Papua New Guinea
LNG Project

Independent Environmental and Social Consultant

IESC - PNG LNG 2023 Field Monitoring - Final Report

Doc. No. P0022407-4-H1Rev. 0 - 09 June 2023

Rev.	Description	Prepared by	Controlled by	Approved by	Date
0	Final Issue	B. Johnson K. Connor L. Johnson E. Schirinzi L. Meozzi	B. Grosso	E. Napoli	09 June 2023

RINA Consulting S.p.A. | Società soggetta a direzione e coordinamento amministrativo e finanziario del socio unico RINA S.p.A.
Via Cecchi, 6 - 16129 GENOVA | P. +39 010 31961 | rinaconsulting@rina.org | www.rina.org
C.F./P. IVA/R.I. Genova N. 03476550102 | Cap. Soc. € 20.000.000,00 i.v.

TABLE OF CONTENTS

			Page
LIST OF TABLES			**3**
LIST OF FIGURES			**3**
ABBREVIATIONS AND ACRONYMS			**4**
EXECUTIVE SUMMARY			**6**
1	**INTRODUCTION**		**15**
	1.1	PRODUCTION OPERATIONS OVERVIEW	15
	1.2	SOURCES OF INFORMATION	19
	1.3	REPORT ORGANIZATION	19
2	**ISSUES TABLE**		**20**
3	**ENVIRONMENTAL AND SOCIAL MANAGEMENT**		**25**
	3.1	ENVIRONMENTAL AND SOCIAL MANAGEMENT SYSTEM	25
	3.2	ORGANIZATION AND STAFFING	25
	3.3	MANAGEMENT OF CHANGE	25
	3.4	INCIDENTS	25
	3.5	ASSOCIATED FACILITIES	26
4	**POLLUTION PREVENTION**		**29**
	4.1	WASTE AND WATER MANAGEMENT	29
		4.1.1 Project Strategy	29
		4.1.2 Observations	29
	4.2	HAZARDOUS MATERIALS MANAGEMENT AND SPILL PREVENTION	34
		4.2.1 Project Strategy	34
		4.2.2 Observations	35
	4.3	AIR QUALITY AND NOISE	35
		4.3.1 Project Strategy	35
		4.3.2 Observations	35
	4.4	EROSION AND SEDIMENT CONTROL	37
		4.4.1 Project Strategy	37
		4.4.2 Observations	37
5	**BIODIVERSITY AND ECOLOGICAL MANAGEMENT**		**39**
	5.1	INTRODUCTION	39
	5.2	BIODIVERSITY STRATEGY AND IMPLEMENTATION	39
		5.2.1 Project Strategy	39
		5.2.2 Observations	41
		5.2.3 Recommendations	48
	5.3	INDUCED ACCESS	49
		5.3.1 Project Strategy	49
		5.3.2 Observations	49
		5.3.3 Recommendation	50
	5.4	REINSTATEMENT AND REGENERATION	51
		5.4.1 Project Strategy	51
		5.4.2 Observations	51
		5.4.3 Recommendation	52
	5.5	INVASIVE SPECIES, PESTS AND PLANT PATHOGENS	52
		5.5.1 Project Strategy	52
		5.5.2 Observations	52
		5.5.3 Recommendations	57

6 SOCIAL 58
6.1 LAND ACCESS, RESETTLEMENT, AND LIVELIHOOD RESTORATION 58
6.1.1 Project Strategy 58
6.1.2 Observations 58
6.1.3 Recommendations 58
6.2 COMMUNITY IMPACTS MANAGEMENT AND SECURITY 59
6.2.1 Project Strategy 59
6.2.2 Observations 59
6.2.3 Comment 60
6.3 COMMUNITY DEVELOPMENT SUPPORT PROGRAM 60
6.3.1 Project Strategy 60
6.3.2 Observations 61
6.3.3 Recommendation 62
6.4 NATIONAL CONTENT PROGRAM COMPONENT 62
6.4.1 Project Strategy 62
6.4.2 Observations 62
6.4.3 Recommendations 65
6.5 STAKEHOLDER ENGAGEMENT AND COMMUNITY GRIEVANCE MANAGEMENT 65
6.5.1 Project Strategy 65
6.5.2 Observations 65
6.5.3 Recommendations 66
6.6 STATE CLAN BENEFITS INTERFACE - UPDATE 66
6.6.1 Project Strategy 66
6.6.2 Observations on Status 66
6.6.3 Recommendations 67
7 LABOR AND HUMAN RESOURCES 68
7.1 PROJECT STRATEGY 68
7.2 OBSERVATIONS 68
7.2.1 Professional Development 68
7.2.2 Personal Development 68
7.2.3 Labor Grievance Management 69
7.3 RECOMMENDATIONS 69
8 HEALTH AND SAFETY 70
8.1 OCCUPATIONAL HEALTH AND SAFETY 70
8.1.1 Project Strategy 70
8.1.2 Observations 70
8.1.3 Recommendations 71
8.2 COMMUNITY HEALTH 71
8.2.1 Observations 71
8.2.2 Recommendations 71
9 CULTURAL HERITAGE 72
9.1 PROJECT STRATEGY 72
9.2 OBSERVATIONS 72

LIST OF TABLES

Table 6.1: Workforce Statistics 63
Table 6.2: Community Engagements in 2022 66

LIST OF FIGURES

Figure 1.1: 2022 LNG Production 16
Figure 1.2: Angore Wellpad C in February 2023 16
Figure 1.3: Nabors 702 Rig Drill Floor at Wellpad C 17
Figure 1.4: Trenching for Angore Pipeline 18
Figure 1.5: Aerial View of HDD under Tagari River 19
Figure 3.1: RoW MOC Sketch
Figure 3.2: Environmental Compliance Incidents 26
Figure 3.3: August 2011 PNG LNG Flowchart for Management of Associated Facilities 27
Figure 3.4: HDGC Quarry 28
Figure 4.1: 2021 Total Project Waste Disposal
Figure 4.2: Exposed Landfill Liner at HWMF 30
Figure 4.3: Improperly Ventilated Mediburn Incinerator at HWMF 30
Figure 4.4: LNG Plant Landfill Close to Final Closure 31
Figure 4.5: TWM Landfill at Roku Under Construction 31
Figure 4.6: HWMF Reed Bed Suitable for Treatment of Wash Water 32
Figure 4.7: Average 2022 Concentrations of Main Leachate Parameters in Groundwater at HWMF 33
Figure 4.8: Amine-Contaminated Test Water at the Roku Facility 34
Figure 4.9: EMPNG Spill Performance – Volume (bbl) and Frequency 35
Figure 4.10: Flaring 2019 - 2022 35
Figure 4.11: 2020 Project Emissions by Component 36
Figure 4.12: Project GHG Emissions 37
Figure 4.13: ROW Stabilization at KP 82 after Reinstatement 38
Figure 4.14: Komo Stormwater Management 2013 vs. 2023 – NW Runway 38
Figure 4.15: Komo Stormwater Management 2014 vs. 2023 – NE Runway 38
Figure 5.1: Lake Kutubu WMA Enhancement Program Status Update 45
Figure 5.2: Lower Kikori Community Engagement Progress 2020-2022 47
Figure 5.3: Mangrove Regeneration ‘Static Photo Point C’ Images, looking Left, Central and Right – Top Images from Feb 2022, Bottom Images from Jan 2023. 51
Figure 5.4: EMPNG’s Overview of their Weed Control Process 53
Figure 5.5: Monthly Cane Toad Observations at HWMF 55
Figure 5.6: Summary of Project-Related Shipments, NAQIA-Required Inspections and Re-Fumigations 57
Figure 6.1: Proposed Location for HGSF Camp near Well Pad C 60
Figure 8.1: Safety Record 2021 - 2022 70
Figure 9.1: Ceremony to Appease Spirits 72

ABBREVIATIONS AND ACRONYMS

AA	Assessment Area
ADR	Alternative Dispute Resolution
ALS	Alternative Livelihood Strategy
bbl	Barrel
BIMP	Biodiversity Implementation and Monitoring Program
BRC	(New Guinea) Binatang Research Centre
BS	Biodiversity Strategy
CA	Community Affairs
CBD	Convention on Biological Diversity
CDS	Community Development Support
CEPA	Conservation and Environment Protection Authority
CEXIM	Export-Import Bank of China
COH	Culture of Health (EMPNG Program)
CP	Cathodic Protection
CTA	Common Terms Agreement
CV	Check valves
E&S	Environmental and Social
EC	Enterprise Centre
ECA	Export Credit Agency
ECCP	Enhancing Conservation Capacity Program
ECI	Environmental Compliance Incident
EHS	Environmental Health & Safety
EIS	Environmental Impact Statement
EM	ExxonMobil
EMP	Environmental Management Plan
EMPNG	ExxonMobil PNG Limited (formerly EHL – Esso Highlands Limited)
EQR	Earthquake Recovery
ERP	Emissions Reduction Plan (ExxonMobil Program)
ESC	Erosion and Sediment Control
ESMP	Environment and Social Management Plan
ESMS	Environmental and Social Management System
ESRP	Erosion, Sediment, Reinstatement Plan
GBIF	Global Biodiversity Information Facility
GIIF	Good International Industry Practice
HDD	Horizontal Directional Drilling
H&S	Health and Safety
HGCP	Hides Gas Conditioning Plant
HGDC	Hides Gas Development Company
HWMF	Hides Waste Management Facility
IESC	Independent Environmental and Social Consultant
IFC	International Finance Corporation
ISOS	International SOS
JBIC	Japan Bank for International Cooperation
Km	Kilometer
KP	Kilometer Pipeline
KPA	Kumul Petroleum Academy
L&CA	Land and Community Affairs

LI	Linear Infrastructure
LNG	Liquefied Natural Gas
LOBID	Landowner Beneficiaries Identification
LTI	Lost Time Incident
M&E	Monitoring and Evaluation
MLV	Main Line Valves
MOC	Management of Change
MOH	Medicine and Occupational Health
MOU	Memorandum of Understanding
MTA	Million tons per annum
NAQIA	National Agriculture Quarantine and Inspection Authority
NBSAP	National Biodiversity Strategy and Action Plan
NC	Non-Conformance or Non-Compliance
NCCC	National Content Coordination
NEXI	Nippon Export and Investment Insurance
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
P1, P2, etc.	Priority 1 weed, Priority 2 weed, etc.
PCS	Pre-Construction Survey
PDL	Petroleum Development License
PIA	Project Impacted Areas
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
SACE	Servizi Assicurativi del Commercio Estero
SCICC	Strategic Community Investment Coordination Committee
STP	Sewage Treatment Plant
TOR	Terms of Reference
TRIR	Total Recordable Incident Rate
TSS	Total suspended solids
TWM	Total Waste Management
UA	Upstream Area
U-PNG	University of PNG
USEXIM	Export-Import Bank of the United States
VLO	Village Liaison Officers
VMP	Vehicle Monitoring Plan
WCS	Wildlife Conservation Society
WMA	Wildlife Management Area
WMZ	Weed Management Zone

EXECUTIVE SUMMARY

This report represents the 19th field monitoring and the 22nd 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. 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). This report is based on the first field visit undertaken since February 2019 due to 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) and is the reason why this report is for the 19th field visit, but the 22nd review. The review was based on the documentation provided to the IESC as well as field observations.

PNG LNG continues to have good performance. Production continued to be above projections in 2022 and the Project had its best ever safety and security performance. The Angore project is now well advanced with drilling taking place at Wellpad C and pipelaying operations to connect Wellpad C with the HGCP have started. The recovery projects from the M = 7.5 February 2018 continue to progress effectively with $340 million out of a budget of $540 million having been spent to date. Also noteworthy in 2022 has been the participation of PNG nationals in the workforce (91%) with the note that females make up 20% of the PNG workforce. Women make up about 25% of the PNG field workforce, which is the highest worldwide within the ExxonMobil organization.

Environmental and Social Management System

The Environmental and Social Management System (ESMS) is a mature and active System. EMPNG continues to operate within their Production Environmental and Social Management Plan (ESMP) implemented through three Environmental Management Plans and seven Social Management Plans. There have been no changes to the ESMS since the last IESC reporting. Since the last IESC reporting period there have been two Lender-Reportable (Class II) MOCs: Additional RoW width extension from KP 7.35 to KP 24.6 required for pipeline inspection purposes and protect pipeline integrity; and treatment of wash water (after pre-treatment removal of oil and grease) using the reed bed at the Hides Waste Management Facility at Kopeanda. IESC concurs with the EMPNG' s following of the MOC process.

A change we have seen since our last field visit is something we would not have perceived based on desktop studies, and this is staffing. The Project has a mature organization, but the IESC's perception is that EMPNG's senior staff are trying to do too many jobs and that there is not enough support staff. We can see that the Papua LNG project has recruited some key staff and that COVID 19 resulted in some expats and staff contractors returning home; some of these have not been replaced.. We see this as a potential compliance issue where the lack of qualified staff might prevent EMPNG from fulfilling some commitments, in particular with respect to biodiversity. This subject is discussed in greater detail in Section 5.2.1.1.

An additional aspect environmental and social management required by Lenders under PS1 is stewardship of associated facilities. We noted during this field visit good stewardship of the TWM waste management facility at Roku near the LNG Plant, but poor stewardship of the quarry operated by Hides Gas Development Company (HGDC) near Hides. EMPNG has room for improvement for their associated facilities.

Pollution Prevention

EMPNG continues to monitor Environmental Compliance Incidents (ECIs) and EMP Non-conformances (NCs), which indicates that the Environmental Management System is healthy. There were no ECIs recorded in 2022, which is a first since the start of the Project.

Waste and Water Management

Overall, there has been a slight increase in waste generated from 2021. Upstream waste volumes have increased due to Angore operations with most of the waste consisting of non-restricted domestic wastes associated with camp activities. Waste volumes are relatively steady at LNGP reflective of base operations. In the Upstream area there is good landfill capacity, but IESC notes some operational problems related to the liner integrity. Waste management at the LNG plant utilizes a new landfill at the location of Construction Landfill C but expects to transition to using a new landfill currently under construction at the Total Waste Management (TWM) facility in Roku, expected for completion in June 2023. EMPNG has used the TWM incinerator at Roku since the beginning of Q3 2020 and has continued to work with TWM Roku in 2022 to develop their landfill and industrial wastewater treatment plant facilities.

Wastewater continues to be well managed. Although there have been some minor exceedances from both Upstream and LNG Plant wastewater treatment plants, there have been no exceedances to surface waters. The biggest wastewater disposal problem is 137 T (Amine contaminated wash water, Activated C) that has to be exported to Australia. The TWM Industrial Wastewater Treatment Plant has undergone wet commissioning, pending water quality reporting for initial wastewater batch treatment to ascertain treatment capacity for certain batches of wastewater. It is expected that the Roku treatment plant will eventually be a demonstrable solution for certain

wastewaters. An important change to wastewater treatment in the Upstream area has been that CEPA has given approval for the treatment of wash water in the HWMF reed bed after a pre-treatment to remove oil and grease.

Groundwater monitoring around the HGCP continues to show no evidence of groundwater contamination. Conversely, at the Hides Waste Management Facility (HWMF), evidence of infiltration of leachate from the facility has been recorded since 2014. Three new groundwater monitoring wells at the HWMF were installed in 2021. The data collected from the new wells were not conclusive in 2021, but the 2022 data confirm that the landfill and/or the reed bed are a source of groundwater contamination. Testing of the leachate from the landfill highlights the presence of high ammonia-nitrogen, manganese, iron, barium, and potassium. The testing for these parameters (averaged over all of the testing from 2022) shows that there is a significant difference between upgradient and downgradient concentrations of the anomalous leachate parameters. The IESC recognizes there are no users of groundwater in the neighborhood of the HWMF and that impact to the nearby Tagari River is probably negligible. At this stage, however, the risk of the contamination of the Tagari River should be quantified as part of a risk assessment in association with a fate and transport analysis.

The 2022 groundwater monitoring network surrounding the landfill at the LNG Plant has continued to identify anomalous measurements of a few chemical parameters without identifying an obvious plume in the groundwater where westward flow towards Caution Bay would be expected. Local groundwater is saline and therefore not a resource. Measurements around the landfill generally fall within the range of groundwater test results from other wells around the LNG Plant and there are no obvious problems to report.

Hazardous Materials Management and Spill Prevention

Hazardous materials management practice is undertaken consistent with GIIP. Spills continue to be consistently recorded and their causes investigated, and procedures developed to minimize future spills. There were a total of 40 small spills in 2022 with only one designated as recordable (>1 bbl). None of these spills had significant environmental consequence.

Air Quality and Noise

Substantial effort is being placed in the reduction of flaring. Routine flaring emissions were reduced from 2021 to 2022 at both the LNG Plant and HGCP. Spikes were from non-routine conditions. This effort supports ExxonMobil's 2030 Emission Reduction Plan (ERP). Four other GHG reduction plans were also completed in 2022.

With respect to stack emissions, in 2021 the two gas turbine gensets tested at HGCP failed for NOx (the standard is 42 ppm and concentrations of 43 and 48 ppm were recorded). EMPNG Engineering and Maintenance teams successfully performed software adjustments to lower the set points for the SoloNox ® system on the Hides gensets and in 2022 third party remote verification emissions testing found full compliance at HGCP. The next testing is scheduled for 2024.

Noise monitoring was undertaken in 2022 with no problems to report. No monitoring was conducted at the HWMF as the HWMF hazardous waste incinerator is still not being used.

Erosion and Sediment Control

The earthquake caused some serious problems with respect to slope failures in the Upstream area, including at the wellpads and spineline, Komo airfield, and along the pipeline route. Remediation efforts are ongoing with $421 million spent out of a budget of $560 million, which does not include the full reinstatement of the Komo airfield. Several remediation sites along the pipeline route were visited with excellent work observed related to slope stabilization. In retrospect, when IESC last visited these projects in 2019 we were just coming to understand the scope of the recovery effort, but we did not expect it to still be ongoing in 2023. Nevertheless, we are impressed with the quality of the work undertaken.

With respect to erosion and sediment control, IESC is pleased to report major success stories. The stormwater management infrastructure at both Komo and Hides is now permanent and fully functional. Further work is in the realm of maintenance. IESC also reviewed the new stormwater management infrastructure at Angore Wellpad C and found that it is being well installed.

Ecological Management and Biodiversity

Biodiversity

EMPNG currently have three empty positions within the Biodiversity Team which the organization chart shows as comprising six internal roles. The current situation appears to be placing additional pressures on the whole team in work-program implementation. In the IESC's opinion this could have repercussions in the short term on the Project's ability to meet program delivery and Lender requirements. EMPNG are aware of the potential pressures the personnel and capacity gaps are having on existing personnel and are actively seeking to source capable candidates.

The biodiversity monitoring program – some highlights noted below , but see main report for further detail:

- ✓ Responding to a previously observed inconsistency when determining whether land use changes in the proximity of Project infrastructure could in fact be deemed to be indirect impacts related to the Project, EMPNG have now developed guidelines to help make the process more robust. The guidelines should now be applied retrospectively to previous detected land cover changes as appropriate, to understand whether these may or may not have been Project-enabled.
- ✓ Results of the 2021 specialist rapid biodiversity surveys were presented, and the IESC commends the company in continuing with these valuable monitoring opportunities and publishing the resulting reports.
    - Results indicate that both survey areas (Hides Ridge and Agogo Ridge) retain high biodiversity values for all surveyed taxa, with both areas continuing to support rare, conservation listed, restricted range and hunting-sensitive species.
    - Notable declines have been recorded for three hunting-sensitive IUCN Threatened species at the Agogo sites over the last two sampling years.
    - Edge avoidance was clearly demonstrated at the Agogo sites by multiple species, whereas edge preference was observed by several species on Hides Ridge.
    - Increases in hunting pressure and feral dog predation, and the potential spread of exotic rodent species, both associated with installation of the pipeline ROW and associated roads, remain the two major factors most likely to threaten biodiversity values in the BAAs.
    - Detailed surveys to characterize the community hunting observed were recommended by the survey specialists from 2017. In 2021, EMPNG developed a pilot questionnaire, but advise that the survey methodology now requires adaptation. The IESC recommend more urgency in EMPNG's approach as this work is critical whilst hunters and dogs are preferentially using the pipeline RoW corridor to access hunting grounds.
    - Dieback on Hides Ridge has been observed during surveys in 2015, 2017, 2019 and 2021 and the survey specialists and IESC have recommended further investigation into the causes of the dying canopy trees. EMPNG are only now arranging for further visual observations to take place. A sense of urgency to investigate and ascertain the type of plant pathogen has been absent for several years. The previous Observation is raised to a Level II Non-Conformance – see Plant Pathogen section below.
- ✓ Using high resolution satellite imagery, a pilot study at Lake Kutubu Wildlife Management Area (WMA) is being undertaken to help identify increases in habitat condition/vegetation cover from satellite imagery. Conclusions to the broader applicability of the approach to other offset areas are still under discussion, and a similar assessment of Aird Hills WMA will be performed during 2023. The intention is that this will contribute to the assessment of habitat restoration and therefore inform calculations for achieving biodiversity no net loss.

The biodiversity offset program – some highlights noted below, but see main report for further detail:

- ✓ In program support for PNG's implementation of the National Biodiversity and Strategy Action Plan (NBSAP), no Communicating Conservation Meetings have been held since 2019. The Project could consider exploring other ways to support NBSAP implementation until further.
- ✓ A new conservation capacity partnership program has been developed with New Guinea Binatang Research Centre (NGBRC), an existing biodiversity specialist service provider to EMPNG. The program will support a number of existing MPhil and PhD students and will also support NGBRC's existing Conservation Rangers Training course, which has already been attended by five Rangers from the Project's Lower Kikori offset program communities.
- ✓ A first draft of the Lake Kutubu WMA Management Plan has been developed, although not yet seen by IESC. The current schedule is for a final draft of the Plan to be available by the end of 2023. The IESC again stresses the importance that the Lake Kutubu WMA Plan is representative of the biodiversity values to be conserved (including freshwater ecology), be scientifically robust, based on up-to-date information, setting clear ecological and ecosystem service preservation objectives and outcomes, and be well informed by a wide range of stakeholders' needs and opinions. Discussions with EMPNG indicate that additional broad stakeholder engagement will be necessary for the process to be considered legitimate and transparent. Once complete, this Plan should help guide conservation within the WMA for the benefit of communities and stakeholders far and wide.
- ✓ At Lake Kutubu the work being done by EMPNG with the Lake Kutubu WMA communities is highly valuable; nevertheless, the IESC's opinion is that aquatic ecology/endemic fish biodiversity values do not appear to be adequately represented in EMPNG priorities. When queried by the IESC, EMPNG have repeatedly stated that if the WMA Committee chose to include fish conservation monitoring activities in their work plan, then EMPNG would support the work through their offset Lake Kutubu Enhancement program. EMPNG chose not to include aquatic ecology within the PMA3 biodiversity survey scope of work. The Committee have recently undertaken

their own citizen-science fish surveys, attempting to identify fish population compositions (endemic species and introduced species). In repeated IESC conversations with the WMA Committee, it is unquestionable that the Committee has significant interest in understanding the aquatic ecology of the lake and in maintaining the unique endemic fish populations for which the lake is internationally recognized. Yet EMPNG is not actively supporting the Committee in this vital component of long-term lake conservation. The IESC raises the previous Observation to a Non-Conformance Level 1.

