Papua New Guinea LNG Project

Report of the Independent Environmental and Social Consultant

IESC - PNG LNG Desktop Monitoring Report

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ABBREVIATIONS AND ACRONYMS

ADR	Alternative Dispute Resolution
AGI	Above-Ground Installation
ANUE	ANUedge–Australian National University Social development initiative
APNG-WLN	Advancing PNG Women Leadership Network
BAA	Biodiversity Assessment Area (PMA-3)
bbl	Barrel
BIMP	Biodiversity Implementation and Monitoring Program
BMVG	Benchmark Vegetation Group
BOM	Board of Management
BRC	(New Guinea) Binatang Research Centre
BS	Biodiversity Strategy
CALM	Catenary Anchor Leg Mooring
CBD	Convention on Biological Diversity
CCA	Clan Caretaking Agreement
CCI	Clan Caretaking Inspections
CDS	Community Development Support
CEPA	Conservation and Environment Protection Authority
CLIP	Community Livelihood Improvement Program
COH	Culture of Health
CP	Cathodic Protection
CPG	Central Province Government
CTA	Common Terms Agreement
CV	Check valves
CVP	Clan vetting process
DFAT	Australian Department of Foreign Affairs and Trade
DPE	Department of Petroleum and Energy
E&S	Environmental and Social
ECA	Export Credit Agency
ECCP	Enhancing Conservation Capacity Program
ECI	Environmental Compliance Incident
EHS	Environmental Health & Safety
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EMPNG	ExxonMobil PNG Limited (formerly EHL – Esso Highlands Limited)
EPR	Emergency Preparedness and Response
ESMP	Environment and Social Management Plan
ESMS	Environmental and Social Management System
FCL	Full Container Load
FF	Freight Forwarders
FSV	Family Sexual Violence
GRD	Gas Resources Directors
H&S	Health and Safety
HGCP	Hides Gas Conditioning Plant
HWMF	Hides Waste Management Facility
IAI	Innovative Agro Industries

ICS	Incident Command System
IESC	Independent Environmental and Social Consultant
IFC	International Finance Corporation
IMT	Incident Management Team
ISOS	International SOS
ISPM-15	International Standard for Phytosanitary Measures No. 15
km	Kilometer
KP	Kilometer Point
KPI	Key Performance Indicator
L&CA	Land and Community Affairs
LCL	Less Container Load
LKRUMP	Lower Kikori Resource Use Management Plan
LLG	Local Level Government
LNG	Liquefied Natural Gas
LOBID	Landowner Beneficiaries Identification
LR	Livelihood Restoration
LSA	Livelihood Strategic Assessment
LTI	Lost Time Incident
M&E	Monitoring and Evaluation
MD	Ministerial Determinations
MLV	Main Line Valves
MOC	Management of Change
MOH	Medicine and Occupational Health
MOU	Memorandum of Understanding
MTA	Million tons per annum
MZ	Mosquito Zone
NAQIA	National Agriculture Quarantine and Inspection Authority
NBSAP	National Biodiversity Strategy and Action Plan
NC	Non-Conformance or Non-Compliance
NGO	Non-Governmental Organization
NMAG	National Museum & Art Gallery
NNL	No Net Loss
O&M	Operation and Maintenance
OIMS	Operations Integrity Management System
OSL	Oil Search Limited
OSRL	Oil Spill Response Limited
P&GA	Public and Government Affairs
P1, P2, etc	Priority 1 weed, Priority 2 weed, etc
PCS	Pre-Construction Survey
PDL	Petroleum Development License
PMA	Program Monitoring Activity
PNG LNG	Papua New Guinea Liquefied Natural Gas Project
PS	Performance Standard
Q	Quarter
RAP	Resettlement Action Plan
RoW	Right-of-Way
SAF	Suspended Air Flotation

SBR	Sequencing Batch Reactor
SFPD	Sports For Peace and Development
TOR	Terms of Reference
TRIR	Total Recordable Incident Rate
TSS	Total suspended solids
TWM	Total Waste Management
UA	Upstream Area
UNDP-SGP	United Nations Development Program – Small Grants Program
U-PNG	University of PNG
VMP	Vehicle Monitoring Plan
WCS	Wildlife Conservation Society
WMA	Wildlife Management Area
WMZ	Weed Management Zone
WWTP	Wastewater Treatment Plant
YTD	Year to Date

EXECUTIVE SUMMARY

This report represents the nineteenth post-financial close review of the Papua New Guinea Liquefied Natural Gas (PNG LNG) Project with ExxonMobil PNG Limited (EMPNG) as the Operator made by Rina Consulting S.p.A. (formerly D'Appolonia S.p.A.) of Genoa, Italy serving in the role of the Independent Environmental and Social Consultant (IESC) on behalf of Export Credit Agencies (ECAs) and Commercial Banks providing Project financing (Lenders). The purpose of this review has been to evaluate conformance with Project environmental and social commitments made for the Production phase of this development. This report has been conducted on a desktop review based on information provided by EMPNG without undertaking a field visit as various international restrictions imposed by the Papua New Guinean Ministry for Immigration and Border Security and uncertainties related to the outbreak of the Coronavirus (COVID-19) prevented the IESC from visiting the Project. The review was therefore based on the documentation provided to the IESC by an agreed cut-off date and presentations undertaken on the basis of conference calls during the weeks of February 3rd and February 10th, 2020. As such, this IESC review is not as comprehensive as presented in past reports as it was not possible to make field observations as is the normal approach to monitoring.

The Project continues to make excellent recovery from the M = 7.5 February 2018 earthquake, but the biggest news from 2019 has been the reduction of civil unrest in the Angore area, enabling the start of development of the Angore field. The wells originally drilled at Wellpads A and B will now be permanently plugged and abandoned and a new Wellpad C will be constructed to develop 2 new wells.

Environmental and Social Management System

The Environmental and Social Management System (ESMS) is a mature and active System. As such, it continues to evolve and be revised. Key framework documents to the ESMS are the Project Environmental Management Plans (EMPs), which were reviewed at the time of the last field visit in February 2019 and found to represent significant improvements to the ESMS. The environmental and social requirements for the ongoing work to develop the Angore Field are defined in a specific EMP for the Angore Gathering System and our initial observation is that this EMP is fit for purpose and reflects lessons learned over the course of the PNG LNG Project for the management of environmental and social issues.

Pollution Prevention

Environmental management is a subject best reviewed from field observations but based on information provided by EMPNG there are no major problems to report and work undertaken over the last year has eliminated some problems. The past year has seen the best flaring performance since the start of production. Sound insulation has reduced problem noise, such as the insulation of the HGCP wastewater treatment blower enclosure.

EMPNG continues to work towards improving their pollution prevention systems, and recovery from the February 2018 earthquake is nearly complete. Upstream waste quantities over the past year have increased due to the work at Angore and the earthquake recovery effort, but the new incinerator at Kopeanda is close to being commissioned and the OSL Waste Management Synergy effort is just now starting to be reinitiated after delays caused by the earthquake. Waste management at the LNG plant has continued as in the past with no issues to report, and the plan continues to be to support Total Waste Management (TWM) in their development of an integrated third-party waste management facility. EMPNG is best served when competent third parties can manage waste.

A Level 1 Non-conformance (NC) was assigned to wastewater treatment in the 2017 IESC report. In 2018, the situation was not fully resolved, but much improved over 2017 and the Level 1 NC was reduced to an Observation. 2019 performance continues to be better than 2017, but the gains made in 2018 did not continue through 2019. This Observation continues in the Issues Table.

The Moro treatment plant is currently non-compliant for BOD, ammonia nitrogen and fecal coliforms; Trace amounts of mercury of unknown origin have been observed in the HGCP retention pond. The Angore treatment plant is still undergoing stabilization as it was only recently commissioned. There was a deterioration in the discharges from the Toray treatment plant at the LNG Plant with respect to total suspended solids (TSS) and ammonia nitrogen, although equipment repairs were made, and the plant has been compliant since July 2019. Water discharges from the stormwater retention pond have had problems with selenium (from brine) and fecal coliforms (found not to be of human origin). None of the non-conformances with wastewater management represent major problems, but have been chronic over the course of the Project.

A similar situation exists from groundwater monitoring around the Hides Waste Management Facility (HWMF). Non-conformant measurements of iron, ammonia-nitrogen and manganese have been recorded since 2014 and these could originate from infiltration of leachate from the facility, although it is recognized that impact to the nearby Tagari River is probably negligible and there are no users of groundwater in the neighborhood of the HWMF.

Erosion and Sediment Control

The earthquake caused some serious problems with respect to slope failures in the Upstream area, including at the Komo airfield and along the pipeline route. Much of the work to fully recover from the earthquake is complete, but there is still more to do. Some of the worst problems were associated with the Komo Airfield, but much of the drainage control has been reestablished as part of maintenance and repair activities. It is understood that a major new program is planned for permanent erosion and sediment control infrastructure at the Komo Airfield in 2020.

Ecological Management and Biodiversity

EMPNG have logged a number PS6-relevant incidents and/or non-conformances within their internal incident management tracking system in 2019: these include mistaken clearance of areas of pipeline RoW, on the Hides spineline as well as south of Moro where regenerating and primary forest was inadvertently cleared, the increased access to the mangrove forest for subsistence, including cutting of old mangrove trees by landowners near pipeline landfall at LNG Plant, and a large number of invasive fish (carp and tilapia) found dead in a sewage treatment retention pond at HGCP.

A number of monitoring program activities were undertaken during 2019, although results are not yet available; monitoring reports will be finalized later in 2020 at which time the IESC will review. Analysis of 2017's remote sensing imagery (to identify potential areas of land use change or forest degradation attributable to the Project from indirect impacts) had flagged a number of priority inspection zones where potential Project-related change was suspected; on the ground/aerial inspection was performed during 2019, where only one of the areas assessed (near Angore) was actually deemed to be attributable to Project. Visual inspection of accessible focal habitats and sensitive ecological features potentially affected by the Project continues annually along the RoW, indicating all sites recovering/functioning. PMA3 biodiversity surveys were undertaken at two locations (Hides Ridge and Agogo Range near Moro) by external species specialist teams, as previously; preliminary results are not yet available. The PMA-4 Protocol used to aid the Project in monitoring the efficacy of the biodiversity offset program to deliver No Net Loss is not current and should be updated.

Several biodiversity offset components are making progress: The bi-annual external Conservation Forum meetings continue to facilitate technical sharing amongst community conservation groups, conservation NGOs, government, industry, development agencies, etc.; a key outcome is agreement that the PNG Redbook of species needs to be updated. Project funding will be reduced going forward, and co-sponsors are actively sought. EMPNG's support to formal biodiversity education has continued, with class graduations for Certificates in Conservation Biology and Post-Graduate Diplomas; the funding strategy for this program is being reviewed currently and may take a different format for partnership into the future. In 2020, 4 Master's scholarship recipients will be graduating. EMPNG has committed to an additional 5 years of scholarship for higher education in biodiversity conservation. EMPNG is reviewing options for the administration of the scholarships.. At the Lake Kutubu Wildlife Management Area (representing EMPNG's middle-elevation offset component), the WMA committee continues to undertake training and program activities through self-sourced support and grants. Activities include poultry farming, fish monitoring, and Ramsar-funded training of the WMA Committee on wetlands conservation including the Lake Kutubu Ramsar site in particular. The IESC is seeking more systematic reporting of progress at Lake Kutubu against the Project's Enhancement Program components, and provision of information related to key offset tasks considered complete (see Recommendation below). The offset program in the Lower Kikori (representing EMPNG's lower-elevation offset component) is being well received by community groups, working through a process of engagement, resource mapping, site demarcation then identification of areas specifically for conservation; 5 communities are at the stage ready for establishment of Conservation Deeds, and EMPNG's on-site and central teams are providing valuable support to the process. In EMPNG's upper elevation zone, there has been little progress in development of a program to offset residual impacts. The IESC recognize that there have been multiple obstacles and challenges in establishing an offset program in this upper elevation zone including the 2018 earthquake and significant security concerns. However, construction-related residual impacts began 10 years ago, and Lenders would expect to see greater progress in achieving biodiversity gain, and thus be some way towards demonstrating No Net Loss at this stage of the development; we raise this in the Issues Table.

Recommendations focus on: documenting instances of land use change/forest degradation considered potentially attributable to the Project along with justifications/attribution decisions; update the PMA4 Protocol to reflect how offset efficacy in achieving NNL via Components 4 and 5 will be measured and tracked, especially with regard to better understanding how outputs from PMA1 and PMA3 will inform the NNL calculations, and the verification process going forward; that the Lake Kutubu Enhancement Program document be updated and used systematically to demonstrate progress towards enhancing the protection of an area managed for biodiversity e.g. development of conservation objectives, identification of biodiversity values, updated WMA management plan, etc.

Induced Access

In relation to site-specific commitments to control access in the published EMP versus actual controls in place, we tabulate the differences in Table 5.1. EMPNG advise that no observed signs of logging adjacent to the pipeline RoW/infrastructure or bypassing of access controls has been observed; however, a boom gate at KP-12 near Angore has been removed by the community. Regarding the vehicle traffic data captured by Access Monitors on Project roads (e.g. the Kantobo to Gobe road, and the Kaiam Bridge), EMPNG has undertaken a review of the vehicle data recording methods and categorization of vehicle traffic – an example dataset is included in Section 5.3.2 and more complete analysis will be available for the next IESC visit. EMPNG advise that 60% of traffic using the Kantobo to Gobe road is OSL traffic. We propose the next IESC visit include a road trip to allow direct observation and verify the access controls in place, as has been undertaken previously.

At the LNG Plant, EMPNG report that landowners are cutting down old mangrove trees more frequently than previously observed. Security cameras have captured laden trucks and people cutting/extracting mangrove timber at the perimeter track that skirts the outer fence-line. In response, Environmental Specialists are working with the Community Affairs team to further increase community awareness on access restriction agreements and have installed large concrete blocks as barriers to vehicles driving through access points.

EMPNG advises there has been no change to previous updates regarding requests from the government related to handover of Project road infrastructure.

Reinstatement and Regeneration

The team from the New Guinea Binatang Research Centre (BRC) undertook the third Regeneration Monitoring survey in 2019. The team surveyed 69 plots along the pipeline RoW, from Hides Ridge down to Kopi, sampling 12 forest types (benchmark vegetation groups) using existing Forest Inventory Mapping System classification. Preliminary results are not yet available, and the report will be reviewed when available in 2Q 2020. The biodiversity team discovered the extensive cutting back of regenerating and primary forest (the extent of which was further documented during the regeneration survey with the BRC team), noted above as a Project Non-Conformance. Clearance had extended over 204km of pipeline length south of Moro, and resulted in the loss of approx. 25% of previously used comparative regeneration plots. Some over-clearance had been noted by the internal biodiversity team in 2018, however EMPNG raised the severity level of the non-conformance once the real extent of clearance had been notified.

Invasive Species and Quarantine Management

A 2019 weed monitoring campaign was undertaken by BRC in the first half of 2019. For this desktop review, the IESC were advised that preliminary results were not yet available, and a final report had not been received. As noted in previous reports, the IESC has flagged concerns with accessing information on weed priority areas to determine whether risks raised in the EIS were being effectively mitigated. We have made a number of recommendations (and Observations) previously. From documents provided for this desktop review, we note that weed control along some areas of the pipeline RoW, including parts of Priority Ecosystem areas Homa-Benaria Ridge and Lake Kutubu, has not been possible by EMPNG's weed control contractor due to lack of access to vehicles, availability of accommodation, availability of mobile security squad, flooding, earthquake, etc. The Project is transitioning to a new weed control contractor during 2020, and the IESC note their scope of work does not include control along the pipeline RoW[1].

We recommended in 2019 that greater analysis and interpretation of P1 weed distribution/abundance/ecological risks be included in the weed monitoring report to assist the Project in targeted, prioritised weed control of those areas, and we will review the report when it is available sometime during first half of the year, ideally prior to 2020's weed monitoring campaign. Considering the Critical Habitat nature of the Upstream area, we encourage EMPNG to liaise with their contractors to ensure more timely provision of weed monitoring reports going forward.

As reported in 2019, cane toads (*Rhinella marina*) are becoming an increasingly challenging invasive pest in the Upstream Highlands area. Increased sightings at Project facilities in the Highlands has prompted increased surveillance and control by the Project. External specialist input has been sought to guide monitoring and control activities. Data is being tracked monthly, generated through use of sightings report cards and control activities. Vehicle and cargo inspection regimes have been developed to protect Hides Ridge Priority Ecosystem areas. Additional workforce has been hired to assist with cane toad control at Project sites.

Regarding quarantine, although import volumes increased during 2019, only six re-fumigations were necessary following inspection by PNG's quarantine authority, NAQIA. The Project continues to work with their freight

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[1] The Project advise this is to be rectified.

forwarders to ensure improved inspection/fumigation at point of origin, and that adequate paperwork accompanies the cargo.

Recommendations focus on: prioritizing pipeline RoW weed control, especially in Priority Ecosystem areas, and ensuring the new weed control contractor scope of work clearly defines pipeline RoW areas for weed control.

Resettlement

The Project has completed provision of assistance for voluntary relocation of 20 households found to be in unsafe locations due to effects of the 2018 earthquake. These relocations are not covered by IFC PS5 as they are not project caused, however the offer of voluntary relocation is considered good practice.

Only one household required resettlement governed by IFC PS5 to allow the Project to access the pipeline RoW for repairs of earthquake damage. The Project has fulfilled its obligations with the exception of completion of Livelihood Restoration (LR) program started by one wife who left area and cannot be located. The IESC considers the case closed but recommends that the Project reassess the issue periodically and maintain detailed documentation. In event the wife is able to return in a reasonable time, offer to provide the remaining the LR program support.

Resettlement for Angore Wellpad C involves nine households that will lose structures, eight of which will also lose gardens The IESC reviewed the Resettlement Action Plan (RAP) in November 2019 and deemed it compliant with IFC PS5. Nearly all affected households possess structures and sustainable gardens elsewhere and will be provided with replacement value compensation and livelihood restoration assistance.

Community Impacts Management

Tribal fighting continues in the Upstream areas, but relative peace prevails. The Community Development Support (CDS) Law and Justice are implementing a number of programs, particularly with youth, aimed at reducing conflict for the longer term.

Community Development Support

Individual CDS activities are described in the relevant sections of the main report. In terms of strategic activities, the Project has made major progress toward developing a comprehensive approach to CDS, recommended by the IESC, that assures that all contributions to PNG communities, whether implemented by CDS, another Project Unit or the Project as a whole, are those that contribute to the CDS overarching goal of “promoting development of conditions conducive to enhancing economic self-reliance of individuals whilst also mitigating potential impacts.” The IESC also recommended in its 2019 Report that a steering committee be created to facilitate development of this comprehensive approach.

In response, the Project has agreed on the Terms of Reference and a Charter for the Community Investment Committee with the purpose screening projects against established criteria, ensuring that potential project areas reflect company values, approve projects, provide strategic oversight and internal coordination and prepare Community spend reports. Committee members represent each of the Project functions that are or plan to support community support initiatives.

At this stage of CDS implementation, the core CDS program (PGA CDS) is in the process of re-assessing the programs starting with a Livelihood Strategic Assessment (LSA). The LSA began in 2019 with a scoping activity to review community needs and identify influencing factors. The scoping is followed by further formal technical assessments of priority needs and independently facilitated consultations with communities to generate strategic goals and key outcomes of activities. Assessment results will be used to generate proposals of options for refining activities and approaches and work plans for ongoing phases of the Livelihood Program Component. Geographic focus is on:

- ✓ Upstream – Hela Province;
- ✓ Plant Site – Hiri District of Central Province;
- ✓ RoW – Kutubu and Gobe areas of SHP and Kikori region of Gulf Province; and
- ✓ Port Moresby Head Office - National Interests.

The IESC also recommended that a Monitoring and Evaluation (M&E) Procedure be developed for use by all Project functions implementing CDS activities. Progress has been made for developing a format for the Livelihood Restoration component of the core CDS program. The IESC looks forward to receiving information on development of the Project wide CDS M&E Procedure.

Finally, the IESC would appreciate CDS presentations and reports to provide more information on the selection process for education and health construction or structural upgrades.

National Content

The Project continues to make notable progress toward replacement of expatriate staff with PNG citizens as shown in the table below.

Statistics on Workforce	Number nd 2018	End 2019
Total Workforce across Project	3,295	3,964
PNG Workforce	2,797(85%)	3,411 (86%)
EMPNG Workforce (direct hire employees or employees from recruiting agencies)	543	520
3rd Party Contractor Workforce	2,228	2891 (85%)
PNG Citizens Female workers	539	569
Origins of PNG Workforce		
Local origin	1,160 (42%)	1690 (42%)
Regional origin	902	936 (27%)
From non-Project areas	709	785 (23%)
Job Categories		
Management Responsible for supervising workers or for managing a SOW)	250	271(8%)
Office	284	307 (9%)
Field – Both technical and non-technical roles	2,237	2833 (23%)

In terms of competency building, highlights include:

- ✓ 26 of 32 Control Room Technicians at both LNGP and HGCP are filled by PNG citizens (10 female);
- ✓ LNGP US&L panel is fully operated by PNG Citizens;
- ✓ O&M Technicians broadening assignment (2 Technical Writers, 4 Safe Choice trainers); and
- ✓ 39% of technicians progressed to next tech level.

For Operations and Maintenance (O&M) Intake 5, 27 sponsored trainees, 10 of whom are women, transitioned to EMPNG in January 2020. Recruitment for Intake 6 attracted 2,000+ applicants from which the best 18 operations technician trainees will start training on 2nd March 2020.

In terms of Local Procurement and Supplier Development, Production phase spend to date is almost PGK3.7 billion on Papua New Guinean services, PGK1 billion spent with Lancos, 17.5 billion on services provided in Papua New Guinea. In 2019 13 Lancos and some 270 non-Lanco Papua New Guinean businesses were utilized and more than PGK691 spend with Papua New Guinean businesses. Of this, over PGK246 million spent on Lanco services.

Stakeholder Engagement and Consultation

The total number of Project engagements from January to the end of December 2019 was 3,971 involving 190 communities across the Project's directly and indirectly affected areas. The number of attendees dramatically increased from 29,815 in 2018 to 58,500 in 2019, attributed to improvement in Upstream stability which, in turn, expanded the number of project work fronts and allowed for more engagements.

Community Grievance Management

Issues raised in 2019 totaled 791 compared to 698 issues in 2018. The slight increase in issues in 2019 is thought to be related to improved stability in the Upstream and a drop-in work fronts later in 2019 that may have generated an increase in issues.

