

Semi-Annual
Report

July 2019

PNG: HIGHLANDS REGION ROAD IMPROVEMENT INVESTMENT PROGRAM (TRANCHE 3)

Nipa-Munihu Road Sub-Project

(January to June 2019)

Prepared by Highlands Road Management Group (HRMG) of the Department of Works for the Asian Development Bank

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Abbreviations

ADB	-	Asian Development Bank
AIDS	-	Acquired Immune Deficiency Syndrome
AP	-	Affected People
CEMP	-	Construction Environment Management Plan
CRO	-	Community Relations Officer
PSC	-	Project Supervision Consultant
DBST	-	Double Bitumen-layer Surface Treatment
DC	-	Design Consultant
DOW	-	Department of Work
EA	-	Executive Agency
EMP	-	Environmental Management Plan
EO	-	Environmental Officer
ESSU	-	Environment and Social Safeguards Unit
GoPNG	-	Government of Papua New Guinea
GRC	-	Grievance Redress Committee
HCRN	-	Highlands Region Core Road Network
HIV	-	Human Immunodeficiency Virus
HRMG	-	Highlands Road Management Group
HRRIIP	-	Highlands Region Road Improvement Investment Program
IA	-	Implementation Agency
IEE	-	Initial Environment Examination
ISS	-	International Safeguards Specialist
LLG	-	Local Level Government
MFF	-	Multi-tranche Financial Facility
MOA	-	Memorandum of Agreement
NRA	-	National Road Authority
PNG	-	Papua New Guinea
PRO	-	Public Relations Officer
PWM	-	Provincial Works Manager
ROW	-	Right of Way
RP	-	Resettlement Plan
SHP	-	Southern Highland Province
SIS	-	Socio-economic Impact Study
SPS	-	Safeguard Policy Statement
STDs	-	Sexual Transmitted Diseases
TOR	-	Terms of Reference

FACT SHEET:

Loan	ADB Loan: 3404/3408 and Grant 0485 PNG
Project Number	CSTB 3531
Subproject	Nipa-Munihu Road Subproject
Executing Agency	The Department of Works (DOW) is the executing agency for the Highlands Region Road Improvement Investment Program (HRRIP). It has overall responsibility to manage the planning, implementation and monitoring for all road improvement works including environmental management and environmental compliance monitoring. It also includes the acquisition of use rights for additional land to implement HRRIP subprojects, as well as compensation for damages on project-affected land DOW is also responsible for reporting to ADB and the recruitment of the organization to conduct independent monitoring
Implementing Agency/Unit	<p>The DOW will also be the Implementing Agency for the road improvement works. The DOW has delegated to the Highlands Road Management Group (HRMG), the responsibility to carry out the planning, implementation and monitoring for environmental management and environmental compliance monitoring, land acquisition and/or resettlement activities, as required. The more relevant delegated responsibilities include the following;</p> <p>Prior to the commencement of civil works:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Submit and indorse environmental assessments required for regulatory approval of the CEPA and require the Contractor to obtain approval, e.g., environmental clearance, environmental permit or permits from other statutory authorities as required by the Government. <input type="checkbox"/> Ensure that all regulatory clearances for the subproject are obtained from the relevant government authorities and are submitted promptly to ADB. <input type="checkbox"/> Ensure that the EMP is updated based on detailed design and included in the bidding document of the subproject and that all bidding Contractors have access to the environmental assessments and EMP. <input type="checkbox"/> Ensure that the EMP and all required mitigation measures during construction, including conditions stipulated in the CEPA's clearance or environmental permit, are included in BCD with requirements to update the EMP in response to any unexpected impacts and <input type="checkbox"/> That all selected Contractors have agreed to implement in full the requirements of environmental mitigation measures prescribed in the EMP <input type="checkbox"/> Provide training as required to HRMG in Mt Hagen and Contractor; <input type="checkbox"/> Receive environmental safeguard clearance on subproject(s).

	<ul style="list-style-type: none"> <input type="checkbox"/> Provide training to Contractor prior to preparation of CEMP, safeguards requirements of ADB and regulatory requirements of CEPA. <input type="checkbox"/> Approve CEMP for the subproject, after being cleared by PSC. <p>During the implementation of civil works:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Ensure that the CEMP including all proposed mitigation measures and monitoring and relevant provisions of the environmental assessments is updated as required, <input type="checkbox"/> Conduct environmental management and compliance monitoring on a monthly basis in cooperation with the PSC. <input type="checkbox"/> Review and assess the Contractor's monthly environmental monitoring report and compliances as contained in the CEMP. <input type="checkbox"/> Assist the Engineer in the compliance of the submitted CEMP. <input type="checkbox"/> Prepare the quarterly and semi-annual reports in cooperation with the PSC for submission to DOW and ADB.
Coverage of the Semi-Annual Environmental Monitoring Report	January to June 2019

1.0 EXECUTIVE SUMMARY

1. This semi-annual environmental monitoring report covered the period from January to June 2019. This report was carried out by the DOW through the Highlands Road Management Group (HRMG) with the support from the Project Supervision Consultants and the monitoring results will be communicated to ADB through this report.

