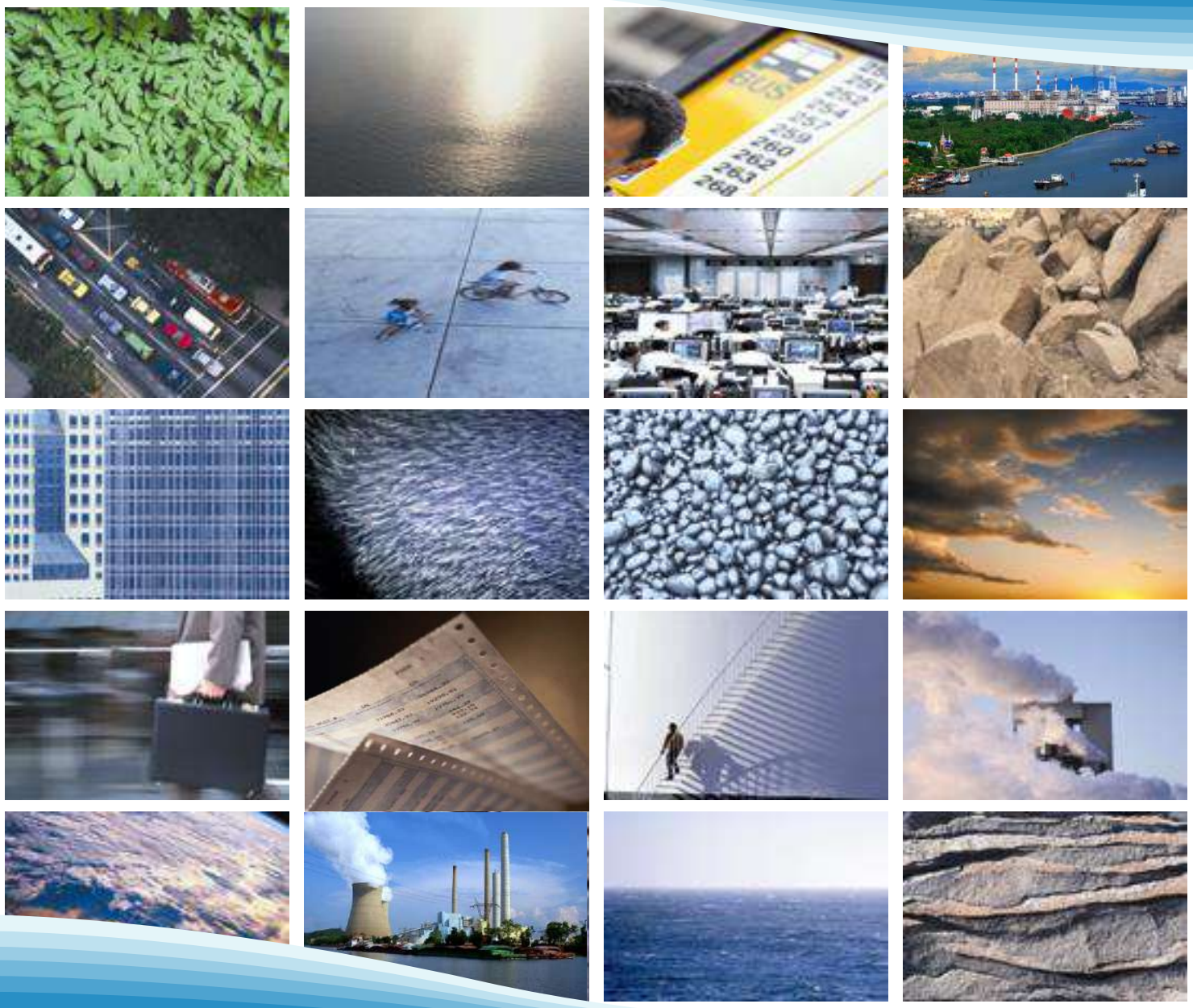

Environment Management Plan (EMP) Report for Zawtika Onshore Development Project

Andaman Transportation Limited (ATL)

Final Report

SEPTEMBER 2022

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The business of sustainability

Andaman Transportation Limited
A Company of PTTEP Group

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ATL 13253/01-1774/2020

(SSHE Department)

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24th July 2020

DIRECTOR GENERAL
Environmental Conservation Department
Office No. (53)
Ottrathiri Township
Nay Pyi Taw, Myanmar

Subject: Commitment letter for EMP Report of Zawtika Onshore Development Project

Dear Sir,

We refer to the EMP report of Zawtika Onshore Development Project, which was prepared and finalized by Environmental Resources Management (ERM) Co., Limited in accordance with the Environmental Conservation Law, Rule and Procedures under the instructions of Ministry of natural Resources and Environmental Conservation (MONREC).

Intending to be legally bounded hereby and financially liable to the Ministry of natural Resources and Environmental Conservation hereunder, we:

Endorse and confirm to Environmental Conservation Department;

a) The EMP Report is accurate, consolidated and complete

b) The EMP has been conducted in accordance with the relevant laws, including the EIA Procedure (2015)

c) The Project will fully follow the commitments, mitigation measure and plans set out in this EMP Report.

Sincerely yours,

Piya Sukhumpanumet
General Manager
Andaman Transportation Limited (ATL)

REPUBLIC OF THE UNION OF MYANMAR
MINISTRY OF NATURAL RESOURCES AND ENVIRONMENTAL CONSERVATION
ENVIRONMENTAL CONSERVATION DEPARTMENT

SUBMISSION FORM OF ENVIRONMENTAL MANAGEMENT PLAN

This is the official submission form of an Environmental Management Plan (EMP) under *Environmental Impact Assessment Procedure Notification No.616/2015*. This form shall be completed in its entirety and submitted to the Environmental Conservation Department, Ministry of Natural Resources and Environmental Conservation, along with all required EMP report.

Project Proponent Information

Proponent Name:	**Andaman Transportation Limited**	Company Registration Number by DICA (if any):	**84 FC**
Contact name of Proponent:	**Zar Chi Saint**		
Proponent's address for correspondence:	**2 Sei-Myaung Yeiktha Lane, 8 ½ Mile, Mayangone Township, Yangon, Republic of the Union of Myanmar**		
Telephone (fixed/mobile):	**09450036594** Fax: **018667783**	Email address:	**zarchiseint@pttep.com**

Project Information

Project Title	**Environmental Management Plan (EMP) Report for Zawtika Onshore Development Project**
Project Location (Address)	**Kanbauk, Yebyu Township, Tanintharyi Region, Myanmar**

Report type

☐	New report	☑	Revised report	Date of submission (dd/mm/yyyy)

Check list of necessary contents for EMP

The EMP, prepared as anall-inclusive or a standalone document,may contain the following information (see also Article 2s) to t), and Article 63 – 8.0 of EIA Procedure No.616/2015)

☑	a)	Executive Summary (if separate volume)
☑	b)	Project Description (if separate volume)
☑	c)	Health Policies and Commitments, legal requirements and institutional arrangements(if separate volume)
☑	d)	Summary of impacts and mitigation measures (if separate volume)
☑	e)	Overall budget for implementation on the EMP
☑	f)	Management and Monitoring Sub-Plans for each identified impact
☑	g)	Contents of each sub-plan

Signature (Representative of the project proponent)

I, the undersigned Proponent (or representative, there of), hereby state that the information provided in/with the application and the report ensure;

a) the accuracy and completeness of the EMP report;

b) that the EMP report has been prepared in strict compliance with applicable laws including EIA Procedure Notification No. 616/2015; and

c) that the Project will at all times comply fully with the commitments, mitigation measures, and plans in the EMP report.

Signature: Date of submission: (dd/mm/yyyy)

Name: Zar Chi Saint

FOR OFFICE USE ONLY

Date received:		Project Identification Number:	
The proponent submitted the reports with the forms of;	☐ Paper copy	☐ Digital copy	
Recorded by:			
Additional comments, notes or recommendations (attached if necessary):			

FINAL REPORT

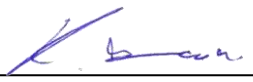
Andaman Transportation Limited (ATL)

Environment Management Plan (EMP) Report for Zawtika Onshore Development Project

SEPTEMBER 2022

Project 0352807

Prepared by: ERM-Siam Co Ltd

For and on behalf of ERM-Siam Co Ltd	
Approved by:	Kamonthip Ma-oon
Signed:	
Position:	Partner
Date:	SEPTEMBER 2022

This report has been prepared by ERM-Siam Co Ltd with all reasonable skill, care and diligence within the terms of the Contract with the client, incorporating our General Terms and Conditions of Business and taking account of the resources devoted to it by agreement with the client.

We disclaim any responsibility to the client and others in respect of any matters outside the scope of the above.

This report is confidential to the client and we accept no responsibility of whatsoever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies on the report at their own risk.

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၁.၁ နိဒါန်း

ဧရာတိက ကုန်းတွင်းဓာတ်ငွေ့သယ်ယူပို့ဆောင်ရေးစနစ် ("စီမံကိန်း") သည် Andaman Transportation Limited (ATL) မှ လက်ရှိလည်ပတ်ဆောင်ရွက်နေသော ဖွံ့ဖြိုးရေး လုပ်ငန်းတစ်ရပ်ဖြစ်ပါသည်။ ၎င်းတွင် မော်ကြီးကျေးရွာ (ပိုက်လိုင်းမြေချသည့်နေရာ) ရှိ ကုန်းတွင်း ဧရာတိကပိုက်လိုင်းမှ Ban-I-Tong (မြန်မာ နှင့် ထိုင်း နယ်နိမိတ်နေရာ) ရှိ PTT ဓာတ်ငွေ့ ပိုက်လိုင်း၊ ဧရာတိက ကုန်းတွင်း လည်ပတ်ရေးစင်တာ (ZOC)၊ ဧရာတိက လုပ်ကွက်အမှတ် ဗားခလုတ် #၁ နှင့် #၂ (ZBV1 နှင့် ZBV2)၊ နှင့် ဧရာတိက တိုင်းတာရေးစခန်း (ZMS) အထိ ချိတ်ဆက်ထားသည့် ၇၁ ကီလိုမီတာ ရှိ ကုန်းတွင်းဓာတ်ငွေ့သယ်ယူပို့ ဆောင်ရေး ပိုက်လိုင်း တို့ပါဝင်ပါသည်။

၂၀၁၅ ဒီဇင်ဘာလ ၂၉ ရက်နေ့တွင် ထုတ်ပြန်ခဲ့သည့် ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း (EIA) ဆိုင်ရာ လုပ်ထုံးလုပ်နည်း၏ သတ်မှတ်ချက်များနှင့်အညီဖြစ်စေရန်၊ ATL အနေဖြင့် လက်ရှိလည်ပတ်ဆောင်ရွက်မှုများအတွက် ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ် (EMP) ကို ဆောင်ရွက်ရန်ရန် နှင့် ၎င်း၏ လက်ရှိလည်ပတ်နေသော ဧရာတိက ကုန်းတွင်း ဖွံ့ဖြိုးရေး စီမံကိန်းအတွက် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဆိုင်ရာ လိုက်နာဆောင်ရွက်မှု သက်သေခံ လက်မှတ် (ECC) ကို လက်ခံရရှိရန် ထည့်သွင်းစဉ်းစားမှု နှင့် ခွင့်ပြုချက်တို့အတွက် သယံဇာတနှင့်သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေး ဝန်ကြီးဌာန (MONREC) (ယခင်က ပတ်ဝန်းကျင်ထိန်းသိမ်းရေး နှင့် သစ်တောရေးရာ ဝန်ကြီးဌာန (MOECAF)/ (ပတ်ဝန်း ကျင်ထိန်းသိမ်းရေးဦးစီးဌာန (ECD) ထံသို့ တင်သွင်းရန် လိုအပ်ပါသည်။

၁.၂ စီမံကိန်းအဆိုပြုသူအကြောင်းအနှစ်ချုပ်ဖော်ပြချက်

PTT Exploration and Production Company Limited (PTTEP) ကုမ္ပဏီခွဲဖြစ်သည့် Andaman Transportation Limited (ATL) သည် မြန်မာနိုင်ငံရှိ စီးပွားရေးလုပ်ငန်းများနှင့် ဆက်စပ်သည့် ရေနံရှာဖွေရေး နှင့် ထုတ်လုပ်ရေးလုပ်ငန်းများကို ဆောင်ရွက်ရန် စီမံကိန်း အတွက် လုပ်ငန်းဆောင်ရွက်သူအော်ပရေတာ ဖြစ်ပါသည်။

ATL သည် ရေရှည်တန်ဖိုးဖန်းတီးမှုအတွက် ယှဉ်ပြိုင်နိုင်သောဆောင်ရွက်မှု နှင့် တီထွင်ဆန်း သစ်မှု တို့ဖြင့် "စွမ်းအင်မိတ်ဖက်ရွေးချယ်မှု" ဆိုင်ရာ ခိုင်မာသော ရည်မှန်းချက်တစ်ရပ်ကို သက်ဆိုင်သူများအားလုံးထံသို့ ယုံကြည်နိုင်သော စွမ်းအင်ထောက်ပံ့ပေးရေး နှင့် ရေရှည်

ဖြစ်သောတန်ဖိုးတို့ကို တစ်ကမ္ဘာလုံးတွင်လည်ပတ်ဆောင်ကြဉ်းပေးရန် ဖြစ်သည့် PTTEP ၏ မစ်ရှင်ကို ကျင့်သုံးပါသည်။

ATL သည် PTTEP ကော်ပိုရိတ်နှင့် PTTEP မြန်မာကုမ္ပဏီ တို့၏ SSHE မူဝါဒ နှင့် စာရွက်စာတမ်းများ ကို ကျင့်သုံးပါသည်။ PTTEP ၏ မြန်မာကုမ္ပဏီသည် (၁) ထိခိုက်နာကျင်မှု သုည၊ (၂) ကြီးမား သောမတော်တဆမှု သုည (ဥပမာ၊ ကြီးမားသော ဟိုက်ဒရိုကာဗွန် ယိုစိမ့်မှု သုည၊ ယာဉ် မတော်တဆမှု သုည၊ ရေယာဉ် တိုက်မိမှု သုည) နှင့် (၃) ယိုဖိတ်မှု သို့မဟုတ် အပြင်မှ တိုင်းကြားခံရမှု သုည (ဥပမာ၊ အာဏာပိုင်များ/ ရပ်ရွာလူထုများ/ ပင်လယ်အသုံးပြုသူများက တိုင်ကြားခြင်း သုည) တို့ပါဝင်သည့် "ဦးတည်ချက် သုည - ကျွန်ုပ်တို့၏ လုပ်ငန်းလည်ပတ် ဆောင်ရွက်မှုဌ မည်သူတစ်စုံတစ်ဦးမှ ထိခိုက်နာကျင်မှု မရှိစေရ" ဟူသည် အန္တိမပန်းတိုင်ဖြင့် မြန်မာနိုင်ငံတွင် ဘေးကင်းသော ရှာဖွေတူးဖော်မှု နှင့် ထုတ်လုပ်မှု (E&P) တို့ကို ဆောင်ရွက် ရန် အာမခံထားပါသည်။

ATL ၏ ဆက်သွယ်ရန်အသေးစိတ်ကို ***ဇယား (၁-၁)*** တွင် ဖော်ပြပေးထားပါသည်။

ဇယား (၁-၁) ATL ကို ဆက်သွယ်ရန်

ကဏ္ဍ	ဖော်ပြချက်
ကုမ္ပဏီအမည်	Andaman Transportation Limited
လိပ်စာ	ဗန်းတော့ရှ် တာဝါ၊ အမှတ် (၆၂၃) ပြည်လမ်း၊ ကမာရွတ်မြို့နယ်၊ ရန်ကုန်၊ ပြည်ထောင်စုသမ္မတ မြန်မာနိုင်ငံ။
ဖုန်းနံပါတ်	+၉၅(၁) ၆၅၂၀၀
ဖက်စ်နံပါတ်	+၉၅(၁) ၆၆၁၈၁၄

၁.၃ *စီမံကိန်း အကြောင်းအရာ ဖော်ပြချက်*

ဧရာတိကကုန်းတွင်းလုပ်ငန်းလည်ပတ်ဆောင်ရွက်မှုသည် မြန်မာ့ရေနံ နှင့် သဘာဝဓာတ်ငွေ့ လုပ်ငန်း (MOGE) မှ ပိုင်ဆိုင်သည့် လုပ်ကွက်အမှတ် M9 နှင့် လုပ်ကွက်အမှတ် M11 ၏ အစိတ်အပိုင်းအနည်းငယ်တို့တွင် တည်ရှိသည့် ဓာတ်ငွေ့ထုတ်လုပ်သောစီမံကိန်းလုပ်ကွင်း တစ်ရပ် ဖြစ်သည့် ဧရာတိကဖွံ့ဖြိုးရေးစီမံကိန်းကို အထောက်အကူပြုသည့် ကုန်းတွင်းနေရာ အဆောက်အအုံ ဖြစ်ပါသည်။ စီမံကိန်းလုပ်ကွင်းသည် ရန်ကုန်မှတောင်ဘက်သို့ ၂၅၅ ကီလိုမီတာခန့်အကွာ နှင့် မြန်မာကမ်းရိုးတန်း၏ အနောက်ဘက်သို့ ၂၀၇ ကီလိုမီတာခန့် အကွာရှိ၊ မုတ္တကွေ့ဌ တည်ရှိပါသည်။

ယခု EMP တွင် အလေးပေးထားသည့် ဇောတိကကုန်းတွင်းနေရာအဆောက်အအုံများတွင် မော်ကြီး (ပိုက်လိုင်းမြေချသည့်နေရာ) ရှိ ကမ်းလွန်ပိုက်လိုင်းမှ Ban-I-Tong (မြန်မာ နှင့် ထိုင်း နယ်နိ မိတ် နေရာ) ရှိ PTT ဓာတ်ငွေ့ ပိုက်လိုင်း၊ ဇောတိက ကုန်းတွင်း လည်ပတ်ရေးစင်တာ (ZOC)၊ ဇောတိက လုပ်ကွက်အမှတ် ဗားခလုတ် #၁ နှင့် #၂ (ZBV1 နှင့် ZBV2)၊ နှင့် ဇောတိက တိုင်းတာရေးစခန်း (ZMS) အထိ ချိတ်ဆက်ထားသည့် ၇၁ ကီလိုမီတာ ရှိ ကုန်းတွင်း ဓာတ်ငွေ့သယ်ယူပို့ဆောင်ရေး ပိုက်လိုင်း ပါဝင်ပါသည်။ ပြည်တွင်းသုံးဓာတ်ငွေ့ အတွက် ပထမဆုံး ဓာတ်ငွေ့ထုတ်လုပ်မှုကို ၂၀၁၄ ခုနှစ် မတ်လ ၁၄ ရက်နေ့ နှင့် ထိုင်းနိုင်ငံသို့ တင်ပို့သည့် ပြည်ပတင်ပို့သောဓာတ်ငွေ့တို့ကို ၂၀၁၄ ခုနှစ် ဩဂုတ်လ ၅ ရက်နေ့တို့တွင် အသီးသီး အောင်မြင်စွာဆောင်ရွက်နိုင်ခဲ့ပါသည်။

