

Environmental Compliance Audit Report

Project Number: 42916
October 2013

INO: Sarulla Geothermal Power Development Project

Prepared by ERM for Sarulla Operations Limited (SOL) and Pertamina Geothermal Energy

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DRAFT REPORT

Volume I: Environmental Compliance Audit Report (ECA) and Corrective Action Plan

Development of Sarulla Geothermal Field and Power Plant of 330 MW Capacity

**North Tapanuli Regency,
North Sumatera Province**

August 2013

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LIST OF ABBREVIATIONS

ANDAL	: Analisa Dampak Lingkungan (Environmental Impact Statement)
CAP	: Corrective Action Plan
DOA	: Deed of Assignment
EHS	: Environmental, Health and Safety
EPFI	: Equator Principles Financing Institutions
ESC	: Energy Sales Contract
ESIA	: Environmental and Social Impact Assessment
ESMS	: Environmental and Social Management System
GHG	: Greenhouse Gas
JOC	: Joint Operation Contract
LD 50	: Lethal Dose, 50%
LOI	: Letter of Intent
MEMR	: Minister of Energy and Mineral Resources
NIL	: Namora I Langit
OHS	: Occupational Health and Safety
PLN	: Perusahaan Listrik Negara
PLTP	: Pembangkit Listrik Tenaga Panas Bumi (Geothermal Power Plant)
RKL	: Rencana Pengelolaan Lingkungan (Environmental Management Plan)
RPL	: Rencana Pemantauan Lingkungan (Environmental Monitoring Plan)
SIL	: Silangkitang
SOL	: Sarulla Operations Limited
TCLP	: Toxicity Characteristic Leaching Procedure
UNSG	: Unocal North Sumatera Geothermal

EXECUTIVE SUMMARY

Background

SOL or “Sarulla Operations Limited” plans to develop the geothermal field and the power plant in Sarulla, in Pahae Jae and Pahae Julu Districts, North Tapanuli Regency, North Sumatera Province. In the development of the Sarulla geothermal field and power plant at 330 MW capacity, SOL signed a DOA with PT. PLN (Persero); a JOC with PERTAMINA Geothermal Energy; and an ESC 1 with PERTAMINA Geothermal Energy - and PT. PLN (Persero) on 14 December 2007.

SOL is proposing the Sarulla Geothermal Field and Power Plant Development Project to further develop the geothermal potential in Sumatera, commenced in 1993 by Unocal North Sumatera Geothermal (UNSG). As part of this development plan, SOL is seeking a financial investment from the Asian Development Bank (ADB) and a group of Equator Principles Financing Institutions (EPFIs). Project proponents seeking financing from the ADB and EPFIs are required to comply with the applicable bank’s environmental, social and health policies, developed for managing the environmental and social risks associated with project finance.

The ADB and EPFIs recognize the specific issues associated with private sector projects and manage these through the ADB Safeguard Policies and Equator Principles.

ERM was commissioned by Sarulla Operation Limited (SOL) to undertake an independent Environment Compliance Audit of their Geothermal Exploration and Production Area located in the district of North Tapanuli, North Sumatra Indonesia in July 2013.

Audit Overview

The ERM team conducted a brief kick-off meeting at the SOL office in Jakarta with representatives of SOL management. The objective was to obtain an overview of the current status of SOL progress in the development of their policies and to review available documents relevant for the project.

As part of this assessment, the ERM conducted a site visit on July 15-18th, 2013 to assess a number of operations in the SIL, NIL and areas in order to observe the existing UNOCAL facilities including production well, injection well, pipelines, site office, and warehouse. Sipirok site has been included during this visit since UNOCAL has a warehouse facility for storage of drilling mud material and some spare parts of pipelines.

A number of activities were observed at SIL and NIL such as:

- Land clearing and construction of a sump pit at SIL 1 well pad;
- Land clearing activities for the new piping lines from Batang Toru river to SIL 1 well pad; and
- Renovation of Hamilton bridge from main road access to NIL road access.

Audit Findings and Recommendations

The desktop study and site audit found that some HSE issues were not in accordance yet with the ADB's Environment Safeguard, EHS General Guidelines and EHS Guidelines Geothermal Power Generation.

Some omissions of HSE issues within SOL's high level document and lack of waste management plan of subcontractor were noted. At the time of the visit, potential sources of soil and groundwater contamination from current and historical activities at the site were observed.

Furthermore, some deficiencies were found on past and recent activities that associated with dumped waste disposal, permit of new sump for containing all sludge from historical sumps, new sumps and drilling mud waste and drilling cutting from future drilling activities, sump's water quality and safety of heavy equipment operation.

