Environmental Compliance Audit Report

Project Number: 48423-001
August 2015

Tiwi and MakBan Geothermal Power Green Bonds Project
(Philippines)

Prepared by Aboitiz Power Renewable Inc. (APRI) for submission to Asian Development Bank.

CURRENCY EQUIVALENTS

(As of 12 August 2015)

Currency unit	–	PhP
PhP 1.00	=	$ 0.022
$1.00	=	PhP 46.17

ABBREVIATIONS

ADB	–	Asian Development Bank
APRI	–	Aboitiz Power Renewable Inc.
CAP	–	Corrective Action Plan
CMR	–	Compliance Monitoring Report
CMVR	–	Compliance Monitoring and Validation Report
DAO		DENR Administrative Order
DENR	–	Department of Environment and Natural Resources
DOE	–	Department of Energy
ECAR	–	Environmental Compliance Audit Report
ECC	–	Environmental Compliance Certificate
EIA	–	Environmental Impact Assessment
EIS	–	Environmental Impact Statement
EGF	–	Environmental Guarantee Fund
EHS	–	Environment Health and Safety
EMB	–	Environment Management Bureau
EMF	–	Environmental Monitoring Fund
EMMP	–	Environmental Management and Monitoring Plans
EMS	–	Environmental Management System
IEE	–	Initial Environmental Examination
ISO	–	International Organization for Standardization
JOG	–	Joint Operational Guideline
GROC	–	Geothermal Renewable Energy Operating Contract
GRSC	–	Geothermal Resource Sales Contract
MMT	–	Multipartite Monitoring Team
NPC	–	National Power Corporation
O & M	–	Operation & Maintenance
OSHA	–	Occupational Safety and Health Administration
PCO	–	Pollution Control Officer
PD	–	Presidential Decree
PGPC	–	Philippine Geothermal Production Corporation
PPE	–	Protective Personal Equipment
SMR		Self-Monitoring Report
SPS	–	Safeguards Policy Statement
SR	–	Safeguard Requirements

WEIGHTS AND MEASURES

dB (A)	–	Decibel Scale A
km	–	Kilometers
mg/L	–	Milligrams per Liter
MW	–	Megawatt

NOTE

In this report, "$" refers to US dollars.

This environmental compliance audit report is a document of the borrower. The views expressed herein do not necessarily represent those of ADB's Board of Directors, Management, or staff, and may be preliminary in nature.

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EXECUTIVE SUMMARY

Since Tiwi and MakBan are existing geothermal power plant generating facilities, an environmental compliance audit report (ECAR) including a Corrective Action Plan (CAP) was prepared by an appropriate external expert in accordance with ADB SPS requirements. APRI in coordination with PGPC is fully accountable for and in compliance with Environmental Compliance Certificate (ECC) conditions on the existing generating and steam field facilities transferred under its name in September 2009. Environmental management and monitoring plans (EMMPs) and permitting requirements stipulated in the ECCs are being complied with and reporting obligations are being met. APRI has in place an adequately resourced environmental, health and safety team. As the PGPC steam field, an associated facility, is covered under the ECCs it also complies with relevant national environmental legislation.

Relevant national and international emissions standards are being met. The plants use a closed loop system in which wastewater and condensates are disposed of through reinjection into injection wells fitted with leak proof casings. Surface and drinking water monitoring results demonstrate compliance with national standards for drinking water. As commonly found in geothermal areas, elevated levels of boron have been measured in groundwater. PGPC has signified its intent to request that the geothermal area in MakBan be designated as a non-attainment area for Boron in groundwater as provided for in the Philippine Clean Water Act. APRI has adopted internationally recognized environmental and safety management system standards and is in the process of seeking management system certification. An ongoing process of community engagement including Stakeholders' Grievance Mechanism (SGM) and Barangay Emergency Response Training (BERT) in compliance with the ECCs ensures that pertinent information on the Tiwi-MakBan activities is fully disclosed and a functioning stakeholder grievance mechanism is in place.

The ECAR identified some information gaps and a corrective action plan has been developed to enhance the EMMPs including: (i) clear delineation of the roles and responsibilities as per Geothermal Resource Sales Contract (GRSC) provisions, and (ii) conditions stipulated in the ECC agreed upon by APRI and PGPC. A Joint Operational Guideline (JOG) is currently being developed by APRI and PGPC to more clearly delineate roles and responsibilities for the monitoring and reporting requirements of government agencies.

I. INTRODUCTION

1. **Project Description.** The Project involves refinancing past and new capital expenditure, operation and maintenance of, and ongoing environmental investments at Tiwi Geothermal Power Plant (hereinafter referred to as "Tiwi") and Makiling-Banahaw Geothermal Power Plant (hereinafter referred to as "MakBan") by the Aboitiz Power Renewable Inc. (APRI), a wholly owned subsidiary of the Aboitiz Power Corporation (APC)[1]. APRI acquired Tiwi-MakBan from the government in 2009 for $447 million and invested a further $150 million to improve operations, both on an all equity basis. The Project utilizes a credit enhancement from the Asian Development Bank (ADB) and risk sharing with Credit Guarantee and Investment Facility (CGIF)[2] to support the issuance of the Philippines' first project bonds since 1997 and first-ever local-currency project bonds, and one of the first issuances of green bonds in Southeast Asia.

2. Tiwi is located in the province of Albay approximately 569 kms south of Metro Manila. It is situated in southeastern Luzon along the Lagonoy Gulf[3] of the Philippine Sea (Fig. 1). Initially, Tiwi with a combined installed capacity of 330 MW, consists of 3 power plants (Plant A, Plant B and Plant C) each having two generating units rated 55MW per unit. The units were commissioned between 1979 and 1982. In 1999, Unit 4 of Plant B was decommissioned due to insufficient steam supply and turbine-generator. Details of the partial rehabilitation work undertaken by National Power Corporation (NPC) in 2003 and was completed in 2005 is presented in Table 1. The current geothermal field size is 18 km^2 (11.2% of the total reservation area) with 156 drilled wells (66 operating, 56 non-operating and 34 retired) (Fig. 2). The existing pipeline route is equivalent to 97.4 kms.

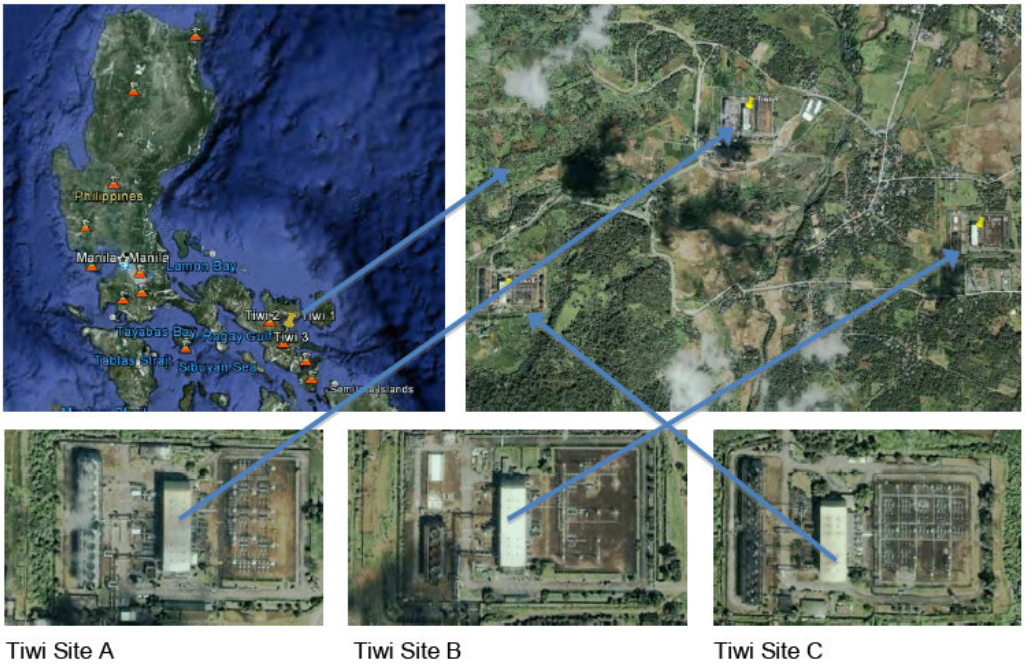


Figure 1. Location of Tiwi Geothermal Power Plant and its Plant A, B and C.
Source: Risk Engineering Survey Report for Tiwi Geothermal Power Plant Albay, Luzon, Philippines (Aon Risk Solutions, 6 August 2012)

[1] Aboitiz Power Corporation (APC) has its controlling shareholder, Aboitiz Equity Ventures, Inc. (AEV), is a diversified conglomerate that is listed on the Philippine Stock Exchange and has interests in power generation, power distribution, financial services, transportation and food manufacturing.

[2] CGIF was established by the ten members of the Association of Southeast Asian Nations (ASEAN) together with the People's Republic of China, Japan, Republic of Korea (ASEAN+3) and ADB,to promote financial stability, and, boost long-term investment through the development of ASEAN's local currency bond markets.

[3] Lagonoy Gulf is on the west side of Tiwi town. Tiwi geothermal field lies on the northeast flank of Mt. Malinao, an extinct quaternary strato-volcano in the East Philippine Volcanic Arc. In 1970, the Philippine government declared the 176.61 km2 of lands within Tiwi geothermal field reservation for energy exploration and development under Presidential Decree No. 739. Tiwi was originally owned by National Power Corporation (NPC) and has been acquired and officially taken over by APRI in 26 May 2009.

Table 1. Status of Tiwi Geothermal Facilities

Tiwi Geothermal Facilities	Location	Started Operation	Original Capacity	Capacity After Rehabilitation in 2003	Status of Operation (as of January 2015)
Plant A (Units 1 and 2)	13°27"56.23"N 123°38'54.54"E	1979	2 x 55 MW	2 x 60 MW	Operational. Outputs of the units increase the load capability of each unit from 55 MW to 60 MW after rehabilitation work. Initiated a stage-two supplemental rehabilitation in 2005. Currently undergoing further extensive rehabilitation.
Plant B (Units 3 and 4)	13°27"41.55"N 123°39'27.36"E	1980	2 x 55 MW		Unit 4 was decommissioned in 1999 as per NPC Board Resolution No. 2000-88 while Unit 3 in 2003.
Plant C (Units 5 and 6)	13°27"33.73"N 123°38'21.57"E	1981/ 1982	2 x 55 MW	2x 57 MW	Operational. Outputs of the units increase the load capability of each unit from 55 MW to 57 MW after rehabilitation. Initiated a stage-two supplemental rehabilitation in 2005. Currently undergoing further extensive rehabilitation.

Source: Risk Engineering Survey Report for Tiwi Geothermal Power Plant Albay, Luzon, Philippines (Aon Risk Solutions, 6 August 2012)

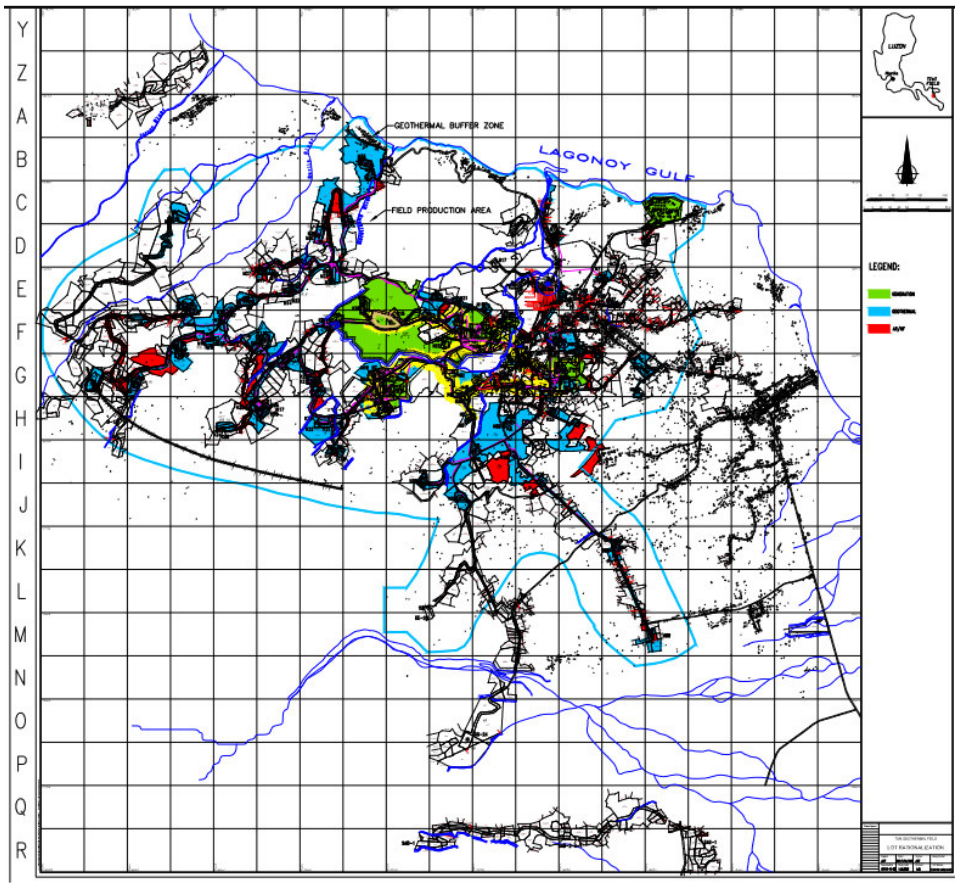


Figure 2. Tiwi Geothermal Field indicating Generation (green) and Geothermal (blue) Facilities.

Source: APRI (2015)

3. MakBan is the second-largest geothermal plant in the country, and the fourth-largest in the world with a combined installed capacity of 442 MW (Fig. 3). It is located within a geothermal reservation area[4] declared in 1973 under Presidential Decree 1111 covering approximately 1,600 km^2. MakBan consists of 10 generating units housed in 5 power plants (Plants A and B with two 63MW units each, Plant C with two 55 units and Plants D and E with two modular 20 MW units each) and a 15.73MW Binary Cycle Geothermal Power Generating Plant with five units, twin turbine of 3MW each and one single turbine of 0.73MW. The units were commissioned between 1979 and 1996. MakBan was turned-over to APRI on 25 May 2009. Details of the rehabilitation work undertaken in the plants is presented in Table 2. The current geothermal field size is 7 km2 (0.04% of the total reservation area) with 120 drilled wells (87 operating, 17 non-operating and 16 retired) (Fig. 4). The existing pipeline route is equivalent to 96.94 kms.