To supplement EMPNG's existing efforts with communities in the Lower Kikori offset program, an Environmental Lawyer has been engaged to work with communities on formalizing Conservation Deeds and to facilitate their implementation EMPNG are transparent and realistic in the challenges they are facing in supporting the establishment of the Conservation Deeds. For the Lower Kikori and other offset programs currently supported, the Project have developed an Alternative Livelihoods Strategy (ALS) which is to be welcomed. Establishing protected areas through preservation of biodiversity values sometimes restricts traditional access to natural resources, so site-specific plans will help guide ALS work at offset program sites focusing on three primary areas: household food security and nutrition; diversifying household incomes; and community capacity building for self-reliance and autonomy.

Induced Access

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 (Gobe to Kantobo road section) and the Kaiam Bridge. In the event of any request to transfer ownership of roads/infrastructure, EMPNG should ensure as part of any negotiations with the PNG government 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. Lenders would require that potential risks are fully understood and effective mitigation options discussed to achieve these aims.

Two points of access from public roads onto project roads and infrastructure are not currently controlled in alignment with the stated controls in the EMP: these are at Angore and at Benaria.

Quarterly data on vehicle movements on the Project's road between Gobe and Kantobo was presented, although there are some discrepancies with data provided to the IESC previously. EMPNG state that overall Gobe to Kantobo road usage is decreasing, despite 2022 being an election year. The new Agiru Highway was opened by the government during 2022, which links into the Project's Kaiam Bridge.

The Access Monitors usually stationed at the Project's Gobe to Kantobo road allow movement of vehicles along the 'Southern Highway' section although the Project confirms that vehicle and destination details are usually recorded. A similar situation typically exists at the Project constructed Kaiam Bridge. However, there have been recent contractual and payment challenges with the Clan Agency that employs clan member who undertake the role. This has meant that vehicle movement data has not been recorded or collated for 4Q 2022 or 1Q 2023. EMPNG are actively working to rectify the situation.

Although EMPNG provided valuable chopper opportunities to have aerial views of the majority of the pipeline RoW and above ground installations, EMPNG stated it was not possible to undertake a road trip (due to security threat level) along the 'Southern Highway' linking Kaiam – Gobe – Mubi River – Heartbreak Hill – Kantobo – Moro, to observe access controls on the ground. This will be a focus for the next trip.

Reinstatement and Regeneration

No updates on regeneration monitoring were presented during this site visit. The last IESC report described the 2021 regeneration monitoring mission by NGBRC. The next regeneration monitoring surveys will occur in Q1 2023 as per 2-yearly schedule..

For mangrove regeneration at the LNG Plant, following three years of desktop review absence, the IESC were able to visually observe that mangrove regeneration has progressed, with individual trees in general looking taller and wider than the last visit. No obvious signs of recent harvesting of mangrove trees were observed.

The Project continues to engage with the communities on the benefits of mangroves. If there is an incursion, the CA team works with VLOs and village leaders to caution those known to have strayed into agreed exclusion zones (for which compensation for restricted access has already been paid).

Invasive Species and Quarantine Management

For weed inspection and control, routine vector control site inspections have occurred at certain points along the pipeline RoW and infrastructure, but are somewhat limited in frequency, geographical extent and choice of location. Access to vehicles by the vector control contractor has become a significant limiting factor due to the need for all journeys to be accompanied by Host Government Security Force vehicles, and these are very busy supporting the high priority earthquake recovery works along the RoW. The opportunities to speak with vector control contractors

were useful to not only better understand their current work approach and some of the challenges they face in weed control, but also to observe capacity and resource levels. EMPNG need to ensure their vector control contractors are fully trained in safe, ecologically appropriate use of herbicides, especially when in proximity to water bodies. In the IESC's opinion, the equivalent of one full-time vector control contractor at each of the Hides and Moro sites is not sufficient to tackle the P1 weeds in the Project's Upstream area of influence. EMPNG have provided information on an approach being developed to tackle weed control on a more localized basis i.e. to expand the existing Clan Caretaking Agreements to incorporate some responsibilities for weed management along the RoW, in addition to the existing requirements for grass-cutting RoW maintenance.

The annual weed audit was again undertaken by NGBRC in 2022, this time covering 672 transects, the highest sampling effort to date, in comparison to 108 transects in 2018, 367 in 2019 and 389 in 2021. Diversity per transect has increased from 2021 to 2022 in all four elevation zones, but not in the overall number of P1 species. The abundance and dominance of the top five most common Priority-1 (P1) species across the Upstream survey area indicates these five currently comprise approx. 80% of all P1 species records. Piper aduncum, Ludwigia leptocarpa and Desmodium sequax are the dominant P1 species in most zones, although abundance has slightly declined/stable when compared to 2021.

As noted in the last IESC report, EMPNG were previously considering moving from weed audits every year to once every two years, however this is no longer the plan – the next specialist monitoring will be done during May 2023.

Weed transmission along the RoW was a significant impact predicted in the EIS,and mitigation measures were developed. Demonstrating the effectiveness of mitigation measures implemented is important so that adaptive management can be deployed where necessary. However, in the Project's area of impact, EMPNG continue to state that certain P1 weeds currently found in areas where they were not previously recorded, were potentially present prior to construction but had not been correctly identified at the time. In the IESC's opinion, understanding whether EIS-predicted impacts may have occurred is vital; instances where mitigation may not have fully worked include: (1) Homa-Benaria Ridge is a key priority ecosystem, and was deemed to be largely weed-free[1], but now there are 20 species recorded, (2) Ludwigia leptocarpa, during pre-construction this P1 weed was only found at Omati & Kikori, but by late 2013 was at Moro, and by 2015 was found at Angore. It is IESC opinion that some sort of independent specialist verification should be undertaken to try to resolve this significant, alleged discrepancy, and an Observation is noted in the Issues Table[2].

Cane Toads: cane toads (*Rhinella marina*) have become an increasingly challenging invasive species in the Upstream Highlands area. Target areas for EMPNG prevention, detection and response are the HGCP, the Hides vehicle-washdown facility, the Hides Waste Management Facility (HWMF) at Kopeanda, Moro, Komo and Angore. EMPNG report a decreasing trend for 2019 to 2022 across the Upstream sites of interest, although the HWMF continues to be an issue. The HWMF is the dominant area where juveniles are recorded, a challenging situation observed first-hand by the IESC during this visit. The strategy is to limit the introduction of cane toads into priority ecosystems such as Hides Ridge, the Homa-Benaria Ridge and Lake Kutubu WMA. As Earthquake Recovery Work (EQX) continues, vehicles and equipment are currently regularly accessing and utilizing a section of the sensitive Homa-Benaria Ridge; the Project have established a mobile washdown unit for vehicles at the base of the MLV2 Access Track to minimize transmission of invasive species, pathogens and pests, including cane toads. Key from a Lender risk perspective is that the Project should continue to receive specialist advice from external experts and act responsively to their recommendations.

Noted in biodiversity monitoring above, recent surveys have recorded tree canopy dieback in the vicinity of the RoW on Hides Ridge. The Upstream EMP (Dec 2019, Section 15.4-15.6) highlights the need to apply the precautionary principle, to inspect and sample instances of dieback in the case of outbreaks of the fungus *Phytopthera cinnamomi*, especially in sensitive areas that are susceptible to senescence such as Hides with various *Nothofagus* species and the Papua New Guinea Oak *Castanopsis acuminatissima*. Type A2 *Phytopthera* is a relatively recent introduction to PNG and the full potential impact of this mating type on native vegetation is not yet known. Therefore, immediate consideration of a sampling program and reinforcement of necessary mitigation measures would be prudent. Considering the period of repeated reporting of dieback by the specialist survey team, the lack of regular observation during 2021 by the Project noted by the PMA-3 survey team (compounded by the loss of further key EMPNG personnel during 2022 noted in Section 5.2.2.1), and that (although discussions with surveyors have started) no targeted investigative dieback surveys have yet commenced, the IESC escalates the Observation raised the last IESC report to a Level II non-conformance,

As noted in the last IESC report, wallaby (*Macropus agilis*, IUCN Least Concern) numbers within the Project's LNG Plant boundary fence had reached a level whereby EMPNG senior management deemed them a risk to personnel

****

1 EMPNG Biodiversity Strategy Rev.2

2 EMPNG disagree with this IESC opinion, and state that BRC contracted to undertake the weed audits currently are sufficiently independent.

safety and plant integrity. The population had reached such a level that local hunters were hunting through the fence from the public road, gun shots had been heard and intruders were caught on CCTV trying to hunt wallabies at night inside the facility fence. Following expert opinion from Port Moresby Nature Park's macropod specialists and after consultation with and approval from CEPA, EMPNG contracted expert marksmen to undertake staged culls during early 2022 and 2023, of up to 1000 animals. EMPNG stated that all CEPA waiver approval conditions were complied with i.e. EMPNG submitted to CEPA, prior to the culling campaign, the detailed plans for the disposal of carcasses.

Social

Resettlement

Resettlement obligations carried over from 2021 were completed in 2022 with the exception of one outcome evaluation currently in progress. Additional land was or will be (2022-23) accessed for earthquake related pipeline remediation work, increased permanent exclusion zones, or extension or widening of the pipeline in certain areas to maintain pipeline integrity. Of the nine households affected, RAP addendums were warranted for only two as the other seven land acquisitions caused no or only minimal impact for which compensation was preferred. The IESC reviewed and accepted the Addendums.

Community Impacts Management-Community Security Conditions

Clan fighting continued to destabilize political and economic community conditions in the PNG LNG Project footprint, particularly in Hela Province where intra and inter-clan rivalries persist. The frequency of tribal and other disputes has intensified with the spread of arms. The GoPNG, through official Peace and Good Order Committee work and by Hela Provincial Law and Justice Advocacy, has been actively involved in mediating tribal conflicts and promoting dialogue between disputing factions in the Upstream Operating Area. The GoPNG continues its firearm buy-back/hand-in scheme, and in Hela conducted several rounds of Host Government Security Force (HGSF) led community firearm awareness activities.

Excessive alcohol consumption continues to exacerbate the fragile security situation producing antisocial behavior, criminality and public disturbances in local communities across the Project footprint. The Hela Provincial Government has stated the intent to enforce a liquor ban and conducted several outreach programs in 2022.

PNG's patronage-based politics leads to fierce competition and resentment over political appointments and power linked to the distribution of scarce resources and commercial opportunities promote conflicts that polarize and destabilize communities. The GoPNG instituted a major security operation supported by external partners to address law and order challenges during its 2022 election. It has also appointed individuals to facilitate dialogue on occasion when political disputes escalate into violence.

EMPNG operations within the Highlands are under a "Severe" security threat characterization due to increased security complexity, increased law-and-order challenges, and significant security incidents. The Project includes communities in its security programs. In response to a recommendation made in the 2019 Security Risk Assessment for Papua New Guinea and a Host Government Security Forces (HGSF) camp will be established at Hides Well Pad in order to implement effective safeguards for the protection of people and assets along the Hides Well Pad Access Road.

Community Development Support

The IESC 2021 review recommended that the Project accelerate update of the CDS strategy and Plan with particular focus on:

- ✓ Implementation and management arrangements and Monitoring and Evaluation (M&E) procedure.
- ✓ Reporting – especially identifying the Project role (e.g., financial, involvement in planning and/or implementation).
- ✓ Assessment of the focal themes (livelihood, health, education, law and justice) to determine (i) whether goals are being reached and (ii) whether the collective impact of activities in each thematic area justifies the investment in terms of money and time.
- ✓ Cross Functionality - achieving a Project-wide comprehensive and coordinated community support program.

The IESC recommendations were taken on board, but implementation has been slow due to COVID effects, staffing changes and re-structuring. Both CDS and National Content (an essential Community development effort) were moved from under P&GA (Public & Government Affairs) to L&CA (Land and Community Affairs under Operations). The IESC considers this organizational change a positive move. Internal discussions during 2022 involving Project management and relevant department staff resulted in some additional changes intended to facilitate CDS efficiency and cross functionality and increase project stewardability.

The IESC appreciates that the effects of COVID and other events in the last few years have had profound adverse impacts on progressing tasks. The IESC, however, advises the Project to make a demonstrable effort to develop and begin implementation of a Project level CDS strategy and plans.

National Content

PNG Nationals made up 88% of the total workforce in 2022 – 3,315 up from 2,978 at the end of 2021. Of the EMP workforce, 76% were nationals while third party contractors were 91% national. In terms of PNG workforce origins, workers from local areas continued to be the largest group (44%) followed by regional at 23% and National at 33%. In terms of positions held in the EMP workforce, 16 employees rose to supervisor positions, 23% are senior professionals and 68% are in professional roles. In terms of Competency Enhancement, 148,000 training hours were delivered in 2022 – up from 117,000 hours in 2021 and representing an average 46 hours of training per person. 2023 Focus includes continued Partnership with Kumul Petroleum Academy for O&M Intake Program; facilitating training for Global Leadership Courses for supervisors; and implementing "modern worker" office skills and personal effectiveness training to upskill workforce. EMPNG has also continued to emphasize increased national content in their supply chains.

Stakeholder Engagement and Consultation

The number of engagements rose slightly in the area of the LNG Plant and significantly in the Highlands project areas, nearly double the engagements that took place in 2021 and exceeding 10,000 engagements with 43,000 atendees. This increase is attributed to the increase in external work fronts that allowed more face to face engagement.

Community Grievance Management

The Project continues to effectively communicate and coordinate with the cross-functional team (Security, P&GA, Law, ERB). Grievances increased by only two in 2022 of which 19 came from Highlands communities, one from the Plant site area and one from the Port Moresby area. The majority of grievances involved damages/claims (70%) followed by environment-related (25%). Most grievances were closed within the 100-day period. Two complicated grievances filed in 2022 required more than 100 days to resolve. Six complicated grievances carried over from 2021 were closed in 2022.

The number of issues increased considerably during 2022 – 2,298 compared to 1,199 in 2021. The larger number of issues correlates to the increase in external work fronts requiring face-to-face engagements leading to stakeholders having questions and the opportunity to express them. The main categories of issues related to social, economic and land access queries and concerns.

Landowner Beneficiary Payments

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 positive engagements with CoVs, PNG Government and other stakeholders. EMPNG provides logistical support to government activities as appropriate.

Progress is being made to deliver benefits to mandated beneficiaries. Downstream areas received the third royalty payment in Nov 2022. The second Gas Resource Director's elections were held in Dec 2022 with all four incumbents re-elected. Upstream payments are in progress with status varying between Petroleum Development License (PDL) areas. Launching of Upstream clan account opening exercise took place in November 2022, following the clearance of remaining legal challenges against the Ministerial Determination.

Labor and Human Resources

Professional Development

The main elements of professional development support measures in 2022 were:

- ✓ Supervisor Network using virtual sessions on equipping supervisors with information necessary to present key messages across the organization, as well as face-to-face sessions with visiting Senior Leaders
- ✓ Employee Forums using virtual sessions on key messages such as Business Unit Goals and Business performance updates, provision of highlights from Employee Resources Group Activities, updates on Employee policies and programs and rolling out of the Nambawan Awards.
- ✓ The Toastmaster Face-to-face Program reinstated and a membership drive introduced.
- ✓ Various Award Programs, such as:
  - LCM Awards, annual awards open to all staff, recognize, promote and reward outstanding examples of Em Pasing Bilong long ExxonMobil PNG values and behaviors.

- Introduction of the Nambawan Awards nominated by staff to recognize, promote and reward peers' outstanding performance.

Personal Development Activities

The Project also supports staff personal development with various activities including:

- ✓ Business Acumen Financial Literacy program
- ✓ Participation in the Women of Worth Conference
- ✓ Work-life-balance Seminars
- ✓ PNG Tribal Foundation's Senisim Pasin campaign dealing with gender violence
- ✓ Giving Back program with activities such as staff participation in:
  - Grade 12 Career Expo
  - Buk Bilong Pikinini (Books for Children Program)
  - Science Ambassador Program
  - National Development Summit
- ✓ Support to mental health through 24/7 face-to-face counseling resumption through Magellan Healthcare, and group counseling available under EHAP Services.

Labor Grievance Management

The "HR Direct' automatic system continues to be used by employees to direct questions to appropriate teams. Positive feedback from had an average score of 4.7 out of 5. For the 792 queries in 2022, the average response time was less than 1 day. Most inquiries were related to emergency loans, payroll, Savings Plan and the HOAP. No time was lost due to industrial action.

In terms of Camp Performance Indicators, issues are largely related to minor maintenance issues. Complaints about food are rare and most feedback on food is positive and often involves requests to repeat popular menu items. Recreational amenities have been maintained on a resident usage basis.

Health and Safety

Community and Occupational Health

Community health continues to be a component of the CDS program. In the Upstream area EMPNG continues to work to reduce the factors that limit the capacity of Papua New Guineans to fully participate in livelihood/economic activities by targeting high risk diseases and health complications. CDS health activities in Hela Province and the Southern Highlands in 2022 focused on distribution of health care items to eight primary schools in Hides and Komo; refurbishment of the Idauwi Community Health Post in Angore; completion of the fencing of the Undupi Sub health center; mobilization of a contractor to the Biame elementary school for the construction of hand wash station installations; and construction of 18 water catchments across the Upstream PIA and ROW by providing communities access to safe drinking water and reducing instances of waterborne diseases. EMPNG also maintains community health programs in the LNG Plant area with the same overall goal as in the Upstream area to reduce the factors that limit the capacity of Papua New Guineans to fully participate in livelihood/economic activities by targeting high risk diseases and health complications. Community health programs have been well implemented since the start of the Project.

The occupational health program is world class and continues to perform well in all areas (clinical operations, public health and industrial hygiene). In 2022 the COVID-19 pandemic was still a health factor, but not as important as before, such that the occupational health program has returned to more conventional topics such as hearing and respiratory protection, implementation of a TB control program, and mental health first aid training programs (the first such program in PNG), as well as implementing the health program with medical treatment and evacuations. An important change in the EMPNG program in 2022 has been the elimination of the mandatory malaria chemoprophylaxis requirement for non-immunes in HGCP and Angore workers. The Culture of Health (COH) program continues to be implemented with a COH Week undertaken in October 2022. The Industrial Hygiene Program continues to review worker exposure to chemicals and noise and verifies that personnel protective equipment is appropriate for the different work environments.

Occupational Safety

EMPNG Production safety performance through Q4 2022 continues to be excellent, although not as good as 2021 as there was a single Lost Time Incident (LTI) that took place in the Upstream area where a worker at Komo fell

and hit his head on a rock with no long-term consequences. Even with this accident, the 2022 Lost Time Incident Rate (LTIR) was 0.01 normalized to 200,000 man hours and the Total Recordable Injury Rate (TRIR) was 0.09, both of which are much better than industry standards. Note that 1.0 is the average LTIR and 3.1 is the average TRIR across all industries in the United States.

Cultural Heritage

Cultural heritage management continues to be undertaken, currently in association with the Angore project, and preferred practice continues to be avoidance. In 2022 efforts associated with the Angore Pre-Construction Survey (PCS) conducted from September 24 – 30 for the KP 65 .1 and KP 61.8 river crossings identified 23 sites: 15 Archeological sites and 8 Cultural Heritage sites.

Cultural heritage is being gathered opportunistically as part of the Lower Kikori Biodiversity resource mapping program and attracts community members to participate in conservation activities and share details of their oral histories. EMPNG worked with the Papua New Guinea Social Research Institute to create a cultural heritage children's storybook based on these oral histories and is expected to be published this year. EMPNG also has conducted cultural heritage induction and awareness sessions since the start of PNG LNG construction. During 2022, these sessions helped raise awareness with some 500 workers from the Seismic Projects exploration team.

Upcoming in 2023 is the ongoing work with vendor towards development of the resource books, as well as ongoing awareness with new projects coming online and continued mapping of cultural heritage values through inclusion in the Lower Kikori.

1 INTRODUCTION

RINA Consulting (hereafter '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 Common Terms of Agreement (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 is based on the first field visit undertaken since February 2019 due to 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) and is the reason why this report is for the 19th field visit, but the 22nd review. The review was based on the documentation provided to the IESC as well as field observations.

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 review in February 2022, there have been no requirements for the IESC to prepare any supplemental certifications.

1.1 PRODUCTION OPERATIONS OVERVIEW

2022 was a good year for production, with 8.6 million tons (MTA Eq) and 114 LNG cargoes loaded. It should be recalled that the project was defined to the IESC in 2009 to be a development of 6.3 MTA Eq, so current production continues to be significantly more than originally projected. Figure 1.1 depicts 2022 LNG production.

Angore field activities were suspended in November 2018 after execution progress was affected by the earthquake in February 2018, site incursion and vandalism in June 2018, and a near-miss security incident in October 2018. Wellpad C construction started in July 2021 covering an area of about 150m x 200m and is now complete. Surface facilities at Wellpad C include a Local Equipment Room (LER), flowlines, knock-out drum, multiphase metering, MEG/corrosion injection, pig launcher, sump, cathodic protection. The drilling and completion of two wells from Nabors Rig 702 has been underway at Wellpad C since November 2022 and their completion is expected in Q1 2024 with First Gas scheduled for Q3 2024. Figure 1.2 shows photograph of Wellpad C taken during the field visit and Figure 1.3 shows the Nabors Rig 702 drill floor.

Construction of the ~13 km 14" gas and 2" MEG lines with associated high voltage (HV) and fiber optic cables connecting Angore with the HGCP started in July 2022 and is expected to be completed by Q3 2023. Figure 1.4 shows the main pipeline under construction and Figure 1.5 shows an aerial view of the HDD under the Tagari River. At the time of the field visit the Horizontal Directional Drilling (HDD) under the Tagari River had started.

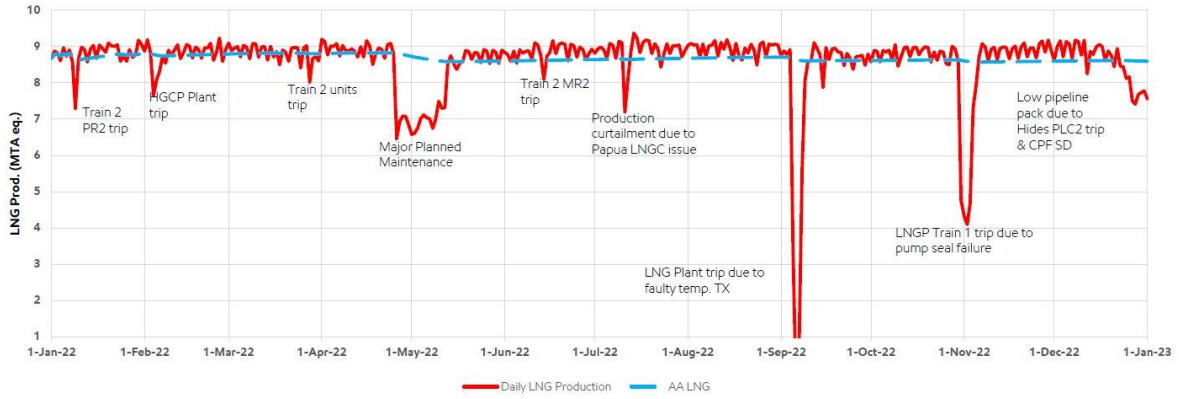


Figure 1.1: 2022 LNG Production

Figure 1.2: Angore Wellpad C in February 2023

The effort associated with the recovery from the M = 7.5 February 2018 earthquake is nearing completion with $404 million spent out of a budget of $560 million, making this the largest purely geotechnical project with which the IESC is familiar. Additional information on the Earthquake Recovery (EQR) Project is discussed in the context of erosion and sediment control in Section 4.4.2. Also with respect to erosion and sediment control and a major accomplishment is the completion of the permanent drainage system at the Komo airfield which was completed in September 2021 as also further discussed in Section 4.2.2. Further work is in the realm of maintenance. A full repair of the runway continues to be evaluated.