The 18 grievances filed in 2019 were all from the Upstream areas. Of the 18 grievances 58% were related to environment and 28% to land issues. This number of grievances was a significant reduction from the 59 grievances in 2018 and in all previous years. Six of the grievances were closed in the 4-30 day category and 12 requiring more lengthy investigation were closed within 100 days.

State Clan Benefits

LNGP plant site villages received royalty payment in September 2017 and equity dividends in July 2018.

Delivery of State Clan Benefits in upstream areas is showing progress with the first payments of Project Royalties and Equity Dividends to upstream clans made on 4 March to the 37 clans of PDL Segment 7. The payment included Project royalties from 2014-2018 and Equity Dividends for 2014-2016. Progress toward payments to the other PDLs is progressing.

Labor and Working Conditions

EMPNG continues to handle issues/grievances through the open-door policy and the overwhelming majority are resolved promptly at the supervisor level. In the event an employee is dissatisfied with a response from an immediate supervisor, the employee is entitled to further review by the applicable level of management. During 2019, no time has been lost to disruption from grievances or any form of industrial dispute and no separations were caused by breaches of the Harassment in the Workplace Policy.

The Project continues to provide counseling services to staff with a new contractor (Magellan HealthCare) on board who are available for scheduled days at the three facilities and can be contacted by telephone as well. Counselors are both male, but the need for a female counselor may not now be necessary. The IESC recommends the Project survey a representative sample of female staff regarding the need for a female counselor. If a survey or other consultation on this issue was done, the IESC will appreciate being informed.

The Project has initiated several new approaches to engaging its workforce in reducing family violence, including a Family Sexual Violence (FSV) Network consisting of male and female staff who provide support to other staff members: a male Champions panel discussion with the PNG LNG Rugby League on the theme “Strongpela Man Respektim Meri” (“Strong Men Respect Women”) to bring awareness to the workforce and Project communities of mutual trust, respect and communication: participation of male/female staff in the Bel Isi (Peaceful PNG) Walk Against Violence and attendance of Port Moresby staff in a Bel Isi learning session on the support it provides, negative effects of violence, etc.

Based on the information provided, workforce field accommodation continues to be well-managed and consistently updated. The IESC notes especially that introduction of the new program called “Culture of Health” that is sponsored by the Occupational Health program. Program elements include components on health awareness, nutrition and nutritional elements of diet (specifically focusing the camp environment), physical activity/bio-metric screening and mental health and wellbeing. The IESC looks forward to speaking with a sample of the workforce to get their perspective on the program and its personal results.

Community and Occupational Health

Community health continues to be a component of the CDS program. One of the results of the February 2018 earthquake was to highlight inadequacies in Hela Province health infrastructure and the Project-constructed Juni facility now qualifies for the Government placement of a Health Extension Officer on site. EMPNG has undertaken training for food handlers for over 30 key stakeholders that manage and serve food to the public, an issue identified with an increase in food borne illnesses at Tari Hospital. In the communities surrounding the LNG Plant, EMPNG has contributed to upgrading the Porebada Health Center. With two permanent staff, Porebada clinic is now able to expand their services to the nearby villages.

The occupational health program is world class and continues to perform well in all areas (clinical operations, public health and industrial hygiene). As noted above it now includes the ‘Culture of Health’ program. The EMPNG Industrial Hygiene program delivered on its focus areas in 2019. This included the implementation of a new task monitoring strategy which prioritizes on high noise and chemical exposure from short duration tasks, and also increased field inspections and awareness of Industrial Hygiene Programs. Plans forward in 2020 include improving compliance to the Hazardous Materials Management Program, implementing a short-term high intensity noise exposure strategy, and undertaking health requirements for new Project locations.

Occupational Safety

EMPNG Production safety performance through Q4 2019 continues to be excellent. There were no Lost Time Incidents (LTIs) that took place in all of 2018-2019 with more than 25 million man-hours worked. This is a remarkable testament to a robust safety program.

Cultural Heritage

Cultural heritage management continues to be undertaken, currently in association with the Angore project, and preferred practice continues to be avoidance. Other cultural heritage activities have been to provide support to the University of Otago in New Zealand for a study to match the clay used in Lapita pottery fragments found at the LNG Plant site with different sources of clay from the local environment. The PNG National Museum and Art Gallery also hosted the Lapita conference in Port Moresby in October 2019 with 90 archeologists in attendance. The information generated from the LNGP cultural heritage excavations featured at the conference. The large number of artifacts gathered at the LNG Plant in 2010 at the beginning of the construction phase of the Project have been extensively studied and reported. Lapita Pottery from LNG Plant Site has recently (October 2019 – January 2020) been part of a special exhibition at the National Museum & Art Gallery (NMAG) in Port Moresby.

1 INTRODUCTION

Rina Consulting (Rina), formerly D'Appolonia S.p.A., located in Genoa, Italy, was appointed as the post-financial close Independent Environmental and Social Consultant (IESC) for the Papua New Guinea Liquefied Natural Gas Project (PNG LNG or the "Project") being developed by ExxonMobil PNG (EMPNG), the designated Operator and also representing a consortium of co-ventures including: Oil Search Limited; Kumul Petroleum Holdings Limited: Santos Limited; JX Nippon Oil and Gas Exploration Corporation; and Mineral Resources Development Company Limited, and their affiliates. Rina's role as the IESC is to support the Export Credit Agencies (ECAs) providing Project financing, including the Export-Import Bank of the United States (USEXIM); Japan Bank for International Cooperation (JBIC); Export Finance and Insurance Corporation (EFIC) of Australia; Servizi Assicurativi del Commercio Estero (SACE) from Italy; Export-Import Bank of China (CEXIM); and Nippon Export and Investment Insurance (NEXI), as well as a group of commercial banks, collectively referred to as the Lenders or Lender Group.

The overall role of Rina as the IESC within the PNG LNG Project is to evaluate conformance with commitments made by EMPNG within their Environmental and Social Management System (ESMS) including health and safety. The benchmark for the ESMS is now the Production Environmental and Social Management Plan (ESMP), supplemented by the associated environmental and social support plans, also including associated commitments made within the ExxonMobil Operations Integrity Management System (OIMS) and the documents associated with biodiversity management.

The IESC Terms of Reference (TOR) requirements refer to an evaluation of Project "compliance", whereas the reporting requirements of the TOR state that the reporting will include a "list of non-conformance findings". Within this report, the terms "compliance" and "conformance" are considered to be equivalent. In general, issues to be resolved are identified as non-conformances, but one of the requirements of the IESC is to identify any "material non-conformances" within the context of the CTA. The IESC believes that a "material non-conformance" within the context of the CTA would need to be a Lender decision, but for the purposes of this report a potential "material non-conformance" would be a Level III non-conformance or repeated Level II non-conformances as defined in the Section 2 Issues Table. It is emphasized that a Level III non-conformance is not necessarily equivalent to a "material non-conformance" and that extensive discussions among EMPNG, Lenders and the IESC would need to take place before any "material non-conformance" is identified.

The IESC's review has included the environmental and social (E&S) and health and safety (H&S) management activities of EMPNG. This report has been conducted on a desktop review based on information provided by EMPNG without undertaking a field visit as access restrictions related to the outbreak of the Coronavirus (COVID-19) prevented the IESC from visiting the Project. The review was therefore based on the documentation provided to the IESC by an agreed cut-off date and presentations undertaken on the basis of conference calls during the weeks of February 3rd and February 10th, 2020. As such, this IESC review is not as comprehensive as presented in past reports as it was not possible to make field observations as is the normal approach to monitoring.

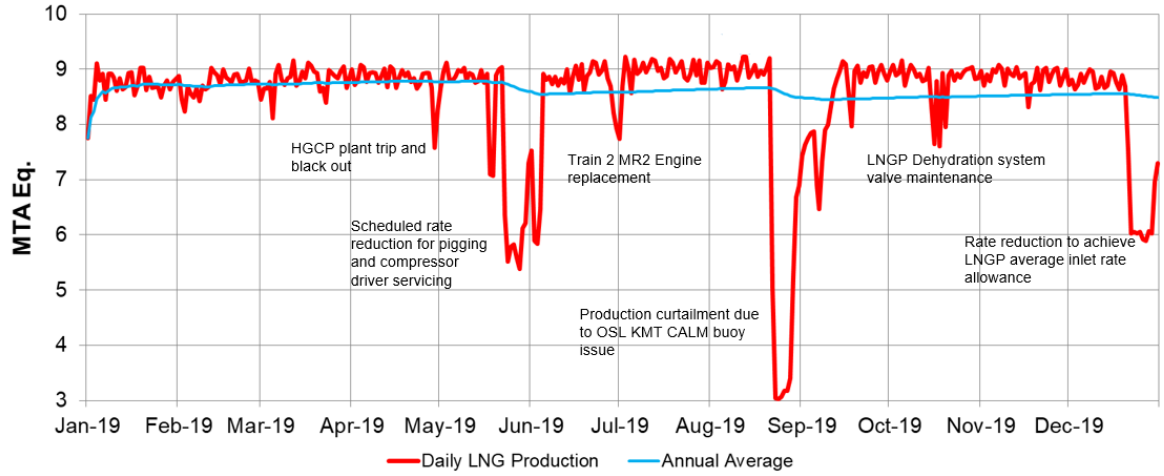
An activity that does not fall under the category of "monitoring" yet is within the scope of the CTA is a requirement for the IESC to certify certain non-Project operations (section 14.2(m)(iii) of CTA). Since the last field visit in January – February 2019 the only action has been a "non-objection" to the Management of Change document prepared for drilling at Angore Wellpad C that was provided to the Intercreditor Agent on October 29, 2019.

1.1 PRODUCTION OPERATIONS OVERVIEW

The Project continues to make excellent recovery from the M = 7.5 February 2018 earthquake, but the biggest news from 2019 has been the reduction of civil unrest in the Angore area, enabling the start of development of the Angore field. The wells originally drilled at Wellpads A and B will now be permanently plugged and abandoned and a new Wellpad C will be constructed to develop 2 new wells. By the end of 2019 the annual plant production averaged 8.5 MTA significantly exceeding the design capacity of 6.9 MTA, even with production curtailment at the end of August due to the CALM buoy issue (see Figure 1.1).

The CALM (Catenary Anchor Leg Mooring) buoy is OSL's end-of-pipe single-point mooring system in the Gulf of Papua. After its anchor chain broke, it could no longer serve as designed as the distribution point for EMPNG's condensate and required lower than normal condensate export rates. This incident affected EMPNG's ability to export gas at normal rates as there was no means to stockpile the condensate and production had to be curtailed. This incident was not associated with any environmental spill and was resolved by Oil Search Limited (OSL) with minimal impact to overall PNG LNG production.

Table 1.1: 2019 Production



Since June 2015 EMPNG has been supplying reliable power to the PNG Government from generators at the LNG Plant that produce about 25 MW of power. This operation continued through 2019, but the PNG Government owned (NiuPower) 58MW Gas-fired power generation plant near the LNG Plant was commissioned on December 6, 2019. The gas line connection to the LNG Plant is now fully operational.

Angore field activities were suspended in November 2018 after execution progress was affected by the earthquake in February, site incursion and vandalism in June 2018 and a near-miss security incident in October 2018. Community negotiations allowed for the Angore work to restart and the pipeline contractor was remobilized in November 2019 and mobilization for a Horizontal Directional Drilling (HDD) was taking place at the time of the IESC briefings in February 2020. Camp accommodations were constructed and occupied on December 10, 2019, which has allowed for rig mobilization and the start of P&A (plugging and abandonment) activities for wells at Wellpads A and B. Pre-Construction Surveys were completed for Wellpad C in September 2019 and land access is underway. Rig mobilization is in progress with drill to be first undertaken at the Hides F2 location with the rig then moving to drill Angore C1 and C2 locations. Start-up is targeted for mid-2023.

As a result of the earthquake, the Komo Airfield runway was approximately 50% serviceable at the beginning of 2019, but substantial repairs have been made (see Figure 1.2). Komo Airfield repair scopes continue into 2020.

Figure 1.1: Repairs to Earthquake Damage at Komo Airfield

The total workforce as of the end of December 2019 was 3,929 (3,295 at end of September 2018), a 16% increase in workforce since 2H2018. The total PNG workforce is 3,382 which corresponds to 86 % being Papua New Guinean. Women make up about 17% of the PNG workforce.

1.2 SOURCES OF INFORMATION

The main sources of information used to prepare the report are from documents and presentations provided by EMPNG and discussions held with EMPNG personnel via conference calls. As noted above, the IESC was not able to conduct the site visit due to travel restrictions related to the outbreak of the coronavirus.

1.3 REPORT ORGANIZATION

Subsequent sections of this report are organized as follows:

- ✓ Section 2.0 – Issues Table;
- ✓ Section 3.0 – Environmental and Social Management;
- ✓ Section 4.0 – Pollution Prevention;
- ✓ Section 5.0 – Biodiversity and Ecological Management;
- ✓ Section 6.0 – Social;
- ✓ Section 7.0 – Labor and Human Resources;
- ✓ Section 8.0 – Health and Safety; and
- ✓ Section 9.0 – Cultural Heritage.

The basic findings of the review are presented in the form of observations, comments and recommendations that are generally described according to topics within each section. Significant findings are summarized in the Issues Table provided in Section 2.0.

2 ISSUES TABLE

This Chapter tabulates a summary of the non-conformances raised in this report, consistent with our TOR as discussed in Section 1.0. The Table has been structured to provide a color-coding for strict non-conformances raised during each site visit, as well as IESC observations for situations that if left unattended could result in a non-conformance. Non-conformance is referenced with respect to Project commitments as included in applicable Project documents and with respect to on-going compliance with Applicable Lender Environmental and Social (E&S) Standards. As noted in Section 1.0 of this report, "Applicable Lender Environmental and Social Standards" means the environmental and social standards applied by the Loan Facility Lenders to the Project in the form attached to Schedule H-1 (Environmental and Social – Applicable Lender Environmental and Social Standards) of the CTA. The nomenclature of the color-coded categorizations is assigned based on non-conformance levels similar to the non-conformance levels defined in the ESMP, somewhat revised to reflect the point of view of the IESC and to address that certain non-conformances need to be framed in the context of the Applicable Lender E&S Standards. The following descriptions are provided:

- ✓ **High**: Level III critical non-conformance, typically including observed damage to or a reasonable expectation of impending damage or irreversible impact to an identified resource or community and/or a major breach to a commitment as defined in Project documents or the Applicable Lender Environmental and Social Standards. A Level III non-conformance can also be based on repeated Level II non-conformances or intentional disregard of specific prohibitions or Project standards. In some cases, Level III non-conformances or repeated Level III non-conformances may, but not necessarily, represent a material non-compliance with the CTA. This would be decided on a case-by-case basis;
- ✓ **Medium**: Level II non-conformance representing a situation that has not yet resulted in clearly identified damage or irreversible impact to a sensitive or important resource or community but requires expeditious corrective action and site-specific attention to prevent such effects. A Level II non-conformance can also represent a significant breach of a commitment, or a risk of a significant breach if not expeditiously addressed, requiring corrective action as defined in Project documents or Applicable Lender Environmental and Social Standards. A Level II non-conformance can also be based on repeated Level I non-conformances;
- ✓ **Low**: Level I non-conformance not consistent with stated commitments as defined in Project documents, but not believed to represent an immediate threat or impact to an identified important resource or community. A Level I non-conformance can also represent a minor breach of a commitment requiring corrective action as defined in Applicable Lender Environmental and Social Standards; and
- ✓ **IESC Observation**: A potential non-conformance situation that could eventually become inconsistent with stated commitments as defined in Project documents or the Applicable Lender Environmental and Social Standards.

Item ID	Site Visit	Closing Date	Description	Non-Conformance	Reference	Status	Comments/Report Reference
Environmental Issues – Environmental Management							
M17.1	Nov '17		Wastewater Treatment Plants (WWTPs) are operated at the LNG Plant, Angore, HGCP, and Moro. All of them have problems with their discharges, which have been the subject of numerous Environmental Compliance Incidents (ECIs) and EMP non-conformances (EMP NCs) internally assigned, but in many cases the problems have worsened over 2017.	IESC Observation	EMP Section 9	Open	The problems experienced in 2017 have largely been resolved, but non-conformances with Project standards still occur and 2019 was not an improvement over 2018.
M19.1	Desktop review Feb '20		Groundwater monitoring at the HWMF at Kopeanda indicates that waste management operations could possibly be impacting groundwater.	IESC Observation	Upstream EMP Section 9	Open	Damaged groundwater monitoring wells should be replaced if they become non-functional. EMPNG should make sure that the entire HWMF has upgradient and downgradient well coverage, and this coverage should be specifically characterize the reed bed. A groundwater modeling exercise should be undertaken to calculate the extent of contamination and the rate of infiltration into the Tagari River assuming both the reed bed and landfill as potential sources. This should be part of an overall risk analysis to determine what mitigation measures, if any, might be required for groundwater management at the HWMF.
Environmental Issues - Biodiversity and Ecological Management							
M19.2	Desktop review Feb 2020		PS6 2006 requires mitigation measures to be designed to achieve no net loss (NNL) where feasible, including offset of losses through the creation of ecologically comparable area(s) managed for biodiversity. The Project's stated biodiversity strategy requires the establishment of offsets at each of three elevation zones for the purposes of reflecting representativeness and demonstrating NNL. EMPNG's offset program in the lower and middle elevations has progressed since residual impacts occurred in each zone. Although the Project's approach to offsets in each zone has been quite different, and implementation is still ongoing, the IESC has observed the Project make degrees of progress towards enhancing or establishing protected areas in these two zones. Stakeholder engagement has been focused, external specialist input sought on program development, capacity building undertaken, internal/contractor resources allocated, all contributing to degrees of progress in creating effective protected areas. There is little equivalent demonstrable progress for the upper elevation pursuit of NNL. The IESC acknowledge and note the Project's observation that although security issues have prevented EMPNG's progress so far, the situation appears to be improving.	Low: Level 1	EMPNG Biodiversity Strategy Section 3 EMPNG Biodiversity Implementation and Monitoring Program Section 4 IFC PS6 requirements in relation to Natural and Critical Habitat	Open	Residual impacts in the Projects upper elevation zone (>1200m) have existed since 2010, when construction commenced. Over 50% of the projects total direct footprint occurs in this upper elevation zone. The IESC appreciate that offset programs take time and there have been various challenges to the Project's work in the region (including the 2018 earthquake, significant security issues and safety concerns). Nevertheless, there is currently no operational offset program in the upper elevation zone, indicating there will be a minimum 10-year time-lag in demonstrating biodiversity gain to compensate for Project-related biodiversity losses. However, through our ongoing regular visits since 2010, we have not observed the same level of focused effort applied on developing an offset in the upper elevation zone as in the lower zone. Component 5 work activities are still in the exploratory, preliminary stages. EMPNG should present (by 2021) and instigate a clear, targeted program of work (by 2022, or when safe to do so), having sought stakeholder input on candidate conservation site(s), focused on achieving sufficient representative biodiversity gain, that when implemented will enable demonstration of NNL in this upper elevation zone. (Report section reference for further background detail: Section 5.2.2.2)

3 ENVIRONMENTAL AND SOCIAL MANAGEMENT

3.1 ENVIRONMENTAL AND SOCIAL MANAGEMENT SYSTEM

The Environmental and Social Management System (ESMS) is a mature and active System. As such, it continues to evolve and be revised. Key framework documents to the ESMS are the Project Environmental Management Plans (EMPs), which have been upgraded to an advanced draft with the following objectives:

- ✓ ensure EMPs reflect as-built conditions and reflect current practices;
- ✓ provide clarifications to queries that have been raised since Production commenced;
- ✓ include Regulatory changes that have occurred since Production commenced; and
- ✓ incorporate mitigation measures that were included during construction that are still applicable to Production Projects.

The EMPs were reviewed at the time of the last field visit in February 2019 and found to represent significant improvements to the ESMS. The E&S requirements for the ongoing work to develop the Angore Field are defined in a specific EMP for the Angore Gathering System. The initial IESC observation is that this EMP is fit for purpose and reflects lessons learned over the course of the PNG LNG Project for the management of environmental and social issues.

3.2 MANAGEMENT OF CHANGE

Since the last field visit in January – February 2019 the IESC has reviewed two Management of Change (MOCs):

- ✓ Angore Well A1, A2 and B1 Plug & Abandon Management (Class III – minor significance); and
- ✓ Angore Well C (Class II – moderate significance).

The provision of the MOC for the plug and abandonment activities was a courtesy, as there is no requirement for IESC review of a Class III change. The Wellpad C MOC was reviewed by the IESC considering that our team had been informed of the work that was going to be undertaken, in particular with respect to resettlement activities, and had given approval of the approach taken by EMPNG. This MOC was needed, because EMPNG determined that drilling from planned Wellpads A and B could not be undertaken for technical reasons and development from a new wellpad (Wellpad C) was necessary. Drilling from Wellpad C would have different E&S impacts and therefore required an MOC that accounted for these changed conditions. In essence, the basis for the IESC review was the appropriateness of the Class II level assigned to the change, which was considered appropriate given that there were no obvious new impacts that could not be addressed through existing ESMP measures. IESC submitted a “non-objection” to the MOC document prepared for drilling at Angore Wellpad C to the Intercreditor Agent on October 29, 2019.

A pending MOC, now reported for several years, is the anticipated turnover of Project infrastructure to the PNG Government. No activity has taken place. The PNG Government has not occupied any of the infrastructure and the status quo is being maintained.

3.3 INCIDENTS

Tribal fighting continues in the Upstream areas, but over the past year relative peace has prevailed. This relative peace has allowed for the startup of additional work at Angore, but social uncertainty remains high. There were four security incidents in 2019 compared to nine in 2018.

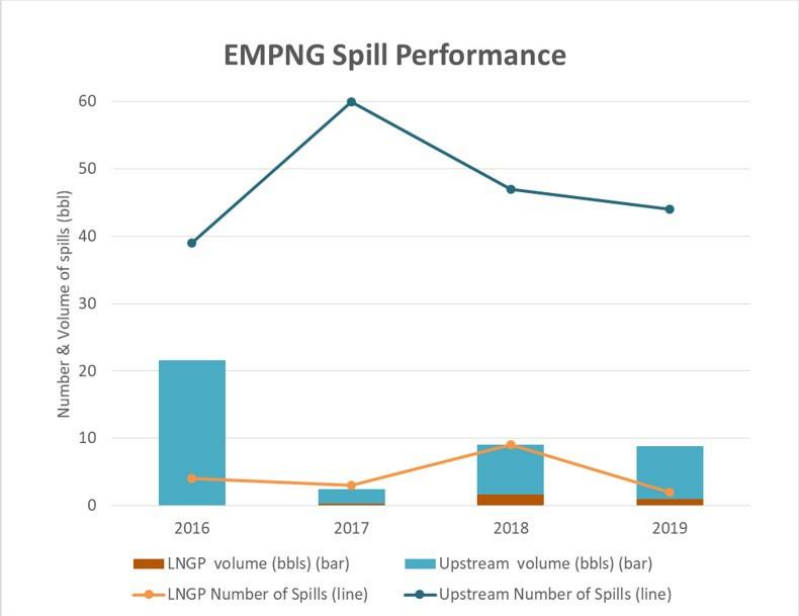
In terms of environmental incidents, the number of spills in 2019 was similar to 2018. There was one Corporate reportable spill (>1 bbl) when 1000 liters of chlorinated water used for potable water system flushing for Earthquake Recovery project repairs were released to the earthen drain near HGCP retention pond (effectively a spill to the ground). Sampling of surface water downstream of reed bed did not indicate impact. Most spills were minor with 46 recorded in 2019, most less than five liters (see historical spill performance in Figure 3.1).

