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Enabling Sustainable Geothermal Operations Through Social Impact Assessment

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ABSTRACT

This paper provides a thorough discussion of the social impact assessment program of Philippine Geothermal, with an emphasis on a Community Impact Review (CIR) tool that integrates community issues with operations and provides valuable information to facilitate successful project planning, design, and implementation. The CIR conducted by all functional groups involved in a specific project promotes a shared understanding and coordinated resolution of issues that may expose host communities to risks and potentially interrupt geothermal operations. CIR evaluates socio-political issues, including security, religious, cultural, economic, and other local norms that should be considered in the overall project management. This paper demonstrates the value of social impact assessment in facilitating geothermal operations by presenting the application of the CIR in the case of the two drilling projects in the Mak-Ban Geothermal Field – the plug and abandonment of Puting Lupa-1 and the work-over of Bulalo-13.

1. INTRODUCTION

1.1 Mak-Ban Geothermal Field

For 35 years, the Mak-Ban (Makiling- Banahaw) Geothermal Field has operated in a safe and reliable manner, powering a major island in the Philippines with clean and renewable energy. With an installed capacity of 442.8 MW steam turbine plants and 15.73 MW of binary plants, Mak-Ban has generated a total of 72,290 GWh of electricity since 1979, displacing 134 MMBOE. Mak-Ban is operated by Philippine Geothermal Production Company, Inc. (PGPC), a joint venture between Allfirst Equity Holdings, Inc. and Chevron Geothermal Philippines Holdings, LLC.

Located 70 kilometers south of Manila, Mak-Ban is hosted by a rapidly industrializing area covering parts of two provinces and three municipalities with a combined population of 260,000 (2010 est.), and growing at 3% every year, double the national average population growth rate (National Statistics Office, 2014). Contiguous to Mak-Ban are agro-industrial facilities, residential communities, and a protected forest reservation. The diverse social landscape where Mak-Ban is situated, exacerbated by a large population in the area, poses unique challenges, such as encroachment and informal settlements, pilferage and vandalism, and right-of-way issues, to maintaining safe and stable operations. Mak-Ban's co-location in a rapidly growing urban corridor requires implementation of a thorough and systematic approach to identifying safety, environmental, and health risks to prevent disruption of operations for major capital projects and other routine activities. (Annex 1. Map of the Mak-Ban Geothermal Field).

To help illustrate the processes that have been followed, two recent projects that were successfully completed are referenced. These projects are:

Puting Lupa-1 Plug and Abandonment (PL-1 P&A); 2012-2013

Puting Lupa-1 was drilled as an exploratory well in 1976 by geothermal pioneer and subsidiary of Union Oil of California, Philippine Geothermal, Inc. (Diaz, *in press*). The well is located within the Mt. Makiling Forest Reserve (MMFR), a 4,244-hectare conservation site managed by the University of the Philippines – Los Baños, Laguna. Declared as a heritage park by the Association of South East Asian Nations, the MMFR is home to a large number of flora and fauna classified as endangered by the International Union for the Conservation of Nature, including the Philippine eagle owl (Bubo philippinensis), Philippine pygmy fruit bat (Haploncyteris fischeri), and the Philippine monkey (Macaca fascicularis philippensis) (Caparas, 2014).

Puting Lupa-1 was not utilized for power production because it was not able to produce steam. As such, plug and abandonment of the well was recommended to mitigate potential risks to the environment and the community.

Bulalo-13 Work-Over (Bul-13 WO); 2009

Bulalo-13 is a production well located in Barangay Bitin, Bay, Laguna. It was drilled in 1977 and continued to produce steam, yielding 2MW. In 2009, work-over for Bulalo-13 was implemented to address safety issues by replacing the wellhead pack-off to arrest leaks and pressure testing the well to assure integrity.