Also noteworthy in 2022 has been the participation of PNG nationals in the workforce (91%) with the note that females make up 20% of the PNG workforce. Women make up about 25% of the PNG field workforce, which is the highest worldwide within the ExxonMobil organization.

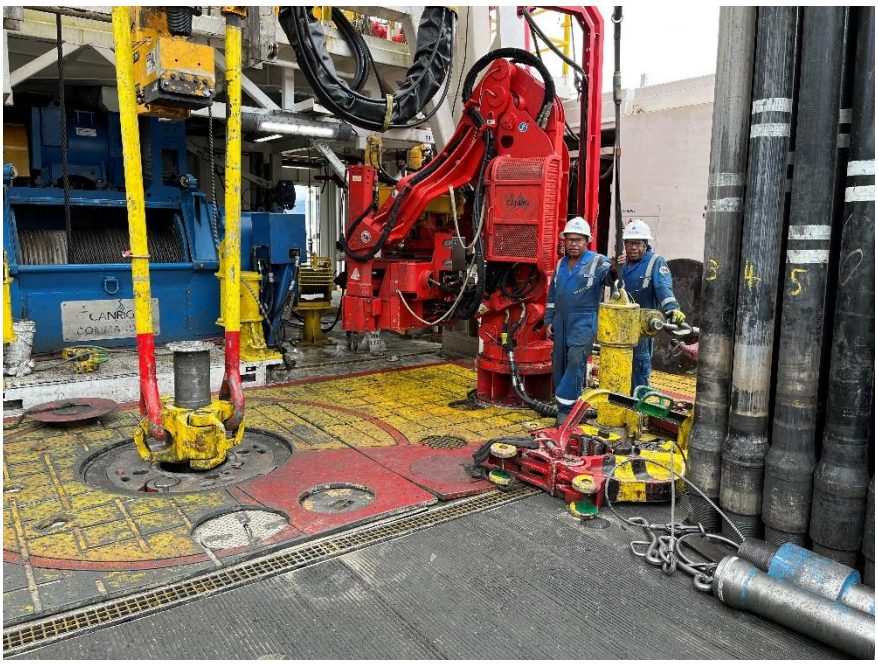


Figure 1.3: Nabors 702 Rig Drill Floor at Wellpad C

Figure 1.4: Trenching for Angore Pipeline

Figure 1.5: Aerial View of HDD under Tagari River

1.2 SOURCES OF INFORMATION

The main sources of information used to prepare this eighteenth IESC trip report are primarily those provided by EMPNG, but RINA also obtained information by means of interviews with local stakeholders during the field visit in PNG as well as EMPNG employees. The information provided by EMPNG has included presentations made to the IESC and additional documents consistent with the trip schedule provided in Appendix A.

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 and Social Management System							
[3]M22.1	Feb '23		IESC's impression is that for various reasons, EMPNG is not fully staffed for EHS compliance.	Observation	Overall ESMS	Open	The Project has a mature organization, but the IESC's perception is that EMPNG's senior staff are trying to do too many jobs and that there is not enough support staff. We can see that the Papua LNG project has poached some key staff and that COVID 19 forced staff layoffs that are no longer available to return. We see this as a potential compliance issue where the lack of qualified staff might prevent EMPNG from fulfilling your commitments, in particular with respect to biodiversity. This subject is discussed in greater detail in Section 5.2.1.1.
M22.2	Feb '23		Associated facilities are not being stewarded consistent with the commitment in the ESMP for Production that these facilities would be managed consistent with the practices developed during construction.	Low – Level I	ESMP - Production	Open	IESC observed that EMPNG has not recently attempted to exert any stewardship over HGDC, a company whose mission is to serve PNG LNG, and who is currently operating what appears to be a poorly managed quarry near Hides. EMPNG needs to review all of their Lanco operations and potentially other suppliers/service companies with respect to stewardship of the quarry that falls under the definition of an associated facility.
Environmental Issues – Environmental Management							
M19.1	Desktop review Feb '20 Modified Feb '22 Modified Feb '23		Groundwater monitoring at the HWMF at Kopeanda indicates that waste management operations are impacting groundwater (added 2/2023).	Low – Level I	Upstream EMP Section 9	Open	2022 sampling of leachate and groundwater leaves no doubt that groundwater at the HWMF at Kopeanda is being impacted by the landfill or reed bed. The observed poor condition of the primary landfill liner suggests the landfill to the IESC. This non-conformance with Project commitments can be resolved by demonstrating with a risk assessment including a fate and transport analysis that the contaminant plume is confined to EMPNG property and that the Tagari River will not be significantly impacted. A review of groundwater data from the area of the LNG Plant landfill does not suggest groundwater contamination originating from the landfill.
Environmental Issues - Biodiversity and Ecological Management							
M20.1	Desktop review Feb 2021		**Freshwater ecology and protected area enhancement:** As the Project is located within a legally protected area, it has additional responsibilities to ensure tangible benefits to protection of the area, for example carrying out research needed for it to meet its conservation aims. The Project has undertaken over a decade of solid foundational work with the Lake Kutubu WMA Committee as part of the mid-elevation offset program. However, there is a need to consider the gaps in alignment between the approach taken for offsetting residual impacts on specific biodiversity values versus the requirement to promote and enhance the conservation aims of the protected area within which the Project is located. The Project's intentional exclusion of an updated scientifically robust aquatic biodiversity survey in	Low – Level I	IFC PS6 Para.11	Open	An updated freshwater biodiversity assessment aligned with the other components of the 2017 PMA3 biodiversity surveys would have provided a comprehensive snapshot of species diversity and abundance, as a basis for the revised WMA Management Plan conservation objectives. The IESC recommends the Project plan to include an updated appropriate assessment of the Lake Kutubu freshwater ecosystem via a PMA3-type biodiversity assessment survey as part of the foundation for enhancing the conservation aims of the WMA. This will provide up to date, PMA-3 comparable data on biodiversity values for input to the development of a Lake Kutubu WMA Management Plan for the protected area. (Report reference for background detail: Offset component 4 in Section 5.2.2.3)

****

[3] In order to better track project progress and accomplishments, the issues identified during each site visit are identified by a letter (M) and number (e.g. M1) that identifies the site visit (e.g.: M1 for the first visit, M2 for the second visit, etc.) followed by a digit that identifies the specific issue found (e.g. M22.1 refers to issue 1 found in visit 22).

Item ID	Site Visit	Closing Date	Description	Non-Conformance	Reference	Status	Comments/Report Reference
			the Lake Kutubu WMA in 2017, to support the preservation of the freshwater ecosystem, is not in alignment with primary conservation aims of the protected area.				
M20.2	Desktop review Feb 2021		**Consequences of weed control challenges:** As reported in previous IESC reports, access to key priority areas by the weed inspection and control contractors has been restricted. Security issues, the 2018 earthquake, and a lack of transportation for weed contractors to get to sites, have restricted the likelihood for effective, widespread weed inspection and control. Further security issues, lack of vector control personnel the COVID-19 pandemic and now earthquake recovery work all continue to mean that weed inspection/control is still hampered. Obviously, some of the challenges noted are outside of the control of the Project. However, the *consequences* of those challenges are that large parts of the Project's Upstream footprint, including priority ecosystem areas such as the Homa Benaria Ridge, weed inspection and control had been at a lower frequency than required) The current situation is not consistent with stated commitments in the EMP, and it is unclear whether the situation represents an immediate threat or impact to priority ecosystem areas. The IESC does not receive analyses of weed inspection/control findings or Project-induced weed distribution/abundance status relevant to closing this NC.	Low: Level I	Upstream EMP	Open	EMPNG should undertake an analysis of the weed inspection/control data and present to Lenders: ✓ Locations (distribution) of P1 weeds of key concern, currently compared to distribution during the PCS; ✓ Areas where P1 weeds are now so well established and persistent that repeated control is required or is proving difficult; ✓ Ecological consequences of P1 weeds remaining established in these areas e.g. any detrimental impacts on the ability of native species to thrive in their natural habitat; ✓ What adaptive management is necessary in the Project's approach? ✓ Outputs from EMPNG's Strategic Weed Control Review. EMPNG needs to work with the weed inspection/control contractor to better resource the team, ensuring sufficient headcount and dedicated vehicles to access weed inspection/control sites as regularly as necessary to meet the requirements of the Upstream EMP. (Report reference for background detail: Sections 5.5.2.1 and 5.5.2.2)
M21.1	Desktop review Feb 2022		**Project indirect impacts related to land use/land cover change:** PMA-1 uses remote sensing 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). The Project has not been classifying instances of Project-attributable forest loss and land use change/degradation as even though they could potentially be the result of indirect impacts. Only change related to direct Project impacts e.g. installation of new infrastructure, are being considered as Project-attributable. Local landowners have the right to clear their land but when this is in direct proximity to the pipeline RoW or infrastructure, and therefore access to those areas newly cleared may have been enhanced by the presence of the Project (as noted in the 2019 PMA3 survey report), this should be acknowledged and categorized accordingly.	Observation	Biodiversity Strategy	Open	EMPNG have now produced a set of field guidelines intended to assess Project-attributable impacts in a more consistent, repeatable manner. The database cataloguing all previous observations requiring follow-up inspection should now be reanalysed according to the new guidelines. This will help the Project better understand any potential gaps in previous attribution analyses and ensure attributions of Project-related change (both direct and indirect) have been determined consistently. (Report reference for background detail: PMA1 in Section 5.2.2.1 of IESC report dated May 2022)

Item ID	Site Visit	Closing Date	Description	Non-Conformance	Reference	Status	Comments/Report Reference
M21.2	Desktop review Feb 2022 Modified Feb 2023		**Plant pathogens: Dieback** During 2015 - 2019 PMA-3 surveys, dieback was noted during transect work up on Hides Ridge. Dieback is caused by the plant pathogen, *Phytophthera cinnamomi*, and *Nothofagus* trees as occur on Hides Ridge are particularly susceptible. EMPNG state that photographs were taken of the potential dieback during the 2021 surveys, and these have been forwarded to the scientific team leaders for their visual assessment. Targeted reporting and sampling have still not been undertaken to confirm the presence of *Phytophthera* observed previously, or to determine whether it is Type A1 or A2. EMPNG have now identified a contractor to undertake visual observations, but there have been contractual issues and delays in sub-contracting and therefore the work is yet to commence.	Medium: Level II	EMPNG's Dieback Infection Management Guidelines Upstream EMP Section 15.4 – 15.6 Multiple PMA3 reports 2015 - 2021	Open (escalated from an Observation to Level II in Feb 2023)	The IESC again recommends more urgency in EMPNG's approach so that priority analysis is undertaken of the suspected dieback, and the type of dieback determined (A1 or A2). This should confirm whether active control measures should be implemented If found to be A2, more stringent measures should be in place and/or re-evaluated, to prevent the movement of Type A2 (an introduced species) further into the priority ecosystem at Hides Ridge. (Report reference for background detail: PMA-3 in Section 5.2.2.1, and Dieback in Section 5.5.2.4)
M22.3	Feb '23		**Hunting and feral dog predation:** EMPNG's biodiversity survey specialists have noted increased prevalence of hunting and feral dog predation in the vicinity of the pipeline RoW, and are observing reduced numbers of hunting-sensitive IUCN Threatened species around BAA2 survey sites. EMPNG have been developing questionnaires to use with communities, but the development of the work has taken too long considering the potential threat level associated with use of Project infrastructure and enhanced access.	Observation		Open	The IESC recommends work on the hunting and feral dog predation threat assessment / questionnaires should be expedited so that EMPNG can better understand the threats posed by hunters preferred use of Project infrastructure and enhanced access. Refine questionnaire methodologies so they are fit for purpose, undertake hunting community surveys with relevant communities at both BAA1 and BAA2 sites. Provide results and an analysis on the threats and mitigation measures that EMPNG propose to implement. (Report reference PMA3 text in Section 5.2.2.2)
M22.4	Feb '23		**Access controls:** Two access controls in situ are not in alignment with requirements as stated in the EMP, and the situation has continued for several years. During Q4 2022 and Q1 2023, Access Monitors have not been in place to record vehicles using Project roads, and report data for analysis.	Observation	Upstream EMP Section 17	Open	EMPNG should ensure that Access Monitors are back in position full-time and that full vehicle monitoring records are being submitted every day, as previously. EMPNG to provide a memo detailing how/when the two physical access controls not yet meeting EMP requirements will be put into place. (Report reference Section 5.3.2)

Item ID	Site Visit	Closing Date	Description	Non-Conformance	Reference	Status	Comments/Report Reference
M22.5	Feb '23		**Baseline weed mis-identification discrepancy** EMPNG insist that certain P1 weeds currently found along the RoW in areas where they were not previously recorded, were actually present prior to construction but were not correctly identified. Due to a number of P1 weeds now being found in areas where they were originally not observed there is a discrepancy that should be resolved in the interests of transparency and clarity. The EIS significance assessments related to weed impacts were based on planned mitigations being in place and implemented successful e.g. limiting vehicular access along RoW and project roads. If implementation of mitigation measures have not been successful, the significance is therefore greater. This should be recognised and the mitigation approach reassessed where necessary.	Observation	Upstream EMP Section 17	Open	The IESC recommends EMPNG consider an independent specialist evaluation and verification of baseline PCS and early weed audits versus more recent records of weed distribution, abundance and diversity.[4] The IESC believe an independent review of this data, of stated inconsistencies, of learnings, of risks/impacts related to construction/management of a long linear infrastructure in PNG, etc is warranted. Lenders require assurance that potential impacts predicted in the EIS have not come to fruition and that the Project's mitigation approach is appropriate. (Report reference Section 5.5.2.2)

****

[4] EMPNG disagree with IESC opinion, and state that BRC contracted to undertake the weed audits currently are sufficiently independent.

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. EMPNG continues to operate within their Production Environmental and Social Management Plan (ESMP) implemented through three Environmental Management Plans and seven Social Management Plans. There have been no changes to the ESMS since the last IESC reporting.

3.2 ORGANIZATION AND STAFFING

A change we have seen since our last field visit is something we would not have perceived based on desktop studies, and this is staffing. The Project has a mature organization, but the IESC's perception is that EMPNG's senior staff are trying to do too many jobs and that there is not enough support staff. We have seen that some key staff are no longer present and that COVID 19 resulted in some expats and staff contractors returning home; some of these have not been replaced.. We see this as a potential compliance issue where the lack of qualified staff might prevent EMPNG from fulfilling some commitments, in particular with respect to biodiversity. This subject is discussed in greater detail in Section 5.2.1.1.

3.3 MANAGEMENT OF CHANGE

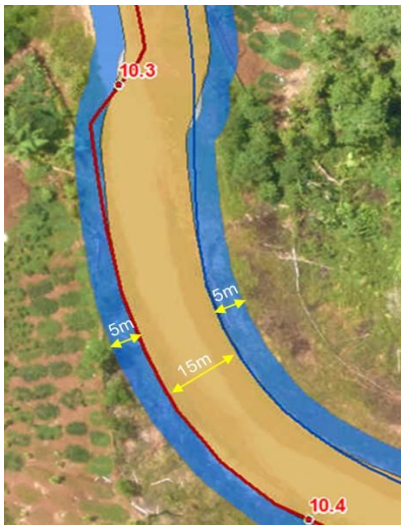


Figure 3.1: RoW MOC Sketch

Since the last IESC reporting period there have been two Lender-Reportable (Class II) MOCs: Additional RoW width extension from KP 7.35 to KP 24.6; and treatment of wash water using the reed bed at the Hides Waste Management Facility at Kopeanda.

The driver for the expansion of the permanent RoW is pipeline integrity and safety and is intended to expand the ROW width to ~5m each side at KP7.35 and KP24.60 to maintain adequate buffer; still within the original 30m-wide construction corridor (Figure 3.1). The 8" and 32" pipelines were installed between KP 7.35 and KP 34.6 in separate trenches that resulted in a RoW buffer width less than the originally designed permanent RoW buffer. The width expansion is required for pipeline inspection purposes and to protect the pipeline from deep root and ROW easement in order to maintain pipeline integrity. Meeting Global Practice GP 59-01-01 (P/L should have min of 4.6m buffer to the edge of ROW).

The second MOC is the treatment of wash water (after pre-treatment removal of oil and grease) at the HWMF reed bed. This change in treatment procedure approved by CEPA simplifies the overall treatment process for this significant wastewater stream.

IESC concurs with the EMPNG' s following of the MOC process.

3.4 INCIDENTS

EMPNG continues to monitor Environmental Compliance Incidents (ECIs) and EMP Non-conformances (NCs), which indicates that the Environmental Management System is healthy. There were no ECIs recorded in 2022, which is a first since the start of the Project (Figure 3.2).

There was one carryover compliance issue from 2021 closed in 2022: Vegetation clearance outside approved 30m Construction footprint along RoW. Overall, EMPNG continues to do a good job of tracking incidents and non-conformances.

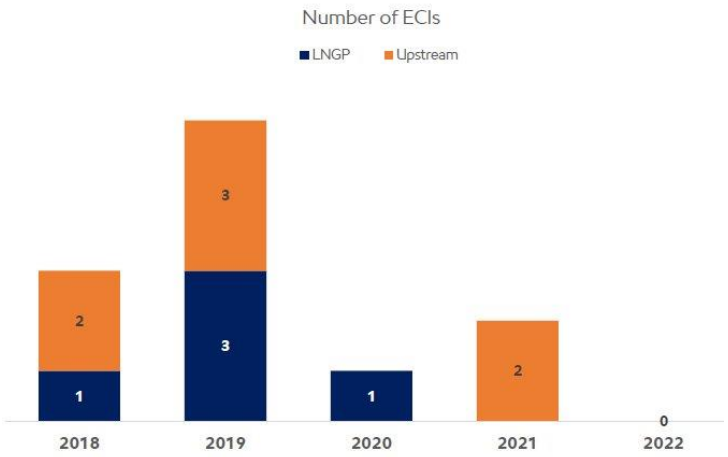


Figure 3.2: Environmental Compliance Incidents

3.5 ASSOCIATED FACILITIES

A topic not reviewed since PNG LNG's Construction phase is "associated facility." As defined in the 2006 Performance Standard 1 followed by EMPNG "associated facilities that are not funded as part of the project (funding may be provided separately by the client or by third parties including the government), and whose viability and existence depend exclusively on the project and whose goods or services are essential for the successful operation of the project."

The definition of what constitutes an associated facility was a subject of considerable discussion over the environmental and social due diligence process in 2009. The EIS discussion did not encompass all criteria that could be considered for defining an "associated facility" as described in Para. 5 of PS1. At that time IESC recommended that EHL (now EMPNG) and the Lenders needed to outline an overall approach for handling this issue. The agreement that was reached covered for three categories of these facilities in question, new plant within a third party footprint, shared facilities and existing oil project facilities:

- ✓ *New plant within third party footprint* – examples anticipated in 2009 were considered to be the expansions to the Kutubu, Gobe and Agogo sites, where additional facilities would be required for the production of associated gas into the PNG LNG Project or where upgrades would be required for the existing crude oil handling and storage facilities to be utilized for the storage and handling of PNG LNG Project condensate. Over the course of the construction phase IESC visited Oil Search (now Santos) facilities providing services to EMPNG with no problems to report.
- ✓ *Shared Facilities* – examples anticipated in 2009 were considered potentially waste disposal areas and quarry sites, where the facility would be considered as an "associated facility" subject to a risk-based monitoring similar to a new plant within a third-party footprint. During the construction phase third-party quarries were reviewed with recommendations for improvement, as well as several OSL-managed waste management facilities used by the Project.
- ✓ *Existing oil project facilities* – in 2009 examples potentially included the existing Kutubu crude oil pipeline system and Kumul export terminal to be utilized for the export of PNG LNG Project condensate. These were eventually not considered to be reviewable by IESC.

Additional negotiations covering stewardship requirements for associated facilities took place over a two-year period and in August 2011 a flowchart was developed whereby stewardship requirements were defined (Figure 3.4).

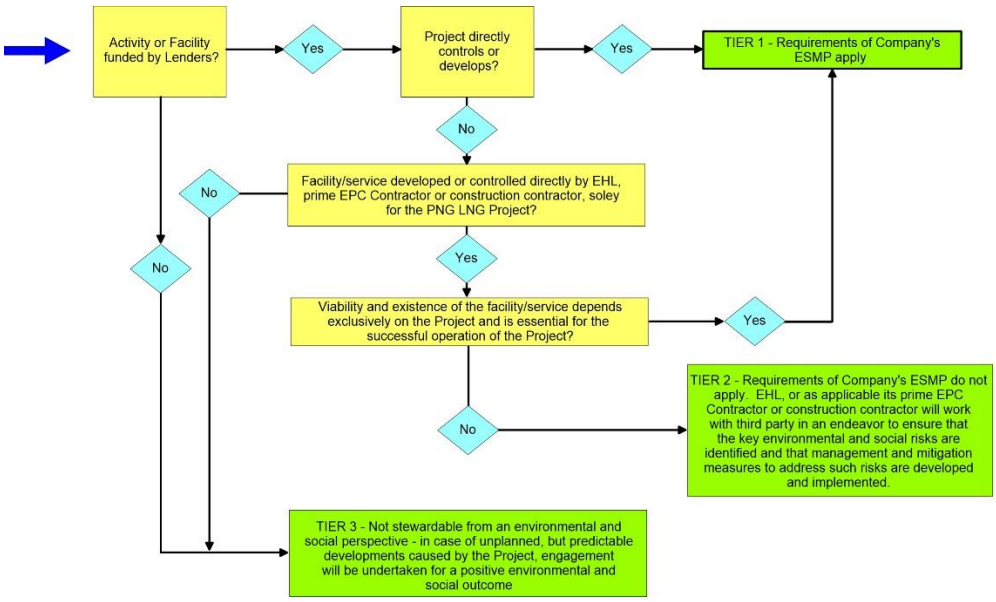


Figure 3.3: August 2011 PNG LNG Flowchart for Management of Associated Facilities

Third-party quarries and borrow pits, sources of concrete, waste management facilities, and Lanco camps and facilities were the main facilities that were designated for Project stewardship as associated facilities. The rule of thumb followed during construction was that if a third-party facility dedicated more than 50% of its product or services to the Project it would be considered as an associated facility. The intent of stewardship of third-party facilities (Tier 2 – dependent on the Project) was never for the Project to require full compliance with the ESMP, but "work with third party in an endeavor to ensure that the key environmental and social risks are identified and the management and mitigation measures to address such risks are developed and implemented." Even for non-stewardable projects (Tier 3 – partially dependent on the Project) "engagement will be undertaken for a positive environmental and social outcome."

The Environmental and Social Management Plan – Production basically says that associated facilities will be treated the same as during the construction phase of the Project: "The approach to managing the risks and impacts associated with the operation of these facilities will be the same as that adopted for the construction phase, that is, commensurate with risk and impact, as well as the degree of influence that can be exerted on the third-party operator by the Project."