To response these findings, some recommendation were provided in Table IV-1 and a specific Corrective Action Plan were provided in Table V-1 to assist SOL in defining necessary remedial actions, budget for such actions and the time frame for resolution of non-compliance to ADB's Environment Safeguards (2012), EHS General Guidelines and EHS Guidelines Geothermal Power Generation (2007).

1 INTRODUCTION

1.1 PROJECT PROPONENT

SOL or “Sarulla Operations Limited” is the operation company established by the Consortium of Itochu Corporation, Kyushu Electric Power Co., Inc., Ormat International, Inc. and PT. Medco Energi International Tbk. SOL plans to develop the geothermal field and the power plant in Sarulla, in Pahae Jae and Pahae Julu Districts, North Tapanuli Regency, North Sumatera Province. Project proponent contact details can be found below:

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In the development of the Sarulla geothermal field and power plant at 330 MW capacity, the Consortium and SOL signed a DOA with PT. PLN (Persero); a JOC with PERTAMINA Geothermal Energy; and an ESC 1 with PERTAMINA Geothermal Energy - and PT. PLN (Persero) on 14 December 2007. Further detail of contract status are addressed in section 1.4 of this report.

1.2 REPORT CONTEXT

The Indonesian electricity business is largely conducted by the State and carried out by The State own enterprise (PLN). Indonesia’s energy demand is increasing with a growth of electricity demand estimated at 7.1% annually (2006-2026) and there is currently a shortage of electricity supply in several provinces, particularly in Java and Sumatera (Djamin, 2008). Operative, private sector and local enterprises have an opportunity to participate in electricity business as Independent Power Producers (IPPs).

Indonesia is estimated to hold approximately 40% of the World’s estimated geothermal resource. These resources are concentrated within tectonic areas in Sumatera, Java and Sulawesi, in the same areas where electricity demand is under met. With traditional fossil fuels widely developed, the Indonesia Government has placed a priority on alternative energy development including renewable energy to enhance energy security.

SOL is proposing the Sarulla Geothermal Field and Power Plant Development Project to further develop the geothermal potential in Sumatera, commenced in 1993 by Unocal North Sumatera Geothermal (UNSG). As part of this development plan, SOL is seeking a financial investment from the Asian Development Bank (ADB) and a group of Equator Principles Financing Institutions (EPFIs). Project proponents seeking financing from the ADB and EPFIs are required to comply with the applicable bank's environmental, social and health policies, developed for managing the environmental and social risks associated with project finance.

The ADB and EPFIs recognise the specific issues associated with private sector projects and manage these through the ADB Safeguard Policies and Equator Principles. These are further discussed in Section 1.3.

This report presents the Environmental Compliance Audit Report and Corrective Action Plan for the Project as requested during consultation with ADB and the EPFIs, which builds upon the information presented in the studies prepared for environmental approval under Indonesian Regulations. As such, this document is not a stand-alone report but forms part of an overall set of documentation and should therefore be read together with the following reports:

- Environmental Impact Statement (ANDAL), Development of Sarulla Geothermal Field and Power Plant of 330 MW Capacity North Tapanuli Regency, North Sumatera Province; August 2009. This report is available on ADB's website¹;
- Environmental Management Plan (RKL), Development of Sarulla Geothermal Field and Power Plant of 330 MW Capacity North Tapanuli Regency, North Sumatera Province; August 2009. This report is available on ADB's website (as per the footnote below);
- Environmental Monitoring Plan (RPL), Development of Sarulla Geothermal Field and Power Plant of 330 MW Capacity North Tapanuli Regency, North Sumatera Province; August 2009. This report is available on ADB's website (as per the footnote below);
- Addendum to ANDAL, RKL-RPL, Relocation Activities of Wellpad Sites in Namora I Langit (Nil), Power Plant in Silangkitang (Sil), Transmission Line, Development of Geothermal Field and Construction of the 330 Mw Capacity PLTP Sarulla. Sarulla Operations Limited, in North Tapanuli District North Sumatra Province; July 2013. At the time of writing, these reports are currently undergoing review under the Indonesian regulatory approval process.