၁.၄ *မူဝါဒ၊ ဥပဒေ နှင့် အဖွဲ့အစည်းဆိုင်ရာ မူဘောင်*

ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှု အစီအစဉ်ကို စီမံကိန်း၏ လုပ်ငန်းအဆင့်များအားလုံးအတွက် ကြီးကြပ်ရေး နှင့် ကြီးကြပ်ရေးမဟုတ်သည့် ဆောင်ရွက်မှုသတ်မှတ်ချက်များနှင့်အညီ ပြုစုထားပါသည်။ အမျိုးသားအဆင့် သတ်မှတ်ချက်များ နှင့် သက်ဆိုင်ရာ နိုင်ငံတကာ သဘောတူစာချုပ်များ နှင့် ကွန်ဗင်းရှင်းများပါဝင်လျက် စီမံကိန်းအတွက် မူဝါဒ နှင့် ဥပဒေ မူဘောင် တို့ကို အခန်း (၄) တွင် ဖော်ပြထားပါသည်။

ပတ်ဝန်းစီမံခန့်ခွဲမှုအစီအစဉ်သည် အောက်ပါတို့ကို ရည်ရွယ်ပါသည် -

- ဤဇောတိက တူးဖော်ထုတ်လုပ်ရေးဆောင်ရွက်မှု နှင့် ကုန်းတွင်း သဘာဝဓာတ်ငွေ့ သယ်ယူရေးစနစ် စီမံကိန်းကို PTTEPI က ထောက်ပံ့ပေးသော သတင်းအချက် အလက်များ အပေါ်အခြေခံ၍ ရှင်းပြရန်၊
- ပတ်ဝန်းကျင် နှင့် လူမှု ဆိုင်ရာ ထည့်သွင်းစဉ်းစားချက်များကို စီမံကိန်းနှင့်ပတ်သက်၍ ဆုံးဖြတ်ချက်များချမှတ်ရာတွင် ရှင်းလင်းစွာ ထည့်သွင်းအသုံးပြုသွားနိုင်စေရန်၊
- အကြံပြုထားသော လုပ်ထုံးလုပ်နည်းများ နှင့် အလေ့အကျင့်များကို ပတ်ဝန်းကျင် နှင့် လူမှုဆိုင်ရာ သက်ရောက်မှုများကို ရှောင်ကြဉ်ရန်၊ လျှော့ချရန် သို့မဟုတ် လျော့ကျစေရန် စီမံကိန်းကာလအတွင်း လေးစားလိုက်နာဆောင်ရွက်ရန်၊ နှင့်
- စာရင်းစစ်ခြင်း နှင့် အရေးပေါ်အစီအစဉ်များအပါအဝင် ပတ်ဝန်းကျင်ဆိုင်ရာ စီမံခန့်ခွဲမှု အစီအစဉ်များနှင့်ပတ်သက်၍ လမ်းညွှန်ပေးနိုင်ရန်။

စီမံကိန်းလုပ်ငန်းလည်ပတ်မှုနှင့်ပတ်ဝန်းစီမံခန့်ခွဲမှုအစီအစဉ်၏မူဝါဒ၊ဥပဒေ နှင့် အဖွဲ့အစည်းဆိုင်ရာ မူဘောင်များကို အစိတ်အပိုင်းအနေဖြင့် စီမံကိန်းအဆိုပြုသူ၏ မူဝါဒ နှင့် မြန်မာနိုင်ငံ၏ မူဝါဒ နှင့် ဥပဒေဆိုင်ရာ မူဘောင်များကို ထည့်သွင်းထားပါသည်။ PTTEP ၏ စီမံကိန်းလည်ပတ်ဆောင်ရွက်မှု ကာလတစ် လျောက်လုံး ကုမ္ပဏီတွင်း မူဝါဒများ မှာ ထိခိုက်မှု သုညအဆင့်ရောက်ရန် ရည်ရွယ်သော PTTEP SSHE (ဘေးအန္တရာယ်ကင်းရှင်းရေး၊ လုံခြုံရေး၊ ကျန်းမာရေးနှင့် ပတ်ဝန်းကျင်) မူဝါဒ နှင့် PTTEP Myanmar Asset SSHE မူဝါဒများ ပါဝင် သည် (ဥပမာ - "သုည သတ်မှတ်ခြင်း - ကျွန်ုပ်တို့၏ လုပ်ငန်းလည်ပတ်မှုကြောင့် မည်သူမျှ ထိခိုက်မှု မရှိ။)

၄င်းအပြင် စီမံကိန်းနှင့်သက်ဆိုင်သော အပြည်ပြည်ဆိုင်ရာ သဘောတူညီချက် နှင့် မြန်မာနိုင်ငံ ဥပေဒ များကို နားလည်ရန် နောက်ထပ်လေ့လာမှုများကို ဆောင်ရွက်ခဲ့ပါသည်။ လေ့လာမှု အသေးစိတ်ကို အခန်း ၄ တွင် ဖော်ပြထားပါသည်။

၁.၅ အနီးပတ်ဝန်းကျင် အကြောင်းအရာ ဖော်ပြချက်

ဤအခန်းသည် စီမံကိန်းအနီးဝန်းကျင်နယ်မြေဧရိယာအတွင်းရှိ ပတ်ဝန်းကျင် နှင့် လူမှုအနေအထား အကျဉ်းကို ပြဋ္ဌာန်းပေးရန် ရည်ရွယ်ပါသည်။

၁.၅.၁ ရုပသွင်ပြင်ဆိုင်ရာ အစိတ်အပိုင်းများ

၁.၅.၁.၁ ပထဝီ နှင့် ဘူမိဗေဒ

ဧရာတိကကုန်းတွင်းဓာတ်ငွေ့ပိုက်လိုင်းစကြံ်လမ်း၏ ယေဘုယျပထဝီအနေအထားတွင် မြေနိမ့် နှင့် မြေမြင့်နယ်မြေများဖြင့် ပေါင်းစပ်ထားပြီး၊ ကမ်းရိုးတန်း နှင့် ထိုင်းနိုင်ငံနယ်နိမိတ်တို့အကြား အနောက်-မြောက် မှ အရှေ့-တောင်သို့ သွားနေသည့် ဖြောင့်တန်းနေသော မြေပြင် အနေ အထားအဂ်ါရပ်များပါဝင်ကြပါသည်။ အနောက်ပိုင်းကို ရာသီအပေါ်မူတည်၍ ရေကြီးခြင်းတို့ ဖြစ်ပေါ်သည့် မြေနိမ့်နယ်မြေများဖြင့် တည်ရှိနေပါသည်။

စီမံကိန်းနယ်မြေဧရိယာအများစုသည် ဒေသတွင်းပြတ်ရွှေ့ကြောင်းများအတိုင်း လိုက်သွားသည်။ အဓိက အလွှာများကိုကို ကာဗွန်နီ (Carboniferous) - နှမ်းဖတ်ကျောက်အလွှာ - Quaternary တို့ဖြင့် ဖွဲ့စည်းထားပါသည်။ တနင်္သာရီချိုင့်ဝှမ်း၌ အနည်းဆုံး Granitoid plutons တို့သည် Mergui Group (Carboniferous) ၏ အသွင်ပြောင်းနှုန်း (metasedimentary) ကျောက်များ ရှိနေကြပါသည်။ ၃-၄ ကီလိုမီတာအထိ ဖြတ်နေကြသော Granitoid အစုအဝေးငယ်များစွာ ကို အဓိက Granitoid Pluton ၏ နယ်နိမိတ်တွင် လေ့လာတွေ့ရှိရပါသည်။

၁.၅.၁.၂ *ရာသီဥတု နှင့် မိုးလေဝသ*

မြန်မာနိုင်ငံ၏ ရာသီဥတုအခြေအနေများသည် တည်နေရာ၊ မြေမျက်နှာသွင်ပြင်၊ မြေ နှင့် ပင်လယ် လွှမ်းမိုးမှု၊ နှင့် အမြင့်လေ လည်ပတ်မှုတို့က လွှမ်းမိုးပြီး၊ ၎င်းမှာ နွေရာသီ၊ မိုးရာသီ၊ မိုးလွန်ရာသီ နှင့် ခြောက်သွေ့ရာသီ တို့အဖြစ် ရာသီဥတု လေး (၄) မျိုးအဖြစ် ခွဲနိုင်သည် ရာသီလိုက်ကွဲပြားမှုကို ဖြစ်ပေါ်စေပါသည်။

မြန်မာနိုင်ငံသည် အထူးသဖြင့် ဧပြီလ မှ မေလ နှင့် အောက်တိုဘာလ မှ နိုဝင်ဘာလတို့၌ မိုးရာသီအကြို နှင့် မိုးရာသီအလွန်ကာလများအတွင်း အင်္ဂလားပင်လယ်အော်၌ စတင်ဖြစ်ပေါ်တတ်သော ဆိုက်ကလုန်းတိုက်ခတ်မှုများကို ခံရတတ်ပါသည်။ တနင်္သာရီတိုင်းဒေသကြီးတွင် ပုံမှန်အပူဆုံး အပူချိန်မှာ ၃၁°C နှင့် ပုံမှန် အအေးဆုံး အပူချိန်မှာ ၂၃°C တို့ဖြစ်ကြသည်။ တနင်္သာရီတွင် ဆောင်းရာသီ (အေးခဲရာသီ) မရှိဘဲ၊ ခြောက်သွေ့ရာသီဖြစ်သည့် အပူပိုင်း မုတ်သုံရာသီ နှင့် နှစ်တစ်နှစ်၏ကျန်ရှိသည့်ကာလများတွင် မိုးပြင်းထန်စွာရွာသွန်းမှုတို့ ရှိသည်။ [1]

၁.၅.၁.၃ *ထိတွေ့ဝန်းကျင် လေထုအရည်အသွေး နှင့် ထိတွေ့ဝန်းကျင် ဆူညံသံအဆင့်*

လေထုအရည်အသွေးအညွှန်း (AQI) နှင့် မြန်မာနိုင်ငံ၏ အမျိုးသားပတ်ဝန်းကျင်ထုတ်လွှတ်မှု လမ်းညွှန်ချက် (EQEG, ၂၀၁၅) တို့အပေါ်အခြေခံထားချက်အရ၊ ၎င်းနေရာရှိ ထိတွေ့ဝန်းကျင် လေထုအရည်အသွေးသည် အတော်အတန်ကောင်းမွန်သည့်အနေအထား၌ရှိပြီး၊ အနီးဝန်းကျင်ရပ်ရွာများရှိ လူများအပေါ် ကျန်းမာရေးဆိုင်ရာ သိသာသော ဆိုးကျိုးသက်ရောက်မှုများကို မဖြစ်ပေါ်စေကြောင်း တွေ့ရှိရပါသည်။ ဤသို့ဖြစ်ရသည်မှာ ယင်းနေရာ၌ လေထုညစ်ညမ်းနိုင်စေမည့် သိသာသော ရင်းမြစ်များမှာ အကန့်အသတ်ရှိမှုကြောင့် ဖြစ်ပါသည်။

၎င်းနေရာရှိ ထိတွေ့ဆူညံသံအဆင့်မှာ ထိုင်းနိုင်ငံ နှင့် မြန်မာနိုင်ငံတို့၏ EQEG ဆူညံသံအဆင့်စံနှုန်းများအတွင်း ကျရောက်ပါသည်။ စီမံကိန်းလုပ်ငန်းခွင်ရှိအဓိကဆူညံသံရင်းမြစ်မှာ လူများ၏ဆောင်ရွက်မှုလုပ်ငန်းများမှ ဖြစ်ပြီး၊ များသောအားဖြင့် ကျောင်းစာသင်ခန်းများ နှင့် သယ်ယူပို့ဆောင်ရေးတို့မှ ဖြစ်ကြပါသည်။

[1] http://www.tanintharyi.climatemps.com

၁.၅.၁.၄ *မြေပေါ်ရေ အရည်အသွေးနှင့် ရေထု*

ရလဒ်များအရ၊ အချို့နေရာများရှိ BOD တန်ဖိုးများမှလွဲ၍ တန်းဖိုးအများစုမှာ ထိုင်းနိုင်ငံ၏ မြေပေါ်ရေ အရည်အသွေးစံနှုန်းများနှင့် ကိုက်ညီမှုရှိပါသည်။ ဤသို့ဖြစ်ရသည်မှာ ရေယာဉ် ဆေးခြင်း၊ ရေယာဉ် ဝမ်းအောက်ခံရေ နှင့် အိမ်သာ ရေ တို့ကဲ့သို့သော လူများ၏ ဆောင်ရွက်မှု လုပ်ငန်းများကြောင့် ဖြစ်နိုင်ပါသည်။ ထို့ပြင်၊ နမူနာကောက်ယူသည့် စခန်းနေရာတစ်ခုချင်း၌ ကြေခဲသောသတ္တုများနှိုင်းယှဉ်ချက်တွင် အားလုံးမှာ သက်ဆိုင်ရာစံနှုန်းများအတွင်း ကျရောက်ကြပါသည်။ ၎င်းအပြင်၊ နမူနာကောက်ယူသည့်စခန်းနေရာများအားလုံး၌ ဗက်တီးရီးယားပိုးပါဝင်မှုသည် မြန်မာနိုင်ငံ၏ အမျိုးသား သောက်သုံးရေ အရည်အသွေး စံနှုန်းများကို ကျော်လွန်သွားကြောင်း တွေ့ရှိရပါသည်။

ဧရာတိက ကုန်းတွင်းဓာတ်ငွေ့ပိုက်လိုင်း လမ်းကြောင်းတစ်လျှောက် စီးဆင်းနေကြသော မြေပေါ်ရေရင်းမြစ်နေရာများစွာ ရှိပါသည်။ ဓမင်းဆိပ် (Daminseik) မှ Ban-I-Tong အထိ ခြောက်ဆယ့်ငါး (၇၁) ကီလိုမီတာရှည်မည့် အဆိုပြုပိုက်လိုင်းလမ်းကြောင်းတစ်လျှောက်တွင် မြစ်ခြောက် (၆) စင်း နှင့် စမ်းချောင်း နှစ်ဆယ့်သုံး (၂၃) ခုရှိကြောင်း မှတ်တမ်းကောက်ယူထားပါသည်။ သို့ရာတွင်၊ အဓိက မြေပေါ်ရေအင်္ဂါရုပ်မှာ Heinze မြစ်၊ ထားဝယ်မြစ် နှင့် Zinba မြစ် တို့ဖြစ်ကြပြီး၊ ၎င်းတို့၏ မြစ်လက်တက်တို့ ဖြစ်ကြပါသည်။

၁.၅.၁.၅ *မြေကြီး*

မြန်မာနိုင်ငံ၏ မြေအသုံးချမှုအစိုးရဌာနသည် မြန်မာနိုင်ငံရှိ မြေအမျိုးအစားများကို အပြည်ပြည်ဆိုင်ရာ မြေကြီး သိပ္ပံ လူအဖွဲ့အစည်း နှင့် FAO/UNESCO တို့မှ ဆောင်ရွက်ခဲ့သည့် မြေအမျိုးအစားသတ်မှတ်သည့်စနစ်များအရ မြေအမျိုးအစား နှစ်ဆယ့်လေး (၂၄) မျိုးကို ဖော်ထုတ်ထားပါသည်။ တိုင်းနသံ်ာရီတိုင်းဒေသကြီး၌ တည်ရှိသော စီမံကိန်းနယ်မြေ ဧရိယာရှိ မြေအမျိုးအစားမှာ နီညိုရောင်သစ်တောမြေ နှင့် တောင် နီညိုရောင်သစ်တော မြေများ [Acisol (rhodic) & Cambisols (chromic)] နှင့် မြက်ခင်းပြင် စိမ့်မြေ၊ နှင့် မြစ်ဝှမ်း၏ နုန်းမြေများ (Gleysols & Fluvsols) တို့အဖြစ် အမျိုးအစားသတ်မှတ်ပါသည်။

စီမံကိန်းနယ်မြေဧရိယာရှိ မြေအရည်အသွေးကို လူတို့၏ဆောင်ရွက်မှုလုပ်ငန်းမှ ညစ်ညမ်းမှု မရှိဟု ဆုံးဖြတ်ထားပါသည်။

၁.၅.၁.၆ *မြေအောက်ရေ အရည်အသွေး*

မြေအောက်ရေသည် သောက်သုံးရန် မသင့်ကြောင်း တွေ့ရှိရပါသည်။ သို့ရာတွင် ရေချိုးခြင်း နှင့် အဝတ်လျှော်ခြင်းတို့ကဲ့သို့သော အခြားအရာများအတွက်အသုံးပြုနိုင်ပါသည်။ နမူနာ ကောက်ယူခဲ့သော မြေအောက်ရေ ရေတွင်းအများစုမှာ သုံးရေ နှင့် သောက်ရေအဖြစ်အသုံးပြု ကြသည့် အုန်းပင်ကွင်း နှင့် ရှင်ပျံ (Shinbyan) တို့မှလွဲ၍ အခြားနေရာတို့တွင် သုံးရေအဖြစ် အသုံးပြုကြပါသည်။ နမူနာကောက်ယူသည့်စခန်းနေရာများမှ pH တန်ဖိုးများသည် ထိုင်း နိုင်ငံ မြေအောက်ရေ အရည်အသွေး နှင့် မြန်မာနိုင်ငံ အမျိုးသား သောက်သုံးရေ အရည် အသွေး စံနှုန်းများကို ကျော်လွန်သွားကြောင်း တွေ့ရှိခဲ့ပါသည်။