If we review PNG LNG activities in 2023, the development of the TWM Roku facility stands out as a Tier 2 associated facility. 75% of TWM's business at Roku is from PNG LNG (information provided by TWM) and EMPNG needs the Roku facility. In concert with EMPNG, TWM has developed a Management System covering environmental, social, and health & safety issues and has constructed facilities that comply with stringent EMPNG technical requirements for environmental management. EMPNG has not forced TWM to follow the Project's ESMP, but has coached them into accepting an acceptable, fit-for-purpose ESMS. This is appropriate stewardship for EMPNG.

Hides Gas Development Company (HGDC) operates a quarry near the HGCP we assume is fully dedicated to the PNG LNG project given that HGDC is the umbrella Lanco for PNG LNG Upstream operations. IESC did not have the opportunity to physically visit this facility but it was observed by helicopter to have problems with occupational safety and environmental management. IESC can also point out that this is not the first time we have observed problems with HGCP and quarry management, as this was the subject of non-compliances up to Level II at the beginning of construction. Quarry basics are for quarry benches to have stable slope angles and adequate benched with bench widths at least half of the face height, an erosion and sediment control system, and safe working conditions for the operator. The HGDC quarry is operated with benches that are too high and bench widths that are too narrow, zero erosion and sediment control systems, and unsafe working conditions, especially considering that what is being excavated is soft, fractured limestone (Figure 3.5)

Figure 3.4: HDGC Quarry

IESC observed that EMPNG has not recently attempted to exert any stewardship over a company whose mission is to serve PNG LNG. EMPNG needs to review all of their Lanco operations and potentially other suppliers/service companies with respect to stewardship that should be provided to an associated facility. The Kokore Hill Quarry used for providing the LNG Plant with aggregate during construction never had Project stewardship..

4 POLLUTION PREVENTION

4.1 WASTE AND WATER 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

Upstream

Overall, there has been a slight increase in waste generated from 2021 and the amount of landfilling has increased (Figure 4.1). Upstream waste volumes have increased due to Angore operations with most of the waste consisting of non-restricted domestic wastes associated with camp activities. Waste volumes are relatively steady at LNGP reflective of base operations. In the Upstream area there is good landfill capacity, but IESC noted in the field some operational problems related to the primary liner integrity.

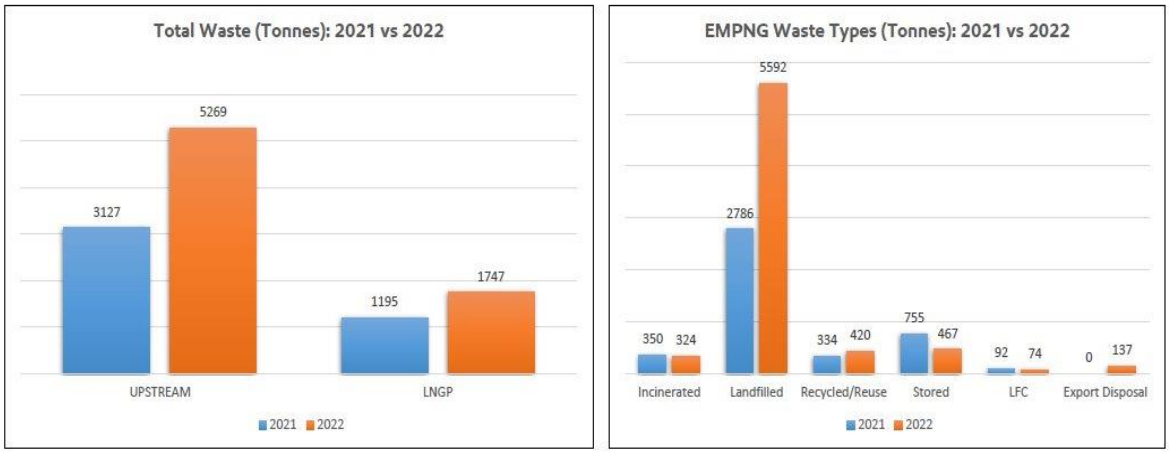


Figure 4.1: 2021 Total Project Waste Disposal

The liner at the HWMF appears to have been exposed unprotected to the elements for a long time (Figure 4.2). The actual liner as-built is not clear, but the intent of the landfill construction according to the URS "Hides Waste Management Area, Design Basis Report" dated January 11, 2011 was to "*provide a barrier liner over the base, sides and top of the landfill using geomembranes (e.g., HDPE or LLDPE) and geosynthetic clay layers (GCL)*". In terms of landfill construction, the Design Basis Report states: "*The landfill will be constructed in stages, to minimise the area of landfill liner exposed at any time. This method will be adopted to protect the geosynthetic liner materials from degradation, and to reduce the volume of incident rainfall that is collected and will so require treatment as leachate*." It can be noted that there are no procedures to reduce the volume of incident rainfall (*covering the waste face during non-operational periods with waterproof barriers*) as the only procedure is to cover the waste with soil on a weekly basis.

IESC would have expected to see some sort of cover to the liner that could have been soil or gravel or GCL prior to the placement of waste. Such material is usually placed over a liner prior to the placement of waste to prevent sharp objects from compromising the liner. Given the results of the groundwater monitoring presented in Section 4.1.2.2, it seems possible that the liner is compromised.

Figure 4.2: Exposed Landfill Liner at HWMF

The only incineration conducted at the HWMF is a small Mediburn for small amounts of medical waste and the carcasses of captured cane toads. Another field observation is that this incinerator vents within a covered roof, which would seem to be a potential problem with ambient air quality for the workers at the HWMF. This problem can be resolved by extending the stack through the roof or venting it outside the roof.

Figure 4.3: Improperly Ventilated Mediburn Incinerator at HWMF

LNG Plant

Waste management at the LNG plant utilizes a new landfill at the location of Construction Landfill C (Figure 4.4) but expects to transition to using a new landfill currently under construction at the Total Waste Management (TWM) facility in Roku, expected for completion in June 2023 (Figure 4.5). EMPNG has used the TWM incinerator at Roku since the beginning of Q3 2020 and has continued to work with TWM Roku in 2022 to develop their landfill and industrial wastewater treatment plant facilities.

Figure 4.4: LNG Plant Landfill Close to Final Closure

Figure 4.5: TWM Landfill at Roku Under Construction

IESC visited the TWM facility during this field visit and found it to be professionally managed and working to develop state-of-the-art waste management solutions for PNG industry and not just EMPNG. IESC considers TWM to be a good partner for managing EMPNG's waste streams.

4.1.2.2 Water Management

Wastewater continues to be well managed. Although there have been some minor exceedances from both Upstream and LNG Plant wastewater treatment plants, there have been no exceedances to surface waters.

EMPNG received CEPA approval on September 12, 2022 to reduce the number of parameters tested for water quality compliance to eliminate parameters not detected since the start of Production in 2014 as an Amendment to the water quality criteria prescribed in Annex 2 (Environmental Limits) of the EMPNG's Environment Permit EP-L3 (210). IESC concurs with CEPA's ruling on this.

EMPNG has also recently completed an assessment of all major STPs as part of preventative maintenance program screening, whereby maintenance spare components were identified and procured to prevent delays in undertaking critical maintenance.

Upstream

An important change to wastewater treatment in the Upstream area has been that CEPA has given approval for the treatment of wash water in the HWMF reed bed after a pre-treatment to remove oil and grease.

Figure 4.6: HWMF Reed Bed Suitable for Treatment of Wash Water

The Upstream STPs have also performed with minor excursions and the only issue carried over into 2023 (now resolved) has been Oil & Grease exceedance from the Angore WP C STP. Only one surface water exceedance (COD) occurred from the HGCP retention pond suspected to have originated from the MEG Regeneration unit's bund, when a valve was left open from the unit's vent drain line. Surface water discharges have been compliant from all Upstream treatment facilities.

Groundwater monitoring around the HGCP continues to show no evidence of groundwater contamination. Conversely, at the Hides Waste Management Facility (HWMF), evidence of infiltration of leachate from the facility has been recorded since 2014. Three new groundwater monitoring wells were installed in 2021 HWMF. The data collected from the new wells were not conclusive in 2021, but the 2022 data confirm that the landfill and/or the reed bed are a source of groundwater contamination. Testing of the leachate from the landfill highlights the presence of high ammonia-nitrogen, manganese, iron, barium, and potassium. The testing for these parameters (averaged over all of the testing from 2022) shows that there is a significant difference between upgradient and downgradient concentrations of the anomalous leachate parameters and that the new well installed to be in the most downgradient position (MW-8) more often than not has the highest concentration or close to the highest concentration of these parameters (Figure 4.7).

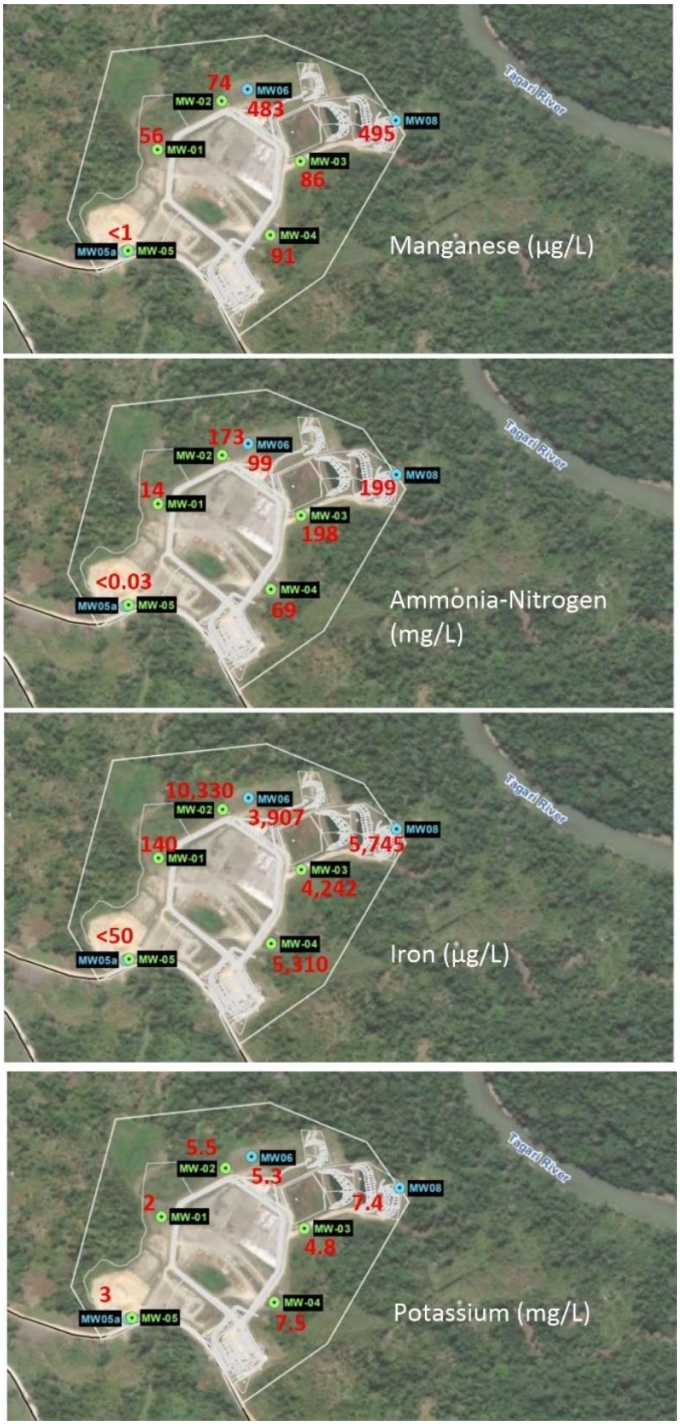


Figure 4.7: Average 2022 Concentrations of Main Leachate Parameters in Groundwater at HWMF

As noted in the previous IESC report, the new upgradient well (MW-5a) exhibited unnatural pH values greater than 12 in 2021, a parameter repeated in 2022 testing. This repeated testing confirms the results are not a laboratory artifact and the most likely explanation is that the well was installed near an unreported spill. The IESC recognizes there are no users of groundwater in the neighborhood of the HWMF and that impact to the nearby Tagari River is probably negligible. At this stage, however, the risk of the contamination of the Tagari River should be quantified as part of a risk assessment undertaken with a fate and transport analysis.

LNG Plant

The biggest wastewater disposal problem is 137 T (Amine contaminated wash water, Activated C) from the LNG Plant that has to be exported to Australia. The TWM Industrial Wastewater Treatment Plant has undergone wet commissioning, pending water quality reporting for initial wastewater batch treatment to ascertain treatment capacity for certain batches of wastewater (e.g.; amine water), but has not achieved regulatory compliance for Amine contaminated wastewater. It is expected that this waste stream will continue to be sent to Australia unless TWM can make improvements to their treatment system. Some of this wastewater is still being stored at TWM (Figure 4.6).

Figure 4.8: Amine-Contaminated Test Water at the Roku Facility

The LNG Plant Toray STP had generally exhibited good performance in 2022. The plant had an oil & grease exceedance due to deviation from waste management procedure with no impact to receiving environment. The plant has also had exceedances for TSS & turbidity exceedance due to deviation from the unit's maintenance and operations procedure, again with no impact to the receiving environment (Vaihua Creek).

Surface water discharges at the LNG Plant were all compliant with Project standards and there has not been an exceedance of stormwater discharge or retention pond discharge since June 2021 and there have been no exceedances to the receiving water environment since November 2000 and there has never been an exceedance into Caution Bay.

The 2022 groundwater monitoring network surrounding the landfill at the LNG Plant has continued to identify anomalous measurements of a few chemical parameters without identifying an obvious plume in the groundwater where westward flow towards Caution Bay would be expected. Local groundwater is saline and therefore not a resource. Measurements around the landfill generally fall within the range of groundwater test results from other wells around the LNG Plant and there are no obvious problems to report.

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

Hazardous materials management practice is undertaken consistent with GIIP. Spills continue to be consistently recorded and their causes investigated, and procedures developed to minimize future spills. There were a total of 40 small spills in 2022 (predominantly hydraulic fluid) with only one designated as recordable (>1 bbl). None of these spills had significant environmental consequence.

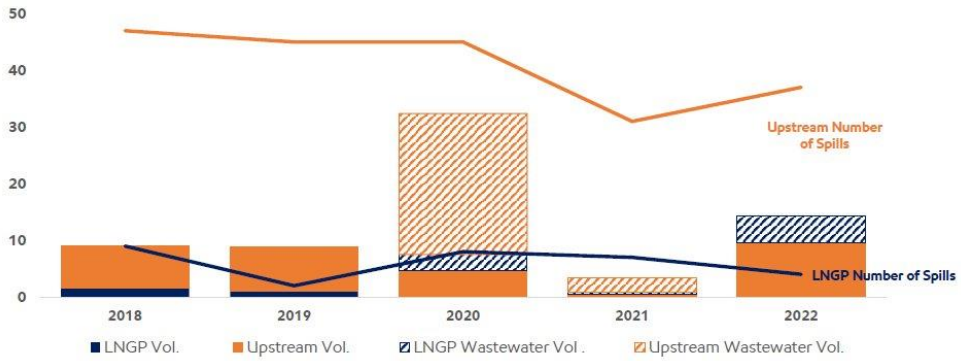


Figure 4.9: EMPNG Spill Performance – Volume (bbl) and Frequency

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

Substantial effort is being placed in the reduction of flaring. Routine flaring emissions were reduced from 2021 to 2022 at both the LNG Plant and HGCP. Spikes were from non-routine conditions, the most significant being a shutdown valve trip in September 2022. This effort supports ExxonMobil's 2030 Emission Reduction Plan (ERP).

Figure 4.10: Flaring 2019 - 2022

With respect to stack emissions, in 2021 the two gas turbine gensets tested at HGCP failed for NOx (the standard is 42 ppm and concentrations of 43 and 48 ppm were recorded). EMPNG Engineering and Maintenance teams successfully performed software adjustments to lower the set points for the SoloNox ® system on the Hides gensets and in 2022 third party remote verification emissions testing found full compliance at HGCP. The next testing is scheduled for 2024.

Noise monitoring was undertaken in 2022 with no problems to report. No monitoring was conducted as the HWMF hazardous waste incinerator is still not being used.

EMPNG also tracks emissions in terms of greenhouse gasses (GHG). As previously noted, most emissions are from the turbine drivers and generators (Figure 4.11). To reduce these emissions, EMPNG undertook four GHG reduction plans in 2022:

- ✓ LNGP: BOG N 2 Analyzer Installation
- ✓ LNGP: BOG Tie In Automated
- ✓ LNGP: HP Recycle Compressor Shutdown
- ✓ HGCP: Operate one Overhead Compressor instead of two

IESC is not in a position to evaluate the efficiency of the various systems producing emissions but has been informed by the Independent Technical Consultant (ITC) that they have world-class efficiency. Four other GHG reduction plans were also completed in 2022.

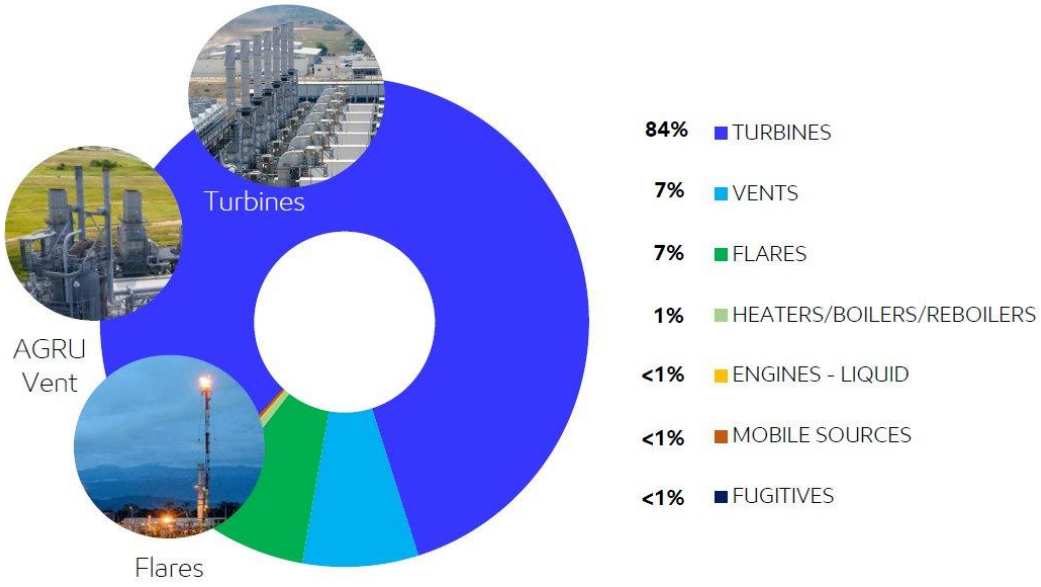


Figure 4.11: 2020 Project Emissions by Component

EMPNG is continuing to evaluate emission reduction opportunities consistent with ExxonMobil's EM 2030 Emission Reduction Plans and Near Zero Methane by 2050 ambition and Net Zero Methane by 2030 goals.

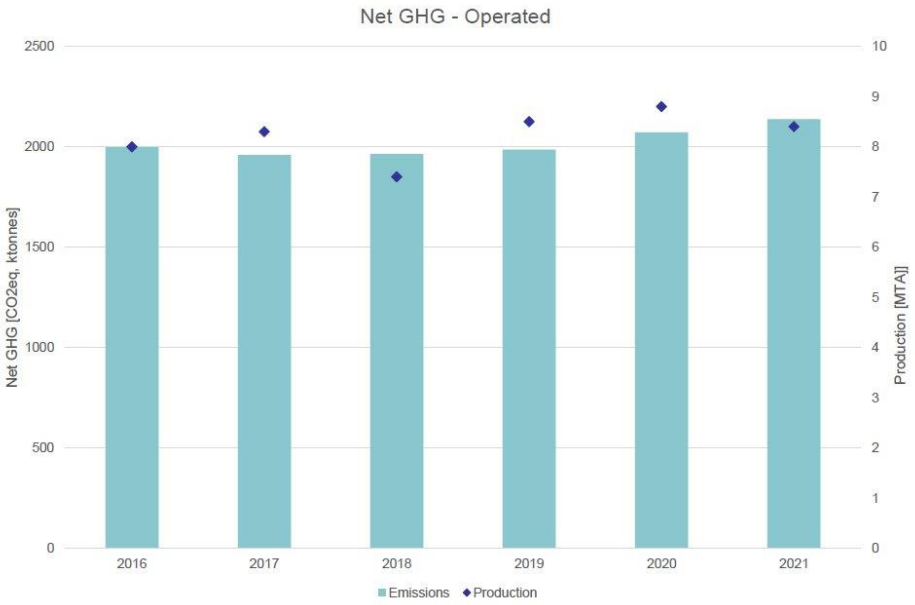


Figure 4.12: Project GHG Emissions

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 effort associated with the recovery from the M = 7.5 February 2018 earthquake is nearing completion. Remediation efforts with Earthquake Recovery (EQR) are well advanced with $404 million spent out of a budget of $560 million. Repairs have been performed at three major areas:

- ✓ Hides (HGCP, Wellpads and Spineline) where Phase 1 repairs are complete;
- ✓ Komo Airfield Phase 1 where Phase 1 repairs are complete and the decision to start Phase 2 will not be made until a decision is made regarding if the full runway will be needed for future project work;
- ✓ Pipeline Right-of-Way (RoW) – ongoing.

Several remediation sites along the pipeline route were visited with excellent work observed related to slope stabilization. These ROW repairs are technologically challenging through the use of micropiles, drainage improvements, and reinstatement. The next big EQR projects are river crossing repairs at KP 61.8 and KP 65.9, initially scheduled to be executed in 2024, but accelerated to 2023 after it was determined that the riverbed cover is less than original construction (as shallow as 0.8m). Overall EQR work is vastly more intense than when the pipeline was placed, and it is difficult to appreciate the level of effort until it is observed in the field. Figure 4.13 shows a reinstated portion of the EQR project at KP 82. In retrospect, when IESC last visited these projects in 2019 we were just coming to understand the scope of the recovery effort, but we did not expect it to still be ongoing in 2023. Nevertheless, we are impressed with the quality of the work undertaken.

With respect to erosion and sediment control, IESC is pleased to report major success stories. The stormwater management infrastructure at both Komo and Hides is now permanent and fully functional. It is difficult to visualize the difficulties associated with the earthworks at Hides and Komo but after an effort of more than 10 years the effort looks to be complete and further work is in the realm of maintenance. Representative before and after comparisons of drainage control structures at Komo are provided in Figures 4.14 and 4.15. IESC also reviewed the new stormwater management infrastructure at Angore Wellpad C and found that it is being well installed.

Figure 4.13: ROW Stabilization at KP 82 after Reinstatement

Figure 4.14: Komo Stormwater Management 2013 vs. 2023 – NW Runway

Figure 4.15: Komo Stormwater Management 2014 vs. 2023 – NE Runway

5 BIODIVERSITY AND ECOLOGICAL MANAGEMENT

5.1 INTRODUCTION

This section provides a record of IESC Observations and Recommendations associated with EMPNG's ecological management (terrestrial, marine and freshwater) including: the ecological monitoring of areas potentially impacted by the project to ensure the Biodiversity Strategy is being adequately implemented; the planning and implementation of the biodiversity offset program (to address those residual impacts remaining after impact avoidance and mitigation); the reinstatement and re-vegetation of areas cleared by the Project, including the Right-of-Way (RoW), camps, quarries, etc.; the management of issues related to invasive species, pests and plant pathogens (including importation quarantine management); and the avoidance of project-related induced access through the construction/retention of roads and the RoW corridor.