¹ <http://www.adb.org/projects/42916-014/documents>

This study presents the Environmental Compliance Audit Report and Corrective Action Plan. This report forms part of five (5) Volumes for the proposed development of the Sarulla Geothermal Field and Power Plant of 330 MW Capacity, North Tapanuli Regency, North Sumatera Province. All Volumes are as follows:

- Volume I: Environmental Compliance Audit Report and Corrective Action Plan(this report);
- Volume II: Environmental and Social Impact Assessment (ESIA) Addendum;
- Volume III: Social Impact Assessment and Integrated Social Program;
- Volume IV: Social Safeguards Compliance Audit Report and Corrective Action Plan; and
- Volume V: Resettlement Plan

1.3 STRUCTURE OF THE ENVIRONMENTAL COMPLIANCE AUDIT REPORT AND CORRECTIVE ACTION PLAN

This Report is structured to address ADB requests for additional Project information on the management of environmental and social risks. This report is structured as follows:

- Chapter 1: Introduction and context of the Environmental Compliance Audit Report and Corrective Action Plan;
- Chapter 2: Methodology of the Environmental Safeguards Audit;
- Chapter 3: Overview of the Sarulla Geothermal Power Plant Development Plan;
- Chapter 4: Audit Findings; and
- Chapter 4: Corrective Action Plan.

1.4 BACKGROUND

The development of geothermal energy is a priority for the Government of Indonesia in securing alternative energy sources. This is in line with the Government's policies in energy diversification, fuel oil (Bahan Bakar Minyak or BBM) consumption reduction and anticipating the rise in electricity demand in Indonesia, especially in North Sumatera.

The development of Sarulla geothermal field and the construction of Sarulla power plant in Pahae Julu and Pahae Jae Districts, North Tapanuli Regency, North Sumatera Province (**Figure I-1**) commenced in 1993 by Unocal North Sumatera Geothermal (UNSG) that was officially awarded the right as contractor from PERTAMINA to develop Sarulla geothermal field and power plant. The owner of Sarulla Geothermal Working Area, through Joint Operation Contract (JOC) and direct right (through PERTAMINA), has access to sell electricity to PT. Perusahaan Listrik Negara (PLN, the State Utility Company) according to Energy Sales Contract (ESC). UNSG conducted a number of engineering technical and environmental studies covering the exploration, the development of Sarulla geothermal resources and the related infrastructures from 1994 to 1997. According to the JOC, all infrastructures and assets were properties of PERTAMINA and UNSG had the right to use them.

In 2002, UNSG decided to sell their right as contractor to PLN. In February 2004, PLN acquired the entire concession ownership from UNSG. The acquisition was approved by PERTAMINA and the Minister of Energy and Mineral Resources (MEMR). At the same time, the tender process to transfer PLN ownership as PERTAMINA contractor to a third party was also approved.

In 2004, PLN started an international tender process to transfer the concession ownership for the development and the operation of 330 MW power plant at Sarulla geothermal field. It was stated in the Request for Proposal, that the winning company would have the right to fund, design, build, test, operate and maintain the field, and also to have the right as contractor of PERTAMINA to develop Sarulla geothermal field through DOA (Deed of Assignment).

After three rounds of tendering process, in June 2005, PLN issued a Letter of Intent (LOI) for PT. Geo Dipa Energi (a joint venture between PLN and PERTAMINA) as the tender winner based on the lowest offered electricity price (\$4.445 cent/kWh). PLN and PERTAMINA gave more than one year for PT. Geo Dipa Energi to present their financial plan as a basis to approve the changes of the ESC and the JOC. However, PT. Geo Dipa Energi could not meet the deadline and hence the LOI was cancelled in July 2006.

On 25 July 2006, PLN awarded the LOI to a Consortium of Medco-Ormat-Itochu (subsequently Kyushu joined in Oct 2007) as the second lowest bidder on electricity price (\$4.642 cent/kWh). The Consortium was awarded the right from PLN to develop Sarulla geothermal field and power plant.

Head of Agreement authorization to develop Sarulla geothermal field in North Tapanuli Regency, North Sumatera Province, was signed by PERTAMINA, PLN and the Consortium on 20 August 2007, witnessed by the Prime Minister of Japan, Mr. Shinzo Abe, and the President of Republic of Indonesia, Mr. Soesilo Bambang Yudhoyono at the Indonesia-Japan Business Forum.

By early 2008, in the context of rising raw materials prices, costs of power plant equipment, and well drilling costs, it became apparent that the Consortium's tariff originally bid in 2005 was no longer viable. In fact, many other power projects in Indonesia that had been delayed for various reasons faced the same problem, leading to requests by many companies to adjust the tariff to offset the increased construction costs.

The Consortium presented its tariff adjustment proposal to PLN in July 2008. The Consortium and PLN held several rounds of negotiations on the basis for the tariff increase, with support from relevant ministries and government agencies, until the approaching presidential elections (held in June 2009) meant a temporary inability to advance the discussions to a conclusion.