Most of the Environmental Compliance Incidents (ECIs) and EMP non-conformances (EMP NCs) in 2019 assigned by EMPNG related to water discharges. In addition, cases of improper vegetation clearing were again documented. An incident of vegetation over-clearance originally identified on the pipeline ROW south of Moro in 2018, was reclassified as Severity Level II in 2019, when the full extent (204km) of affected RoW was observed during the regeneration survey (a wider width had been cleared outside of the approved footprint). In addition, a separate

vegetation over-clearance incident occurred on the Hides spineline where vegetation was cleared back to the construction footprint, not the smaller operational footprint. Investigations identified a lack of clarity around clan caretaking agreements and inspections, which have now been reviewed and awareness activities implemented. Non-conformances regarding reinstatement and regeneration procedures, an incidence of noise exceedance and mangrove cutting were also internally identified by EMPNG.

Overall, EMPNG continues to do a good job of tracking incidents and non-conformances. The number of Upstream non-conformances in 2019 was the same as 2018, but better than 2017. The non-conformances identified at the LNG Plant were slightly worse than the number from 2018.

Table 3.1: Historical Spill Performance



3.4 EMERGENCY RESPONSE

The Emergency Preparedness and Response (EPR) system is fully in place, but 2019 fortunately proved to be a year that could focus on preparedness rather than response. Major trainings and drills were conducted per an annual schedule:

- ✓ LNGP - ISPS Marine Port Security Practical Exercise;
- ✓ HGCP - Inland Response Exercise at Kopeanda Exercise;
- ✓ HGCP – IDOM Training & Tabletop Exercise; and
- ✓ Conducted ~105 Emergency Response exercise's for EMPNG in 2019.

The Fire & Rescue Team competed in their first PNG Extractive Industries Emergency Response Challenge against ten other oil & gas and mining companies. Oil Spill Response Limited (OSRL) has developed a Mutual Aid Agreement among several companies and this agreement was tested on the basis of a tabletop exercise with the scenario of a Puma Energy oil spill where ExxonMobil equipment was requested through OSRL. EMPNG has also recently transitioned to an Incident Command System (ICS) to enhance EMPNG Incident Management Team (IMT) capabilities in responding to major incidents:

- ✓ Conducted six ICS Training sessions with EPNG IMT;
- ✓ ~ 75 IMT members trained in ICS process;
- ✓ 12 Incident Commanders trained/ assessed as Incident Commanders; and
- ✓ ICS Implementation to continue throughout 2020.

Overall, EMPNG has a solid EPR program.

4 POLLUTION PREVENTION

4.1 WASTE AND WASTEWATER MANAGEMENT

4.1.1 Project Strategy

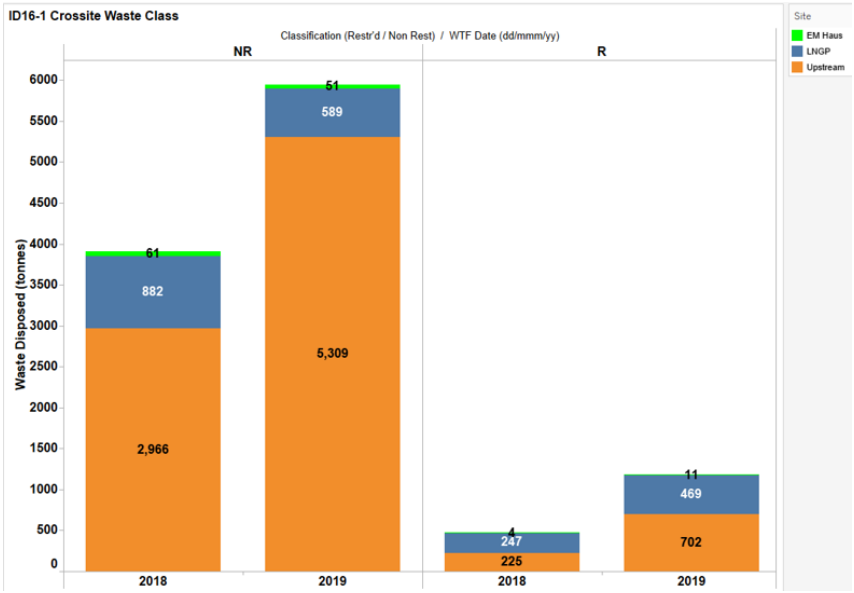
EMPNG's objectives are to apply the waste management hierarchy (wastes will be preferentially and sequentially avoided, reduced, reused, recycled or recovered) and to dispose all wastes at EMPNG facilities and approved third party facilities only. EMPNG's objectives are also to avoid significant impacts associated with the release of pollutants to surface water and groundwater and meet applicable discharge criteria. These applicable discharge requirements are those tabulated in Chapter 9 of the Upstream and LNG Plant EMPs.

4.1.2 Observations

4.1.2.1 Waste Management

The amount of waste generated has increased in the Upstream area and remained fairly steady at the LNG Plant (Figure 4.1) where NR = Non-Restricted and R = Restricted waste categories. Non-restricted wastes are those that do not pose an immediate threat to health, safety and/or the environment (examples are canteen waste, paper, cardboard, packing materials, scrap metal, rubble, timber and plastic). Restricted wastes are those that are easily ignited, corrosive or reactive, toxic, pathogenic or otherwise hazardous (examples are oils and greases, oil-contaminated rags, containers, filters, degreasing agents, fluorescent tubes, batteries, and health care waste). The increase in waste volume in the Upstream area is due mainly to activities related to earthquake recovery and the startup of Angore construction.

Table 4.1: Project Waste Generation Profile



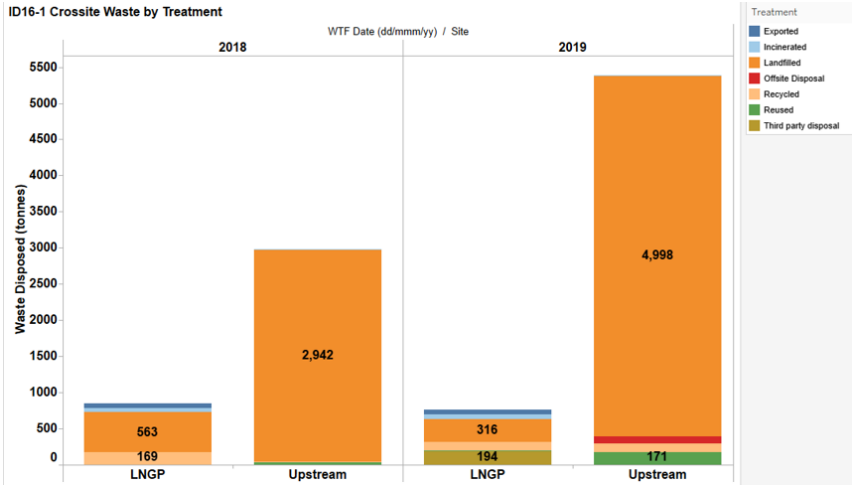
EMPNG continues to work towards improving their pollution prevention systems. One of the aspects of improvement has been the adoption of Tableau software to track the different waste streams. Figure 4.1 is a display from the Tableau software. Figure 4.2 presents a different output from the software whereby it is apparent that in the Upstream area landfilling has significantly increased, whereas at the LNG Plant site it has decreased.

Upstream waste management is nearly recovered from the February 2018 earthquake that damaged infrastructure and caused other situations that slowed the process of improvement, but the lack of incineration capacity in 2019 forced continued landfilling. The February earthquake caused the collaboration with OSL (Synergy Program) to be put on hold, as the OSL incinerator was damaged, but in Q4 2019 the incinerator became again operational and the Synergy program has resumed. The Project still does not have an operating incinerator, either Upstream or at the LNG Plant, but a new incinerator at the Hides Waste Management Facility (HWMF) at Kopeanda is being

installed. It is expected that the commissioning of the new incinerator at Kopeanda will reduce the need for landfilling.

Based on internal reviews conducted in 2019, landfill capacity at the HWMF is adequate and caters to the period of Production. An overall health check/review operation of the HWMF was also undertaken and recommendations from this review are being addressed.

Table 4.2: Project Waste Treatment Profile



Waste management at the LNG plant has continued as in the past with no issues to report, except that there is limited landfill capacity. This situation stimulates support Total Waste Management (TWM) in their development of an integrated third-party waste management facility and EMPNG's plan continues to be to provide support to TWM, but to also make sure that TWM does not develop to be an EMPNG dependent company. TWM needs to develop to be a facility that can improve waste management across multiple industries and generally improve waste management in PNG. EMPNG is best served when competent third parties can manage waste in an environmentally sound manner and when the third-party services are independently sustainable.

EMPNG has focused in 2019 to identify opportunities to improve recycling, reuse and waste reduction, as well as to commit to dispose of stockpiled waste, mainly in the category of restricted waste, and avoid future stockpiling. Efforts to improve recycling, reuse and waste reduction have included:

- ✓ A strategy to have consistent labeling of waste bins across the Project to minimize comingling of waste and to enhance recycling possibilities (Figure 4.3);
- ✓ Recycling of a record number of batteries, ~50 tons;
- ✓ Over 170 tons waste oils recycled;
- ✓ Single-use plastics reductions at all sites;
- ✓ Biodegradable crib meal boxes in use in Upstream work areas; and
- ✓ In-country wastewater disposal solutions being investigated.

EMPNG has started disposal of all various stockpiled intractable/aged restricted wastes (476 Tons) from the LNG Plant (224 Tons) and Upstream (252 Tons):

- ✓ LNG Plant: 70 Tons of assorted chemical wastes and waste oils, 154 Tons of amine wash waters exported.
- ✓ Upstream: 76 Tons of intractable/restricted wastes exported; another 176 Tons is awaiting permit from the Australian DoE.

Undertaking all of the above requires the commitment of a large number of people and over 2019 EMPNG trained 250 people in updating the Waste Management Waste Acceptance Protocols.

Figure 4.1: Standardized Waste Bins

Figure 4.2: Intractable/Aged Restricted Waste Disposal

4.1.2.2 Water Management

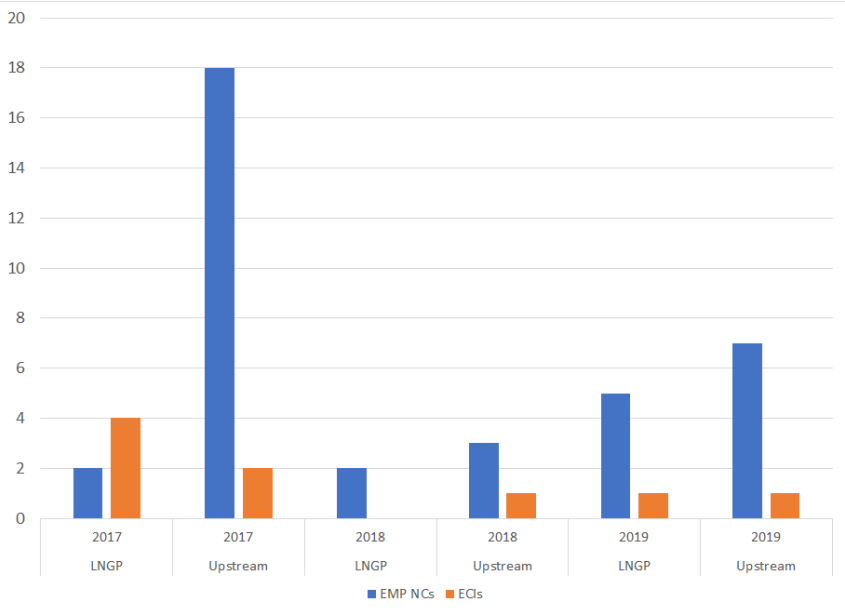
A Level 1 NC was assigned to wastewater treatment in the 2017 IESC report. In 2018 the situation was not fully resolved, but much improved over 2017 and the Level 1 NC was reduced to an Observation. 2019 performance continues to be better than 2017, but the gains made in 2018 did not continue through 2019. As shown on Figure 4.5 NCs at the LNG Plant were more than double what they were in 2018, but less than the NCs Upstream, which also more than doubled from 2018, but were still much less than they were in 2017. 2017 was also significantly worse with respect to ECIs, which have remained at a low level in 2018 and 2019. Looking at overall performance, improvements still need to be made and the past Observation continues in the Issues Table.

The following Wastewater Treatment Plants (WWTPs) are in use by the Project, not all of which are operational:

- ✓ LNG Plant - Toray WWTP: Status: online;
- ✓ LNG Plant - Unidro WWTP Status: offline (under repair);
- ✓ HGCP – Sequencing Batch Reactor (SBR) unit + Suspended Air Flotation (SAF) unit alongside (relocated from Angore): Status: online;
- ✓ Angore Wellpad A - SAF unit and SBR unit: Status: online, stabilizing; and
- ✓ Moro B - SAF unit: Status: online.

The Moro treatment plant is currently non-compliant for BOD, ammonia nitrogen and fecal coliforms; retention pond discharge from HGCP has detected trace amounts of mercury of unknown origin. The Angore treatment plant is still undergoing stabilization, which we take to understand that the discharges have not yet reached compliant levels. There was a deterioration in the discharges from the Toray treatment plant at the LNG Plant with respect to total suspended solids (TSS) and ammonia nitrogen, although equipment repairs were made, and the plant has been compliant since July 2019. Water discharges from the stormwater retention pond have had problems with selenium (from brine) and fecal coliforms (found not to be of human origin). None of the non-conformances with wastewater management represent major problems, but have been chronic over the course of the Project. (Figure 4.5).

Table 4.3: Environmental Compliance Incidents (ECIs) and EMP Non-Conformances (EMP NCs) at WWTPs



A second aspect of water management is the monitoring of groundwater to verify that Project activities are not producing contamination below the ground surface. Groundwater monitoring at HGCP has never encountered evidence of contamination and EMPNG is considering revising the frequency of groundwater monitoring events given the lack of impact. At the LNG Plant in 2018 a quarter of the samples from the 12 monitoring wells indicated possible fecal coliform impact, but subsequent testing of samples hand-carried to a laboratory in Australia indicates that the results were a misinterpretation and that bacteria (bacteroids) are not human fecal coliforms and the December 2019 samples were all clear. The situation at the HWMF at Kopeanda is not straightforward.

The presence of high iron, manganese, and ammonia-nitrogen concentrations interpreted to be due to anaerobic conditions in groundwater at the HWMF was first reported to the IESC from sampling events that took place August 2014 and March and August 2015. Cobalt from two wells, one upgradient and the other side-gradient, was encountered in consistent concentrations. Based on a review of monitoring data through 2019, landfill leachate impact to groundwater is potentially indicated mainly by the elevated ammonia concentrations in downgradient and cross-gradient monitoring wells.

To date the Project has not provided an explanation for the anomalous, non-conformant groundwater at the HWMF, but high iron, manganese and ammonia nitrogen are common contaminants in groundwater around leaking landfills. Although there are many references for this, a recent publication by Nyika and Onyari, 2019[2] describes a case history of this.

Part of the problem at the HWMF is that ground movements are bending three of the wells, making them difficult to sample. It is understood that for the time being it is possible to sample the wells and they would be replaced should they become non-functional. Also, as the reed bed does not have a liner, it is not possible to understand if the *******

[2] Nyika, J. and E. Onyari, 2019, Hydrogeochemical Analysis and Spatial Distribution of Groundwater Quality in Roundhill Landfill, Vicinity of South Africa, Air, Soil and Water Research Volume 12: 1–8.

apparent groundwater impacts are due to infiltration from the reed bed or a leak in the landfill liner. It is understood that new groundwater monitoring wells downgradient of the reed beds and retention ponds are planned and it is hoped that additional monitoring data will help understand the groundwater environment at the HWMF. It is noted that the soils at the HWMF are clayey such that groundwater flow into the nearby Tagari River is at a very low rate and that there are no groundwater users in the vicinity of the facility, so it does not appear that the situation is causing a significant environmental problem.

4.1.3 Recommendations

1. EMPNG should make sure that there is complete upgradient and downgradient groundwater monitoring coverage for the entire HWMF, including the reed bed and that data continue to be gathered and analyzed.
2. A groundwater modeling exercise should be undertaken to calculate the extent of contamination and the rate of infiltration into the Tagari River assuming both the reed bed and landfill as potential sources. This should be part of an overall risk analysis to determine what mitigation measures, if any, might be required for groundwater management at the HWMF.

4.2 HAZARDOUS MATERIALS MANAGEMENT AND SPILL PREVENTION

4.2.1 Project Strategy

EMPNG's objectives are to prevent spills of hydrocarbons and chemicals and to respond effectively to spills should they occur. EMPNG also has standards for materials management where objectives are to avoid significant impacts associated with the procurement and use of raw materials and to use materials that are less hazardous or otherwise preferable from an environmental perspective, where practical.

4.2.2 Observations

Spill prevention continues to be effective. As discussed in greater detail in Section 3.3 of this report, there was only one Corporate reportable spill (>1 bbl) in 2019, and the spill did not have environmental consequences. The verification of hazardous materials management practice is something that requires field observation, which could not be undertaken for this review, but this is not an issue that the IESC has ever identified during the Production phase of the PNG LNG project.

4.3 AIR QUALITY AND NOISE

4.3.1 Project Strategy

EMPNG's objectives are to avoid significant impacts associated with the release of pollutants to air and meet applicable emissions and air quality criteria. Requirements for noise control are those identified in the IFC General EHS Guidelines.

4.3.2 Observations

The last stack testing was completed in August 2018 at the LNG Plant and all stacks were tested. Compliance was achieved for 19 stacks out of 22. Three Train 2 compressors were non-conformant with follow-up actions in progress at the time of the last field visit in February 2019. The last stack testing at HGCP took place in November 2018. All stacks in use were tested and compliant. Although stack testing was expected to be undertaken in 2019 the testing is now scheduled for 2020 and 2021. Changes to stack testing procedures were submitted for CEPA approval in December 2019 consistent with the MOC from June 2018 that has received IESC approval.

Flaring has generally trended downwards at Upstream and LNG Plant locations over the past five years with the exception of 2018 where upset conditions caused by the earthquake affected performance in March-April 2018 accounting for ~104 mscf at HGCP and ~1587 mscf at the LNG Plant. In 2019 the downward trend excluding 2018 continue with the best performance to date (Figure 4.6).

New noise monitoring equipment was purchased in May 2019 and results are now made with improved confidence. A new noise baseline surrounding Moro B and Moro X locations has been developed. Noise monitoring surrounding Project facilities has shown that noise is not an issue at the LNGP and Port Moresby Office monitoring sites for both day and nighttime limits. The most significant past noise issue has been the incinerator at the HWMF, but incineration has not taken place there for more than two years and the single noise non-conformance has been the

at-the-fence nighttime noise measured in association with the WWTP pumps/blowers at the HGCP. The final noise barrier (Figure 4.7) is in place and the at-the-fence noise levels now conform with standards.

Table 4.4: Five-Year Flare Performance

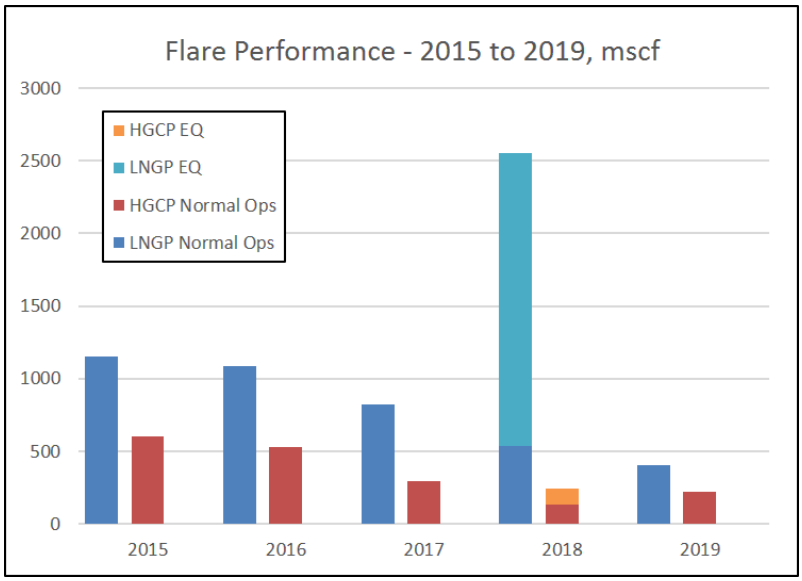


Figure 4.3: Final Noise Barriers at HGCP WWTP Blower Enclosure

4.4 EROSION AND SEDIMENT CONTROL

4.4.1 Project Strategy

EMPNG's objectives are to control significant erosion and prevent sedimentation of surface waters.

4.4.2 Observations

The earthquake caused serious problems with respect to slope failures in the Upstream area, including at the Komo airfield and along the pipeline route. In particular, there was major damage to the drainage infrastructure at the

Komo Airfield. Work to undertake repairs along the pipeline route relate mainly to the establishment of erosion and sediment control systems (Figure 4.8), but the process is not simple and the target completion for all of the work is April 2024. The degree to which the Komo Airfield will be fully repaired is currently undergoing a study that will be available in March 2020, but much of the drainage control at the Komo Airfield has been reestablished as part of maintenance and repair activities (Figure 1.2). It is understood that a major new program is planned for permanent erosion and sediment control infrastructure at the Komo Airfield in 2020.

