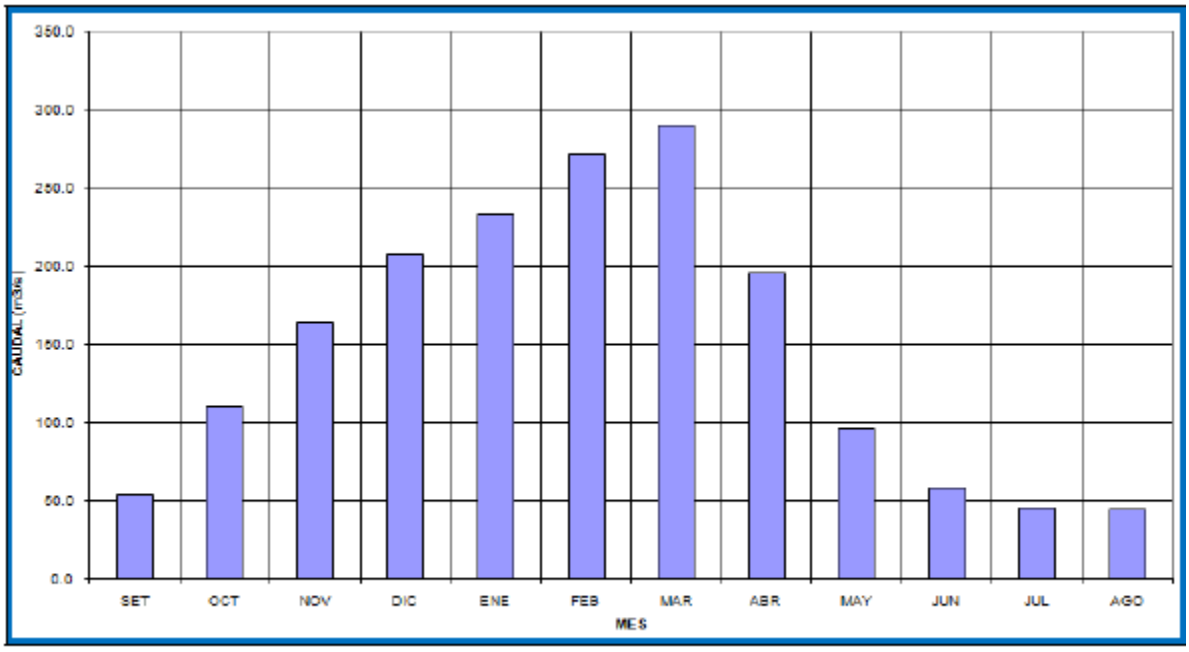
[7] The Peruvian Yungas are tentatively defined as the eco-region located on the Eastern flank of the Peruvian Andes, approximately between 800-1,000 and 3,600 m above sea level, and at latitude between 5° and 15° south.

[8] See: http://cdc.lamolina.edu.pe/Descargas/ecorregiones/yungas_planificacion.html

flows around 50 m^3/s (June – September). Actual average annual flows vary according to annual rainfall, ranging between 100 m^3/s and 200 m^3/s over the last 36 years. The lowest monthly average flow on record is 19.8 m^3/s, and 95 % of recorded average monthly flows have exceeded 35 m^3/s (Q95). It should be noted that there are also significant fluctuations in the daily average flows, particularly in the rainy season; due to the high slopes in the catchment area, rainwater runs off to the main river channel relatively quickly and heavy rains can cause sudden surges in the river flow.

22. The Project's direct area of influence includes many tributaries to the Huallaga River. The most important in terms of flow contributions are the following: in the reservoir area, the Tambo River (catchment area: 164 km^2), whose confluence is located about 2 km upstream of the dam; between the dam and the powerhouse: the Quebrada Lluto (2 km downstream, catchment area: 51 km^2), the Santa Clara River (8 km downstream, catchment area: 42 km^2) and the Chimao River (8 km downstream, catchment area: 62 km^2). The total catchment area of the main tributaries joining the Huallaga River in the section between the dam and the powerhouse is about 210 km^2, or approximately 3 % of the catchment area of the Huallaga River at the dam site.

Chart #1: Average monthly flows in the Huallaga River at the dam site



Fuente: Walsh Perú S.A. 2010.

23. ***Water quality.*** As part of the update of the EIA process, a water quality analysis was conducted during both dry and rainy seasons at several points along the Huallaga River in the Project's direct area of influence and two tributaries (Tambo River and Quebrada Lluto), which indicates that water quality is generally good. Dissolved oxygen concentrations greater than 8 mg/l in the wet season, and 5 mg/l in the dry season were recorded. However mercury, copper, and nickel were detected at levels exceeding the applicable national standard during the wet season. Lead was found in high concentrations, exceeding the

applicable national standard, at five locations in the wet season and one in the dry season. Since no mining activities or other anthropic activities which may be potential sources of contamination are known to exist upstream of the Project's site, it is assumed that such relatively high concentrations in mercury, copper, and nickel reflect natural geologic conditions and erosion process caused by high flows and high water velocities during wet season.

24. ***Natural Disasters.*** The project is located in a region prone to natural disasters, in particular seismic activities. The Nazca Plate off the coast of central Peru is a subductive oceanic plate which meets the South American Plate to form the Peru-Chile Trench (Atacama Trench). The movement of these plates has been known to cause several destructive earthquakes in the general region of the Project. The ground accelerations established in the design studies would categorize the project area as being of medium seismicity. The general region of the Project is known to experience severe rainfall and flooding events.

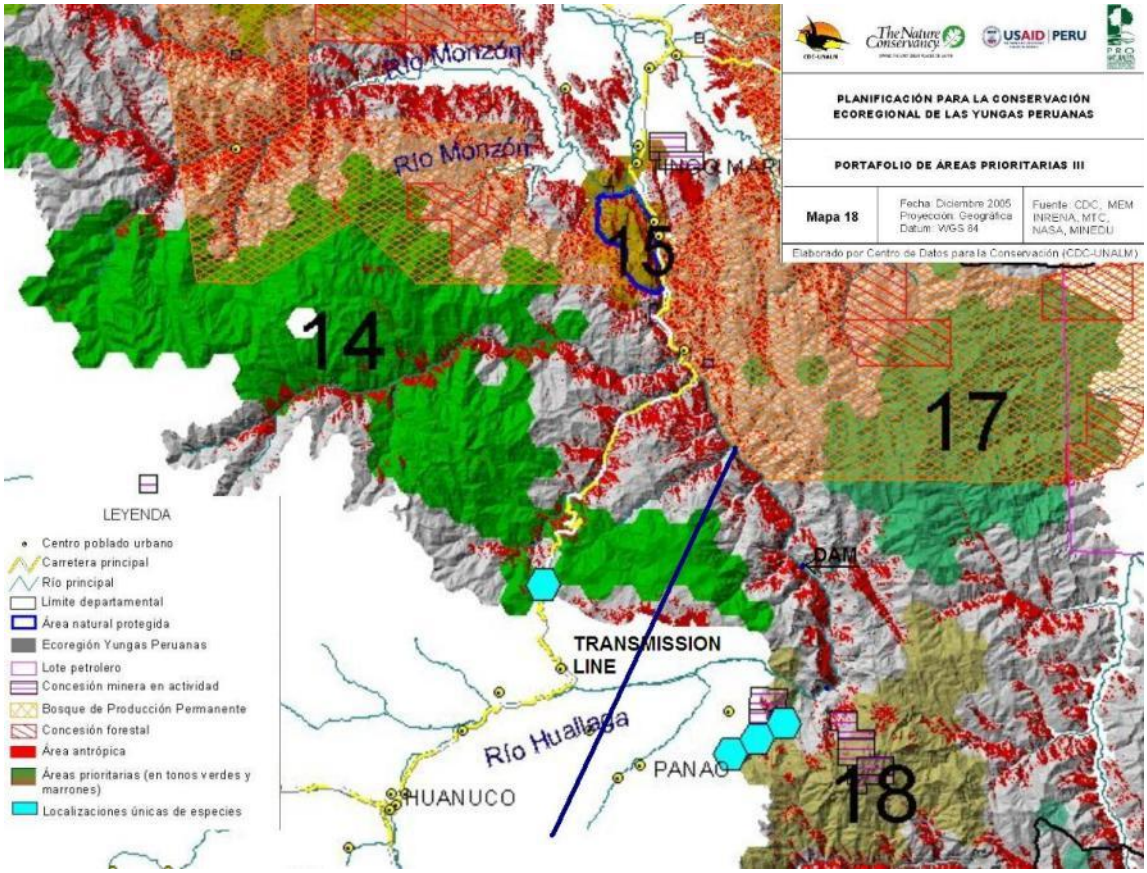
3.2 Natural habitat conditions

25. ***Terrestrial Habitats.*** The EIA identifies four vegetation units in the project area (not including the trajectory of the transmission line, for which a separate EIA is currently underway): interandean xeric scrub, montane forest, riparian vegetation, and areas with anthropogenic interventions. Coarse-scale vegetation maps provided with the EIA show the first of these units—interandean xeric scrub—limited to slopes above approximately the uppermost third of the future reservoir area. Montane forest and areas with anthropogenic interventions run the length of the affected river corridor, with montane forest more prevalent on the left bank and at higher elevations (mostly above 1,600 msl), while the more heavily intervened areas are more prevalent on the right bank and at lower elevations. Riparian vegetation covers most of the banks dropping to the Huallaga River channel as well as the banks of the lower reaches of the main tributaries entering the river, except in areas of sheer rock faces and heavily graveled slopes. Just upslope from this gallery forest along the Huallaga River corridor is found a band of arboreal and shrub vegetation on either side of the river, varying in width and density according to accessibility and soil type (with few to no trees or shrubs appearing in easily accessible or very rocky areas, and dense forest appearing in some presumably inaccessible areas with deeper soils).

26. ***Protected areas and priority conservation areas.*** The only nationally protected area in the general project area is the Tingo Maria National Park, located approximately 30 km downstream from the Project powerhouse on the left margin of the Huallaga River. The eastern boundary of the park is formed by the river, except in areas where the boundaries have been moved upslope to exclude areas under cultivation. The park is unlikely to be directly affected by the Project. In addition, the Important Bird Area (IBA) known as Carpish runs the length of the Huallaga River in the project area, beginning at an elevation of 2,000 m.a.s.l. and encompassing 220,000 hectares.[9] The proposed transmission line routing will pass through the southern portion of this IBA. Much of the IBA falls within the larger Monzón-Carpish Priority Conservation Area (PCA), one of 46 PCAs identified for the

[9] http://www.birdlife.org/datazone/sitefactsheet.php?id=14916 (accessed May 4, 2011).

Peruvian Yungas region in a collaborative planning effort between The Center for Conservation Data at the La Molina Agrarian National University and the Nature Conservancy, with support also from USAID Peru, ProNaturaleza, and NatureServe (see Area 14 in map below).[10] The PCA falls within a still larger area, also known as Carpish, designated in 2009 as priority conservation zone by the Peruvian *Servicio Nacional de Áreas Naturales Protegidas por el Estado* (SINANPE).



27. ***Species of conservation importance. Plants.*** Three endemic plant species were registered during the EIA studies: *Begonia glauca*, endemic to the department of Huánuco, was recorded in riparian vegetation at the dam site; *Siphocampylus comosus*, restricted to the departments of Huánuco, Junín, and Pasco, and *Ferreyranthus excelsus*, found more broadly throughout Peru, were found in montane forest and human-disturbed areas. No species listed as threatened on the IUCN Red List were recorded. According to the EIA, five species of plants found during the studies are categorized by the government of Peru as being threatened: *Alnus acuminate* (Vulnerable), *Argyrochosoma nivea* (Vulnerable), *Buddleja incana* (Critically Endangered), *Cedrela montana* (Vulnerable), and *Otholobium munyensis* (Critically Endangered). The EIA describes these five species as occurring commonly and ranging widely throughout Peru.

[10] CDC-UNALM y TNC. 2006. Planificación para la Conservación Ecoregional de las Yungas Peruanas: Conservando la Diversidad Natural de la Selva Alta del Perú. Informe Final. Lima, Perú. 207 pp. + anexos.