Following President Susilo Bambang Yudhoyono's re-election and a cabinet reshuffle, momentum resumed to the negotiations in September 2009 and the parties finally agreed a revised base tariff of 6.79 cents per kWh (calculated on a levelized basis with 3 step-down tariff stages) memorialized in a "Principle Agreement" dated 1 April 2010.

Following which, the Consortium discussed with PLN and relevant parties on the resolution of any remaining bankability issues. Finally the amended ESC and JOC were signed on 4 April 2013.

Figure I-1 Location of the Project for Development of Geothermal Field and Construction of PLTP Sarulla



1.5 *AIMS AND OBJECTIVES OF THE AUDIT*

ERM was commissioned by Sarulla Operation Limited (SOL) to undertake an independent Environment Compliance Audit of their Geothermal Exploration and Production Area located in the district of North Tapanuli, North Sumatra Indonesia in July 2013.

This report reviews the environmental compliance and provides a corrective action plan of the proposed project existing facilities in accordance to Asian Development Bank's Safeguard Policy Statement (2009) Safeguard Requirements 1: Environment, and World Bank Group's EHS General Guidelines and EHS Guidelines for Geothermal Power Generation (2007).

1.6 *SITE SETTING*

Project site development commenced in 1993, initially by Unocal North Sumatra Geothermal (UNSG) which was officially appointed as contractor by PERTAMINA to develop the Geothermal Field and Sarulla Geothermal Power Plant. Then in 2007, PLN, PERTAMINA and the current Consortium signed a Heads of Agreement to handover the development and operational right of 330MW power plants in Sarulla Geothermal to SOL.

Development of the geothermal field and Sarulla geothermal power plant construction consist of several activities as follow:

- Sarulla geothermal field development at Silangkalang (SIL) and Namora I Langit (NIL);
- Development and operation of a 330MW geothermal power plant (1 Unit located in Silangkitang (SIL) and 2 Unit situated in Namora I Langit (NIL)) with each unit capacity of 110MW;
- Development of total 13-15km long 150kV transmission line from Silangkitang (SIL-1) field to PLN sub-station and from Namora I Langit (NIL-1) field to PLN sub-station.

SIL geothermal power plant's location, most are in plantation are (paddy field and mixed plantation), will be shifted to hill side. Location changes will be applied in location of well-pad in NIL and power plant in SIL, and also to electrical transmission lines which were mostly on Production Forest Area and Limited Production Forest into all on non-forest area (Area Penggunaan Lain/APL).

For further detail on the Project Description, reference should be made to Volume II: Environmental and Social Impact Assessment (ESIA) Addendum.

1.7 POLICY DEVELOPMENT

SOL is in the process of formulating environmental and social policies to the requirements of the ADB. It is understood that SOL has formulated a draft eligibility policy for Sarulla Geothermal Power Plant Project that is currently under review by the management.

2 METHODOLOGY OF THE ENVIRONMENTAL SAFEGUARDS AUDIT

2.1 ERM APPROACH

The methodology adopted for the environmental safeguards audit included the following activities.

2.1.1 Review Meeting at SOL's Corporate Office in Jakarta

The ERM team conducted a brief kick-off meeting at the SOL office in Jakarta with representatives of SOL management. The objective was to obtain an overview of the current status of SOL progress in the development of their policies and to review available documents relevant for the project.

2.1.2 Site Assessment

ERM conducted a site inspection of existing SOL operations. The site visit covered the following:

- Existing facilities constructed by UNOCAL, such as well pads and a number of pits, pipelines and access roads;
- Procedures and actual implementation of well abandonment and dismantlement of pipelines;
- Restoration or abandonment of a number of pits used during drilling operations;
- Repair/improvement/widening of existing roads and bridges; and
- SIL 3 boundary fences restoration.

As part of this assessment, the ERM conducted a site visit on July 15-18th, 2013 to assess a number of operations in the SIL, NIL and areas in order to observe the existing UNOCAL facilities including production well, injection well, pipelines, site office, and warehouse. Sipirok site has been included during this visit since UNOCAL has a warehouse facility for storage of drilling mud material and some spare parts of pipelines.

A number of activities were observed at SIL such as:

- Land clearing and construction of a sump pit at SIL 1 well pad;
- Land clearing activities for the new piping lines from Batang Toru river to SIL 1 well pad; and

- Renovation of Hamilton bridge from main road access to NIL road access.

2.1.3 Stakeholder Consultations

As part of the wider Environmental and Social Impact Assessment (ESIA), ERM has also consulted with one stakeholder PP who is sub-contracted to HYUNDAI in the development and upgrade of the road network and relevant bridges, laydown/disposal area, and well pads in the project area.