Figure 4.4: Installing Drainage at KP6

5 BIODIVERSITY AND ECOLOGICAL MANAGEMENT

5.1 INTRODUCTION

This section provides an updated record of IESC Observations and Recommendations associated with EMPNG's ecological management (both terrestrial and aquatic) including: implementation of the Biodiversity Strategy and related monitoring of areas potentially impacted by the project; the ongoing development and implementation of the biodiversity offset program (to address residual impacts); the reinstatement and regeneration of areas previously and newly cleared by the Project (including pipeline Right-of-Way (RoW), construction camps, quarries, etc.); the management of issues related to invasive species, pests and plant pathogens (including quarantine management of imports); and the avoidance of project-related induced access resulting from the construction/upgrade/retention of roads, tracks and the pipeline RoW corridor.

The whole Upstream Project area is deemed to be Critical Habitat in accordance with the 2006 version of IFC Performance Standard 6 (the loan was agreed in 2010), and therefore no net loss (NNL) of biodiversity is a key deliverable. EMPNG's approach to biodiversity and ecological management is described in the Biodiversity Strategy, the Biodiversity Implementation and Monitoring Plan and Production-phase EMPs, along with other associated documents.

Records from the EIS baseline studies and the Pre-Construction Surveys (see previous IESC reports for background) serve to establish the ecological conditions prior to ground disturbance/clearance or infrastructure development. These records include information on the presence and distribution of invasive species, and the locations of focal habitats and ecological sensitivities such as (but not restricted to): pinnacles that contain bat colonies; potential Bulmer's fruit bat (*Aproteles bulmerae*) colonies; bird-of-paradise and bowerbird display grounds and trees; large individual trees (>1m diameter breast height); areas of Pandanus swamp forest; swamps in sinkholes less than 50 m deep on Hides Ridge; and *Nothofagus* (beech) forest that will require special hygiene measures (due to risk of dieback as caused by pathogens such as *Phytophthora cinnamomi*). These detailed records have been compiled into a Register of Focal Habitats and Significant Ecological Features. This Register is being supplemented by information related to post-construction and current ecological conditions through ongoing monitoring studies and surveys.

5.2 BIODIVERSITY STRATEGY & IMPLEMENTATION

5.2.1 Project Strategy

EMPNG's commitment is to safeguard biodiversity in areas where the company operates and in particular, the biodiversity values in the Upstream area. The Biodiversity Strategy was developed to guide the long-term management of terrestrial and freshwater biodiversity within the Upstream area. The Strategy provides an overview of EMPNG's overall approach to mitigating impacts on biodiversity in alignment with the avoid, reduce, remedy, and offset mitigation hierarchy. The goal of the Strategy is to retain the biodiversity values of the Upstream Project Area on a regional scale for the long term. To achieve the overall goal, EMPNG's objectives are to:

i. maintain the intactness of the Upstream Area as a whole;
ii. conserve priority ecosystems;
iii. protect focal habitats; and
iv. identify, measure and offset significant residual impacts.

In order to achieve these objectives, avoidance, mitigation and monitoring of biodiversity values takes place at three levels:

- ✓ the large scale, which is the entire Upstream Project Area – biodiversity values at this scale include extensive intact forest, high levels of flora and fauna diversity and endemic species, unique assemblages of species, species of conservation concern, and biodiversity of importance to local communities;
- ✓ the medium scale, which is represented by particularly valuable areas referred to as 'priority ecosystems', including forests in the Hides Ridge and high-altitude Homa-Benaria Ridge areas, the Lake Kutubu area and forests in the Juha area; and
- ✓ the small local-scale, which are sensitive habitats referred to as 'focal habitats' and significant ecological features; these include caves and pinnacles, sinkhole swamps, upland streams, stream refuges in unstable landscapes, lowland rivers in stable landscapes, off-river waterbodies, flora/fauna/habitats of cultural significance and lekking trees/grounds.

To ensure that implementation of the Biodiversity Strategy is effective, the Biodiversity Implementation and Monitoring Program (BIMP) assesses on the ground performance against the following five Key Performance Indicators (KPIs):

i. intactness of forest;
ii. trends in species diversity and abundance;
iii. conditions of focal habitats;
iv. occurrence of invasive species/pathogens; and
v. offset gains.

Four Programmed Monitoring Activities (PMAs) are used to collect information for analysis against these KPIs:

- ✓ PMA-1: remote sensing of broad-scale land cover, designed to monitor forest loss, land use change and degradation in the Upstream Area as caused by impacts that are directly Project-related, indirectly Project-related (third party, induced), non-Project (third party, expansion of pre-existing activity), and/or natural change (e.g. landslide). Landsat data was acquired for 2009, 2011, 2013 and 2015 periods for the entire Upstream Area (UA), and higher resolution RapidEye data was acquired for 2011, 2013 2015 and 2017 periods for a linear infrastructure (LI) corridor containing the PNG LNG RoW, facilities and all other infrastructure within the Upstream area.
- ✓ PMA-2: 'condition' surveys of focal habitats and significant ecological features adjacent to and in the vicinity of the pipeline RoW, facilities and other infrastructure.
- ✓ PMA-3: specialized biodiversity surveys, designed to collect and analyze flora, fauna and ecosystem data both in/around areas affected by the project and in protected areas enhanced and/or established through the offset program; and
- ✓ PMA-4: to assess the efficacy of the various components of the biodiversity offset program, and to establish, over time, EMPNG's progress with respect to achieving NNL of biodiversity.

In addition, three Environmental Management Plan (EMP) Protocols are used to inform the KPIs. IESC observations on their implementation are provided in sections of this chapter:

- ✓ Access Control: the protocol formalizes the monitoring of vehicle access to and along PNG LNG project roads and infrastructure to prevent potentially damaging third party activities resulting from access;
- ✓ Regeneration Monitoring: the protocol formalizes the collection and analysis of information relating to the regeneration of temporary work areas disturbed during construction and evaluated against established benchmarks; and
- ✓ Invasive Species and Plant Pathogens: the protocol formalizes monitoring of the occurrence and distribution of invasive species, pests and plant pathogens, and provides guidance on remedial actions.

EMPNG will evaluate monitoring results gathered via the various PMAs and EMP protocols, and depending on the significance of the findings, implement adaptive actions through management response.

To address residual impacts on critical habitat, and in accordance with the Biodiversity Strategy, EMPNG is implementing a Biodiversity Offset Program to ensure no net loss (NNL) in biodiversity. The program components include protected area planning, supporting the national biodiversity strategy, building conservation capacity, enhancing existing protected areas and establishing new protected areas.

EMPNG's Biodiversity Strategy (BS) and Biodiversity Implementation and Monitoring Program (BIMP) documents are publicly available for download at https://pnglng.com/Environment/Biodiversity-management.

5.2.2 Observations

Note: as this 2020 review was undertaken through desktop study only, the IESC were unable to observe and discuss issues to the same extent as for previous reviews. Therefore, the observations and opinion reported herein are based solely on presentations provided by EMPNG and documentation requested post-presentation.

5.2.2.1 Biodiversity Strategy, Implementation and Monitoring Program

Information on EMPNG's 2019 Environmental Compliance Incidents (ECI) and EMP Non-Conformances (NC) was provided and are covered in Section 3.3. PS6-relevant incidents are detailed here:

- ✓ An incident of mistaken clearance of vegetation along the Right of Way (RoW) previously recorded in 2018 was found to be more severe when the area was visited in 2019 by the New Guinea Binatang Research Centre (BRC) team, undertaking their biennial Regeneration surveys (see 5.4.2 below). Areas along the Row, totaling 204km in length, were found to have been cleared of vegetation over and above that which the Clan Caretaking Agreements (CCA) and EMP require to be cleared. A number of cleared areas were in primary forest, not disturbed during construction. This had not been picked up during EMPNG regular aerial survey. EMPNG duly reclassified the severity of the incident to Non-Conformance Level II following the discovery by the biodiversity team during the regeneration survey. Subsequent investigations following this NC severity reclassification identified a lack of clarity around the CCAs and Clan Caretaking Inspections (CCI). As a result, both CCA and CCI are under review to enhance the clarity of the width of RoW that is to be cleared; enhanced awareness activities will continue into 2020, including Environmental Advisor guidance to Community Affairs that deal directly with the clans undertaking the caretaking activities.
- ✓ During the PMA-3 survey (detailed below), EMPNG Biodiversity Team participants observed that in three places the spineline RoW vegetation clearance had been cleared back 32m (more aligned to the 30m RoW width used during construction) as opposed to the reinstated spineline RoW width of 10m[3] (construction RoW width being 18m on Hides Ridge[4] with operational RoW width being 10m or less). Again, investigations identified a lack of clarity around the allowed RoW width in the CCA and CCI. The CCA/CCI review and Project responses noted in the bullet above are the same for the Hides Ridge clearance incident.
- ✓ As described more fully in Section 5.3.2 Induced Access below, an increase in opportunistic cutting of old mangrove trees has been observed at the LNG Plant pipeline landfall RoW and at the outer security fence perimeter. Multiple observations of people with laden trucks have been made where people are harvesting mangrove from areas made more accessible by Project infrastructure – these incursions were recorded as an ECI and an EMP NC in 2019. Mangrove cutting had been noted and observed by IESC previously, but as fence-line security cameras are now being utilized to capture incursions, evidence and images of the perpetrators has been gathered. Again, Environmental Advisors are working with Community Affairs to reiterate land access restrictions, and the Project has placed large concrete blocks in the way of access points in an attempt to deter vehicular access.
- ✓ A large number of fish (Carp and Tilapia) were found dead within the four sewage treatment retention ponds at HGCP – these are invasive species, and contrary to EMP requirements. EMPNG investigated and although not certain, concluded the most likely scenario was that the invasive fish were introduced by people on site. Site induction, employee engagement and signage has been and will continue to be actioned.

Biodiversity Monitoring Program

Monitoring campaigns have continued on a one/two-yearly cycle as noted in previous reports, and Program Monitoring Activity (PMA) updates are provided below:

- ✓ PMA-1 Remote sensing update:
  - Field assessment of 2017 analyses: As IESC noted in our last report, following the analysis of 2017 RapidEye remote sensing data, a number of areas had been deemed 'priority inspection zones' because land cover change had been detected near Project roads/infrastructure/facilities – ground-truthing allows the identification of whether the change is deemed to be third-party (including whether potentially indirect impact from enhanced access) or Project-caused. During 2019, additional desktop review using higher resolution imagery identified (and excluded) a number of those sites deemed to be definitely (a) related to ongoing Project activities or (b) *not* related to Project-induced enhanced access. Remaining priority inspection sites were flagged for on-the-ground follow-up to assess whether land cover change/forest degradation was actually third-party clearance or attributable to the Project. Where accessible by road, these sites were visited in person, otherwise were surveyed visually by air via overflights. As a result, EMPNG concluded that only one of the sites where land use change was observed indicated actual clearance, and this was deemed to be Project-related planned clearance, near the original Angore tie-in. At a number of sites where the reason for land use change or forest degradation was not immediately clear, these will continue to be monitored for any further change, and attribution decided following further analysis/ground-truthing.

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[3] Mitigation measure M76 as per construction phase Ecology Management Plan regarding post-construction RoW width being 15m.

[4] Mitigation measure M77 as per as per construction phase Ecology Management Plan Hides Ridge design criteria being 18m (construction width). Note: In theory this states that the Hides Ridge RoW would be allowed to regenerate, and the accompanying road width would be limited to 10m.

- 2019 remote sensing campaign: Sentinel-2 imagery was captured during 2019, as per the reduced monitoring footprint chosen to focus more closely on the linear infrastructure, priority ecosystem areas and existing/new conservation areas related to the offset program (versus the full 'Upstream Area' as undertaken previously). The Project is transitioning to a new remote sensing specialist service provider (IESC has received the scope of work) and is piloting the use of radar data to work around persistent cloud cover issues. The Project advises the PMA-1 report detailing the 2019 remote sensing analyses will be available in the second half of 2020.
- The IESC note the PMA1 Protocol (S.8.2.7) provides a number of examples of anthropogenic change resulting from third-party clearance that would be deemed indirect impacts related to the Project (and therefore contribute towards an assessment of whether broad-scale[5] loss/degradation of forest has occurred). The IESC recommend all instances of forest degradation/land use change considered potentially Project attributable (direct and indirect), along with their resulting attribution features/justifications and monitoring/mitigation measures, should be clearly documented for future reference.
- In response to the IESC Recommendation that the Project adopt their remote sensing contractor's Recommendation to keep the frequency of remote sensing/analysis monitoring at two-yearly intervals (versus EMPNG's proposed move to five-yearly monitoring from 2019), the Project responded that a decision will be made following analysis of the 2019 imagery, and following input from a workshop where the Project's technical contractors would help inform adaptive management.

✓ PMA-2 Visual observations of 'condition', update on surveys of focal habitats & significant ecological features that were avoided or may have been affected as a result of construction of pipeline RoW, infrastructure or facilities:

- Field visits were made to survey 22 sites during 2019, with the conclusion being that all sites assessed remain ecologically functional. The field team noted that streams and cave monitoring sites in close proximity continue to be used by local communities, as was the case prior to construction of the RoW. The Project advised that the site considered potentially susceptible to dieback (#622) (due to disturbance from construction activity and its proximity to areas showing dieback) continues to not indicate any occurrence of dieback. PMA-2 sites no longer accessible due to the extent of natural revegetation are now deemed no longer affected, and that ecological condition post-impact is in the process of restoration or already restored. Attempts to access some of these sites may actually affect natural restoration processes, so sites deemed inaccessible will no longer be monitored regularly through PMA-2 fieldwork.

✓ PMA-3 Biodiversity survey updates:

- The third of the two-yearly rapid biodiversity surveys were undertaken during Aug-Sept 2019 at two Biodiversity Assessment Areas (BAA), namely Hides Ridge and the Agogo Range near Moro – preliminary results were not available at the time of writing this IESC report, and the full report should be available during the second half of 2020. EMPNG advise that an increased number of PNG Nationals participated in the survey team, led again by Dr Stephen Richards of the South Australian Museum in Adelaide. Capacity building is considered a key aspect of the fieldwork, and the inclusion of additional PNG Nationals ensures specialty local knowledge of flora/fauna enhances the survey effort. Full use of camera traps was made during this campaign following their successful inclusion in 2017. Environmental genomics is being trialed through analysis of soil and water samples from both PMA-3 survey BAAs; a report from Year 1 (2019) of the 5-yr program will be available later in 2020.

✓ PMA-4 Evaluation of the efficacy of the offset program, tracking progress in achieving NNL of biodiversity:

- Scorecards designed to measure and track progress in each of the components are detailed in the PMA4 protocol (dated 2017). As noted in our 2019 report,
- the detailed protocol scorecards are not being used to measure progress of enhancement/management of the protected areas and thus contribution towards NNL. Instead, the Project provided a high-level bullet of progress for each offset program component.
- the Project advised a single KPI would be adjusted from a generic 'offset gains' to include 'trends in size and quality of conservation areas' associated with the Project offset program (where 'quality' and 'condition' were being determined by rapid assessments at the Lake Kutubu WMA and Wau Creek/Veiru Creek in the Lower Kikori, undertaken in 2017).

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[5] 'Broad-scale' is not defined in the Protocol. Defining the extent of what constitutes broad-scale would make BIMP performance indicators measurable and aid adaptive management.

- The PMA4 Protocol has not been updated to reflect a current methodology for tracking progress in achieving NNL, linking in outputs from PMA1, PMA3 and the NNL Verification Approach discussed in 2018/early 2019[6]. The IESC is not aware of how/whether condition and quality were derived from the 2017 PMA3 surveys. The IESC recommends EMPNG to update the PMA4 Protocol to reflect how offset efficacy in achieving NNL via Components 4 and 5 will be measured and tracked, especially with regard to better understanding how outputs from PMA1 and PMA3 will inform the NNL calculations, and the verification process going forward.
- Components 4 and 5 are the primary direct mechanisms to achieve NNL in terms of enhancing existing and establishing new protected areas. From the perspective of monitoring and understanding progress in the Project's implementation of enhancement work at existing protected areas (Component 4), the Project advises that the 'Lake Kutubu Enhancement Program' document is still the current program of work. The document is dated 2014 including an indicative program timing of 2013-2015 – however, we are not aware whether the workstreams and activities contained within the program are used as the basis for reporting progress. See next sub-section Offset Component 4 for related IESC observations.

Freshwater Ecology

EMPNG have undertaken freshwater ecology (changes in macroinvertebrate community composition and diversity) sampling at a number of sites since 2010 (pre-impact) to assess the recovery of watercourses previously affected during construction. Through time, as results indicate that affected sites return to baseline/control/reference conditions, surveying is discontinued; a limited subset of sites are still surveyed, generally upstream/downstream of the HGCP and Komo airfield.

We noted in the 2018 IESC report that freshwater monitoring was unable to be performed during 2017 due to security reasons, and these activities were to be deferred to 2018. Due to the Feb 2018 earthquake, freshwater ecology surveys were instead undertaken in April 2019, where 6 sites were assessed..

Despite the February 2018 earthquake, results indicate that sites downstream of the HGCP continue to recover, including the Akara Creek site heavily impacted during 2012. In general, 2019 results indicate that most site remain similar or 'stable' when compared to the 2016 results.

At both sites downstream of Komo (WAKU1 and KOM4), the multivariate analyses continue to indicate much higher variability over time at the impacted downstream sites when compared with reference sites, although tracking towards reference sites. Therefore, impacts appear to still be present for Ariago Creek and the Wakuba River downstream of the Komo airstrip. Macroinvertebrate indices confirm the improvement observed at Akara Creek; KOM4 downstream of Komo remains impacted with low diversity although has shown some improvement. Overall 'embeddedness' (indicating the level of sedimentation and resulting potential for habitat smothering) showed a slight increase at both HGCP and Komo downstream sites.

Periodic freshwater ecology monitoring will continue.

5.2.2.2 Biodiversity Offsets

Offset Framework & Technical Rationale

No updates were received for this review. As noted in our 2019 report, and related to PMA4 observations above, key to verification of losses and gains, and compliance with PS6 requirements for Natural and Critical Habitat, will be the ongoing implementation of the Project's monitoring program, not least the use of remote sensing and expert-led biodiversity field surveys.

Offset Program Design and Early Implementation

To achieve NNL, EMPNG's offset program combines both direct and indirect (enabling) components. The company has provided the IESC with updates on each component:

✓ Offset Component 1: Protected area planning. Support to CEPA[7] in meeting its international Convention on Biological Diversity (CBD) commitments via production of a 'Protected Area System Plan' for a Kikori-wide river basin (on World Heritage 'Tentative' list):

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[6] Biodiversity No Net Loss Accounting for the PNG LNG Project, Dec 2018 – we believe Draft V10.2 20181213 is the latest version seen by IESC

[7] Conservation and Environment Protection Authority, PNG Government.

- As noted in the IESC 2019 monitoring report, EMPNG consider this component complete due to the publication of the 'Protected Area Planning for the Kikori River Basin' report written by WCS in 2017, and the repeated yet unsuccessful efforts to engage with CEPA on such planning. EMPNG consider that further work in relation to conservation areas in the Kikori River Basin be implemented as part of the establishment of protected areas covered in Components 4 and 5 below.

✓ Offset Component 2: Support the National Biodiversity Strategy and Action Plan (NBSAP). EMPNG's focus has been to support communication and networking initiatives:

- 2020 update: two further Communicating Conservation meetings were held during 2019, with 51 and 100+ attendees respectively, including representatives from an additional five provinces over those attending in 2018 – see figure below indicating the broad distribution of participants. Attendees included those from local communities, the conservation community, government, research institutions, industry and development agencies. Themes were 'Life Below Water' and 'Development and Research Challenges'. One key meeting output was the agreed need for the PNG IUCN Red List to be updated to provide more clarity on species conservation priorities. Two further newsletters were also published and circulated during 2019, featuring topical conservation news stories written by partner PNG Mama Graun Conservation Trust Fund.

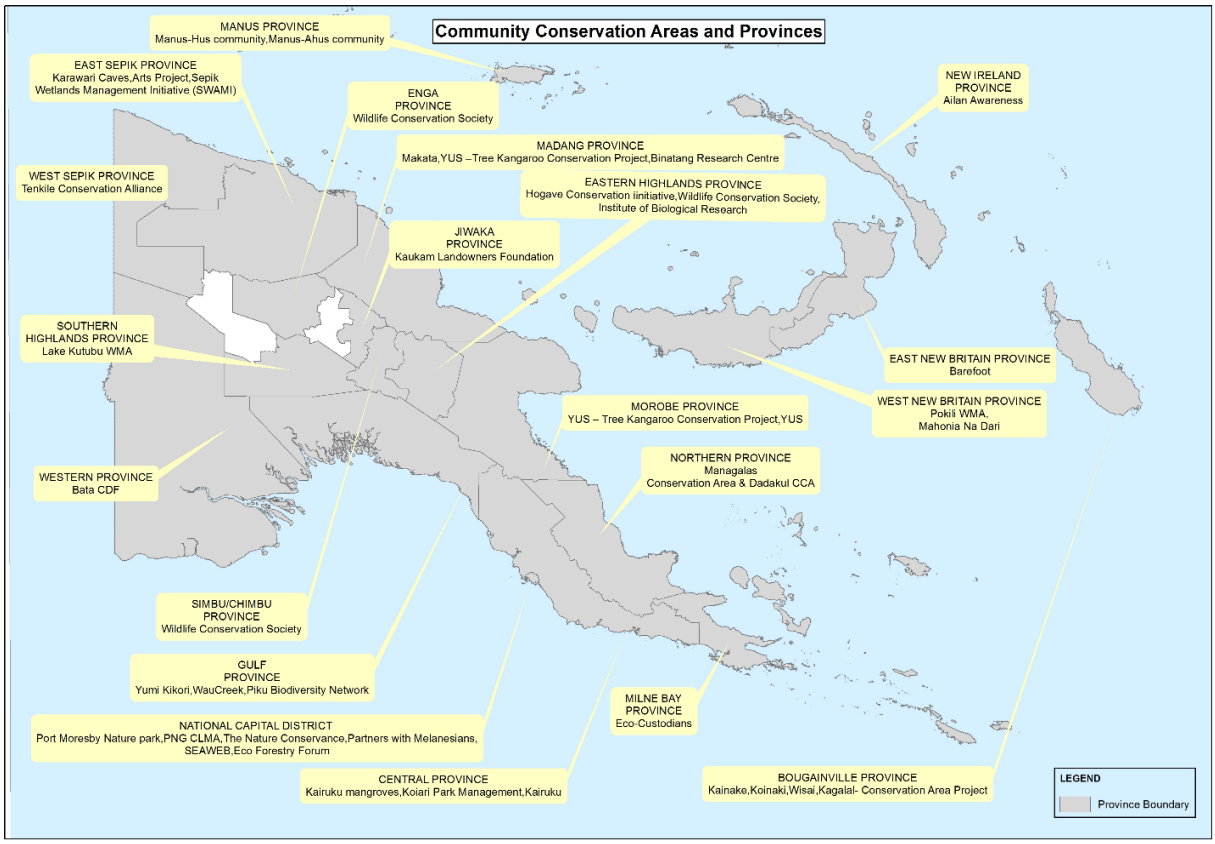

Figure 5.1: Distribution of Community Participants at EMPNG Biodiversity Meetings 2020

- EMPNG advise that participant feedback continues to indicate a great appreciation for the opportunities these networking and collaborative workshops provide, not least as they allow small local and provincial conservation projects valuable opportunities to meet with CEPA representatives and government ministers. Beyond 2020, the Project has advised that they plan to reduce funding for this Component – they are actively seeking co-sponsors willing to help co-fund and support an ongoing program.