1. The Nipa-Munihi sub-project road is one of the 4 sub-projects of Tranche 3 of the Highlands Region Roads Improvement Investment Program, an ADB assisted road program. The sub-project is covered by CSTB contract # 3531 entered into by the Independent State of Papua New Guinea represented by the Department of Works and China Overseas Engineering Company LTD (COVEC China).
2. The project has commenced in December 11, 2017 with the mobilization of the Contractor. The construction period of the project is 24 months. The Long Term Performance Based Maintenance Services is 60 months from the issuance of the Performance Certificate for the Improvement Work.
3. The contractor's revised HIV/AIDS and STD Plans, Hazardous Waste Management, Sewerage Waste Management and Solid Waste Management Plans have been approved by DOW-ESSU. DOW-ESSU also approved the revised Quarry Management Plan for Wapun Su-oro Quarry located about a kilometer from the Mt. Wiri Campsite along the Mendi Kandep Road. Furthermore, the contractor has submitted QMPs for 3 quarries at the Nipa end of the project. Sopharam quarry located at Ch:0+900 and Haren quarry located at Ch:4+300 have been approved by PSC however, Utami quarry located at Ch:7+000 was disapproved thus the contractor needs to revise and resubmit for approval.
4. Monthly project monitoring from March-May 2019 was disrupted due to situations on ground which did not permit the PSC safeguards team to visit the sites because of security reasons. Nevertheless, there have been also many delays as clearly seen in the slow progress of the project.
5. Clearing and grubbing has been completed in May 2019 where the clearance from Nipa end met the clearance from Munihi end at Ch:11+800 thus joining to the 2 ends.
6. All the environmental related grievance has been handled accept for the church at Ch:6+760 which recommendations were made for payments if the section will be affected. However, any grievances outside the construction limit will be the responsibility of the contractor.
7. The contractor has purchased its in-situ monitoring equipment which a joint monitoring was conducted by the PSC and the contractor in June as part of the training for the contractor's environmental officer.
8. The setback for the implementation of the CEMP and the associated plans for this project was due to the lack of monitoring from March-May 2019 by PSC/HRMG and the several change of the contractor's environmental officers. Nevertheless, the delay in the progress of the project with the recent completion of clearing and grubbing requires adequate monitoring. PSC and HRMG should continue the issuance of Notices of Violation to implement best practices in environmental management.
9. Working at both ends of the project was seen to be difficult for the contractor's environmental officer to be present on ground when the civil works were undertaken, however, this should not be an excuse. It is the contractor's responsibility to ensure its environmental officer is physically present onsite to implement its CEMP and sub-plans.

2.0 INTRODUCTION

2.1 Background

10. The Highlands Region of Papua New Guinea (PNG), comprising the Provinces of Western Highlands, Jiwaka, Southern Highlands, Hela, Eastern Highlands, Enga and Chimbu, is a major contributor to the PNG economy through its agricultural production and mineral resources. A well-maintained road network is essential to facilitate the movement of goods and people. The Government of PNG (GoPNG) has made significant investments in improving the road network but a lack of maintenance has resulted in the deterioration of the roads such that the Highlands Core Road Network (HCRN) is now in poor condition.
11. In order to address the deterioration of the HCRN, there is a clear need to: (i) implement a program of regular maintenance on all HCRN roads that are in good condition; and (ii) improve those roads that are in poor condition and (iii) ensure that maintenance begins on those roads as soon the improvement works are completed.
12. The GoPNG has negotiated a Multi-Tranche Financing Facility (MFF) loan with the Asian Development Bank (ADB) to implement the Highlands Region Road Improvement Investment Program (HRRIP) in tranches. The HRRIP includes projects to improve the HCRN, the preparation of long-term maintenance contracts for the HCRN, and the capacity development of road agencies. In total, 13 road sections are expected to be funded under the program.
13. Project 1 has included the improvement of two road sections and Project 2 is currently being implemented to upgrade three road sections while Project 3 is rehabilitating four road sections comprising 113.3 km of the HCRN.
14. The Execution Agency (EA) for the program is the Department of Works (DOW) whilst the Highlands Region Management Group (HRMG) is the Implementation Agency (IA).
15. Tranche 3 (ADB 3043/3408 and EU Grant 0485) include the upgrading, rehabilitation and maintenance of four road sections namely, Henganofi-Napuru, Gewa-Gembogl, Pangia-Wiru Loop, and Nipa-Munihi in the Eastern Highlands Province (EHP), Chimbu Province and Southern Highlands Province (SHP).
16. The rehabilitation of the Nipa to Munihi road in the Southern Highlands province has a length of 28.55 km. The works proposed for the upgrading and rehabilitation of the Nipa to Munihi Road such as earthworks, establishment and operation of quarry sites and extraction of materials, minor civil works and discharge of wastewater are Level 2 activities under the EPAR and requires an EP depending on the duration and scale of those activities.
17. The CEMP was approved in February 5, 2018 and the project commencement date was February 23, 2018 with the mobilization of the Contractor. The construction period of the project is 24 months. The Long Term Performance Based Maintenance Services is 60 months from the issuance of the Performance Certificate for the Improvement Work.
18. The Nipa-Munihi Road Section is covered by CSTB contract # 3531 entered into by the Independent State of Papua New Guinea represented by the Department of Works and China Overseas Engineering Group Co. Ltd (COVEC LTD).

2.2 Sub-Project Description

19. The Nipa to Munihu road, located in the Southern Highlands Province, commences at the junction with the Highlands Highway in Nipa and extends to Peane junction on the Mendi – Kandep road, a distance of 27.73 km. The road connects the two electorates of Nipa-Kutubu and Mendi-Munihu with the border located at an existing log bridge at km 18+850. The road traverse's hilly terrain from the commencement at Nipa to around Km 4 and again from Komal Bridge at Km 17+350 to the end of the road at Peane. The central portion of the road runs through mountainous terrain as the route crosses the Tondon Range. Within this central portion of the road the elevation rises to a maximum of 2,300 meters from the average mean sea level (amsl) to 1,950 meters at the end of the hilly sections.
20. The existing road comprises mainly of a silty clay subgrade covered with a gravel layer consisting of poorly graded limestone material which results in a rough running surface. There are also several sections where the subgrade has been exposed with no gravel layer. The road width varies from 3m to 4m in the mountainous section and 6 to 8 m in the hilly sections. Where widening of the road bench is necessary, the design is based on cutting existing slopes rather than widening embankments.
21. When completed, the improved road will facilitate the delivery of services to the population and stimulate economic growth through the reduction in travel times and costs of transporting goods to markets. The impacts of the improvements in what is already a highly disturbed environment will be minimal. Improvements will generally be restricted to a maximum 3 metre wide strip each side of the existing formation and implementation of the EMP will minimize the environmental impacts during construction. Restoration of quarry and dump sites upon completion and the planting of trees are an integral part of the works. See **Figure 1: Location Map of Nipa Munihu Road.**