2.1.4 Reporting

This task comprised compiling the documents reviewed, site observations and findings against the ADB requirements. On the basis of this review, a Corrective Action Plan (CAP) has been developed in consultation with SOL to provide a framework to manage environmental risks for the proposed Project.

2.2 LIMITATIONS

Professional judgments expressed herein are based on facts and information provided. Wherever ERM has not been able to make a judgment or assess any process, it has highlighted that as an information gap and suggested a way forward.

2.3 INFORMATION GAPS

The program being undertaken by SOL is at an early stage of development and as such a number of policies and implementation plans have not yet been developed or implemented. In addition, the manpower resources for the project are also being developed. This has given rise to a number of the gaps identified by ERM during this assessment process.

2.4 USE OF THIS REPORT

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3 OVERVIEW OF SARULLA GEOTHERMAL POWER PLANT DEVELOPMENT PLAN

3.1 DEVELOPMENT HISTORY

The project was initiated by UNSG, after ESC and JOC were signing in 1993. An extensive exploration activity was conducted in geo scientific geology, geochemistry, geophysics investigations, and certain infrastructure development including well pad and its access road and followed by drilling activity starting from 1994 to 1998.

There are nine exploratory wells (5 in SIL, 4 in NIL) that were drilled in the contract area followed by well completion and production testing to prove the quality and quantity of the resource.

After receiving the right to develop the Sarulla project, the Consortium has reevaluated the all of the Sarulla exploration data (geo scientific and exploration drilling) in order to undertake next strategy for field development stage of the Sarulla Contract Area.

New development plan including future drilling plan by utilizing reservoir forecast simulation were established in 2011 and reflected to the well pad design and so on.

3.2 SOL PROJECT DEVELOPMENT PLAN

SOLs current activities are grouped into three parts namely the Activity Plan Location, the Geothermal Field Development Activity Plan Phases and the Construction of the geothermal power plant Sarulla. During the lifetime of the project, SOLs activities will be grouped into four distinct, although overlapping phases as follows:

3.2.1 Pre-construction

Activities involved in the pre-construction phase are geothermal field development including preliminary engineering and land acquisition, construction of the infrastructure facilities including access roads and well pads, and well testing for SIL. These activities are then divided into:

- Preliminary study, such as technical planning, topography measurement, geotechnical investigation and feasibility study;
- Engineering Work, concerning preliminary technical design including civil, mechanical, and electrical;
- Land Acquisition, which they already gained approximately 66,9 acres in Pahae Jae and Pahae Julu sub-districts from total requirement of approximately 117,4 acres from previous studies. Land acquisition for

the updated data is now still on going.

- Construction of infrastructure facilities
- Well testing for SIL

3.2.2 Construction

Related with the geothermal field development, initial activities that will be conducted are:

- Recruitment of manpower;
- Mobilization of equipment and materials; and
- Preparation of land and civil construction.

In addition to the above, during development of the geothermal power plant it is envisioned by SOL that the following will be key components of the work:

- Construction of geothermal power plant;
- Construction of transmission line

SOL envisages that during the course of the construction activities, that plans will be updated and changes in the currently developed conceptual development will occur (as is common with this type of development).

3.2.3 Operation

Activities during the Operation Phase consist of the potential for further Development of the Sarulla Geothermal Field, the PLTP Operations Phase, and the Operation of the Transmission Network from Silangkitang (SIL) to PLN sub-station and from Namora I Langit (NIL) to PLN sub-station, which transmission line operation and maintenance will be conducted by PLN. The active management of impacts identified as a result of the ESIA and the Environmental, Social Management System (ESMS) will also be required.

3.2.4 Post-operation

Activities in the Post-Operations Phase consist of Closure of Production Wells and Injection Wells, Decommissioning of the Pipe Networks and the Supporting Facilities, and Decommissioning of the Geothermal Energy Power Plant.

3.3 PROJECT STATUS AND ONGOING ACTIVITIES

Sarulla Operation Limited (SOL) is currently in Pre-Construction phase of both the SIL (Silangkitang) and NIL (Namora-I-Langit) sites although some development/rehabilitation work is being undertaken. It should be noted that the geothermal operation was established in 1993 by Unocal North Sumatera Geothermal (UNSG) and that SOL has taken over operation of the area since 2007.