၁.၅.၂ *ဇီဝဆိုင်ရာ အစိတ်အပိုင်းများ*

၁.၅.၂.၁ *ဂေဟဒေသ*

မြန်မာနိုင်ငံတောင်ပိုင်းကို မြန်မာကမ်းရိုးတန်းမိုးသစ်တောများ၊ ဧရာဝတီရေချိုရေဝမ်းသစ်တောများ၊ မြန်မာနိုင်ငံ ကမ်းရိုးတန်းဒီရေတောများ၊ တနင်္သာရီ - ထိုင်းတောင်ပိုင်း Semi Evergreen မိုးသစ်တော နှင့် မီဇိုရမ်-မဏိပူရ-ကချင် မိုး သစ်တောများ ဖြစ်ကြသည့် ဂေဟဒေသ လေး (၅) ခုကို ပိုင်းခြားကိုယ်စားပြုပါသည်။

၁.၅.၂.၂ *မြေမျက်နှာသွင် နှင့် သဘာဝပေါက်ပင်ဆိုင်ရာ ယေဘုယျဖော်ပြချက်*

တနင်္သာရီတိုင်းဒေသကြီးတွင် စတုရန်းကီလိုမီတာ ၄၃,၃၄၄ (စတုရန်းမိုင် ၁၆,၇၃၆) ရှိ နယ်မြေဧရိယာ နှင့် အမြဲစိမ်းတောဖြင့် ဖုံးလွှမ်းနေသည့် ဧရာမမြေနေရာရှိပါသည်။ တနင်္သာရီသည် နှစ်စဉ် မိုးရေချိန် မီလီမီတာ ၃,၀၀၀ မှ ၄,၀၀၀ ရရှိပြီး၊ ပုံမှန်အားဖြင့် မေလ မှ အောက်တိုဘာလအထိ မိုးရွာသွန်းပါသည်။

ပြည်မကမ်းရိုးတန်းအရှည်မှာ ကီလိုမီတာ ၁,၂၀၀ ခန့် *ရှိပါသည်။*

စီမံကိန်းနယ်မြေဧရိယာတွင် လူသိများသော မြစ်အချို့မှာ မရမ်း မြစ်၊ ထားဝယ်မြစ်၊ မဲခီ မြစ် နှင့် ဇင်းဘာမြစ် တို့ဖြစ်ကြသည်။ ကိုတမာ ချောင်း၊ နတ်ကြီးစင် ချောင်း၊ ကျောက်လုံးကြီးချောင်း နှင့် ပသီ ချောင်း တို့ကဲ့သို့သော အချို့ချောင်းများမှာ ကျားများ အပါအဝင် တောရိုင်းတိရိစ္ဆာန်များအတွက် အရေးပါသည်။ လာသည့်နယ်မြေဧရိယာနှင့်နီးကပ်သည့် လူသိများသော တောင်များတွင် သစ်ခတောင်၊ မရမ်း တောင်၊ နဟိ တောင်၊ ဘန်းနီ တောင်၊ မဲခီ တောင် နှင့် မလွဲ တောင်တို့ ပါဝင်သည်။

၁.၅.၂ *သစ်တောအမျိုးအစားများ နှင့် ပို့နှုံမှု*

"တနင်္သာရီ သဘာဝဘေးမဲ့တော" သည် ဟိန်းဇဲ နှင့် ကလိန်အောင် ထိန်းသိမ်းရေးသစ်တောများအတွင်း ကျရောက်ပါသည်။ ထိန်းသိမ်းရေးတောများသည် တနင်္သာရီသစ်တောဒေသ၏ လတ္တီတွဒ် 97° 55' and 98° 30' နှင့် 14° 30' မြောက်၊ နှင့် လောင်ဂျီတွဒ် 97° 55' နှင့် 98° 30' အရှေ့တို့အကြားတွင် တည်ရှိပါသည်။ ထိန်းသိမ်းရေးတောများသည် အရှေ့ဘက်မြန်မာ/ ထိုင်းနယ်နိမိတ်လိုင်းဖြင့် နယ်နိမိတ်ခြားထားပါသည်။ ဟိန်းဇဲ နှင့် ကလိန်အောင် ထိန်းသိမ်း ရေးတောနယ်မြေရေိယာသည် စတုရန်းမိုင် ၆၁၄ မိုင်ခန့် ရှိပါသည်။

ထို့ပြင်၊ စီမံကိန်းနယ်မြေရေိယာအတွင်း အပင်မျိုးစိတ် သုံးရာ့ခြောက်ဆယ်ခြောက် (၃၆၆) မျိုးကို မှတ်တမ်းယူခဲ့ပါသည်။ ၎င်းတို့အများစုမှာ သစ်ပင် (မျိုးစိတ် ၁၁၇ မျိုး သို့မဟုတ် ၃၂%)၊ ချဉ် (မျိုးစိတ် ၆၃ မျိုး သို့မဟုတ် ၁၇%)၊ ဆေးဘက်ဝင်အပင် (မျိုးစိတ် ၅၁ မျိုး သို့မဟုတ် ၁၄%) နှင့် သစ်ပင်ငယ် (မျိုးစိတ် ၃၅ မျိုး သို့မဟုတ် ၉.၅%) နှင့် ၎င်းတို့ထဲမှ ခြောက် (၆) မျိုးမှာ မျိုးသုဉ်းပျောက်ကွယ်နိုင်သော အပင်မျိုးစိတ်များကို တွေ့ရှိရပါသည်။

၁.၅.၂.၄ *အဓိကအရေးကြီးသော ဇီဝမျိုးစုံမျိုးကွဲ နယ်မြေရေိယာများ (KBA)*

စီမံကိန်းနယ်မြေရေိယာ နှင့် ကြားခံဇုန် ကီလိုမီတာ ငါးဆယ် (၅၀) တို့သည် အောက်ပါ KBA ခုနှစ် (၇) ခုကို ဖြတ်သွားကြပါသည် -

- တနင်္သာရီသဘာဝဘေးမဲ့တော (မြန်မာနိုင်ငံအတွင်း)၊
- မော်စကိုကျွန်း(မြန်မာနိုင်ငံအတွင်း)၊
- မြင့်မိုရ်လက်ခတ်(မြန်မာနိုင်ငံအတွင်း)၊
- စိုင်းယော့ (Sai Yok) (ထိုင်းနိုင်ငံအတွင်း)၊
- သီရိနကာရင် (Sri Nakarin) (ထိုင်းနိုင်ငံအတွင်း)၊
- လန်ခလောင်း ငူ (Lam Khlong Ngu) (ထိုင်းနိုင်ငံအတွင်း)၊ နှင့်
- ခေါင်လဲ (Khao Laem) (ထိုင်းနိုင်ငံအတွင်း)။

၁.၅.၂.၄ (၁) *ထိန်းသိမ်းကာကွယ်ထားသောနယ်မြေရေိယာများ (PA)*

စီမံကိန်းနယ်မြေရေိယာ နှင့် ကြားခံဇုန် ကီလိုမီတာ ငါးဆယ် (၅၀) တို့သည် အောက်ပါ PA ခုနှစ် (၇) ခုကို ဖြတ်သွားကြပါသည် -

- တနင်္သာရီသဘာဝဘေးမဲ့တော (မြန်မာနိုင်ငံအတွင်း)၊
- မော်စကိုကျွန်းတောရိုင်းဘေးမဲ့တော (မြန်မာနိုင်ငံအတွင်း)၊
- စိုင်းယော့ (Sai Yok) အမျိုးသား ပန်းခြံ (ထိုင်းနိုင်ငံအတွင်း)၊
- ခူအန်သီရိနကာရင် (Khuen Sri Nakarin) အမျိုးသားဥယျာဉ် (ထိုင်းနိုင်ငံအတွင်း)၊
- သုန်းဖဖန်း (Thong Pha Phum) အမျိုးသားဥယျာဉ် (ထိုင်းနိုင်ငံအတွင်း)၊
- ခလောင်း လန်ငူ (Khlong Lamngu)Khlong Lamngu အမျိုးသားဥယျာဉ် (ထိုင်းနိုင်ငံအတွင်း)၊ နှင့်
- ခေါင်လဲ (Khao Laem) အမျိုးသားဥယျာဉ် (ထိုင်းနိုင်ငံအတွင်း)။

၁.၅.၂.၄ (၂) အရေးပါသော ဌက်များ နှင့် ဇီဝမျိုးစုံမျိုးကွဲနယ်မြေရိယာ (IBA)

အရေးပါသော ဌက် နှင့် ဇီဝမျိုးစုံမျိုးကွဲ နယ်မြေဧရိယာ (IBA) သည် ဌက်ကောင်ရေး ထိန်းသိမ်းရေးအတွက် ကမ္ဘာလုံးဆိုင်ရာအရေးပါသည့် နယ်မြေဧရိယာဖြစ်ပါသည်။ အနီးဆုံး IBA သည် ခေါင်လဲ (Khao Laem) အမျိုးသားဥယျာဉ် ဖြစ်ပြီး ၁၄၈,၄၅၁ ဟက်တာ ရှိပါသည်။ ငါးဆယ် (၅၀) ကီလိုမီတာရှိ ကြားခံဇုန်အတွင်းရှိသည့် ကျန်ရှိသော IBA များမှာ ခူအန်သီရိနကာရင် (Khuen Sri Nakarin) အမျိုးသားဥယျာဉ်ဖြစ်ပြီး၊ ၁၈၄,၂၆၆ ဟက်တာ ရှိပါသည်။

၁.၅.၂.၄ (၄) ကျားထိန်းသိမ်းရေးမြေယာရှုခင်းများ

စီမံကိန်းနယ်မြေဧရိယာအတွင်း တည်ရှိသော တနင်္သာရီသဘာဝဘေးမဲ့တောသည် မျိုးသုဉ်းမှု ပပျောက်ရေးနေရာ မဟာမိတ် (AZE) အဖြစ် ဖော်ထုတ်သတ်မှတ်ခဲ့ပြီး၊ ဤအဆင့်အတန်းကို ဖြစ်ပေါ်စေသည့် မျိုးစိတ်များတွင် ကျား (*Panthera tigris*) နှင့် ဖားအမျိုးအစားတစ်မျိုး (*Ansonia thinthinae*) တို့ ပါဝင်ကြပါသည်။

၁.၅.၂.၅ ဒေသရင်း ဌက်မျိုး နယ်မြေဧရိယာများ

ဒေသရင်းဌက်နယ်မြေဧရိယာများ (EBAs) တို့မှာ နှစ်မျိုး သို့မဟုတ် နှစ်မျိုးထက်ပိုသော တားမြစ်အပိုင်းအခြား ဌက်မျိုးစိတ် ပုံနှံမှုရှိသည့် ဌက်ဒေသရင်းမျိုး သဘာဝနယ်မြေဧရိယာများကို ကိုယ်စားပြုသည့် ဒေသများ ဖြစ်ကြသည်။ တားမြစ်အပိုင်းအခြားသည် စတုရန်းကီလိုမီတာ ၅၀,၀၀၀ ထက်မပိုသော မွေးဖွားမှုအပိုင်းအခြားကို ဆိုလိုပါသည်။ စီမံကိန်းနယ်မြေဧရိယာ သို့မဟုတ် ငါးဆယ် (၅၀) ကီလိုမီတာ ကြားခံဇုန် အတွင်း EBAs များမရှိပါ။ စီမံကိန်းနယ်မြေဧရိယာနှင့် အနီးဆုံး EBA မှာ ဧရာဝတီကွင်းပြင်များဖြစ်ပြီး၊ သုံးရာခြောက်ဆယ် (၃၆၀) ကီလိုမီတာခန့် ကွာဝေးကာ၊ စုစုပေါင်း ဧရိယာမှာ စတုရန်းကီလိုမီတာ ၁၆၀,၀၀၀ ရှိပါသည်။

၁.၅.၂. ၆ *ကျားထိန်းသိမ်းရေးမြေယာရှုခင်းများ (TCL)*

ကြီးမားသော TCL တစ်ခုသည် မြန်မာနိုင်ငံအတွင်း ရှိပြီး၊ အလယ်ဗဟိုမှ တောင်ပိုင်းဒေသများအထိ ဖြတ်ဆင်းကျယ်ပြန့်သွားပါသည်။ ဤ TCL မှာ နိုင်ငံများအကြားဖြစ်သွားပြီး၊ ထိုင်းနိုင်ငံ၏ အနောက်ပိုင်းနယ်နိမိတ်နယ်မြေဧရိယာများ ပါဝင်သည်။ စီမံကိန်းသည် ၎င်း TLC အတွင်း ကျရောက်ပါသည်။

၁.၅.၂. ၇ *သစ်တော နှင့် သဘာဝပေါက်ပင်များ*

မြန်မာနိုင်ငံသည် ၎င်း၏ ရာသီဝတုမျိုးစုံမှုကြောင့် သစ်တောများထူထပ်သည်။ သစ်တောများ သည် ဒီရေဝပ်နေရာများမှ ပင်လယ်ရေမျက်နှာပြင်အထက်အမြင့် ပေ ၁၂,၀၀၀ အထိ နေရာ များတွင် ပေါက်ရောက်ကြပါသည်။ သစ်တောအမျိုးအစားများမှာ ရာသီဥတု၊ မြေမျက်နှာ သွင်ပြင်၊ မြေကြီး နှင့် အခြားအကြောင်းအရာများဖြစ်သော ရေချို၊ ရေငန်စသည်တို့အပေါ် မူတည်ပါသည်။ မြန်မာနိုင်ငံရှိ အဓိကသစ်တောအမျိုးအစား ရှစ် (၈) မျိုးကို ဖော်ထုတ်ခဲ့ပြီး၊ အောက်တွင် တင်ပြထားပါသည် -

- ဒီရေသစ်တောများ၊
- ကမ်းခြေ နှင့် သဲခုံ သစ်တောများ၊
- ရေဝပ်သစ်တောများ၊
- အမြဲစိမ်းသစ်တောများ၊
- ရောနှော ရွက်ပြတ်သစ်တောများ၊
- ခြောက်သွေ့သစ်တော၊
- ရွက်ပြတ် Dipterocarp (အင်တိုင်း) သစ်တောများ၊ နှင့်
- တောင်ကုန်း နှင့် အပူအအေးမျှသော အမြဲစိမ်း သစ်တော။

၁.၅.၂. ၈ *တောရိုင်းသက်ရှိသတ္တဝါများ*

သတ္တဝါကြီး မျိုးစိတ် ဆယ့်နှစ် (၁၂) မျိုးကို တွေ့ရှိခဲ့ရပြီး၊ ၎င်းတို့ထဲမှာ လေးမျိုးဖြစ်ကြသည့် ဆင် (*Elephas maximus*)၊ ကျား (*Panthera tigris*)၊ စိုင် (*Bos javanicus*) နှင့် မလေးဝက်ဝံ (*Helarctos Malayanus*)တို့မှာ မျိုးသုဉ်းပျောက်ကွယ်လု (E) စာရင်းဝင်ပြီး၊ ငါး (၅) မျိုးမှာ အားနွဲ့သော (V)၊ တစ် (၁) မျိုးမှာ မျိုးသုဉ်း ပျောက်ကွယ်လု နီးပါး (NT) နှင့် နှစ် (၂) မျိုးမှာ IUCN အနီရောင်စာရင်း မဝင်ကြပါ။

စုစုပေါင်း နို့တိုက်သတ္တဝါငယ် မျိုးစိတ် လေးဆယ့်လေး (၄၄) မျိုးကို မှတ်တမ်းယူခဲ့ပါသည်။ နို့တိုက်သတ္တဝါငယ်အများစုမှာ IUCN အနီရောင်စာရင်း မဝင်ကြပါ။ မျိုးစိတ် နှစ် (၂) မျိုးဖြစ်ကြသည့် သင်းခွေချပ် (*Manis javanica*) နှင့် မျောက်လွှဲကျော် (*Hylobates lar*) တို့မှာ မျိုးသုဉ်းပျောက်ကွယ်လု မျိုးစိတ်များ ဖြစ်ကြပြီး၊ သမင်ကြီး (Mouse deer Tragulus napu) မှာ မျိုးသုဉ်း ပျောက်ကွယ်လု နီးပါး မျိုးစိတ် စာရင်းဝင် ဖြစ်ကြသည်။

စုစုပေါင်း တွားသွားသတ္တဝါ မျိုးစိတ် ဆယ့်ရှစ် (၁၈) မျိုး နှင့် ကုန်းနေရေနေသတ္တဝါ မျိုးစိတ် ဆယ့်သုံး (၁၃) မျိုးကို မှတ်တမ်းယူခဲ့ပါသည်။

သုံးဆယ့်ခုနှစ် (၃၇) မျိုးရင်း နှင့် ကိုးဆယ့်သုံး (၉၃) မျိုးစု တို့တွင် အကျုံးဝင်သည့် စုစုပေါင်း ငှက်မျိုးစိတ် တစ်ရာငါးဆယ့်ကိုး (၁၅၉) မျိုးကို မှတ်တမ်းယူခဲ့ပါသည်။

၁.၅.၂.၉ ရေရှိ ဂေဟဗေဒ

လေ့လာသည့်ကာလအတွင်း ငါးနမူနာရလဒ်များမှ စုစုပေါင်း အရှည် ၇.၄-၂၂ စင်တီမီတာ နှင့် ကိုယ်အလေးချိန် ၅-၁၀၀ ဂရမ် ရှိသည့် စုစုပေါင်း ငါးမျိုးစိတ် ရှစ် (၈) မျိုးကို တွေ့ရှိခဲ့ပါသည်။

ထို့ပြင်၊ ငန်ရိရိရေ စခန်းများ (Wharf နှင့် Heinze တံထား) ၌ ဖိုင်တိုမျောလှေး (phytoplankton) နှင့် သတ္တမျောလှေး (zooplankton) များ တွေ့ရှိရမှုမှာ ရေချိုစခန်း နေရာများထက် ပိုများပါသည်။ ဖိုင်တိုမျောလှေး (phytoplankton) ပုံမှန်သိပ်သည်းမှုမှာ ကုဗမီတာတစ်ခုတွင် ၁,၅၂၄,၉၈၃ ဆဲလ်တို့ရှိကြပြီး၊ သတ္တမျောလှေး (zooplankton) မှာ ကုဗမီတာတစ်ခုတွင် ၉၃,၆၂၂ ဆဲလ်တို့ ရှိကြသည်။