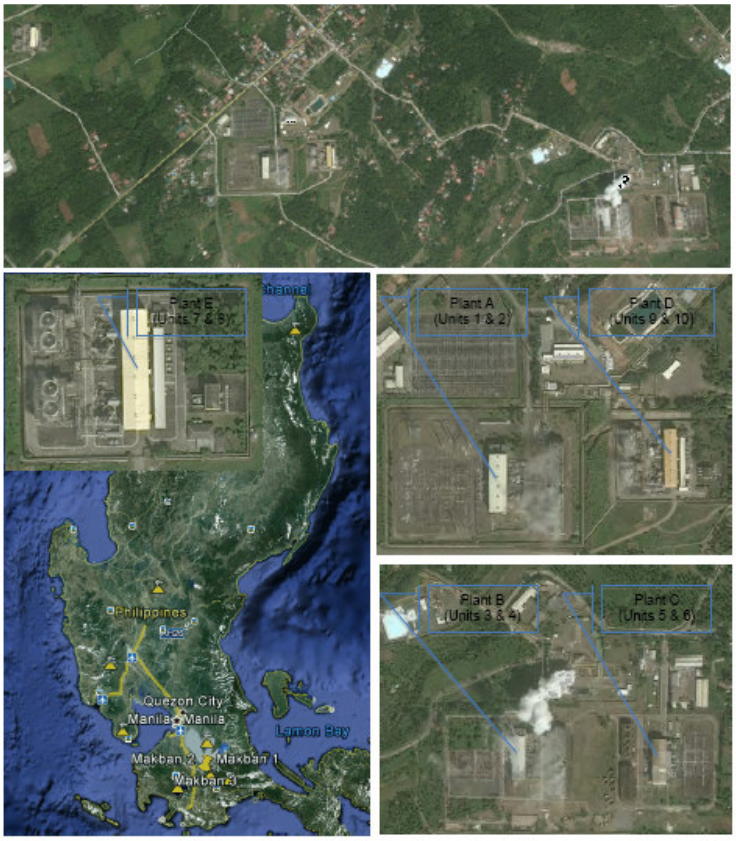


Figure 3. Location of MakBan Geothermal Power Plant and its Plants A, B, C, D and E.
Source: Risk Engineering Survey Report for MakBan Geothermal Power Plant Barangay Bitin, Aia, Laguna, Luzon, Philippines (Aon Risk Solutions, 24 August 2012)

Table 2. Status of MakBan Generation Facilities

Mak-Ban Geothermal Facilities	Location	Started Operation	Original Capacity	Capacity After Rehabilitation in 2003	Status of Operation (as of January 2015)
Plant A	14°05'28.24"N 121°12'48.07"E	1979	2 x 55 MW	2 x 63 MW	Operational. Rehabilitation work in 2003 and upgrading of the steam field surface facilities increase the load capability of

[4] The geothermal reservoir is at the southwest flank of Mt. Makiling with Mt. Banahaw on the east and 72 km southeast of Metro Manila on the boundary of Laguna (Bay and Calauan) and Batangas (Sto. Tomas) provinces. In 1987, Executive Order No. 224 declared the Makiling Banahaw Geothermal Reservation as a watershed reservation along with the other reservations nationwide and vested to the NPC the complete jurisdiction, control and regulation over them. The Mt. Makiling Forest Reserve (MMFR), a 4,244-hectare conservation site managed by the University of the Philippines – Los Baños (UPLB), Laguna was declared as a heritage park by the Association of South East Asian Nations.

Mak-Ban Geothermal Facilities	Location	Started Operation	Original Capacity	Capacity After Rehabilitation in 2003	Status of Operation (as of January 2015)
					from 55 MW to 63 MW.
Plant B	14°05'17.13"N 121°13'29.93"E	1980	2 x 55 MW	2 x 63 MW	Operational. Rehabilitation work in 2003 and upgrading of the steam field surface facilities increase the load capability of from 55 MW to 63 MW.
Plant C	14°05'16.35"N 121°13'38.02"E	1984	2 x 55 MW	2 x 55 MW	Operational.
Plant D	14°05'42.21"N 121°12'55.98"E	1995	2 x 20 MW	2 x 20 MW	Operate as stand-by plant. Not included in the rehabilitation program in 2003.
Plant E	14°05'28.24"N 121°12'07"E	1996	2 x 20 MW	2 x 20 MW	Served as base load plant. Not included in the rehabilitation program in 2003
Binary Plant[5]			5 x 3 MW and 1 x 0.73 MW	5 x 3 MW and 1 x 0.73 MW	Non-operational. When APRI took over the operation of the power plants and until now, the binary plants have been on shut down as attested to during the site visit in January 2015. Currently, this is undergoing rehabilitation that is expected to be completed by Q2 2016.

Source: Risk Engineering Survey Report for MakBan Geothermal Power Plant Barangay Bitin, Aia, Laguna, Luzon, Philippines (Aon Risk Solutions, 24 August 2012)

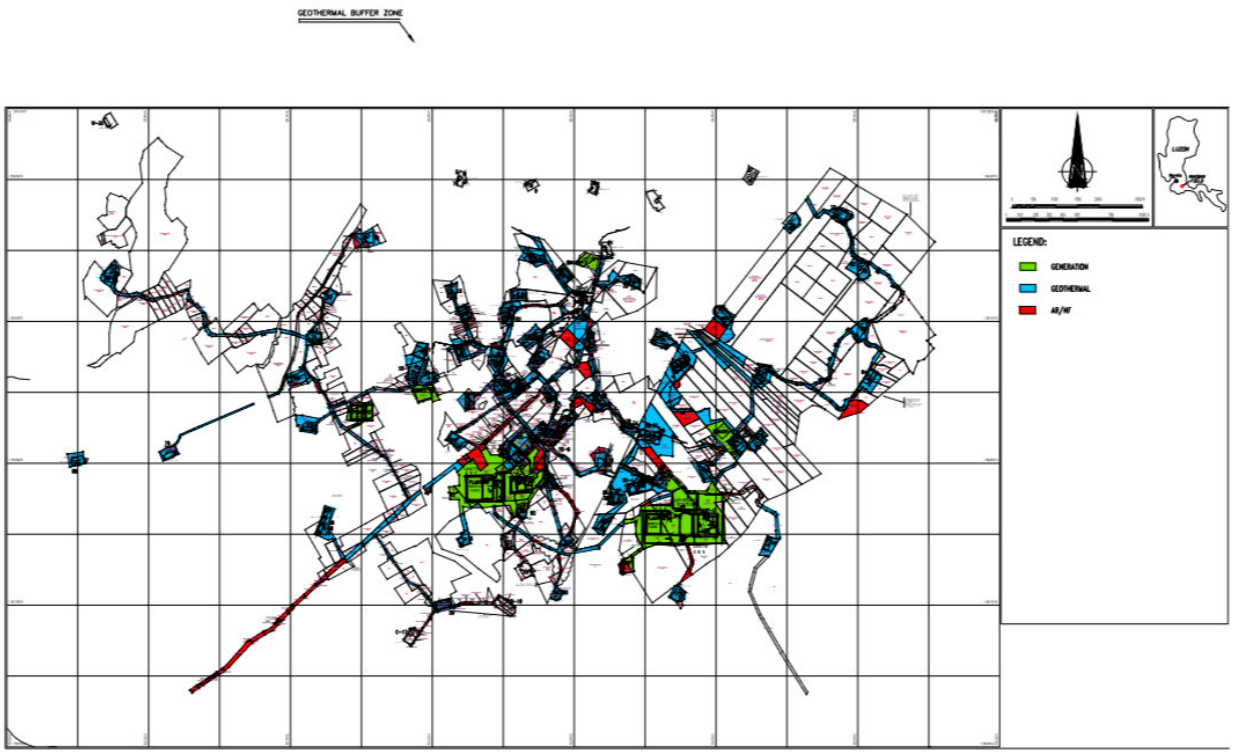


Figure 4. MakBan Geothermal Field indicating Generation (green) and Geothermal (blue) Facilities.
Source: APRI 2015

[5] The binary plants are utilizing waste heat from the geothermal brine downstream of the steam separators of the existing geothermal power plant.

4. The power plant is operated by APRI while the steam field including geothermal water and steam production is operated by Philippine Geothermal Production Corporation[6,7] (PGPC) (Fig. 5). The Tiwi-MakBan geothermal power facilities consist of three components: (i) steam gathering system or SGS, (ii) power generating system or power plants, and (iii) electrical transmission system. The SGS basically consists of steam production wells and surface facilities required to produce, transport and process geothermal fluids to deliver clean steam to the power plants. As indicated earlier, the Tiwi and MakBan used the steam generated from PGPC geothermal fields. It is a closed loop system in which wastewater and condensates are disposed through reinjection. Also included are facilities to dispose wastewater and condensates. The power plants mainly include turbine-generators, condensers, cooling towers and electrical switchyards. And the electrical transmission system consists of high voltage transmission lines that convey electricity from power plants to its ultimate market

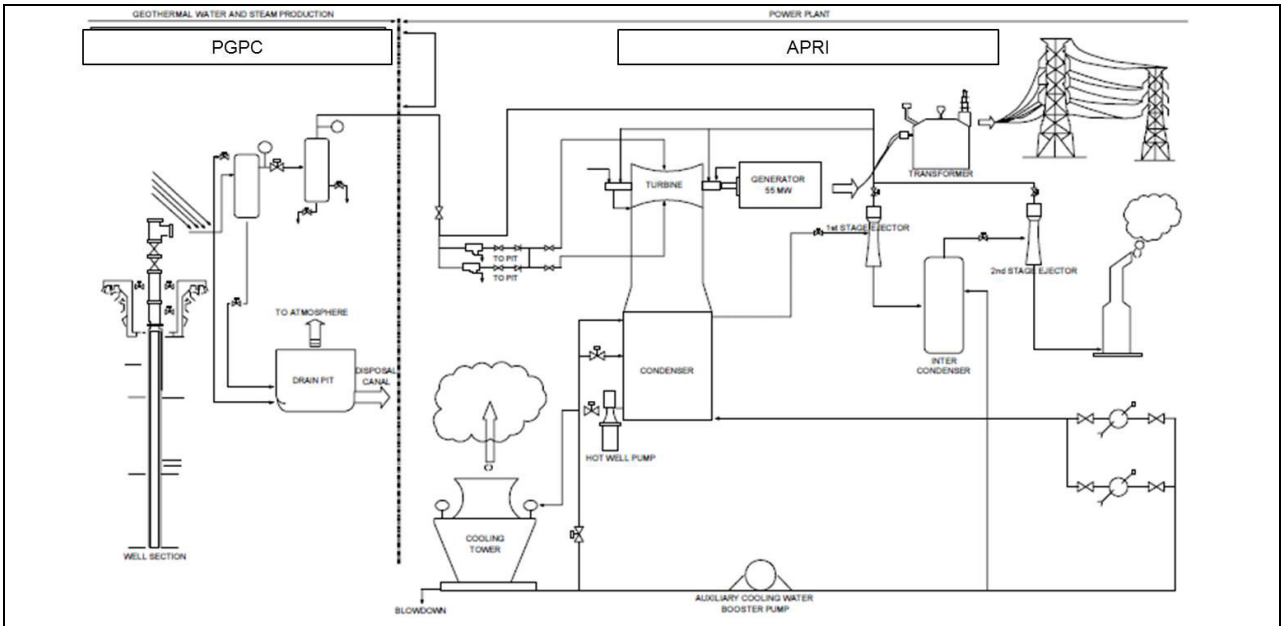


Figure 5. Process Flow Diagram

Source: Modified from Phase I Environmental Site Assessment Mak-Ban Geothermal Power Plant Batangas and Laguna, Philippines (AECOM Environment, July 2009); Phase I Environmental Site Assessment Tiwi Geothermal Power Plant Tiwi, Albay Philippines (AECOM Environment, July 2009)

5. Based on the Legal Due Diligence Report (LDDR) for the Project, APRI acquired a Geothermal Renewable Energy Operating Contract (GREOC) in 2009 with the Department of Energy (DOE) for the operation of the Tiwi (No. 2009-10-006) and Makban (No. 2009-10-007). Under GREOC, APRI agrees to perform the required geothermal energy operations[8] and provide at its sole cost all of the services,

[6] PGPC's precursor company Chevron Geothermal Philippines Holdings Inc. (CGPHI) (which was formerly Philippine Geothermal Inc.), a wholly owned subsidiary of Chevron Group Corp. of the US, has partnered with NPC and has been operating the Tiwi and MakBan steamfield assets since September 1971 or about 42 years.

[7] Geothermal Chevron has a 40% interest in PGPC affiliate. PGPC develops and produces steam energy for the third-party Tiwi and MakBan geothermal power plants in southern Luzon. They have a combined generating capacity of 692 MW. In April 2013, the PGPC secured a 25-year renewable energy service contract with the Philippine government for the continued development and operation of the Tiwi and MakBan steam fields. (Source: http://www.chevron.com/documents/pdf/philippinesfactsheet.pdf)

[8] "Geothermal Energy Operations" shall include exploration, development, production, and utilization, including the construction, installation, operation and maintenance of Geothermal Energy Systems to Convert Geothermal Energy to electrical power and the transmission of such electrical power and/or other non-electrical uses.
"Geothermal Energy Systems" refers to the machines or other related equipment that convert Geothermal Energy into useful electrical or mechanical energy; includes, but is not limited to, Water Turbine Generators (WTG's), electrical collection and transmission grids, overhead and underground electrical transmission and communication lines, electric transformers and conditioning equipment, energy storage facilities, telecommunications equipment, power generation facilities to be operated in conjunction with WTG installations, meteorological towers and wind measurement equipment, control buildings, maintenance

technology, and financing in connection therewith. In compliance with the provision of the 2003 Compromise Agreement and the RE Law[9], PGPC and DOE executed a Geothermal Service Contract (GSC) on April 2013 to operate the geothermal steam fields in Tiwi (No. 2013-04-044) and Makban (No. 2013-04-045). Steam is supplied by PGPC under a Geothermal Resources Sales Contract (GRSC) (2003) with APRI. Under the GRSC, the rights and obligations of APRI and PGPC is enumerated in the box below.

Box 1. Rights and Obligations of APRI and PGPC under the GRSC (2003)

APRI

a) Purchase the geothermal resources made available at the delivery points from PGPC for use in the generation of electricity which has been successfully bid into the WESM or otherwise contracted for or dispatched.;
b) At no charge to PGPC, supply and deliver to PGPC the electricity required for all aspects of the development, operation and maintenance of the geothermal facilities and equipment. The quantity of house power shall be deducted from the Actual Net Generation;
c) Responsible for the mitigation, storage and disposal of waste resulting from the operation of its generating facilities, including compliance with all laws and regulations related thereto. When requested by PGPC to do so, APRI shall also be responsible for the delivery of "injectable generating waste" (generating waste which are capable of and are required by the DENR to be re-injected into the geothermal reservoir) to PGPC for disposal in accordance with the latter's disposal procedures.; and
d) Responsible for the decommissioning, abandonment[10] and surface rehabilitation, including all permits and costs associated therewith, of any geothermal facilities existing on the date of effectivity of the GRSC.

PGPC

a) Upon consultation with APRI, shall decide the allocation of geothermal resources to the delivery points to maximize generation;
b) Entitled to exploit in any manner the geothermal resources not specifically allocated for delivery to the delivery points, including the sale thereof to third parties as allowed under PD 1442 and other applicable laws of the Republic of the Philippines.;
c) Obligated to make any capital expenditure but shall have the option, at its sole discretion, risk and expense, to make capital expenditure as it may deem economically feasible and operationally necessary for the operation of the geothermal facilities.; and
d) Responsible for the decommissioning, abandonment and surface rehabilitation, including all permits and costs associated therewith, of any geothermal facilities coming into existence after the date of effectivity of the GRSC.

6. **Objectives and Scope of the Report.** In accordance with ADB's Safeguard Policy Statement (ADB SPS 2009) and as earlier mentioned the proposed project is classified as environment category B. No Initial Environmental Examination (IEE) Report will be required since no new project facilities will be constructed using ADB funds. However, since the two geothermal plants have existing facilities and business activities, an environmental compliance audit was undertaken, including on-site assessment and identify past and present concerns related to impacts on the environment. The objective of the compliance audit is to determine whether actions were in accordance with ADB's safeguard principles and requirements for borrowers and to identify and plan appropriate measures to address outstanding compliance issues. In case noncompliance is identified, a corrective action plan agreed on by ADB and the borrower will be prepared.

yards, access facilities, and related facilities and equipment deemed by the Company to be necessary or convenient for the production of electricity from Geothermal Energy and its delivery.