In meeting the project implementation plan, SOL collected additional data on the geothermal potential in Namora-I-Langit (NIL) and the geotechnical condition in the planned power plant site in Silangkitang (SIL). Review of SOL of this additional data has indicated that there will be only limited need for the relocation of well-pads in NIL and the SIL power plant. The currently identified relocation of geothermal well pads are as follows: well pads in NIL-1, NIL-2, WJP-1 production well site, WJR-1 and WJR-2 reinjection well site.

Given the above, the approved AMDAL of 2009 requires updating. This is currently being undertaken as an Addendum which will be available in 4Q 2013. All current activities being undertaken by SOL are understood to be approved under the current 2009 AMDAL.

4 ***AUDIT FINDINGS***

This Section of the Report, Table IV-1, provides the compliance status of the environmental performance of SOL regarding the ADB Safeguards Requirement for Environment.

Table IV-1 Audit Findings

<i>ADB Requirements</i>	<i>Issue and Description of Observations</i>	<i>Recommendations</i>
Environment Safeguards - This section provides an assessment of the compliance status of SOL’s environmental performance, compared to the ADB Safeguards Requirements for Environment, the EHS General Guidelines and the EHS Guidelines Geothermal Power Generation.		
1 Environment Assessment Requirements for Various Financing Modalities	The HSE Policy and Procedure of Sarulla Operation Ltd (SOL) as a high level document were issued in April 2013. However, some relevant summary of HSE issues as specified in the ADB’s Environment Safeguard, EHS General Guidelines and EHS Guidelines Geothermal Power Generation are still omitted within this document, as follows: - Environmental issues: Effluents (drilling fluids & cuttings, produced water), Air Emissions (include energy efficiency and Greenhouse Gas (GHG) emission), Solid Waste resulted from drilling (Sulfur, silica and carbonate precipitates waste), Water Consumption (in particular for well drilling). - OHS issues: Heat exposure in the power house. - Community Health and Safety issues: Exposure to H2S gas, infrastructure safety and impacts on water resources.	Update and revise the current high level document of SOL HSE Policy and Procedures to address any gaps with ADB’s Environment Safeguard, EHS General Guidelines and EHS Guidelines Geothermal Power Generation. Moreover, the lower level document on detail procedures should be developed in accordance with the above requirements as well.
2 Occupational and Community Health and Safety	Hamilton bridge is more than 20 years old and currently under re-construction by SOL for access to the SIL well pads. It was verbally confirmed that engineering study has been undertaken to ensure the safe use of this bridge. However, this engineering study result could not be shown yet during this audit.	To ensure that recommendation to upgrade this bridge is undertaken as per undertaken engineering study result for upcoming planned well drilling and the associated mobilization of heavy equipment.
	It was observed that one of contractor was standing within the swing zone area of heavy equipment’s shovel arms at SIL 1 well pad area.	Ensure that all of the contractors are aware of heavy equipment’s OHS hazard in their activities. Ensure that all contractors comply with OHS requirements.
3 Biodiversity Conservation and Sustainable Natural Resource Management	This point refer to separated ERM’s Biodiversity Report	This point refer to separated ERM’s Biodiversity Report

<i>ADB Requirements</i>		<i>Issue and Description of Observations</i>	<i>Recommendations</i>
4	Pollution Prevention and Abatement	<p>In the area of SIL 1, SIL 2, and SIL 3, some observations were made, such as:</p> <ol style="list-style-type: none"> 1. Access to SIL 2 and 3 has not been secured to prevent unauthorized person to these areas. 2. Existing pipes (Historical UNOCAL assets) in all SIL areas were found to be rusted. 	<ol style="list-style-type: none"> 1. Build security barrier to ensure that only authorized persons, can access the area. 2. As part of the site development and ongoing operational maintenance/asset integrity plans, SOL need to provide study in order to develop pipes utilization plan and also to ensure that all rusted pipes in particular for pipes material in site office's pipe yard are in good condition (if these pipes will be utilized for existing project).
		<p>Heavy equipment mobilization will be conducted soon by PP as one of sub-contractor (under HYUNDAI Corporation as a main contractor). However, waste a management plan for heavy equipment oil waste was not found. The sub-contractor states that they will provide this during the mobilization period.</p>	<p>Ensure that all waste and hazardous waste generated by third parties (both for main contractor and their sub-contractors) are being identified and controlled. This should be done prior to well test and heavy equipment mobilization.</p>
		<p>A new sump within SIL D well pad area is still being constructed. All sludge from historical sumps, new sumps and drilling mud waste and drilling cutting from future drilling activities will be temporarily disposed to this new sump. However, there is not sufficient evidence in the securing permit for this sump to identify if those sludges classified as hazardous waste.</p>	<p>Secure permit for sludge temporary disposal, this permit should be done prior to sludge dumping activity. This permit will confirm whether the constructed facility including type of HDPE is in accordance with the relevant regulation on landfill of hazardous waste.</p>
		<p>Potential sources of soil and groundwater contamination from current and historical activities at the site including:</p> <ul style="list-style-type: none"> • Storage of expired drilling mud material that is stored on un-paved ground at the Sipirok warehouse. • A fuel tank which is located on un-paved ground at SIL site office. • Historical sumps without any lining from historic UNOCAL operations at SIL and NIL that were used for containing brine during drilling and well testing. 	<p>SOL should conduct some corrective actions, such as:</p> <ol style="list-style-type: none"> 1. Conduct intrusive soil and groundwater assessments through boring at the appropriate place in the areas of potential contamination to investigate if further action to remediate or control future activities is required. 2. All expired drilling mud and used tank should be moved to an appropriate area to prevent contamination or treated and managed as per relevant regulation (note: after PLN transfer their asset to SOL) 3. Expired drilling mud must be disposed to the authorized waste collector or other measure implemented to comply with local regulation during the implementation stage (note: after PLN transfer their asset to SOL)