ရေအောက်ကြမ်းပြင်နေငါးနမူနာများအရ ပုံမှန်သိပ်သည်းမှုမှာ စတုရန်းမီတာတစ်ခုတွင် ခြောက်ဆယ့်သုံး (၆၃) ကောင်ခန့်ရှိကြသည်။

၁.၅.၃ လူမှုဆိုင်ရာအစိတ်အပိုင်းများ

၁.၅.၃.၁ မြေဖွားခြင်း၊ သေဆုံးခြင်းလေ့လာချက်

စီမံကိန်းတွင် တနင်္သာရီတိုင်းဒေသကြီး၊ ထားဝယ်ခရိုင်၊ ရေဖြူမြို့နယ်၌ ကျေးရွာ ခြောက် (၆) ရွာ တို့ပါဝင်ခဲ့ပါသည်။ ၎င်းတို့မှာ ဓမင်းဆိပ် (Daminseik)၊ ဖောင်တော်၊ ကေင်းမှူး၊ အုန်းပင် ကွင်း၊ မိဂျောင်းအိုင် (Mighaungaing) နှင့် ရှင်ပျံ (Shinbyan) ကျေရွာတို့ ဖြစ်ကြသည်။ ကျေးရွာများတွင် ဗမာ၊ မွန် နှင့် ကရင်လူမျိုးတို့ကဲ့သို့သော တိုင်းရင်းသားမျိုးစုံ ရှိကြပါသည်။ ကျေးရွာအများစုတွင် အလုပ်လုပ်ကိုင်သော အသက်ရွယ်ရှိ

အမျိုးသမီးအများစုရှိကြပါသည်။ အိမ်အဆောက်အအုံပုံစံများမှာ များသောအားဖြင့် ကြမ်းပြင်အမြင့်ရှိ တစ်ထပ်အဆောက် အအုံဖြစ်ကြပြီး၊ သဘာဝထွက် ပစ္စည်းများဖြင့် တည်ဆောက်ထားခြင်း ဖြစ်ကြပါသည်။

၁.၅.၃.၂ *လူမှု-စီးပွား*

ဒေသရှိ တွေ့ရအများဆုံး အသက်မွေးလုပ်ငန်းများမှာ လယ်ယာလုပ်ကိုင်ခြင်း၊ နေ့စားလုပ်ခြင်း၊ နှင့် လက်လီရောင်းချခြင်းတို့ ဖြစ်ကြသည်။ အဓိက ဝင်ငွေရသော သီးနှံများမှာ သစ်သီးများ၊ အုန်းသီးများ၊ ကွမ်းသီးများ၊ သီဟိုဠ်သရက်၊ ဆန်စပါး နှင့် ရော်ဘာတို့ ဖြစ်ကြသည်။ ခြံမွေးတိရိစ္ဆာန်လုပ်ငန်းများကိုလည်း တွေ့နိုင်ပါသည်။

၁.၅.၃.၃ *အခြေခံအဆောက်အအုံ နှင့် အသုံးဝန်ဆောင်လုပ်ငန်းများ*

ကျေးရွာအများစုအတွက် ရေ နှင့် လျှပ်စစ်မီးအဓိကရင်းမြစ်များမှာ ရေတွင်းများ နှင့် ဒီဇယ်သုံးစက်များ အသီးသီးဖြစ်ကြပါသည်။ ကျေးရွာအများစုမှာ ရေသန့်စင်ရေးနေရာအဆောက်အအုံ မရှိကြပါ။ ကျေးရွာတစ်ရွာစီတွင် အနည်းဆုံး ကျောင်း နှင့် ကျန်းမာရေးနေရာအဆောက်အအုံ တစ် (၁) ခုစီကို တွေ့ရှိနိုင်ပါသည်။ ကျေးရွာများအားလုံးသည် လမ်းများဖြင့် ချိတ်ဆက်မှုတို့ ရှိကြသော်လည်း၊ လမ်းများမှာ မြေသားလမ်းများ ဖြစ်ကြပါသည်။ ကျေးရွာသူ/သားများသည် များသောအားဖြင့် ခြေကျင်၊ ဆိုင်ကယ် နှင့် ဘတ်စ်ကားများဖြင့် ခရီးသွားကြသည်။

၁.၅.၃.၄ *ငါးဖမ်းလုပ်ငန်း*

တနင်္သာရီတိုင်းဒေသကြီးသည် မြန်မာနိုင်ငံ၌ အဓိကငါးဖမ်းလုပ်ငန်းအလုပ်ကိုင်ဆုံး နယ်မြေများ ထဲမှ နယ်မြေတစ်ခုဖြစ်ပြီး၊ အထူးသဖြင့် ဒေသကမ်းရိုးတန်းတစ်လျှောက် ကမ်းနီးငါးဖမ်းရေယာဉ် ၁၀,၀၀၀ ကျော် နှင့် ကမ်းဝေးငါးဖမ်းရေယာဉ် ၁,၂၀၀ ကျော် အသီးသီး ရှိကြပါသည်။ ရရှိသောငါးများကို မြန်မာနိုင်ငံအတွင်း ဖြန့်ဝေပြီး၊ အချို့ကိုလည်း ထိုင်းနိုင်ငံဘက်သို့ တင်ပို့ကြပါသည်။ အဓိက ငါးလုပ်ငန်းထွက်ကုန်များမှာ ငါးခြောက်၊ ပုစွန်ခြောက်၊ ပုစွန်ဆိတ်ခြောက် နှင့် မျှင်ငပိတို့ဖြစ်ကြသည်။

ထို့ပြင်၊ ဒေသတွင်း အရည်အသွေးမြင့် ပုလဲထုတ်လုပ်ခြင်းသည်လည်း လူသိများကြပါသည်။ ၁၉၅၄ ခုနှစ်တွင် မြန်မာနိုင်ငံအစိုးရ နှင့် ဂျပန်နည်းပညာရှင်များသည် မြိတ်ကျွန်းစုတွင် ပုလဲထုတ်လုပ်မှုကို စတင်ခဲ့ပြီး ဒေသတွင်းသို့ ပျံနှံ့သွားပါသည်။

၁.၆ *ဖြစ်ပေါ်လာနိုင်သည့် အဓိက သက်ရောက်မှုများ နှင့် လျော့ချရေး အစီအမံများ တင်ပြခြင်း*

ဆောင်ရွက်လည်ပတ်နေသည့် စီမံကိန်းလုပ်ငန်းများမှ ဖြစ်ပေါ်လာနိုင်သည့် အဓိက အရေးကြီးသော ထိခိုက်မှုများ နှင့် အဓိကလျော့ချရေး အစီအမံများ၏ အနှစ်ချုပ်ကို ***ဇယား ၁-၂*** တွင်ဖော်ပြထားသည်။ ၄င်းဖော်ပြချက်များသည် အဓိကအရေးပါဆုံးသော ထိခိုက်မှုများနှင့် လျော့ချရေးအစီအမံများကို အကျဉ်းချုံးထားသည့် ဖော်ပြချက်သာ ဖြစ်သည်။ လုပ်ငန်းတစ်ခုစီတိုင်းမှ ဖြစ်ပေါ်လာနိုင်သည့် သက်ရောက်မှုများ၏ အသေးစိတ် ဖော်ပြချက်များကိုမူ ***အခန်း(၆)*** တွင် ဖော်ပြထားပြီး သက်ရောက်မှုတစ်ခုစီတိုင်းအတွက် လျော့ချရေး အစီအမံများစာရင်းကိုမူ ***အခန်း(၇)*** တွင် ဖော်ပြထားသည်။

ဖော်ထုတ်သတ်မှတ်ထားသည့် လျော့ချရေး အစီအမံများများကို ထိခိုက်မှုများ၏ ဖြစ်နိုင်ခြေကို လျော့ချရန် နှင့်/သို့မဟုတ် ထိခိုက်မှုဖြစ်ပွားလျှင် ၎င်း၏ အတိုင်းအတာပမာဏ သို့မဟုတ် ပြင်းထန်မှု ကိုကန့်သတ်ရန် အသုံးပြုသည်။ အဆိုပြုလျော့ချရေးအစီအမံများ၏ ရည်ရွယ်ချက်မှာ ဖော်ထုတ်သတ်မှတ်ထားသည့် ထိခိုက်နိုင်မှုများကို စီမံခန့်ခွဲရန်၊ နည်းဥပဒေများကို လိုက်နာရန် နှင့် စီမံကိန်းလုပ်ငန်းများအား အကောင်အထည် ဖော်ဆောင်နေစဉ်အတွင်း နိုင်ငံတကာ စက်မှုလုပ်ငန်းဆိုင်ရာ အလေ့အကျင့်များ၏ စံချိန်စံညွှန်းများကို လိုက်နာကျင့်သုံးကြောင်းသေချာစေရန် ဖြစ်ပါသည်။

ဖော်ထုတ်သတ်မှတ်ထားသည့် ဖြစ်နိုင်ခြေရှိသော ထိခိုက်မှုများအားလုံးသည် အဆိုပါ လျော့ချရေး အစီအမံများကို အကောင်အထည်ဖော်ဆောင်ခြင်းဖြင့် သင့်တော်စွာ စီမံခန့်ခွဲနိုင်မည်ဖြစ်ပြီး၊ စီမံကိန်းလုပ်ငန်းများမှ အရေးကြီးသောထိခိုက်မှုများ ရှိမည်မဟုတ်ကြောင်း မှတ်သားသင့်ပါသည်။

ဇယား (၁.၂) ဖြစ်ပေါ်လာနိုင်သည့် အဓိက သက်ရောက်မှုများ နှင့် လျော့ချရေး အစီအမံများ တင်ပြခြင်း

ကဏ္ဍ	ဖြစ်ပေါ်လာနိုင်သော သက်ရောက်မှုများ	လျော့ချရေး အစီအမံများ
၁။ လေထု အရည်အသွေး	၁.၁။ ဖုန်မှုန့်ထုတ်လွှတ်မှုများမှ လေထု အရည်အသွေးအပေါ် ဆိုးရွားစေခြင်း	၁.၁.၁။ စီမံကိန်းသို့သွားရာလမ်းများတွင် မြန်နှုန်းကန့်သတ်ချက်များ စိုက်ထူခြင်းနှင့် ယာဉ်မြန်နှုန်းကန့်သတ်ချက်များကို လိုက်နာစေခြင်း
		၁.၁.၂။ လမ်းဆိုးရွားစေမှု နှင့် ဖုန်မှုန့်ထွက်ရှိမှုတို့ကို ရှောင်ကြဉ်ရန် လမ်ကြောင်းများ နှင့် သွားလာသည့်လမ်းများကို ထိန်းသိမ်းပြုပြင်ခြင်း
	၁.၂။ ဒီဇယ်လောင်စာ လောင်ကျွမ်းမှုထုတ်လွှတ်ခြင်းမှ လေထု အရည်အသွေးအပေါ် ဆိုးရွားစေခြင်း	၁.၂.၁။ ထုတ်လုပ်သူက အကြံပြုပေးထားသည့် ထိန်းသိမ်းပြုပြင်မှု အချိန်ဇယားနှင့်အညီ စက်များ နှင့် ယာဉ်များ အားလုံးကို စနစ်တကျထိန်းသိမ်းပြုပြင်ဆောင်ရွက်ပေးခြင်း
	၁.၃။ ZBV1 နှင့် ZBV2 တို၌ ပိုက်လိုင်း၏ ဗားခလုတ်များ၊ အကွပ်များ နှင့် ကြိုးကြား ကြိုးကြား လေဝင်လေထွက်ပေါက်တို့မှ လည်ပတ်ရေးကာလအတွင်း ဖိအားသုံး ကိရိယာများမှ ယိုစိမ့်မှုကြောင့် ထုတ်လွှတ်မှုများ (fugitive emissions)	၁.၃.၁။ ဖိအားသုံး ကိရိယာများမှ ယိုစိမ့်မှုကြောင့် ထုတ်လွှတ်မှုများ (fugitive emissions) ကို ထိန်းချုပ်ရန် လည်ပတ်ရေး အဆင့်ကာလအတွင်း စစ်ဆေးခြင်း နှင့် ထိန်းသိမ်းပြုပြင်ခြင်းအစီအစဉ်တို့ကို အကောင်အထည်ဖော်သွားမည် ဖြစ်ပါသည်။
၂။ ဆူညံသံ	၂.၁။ ယာဉ်များ နှင့် စက်များအသုံးပြုမှု ကြောင့် ဆူညံသံ ကြီးထွားလာခြင်း	၂.၁.၁။ ဒီဇယ်/ဓာတ်ငွေ့ဖြင့် မောင်းနှင်သည့် စက်များနှင့် ပတ်သက်၍ နားအကာအကွယ်များကို အသုံးပြုစေခြင်း
		၂.၁.၂။ ထုတ်လုပ်သူက အကြံပြုပေးထားသည့် ထိန်းသိမ်းပြုပြင်မှု အချိန်ဇယားနှင့်အညီ စက်များ နှင့် ယာဉ်များ အားလုံးကို စနစ်တကျထိန်းသိမ်းပြုပြင်ဆောင်ရွက်စေခြင်း
		၂.၁.၃။ ဖြစ်နိုင်လျင် နေ့ခင်းအချိန်တွင် ဆူညံသံထွက်သည့် လုပ်ငန်းများကို ကန့်သတ်ခြင်း

ကဏ္ဍ	ဖြစ်ပေါ်လာနိုင်သော သက်ရောက်မှုများ	လျော့ချရေး အစီအမံများ
၃။ မီးအလင်း	၃.၁။ ညအချိန်၌ ZOC နှင့် ZMS လည်ပတ်မှုများမှ မီးအလင်းများ တိုးပွား လာခြင်း	၃.၁.၁။ ZOC နှင့် ZMS တို့၌ လုံလောက်သော ညမီးအလင်းရောင်ကို ဆောင်ရွက်ပေးခြင်း ၃.၁.၂။ ညပိုင်းမီးအလင်းရောင်ပေးသည့် ကိရိယာများအတွက် စစ်ဆေးခြင်း နှင့် ထိန်းသိမ်းပြုပြင်သည့် အစီအစဉ်များ
၄။ မြေကြီး၊ မြေပေါ်ရေ၊ မြေအောက်ရေ	၄.၁။ စနစ်မကျသော အိမ်တွင်းသုံး စွန့်ထုတ်ရေ (မိလ္လာရေဆိုး) ဆိုင်ရာ စီမံခန့်ခွဲမှုမှ ညစ်ညမ်းစေခြင်း	၄.၁.၁။ PTTEP မြန်မာ၏ စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှုဆိုင်ရာ လုပ်ထုံးလုပ်နည်း အကောင်အထည် ဖော်ခြင်း
		၄.၁.၂။ လူများအမြဲတမ်းရှိနေသည့်နေရာအဆောက်အအုံများတွင် လက်ရှိ ရှိနေသော အိမ်သာများနှင့် မိလ္လာကန်များကို ထိန်းသိမ်းပြုပြင်ခြင်း
		၄.၁.၃။ အိမ်တွင်းထွက် စွန့်ပစ်ရေများ စွန့်ထုတ်ရာတွင်၊ မြန်မာနိုင်ငံ၏ ပတ်ဝန်းကျင်အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်များ (***ဇယား-၄.၁*** တွင်ကြည့်ပါ) ပါ လုပ်ငန်းအသေးစိတ်ဆိုင်ရာ သတ်မှတ်ချက်များနှင့်အညီ ဖြစ်စေရန် စွန့်ပစ်ရေများအား လုံးကို သန့်စင်ခြင်း
	၄.၂။ အန္တရာယ်မရှိသော၊ အန္တရာယ်ရှိသော စွန့်ထုတ်ပစ္စည်းများကို စနစ်မကျသော သိုလှောင်မှု သို့မဟုတ် စွန့်ထုတ်မှု ဆိုင်ရာ စီမံခန့်ခွဲမှု မှ ညစ်ညမ်းစေခြင်း	၄.၂.၁။ PTTEP မြန်မာ၏ စွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲမှု လုပ်ထုံးလုပ်နည်းကို အကောင်အထည်ဖော် ဆောင်ရွက်ခြင်း