28. ***Species of conservation importance. Birds.*** One species of bird recorded during the EIA studies appears on both the IUCN Red List and in Peruvian national legislation (D.S. 034-2004-AG) in the category "Vulnerable": *Ara militaris* (Military Macaw). Another psittacid species subsequently found in the project area, *Primolius couloni*, also appears as Vulnerable on the IUCN Red List. *A. militaris* appears to occur in very low numbers in the project area, while *P. couloni* is quite common. A field campaign targeted at understanding the use of the area by these species was recently completed. During the campaign, no clay-licks, nesting sites or roosting sites were located in areas to be flooded or otherwise physically impacted by the project. One clay-lick was found in the Tambo River, above the upper reservoir limit (1,414 msl), approximately 2.5 km from the Huallaga River.

29. Although Project-specific baseline studies have not yet taken place in the area proposed for the transmission line routing, the Carpish IBA through which a small portion of the line may run is known to harbor four bird species threatened with extinction according to the IUCN Red List: *Buthraupis aureodorsalis* (Endangered), *Leptosittaca branickii* (Vulnerable), *Acestrura bombus* (Vulnerable) and *Agriornis andicola* (Vulnerable).

30. ***Species of conservation importance. Amphibians and reptiles.*** One species of iguana (*Stenocercus cupreus*) found in montane forest over a thousand meters above the reservoir area is thought to be endemic to high valleys of the Huallaga River, between 1,900 and 2,300 m.a.s.l. A frog, apparently of the genus *Hyloxalus,* encountered at one montane forest location also above the reservoir area is still undergoing identification. It's highly probable that that the Hyloxalus collected at the project area belongs to one of the species already described. Morphological analysis indicates similarities with *H. littoralis*, *H. eleutherodactylus*, or *H. nexipus*, species from localities near the Huallaga River. Comparisons with museum specimens indicated that the collected specimens are more similar to *H. littoralis*. It is important to note that correct assignment of the species depends on a review of the genus, still poorly studied especially from the taxonomic point of view. DNA from tissues of the species from the project area has already been sequenced and is undergoing comparison with other species of the genus that shall result in a final identification.

31. Although not encountered during the EIA studies, the ranges of five amphibians endemic to the portion of the Peruvian Yungas surrounding the Project area and in IUCN Red List threatened categories are thought to intersect the Project area. These species, all normally found at elevations substantially higher than the level of the reservoir but potentially overlapping with the transmission line routing, are as follows: *Phrynopus dagmarae* (Critically Endangered), *Phrynopus kauneorum* (Critically Endangered), *Rhinella chavin* (Critically Endangered), *Telmatobius brevirostris* (Endangered), and *Phrynopus horstpauli* (Vulnerable). In addition, *Melanophryne carpish* (Endangered) is only known from between 2,750 and 2,960 m.a.s.l. in the Carpish IBA and in one other locality in northern Peru.

32. ***Species of conservation importance. Mammals.*** Four mammal species found during the EIA field studies appear as Vulnerable on the IUCN Red List: *Tremarctos ornatus* (Spectacled Bear), *Aotus miconax* (Peruvian Night Monkey), *Thomasomys kalinoswkii* (Kalinowski's Oldfield Mouse), and *Myrmecophaga tridactyla* (Giant Anteater) – the first

two being considered Endangered by Peruvian legislation and the latter two considered Vulnerable (D.S. 034-2004-AG). *T. ornatus* appears to occur throughout the general project area. *A. miconax* is endemic to the Peruvian Andes, occurring south and east of the Marañon River and west of the Huallaga River, normally at elevations between 800 and 2,400 msl. This species is thought to prefer intact, lower montane cloud forest, although in the project area it was observed in lower elevation forests experiencing varying degrees of degradation, including degraded forests in the area to be flooded by the reservoir. *T. kalinowskii* is endemic to the central Andes of Peru, where it is known from fewer than 10 locations. In the project area, this species was found in montane forest well upslope from the upper reaches of the reservoir area. In addition, *Sciurus pyrrhinus* (Junín Red Squirrel) was encountered in the general project area. This species is listed by the IUCN as Data Deficient, with an unknown conservation status, although its range is thought to be restricted to the eastern slope of the Andes in central Peru. In Peruvian legislation the species appears as Vulnerable.

33. Interviews with local residents during the EIA study found that *Ateles sp.* (Spider Monkey) uses degraded habitat and riparian vegetation in the project area. There are two *Ateles* species potentially found in this region—*A. chamek* and the more probable, *A. belzebuth.* Both species are categorized as Endangered on the IUCN Red List; *A. chamek* is classified in national legislation as Vulnerable, while *A. belzebuth* is classified as Endangered (D.S. 034-2004-AG).

34. ***Species of conservation importance. Fish.*** Twenty-eight fish morphospecies were identified during both climatic seasons (dry and wet) during the EIA baseline and a subsequent sampling campaign conducted between March and May of 2011. Of the 28 morphospecies reported, four were not identified to the species level. Two of the unidentified morphospecies belong to the genus *Chaetostoma*, (referred to in the EIA as *Chaetostoma sp.1* and *Chaetostoma sp.2*), and appear not to match definitively with any species or morphospecies in any collections, and thus may represent species new to science. In this regard, it is important to point out that the taxonomy of the genus is still not consensual, and the genus is in need of taxonomic revision. *Chaetostoma sp.1* was collected in the Huallaga River approximately at the confluence with the Jaupar River (approximately 16 km downstream from the power house) and in the Santa Clara tributary (which flows into the dewatered section) up to an elevation of 1,138 m.a.s.l. *Chaetostoma sp.2* was collected in three locations: (i) the Huallaga River approximately two kilometers downstream of the power house, (ii) in the lower part of the Huishuis tributary, which flows into the dewatered section and appears from maps of the area to be seasonally intermittent), and (iii) in the main River channel just downstream from where the Huishuis tributary enters (see map #3 in Annex). Because of the distribution of this species in the lower part of the project area, it is possible that there are survival alternatives in the Huallaga River and tributaries, both in the reduced flow segment (RFS) and the area downstream of the RFS. Additional surveys will be carried out during development of the Ecological Flow Management Plan to confirm identification and distribution of morphospecies, and whether other morphospecies are present in the Project's area of influence. Two other unidentified morphospecies belong to the genus Astroblepus, and have been confirmed to be the same species as specimens collected previously in other sub-basins of the Huallaga River outside of the Project area. Astroblepids occur in the Andean cordillera from Venezuela to northern Bolivia, in both cis- and trans-

andean river systems, and also in the central mountains of Panama (Schaefer &Arroyave, 2010). For *Atroblepus sp 1*, other registers in Peru occur in Montecristo River, Mariscal Cáceres Provinces, San Martin Department (MUSM 3080, MUSM 3086 and MUSM 3074) and inside the Parque Nacional Río Abiseo (MUSM 2605), according to data from the collection of the Ichthyology Department of the Museo de Historia Natural de San Marcos (MUSM). *Astroblepus sp 2* has other registers in Peru in the Pucayacu River, Aucayacu Province, Huánuco Department (MUSM 32829), according to data from the MUSM collection. Species of the genus *Astroblepus* are difficult to distinguish based on morphological characters, and therefore taxonomic reviews are complemented with molecular analyses. Nucleotide sequence data confirmed diagnosis and local endemism of various morphospecies of Andean *Astroblepid* catfishes - Siluriformes: *Astroblepidae* – (Schaefer et al., 2011). Sequences for the newly described species of *Astroblepus* are deposited in Genbank, thus allowing comparisons and future analyses. One other morphospecies that raised identification doubts appears to be the same species as the recently discovered type specimen for a new genus that is currently being described. This type specimen, from the family *Loricariinae*, was collected in the Río Monzón (a tributary of the Huallaga entering near Tingo Maria) and other specimens of this species have been found near Tocache, further downstream. Species of the *Loricariinae* subfamily present a wide distribution, reaching from Costa Rica to Argentina. The highest point of occurrence in the Project area is CH 5 in the Huallaga River, at an altitude of 1016 m.a.s.l., within the area of the projected reservoir. Other registers include points CH 8, CH 11 and V-1 downstream of the dam, in and downstream of the reduced flow section.

35. In addition to the four morphospecies not identified to the species level, eight others which were identified to the species level displayed one or more characteristic not consistent with the species with which they were grouped, as indicated in the EIA and additional study report, by names including the infix “aff” and “cf.” All morphotypes identified as "aff." or "cf." belong to genera lacking thorough taxonomic studies. Some of them, such as *Astroblepus*, are now undergoing extensive revisions by specialists. Furthermore, one morphospecies was identified as *Astyanax bimaculatus*, with the caveat that this species was described based on collections from Suriname. The presence of this species in the Huallaga needs to be confirmed through morphological studies of the collected specimens and comparison with other museum specimens.

36. One migratory fish species, *Prochilodus nigricans*, was recorded in the project area in the Huallaga River as far upriver as approximately 705 m.a.s.l. and local residents report finding the species as far upriver as the mouth of the Tambo River, approximately two kilometers above the location of the dam. Interviews with local residents indicate there may be two other species with migratory behavior. These species are broadly distributed and are not fished by the local population. Clarification on the migratory status, range, and ecosystem functions of these species will be further obtained during the additional surveys planned as part of the Ecological Flow Management Plan.

3.3 Social conditions

37. ***General setting.*** The Project's direct area of influence include the villages of i) Santa Rita Sur, Pampamarca, and Chichiparra on the right bank and ii) Higropampa, Huanipampa, Shavinito Playa, and Chulla are on the left bank of the Huallaga River. The villages on the right bank belong to the District of Chaglla and the villages on the left bank belong to the District of Chinchao and the Comunidad Campesino de Pillao. The villages within the Project's direct area of influence are extended over large areas and encompass wide tracts of land. Households are often dispersed from mountainous slopes to the banks of the Huallaga River.

38. ***Livelihood.*** Livelihoods in the region are dependent on agricultural and livestock activities. Nearly eighty percent of the economically active population depends on agricultural consisting of subsistence agriculture and sale of cash crops. The main subsistence crops include banana, manioc, guayaba, beans, limes, corn, and avocado. Coffee and some cacao are grown for sale. Over ninety percent of coffee and cocoa producers in the region belong to the Naranjillo Cooperative selling directly to the cooperative. Livestock is practiced by a limited number of households. Households depend on the Huallaga River and its tributaries mostly for subsistence fishing.

39. ***Education and access to social services.*** Educational facilities are limited to primary schools in the larger communities in the Project area of influence. Educational status in the area of influence is generally low; while the majority of the population has attended some primary education, few have continued to secondary, technical or university education. Nearly half, 47.64%, of the inhabitants within the Project's direct area of influence have not finished primary school. Ten percent of inhabitants are illiterate. Primary schools are within walking distance for most communities (~ten minute walk) but this can increase greatly for more remote villages. The average walk time is five hours to access other basic social services such as health clinics, police stations or markets for many of the communities in the direct area of influence. Medical facilities close to the Project area of influence are limited to a public health center (*puesto de salud*) in Chinchavito and Puerto Guadalupe. There is also a satellite public health center (*puesto de salud sátelite*). While these facilities can provide basic care, they lack the capacity for long term or specialized treatment. In such cases, residents travel to Tingo Maria or Huánuco.

40. ***Land tenure.*** Approximately three-quarters of the total land area to be acquired for the Project belong to Rural Communities (*Comunidades Campesinas*). *Comunidades Campesinas* are legal entities regulated according to the General Rural Communities Law and amendments (*Ley Nº 24656, Ley General de Comunidades Campesinas and Decreto Supremo Nº 008-91-TR*). These laws establish a legal basis for Peru's *Communidades Campesinas* including roles, responsibility, rights and privileges of such communities. Each *Comunidad Campesina* has the authority to determine how to allocate and use community owned land. Land tenure on communal land may include both communal land and individual titles of possession granted by the community to individual community members. Possession rights are allocated through a communal decision-making at the direction of the Community

Council, and are certified through a community act. In general, community members over the age of eighteen in good standing with the community may be granted the use of land suitable for agricultural or residential purposes. Land may not be sold; all land is owned by the community. However, improvements (house, crops, etc) to communal owned land may be compensated if possession rights are transferred between land users. The other quarter of land area to be acquired by the project is on privately held land. In these cases land is held either by i) formal land owners, ii) land owners without formally recognized documents, or iii) land squatters.