[9] REPUBLIC ACT (RA) NO. 9513 – The Renewable Energy (RE) Law provides the mechanism on the awarding of a Geothermal Service Contract (GSC)/Geothermal Operating Contract (GOC) between the DOE and the interested RE Developer. Under the new scheme, a GSC is awarded through Direct Negotiation and by Open and Competitive Selection Process or via public bidding to a local and/or foreign company who are legally, technically and financial capable to undertake operation of the geothermal power project. Still, under the RE Law, the State owns the resource and has full control and supervision over the exploration, development and utilization of the geothermal resource.

[10] "While a copy of the Abandonment Agreement has been initialed by signatories from the DOE, PSALM and CGPHI, however, the execution blocks of the contract have not been signed by such signatories." (LDDR 2015).

7. **Methodology.** This environmental compliance audit report consolidates the results of the due diligence assessment undertaken for the aforementioned Project that focuses on: (i) compliance status of the existing facilities and operations with relevant environmental laws, regulations and ADB requirements; (ii) implementation of mitigation measures on identified risks and impact areas; and (iii) nature and extent of any adverse environmental impacts as a result of the implementation of the Project. It also describes the current conditions of the Project and makes recommendations for mitigation of any adverse impact for future operations.

8. The audit procedure adopted for the Project involves: (i) desk review of the available documents including environmental monitoring reports, previous environmental, health and safety audit reports, socioeconomic and health survey reports, risk assessments studies, environmental permits and licenses; Multipartite Monitoring Team (MMT) documents; and other related documents and (ii) site visit and meetings with the borrower. The site visits for the Project were undertaken on: 7 January and 2 February 2015 at MakBan and 8 -9 January at Tiwi. Table 3 details the documents reviewed and assessed in this audit report.

Table 3. Detailed list of the documents reviewed

Type of Document	MakBan	Tiwi
Environmental monitoring reports	Multipartite Monitoring Team (MMT) Compliance Monitoring and Validation Reports (CMVRs): CMVR 2H12; CMVR 1H13 - 2H13; CMVR 1H14	(a) Multipartite Monitoring Team (MMT) Compliance Monitoring and Validation 1stH2012-CMVR Tiwi; 1stH2013-CMVR Tiwi; 2ndH 2012-CMVR Tiwi; 2ndH2013-CMVR Tiwi
	APRI Compliance Monitoring Report (CMR): CMR 1H13; CMR 2H13; CMR 1H14; CMR 2H14	APRI Compliance Monitoring Report (CMR): CMR 2H12; CMR 1H13; CMR 2H13; CMR 1H14; CMR 2H14
	APRI Self-Monitoring Report (SMR): SMRQ113; SMRQ213; SMRQ313; SMRQ413;	APRI Self-Monitoring Report (SMR): SMRQ113; SMRQ213; SMRQ313; SMRQ413; SMRQ114; SMRQ214; SMRQ314; SMRQ414;
	PGPC Compliance Monitoring Report (CMR): PGPC_CMR 1H13; PGPC_CMR 2H13; PGPC_CMR 1H14; PGPC_CMR 2H14	No CMRs received from PGPC
	PGPC Self-Monitoring Report (SMR): PGPC_SMRQ213; PGPC_SMRQ313; PGPC_SMRQ114; PGPC_SMRQ214; PGPC_SMRQ314; PGPC_SMRQ414	No SMRs received from PGPC
Environmental, health and safety audit reports	Environmental Permit / Licenses Audit and Inventory Mak-Ban Geothermal Power Plant Batangas and Laguna, Philippines by AECOM Environment (AECOM Environment July 2009),	Environmental Permit / Licenses Audit and Inventory Tiwi Geothermal Power Plant Tiwi, Albay Philippines (AECOM Environment April 2009),
	Health and Safety Permit / Licenses Audit and Inventory Mak-Ban Geothermal Power Plant Batangas and Laguna, Philippines (AECOM Environment July 2009),	Health and Safety Permit / Licenses Audit and Inventory Tiwi Geothermal Power Plant Tiwi, Albay Philippines (AECOM Environment April 2009)
	Environmental Waste, Hazardous Material and Hazardous Waste Identification Mak-Ban Geothermal Power Plant Laguna and Batangas, Philippines (AECOM Environment July 2009),	Environmental Waste, Hazardous Material and Hazardous Waste Identification Tiwi Geothermal Power Plant Tiwi, Albay Philippines (AECOM Environment April 2009)
	Phase I Environmental Site Assessment Mak-Ban Geothermal Power Plant Batangas and Laguna, Philippines (AECOM Environment, July 2009)	Phase I Environmental Site Assessment Tiwi Geothermal Power Plant Tiwi, Albay Philippines (AECOM Environment, July 2009)
	Internal Audit Report (March 2011)	Environmental Audit Report for TGP (16 August 2013)
	MKB EHS- Environmental Audit Report (2012)	
	MKB-EHS-13-38 Environmental Audit Report (2013)	
	Tiwi and MakBan Geothermal Power Plants Independent Technical Review (Shaw	

Type of Document	MakBan	Tiwi
	Consultants International Inc. February 2010)	
Socioeconomic and health survey reports	GHD Socioeconomic and Health Survey (April 2011)	No socio-economic survey reports provided for review
	UPLBFI Socioeconomic and Health Survey (December 2011)	
Risk assessments studies	2014 Bulalo Fieldwide Precision Leveling Survey	Caliper Survey
		Subsidence report for Tiwi
	Risk Engineering Survey Report for MakBan Geothermal Power Plant Barangay Bitin, Aia, Laguna, Luzon, Philippines (Aon Risk Solutions, 24 August 2012)	Risk Engineering Survey Report for Tiwi Geothermal Power Plant Albay, Luzon, Philippines (Aon Risk Solutions, 6 August 2012
Environmental permits and licenses	APRI Transferred Water Permits-Makban	APRI-TIWI permits
	Aug 12'11 Cancellation of CCO for Hg GRANTED	Letter re.revocation of CCO for Mercuric thiocyanate
	CCO_Asbestos_Reg.Certificate	CCO
	CCO_PCB_Reg.Certificate	
	DENR ID No. GR-04-34-0026	DENR ID 05-05-0007
	Discharge Permit-2013-15	Dischage Permits for Waste Water TGP Plants A and C (2014)
	ECC Binary	ECC 0407-162-5012 (TGP)
	ECC Modular	ECC 0402-044-4220
	ECC Rehab	
	ECC Transfer of Ownership	ECC Transfer of Ownership (TGP)
	Envi Mgt Training_Managing Head_JMM_APRI Makban	TGP EHS Trainings for 2013 and 2014
	PCL certificate-Cadmium Acetate Feb 2014-2015	Certification PCL TGP
	PCO JHG	Certificate of Accreditation of PCO TGP
	PCO PCM	
	PCO_JHG LLDA accdt	
	PTO_2014	Transport Permit (TGP) (2014) and Transport Registration Certificate (TGP)
	IMS Certification	tgpp_ims.certification1
		tgpp_ims.certification2
		tgpp_ims.certification3
MMT Documents	MBGPF-MMT Resolution No.1 Series of 2013 re BDO Account for EMF	EGF
	MMT MOA Mar15'11 signed notarized	MMT Manual of Operation
	MMT Resolution No.1 Series 2010 re Inclusion of NPC MWAT to MMT	
	MMT resolution No.1 Series of 2012 re SBLC	
	BDO - MMT MBGPF EGF	
	AWFP for 2013	
	AWFP 2014	
Other related documents	Compromise Agreement & Amendment	BERT-MERT
	CAMS Docs	WSF
	Photo Update_AECOM Report	
	EHS_2015 ADB	TGP Emergency Response Team TGP Fire & Earthquake Drill May 30 2014 TGP Fire Drill 2015 result and attendance
	CorpGov_AboitizPower_Executing the Strategy_2012	

9. **Limitations of the Study.** Since the Project involves APRI's refinancing past and new capital expenditure, operation and maintenance of, and ongoing environmental investments in Tiwi-MakBan, this environmental compliance audit report (ECAR) is focused on the operation and maintenance (O&M) of the existing generation facilities (i.e., MakBan's ten and Tiwi's six generating units) operated by APRI.

Professional judgments expressed in the report are based on the facts and information provided by APRI. Information gaps were identified and suggested actions to move forward are reflected in Table 13 – Corrective Action Plan for Tiwi and MakBan on their Environmental Compliance during Operation and Maintenance. Since the steam fields have been in operations for more than 30 years supplying steam to APRI (before to NPC) therefore are considered as associated facilities. And since APRI has no control or influence over PGPC operations it is not possible for them to implement corrective action in respect of the steam fields. However APRI noted that PGPC's operations on geothermal facilities specifically environmental impacts and risks particularly handling and disposal of effluent (through re-injection) were in compliance with the national and international standards. Other environmental management and monitoring plans related to these steam facilities as stipulated in the ECC is an obligation of PGPC and are being implemented, monitored and reported to the concerned government regulatory bodies

II. REGULATORY SETTING

10. **Environmental Compliance Certificate (ECC).** Presidential Decree 1586 was promulgated in 1978, which requires that an environmental impact assessment (EIA) be conducted for any critical project which has high potential for negative environmental impacts. EIA is a study that involves evaluating and estimating the likely impacts of the particular project on the environment during construction, commissioning, operation and abandonment. Designing appropriate preventive, mitigating and enhancement measures addressing these consequences to protect the environment and the community's welfare are also included in the study.

11. A key output of the EIA process is an Environmental Compliance Certificate (ECC), which is required to be obtained from the Department of Environment and Natural Resources (DENR) prior to the construction of the new facility. ECC is a document to confirm that the project has complied with the requirements of the Environmental Impact Statement (EIS) System for programmatic compliance and will not have any unacceptable environmental impacts. It is issued by the Secretary of the DENR after positive review of the project. For critical project established prior to 1982, there is no requirement to conduct an EIA or obtain an ECC. However, a Certificate of Non-Coverage (CNC) may be obtained from DENR, but it is not mandatory.

12. **ECC Monitoring Roles and Responsibilities.** Proponents issued ECCs is primarily responsible for monitoring their projects. ECC Compliance Monitoring Report (CMR) which any Proponent, through its Environmental Unit or Environmental Officer, is required to submit to the designated monitoring Environmental Management Bureau (EMB) office on a semi-annual frequency. The detailed report on compliance to environmental standards specific to environmental laws shall be submitted thru the Self-Monitoring Report (SMR) as required by DAO No. 2003-27 on a quarterly basis to the concerned EMB Regional Office.

13. Multi-partite Monitoring Team (MMT) is organized to encourage public participation, to promote greater stakeholders' vigilance and to provide appropriate check and balance mechanisms in the monitoring of project implementation. The MMT is recommendatory to EMB. Compliance Monitoring and Validation Report (CMVR) has to be customized by every MMT based on the project to be monitored. The CMVR shall be submitted semi-annually to the concerned EMB Regional Office, with the Proponent's CMR/SMR as attachment. For projects with MMT, documentation by the EMB of its evaluation findings shall be through use the EMB Compliance Evaluation Report (CER), with the MMT's CMVR and the Proponent's CMR/SMR as attachments. The CER shall be prepared semi-annually. Table 4 summarizes the monitoring, validation and evaluation/audit schemes of an ECC.

Table 4. Monitoring, Validation and Evaluation/Audit Schemes under the EIS System of the Philippines

Monitoring Aspects		**Frequency / Timing**		
		Proponent Self-Monitoring	**MMT Validation of Proponent's Performance**	**EMB Evaluation/ Audit**
A. Compliance Reporting	ECC	Semi-annual in CMR	Semi-annual in CMVR	Semi-annual in CER
	EMP	Semi-annual in CMR	Semi-annual in CMVR	Semi-annual in CER
	Environmental	Detailed report in Quarterly	Semi-annual in CMVR	Semi-annual in CER

Monitoring Aspects		Frequency / Timing		
		Proponent Self-Monitoring	**MMT Validation of Proponent's Performance**	**EMB Evaluation/ Audit**
	Standards (under specific environmental laws)	SMR; Summary of compliance in semi-annual CMR		
B. Field Validation			Semi-annual	Semi-annual, or whenever there are complaints, exceedance of standards, suspicious data
C. Effectiveness of Environmental Management Measures	Sampling & Measurement	Monthly/ Continuous as committed in the Environmental Monitoring Plan (EMoP) within the EMP	Only in cases of complaints/ exceedance of standards/ Suspicious data	As the need arises in coordination with the MMT
	Trend Analysis /Cumulative Performance Report	2nd semi-annual CMR; 4th Quarter SMR	2nd Semi-annual CMVR	2nd semi-annual CER

Source: http://www.emb.gov.ph/eia-adb/mon-how.html#1

14. The Environmental Monitoring Fund (EMF) is a fund that a proponent establishes in support of the activities of the MMT. The Environmental Guarantee Fund (EGF) is required to be established for all co-located or single projects that have been determined by DENR to pose a significant public risk or where the project requires rehabilitation or restoration.

15. **Other related Philippine Environmental Regulations.** Table 5 details the related environmental regulations related in the implementation and monitoring of ECC. As indicated in the table, the importation and manufacture, as well as the storage, transport and disposal of these substances and its wastes are being controlled and regulated by the government under their respective DENR Administrative Orders (DAO). The Chemical Control Order (CCO) details the application and registration requirements needed by users, importers, manufacturers, transporters or treaters to conduct their businesses.

