A. BASIC PROJECT INFORMATION

Name of Project:	**SOUTH PULANGI HYDROELECTRIC POWER PLANT PROJECT**
Project Location:	Municipalities of Dangcagan, Damulog, Kibawe, and Kitaotao, Province of Bukidnon
Project Proponent:	**PULANGI HYDRO POWER CORPORATION (PHPC)**
Proponent's Address	15th Floor Ramon Magsaysay Center, 1680 Roxas Blvd., cor. Quintos St., Malate Manila
Contact Person:	**MR. JOSUE A. LAPITAN**
Position/ Designation:	President and Chief Executive Officer
Contact No:	Tel Nos.: (02) 554-9963/ (02) 567-1654 Email add: phpchydro@gmail.com
Name of Consultant:	**LICHEL TECHNOLOGIES INC.**
Consultant's Address:	Unit 1403 Prestige Tower Condominium, F. Ortigas Jr. Road, Ortigas Center, Pasig City
Contact Person:	**RACHEL A. VASQUEZ**
Position/ Designation:	Managing Director
Contact No:	02-633-00-94
E-mail Address	ravasquez@licheltechnologies.com
Estimated Project Cost	US $ 699,666,000.00 or Php 37,369,161,060.00 (as of Aug 14, 2018 exchange rate of Php 53.41)

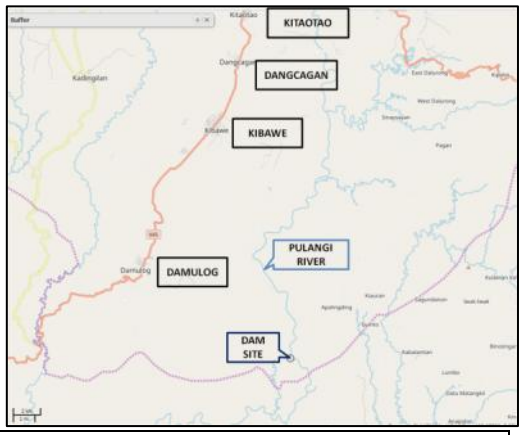

Table ES 1: Summary of Projec Component

	Project Component	Description/Specification
1	Dam	
	Dam type	Concrete face rockfill dam
	Maximum dam height	143.1 m
	Length of dam crest (including spillway)	878.5 m
2	Reservoir	
	Area	2,924 ha
	Storage capacity	1169.3 10^6 m^3
3	River Diverison and Outlet Facilities	
	Cofferdam Elevation	73 m
	Design Flood	1.5 year return period
	Diversion Tunnel-diameter	10 m
	Number of untis	3
	Length	900 m
4	Spillway	
	Elevation of weir crest	149.0 m
	Gate quantity	3 sets
5	Power Intake and Waterways	
5.1	Intake structures	

	Project Component	Description/Specification
	Overall width (with middle pier)	55 m
	Height	55 m
6	Powerhouse	
	Type	ground
	Rated capacity	250 MW
	Dimension (L x W x H)	85.41m*39.28m*51.2m
7	Generating Equipment	
7.1	Model of water turbine	HL()-LJ-340
	Quantity	3 sets
	Rated output	87.18 MW
7.2	Model of generator	SF85-28/7650
	Quantity	3 sets
	Rated capacity	85 MW
8	Switchyard and Transmission Facility	
8.1	Switchyard	
	Type	GIS
	Area (L x W)	49.57m*11.5m
8.2	Transmission Line	
	Transmission voltage, double circuit	138 kV
	Length of transmission line	20 km
9	Access Road	Length 15.3 km, width 6 m

B. Process Documentation

1. Brief Summary of the Project's EIA Process

The Pulangi Hydopower Corporation (PHPC) commissioned Lichel Technologies Inc. (LTI) to conduct the Environmental Impact Assessment (EIA) for their proposed South Pulangi Hydroelectric Power Plant Project located in the Municipalities of Damulog, Kibawe, Dangcagan and Kitaotao all in the Province of Bukdinon. The conduct of the EIA was guided by relevant issuances of the Department of Environment and Natural Resources (DENR) and the Environmental Management Bureau (EMB) including, but not limited to, DAO 2003-30, MC 2010-14, EMB MC 2014-005 and DENR DAO 2017-15 and its Implementing Rules and Regulations. Proponents of Environmentally Critical Projects (ECPs) must conduct an EIA and submit an Environmental Impact Statement (EIS) or Environmental Performance Report and Management Plan (EPRMP) for review and approval by the DENR through the Environmental Management Bureau (EMB) prior to the issuance of the Environmental Compliance Certificate (ECC).