41. ***Access to water and other natural resources (e.g. fish).*** Agriculture in the region is rainfed and does not rely on irrigation from the Huallaga River or its tributaries. Directly impacted communities' use the Huallaga River and its tributaries for subsistence fishing. There is little information regarding how much of household's livelihoods are dependent on fish although informal interviews suggest that households may fish on average two to four times a week during the dry season (May through December). A baseline survey of the inhabitants' fishing activities will be conducted to determine the impact on households in the area directly impacted by decreased river flow between the dam and the powerhouse.

42. ***Indigenous Peoples.*** There are no indigenous people settlements in the Project's direct and indirect areas of influence.

4. ENVIRONMENTAL AND SOCIAL IMPACTS AND RISKS

4.1 Construction phase

a. Environmental Impacts and Risks

43. The primary environmental impacts anticipated during the construction phase relate to temporary erosion and increased sedimentation; potential changes to surface water flow and quality; clearing of vegetation for construction of the dam, powerhouse, access roads, diversion tunnel, and transmission line; and temporary and localized construction impacts such as air emissions, generation of dust, noise, vibrations, and pollution created by accidental spills.

44. ***Access Road.*** The main access road will be constructed in the canyon along the Huallaga River, with the secondary roads going up the steep slopes on the left bank. The primary environmental impacts related to the construction of the access roads are increased soil erosion and changes in drainage patterns, which may lead also to an increase in suspended solids in the River and tributaries. Construction of the road may also affect locally river banks stability. Once the access roads are completed and in use for the rest of the Project construction, noise, dust and increased risks of accident due to traffic may affect the local communities located close to the road, such as Higropampa, Huanipampa and Chulla. Significant barrier effect on the movement of fauna is not expected since the Huallaga River and its deeply incised gorges in the Project's area of influence already constitute natural barriers.

45. ***Hydropower facility.*** The primary environmental impacts related to the construction of the hydropower facility are those caused by the excavation of the tunnels, sourcing of construction materials in the river bed, and disposal of the spoils generated by excavation works. Excavation of the tunnels may generate vibrations (caused by the use of explosives), contamination of surface water with fine particles, and changes in groundwater drainage. Sourcing of construction materials in the river bed may also cause contamination of surface waters, erosion of the River banks downstream and affect fish habitats. Disposal in or close to the River bed of important quantity of spoils generated by the excavation of the dam, tunnels and powerhouse may change surface drainage patterns, cause contamination of the surface waters (through leachate and surface runoff), and affect riparian habitat and stability of the River banks. Besides, due to the site topography, in all places affected by construction activities there is a significant risk of soil erosion leading to increased suspended sediments in the Huallaga River and its tributaries. Risk of creating a backwater effects during construction, when the flow in the Huallaga River exceeds the capacity of the temporary diversion tunnel and starts flooding upstream, exists in case of an extraordinarily intense rainy event, but is considered low.

46. ***Transmission line.*** The final routing of the transmission line is not known yet. Primary generic environmental impacts and risks from the construction of a 220-kV transmission line include: disturbances to habitats related to the clearance of the 25-m wide Right-of-Way, including direct land use conversion and indirect fragmentation effects; increased soil erosion caused by construction activities; risk of increased access to areas previously difficult to access; risks of collision for birds.

47. ***Impacts and risks on terrestrial habitat and threatened species***. Construction activities in terrestrial areas will take place in a patchwork landscape dominated by lands with some degree of human intervention evident, but with remnants of little-impacted, late-succession stage habitats. These patches, as described in the EIA and subsequent reports, still harbor native flora and fauna, some of national and international conservation importance. Some of these species can also be found in the more degraded portions of the patchwork, such as is the case with the Andean Night Monkey. Impacts of construction activities other than for the transmission line are believed to be of only local consequence for this flora and fauna, given the small percentage of the overall ranges and populations of the species of concern found within these portions of the project area. The transmission line EIA is still outstanding, but considering that locally endemic and threatened species of birds and amphibians are known to occur in the Carpish area through which the line will pass, the construction of the line could impact adversely on the populations of such species. The potential for such impacts and their significance will be better understood once the EIA for this portion of the project is completed, providing for a more precise understanding of the composition and distribution of species of concern in the Carpish area. Three of the routing options under study cross the Carpish area in its narrower, outer portion and one avoids the Carpish but impacts a larger area due to its extra-length.

b. Social Impacts and Risks

48. ***Land Acquisition and physical resettlement.*** Most of the land to be acquired is located on the left bank of the Huallaga River to construct the Project's main access road. The Project will acquire land mostly along the route of the proposed access road. The Project will acquire 142 parcels of land of which 107 land parcels are in use (settlement, agriculture, grazing, etc). In addition, there are twenty-five households that will need to be physically resettled. There are no households or land parcels in use in the reservoir area.

49. The land parcels in use are often a mix of cultivated, fallow, and un-cleared land. Twenty-eight of the one hundred and forty-two land parcels to be acquired will lose more than 50% of their total area. Nineteen of the one hundred and forty-two land parcels to be acquired will lose more than 80% of their total area. Not all of the land to be acquired is cultivated; some land in the region is too steep or inapt for cultivation. The main compensation option designated in the resettlement and compensation framework is monetary compensation for land acquired for the Project. Land users losing significant cultivated land will receive monetary compensation for their land and an optional monetary bonus to develop cultivable areas within their remaining land parcel. In cases where land users cannot reestablish at least 90% of their original cultivated area within the remaining property or possession, the land users will be eligible for land-based compensation. Additionally, compensation will be provided for land users opportunity cost for profits lost during the period of maturation of new plants and production.

50. Since livelihoods of affected people are generally dependent on agriculture, the magnitude of the impact could be substantial at the household level. Households losing cultivated land especially those losing more than 50% of their cultivated land will see the greatest impacts. These impacts are tied to the time necessary for plants to mature and begin to produce on new land. At the community level, i.e. *Comunidades Campesinas* and villages holding private land, there is not likely to be significant impacts. The biggest factor is the need for available land, and land is available that could accommodate affected persons losing land to the Project.

51. In the case of the *Comunidad Campesina* of Pillao there is some risk that the governing body may not allocate adequate resources gained from compensation to directly impacted villages. Individuals losing the use of the land due to the Project will be compensated for improvements and crops on the land however compensation for the land itself will be given to the *Comunidad Campesina*. The impacted villages are over five hours in a vehicle from the governing body and are composed of different livelihoods and interests. This could create tensions within the *Comunidad Campesina* of Pillao.

52. ***Social impacts and risks related to construction.*** At its peak Project construction will involve as many as 1800 workers. It is anticipated that many of the workers will come from within the region and will stay in the camp as villages may still be distant. These workers will face occupational health and safety risks including handling of explosives, tunnel excavation, earth movement, and use of heavy machinery. Construction impacts and risks to

communities include risk of traffic accidents with pedestrians, increased noise, dust and vibration due to increased traffic, transport of construction materials, borrow pits, and tunnel blasting, decreased air quality. There are potential health and security risks associated with the presence of foreign workers in the area. The influx of workers from nearby communities and towns may also create tensions as locals compete for the same work with the Project and because of the anticipated high concentration of workers in the construction camp.

53. ***Cultural heritage.*** No archeological remains or other evidence was found. The EIA (2010) included a surface level archeological investigation in order to identify and assess the possible presence of and impact to archeological resources in the Projects area of influence. The methodology utilized consisted of a documentation review and archeological surveys in twenty-one sites throughout the project area of influence. No evidence was found during the documentation review suggesting that the Project area of influence would pose greater possibilities of archeological heritage than the surrounding region. Despite these negative findings, the Project, in line with national regulations and international best practice, has incorporated a chance find and archeological monitoring program in its management planning framework.

4.2 Operational phase (including reservoir impoundment)

54. ***Impacts and risks on terrestrial habitat and threatened species.*** Impoundment of the reservoir will convert the riparian habitat and part of the gallery forest located along the slopes of the Huallaga River for 17 km upstream of the dam. Although, as mentioned in section 3.2 above, some species of conservation importance have been found close to or in the reservoir area, their known distribution and local habitat ranges imply that local extinction of these species due to the Project is very unlikely. There will be however residual impacts and risks on these species, which will need to be adequately managed, and compensated.

55. ***Impacts and risks on aquatic habitat and fish species.*** The most significant potential environmental impacts and risks during the operational phase are those on aquatic habitat, particularly on fish. There are four main impacts zones:

a. Zone 1: the reservoir area (upstream of the dam): aquatic habitat in the reservoir area is likely to experience significant impacts in relation to the substantial changes in hydrodynamics (from fast flowing river to a lake), and possibly changes in water quality. Native riparian habitat will be flooded. Downstream connectivity of the main river channel will be maintained in rainy season (through spills) but upstream connectivity will be lost. This is likely to lead to changes in relative abundance of fish species and a reduction in their diversity.

b. Zone 2: the main river channel in the dewatered section between the dam and powerhouse: this area will experience a significant reduction in flows in dry season (May through September) in relation to baseline conditions. If appropriate depth/velocities, connectivity, and trophic conditions are not maintained, this is likely to lead to a significant degradation of the aquatic habitat. Reduction in

available habitat may lead to a reduction in fish abundance, and possibly a decrease in diversity.

c. Zone 3: the tributaries in the dewatered section: the tributaries between the dam and the powerhouse will not be directly impacted by the Project. Their aquatic habitat may be affected however in case connectivity with the main river channel were to be lost, and adequate depth/velocity conditions in the main river channel adequate to ensure fish movements between the tributaries were not maintained.

d. Zone 4: Downstream of the powerhouse: the main impacts downstream of the powerhouse relate to potential changes in water quality and daily variations of flow when operating in peaking mode in dry season (turbine on / turbine off).

56. Regarding specifically potential impacts of the Project on fish species of conservation interest, only the *Chaetostoma sp. 1* and *sp. 2* have so far not been found outside of the Project's area of influence.[11]. Neither of the two morphospecies has been found in Zone 1. *Chaetostoma sp. 1* has been found in zones 3 and 4, and is likely to use zone 2 at specific periods of the year (e.g., breeding). *Chaetostoma sp. 2* has been found in zones 2, 3 and 4. It is anticipated that potential adverse impacts on these morphospecies can be mitigated through an appropriate management of the ecological flow (zones 2 and 3), and variations of flow downstream (zone 4). However, because these species are potentially new to science, there are still many uncertainties regarding their final identifications, distributions, habitat and feeding requirements, ranges, migratory movements, and life histories. Additional studies will be needed in order to better understand potential impacts of the Project particularly on these species, and its significance, in order to better define appropriate mitigation and management measures. Potential impacts on migratory fish are likely to be of limited significance provided connectivity between tributaries flowing into the dewatered section is maintained, since their altitudinal range is believed to be below or marginally above the dam site.

57. ***Changes in water quality in the reservoir and downstream of the dam.*** Due to changes in the hydrodynamic conditions, reservoirs generally experience significant changes in water quality through the water column. For most reservoirs it is common to experience thermal stratification, and for the deeper waters, below the epilimnion or surface layer, to become anoxic during warmer part of the year. Depending on the relative elevation and configuration of the water intakes vis-à-vis the reservoir surface level, anoxic water can also be discharged downstream of the dam. In order to assess further the potential changes in water quality in the reservoir and in the Huallaga River downstream, a 2-D water quality modeling (CE-QUAL-W2) was run specifically for the Project[12], using dimensional hydrodynamic and water quality model capable of predicting water surface elevation, velocity, temperature, nutrient concentrations, dissolved oxygen, pH, alkalinity, and other variables. The model is set up to predict these state variables at longitudinal segments and vertical layers.