✓ Offset Component 3: Enhancing Conservation Capacity Program (ECCP). EMPNG's support is focused on developing and institutionalizing Post-Graduate Diploma and Masters degree courses at University-PNG (U-PNG), providing scholarships, and establishing a framework for placements and mentorships with field-based conservation NGOs:

- 2020 update: 42 community conservation practitioners graduated with Certificates in Conservation Biology in Dec 2019. In addition, ten students have successfully completed their Post-Graduate Diplomas in Biodiversity Conservation at University of PNG, having started in 2018 and graduating in April 2019. Finally, four Masters students are scheduled to graduate in 2020 (Note: EMPNG funded and worked with Mama Graun and the University to develop the Masters and Post-Graduate Diploma course modules and integrate the modules to become taught courses at the University). Data on annual intake and graduations to date are shown in the Figure below. .
- EMPNG funding for the UPNG Post-Graduate, Masters and Certificate training under the current arrangement with Mamagraun Trust Fund ended in 2019. A new format for funding is being explored currently with potential partners. The Project advises they continue to be committed to supporting the formal institutionalized capacity building program into the future.

Table 5.1: EMPNG Supported University of PNG Courses, including Intake and Graduations To Date

	Target # Graduates	Enrollment year	Graduation year	# Graduates	
				Completed	*Enrolled*
Certificate in Conservation Biology	200-300	2017	2017	47	47
		2019	2019	42	42
Post-Graduate/ Bachelor of Science Honors	9	2018	2019	10	10
		2019	2020	-	5
Masters in Conservation Biology	3	2018	2020	-	4
		2019	2021	*planned*	
		2020	2022		
		2021	2023		
		2022	2024		
		2024	2026		

✓ Offset Component 4: Support for existing protected areas.

Enhancement of the Lake Kutubu WMA (Wildlife Management Area) is the primary focus for achieving this component. EMPNG has supported an on-site Coordinator role to work with WMA Committee for several years, and the Committee hold regular quarterly meetings. EMPNG receives a quarterly report from the on-site Coordinator. Initial priorities have been to build capacity with the aim to develop and implement a protected area management plan. Ultimately, the Project should ensure the area is managed for biodiversity (as per PS6 2006 requirements) and achieves biodiversity conservation gain to offset residual impacts within EMPNG's mid-elevation zone:

- 2020 update: The Project advises that capacity building of the WMA Committee has continued – a USD 15,000 fund from Ramsar allowed for training of the Committee on wetlands conservation and the Lake Kutubu Ramsar site in particular. As part of this program, the Committee visited a number of elementary/primary/secondary schools within the Ramsar site, conducting awareness raising sessions. The Committee has also continued to implement components under their successful UNDP-Small Grants Program (UNDP-SGP) award reported on previously – this includes a fish monitoring survey although results were unavailable at the time of writing. A Review of the program was undertaken during a visit by the UNDP-SGP Manager, and the Project advises that their assessment was that program activities and reporting have been outstanding and delivered on time. The Committee also continued their participation in the Kundu and Digaso annual festivals, which help to promote the Lake Kutubu WMA across the area.
- As noted under PMA4 above, progress made on offset implementation at this mid-elevation level is generally provided to IESC as general highlights. Although the Project advises that the Project's 2014 Lake Kutubu Enhancement Program document remains the current program plan for detailing site-specific Lake Kutubu enhancement, the workstreams and activities contained within the document are not used as the basis on which progress is reported, and the indicative program timing within the document is out of date. The IESC recommend EMPNG to revisit the Lake Kutubu Enhancement Program document to ensure it is current and reflects the Project's complete program of site-specific activities for the

implementation of an offset at the Lake Kutubu WMA protected area. In addition to the valuable general updates usually provided, the IESC requests that future Component 4 Lake Kutubu updates include a more systematic representation of progress made as per the program workstreams, activities and intended conservation outcomes.

- Delivery of key offset design/implementation components will provide assurance that the offset is being managed for biodiversity and that enhancement of the conservation aims of the projected area will be delivered.

✓ The Offset presentation provided to the IESC includes a diagrammatic Summary of Progress slide for Lake Kutubu. It indicates that:

- the Biodiversity Values of the WMA have been confirmed – as this stage is marked as completed, we request this information be provided to the IESC, and detail on the process used to define these.
- enhancement and/or management plans have been developed/updated – as this stage is marked as completed, we request this information be provided to the IESC, and detail on the process used to develop/update these.
- Previous updates to IESC in 2016 and 2017 have indicated that development of Conservation Objectives would be a focus for the following years – if these have been developed, we request these also be provided to the IESC, along with detail on the process used to develop these.

✓ Offset Component 5: Establishing new protected areas.

1. at the Lower Elevation Zone (0-600m), EMPNG's intention is to establish a Lower Kikori Resource Use Management Plan (LKRUMP), so as to offset residual impacts on biodiversity values affected in the Project's lower elevation footprint. The creation of a new community based, regionally-gazetted protected area (Community Conservation Area) will be in the vicinity of the existing Aird Hills WMA. To achieve this, EMPNG plans to work with former Barging Route Waterways Committee members and the Aird Hills WMA Committee, and supports a coordinator (based in Kikori Station at times) to assist with support to the communities and offset program:
   - 2020 update: The Project continues to engage and work with communities in the Kikori Delta using the process of initial community engagement, resource mapping, reviewing the resource mapping, demarcating sites with GPS, and then dialogue to make an initial identification of land for conservation. During 2019, EMPNG advise that the team had successful engagement with ten communities, with five communities now being at the stage ready for establishment of Conservation Deeds, and another five being actively engaged on resource mapping and GPS tracking. Other tribes have indicated their interest to participate in conservation efforts. An event which EMPNG state was very well received was the gathering of representatives from the five communities ready to proceed with development of Conservation Deeds, which brought together approximately 130 participants that share common boundaries, indicating their willingness to work together to conserve common areas. A community-based conservation organization has been formed, called Yumi Kikori; the organization will be fully registered with its own constitution, will elect office bearers and an organizational structure will be developed during 2020. Yumi Kikori have already arranged a successful fishing competition for invasive tilapia from the Kikori waters. Invasive species awareness forms part of EMPNG's program.
2. Representative offset locations in the Upper Elevation Zone (montane >1200m) – biodiversity at this higher altitude represents the largest residual impact for the Project i.e. the biodiversity loss in this montane zone was larger than the mid or lower elevation areas. Therefore, the proportion of biodiversity gain required, through the creation of ecologically comparable areas managed for biodiversity, is highest here:
   - 2020 update: EMPNG advise they had no opportunities for engagement in 2019.
   - The IESC recognize that there have been multiple obstacles and challenges in establishing an offset program in this upper elevation zone including earthquake, government elections, provincial boundary changes and significant security concerns. However, as residual impacts from the commencement of construction footprint in this area date from 2010, a time-lag of at least ten years exists between biodiversity loss and the likelihood of any gain being demonstrated. In the IESC's opinion, the Project should aim to prioritize development of an approach that will deliver NNL in this zone, working with stakeholders to determine the best sites for conservation, so that an appropriate offset program can be designed then implemented. PS6 requirements for NNL and company commitments means that Lenders would be looking for greater progress made during this timeframe – therefore the IESC raise this as a Level 1 non-conformance in the Issues Table. The IESC acknowledge and note the Project's observation that although security issues have prevented EMPNG's progress so far, the situation appears to be improving. In addition, we also note that the creation of a new position within the

biodiversity team sited at Hides should provide greater opportunities for community engagement going forward.

5.2.3 Recommendations

1. All instances of forest degradation/land use change observed through PMA-1 that are considered potentially project attributable (direct and indirect), along with their resulting attribution decisions/justifications and monitoring/mitigation measures, should be clearly documented for future reference.
2. EMPNG to update the PMA4 Protocol to reflect how offset efficacy in achieving NNL via Components 4 and 5 will be measured and tracked, especially with regard to better understanding how outputs from PMA1 and PMA3 will inform the NNL calculations, and the verification process going forward.
3. To more effectively demonstrate progress made in the Lake Kutubu WMA offset, the IESC recommend:
    a. EMPNG revisit the Lake Kutubu Enhancement Program document to ensure it is current and reflects the Project's complete program of site-specific activities for the implementation of an offset at Lake Kutubu WMA protected area.
    b. In addition to the valuable general updates usually provided, that future Component 4 Lake Kutubu updates to Lenders/IESC include a more systematic representation of progress made as per the program workstreams, activities and intended conservation outcomes.
    c. The provision of key information relating to delivery of key offset design/implementation components, to provide assurance that the offset is being managed for biodiversity and that enhancement of the conservation aims of the projected area will be delivered:
        i. The Offset presentation provided to the IESC includes a diagrammatic Summary of Progress slide for Lake Kutubu. It indicates that:
            – the Biodiversity Values of the WMA have been confirmed – as this stage is marked as completed, we recommend this information be provided to the Lenders/IESC, and detail on the process used to define these;
            – enhancement and/or management plans have been developed/updated – as this stage is marked as completed, we recommend this information be provided to the Lenders/IESC, and detail on the process used to develop/update these.
        ii. Previous updates to IESC in 2016 and 2017 have indicated that Conservation Objectives would be a focus for the following years – if these have been developed, we recommend these also be provided to the Lenders/IESC, along with detail on the process used to develop these.

5.3 INDUCED ACCESS

5.3.1 Project Strategy

EMPNG's objective is to control vehicle access to Project roads and infrastructure, to prevent potentially damaging third party activities through enhanced access.

EMPNG has retained a number of RoW construction access tracks/roads for permanent use during the Production-phase, so as to allow emergency access, maintenance and delivery of fuel to above ground installations (AGIs), such as main line valves (MLV), check valves (CV) and cathodic protection stations (CP). Background on the justification for access and methods of access control is provided in the EMP and in previous IESC reports detailing our opinion on the status and effectiveness of each vehicle access control.

EMPNG's strategy is that access will generally be allowed only to EMPNG vehicles. The Project's management plans state access by third party vehicles serving operational needs may be sanctioned subject to prior approval from EMPNG, and that access by landowner vehicles may be sanctioned subject to approval from EMPNG. In both cases, access will be authorized only by designated EMPNG personnel. Vehicles will be inspected as deemed appropriate. A Vehicle Monitoring Plan (VMP) describes the process to be followed for vehicles seeking authorization to use EMPNG roads, and data is being gathered on type of vehicles passing through points where Access Monitors are located.

CEPA's Environmental Permit states that EMPNG is "required to establish and maintain systems to ensure project infrastructure and road systems are not used in any way to provide support of logging activity or any other uncontrolled access. Prevention of access should continue until such time as natural vegetation regrowth prevents their use."

5.3.2 Observations

Ownership of Roads / Infrastructure and Responsibility for Mitigation

EMPNG advise there has been no change to previous updates regarding any requests from the government related to handover of Project road infrastructure such as the Southern Highway (Gove to Kantobo road section) and the Kaiam Bridge (see IESC report Nov 2016, Section 3.2 and Section 5.4.2 p.42-43 for background) – the IESC retain at the end of this section the recommendation noted previously.

EMPNG has completed an internal risk assessment developed in the eventuality of a request for handover of the Gobe-Kantobo section of the 'Southern Highway'. EMPNG intend to develop an MOU with the government to detail commitments for environmental and social protection.

The Project road linking the Kopi shore base to the Kopi Scraper Station at KP was formally handed over to the government in 2016 following their request in 2015.

Access Control - Upstream

Although EMPNG's strategy summarized above is generally to only allow access to EMPNG vehicles, and that access by third party vehicles is only by prior approval, the Access Monitors stationed at the Project's Kantobo to Gobe road essentially allows free movement of vehicles along that 'Southern Highway' section although vehicle and destination details are recorded. A similar situation exists at the Project constructed Kaiam Bridge.

There remain a number of differences between the controls stated in the published Upstream EMP[8] (Dec 2013) and the control mechanisms actually in place on the ground. EMPNG advise that a revised EMP is currently being reviewed by CEPA, which more accurately describes the actual status of controls - this will be published in due course. – Until that time, the IESC list in Table 5.1 the differences between what the published Project EMP states and the actual controls in place. Note: the access points are listed in RoW order from the Highlands down to the Kikori River, whereas the published EMP access points are ordered differently.

Table 5.2: Status of Access Controls / Monitors

	Access location	Access reason	Current Vehicle Access Control/Monitor Status from EMPNG
1	Hides Ridge	Producing wells	As per EMP. **Manned** station at vehicle wash at base of well pad access road. EMPNG advise that all vehicle access is logged, and all vehicles washed on entry to the road.
2	CV-1 near Tagari River crossing	AGI (Above ground installation)	**Different from EMP.** **Unmanned** boom-gate between Angore WP-B and the RoW was installed but **unlocked** (due to ongoing works for the Angore pipeline and surface facility work) **Update**: EMPNG advise that the **gate has actually been removed** by the local community – therefore no physical control measure in place.
3	Angore well pad access road	Producing wells (future)	**Different from EMP.** Boom-gate installed but **open**, & **not permanently manned**. In an attempt to control access onto the well pad access roads, EMPNG has been working with the community on how the gate will be managed. **Update**: EMPNG advise they continue to have significant presence in the area due to Angore pipeline & surface facility work. Vehicle tracks have been observed in the area previously, as noted in recent IESC reports.
4	MLV-1 Benaria	AGI	**Different from EMP.** **No boom-gate** is currently installed. EMPNG previously advised that a locked boom-gate would be installed once the government has completed the installation of a permanent bridge to link Benaria Station to the public road. Vehicle Access Monitor are located at Benaria village, not at the Project bridge/infrastructure. The government has now completed the installation of the public bridge. IESC were advised in 2016 that the lockable boom gate would be in place and the

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[8] The version available to the public at www.pnglng.com is still the Dec 2013 version, hence the table above provides a comparison of Project intended access controls with what is actually in place.

	Access location	Access reason	Current Vehicle Access Control/Monitor Status from EMPNG
			temporary construction bridge would be removed before the end of the year - this did not occur due to security issues in the area. **Update**: EMPNG advise that a culvert on the road to the government bridge washed out in 2016, rendering the road impassable – this has not been fixed by the government. Therefore, **communities continue to use the temporary construction bridge and section of RoW access track running past MLV-1**.
5	MLV-2 & Homa-Benaria Ridge access track	AGI / Road	**Different from EMP.** The EMP states that access to MLV-2 is by helicopter and there is no vehicle access. This has not been the case, as the Homa Ridge construction access track was retained for use during Production. Boom gates (two) are installed along the Ridge track, one near MLV-2 and one at the intersection with the tax-credit public road. **Update**: the IESC were previously told these gates were locked but this is not stated in current updates. EMPNG did advise the Ridge access track was damaged in the 2018 earthquake and the track is not currently considered passable, therefore access is **currently via helicopter**.
6	MLV-3	AGI	As per EMP. Boom-gate installed and locked.
7	MLV-4	AGI	As per EMP. Boom-gate installed and locked.
8	CV-2, Moro	AGI	As per EMP. No EMPNG control. Rely on OSL road controls at Moro.
9	Agogo tie-in (KP101.8)	AGI	As per EMP. Boom-gate installed and locked.
10	Kutubu MLV (KP 107.5)	AGI	As per EMP. Boom gate installed and locked.
11	**Moro to Kantobo** OSL road, access to CP-1 (KP153). **Kantobo to Gobe** EMPNG road (incl. Heartbreak Hill & Mubi Bridge)	AGI / Road / Bridge / Road	Southern Highway - The EMPNG constructed Southern Logistics Route from Kantobo to Gobe, linking Moro to Kaiam. ***Access from the north*** *(Moro to Kantobo):* **Different from EMP**: The EMP states access is controlled via a locked unmanned boom-gate at KP164 near Kantobo. EMPNG maintains that due to community requests for access, this **gate is not in place**. Instead EMPNG rely on OSL road controls at Moro (KP95) and Manu (KP115). ***Access from the south*** *(Kantobo to Gobe, including the Mubi Bridge):* As per the EMP. Access Monitors record vehicles using the road at a manned boom gate at Gobe (a re-instated Chevron/OSL gate).
12	Gobe MLV	AGI	As per EMP. Boom gate installed and locked.
13	CP-2	AGI	As per EMP. Boom gate installed and locked.
15	KP232	AGI	As per EMP. Boom gate installed and locked.
14	Kopi shore base to Kopi scraper station	Road / Bridge	**Note**: This road was formally handed over to the government in 2016 following their request in 2015.
16	Kikori River Bridge	Road / Bridge	As per EMP. Boom gate installed and manned with Access Monitor (records vehicles using road).

EMPNG advise that aerial patrols have been completed for the entire RoW - these report there have been no observed signs of logging adjacent to the RoW or infrastructure, and no bypassing of access control equipment e.g. driving around gates. However, for 2020 they do report that the boom gate at KP-12 has been removed by the community – this boom gate was intended to control access to the RoW towards CV-1, in the vicinity of the Angore flowline works to Targari River crossing. We are advised this area has experienced high levels of unrest.

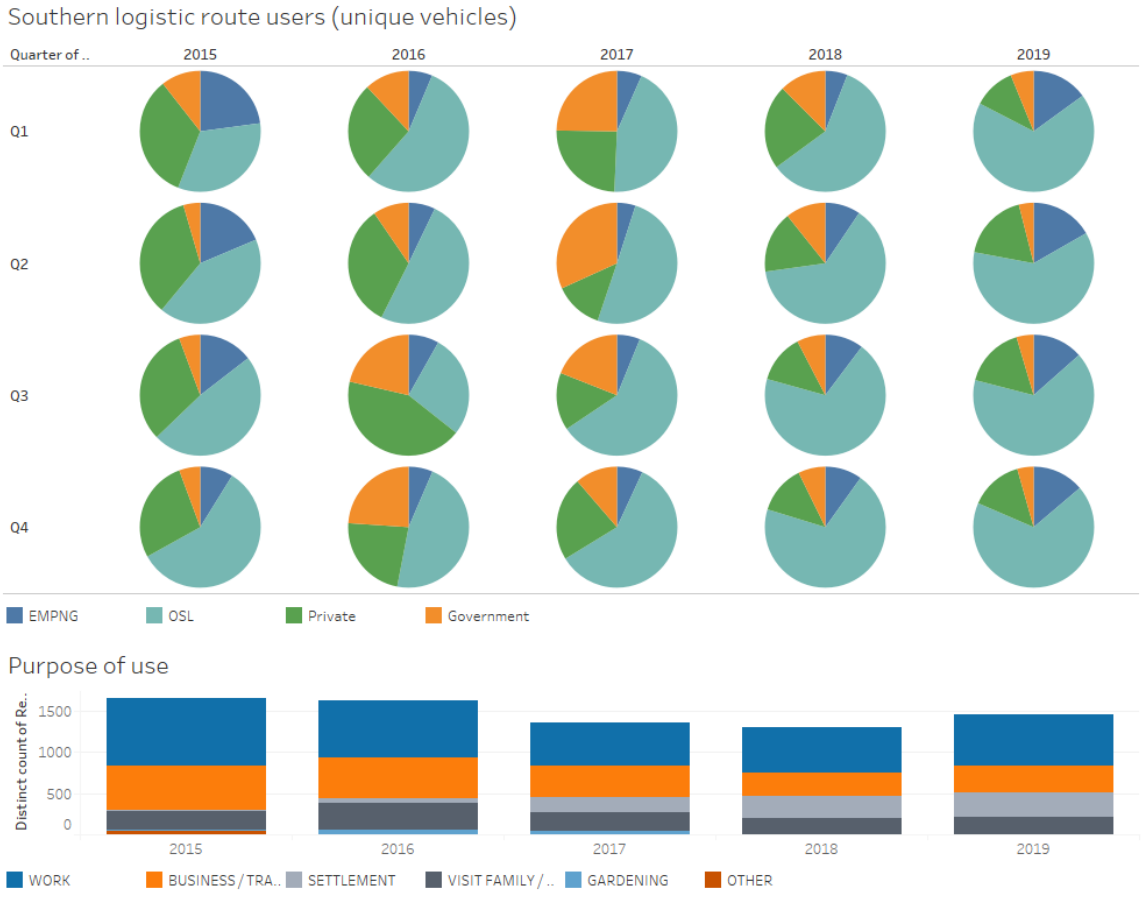
As this IESC report is based on desktop information only, we propose that the next IESC site visit include a road-trip from Moro to Kopi (as has been undertaken previously) to allow direct observation of access controls in place, including verifying presence and function of Access Monitors. Upstream of Moro, in addition to the usual helicopter flyover, the ability to visit and directly observe readily accessible access controls in place (where security allows) would also help provide further assurance to Lenders on the status of control measures in place. This would also allow for on-the-ground observation of reinstatement/regeneration at points along the pipeline RoW where this intersects with the OSL/EMPNG/public road.

Access Control – Upstream vehicle movements recorded

Regarding the recording and analysis of vehicle data, EMPNG has undertaken a review of how vehicle data was being recorded by Access Monitors, how vehicles were categorized, and how data was quality assured. The Project advise the review has resulted in improved data recording and vehicle data categorization, where categorization will be simplified and standardized with some historical data being regrouped. As a result, they conclude that improved analysis will be possible, and trends more easily visualized. An example visualization for the southern logistics route was provided (included below), but a more complete analysis will be available for the next IESC visit where a full suite of re-categorized data can be probed. The IESC seek to ensure that the historical context of observed vehicle use of Project roads reported previously are still valid and comparable to new data.

High level data for 2019 provided by the Project shows the Southern Logistics Route is mostly used by OSL and their contractors – representing 60% of road vehicles monitored at Gobe. Note: vehicle data breakdown/analysis from Benaria Station Access Monitor is no longer provided, last dataset seen was 3rd quarter 2015).

Table 5.3: An Example Visualisation of Newly Re-Categorized Vehicle Data



Access Control – LNG Plant

Mangrove regeneration at the LNG Plant is described below, however EMPNG advise that vehicle incursions continue to be observed accessing the mangrove areas at the pipeline landfall RoW and around the Plant outer security fences. Vehicle tracks were observed by IESC during our 2018 and 2019 visits in the backshore area, and old mangrove trees cut by communities observed in 2019. EMPNG have increased community liaison messaging, installed multi-lingual signs and have used fence-line security cameras to observe/record incursions.