Figure 1: Location Map of Nipa Munihu Road

22. The route crosses two rivers, the Nembi and the Lai River, both on Bailey bridges which are in good condition. There are 8 creeks crossing the alignment, all of which have log/timber

bridges which will need to be replaced with Bailey bridges with steel deck. All of the creeks have well defined incised channels which are sufficient to contain flood flows

23. The environmental impacts assessed at the time of preliminary design categorised the subproject as Category B for environment. The same category was confirmed by the in-depth environmental analysis conducted at the time of project preparation. The Initial Environment Examination (IEE) dated April 2016 has already been disclosed in the ADB web site. The IEE confirmed that environmental impacts of the rehabilitation of the Nipa-Munihu subproject road are limited to the road corridor, are of minor scale and can be mitigated through the thorough implementation of the measures contained in the environment management plan. The impacts such as dust, noise, materials sourcing, storage, haulage, soil erosion, sedimentation and run-off are likely to occur mainly during the construction phase.
24. Based on the EMP presented in the IEE, a Construction Environmental Management Plan (CEMP) was prepared and approved by DOW-ESSB on February 5, 2018.
25. An Induction Meeting was conducted for all the Contractors in July 12, 2017 by the Project Supervision Consultants, HRMG and The Engineer to provide a background of the environmental management plans and compliance monitoring requirements.
26. Electronic reference materials were provided to the Contractors during this meeting containing best practices for environmental management and mitigation, including sewage treatment, solid and hazardous waste management; and soil erosion control and management. Based on the experiences with Tranche 1 and Tranche 2, environmental laws including a summary presentation on the legal framework of PNG, CEPA Act, Environment Act of 2000, list of suggested environmental monitoring equipment, and PNG Water Quality Standards, was also provided. Other important forms and documents were also provided such as sample forms and requirements for monthly monitoring report, Notice of Violation Form, and Logbook Sample Content.
27. An Induction Training was also conducted on October 31 to November 1, 2017 by PSC and HRMG to address Construction Environmental Management Plans formulation, Environmental Management, Environmental Monitoring and Best Practices for Environmental Mitigation at Kuri Lodge, Mt. Hagen. The training was attended by the contractor's representative and environmental officers, HRMG, PSC and NRA.
28. Internal monitoring will be conducted by the environmental specialist of the Construction Supervision Consultant (PSC) whereas independent monitoring will be conducted by the Environmental Officer (EO) of HRMG. However, the monthly environment reports submitted to DOW are joint PSC and HRMG reports.

2.3 Proposed Scope of Works

29. The project intends to improve the existing Nipa to Munihu Road through the provision of a 5.5 meter wide pavement, sealed with DBST and 0.25 meter gravel shoulders which will be sealed where necessary to prevent erosion. Earthworks will be required to provide an adequate bench for construction of the pavement and associated drainage and will also be required where improvements are required in the vertical alignment to ensure adequate stopping sight distance. An average additional width of 2.5 m on each side of the existing cleared width will be required to accommodate the improvement works. The estimated volume of excavation is 196,000 cu.m. of which 86,000 cu.m. will be reused for embankments and the remainder is expected to be partly surplus and partly unsuitable and

therefore to be disposed of. Approximately 40,000 cu.m. of borrow will be required for the balance of embankment construction.

30. Approximately 850 linear meters of retaining wall will be required at various locations throughout the road length to provide adequate formation width and avoid extensive embankment construction. The improvements will include the provision of road safety features including signs, pavement markings and guardrails.
31. A total of 55 additional culverts are proposed in addition to the replacement of 56 existing culverts which are of inadequate capacity (typically 450mm diameter) while 65 existing culverts are redundant and will be removed. Approximately 28,000 meters of lined roadside drain will be provided to cater for surface water runoff from the road and adjacent slopes. The rehabilitation and upgrading would approximately take 24 months.
32. The rehabilitation and upgrading would involve the following activities:
 - (i) Transport, handling and storage of construction materials, fuel and lubricants and, machinery to site;
 - (ii) Preparation of Contractor's camp and work sites;
 - (iii) Establishment of ancillary facilities, i.e. identification and establishment of suitable material sources/quarries, batching, crushing and asphalt plants;
 - (iv) Clearing and grubbing (shoulders and drainage);
 - (v) Excavate defective sections and improve side drains as required;
 - (vi) Excavation and/or filling to widen the existing road bench;
 - (vii) Culvert removal, installation, extension and/ or replacement;
 - (viii) Construct masonry retaining walls;
 - (ix) Construction of gabion protection works;
 - (x) Rehabilitate bridges which may include installation of new steel decks if necessary, removing rust and repainting and, construct a new bridge;
 - (xi) Backfill and compact as required;
 - (xii) Layout sub-base and base materials and compaction;
 - (xiii) Install road furniture required (guardrails, pavement markings, etc.); and
 - (xiv) Pave roadway with DBST.
33. The upgrading and rehabilitation works for the Nipa to Munihi Road would require approximately 231 people of which 120 unskilled workers will be sourced from the local communities in the area. Various machinery and heavy equipment will be required in the rehabilitation and upgrading works. This would range from 4WD vehicles to bulldozers and represents the manpower complement and machinery and equipment required for the works.
34. The works require materials including fuel, lubricants, paint, bitumen, cement, aggregates, cement, sand, timber, geotextile, drainage pipes and culverts. All materials will be sourced from approved suppliers. Workers, including local women, will make gabions using local materials for embankment and bridge pier protection:

2.4 Purpose

35. This report is written to present the status of the environment including compliance with the approved CEMP in respect of the Nipa - Munihi road section covering January to June 2019. Semi-Annual environment safeguards monitoring reports is a requirement under the SPS. In addition, the report provides a clear picture with regard to the future implementation of CEMP activities as well as the environmental outcome.
36. Since the project's commencement, the compliance monitoring requirements enumerated in the monitoring findings were prospective and have been evaluated with the approved CEMP.
37. Furthermore, the report serves the client, ADB, other organizations and the public to understand the environmental management process, its outcome, the corrective actions that are required and the impact of such actions on the environment.