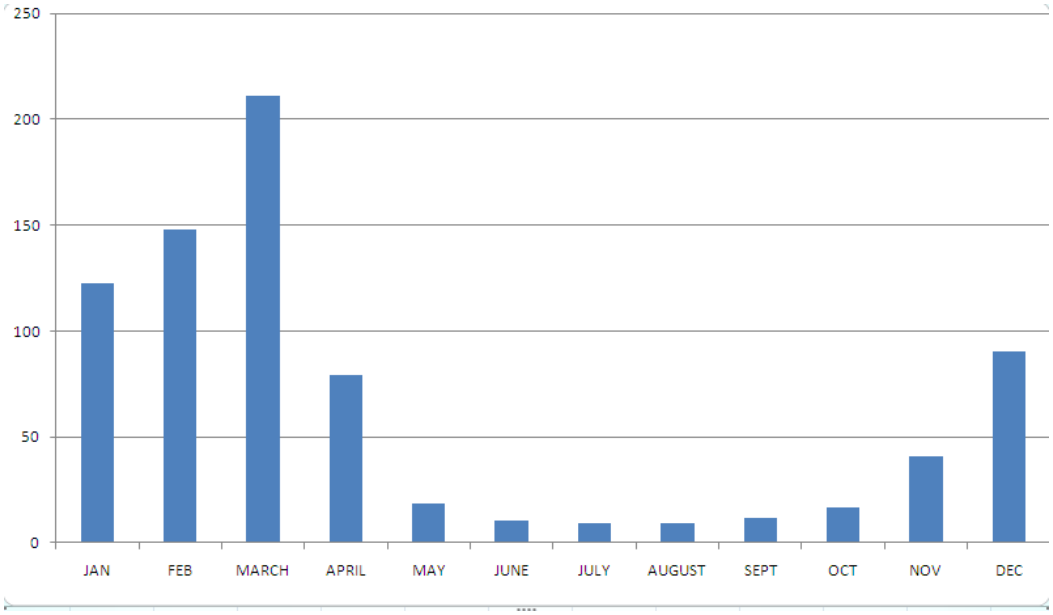
[11] This does not necessarily mean that these two morphospecies are restricted only to the Project area.

[12] The first phase report on water quality is available on IDB's website as part of the Supplementary Information Package for Lenders.

58. Main outcomes of the initial running of the water quality model are that: (i) the reservoir is likely to experience thermal stratification, particularly during the dry season with epilimnion temperatures being at least several degrees warmer than temperatures in the hypolimnion; (ii) however the high elevation of both the main water intake and the ecological flow intake result in water being withdrawn from the reservoir at depths where water is likely to be relatively well oxygenated, with dissolved oxygen concentrations of dam outflows rarely below 6 mg/l and in average close to 7.5 mg/l; and (iii) as a consequence dissolved oxygen concentrations in the river downstream of the dam are expected to be generally well-above 6 mg/l, generally approaching 8 mg/l. Downstream of the powerhouse, other variables would also not experience significant changes in comparison with the baseline situation. Potential adverse impacts related to changes in water quality downstream of the dam are therefore expected to be of limited significance. These results will be refined in a second phase of the assessment of changes in water quality running the model with additional empirical data coming from subsequent field surveys.

59. ***Changes in flow in the dewatered section of the Huallaga River between the dam and the powerhouse.*** A substantial proportion of the flow of the Huallaga River on its 15.5-km section between the dam and powerhouse will be diverted by the Project. The Project is currently planning to release continuously downstream of the dam a minimum flow of at least 3.68 m^3/s, corresponding approximately to 2.5 % of the annual average flow of the Huallaga River at the dam site. There are tributaries providing additional flow in this section of the Huallaga River. They are however of limited importance during dry season: in the three driest months (June, July and August) the flow in the Huallaga River just before the powerhouse, hence including all additional flows from tributaries, is expected to be around 10 m^3/s, i.e. less than the 20 % of the corresponding minimum monthly average flow. Some additional flow will be released through the spillways about 6 months a year, but only during rainy season, when the flow in the River is higher than the design flow of the Project. As can be observed in Chart #2 below, the reduction of flow in the Huallaga River between the dam and powerhouse is therefore expected to be significant during the dry season, between May and October. Impacts from such flows reductions are likely to include reduction in aquatic habitats and therefore in abundance of fish; barrier effects on fish movements due to low depth and/or high velocity in critical sections of the River; loss of connectivity between the main River channel and its tributaries. Without appropriate mitigation measures in place, there is also a substantial risk of a collapse of the food chain in this section of the Huallaga River. An ecological flow management plan, including further assessment of the impacts on the River ecology of reduced flow based on actual River bathymetry and corresponding mitigation measures will be developed and implemented (see section 5).

Chart #2: Average monthly flows (m^3/s) in the Huallaga River just before the powerhouse when the Project is in operation (minimum flow of 3.68 m^3/s)



60. ***Changes in flow of the Huallaga River downstream of the powerhouse.*** During rainy season, the Project will operate as run-of-the river and therefore no changes in flow downstream of the powerhouse are expected vis-à-vis the baseline conditions. However during the driest months of the year (June-September), the flow in the Huallaga River is on average less than design flow of one turbine (about 66 m^3/s). During these months, it is therefore likely that the Project will operate in peaking mode, i.e. will store water in the reservoir during a few hours (turbine off), then generate power operating one turbine at design flow capacity (turbine on). Reservoir water level variations as a result of this operating mode will be limited to 1 meter. This operating mode will also generate daily fluctuations in flows downstream of the powerhouse, which get attenuated further downstream with flows contributions of the tributaries. A preliminary hydrological model was run to estimate the significance of this effect. Results of this preliminary model indicate that when operating in peaking mode in the driest months, flows will vary on a daily basis about 15 km downstream of the powerhouse by about a factor 2 (e.g. from 53 to 119 m^3/s), slightly above the natural monthly standard deviation (e.g. 31.7 m^3/s in August). In terms of velocity, the model estimates that peaking operations will result in an increase in average velocities in the downstream segment of about 15.6%. Such daily fluctuations of flow may also affect wetted perimeter, depth, and fish micro-habitat that would be located close to the river banks.

61. ***Cumulative impacts.*** There is currently no plan to build any other hydropower project on the Huallaga River, or any other large infrastructure in the Project's direct and indirect areas of influence. In April 2009, an EIA for the 180 MW Belo Horizonte Hydropower Project, located on the Monzon River, a tributary that enters the Huallaga River near Tingo Maria, was presented to MINEM. It seems however that the time allowed by the temporary concession for the developer of the Belo Horizonte Hydropower Project to present detailed

feasibility studies has now elapsed and that this project is not moving forward. Cumulative impacts are therefore unlikely and, if any, expected to be of limited significance.

62. ***Greenhouse gases emissions.*** A detailed inventory[13] was carried out for greenhouse gases (GHG) emissions from construction, including fuel use, electricity use, land use change and embedded carbon in construction materials. GHG emissions for the whole Project construction (at the exclusion of the transmission line) are estimated to be approximately 239,000 teq-CO_2. Due to a very high power density ratio[14] of 87 W/m^2, GHG emissions of the reservoir during operation are considered negligible. Annual reductions of GHG emissions during operation due to displacement of fossil fuels power generation in the Peruvian grid are estimated around 467,000 teq-CO_2/year[15].

63. ***Risks caused by Natural Disasters.*** A partial or full dam failure is unlikely, but would have significant consequences, particularly for the communities living downstream of the dam, in the Project's area of influence and down to the city of Tingo Maria. It is recognized that the project area is seismically active. Seismic risk was evaluated for the initial Chaglla Project in the Pre-Feasibility Study (Lavalin, 1986) and reviewed for the Feasibility Study (1994). The ground accelerations established in the design studies would categorize the project area as being of medium seismicity. However, in view of the seismicity of the country and the scale of the project, it has been recommended that a Seismic Hazard study be undertaken, as part of the detailed design, to confirm these values. Regarding potential failure of the dam due to overtopping resulting from a flood higher than the spillway capacity, in the Basic Design the spillway has been sized to discharge the 1 in 10 000 year return period flood, estimated at 3621 m^3/s. A Dam Break study will be undertaken as part of the Executive Design to identify the risk to life downstream in the event of a failure of the dam, by establishing the river regime including both depths and velocities of flow, as these together will indicate where there is risk to life or major damage.

64. ***Climate change impacts.*** While local historical record suggests no evidence of adverse impacts of climate change, recent developments in climate modeling have suggested that significant changes may be predicted for annual and seasonal rainfall over the Amazon basin. The recent publication from the World Bank[16] on possible implications of climate change scenarios on Amazon basin hydrology highlights regional concerns. The Project catchment is not located within one of the sample areas considered in the World Bank report, but is assumed to be represented by the 'north west Amazon' sample area in that document. For this sample area, the World Bank's report found no significant change from current climate models - with possible long term increase in precipitation over the Inter-Tropical Convergence Zone (ITCZ) and the Northwestern Amazon.

[13] This inventory is available on IDB's website as part of the Supplementary Information Package for Lenders.

[14] Well above the threshold of 10 W/m^2 above which, according to the Clean Development Mechanism, GHG emissions from the Reservoir can be neglected (http://cdm.unfccc.int/EB/023/eb23_repan5.pdf).

[15] Estimation is based on an average emission factor for the grid. The Clean Development Mechanism´s tool to calculate emission factors, based on the marginal emissions of the most probable alternative to the project, would likely result in a much larger emission reduction of over 1 million teq-CO_2/year.

[16] "Assessment of the Risk of Amazon Dieback", World Bank, 2010.

5. MANAGEMENT OF ENVIRONMENTAL AND SOCIAL IMPACTS AND RISKS

65. ***Environmental and Social Management Framework.*** The Empresa de Generación Huallaga S.A. (EGH), a subsidiary of the Odebrecht Energy Group incorporated under Peruvian law, holds the energy generation concession for the Chaglla Hydroelectric Project. As such, EGH will be responsible for ensuring that the Project complies with all applicable environmental and social permitting procedures, laws and regulations under Peruvian Law, and IDB's environmental and social safeguards policies. The EGH has entered into an EPC contract agreement with Odebrecht Peru Ingeniería y Construcción (OPIC) who will serve as the primary EPC contractor for the Chaglla Project. The relation between the two companies is regulated by the EPC contract, which requires OPIC to implement all elements of the environmental and social management framework described in the EIA and approved by the DGAAE – MEM. As a part of the Odebrecht Organization, both EGH and OPIC are also obligated to comply with Odebrecht's corporate policies on environment, health, safety, security and sustainability.

66. Within OPIC, the Office of Environment and Community Relations (ECR) is responsible for administering the environmental and social management framework, including the design, implementation, monitoring and evaluation of each component included in the environmental and social management plans. The ECR Office consists of a Director of Environment and Community Relations based in Lima, two environmental specialists based in Lima and two community relations specialists based in Tingo Maria. In addition to implementing the environmental and social management framework, the ECR team has been involved in coordinating environmental and social aspects of the EIA process and coordinating the initial implementation of the community relations programs. Contracting companies are also contractually required to comply with the Company's environmental and social standards, including the code of conduct, and all other elements of the environmental and social management framework. In cases of non-compliance, the ECR office has the authority to leverage fines or stop work, if necessary. OPIC has plans to increase the capacity of the ECR team as the Project progresses, such that the capacity of the ECR team is commensurate with the environmental and social activities during the construction and operation of the Project.

67. ***Management of environmental impacts and risks during construction.*** The EIA (2010) includes an Environmental Management Plan corresponding to the environmental impacts identified through the impact assessment process. The Environmental Management Plan includes a Policy and lists the responsibilities that EGH and the EPC contractor will have in each phase**.** A series of specific programs are detailed under the plan. Each program lists the mitigation and management measures associated with the potential impacts of each Project phase. The programs relevant to the construction phase are the following: Ancillary Facilities Management Program (construction camp; banks of materials; spoils disposal sites); Erosion and Sedimentation Control Program; Explosives Management Program; Underground Excavation Management Program; Re-vegetation Program; Solid Waste and Effluent Management Program; Workers Health and Safety Program. Measures address the key environmental impacts to air, surface water, groundwater, soil, vegetation, fauna,

hydrobiology and landscape. The measures listed in the EIA are appropriate and will serve as a good basis to develop more implementation-oriented documents. Most of the programs presented in the EIA are currently generic in nature, and EGH/OPIC will prepare more detailed and site specific management plants that specify the actions to undertake for implementation.