The whole Upstream Project area is deemed to be Critical Habitat, in accordance with IFC Performance Standard 6 (2006) . EMPNG's overall strategy for biodiversity and ecological management is described in the Biodiversity Strategy and both Production-phase EMP's and associated documents.

Records from the EIA baseline studies and the Pre-Construction Surveys (see previous IESC reports for background) serve to establish the ecological conditions prior to any ground clearance or infrastructure development. These records include information on the presence of weeds, and the locations of 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 50m 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 are being compiled into Registers (i.e. Focal Habitats Register and Weed Register) , and information on existing and ongoing ecological condition will be collected through continuing monitoring studies

5.2 BIODIVERSITY STRATEGY AND 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 with this being deemed Critical Habitat. 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) (and each are supplemented by Supporting Indicators:

v. intactness of forest;
vi. trends in species diversity and abundance;
vii. condition of focal habitats;
viii. occurrence of invasive species/pathogens; and
ix. accumulated offset gains progressing towards No Net Loss targets.

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

- ✓ PMA-1: remote sensing[5] 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);
- ✓ 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: species specialist-led biodiversity surveys, designed to collect and analyze priority 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. Areas of focus for these surveys have been Hides Ridge in Hela Province (termed site BAA1) and Agogo Range near Moro in Southern Highlands Province (BAA2) which have been surveyed during 2015, 2017, 2019 and 2021. The 2017 surveys also covered additional areas at Wau & Uro Creeks in Lower Kikori, plus non-aquatic aspects of Lake Kutubu; 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 is to formalize 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 is to formalize 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 is to formalize 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] 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. Landcover classification of 2019 data was primarily based on 10m Sentinel-2 imagery. A combination of imagery sources was used for the 2020 change analysis including Sentinel-1, Sentinel-2a, Sentinel-2b (Sentinel-2), and high resolution Maxar Imagery captured by WorldView satellites. Data from Sentinel-1 SAR (20m resolution) and Sentinel-2 (10m resolution) satellites was used for RPCM (Radar Persistent Change Monitoring) and Two-date Optical change detection, respectively

5.2.2 Observations

The observations and opinion reported herein are derived from a physical in-country site visit, presentations made by and discussions held with EMPNG, and documentation provided during and post-visit.

5.2.2.1 Staffing and Resources

EMPNG currently have three empty positions within the Biodiversity Team which the organization chart shows as comprising six internal roles. The Biodiversity Supervisor position (previously termed Biodiversity Lead) has remained empty since 2021. One newly appointed team member (sourced from the Environment Team) is still performing activities related to their old role part-time whilst learning their new role. Two key personnel left the Biodiversity Team in 2022. Although general environmental and community experience is valuable, the team's Hides/Upstream Biodiversity Specialist personnel do not have ecological qualifications, with minimal levels of specific ecological training and/or experience.

The current situation appears to be placing additional pressures on the whole team in work program implementation. In the IESC's opinion this could have repercussions in the short term on the Project's ability to meet program delivery and Lender requirements. EMPNG are aware of the potential pressures the personnel and capacity gaps are having on existing personnel and are actively seeking to source capable candidates. However, there is currently a challenging human resource market in PNG where other large-scale projects are also recruiting people experienced in biodiversity management.

5.2.2.2 Biodiversity Strategy, Implementation and Monitoring Program

PS6 relevant Project incidents

Regarding environmental incidents, in 2022 there were no new PS6-relevant incidents reported to the IESC. The unauthorized vegetation/large tree clearance incidents noted in the last IESC report (around helipads at KP284 and KP290) have been closed and incident investigations completed.

Biodiversity Monitoring Program

Monitoring campaigns have continued on a one/two/four-yearly cycle depending on frequency of data capture and analysis. PMA updates provided are summarised below.

PMA-1 Remote sensing update:

The last analysis was conducted in 2020 (reported in the last IESC report); the next satellite imagery analyses are scheduled for 2024; the Project has thus moved to a four-yearly cycle for assessing the Upstream area as a whole. In the interim, the contractor has been engaged in a high resolution habitat quality analysis for a pilot study during 2022, related to PMA4 (measuring losses/gains) – see section below.

Lenders will recall the issues related to the attribution of indirect Project-related change in landcover noted in the IESC's last report, that is, relating to whether anthropogenic changes in land cover and land use are deemed to be as a result of the Project's presence or enhanced access. The IESC had observed some inconsistency when EMPNG were determining whether newly cleared areas were related to the Project, and not necessarily classifying those that might have been legitimate indirect impacts (and therefore Project related). EMPNG have now produced some field guidelines and a decision tree to help assess attributable impacts in a more consistent, repeatable manner. The approach uses proximity and connectivity of the observed change to any PNG LNG footprint/activities, and references levels of evidence thresholds required to determine attribution.

As per Observation M21.1, the Project should use the Guidelines to re-analyse retrospectively any past instances of relevant land cover change to enable EMPNG to better understand any gaps in previous attribution.

PMA-2 Visual observations of 'condition' of sensitive sites avoided by the Project but potentially affected due to their proximity to Project RoW, Project roads and access by communities:

The loss of key staff from the Biodiversity Team affected the Project's ability to undertake extensive periods of field work, so for PMA-2 surveys, the Project opportunistically aligned with other surveys during 2022 when personnel were already on the ground . Twenty sites were assessed in 2021, and similarly the same twenty in 2022. The survey requirements have declined through time commensurate with the PMA2 objective and time since construction. Streams and swamps now comprise the majority of sites that remain on the PMA-2 list.

All were again deemed to be ecologically functional (as assessed through visual observation) with healthy vegetation regrowth, and sites known to be used by the surrounding communities retained evidence of still being

used. All sites will continue to remain on the PMA-2 register due to their proximity to infrastructure and nearby communities.

A new PMA2 protocol was developed 3Q 2022.

PMA-3 Rapid, standardised biodiversity survey updates:

The last IESC report noted highlights and initial results from the PMA-3 survey undertaken in 2021, focusing again on sites on Hides Ridge (BAA1 sites) and at the Agogo Range near Moro (BAA2 sites). The report documenting the 2021 survey (published 2022) was supplied to the IESC in Feb 2023. The report's major conclusions are:

- ✓ Results of the 2021 PMA3 survey indicate that both BAAs retain high biodiversity values for all surveyed taxa, with both areas continuing to support rare, conservation listed, restricted range and hunting-sensitive species.
- ✓ Notable declines have been recorded for three hunting-sensitive IUCN Threatened species at the Agogo sites over the last two sampling years. Following a sharp decline in records of the IUCN Vulnerable Eastern Long-beaked Echidna and Pademelon at Arakubi in 2019, neither species was again recorded there in 2021. In 2021, novel declines were also recorded for the IUCN Endangered Goodfellow's Tree Kangaroo at Arakubi (first year with no records) and for the Pademelon at KP107 (sharp decline to <less than 10% of previous annual records). By contrast, at Hides High in BAA 1, naïve occupancy of the Eastern Long-beaked Echidna increased sharply in 2021 and that of the Ifola has risen steadily from one camera (5%) in 2017 to three cameras (16%) in 2021.
- ✓ Edge avoidance by multiple species was clearly demonstrated in BAA 2. By contrast, reverse-pattern edge effects were commonly observed in BAA 1. These results are counter-intuitive for interior forest species and causal factors are likely to be environmental rather than anthropogenic. Regardless of the cause, after three years of camera trap monitoring there is little evidence of forest edge avoidance on Hides Ridge.
- ✓ There have been no consistent temporal shifts in frog, rodent or bat species diversity or composition since establishment of the PMA3 monitoring program in 2015 along linear clearings in BAA 1 on the Hides spine-line and in BAA 2 on the Agogo Range near Moro.
- ✓ Bat diversity was significantly greater in open areas at the forest edge compared to the forest interior, which reflects an influx of species that forage in edge and open flight spaces, particularly in BAA 2. These species, mostly small Emballonuridae, have benefitted from creation of additional forest-edge habitats but opening of the forest for linear infrastructure has not impacted the diversity or community composition of forest interior species.
- ✓ Overall, increases in hunting pressure and feral dog predation and the potential spread of exotic rodent species, both associated with installation of the pipeline ROW and associated roads, remain the two major factors most likely to threaten biodiversity values in the BAAs.

The PMA-3 specialist survey team report authors make a number of recommendations, highlighting the need for rapid assessment and documentation of dieback along Hides Ridge. Within EMPNG's Priority Ecosystem at Hides Ridge, all three previous surveys (2015, 2017 and 2019) had noted canopy trees along the edge of linear clearings becoming increasingly stressed, and in many cases, dying. This was particularly evident for *Nothofagus* trees along the eastern (lower) half of Hides Ridge. Due to the changes in the biodiversity team the authors note there have been limited observations made on dieback during 2021. The 2019 Upstream EMP Section 15.4-15.6) highlights the need to apply the precautionary principle, to inspect and sample instances of outbreaks of the spread of the fungus *Phytopthera cinnamomi*, especially in sensitive areas such as Hides with various *Nothofagus* species and the Papua New Guinea Oak *Castanopsis* acuminatissima which are particularly susceptible to senescence. In IESC opinion, these rapid,detailed field surveys continue to provide valuable information helpful for EMPNG to understand progress in meeting biodiversity program objectives - but this is dependent on EMPNG acting appropriately to the findings and recommendations made by their PMA-3 specialist advisors. See specific text on Plant Pathogens: Dieback in Section 5.5.2.4 for further information and Section 2 Issues Table for the Non-Conformance M21.2).

Regarding observations around increased prevalence of feral dog predation and hunting pressure made in 2017 and 2019, a recommendation made by the PMA-3 specialists was for EMPNG to better understand these observed threats. This is critical as the PMA3 specialists note that hunters and dogs have been preferentially using the pipeline RoW corridor to access hunting grounds. The recommendation was for surveys to be completed twice in the first 12 months, then annually thereafter for the three years to establish trends, prior to review. As reported in the last IESC Report (2022), EMPNG were then developing a pilot hunting questionnaire during 2021 for use with communities around BAA1 sites at Hides to better understand hunting characteristics. By early 2022, EMPNG reported that engagement had commenced. During this 2023 IESC review, EMPNG advised that the BAA1 pilot study outputs were found to be less than satisfactory, and that alternate ways to gather the data from hunting communities would be explored; the hunting study methodology would then be adapted and used to engage with

BAA2 communities, as hunting pressure was noted to have increased at this location. If this adapted approach proved successful, EMPNG would then resurvey BAA1 hunting communities. The IESC acknowledge the Project acting on the advice of the PMA3 specialists but strongly recommend EMPNG demonstrate more urgency in completing this work – the timescale from observations and recommendations to the Project to characterizing and understand the threat should not take over 4years, especially in areas where enhanced access may be causing increased pressures on species in Critical Habitat. Reduced headcount and personnel changes in the Biodiversity Team have potentially impacted the Project's ability to focus effectively across all required aspects in the work program. This is raised as an Observation in the Issues Table Section 2.

The record number of rodents observed on Hides Ridge reported in the last IESC report was found *not* to be statistically significant and may instead simply be a result of the type of bait used during the 2021 survey. Although increased numbers were trapped during 2021 surveys, there were no invasive species recorded, and all were found to be one of four relatively common species known locally. The specialists recommend that EMPNG undertake a rapid assessment of rodent species known to be prevalent in inhabited areas around the HGCP so that the threat to the Hides Ridge can be better understood. Considering that rodent control is already implemented at HGCP by EMPNG's contractors, the IESC would expect at the next review that relevant data collection has commenced to help inform future PMA-3 surveys.

EMPNG states the 2021 report will be published shortly in the Ecology Report section of the Project's website. The IESC previously recommended the PMA-3 survey reports from the 2017 and 2019 missions be published on the PNG LNG website, alongside the already published earlier 2015 mission report – the Project has added the 2019 report, but not the 2017 report.

The PMA-3 Protocol has been updated to reflect updated survey methodologies and approaches refined over the last few surveys. This will be used in the next survey campaign, planned for June 2023.

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

EMPNG presented their current interpretation of identifying losses and gains in relation to delivering NNL. A combination of known construction footprint and the PMA1 assessments have helped identify losses. But to account for habitat restoration within any gain generated, EMPNG have undertaken a pilot study at the Lake Kutubu WMA to help identify any increases in vegetation cover and changes in habitat, and is working with its PMA1 contractor to provide the required data. This has sought to establish a high resolution 2014 baseline landcover map, based on categories used in the Project's BIMP, then assessing the changes from 2014 to 2021 to see whether the approach would be feasible to use across all EMPNG offset areas. Preliminary results were presented to the IESC – over 2,000 ha of total change were detected between the two years, with the primary contributor being a change from the Terrestrial Forest class to the Wetland Forest class, and not in improvement in habitat condition. Conclusions as to the broader applicability of the approach to other offset areas are still under discussion, and a habitat change analysis focusing on the Aird Hills WMA (2016 to 2022) will be undertaken during 2023.

Discussions followed on predicted offset gain trajectories, where based on averted loss alone, EMPNG's approach to date has been to secure 'biodiversity gain' upon the signing of Conservation Deeds, for example, as occurring in the Lower Kikori offset program. The gain claimed by averted loss can be highly uncertain and inadvertently overestimated[6] and good practice requires there to be a genuine threat of loss that requires averting, otherwise the Project could be accused of claiming gains inappropriately. The signing of a Deed, although rooted in extensive community involvement and direction, is a political declaration of conservation intent and therefore needs to be combined with the demonstration of positive conservation outcomes to legitimately claim associated gains. Therefore, the Project's attempts to better incorporate tangible improvements in habitat condition is welcomed and should lead to more defensible claims of biodiversity gain associated with the offset program. As noted in the last IESC report, best estimation averted loss will still be tracked but will be supplemented by habitat condition data to help ascertain actual loss/gain levels.

Freshwater Ecology

No detail on past or forthcoming freshwater ecology surveys or sampling was presented. However during the trip EMPNG mentioned that freshwater ecology surveys are planned for 2023 or 2024 as per the original pre-earthquake program. This will be included in the next IESC report.

****

[6] Maseyk et al, 'Improving averted loss estimates for better biodiversity outcomes from offset exchanges', Oryx, 2021, 55(3), 393-403.

5.2.2.3 Biodiversity Offsets

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 the Conservation and Environment Protection Authority (CEPA) 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).

EMPNG considers this component complete with the publication of the 'Protected Area Planning for the Kikori River Basin' report written by WCS in 2017. They state the work has informed the identification of Project offset sites and protected areas established via Components 4 and 5 below. The Project had no update on the Government's progress for the Kikori Catchment as a UNESCO Cultural/Natural World Heritage Site, and the Kikori River Basin entry on the WHS website remains on the Tentative list dated 2006[7].

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

Post-2020, the Project has scaled down and reduced funding to this component of the offset program, as originally planned. Due to COVID-19, no Communicating Conservation meetings were held in either 2020, 2021 or 2022. Although the intention was to publish a newsletter in 2022, this did not occur. The reduced number of Biodiversity Team staff has affected implementation of activities within the work program.

During this visit, the Project confirmed their intention to continue funding towards this NBSAP-support component for the next five years. EMPNG continues to explore discussions with external multi-lateral organisations regarding co-sponsorship of the previously highly successful Communicating Conservation Meetings.

As there have been no active outputs of this component to help support the PNG government in implementation of priorities in the NBSAP, the IESC recommend EMPNG might also reconsider other priorities within the NBSAP where EMPNG's support could be put towards positive conservation outcomes.

Offset Component 3: Enhancing Conservation Capacity Program (ECCP). EMPNG's approach to supporting the enhancement of conservation capacity has changed. There had been challenges supporting the Post-Graduate Diploma and Master's degree courses and staff at University-PNG (U-PNG) due to extended COVID-19 restrictions. Instead, EMPNG have started a collaboration with the New Guinea Binatang Research Center (NGBRC) with confirmed funding for the period 2022 to 2026. Note: NGBRC already supports EMPNG on a number of biodiversity work programs, including regeneration and weed audits.

This new program partnership will support a number of newMasters/MPhil (2) and PhD (2) students through their post-graduate research programs. The students are PNG nationals, studying either at the PNG University of Technology (MPhils) or at the University of South Bohemia (PhDs) in the Czech Republic where NGBRC already has a long-term relationship.

The new collaboration program will also provide support for NGBRC's existing Conservation Rangers Training Course. The first EMPNG-supported course was held in Nov 2022 and trained 13 participants including five from the community at EMPNG's Lower Kikori offset program (see component 5 below) – this support creates a win:win situation as it combines national capacity building in an already established program with greater conservation support for communities living in areas to be conserved through biodiversity offset. The plan going forward is to expand the number of course attendees, with 20 participants for 3 weeks every October, annually from 2023 to 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 provided an update to the scorecard (updated version included in Figure below) to indicate progress through components of the Lake Kutubu WMA Enhancement Program. EMPNG's part-time contractor continues to support the WMA Committee in their WMA tasks and grant funding processes. The WMA Committee continue to implement programs funded through their UNDP (GEF Small Grants) Fund, awarded several years ago. Activities include training for and monitoring of chicken layer projects; training and monitoring of gardens; monitoring related to no-go fishing zones; fish surveys; and protected area business training and National Protected Area Forum participation.

****

[7] UNESCO WHS available at https://whc.unesco.org/en/tentativelists/5060/ accessed in March 2021.

Lake Kutubu WMA Enhancement Program	Status
Workstream 1: Conservation Design and WMA Management Plan	
Stakeholder Engagement: WMA Committee	WMA Committee fully engaged in all activities
Stakeholder Engagement: Community	LKWMA Communities fully engaged in activities
Stakeholder Consultation: Other Stakeholders	Conservation community and PNG government (CEPA) had been informed through conservation meetings; SHP,
Conceptual Enhancement Plan	Completed - 2015; four programmatic areas: *(i) Conservation (ii) Livelihood, (iii) Awareness, and (iv) Training*
Environmental Awareness and Education	Completed and ongoing
Ecosystems Services Analysis	Work in progress – Environmental Services (Biodiversity and Cultural values)
Biodiversity Surveys	Completed in 2017, report published in 2018
Design and Development of Enhancement Program	Completed- 2012; The LKWMA Enhancement Program
Mapping	Progressed - WMA Management Plan Draft
WMA Management Plan [Update and enhance the existing Lake Kutubu Catchment Management Plan as part of a new Lake Kutubu WMA Management Plan]	Progressed; draft WMA Management plan produced; stakeholder consultation on draft TBC 2023
Workstream 2: Enhance Organizational Capacity	
Training and Capacity Building	Training activities conducted over the years – eg. conservation science, livelihoods training (poultry, crop rotations etc..)
Structure and Composition of WMA Committee	Completed
Registration of the WMA Committee and Lake Kutubu Foundation	Completed - LKWMA Inc.
Premises	Completed - Resource Center built
Equipment	Completed along with Resource Center
Communication	Out Board Motor Boat delivered – for communication and logistics across the Lake communities
Workstream 3: Local and Provincial Level Government Planning	
Stakeholder Engagement: Local Government	Progressed – more engagement planned with WMA Management Plan consultations
Stakeholder Consultation: Provincial Government	Progressed; workshop planned for 2023 with draft of WMA Management Plan
Inclusion of WMA Management Plan in Ward Development Plan, Local Government Plan, Provincial Plans	Ongoing; progressed with WMA Management Plan consultations for incorporation; LLG Memebers (councillors) already involved at community level. More engagement planned with WMA Management Plan draft consultations in 2023

Figure 5.1: Lake Kutubu WMA Enhancement Program Status Update

As indicated in the scorecard above, the Project advise that a first draft of the Management Plan for the Lake Kutubu WMA has been developed although no presentation slides were provided on this. This Plan will be key to establishing the conditions for ongoing protection of the unique biodiversity values at the Lake Kutubu WMA. The IESC requested to view the draft Management Plan, but EMPNG's preference is to wait until a more final version is developed before sharing. As flagged in the last IESC report, timely stakeholder mapping and effective engagement with a wide range of governmental, civil society and non-governmental organisations will be important for the Lake Kutubu WMA Management Plan to be considered legitimate, be informed by a range of views and therefore owned by the wider 'community' of stakeholders essential for longer-term protected area management. (see Recommendation, which is retained). This means dialogue beyond EMPNG's usual stakeholders. The Project agreed that further consultations are necessary – following a discussion around Lender expectations on broad stakeholder involvement in developing the management plan, they acknowledged that stakeholder mapping and further engagement would help create a better protected area management plan. Originally scheduled to be complete by the end of 2022 (in IESC opinion, too tight a schedule to adequately represent the views of the various different stakeholders), the Project now predicts that an improved final draft should be available by the end of 2023, which should be in time for the next IESC review.

The IESC again stresses the importance that the Lake Kutubu WMA Plan is representative of the biodiversity values to be conserved, be scientifically robust, based on up-to-date information, setting clear ecological and ecosystem service preservation objectives and outcomes, and be well informed by a wide range of stakeholders' needs and opinions. Long-term engagement, adaptation and clear target outcomes are equally important, and it is encouraging that the Project states that IUCN protected area management plan guidance will be followed.

Regarding conservation objectives and understanding baseline ecology, as flagged multiple times before, the IESC's opinion is that EMPNG should be more cognizant of the conservation of the lake's unique freshwater ecology and therefore this be represented more fully in the support provided via the Project's WMA Enhancement Program – for background, Lenders should refer to the 2022 IESC report Sections 5.2.2.2 (Component 4) and 5.2.2.3 (responsibilities of clients operating in Protected Areas). Note: as EMPNG infrastructure is located within the WMA, a legally protected area, to align with PS6 requirements, the Program should be representative of the aquatic conservation objectives of the lake and EMPNG's Biodiversity Team should be cognizant of this.

The work being done by EMPNG with Lake Kutubu communities is highly valuable; nevertheless, the IESC's opinion is aquatic ecology/endemic fish biodiversity values do not appear to be adequately represented in EMPNG priorities. EMPNGhas repeatedly stated that freshwater biodiversity values do not form part of the company's offset program; however, it has often been stated that if the WMA Committee choose to include fish conservation and monitoring activities in their work plan then EMPNG would support this as part of the WMA Enhancement Program. During IESC conversations with the WMA Committee in 2017, it was clear that health of fish populations in the lake was of

great importance to the Committee. During desktop reviews in the intervening years, it was difficult to determine whether the current wishes of the community were being reflected in EMPNG's program priorities and activities. Therefore, for this 2023 site visit, the IESC requested to meet again with members of the WMA Committee. From the conversations held at Lake Kutubu, it is absolutely clear that the WMA Committee has significant interest in understanding the aquatic ecology of the lake and in maintaining the unique endemic fish populations for which the lake is internationally recognised.