ကဏ္ဍ	ဖြစ်ပေါ်လာနိုင်သော သက်ရောက်မှုများ	လျော့ချရေး အစီအမံများ
	၄.၃။ အန္တရာယ်ရှိသော စွန့်ပစ်ပစ္စည်းများ (ဒီဇယ်၊ သုတ်ဆေး၊ ချောဆီရည်များ၊ ဓာတုပစ္စည်းများ စသည်ဖြင့်) တို့ မတော်တဆ ယိုစိမ့်မှုများကြောင့် ညစ်ညမ်း စေခြင်း	၄.၃.၁။ PTTEP မြန်မာ၏ ယိုဖိတ်မှုဆိုင်ရာ အရေးပေါ်အစီအစဉ် ကို အကောင်အထည်ဖော် ဆောင်ရွက်ခြင်း
		၄.၃.၂။ အန္တရာယ်ရှိသော ပစ္စည်းများ သိုလှောင်မှုကို အနည်းဆုံးဖြစ်အောင် လုပ်ခြင်း
		၄.၃.၃။ ယာဉ်များထိန်းသိမ်းပြုပြင်ထိန်းသိမ်းရာတွင် ဘိလပ်မြေခင်းထားသောမျက်နှာပြင်များပေါ်၌သာ ဆောင်ရွက်ရန် နှင့် ယာဉ်များအောက်တွင် ဆီစုပ်သည့်ခွက်ကို အသုံးပြုခြင်း
		၄.၃.၄။ အန္တရာယ်ရှိသော ပစ္စည်းများကို ဘေးကင်းစွာအသုံးပြုခြင်း နှင့် ကိုင်တွယ်ဆောင်ရွက်ခြင်းတို့နှင့်ပတ်သက်၍ အမှုထမ်းများအား လေ့ကျင့်သင်ကြားပေးခြင်း
		၄.၃.၅။ ယိုဖိတ်မှုရှင်းလင်းရေးဆိုင်ရာ အသင့်ဆောင်ကိရိယာများ နှင့် ယိုဖိတ်မှုကို တုံ့ပြန်သည့် လေ့ကျင့်သင်ကြားမှုများ ဆောင်ရွက်ပေးခြင်း
		၄.၃.၆။ လောင်စာ နှင့် ဓာတု သိုလှောင်မှုနေရာများကို ပုံမှန် စစ်ဆေးခြင်း
		၄.၃.၇။ စိမ့်မဝင်နိုင်သော (ဘိလပ်မြေလောင်းထားသော သို့မဟုတ် ပလတ်စတစ်ခံထားသော) ကြမ်းပြင် နှင့် တာဆည်ထားသောနံရံတို့ရှိသည့် လုံခြုံသော သိုလှောင်နေရာတွင် ဓာတုပစ္စည်းများအားလုံးကို သိုလှောင်ခြင်း
		၄.၃.၈။ သူတို့၏ SDS အရ ဓာတုပစ္စည်းများအားလုံးကို ကိုင်တွယ်ဆောင်ရွက်ခြင်း
၅။ ဂေဟစနစ် နှင့် ဇီဝမျိုးစုံမျိုးကွဲ	၅.၁။ ပတ်ဝန်းကျင်အရင်းအမြစ်များ၊ သဘာဝ ပေါက်ပင်တို့အပေါ်သက်ရောက်မှုနှင့် တောရိုင်း သတ္တဝါများအနှောင့်အယှက် ဖြစ်မှုတို့ကြောင့်နေရင်း ဒေသအရည်အသွေး လျော့ကျစေခြင်း	၅.၁.၁။ စီမံကိန်းနယ်မြေရေယာများကို ရှင်းလင်းစွာ အမှတ်အသားလုပ်ပြီး၊ အနီးဝန်းကျင်မြေပေါ်သို့ လုပ်ငန်းခွင်ပြင်ပ ယာဉ်များ ဝင်ရောက်မှုကို တားမြစ်ခြင်း
		၅.၁.၂။ ရပ်ရွာလူထုပိုင်ဆိုင်မှုများ ဆိုလိုသည်မှာ သစ်တောအရင်းအမြစ်များ၊ မြစ်ချောင်းများ စသည်တို့ကို ဖော်ထုတ်ပြီး၊ လက်လှမ်းမီမှုနှင့်ပတ်သက်၍ ပိတ်ဆို့မှုကို ရှောင်ကြဉ်ရန် သို့မဟုတ် ၎င်းနေရာများသို့ အခြားနည်းလမ်းဖြင့် လက်လှမ်းမီးမှုကို ဆောင်ကြဉ်းပေးရန် စီမံကိန်းလုပ်ငန်းများကို ဆောင်ရွက်ခြင်း

ကဏ္ဍ	ဖြစ်ပေါ်လာနိုင်သော သက်ရောက်မှုများ	လျော့ချရေး အစီအမံများ
		၅.၁.၃။ ထိန်းသိမ်းကာကွယ်ထားသော နယ်မြေဧရိယာများ နှင့် တားမြစ်ထားသော လုပ်ရပ်များနှင့်ပတ်သက်၍ စီမံကိန်းလုပ်သားများ နှင့် ကန်ထရိုက်တာများအား သိမြင်စေရန် ဆောင်ရွက်ပေးခြင်း နှင့် စည်းမျဉ်းများကို ချိုးဖောက်သူမည်သူ့ကိုမဆို ပြင်းထန်သော ပြစ်ဒဏ်များချမှတ်ပေးခြင်း
		၅.၁.၄။ စီမံကိန်းလုပ်သားများအား အမဲလိုက်ခြင်း၊ ထောက်ချောက်ဖြင့်ဖမ်းခြင်း သို့မဟုတ် ငါးဖမ်းခြင်းတို့ကို တားမြစ်ခြင်း
		၅.၁.၅။ ထိခိုက်လွယ်သူများ နှင့် နေရာများ (ဆိုလိုသည်မှာ အမျိုးသမီးများ၊ ကလေးငယ်များ၊ သက်ကြီးရွယ်အိုများ၊ အများပြည်သူသုံးနေရာအဆောက်အအုံများ နှင့် အရင်းအမြစ်များ၊ ထိန်းသိမ်းကာကွယ်ထားသော နယ်မြေဧရိယာများ နှင့် မျိုးသုဉ်းရန်ခြိမ်းခြောက်ခံနေရသော မျိုးစိတ်များ စသည်တို့) ကို သိမြင်မှု နှင့် သင့်တင့်လျောက်ပတ်သော အပြုအမူများဆိုင်ရာ လမ်းညွှန်ချက်များနှင့်ပတ်သက်၍ စီမံကိန်းအမှုထမ်းများကို လေ့ကျင့်သင်ကြားပေးခြင်း
	၅.၂။ ရှားပါး၍ မျိုးသုဉ်းလုနီး မျိုးစိတ်များအပေါ် သက်ရောက်မှု	၅.၂.၁။ မိတ်ဆက်အစီအစဉ်များ၏ အစိတ်အပိုင်းအနေဖြင့် ဒေသနှင့်သက်ဆိုင်သော ရှားပါး၍ မျိုးသုဉ်းနိုင်ခြေရှိသော မျိုးစိတ်များနှင့်ပတ်သက်၍ သိမြင်မှုရှိစေရန် စီမံကိန်းလုပ်သားများအား ဆောင်ရွက်ပေးခြင်း ၅.၂.၂။ ပိုက်လိုင်း ROW အတွင်း ရှားပါးမျိုးသုဉ်းနိုင်သော မျိုးစိတ်များကို မြင်တွေ့ရလျှင် စီမံကိန်းလုပ်ငန်းခွင် မန်နေဂျာထံသို့ အစီရင်ခံစေပြီး၊ ၎င်းမှတစ်ဆင့် နောက်ထပ်ဆောင်ရွက်မှုအတွက် အကြီးတန်းမန်နေဂျာထံသို့ အစီရင်ခံစေခြင်း
		၅.၂.၃။ ရှားပါး၍ မျိုးသုဉ်းနိုင်ခြေရှိသော မျိုးစိတ်များနှင့်ပတ်သက်၍ သက်ရောက်မှုကို စောင့်ကြပ်ကြည့်ရှုစစ်ဆေးရန် ထိခိုက်လွယ်နယ်မြေဧရိယာများတွင် လိုအပ်သလို နောက်ထပ် ဂေဟဆိုင်ရာ စစ်တမ်းများကို ပြင်ဆင်ရေးဆွဲစေခြင်း

ကဏ္ဍ	ဖြစ်ပေါ်လာနိုင်သော သက်ရောက်မှုများ	လျော့ချရေး အစီအမံများ
	၅.၃။ တနင်္သာရီ သဘာဝ ထိန်းသိမ်းရေးနေရာ၌ အလုပ်သမားများ လုပ်ငန်းများသည် အရေးကြီးသော သဘာဝပေါက်ပင်တန်ဖိုးများကို ခြိမ်းခြောက်စေနိုင်ခြင်း	၅.၃.၁။ TNRP ရှိ လမ်းများ အသုံးပြုမှု နှင့် လျှောက်လမ်းများအသုံးပြုမှုတို့နှင့်ပတ်သက်၍ စည်းမျဉ်းစည်းကမ်းများကို လိုက်နာစေခြင်း ၅.၃.၂။ လျှောက်လမ်းများအသုံးပြုခြင်းနှင့်ပတ်သက်၍ သစ်ပင်များခုတ်လှဲမှုကို တားမြစ်ခြင်း ၅.၃.၃။ TNRP စီမံကိန်းကို နှစ်စဉ်ငွေးကြေးဆိုင်ရာထောက်ပံ့ဆောင်ရွက်ပေးခြင်း
၆။ လူမှု-စီးပွား	၆.၁။ ဒေသခံအလုပ်သမားခန့်အပ်မှု အခွင့်အလမ်းများ တိုးပွားလာနိုင်ခြင်း (ကောင်းကျိုး)	၆.၁.၁။ ကျွမ်းကျင်မှု များစွာမလိုအပ်သော၊ ကျွမ်းကျင်မှုများမလိုအပ်သော အလုပ်များ၌ "ပိုက်လိုင်းကြောင့် ထိခိုက် ခံစားရသည့် ရပ်ရွာများ" မှ ဒေသခံများကို ဦးစားပေး ခန့်အပ်ခြင်း
		၆.၁.၂။ သင့်လျော်သော ဒေသခံရင်းမြစ်နေရာများ (ဆိုလိုသည်မှာ မြို့နယ်အလုပ်အသားရုံး၊ ကျေးရွာခေါင်းဆောင်အိမ်၊ ဘုန်းကြီးကျောင်းစသည်တို့) မှ စီမံကိန်းမစတင်မီ ကြိုတင်၍ အလုပ်ခေါ်စာများကို ကြော်ငြာပေးခြင်း
		၆.၁.၃။ လုပ်သားအသစ်များခန့်အပ်မှုမှာ ပွင့်လင်းမြင်သာမှုရှိပြီး၊ အများပြည်သူများ နှင့် ခွဲခြားမှုမရှိစေရန် သေချာအောင်ဆောင်ရွက်ခြင်း
		၆.၁.၄။ ဒေသခံများအတွက် ကျွမ်းကျင်မှုများ နှင့် လေ့ကျင့်သင်ကြားမှုများဆိုင်ရာ အခွင့်အလမ်းများကို ဆောင်ရွက်ပေးခြင်း
	၆.၂။ ဒေသခံထံမှဝယ်ယူမှုအခွင့်အလမ်းများ တိုးပွားလာနိုင်ခြင်း (ကောင်းကျိုး)	၆.၂.၁။ ဒေသခံ နှင့် နိုင်ငံသားစီးပွားရေးလုပ်ငန်းများထံမှ ဝယ်ယူမှုကို ကြေငြာ၍ ဦးစားပေးခြင်း
		၆.၂.၂။ ကျင့်ဝတ်ဆိုင်ရာ အပြုအမူအနေထိုင် နှင့် စီမံကိန်းနေရာအဆောက်အအုံများအတွက် လုံခြုံရေးရှိရန် ခန့်အပ်သည့် သင့်လျော်သောအစောင့်များထားရှိခြင်းအပါအဝင် လုပ်သားများအား မိတ်ဆက်လေ့ကျင့်သင်ကြားမှု၏ အစိတ်အပိုင်းအ ဖြင့် ဒေသရှိလေ့ နှင့် ရိုးရာတို့ကို သိမြင်မှုရှိစေရန် ဆောင်ရွက်ပေးခြင်း

ကဏ္ဍ	ဖြစ်ပေါ်လာနိုင်သော သက်ရောက်မှုများ	လျော့ချရေး အစီအမံများ
၇။ အများပြည်သူပါဝင်မှု နှင့် ရပ်ရွာလူထုနှင့်ဆက်ဆံရေး	၇.၁။ စီမံကိန်းအကျိုးအမြတ်များကို တိုးပွားစေခြင်း	၇.၁.၁။ ဒေသလုပ်ငန်းများကို အထောက်အကူဖြစ်စေရန် CSR အစီအစဉ်များအကောင်အထည်ဖော်မှုကို ဆက်လက်ဆောင်ရွက်ခြင်း (နောက်ဆက်တွဲ-ဂ) - စီမံကိန်းနယ်မြေရေိယာအတွင်း ရှိလျှင် NGO များနှင့် ပူးပေါင်းဆောင်ရွက်လျက် ဒေသခံ နှင့် ဌာနေတိုင်းရင်းသား ရပ်ရွာများ၏ လိုအပ်ချက်များကို ဖြည့်ဆည်းပေးမည့် လက်ရှိ ဆောင်ရွက်နေသော ဖွံ့ဖြိုးရေးအစီအစဉ်များကို စတင်ခြင်း သို့မဟုတ် အထောက်အကူပေးခြင်း။ ဖွံ့ဖြိုးရေးအစီအစဉ်နမူနာများတွင် ငွေစုငွေချေးအစီအစဉ်များ၊ ဘာသာစကားပညာရေးအစီအစဉ်များ၊ ကျန်းမာရေး နှင့် အာဟာရအစီအစဉ်များ၊ ရေ နှင့် သန့်ရှင်းရေး အစီအစဉ်များ စသည်တို့ ပါဝင်ကြပါသည်။
	၇.၂။ လူမှုဆိုင်ရာ တင်းမာမှုများ/ပဋိပက္ခများ	၇.၂.၁။ PTTEP ၏ အကြံပြုတိုင်ကြားရေးဆိုင်ရာလမ်းညွှန်အရ ရပ်ရွာလူထုက အကြံပြု တိုင်ကြားရေးဆိုင်ရာစနစ်ကို အကောင်အထည်ဖော်ဆောင်ရွက်ခြင်း ၇.၂.၂။ ကိစ္စရပ်များကို လျင်မြန်စွာ ဖြေရှင်းဆောင်ရွက်နိုင်ရန် အနီးဆုံးရပ်ရွာလူထု နှင့် ထိခိုက်လွယ် နေရာများ/လူများနှင့် မကြာခဏ ဆက်သွယ်ဆောင်ရွက်ခြင်း
၈။ ရေနံ နှင့် ဓာတုပစ္စည်းများ မတော်တဆ ယိုဖိတ်မှုများ နှင့် ယိုစိမ့်မှုများ	၈.၁။ အောက်ပါတို့အပါအဝင် အမျိုးမျိုးသော သက်ရောက်နိုင်မှုများ - • မြေပေါ်ရေ၊ မြေအောက်ရေ၊ ပင်လယ်ရေ၊ မြေကြီး နှင့်/သို့မဟုတ် နုန်းတို့အပေါ် ညစ်ညမ်းစေနိုင်ခြင်း • အစားအစာ ရင်းမြစ်များ (သီးနှံများ၊ ပင်လယ်စာ၊ ခြံမွေးတိရိစ္ဆာန်)၊ ဇီဝမျိုးစုံမျိုးကွဲ စသည်တို့အပေါ် တစ်ဆင့်ခံ သက်ရောက်နိုင်ခြင်း	၈.၁.၁။ PTTEP မြန်မာ၏ ယိုဖိတ်မှုဆိုင်ရာ အရေးပေါ်အစီအစဉ်ကို အကောင်အထည်ဖော် ဆောင်ရွက်ခြင်း ၈.၁.၂။ အန္တရာယ်ရှိသော ပစ္စည်းများ သိုလှောင်မှုကို အနည်းဆုံးဖြစ်အောင် လုပ်ခြင်း ၈.၁.၃။ ယာဉ်များထိန်းသိမ်းပြုပြင်ထိန်းသိမ်းရာတွင် ဘိလပ်မြေခင်းထားသောမျက်နှာပြင်များပေါ်၌သာ ဆောင်ရွက်ရန် နှင့် ယာဉ်များအောက်တွင် ဆီစုပ်သည့်ခွက်ကို အသုံးပြုခြင်း ၈.၁.၄။ အန္တရာယ်ရှိသော ပစ္စည်းများကို ဘေးကင်းစွာအသုံးပြုခြင်း နှင့် ကိုင်တွယ်ဆောင်ရွက်ခြင်းတို့နှင့်ပတ်သက်၍ အမှုထမ်းများအား လေ့ကျင့်သင်ကြားပေးခြင်း ၈.၁.၅။ ယိုဖိတ်မှုရှင်းလင်းရေးဆိုင်ရာ အသင့်ဆောင်ကိရိယာများ နှင့် ယိုဖိတ်မှုကို တုံ့ပြန်သည့် လေ့ကျင့်သင်ကြားမှုများ ဆောင်ရွက်ပေးခြင်း

ကဏ္ဍ	ဖြစ်ပေါ်လာနိုင်သော သက်ရောက်မှုများ	လျော့ချရေး အစီအမံများ
		၈.၁.၆။ လောင်စာ နှင့် ဓာတု သိုလှောင်မှုနေရာများကို ပုံမှန် စစ်ဆေးခြင်း
		၈.၁.၇။ စိမ့်မဝင်နိုင်သော (ဘိလပ်မြေလောင်းထားသော သို့မဟုတ် ပလတ်စတစ်ခံထားသော) ကြမ်းပြင် နှင့် တာဆည်ထားသောနံရံတို့ရှိသည့် လုံခြုံသော သိုလှောင်နေရာတွင် ဓာတုပစ္စည်းများအားလုံးကို သိုလှောင်ခြင်း
		၈.၁.၈။ သူတို့၏ SDS အရ ဓာတုပစ္စည်းများအားလုံးကို ကိုင်တွယ်ခြင်း
၉။ ပိုက်လိုင်း ယိုစိမ့်မှု နှင့် အက်ကွဲမှု	၉.၁။ အောက်ပါတို့အပါအဝင် အမျိုးမျိုးသော သက်ရောက်မှုများ - • အလုပ်သမားများ နှင့် အများပြည်သူတို့အပေါ် သက်ရောက်နိုင်သည့် မီးလောင်ခြင်း နှင့် ပေါက်ကွဲခြင်းတို့ ဖြစ်နိုင်ခြင်း • အနီးဝန်းကျင် သဘာဝအရင်း အမြစ်များကို ညစ်ညမ်းစေခြင်း • အကယ်၍ သဘာဝဓာတ်ငွေ့သည် တစ်နေရာတည်း၌ စုပုံလာလျှင် လုပ်ငန်းခွင်အပေါ် အန္တရာယ်ရှိနိုင်ခြင်း • ယိုစိမ့်မှုနှင့်ဆက်စပ်နေသောနေရာတို့ရှိ ရေနေသက်ရှိများအပေါ် အဆိပ်အတောက်ဖြစ်စေခြင်း	၉.၁.၁။ PTTEP မြန်မာ၏ အရေးပေါ် စီမံခန့်ခွဲမှုအစီအစဉ်ကို အကောင်အထည် ဖော်ဆောင်ရွက်ခြင်း နှင့် အလုပ်သမားများအားလုံးအား အစီအစဉ်နှင့်ပတ်သက်၍ လေ့ကျင့်သင်ကြားပေးခြင်း
		၉.၁.၂။ အောက်ပါတို့အပါအဝင်၊ ပိုက်လိုင်းကို စစ်ဆေးမှု နှင့် ထိန်းသိမ်းပြုပြင်မှုလုပ်ထုံးလုပ်နည်းတို့ကို ပုံမှန်ဆောင်ရွက်ခြင်း - • ROW စောင့်ကြည့်စစ်ဆေးခြင်း • ROW ထိန်းသိမ်းပြုပြင်ခြင်း • ပိုက်လိုင်းခိုင်ခံမှုကို သံစိမ်းသံကြွပ်ဖြင့် ပုံမှန် စစ်ဆေးခြင်း • ပိုက်အုပ်ထားသောအလွှာ နှင့် ကာကွယ်ထားသည့် အချိတ်အဆက်များ/အကွပ်များကို စစ်ဆေးမှုအပါအဝင် ယိုစိမ့်မှုကို တိုင်းတာခြင်း • ကတ်သောဒစ်ကာကွယ်မှု ထိန်းသိမ်းပြုပြင်ခြင်း နှင့် သံချေးတက်မှုကို စောင့်ကြပ်ကြည့်ရှုစစ်ဆေးခြင်း
		၉.၁.၃။ ပုံမှန်စစ်ဆေးမှု နှင့် ထိန်းသိမ်းပြုပြင်မှုဆောင်ရွက်ရာတွင် ပိုက်လိုင်းခိုင်ခံမှုကို သံသယရှိလျှင်၊ ပြုပြင်မှုကို ချက်ချင်းဆောင်ရွက်ခြင်း
		၉.၁.၄။ စီဆင်းမှုဆိုင်ရာ ပါရာမီတာများ (ဖိအား၊ အပူချိန်၊ စီးဆင်းမှုနှုန်း) စဉ်ဆက်မပြတ်ဖြစ်သော စောင့်ကြပ် ကြည့်ရှုစစ်ဆေးမှု SCADA ဖြင့် ၂၄ နာရီ စောင့်ကြပ်ကြည့်ရှုစစ်ဆေးခြင်းကို ဆောင်ရွက်ခြင်း