2. COMMUNITY IMPACT REVIEW

The Community Impact Review (CIR) is among the in-house risk assessment tools utilized by Philippine Geothermal in identifying project-related risks and formulating appropriate measures to mitigate potential hazards that may hamper successful completion of any project in the geothermal field. (Annex 2. CIR checklist). The purpose of conducting a CIR is to secure community support so that all field activities are carried out safely and within budget and schedule. By integrating assessment of community issues into the project management process, the company earns its license to operate through meaningful community engagements which provide critical

information about key stakeholder needs that can affect the design, implementation, and completion of a project.

The CIR process involves functional groups in the thorough assessment of activities undertaken in the field and the development of solutions to mitigate safety, health, and environmental impacts of these activities to the community. A shared understanding and coordinated resolution of community issues are promoted by involving all internal stakeholders or the members of various functional groups in the CIR process. Furthermore, frontline team members who participate in the CIR are empowered to undertake direct community relations given their increased sensitivity to stakeholder expectations.

A critical factor which contributed to the successful completions of the PL-1 P&A and Bul-13 WO was the proactive use of the CIR by the assigned project teams. The CIR not only enabled the company to secure community support, but also contributed to the improvement of the project design for a safe, on-time, and within-budget execution of both well work activities.

2.1 Stakeholder Mapping

The CIR process starts with mapping or the identification of key stakeholders – individuals, group, community, and organizations with an interest in a specific activity as a result of either a potential or actual positive or negative impact (Department for International Development, 2003). The project team prepares a list of stakeholders with the ability to influence the project process and outcome, and identifies their level of support and influence, as well as their motivation for supporting or opposing the project. Once the stakeholders are mapped, the team proceeds to its initial engagement activities to gather information from community residents, local government officials, regulatory agencies, academe, and other concerned non-governmental organizations.

In the case of PL-1 P&A, a critical stakeholder organization was the University of the Philippines-Los Baños (UPLB), the administrator of the forest reserve where the well is located. In line with UPLB's mandate to conserve the forest and protect the watershed as provided by Republic Act 6967 of 1990, the state-run university implemented regulations which prohibited cutting, destroying, or injuring trees and other plants, fungi, or other natural products or objects (Diaz, *in press*). The project team engaged with UPLB representatives, not only to secure a work permit prescribed by law, but also to seek guidance in identifying risks from pre-mobilization, execution, and demobilization of the P&A works within the forest reserve.

On the other hand, community residents were identified as the most critical stakeholders of Bul-13 WO based on the social mapping conducted for the project. Around 500 residents or 99 households within the 150-meter radius were found to be most likely affected by the drilling activities related to the work-over due to their proximity to the project site.

2.2 Conducting the CIR

The work group involved in the CIR process is composed of representatives from reservoir engineering, health, environment and safety, facilities engineering, drilling, supply chain and management, and community affairs. Information collected from engagements with diverse groups of stakeholders is evaluated by accomplishing a CIR checklist which serves as a preliminary assessment tool to identify the project's impacts on the community. Data obtained from direct engagements with stakeholders should be supported by official reports by relevant subject matter experts.

The work group supervisor and the community affairs supervisor lead this exercise as members of the project team go through a set of community impact criteria classified into a) project benefit, b) socio-political, and c) environmental. Once the impact criteria are noted, control measures and groups responsible for implementation are evaluated and selected.

2.2.1 Project Benefits

Field activities provide various benefits to host communities where the geothermal field operates. These include economic opportunities such as higher power generation and job creation. In other instances, non-economic benefits, such as improved health and safety conditions, are derived from the implementation of certain field activities. Stakeholders are motivated to be supportive as they recognize the benefits the project may bring to the community or to their organization.

For instance, UPLB acknowledged that the forest reserve would benefit from the plug and abandonment works for Puting Lupa-1 as this removed potential safety and environmental risks. Furthermore, UPLB also appreciated the rehabilitation by Philippine Geothermal of a 3-km rough and narrow dirt road which will be used by UPLB foresters as access to their central nursery within the forest reserve.