2.5 Methodology

38. This six-month consolidated report is written using data gathered from several sources. These include (i) Contractor's interviews and monthly reports; (ii) Monthly monitoring report of the Project Supervision Consultant's Environment Specialist and (iii). Monthly HRMG-PIU verification on site and observations.
39. This report is reviewed and prepared by the Project Supervision Consultant and HRMG-PIU prior to its submission to DOW. It also follows the format prescribed by ADB and a checklist for monitoring environmental compliance. The list of reports reviewed is in Appendix 1 whilst names of people interviewed are in Appendix 2.

2.6 Institutional Arrangements

40. The Department of Works, as the executing agency, has the overall responsibility to manage the planning, implementation and monitoring related to acquiring use rights for additional land to implement HRRIP subprojects, as well as compensation for damages on project-affected land.
41. DOW established a Project Management Office (PMO) headed by a Project Director which manages the day to day activities of the program. Within the PMO, there are two units, the Project Management Unit (PMU) which is based in Port Moresby. The other is the Highlands Road Management Group (HRMG), the DOW's Project Implementation Unit (PIU) for HRRIP subprojects to carry out the planning, implementation, monitoring and reports preparation for land activities, as required and is based in Mt. Hagen City.
42. In the revitalized organizational chart (as of February 2017), the HRMG is headed by the Field Project Manager (FPM). Under the FPM are two sub-units, the construction unit headed by the "Engineer" and the social and environmental safeguards unit headed by the Senior Field Project Coordinator (SFPC).

2.7 Report Organization

43. The report consists of the foregoing introduction and 2 other sections as follows:
 - i) Section 1 – Executive Summary
 - ii) Section 2 - Introduction,

- iii) Section 3 – Monitoring results and finding
- iv) Section 4 – Conclusions and recommendations and appendices

3.0 MONITORING RESULTS AND FINDINGS

44. The main findings of monitoring shall include the assessment of environmental impacts during the review period and proscriptive requirements are presented in this section.
45. The basis for monitoring are the parameters that would be considered in the CEMP of which there are 18 as follows:
- Contractor's camp and yard
 - Erosion and sedimentation
 - Water quality
 - Air quality
 - Noise
 - Waste management
 - Hazardous material management
 - Aggregates extraction
 - Tree removal and vegetation management
 - Socio-economic issues (workers)
 - Socio-economic issues (community)
 - Public safety
 - Health and safety issues
 - Traffic management
 - Prevention of HIV/AIDS and STDs
 - Existing Infrastructure Issues
 - Environment Related Grievances
 - Training and Mentoring
46. The summary of non-compliance from the monthly reports prepared jointly by HRMG and PSC is provided in Table 1. Environment Officers from HRMG with PSC should prepare the Notices of Violation if warranted based on the standards set during a meeting for this purpose.

Table 1. Summary of Non-Compliance for January to June 2019 for Nipa - Munihi.

NON-COMPLIANCE	MONTHS					
	J	F	M	A	M	J
Conduct monthly environmental monitoring and compare it with previously conducted environmental baselines.	✓	✓	X	X	X	✓
Wastes from clearing and grubbing are dumped into environmentally rivers and streams.	X	X	X	X	X	X
Absence of soil erosion and sedimentation mitigation measures.	X	X	X	X	X	X
Use of environmental in-situ equipment to conduct field measurements.	X	X	X	X	X	✓
Absence of appropriate PPEs for the majority of workers.	X	X	X	X	X	✓
Addressing Grey Water issue	X	X	✓	✓	✓	✓
Presence of traffic personnel and warning signages in the road project.	✓	X	✓	✓	✓	✓
Conduct of HIV-AIDS services.	✓	✓	✓	✓	✓	✓

Utami Quarry (Ch:7+000) QMP	X	X	X	X	X	X
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3.1 Contractor's Camp and Yard

47. The contractor operates two main camps and one sleeping quarters for fulltime local employees. Mt. Wiri Campsite is the contractor's main project management facility, while the River Nembi campsite hosts the project operations at the Nipa end of the project. The local employees' accommodation quarters are located 20m down the road from Mt. Wiri Campsite.
48. All office, accommodation, kitchen and entertainment facilities at Mt. Wiri and River Nembi Campsites were generally well maintained.
49. However, the River Nembi Campsite septic system needs to be monitored closely even thou the gray water effluent has been mitigated.
50. Furthermore, the River Nembi campsite needs proper drainage system, which was evident with stagnant water pools inside the campsite.
51. The proper containment of used oil and lubricants need to be followed and closely monitored due to a recurring problem of spillage and improper disposal which has been observed leaking from the storage drum (Photograph 1).



Photograph 1. Oil Leakage from damaged storage drum.



Photograph 2. No proper drainage system, evident with stagnant water pools inside the campsite.

3.2 Erosion and Sedimentation Control

52. There are ongoing issues with improper spoils disposals. The operators were pushing spoils to the road side and dumped at some locations without the consent of the landowners.
53. Working at two fronts of the project proved to be difficult for the contractor's environmental officers to be present onsite during clearing and grubbing and major excavation works to ensure its CEMP is implemented.
54. There were several major slips at the Munihi end of the project, however these were not new areas; landslips have been occurring between these sections because of the unstable geological structures since clearing and grubbing commenced last year.
55. Recently there was a major slip at Ch:7+500 at the Nipa end of the project which showed a huge erosion which ended at the upstream of Boldom 2 creek). A culvert installed about 10m from the slip area also caused erosion problems. (Photograph 3



Photograph 3. Major erosion from the landslide at Ch:7+500 which ended at the upstream of Boldom 2 Creek.