ADB Requirements		Issue and Description of Observations	Recommendations
			4. SOL to ensure that all sumps are already equipped with impermeable lining to prevent impact to surrounding environment prior to drilling.
		Various hazardous wastes generated from the old basecamp at SIL, e.g. Suspected Asbestos Containing Material (ACM) from roofs of some structures, used fluorescent lamps etc. However, there is no planning yet on disposal of those wastes due to the awaited completion of handover of these asset from PLN.	SOL should conduct some corrective actions, such as: <ol style="list-style-type: none"> 1. Conduct waste inventory to identify the type and quantity of waste materials held, stored or disposed of in their operational area. 2. Used lamp /asbestos containing material waste must be disposed to the authorized waste collector or other measures implemented that comply with local regulation.
		It was verbally confirmed by SOL's site staff that drilling mud waste and drilling cutting during the UNOCAL operation were dumped into the historical sump units in SIL and NIL. However, test results indicating whether the above dumped waste was classified as hazardous waste or non-hazardous waste cannot be found.	To conduct hazardous waste test for sludge in Sump pit prior to clean up activity.
		Water quality from sumps SIL 1 and SIL 2 has been tested referring to raw water standard of Government Regulation no. 82 year 2001, but it has not been tested to more relevant regulation, i.e. Ministry of Environmental regulation no. 19 year 2010 on Threshold Limit Value of wastewater from Oil and Gas and Geothermal.	Conduct testing for sump pit water and refers to Environmental regulation no. 19 year 2010 on Threshold Limit Value of wastewater from Oil and Gas and Geothermal.
5	Physical Cultural Resources	This has been assessed as part of the Social Impact Assessment (see ' <i>Volume II: Environmental and Social Impact Assessment (ESIA) Addendum</i> ' of this report.	

5 CORRECTIVE ACTION PLAN

Table V-1 provides a Corrective Action Plan to assist SOL in defining necessary remedial actions, budget for such actions and the time frame for resolution of non-compliance to ADB's Environment Safeguards (2012), EHS General Guidelines and EHS Guidelines Geothermal Power Generation (2007).

Table V-1 Corrective Action Plan for Sarulla Operation Limited

<i>Measures and/or Corrective Actions</i>	<i>Deliverable</i>	<i>Timelines</i>	<i>Responsible agency</i>	<i>Source of Budget</i>
SR 1: Environmental Safeguards				
Update and revise the current high level document of SOL HSE Policy and Procedures to address any gaps with ADB's Environment Safeguard, EHS General Guidelines and EHS Guidelines Geothermal Power Generation. Moreover, the lower level document on detail procedures should be developed in accordance with the above requirements as well.	Revised SOL's HSE Policy and Procedure.	Q1 2014	SOL Relevant contractor	Within relevant contract price HSE guideline was developed by SOL itself. Contractor will prepare their plan under the relevant contract.
Ensure that recommendation to upgrade this bridge is undertaken as per undertaken engineering study result for upcoming planned well drilling and the associated mobilization of heavy equipment.	Hamilton bridge feasibility study result.	Q4 2013	SOL Relevant Contractor	Not necessary Contractor has already studied.
Ensure that all of the contractors are aware of heavy equipment's OHS hazard in their activities, and comply with OHS requirements	Contractor's training records and contractor's audit and evaluation result	Q4 2013	SOL Relevant Contractor	Within relevant contract price Contractor will prepare under the relevant contract.
<ol style="list-style-type: none"> Build security barrier to ensure that only authorized person, and no animal can access the area. Provide study in order to develop pipes utilization plan and also to ensure that all rusted pipes in particular for pipes material in site office's pipe yard are in good condition (if these pipes will be utilized for existing project) 	<ol style="list-style-type: none"> Solid barrier and safety signage around well pads Monitoring and inspection records 	Q2 2014	SOL Relevant Contractor	<ol style="list-style-type: none"> Not necessary It is already EPC contractor's scope. Not necessary since we will not use