Table 5. Related Philippine Environmental Regulations for the Implementation and Monitoring of the ECC

Philippine Environmental Regulations	Particulars
Environmental Compliance Certificate (ECC)	
Presidential Decree No. 1586 (PD No. 1586)	The Environmental Impact Statement System
DAO 2003-30	Implementing Rules and Regulations (IRRS) for the Philippine Environmental Impact Statement (EIS) System.
DAO 1992-26	To effectively enforce the "Pollution Control Decree of 1976", otherwise known as PD 984, and its implementing rules and regulations by establishing linkages among the (1) Department of Environment and Natural Resources, (2) industrial establishments which are potential and actual sources of pollution and (3) local government agencies, and in order to carry out the national policy of maintaining a reasonable quality of the environment.
DAO 2014-02	Revised Guidelines for Pollution Control Officer Accreditation – To effectively enforce RA 9275 by establishing linkages among the (1) Department of Environment and Natural Resources, (2) industrial establishments which are potential and actual sources of pollution and (3) local government agencies, and to carry out the national policy of maintaining a reasonable quality of the environment.
DAO 2003-27	Details the preparation and submission of Self-Monitoring Report (SMR). Unless otherwise provided, all covered firms shall submit the SMR on a quarterly basis. SMR covering activities in a quarter shall be submitted within fifteen calendar days after the end of the said quarter as may be determined by the DENR-EMB regional office concerned.
DAO 2003-14	Creating the Philippine Environment Partnership Program to Support Industry Self-Regulation Towards Improved Environmental Performance
Law associated with Air Emissions	
Republic Act (RA) No.	Also known as the Clean Air Act that consolidates all the rules and regulations on air

Philippine Environmental Regulations	Particulars
8749	quality. It also establishes the standards for ambient air quality and emission standards for point sources. The Act contains provisions on empowering ordinary citizens to address situations involving violators and government officials who neglect the performance of their duties. This law mostly provides a general framework for the new air pollution requirements.
DENR Administrative Orders (DAO) for the implementation of the Law on Air Emissions	
DAO 2000-81	Under this order, a valid Permit to Operate must be obtained from DENR for any source of air pollution continuously emitted out to the environment. Air emission and ambient standards are also listed under this order.
DAO 2009-02	Designation of Makiling-Banahaw Geothermal Airshed and its Governing Board) details the coverage of the airshed and the designation of the airshed governing board members.
DENR Memorandum Circular on Air Emissions	
2007-003	Provides the implementing rules and regulations for RA. 8749. Details the policy on compliance and permitting for industrial facilities relating to air quality. The frequencies of emission testing for new or existing sources are also specified in this Order.
2002-13	Details the requirements and procedures on the establishment of geothermal areas as airsheds. Requirements include an air dispersion modeling and at least two continuous H_2S ambient monitors
Laws associated with control of Hazardous Wastes and Substances	
PD 984	Commonly known as the Pollution Control Law that provides the standards for storage, collection, processing, transport and disposal of solid and hazardous wastes
RA 6969	Toxic Substances and Hazardous and Nuclear Wastes Control Act of 1990. This act regulates, prohibits and restricts the importation, manufacture, processing, sale, distribution, use and disposal of chemical substances and mixtures that present unreasonable risk and/or injury to health or the environment. This Act also specifies proper handling of toxic substances which includes pre-manufacture and pre-importation requirements.
RA 9003	The Ecological Solid Waste Management Act provides the framework for the handling of solid wastes, standards for the establishment of dumpsites, and guidelines for the segregation and recycling of solid wastes.
DAO for the implementation of the Law on Hazardous Wastes and Substances	
DAO No. 29 of July 6, 1992 (DAO 92-29)	Provides the implementing rules and regulations for RA. 6969. List of hazardous wastes is described under this order. There is a requirement that hazardous waste generators must register its wastes with the Environmental Management Bureau (EMB) Regional Office, by providing information regarding the type and quantity of hazardous wastes generated. It also requires the facility to obtain a license from DENR if it is involved in the treatment of hazardous waste. Hazardous wastes are only allowed to be collected and treated/disposed by DENR accredited companies. Records on wastes transported out from the facility must be submitted to DENR and retained on site for two years.
DAO 94-28	Provides guidelines for the importation of recyclable materials containing hazardous materials
DAO 97-28	Includes used oil in the list of hazardous materials
DAO 2001-34	Provides the implementing rules and regulations for RA. 9003
DAO 2004-27	Provides the updated limiting condition for the import of used lead-acid batteries under the scrap metal category;
DAO 2004-01	Provides the Chemical Control Order (CCO) for Polychlorinated Biphenyls (PCBs)
DAO 2000-02	Regulates the use and disposal of asbestos
DAO 1997-38	CCO for Mercury and Mercury Compounds
DAO 1997-39	CCO for Cyanide and Cyanide Compounds
DAO 2004-08	Ozone-Depleting Substances (ODS)
DAO 2004-36	Revises Title III of DAO No. 92-29 regarding management of hazardous wastes.
DAO 2007-23	Implementation of Priority Chemical List (PCL) to regulate the use and importation of selected chemicals such as cadmium acetate
DAO 1992-29	States that a PCL Certification by DENR-EMB stating that the chemicals used are included in the Philippine Inventory of Chemicals and Chemical Substances (PICCS) and as such are not required to have a Pre-Manufacturing Pre-Importation Notification (PMPIN)
Laws associated with Water Resources	

Philippine Environmental Regulations	Particulars
PD 1067	The Water Code of the Philippines, provides the framework relating to the appropriation, control, and conservation of water resources, as well as defines the rights and obligations of water users and water owners. This decree further sets basic laws governing the ownership, utilization, and exploitation of water resources and identifies administrative agencies that will enforce the Code.
RA 9275	Otherwise known as the Clean Water Act of 2004 provides the rules and regulations for the proper implementation of water utilization, protection and conservation to protect water bodies from pollution from land-based sources such as industries and commercial establishments, agriculture and community/household activities.
DAO for the implementation of the Law on Water Resources	
DAO 1990-35	Provides the implementing rules and regulations pertaining to wastewater effluent. The order sets regulations for effluent permitting, monitoring, limitations of effluent impacts on the natural environment and other rules governing the discharge of industrial wastewater. There is a requirement on obtaining a Wastewater Discharge Permit from DENR for wastewater discharge into Philippine waters. Effluent discharge standards are specified under the orders. However, there is no standard on effluent injected into a deep reservoir. Reinjection of condensate or cooling water blowdown is covered by a Discharge Permit by the entity operating the treatment or reinjection.
DAO 2005-10	Provides the implementing rules and regulations for RA 9275. Under this Order, discharging, injecting or allowing seeping into the soil or sub-soiling any substance in any form that would pollute groundwater is prohibited. In the case of geothermal projects, regulated discharge for short-term activities (e.g. well testing, flushing, commissioning or venting) and deep reinjection of geothermal liquids may be allowed subject to the approval of DENR.

Source: Modified from the following references: Environmental Waste, Hazardous Material and Hazardous Waste Identification Mak-Ban Geothermal Power Plant Laguna and Batangas, Philippines (AECOM Environment July 2009), Environmental Waste, Hazardous Material and Hazardous Waste Identification Tiwi Geothermal Power Plant Tiwi, Albay Philippines (AECOM Environment April 2009)

III. FINDINGS AND AREAS OF CONCERN

A. Compliance with national and local laws and regulations and permitting requirements

16. APRI were granted Certificates of Compliance (COC) by the Energy Regulatory Commission (ERC) under Republic Act No. 9136 (otherwise known as Electric Power Industry Reform Act of 2001). The COCs were granted after MakBan's ten and Tiwi's six generation facilities for complying with the ERC's required environmental, technical and financial standards. COC conditions include that "a Generation company shall ensure that its Generation Facilities comply with applicable environmental laws, rules and regulations."

Table 6. Status of the COC of Tiwi-MakBan Geothermal Plants

Geothermal Plant	COC Title	Location	Capacity	Fuel	Years of service	Date of Issuance
APRI (Mak-Ban Geothermal Power Plant)	COC No. 10-05-GXT 286e-7833	Brgy. Bitin, Bay, Laguna	Plant A - 126.40 MW	Geothermal	20	May 31, 2010
		Brgy. Bitin, Bay, Laguna	Plant D – 40 MW	Steam		
		Brgy. Limao, Tamlong, Calauan, Laguna	Plant B – 126.40 MW	Steam		
		Brgy. Limao, Tamlong, Calauan, Laguna	Plant C – 126.4 MW	Steam		
		Brgy. Sta. Elena, Sto. Tomas, Batangas	Plant E – 40 MW	Steam		

Geothermal Plant	COC Title	Location	Capacity	Fuel	Years of service	Date of Issuance
Ormat - MakBan Binary GPP	COC No. 06-04-GXT 286aa - 14632	Brgy. Sta. Elena, Sto. Tomas, Batangas/Brgy. Bitin, Bay, Laguna/Brgy. Tamlong, Calauan, Laguna	18.50 MW	Steam		April 6, 2006 (Non-operational since 2006)
APRI (Tiwi Geothermal Power Plant)	COC No. 10-12-GXT 286r-13736L	Brgy. Cale, Tiwi, Albay	234 MW	Steam	10	December 1, 2010

Source: http://www.aboitizpower.com/AP/8016:Certificate-of-Compliance.html

17. **Environmental Compliance Certificate (ECC).** No ECC were required for the Tiwi and MakBan power plants since these plants were established before 1982, which was prior to the implementation of the Philippine EIS under PD 1586. However, the upgrade and reconstruction works with subsequent facilities added after 1982 need an ECC, hence, NPC has complied with the requirement as enumerated in Table 7. Upon acquisition the ECCs listed below had been transferred ownership to APRI on 8 September 2009 for MakBan and 28 September 2009 for Tiwi. The transfer of ownership necessitated APRI, as per GRSC Provisions Section 6.8[11], to continuously carry the environmental liability and obligations including ECC compliance monitoring and reporting requirements.

Table 7. Status of the ECC of Tiwi-MakBan Geothermal Power Plants

Geothermal Plant	Project	ECC Reference Code	Date of Issuance	ECC Transfer of Ownership	Current ECC Proponent	Remarks/ Issues
MakBan	MakBan Geothermal Modular Power Plant Project -	ECC 9206-041-203C	Issued to NPC on 29 June 1992	8 September 2009	APRI	Valid
	Upgrading and Rehabilitation of Mak-Ban Geothermal Power Plants A and B	ECC 0112-871-203	Issued to NPC and PGI on 21 November 2002	8 September 2009	APRI	Valid
	Mak-Ban Binary Cycle Geothermal Power Generating Plant Project	ECC 9112-037-203	Issued to NPC on 05 March 1992	8 September 2009	APRI	Valid. (Non-operational since 2006)
	MakBan Waste Storage Facility Project of PGI	ECC 4A-2003-529-120	Issued to PGI on 25 June 2003		PGPC	Non-operational. Delisted as Treatment, Storage and Disposal (TSD) Facility (as per the DENR letter dated 22 December 2011 to Chevron).
Tiwi	Upgrading and Rehabilitation activities of the Tiwi Geothermal Power Plant	ECC 0109-642-203	Issued to NPC and PGI on 10 September 2002	28 September 2009	APRI	Valid (Based on Transfer of Ownership.)
	Proposed	ECC	Issued to		PGPC	Valid

[11] GRSC (2003), Section 6.8, "All Government approvals (if any) required under applicable law to be maintained by the Owner (PSALM) in connection with, and which are material to, the Generating Facilities and the by the Contractor (PGI) in connection with, and which are material to, the Geothermal Facilities shall be obtained and at all times maintained, or caused to be obtained and maintained, by the relevant Party, in full force and effect and, where applicable, renewed and caused to be renewed by the relevant Party at the relevant time."

Geothermal Plant	Project	ECC Reference Code	Date of Issuance	ECC Transfer of Ownership	Current ECC Proponent	Remarks/ Issues
	Geothermal Residue Non-hazardous Disposal Landfill Facility Project	0602-038-9200	Unocal Philippines Inc. (UPI) on 07 April 2006			
	Tiwi Warehouse 3 and 4 Hazardous Waste Storage Facility Project	ECC 0407-162-5012	Issued to PGI on 21 July 2004		PGPC	Valid
	Permeability Enhancement of Production and Injection Wells Project	ECC-0402-044-4220	Issued to NPC and PGI on 16 February 2004		PGPC	Valid

18. **ECC Compliance Reporting Roles and Responsibilities.** As indicated earlier, regulatory permits authorizing construction and operation of Tiwi and MakBan have been issued, including ECCs for units and major facility rehabilitations after 1982. Transfer of ownership to APRI was completed in 2009. In MakBan, APRI and its contractor PGPC have a separate SMR and CMR submissions as per GRSC Provisions (Section 6.8), and with conditions stipulated in the ECC agreed upon by both parties on issue of ownership and responsibilities (Table 8). APRI has been in discussion with both PGPC and DENR-EMB for the integration and splitting of the ECCs to simplify reporting and accountability of plant and steam environmental management options. There is ongoing preparation of documentary requirements for this ECC screening (i.e., Environmental Performance Report and Management Plan, EPRMP) and continuous coordination meeting with PGPC, project preparers and DENR.

19. In Tiwi, the transfer of ownership to APRI is for ECC 0109-642-203 which was originally issued to NPC and PGI. APRI is the entity submitting the ECC compliance reports for the said ECC. The transfer of ownership to APRI includes the conditions on the ECC that are applicable to both APRI and PGPC. It must be clarified if both the plants and steam fields are being assessed in PGPC's ECC compliance plan as it used to be. Similar to MakBan, APRI in Tiwi is planning to separate ECCs for the generation plant and the steam fields. Moreover, given the quality of the submitted CMVR by MMT in Tiwi, APRI's Environmental, Health and Safety (EHS) Team should provide technical support to MMT.

Table 8. Status of ECC Compliance Monitoring

ECC	Issued to	Assigned to	ECC Compliance Reporting Responsibility			Remarks/ Issues
			CMR	SMR	MMT-CMVR	
MakBan						
ECC 9206-041-203C	NPC + PGI	APRI	APRI + PGPC	APRI + PGPC	APRI + PGPC	PGPC report compliance to APRI relevant to applicable permits and submit separate CMR and SMR.
ECC 0112-871-203	NPC + PGI	APRI	APRI + PGPC	APRI + PGPC		
ECC 9112-037-203	NPC	APRI	APRI	APRI		
ECC 4A-2003-529-120	PGI	Remained in the name of PGPC	PGPC	PGPC	Non-operational	
Tiwi						
ECC 0109-642-203	NPC + PGI	APRI	APRI	APRI	APRI + PGPC	APRI is submitting compliance reports for ECC 0109-642-203 except for water quality
ECC 0602-038-9200	UPI	PGPC	PGPC	PGPC		
ECC 0407-162-5012	PGI	PGPC	PGPC	PGPC		
ECC-0402-044-	NPC + PGI	PGPC	PGPC	PGPC		

ECC	Issued to	Assigned to	ECC Compliance Reporting Responsibility			Remarks/ Issues
			CMR	SMR	MMT-CMVR	
4220						monitoring which is being undertaken by PGPC. PGPC is submitting separate compliance reports for other ECCs.

20. **ECC Staff Resources.** In compliance with DAO 1992-26 and Laguna Lake Authority Development (LLDA) Memorandum Order No. 2, Series of 2011, accreditation of Pollution Control Officers (PCOs) of MakBan and Tiwi is detailed in Table 9. Under Section 5 of DAO 2014-02 "Revised Guidelines for PCO Accreditation", PCOs shall be accredited based on the categorization of establishments. This categorization shall define the needed qualifications of PCO.

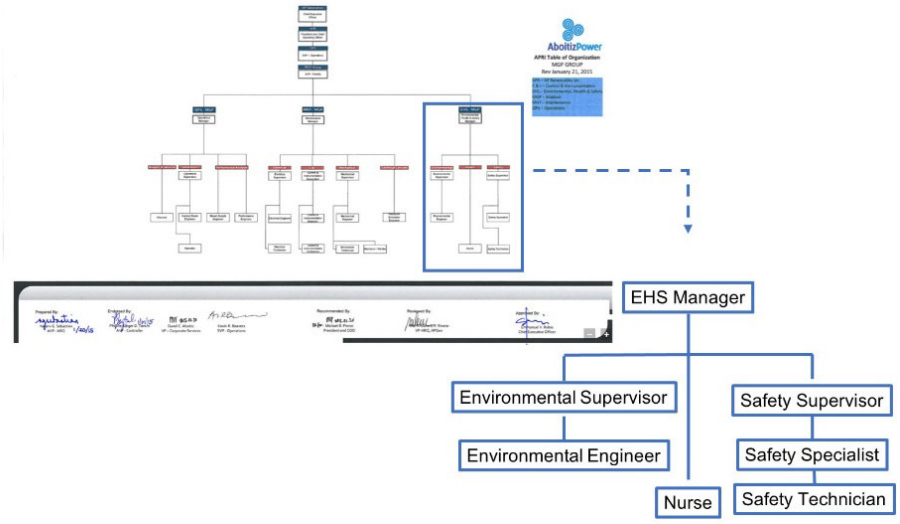
Table 9. Status of the PCO Certifications in Tiwi and MakBan Geothermal Power Plants

Geothermal Plant	PCO Name	PCO Certificate No.	Accreditation Agency	Accreditation Date
MakBan	(APRI) Judy Ann H. Guevarra	PCO-COA 2012-00871	LLDA	7 January 2013
		COA-2010-3503	DENR-EMB IV	9 June 2010
	(APRI) Paul Joseph C.Mendoza	COA-2014-5839	DENR-EMB IV	11 July 2014
	(PGPC) Susana M. Maligalig	_	_	_
Tiwi	(APRI) Esmeraldo Martin, Jr.	COA-0066	DENR-EMB V	09 February 2015
	(PGPC) Alberto C. Buban	_	_	_

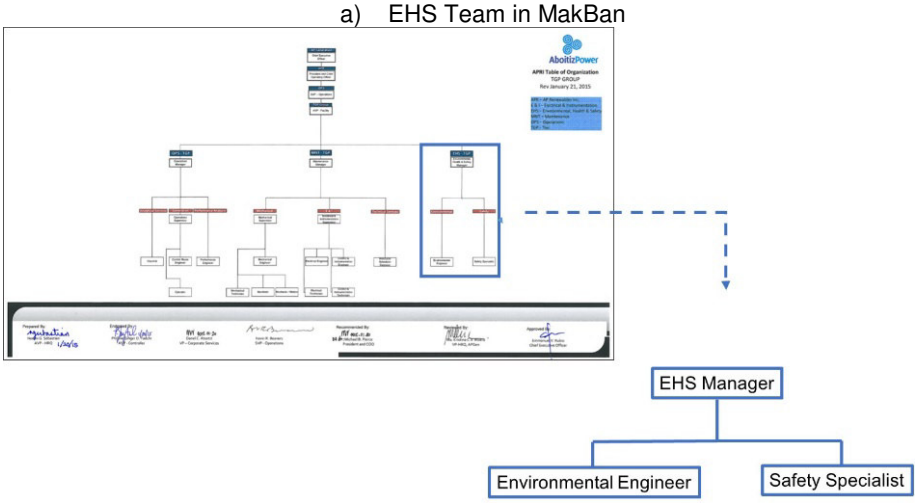
Source: PCOs for MakBan and Tiwi Geothermal Plants.