EMPNG have now advised that landowners are cutting down old mangrove trees more frequently than observed previously. Security cameras have now captured laden trucks accompanying people cutting wood and extracting mangrove timber at the perimeter road that skirts the outer fence-line. In response, EMPNG advise that Environmental Specialists are working with Community Affairs to further increase community awareness and reiterate previous agreements on access restrictions. They have also installed large concrete blocks as barriers to vehicles driving through access points.

These incidents were captured in EMPNG's incident management system as an Environmental Compliance Incident and an EMP Non-Conformance for 2019, as these incursions create a situation in contravention of the EMP and their Environmental License.

5.3.3 Recommendations

1. EMPNG should ensure as part of any negotiations with the PNG government regarding transfer of ownership of roads/infrastructure that every effort is made to prevent any ecological damage through third party access to areas, and therefore allow the company to uphold their commitments made to Lenders with regard to invasive species, induced access and ecological management. Potential risks need to be fully understood and effective mitigation options discussed.

5.4 REINSTATEMENT AND REGENERATION

5.4.1 Project Strategy

EMPNG's objectives are to promote regeneration of temporary work areas disturbed during construction and achieve vegetation succession according to established benchmarks. Where new ground is disturbed, the objectives are to establish stable landform conditions and create ground conditions conducive to natural regeneration to then achieve vegetation succession as above.

The Regeneration Monitoring Program, currently undertaken every two years, uses fixed and random sampling and a benchmarking scoring system to evaluate the progression of plant community succession within the Upstream area. Project-affected areas undergoing natural restoration are visited, and progress compared against benchmark sites determined previously. The methodology is detailed in Appendix 3 of the Upstream EMP available at ww.pnglng.com, and supplements EMPNG's regular aerial assessments of regenerating areas to check for evidence of encroachment or slope failure.

5.4.2 Observations

5.4.2.1 Reinstatement

As this review is a desktop review, the IESC are not able to provide direct observations on reinstatement/revegetation. As noted in the Induced Access section above, we propose a road-trip between Moro and Kopi during the next IESC visit as this would also allow for on-the-ground observation of reinstatement/regeneration at points along the pipeline RoW where this intersects with the OSL/EMPNG/public road. Coupled with the usual helicopter overflight, this will allow IESC to report more fully on reinstatement in the next IESC report.

5.4.2.2 Regeneration Monitoring

For LNG Plant mangrove restoration, EMPNG have provided comparative photographs of Jan 2019 vs Jan 2020 photo-point views at the pipeline landfall RoW. A higher tide was apparent at the nearer shore Location A when the 2020 photos were taken, but at Location B an increased mangrove growth was perceptible when compared with equivalent 2019 images. Comparisons back to the first comparable photo-point year should indicate more clearly a level of progress difficult to observe year on year.

In the Upstream area (from Hides to Kopi) the BRC survey team completed the third Regeneration Monitoring campaign in 2019. The team surveyed a total of 69 plots (),. Results will be available during the first half of 2020 and will be reported in the next IESC report.

During the field surveys, the EMPNG biodiversity and BRC teams observed areas where extensive cutting of vegetation along the pipeline RoW had occurred (incidents as noted earlier in 5.2.2.1 above). Both regenerating and primary forest (that had not been disturbed during construction) were affected, with a total length of 204km along the RoW impacted. South of Moro, a total of 14 out of 57 previously used regeneration plots were affected, meaning these monitored sites are no longer able to contribute comparative regeneration data.

5.4.3 Recommendation

There are no recommendations on this topic at this time.

5.5 INVASIVE SPECIES, PESTS AND PLANT PATHOGENS

5.5.1 Project Strategy

EMPNG's objectives are to prevent invasive species (i.e. priority weeds and pests) and plant pathogens from entering or becoming established in (or in the vicinity of) their facilities and infrastructure, and contain existing priority weeds, pests and plant pathogens already present. A Weed Identification Manual has been developed, the Weed Monitoring Protocol revised (as per the revised audit approach in 2018), and a Register of Invasive Species, Pests and Pathogens was previously kept to track any changes in invasive species type, abundance and distribution (previously updated through external specialist audits). Now, records are made by EMPNG's external contractor MosquitoZone and staff members where weeds are noted and control measures performed.

The project footprint is split into separate Weed Management Zones (WMZs), each delineating broad ecological units based on previously understood patterns of distribution and abundance of weed populations; these zones were used for the phased mitigation approach as pipeline construction/reinstatement progressed through the Project area. Priority-1 (P1) weeds are defined as species that rapidly colonize disturbed areas and displace and/or invade native vegetation; the Project aims to control and monitor all P1 weeds and exclude them from all work areas through active control. Priority-2 (P2) weeds are defined as species that may rapidly colonize disturbed areas and displace native vegetation, but rarely invade natural habitats; P3 weeds are deemed low risk, receive minimal attention and may provide value in soil stabilization during regeneration.

EMPNG commits to manage the threat of spread of *Phytophthora cinnamomi* by preventing the spread or introduction of Type A2 into unaffected areas, in particular ecologically sensitive areas susceptible to senescence.

With regard to quarantine implications of imports into PNG, EMPNG has developed and adopted quarantine requirements which aim to prevent the importation and spread of foreign invasive species, pests, pathogens or disease; quarantine requirements are contained within a Quarantine Procedure.

5.5.2 Observations

5.5.2.1 Invasive Species

Weed monitoring and control

A 2019 weed monitoring campaign was undertaken by BRC in the first half of 2019 – for this desktop review, the IESC were advised that preliminary results are not yet available, and a final report had not been received. On further requesting information on any initial findings, EMPNG stated that *Piper aduncum* was noted to not be proliferating and advised we await the BRC report.

Considering the potential impacts related to the presence of weeds potentially related to project footprint, in the IESC's opinion it would be prudent for EMPNG to liaise closely with their contractors to ensure more timely provision of weed monitoring findings for targeted weed control.

As reported in detail in previous reports (in particular, IESC 2017 report), the IESC has flagged areas of concern in relation to weed reporting errors, historical data inconsistencies, and the adequacy of analyses presented, making it difficult for IESC/Lenders to determine whether risks raised in the EIS were being effectively mitigated. This included the requirement to be able to better understand whether weed presence, persistence, abundance and/or distribution changes observed were of actual ecological significance and how adaptive management was addressing any impacts not fully mitigated. A series of Observations have been issued (see Issues Tables in

previous IESC reports), and the IESC have made a number of recommendations related to weed management, as we have sought to encourage EMPNG to provide adequate information on weed distribution/abundance risks and areas of priority weed control.

Due to this being a desktop review, and as the 2019 weed monitoring results were unavailable to us, there has been insufficient opportunity to further consider potential risks arising from the Projects weed management approach. However, to follow up on IESC 2019 recommendations we include them along with EMPNG responses provided for our 2020 review, plus updated IESC observations.

2019 IESC weed management recommendations 1, 2 & 3:

The IESC recommend, as soon as it is safe to do so, that weed monitoring commence in the area between Kutubu MLV and the Hides Ridge wash-down to fill in the large geographical gap not covered in the revised weed audit approach, especially around the Homa-Benaria Ridge Priority Ecosystem.

When safe to do so, the IESC recommend prioritized dedicated vehicular access and Mobile Squad be sanctioned to allow effective weed control of the Homa Access road/MLV2 area/ Homa-Benaria Ridge.

Considering the increased expanses of disturbed/bare ground left as a result of the earthquake, plus the duration where access to some areas has been restricted due to security concerns, the IESC recommend the Project consider expanding the MosquitoZone9 (MZ) resources available to maximise targeted opportunities for weed control across the Upstream area. A single operative does not appear sufficient

EMPNG's response:

There is ongoing weeds monitoring/control between Kutubu MLV and KP107 managed by MZ in Moro. Weed audit in 2019 covered areas between Kutubu MLV and MLV2 at Paua.

Still there is no dedicated vehicle for pests and/or weeds control activities. EMPNG continues to manage this based on availability of resources.

EMPNG already have an ongoing weed monitoring program in place managed by Mosquito Zone onsite. Their scope covers Komo, HGCP, Hides Spineline and Well Pads, Angore, Pipeline and the AGIs.

IESC follow-up observations:

Following the Invasive Species presentation provided by EMPNG as part of this desktop review, the IESC requested further information on RoW weed control activities and priority control locations. In this regard, the IESC have a particular interest in the effectiveness of weed control in EMPNG's priority ecosystems, for example the pipeline RoW between HGCP and Kutubu, which includes the Homa-Benaria Ridge priority ecosystem. This Ridge area was deemed largely weed-free during Pre-Construction Survey (PCS) although later BioTropica weed audits noted the presence of P1 weeds within the area. Similarly, at the Lake Kutubu WMA protected area, where earlier weed audits had cautioned against *Ludwigia leptocarpa* becoming established in the particularly sensitive lake/swamp forest habitats – later weed audits had flagged *L.leptocarpa* needing extensive control in the vicinity of the lake.

In response, EMPNG provided a field observation spreadsheet and a weed control spreadsheet for MosquitoZone based at Moro:

- ✓ The field observation spreadsheet indicates a variety of weed observations and control follow-up, focusing at project facility sites e.g. HGCP, Hides Waste Management Facility (HWMF), LNG Plant. Hides Spineline RoW observations are included, but no pipeline RoW observations downstream of HGCP (KP-0) are noted.
- ✓ The weed control spreadsheet is maintained by MosquitoZone (MZ) and it tracks weed control field visits to discrete portions of the RoW, plus RoW Above Ground Installation (AGI) locations, by month for 2017-2019.
    - Scope: The spreadsheet contains no RoW locations upstream of the Homa Access Road/MLV2 (approx. KP-53). The MZ control spreadsheet indicates Desmodium sequex & Piper aduncum being the target P1 weed species for control at the Homa Access Road/MLV2.
    - Weed control visits: The weed control spreadsheet indicates that MZ made very few visits to the RoW between Homa Access Road/MLV2 down to Moro/Kaimari Market:
        - In 2017, MZ visited MLV2once in February The record shows that more visits are required due to the fact that P1 *Piper aduncum* is growing rapidly.

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[9] MosquitoZone have been EMPNG's weed control contractor.

  - In 2018, no visits are possible until Oct when a single visit indicates that floods hampered treatment in the infested areas, therefore MZ had difficulty treating (the reason provided is lack of Mobile Squad support, required when visiting areas when there are security issues).
  - No visits during 2019.
- Weed control visits: for the vicinity around north-eastern Lake Kutubu, through the Project's intersection with the WMA, MZ have not visited to control weeds since Oct 2018.

On seeking further information as to why the weed control spreadsheet contained so many blank location/months for 2018 and 2019, and how weed control is therefore being undertaken in these areas, EMPNG confirmed that MZ have not visited significant lengths of the RoW (excluding Hides Ridge) to control weeds during 2018-2019.

EMPNG's response above notes that the 2019 weeds audit undertaken by BRC covers the area between MLV2 and Kutubu – we have not yet seen these results. BRC's 2018 weed report indicated that the majority of sites between Komo airfield and Lake Kutubu (and thus including the Homa-Benaria Ridge) had to be excluded from their original 2018 list of survey sites due to security concerns.

Although earthquake recovery effort, lack of vehicles/accommodation and unavailability of mobile security squad are likely legitimate reasons why the MZ contractor has not been able to access certain areas at certain times, the fact that Priority Ecosystem areas such as Homa-Benaria Ridge and Lake Kutubu areas contain P1 weeds that are not being actively controlled is a potential risk that must be raised. We acknowledge that other teams (including BRC and in-house aerial surveillance) undertake weed monitoring of varying degrees. However, MZ are EMPNG's designated weed control contractor, and if they do not visit areas of the pipeline RoW, we conclude that weeds may not be as effectively controlled were these areas visited regularly. In Critical Habitat, and especially to protect the ecological integrity of Priority Ecosystems, the IESC again recommend that pipeline RoW weed control management be prioritized, and if there is insufficient accommodation/vehicles to allow the MZ operative access to a car to fulfill their weed control duties, then they should be deemed a higher priority for accommodation/access to vehicles and allocated Mobile Security Squad resources where necessary.

The IESC desktop review timeframe has not allowed for full interrogation of weed information (Note: EMPNG also provided 50+ zip files [one per week in 2019] each containing between 8-10 facility-specific vector control documents, that are not individually feasible to review in the timeframe allowed for this report). The IESC recommended in our 2019 report that the next weed monitoring report should include more analysis and interpretation specifically on P1 weeds as these have the greatest potential to affect areas where they are introduced, become persistent, or increase their abundance or distribution, as identified within the EIS. The IESC anticipate reviewing the 2019 weed monitoring report when it is available.

EMPNG have advised that their weed control contract will be transitioning from MZ to International SOS (ISOS) during 2020 (ISOS are an established existing provider of clinical services to the Project). On reviewing the scope of work provided, the IESC note it covers 'Upstream Field Sites' to include Komo airport, HGCP and associated buildings, Moro Camp B and Kopianda HWMF. The scope of work focuses on pests, with only scant mention of weeds ias a named example of work for the spineline. The IESC recommend that weed control for the pipeline RoW be specified and more clearly included in the scope of work for the replacement weed control contractor (Note: during report finalisation, the Project advised the intent is for the scope to include the whole RoW and will be amended).

Cane Toads

As reported last year, cane toads (*Rhinella marina*) are becoming an increasingly challenging invasive pest in the Upstream Highlands area. This toxic pest affects native fauna that die due to ingestion of their poison and can create imbalance across ecosystems wherever they are found. Following the detections of cane toads at Kopi Shore base during construction, at Tamadigi (around 2012/13), in Moro-B in 2015, at HWMF in 2016, and HGCP in 2018, a recorded increase in the number of sightings at HGCP and HWMF has prompted an increased Project response.

EMPNG has developed two objectives in relation to cane toad management: to (1) prevent these pests from entering the Hides Ridge Priority Ecosystem and (2) prevent the proliferation of cane toads at HGCP. Key Performance Indicators and measurement instructions have been developed. Monthly data from December 2018 is being tracked on Total Eggs & Tadpoles, and Total Juveniles and Adults, generated through the use of the Cane Toad Sighting report cards and control activities as we noted last year.

To help protect the Priority Ecosystem, EMPNG has updated the Cane Toad Vehicle and Cargo Inspection Procedure for use at Hides; a similar inspection regime is being developed/implemented for the Homa-Benaria Priority Ecosystem. We are advised there is mandatory cane toad inspection at the Hides wash bay. A dedicated

workforce of 25 locals has been hired to assist with control at Komo, HWMF and HGCP. A cane toad proof fence has been installed around the HWMF. Awareness campaigns continue.

The Project has sought external specialist monitoring and control guidance from Dr Stephen Richards, who leads the PMA-3 biodiversity surveys and is a world-renowned specialist in amphibian biology and conservation. In addition, George Dahl of BRC, a frog specialist, has assisted with monitoring and awareness raising.

5.5.2.2 Quarantine

The National Agriculture and Quarantine Inspection Authority (NAQIA) is the public-funded institution under the Ministry of Agriculture and Livestock whose role is the protection of Papua New Guinea from infectious pests and diseases that have the potential to seriously harm our unique animal and plant life and affect economic growth.

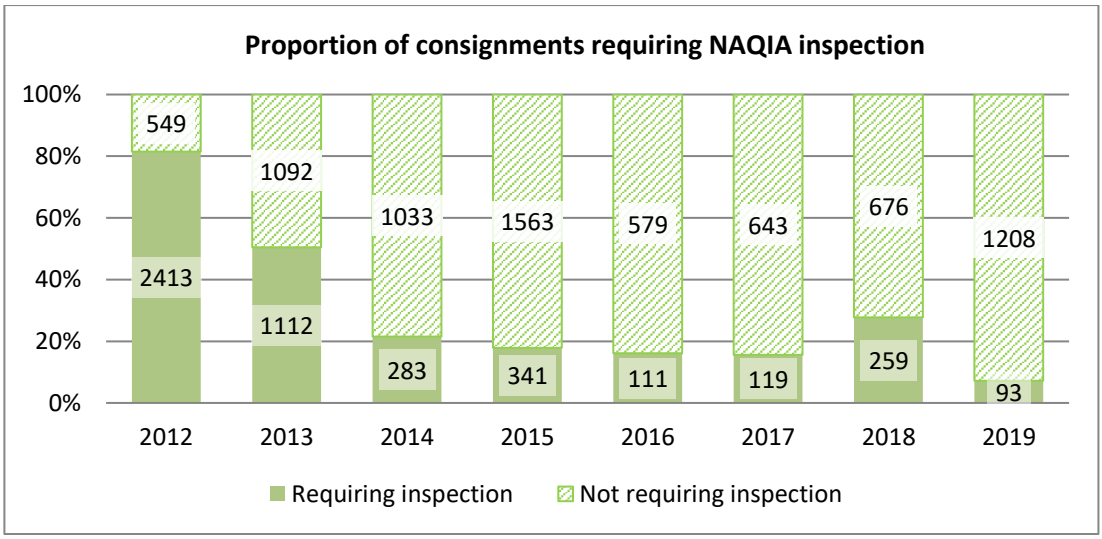
Prior to construction, a Lender concern was to ensure the project did not increase pressure on NAQIA resources, hence the IESC have tracked the number of NAQIA inspections of EMPNG-related imports. Of particular note has been to track the number of inspections that resulted in the need for re-fumigation once the cargo arrives in PNG:

- ✓ container inspections are typically triggered by inadequate/incomplete documentation accompanying the consignment, or the source of the consignment is a country that NAQIA deems to be higher risk. Thus, the likelihood of inspection is not always within the control of EMPNG or their Contractors; and
- ✓ container fumigations are meant to occur at the point of origin – this is a condition of EMPNG freight forward contracts. The need for re-fumigations shown in the bottom two graphs below are typically triggered by a suspicious item (e.g. insect) found during the NAQIA inspection on the container's arrival into PNG. Hence where a re-fumigation is indicated below, it should have been preventable by good housekeeping and effective contractor management at the point of origin of the consignment.

EMPNG quarantine management performance data for 2019 are included in the following two IESC graphs, presenting information on:

- ✓ the proportion of total consignments requiring a NAQIA inspection on arrival into PNG (see first figure below, showing numbers of consignments within the graph bars); and
- ✓ the proportion of those inspections that result in the need for fumigation of that consignment (see second figure below, showing the inspection outcome).

Table 5.4: Proportion of Consignments Requiring an Inspection by NAQIA



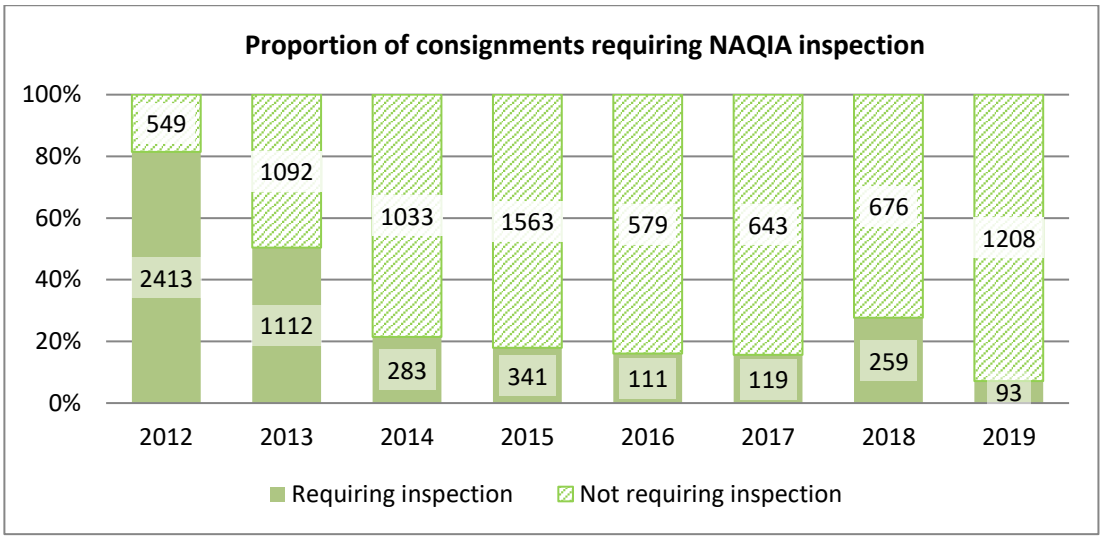
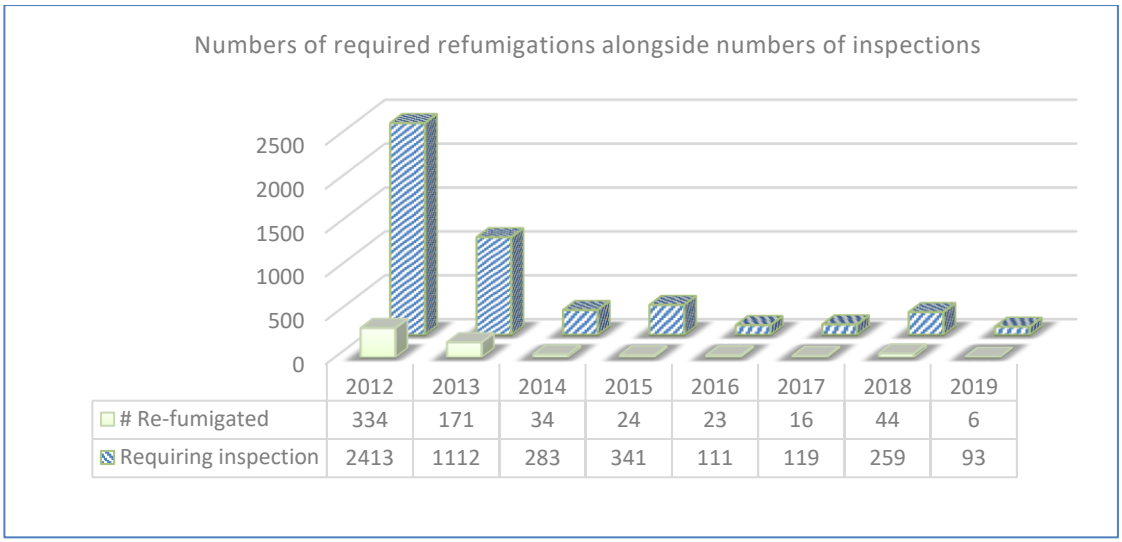
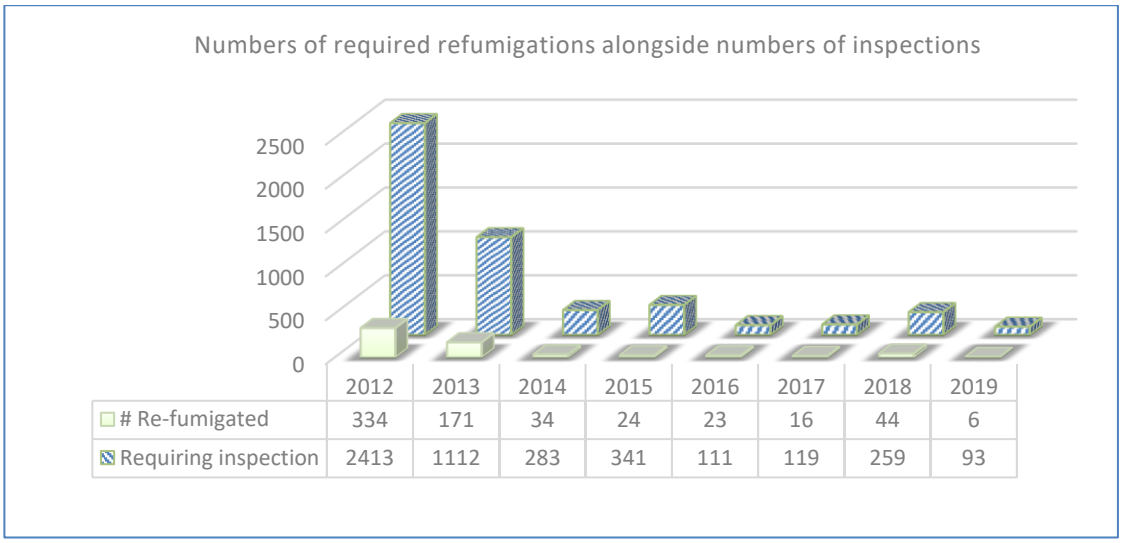


Table 5.5: Inspection Outcomes (i.e. If Refumigation Was Required)





Key points on performance in relation to inspections and fumigation include:

- ✓ Only EMPNG Production and the contractor Wood (previously known as Wood Group PSN) are currently importing consignments.
- ✓ Number of import volumes increased by 39% in 2019.
- ✓ However, only 6 re-fumigations were required in 2019 – the lowest rate since Project start-up:
  - 2 full container loads (FCL): one wooden package showed mold, and another was non-ISPM-15 rated wood was found
  - 4 less-than-container loads (LCL) where EMPNG cargo is transported in containers that also contain the cargo of other companies.
- ✓ Freight Forwarder (FF) is now present at all inspections by NAQIA, and the requirement for immediate notification by FF to EMPNG if any NAQIA concerns.