Meanwhile, community stakeholders and the local government officials were made aware that work-over of Bul-13 would address safety risks, continue reliable operations, and sustain power supply. The implementation of work-over activities during the 2009 drilling campaign which covered Bul-13 also created additional employment opportunities for members of the community. About 55 jobs were created, where community residents were hired as crane and forklift operators, roughnecks, tool pushers, warehousemen, welders, cooks, helpers, traffic aides, etc.

2.2.2 Socio-Political and Environmental

The CIR checklist evaluates proximity of an activity to residential and/or public infrastructure and determines its potential impact on electrical systems, road access, telecommunication lines, and water supply and demand. Furthermore, the CIR gives significant attention to project impact on wildlife and the natural ecosystem in the area. The checklist also requires assessment of any local and social norms and traditions, complaints over a similar project executed in the past, as well as security issues. Potential or actual concerns that may impact the community and the corresponding mitigating measures are identified, including crop/property/livestock damage, dust, H2S, land use conflict, noise, odor, radiation, right-of-way, vehicular traffic, waste, and water discharge.

Central to the challenges related to the execution of PL-1 P&A is its location within the Mt. Makiling Forest Reserve. In consideration of this, a non-traditional project design for the P&A was formulated to comply with the regulations being enforced in the area. A rig-less P&A equipment was utilized to minimize footprint and environmental impact. The project also considered the repair of the existing road to accommodate the smaller vehicle requirement. The project had almost no impact on vegetation and minimal noise disturbance on wildlife due to low noise level because of the type of equipment used for the P&A. Site-specific waste and fluid management was also set to ensure no return fluids would contaminate the ground (Diaz, *in press*).

The CIR for PL-1 P&A also indicated that the activities would impact road access and water supply. Hence, it was recommended that traffic management and repair of existing waterline within the forest reserve were necessary. A security plan was also set after the CIR revealed a potential security issue in the project site. Furthermore, a journey management plan for equipment mobilization was also created to identify the best route that would ensure the safety of campers and students within the area. During a pre-activity meeting, a forester from UPLB was also invited by the work group to discuss the rules and regulations strictly enforced in the Makiling Forest Reserve. In consideration of local traditions, the team also factored into the project timeframe the schedule of holiday celebrations in the community to avoid accidents and other untoward incidents.

Proximity of the Bulalo-13 to fenceline communities was an important factor to the implementation of work-over activities. Noise was identified by the CIR as the most significant community concern. In response to this issue, a comprehensive noise mitigation plan was implemented, covering schedule and location of drilling, cementing, and fabrication activities, handling of pipes, blowing of horns, as well as communications among frontline crew. In particular, drillers were advised to tread lightly and efficiently on accelerator and brakes, crew were to avoid cementing during the evenings, shouting and making loud noises, ensuring that pipes were to be laid down/lifted slowly, and that the use of power tools, fabrication and hammering should be carried out away from the community area. The noise mitigation plan covered 17 monitoring points which were tracked every two hours and key members of the work group were assigned to be the company's contact persons available 24/7 to receive calls from the community.

An evacuation plan was also prepared in case there would be a need to temporarily relocate the residents within the project site to ensure their safety. The local government was consulted by the work group in the preparation of the plan as well as in the identification of the possible evacuation center located in the barangay hall. As partners in the CIR, local government officials also assisted the project team during community consultations and in traffic management during mobilization and demobilization of P&A equipment. Furthermore, community stakeholders were regularly updated on progress of the project's implementation. (Annex 3. CIR Process Chart)

3. RESULTS

PL-1 P&A was completed in 12 days, half of which was spent on the mobilization of equipment to the site. On the other hand, work-over activities for Bul-13 were completed within 7 days. By involving the community early in the process, the company ensured transparency and trust in both projects and secured necessary stakeholder support. Because a CIR was introduced at the initial planning stage of these projects, valuable information were obtained from engagement with key stakeholders about the potential consequences to the community of drilling and associated activities. Information derived from the CIR helped the project teams create appropriate interventions to address community issues that could have jeopardized project execution if left unresolved.