21. The accredited PCOs of MakBan and Tiwi are part of the Environmental Component of their EHS Teams (Fig. 6). The head of the EHS Team manages two units (i.e., Safety and Environmental). The roles and responsibilities of the PCOs of APRI including their duties in the implementation of environmental programs are enumerated in Annex 1.

22. APRI's EHS Staff has a collaborative working relationship with PGPC's EHS Staff as APRI's contractor for the steam supply. Both PCO of APRI and PGPC work hand in hand in some aspects of regulatory compliance e.g. MMT monitoring water and air quality monitoring and other ECC compliance. On the other hand, the APRI's EHS Staff has harmonious working relations with DENR as regulating agency. APRI and DENR treat each other as partners in environmental protection.



a) EHS Team in MakBan



b) EHS Team in Tiwi

Figure 6. APRI's EHS Teams

Source: EHS MakBan (2015), EHS Tiwi (2015)

A.2. Related ECC Permitting Requirements

23. The ECCs of the geothermal facilities required compliance with other sectoral requirements mandated by other government agencies including securing all necessary permits from concerned agencies related to air emissions (RA 8749), hazardous and solid wastes (PD 984, RA 6969) and water resources (PD 1067, RA 9275) during O&M

24. Compliance with ECC conditions have been a "shared responsibilities" between APRI (as the Owner) and PGPC (as the Contractor) by implementing activities and projects for Generation and Geothermal facilities, respectively. As indicated earlier, three ECCs' for MakBan and one ECC for Tiwi had been transferred from NPC's name to APRI in 2009. While APRI is fully accountable for the compliance to ECCs transferred under its name, APRI is limited to PGPC's environmental monitoring of the associated activities and projects in the geothermal field or steam field.

25. Particular issues derived from the review of current status of ECC permitting requirements under the name of APRI are detailed in Table 10. PGPC is obliged to submit separate permitting requirement as per the GRSC provisions and stipulations in the ECCs. As indicated earlier, as per the CMVRs, PGPC of MakBan and Tiwi are in compliance with the stipulations in the ECCs including permitting requirements to concerned agencies.

Table 10. Status of the Permitting Requirements of the Related Power Generation Facilities of MakBan and Tiwi

(a) Permitting Requirement in MakBan

Related Legal Requirements	Particulars	Code	Issuing Agency	Issued to	Issued On	Valid Until	Remarks/ Issues
MakBan							
Air Emissions							
Section 1 Rule XIX Part VI, IRR of RA 8749 (Clean Air Act)	**Permit-to-Operate Air Pollution Sources and Control Installations**						**Annual Renewal**
	Plant A Two (2) units 63 MW Turbines/ Generators provided with two (2) units condenser, cooling tower and steam ejector gas removal system	2014-POA-0434-346	DENR-EMB IV	APRI	2 April 2014	15 April 2015	Valid
	Plant B Two (2) units 63 MW Turbines/ Generators provided with two (2) units condenser, cooling tower and steam ejector gas removal system						
	Plant C Two (2) units 55 MW Turbines/ Generators provided with two (2) units condenser, cooling tower and steam ejector gas removal system						
	Plant D Two (2) units 20 MW Turbines/ Generators provided with two (2) units condenser, cooling tower and vacuum pump						
	Plant E Two (2) units 20 MW Turbines/ Generators provided with two (2) units condenser, cooling tower and vacuum pump.						
	Two (2) units 3 MW each turbine (Blalo 45); two (2) units 3 MW each turbine (Bulalo 02); one (1) unit each (3 MW and 0.73 MW) turbine (Bulalo 51); three (3) units 250kW/313 kVA DMT Cummins diesel engine generator set and five (5) units 281 kVA Cummins diesel engine generator set (standby) provided with muffler.						
Section 3(d) of DAO 2009-02	Designation of Makiling-Banahaw Geothermal Airshed				11 February		The Order states that one representative from the geothermal

Related Legal Requirements	Particulars	Code	Issuing Agency	Issued to	Issued On	Valid Until	Remarks/ Issues
					2009		power plant operator should be one of the members of the Board. To date, APRI has a representative officially designated by the DENR in the governing board of the Makiling-Banahaw Geothermal Airshed (Orientation of MakBan Geothermal Airshed, 23 March 2010 at Sto, Tomas Batangas)
Hazardous and Solid Wastes							
RA 6969 Hazardous Waste Generator Registration Certificate	**DENR Hazardous Waste Generator ID Number**						
	5 Modular Plants	04-34-0026	DENR-EMB Main	NPC (Modular)	28 August 1995	No expiration	Assigned to APRI on 22 January 2010
	Binary Plant	04-34-0283	DENR-EMB Main	NPC (Binary)	27 August 2003	No expiration	Assigned to APRI on 22 January 2010
RA 6969 Chemical Control Orders (CCO)	**Chemical Control Orders (CCO) Certificate of Registration**						
DAO 1997-38	Mercury (Mercuric Thiocyanate)	CCOR4A-2004-0005Hg	DENR-EMB IV	NPC (Modular)	30 September 2004	No expiration	Cancellation of CCO registration is granted to APRI on 12 August 2011 due to the adaptation of new procedure in analyzing steam (i.e., from Spectrophotometry to Flame Photometry) eliminating the use of this chemical as primary reagent.
DAO 2004-01	Polychlorinated Biphenyls (PCB)	CCOPCB-05-01-000606	DENR-EMB Main	NPC (Binary)	23 June 2006	No expiration	APRI concurred that there was no transfer of ownership to APRI, because there is no need for CCO for PCBs since MakBan was tested and found PCB-free according to ITR (2010)[12].

[12] Tiwi and MakBan Geothermal Power Plants Independent Technical Review (Shaw Consultants International Inc. February 2010)

Related Legal Requirements	Particulars	Code	Issuing Agency	Issued to	Issued On	Valid Until	Remarks/ Issues
DAO 2004-01	Polychlorinated Biphenyls (PCB)	CCOPCB-05-01-000606	DENR-EMB Main	APRI (Modular)	17 November 2009	No expiration	Valid
DAO 2000-02	Asbestos	CCO R4A-2009-0035AS	DENR-EMB IV	APRI	15 September 2009	No expiration	Valid
	Priority Chemical List (PCL) Compliance Certificate						
DAO 23-2007	PCL Compliance Certificate for cadmium acetate	PCL-2014-138	DENR-EMB Main	APRI	28 February 2014	28 February 2015	For annual renewal
	Waste Storage Facility Regulatory Requirements						Not applicable for MakBan provided that no other wastes coming from other generators are stored in the facilities.
	Permit-to-Operate Waste Water Treatment Facility						Not applicable for MakBan. As indicated in the ITR (2010), wastewater generated by the power plant operations is pumped back to PGPC to be re-injected to their non-productive wells. Thus, there is no wastewater treatment facility in the plants.
	Brine Disposal Permits						Not applicable for MakBan, the disposal of brine is managed by PGPC since they maintain the geothermal wells used for reinjection and not covered in this compliance report. Wastewater from Tiwi and MakBan are reinjected by PGPC to their cold reinjection wells (i.e., P & A wells at Nag 8 for Tiwi, Bulalo 25 for MakBan). The cold reinjection system handles turbine condensate, cooling tower blowdown and various cold fluids such as laboratory wastewater. Reinjection wells at very deep wells (~1,680 m) are acceptable to DENR as the best available

Related Legal Requirements	Particulars	Code	Issuing Agency	Issued to	Issued On	Valid Until	Remarks/ Issues
							technology for disposal. The control provided by DENR is the wastewater discharge permit, renewed annually, and carries with it certain conditions.
Water Resources							
Section 13 and 14 , IRR of RA 9275 (Clean Water Act)	**Discharge Permit**						**Annual Renewal**
	Discharge Permit of Liquid Waste and Wastewater Effluents –Wastewater (maximum at 31.5 m^3 per day)	DP-16a-013-00823	LLDA	APRI	13 October 2013	16 September 2015	Valid. Revalidation of permit was already applied to LLDA. Given that all injection wells are managed by PGPC, as recommended in the 2009 environmental audit, review of the existing agreement with PGPC to determine who between APRI and PGPC shall secure the Discharge Permit given that PGPC operates the reinjection wells.
PD 424 and PD 1067	**Water Permit**						
	Groundwater for cooling system not greater than 40 liter per second (lps) in January-December	11-11-029-022580	NWRB	APRI	2 November 2011	No expiration	Valid
	Groundwater for cooling system not greater than 40 lps in January- December	11-11-030-022581	NWRB	APRI	2 November 2011	No expiration	Valid
	Groundwater for industrial purposes not greater than 2.325 lps in January-December	11-11-027-022578	NWRB	APRI	2 November 2011	No expiration	Valid
	Groundwater for industrial purposes not greater than 2.325 lps in January-December	11-11-028-022579	NWRB	APRI	2 November 2011	No expiration	Valid
	Groundwater for industrial purposes not greater than 5.36 lps in January-December	11-11-031-022582	NWRB	APRI	2 November 2011	No expiration	Valid

(b) Permitting Requirement in Tiwi

Related Legal Requirements	Particulars	Code	Issuing Agency	Issued to	Issued On	Valid Until	Remarks/ Issues
Air Emissions							
Section 1 Rule XIX Part VI, IRR of RA 8749 (Clean Air Act)	**Permit-to-Operate Air Pollution Sources and Control Installations**						**Annual Renewal**
	2 units 60MW single cylinder double flow reaction type condensing turbine and auxiliaries; NCG extraction system; 2 units Mechanical Induced Draft Cooling Tower and 2 units 55 MW 3-phase synchronous type Generator	POA-14B-05AL-029(A)	DENR-EMB V	APRI	17 February 2014	26 February 2015	For renewal. Renewal in-progress (APRI 5 May 2015, pers. comm.).
	2 units 57MW single cylinder double flow reaction type condensing turbine and auxiliaries; NCG extraction system; 2 units Mechanical Induced Draft Cooling Tower and 2 units 57 MW 3-phase synchronous type Generator	POA-14B-05AL-029(C)	DENR-EMB V	APRI	17 February 2014	26 February 2015	For renewal. Renewal in-progress (APRI 5 May 2015, pers. comm.).
	One (1) unit Diesel Engine Driven Fire Pump at Plant A and C)	POA-14H-05AL-029(E)	DENR-EMB V	APRI	31 July 2014	11 August 2015	Valid
Hazardous and Solid Wastes							
RA 6969 Hazardous Waste Generator Registration Certificate	**DENR Hazardous Waste Generator ID Number**						
	Geothermal Plants	05-05-0007	DENR-EMB Main	NPC	28 August 1995	No expiration	Valid
RA 6969 Chemical Control Orders (CCO)	**Chemical Control Orders (CCO) Certificate of Registration**						
DAO 1997-38	Mercury (Mercuric Thiocyanate)	CCO-2009-0505-0014Hg	DENR-EMB V	APRI	17 June 2009		Revocation of CCO registration in the name of APRI on 16 October 2009 due to the adaptation of new procedure in analyzing steam (i.e., from Spectrophotometry to Flame

Related Legal Requirements	Particulars	Code	Issuing Agency	Issued to	Issued On	Valid Until	Remarks/ Issues
							Photometry) eliminating the use of this chemical as primary reagent
DAO 2000-02	Asbestos	CCO-2009-0505-005-AS	DENR-EMB V	APRI	28 September 2009	No expiration	Valid
	Priority Chemical List (PCL) Compliance Certificate						
DAO 1992-29	PCL Certification				October 6, 2004	No expiration	No expiry dates unless Tiwi will use additional chemicals not listed in the certification.
	Waste Storage Facility Regulatory Requirements						Not applicable for Tiwi, as indicated above, provided that no other wastes coming from other generators are stored in the facilities.
	Permit-to-Operate Waste Water Treatment Facility						Not applicable for Tiwi, as indicated above, in ITR (2010), wastewater generated by the power plant operations is pumped back to PGPC to be re-injected to their non-productive wells. Thus, there is no wastewater treatment facility in the plants.
	Brine Disposal Permits						Not applicable for Tiwi, as indicated above, the disposal of brine is managed by PGPC since they maintain the geothermal wells used for reinjection. Wastewater from Tiwi and MakBan are reinjected by PGPC to their cold reinjection wells (i.e., P & A wells at Nag 8 for Tiwi, Bulalo 25 for MakBan). The cold reinjection system handles turbine condensate, cooling tower blowdown and various cold fluids such as laboratory wastewater. Reinjection wells at very deep wells (~1,680 m) are acceptable to DENR as the best available technology for disposal. The

Related Legal Requirements	Particulars	Code	Issuing Agency	Issued to	Issued On	Valid Until	Remarks/ Issues
							control provided by DENR is the wastewater discharge permit, renewed annually, and carries with it certain conditions.
Water Resources							
Section 13 and 14 , IRR of RA 9275 (Clean Water Act)	**Discharge Permit**						**Annual Renewal**
	Discharge Permit for the entire Tiwi Geothermal Complex						While this is not covered by the compliance report, based on the documents reviewed, the permit was secured by PGPC since it is responsible for the reinjection of the condensate and cooling water blowdown.
	Wastewater Discharge Permit (Plant A-A2) – Wastewater from 1 unit septic tank into Visitant Naga River	WDP-14H-05AL-096	DENR-EMB V	APRI	22 September 2014	26 August 2015	Valid.
	Wastewater Discharge Permit (Plant C-C) – Wastewater from 1 unit septic tank to Ayubi River	WDP-14H-05AL-098	DENR-EMB V	APRI	22 September 2014	26 August 2015	Valid
PD 424 and PD 1067	**Water Permit**						
	Surface water from Visitang Naga River for industrial use not greater than 52 lps in January-December	11-11-026-022577	NWRB	APRI	2 November 2011	No expiration	Valid
	Surface water from Visitang Naga River for power use not greater than 21 lps in January-December	11-11-025-022576	NWRB	APRI	2 November 2011	No expiration	Valid
	Surface water from Visitang Naga River for power use not greater than 80 lps in January-December	11-11-024-022575	NWRB	APRI	2 November 2011	No expiration	Valid
	Groundwater for employees use not greater than 0.042 lps in January-December	023077	NWRB	APRI	27 November 2011	No expiration	Valid
	Groundwater for employees use not greater than 0.012 lps in January-December	023076	NWRB	APRI	27 November 2011	No expiration	Valid

B. Environmental Issues during Plant Operations

26. **Project Impacts at the Operation and Maintenance (O&M) Phase.** No adverse environmental impacts were anticipated during operation stage of the geothermal plants based on the EIS, instead, it is expected to benefit the environment and socio economic conditions as one of the clean renewable energy projects that can reduce the dependency on fossil fuel and would have long term environmental benefit to local villagers and surroundings

27. Mitigation measures, including soil erosion controls such as tree planting and site greening, were satisfactory. The operation of the existing geothermal plants visited during due diligence were in general positive that entails adopting the environment friendly measures to prevent any damage to the environment. APRI's EHS team were in place and are responsible in complying all regulatory requirements. APRI adopted the internationally recognized Environmental Management System (EMS) guidelines used by NPC and currently initiated the processing of APRI's ISO accreditations including 9001:2000[13], ISO 14001:2004[14] and OHSAS 18001:2007[15] to equally improve their environmental management programs. Adequate safety measures have been undertaken to prevent accidents and injuries and provide workers with safe environment. There is also an ongoing process of community engagement in compliance with the ECCs including a Stakeholders Grievance Mechanism (SGM) and Barangay Emergency Response Training (BERT) to provide continuing assistance to the stakeholders and ensure that critical information on the Tiwi-MakBan activities is fully disclosed.