The Oil Search Ltd (now Santos) fish surveys (specialist fish composition and health studies) around 2014 highlighted threats and vulnerabilities of the endemic species in the lake and recommended a number of strategies to limit the consequences of introduced tilapia on endemic fish populations – the 2014 study recommended continued use of eDNA and follow up annual surveys. The IESC has not had the opportunity to discuss this with Santos, but EMPNG were not aware of any follow up eDNA or annual surveys. In performing PMA-3 biodiversity surveys within the Lake Kutubu WMA in 2017 (to document biodiversity values and establish a multi-taxa biodiversity baseline), EMPNG chose *not* to include aquatic ecology within the survey scope of work. The Committee have recently undertaken their own fish surveys, attempting to identify fish population compositions (endemic species and introduced species). Also in an attempt to conserve endemic species, efforts are being made to deter fisherfolk from areas where endemic species are most regularly seen. However, during this IESC visit, EMPNG again stated that if the WMA Committee were to request that freshwater ecology surveys be undertaken then the Project would support this – however, it is not clear how the Committee would know to ask EMPNG to undertake PMA-3 type aquatic ecology surveys for them. With evidence as told by the WMA Committee to the IESC in the presence of EMPNG, it is IESC opinion that EMPNG reassess its stance in not actively supporting the Committee in this vital component of long-term lake conservation. The longer the delay before investigation and possible mitigation measures are employed, the greater the potential threat of introduced species outcompeting endemic species, for example. The Observation M20.1 raised in 2020 is now elevated to a Non-Conformance Level 1 as a breach of a commitment requiring corrective action as defined in Lender standards.[8]

Lenders will recall mention in the last IESC report that EMPNG have flagged interest in developing a potential additional protected area to the west of the Lake Kutubu WMA. EMPNG intend to undertake village/clan awareness and consultation workshops in 2023.

Offset Component 5: Establishing new protected areas.

a) At the Lower Elevation Zone (0-600m):

To fulfill the offset program at this lower elevation, EMPNG's desire is to enable the creation of a new community-based, regionally gazetted protected area (in PNG legal terminology, a 'Community Conservation Area') in the vicinity of the existing Neiru (Aird Hills) WMA. This will require the establishment of a protected area management plan for the Lower Kikori which will help offset residual impacts on biodiversity values affected in the Project's lower elevation footprint. To achieve this, EMPNG is working with former Barging Route Waterways Committee members, the Aird Hills WMA Committee, and a growing number of communities in the Lower Kikori. The Project supports a full-time coordinator (part-time based in Kikori Station) to assist with support to the communities and the lower elevation offset program.

EMPNG have engaged an Environmental Lawyer to inform communities on the concept of Conservation Deeds, to prepare the draft Deeds for discussion, and to facilitate their implementation. Two reconnaissance missions were made by the Lawyer to the Kikori Delta during 2022, to consult with communities already engaged in the Lower Kikori offset program to date. The Lawyer's work builds on the resource mapping activities of the past five years, and how the mapping has helped resolve any land-owner conflicts necessary for effective Deed development.

Therefore, as presented in EMPNG's community engagement status table above, good progress has continued during 2022. Work with the communities will continue through 2023.

To help formalize the Deeds and thus protection, EMPNG will liaise with representatives of the Gulf Provincial Development during 2023and with national government agencies, especially CEPA.

EMPNG are transparent in the challenges they are facing in supporting the establishment of the Conservation Deeds, for example, in managing threats related to logging and commercial fishing, and managing any competing conflicts of interest between clans and/or management committees. To increase the likelihood of successful conservation outcomes, the Project plans to train local enforcement officials, including village court magistrates and

****

[8] Note, EMPNG disagrees with IESC opinion on this issue. EMPNG's opinion is that the IESC is not accurately reflecting the opinion of the Committee and the IESC's priorities do not align with the Committee's opinion. EMPNG state the company's interactions directly with the Committee provide a better understanding of the Committee's interests, activities and priorities than can be gained through the IESC's periodic visits.

local Conservation Rangers. As noted in Offset Component 3 above (Enhancing Conservation Capacity Program), EMPNG's support to training Conservation Rangers, through their partnership with NGBRC, has enabled five locals to participate in the 2-week training course, run in Madang. This allowed the Rangers to learn practical aspects of conservation and share experiences with Rangers from other proposed/actual protected areas from other parts of PNG.

LKCE 2020-2022 Progress Chart			
Pre-2020	2020	2021	2022

	Kikori Delta Community	Initial community engagement	Resource Mapping	Review of resource mapping	GPS of sites	Initial identification of land for conservation	Conservation Deeds (1st draft)
1	Goare	Complete	Complete	Complete	Complete	Complete	Progressing
2	Bisi	Complete	Complete	Complete	Complete	Well Progressed	Progressing
3	Aidi'io	Complete	Complete	Complete	Complete	Complete	Progressing
4	Kemei	Complete	Complete	Complete	Complete	Complete	Progressing
5	Doibo	Complete	Complete	Complete	Complete	Complete	Progressing
6	Babeio/Veiru	Complete	Complete	Complete	Complete	Well Progressed	Progressing
7	Goro	Complete	Complete	Complete	Complete	Complete	Progressing
8	Dopima	Complete	Complete	Complete	Complete	Complete	Progressing
9	Aimahe	Complete	Complete	Complete	Complete	Complete	Progressing
10	Mubagovo	Complete	Complete	Complete	Complete	Complete	Progressing
11	Veraibari	Complete	Complete	Complete	Complete	Well Progressed	Progressing
12	Waira	Complete	Complete	Planned	Planned	Planned	
13	Apeawa	Complete	Complete	Complete	Complete	Well Progressed	
14	Omati	Complete	Well Progressed	Planned	Planned	Planned	
15	Lalau	Complete	Well Progressed	Planned	Planned	Planned	
16	Ero/Wouwou	Well Progressed	Planned	Planned	Planned	Planned	
17	Kopi	Complete	Progressing	Planned	Planned	Planned	
18	Kaiam	Complete	Planned	Planned	Planned	Planned	

Figure 5.2: Lower Kikori Community Engagement Progress 2020-2022

b) The Upper Elevation Zone

The Montane altitude (elevation >1200m) represents the largest proportion of the overall residual biodiversity impact for the Project. Therefore, the biodiversity gain required is greatest at this higher altitudinal zone, through the creation of ecologically comparable areas managed for biodiversity.

Since 2020, EMPNG has given offset activities in this upper elevation zone a higher priority than previously. Work undertaken during 2022 has included:

- ✓ further engagement with HGCP workforce to create a network amongst the local workforce – 678 participants have heard offset-preparatory messaging via toolbox talks; in addition, in-depth engagement with Community Affairs, Village Liaison Officers (VLOs) and Community Safety Monitors has started ;
- ✓ visits with 19 local communities in PDL 1 & 7 to establish contact and initiate a more formal community network, although tribal conflicts and security concerns have made it more challenging to achieve full engagement;
- ✓ development of an education program in conjunction with local schools: a third-party contractor has been engaged to help develop and manage the program.

The VLOs are typically Clan Leaders in the area, and four VLOs expressed interest in knowing more about the Montane Offset Program. Following further engagement, the VLOs then went on to share information with their respective clans. Subsequently, the Biodiversity Team were invited to conduct awareness and engage directly with the Clans – this engagement has been deferred to 2023, when further in-depth engagement is planned including

with women's groups. EMPNG has allocated additional staff time to help progress these engagements – there is now a full-time position (two back-to-back staff) to progress this (although see Section 5.2.2.1 on staff performing multiple roles). EMPNG are building on the opportunity of Gigira Laitebo, an existing external cultural program, to help discuss common biodiversity values across different Hides Communities.

Alternative Livelihood Strategy for Offset areas

As noted in the last IESC report, EMPNG has developed an Alternative Livelihood Strategy (ALS). This will define a work program for implementation in each offset program area, recognizing that different location characteristics will mean tailored approaches, which will be defined in site-specific plans. EMPNG has significant experience in tailoring and implementing livelihood and community development programs.

Therefore, ALS application in offset areas is to be welcomed, where the preservation of biodiversity values might otherwise restrict traditional access to natural resources to a greater or lesser extent – in addition, aspects of PS7 can be addressed by providing opportunities for development benefits (this will be a focus area for future IESC reports). As site-specific conservation objectives and sustainable natural resource plans (developed as part of the offset program) will be different for each offset area, so will the alternative livelihood activities – this complements a previous IESC recommendation to have site-specific offset management plans. The Project has developed a 3-component strategy, with focus areas: household food security and nutrition; diversifying household incomes; and community capacity building for self-reliance and autonomy.

The Strategy highlights that key to getting the program implemented will be sourcing adequate high-calibre personnel to implement the program. As noted in the Community Development Support (CDS) section by the IESC's Social Specialist, the CDS team currently require additional qualified staff; and cross-functional work programs need more coordination. Next steps involve a scoping study using two or three of the existing offset areas to generate a SWOTs analysis (strengths, weaknesses, opportunities, threats). This will then inform the development of a site-specific Alternative Livelihoods Plan.

The IESC agrees that successful conservation should be cognizant of the needs of people in and around areas of high ecological and ecosystem value. Such an ALS program if suitably funded, resourced and managed through time should help achieve sustainable gains over the required timeframe and increase the chances of offset success.

5.2.2.4 Legally Protected Areas

The IESC refers Lenders to the IESC's 2021 report for background on EMPNG's responsibilities in relation to PS6 (2006) Paragraph 11 relating to operating in a legally protected area, including those related to the promotion and enhancement of the conservation aims of the protected area. Also reference Section 5.2.2.2 above on Offset Component 4 (existing protected areas) for how the Project's support for conservation should address all priority biodiversity values within the protected area.

The Project has undertaken over a decade of solid foundational work with the WMA Committee as part of the mid-elevation offset program. The IESC Non-Conformance in the Issues Table recommends EMPNG now consider the gaps in alignment between the approach taken for offsetting residual impacts on specific biodiversity values versus the requirement to promote and enhance the conservation aims of the protected area within which the Project is located. The Project's exclusion of an updated scientifically robust aquatic biodiversity survey to support the preservation of the freshwater ecosystem, is not in alignment with primary conservation aims of the protected area. The IESC recommends the Project plan to include an updated appropriate assessment of the Lake Kutubu freshwater ecosystem via a PMA3-type biodiversity assessment survey as part of the foundation for enhancing the conservation aims of the WMA.

5.2.3 Recommendations

1. EMPNG to reconsider other priorities within the NBSAP that could be supported through Offset Component 2, recognizing that workshops will not have been held for 4 years.
2. The IESC encourages the Project to seek improved engagement with conservation NGOs to help provide additional transparency and alternative viewpoints for the residual impact and offset programs;
3. The 2017 and 2021 PMA3 biodiversity reports should be posted on www.pnglng.com alongside the 2015 and 2019 report.
4. EMPNG to consider sharing PMA3 data directly with GBIF in alignment with the Equator Principles.

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

As flagged in the last few IESC reports, for this site visit, the IESC specifically requested sufficient time in the field so as to drive the Southern Highway to observe Access Monitors in place and observe the current status of access controls. An itinerary that would enable a full road-trip was deemed not possible (due to security concerns, the level of which is currently deemed 'severe') therefore direct observations could not be made.

Information presented by EMPNG was lacking Q4 2022 due to data not being reported in from the field because of contractual and payment disputes – see Access Control Upstream below.

Ownership of Roads / Infrastructure and Responsibility for Mitigation

There is no change for 2022, and both road-ownership negotiation descriptions reflect the current status:

- ✓ 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.
- ✓ EMPNG advises 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** (Gobe to Kantobo road section) and the **Kaiam Bridge** (see IESC report November 2016, Section 3.2 and Section 5.4.2 p.42-43 for background) – the IESC retains 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 intends to develop an MOU with the government to detail commitments for environmental and social protection once dialogue restarts.

Controlling access to Project infrastructure along the RoW

In summary, EMPNG's strategy noted above in Section 5.3.1 is generally to only allow access to EMPNG vehicles, and that access by third party vehicles is only by prior approval.

In reality, the Access Monitors usually stationed at the Project's Kantobo to Gobe road allow free movement of vehicles along the 'Southern Highway' section although the Project confirms that vehicle and destination details are recorded. A similar situation typically exists at the Project constructed Kaiam Bridge.

However, during 2022, a payment issue between the clan members and the Clan Agency that manages the employment of clan members has meant that Access Monitors have not always been in position, and that data has not been collected – this has impacted Q4 2022 data collection and reporting, and will also impact collection and reporting for Q1 2023. This has jeopardized EMPNG's 'control' of vehicular access using project infrastructure.

Of the 15 facilities/infrastructure areas being monitored, 13 are controlled as per the EMP requirements (Table 17.1, version available on www.pnglng.com). Therefore, two points of access to Project roads are not controlled from public roads in the way stated in the EMP, due to uncontrolled situations:

- ✓ Condensate Pipeline (Check Valve) CV1 –The boom gate to restrict access to the RoW was removed by locals in 2019. Currently the boom-gate giving access into Angore Well Pad-B acts as the control to CV1 and the pipeline RoW. It is now manned because of ongoing Angore project activities.
- ✓ At Benaria Station, vehicular access to MLV1 is made possible through continued use of the track and bridge built during pipeline construction. The community also continues to use the bridge, as the government constructed bridge was washed away by a flood in 2017. During chopper flyover for this site visit, it was difficult to properly ascertain but it appeared as if the government bridge is back in place.

During construction, a Project road was built to link up OSL roads between Kantobo and Gobe (including the Mubi Bridge). The Kaiam bridge was also built, thereby allowing construction access from Moro south to the Kopi Scraper Station and to the Omati landfall. The basis for the EIS assessment of impacts and significance was that the Project road and bridges were to be closed and restored. However, the Project construction road and bridges were kept open, thereby creating the Southern Highway. Therefore making it imperative that EMPNG control access to Project roads to avoid and minimize impacts related to enhanced access such as increased hunting to more easily accessible areas, land clearance/logging and the transmission of weeds, pests and pathogens.

The EMP 1) requires access controls that restrict vehicular access to EMPNG roads, (2) requires access to only pre-authorised vehicles, and (3) defines the mitigation controls at access points along project roads. The IESC is not able to verify the sanctioning process intended to allow only pre-authorised vehicles entry. The combination of the two access areas not being implemented in line with the EMP, and the Access Monitors not being on station to 'control' access through the manual recording of vehicles, results in IESC opinion that EMPNG are not controlling vehicular access along Project roads in line with stated commitments. An Observation is raised in the Issues Table.

Access Control – data collection of Upstream vehicle movements

Quarterly tabular data indicating the total number of vehicles broken down by vehicle user was again presented to the IESC for all years 2015-2022 (excluding 4Q 2021 as noted above), However, quarterly vehicle data now presented for 2021 is an order of magnitude higher than what was provided for the same period during the IESC desktop review in Feb 2022. e.g., picking just a single quarter's data for 2021:

- ✓ In Feb 2022, the data for Q1 2021 shows EMPNG vehicles = 47, OSL vehicles = 93, government vehicles = 29, private vehicles = 99
- ✓ In Feb 2023, the data for Q1 2021 now shows as EMPNG = 244 , OSL vehicles = 650, government vehicles = 278, private vehicles = 265

The usual IESC graph presenting quarterly data 2015 to latest update is therefore not included in this report - EMPNG should check the data and provide clarification.

EMPNG bullet points present that overall road usage is decreasing, despite 2022 being an election year. They also state that a new section of government road was opened in 3Q 2022 – the Agiru Highway. This connects the Okuk Highway through Erave down to the Kikori, through Semberigi, and utilizes the Project's Kaiam Bridge to link down to Kopi shore base.

Access Control – LNG Plant

IESC reports in 2018-2019 noted repeated vehicular incursions into the pipeline landfall RoW area, with evidence of mangrove trees being cut and extracted. During 2020/21, concrete blocks were placed blocking off the vehicular access route.

EMPNG state that ongoing monitoring makes use of security cameras placed along the fenceline at the RoW pipeline landfall. They state when there is an incursion , Community Affairs team works with the VLOs and village leaders to caution the imposters, remind about the restrictions in place and the benefits to the community of a healthy mangrove ecosystem.

The IESC visited the RoW landfall at the LNG Plant, and did not see any evidence of fresh mangrove harvesting or vehicle tracks in the open back mangrove area.

5.3.3 Recommendation

1. As previously, 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, 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 Regeneration Monitoring

No updates on regeneration monitoring were presented by EMPNG during this site visit. The last IESC report described the 2021 regeneration monitoring mission by NGBRC.

For mangrove regeneration at the LNG Plant, the Project continues to engage with the communities on the benefits of mangroves. If there is an incursion, the CA team works with VLOs and village leaders to caution those known to have strayed into agreed exclusion zones (for which compensation for restricted access has already been paid).

Updated photo-point images were presented and EMPNG report that mangrove regeneration is steady and healthy. The IESC visited the RoW pipeline landfall area, and following three years of desktop review absence, visual observations were clear that mangrove regeneration had progressed, with individual trees in general looking taller and wider than our last visit. No obvious signs of recent harvesting of mangrove trees were observed. See figure below for static point images from Point C which is the furthest inland of the three static points, and therefore regeneration appears to be more successful, furthest from wave action effects.

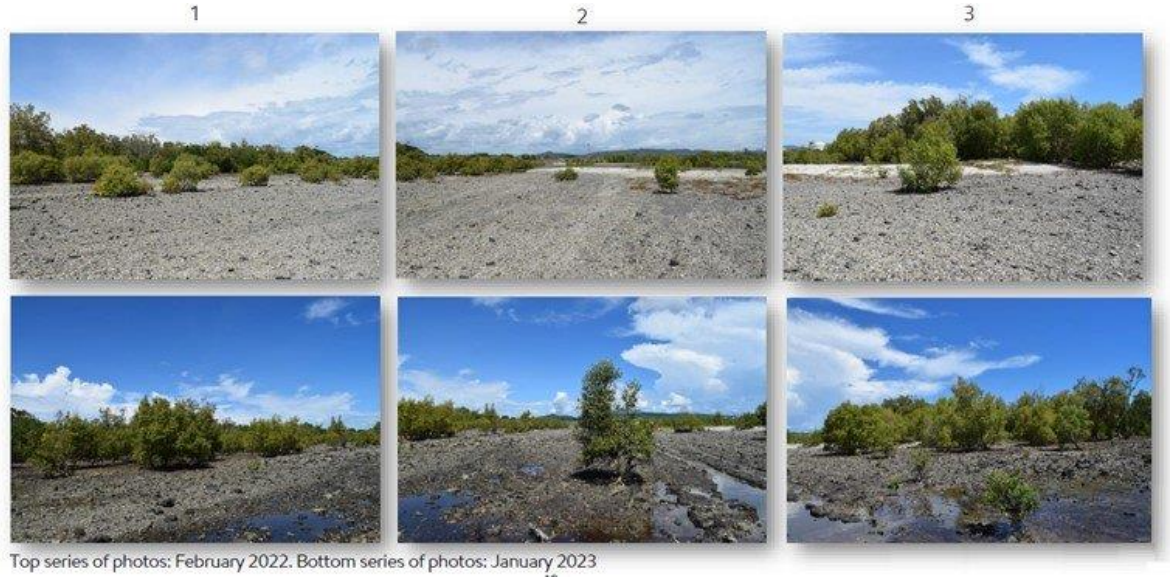


Figure 5.3: Mangrove Regeneration 'Static Photo Point C' Images, looking Left, Central and Right – Top Images from Feb 2022, Bottom Images from Jan 2023.

5.4.3 Recommendation

1. No recommendations 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 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 ISOS and staff members where weed observations are noted and control measures performed.

The project footprint was originally 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 – these WMZs are summarized in the Upstream EMP (2019). The current specialist monitoring approach utilized by NGBRC on the Project's behalf was developed and adopted in 2018 and assesses weed abundance and distribution across four elevation zones.

The EMP notes that invasive weeds exist in the natural environment but are categorized according to their potential for environmental harm and hence priority for management. The distinction between different priorities of weeds are defined as: Priority-1 (P1) weeds have the ability to suppress and displace most native species especially in new disturbed areas; the Project aims to control and monitor all P1 weeds and exclude them from all work areas through active control. Priority-2 (P2) weeds have the ability to become locally dominant with potential to outcompete some native species; P3 weeds have the potential to proliferate in new disturbed areas.

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

As predicted in the EIS, for the Operational period, the impacts associated with weeds and exotic fauna were considered likely to increase with time (Table 18.20). It predicted that 'over the 30-year operational life of the PNG LNG Project, the potential impacts such as wildlife, dieback, weed & pest invasion and enhanced access to these remote and pristine parts of PNG present some of the greater challenges to the Project'. Also, 'possible introduction of weeds, pests and pathogens could immediately impact on the core set of significant areas along the pipeline routes'. 'The control of wildfire initiation, quarantine and the control of access along the PNG LNG Project infrastructure are fundamental mitigations required to manage any indirect impacts on the significant biological areas.

5.5.2.1 Weeds Site Inspection and Control

EMPNG state their vector control contractor undertakes weekly monitoring comprising visual inspections of areas known to support weeds, detecting new outbreaks, and follows-up opportunistic observations by field teams and drivers. Records generated for part of daily, weekly and monthly reports from the contractor to EMPNG, which then updates the Weed Register so that weed control can take place. There is a contractor rep (or their back to back) at both Hides and Moro.

EMPNG have provided the following process diagram and brief observations on these main elements are noted below.

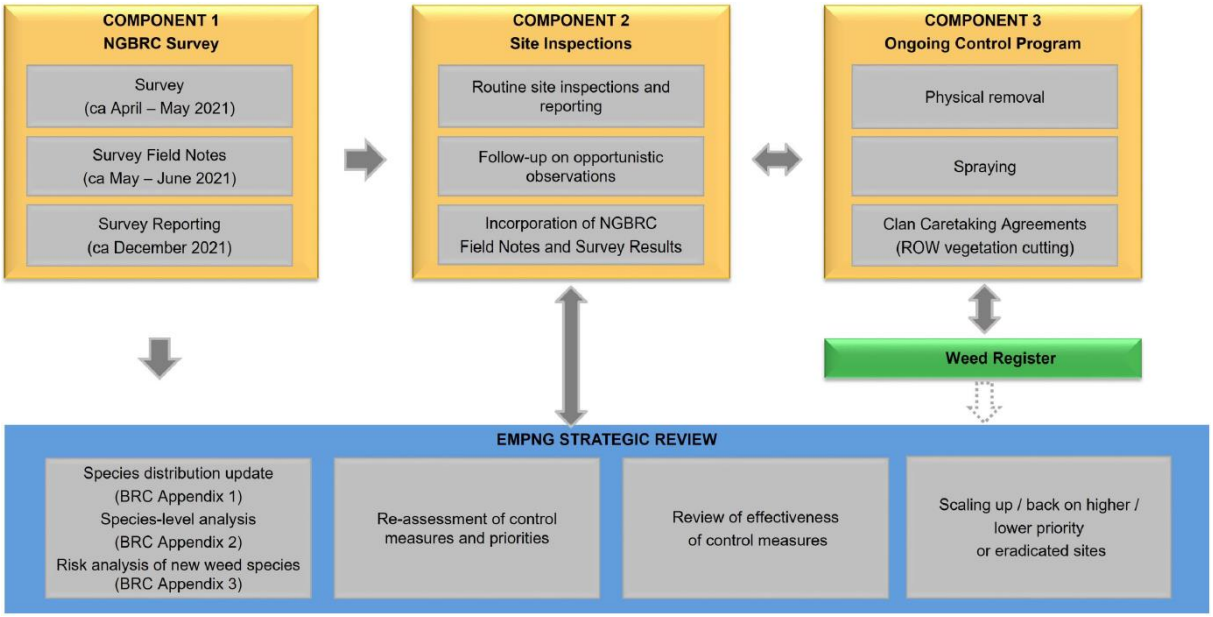


Figure 5.4: EMPNG's Overview of their Weed Control Process

Component 1: is discussed in more detail in the next sub-section (Specialist Weed Audits).