The collaborative approach of accomplishing a CIR also demonstrated the company's commitment as a good neighbor to the Mak-Ban host community and strengthened relationships with key stakeholders whose support was vital to the continued operations of the geothermal facilities. Success of both PL-1 P&A and Bul-13 WO was contingent on the ability of the project teams to address community issues with direct or indirect influence on project outcome. A proactive social impact assessment supported by strategic stakeholder engagement enabled seamless and incident-free implementation of both drilling activities.

4. CHALLENGES AND LIMITATIONS

Integrating the community impact review early into the project cycle was a key challenge in the past. Subject matter experts on the CIR were invited to the project team only when project design was more or less final. Costly redesign, delays in implementation, and even the occurrence of safety incidents limited the probability of success when important information about the project's impact on the community and vice versa were not captured at an early stage of the project management cycle. To address this, completion of the CIR was required as part of the permitting process of all capital projects and routine activities in the geothermal field.

Another challenging aspect of the CIR was the sustainment of buy-in and compliance to agreed mitigation measures by internal stakeholders or the members of the project team. Integrating findings from the CIR into the project management cycle would entail additional resources and workload, requiring the team to identify and evaluate non-traditional alternatives compatible with context-specific factors that influence project success. CIR experts and project decision makers should facilitate a shared appreciation by team members of the benefits of designing and implementing projects according to the data obtained from the CIR.

Finally, the CIR does not provide the strategies necessary for engaging key stakeholders regarding a specific project. The CIR should be complemented by a stakeholder engagement plan which outlines appropriate methods of managing stakeholder expectations, as well as tactics to increase stakeholder favorability and support (Annex 4. Stakeholder Map Template)

5. CONCLUSION

Social impact assessment significantly contributes to the successful and incident-free completion of a project if it becomes an integral component of the project management cycle. Given Mak-Ban's location in a dynamic environment where management of socio-political issues is central to efficient and reliable operations, the implementation of a community impact review provides project

decision-makers with valuable input on project design, resource utilization, and execution.

With the valuable information obtained from the CIR, the plug and abandonment activities for Puting Lupa-1 and work-over of Bulalo-13 were completed safely and within schedule without any work disruption, no dollar loss, and increased community confidence in the company's top-of-class ability to manage the Mak-Ban geothermal facilities. Philippine Geothermal was recognized by the local government and the forest reserve administrator for its efforts to ensure safe, efficient, and reliable execution of even the most sensitive activities within a complex environment.

The participatory approach of the CIR process also demonstrates the company's commitment as a good partner to its host communities, enhances relationships with stakeholders, and strengthens the company's brand and reputation. The CIR enables Philippine Geothermal to effectively accomplish its commitment to explore, develop, and operate the geothermal fields in a safe reliable, efficient, and environmentally sustainable manner.