28. The results of the environmental monitoring for ECC compliance (i.e., based from recent SMR, CMR and CMVR) are detailed in Table 11. The environmental monitoring includes both the generation facilities and geothermal steam fields. In MakBan, since the power plant is operated by APRI, environmental monitoring of the power plant facilities is under their responsibility while monitoring of the geothermal field operations is under PGPC. As indicated earlier, APRI and PGPC are submitting separate environmental monitoring reports (CMR and SMR). Likewise, in Tiwi, the PCOs of APRI and PGPC are responsible for their own environmental monitoring. Water quality monitoring in Tiwi is mainly under the responsibility of PGPC. The issues derived from the monitoring were based on the time series data of air quality (H_2S and noise) and water quality assessments (pH, TDS, Cl, B and As), permitting requirements of solid and hazardous wastes and recent studies on subsidence. Following the discussion of the existing EHS management program, occupational and community health and safety program and programs under the implementation and monitoring of environmental management plan (EMP). Figure 7 shows the environmental monitoring stations in MakBan.

Figure 7. Ambient Air and Water Quality Monitoring Stations in MakBan

[13] ISO 9001:2000 is a recognition established by the International Organization for Standardization on the quality management systems of a facility

[14] ISO 14001:2004 is a recognition that the facility has a framework for a holistic and strategic approach to its environmental policy, plans and actions

[15] OHSAS 18001:2007 is a recognition that the facility has a health and safety management system to control the occupational health and safety risks of its operation

Table 11. Issues Derived from Environmental Monitoring of MakBan and Tiwi Geothermal Power Plants.

(a) MakBan Geothermal Power Plant

Responsible Proponent	Impact	Compliance Status	Mitigation Measures	Remarks/ Issues
MakBan Power Generation Facility				
APRI	**Ambient H_2S Pollution**[16]	Results showed that ambient H_2Scomplied with ambient air standards set by DENR at 0.07 ppm for a 30-min averaging time.	– Measurement H_2S concentration every six months generated from cooling tower as per the ECC requirements. – Ducting of flash tank exhaust pipe to cooling tower is operational since 2010. – Appropriate personal protective equipment (PPE) and H_2S Patch on identified high level H_2S areas were provided to workers involved in the operations to mitigate the effects of air pollution to reduce health impact. – During site visit in February 2015, good housekeeping and proper maintenance were observed to further control air pollution.	Compliant. Monthly (2014) and time series monitoring of H_2S in MakBan is presented in Annex 2. Aside from the documents assessed no additional mitigation measures provided by APRI.
		As per the requirements of DENR Memorandum Circular No. 2002-13 on the establishment of geothermal areas as airsheds[17]	– Continuous Ambient Monitoring System (CAMS) and MET Station are operational at location points identified by the consultant who conducted Airshed Modeling Study. Data are retrieved quarterly for H_2S level and are attached to CMRs.	Compliant. While there is no calibration and maintenance record provided by APRI during this audit, this record must be in the periodic environmental audit in compliance of the ECCs.

[16] Ambient H_2S: Philippine standard is 0.07 ppm for a 30-min averaging time and OSHA standard for toxic and hazardous substances exposures must not exceed 20 ppm (ceiling) with the following exception: if no other measurable exposure occurs during the 8-hour work shift, exposures may exceed 20 ppm, but not more than 50 ppm (peak), for a single time period up to 10 minutes.

[17] IFC-EHS (2008): The term “airshed” refers to the local area around the plant whose ambient air quality is directly affected by emissions from the plant. The size of the relevant local airshed will depend on plant characteristics, such as stack height, as well as on local meteorological conditions and topography. In some cases, airsheds are defined in legislation or by the relevant environmental authorities. If not, the EA should clearly define the airshed on the basis of consultations with those responsible for local environmental management.

Responsible Proponent	Impact	Compliance Status	Mitigation Measures	Remarks/ Issues
			– The maintenance and operation of the CAMS Stations is taken care of by the Environmental Unit. The equipment, due to its continuous operation, is stored at a cooler temperature (around 20-22 °C). The facility is being visited periodically for general maintenance. Most of the warnings notified by the equipment are due to air flow, which can then be solved by replacing the air filter.	
APRI	**Noise Pollution**[18]	Results showed values within OSHA and Philippine Standards at a noise level of 75dB for heavy industrial area during daytime (9am to 6pm).	– Continuous monitoring of the noise level is being undertaken on a monthly basis.	Compliant. Monthly (2014) and time series monitoring of ambient noise in MakBan is presented in Annex 2.
		Average noise level would slightly increase due to operation of steam vent valve, turbine, generator, cooling tower and transformer.	– APRI's turbine generators are housed in a soundproof powerhouse. – Stand-by generator sets were installed inside a concrete housing. – Occupational noise monitoring is regularly being conducted by the Safety Unit. – Use of PPE is mandatory during the operation. – Noise reduction measures are in place in the surrounding location and trees are planted to reduce the noise compressors.	Compliant.
APRI	**Hazardous Wastes**	Existing Hazardous Waste Storage Facility (HWSF) located approximately 70 m east of the	– Hazardous wastes were properly managed from identification, labeling, storage and disposal.	Compliant.

[18] Ambient noise level: Philippine standard is 70 to 75dB for light to heavy industrial area during daytime (9am to 6pm); IFC-EHS guideline using WHO standard is 70dB for industrial and commercial areas; IFC-EHS guideline recommends 60 dBA as good international industry practice (GIIP), with an understanding that up to 65 dBA can be accepted for reciprocating engine power plants if 60 dBA is economically difficult to achieve. OSHA standard at engineering and administrative controls section is 90 - dBA criterion for an 8 - hour time - weighted average (TWA) permissible exposure limit (PEL) and is measured using a 90 - dBA threshold (i.e., noise below 90 dBA is not integrated into the TWA.

Responsible Proponent	Impact	Compliance Status	Mitigation Measures	Remarks/ Issues
		Waste Segregation Area that stores used oil and geothermal scale sludge in drums.	– The used oil are mainly stored in MakBan Used Oil Building, which is covered with roof, paved with concrete and provided with a secondary containment. – The storage facilities were observed to be accessible in cases of emergency and for inspection and monitoring. – Adequate ventilation was observed within the storage facilities. – The storage facilities were observed to be 100% concrete paved. – Strict security within the facilities prevents unauthorized access. – Pumps are installed to avoid discharges to environment. – Registered Treatment, Storage and Disposal (TSD) (TR05-05-002).	
	Asbestos	Disposed through 3rd Party Company Accredited by DENR	– APRI's asbestos was disposed through Waste Solutions & Management Services, Inc. with Permit to Transport No. (R4A-12-01-084) with disposal site at Metro Clark Waste Management Corporation and Cleanway Environmental Mgt. Solutions Inc.	Compliant. No ACWM landfill site developed instead APRI opted to hire a 3rd party hauler and disposer WSMSI. The last assessment for asbestos was conducted in 2009. No recent asbestos survey provided by APRI.
	Other hazardous wastes	Disposed through 3rd Party Company Accredited by DENR	– Cleanway Technology Corporation (R4A-14-05-064) (20 May -20 November 2014) – The hazardous wastes transported in 2014 include: acid and alkali waste; waste with inorganic chemicals; inks, dyes, paints, latex, adhesives and organic sludge; used industrial oil; oil contaminated materials;	For renewal. Renewal in-progress (APRI 5 May 2015, pers. comm.).

Responsible Proponent	Impact	Compliance Status	Mitigation Measures	Remarks/ Issues
			contaminated containers; pathological/ infectious waste; waste electrical and electronic equipment.	
			– Oriental and Motolite Marketing Corporation/ Evergreen Environmental Resources Inc. (PTT 03-14-0414-0425) (14 April - 14 October 2014)	For renewal. Renewal in-progress (APRI 5 May 2015, pers. comm.).
			– Certificate of Treatment and Final Disposal (COTD) – CTD at the Cleanway Environmental Management Solutions Inc. – Integrated Hazardous Waste Management Facility located inside the Meridian Industrial Complex II, Barangay Maguyan, Silang Cavite.	As per the CMVR, issued and also available for all disposals in the 1st half of 2014.
	Chemical wastes	APRI's Chemical Safety Management	- CCO for Cadmium Acetate (Cadmium related Laboratory Waste); - Chemical safety; - PPEs; - Procedure in handling chemicals in place; - Chemical laboratory personnel attended Chemical Handling Training; - Labeled reagent container; generated laboratory waste with secondary containment; - Safety Data Sheet (SDS) available and - Procedure on emergency spills in place.	Adequate. While there is no information on the in-house laboratory for chemical analysis including the parameters being tested, number of laboratory staff and their roles and responsibilities provided by APRI during this audit, these information must be in the periodic environmental audit in compliance of the ECCs.
APRI	**Solid Wastes**	Each Plant manages its own solid wastes generated. Segregation at source is being implemented (see Annex 3)	- Waste segregation system include separating domestic wastes into three types: biodegradable waste (BW), non-biodegradable waste (NBW) and paper and made of paper waste	Compliant.

Responsible Proponent	Impact	Compliance Status	Mitigation Measures	Remarks/ Issues
			(PMPW). - BWs are mainly leftover food being buried in the Plant's garbage pit designed for compostable wastes. - NBWs are segregated in the Waste Segregation Area (i.e., scrap metals, plastics, etc.). Most of these NBWs are recyclable, and mainly sold to recycling companies. Metal scraps collectors are subjected to a bidding process prior to collecting metal scraps from the plants. Dismantled parts such as metal beams and woods are being used as construction materials within the plant. - The residual wastes are collected by a 3rd Party disposer while metal scraps and other recyclables are sold for recycling.	
			- Disposal was done through DENR-accredited 3rd party hauler/disposer of residual wastes (La Felonila Scrap Dealer and Cleanway for non-hazardous sludge). - Material Recovery Facility (MRF) is operational. - Re-use materials as applicable and as much as possible. - Non-usable wood are donated to janitors for firewood. - Employees are guided by Solid Waste Management Flowchart and 5S Program/Standards.	The updated photos of the hazardous and solid wastes management system in MakBan provided in Annex 4 indicated the rehabilitation and/or cleanup activities undertaken in the facilities by APRI to attain compliance.
APRI	**Water Quality**	Except for Boron (B), Total Dissolved Solids (TDS) and Arsenic (As), the other effluents conformed to DENR standards based on the	- Water Quality Monitoring	Compliant. Time series water quality monitoring (B, TDS and As) is presented in Annex 5. High concentrations of B, TDS and As of

Responsible Proponent	Impact	Compliance Status	Mitigation Measures	Remarks/ Issues
		water quality monitoring.		ground waters are said to be inherent characteristics of geothermal field based on the early characterization period of the site.
APRI	**Rainwater**	Based on the rainwater monitoring from July to December 2014, MakBan operation does not cause acid rain. In rainwater applications, neutral point is pH 5.6. pH below 5.6 is considered acid rain.	- Conduct an acid rain monitoring on the impacted area and submit the results to EMB yearly as per EMB's request in 23 July, 2007.	Compliant. Time series water quality monitoring (pH) is presented in Annex 6.
MakBan Steam Field				
PGPC	**Ambient H_2S Pollution** (see footnote 17 for the national and international standards)	In the latest PGPC's CMR, Ambient H_2S showed compliance to DENR regulatory limit.	– Monitoring of ambient H_2S at ten residential locations within the steam field between 2000 and 2014	Compliant. Time series ambient H_2S monitoring is presented in Annex 7.
PGPC	**Noise Pollution (**see footnote 18 for the national and international standards)	In the latest PGPC's CMR, noise measurement showed compliance to DENR regulatory limit.	– Noise measured at ten residential locations within the steam field between 2000 and 2014	Compliant. Time series ambient noise monitoring is presented in Annex 7.
PGPC	**Hazardous Wastes**	Under PGPC disposed through 3rd Party Company Accredited by DENR	– PGPC - Dolomatrix Philippines Inc/ Waste Recovery Co. Inc. (PTT 03-14-0914-0355) (26 September 2014 - 26 March 2015) – The permit is limited only for the transport of the following: laboratory wastes (hydrochloric acid, mixture of sulfuric and hydrochloric acid, other mixed acids, potash, Ba and its compound); potable contaminated containers; oil contaminated clothing and rags and busted fluorescent lamps.	Compliant.
PGPC	**Solid Wastes**	PGPC's residual wastes	- Hauled by Bitin Cooperative and disposed at Suri Waste Management and Disposal Services, Brgy. Bubuyan, Calamba City. Disposal dates	Compliant. Document to validate is with PGPC.

Responsible Proponent	Impact	Compliance Status	Mitigation Measures	Remarks/ Issues
			are 10 April, 9 May and 5 June 2014. Non-hazardous sludge was backfilled to Bulalo 2	
PGPC	**Water Quality**	As per PGPC-CMR 2014 and CMVR 2014, Boron exhibited high values and exceed the limits of Drinking Water according to Philippine National Drinking Water Standards (PNDWS 2007). TDS with concentration > 500 mg/L is inherent and Boron is endemic in geothermal areas and as such can be expected to be found in naturally elevated concentrations in soil and water resources.	- Periodic measurement of ground water quality at ten locations (see Annex 8) around injection well area is being done by PGPC to ensure that there will be no leak indication from injection well to surrounding area.	Since the characterization study in 1982, the range of Boron value was 0-4 mg/L. It is provided in Section 6 of the Philippine Clean Water Act or RA 9275 that areas which have already water quality guideline due to naturally occurring pollutants (e.g. Boron in geothermal area), the LLDA in coordination with relevant agencies may designate the geothermal area as non-attainment area for Boron. The PGPC has signified its intent to the DENR and LLDA early in 2014. In a meeting with LLDA, this issue was resolved that there is no need for APRI to apply for non-attainment area (APRI 5 May 2015, pers. comm.)
		Results obtained from a 3rd party laboratory (CRL Environmental Corporation) surface and drinking water monitoring complied with standards stipulated in DAO 34, DAO 35 and National Standards for Drinking Water.	– Water obtained from the deep wells is not used for drinking, but only for industrial use.	For Arsenic analysis of surface water, historically (2000 to 2014) there were sampling points in the MakBan site with high concentrations (see Annex 8).
PGPC	**Subsidence**	Results of the 2014 Bulalo Fieldwide Precision Leveling Survey showed consistent general subsidence pattern as seen in previous years. The highest elevation change still occurs at center of the production area where fluids are being produced. The central subsidence bowl has long been correlated to poroelastic compaction associated with production and pressure drawdown. For the past 33 years (1981-2014), the maximum subsidence in MakBan is only about 980 mm or	- Subsidence monitoring in 2014 was undertaken using the Bulalo Fieldwide Precision leveling survey.	Subsidence is monitored as required by the ECCs and is centered on the production area with maximum subsidence rate of about 30 mm per year. The findings will be evaluated to determine the applicable intervention and mitigation based on reasonable priority criteria considering public safety among others. PGPC reported to DENR the current status of the intervention being undertaken on this issue in APRI's 3rd Quarter Stakeholder Meeting on 23-25 September 2014.