2. EIA Team

The key members of the multi-disciplinary team who conducted the EIA study and their fields of expertise are shown in **Table ES 2** below:

Table ES 2: EIA Team

	NAME	SPECIALIZATION	REGISTRATION NO.
1.	Rachel A. Vasquez	Project Director/Peer Reviewer/Air Quality/ Water Quality	IPCO-280
2.	Emmanuel Cleofas	Socioeconomics/People	IPCO-277
3.	For. Jan Paolo Pollisco	Terrestrial Flora and Fauna	IPCO 276
4.	Dr. Roberto Pagulayan	Freshwater Ecology/Fisheries/Aquatic Resources	
5.	Engr. Franklin D. Ramones	Hydrology/Hydrogeology/ Agriculture	
6.	Dr. Perfecto Evangelista	Soils and Land Use	IPCO-179
7.	Ronald Pahunang	Meteorology, Air Quality	IPCO-173
8.	Anacleto Suelto, Jr.	Geology/Geological Hazards/Disaster Risk Reduction/EGGAR	
9.	Rainier D. Reyes	Peer Reviewer/Water Quality	IPCO-104
10.	Allen B. Villanueva	Climate Change	IPCO-279
11.	Lynnette Lyzelle Ferrer	Biology/ Aquatic Resources	IPCO-275

3. EIA Study Schedule

Table ES 3 below shows the study schedule. Initial IEC Activities were conducted last August 2018. The Public Scoping was conducted last September 4, 2018. The Scoping meeting with the Environmental Management Bureau was conducted last September 25, 2018.

Table ES 3: EIA Study Schedule

Module	Activity	Date
Pre-Scoping/ Scoping Activities	Initial IEC	July 26, 2018 August 7-8, 2018
	Public Scoping	September 4, 2018
	Technical Scoping with EMB	September 25, 2018
Land	Soil Sampling	August 26-29, 2018
	Geological Survey	September 5-6, 2018

Module	Activity	Date
	Terrestrial Ecology	August 26-29, 2018
Water	Water Quality	September 5-6, 2018
	Hydrology	August 20-21, 2018
	Water Ecology	August 20-21, 2018
Air	Air Quality and Noise Sampling	September 5-6, 2018
People	Household Surveys and Secondary data collection	August 17-24, 2018

4. EIA Study Area

The study area covers the identified direct impact areas such as the location of the proposed damsand the reservoir area. The study covers the Municipalities of Damulog, Kibawe, Dangcagan and Kitaotao, all in the Province of Bukidnon.

5. EIA Methodology

Environmental studies focused on the identified location of each component as the direct impact area. All information and data gathered were compiled and analyzed based on the Guidelines of DAO 03-30. Field investigations and sampling were conducted, together with the secondary data gathered, and the critical parameters for the environmental conditions were established.

The EIA methodology for each study modules are provided in Section 2 and are summarized in **Table ES 4** below**.**

Table ES 4: Methodology Used for each Module

<table>
<tr><th>Modules</th><th>Methodologies Used for Assessment</th></tr>
<tr><td>Geology</td><td>Secondary data gathering from different offices and institutions (e.g., Mines and Geosciences Bureau)
Site visit;</td></tr>
<tr><td>Soils</td><td>Secondary data gathering from different offices and institutions
Sampling conducted by sub-stratum
Parameters analyzed include pH, OM, K, P, N, Cd, Pb, Hg, As, CR $^{6+}$