Photograph 4: Calvert at Ch:7+510 causing major erosion

3.3 Water Quality

56. The environmental officers of the contractor, HRMG and PSC have conducted monthly monitoring of water quality for the month of June 2019. The results of the monitoring activities for temperature and pH are summarized in Table 2. Station 3=Nembi River, Station 4=Boldom 2, Station 5=Downstream Tagil and Station 6=Downstream Lai.
57. The monitored values of pH for June 2019 indicate that it has slightly increased from its baseline values. However, the changes are surmised to be due to normal fluctuations since there were no observed disturbances in the sampling sites.

Table 2. Environmental parameters for temperature and pH.

Months	Temperature						PNG Standar ds	pH												
	S1	S2	S3	S4	S5	S6		S1		S2		S3		S4		S5		S6		
	S1	S2	S3	S4	S5	S6	< 2°C increase	S	B	S	B	S	B	S	B	S	B	S	B	
Oct 2018			24.5		23.8								8.05	7.65			8.79	7.44		
Jan																				
Feb																				
March																				
April																				
May																				
June			21	19.9	19.1	19.3						8.8	7.65	7.15	6.93	8.0	7.10	8.27	7.44	

Temperature: There has been no increase of temperature greater than 2°C.

pH: PNG standard advocates no alteration of pH based on the baseline values. Where S = Water Sample; B = Baseline Value. Shaded row is the results for October 2018 compared to current results.

58. Monitoring for dissolved oxygen and turbidity were also conducted for the same sampling stations covering the same periods (Table 3).
59. It was observed that dissolved oxygen is above the prescribed requirements of PNG's water guidelines. In the case of turbidity, all the samples were below the PNG guideline of no alteration greater than 25 NTU (Nephelometric Turbidity Unit). It was observed that the elevated turbidity was caused by rainfall events upstream which has caused sediment deposition into the water body. However, the high turbidity reading at station 5 (lower Tagil) was due to the rain and the wet crossing at Ch:17+500 (a tributary of Tagil) where heavy construction vehicles were crossing at the time of sampling.

Table 3. Environment parameters for dissolved oxygen and turbidity.

Months	Dissolved Oxygen						PNG Standards	Turbidity						PNG Standards
	S1	S2	S3	S4	S5	S6		S1	S2	S3	S4	S5	S6	
Oct 2018			8.65	-	-	8.76	Samples should not be less than 6 mg/L			41.3	-	-	28.5	No alteration greater than 25 NTU
Jan														
Feb														
March														
April														
May														
June			18.56	7.31	9.60	8.62				37.78	10.08	254	23.44	

Shaded row is the results for October 2018 compared to current results.

3.4 Air Quality

60. The baseline for air quality was done using particulate pollution sampling for PM_{2.5} and PM₁₀. Monitoring was done for the months of June, however, PNG standards are not available (Table 4). The World Health Organization (WHO) Air Quality Guidelines for annual mean concentrations should not be greater than 10 µm/m³ for PM_{2.5} and 20 µm/m³ for PM₁₀.

The contractor's Environmental Officers were unable to conduct weekly monitoring using the in-situ equipment because they lack the know-how to use these instruments. Thus the June joint monitoring was done was part of the training for the current Environmental Officer.

Table 4. Environmental parameters for total suspended particulates (TSP).

Months	PM _{2.5}						PNG Standards	PM ₁₀ With vehicles						PNG Standards
	S1	S2	S3	S4	S5	S6		S1	S2	S3	S4	S5	S6	
October 2018	3.3	4.6	3.0	2.5	2.8	23.1	No Standards	4.8	5.3	5.1	3.3	3.7	25.6	No Standards
Jan														
Feb														
March														
April														
May														
June	3.6	3.3	2.0	2.8	3.9	4.5		5.0	4.8	4.3	5.1	5.8	6.3	

Note: WHO Air Quality Guidelines for annual mean concentrations should not be greater than 10 µm/m³ for PM_{2.5} and 20 µm/m³ for PM₁₀. Shaded row is the results for October 2018 compared to current results. Shaded row is the results for October 2018 compared to current results.

3.5 Noise

61. The results of noise level monitoring which was done for June 2019 (Table 5).

Table 5. Environmental parameters for noise levels

Months	Noise Levels (dB)*											
	S1		S2		S3		S4		S5		S6	
	With	Without	With	Without	With	Without	With	Without	With	Without	With	Without
Oct 2018	40.5	37.3	53.5	43.6	59.8	45.9	56.7	43.1	63.4	38.5	67.8	39.9
Jan												
Feb												
March												
April												
May												
June	42.9	37.8	75.5	39.2	55.7	42.8	40.4	36.7	58.3	38.0	48.4	35.2

* With and without cars/trucks. Shaded row is the results for October 2018 compared to current results. Shaded row is the results for October 2018 compared to current results.

62. The ambient noise levels for the sampling stations fall within the prescribed 45-60dB. Some sampling sites however were slightly higher where trucks were passing through.
63. Station 2 shows the results for Sopharam quarry at Ch:0+900 where extraction was taking place. Nevertheless, it is important to monitor the quarry areas where noise levels could go beyond 85dB. These noise levels when exposed for prolonged periods could cause impaired hearing.



Photograph 5. Newly purchased monitoring in-situ equipment displaced by the contractor.

3.6 Wastes Management

64. Not all spoils were dumped at designated areas because some were good materials used for embankment construction purposes. However, spoils dumped on unstable and undesigned areas such as Ch:7+300 – Ch:7+500 has caused severe erosion issues and environmental damage.
65. The contractor's environmental officer has to assess all proposed dumpsite to make sure the sites are stable and free from sensitive receptors and proper agreements are done with the respective landowners.
66. All campsite facilities were adequately aided with trash bins and domestic wastes timely removed. All campsites also have their landfills for domestic trash disposal. However strict application of wastes segregation needs to be monitored.
67. The contractor is cultivating its own greens at the Mt. Wiri campsite, thus the application of compost from biodegradables will be useful.