Responsible Proponent	Impact	Compliance Status	Mitigation Measures	Remarks/ Issues
		about 3 cm per year while the highest elevation change for the period 2011-2014 is -63 mm at center of production area.		

(b) Tiwi Geothermal Power Plants

Responsible Proponent	Impact	Compliance Status	Mitigation Measures	Remarks/ Issues
Tiwi Power Generation Facility				
APRI	**Ambient H_2S Pollution** (see footnote 17 for the national and international standards)	Aside from the July 2013 reading that exceeds the standard level, the results of 2012 and 1st half of 2013 are within the Philippine standard (Annex 9).	– Air Quality Monitoring	Compliant based on CMVR (2013) and CMRs and SMRs (2014). While Plant B is not operational, monitoring has to be continued, since it is not yet decommissioned. EMB will require submission of monitoring data from the same stations/location.
APRI	**Noise Pollution** (see footnote 18 for the national and international standards)	Noise level is relatively high but within the Philippine ambient noise standard (Annex 9).	– As indicated in the 2009 environmental audit, an air dispersion modeling for Tiwi geothermal airshed was conducted on 15 January 2005 for NPC.	Compliant based on CMVR (2013) and CMRs and SMRs (2014).
APRI	**Hazardous Wastes**	The ECC for the HWSF specifically stipulates the location of the facility, i.e. in Warehouse 3 and 4 of Plant B Complex.	- The waste materials and debris are properly disposed in an appropriate disposal area. - Storm drains are installed at the facility. - Qualified local residents are employed to maintain the facility. - The Toxicity Characteristic Leaching Procedure (TCLP) test is a standard procedure to identify unknown wastes to be stored in the facility. - An entry procedure is observed prior to entering the facility. - Wastes are properly packed to avoid spillage. - Hazardous waste inventory is reported through the quarterly SMR submitted to DENR-EMB	Compliant based on CMVR (2013) and CMRs and SMRs (2014).

Responsible Proponent	Impact	Compliance Status	Mitigation Measures	Remarks/ Issues
			V. - Personnel are trained to respond to spill incidents. - Spill response and materials and equipment are in place. - Growing trees are observed, however, the number of trees is limited due to safety and security purposes.	
APRI	**Solid Wastes**	Each Plant manages its own solid wastes generated. Segregation at source is being implemented.	- Waste segregation system include separating domestic wastes into three types: biodegradable waste (BW), non-biodegradable waste (NBW) and paper and made of paper waste (PMPW). - BWs are mainly leftover food being buried in the Plant's garbage pit designed for compostable wastes. - NBWs are segregated in the Waste Segregation Area (i.e., scrap metals, plastics, etc.). Most of these NBWs are recyclable, and mainly sold to recycling companies. Metal scraps collectors are subjected to a bidding process prior to collecting metal scraps from the plants. Dismantled parts such as metal beams and woods are being used as construction materials within the plant. - The residual wastes are collected by a 3rd Party disposer while metal scraps and other recyclables are sold for recycling.	Compliant based on CMVR (2013).
APRI		The Geothermal Residue Non-Hazardous Disposal Landfill Facility is located within the Tiwi Geothermal Power Plant Complex.	- The unusable non-biodegrable materials (residual) are disposed through the offsite BD Facility in Laguna. Waste Storage Facility	Compliant based on CMVR (2013).

Responsible Proponent	Impact	Compliance Status	Mitigation Measures	Remarks/ Issues
			in Tiwiis shown Annex 10.	
APRI and PGPC	**Subsidence**		- The report on modelling on the magnitude of subsidence of at least 25 years was submitted to DENR-EMB. The report that was submitted to DENR was not made available by APRI for further review.	Any update on subsidence and pipe monitoring should be reported to DENR as part of their ECC compliance. The report should include assessment of potential issues related to subsidence which could affect project operation.
Tiwi Steam Field				
PGPC	**Ambient H_2S Pollution** (see footnote 17 for the national and international standards)	NPC would like to make the coverage of the airshed smaller	– Two continuous ambient H_2S monitors were installed near Lagonoy Gulf and outside Plant B.	Compliant based on CMVR (2013). – APRI did not increase its capacity. – There used to be EMB-operated CAMS at site, but no data was provided to APRI. CAMS equipment was pulled out by DENR-EMB in 2014. – DENR-EMB, and not APRI, owns the CAMS, thus the latter has no calibration or maintenance records. The last calibration for the sound meter was on 23 July 2014. The sound level meter calibration schedule will be done in June 2015. – It is DENR-EMB which establishes the Airshed by virtue of DENR Administrative Order. Once this is established APRI will comply.
PGPC	**Hazardous Wastes**	Permit to Transport is secured prior to waste disposal through a 3rd party Facility.	– PGPC, Inc. – Tiwi Asset completed the transport of its laboratory wastes to PGPC Laboratory Waste Injection Facility at Nag-08 in Tiwi, Albay under PTT 05E-PTHW-0505-009. A transport report was submitted to DENR-EMB V on 17 June 2011. – Transport Permit for used lead acid batteries of Oriental & Motolite Marketing Corporation/	Valid until April 2015. Note that the Transporter Registration Certificate of Oriental & Motolite Marketing Corporation (TP 13-74-0112) expired on 20 March 2015. Renewal in-progress (APRI 5 May 2015, pers. comm.).

Responsible Proponent	Impact	Compliance Status	Mitigation Measures	Remarks/ Issues
			Evergreen Environmental Resources, Inc. (TP 13-74-0112/ TR 03-14-0023) issued on 07 October 2014.	
		The Tiwi Laboratory Wastes Injection is located in an open area at Nag-08, Booster Pump House, Tiwi, Albay.	- A safety plan is being followed during injection of the laboratory wastes. - Personnel involved are trained and knowledgeable of the injection procedures. - The Job Hazard Analysis is developed to ensure zero incidents during operations including the use of PPEs. - Springs and other sources of water within the vicinity of Nag-08 are monitored prior, during and after injection.	Compliant based on CMVR (2013).
PGPC	**Water Quality**	The results of the last quarter of 2013 water quality measurement are in compliance with Philippine regulation. However, note that the pH of water during the 1st quarter monitoring is 5 and below the standard pH for drinking water of 6.5 to 8.5.	- Groundwater source within the vicinity are regularly monitored.	The CMVR (2013) recommends the following: conduct monitoring at source and at storage of water, inform the LGU about the findings of the Water Quality Monitoring Team and request DENR-EMB Region V to lend MMT, water quality monitoring equipment to be used in the next monitoring activity.

29. **Environment, Health and Safety (EHS) Management Program.** As indicated earlier, APRI initiated the processing of the Integrated Management System (IMS) of Tiwi and MakBan which covers the following international accreditation: ISO 9001:2000, ISO 14001:2004 and OHSAS 18001:2007. The Tiwi and MakBan sites have an EHS Procedures Manual, Control Plan, Work Instructions Manual, Hazards/Aspect Identification, Risk Assessments and Controls; and Emergency Preparedness and Response Procedures Manual that they implement in their operations. Annex 11 showed APRI's EHS Policy, General Safety and Health Rules and EHS Strategy. In MakBan, the Quality, Environmental, Safety and Health Management System (QESHMS) are being implemented since September 2008 has been adopted by APRI during its operations.

30. In compliance with the ECC on upgrading and rehabilitation of MakBan, an Environmental Audit Report is being submitted to EMB Main Office every 2 years by APRI since 2011. The scope of the audit report is to evaluate the geothermal facilities compliance to ECCs and relevant environmental laws. No evaluation had been undertaken on the implementation of commitments indicated in the EMP of the EIS including the EHS management programs (Annex 12). In this regard, APRI facilitated the conduct of an environmental audit that encompasses the biophysical and social aspects, public health, occupational safety and health, Social Development Programs (SDP) and Information Education and Communication (IEC). The audit report was submitted to DENR and is currently being reviewed. No document on the update of the status of this audit report submitted to DENR 1st quarter of 2015 was provided by APRI for further review. In Tiwi, the latest environmental audit report submitted to DENR was last 16 August 2013. To date based on the documents provided and the in site visit to the geothermal facilities of the plant, their EHS management program is adequate to comply with international and national laws, however, the other EMP commitments should be evaluated also as part of the compliance to ensure effectiveness of the EHS management programs.

31. The Full Corporate Governance Report[19] has a detailed discussion on the Company's Occupational Health and Safety practices and procedures including Awards and Citations (Annex 12) received by the different business units (BUs) for their commitment to the health well-being and safety of its employees.

32. **Safety Management Programs**. Annexes 14-19 illustrate APRI's safety management programs in MakBan and Tiwi that include the following:

33. **Safety Training/ Capability Building.** Based on the interviews, training programs are being organized at the Tiwi-MakBan geothermal facilities on the subject related to EHS as well as training is a continuous and on-going process on the use of PPE and on emergency preparedness. Annexes 15-16 detail the Fire and Earthquake Drills conducted on 30 May 2014 in Tiwi and the list of participants including follow-up actions. Annex 17 enumerates the EHS training programs undertaken in 2013 and 2014 in Tiwi.

34. **Accident/ Incident Management.** Tiwi-MakBan Geothermal Power Plants have a written procedure on incident reporting and investigation. All incidents including near miss were investigated and records on these incidents were documented. No spill recorded to date in Tiwi and MakBan. The existing Incident and Accident Reporting Procedure, Corrective Action and Preventive Action Form and Work Order Procedure are undergoing review and continuous updating. PGPC in Tiwi follows the incident reporting process to address concerns on its operation. As per the ECC requirement, APRI should furnish DENR-EMB with copies of the records published in broadsheet involving incidents/ accidents related to project's operation. Figure 6 shows the published environmental and safety statistics in MakBan. No incident/ accident published on broadsheet for the 2nd semester of 2014 in MakBan and Tiwi. There is a contingency program submitted to DENR on 23 February 1994.

35. **Personal Protective Equipment/ Safety Signages**. PPEs were issued to all employees. Basic PPEs were hard hats, safety shoes, eye protection and earplugs (see Annex 14 for illustrations). Special type of PPE is provided for some activities such as face shields for welding and safety harness for work at

[19] http://www.aboitizpower.com/AP/8018:Compliance-with-heath-safety-environment-laws.html

heights. Continuous installation of warning signs at strategic locations. (i.e, speed limit signs, caution for high voltage signs, etc.).

36. **Safety Orientation/ Safety Awareness**. Personnel working in the plant are required to comply with the existing permit to work system. Identified activities that need permits are: general work, hot works, confined space entry, work at heights and during isolation/ lock out and tag out (LOTO). The Permit to Work System is implemented at the sites. Signature from responsible personnel is required on the permits before the start of work. In MakBan, APRI considered local applicants in the hiring of employees. 78% of APRI employees are locals. Majority of contractual employees are from the host communities for APRI. As indicated in Fig. 6, APRI has safety component in the EHS Team including a Safety Manager, Safety Specialist and Safety Technician. Details of the roles and responsibilities of Environmental Engineer/ PCO during operations is discussed in Annex 1 as indicated earlier.

37. **Contractor Management**. As per the ITR 2010, it is indicated that each contractor working inside the plant must comply with the different rules and regulations of the plant especially on health and safety. All contractors must apply for permit to work and a pre-entry briefing is conducted prior to commencement of any job at the site. In APRI, there is Safe Work Permit (SWP) system that ensures proper monitoring of contractors. Sample of SWP is in Annex 13. Orientation including safety related aspects before the start of work is conducted; contractors are monitored to comply with Plant regulations. Safety orientation includes IEC about the project operation.

Figure 8. EHS Status in MakBan as of December 2014

38. **Environmental Management Plan (EMP).** APRI has designated staff under the EHS Team and allocated budget to implement the EMP. The EMP details the mitigative measures for any anticipated impacts, and to ensure the monitoring of environmental impacts and measures are properly implemented during operation. Environmental monitoring programs are being carried out and the results are being used to evaluate: (i) the extent and severity of actual environmental impacts against the predicted impacts, (ii) the performance of mitigation measures and compliance with related rules and regulations, (iii) trends of impacts, and (iv) the overall effectiveness of the project EMP. APRI has no records of violations or penalty charged by DENR.

39. **Environmental Monitoring Program (EMoP).** For the existing plant operations of Tiwi and MakBan, the implementation of the EMoP is being carried out by EHS and complemented by the Multipartite Monitoring Teams (MMT). The MMT oversees the implementation of the monitoring program to ensure that ecological balance and environmental safety is preserved and any adverse effect on the

environment could be controlled if it is averted earlier and necessary mitigating measures are applied. The EMP and the EMoP related to plant generation facilities for Tiwi and MakBan are being complied by APRI.

40. The MMT in MakBan was formed in compliance to conditions of the ECC, DAO 30 series of 2003 and thru a Memorandum of Agreement (MOA) that was signed and notarized on 5 October 2011. The MMT is composed of representatives from the proponent, DENR, LGUs, municipal/rural health center, PO, NGO, DOE and academe (UPLB). The MMT in Tiwi was organized and became operational since 2003. It serves as the monitoring arm during project implementation to ensure APRI and PGPC's compliance to ECC conditions. MOA was signed on 8 June 2011.

41. APRI has allocated a budget for conducting environmental monitoring and audit activities. An Environmental Guarantee Fund (EGF) covers emergency fund for unanticipated accidents arising from the operation of the project. Under an EGF, an Environmental Monitoring Fund (EMF) covers all costs of operation of the MMT such as training, sampling and analysis, hiring of technical experts including third party, meals, accommodations and transportation.

42. **Environmental Risk Management (ERM) Program.** ERM Program presents the consequences and threats to top five hazardous situations such as the (i) steam pipeline failure, (ii) well blow out (only when production wells are on stream), (iii) process vessels failures: separators and scrubbers, (iv) steam pipeline explosion, valve and turbine casing failure, and (v) leaks from brine and condensate injection and gas ejection systems and the mitigation measures and capability to address these risks. APRI's Risk Governance Policy and Risk Governance Structure and Response Teams are in place. (Annexes 18 and 19). According to APRI, to date no record of any of those hazardous situations. No record provided by APRI to validate

43. **Emergency Response Plan (ERP).** Tiwi-MakBan has a written emergency preparedness and response plan that covers fire, chemical and oil spillage, earthquake, and other natural disasters. Fire drills are conducted twice a year while the Chemical and Earthquake drills are conducted once a year. As indicated earlier, drills undertaken include Fire and Earthquake Drill and no local communities participated. Emergency showers are mostly provided to the areas where chemicals are stored or used (except the laboratory on Plant B). Eyewash stations are provided in the laboratory and near the battery rooms on all plants. An emergency response operation is managed by the ERT under EHS Department. Unified Disaster Preparedness Plan as part of ERP was prepared and was turned-over to 4 barangays in 2007. Barangay Emergency Response Training (BERT), community component program of the Unified Disaster Preparedness Group, was also organized in 2005-2007.