<table><tr><td>Parameter</td><td>Method</td></tr><tr><td>pH</td><td>Electrometric</td></tr><tr><td>Potassium</td><td>Flame AAS</td></tr><tr><td>Phosphorus</td><td>Colorimetric</td></tr><tr><td>Organic Matter</td><td>Walkley-Black</td></tr><tr><td>Nitrogen</td><td>kjeldahl</td></tr><tr><td></td><td></td></tr><tr><td>Cadmium</td><td>Flame AAS</td></tr><tr><td>Lead</td><td>Flame AAS</td></tr><tr><td>Mercury</td><td>Cold Vapor AAS</td></tr><tr><td>Arsenic</td><td>GF/AAS</td></tr><tr><td>Chromium (Cr 6+)</td><td>Diphenylcarbazide</td></tr></table></td></tr>
<tr><td>Land Use</td><td>Secondary data gathering from Comprehensive Land Use Plan, National Commission on Indigenous People and Proponent
Site visit</td></tr>
<tr><td>Terrestrial Flora</td><td>Transect survey
Secondary data from relevant sources</td></tr>
<tr><td>Terrestrial Fauna</td><td>Transect line survey
Interviews
Secondary data from the relevant sources s</td></tr>
<tr><td>Hydrology</td><td>Stream flow measurement
Secondary data gathering from different offices and institutions
Secondary data used for flood peak prediction</td></tr>
<tr><td>Water Quality</td><td>In situ measurement of water temperature and DO parameters Orion Oxygen Meter (Model 840)

Parameter — Methodology
Total Suspended Solids (TSS) — Grab sampling</td></tr>
</table>

Modules	Methodologies Used for Assessment	
	Oil and Grease	Grab sampling
	Biochemical Oxygen Demand (BOD)	Grab sampling
	Dissolved Oxygen (DO)	Multi-parameter meter
	Temperature	Multi-parameter meter
	pH	Multi-parameter meter
	Total Dissolved Solids (TDS)	Multi-parameter meter
	Salinity	Multi-parameter meter
	Conductivity	Multi-parameter meter
Freshwater Ecology	a. Riparian, Channel, and Environmental Inventory done using the metrics of Petersen (1992) b. Plankton sample collection was done using a plankton net of 80 µm mesh size. c. Riverside macroinvertebrate sampling was done using an improvised 1 mm mesh sieve d. Fish and macro-biota were done on wadable areas with the help of local fisherfolk using cast nets, e. line, or hand sieves, where applicable. f. Interview with local fisherfolk g. Secondary literature search	
Air Quality	High Volume Sampler for TSP sampling, Gas Bubble Sampler. Sound level meter for noise/sound level determination Secondary data from PAGASA for climatic conditions	
Socio-economic	Secondary data gathering for demographic analysis Key Informant Interview Household and Perception Interview Land Acquisition and Resettlement Plan-FGDs, Inventory of Assets; IPDP-FGDs, Interviews, site visits at sacred sites.	

6.

7. Scoping and Public Participation

i. IEC Activities

Table ES 5 below shows the summary of IEC and public participation activities conducted. Summary of the issues and concerns raised during the IEC activities is further discussed in **Section 2.4.7**

Table ES 5: Summary of IEC Activities

Date	Activity	Venue	Participants
July 24, 2018	Project Presentation (LGU-PHPC initiated)	Maramag Gymnasium, Maramag Bukdinon	Local Government Units (Municipal) Barangay LGUs Tribal Leaders/Elders
August 7, 2018 9:00 am	Project Presentation EIA Process Presentation	Function Hall, Municipality of Damulog	Local Government Units (Municipal) Barangay LGUs Tribal Leaders/Elders Women's Organization Senior Citizen's Organization Youth Organization Community Leaders School Heads
August 7, 2018 1:00 pm	Project Presentation EIA Process Presentation	Municipal Gymnasium, Municipality of Kibawe	Local Government Units (Municipal) Barangay LGUs Tribal Leaders/Elders Women's Organization Senior Citizen's Organization Youth Organization Community Leaders School Heads

Date	Activity	Venue	Participants
August 8, 2018 9:00 am	Project Presentation EIA Process Presentation	Lucky 9 Resort Municipality of Dangcagan	Local Government Units (Municipal) Barangay LGUs Tribal Leaders/Elders Women's Organization Senior Citizen's Organization Youth Organization Community Leaders School Heads
August 8, 2018 1:00 pm	Project Presentation EIA Process Presentation	Municipal Tennis Court, Municipality of Kitaotao	Local Government Units (Municipal) Barangay LGUs Tribal Leaders/Elders Women's Organization Senior Citizen's Organization Youth Organization Community Leaders School Heads

ii. Public Scoping

The Public Scoping for the proposed South Pulangi Hydroelectric Power Plant Project was held last September 4, 2018 at the East Kibawe Covered Court in the Municipality of Kibawe, Bukidnon. Around 64 attendees were present during the activity. The Public Scoping Repor is attached as **Annex 13.** Present during the scoping are the following representatives:

- Hon. Minerva Casinabe, Mayor, Municipality of Kibawe
- MENRO, Municipality of Dangcagan
- MPDC, Municipality of Dangcagan
- SB Secretary, Municipality of Dangcagan
- Barangay Affairs Office, Municipality of Kitaotao
- MPDC, Municipality of Kitaotao
- Punong Barangay
    - Dolorosa, Dangcagan
    - Miaray, Dangcagan
    - San Vicente, Dangcagan
    - Balintawak, Kibawe
    - Bukang Liwayway, Kibawe
    - Magsaysay, Kibawe
    - Mascarinas, Kibawe
    - Natulongan, Kibawe
    - Pinamula, Kibawe
    - Sanipon, Kibawe
    - Talahiron, Kibawe
    - Tumaras, Kibawe
    - Cagawasan, Kibawe
    - Kitaihon, Kitaotao
    - Kitobo, Kitaotao
    - Metebagao, Kitaotao
    - San Lorenzo, Kitaotao
- Senior Citizen's Organization
- Magsaysay Elementary School Kibawe
- Department of Energy
- Tribal Chieftain/IPMR
    - Dolorosa, Dangcagan
    - Miaray, Dangcagan
    - San Vicente, Dangcagan
    - Bukang Liwayway, Kibawe
    - Bukang Liwayway, Kibawe
    - Cagawasan, Kibawe
    - Mascarinas, Kibawe
    - Pinamula, Kibawe
    - Talahiron, Kibawe
    - Balocbocan, Kitaotao
    - Kitobo, Kitaotao
    - Metebagao, Kitaotao
    - Tandong, Kitaotao
    - Tangkulan, Damulog

- National Irrigation Administration Bukdinon IMO
- Environmnetal Management Bureau 10

C. EIA Summary

a.) Summary of Alternatives

Table ES 6 shows the summary of alternatives considered for the project in terms of siting and dam type. This is further discussed in **Section 1.3.**

Table ES 6: Summary of Project Alternatives

Positive Feature	Negative Feature
Siting	
Municipality of President Roxas, North Cotabato (Pulangi V)	
Higher project production (300MW)	Larger reservoir area; Higher number of affected household; Political uncertainty
Municipality of Damulog, Province of Bukidnon (South Pulangi HEPP)-**adopted as project**	
Smaller reservoir area, hence less affected households; More favourable political situation	Lower project production (250MW)
Dam Type	
Embankment with Core	
Accepts poor quality but low cost fill material from excavations	Impervious material source uncertain
Appropriate for weak foundation	Wide base requires longer diversion and power tunnels
Least Foundation treatment	Need most protection during construction
Conventional, conservative, ample precedent	
Conclusions: rejected, based on technical	
CFRD	
Least affected by rainfall during construction	Needs substantial volume of imported hi-cost rock fill
Shorter waterways (than embankment with core)	Foundation treatment at plinth grout cap very critical
	Unprecedented for these weak foundations and materials
Conclusion: adopted, basic project	
Hard fill	
Accepts poor quality and low cost aggregates	Unprecedented for this size and combination of conditions
Appropriate for weak foundation	Needs more foundation treatment (than embankment with core)
Least cost for appurtenant structures	Less suited to higher reservoir FSL (dam heights)
Non-erodible and less sensitive to foundation treatment (than CFRD)	Estimated cost least certain.
Conclusion: potential alternative at lower FSL	

b.) Summary of Main Impacts

The summayr of main impact, mitigating and enhancement measures and residual impacts is shown Table ES 7. Project impacts are further discussed in **Section 3.**