Component 2: Opportunistic observations are fed into the contractor or EMPNG – the IESC was provided with examples of such reports. Vector control routine site inspections occur but are limited in frequency, geographical extent and choice of location. Previously, the aftermath of the 2018 earthquake, community unrest, COVID-19 travel restrictions and lack of available vehicles have all confounded the contractor's ability to have predictable, regular access to areas where weeds need to be controlled, as reported in the last several IESC reports. More recently, access to vehicles by the vector control contractor has become much more a limiting factor. Currently all vehicles are required to have security vehicles accompany them to remote sites (whether internal security or Host Government Security Forces, HGSF); however, security vehicle numbers are severely limited due to the demand on their services to support the Earthquake Recovery Works. On some days, if the contractor wishes to head into the field, they are restricted in their destinations to those sites where EQX work is occurring.

Component 3: Regarding effective control, in the IESC's opinion the equivalent of one full-time vector control contractor (made up of two personnel working back-to-back) at each of the Hides and Moro sites is not sufficient to tackle the abundance and distribution of Priority 1 weeds in the Project's Upstream area of influence. During discussions with the vector control contractor, it was apparent they were not aware of good practice use of weed spray and requirements in terms of use in proximity to water (ecotoxicology impacts) – EMPNG should ensure that all contractor staff are aware of EMPNG requirements when using Glyphosate and/or other weed control chemicals (see new Level-1 Non Conformance). EMPNG provided information on an approach being developed, to expand the existing Clan Caretaking Agreements to incorporate some responsibilities for weed management along the RoW, in addition to the existing requirements for grass-cutting RoW maintenance.

EMPNG strategic review: when the IESC questioned what the review had generated, there was limited response from EMPNG[9].

Lenders will recall previous IESC reviews trying to gain an understanding of the distribution, abundance and spread of priority weeds, what ecological risks might arise from weeds observed in areas where they weren't seen previously, locations where weed control is particularly challenging, updates on priority areas for P1 high priority weeds control, etc. The opportunities to speak with vector control contractors were useful to not only better understand their current work approach and some of the challenges they face in weed control, but also to observe

****

[9] During finalisation of this IESC report post visit, EMPNG provided follow up information on outcomes that are attributable to this strategic review (which they state is an ongoing process, not a one-off review). This will be followed up in the next IESC visit.

capacity and resource levels. Nevertheless, the deliverables required to close Non-Conformance M20.2 were not made available and therefore it is retained.

5.5.2.2 Specialist Weed Audits

Theannual weed audit was again undertaken by NGBRC in 2022, this time covering 672 transects, the highest sampling effort to date, in comparison to 108 transects in 2018, 367 in 2019 and 389 in 2021.

The IESC appreciate there is now more of a focus on Priority 1 weeds in the NGBRC audit reports. The abundance and dominance of the top five most common P1 species across the Upstream survey area indicates these five currently comprise approx. 80% of all P1 species records. *Piper aduncum*, *Ludwigia leptocarpa* and *Desmodium sequax* are the dominant P1 species in most zones, although abundance has slightly declined/stable when compared to 2021. The report deems these to be some of the Project's most significant weeds since 2015.

Altitudinally, *Piper aduncum* has the broadest elevation distribution, and is important across all four zones; *Ludwigia leptocarpa* and *Mikania micrantha* are predominately lowland species; *Desmodium sequax* a montane species, and *Cenchus purpureus* prefers mid elevations.

Diversity per transect has increased from 2021 to 2022 in all four elevation zones, but not in the overall number of P1 species.

NGBRC now recommend active control of more P1 species than their previous report, in those locations where they are highly abundant – of *Piper aduncum* , *Ludwigia leptocarpa* , *Mikania micrantha* and *Desmodium sequax*.

This is still only NGBRC's fourth Upstream wide weed audit, so although more valuable trend information if being generated according to the new methodology, there will be more benefit in years to come as a dataset over a longer duration is generated. The IESC had previously reported that EMPNG were considering moving from annual audits to one every other year – confirmation has now been provided that there are no current plans to change from annual audits..

BRC recommends that (i) the present quantitative weed monitoring is continued on annual basis, required due to the rapid changes observed in the weed communities, (ii) weed surveys are conducted also outside the PNG LNG project at selected sites with various anthropic and natural disturbance regimes, in order to establish the benchmark values against which the ROW data could be evaluated; and (iii) the potential impact of *P.aduncum* on native vegetation is studied using experimental removal of this species from a series of plots established in the four elevation zones of the ROW area.

EMPNG insist that certain P1 weeds currently found along the RoW in areas where they were not previously recorded, were actually *present* prior to construction but were not correctly identified. For example, (1) Homa-Benaria Ridge is a key priority ecosystem, and was deemed to be largely weed-free[10], but now there are 20 species recorded, (2) *Ludwigia leptocarpa*, during pre-construction this P1 weed was only found at Omati & Kikori, but by late 2013 was at Moro, and by 2015 was found at Angore. Speaking with a representative that participated in some of those PCS surveys, it appears that specialist vegetation scientists were employed to undertake the work and in their opinion it's considered highly unlikely that so many easily identifiable P1 weeds could have been repeatedly mis-identified. The potential for weed transmission along the RoW was a significant impact predicted in the EIS, and is therefore a risk of significant interest to Lenders. A recent State of the Environment report[11] indicates that invasive species are an area of concern requiring urgent attention, and listed as one of the top threats to Pacific Island resilience.It is IESC opinion that EMPNG should consider an independent specialist review be undertaken to try to resolve this significant, alleged discrepancy – a new Observation is raised in the Issues Table.

5.5.2.3 Cane Toads

As reported in the last few IESC reports, cane toads (*Rhinella marina*) have become an increasingly challenging invasive species 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.

****

[10] EMPNG Biodiversity Strategy Rev.2

[11] State of the Environment and Conservation in the Pacific Islands: 2020 Regional Report. Apia, Samoa : Secretariat of the Pacific Regional Environment Program, 2021.

The Project's cane toad program strategy continues to be to limit the introduction of cane toads into priority ecosystems (Hides Ridge, Homa-Benaria Ridge and Lake Kutubu WMA). Their approach is three-fold: prevention, detection, response & recovery. Target areas for prevention, detection and response are the HGCP, the Hides vehicle-washdown facility, the Hides Waste Management Facility (HWMF) at Kopeanda, Moro, Komo and Angore.

As noted previously, the numbers of juveniles/adults recorded were initially quite staggering, although depending on location, numbers of juveniles and adults now appear to be decreasing in places such as the HGCP. EMPNG report a decreasing trend for 2019 to 2022 across the Upstream sites of interest, although the HWMF continues to be an issue – see graph below. The HWMF is the dominant area where juveniles are recorded, a challenging situation observed first-hand by the IESC during this visit. During the HWMF walkaround, the IESC noted widespread cane toad juveniles moving across the roads, although numbers here have apparently improved and the Project advises are much reduced.

As Earthquake Recovery Work (EQX) continues, work at some locations requires accessing and utilizing a section of the sensitive Homa-Benaria Ridge. The Project have established a mobile washdown unit for vehicles at the base of the MLV2 Access Track to minimize transmission of invasive species, pathogens and pests, including cane toads. Vehicles and cargo are also then washed on their arrival at Moro EQX base.

EMPNG report that vehicle inspections using security-style under-chassis and wheel-arch mirrors are being conducted in multiple locations, with nearly 6,500 inspections undertaken to date. They report that no cane toads have been found during vehicle inspections at any location. This statistic could indicate that toads are not being frequently transported by vehicle, or the current inspection approach is possibly not effective. The IESC acknowledges EMPNG are trying to locally manage a situation that is very challenging, but suggests that EMPNG again consult with cane-toad management specialists to ensure their protocols, vehicle inspections and washdown locations are an effective approach to combatting unintentional transportation, appropriate for the Project's operations.

Key from a Lender risk perspective is that the Project continues to receive specialist advice from external experts and acts responsively to their recommendations.

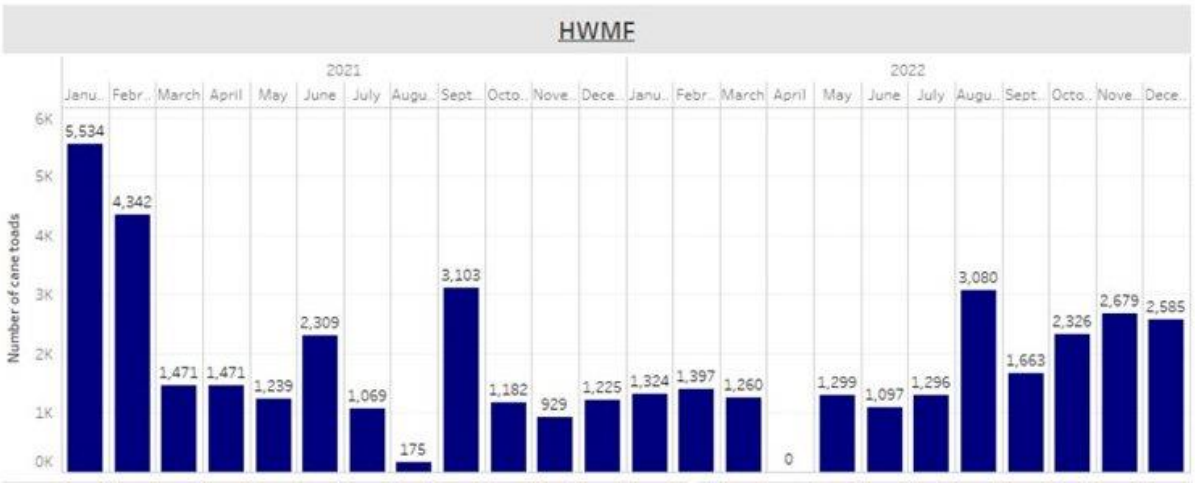


Figure 5.5: Monthly Cane Toad Observations at HWMF

5.5.2.4 Plant Pathogens: Dieback

As noted in Section 5.2.2.1, the last four PMA3 surveys at Hides Ridge (2015, 2017, 2019 and 2021) have noted canopy trees along the edge of linear clearings becoming increasingly stressed, and in many cases, dying. This was particularly evident for *Nothofagus* trees along the eastern (lower) half of Hides Ridge. The affected canopy trees on Hide Ridge could potentially represent the effects of the plant pathogen, *Phytophthera cinnamomi*, to which *Nothofagus* species and Papua New Guinea Oak *Castanopsis acuminatissima*.are particularly susceptible.

In the most recent PMA3 report (detailing 2021's survey) the survey specialist authors note the reduced field observations for dieback undertaken during 2021 due to biodiversity team changes, and recommend the team initiate regular quantitative assessments of vegetation condition along transects to provide a covariate of vegetation condition for future surveys. They also say similar assessments should be considered to more rigorously document

dieback at regular intervals at sites in Hides Ridge. They recommend further consideration to select an appropriate and rapid assessment method.

The 2021 IESC report recommended that EMPNG consult appropriate pathogen experts to determine whether specialist sampling is warranted at these dieback sites on Hides Ridge for exotic Type A2. Note: Type A2 had only previously been recovered at sites below the HGCP, and measures such as the vehicle washdown were implemented to avoid Type A2 reaching and affecting the Hides Ridge, a priority ecosystem as per the Biodiversity Strategy.

The 2022 IESC report raised an Observation (M21.2) that EMPNG should demonstrate more urgency in their approach so that priority analysis be undertaken of any suspected dieback on the Ridge, and the type of dieback determined (A1 or A2), to confirm whether active control measures should be implemented – this would then if necessary prompt active control mitigation measures. At the time, EMPNG stated that the potential dieback on Hides Ridge noted during the 2015 to 2021 PMA3 surveys had not yet triggered the necessary sampling to confirm or determine the type of dieback present. Instead, EMPNG had forwarded photographs taken by the PMA3 field team of the potential dieback to the PMA3 scientific team leaders for their visual assessment.

For this IESC site visit, again, no specific slides on dieback follow-up, investigation or mitigation were presented. In response to IESC questions, EMPNG state that EMPNG have now identified a contractor to undertake visual observation work, but there have been issues and sub-contracting delays and the observation work is yet to commence. The IESC requested the ToR for this work, but this was not available at the time of writing. The IESC stresses that more urgency should be applied in resolving the contractual issue, and completing the visual observations, as it may be necessary to immediately undertake a detailed sampling investigation.

As noted in the Esso Highlands Ltd 2013 report, 'Understanding and Management of *Phytophthera'* manual, Type A2 is a relatively recent introduction to PNG and the full potential impact of this mating type on native vegetation is not yet known. Therefore, immediate consideration of a sampling program and reinforcement of necessary mitigation measures would be prudent. .

The Upstream EMP (Dec 2019, Section 15.4-15.6) highlights the need to apply the precautionary principle, to inspect and sample instances of outbreaks of the spread of the fungus *Phytopthera cinnamomi*, especially in sensitive areas that are susceptible to senescence such as Hides with various *Nothofagus* species and the Papua New Guinea Oak *Castanopsis acuminatissima*. Considering the period of repeated reporting of dieback by the specialist survey team, the lack of regular observation during 2021 by the Project noted by the PMA-3 survey team (compounded by the loss of further key EMPNG personnel during 2022 noted in Section 5.2.2.1), and that no targeted investigative dieback surveys have yet commenced, the IESC escalates the Observation raised the last IESC report to a 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 (see Issues Table, Section 2).

5.5.2.5 Wallabies at LNG Plant

As noted in the last IESC report, wallaby (*Macropus agilis*, IUCN Least Concern) numbers within the Project's LNG Plant boundary fence had reached a level whereby EMPNG senior management deemed them a risk to personnel safety and plant integrity. Since construction, the barrier of the boundary fence and abundance of maintained grass within the fence has created a relatively safe habitat and breeding space The population had reached such a level that local hunters were hunting through the fence from the public road, gun shots had been heard and intruders were caught on CCTV trying to hunt wallabies at night inside the facility fence.

Following expert opinion from Port Moresby Nature Park's macropod specialists and after consultation with and approval from CEPA[12], EMPNG contracted expert marksmen to undertake partial culls during early 2022 and 2023, of up to 1000 animals. The carcasses were buried on site following a site selection analysis process to identify the most optimal, permanently marked location. EMPNG are now evaluating the effectiveness of the cull campaign to develop a long-term control plan to further limit and monitor wallaby numbers going forward.

EMPNG stated that all CEPA waiver approval conditions were complied with i.e. EMPNG submitted to CEPA, prior to the culling campaign, the detailed plans for the disposal of carcasses.

****

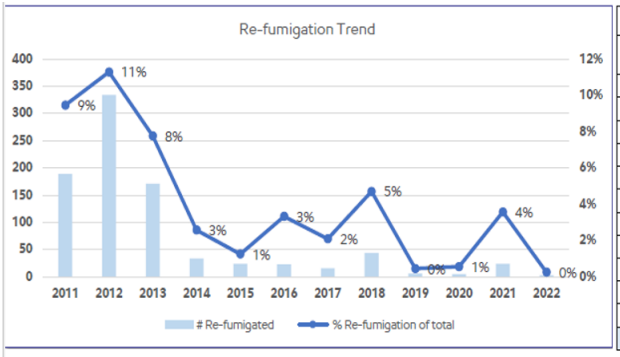
[12] CEPA wrote to EMPNG to approve a waiver to parts of the Environmental Permit (subject to certain conditions being met), thereby allowing the cull to proceed – this letter has been provided to the IESC.

5.5.2.6 Quarantine & Import/Export Permits

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 PNG's unique animal and plant life and affect economic growth. Prior to construction, a Lender concern was to ensure the project did not create undue pressure NAQIA resources, hence the IESC has tracked EMPNG-related imports over time – see figure and table below, updated to now include 2022 data. EMPNG provides data related to the number of total shipments imported into PNG by EMPNG or their contractors, the number of these shipments inspected by NAQIA, and the numbers of refumigations that NAQIA believe to be necessary following that inspection (typically due to either dead or live species being found within, or incorrect/unclear documentation). As fumigations are meant to happen at the port of origin, refumigations should not be necessary if EMPNG's requirements to freight forwarders or shippers are properly followed – hence this is a good indicator of how well the process is going.

Numbers for refumigations required in 2021 presented to the IESC during this 2023 visit were very different from the numbers provided previously for that same period (see table below versus table in the last IESC report) i.e. last year, the IESC were told there were zero refumigations in 2021, but the historical data given this year (shown below) indicates there were 24 refumigations required (7% of all shipments inspected by NAQIA). This conflicting data was not noticed during the face-to-face presentation; if this was a factual correction to previous data, no justification was given during the presentation. Clarification (and correction if needed) should be provided – see Recommendation.

Nevertheless, the 2022 refumigation data indicates good performance, with only three refumigations required, especially considering the numbers of shipments increased by approx. 70% vs 2021.



CUMULATIVE SUMMARY : 2011 - 2022					
YEAR	# Shipments	# Inspected	# Re-fumigated	% Inspected of total	% Re-fumigation of total
2011	2000	1407	189	70%	9%
2012	2962	2413	334	81%	11%
2013	2204	1112	171	50%	8%
2014	1316	283	34	22%	3%
2015	1904	341	24	18%	1%
2016	690	111	23	16%	3%
2017	762	119	16	16%	2%
2018	935	259	44	28%	5%
2019	1301	93	6	7%	0%
2020	878	12	5	1%	1%
2021	671	44	24	7%	4%
2022	1140	43	3	4%	0%

Figure 5.6: Summary of Project-Related Shipments, NAQIA-Required Inspections and Re-Fumigations

During discussions on any regulatory export or biosecurity permit requirements associated with licenses for PMA3-related eDNA or specimen samples, EMPNG confirmed that the PMA3 team leader is responsible for (and very experienced in) securing the necessary permits prior to any export.

5.5.3 Recommendations

1. EMPNG again consult with cane-toad management specialists to ensure their protocols, vehicle inspections and washdown locations are an effective approach to combatting unintentional transportation, appropriate for the Project's operations.
2. EMPNG to provide corrections to the 2021 refumigation numbers provided during this review, or justifications as to why the change from zero to 24 refumigations in the Quarantine annual data table.

6 SOCIAL

The 2022 review was undertaken through a desktop study. The observations and opinions reported herein are based solely on presentations provided by EMPNG and additional documentation.

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.

6.1.2 Observations

6.1.2.1 Outstanding Resettlement Obligations – 2020 IESC Review

The two cases of resettlement in 2020 related to Pipeline repairs have been closed with no outstanding obligations for the Project. An outcome evaluation conducted post-resettlement indicates that all 10 affected households now have improved Standard of Living and Livelihood.

6.1.2.2 Current Resettlement

Resettlement obligations for the five households carried over from 2021 were completed in 2022 with the exception of one outcome evaluation currently in progress. Results of the two household evaluations deemed warranted showed a combination of improved or maintained post-resettlement standard of living and livelihood conditions.

New Land accessed Areas 2022-2023

Additional land was accessed for pipeline remediation work caused (i) by the 2018 earthquake or (ii) the need for increased permanent exclusion zones necessitated by risk of potential landslips from 'land fills' placed during Foundation construction.

Of the 9 areas acquired, only two required preparation of a RAP Addendum. The IESC reviewed and accepted these Addendums. RAP Addendums were not required for the other 7 areas acquired as acquisition caused no or only minimal economic impacts for which owners/users preferred compensation.

The status of resettlement implementation for households in the two area/locations that were economically affected area:

- ✓ KP 61.8: Compensation payment completed, monitoring of dismantling and relocation of structures completed; all new relocation sites outside impact area.
- ✓ KP 65.9: Compensation payments ongoing, monitoring of dismantling and relocation of structures on-going, in- kind compensation to be delivered, outcome evaluation to be conducted.

The Project resettlement team will continue to engage with all impacted households and monitor dismantling and relocation of structures out of the impact areas and complete compensation and settle the disputed economic agreements of for two of the households.

6.1.3 Recommendations

None arising from this review.

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; and
- ✓ maintain a monitoring and evaluation program that is community-based, participatory, and transparent and covers all phases of production and decommissioning.

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

Based on the IESC's long review history of the Project, we feel that understanding of the security conditions in which the Project and its surrounding communities operate is essential as the Project goes forward. The discussion below focuses on the main security community contextual circumstances.

Tribal Conflicts

- ✓ Clan fighting continued to destabilize political and economic community conditions in the PNG LNG Project footprint, particularly in Hela Province where intra and inter-clan rivalries persist. The main drivers are reported to be land disputes, economic competition, conflicts over women, generational disputes and other long standing grievances and escalation of simple disputes. The GoPNG, through official Peace and Good Order Committee work and by Hela Provincial Law and Justice advocacy, has been actively involved in mediating tribal conflicts and promoting dialogue between disputing factions in the Upstream Operating Area.
- ✓ The frequency of tribal and other disputes has intensified with the spread of arms. Anecdotal evidence suggests that increased availability of high-powered weaponry has raised the risk and adverse outcomes of conflicts and is undermining traditional authorities and law and order. In addition to the growing trade in black-market weapons, the use of hired gunmen has been regularly reported. An outbreak of fighting in Tari in December 2022, for example, involved outside gunmen using factory-made weapons in a conflict that lasted several days and resulted in 15-17 fatalities. GoPNG continues its firearm buy-back/hand-in scheme, and in Hela conducted several rounds of Host Government Security Force (HGSF) led community firearm awareness activities.

Politics Related Violence

- ✓ PNG's patronage-based politics leads to fierce competition and resentment over political appointments and power linked to the spread of scarce resources and commercial opportunities promote conflicts that polarize and destabilize communities. The tensions and violent outbreaks occurring around the 2022 elections reflected this competition for resources. The GoPNG instituted a major security operation supported by external partners to address law and order challenges during its 2022 election. It has also appointed individuals to facilitate dialogue on occasion when political disputes escalate into violence.

Effects of Alcohol

- ✓ Excessive alcohol consumption, long a problem in PNG, continues to produce antisocial behavior, criminality and public disturbances in local communities across the Project footprint. Alcohol acts as a primary driver of violence including familial, domestic, sexual, and gender-based violence and often leads to recurring cycles of conflict. The Hela Provincial Government has stated the intent to enforce a liquor ban and conducted several outreach programs in 2022.

Project Effects

EMPNG operations within the Highlands are under a “Severe” security threat characterization due to increased security complexity, increased law-and-order challenges, and significant security incidents. In addition to efforts to enhance the livelihoods of local communities, the Project includes communities in its security programs. In response to a recommendation made in the 2019 Security Risk Assessment for Papua New Guinea, a Host Government Security Forces (HGSF) camp will be established at Hides Well Pad C in order to implement effective safeguards for the protection of people and assets along the Hides Well Pad Access Road.

Figure 6.1: Proposed Location for HGSF Camp near Well Pad C

6.2.3 Comment

The IESC appreciates the detailed information on the community security situation and looks forward to updates in the future.

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. The objectives of the CDS program apply also to project functions undertaking other 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 Update on IESC Recommendations from 2021 IESC Review

The IESC 2021 review proposed actions intended to enhance the overall effectiveness of the CDS system. These included acceleration of a refreshed CDS strategy and Plan with particular focus on:

- ✓ Implementation and management arrangements and the Monitoring and Evaluation (M&E) procedure.
- ✓ Reporting – explanation of the role(s) of the Project in descriptions of CDS activities, such as financial, involvement in planning and/or implementation.
- ✓ Review of the focal themes (livelihood, health, education, law and justice) to determine (i) whether the goal of each thematic area is being reached and (ii) whether the collective impact of activities in each thematic area justifies the investment in terms of money and time.
- ✓ Cross Functionality - achieving a Project-wide comprehensive and coordinated community support program that guides the contributions of all Project components.