68. Specifically, the following aspects will require careful planning, management and supervision during the construction phase:

a. ***Erosion Prevention and Sedimentation Control:*** tailored plans will need to be developed and implemented to ensure that as construction advances the most appropriate measures are being implemented in each construction front, considering site-specific geomorphologic and hydrologic conditions;

b. Sourcing of construction materials in the riverbed: further optimization of sourcing of construction materials will be undertaken, and site-specific specific mitigation measures to avoid contamination of the Huallaga River will be developed and implemented;

c. Effluent Treatment and Disposal: there are several sources of potential contamination to the surface water through effluent discharges, including construction camp, batching plant, tunnel excavation activities, and leachate from spoil disposal. Sources-specific measures for effluent treatment and disposal will be developed and implemented.

d. Re-vegetation and slopes stability: The re-vegetation program included in the EIA aims to establish measures and standards necessary for an effective restoration of temporary areas affected by the Project construction. More detailed planning will be required to ensure that the intervened areas are being restored at a level that preserves its original condition (e.g., reforestation of multiple individuals for each individual removed), and overall slopes stability.

69. ***Management of social impacts related to land acquisition, physical resettlement and construction activities.*** The resettlement and compensation plan has established baselines studies, asset evaluations, a cut-off date, consultation and negotiation processes, compensation framework and entitlement criteria), legal and land title procedures, and a communication and conflict resolution system. The resettlement and compensation plan will physically resettle twenty-five households and there will be acquisition of 142 land parcels. The main compensation option for affected persons losing land to be acquired for the Project is monetary compensation. Landowners are to receive monetary compensation for the land acquired and for improvements made to the land such as buildings, crops, etc. Land users on communal lands, such as the *Comunidades Campesinas*, are to receive monetary compensation for improvements to the land while the governing body of the *Comunidad Campesina* will receive monetary compensation for the land. If one is losing over 60% of their cultivated land affected persons will be provided the option of land-for-land compensation.

70. Landowners and land users losing cultivated land will be eligible to receive additional monetary bonus and technical assistance to develop cultivable areas within their remaining land parcel. To be eligible for this compensation option one must be losing greater than 10%

of one's cultivable land. If remaining land does not yield the ability to regain at least 90% of the cultivated land loss the affected person will be eligible for a land-for-land option.

71. Careful attention will be needed to ensure the compensation framework is viable in practice. In most cases, land parcels are only cultivated in part. However, there is no information available regarding the level of cultivability of the land to be acquired or of the land remaining. If remaining land on a parcel is inapt for cultivation it will have a bearing on determining the appropriate compensation option.

72. ***Management of social impacts related to construction activities.*** The EIA includes a Social Management Plan which consists of a communications and consultation program, a local contracting program, community development program, and a participatory monitoring program for the construction phase.

73. ***Management of impacts and risks on threatened terrestrial species.*** Programs identified in the EIA that will be developed and implemented to mitigate potential impacts to threatened terrestrial species include: a terrestrial fauna management plan, a re-vegetation program, a landscape restoration program, erosion and sedimentation control plan, and a terrestrial fauna rescue and protection plan. These plans will be developed with specific attention paid to mitigating effects on species of conservation concern previously described in section 3.2. In addition, as compensation for unavoidable impacts occasioned by project construction and operation on natural habitats, a biodiversity compensation plan will be developed. This plan is expected to include actions such as: support to the Tingo Maria National Park in order to help ensure that the Park meets its conservation objectives (which include protecting much of the same terrestrial fauna and flora to be impacted by the Project); developing and implementing programs aimed at conserving the biodiversity of the Carpish Important Bird Area and the Monzón-Carpish Priority Conservation Area. To the extent possible these programs and the support to Tingo Maria National Park will be developed and carried out in conjunction with Peruvian conservation NGOs and/or international conservation NGOs with demonstrated success working in these or ecologically and socially similar areas in Peru.

74. ***Ecological flow determination and management.*** As mentioned in the previous section on impacts and risks, an Ecological Flow Management Plan will be developed and implemented. The first phase in the development process of such a Plan is to complete the ecological flow assessment study, which will evaluate the potential Project impacts on aquatic ecosystems in the dewatered section of the Huallaga River according to a range of feasible minimum flow discharges. This study has not been completed yet since it requires collection of additional bathymetric data (Rived bed morphology) during the dry season. When the necessary additional field data have been collected, depth, velocity and habitat conditions in the dewatered section will be predicted using the Instream Flow Incremental Methodology[17] (IFIM) and associated Physical Habitat Simulation System Model (PHABSIM), and compared to suitability curves for target fish species. Target fish species are expected to include the morphospecies encountered in the dewatered section and tributaries, and thought

[17] For an overview of IFIM/PHABSIM, see e.g. the following US Geological Survey (USGS)'s website: http://www.fort.usgs.gov/products/Publications/15000/chapter1.html

to be endemic of the Huallaga River basin, such as *Astroblepus sp.1* and *sp.2* and *Chaetostoma sp.1* and *sp. 2*. One specific challenge here is that suitability curves for these species are not well known, and therefore will need to be refined as additional surveys are undertaken during the construction phase to understand further their life history and habitat requirements. The initial run of IFIM/PHABSIM will be used to develop a Phase 1 Ecological Flow Management Plan, which will include a preliminary proposition of mitigation measures to be implemented in order to: i) maintain connectivity in terms of target fish movements between the tributaries found in the dewatered section and the main River Channel; and ii) preserve as much as possible of the natural native aquatic microhabitat. Such mitigation measures are expected to include, as appropriate:

- Occasional increase of the minimum flow during critical periods in the life history of the target species (e.g. spawning, juvenile, migration to the main River channel due to temporary unsuitability of the habitat in tributaries);
- Channel modifications, as necessary to concentrate flows on selected portions of the available river bed;
- Non-structural barriers, as necessary to raise water levels at selected locations;
- Water velocity control devices, where river slope inclination favors velocities that exceed the desirable range;
- Physical modifications at tributary confluences, as necessary to assure adequate connectivity;
- Microhabitat restoration in critical section of the main River channel.

75. Mitigation measures proposed in the Phase 1 Ecological Flow Management Plan should provide sufficient comfort that the Project is unlikely to lead to the extinction of fish species only found in the general region of the Project (either directly, or indirectly through reducing their global population to unviable numbers). Results of Phase 1 Ecological Flow Management Plan will be reviewed and the overall viability of the approach will be confirmed by two independent experts. It is anticipated that some of the mitigation measures (e.g. channel modifications) will be implemented, at least on a pilot basis, during the construction phase, which will enable to gain valuable knowledge about their performance and possible optimization. Regarding the other native fish species found in the dewatered section, in case it proves not feasible to maintain viable populations there, compensatory options (i.e. biodiversity offset targeting similar aquatic habitats, e.g. downstream) will need to be explored.

76. Prior to the Project's technical completion and commencement of operation, a Final Ecological Flow Management Plan will be developed. On the basis of the additional surveys and pilot implementation of mitigation measures undertaken during construction, this plan is expected to include: i) final results of the IFIM/PHABSIM modeling; ii) a proposed ecological flow regime, including management of variations of flow downstream of powerhouse; iii) other relevant mitigation and/or compensation measures to be implemented; and iv) an adaptive management process, including a system to monitor impacts during operation and to adapt mitigation measures accordingly.

77. ***Management of potential impacts on water uses.*** In terms of water use, it should be noted that in general communities located along the dewatered section of the Huallaga River are using water from the main river channel and from tributaries, springs, etc… The currently planned minimum flow (and any flow greater) would be sufficient to cover direct water needs, bathing, cattle, etc. Communities however do engage in fishing for subsistence purposes on a limited, but ongoing basis. Fishing is most common during the dry season, during which time residents fish about three times per week on average. Even if the ecological flow regime and other mitigation measures are successful in preserving viable populations of native fish species in the dewatered section of the Huallaga River and tributaries, it is likely that fish abundance will diminish in relation to the decrease in available habitats, particularly in dry season. Depending on the results of the Fishing Baseline Study to be undertaken to complete a quantitative identification of baseline subsistence fishing and to assess the potential socio-economic and health impacts related to reduced opportunities, compensation measures will be developed, which could include: in-kind replacement through community based aquaculture projects using native fish species, or recreation of favorable fishing grounds in the river channel or tributaries; or in case such options are not feasible or desirable, support to alternative productive activities to increase income and/or agricultural production by collaborating with organizations or cooperatives already involved in agricultural extension, technical training or agricultural commercialization in the area.

78. ***Management of impacts and risks downstream of the powerhouse.*** When operating in peaking mode during dry season, daily flows variations downstream of the powerhouse are not negligible, and potential impacts in terms of community safety and potential impact on aquatic habitat will need to be properly assessed and managed. Potential impacts on aquatic communities will be further assessed as more data about distribution, life history, of fish species found downstream of the powerhouse are collected and analyzed. Prior to operation, a management plan will be developed to mitigate such potential impacts. It is expected that this management plan will establish a maximum rate of increase in flow levels when switching from turbine off to turbine on and other operating rules aiming to minimize impacts of daily flow fluctuations, and will include an adaptive management process.

79. ***Disasters Risks Management.*** As mentioned in the previous section, a Dam Break study will be undertaken as part of the Executive Design to identify the risk to life downstream in the event of a failure of the dam, by establishing the river regime including both depths and velocities of flow, as these together will indicate where there is risk to life or major damage. On the basis on this study, a more detailed Dam Emergency Plan will be developed, which will address among others the following topics:

- Indicators to identify emergencies (indicators for hydrologic events, landslide detection, physical event detection, etc.);
- Threshold lines from which an event or abnormality can become dangerous;
- Identification of safe scenarios to establish rules and communication procedures; and
- Definition of areas subject to progressive flooding together with the breaking wave and its arrival time, and estimation of potential damage.

6. PUBLIC CONSULTATION

80. ***Public consultation activities carried out and key results.*** A public consultation meeting was organized on December 15, 2010 and two participatory workshops were organized on October 16&17, 2010 and December 2&3, 2010. All meetings took place in the direct areas of influence to discuss the main results of the EIA. There appears to be general support for the Project and participants raised their expectations of the Project: (i) increased access to social services due to improved roads, (ii) access to new services and markets, (iii) job creation, and (iv) fair compensation for acquired land.

81. ***Public consultation activities during Project's implementation.*** The Project has a five-part community relations strategy focusing on communication, worker conduct, local contracting, land acquisition and compensation, and community development. The Project has initiated multiple communication and consultation initiatives focused on community health and safety (traffic awareness), general disclosure of project information through informal dialogue with residents and key stakeholders, the creation of a community relations office in Cayumba, and coordination with a consultant team to interact with affected persons on an ongoing basis. EGH has engaged in a series of meetings to initiate a process to establish collaboration agreements with key stakeholders such as the University of Tingo Maria, the Cooperativa Naranjillo and the Tingo Maria National Park. These initiatives are generally aligned with the communication and consultation strategy outlined in the Community Relations Plan. The Project does not have a complete documentation strategy. Limited documentation was available regarding the communication and consultation program areas, activities, schedules, roles, responsibilities, monitoring or evaluation already conducted, and should be improved specifically with respect to post ESIA consultation.

82. ***Grievance Mechanism.*** A formal Grievance Mechanism applicable to the entire project has not yet been developed or implemented. A grievance mechanism for the land acquisition and compensation process is detailed in the in the Resettlement Framework and is reportedly being implemented. This mechanism includes guidelines for the establishment of a Grievance Mechanism to handle disputes regarding the identification or valuation of affected assets. Disputes regarding compensation options will reportedly be resolved through disclosure meetings and continued dialogue.

7. OPERATION COMPLIANCE EVALUATION

83. ***Compliance with national regulatory framework.*** The 2010 EIA has been approved by the relevant authority (MINEM) in April 2011. Compliance with the EIA will be monitored by the Ministry of Environment. Additional permits necessary for specific activities will be required on an ad-hoc basis.