Table ES 7: Summary of Main Impacts

Impact	Options for Prevention for Mitigation or Enhancement	Residual Impacts After Mitigation
CONSTRUCTION		
- Vegetation loss	- Avoid unnecessary cutting of vegetation - Inventory of biota and riparian zone as	Clearing of vegetation unavoidable due to nature of

Impact	Options for Prevention for Mitigation or Enhancement	Residual Impacts After Mitigation
- Habitat fragmentation	basis for species and volume replacement - Compensate through planting indigenous tree species suitable in the area - Implement watershed Management Plan	project; ensure implementation of watershed management plan.
- Change in topography - Increased landslides	- Use contour- trenching, furrowing, terracing, ripraps and vegetative measures - Limit construction activities during dry season -Adequate positioning of stockpile areas away from river/creek. - Road-bank soil erosion prevention/minimization (use of biological or non-biological structures)	Possible minimal soil erosion even with soil erosion control measures, Considering the nature of the project, damage is inevitable; rehabilitation after construction should be done.
- Increased soil erosion		
Destruction or disturbance of aquatic life due to works in rivers. Degradation of aquatic habitat, species decline		
Change in river depth and width		
Oil and grease leaks from heavy equipment and vehicles	Periodic inspection and maintenance of equipment	Possible minimal spill even with appropriate storage and management
Change in river depth and width Change in river flow Increased Siltation and Sedimentation	- Provision of diversion structures to prevent blockage of river flow	Due to nature of project, change in river depth at the reservoir inevitable.
Change in species richness due to decrease water flow		
Permanent and temporary dislocation of households and loss/destruction of properties, trees, and crops.	Implementation of mutually acceptable compensation scheme Implementation of an IEC program	Displacement of houses is unavoidable considering the nature of the proposed project.
Temporary to permanent physical alteration of site where construction work is to be done dam	Minimize disturbances and proper disposal of spoils	Physical alteration is inevitable due to impounding of water/reservoir.
Reduced biodiversity because of direct habitat alteration or effect of siltation and secondary disturbances; Reduced productivity and upstream-downstream transit of organism in the vicinity of construction area.	Minimize direct disturbance, even allowing a portion of the river to be open for organism transit; minimize all forms of direct and indirect waste discharge to the river water. Compensation from lost and reduction of productivity of harvested aquatic organisms may be in order.	
OPERATIONS		
Prevent/control flooding	Adequate release of water during heavy rainfall Implementation of emergency response plans and safety procedures	Project area is located in area with high landslide susceptibility. Landslide possible even with application of mitigating measures.
Increase in landslides in reservoir area		
Employment opportunities	Prioritization of host communities in employment	Employment is possible as long as the project is in operation

Impact	Options for Prevention for Mitigation or Enhancement	Residual Impacts After Mitigation
Increased source of livelihood for locals	Assistance to LGUs in formulation and implementation of alternative sources of livelihood	
ABANDONMENT		
Land and water pollution	Allocate certain percentage of the construction cost for clean-up after construction - Salvage materials that are usable which can be used by the local workers or residence	Contamination of land and soil during clean up still possible even with mitigating and management measures.
Loss of species richness	-Continual rehabilitation and re-vegetation of idle and barren lands using indigenous species.	Due to nature of project, restoration to pre-project conditions may not be possible.
Riverbanks stabilization through engineering measures and/or regreening technologies	Community-based regreening and maintenance could be instituted	Due to nature of project, restoration to pre-project conditions may not be possible.
Allow enough time for organisms to repopulate the altered environment	Compensation or provision of alternative source of income could be provided.	Due to nature of project, restoration to pre-project conditions may not be possible.

c.) Risks and Uncertainties

The Environmental Impact Statement was prepared based on the latest available information and as a result of the different scenario analysis, modeling and comparison with standards. This should serve as guide to local, regional and national decision makers in decisions concerning project-related activities. However, this should not be the sole basis of decision making since it is possible that there are project-related risks that is not within the scope of this assessment and may not have been considered in the related management plans. Hence, this assessment will only help as a guide and as supplement to the wide array of information available to decision makers.

In the determination of risks and uncertainties, natural and man-made hazards were assessed to aid decision makers in reducing risks for the multipurpose project. Natural hazards with high susceptibility include ground motion, Earthquake induced landslides, seiche, mass wastingand fluvial hazards.