3.7 Hazardous Materials Management

68. Proper inventory of hazardous materials such as fluorescent bulbs, computers and peripherals, printers, used batteries, battery fluids, oils, lubricants, and asphalt products are required so that proper monitoring can be carried.
69. Nevertheless, the wastes generated from the workshop need to be disposed properly because there was no proper disposal for waste like used oil, batteries, battery fluids, lubricants, and asphalt products.
70. Waste oil have been seen to be dumped on the drain at the back of the workshop. Used or waste oil should be stored properly for recycling or given to locals for timber treatment.
71. There are several instances of burning of used tires as well. There is a need for the implementation and monitoring of the contractor's Hazardous Materials Management Plan.



Photograph 6. Improper discharge of waste oil at Mt. Wiri Campsite into the drainage.

3.8 Aggregates Extraction

72. The contractor got the approval for its QMP for Wapun Su-oro quarry from ESSB. Furthermore, the QMPs for Sopharam Ch:0+900 and Haren Ch:4+300 have been approved by the PSC. However, the QMP for Huremi quarry at Ch:7+000 was disapproved thus a revised version is required to be submitted for approval.
73. Meanwhile, the contractor has indicated to source aggregates from Suru quarry near Mopa, which is used for the Mendi-Tambul Road since April.
74. There is also a need for the actual implementation of the QMPs for each quarry to ensure potential impacts on the environment are mitigated. Additional geotech assessment are required for quarrying activities on steep slopes.

3.9 Trees Removal and Vegetation Management

75. Trees felled were within the construction limits from clearing and grubbing works. The felled trees were given to the respective land owners which were then turned into lumber and sold along the road side or used for fencing (Photograph 7)



Photograph 7. Timber from felled trees used for fencing

3.10 Socio-economic Issues of Workers

76. The data for employment (locals and expatriates) showed that a total of 662 employees were employed by the contractor. However, women only consisted of 13.5% for the period covered. The contractor is encouraged to provide additional employment opportunities for women.

Table 6. Disaggregated Employment and Wages from January to June 2019

Month	Employed by Gender (Number)		
	Men	Women	Total
January	231	17	248
February	259	35	294
March	371	67	438
April	411	79	490
May	411	79	490
June	411	79	490
Total	1272	198	1470
Average	212	33	245
Percentage	86.5%	13.5%	100%

Note: Figures from April-June were unchanged

77. The project also tried to capture women employment from road construction activities in minor road works such as gabions, rip-raps and head walls (Table 7).

Table 7. Women involvement in Non – Payroll Activities from January to June 2019.

Month	Gabions	Rip Raps	Head Walls	Total
January	10	5	3	18
February	7	3	1	11
March	5	1	1	7
April	4	3	-	7
May	7	3	3	13
June	5	3	3	11
Total	38	18	11	67

3.11 Socio-Economic Issues of Community

78. The benefits for the community is contained in Table 8 wherein expenditures from the camp in terms of purchases of food, construction materials, other purchases and other local expenses are detailed for the period. A total of K3,909,080.45, was paid to the local communities in the last six months. However, efforts should be made to determine the accuracy of the total purchases which amounted to K 3.9 million.
79. Other benefits including royalties to the community for quarry land leases are detailed in Table 9. The benefits from quarry activities are given to the land owners. However, the project should also consider the provision in their operations for environmental management considering the damages to the environment.
80. The rent for the Contractor's camp is K 3,000 for each camp site while accommodation for local employees is K1300 per month which the contractor paid K43,800.00 in the last six months.

Table 8. Monthly Expenditures for local purchases from January – June 2019.

Month	Purchase of food from locals	Construction materials	Other purchases	Other local expenditures
Jan	K16,662.79	K303,090.15	K168,537.75	K5,069.00
Feb	K7,425.29	K267,201.85	K20,099.83	K29,973.50
Mar	K8,057.01	K236,833.55	K256,498.38	K2,787.30
Apr	K26,137.70	K567,303.53	K556,314.73	K6,924.60
May	K20,209.60	K296,918.65	K374,937.73	K11,393.80
Jun	K23,849.55	K283,359.55	K412,350.23	K7,144.38
Total	K102,341.94	K1,954,707.28	K1,788,738.65	K63,292.58

Table 9. Royalty payments for quarry activities covering Jan – June 2019.

Month	Quarry 1- <i>Wapun Suoro</i>	Quarry 2- <i>Sopharam</i>	Quarry 3 <i>Haren</i>	Quarry 4 <i>Huremi</i>	Quarry 5 <i>Suru</i>	Total (m ³)	Estimated Value (Kina)*
Jan	11,789	8,703	5,882	0	0	26,374	44835.8
Feb	14,745	7338	0	0	0	22,083	37541.1
March	12,425	23,414	0	0	0	35,839	60926.3
April	7,697	10,020	0	0	0	17,717	30118.9
May	14,805	10,258	0	0	0	25,063	42607.1
June	8,327	0	0	16,758	308	25,393	43168.1
Total	69,788	59,733	5,882	16,758	308	152,469	259,197.30

* Calculation using K1.70/m³ rate.

Table 10. Summary of Lease Rentals Paid to Customary Land Owners.