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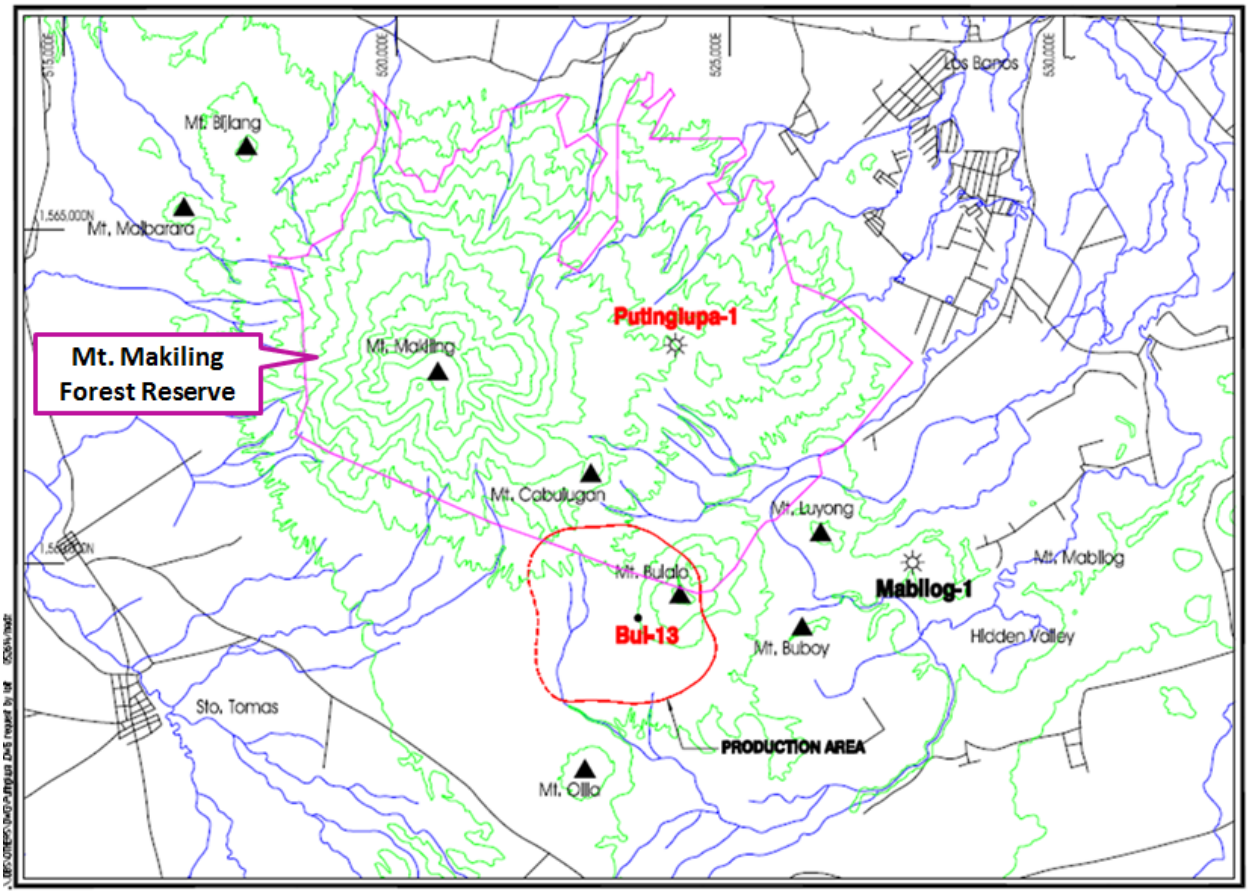
Annex 1. Mak-Ban Contract Area and Mt. Makiling Forest Reserve



Annex 2. Community Impact Review Checklist

Location: **Inclusive Dates of Project/Activity:**
Title of Project/Activity: **Implementing Group:**