ကဏ္ဍ	ဖြစ်ပေါ်လာနိုင်သော သက်ရောက်မှုများ	လျော့ချရေး အစီအမံများ
		၉.၁.၅။ ပုံမှန်မဟုတ်သော ပိုက်လိုင်းအနေအထားများကို တွေ့ရှိရလျှင်၊ ပိုက်လိုင်း၏ သက်ရောက်နေသောအပိုင်းကို ခွဲထုတ်၍ ဖိအားနည်းစေရန် လုပ်ထုံးလုပ်နည်းများကို အကောင်အထည်ဖော်ဆောင်ရွက်ခြင်း
		၉.၁.၆။ မီး နှင့် ဓာတ်ငွေ့ စစ်ဆေးရေးစနစ် နှင့် မီးသတ်ကိရိယာတို့နှင့်ပတ်သက်၍ ကာကွယ်ထိန်းသိမ်းပြုပြင်မှုကို ဆောင်ရွက်ခြင်း
		၉.၁.၇။ မီးငြိမ်းသတ်ဘူးများနှင့်ပတ်သက်၍ လုံလောက်သော အရေအတွက် နှင့် အမျိုးအစားများကို ဆောင်ရွက်ပေးခြင်း နှင့် အမြဲတမ်းနေထိုင်နေသည့် နေရာအဆောက်အအုံများမှ ကြားနိုင် မြင်နိုင်သော မီးသတိပေးချက်များ နှင့် လေညွှန်ပြန်များ တပ်ဆင်ပေးခြင်း
		၉.၁.၈။ မီးလောင်ခြင်းဆိုင်ရာ လေ့ကျင့်သင်ကြားခြင်း နှင့် ယိုဖိတ်မှုများတုံ့ပြန်မှုများကို ဆောင်ရွက်ခြင်း
		၉.၁.၉။ ထိန်းချုပ်ထားသည့်နေရာများ၌ ဆေးလိပ်သောက်ခြင်းကို တားမြစ်ခြင်း
		၉.၁.၁၀။ ပိုက်လိုင်း ROW နှင့်ပတ်သက်၍ မြေဖို့မှုများအပါအဝင် သတိပေးအမှတ်အသားများ နှင့် အကာအရံများဖြင့် ရှင်းလင်းစွာ ဖော်ထုတ်ခြင်း
		၉.၁.၁၁။ အန္တရာယ်များ၊ ကာကွယ်ရေးအစီအမံများ နှင့် အရေးပေါ်တုံ့ပြန်မှုများနှင့်ပတ်သက်၍ အများပြည်သူအား အသိပေးခြင်း
		၉.၁.၁၂။ သင့်လျော်သောနေရာများတွင် ပိုက်လိုင်းခိုင်ခံမှုဆိုင်ရာ ကိစ္စရပ်များဆိုင်ရာ အစီရင်ခံရန် ဆက်သွယ်ရန် နံပါတ် များ နှင့် လိပ်စာများပါသည့် အမှတ်အသားများစိုက်ထူလျက် ပိုက်လိုင်းအခြေအနေနှင့်ပတ်သက်၍ ရပ်ရွာလူထုက စောင့်ကြပ်ကြည့်ရှုမှုကို အားပေးခြင်း
		၉.၁.၁၃။ အန္တရာယ်များ၊ ကာကွယ်ရေးအစီအမံများ နှင့် အများပြည်သူ အရေးပေါ်ဆိုင်ရာ တုံ့ပြန်ရေး အစီအစဉ် တို့နှင့်ပတ်သက်၍ ငလျင်ဇုန်နေရာအနီးရှိ အများပြည်သူထံ အကြောင်းကြားခြင်း

ကဏ္ဍ	ဖြစ်ပေါ်လာနိုင်သော သက်ရောက်မှုများ	လျော့ချရေး အစီအမံများ
၁၀။ မတော်မဆ မီးလောင်ခြင်း (သို့) ပေါက်ကွဲခြင်း	၁၀.၁။ ROW လုပ်ငန်းမှ မီးလောင်နိုင်ခြင်း (သို့) ပေါက်ကွဲခြင်း	၁၀.၁.၁။ နွေရာသီတွင် မြက်မခုတ်စေခြင်း
		၁၀.၁.၂။ အမှိုက် နှင့် သဘာဝပေါက်ပင်များကို မီးတိုက်မှုကို တားဆီးကာကွယ်ခြင်း
		၁၀.၁.၃။ သတ်မှတ်ထားသည် နယ်မြေဧရိယာများတွင်သာ ဆေးလိပ်သောက်ခွင့်ပြုခြင်း
		၁၀.၁.၄။ ကုန်းတွင်းအဆောက်အအုံများတွင် မီးသတ်ဘူး၊ အချက်ပြစနစ် စသည့် မီးဘေးအန္တရာယ်ကာကွယ်ရေး ပစ္စည်းများ ထားရှိခြင်း
		၁၀.၁.၅။ မီးလောင်ခြင်း (သို့) ပေါက်ကွဲခြင်း ဖြစ်လျှင် အရေးပေါ် နှင့် အရေးပေါ်ကာလ စီမံခန့်ခွဲမှုအစီအစဉ်ကို အကောင်အထည်ဖော်ဆောင်ရွက်ခြင်း
		၁၀.၁.၆။ မီးဘေးအန္တရာယ်ကာကွယ်ရေး ပစ္စည်းများကို အချိန်မှန်စစ်ဆေးခြင်း နှင့် အစမ်းလေ့ကျင့်ခြင်းများကို ဆောင်ရွက်ခြင်း။

၁.၇ *စောင့်ကြပ်ကြည့်ရှုစစ်ဆေးရေး အစီအမံများ*

မြန်မာနိုင်ငံ၏ အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်များတွင် ပါဝင်သည့် အသေးစိတ်အချက်အလက်များအရ *"လုပ်ငန်း စီမံကိန်းများသည် ဆက်လက်၍ စဉ်ဆက်မပြတ် တက်ကြွစွာ ဘက်စုံထောင့်စုံမှ ကိုယ်တိုင် စောင့်ကြပ်ကြည့်ရှု စစ်ဆေးပြီး လမ်းညွှန်ချက်များနှင့် စံချိန်စံညွှန်းများကို လိုက်နာ ဆောင်ရွက်ရမည်။ ဤလမ်းညွှန်ချက်များ၏ ရည်ရွယ်ချက်များကို ဖြည့်ဆည်းနိုင်ရန်အတွက် လုပ်ငန်းစီမံကိန်း၏ ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်နှင့်ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဆိုင်ရာ လိုက်နာ ဆောင်ရွက်မှု သက်သေခံ လက်မှတ်ပါ သတ်မှတ်ချက်များအတိုင်း အထွေထွေ လမ်းညွှန်ချက် နှင့် လုပ်ငန်းကဏ္ဍအလိုက်လမ်းညွှန်ချက်များကို လိုက်နာဆောင်ရွက်မှုအပေါ် လုပ်ငန်းစီမံစိန်းက ကိုယ်တိုင်စောင့်ကြပ်ကြည့်ရှုစစ်ဆေးရန် တာဝန်ရှိသည်။"*

ဥပဒေများက ကန့်သတ်ချက်များ (ဆိုလိုသည်မှာ မြန်မာနိုင်ငံ၏ အမျိုးသားပတ်ဝန်းကျင် အရည်အသွေးလမ်းညွှန်းများ) နှင့် ATL ၏ သတ်မှတ်ချက်များတို့ကို လေးစားလိုက်နာကြောင်း သရုပ်ပြရန် စောင့်ကြည့်ကြည့်ရှုစစ်ဆေးမှုကို ဆောင်ရွက်သွားရန် လိုပြီး၊ အကောင်အထည်ဖော်သည့် လျှော့ချရေး/ထိန်းချုပ်ရေး အစီအမံများ၏ လွှမ်းခြုံဒီဇိုင်း နှင့် ထိရောက်မှုတို့ကိုလည်း အတည်ပြုစိစစ်သွားမည် ဖြစ်ပါသည်။ EQEG နှင့်ကိုက်ညီမှုရှိစေရန် ကုန်းပေါ်ဇောတိက (Zawtika) စီမံကိန်းသည် အောက်ပါ ကဏ္ဍများကို စောင့်ကြပ်ကြည့်ရှုစစ်ဆေးမည် ဖြစ်ပါသည် -

- ထုတ်လွှတ်အခိုးအငွေ့
- ဆူညံသံ
- မြေပေါ်ရေအရည်အသွေး
- မြေအောက်ရေ အရည်အသွေး
- မြေဆီလွှာတိုက်စားမှု နှင့် နုန်းတင်မှု
- ဇီဝမျိုးစုံမျိုးကွဲ
- လုပ်ငန်းခွင်ကျန်းမာရေး
- စီးဆင်းရေ ရေနုတ်မြောင်း
- မိလ္လာရေဆိုး

ပတ်ဝန်းကျင်ဆိုင်ရာ စောင့်ကြပ်ကြည့်ရှုရေးအစီအစဉ်အသေးစိတ် အပြည့်အစုံကို ***ဇယား - ၁.၃*** တွင် တင်ပြထားပါသည်။

ဇယား (၁.၃) လုပ်ငန်းလည်ပတ်မှုအဆင့် စောင့်ကြပ်ကြည့်ရှုစစ်ဆေးရေး အစီအမံများ

ပတ်ဝန်းကျင်ကဏ္ဍ	ပတ်ဝန်းကျင်ဆိုင်ရာအတိုင်းအတာ	နည်းလမ်း	နေရာ	အချိန်ကာလ/တိုင်းတာခြင်း အကြိမ်အရေအတွက်	တာဝန်ရှိမှု
၁။ ထုတ်လွှတ်အခိုးအငွေ့	**<u>EQEG နှင့် WHO လေထုအရည်အသွေးလမ်းညွှန်ချက် အရ လိုအပ်သည်။</u>** • Hydrogen Sulfide • PM 2.5 • PM 10 • Ozone • NO_2 • SO_2 **မှန်လုံအိမ်ဓာတ်ငွေ့ (Greenhouse Gas) (GHG)**	<u>နည်းလမ်း</u> • နမူနာများကို အပြည်ပြည်ဆိုင်ရာ အသိအမှတ်ပြုစံချိန်စံညွှန်း နှင့်အညီ စမ်းသပ်ရမည် (ဥပမာ - US EPA)။ <u>နမူနာအရည်အတွက်</u> • တစ်နေရာ နမူနာတစ်ခု။ <u>နည်းလမ်း</u> • မှန်လုံအိမ်ဓာတ်ငွေ့ထုတ်လွှတ်ခြင်းကို လောင်စာအမျိုးအစားအသုံးပြုမှု ပမာဏဖြင့် တွက်ချက်မည်။	• အနီးဆုံးသိသာထင်ရှားသော နေရာ (သို့) တိုင်ကြားခံရခြင်းရှိယာ၏ လေစုန်လမ်းကြောင်း (လိုအပ်လျှင်)။ • လုပ်ငန်းလည်ပတ်မှုရှိယာ။	• တိုင်ကြားခံရခြင်း / ထိခိုက်မှု ဖြစ်လျှင် အာဏာပိုင်များ၏ တောင်းဆိုချက်အရ တိုင်းတာခြင်းကို ဆောင်ရွက်ရမည် (ဥပမာ - MOGE)။ • မှန်လုံအိမ်ဓာတ်ငွေ့ အတွက် လစဉ်အကျဉ်းချုပ်။	ATL ၏ လုပ်ကိုင်ခွင့်ရ ကန်ထရိုက်တာ ATL
၂။ ဆူညံသံ	ဆူညံသံတိုင်းတာခြင်းကို အောက်ပါအတိုင်းဆောင်ရွက်မည်။ • Noise contour • Noise dose နှင့် • ဆူညံသံအဆင့်	<u>နည်းလမ်း</u> • နမူနာများကို OSHA အမေရိကန်ပြည်ထောင်စု၊ အလုပ်သမားဌာန၊ စည်းမျဉ်း (စံချိန်စံညွှန်းအမှတ်	• လုပ်ငန်းလည်ပတ်မှုရှိယာ။	• လုပ်ငန်းလည်ပတ်မှုစတင်ပြီး ၂ နှစ်အတွင်း Noise Contour တိုင်းတာခြင်းကို ဆောင်ရွက်ရမည်။ ၅ နှစ်ပြည့်တိုင်း	ATL ၏ လုပ်ကိုင်ခွင့်ရ ကန်ထရိုက်တာ

ပတ်ဝန်းကျင်ကဏ္ဍ	ပတ်ဝန်းကျင်ဆိုင်ရာအတိုင်းအတာ	နည်းလမ်း	နေရာ	အချိန်ကာလ/တိုင်းတာခြင်းအကြိမ်အရေအတွက်	တာဝန်ရှိမှု
		၁၉၁၀.၉၅)၊ လုပ်ငန်းခွင်ဆူညံသံ ထိတွေ့မှု အရ စမ်းသပ်ရမည်။		တိုင်းတာခြင်း ကို နောက်ထပ်ဆောင်ရွက်ရမည် (သို့) လုပ်ငန်းလည်ပတ်မှု၏ သိသာထင်ရှားသောပြောင်းလဲမှုရှိသောအခါ။ ဆူညံသံအဆင့် သိသာထင်ရှားသောပြောင်းလဲမှုရှိသောနေရာအတွက် တိုင်းတာခြင်းကို နောက်တစ်ကြိမ်ဆောင်ရွက်ရမည်။ • Noise dose ကို နှစ်စဉ်ကျန်းမာရေးစစ်ဆေး ခြင်းမှ အကြားအာရုံပုံမှန် မဟုတ်သော ဝန်ထမ်း အတွက် ဆောင်ရွက်ရမည်။ • တိုင်ကြားစာ တင်ပြသောအခါ ဆူညံသံအဆင့်ကို ဆောင်ရွက်ရမည်။	

ပတ်ဝန်းကျင်ကဏ္ဍ	ပတ်ဝန်းကျင်ဆိုင်ရာအတိုင်းအတာ	နည်းလမ်း	နေရာ	အချိန်ကာလ/တိုင်းတာခြင်း အကြိမ်အရေအတွက်	တာဝန်ရှိမှု
၃။ မြေပေါ်ရေ	မြေပေါ်ရေ အရည်အသွေးစမ်းသပ်ရန် ပတ်ဝန်းကျင်ဆိုင်ရာအတိုင်းအတာများမှာ အောက်ပါအတိုင်းဖြစ်သည်။ • pH • Temperature • Conductivity • Dissolved Oxygen • 5-day Biochemical oxygen demand (BOD) • Chemical oxygen demand (COD) • Oil and grease • Total Petroleum Hydrocabon (TPH) • Total coliform bacteria • Total heavy metal	• နမူနာများကို USEPA ကဲ့သို့ အပြည်ပြည်ဆိုင်ရာ စံချိန်စံညွှန်းနှင့်လိုအပ်ချက်များနှင့်အညီ စမ်းသပ်ရန် ကောက်ယူမည်။	• အနီးဆုံး ကိုယ်စားပြု မြေပေါ်ရေ၏ ရေစုန်နှင့် ရေဆန်။	• ၂ နှစ်တစ်ကြိမ်	ATL ၏ လုပ်ကိုင်ခွင့်ရ ကန်ထရိုက်တာ
			• ကုမ္ပဏီ၏ လုပ်ငန်းဆောင်ရွက်မှုနှင့် ဆက်နွယ်သော တိုင်ကြားမှု / ထိခိုက်မှု ဖြစ်သောနေရာ၏ ရေစုန်နှင့်ရေဆန်။	• တိုင်ကြားခံရခြင်း / ထိခိုက်မှု ဖြစ်လျှင် အာဏာပိုင်များ၏ တောင်းဆိုချက်အရ တိုင်းတာခြင်းကို ဆောင်ရွက်ရမည် (ဥပမာ - MOGE)။	
၄။ မြေအောက်ရေအရည်အသွေး။	မြေအောက်ရေ အရည်အသွေးစမ်းသပ်ရန် ပတ်ဝန်းကျင်ဆိုင်ရာအတိုင်းအတာများမှာ အောက်ပါအတိုင်းဖြစ်သည်။ • pH • Temperature • Conductivity • Dissolved Oxygen • 5-day Biochemical oxygen demand (BOD) • Chemical oxygen demand (COD)	• နမူနာများကို USEPA ကဲ့သို့ အပြည်ပြည်ဆိုင်ရာ စံချိန်စံညွှန်းနှင့်လိုအပ်ချက်များနှင့်အညီ စမ်းသပ်ရန် ကောက်ယူမည်။	• ZOC အတွက် အနီးဆုံး ကိုယ်စားပြု ရေတွင်း။	• ၂ နှစ်တစ်ကြိမ်	ATL ၏ လုပ်ကိုင်ခွင့်ရ ကန်ထရိုက်တာ