44. **Community Assistance Program (CAP).** CAP is part of the ERP. APRI is providing community with assistance and guidance in terms of assessment and evaluation of situation as well as advice to evacuate the area as necessary, among other things. Disaster preparedness programs a disaster operations is being carried out by an inter-agency Barangay Disaster Coordinating Council. A Stakeholders Grievance Mechanism (SGM) has been developed by APRI to manage the Stakeholders' Grievance including issue, concern, problem or claim on APRI's operations, projects and activities raised by the stakeholders. An SGM Committee will be created composing of the: (i) Chairperson: Site AVP-Facility; President (ii) Member: Site CSR Manager; AVP Legal and External Affairs; (iii) and Member/Secretary: Site CSR Officer; CSR Manager, to manage the SGM outlined in the policy.

45. **Social Development Program (SDP).** SDP is being implemented to provide a set of reasonable benefits to the community and with the end-in-view of long term sustainability of its operations (Annex 12). SDP implemented for the MakBan communities from January to June 2014 on the aspect of environment includes continuing activities of APRI's Adopt-A-River supported the UPLB's Make-It-Makiling 2014 through donation of food items and discussion with UPLB Makiling Center for Mountain Ecosystems (MCME) regarding Mt. Bulalo Agroforestry Project. APRI will have until 2020 to pursue its commitment to plant seedlings during environmental events to make up the APARK project (Aboitiz Passion for Agroforestry and Reforestation to Keep) as coordination meetings and planning are now being conducted. APRI's geothermal plants are part of AboitizPower's Cleanergy assets, its brand of cleaner and renewable energy that leaves a lighter impact on the Earth's climate and limited resources.

AboitizPower[20] launched Cleanergy as early as 2001. The Cleanergy Center in MakBan already accommodated 14,487 students/ visitors/ guests from 2013 up to May 2015.

46. **Information, Education and Communication (IEC) Plan.** Community-interaction program and structures in handling complaints and media coverage are in place since May 2009. APRI will enhance the existing IEC parallel to the implementation of SDP. APRI in Tiwi have its own Corporate Social Responsibility (CSR)/ Asset Affairs Unit to implement IEC.

C. Compliance with ADB SPS (2009)

47. The table below provides the compliance status of the environmental performance of Tiwi-MakBan specific to its power generation facilities regarding the ADB SPS Requirement for Environment.

Table 12. Audit Findings on the Compliance to ADB Safeguards Policy Statement (2009)

Ref. No.	ADB SPS (2009)		Status/ Issues	Recommendation
	Requirements	Compliance		
1	Environment Assessment Requirements for Various Financing Modalities (Annex to Appendix 1 of ADB's Safeguard Policy Statement presents the details of the environmental assessment.)	The Project is classified as Category B project for environment suggesting that there is a limited number of specific environmental impacts that can be avoided or mitigated with generally recognized measures and guidelines and where potential impacts are generally mitigable, short-term, limited to the project site and with likely limited impact on environmentally sensitive areas.	In MakBan, the existing three ECCs were transferred in the name of APRI in 8 September 2009. Under ECC-0112-871-203, with the original ECC issued both in NPC and PGI (now known as PGPC), APRI and its contractor PGPC have a separate SMR and CMR submissions as per GRSC Provisions and with conditions stipulated in the ECC agreed upon by both parties on issue of ownership and responsibilities.	(a) Pursue the application of APRI for ECC integration and splitting into two ECCs Steam Gathering System and Power Generating Plants to DENR Central Office. The objective of which are to simplify reporting, to address conditions that are no longer applicable to operations phase of the project, align with GRSC structure and to consolidate conditions that are common to the three ECCs and thus enhancing the environmental management systems (EMS). Preparation of documentary requirements for this ECC screening (i.e., Environmental Performance Report and Management Plan, EPRMP) and continuous coordination meeting with PGPC, project preparers and DENR is ongoing. (b) As indicated in the 2009 environmental reports, given that 15.75 MW MakBan Binary Cycle Geothermal Power Generating Plant is not operational since its turnover in late 2006, verification of the validity of its ECC to DENR-EMB is necessary to ensure future compliance of this plant to environmental stipulation in the ECC as well as to ADB's

[20] AboitizPower is the holding company for the Aboitiz Group's investments in power generation, distribution, retail and power services. It is a major producer of renewable energy in the country with several hydroelectric and geothermal assets in its generation portfolio. The non-renewable portfolio consists of plants throughout the country. The distribution utilities it owns and operates are located in Luzon, Visayas and Mindanao. (www.aboitizpower.com)

Ref. No.	ADB SPS (2009)		Status/ Issues	Recommendation
	Requirements	Compliance		
				requirements as it will part of this Project.
2			In Tiwi, the transfer of ownership to APRI is for ECC 0109-642-203 and PGPC has been the entity submitting the ECC compliance plan for this ECC along with ECC-0402-044-4220. The transfer of ownership to APRI includes the conditions on the ECC that are applicable to both APRI and PGPC. It must be clarified if both the plants and steam fields are being assessed in PGPC's ECC compliance plan as it used to be	Since APRI is fully accountable for the compliance to ECCs transferred under its name, delineation of the roles and responsibilities of APRI and PGPC under the GRSC provisions (Section 6.8 on Government Approvals) and conditions stipulated in ECC 0109-642-203 should be undertaken. As per the GRSC, compliance with ECC conditions have been a "shared responsibilities" between APRI (as the Owner) and PGPC (as the Contractor) by implementing activities and projects for Generating and Geothermal facilities, respectively.
3	Environmental Planning and Management	Strict implementation of the mitigating measures identified in the EMP and monitoring plan. The EMP contain commitments of APRI to prevent, control, mitigate and monitor the environmental impacts at all stages of the project and specifically specify reporting requirements of the environmental management and monitoring activities.	EMP and monitoring plans within the conditions stipulated in the ECCs were being complied and updated in the environmental reporting. Environmental reporting includes submission of quarterly SMRs, semi-annually CMRs, and semi-annually CMVRs by MMT to DENR.	(a) In Tiwi, while APRI's EHS team and its Environmental Officer is designated and responsible for complying all regulatory requirements, to ensure implementation of EMP and monitoring plans, the arrangement on the delineation of the roles and responsibilities of APRI and PGPC should be completed first. APRI and PGPC are currently developing a Joint Operational Guideline (JOG) (APRI 5 May 2015, pers. comm.).
			As per the GRSC (2003), APRI is responsible for the decommissioning, abandonment and surface rehabilitation, including all permits and costs associated of any geothermal facilities existing on the date of effectivity of the GRSC while PGPC is responsible for said activities associated with any geothermal facilities coming into existence after the date of effectivity of the GRSC. While the	(b) The issue of decommissioning, abandonment and surface rehabilitation should be included in the JOG that is currently being developed by APRI and PGPC.

Ref. No.	ADB SPS (2009)		Status/ Issues	Recommendation
	Requirements	Compliance		
			copy of the Abandonment Agreement initialed by the parties, the execution blocks of the contract have not been signed by such signatories.	
4	Occupational and Community Health and Safety	Investigation and reporting of environmental, occupational health and safety incidents and ensuring that contractual obligations of the contractors reflect the environmental management objectives of APRI and conforms with the requirements of World Bank EHS Guidelines.	While, Tiwi-MakBan Geothermal Power Plants have a written procedure on incident reporting and investigation, records of incidents in the plant are not being properly analyzed and assessed.	Strengthen the review process and updating of the existing Incident and Accident Reporting Procedure, Corrective Action and Preventive Action Form and Work Order Procedure. Trend analysis of the most frequently occurring incidents in the plant will show the priority incidents to be addressed by the management. Root cause analysis upon setting up of the trend should be done to prevent the recurrence of the incidents.
5	Biodiversity Conservation and Sustainable Natural Resource Management	Not in a Critical Habitat as defined in the IFC Performance Standards 6. There were no rare, threatened or endangered plant and animal species within and immediately surrounding the project (EIS Report, 2000).	Not in an Environmentally Critical Area as defined in the Philippines EIS System.	Collaborate with the UPLB Makiling Center for Mountain Ecosystems (MCME) through the MMT regarding their environmental programs at the Mt. Makiling Forest Reserve (MMFR) that was declared as a heritage park by the ASEAN and with the NPC Watershed Management Unit as the MakBan Geothermal Reservations was declared as a watershed reservation in 1987.
6			Subsidence is monitored in the power generation facility in MakBan as required by the ECCs and is centered on the production area with maximum subsidence rate of about 30 mm per year. In Tiwi, modelling of magnitude of subsidence is also being evaluated. While there is no issues related to subsidence which could affect project operation have been identified to date specifically in MakBan, based on	Since subsidence is an emerging issue, any update in the subsidence should be reported to DENR as part of ECC compliance.

Ref. No.	ADB SPS (2009)		Status/ Issues	Recommendation
	Requirements	Compliance		
			the socioeconomic survey, the community observed subsidence of some land areas in some barangays.	
	Pollution Prevention and Abatement	Compliance with all applicable international and national standards and regulatory and documentary requirements through the conduct of regular environmental monitoring activities on air emissions, noise, water quality and hazardous substances	APRI and PGPC comply with ECC stipulations as per the environmental monitoring and validation of MMT.APRI has no control/influence on PGPC's operations including their compliance on permitting requirements from regulatory bodies. However it is noted by APRI that PGPC submits regular monitoring report to concerned government agencies.	

IV. CONCLUSION AND RECOMMENDATION

A. Compliance Status

48. In general, operations of APRI Tiwi-MakBan Geothermal Plants are consistent with the specifications of the EIS, i.e., ECC and EMP and monitoring plans including: (i) compliance with all applicable international and national standards and regulatory and documentary requirements through the conduct of regular environmental monitoring activities on air emissions, noise, water quality and hazardous substances; (ii) preparation and submission of the required documents/reports to DENR, namely: CMRs, SMRs and CMVRs; (iii) continuously manage the EMF and the EGF; (iv) establishment and operationalization of MMT; (v) undertake cleanup activities such as removal and disposal of all ACMs, and other hazardous wastes found in the power plant facilities and premised land areas, and (v) implement necessary remediation activities (if applicable) for the removal of hazardous wastes (Asbestos Containing Materials and Total Petroleum Hydrocarbons, TPH) and arsenic and boron monitoring of groundwater in accordance with national laws and procedures. This ECAR will be disclosed to ADB website in June 2015.

B. Gaps Analysis and Corrective Action Plan

49. Based on the results of the environmental due diligence on the documented procedures, policies and records that were provided by APRI on the generation facilities and steam fields, and the information obtained from site inspection of Tiwi-MakBan facilities, the following are the issues and concerns that have been identified and the appropriate corrective actions are recommended to enhance the Tiwi-MakBan EMP and monitoring plans including to satisfy ADB's SPS (2009) requirements. As indicated earlier, since APRI has no control over PGPC's operations and it is not possible for APRI to implement corrective action with respect on the operations and maintenance of the steam fields. It is therefore expected that drafting of Joint Operational Guidelines (JOG) will further strengthen the collaborative effort

of APRI and PGPC and will clearly delineate the roles and responsibilities in terms of environmental compliance requirements by the concerned government regulatory office.

Table 13. Corrective Action Plan for Tiwi and MakBan on their Environmental Compliance during the Operation and Maintenance.

Ref. No.	Measures and/or Corrective Actions	Deliverable	Timelines	Responsible Agency	Budget
1	(a) Pursue the application of APRI for ECC integration and splitting into two ECCs Steam Gathering System and Power Generating Plants to DENR Central Office. The objective of which are to simplify reporting, to address conditions that are no longer applicable to operations phase of the project, align with GRSC structure and to consolidate conditions that are common to the three ECCs and thus enhancing the environmental management systems (EMS). Preparation of documentary requirements for this ECC screening (i.e., Environmental Performance Report and Management Plan, EPRMP) and continuous coordination meeting with PGPC, project preparers and DENR is ongoing. (b) As indicated in the 2009 environmental reports, given that 15.75 MW MakBan Binary Cycle Geothermal Power Generating Plant is not operational since its turnover in late 2006, verification of the validity of its ECC to DENR-EMB is necessary to ensure future compliance of this plant to environmental stipulation in the ECC as well as to ADB's requirements as it will part of this Project.	(a) Revised and updated two new ECCs for Steam Gathering System and Power Generating Plant in MakBan. (b) Validation report from DENR-EMB	2015 - 2018	APRI, PGPC, DENR and other stakeholders	Under APRI's EHS Budget
2	Since APRI is fully accountable for the compliance to ECCs transferred under its name, delineation of the roles and responsibilities of APRI and PGPC under the GRSC provisions (Section 6.8 on Government Approvals) and conditions stipulated in ECC 0109-642-203 should be undertaken. As per the GRSC, compliance with ECC conditions have been a "shared responsibilities" between APRI (as the Owner)	Revised and updated two new ECCs for Steam Gathering System and Power Generating Plant in Tiwi.	2015-2018	APRI and PGPC	Under APRI's EHS Budget

Ref. No.	Measures and/or Corrective Actions	Deliverable	Timelines	Responsible Agency	Budget
	and PGPC (as the Contractor) by implementing activities and projects for Generating and Geothermal facilities, respectively.				
3	(a) In Tiwi, while APRI's EHS team and its Environmental Officer is designated and responsible for complying all regulatory requirements, to ensure implementation of EMP and monitoring plans, the arrangement on the delineation of the roles and responsibilities of APRI and PGPC should be completed first. APRI and PGPC are currently developing a Joint Operational Guideline (JOG) (APRI 5 May 2015, pers. comm.). (b) The issue of decommissioning, abandonment and surface rehabilitation should be included in the JOG that is currently being developed by APRI and PGPC.	Joint Operational Guideline (JOG) between APRI and PGPC	2015-2018	APRI and PGPC	Under APRI's EHS Budget
4	Strengthen the review process and updating of the existing Incident and Accident Reporting Procedure, Corrective Action and Preventive Action Form and Work Order Procedure. Trend analysis of the most frequently occurring incidents in the plant will show the priority incidents to be addressed by the management. Root cause analysis upon setting up of the trend should be done to prevent the recurrence of the incidents.	Revised Incident and Accident Reporting Procedure, Corrective Action and Preventive Action Form and Work Order Procedure to ensure effective implementation	TBD	APRI	Under APRI's EHS Budget
5	Collaborate with the UPLB Makiling Center for Mountain Ecosystems (MCME) through the MMT regarding their environmental programs at the Mt. Makiling Forest Reserve (MMFR) that was declared as a heritage park by the ASEAN and with the NPC Watershed Management Unit as the MakBan Geothermal Reservations was declared as a watershed reservation in 1987.	Collaboration activities with concerned stakeholders	TBD	APRI and other stakeholders	Under APRI's EHS Budget
6	Since subsidence is an emerging issue, any update in	Subsidence reports	TBD	APRI	Under APRI's

Ref. No.	Measures and/or Corrective Actions	Deliverable	Timelines	Responsible Agency	Budget
	the subsidence should be reported to DENR as part of ECC compliance.				EHS Budget

ANNEXES

(Annexes are available upon request.)