84. ***Classification.*** Per the IDB's Environmental and Safeguards Compliance Policy, the project has been classified as a Category A operation due to the construction of a "large dam," as

defined by the International Commission on Large Dams[18]; and the potential for significant direct and indirect impacts on natural habitats, in particular in the future reservoir area and the dewatered section of the Huallaga River.

85. ***IDB's safeguard policies and Directive triggered.*** The project triggers several directives of the IDB's Environmental and Safeguards Compliance Policy (OP-703): Directive B.5 (Environmental Assessment Requirements), Directive B.6 (Consultations), B.9 (Natural Habitats and Cultural Sites), Directive B.10 (Hazardous Materials), Directive B.11 (Pollution Prevention and Abatement); as well as IDB's OP-Involuntary Resettlement Policy (OP-710) in relation to land acquisition activities. The Project also triggers the IDB's Disaster Risk Management Policy (OP-704) based on the proposed large dam and reservoir, and its location in a seismic prone area.

86. ***Level of Project's compliance with OP-703.*** Except for Directive B.9 on natural habitats, requirements of OP-703 are either being met by the Project, or are expected to be met by the proposed management and mitigation measures, and implementation system. Requirements of Directive B.9 for terrestrial habitats are expected to be met through the development and implementation of a biodiversity compensation plan satisfactory to the IDB.

87. Some uncertainties remain on Project's potential impacts on aquatic habitats, and particularly on the fish morphospecies potentially new to science found in the Project area. Regarding specifically the morphospecies *Chaetostoma sp. 1* and *2*, the information currently available does not allow to conclude at this time that it is unlikely that the Project's area is crucial for these species. However, these two morphospecies may not be restricted only to the Project area and it is likely that one morphospecies corresponds to the one as yet not described by Salcedo, and collected in the Huallaga River basin, in the Leoncio Prado Province. Future surveys by the species' main researchers may reveal a broader distribution than that which is currently known. It is also anticipated that potential adverse impacts on these morphospecies can be mitigated through an appropriate management of the ecological flow and variations of flow downstream. An initial set of such mitigation and management actions will be preliminarily developed prior to first disbursement on the basis of the additional surveys to be undertaken in the coming dry season, in a manner to provide further comfort to the IDB that the Project will meet requirements of Directive B.9, and will be further refined prior to commencement of operations.

88. ***Level of Project's compliance with OP-710.*** EGH's proposed resettlement plan is comprehensive and describes the key elements of the land acquisition process and includes parameters such as the baselines studies, asset evaluations, a cut-off date, consultation and negotiation processes, compensation framework and entitlement criteria (including land-for-land and/or monetary compensation), legal and land title procedures and a communication and conflict resolution system. It is expected that EGH will be able to meet the requirements of OP-710 through its proposed management and mitigation measures and implementation system.

[18] The International Commission on Large Dams (ICOLD)[18] defines a large dam, in part, as that which exceeds 15 meters in height, thus qualifying the proposed Chaglla dam as such.

8. REQUIREMENTS TO BE INCLUDED IN THE LEGAL AGREEMENTS

89. ***General Requirements***. The Bank (IDB) will require that *Empresa de Generación Huallaga* (the "Borrower"), and all portions of the Project shall, at all times during the life of the loan, comply with each of the following:

1. All applicable environmental, social, health and safety, and labor Peruvian regulatory requirements.
2. All requirements associated with any environmental, social, health and safety, and labor related permits, authorizations, or licenses that apply to the Project, the Borrower or any party responsible for executing the operation or its mitigation measures.
3. All environmental, social, health and safety, and labor requirements of the Project contracts and any subsequent modifications.
4. All aspects and components of all of the Operation's environmental, health and safety, social and labor documents.
5. Consult with IDB before approving or implementing any and all substantive changes to the Project (including its environmental and social management and mitigation plans) or its timetable which could potentially have negative environmental, social, labor, or health and safety effects.
6. Send written notice of any and all noncompliance with any environmental, health and safety, social and labor requirement of the loan agreement and any significant environmental, social, labor, health and safety accident, impact, event, claim or material complaint.
7. Ensure that all Borrower's contractors hired for construction and operation activities comply with the applicable environmental, labor, social and health and safety requirements of the loan agreement.
8. Implement ongoing information disclosure and consultation activities related to environmental, labor, social, and health and safety aspects of the Project, and, as applicable, participatory monitoring.
10. Implement an environmental, health and safety, social and labor management system that is consistent with international best practice, including ISO 14001.

90. ***First Disbursement.*** Prior to First Disbursement of the Loan, the Borrower must present to the satisfaction of the Bank the following:

(a) Results of an additional dry season survey of the ichthyofauna potentially directly or indirectly impacted by the project, carried out according to a protocol acceptable to the Bank. Results of this survey are expected to provide comfort that the Project is unlikely to place at high risk of global extinction any fish species.[19] In the specific case of the *Chaetostoma sp. 1* and *sp. 2* morphospecies and any other *Chaetostoma sp.* morphospecies found during the surveys, their habitats and feeding requirements, preliminary suitability curves and life histories (e.g. movements within and between the

[19] According to internationally accepted standards, for example the 2001 IUCN Red List Categories and Criteria: http://www.iucnredlist.org/technical-documents/categories-and-criteria/2001-categories-criteria

main stem and tributaries of the Huallaga River, reproductive behavior) will be investigated and, if necessary, these investigations will not be limited to the Project area;

(b) Where technically feasible, results of DNA analysis of each morphospecies of taxa known to display high levels of local endemism (e.g., members of the genera *Astroblepus* and *Chaetostoma*), collected during sampling efforts, including the upcoming dry season sampling effort, where such analysis is necessary to either (i) conclusively identify the morphospecies to the species level, (ii) associate it conclusively with morphospecies collected during previous collections in other areas, or (iii) determine conclusively that the morphospecies is new to science and a taxa previously uncollected; in order to properly inform the development of the Ecological Flow Management Plan;

(c) A Phase 1 Ecological Flow Management Plan as defined in paragraph 74 below. This Phase 1 Plan is expected to include information and to preliminarily propose mitigation and management actions sufficient to provide comfort that the Project is unlikely to lead to the extinction of fish species only found in the general region of the Project (either directly, or indirectly through reducing their global population to unviable numbers); and that the ecological integrity of the Huallaga River in the Project's area of influence, including its ability to maintain viable populations of its native species, will be preserved, or its elimination or severe diminution adequately compensated;

(d) A review of the Phase 1 Ecological Flow Management Plan and a confirmation of the overall viability of the approach by two independent experts acceptable to the Bank, including an assessment of the likely effectiveness of proposed preliminary measures for mitigating downstream impacts resulting from operating the facility in peaking mode that should be reasonably expected to preserve the ecological integrity of viable populations of the native species within the Huallaga River and its tributaries in the Project's area of influence; or in case that it proves not feasible to maintain viable populations of native species there, an assessment of whether proposed compensatory options (i.e. biodiversity offset targeting similar aquatic habitats, e.g. downstream) are adequate to comply with Directive B.9 of the IDB's Environment and Safeguards Compliance Policy (OP-703);

(e) The biodiversity compensation plan, as defined in paragraph 73 above;

(f) A preliminary report on the Environmental and Social Impact Assessment for the transmission line. This should include a thorough analysis of alternative routes and detailed description of environmental conditions along the selected route, as well as the results of a terrestrial fauna survey, and should identify and analyze any potential transmission line impacts on species nationally or internationally recognized to be threatened and on species with normal ranges not known to extend beyond the eastern slope of the Peruvian Andes (including any species new to science discovered during the survey). As pertinent, the report should include a preliminary proposition of measures acceptable to the Bank for mitigating such impacts; and set out the criteria and procedures that will be used to compensate any damage caused by construction and operation of the transmission line on affected communities, if any;

(g) The specific agreements negotiated with the affected households and the specific measures implemented or to be implemented to restore their livelihoods, in line with the principles incorporated in the Resettlement Action Plan (RAP);

(h) A Construction ESMP developed in line with the good international standards and practices applicable to the hydropower sector;

(i) A Dam break study.

91. ***Other Milestones.*** The Final Environmental and Social Impact Assessment for the transmission line will be submitted no later than February 28, 2012. Should a second (wet season) fauna survey be required in view of environmental conditions along the selected route, this deadline will be extended to April 30, 2012.

92. ***Other Disbursements.*** Prior to each disbursement, the Borrower shall certify compliance with all environmental social, health and safety and labor requirements in the loan agreement.

93. The Borrower shall as a specific requirement for Project Technical Completion:

(a) Submit to IDB, in form and substance satisfactory to IDB, a final Construction Phase Environmental and Social Compliance Report;

(b) Submit to IDB, in form and substance satisfactory to IDB, a finalized Environmental and Social Management Plan for the Project's operational phase, including among other management plans: the results of the Additional fish surveys carried out during the construction phase; the Final Ecological Flow Management Plan; the Emergency Management Plan;

(c) Submit to the satisfaction of the IDB, evidence of completion of specific environmental and social programs (e.g., bio-restoration programs, establishment of protected areas, completion of resettlement and compensation plans including livelihood restoration, etc.) required to ensure compliance with IDB safeguards.

94. During the life of the Loan Agreement, the Borrower must prepare and submit an Environmental and Social Compliance Report, in form, content and frequency acceptable to IDB. It is expected that during Project construction (i.e. until Project Technical Completion), the Borrower must prepare a quarterly report and the report must be received by the IDB in the subsequent month. After construction, the report must be prepared annually and must be submitted within 60 days after the close of the Calendar Year. In addition, the Borrower may be required to submit quarterly Environmental Monitoring Reports, in form and content acceptable to IDB, of evolving social or environmental conditions which the parties agree need to be closely monitored during construction, execution or both even if they are not specifically included in any Project environmental or social management or mitigation plan.\

95. To provide for Bank monitoring of the Project's environmental, social, health and safety, and labor aspects the Loan Agreement shall provide for:

(a) Direct Bank supervision actions (e.g., site visits, review of documentation, consultations with affected parties and third parties, etc.);
(b) The Bank's right to contract an external independent environmental consultant to perform more detailed supervision/monitoring actions during the Project construction and initial operation by the Sponsor/Borrower, and, as needed through the life of the loan.
(c) The Bank's right to contract for the performance of an independent environmental, social, health and safety, and labor audit, if the Bank deems necessary;
(d) The Borrower's agreement to provide access to all relevant documentation, facilities and personnel and cooperate fully with any inspection or audit by the Bank or its designated consultants.
(e) The Borrower's agreement to cooperate fully with the IDB's Independent Consultation and Investigation Mechanism (ICIM).