Month	Camp 1	Camp 2	Local accommodations	Worker accommodations	Total
July	3000	3000		1,300	7300
August	3000	3000		1,300	7300
September	3000	3000		1,300	7300
October	3000	3000		1,300	7300
November	3000	3000		1,300	7300
December	3000	3000		1,300	7300
Total	18,000	18,000		7,800	43,800.00

3.12 Public Safety

81. The extraction on the steep slopes at Wapun Su-oro quarry has caused landslips and rock falls (Photograph 8).



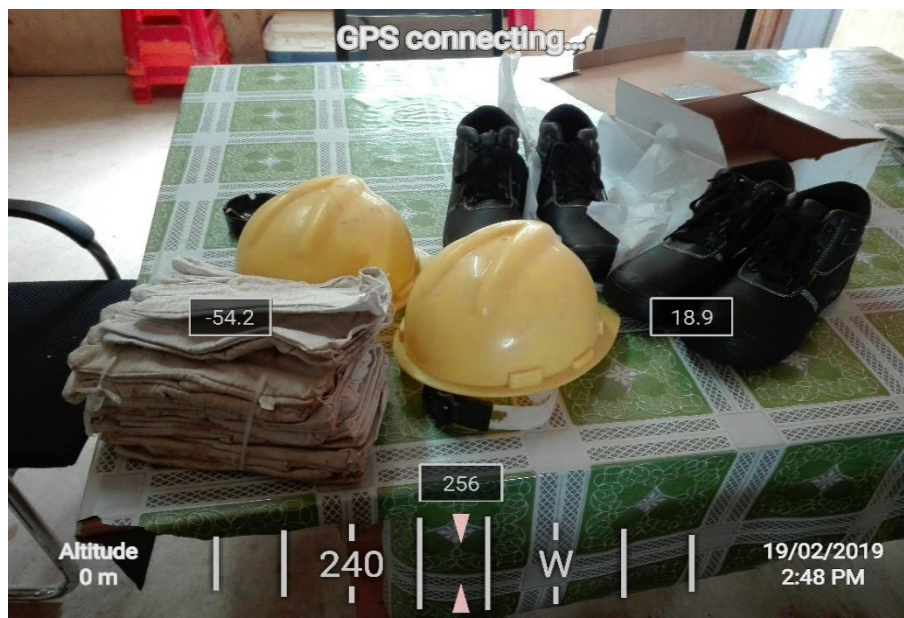
Photograph 8. Warning signage on the road side opposite Wapun Su-oro quarry- Mendi-Kandep road warning for falling stones.

3.13 Workers Health and Safety

82. Despite repeated instructions, some of the workers on site were not provided with PPEs. It is recommended that precautions should be taken by the Contractor to ensure the safety and protection against accidents of all staff and labor engaged in the works (Photograph 11).
83. The Contractor should follow the approved Health and Safety Plan (HSP) which was approved by DOW-ESSU with operational details addressing health and safety concerns during his Works.



Photograph 9. Workshop employee without proper PPE.



Photograph 10. Contractor displaced PPEs which should be given to the all workers

3.14 Traffic Management

84. The contractor has not been consistent with its traffic management. At some workstations there were traffic signs and spotters, others were not.
85. The contractor has been advised to be consistent in providing the required traffic management resources including standard traffic signages based on its TMP.

3.15 Prevention of HIV/AIDS and STDs

86. The Contractor discontinued the services of Appolos Yimbak, who was providing the services for HIV/AIDS and STIs program due to allegations of flawed data and operating outside of Southern Highlands. The contractor replaced Appolos Yimbak with Walpu Memin VCCT Centre of the United Church in Mendi who has been working with the communities along the road project corridor.
87. The contractor's service provider should encourage more people to participate in VCCT exercises.
88. The contractor's HIV/AIDS activities are summarized in Table 11. Condoms and awareness materials were also provided free of charge.

Table 11. Monthly HIV – AIDS Activities from Jan – June 2019.

Month	HIV – AIDS Activity	NO of Participants	NO of VCCT Participants	Treatment Referrals
January	1 batch conducted	35	5	1
February	1 batch conducted	39	6	0
March	2 batch conducted	30	0.	0
April	3 batch conducted	20	6	2
May	2 batch conducted	27	1	1
June	N/A	N/A	N/A	N/A
Total	9	161	18	4

Note: Referrals include treatment for STIs and not necessarily HIV/AIDS.

3.16 Existing Infrastructure Issues

89. Initial compensation payment for affected persons (APs) located within the construction limits have been compensated on the 18th -23rd May 2017 by DOW through the HRMG as per the data collected during detailed measurement survey (DMS) conducted from August 26-September 6, 2015.
90. In spite of the initial payment, grievance in the matter of missed-out or underpaid APs including legacy issues have prompted an on-site re-verification exercise by HRMG on the 18th of May 2018 basically to screen and assess genuine claimants.
91. As such, outstanding payments for infrastructures including food crop and tress etc. have been paid successfully by HRMG/DOW on the 19th of December 2018 at DOW Mendi.
92. Nevertheless, at Ch:6+760 a church building is located at the top of a hill where roadway excavation will be executed through. However, site inspections were carried out on that location by HRMG team and recommendations were made for environmental damage payment if the road will affect these areas.

3.17 Environment Related Grievances

93. According to HRMG records, all the environmental related grievance has been handled except for the Church at Ch:6+760 which recommendation were made for payments if the section will be affected.
94. APs complained about excessive dumping of spoils without their consent posing environmental threats were advised that it is the responsibility of the contractor to select stable rea to dump upon with landowner's consent. The contractor need to use a standard agreement form and sought consent from respective APs.
95. Nevertheless, environmental grievances outside the construction limits remains the responsibility of the contractor to address.



Photograph11. Consultation with APs at Shumbi Village Ch:14+500

3.18 Training and Mentoring

96. The PSC and HRMG convene monthly project monitoring meetings with the contractor onsite to discusses issues highlighted during the monitoring.
97. In June, a joint monitoring was done by the PSC and the contractor using the in-situ monitoring equipment as part of the training for the contractor's environmental officer. Since the equipment was purchased, the contractor was unable to carry out in-situ testing because of its officers lacking the knowledge for calibration and filed testing.
98. On the 28th of May 2019, DOW ESSB conducted a Workshops at the DoW conference room Mt. Hagen which was attended by PSC and HRMG officers.
99. The main objective of the workshop was to introduce the DoW Safeguards Policy 2019 and Safeguards Manual Final Draft for Consultation.
100. This workshop was important for the implementation of DOW and ADB policies on safeguards as per the implementation of the Nipa Munihu Road sub-project.