5.5.3 Recommendations

1. In Critical Habitat, especially to protect the ecological integrity of Priority Ecosystems, the IESC again recommend that pipeline RoW weed control management be prioritized, and if there is insufficient accommodation/vehicles to allow the MZ operative access to a car to fulfill their weed control duties, then they should be deemed a higher priority for access to accommodation/vehicles and allocated Mobile Security Squad resources where necessary.
2. The IESC recommend that weed control for the pipeline RoW be specified and more clearly included in the scope of work for the replacement weed control contractor.

6 SOCIAL

6.1 LAND ACCESS, RESETTLEMENT, AND LIVELIHOOD RESTORATION

6.1.1 Project Strategy

The Land Access, Resettlement and Livelihood Restoration Management Plan – Production applies to any new land access required during the Production phase and for managing the commitments for land that was obtained in the construction phase. This Plan supersedes the Resettlement Policy Framework developed for construction phase land acquisition. Livelihood restoration obligations for displacement that occurred during the construction phase, as well as evaluation of resettlement and livelihood restoration outcomes and the independent external audit of the resettlement and livelihood program, are also covered by this Plan and will be concluded in the Production phase.

The Plan defines the principles and approach to be used for management of the inter-linked activities related to accessing land, resettlement, and livelihood restoration. The content of the Plan is consistent with IFC Performance Standard (PS) 5.

Future tasks for land access, resettlement, and Livelihood Restoration remain under the Public and Government Affairs (P&GA) group.

6.1.2 Observations

6.1.2.1 Resettlement or Relocation Associated with Earthquake Effects

Voluntary Relocation

The Project has now fulfilled its obligations under the Agreements for assistance to voluntarily relocate 20 households found by the Project to be in unsafe conditions due to the 2018 earthquake.

Resettlement

One household near KP76 was displaced to enable Project access to the pipeline RoW for repairs of earthquake damage. The Project has now fulfilled its obligations for this resettlement under IFC PS5 and the Agreement between the household and the Project. The Project has been unable to evaluate the outcome of livelihood restoration (LR) assistance provided to one wife who left the area during the livelihood program and cannot be located. The IESC considers the case closed, but recommends that the Project:

- ✓ Keep detailed documentation for use in the event a future complaint is filed; and
- ✓ Revisit the issue periodically over the next six months (perhaps every two months) and include this information in the case documentation. In the event the legal issue is resolved in time for the Wife to complete the LR program, the Project should make an effort to accommodate her.

The Project continues the assessment of earthquake damages. If any additional displacement is required, the Resettlement group should plan and manage assistance measures that are consistent with the requirements of IFC PS5 and the Project's Resettlement Management Plan.

6.1.2.2 Resettlement for Angore Wellpad C

The Project will access land for construction of a wellpad and safety buffer zone. The resettlement survey determined that land access will displace nine households that will lose structures and eight that will lose gardens. Displacement was avoided for households in the Telecom Tower, Greenfield RoW additional requirements or the Borehole areas. Actual displacement includes 11 structures and 78 gardens (89 agreements), though numbers may fluctuate, for example, in the event an additional garden is identified.. The majority of households have structures and sustainable gardens elsewhere and will be provided with replacement value compensation for lost physical structures, as well as livelihood restoration assistance.[10] There are no "special case" (vulnerable) households in the group.

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[10] For more detailed information on impacts see Angore Well Pads and Access Roads Resettlement Action Plan PGHU-EH-SPZZZ-46003, Angore Tie-In Project Wellpad C and Associated New Areas

One household was identified by the initial ground survey to be located within the land requirement area but was found to be just outside the boundary. Since the majority of its garden area is within the boundary, the household will receive a full resettlement package and Livelihood Restoration Support.

IESC review of the RAP Appendix in November 2019 deemed it compliant with IFC PS5. As of mid-January 2020, half of the agreements with households were signed and payments made (all agreements signed are garden agreements). Negotiation of resettlement agreements was underway at the draft IESC report was submitted. The Project reported during the draft report review that all agreements have been concluded.

6.1.3 Recommendations

1. Household No 042:
   a) Keep detailed documentation for use in the event a complaint is filed in future;
   b) Revisit the issue of Household Number 042 regarding livelihood restoration periodically over the next six months (perhaps every 2 months) and include this information in the documentation. In the event the Wife returns and is able to complete participation in the LR program, the Project should make efforts to accommodate her.
2. Provide updates to IESC on any additional resettlement necessitated by repair or other related works.

6.2 COMMUNITY IMPACTS MANAGEMENT AND SECURITY

6.2.1 Project Strategy

✓ Project commitments to community impacts management during Production are contained in the Community Health, Safety and Security Management Plan – Production that addresses health, safety and security from a community perspective. See Section 8.2 in this report for IESC comments on Community Health.

✓ The objectives of this Plan are to:

- avoid or limit risks to and impacts on the health, safety and security of the community during the production phase from both routine and non-routine circumstances through implementing targeted prevention programs to reduce risks, along with the implementation of an effective monitoring and evaluation program;
- ensure that safeguarding of personnel and property is conducted in an appropriate manner that avoids or limits risks to the community's safety and security;
- maintain a monitoring and evaluation program that is community-based, participatory, and transparent and covers all phases of production and decommissioning; and
- Elements of the Production Community Development Support (CDS) Management Plan also apply as it relates to community development support activities undertaken to mitigate the impacts or potential risks generated by Company activities with the objective to avoid or reduce the risk of adverse social impacts on Papua.

6.2.2 Observations

In the Upstream areas tribal fighting continues, but areas adjacent to Project infrastructure remain relatively stable. The CDS Law and Justice component and other entitles are implementing a number of programs, particularly with youth, aimed at reducing conflict for the longer term. Many of these use sporting events as a platform to demonstrate and grow use of conflict reduction techniques. In the Komo area, for example, an organic approach called "Drop the guns and pick up a rugby ball" supported by EMPNG has resulted in bringing clans together peacefully for rugby games that previously had limited interaction (except for fighting purposes). Additionally, the United Nations (UN) is taking a role in promoting conflict resolution and community resilience in Hela, at least partly motivated by their collaboration with the Project following the earthquake. EMPNG continues to provide logistical (air / ground transportation) and informational support the UN effort, while the PNG government, including the Prime Minister and Hela Governor, are actively engaged with the UN.

See Section 6.4.2.4 in this report for more information on conflict minimization programs.

6.2.3 Recommendations

None arising from this review.

6.3 COMMUNITY DEVELOPMENT SUPPORT PROGRAM

6.3.1 Project Strategy

Project commitments related to community development support are described in the Community Development Support Management Plan – Production. This Plan covers all community development support activities undertaken by the Project. This includes activities undertaken by the Land and Community Affairs team (L&CA) during construction, currently under Public and Government Affairs (P&GA) and the Medicine and Occupational Health team (MOH). The objectives of the CDS program apply also to project functions undertaking community support initiatives.

The objectives of EMPNG community development support activities are to:

- ✓ promote development of conditions that strengthen communities' ability to benefit from the Project's presence;
- ✓ avoid or reduce the risk of adverse social impacts on PNG communities;
- ✓ provide opportunities for sustainable development benefits in a culturally appropriate manner; and
- ✓ ensure that the development process fosters full respect for the dignity, human rights, aspirations, cultures and natural resource-based livelihoods of Indigenous Peoples, thus meeting both local regulatory and IFC Performance Standard 7: Indigenous Peoples (2006) requirements.

6.3.2 Observations

6.3.2.1 The Community Development Program Concept

The IESC report for 2019 recommended that all CDS Activities, whether implemented by CDS, another Project Unit or the Project as a whole, should contribute to the CDS overarching goal of "promoting development of conditions conducive to enhancing economic self-reliance of individuals whilst also mitigating potential impacts" and that a steering committee should be created to facilitate this comprehensive approach.

The Project has made major progress toward developing this comprehensive approach as described below.

Steering Committee

The Terms of Reference (ToR) and a Charter[11] for the Community Investment Committee have been agreed. The Charter states that "At this stage of EMPNG's operations, it has become evident there is a need to establish a coordination point that ensures collaboration between various departments on the types of Community Investments that are executed." The Charter contains the purpose, composition and basic administration of the committee with the P&GA CDS Unit's Manager/Team in the Secretariat role.

The Committee's purpose is to:

- ✓ Screen projects against pre-established principles & project criteria;
- ✓ Ensure that potential investment areas reflect the company's values & approach;
- ✓ Provide strategic oversight;
- ✓ Provide internal coordination;
- ✓ Approve projects; and
- ✓ Undertake Community spend reporting.

Committee members represent each of the Project functions that are supporting or plan to support community support initiatives. The Committee will meet quarterly. An inaugural meeting of strategy owners was held, and meetings of tactical teams will begin soon.

6.3.2.2 CDS Work Planning

Preparation of the CDS 2020 work plan has reached Production Manager level for endorsement of proposed projects. Re-assessment will facilitate development of a clear results chain, review of the current CDS Management Plan and developing new geographical livelihood strategies suited to each local context.

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[11] Community Investment Committee Terms of Reference/Charter 2020

During 2020, the following actions are targeted:

- ✓ Execute Community Development Projects with support from CA/ Production team;
- ✓ Community Investment Committee fully functioning – Q1;
- ✓ Livelihood Strategy to be completed – Q2; and
- ✓ Commission Education Program Review – Q4.

Livelihood Strategy

The process and schedule for further development of the Livelihood Strategy Process is shown in the table below. A report for each phase of the strategy development will be produced.

Table 6.1: Development of Livelihood Strategy Process

Phase	Purpose	Status
1. Scoping	Determine realistic scope and objectives for assessment. Determine who needs to be involved in the Assessment Team including company personnel, stakeholders, subject matter experts and facilitators.	Completed and accepted Scoping Study
2. Planning	Review and refine objectives with the Assessment Team. The Team will develop a list of questions that the assessment will be designed to address. They will develop a plan for data collection including gathering of quantitative and qualitative data.	Completed Stakeholder focus group Guidelines developed and Initial engagements with external stakeholders held and buy in
3. Data Collection	Gather and measure relevant indicators and summarize in a quantitative data report. Conduct interviews and focus group discussions with key stakeholders and compile qualitative data report.	May 2020
4. Analysis	Members of the Assessment Team jointly reach consensus on findings, conclusions and recommendations of assessment through process of facilitated dialogue.	June 2020
5. Strategy Development	Relevant stakeholder representatives jointly develop a common Livelihoods Strategy with a clearly articulated Theory of Change and measurable indicators of progress.	July2020

The first stage of the livelihood strategic re-assessment (in 2019) entailed a detailed scoping activity to review community needs and identify influencing factors including presence of other actors. The scoping is followed by further formal high-level technical assessments of priority needs and independently facilitated consultations with communities to generate strategic goals and key outcomes of activities designed to meet prioritized needs. The assessment results will be used to generate proposals of options to consider for refining activities and approaches and work plans for ongoing phases of the CDS Livelihood Program Component.

Livelihood activity choices emphasize the differences in the needs and issues of the following areas of operations:

- ✓ Upstream – Hela Province;
- ✓ Plant Site – Hiri District of Central Province;
- ✓ RoW – Kutubu and Gobe areas of SHP and Kikori region of Gulf Province; and
- ✓ Port Moresby Head Office - National Interests.

Multi-stakeholder assessment teams and data collection teams were established for each of these four geographic areas. The data collection involves very wide sources of internal and external stakeholders, such as civil society (including affected populations and social institutions such as churches, school boards, sports groups, etc.),

businesses, Government and entities implementing or likely to be or become project implementers in these areas (some of whom may become implementing partners with the Project).

The data collection team received thorough training. The IESC notes that this training was essential to help ensure that collectors understand the purpose of the data collection and that data were collected and registered correctly and consistently. The Data Collection Team Training took place in Port Moresby on 20 August 2019 and included the following subject matter:

- ✓ Understanding the Strategy Development Process and the role of qualitative data collection in the process;
- ✓ Understanding how to effectively conduct interviews and focus group discussions;
- ✓ Understanding how to take appropriate notes to ensure consistent recording of data to enable easy analysis;
- ✓ Revising and refining question lists and stakeholder groups/categories; and
- ✓ Drafting of initial data collection plans.

For additional details on the Livelihoods planning process see PNGLNG Livelihoods Strategy Development Planning Phase Report, September 2019, Hamakua Institute for PNGLNG.

6.3.2.3 CDS Monitoring and Evaluation (M&E) and Reporting

The IESC previously recommended that program and component level monitoring and evaluation be formalized in a CDS M&E Procedure to ensure consistency throughout CDS implementation, irrespective of the function implementing projects. The IESC notes that progress toward M&E standard formats has been made for the CDS livelihood program with the undertaking of the Strategy Assessment and the monitoring and evaluation framework for the CDS agricultural component. The recommendation, however, was aimed at developing a standard progress and outcome format for use by each of the CDS components irrespective of which functions implements them to enable the Project to assess progress toward achieving the *overall* goal of its community development support.

6.3.2.4 PGA CDS Unit Component Activities Since Last IESC Review

Livelihood Enhancement Component Activities

Upstream Communities

The Australian National University Social development initiative - Community Livelihood Improvement Program (ANUE CLIP) agricultural project continues to be the primary livelihood support upstream program. Highlights of the project over the last year include continued progress toward participant financial independence through thriving produce sales reaching PGK 17.3k (@ USD 5,100 per month in September with a target to increase this amount to PGK 40-50k in 2020. Results of a survey of 55 participant households found that the growing financial independence is considered the most significant outcome by 80% of these households. The notable increase in income from pre-project days is encouraging expanded participation, with five new groups from Komo and Angore expected to become participants in 2020. One community group that has been registered as a vegetable vendor to Hides Alliance Group for a few years will be joined by another group in 2020.

Lack of markets for agricultural products in the Upstream areas has long restricted income potential. Interest in market development has greatly increased in the last year or so, at least partly because of the Project's initiatives in this area. Market development at Tari Market development is underway in a partnership involving the Project, Hela Provincial Government, DFAT and UN Women. The Project is also considering support to market developments in Para and Komo areas and IAI (Innovative Agro Industries) also has started market development in the Project area. Komo Women group continues to work with PNG women's support group Mama Helpim Mama and CPL Supermarkets in Port Moresby.

Plant Area Communities

The Sewing Machine Care & Advance Tailoring group (visited by IESC during last year) is the main livelihood activity for Plant area villages. The Group serves women from the four Plant site villages (Papa, Lealea, Porebada and Boera). Outcomes from this activity include:

- ✓ Increased interest of participants results in expansion from sewing machine training to other kinds of training, such as financial literacy and leadership;
- ✓ The Papa women's group qualified for "Training of Trainers" training with training provided to 40 participants including two young males;

- ✓ One of the program's lead tailoring trainer's small business group (Diari Tailoring) was awarded a contract of K18,000 to produce uniforms for LABA's "Meet & Greet" staff. She will be utilizing the trained women to deliver this order; and
- ✓ Advancing PNG Women Leadership Network (APNG WLN) partnered with the Porebada Helaro Women's group to roll out the first ever Motuan (is local language) Pottery making training for young women.

Other CDS livelihood activities for the Plant Site villages are in the planning stages, including:

- ✓ the Project and PNG water are discussing potential long-term water supply projects to plant site communities.
- ✓ the Project is collaborating with Gas Resources Directors (GRD) and Local Level Government (LLG) councilors to identify potential economic activities for the coming years.

The IESC notes that The Fisheries Management Project, planned to begin implementation in 2018, was not executed due to competing priorities and capacity amongst stakeholders. This project will be considered as part of the Livelihood Strategy Re-assessment.

Education Component Activities

Upstream

Upstream educational systems, facilities and staff were seriously inadequate and inefficient at the time the Project began and, as a result, relatively few children attended schools, and even fewer attended for more than for a few years. Though much still needs to be done to improve education, the CDS education component has made important contributions to improving education, as well as educational systems. Highlights of accomplishments since 2015 include:

- ✓ Development of a 5 Year Education Plan for Hela Province - re-aligned to the new National Education Plan;
- ✓ 41 School Board of Management (BOM) executives from the 10 primary schools in upstream north participated in BOM Training and conducted School governance refresher training for the 10 Primary Schools Board of Management (had been put on hold in 2018 due to earthquake);
- ✓ Over 900 elementary teachers are now able to perform well as elementary school teachers;
- ✓ School enrollment has significantly increased; and
- ✓ Launched new scholarship program in partnership with Business & Professional Women's Association.

Structural support has also assisted in improving upstream education through:

- ✓ Infrastructure support (rebuilding and construction of new staff housing, double classrooms and toilet facilities) damaged by earthquake; and
- ✓ Utilizing the Church Partnership Program to restore key education facilities in Hela and Southern Highlands.

Plant Site Communities

Emerging results from CDS education programs are:

- ✓ Signed Funding Agreement with Central Province Government (CPG) for expansion of School Board training program into the rest of Central province;
- ✓ Over 190 elementary teachers in Central Province now qualify for formal teaching positions;
- ✓ Increased enrollment due to improved school facilities and education materials;
- ✓ Boera Primary School earned first place in academic performance in Central Province in 2017; and
- ✓ Robust early childhood education program at Plant Site schools.

Recent Activities

- ✓ Continued the School Governance training focusing on training of teachers in the four plant site area schools and Central Province Division (CPD) of Education;
- ✓ Continued Early Childhood Education Program with refresher trainings, material support and up-skilling of pre-schools in Papa and Porebada villages;
- ✓ Continued infrastructure support to Lealea, Papa, Porebada and Boera schools in partnership with the Gas Resources Directors (GRD); and
- ✓ New scholarship support rolled out.

Health Component Activities

Upstream

CDS supported the following activities in 2019:

- ✓ Continued restoration support to key health facilities in Hides, Komo and Juni;
- ✓ Constructed new health facility at Juni. Upgrades raise the facility Level from third to second level status enabling placement of an on-site Health Extension Officer;
- ✓ Hela Food handlers training conducted for over 30 stakeholders that manage and serve food to the public as part of measures to address the increase in food borne cases reported by the Tari Hospital;
- ✓ Expanded existing program with Texas Children's Hospital in Port Moresby to Tari Hospital as part of arrangement with DFAT (Australian Department of Foreign Affairs and Trade); and
- ✓ Used the Church Partnership Program to restore key health facilities in Hela and Southern Highlands.

The Project has also developed a useful relationship with Hela Provincial Health Authority.

Plant Site

Areas of Health Support since 2015 are:

- ✓ Scholarship support to increase number of community health workers for health centers in Project area;
- ✓ Infrastructure support for bore water facilities;
- ✓ Health awareness and donations (TB, Malaria Cancer, Snake bites & lifestyle diseases) through sponsorship and contributions programs; and
- ✓ Project collaboration with the Porebada Gas Resources Director (GRD) resulted in an upgrade to the Porebada Health Center. Australia Awards PNG LNG Scholarship helped a local person to become a community health worker for the Porebada Health Center which enabled the Center to expand in Porebada and nearby villages.

Law and Justice Component

Upstream

Highlights of the Upstream Law and Justice CDS component during the last year include:

- ✓ Facilitated UN and other Development Partners to conduct Peace and Development workshops in Tari and Komo as a basis for UN development of a joint program for Hela;
- ✓ The Komo Peace Conference was attended by over 80 local leaders and representatives from the 24 ward councils in Komo and resulted in a Komo Commitment signed by the leaders committing to peace;
- ✓ The program Sports For Peace and Development (SFPD) is using sports as a basis for teaching youths the utility of rules of engagement for sports and as the basis for wider application of rules of engagement leading to interactions that are productive instead of causing conflict. The Rugby League, in turn, mobilizes youth (male and female) to participate in weekly rugby league competitions. The Project supported skills training for youths on current rules and coaching methods for Basketball and Rugby Leagues. SFPD helped establish the Komo Rugby League Association by providing infrastructure and sports merchandise with the intent of transferring sports rules of engagement to daily rules of engagement. This initiative is being replicated in Juni and Angore. Also, in the Komo area, an approach called "Drop the guns and pick up a rugby ball" has resulted in bringing clans together peacefully that previously had limited interaction; and
- ✓ Baseline data collected on tribal fighting in Hela.