The Project indicates that it is focusing in 2023 on development of a systematic plan. The IESC recommendations were taken on board, but their implementation has been slow due partly to COVID effects and partly to staffing changes and re-structuring (see also Section 3.2). Both CDS and National Content (an essential Community development effort) were moved from under P&GA (Public & Government Affairs) to L&CA (Land and Community Affairs under Operations). The IESC considers this organizational change a positive move. Internal discussions during 2022 involving Project management and relevant department staff have resulted in some additional changes intended to facilitate CDS efficiency and cross functionality and increase project stewardability through the Grant Agreement process through which local businesses bid on CDS project implementation which, in itself, contributes to community development.

The IESC appreciates that the effects of COVID and other events in the last few years have had profound adverse impacts on progressing tasks – particularly when those tasks involve numerous project, community and government people and entities. The IESC, however, advises the Project to make a demonstrable effort to develop and begin implementation of a Project level CDS strategy and plans for its cross-functional programs.

6.3.2.2 Summary Overview 2015 - 2022

Overall Observations

- ✓ Record 63% spend of the US$7 million allocated for 2022 against backdrop of 2022 General Election disruptions.
- ✓ Redesigning Grant Agreements to contend with cash flow challenges to enable Land Owner companies to execute according to projected schedule.
- ✓ Livelihood support through infrastructure was the largest investment, for example, delivery of Well P&A Community Infrastructure projects (US$1,345,960.30) the Hides community.
- ✓ Increased engagement with key leaders in Hides and Komo has been pivotal for delivery of major projects such as the Komo LLG Chamber in support of Law and Justice initiatives.
- ✓ Construction of water catchments and Hauswins (pavilion-like meeting areas) in the Upstream North and ROW by engaging about 90 youths. This type of activity continues to be key to managing expectations, risks and resulting increased community stability

Continuing Community Issues/Business Risks

- ✓ Law and order challenges still present in most project area communities
- ✓ Difficulty in managing business development and employment expectations from Landowner companies
- ✓ Communities still recovering from earthquake – rebuilding properties and livelihoods
- ✓ Literacy rates a challenge in meeting project target rate

Overall Plant Site Area

- ✓ Total actual spend in 2022 was US $396k of which half spent on Livelihood projects
- ✓ 30% of spend on education, followed by health, minimal spend in law and justice

- ✓ Infrastructure represented 87% of total spend followed by capacity building and community resilience with female empowerment still prioritized
- ✓ Funding was distributed fairly across all villages with general spend for all LNGP Project Impacted Areas (PIA) villages recorded the highest spend, followed by Boera and Papa village
- ✓ Support also given to areas such as the LNGP Road Access corridor villages of Baruni, Hagara and Tatana and at general district and provincial levels (for example the Central Provincial Health Authority)

6.3.3 Recommendation

The Project should make demonstrable effort to develop and begin implementation of a Project level CDS strategy and plans for its cross-functional programs.

6.4 NATIONAL CONTENT PROGRAM COMPONENT

6.4.1 Project Strategy

A key objective of the Project's National Content (NC) 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 the PNG works will be in accordance with the requirements of this Exhibit and relevant law. The first priority is to be given to local persons (proximate to Company locations), while the second priority is to regional citizens, and third priority to persons elsewhere in PNG. It also specifies that the contractors should give preference to local LANCOs for provision of employees.

6.4.2 Observations

6.4.2.1 National Content Plan

EMPNG National Content Plan focuses on the future - Suppliers and Workforce Development:

- ✓ Increased nationalization rates;
- ✓ Increased PNG business participation.

The Plan strives to sustainably optimize local content development:

- ✓ Facilitating the ability to operate without interruption by managing expectations;
- ✓ Building community support through capacity programs.

The Plan supports development of local skills, economic growth and improvements in the standard of living through the implementation of the plan. The NC Plan also aligns with EMPNG's Planning and Budget (P&B) cycle to leverage on considerations for workforce and supplier planning for the forthcoming year as well proceeding years. Some of the considerations for possible National Content 'demand' for the planning cycle are:

- ✓ Company workforce (employees and 'hat' contractors)
- ✓ Onsite contractor workforce
- ✓ Company Suppliers: goods as well as services

6.4.2.2 Workforce Statistics

PNG Nationals made up 88% of the Project's total workforce in 2022 - 3,315 up from 2,978 at the end of 2021. Of the EMP workforce, 76% were nationals while third party contractors were 91% nationals.

In terms of PNG workforce origins, workers from local areas continued to be the largest group (44%) followed by regional at 23% and National at 33%. In terms of positions held in the EMP Workforce:

- ✓ 16 employees rose to supervisor positions
- ✓ 23% are senior professionals, such as supervisors and team leads

- ✓ 68% are in professional roles and above

See Table 6.1 for details on workforce statistics.

Table 6.1: Workforce Statistics

Statistics on Workforce	Year End 2021	Year End 2022
Total Workforce across Project	3,339	3,772
PNG Workforce (% nationalization)	2,978 (89%)	3,315 (88%)
EMPNG* PNG Workforce (% nationalization)	604 (80%)	647 (76%)
3rd Party Contractor PNG Workforce (% nationalization)	2,374 (92%)	2,668 (91%)
PNG Citizens Female workers (% Female)	579 (19%)	633 (19%)
Origins of PNG Workforce		
Local Origin – P1 (%)	1,333 (45%)	1,474 (44%)
Regional Origin – P2 (%)	751 (25%)	762 (23%)
National Non-Project Areas – P3 (%)	894 (30%)	1,079 (33%)
PNG Workforce by Job Type		
Management (%)	167 (5%)	77 (2%)
Office (%)	529 (16%)	609 (18%)
Field (%)	2,643 (79%)	2,629 (79%)

*direct hire employees or employees from recruiting agencies

Of the 89% of PNG workers, 45% are from Project Impact Areas. In terms of gender, females make up 18% of PNG workforce. EMPNG O&M workforce is 34% female, among the highest in ExxonMobil worldwide, 65% of field site work force are female and females hold 11% (67 staff) of the management roles.

6.4.2.3 Workforce Development – Competency Enhancement

In terms of Competency Enhancement, 148,000 training hours were delivered in 2022 - up from 117,000 hours in 2021 and representing an average 46 hours of training per person. Training highlights include:

- ✓ Supervisory skills development continues through the Supervisor Network
- ✓ Commenced a focus on above field training

- ✓ 4th year of graduate management program – on-boarded 3 graduates in 2022 (total of 12) - first batch have settled into host function
- ✓ On-boarded 8 engineering graduates and 5 interns
- ✓ PNG employees on expatatriate assignment (4 Engineers,1 EMIT and 1 O&M Technician).

6.4.2.4 Operations and Maintenance (O&M) Progress

Recruitment Highlights in 2022

Papua New Guineans in the O&M training recruitment program to date:

- ✓ Intake 1 reached 10 year milestone
- ✓ Intake 7 completed the Junior technician program (Aug 2021 - Jul 2022), joined EMPNG for EM specific training (August 2022) and commenced O&M crafts (Dec 2022)
- ✓ Intake 8 recruited 28 total trainees of which16 are in Operations & Maintenance, 6 in Electrical and 6 in Mechanical training, all of whom began Kumul Petroleum Academy (Oct 2022-Oct 2023)

Intake 9 recruitment is planned for Q1 2024

O&M Competency Building

- ✓ First Papua New Guinean O&M Technician selected for foreign assignment (Papua LNG Ops Readiness)
- ✓ CAS Craft/Field Assessors –67/99 (67%) are Papua New Guineans –Of the 67% , 11% are Females
- ✓ O&M Technicians on broadening assignments (OIMS 2, Contract Administration 1, Technical Writing 1, Process Safety 1 and Well Operations 2
- ✓ 22 Papua New Guineans hold O&M Leadership Positions

2023 Focus

- ✓ Continued Partnership with Kumul Petroleum Academy for O&M Intake Program
- ✓ Facilitate training for Global Leadership Courses for supervisors
- ✓ Implement “modern worker” office skills and personal effectiveness training to upskill workforce

6.4.2.5 Local Procurement and Supplier Development – Highlights

Local Supplier Spend

- ✓ During the Production phase to date EMPNG has spent over PGK5.8b (approximately USD 1,647,069,500) in-country split between Papua New Guinean businesses (PGK3.7b) and PGK1.8b with Lancos.
- ✓ More than PGK633 million spent by EMPNG in-country in 2022, of which over PGK292 million with Lancos which is the same as in 2021.
- ✓ The 143 Papua New Guinean owned businesses engaged by EMPNG for production-related activities involves 9 Lancos.
- ✓ The EMPNG Project to date has invested over PGK27 million in PNG business development through IBBM Enterprise Centre (EC).
- ✓ Enterprise Centre completed 19 business assessments for PNG companies.
- ✓ EMPNG 2021 National Content Annual Report presented to Department of Petroleum and Energy showcasing highlights in Supplier Development
- ✓ Oceaneering Services Integrity Management won the 2022 National Content Award with Interational ISOS PNG receiving an Honorable Mention

Enhancing Current Lancos – LABA & HESL

LABA

A Gap Analysis & Compliance Assessment Commenced in September 2022 with audit done with QMS/ISO 9001 2015 Standard by EC/IBBM.

Results are given below:

- ✓ Gaps identified and gap closure plan established gaps to be benchmarked against ISO requirements resulting in identification of 27 gap categories with 42 action items needed for closure. Key gap areas included organization, leadership, planning for QMS, support (resources, data and document control, Operations & Performance Evaluation).
- ✓ EC/IBBM and LABA working collaboratively to close gaps
- ✓ Report issued to LABA Holdings Board
- ✓ Prepare LABA Holdings for subsequent ISO accreditation
- ✓ Recent Focus Area - capacity building and re-organization

HESL

Advisory Group formed June 2022 to:

- ✓ Enhance business performance
- ✓ Drive quality and competitive long term service delivery
- ✓ Enable sustainability across multiple industries

Business Review Action Plan developed to address 44 -> 49 action items action items in the areas of strategy, organization, finances and operations

External Engagement on National Content

- ✓ EMPNG showcased its engineers and graduate management trainees at in induction week of new Members of Parliament.
- ✓ The Annual National Content report was presented in October to the Department of Petroleum. DoP acknowledged the report as a template that could be used as part of PNG Government's own NC policy and plan initiative.
- ✓ The NC team took part in the Chamber of Mines & Petroleum organized Community Affairs & Business Development workshop.
- ✓ EMPNG presented its National Content effort and NC success stories by our contractors at the SSHE Contractor Forum on 3 November during which. The NC "exhibit" was also introduced highlighting expectations of contractors in NC reporting. NC Content Award and Honorable Mentions were made to recipients.
- ✓ Participation in the Chamber of Mines & Petroleum conference in Sydney, Australia (5-7 December) during which national content was a key focus area.

6.4.3 Recommendations

None arising from this review.

6.5 STAKEHOLDER ENGAGEMENT AND COMMUNITY GRIEVANCE MANAGEMENT

6.5.1 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.

6.5.2 Observations

6.5.2.1 Engagement Overview, January - December 2022

The number of engagements rose significantly in the Highlands project areas. This increase is attributed to the increase in external work fronts that allowed more face-to-face engagement.

Table 6.2: Community Engagements in 2022

Location	Engagements 2021	Engagements 2022	Attendees 2021	Attendees 2022
Highlands	5,933	10,636	30,155	43,000
Plant Site	1,490	1,634	7,450	6,868
POM Area	75	40	107	40

6.5.2.2 Issues and Grievances Overview January - December 2021

The Project continues to effectively communicate and coordinate with the cross-functional team (Security, P&GA, Law, ERB) to enhance the effectiveness of grievance and issues management.

Grievances

The number of community grievances increased by only two in 2022 of which 19 came from highlands communities, one from the Plant site area and one from the Port Moresby Office area. The majority of grievances involved damages/claims (70%) followed by environment related (25%).

Most grievances were closed with the 100 day period. Two complicated grievances filed in 2022 required more than 100 days to resolve. Six complicated grievances carried over from 2021 were closed in 2022. The Project attributes its ability to close most grievances quickly to internal L&CA, as well as cross-functional communication and coordination. Grievances taking longer to close typically require assessment by cross functions, such as environmental testing, field assessments, and assessment reports to be compiled.

Issues

The number of issues increased considerably during 2022 – 2,298 compared to 1,199 in 2021. The larger number of issues in 2022 correlates to the increase in external work fronts requiring face-to-face engagements leading to stakeholders having questions and the opportunity to express them. The main categories of issues related to social, economic and land access queries and concerns.

6.5.3 Recommendations

None arising from this review.

6.6 STATE CLAN BENEFITS INTERFACE - UPDATE

6.6.1 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 with 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.

6.6.2 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 positively with the Co-Venturers, PNG Government and other key stakeholders. Continued progress is being made to deliver benefits to mandated beneficiaries.

The information given below is the Project's best understanding of the status of benefits distribution. Benefits distribution and related LOBID / ADR processes are managed and executed by the Government. EMPNG provides logistical support to related government activities as appropriate.

Status of benefit payments to Project Licensed Areas are as follows:

Downstream

- ✓ 3rd royalty payment made in Nov 2022; 2nd Gas Resource Director's elections held in Dec 2022 with all 4 incumbents re-elected.

Upstream

- ✓ PDL 7: Inaugural royalty payments of PGK19.6M made in March 2022
- ✓ PDL 1: Launching of clan account opening exercise took place in Nov 2022, following the clearance of remaining legal challenges against the Ministerial Determination.
- ✓ PDL 8: Ministerial Determination issued for 4 of 5 blocks in Apr 2022; Awatangi block under dispute and subject to further action by the State.
- ✓ PDL 9: Ministerial Determination made in March 2022 for clans in the Western Province licensed area; submission for Hela-based clans subject to Petroleum Minister's action.
- ✓ Pipeline Segments: 2nd royalty payments made for Segments 8, 4, 5, 7, 1, 2 and 3 in 3Q 2022.
- ✓ GR Director's election for Segment 6 currently pending clearance from Courts to proceed.

6.6.3 Recommendations

None arising from this review.

7 LABOR AND HUMAN RESOURCES

7.1 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.

7.2 OBSERVATIONS

7.2.1 Professional Development

The Project uses a variety of materials and activities to promote the professional development of its workforce. The main elements of these support measures in 2022 were:

- ✓ The Supervisor Network involves virtual sessions that focused on equipping supervisors with the information necessary to present key messages across the organization, for example, Business Unit (BU) Goals, Employee Value Proposition, role of supervisor and latest updates on EM's policies & programs. The Network also sponsored face-to-face sessions with visiting Senior Leaders in the 4th quarter of 2022.
- ✓ Employee Forums continued with virtual sessions on key messages across the organization such as Business Unit Goals and Business performance updates, provision of highlights from Employee Resources Group Activities, updates on Employee policies and programs and rolling out of the Nambawan Awards.
- ✓ The Toastmaster Face-to-face Program was reinstated COVID-19 eased and a membership drive introduced.
- ✓ Various Award Programs, such as:
  - LCM Awards, annual awards open to all staff, recognize, promote and reward outstanding examples of *Em Pasing Bilong long* ExxonMobil PNG values and behaviors. Nominations are made by the Country Leadership Team and selection is by Employee Development Committee.
  - Nambawan Awards, introduced in 2022, nominated by staff to recognize, promote and reward peers' outstanding performance by demonstrating *Em Pasing Bilong long* ExxonMobil PNG values and behaviors. Nominated staff receive vouchers.

7.2.2 Personal Development

The Project also supports staff personal development with various activities including:

- ✓ Business Acumen Financial Literacy program;
- ✓ Participation in the Women of Worth Conference;
- ✓ Work-life-balance Seminars;
- ✓ PNG Tribal Foundation's Senisim Pasin campaign dealing with gender violence.

The Project continued its Giving Back program with activities such as staff participation in:

- ✓ Grade 12 Career Expo
- ✓ Buk Bilong Pikinini (Books for Children Program)

- ✓ Science Ambassador Program
- ✓ National Development Summit

In terms of mental health, Face-to- Face counselling resumed in 2022 after the ease of COVID-19 restrictions. Employees are reminded of the professional support available from Magellan Healthcare, 24 hours a day, 7 days a week. Employee participation in group counselling support is also available under EHAP Services.

7.2.3 Labor Grievance Management

The "HR Direct' system continues to be highly utilized allowing for employees to direct questions to appropriate teams through an automated system. In 2022, 792 employee inquiries were received and assessed and closed. The average response time is within a day. Positive feedback from 98% of employees on response with an average score of 4.7 out of 5. Most inquiries were related to Emergency Loans, payroll, Savings Plan and the HOAP. No time was lost due to industrial action.

Camp Performance Indicators:

- ✓ Types of issues primarily related to minor maintenance issues (e.g. replace light bulbs, plumbing repairs, light carpentry work).
- ✓ Rare complaints on food and majority of feedback requests repeat menu items that are popular. Catering tracks Happy or Not customer KIOS daily showing that most customers provide positive feedback weekly>
- ✓ Lodging Complaints – Rare occurrences of complaints about the “Room Type” A, B or C. Some residents request to move from A to B style rooms
- ✓ Recreational amenities have been maintained on a Camp Resident usage
  - “Green Zone” includes a music room, BBQ, movies, karaoke
  - Gyms, indoor basketball and rugby/soccer fields are active, though some other sports facilities are not currently active (outdoor basket ball and volleyball, tennis and outdoor golf driving range).

7.3 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 2022 continues to be excellent, although not as good as 2021 as there was a single Lost Time Incident (LTI) that took place in the Upstream area where a worker at Komo fell and hit his head on a rock with no long-term consequences. Even with this accident, the 2022 Lost Time Incident Rate (LTIR) was 0.01 normalized to 200,000 man hours and the Total Recordable Injury Rate (TRIR) was 0.09, both of which are much better than industry standards. Note that 1.0 is the average LTIR and 3.1 is the average TRIR across all industries in the United States.

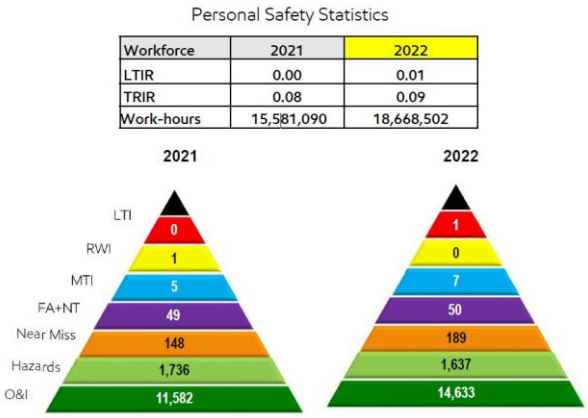


Figure 8.1: Safety Record 2021 - 2022

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). In 2022 the COVID-19 pandemic was still a health factor, but not as important as before, such that the occupational health program has returned to more conventional topics such as hearing and respiratory protection, implementation of a TB control program, and mental health first aid training programs (the first such program in PNG), as well as implementing the health program with medical treatment and evacuations. An important change in the EMPNG program in 2022 has been the elimination of the mandatory malaria chemoprophylaxis requirement for non-immunes in HGCP and Angore workers.

The Culture of Health (COH) program continues to be implemented with a COH Week undertaken in October 2022 focusing on biometric screenings, physical activity challenges, and mental health webinars. The Industrial Hygiene Program continues to review worker exposure to chemicals and noise and verifies that personnel protective equipment is appropriate for the different work environments.

8.1.3 Recommendations

The H&S program continues to be implemented as a “best practice” system. The IESC does 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 CDS program. In the Upstream area EMPNG continues to work to reduce the factors that limit the capacity of Papua New Guineans to fully participate in livelihood/economic activities by targeting high risk diseases and health complications. CDS health activities in Hela Province and the Southern Highlands in 2022 focused on:

- ✓ Distribution of health care items, such as face masks, thermometers and sanitizers to eight primary schools in Hides and Komo as a complement to hand wash stations constructed around Hides and Angore;
- ✓ Refurbishment of the Idauwi Community Health Post in Angore with mobilization targeted for the first quarter 2023;
- ✓ Completion of the fencing of the Undupi Sub health center;
- ✓ Mobilization of a contractor to the Biame elementary school for the construction of hand wash station installations which will support earthquake recovery efforts by providing safe drinking water for students as well as promoting sanitary habits;
- ✓ Construction of 18 water catchments across the Upstream PIA and ROW by providing communities access to safe drinking water and reducing instances of waterborne diseases.

EMPNG also maintains community health programs in the LNG Plant area with the same overall goal as in the Upstream area to reduce the factors that limit the capacity of Papua New Guineans to fully participate in livelihood/economic activities by targeting high risk diseases and health complications. Health support in 2022 has included:

- ✓ Continuing supporting schools for health programs, especially in first aid care for students and teachers by constructing three First Aid Centers for Papa and Lealea Primary Schools and the Redscar High School;
- ✓ Re-kitting of the Porebada Sub Health Centre Ambulance to handle emergency cases;
- ✓ Conducting emergency care first aid training for ambulance drivers and health care workers for LNGP PIA villages;
- ✓ Fabrication and construction of two 40ft containers into a pharmacy and medical storage unit for the Central Provincial Health Authority – still in the process of completion and handover.

Community health programs have been well implemented since the start of the Project.

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. In 2022 efforts associated with the Angore Pre-Construction Survey (PCS) conducted from September 24 – 30 for the KP 65 .1 and KP 61.8 river crossings identified 23 sites: 15 Archeological sites and 8 Cultural Heritage sites.

- ✓ 8 sites are high significance – CH practice is unique to the site
- ✓ 8 medium significance – CH practice is common in the region
- ✓ 9 low significance – CH practice is common throughout PNG and/but no longer practices.

Chance finds sites are declared No-Go Zones with chance finds protocols implemented on site and the sites protected. Some examples of both tangible and intangible resources include:

- ✓ Intangible: Site MAND005 – Spiritual/ritual site. Ceremonial pig killing/feasts done to keep balance between the physical and supernatural world.
- ✓ Intangible: Site MAND003 – Traditional technique of fishing on river using islands on the river channel
- ✓ Tangible: MAND015 – Ossuary site, secondary burial site. Bones removed from the primary burial site to be place at a high place.

Figure 9.1: Ceremony to Appease Spirits[13]

****

[13] This is a traditional ritual carried on for generations whereby we kill a pig and burn the fat. As the fat is burning, the smell/scent is carried off, the spirits small the scent of the burning pig and accept the sacrifice and move away. I am (meaning the clan) is pleased with the Company coming into the area so I must make this sacrifice to the spirits so they are happy and they will move away from this area.

Cultural heritage is being gathered opportunistically as part of the Lower Kikori Biodiversity resource mapping program and attracts community members to participate in conservation activities and share details of their oral histories. EMPNG worked with the Papua New Guinea Social Research Institute to create a cultural heritage children's storybook based on these oral histories and is expected to be published this year. EMPNG also has conducted cultural heritage induction and awareness sessions since the start of PNG LNG construction. During 2022, these sessions helped raise awareness with some 500 workers from the Seismic Projects exploration team.

Upcoming in 2023 is the ongoing work with vendor towards development of the resource books, as well as ongoing awareness with new projects coming online and continued mapping of cultural heritage values through inclusion in the Lower Kikori.