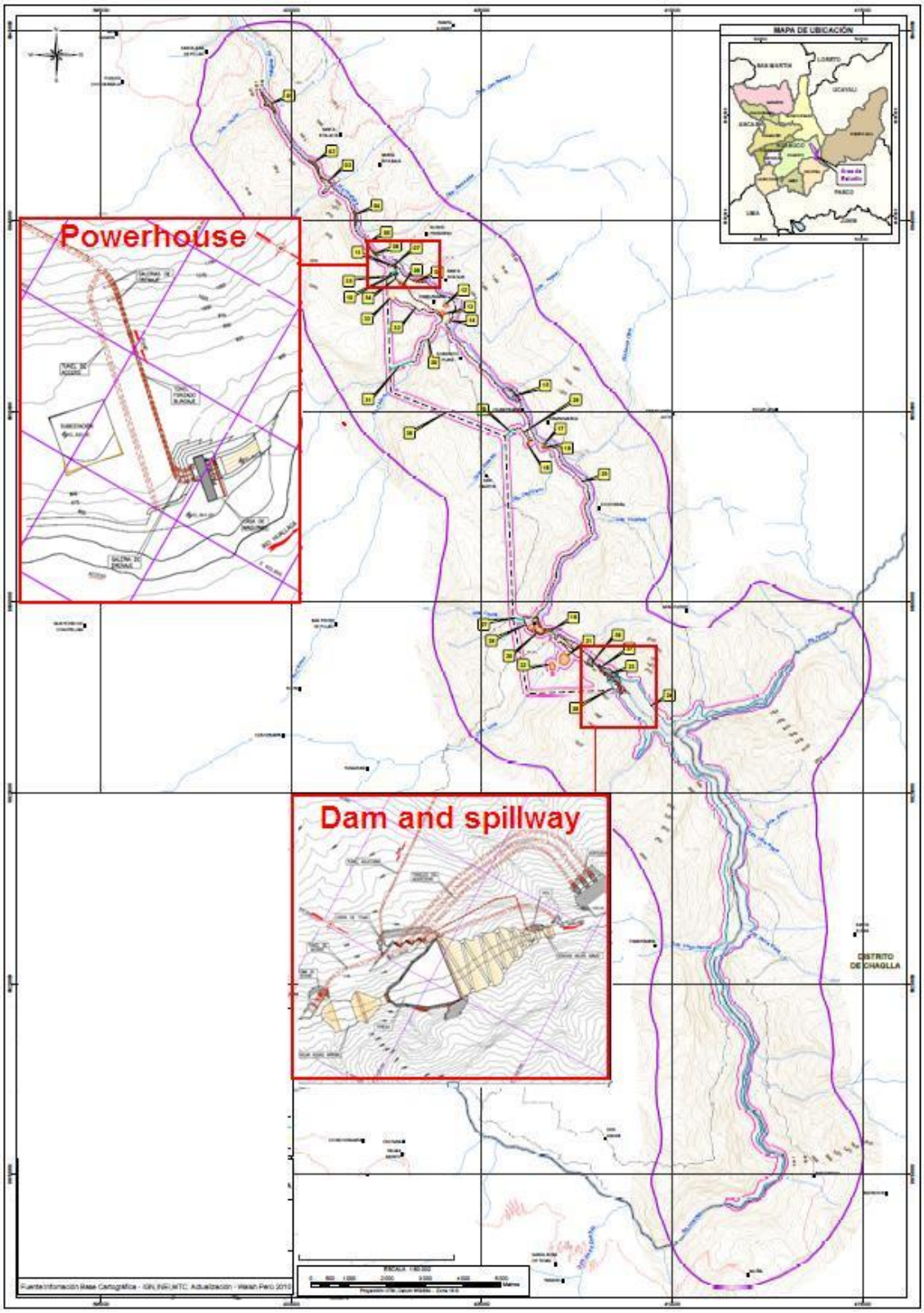
ANNEXES

CONTENT

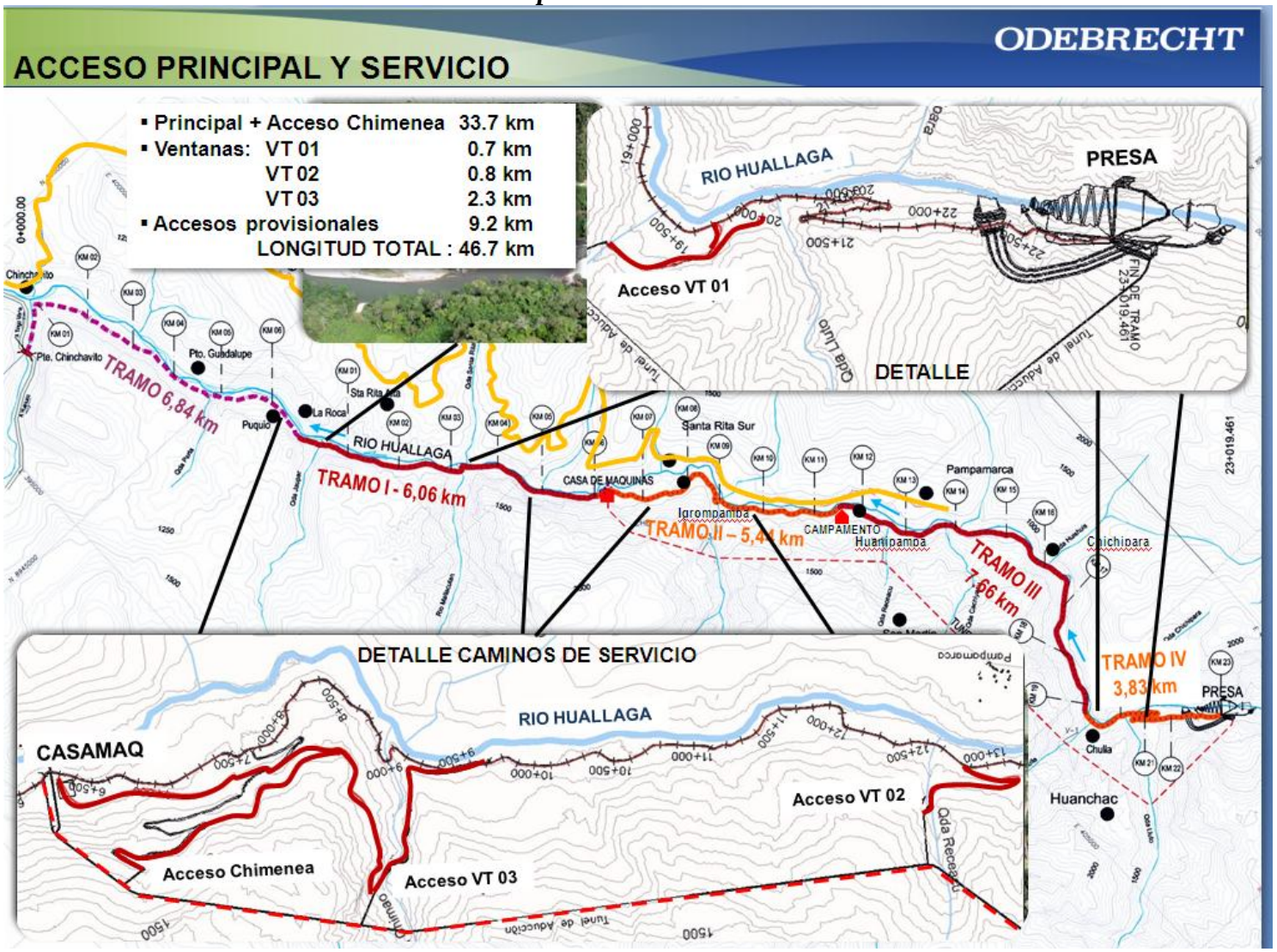
MAPS

PICTURES

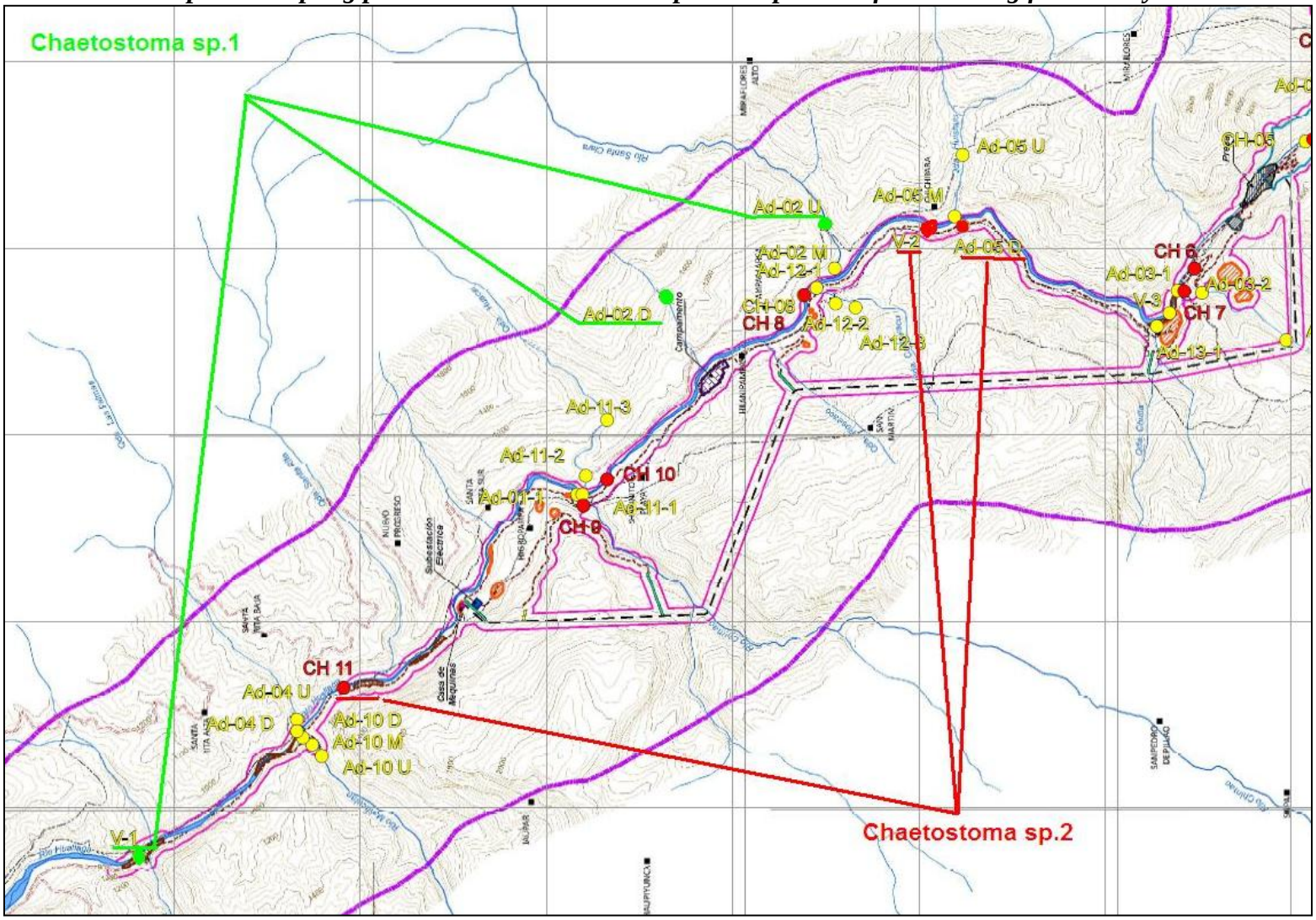
Map #1: Main Project Components



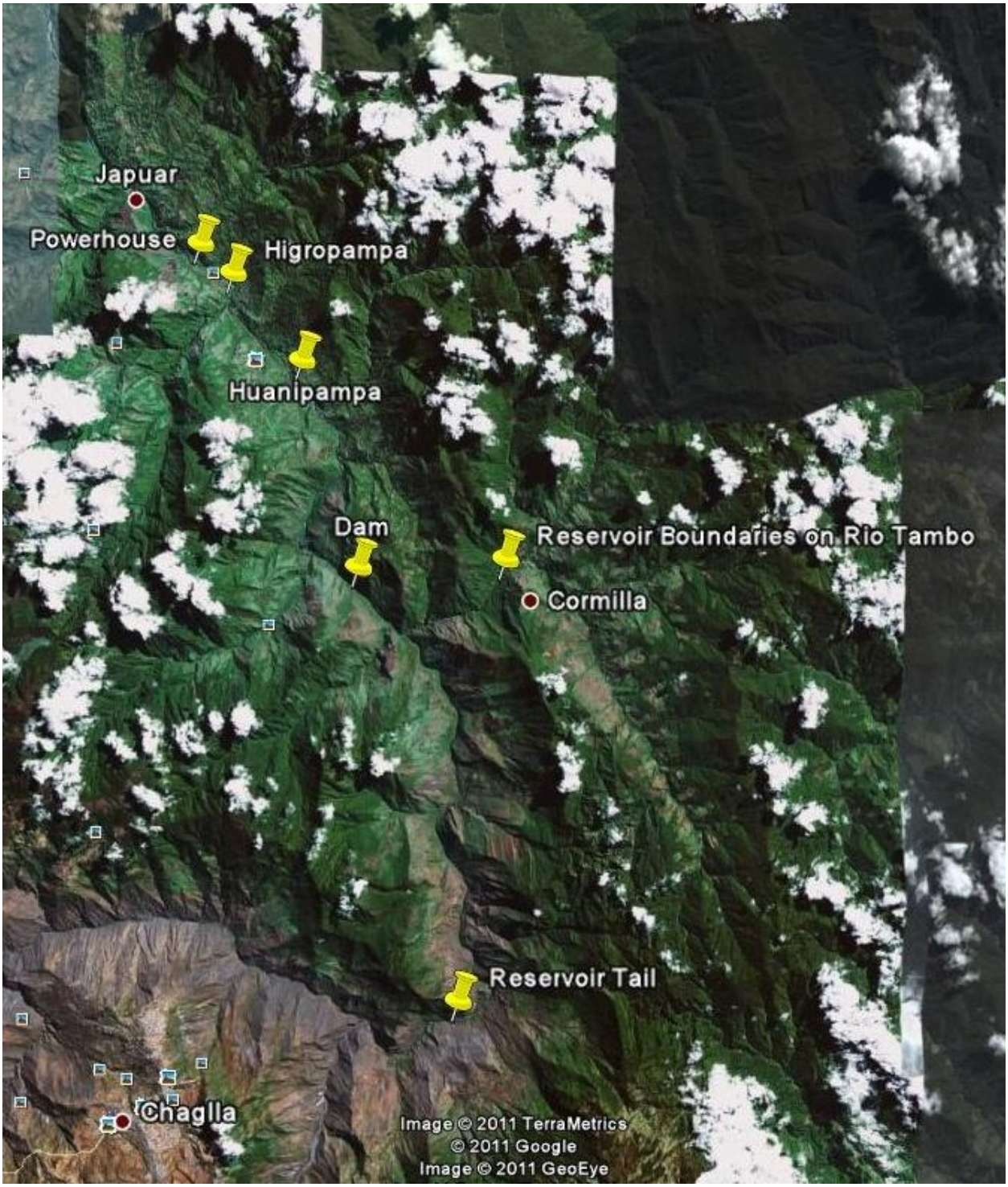
Map #2: Main Access Road



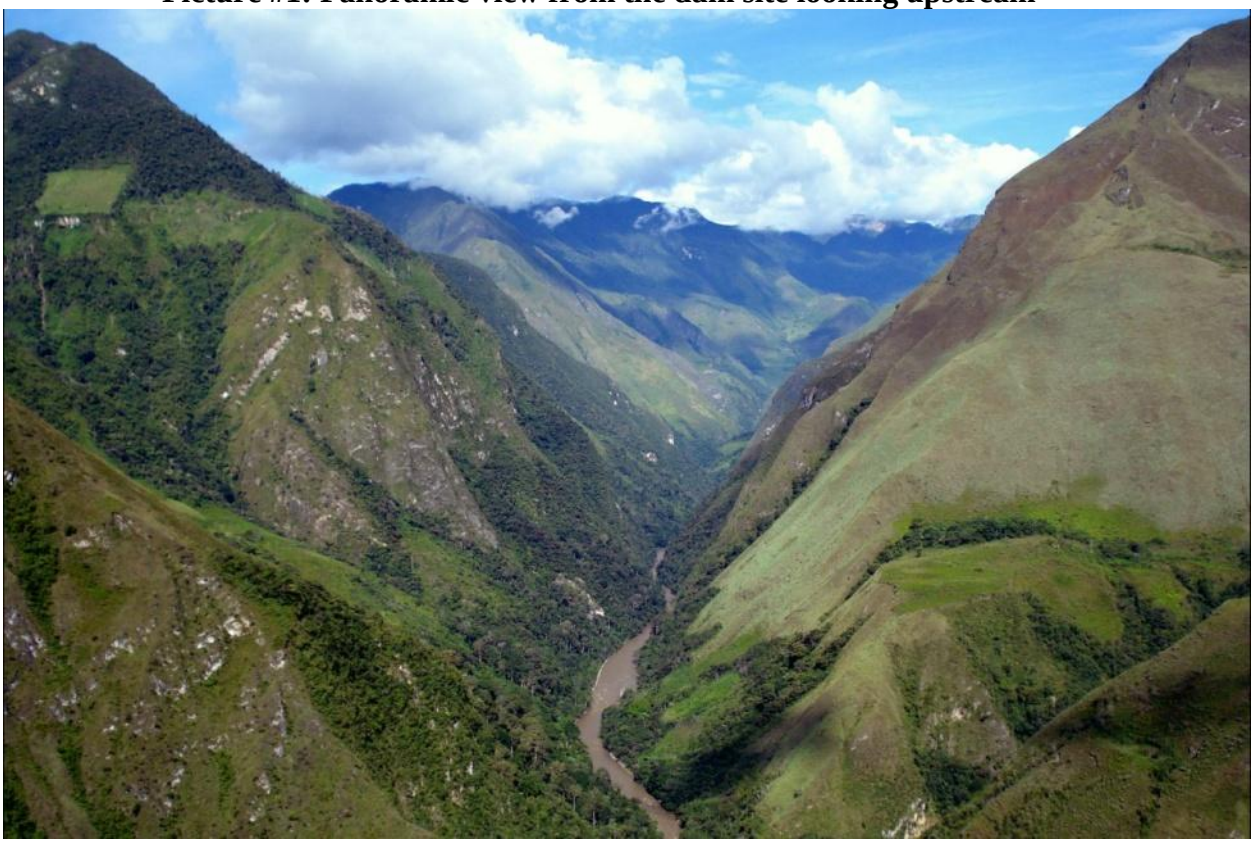
Map #3: Sampling points where Chaetostoma sp.1 and sp.2 were found during field surveys