☐ **MOC** ☐ **Routine Activity** ☐ **Project Requiring Work Permit**

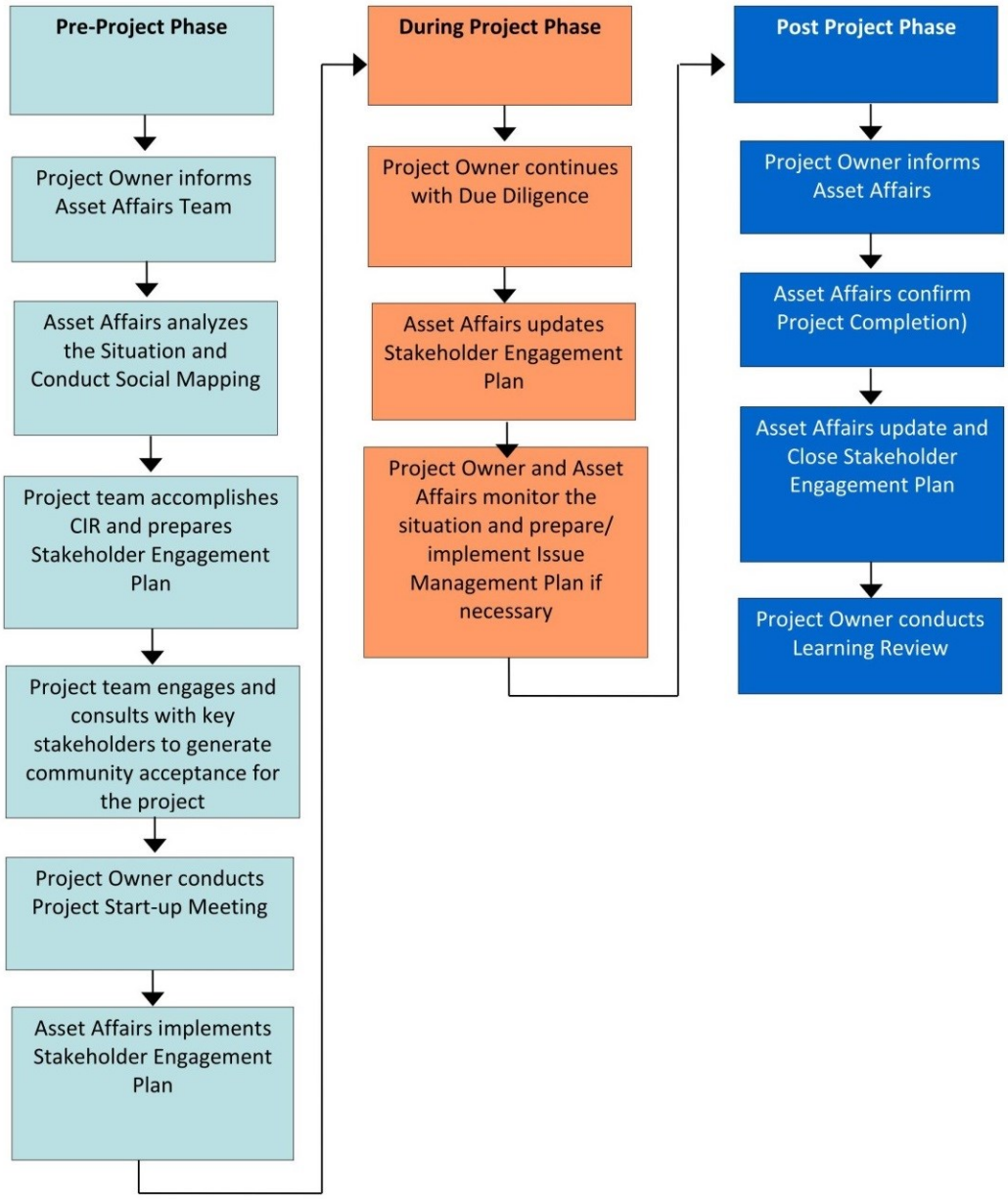
This checklist guides the **MOC Originator, Workgroup Supervisor or Project Owner** in identifying potential project-related risks to the community and the corresponding mitigants. It therefore serves as a preliminary assessment of the project's socio-economic impacts to the community. The checklist is best accomplished jointly by the **MOC Originator, Work Group Supervisor or Project Owner (PO)** and the **Asset Affairs Supervisor** for common understanding and coordinated resolution of the community issues. If the answer to Part I is "YES", the User should recommend how the benefits can be considered in the planning and execution of the project/activity to facilitate community acceptance. If the answer to any of the questions in Parts II and III is "YES", then recommend a resolution. After accomplishing the checklist, the approval authorities will have to agree on the necessary action items to address the issues identified. These will have to be carried out *before actual physical work on the project or activity commences*.