Photograph 12. PSC/HRMG project monitoring meeting with contractor.



Photograph 13. PSC Environmental Specialist showing the contractor's EO how to calibrate the multi-parameter for testing DO, pH, TDS and temperature.

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusions

101. The contractor should ensure its Environmental Officer is present onsite at both ends of the project every week where major earthworks are undertaken including quarry sites monitoring and to ensure the contractor's CEMP is implemented.
102. The PSC needs to closely monitor the implementation of the plans and provide corrections and best practices when needed.
103. The contractor should use its newly purchased in-situ environmental testing equipment to conduct monthly monitoring for the required parameters.
104. An inventory of all hazardous materials need to be provided by the contractor so that proper disposal and monitoring can be carried out.
105. Waste oil need to be properly disposed. All waste oil should be collected and stored in drums for recycle, re-sue or dispatched to local communities for timber treatment.
106. All proposed spoils dump sites have to be inspected by the contractor's Environmental Officer to ensure the site is stable and will not affect any sensitive receptors including rivers and stream. A proper agreement has to be done with the respective landowners prior to dumping.
107. The absence of soil erosion and sedimentation mitigation measures need to be addressed following identified best management practices.
108. The contractor has to provide its workers with appropriate PPEs for the various work requirements and working conditions.

4.2 Recommendations for Implementation and Corrective Actions

109. As per recommended from the last semi-annual report, the experience from Tranche 1 and Tranche 2 indicate that the personnel recruited by the Contractor need capacity building. An intensive training and seminar activity proposed to be conducted for the first quarter of 2019 was not done, thus this should be considered for the 3rd quarter. The participants will include Contractor's staff with the assistance of DOW-HRMG together with the PSC (Table 11).
110. The importance of identifying environmental harm and mitigating or remediating these harmful activities need corrective action. The procedure followed by the project is the identification of environmental non-compliance by PSC and HRMG. The repeated infractions or severity of the environmental harm will be the basis for the issuance of a Notice of Violation of PSC and or HRMG. This NOV becomes the basis for the preparation by the contractor of a Corrective Action Plan to address the violations.
111. In this case, corrective action could be categorized into two; corrections mean that there is immediate relief or action to an environmental problem. Corrective action refers to actions that would ensure that these environmental problems are not repeated either through policy or application of environmental management best practices (Table 12).

Table 12. Recommended Seminars and Trainings for Capacity Building

Activity Number	Item and Recommended Action	Responsibility	Completion Date
1	Training on the use of environmental In-situ equipment for monitoring.	HRMG-PSC-CONTRACTOR	August 2019
2	Echo Seminar-Workshop on Environment Health and Safety Best Practices.	HRMG-PSC-CONTRACTOR	August 2019
3	Seminar Workshop on Status, Issues and Concerns in the Implementation of the CEMP and other plans.	HRMG-PSC-CONTRACTOR	September 2019

Table 13. Recommendations for Implementation and Corrective Action.

Non Compliance	Recommendations for Implementation	Corrective Actions Plan	In-Charge	Date of Implementation
Irregular monthly monitoring for identified environmental parameters.	Advise the contractor to conduct environmental monitoring using in-situ equipment.	Assist the contractor's Environmental Officer in the use of these equipment.	PSC HRMG	July-August 2019
Absence of PPEs for majority of the workers.	Issue Notices of Violation for repeated non-compliances.	For contractor to prioritize PPEs in project .	CONTRACTOR	July-August 2019
Absence of soil erosion management and sediment traps to contain spoils being transported to water bodies.	Issuance of NOVs to the contractor for failure to implement soil erosion control measures such as establishment of sediment traps and tree and grass seeding or planting.	Contractor to be assisted in the preparation of action plan with detailed activities.	CONTRACTOR	July-August 2019
Revise and get approval for the lacking Quarry Management Plans.	Review with the contractor the pending plans and assist in their accomplishment.	Provide a written notification to the contractor to submit and revise these plans.	CONTRACTOR	July – August 2019

5.0 APPENDICES

Appendix 1: List of References

1. Initial Environmental Examination for Nipa - Munihi Road section (2016).
2. Department of Works Specification for Road and Bridge Works 1995
3. Department of Works Specification for Road and Bridge Works 2015 Edition
4. Back to Office Report of HRMG Environmental Officer
5. Monthly EMR of PSC National Environmental Specialist
6. Contractor's Monthly Environmental Report (January-May 2019)
7. Contractor's HIV/AIDS Reports (January-May 2019)
8. Monthly Social Safeguards Reports of PSC National Resettlement Specialist
9. Conformed Documents for the Improvement Works and Long Term Performance Based Maintenance Service (LTPBM) for Nipa - Munihi Road.
10. Scherer, Thomas F. 2016. North Dakota State University Extension Service. Reviewed and Reprinted October 2016.
11. DOWL. 2015. Erosion and Sediment Control Best Management Practices Manual. Montana Department of Transportation. HIV Semi Annual Report
12. General Construction Waste Management and Hazardous Materials Handling and Waste Disposal DEC 1997.
13. ADB Policy Paper, Safeguards Policy Statement 2009
14. DOW Guidelines for Environmental Assessments of Roads and Bridge Infrastructure Projects Version 2, 2013.

Appendix 2: List of People Interviewed

1. Mr. Bienvenido Mirang – Resident Engineer PSC
2. Alphonse Niggins,- Senior Field Coordinator, HRMG
3. Daniel Andrew - Site Engineer PSC
4. Paul Nombri, Manager - Technical Services, HRMG
5. Steven Kolaiye, National Resettlement Specialist, PSC,
6. Saul Nol – Environmental Officer, HRMG
7. Eddy Li Shengnan – Deputy Project Manager COVEC Nipa Munihi Project