Plant Site

During 2019, law and justice aspects were covered in a variety of ways such as the following:

- ✓ Women's Economic Empowerment trainings ended with the women holding community outreach and awareness on domestic violence in each of the communities;
- ✓ The Plant Site Youth Community Sports Program includes a session on advocating against Gender based violence. Youth Sports Groups are also raising awareness on drug and alcohol abuse;
- ✓ Collaboration between Community Gas Resources Directors in each village with community groups (such as Women's, Youth and Sports Groups) has enhanced community ability to resolve conflicts and issues. They have created functional organizations that are engaging with community members and delivering projects with the funds allocated through each community's infrastructure funds; and

- ✓ Supported construction of a community resource center at LeaLea as the venue for the Buria Court which is held every Tuesday.

6.3.2.5 National Content Program Component

Project Strategy

A key objective of the Project's National Content strategy is to replace expatriate staff with PNG citizens through both targeted recruitment and training and development. In addition, national content requirements set out in a National Content Exhibit are contained in agreements with key contractors. The exhibit states that contractors shall "develop and implement a Local and National Content Plan in accordance with the requirements in this Exhibit." The Exhibit requires maximization of employment of PNG citizens in all job categories and sourcing of all PNG works will be in accordance with the requirements of this Exhibit and relevant law. First priority is to be given to local persons (proximate to Company locations), second priority to regional citizens, and third priority to persons elsewhere in PNG. It also specifies that contractors give preference to local LANCOs for provision of employees.

Workforce Statistics

The Project continues to make notable progress toward replacement of expatriate staff with PNG citizens through both targeted recruitment and training and development. Table 6.2 below shows workforce statistics.

Table 6.2: Workforce Statistics

Statistics on Workforce	Number End 2018	End 2019
Total Workforce across Project	3,295	3,964
PNG Workforce	2,797(85%)	3,411 (86%)
EMPNG Workforce (direct hire employees or employees from recruiting agencies)	543	520
3rd Party Contractor Workforce	2,228	2891 (85%)
PNG Citizens Female workers	539	569 (17%)
Origins of PNG Workforce		
Local origin	1,160 (42%)	1,690 (50%)
Regional origin	902	936 (27%)
From non-Project areas	709	785 (23%)
Job Categories		
Management Responsible for supervising workers or for managing a SOW)	250	271 (8%)
Office	284	307 (9%)
Field – Both technical and non-technical roles	2,237	2,833 (23%)

Competency Building

Intake 5

The Career Progression Model is being used for Operations LNGP and Upstream. Highlights of progression are given below:

- ✓ Pipeline Technicians are Maintenance Techs (qualified Level 2) with multi-skill roadmaps (ELEC - Ops & Inst skills; INST – Ops & Mech skills + MoR from Live Conductors; MECH - Ops skills + MoR from Live Conductors);
- ✓ 26 of 32 Control Room Technicians at both LNGP and HGCP are filled by PNG citizens (10 female);
- ✓ LNGP US&L panel is fully operated by PNG Citizens;
- ✓ O&M Technicians broadening assignment (2 Technical Writers, 4 Safe Choice trainers);

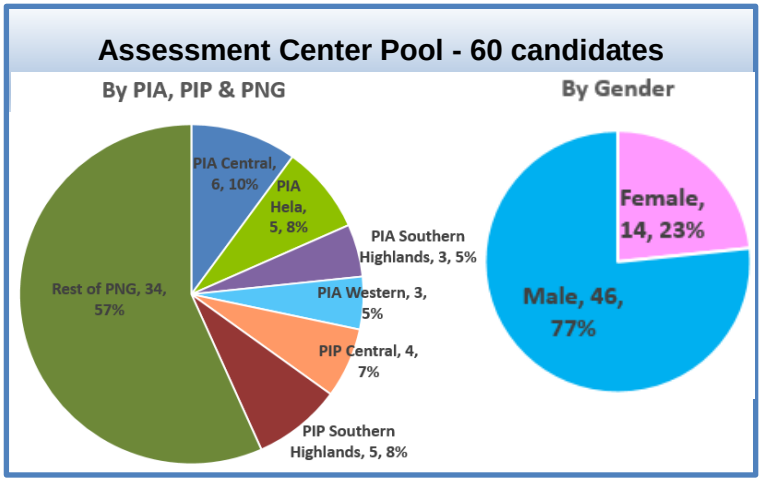
✓ 39% of technicians progressed to next tech level.

For Operations and Maintenance (O&M) Intake 5, 27 sponsored trainees, 10 of whom are women, transitioned to EMPNG in January 2020, including 16 Ops, 7 Electrical and 4 Mechanical.

Intake Six

Recruitment training Intake 6 attracted 2,000+ applicants of which the 118 best candidates were aptitude tested from which 60 candidates were invited to the Assessment Centre. From the 60 best suited candidates, 18 Operations Technicians will start training on 2 March 2020.

Table 6.3: Geographic and Gender Distribution of 60 Best Suited Candidates



Local Procurement and Supplier Development

Production phase to date spend on local services and goods:

✓ Almost PGK3.7 billion on Papua New Guinean services;

✓ PGK1 billion spent with Lancos; and

✓ 17.5 billion kina spent on services provided in Papua New Guinea (PNG).

2019:

✓ 13 Lancos and some 270 non-Lanco PNG a business engaged; and

✓ More than PGK691 spend with PNG businesses. Of this, over PGK246 million spent on Lanco services.

6.3.3 Recommendations

Community Development

1. The IESC previously recommended that program and component level monitoring and evaluation be formalized in a CDS M&E Procedure. The IESC notes that progress toward M&E standard formats has been made for the CDS livelihood agricultural program with the undertaking of the Strategy Assessment and the monitoring and evaluation framework. The 2019 recommendation, however, was aimed at developing a standard progress and outcome format for use by each of the CDS components irrespective of which functions implements them to enable the Project to assess progress toward achieving the overall goal of its community development support.
2. The IESC would appreciate presentations and reports provide more information on the selection process for education and health construction or structural upgrades, that is, what is the rationale for selection of particular facilities?
3. The IESC requests that future presentations and documents all contain either a list of acronyms or the full name given with the acronym the first time it is mentioned.

National Content

None arising from this review.

6.4 STAKEHOLDER ENGAGEMENT AND COMMUNITY GRIEVANCE MANAGEMENT

6.4.1 Project Strategy

The Project commitments with respect to stakeholder engagement are contained in the Stakeholder Engagement Management Plan – Production. This Plan describes the processes and actions applicable during production. The overall objective for stakeholder engagement during Production remains to keep all stakeholders informed with respect to their specific interests, engage people in decisions that directly affect them, and maintain stakeholder confidence and trust in the Project and its activities through open, informative, inclusive and timely communications. A Village Liaison Officer Strategy for the Production Phase supports implementation of the Management Plan and the Land and Community Affairs Plan.

6.4.2 Observations

6.4.2.1 Engagement Overview, January - December 2019

The total number of Project engagements from January to the end of December 2019 (Table 6.3) was 3,971 involving 190 communities across the Project's directly and indirectly affected areas.

Table 6.4: Community Engagements in 2019

Location	No. of Engagements	No. of Communities
Upstream	3,187	178
LNG Facility	724	8
POM Area	60	4

While the total number of Upstream engagements decreased from 2019 to 2018, the number of attendees at the engagements dramatically increased from 29,815 in 2018 to 58,500 in 2019. The Project attributes this significantly enlarged attendance to continued improvement in upstream stability which, in turn, expanded the number of project work fronts and allowed for more engagements.

6.4.2.2 Issues and Grievances Overview January - December 2019

Issues

Issues raised in 2019 totaled 791 compared to 698 issues in 2018. The slight increase in issues in 2019 is thought to be related to improved stability in the Upstream and a drop-in work fronts later in 2019 that may have generated an increase in issues.

Grievances

The 18 grievances filed in 2019 were all from the upstream areas. Of the 18 grievances 58% were related to environment and 28% to land issues. This number of grievances was a significant reduction from the 59 grievances filed in 2018 and the number in all previous years. All grievances from 2019 were closed within the new 100 day target with six closed in the 4-30 day category and 12 requiring more lengthy investigation that were closed within 100 days. Effective grievance closure is the result of good team collaboration through field VLOs, as well as strategies and processes that promoted close working relationships between the units charged with resolving grievances.

Grievances requiring more than 30 days were mostly caused by:

- ✓ Difficulty in accessing the grievant or land to assess the compensation claims (difficult terrain and transport limitations);
- ✓ Time required to process compensation payments;
- ✓ Need to involve third party contractors/LANCOs; and
- ✓ Complexity of assessment required (i.e. environmental testing).

6.4.3 Recommendations

None arising from this review.

6.5 STATE CLAN BENEFITS INTERFACE - UPDATE

6.5.1 Project Strategy

The PNG Government is responsible and accountable for determination and payment of landowner beneficiary royalty and equity dividends. EMPNG's goal is to influence and support the Government in its effort to pay landowner State Cash benefits in accordance to the laws of PNG. Its main challenge in this objective is to help ensure safe, accurate, timely and effective delivery of cash benefits without having any actual control over the process. The IESC notes that the Projects' assiduous documentation of its support for the benefit sharing process is critical for risk management.

6.5.2 Observations on Status

The Project's strategy remains to mitigate near-term risk, support resolution of underlying issues, and capture lessons for potential future projects. To these ends, the Project continues to engage in positive engagements with PNG Government and other stakeholders. The involvement of the Judiciary in the process of determining benefit recipients remains a challenge.

The first upstream benefit payments were made to 37 clans along the upstream section of the PNGLNG pipeline. The payments have been held in trust since 2014 pending the completion of the landowner identification process, opening of bank accounts, and election of directors to landowner company boards. While the distribution of benefits is a government responsibility, it is a significant event for the PNGLNG project, and follows similar payments already made to the landowners located near the plant site, commencing in 2017.

Preparation for payments to other entitled upstream clans is at various stages. The information below is the Project's best understanding regarding the status of benefits distribution. Benefits distribution and related Landowner Beneficiaries Identification (LOBID)/ Alternative Dispute Resolution (ADR) processes are government managed and executed. EMPNG provides logistical support to government activities as appropriate.

The current status of benefit payments is given below:

- ✓ Upstream Petroleum Development License (PDL) areas:
  - PDL1: Clan vetting process (CVP) launched on 15 January 2019 (clans will be vetted before Ministerial Determinations (MDs) are finalized);
  - PDL 2 and 5/6: CVP/LOBID (Landowner Beneficiaries Identification) completed;
  - PDL 4: Currently subject to LTC after Alternative Dispute Resolution (ADR);
  - PDL 7: Field validation completed – Ministerial Determinations (MDSs) pending;
  - PDL 8: Another ADR round done mid-2018. One block has disagreements on total clans that is not yet resolved, thus delaying finalization of ADR;
  - PDL 9: CVP/LOBID done for two ethnic groups;
  - PL 4: Onshore pipeline clan vetting completed by end 2017 and MDs finalized. The current plan is to progress up pipeline using same process.

7 LABOR AND HUMAN RESOURCES

7.1 LABOR AND WORKING CONDITIONS

7.1.1 Project Strategy

Project labor commitments are defined in the Labor and Working Conditions Management Plan – Production (the "Plan"). The Plan describes the requirements and expectations in terms of compliance, reporting, roles, supervision and training with respect to labor and working conditions, including camp accommodation. It covers all production activities for Upstream Facilities, the Pipelines and the LNG Plant. This Plan is expected to be adopted and applicable to EMPNG contractors, recognizing that EMPNG's effectiveness in managing third parties will vary in accordance with the leverage EMPNG is able to exercise. To the extent that EMPNG can exert influence over its supply chain, the principles in this Plan will also apply.

The objectives of the Plan are to:

- ✓ promote fair and equitable labor practices for the fair treatment, non-discrimination and equal opportunity of workers;
- ✓ establish, manage and promote a healthy management-worker relationship;
- ✓ protect workers' rights including migrant and third-party workers; and
- ✓ promote healthy, safe, secure and comfortable accommodation that does not impact negatively on the communities in the surrounding area.

7.1.2 Observations

The information received on compliance of policies, procedures, guidelines, and reporting formats covering labor and working conditions to the obligations of IFC PS2, international labor standards, and PNG labor law adequately demonstrates compliance of the Project and its main contractors. Specific labor and working condition features are presented below.

7.1.2.1 Labor Grievance Management

The labor grievance management process remains part of the Project's Procedures & Open Door Communication Policy. Nearly all grievances and issues are initially addressed by immediate supervisors and nearly all are promptly resolved at the supervisor level. In the event an employee is dissatisfied with a response from an immediate supervisor, the employee is entitled to further review by the applicable level of management.

During 2019, no time has been lost to disruption from grievances or any form of industrial dispute and no separations were caused by breaches of the Harassment in the Workplace Policy as part of the Workplace Guidelines. Workforce grievances in 2019 included three employee harassment cases dealt with through the Policy. There were no grievances reported from any of the four manpower agencies.

7.1.2.2 Counseling Services

The Project continues to provide counseling services to staff. The new contractor, Magellan Healthcare, has two counselors available on site at different facilities with scheduled dates. Staff may also contact the counselors by telephone. During the construction and early production days, family-based violence was the main female staff issue, thus the Project had a female counselor. Both new counselors are male, but the need for a female counselor may not now be necessary. The project continues to search for qualified female counselors. The IESC recommends that the Project survey a representative sample of female staff at the three locations regarding the need for a female counselor. If a survey or other consultation on this issue was done, the IESC will appreciate being informed.

7.1.2.3 Family Violence Initiatives with Workforce

The Project has initiated several new approaches to engaging its workforce in reducing family violence including the following:

- ✓ Establishing a Family Sexual Violence (FSV) Network consisting of male and female staff who provide support to other staff members experiencing family violence. The network member staff received a two-day training;
- ✓ Participation of male and female staff in the Bel Isi Walk Against Violence; and

- ✓ Sponsored a Bel Isi learning session on support it provides, negative effects of violence, etc. attended by a significant number of Port Moresby based staff.

The IESC looks forward to visiting with staff involved in efforts to address family-based violence during the next visit.

7.1.3 Recommendations

1. The IESC recommends that the Project survey a representative sample of female staff at the three locations regarding the need for a female counselor. If a survey or other consultation on this issue was conducted, the IESC will appreciate being informed.

7.2 WORKFORCE ACCOMMODATION

7.2.1 Observations

Workforce field accommodation continues to be well-managed and consistently updated. The IESC has noted in past reports that food served at Moro and HGCP camps includes many high calorie and high salt and sugary food items, but not enough healthy options and that portion control is not practiced. A variety of healthy food options are available to camp workers at every meal, but staff cannot be forced to select them. EMPNG expanded the Culture of Health Program for all work sites including EM Haus which takes a holistic approach to physical and mental wellbeing. A component of this program includes awareness on nutrition and healthy eating based on local dietary practices.

The aims of the CoH Program are to:

- ✓ Reduce chronic health risks;
- ✓ Contain medical expenses
- ✓ Promote sound safety practices both at and off work;
- ✓ Support gains in productivity, engagement and resilience:
- ✓ CoH Program elements consist of the following components:
- ✓ Awareness;
- ✓ Nutrition Program elements;
- ✓ Awareness of Nutritional elements of diet;
- ✓ Physical Activity and bio-metric screening; and
- ✓ Mental Health and Wellbeing.

The IESC looks forward to speaking with a sample of the workforce on their perceptions of the CoH program and its personal results.

7.2.2 Recommendations

None arising from this review.

8 HEALTH AND SAFETY

The PNG LNG Project has a well-developed program to manage both occupational health and safety of workers, as well as a community health and safety program. The success of both programs has been based on the understanding that community and occupational health and safety are linked and interdependent on one another.

8.1 OCCUPATIONAL HEALTH AND SAFETY

8.1.1 Project Strategy

Occupational health and safety are managed independently of the Production ESMP within the ExxonMobil Operations Integrity Management System (OIMS), which is summarized within the ESMP such that the linkages between OIMS and environmental and social management are well defined. The ultimate goal of managing personnel safety is to achieve an incident-free workplace where “Nobody Gets Hurt”. Specific, measurable objectives that contribute to this goal are:

- ✓ reduce at-risk behavior (both on and off-the-job) and manage hazards associated with the work environment to significantly reduce Occupational Integrity risks; and
- ✓ hazard identification and correction programs are comprehensive and widely used across the Unit.

OIMS also provides the structure for identifying and managing health exposures with the following goals:

- ✓ protect the health of personnel on company premises and the public in proximity to our operations from adverse health effects that may result from our operations; and
- ✓ protect the personnel on company premises from environmental and health hazards prevailing in the environment.

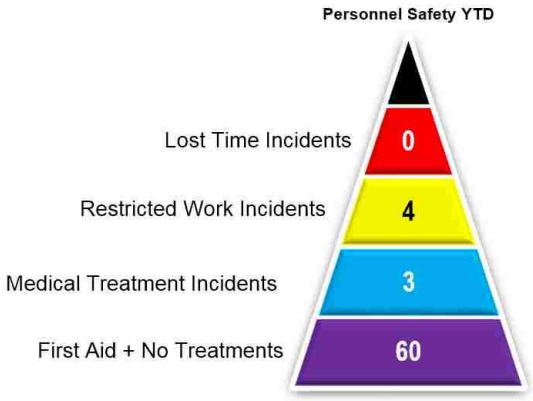
The concept of protecting company personnel from health hazards prevailing in the environment is recognition that there needs to be a linkage between occupational and community health programs.

8.1.2 Observations

8.1.2.1 Worker Safety

EMPNG Production safety performance through Q4 2019 continues to be excellent. There were no Lost Time Incidents (LTIs) that took place in all of 2018-2019 with more than 25 million man-hours worked. The Total Recordable Incident Rate (TRIR) decreased by 50% from 2017 to 2018 and more than 50% again in 2019. This is a remarkable testament to a robust safety program.

Table 8.1: Project Safety Statistics



	2019	2018
LTIR	0.00	0.00
TRIR	0.01	0.11
THIR	0.98	2.23
PHL3+	0.13	0.23

8.1.2.2 Worker Health

The occupational health program is world class and continues to perform well in all areas (clinical operations, public health and industrial hygiene). Clinical services, pathology and medical emergency response is maintained at the highest level across all camp clinics with continued efforts to keep up with the latest in medicine. As also noted in Section 7.2.1, Over the past year EMPNG has initiated a Culture of Health (CoH) program that represents a holistic approach to the health and well-being of workers including components of awareness, nutrition, physical activity/bio-metric screening and mental health and wellbeing. Within this program a Quit Tobacco Campaign was also initiated. EMPNG also continues to implement an industrial hygiene program that prioritizes on noise and chemical worker exposures from tasks being performed that have higher exposures in a short duration of time, examples include grinding, welding, and operating fixed and portable high noise equipment. There has been increased awareness to field personnel on proper selection, care and maintenance of respiratory protection equipment. Plans forward in 2020 include applying cost-effective health risk reduction initiatives e.g. setting up barriers around high noise equipment to reduce noise levels across EMPNG work locations. Also, develop an exposure assessment and monitoring tool for PNG Drilling Operations and provide support to the HGCP and LNGP plant maintenance activities ensuring worker health protection.

8.1.3 Recommendations

The H&S program continues to be implemented as a “best practice” system. We do not offer any recommendations arising from the present review.

8.2 COMMUNITY HEALTH

8.2.1 Observations

Community health continues to be a component of the Community Development Support program. One of the results of the February 2018 earthquake was to highlight inadequacies in Hela Province health infrastructure and the Project has continued restoration support to key health facilities in Hides, Komo and Juni, including the construction of a new health facility at Juni. The Juni facility now qualifies for the Government placement of a Health Extension Officer on site. EMPNG has undertaken training for food handlers for over 30 key stakeholders that manage and serve food to the public, an issue identified with an increase in food borne illnesses at Tari Hospital. In the communities surrounding the LNG Plant, EMPNG has jointly worked with the Gas Resources Director for Porebada and upgraded the Porebada Health Center and contributed the medical equipment to furnish the newly built facility. With two permanent staff, Porebada clinic is now able to expand their services to the nearby villages.

8.2.2 Recommendations

None arising from this review.

9 CULTURAL HERITAGE

9.1 PROJECT STRATEGY

Production has adopted Cultural Heritage Program from Construction:

- ✓ Cultural Heritage Management Protocol;
- ✓ Cultural Heritage Investigation and Salvage Protocol; and
- ✓ Chance Finds Protocol.

EMPNG's objectives are to avoid impacts to cultural heritage sites, including archaeological and oral tradition sites and to manage cultural heritage sites in consultation with landowners.

9.2 OBSERVATIONS

Cultural heritage management continues to be undertaken, currently in association with the Angore project and preferred practice continues to be avoidance. Other cultural heritage activities have been to provide support to the University of Otago in New Zealand for a study to match the clay used in Lapita pottery fragments found at LNGP with different sources of clay from the local environment. PNG NMAG hosted the Lapita conference in Port Moresby in October 2019 with 90 archeologists in attendance.

Figure 9.1: Exhibition of Lapita Pottery from LNG Plant Site at the National Museum & Art Gallery (NMAG) in Port Moresby (October 2019 – January 2020)

As we noted in our 9th IESC field visit (July 2013) as the construction phase was nearing completion was that PS8 requires that "*the client will protect and support cultural heritage by undertaking internationally recognized practices for the protection, field-based study, and documentation of cultural heritage.*" Our point was that the cultural heritage program does not end when the excavations are complete. The artefacts excavated need to be studied and the results publicized. In particular, extensive excavations were undertaken at the LNG Plant under the direction of Monash University. We were aware that Monash University planned to publish their findings, but had not received

their report, but it is publicly available.[12] Participants to this work have continued to publish related articles as referenced on the Monash University web page including: *Hiri: Archaeology of Long-Distance Maritime Trade along the South Coast of Papua New Guinea* (2017); *Why does the conservation of low-fired Caution Bay Lapita pottery matter*? (2018); and *Archaeology is unravelling new stories about Indigenous seagoing trade on Australia's doorstep* (2019). A small exhibition showcasing remnants of Lapita pottery and other archaeological materials from the PNG LNG Plant Site and south coast of New Guinea kept in Monash University in Melbourne, Australia was recently exhibited (October 2019 – January 2020) at the National Museum & Art Gallery (NMAG) in Port Moresby (Figure 9.1).

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[12] Richards, T., David, B., Aplin, K., & McNiven, I. J. (2016). *Archaeological Research at Caution Bay, Papua New Guinea: Cultural, Linguistic and Environmental Setting*. (Caution Bay Studies in Archaeology 1). Oxford UK: Archaeopress.

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