<i>Measures and/or Corrective Actions</i>	<i>Deliverable</i>	<i>Timelines</i>	<i>Responsible agency</i>	<i>Source of Budget</i>
Ensure that all waste and hazardous waste generated by third parties (both for main contractor and their sub-contractors) are being identified and controlled. This should be done prior to well test and heavy equipment mobilization.	Contractor's Waste management procedure	Q4 2013	SOL Relevant Contractor	Within relevant contract price Contractor will prepare under the relevant contract
Secure permit for sludge temporary disposal, this permit should be done prior to sludge dumping activity. This permit will confirm whether the constructed facility including type of HDPE is in accordance with the relevant regulation on landfill of hazardous waste.	Permit for sludge temporary disposal.	Q4 2013	SOL Relevant Contractor	Within relevant contract price Contractor will prepare under the relevant contract
SOL should conduct some corrective actions, such as: 1. Conduct intrusive soil and groundwater assessments through boring at the appropriate place in the areas of potential contamination to investigate if further action to remediate or control future activities is required. 2. All expired drilling mud and used tank should be moved to an appropriate area to prevent contamination or treated and managed as per relevant regulation (note: after PLN transfer their asset to SOL) 3. Expired drilling mud must be disposed to the authorized waste collector or other measure implemented to comply with local regulation during the implementation stage (note: after PLN transfer their asset to SOL). 4. SOL to ensure that all sumps are already equipped with impermeable lining to prevent impact to surrounding environment prior to drilling.	1. Phase 2 Assessment report 2. New and paved ground storage area for expired drilling mud and used tank 3. Permit of waste collector and waste manifest. 4. Lined sump.	Q4 2014	SOL Relevant Contractor	Within relevant contract price Contractor will prepare under the relevant contract
SOL should conduct some corrective actions, such as: 1. Conduct waste inventory to identify the type and quantity of waste materials held, stored or disposed of in their operational area. 2. Used lamp / asbestos containing material waste must be disposed to the authorized waste collector or	1. Result of waste inventory. 2. Revised waste management procedure 3. Permit of waste collector and waste manifest	Q3 2014	SOL Relevant Contractor	Contingency of Development Budget (US\$ 2.8 million)

<i>Measures and/or Corrective Actions</i>	<i>Deliverable</i>	<i>Timelines</i>	<i>Responsible agency</i>	<i>Source of Budget</i>
other measures implemented that comply with local regulation.				
To conduct hazardous waste test for sludge in Sump pit prior to clean up activity	Sludge Hazardous waste test result (TCLP and LD 50)	Q2 2014	SOL Relevant Contractor	Contingency of Development Budget (US\$ 2.8 million)
Conduct testing for sump pit water and refers to Environmental regulation no. 19 year 2010 on Threshold Limit Value of wastewater from Oil and Gas and Geothermal	Water analysis result based on Ministry of Environment Regulation number 19 year 2010	Q4 2013	SOL Relevant Contractor	Contingency of Development Budget (US\$ 2.8 million)


Annex A

Photo Documentation




Photograph 1:	Historical sumps without any lining from Unocal operation for brine during drilling and well testing	
Location:	SIL 2	




Photograph 2:	Historical sumps without any lining from Unocal operation for brine during drilling and well testing	
Location:	SIL 1	



Photograph 3:	No securing permit for this sump pit, if this will be used for hazardous sludge disposal	
Location:	SIL D	



Photograph 4:	Fuel tank stored on unpaved ground	
Location:	SIL site office	



Photograph 5: **Expired drilling mud material stored on unpaved ground**

Location: **Sipirok warehouse**




Photograph 6: **Expired drilling mud material stored on unpaved ground**


Location: **Sipirok warehouse**





Photograph 7:	Asbestos Containing Material (hazardous wastes) from roofs of some structures	
Location:	Old basecamp at SIL Office	



Photograph 8:	One of contractor was standing within the swing zone area of heavy equipment's shovel arms	
Location:	SIL 2 clearing activities	



Photograph 9:

Rusted pipelines

Location:

Pipeline yard at SIL site office