Community Impact Criteria	Yes / No	Issue resolution (e.g. Control Measures)		Responsibility	
				Project Owner	Contractor
I. Project Benefits					
1. Is the project going to generate benefits for the barangay/LGU that can facilitate community acceptance?					
A. Economic					
a) Higher Generation		☐			
b) Jobs		☐			
B. Non-Economic					
a) Health and Safety Measures		☐			
b) Recognition for LGU		☐			
II. Socio-Political					
1.1. Is the project within a 100-meter radius of a residential &/or public facility/infrastructure?		☐ Evacuation		☐	☐
		☐	Proceed to	☐	☐
1.2. Is there potential for the project to impact:					
A. Electrical System		☐		☐	☐
B. Road access		☐ Manage Traffic Flow		☐	☐
		☐ Inform Barangay Leader		☐	☐
C. Telecommunication lines		☐	Close access road during the project's duration	☐	☐
D. Water supply and usage		☐		☐	☐
2. Are there any local norms/traditions or socio-cultural event/s to consider, e.g. fiesta, religious, social or political event?		☐		☐	☐

3. Have there been complaints (ROW, property damage claim) or protests (barricade, threat of work stoppage) in the immediate project area in the past?		☐		☐	☐
4. Have there been similar projects undertaken at the site? If yes, were concerns/issues raised?		☐		☐	☐
5.1. Is there a potential security issue in the area?		☐		☐	☐
5.2. Is there a security plan in place?		☐		☐	☐
III. Environmental					
1. Are there potential/actual issues concerns that may impact the community?					
A. Crop/Property & Livestock Damage		☐ Secure baseline data on crops/property or livestock		☐	☐
B. Dust		☐ Water access road as warranted		☐	☐
C. H2S		☐ Evacuate residents from the point of emission # of affected residents within 50m radius (Mandatory) # of affected residents within 100m radius (Optional)		☐	☐
D. Land Use Conflict				☐	☐
E. Noise		☐ Monitoring		☐	☐
		☐ Relocation		☐	☐
F. Odor		☐		☐	☐
G. Radiation				☐	☐
H. ROW Issues		☐ Identify structures built on APRI property		☐	☐
I. Vehicular Traffic		☐ Design traffic plan		☐	☐
		☐ Install traffic signage		☐	☐
J. Waste		☐	Waste Management Plan	☐	☐
K. Water Discharge		☐		☐	☐

Completed by:	MOC Originator/Work Group Supervisor/Project Owner	_____	Date: _____
Approved by:	Asset Affairs Supervisor	_____	Date: _____
Noted by:	Project Engineer/Facility Owner/AOT Supervisor	_____	Date: _____

Annex 3. Community Impact Review Process Chart



Annex 4. Stakeholder Map Template

- ***POWER***
  - influence/control over policies/decisions
  - derived from the stakeholder's mandate, organization, and relationship to other stakeholders
  - may be formal or informal
- ***SUPPORT***
  - support or opposition to policies/decisions
  - derived from interests, benefits, risks arising from policies/decisions

RATINGS FOR POWER AND SUPPORT	
POWER	**5:** High Capacity to formally and informally instruct change/damage reputation/disrupt process
	4: High Capacity to formally instruct change/damage reputation/disrupt process or Significant informal capacity to cause change, may have input/influence to decision-makers/regulators
	3: Some capacity to formally instruct change; must be consulted or has to approve
	2: Some informal capacity to cause change, may have input/influence to decision-makers/regulators
	1: Relatively low levels of power; cannot generally cause much change
SUPPORT	**5: Active Support:** Provides positive support and advocacy for the plan/decision/company
	4: Passive Support: Support but not actively supportive
	3: Neutral: Is neither supportive nor opposed
	2: Passive Opposition: Will make negative statements/have negative opinion on plan/decision/company but will not do anything to affect its success and failure
	1: Active Opposition: Is outspoken against plan/decision/company and may even act to promote failure and affect success

Stakeholder	Role Relative to Project	Power	Support	What They Consider a Win	Strategy to secure/sustain favorability	What They Can Do	
						Good	Bad

Source: Bourne, L. and Weaver, P: Construction Stakeholder Management. *Blackwell Publishing*, London, 2010.