ပတ်ဝန်းကျင်ကဏ္ဍ	ပတ်ဝန်းကျင်ဆိုင်ရာအတိုင်းအတာ	နည်းလမ်း	နေရာ	အချိန်ကာလ/တိုင်းတာခြင်း အကြိမ်အရေအတွက်	တာဝန်ရှိမှု
	• Oil and grease • Total Petroleum Hydrocabon (TPH) • Total coliform bacteria • Total heavy metal		• ကုမ္ပဏီ၏ လုပ်ငန်းဆောင်ရွက်မှုနှင့် ဆက်နွယ်သော တိုင်ကြားမှု / ထိခိုက်မှု ဖြစ်သောနေရာ၏ ရေစုန်နှင့်ရေဆန်။	• တိုင်ကြားခံရခြင်း / ထိခိုက်မှု ဖြစ်လျှင် အာဏာပိုင်များ၏ တောင်းဆိုချက်အရ တိုင်းတာခြင်းကို ဆောင်ရွက်ရမည် (ဥပမာ - MOGE)။	
၅။ မြေဆီလွှာတိုက်စားမှု နှင့် နုန်းတင်မှု	• ပိုက်လိုင်းလမ်းကြောင်းတစ် လျှောက် စစ်ဆေးခြင်းနေစဉ် မြေပြိုမှု၊ နုန်းတင်မှု (သို့) မြေဆီလွှာတိုက်စားမှု ကို စောင့်ကြည့်ခြင်း။	• ကြည့်ရှုစောင့်ကြည့်ခြင်း။	• ZOC/ZMS • ပိုက်လိုင်းလမ်းကြောင်းတစ် လျှောက်။	• ATL အစီအစဉ်အရ ပိုက်လိုင်းလမ်းကြောင်းတစ် လျှောက် ကြည့်ရှုစစ်ဆေးခြင်း။	ATL ဝန်ထမ်း
၆။ ဇီဝမျိုးစုံမျိုးကွဲ	• တောရိုင်းသက်ရှိသတ္တဝါများကို စောင့်ကြည့်ခြင်း	• ကြည့်ရှုစောင့်ကြည့်ခြင်း။	• ZOC/ZMS • ပိုက်လိုင်း ROW တစ်လျှောက် စစ်ဆေးနေစဉ်	• ၆ လ တစ်ကြိမ် တောရိုင်းသက်ရှိသတ္တဝါများ၏ အကြောင်းအရာ အကျဉ်း။	ATL
၇။ လုပ်ငန်းခွင်ကျန်းမာရေး	• အကြောင်းအရာတစ်ခုချင်း အလိုက်ဆုံးဖြတ်ရန်။ • ထိခိုက်ဒဏ်ရာရခြင်း (သို့) ထိခိုက်မှု။	• အကြောင်းအရာတစ်ခုချင်း အလိုက်ဆုံးဖြတ်ရန်။	• အကြောင်းအရာတစ်ခုချင်း အလိုက်ဆုံးဖြတ်ရန်။	• စိုးရိမ်မှု ဖြစ်လာလျှင် တိုင်းတာရန်။	ATL
၈။ စီးဆင်းရေ ရေနုတ်မြောင်း။	**<u>EQEG အရ လိုအပ်သည်။</u>** • Oil & Grease	• နမူနာများကို USEPA ကဲ့သို့ အပြည်ပြည်ဆိုင်ရာ စံချိန်စံညွှန်းနှင့်လိုအပ်ချက် များနှင့်အညီ စမ်းသပ်ရန် ကောက်ယူမည်။	• စီးဆင်းရေ စွန့်ထုတ်သော နေရာများ။	• ၆ လ တစ်ကြိမ်	ATL ၏ လုပ်ကိုင်ခွင့်ရ ကန်ထရိုက်တာ

ပတ်ဝန်းကျင်ကဏ္ဍ	ပတ်ဝန်းကျင်ဆိုင်ရာအတိုင်းအတာ	နည်းလမ်း	နေရာ	အချိန်ကာလ/တိုင်းတာခြင်းအကြိမ်အရေအတွက်	တာဝန်ရှိမှု
၉။ မိလ္လာရေဆိုး	**<u>EQEG[1/] အရလိုအပ်သည်။</u>** • BOD • COD • Oil and Grease • pH • Total coliform bacteria • Total nitrogen • Total phosphorus • Total suspended solids	• နမူနာများကို USEPA ကဲ့သို့ အပြည်ပြည်ဆိုင်ရာ စံချိန်စံညွှန်းနှင့်လိုအပ်ချက်များနှင့်အညီ စမ်းသပ်ရန် ကောက်ယူမည်။	• စွန့်ပစ်ရေ စွန့်ထုတ်သော နေရာများ။	• ၆ လ တစ်ကြိမ်	ATL ၏ လုပ်ကိုင်ခွင့်ရ ကန်ထရိုက်တာ

[1] In case of wastewater discharge

၁.၈ *အစီရင်ခံစာရေးသားခြင်း လိုအပ်ချက်များ*

ဤအခန်းသည် ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းလုပ်ထုံးလုပ်နည်း သတ်မှတ်ချက်အရ မြန်မာနိုင်ငံအခွင့်အမိန့်ရအဖွဲ့အစည်းလိုအပ်ချက်များနှင့်ဆက်နွယ်သော အစီရင်ခံစာရေးသားခြင်း အသေးစိတ်ကို လိုရင်းအချုပ်ဖော်ပြထားသည်။ ဤအခန်းတွင်ဖော်ပြထားသော အချက်အလတ်များသည် လုပ်ငန်းဆောင်တာများ အရည်အသွေးကောင်းစွာ နှင့် အချိန်တိကျစွာ အကောင်အထည်ဖော်ဆောင်ရွက်နိုင်ရေး စီမံကိန်းအတွက် ပြည့်စုံကောင်းမွန်သော စောင့်ကြည့်လေ့လာရေး အစီအရင်ခံစာအတွက် အတိုဆုံးနှင့် အရှင်းလင်းဆုံးဖော်ပြထားပါသည်၊ အကြမ်းအားဖြင့် အစီအရင်ခံစာသည် စီမံကိန်းလုပ်ငန်းခွင်မှ စတင်ကာ စီမံကိန်းဌာနချုပ်ဆီသို့၊ ၄င်းမှတဆင့် သက်ဆိုင်ရာ အာဏာပိုင်အစည်းအရုံးများထံသို့ အဆင့်ဆင့် ရောက်ရှိသွားမည်ဖြစ်သည်။ ဤအစီအရင်ခံစာ၏ ရည်မှန်းချက်မှာ ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်အား အကျိုးရှိရှိ အောင်မြင်စွာ ဖော်ဆောင်အသုံးပြုနိုင်ရန်ဖြစ်သည်။

ATL သည် ဤစီမံကိန်းအား ဖော်ဆောင်လုပ်ကိုင်သူဖြစ်သည့် အားလျော်စွာ မူမမှန်သော အခြေအနေများ/ ကွဲပြားခြားနားချက်များ/ လုံခြုံစိတ်ချရခြင်းမရှိသော အခြေအနေများကို ကိုဖော်ထုတ်နိုင်ရေး ပုံမှန်စစ်ဆေးလေ့လာရေးလုပ်ငန်များ အပြင်အောက်ပါတို့ကို ဆောင်ရွက်ရန် သဘောတူညီထားပါသည်။

- မတော်တဆ နှင့် အရေးပေါ်အခြေအနေဖြစ်ပေါ် ခဲ့ခြင်းများကို အစီအရင်ခံတင်ပြခြင်း။
- လုပ်ဆောင်နိုင်စွမ်းရည် ကိန်းညွှန်းအား နှိုင်းယှဉ်စောင့်ကြည့်နိုင်ရေးအတွက် စစ်ဆေးရေးနှင့် စောင့်ကြည့်လေ့လာရေး များဆောင်ရွက်ခြင်း။
- လေ့ကျင့်ရေး အစီအစဉ်များ။

ပိုမိုပြည့်စုံသော အစီအရင်ခံစာလိုအပ်ချက်များကို **အခန်း ၁၀** တွင် ဖော်ပြထားပါသည်။

၁.၉ *လုပ်ငန်းဖော်ဆောင်ရေး အစီအစဉ်ခွဲ*

ပတ်ဝန်းကျင်စီမံ ခန့်ခွဲမှုအစီအစဉ် အစီအရင်ခံစာ၏ တစိတ်တပိုင်း အရသော်လည်းကောင်း၊ စီမံကိန်းဖော်ဆောင်ရေး၏ တစိတ်တပိုင်း အရသော်လည်းကောင်း စီမံကိန်း၏ အဘက်ဘက်မှ လုပ်ငန်းဆောင်တာများအားပံ့ပိုးရေးအတွက် အောက်ပါအစီအမံခွဲများကို ပြင်ဆင်ထားပါသည်။

- အရေးပေါ် အစီအစဉ်များ (မြန်မာနိုင်ငံ အရေးပေါ် အခြေအနေ စီမံခန့်ခွဲမှု အစီအစဉ် နှင့် မြန်မာနိုင်ငံ ကပ်ဘေး အခြေအနေ စီမံခန့်ခွဲမှု အစီအစဉ်များ အပါအဝင်)

- စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှု အစီအစဉ်
- သဘာဝအပင်နှင့် တိရိစ္ဆာန်မျိုးကွဲများ စီမံခန့်ခွဲမှု အစီအစဉ်
- ထိန်းချုပ်ရေးနှင့် ထိန်းသိမ်းရေး အစီအစဉ်
- လူမှုပတ်ဝန်းကျင် ဘေးအန္တရယ်ကင်းရှင်းရေး၊ လုံခြုံရေး၊ ကျန်းမာရေး နှင့် သဘာဝပတ်ဝန်း ကျင် စီမံခန့်ခွဲမှု အစီအစဉ်
- လုပ်ငန်းခွင် ကျန်းမာရေး စီမံခန့်ခွဲမှု အစီအစဉ် / အဆင့်အတန်းများ

အစီအစဉ်ခွဲတစ်ခုစီ၏ အသေးစိတ် အချက်အလတ်များကို အခန်း ၁၁ တွင် ဖော်ပြထားပါသည်။

၁.၁၀ *လုပ်ကိုင်ရည် အရည်အသွေးမြှင့်တင်ခြင်း နှင့် သင်တန်းပို့ချခြင်း*

ATL သည် မြန်မာနိုင်ငံ ဘေးအန္တရာယ်၊ လုံခြုံရေး၊ ကျန်းမာရေး နှင့် ပတ်ဝန်းကျင်ကာကွယ်ရေး (SSHE) သင်တန်းများ နှင့် အရည်အသွေးပြည့်မှီရေး လုပ်ငန်းစဉ်များနှင့် ပတ်သတ်၍ အောက်ပါတို့ကို သဘောတူပါသည်။

- အလုပ်အကိုင် ရာထူးတစ်ခုစီ အတွက် (SSHE) သင်တန်းများ နှင့် အရည်အသွေးပြည့်မှီရေး လိုအပ်ချက်များ အားရှင်းလင်းစွာ အဓိပ္ပာယ်သတ်မှတ်ပြီး သတ်မှတ်ချိန် အမှီလိုက်နာ နောက်ဆောင်ရွက်ရေး။
- သင်တန်းများနှင့် အရည်အသွေးပြည့်မှီရေး ဆောင်ရွက်ချက်များ ပြင်ဆင်ရေးတွင် (SSHE) သင်တန်းများ နှင့် အရည်အသွေးပြည့်မှီရေး အဆင့်အတန်း (SSHE-106-STD-340) အားလိုက်နာခြင်း။
- သင်တန်း နှင့် အရည်အသွေးပြည့်မှီရေး စစ်ဆေးလေ့လာရေး ဆောင်ရွက်ချက်များကို မှတ်တမ်းပြုစုခြင်း နှင့် လိုအပ်ချိန်တွင် စစ်ဆေးရေးတင်ပြနိုင်ရန် အသင့်ရှိခြင်း။
- တစ်ဦးတစ်ယောက်ခြင်းစီ၏ သင်တန်းတက်ရောက်မှု များအား မှတ်တမ်းတင် ထားရှိခြင်း။

ထို့ပြင် မြန်မာနိုင်ငံ (SSHE) သင်တန်းများ နှင့် အရည်အသွေးပြည့်မှီရေး လုပ်ငန်းစဉ်များ ၏ အထူးပြု လိုအပ်ချက်များဖြစ်သော

- အရည်အသွေးပြည့်မှီရေး ဆန်းစစ်ခြင်း
- စောင့်ကြည့်လေ့လာခြင်း
- စီစစ်ရေးနှင့် သတ်မှတ်ချက်ပြည့်ညီမှု စစ်ဆေးရေး တို့ပါဝင်ပါသည်။

အထက်ပါ အကြောင်းအရာများအား အခန်း ၁၂ တွင် အသေးစိတ် ဆက်လက်ရှင်းလင်းထားပါသည်။

၁.၁၁ *အများပြည်သူနှင့်တိုင်ပင်ဆွေးနွေးခြင်း နှင့် ထုတ်ဖော်တင်ပြခြင်း*

အများပြည်သူနှင့်တိုင်ပင်ဆွေးနွေးမှုများကာလတွင် ရှာဖွေတူးဖော်မှုစီမံကိန်းနှင့် ပတ်သက်သည့်များကို သက်ဆိုင်သူများနှင့် သူတို့၏ အမြင်များ၊ စိုးရိမ်မှုများကို ဆွေးနွေးခဲ့ကြပြီး၊ PTTEPI ကလည်း ဖြေကြားမှုအချို့ ဆောင်ရွက်ခဲ့ပါသည်။ ၎င်းအဓိကစိုးရိမ်မှုများ နှင့် ATL ၏ ဖြေဆိုမှုတို့ကို အောက်တွင် အနှစ်ချုပ်ဖော်ပြထားပါသည် -

- မြန်မာနိုင်ငံ ကမ်းရိုးတန်းနယ်မြေဒေသများ၏ နုနယ်မှု နှင့် ထိခိုက်လွယ်မှု။ ATL က ရှာဖွေတူးဖော်မှုအဆင့်တစ်ခုလုံးကို ညစ်ညမ်းအန္တရာယ်ကို အတတ်နိုင်ဆုံးလျှော့ချပြီး စည်းမျဉ်းစည်းကမ်းများ (မြန်မာကုမ္ပဏီ ၏ ရေနံဆီ တုံ့ပြန်ရေး အစီအစဉ် နှင့် အမျိုးသားအဆင့် လမ်းညွှန်များ (EQEG)) နှင့် အညီ ဆောင်ရွက်သွားမည် ဖြစ်ကြောင်း ဖြေဆိုခဲ့ပါသည်။
- စီမံကိန်းအတွက် ကျင့်သုံးဆောင်ရွက်မည့် မြန်မာကုမ္ပဏီ၏ CSR အစီအစဉ်ကို ၂၀၀၈ မှစ၍ ပြင်ဆင်ရေးဆွဲခဲ့ပြီး၊ CSR အစီအစဉ်များကို MOGE နှင့် အခြားသက်ဆိုင်ရာ ဌာနများထံသို့ တင်သွင်းထားပါသည်။ ထို့ပြင်၊
- ဒေသတွင်းစီမံကိန်းကို ပံ့ပိုးဆောင်ရွက်မှု။ ဟိုက်ဒရိုကာဗွန်များကို စီးပွားဖြစ် လောက်လောက်သည့်ပမာဏဖြင့် ရှာတွေ့လျှင်၊ မြိတ်မြို့ဒေသံများအနေဖြင့် ဒေသဖွံ့ဖြိုးရေးအတွက် မိတ်ဖက်များဆောင်ရွက်လိုသည် (ဥပမာ၊ လျှပ်စစ်လုပ်ငန်း)။ ATL သည် မှတ်ချက်ကို မှတ်တမ်းယူခဲ့ပါသည်။

ESHIA လေ့လာမှုကာလအတွင်း ဆောင်ရွက်ခဲ့သည့် အများပြည်သူနှင့်တိုင်ပင်ဆွေးနွေးမှု နှင့် ဖော်ထုတ်တင်ပြမှုတို့၌ကို အခန်း (၁၃) တွင် တင်ပြထားပါသည်။ ဤအခန်းအတွင် ဆောင်ရွက်ခဲ့သည့် အဓိကလုပ်ငန်းများအနှစ်ချုပ်ကို ဖော်ပြထားပါသည်။

၁.၁၁.၁ *စီမံကိန်း ထုတ်ဖော်တင်ပြခြင်း*

စီမံကိန်းသတင်းအချက်အလက်များအားလုံးကို စီမံကိန်းရှိ မတူကွဲပြားသော သက်ဆိုင်သူများ အားလုံးအတွက် လက်လှမ်းမီသောပုံစံ (ဒေသသုံးဘာသာစကားကဲ့သို့သော နားလည်လွယ်သည့် ပုံစံ) ဖြင့် သတင်းအချက်အလက်ကို ထုတ်ပြန်ပေးသွားမည် ဖြစ်ပါသည်။ အများပြည်သူနှင့်တိုင်ပင်ဆွေးနွေးမှုလုပ်ငန်းများကို ၂၀၀၉ ဇန်နဝါရီ ၁၀-၁၁ ရက်တို့တွင် ဖော်ထုတ်သတ်မှတ်ထားသည့် သက်ဆိုင်သူအုပ်စုများနှင့် ဆောင်ရွက်ခဲ့ပါသည်။ ထိခိုက်ခံစားရနိုင်သည့်ရပ်ရွာလူထုများအတွက်၊ တိုင်ပင်ဆွေးနွေးမှု နှင့် ဖော်ထုတ်တင်ပြမှုတို့ကို

အခန်း (၁၃) တွင် ဖော်ပြထားသည့်အတိုင်း ဓမင်းဆိပ် (Daminseik) နေရာတွင် ဆောင်ရွက်ခဲ့ပါသည်။

၁.၁၁.၂ *CSR လုပ်ငန်းဆောင်ရွက်မှုများ*

ATL/PTTEPI သည် ဇောတိကစီမံကိန်းလက်အောက်တွင် လက်ရှိ CSR လုပ်ငန်းများကို ဆောင် ရွက်လျက်ရှိသည်။ ၄င်းလုပ်ငန်းဆောင်ရွက်မှုများသည် လုပ်ငန်းလည်ပတ်မှုဧရိယာ၏ လူနေမှုဘဝကို မြှင့်တင်ပေးရန်နှင့် သက်ဆိုင်သူများကြား ကောင်းမွန်သောဆက်ဆံရေး တည် ဆောက်ရန် ရည်ရွယ်ပါသည်။ ဇောတိကစီမံကိန်း၏ CSR Program သည် "ကျန်းမာရေး၊ ပညာရေးနှင့် ရပ်ရွာတိုးတက်ရေး" စသည့် အဓိက ကဏ္ဍ (၃) ခု ပါဝင်သည်။