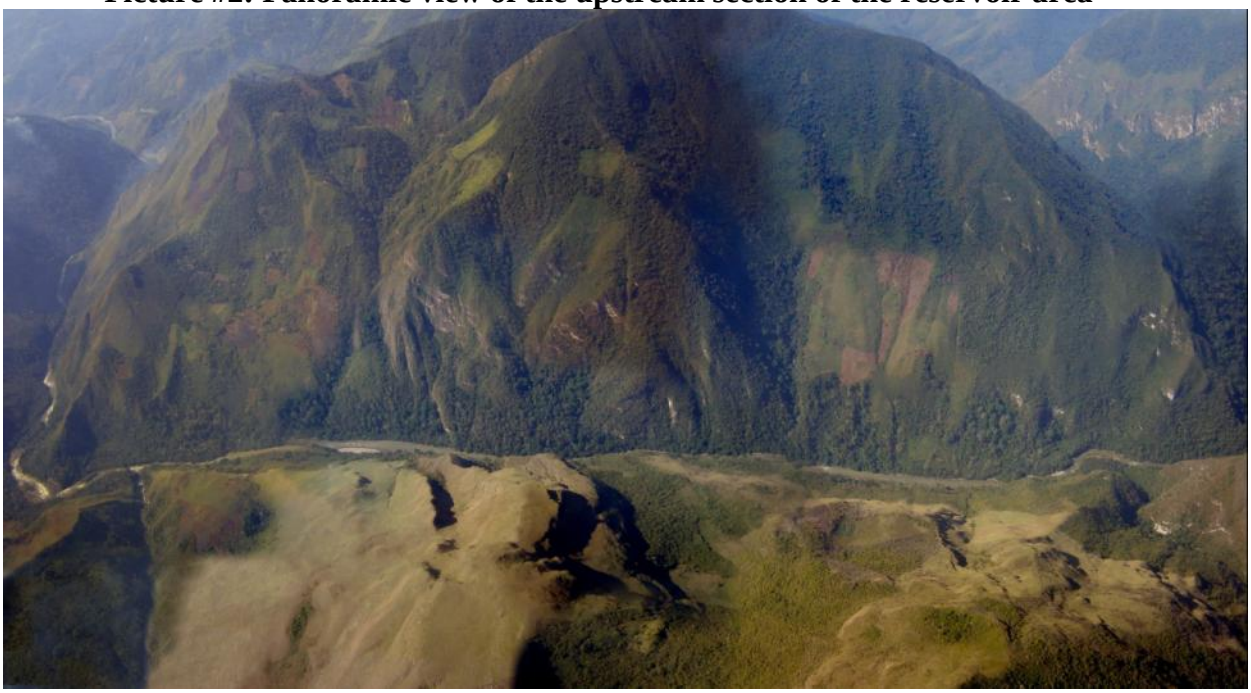
Map #4: Google Earth View of the Project's area



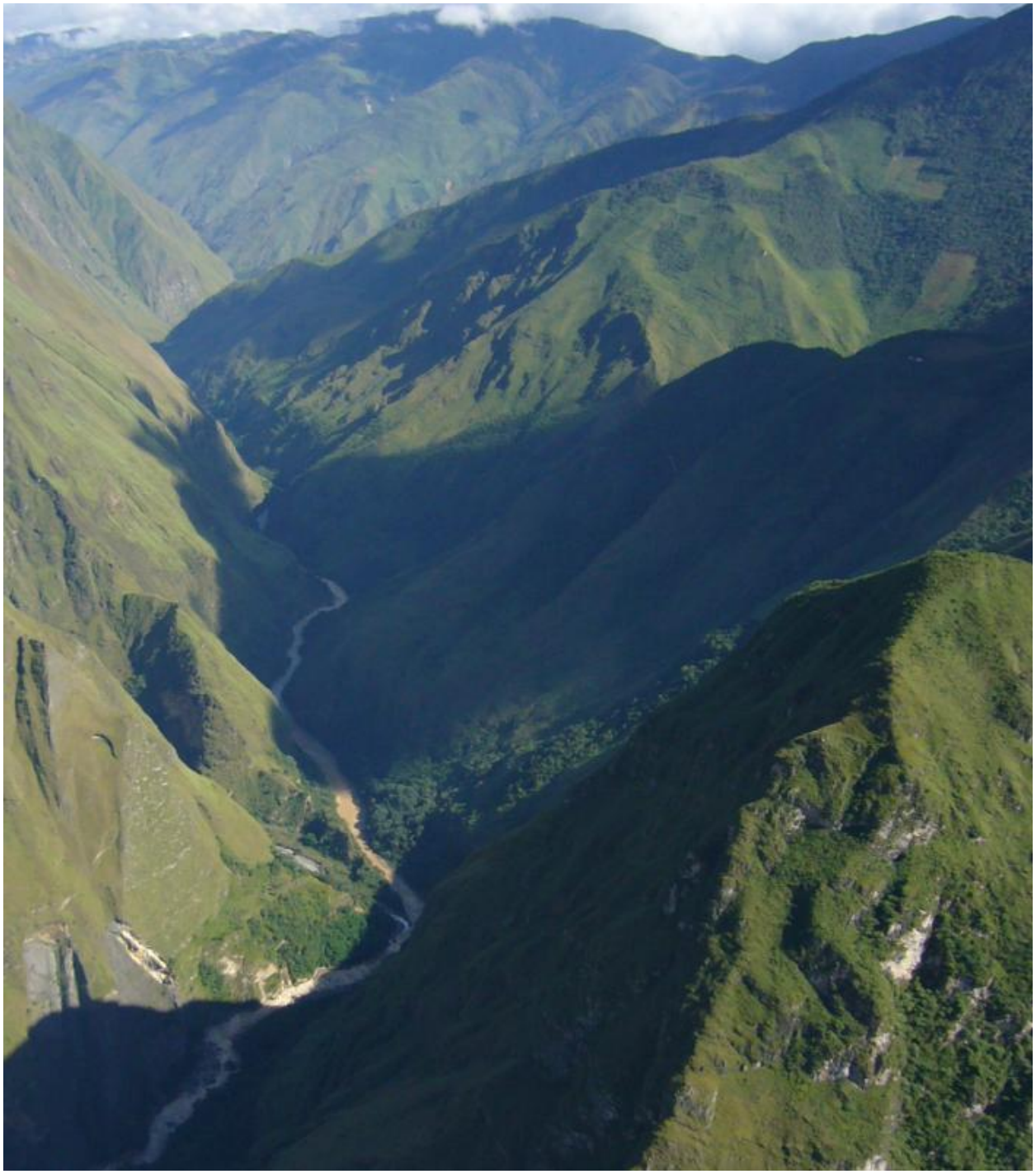
Picture #1: Panoramic view from the dam site looking upstream



Picture #2: Panoramic view of the upstream section of the reservoir area



Picture #3: Downstream of the dam (looking upstream)



Picture #3: Between Pampamarca and the powerhouse (looking downstream)