စီမံကိန်း၏ CSR Budget ကို MOGE မှ နှစ်စဉ် အတည်ပြုရန် လိုအပ်ပါသည်။ ထိုကြောင့် ATL သည် ပြီးခဲ့နှစ်နှင့်အလားတူ ပမာဏ ၅၀၀,၀၀၀ - ၆၀၀,၀၀၀ USD (၁,၀၅၀,၀၀၀,၀၀၀ ကျပ်ခန့်) ကို အဆိုပြုပါသည်။ သို့သော်လည်း ၄င်းသည် MOGE ခွင့်ပြုချက်တွင် မူတည်ပါသည်။ ၂၀၁၉ ခုနှစ်တွင် CSR Budget ၅၈၈,၅၀၀ USD အသုံးပြုခဲ့သည်။ ၂၀၂၀ ခုနှစ်မှစ၍ အဆိုပြု Budget သည် ၆၀၀,၀၀၀ USD နီးပါးရှိပါသည်။ ယခု Budget သည် လုပ်ငန်းဆိုင်ရာ ပရိုဂရမ် ဆက်လက်တိုးတက်ရေးမှာ အသုံးပြု ရန် စီစဉ်ထားသည်။

- အဆင့်မြင့်ပညာရေးအတွက် ဖွံ့ဖြိုးရေး ပညာသင်ဆု
- ပညာရေး ပရိုဂရမ်
- Parasite အခမဲ့ကျောင်း ပရိုဂရမ်
- အမျာပြည်သူအခြေခံအဆောက်အအုံ ဆောက်လုပ်ခြင်း (သို့) ဝန်ဆောင်မှု
- စွန့်ပစ်ပစ္စည်း မှ စွမ်းအင် ပရိုဂရမ်
- ဘုန်းကြီးကျောင်းအထောက်အပံ့
- ရပ်ရွာအထောက်အကူနှင့် အရေးပေါ်ကယ်ဆယ်ရေး
- အဆင့်မြင့်အသက်မွေးဝမ်းကျောင်း ဒီပလိုမာ ပညာသင်ဆု
- ဘုန်းကြီးကျောင်းနှင့် ယဉ်ကျေးမှုဆိုင်ရာ အထောက်အပံ့
- ကန်ထရိုက်တာ၊ အစိုးရ၊ မိသားစု၊ ဝန်ထမ်းများအကြား အလှူဒါန CSR ဆောင်ရွက်မှုများ (အပင်စိုက်ခြင်း၊ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးလုပ်ငန်းများ ဆောင်ရွက်ခြင်း များအပါအဝင်)
- အလုပ်သမားဝန်ကြီးဌာန၊ စွမ်းအင်ဝန်ကြီးဌာန နှင့်ပူးပေါင်းဆောင်ရွက်သော နည်းပညာအဆင့်မြှင့်တင်ခြင်းနှင့်ဖွံ့ဖြိုးရေး ပရိုဂရမ်

1 EXECUTIVE SUMMARY

1.1 INTRODUCTION

The Zawtika Onshore Gas Transportation System ("the Project") is an existing development operated by Andaman Transportation Limited (ATL), consisting of 71 km onshore gas transportation pipeline, connected from offshore Zawtika pipeline at Mawgyi village (landfall point) to PTT gas pipeline at Ban-I-Tong (Myanmar Thailand border point), Zawtika Onshore Operating Center (ZOC), Zawtika Block Valve #1 and #2 (ZBV1 and ZBV2), and Zawtika Metering Station (ZMS).

To comply with requirements of the Environmental Impact Assessment (EIA) Procedure, promulgated on 29th December 2015, ATL is required to undertake an Environmental Management Plan (EMP) for its current operations, and submit to Ministry of Natural Resources and Environmental Conservation (MONREC) (formerly Ministry of Environmental Conservation and Forest (MOECAF)/(Environmental Conservation Department (ECD)) for consideration and approval to obtain an Environmental Compliance Certification (ECC), for its existing Zawtika Onshore Development Project.

1.2 SUMMARY OF PROJECT PROPONENT

Andaman Transportation Limited (ATL), a subsidiary of PTT Exploration and Production Company Limited (PTTEP), is the operator for the Project to carry out petroleum exploration and production activities and related business in Myanmar.

ATL applies the PTTEP's mission which is to operates globally to provide reliable energy supply and sustainable value to all stakeholders with a strong vision of "Energy Partner of Choice" through Competitive Performance and Innovation for Long-term Value Creation.

ATL applies the Corporate PTTEP and PTTEP Myanmar Asset's SSHE policy and documents. The PTTEP Myanmar Asset is committed to safe Exploration and Production (E&P) Operations in Myanmar with an ultimate goal of "Target Zero - Nobody Gets Hurts in Our Operations" which covers (1) Zero Injury, (2) Zero Major Accident (e.g. zero major hydrocarbon leak, vehicle accident, ship collision), and (3) Zero Spill or External Complaint (e.g. zero complaint by authorities/ communities/ sea users)

Contact details of ATL are provided in ***Table 1.1***.

Table 1.1 Contact Details of ATL

Aspect	Description
Company Name	Andaman Transportation Limited
Address	Vantage Tower, 623 Pyay Road, Kamayut Township, Yangon, Republic of the Union of Myanmar
Phone Number	+95(1) 652700
Fax Number	+95(1) 661814

1.3 DESCRIPTION OF PROJECT

The Zawtika Onshore Operation is the onshore facility that support the Zawtika Development Project which is a gas field development project located in Block M9 and a small portion of Block M11, owned by Myanma Oil & Gas Enterprise (MOGE). The field lies in the Gulf of Martaban, approximately 225 km south of Yangon and 207 km west of the Myanmar coast.

The Zawtika onshore facilities, which is the focus of this EMP, consists of 71 km long onshore gas transportation pipeline connected from offshore pipeline at Mawgyi village (landfall point) to PTT gas pipeline at Ban I Tong (Myanmar-Thailand border point), Zawtika Onshore Operating Center (ZOC), Zawtika Block Valve #1 and #2 (ZBV1 and ZBV2), and Zawtika Metering Station (ZMS). The first gas production to Domestic Gas was achieved on 14th March 2014 and Export Gas to Thailand on 5th August 2014, respectively.

1.4 POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

The EMP was prepared in compliance with the regulatory and non-regulatory performance requirements for all stages of the Project. The policy and legal framework for the Project, covering national requirements as well as applicable international treaties and conventions is outlined in Chapter 4.

The EMP aims are to:

- Explain this Zawtika Production Development and Onshore Gas Transportation System Project, on the basis of information provided by ATL;
- Ensuring that environmental and social considerations are clearly quoted and integrated in the decision-making process of the project;
- Recommending procedures and practices to be followed during the project to ensure that environmental and social effects are avoided, minimized or mitigated; and
- Providing guidance on environmental management programs, including auditing and contingency planning.

As part of the policy, legal and institutional framework of the EMP and operation of the Project, the Project Proponent policies and Myanmar policy and legal framework are considered. The internal policies includes the PTTEP SSHE (safety, security, health and environment) policy as well as the PTTEP

Myanmar Asset SSHE Policy where both aims to have zero incident (i.e. "*Target Zero – Nobody Gets Hurts in Our Operations*") throughout their operation.

In addition, further studies were conducted to understand the relevant Myanmar legislation and international conventions to the Project. Detail of this study is described in ***Chapter 4***.

1.5 DESCRIPTION OF THE SURROUNDING ENVIRONMENT

This section aims to provide the summary of the environmental and social setting within the Project surrounding area.

1.5.1 Physical Components

1.5.1.1 Geography and Geology

General geographical condition of the Zawtika onshore gas pipeline corridor comprises both upland and low-lying areas and includes a series of linear relief features running north-west to south-east between the coast and Thai border. The western section is characterised by low lying lands which are subject to seasonal flooding.

Most of the Project Area are following the regional Faults. The main strata is composed of Carboniferous – Granite Stratum - Quaternary. At least six major Granitoid plutons in the Tanintharyi Basin intruded the metasedimentary rocks of the Mergui Group (Carboniferous). Many smaller Granitoid bodies up to 3- 4 km across are observed at the margin of the major Granitoid Pluton.

1.5.1.2 Climate and Meteorology

The climatic conditions of Myanmar are influenced by location, topography, influence of the land and sea and upper-air circulation and this leads to seasonal variation which is divided into four (4) seasons, and these are: hot season, rainy season, post-monsoon season, and dry season.

Myanmar is particularly vulnerable to cyclones originating in the Bay of Bengal during pre- and post-monsoon seasons from April to May and from October to November. In the Tanintharyi Region, the average hottest temperature is 31°C, and the average lowest temperature is 23 °C. Tanintharyi has a tropical monsoonal climate with a dry season and a heavy monsoon the rest of year, with no cold season [(1)].

1.5.1.3 Ambient Air Quality and Ambient Noise Level

Based on the Air Quality Index (AQI) and National Environmental Quality (Emission) Guidelines (EQEG, 2015), it was found that the ambient air quality in this area was still in relatively good condition and was not creating a significant negative health impact to people living in the surrounding

(1) http://www.tanintharyi.climatemps.com

community. This is due to limited significant potential sources of air pollution in this area.

Ambient noise level in the area were within Thailand's and Myanmar's (EQEG) Noise Level Standards. The major noise source at the project site was from human activities, mostly from school activity and transportation.

1.5.1.4 Surface Water Quality and Hydrology

According to the results, most values complied with the Thailand's Surface Water Quality Standard, except for BOD values in some area. This may be due to human activities such as vessel washing, ballast water vessels and toilets. Moreover, comparison of heavy metals at each sampling station, all were within the respective standards. Additionally, Total Coliforms at all sampling stations were found to exceed the Myanmar National Drinking Water Quality Standards.

There are many surface water sources running through the Zawtika onshore gas pipeline route. It was recorded that there are six (6) river and twenty-three (23) stream crossings throughout the seventy-one (71) km proposed pipeline route from Daminseik to Ban-I-Tong. However, the principal surface water features are Heinze River, Dawei (Tavoy) River and Zinba River as well as their tributaries.

1.5.1.5 Soil

Land Use Bureau of Myanmar has categorized soil type in Myanmar to twenty-four (24) major soil types according to the system of soil classification conducted by the International Soil Science Society and FAO/UNESCO. Soil type in the Project Area, which is located in Tanintharyi Division, is classified as Red-brown Forest Soils and Mountain Red-brown Forest Soils [Acisol (rhodic) & Cambisols (chromic)] and Complex o Meadow, Bog, and Alluvial Soils of river valleys (Gleysols & Fluvsols).

Soil quality in the Project Area was determined to be uncontaminated by any human activity.

1.5.1.6 Groundwater Quality

Groundwater was found to be not suitable for drinking, but it can be used for other consumption purposes such as bathing and washing. Most of the groundwater wells sampled was used for consumption only, except Ohnbinkwin and Shinbyan which used groundwater for both consumption and drinking. pH values from all sampling stations were found to exceed both Thailand Groundwater Quality and Myanmar National Drinking Water Quality Standards.

1.5.2 *Biological Components*

1.5.2.1 *Ecoregion*

Southern Myanmar is represented by five (5) ecoregions, namely the Myanmar Coastal Rain Forests, and Irrawaddy Freshwater Swamp Forests, Myanmar Coastal Mangroves, Tenasserim-South Thailand semi-evergreen rain forests, and Mizoram-Manipur-Kachin Rain Forests.

1.5.2.2 *General Description on Topography and Vegetation*

Tanintharyi region has an area of 43,344 square kilometer (16,736 square miles) and the vast land area is covered by Evergreen Forest. Tanintharyi receives 3,000 to 4,000 mm of rain each year and normally it rains from May to October.

The length of the mainland coast is about 1,200 km.

In the Project Area, some of the well-known rivers are Mayan River, Dawei River, Meke River and Zinba River. Some streams found are important for the wildlife animals including tigers such as khotamar stream, Natkyizin stream, kyauklone-gyi stream and ethi stream. The well-known mountains close to the study area include Thitkha Taung, Mayan Taung, Nahi Taung, Banni Taung, Meke Taung and Ma-Lwe Taung.

1.5.2.3 *Forest Types and Distribution*

The "Tanintharyi Nature Reserve" extensively lies in the Heinze and Kaleinaung reserved forests. The reserves are situated between latitudes 15° 7' 30" and 14° 30' North and longitudes 97° 55' and 98° 30' East in the extreme north of the Tanintharyi forest Division. The reserves are bordered with Myanmar/Thai borderline at the east. The area of Heinze and Kaleinaung reserves has approximately 614 square miles.

Additionally, three-hundred-sixty-six (366) plant species were recorded within the Project Area. Most of them were tree (117 species or 32%), shrub (63 species or 17%), herb (51 species or 14%) and small tree (35 species or 9.5%) and from this, six (6) threatened plant species were found.

1.5.2.4 *Key Biodiversity Areas (KBA)*

The Project Area and the fifty (50) km buffer zone crossover with seven (7) KBA, these includes:

- Tanintharyi Nature Reserve (in Myanmar);
- Moscos Kyun (in Myanmar);
- Myinmoletkhat (in Myanmar);
- Sai Yok (in Thailand);
- Sri Nakarin (in Thailand);
- Lam Khlong Ngu (in Thailand); and
- Khao Laem (in Thailand).

1.5.2.4(1) Protected Areas (PA)

The Project Area and the fifty (50) km buffer zone crossover with seven (7) PA, these includes:

- Taninthayi Nature Reserve (in Myanmar);
- Moscos Kyun Wildlife Sanctuary (in Myanmar);
- Sai Yok National Park (in Thailand);
- Khuen Sri Nakarin National Park (in Thailand);
- Thong Pha Phum National Park (in Thailand);
- Khlong Lamngu National Park (in Thailand); and
- Khao Laem National Park (in Thailand).

1.5.2.4(2) Important Bird and Biodiversity Area (IBA)

An important bird and biodiversity area (IBA) is an area that is globally important for the conservation of bird populations. The nearest IBA is Khao Laem National Park, spanning an area of 148,451 ha. The remaining IBAs that are also within the fifty (50) km buffer zone is Khuen Sri Nakarin National Park, with an area of 184,266 ha.

1.5.2.4(3) Tiger Conservation Landscapes

Tanintharyi Nature Reserve, which is located within the Project Area, is identified as an Alliance for Zero Extinction Sites (AZE); species that triggered this status includes the Tiger (*Panthera tigris*), and the Thin Thin's Stream Toad (*Ansonia thinthinae*).

1.5.2.5 Endemic Bird Areas

Endemic Bird Areas (EBAs) are regions that represent natural areas of bird endemism where the distribution of two or more restricted-range bird species overlap, where restricted-range refers to a breeding range of no more than 50,000 km^2. There are no EBAs located within the Project area or the fifty (50) km buffer zone. The closest EBA to the Project Area is the Irrawaddy plains, approximately three-hundred-sixty (360) km, with a total area of 160,000 km^2.

1.5.2.6 Tiger Conservation Landscapes (TCL)

A large TCL exists within Myanmar, which extends from the central down to the southern regions. This TCL is also transboundary, covering the western bordering areas of Thailand. The Project is also located within this TCL.

1.5.2.7 Forest and Vegetation

Myanmar is rich in forest because of its variety of climates. Forests grow from area of tidal swamps at sea level up to an altitude of 12,000 feet. The types of forest depend on climate, topography, soil and other factors such as fresh water,

salt water, etc. Eight (8) dominant type of forest in Myanmar were identified, these are:

- Tidal Forests;
- Beach and Dune Forests;
- Swamp Forests;
- Evergreen Forests;
- Mixed Deciduous Forests;
- Dry Forest;
- Deciduous Dipterocarp (Indaing) Forests; and
- Hill and Temperate Evergreen Forest.

1.5.2.8 Wildlife

Twelve (12) species of large mammals were found, four (4) of them, i.e. Elephant (*Elephas maximus)*, Tiger (*Panthera tigris)*, Banteng (*Bos javanicus)* and Malayan Sun Bear (*Helarctos Malayanus*), were Endangered (E) species, five (5) were Vulnerable (V), one (1) was Near Threatened (NT) and two (2) were not listed according to the IUCN red-list.

A total of forty-four (44) small mammal species were recorded. Most small mammals were not in the IUCN red-list. Only two (2) species of Pangolin (*Manis javanica*) and White-handed gibbon (*Hylobates lar*) were Endanger species and Mouse deer Tragulus napu was Near Threatened species.

A total of eighteen (18) reptilian species and thirteen (13) amphibian species were recorded.

A total of one hundred and fifty-nine (159) bird species, which belong to thirty-seven (37) families and ninety-three (93) genera were recorded.

1.5.2.9 Aquatic Ecology

From fish sampling results, a total of eight (8) fish species were found during the study period with a total length of 7.4-22 cm and 5-100 g of body weight.

Moreover, the abundance of phytoplankton and zooplankton at brackish water stations (Wharf and Heinze Bridge) were higher than freshwater stations. The average total density of phytoplankton was 1,524,983 cells/m^3 and zooplankton was 93,622 cells/m^3.

Considering benthic sampling, the average total density was sixty-three (63) individuals/m^2.

*1.5.3 **Social Components***

1.5.3.1 Demographic

The project covered six (6) villages in Yebyu Township, Dawei District, Tanintharyi Region, which are Daminseik, Phaungdaw, Kaunghmu, Ohnbinkwin, Mighaungaing, and Shinbyan village. The villages are filled with various ethnicity such as Bamar, Mons, and Karen. Most villages comprise of mainly working age people with a higher proportion of women. The housing pattern is mainly one floor style house with high basement, mostly constructed from natural materials.

1.5.3.2 Socio-economic

Occupation types commonly found in the area are farmer, wage labour, fishermen, and retail owners. Main cash crops are orchards, coconut, betel nuts, cashew nuts, rice, and rubber. The products are used for trading and self-consumption. Livestock raising can also be found.

1.5.3.3 Infrastructures and Utilities

Main sources of water and electricity for most villages is water wells and diesel generators respectively. Majority of the villages do not have access to waste treatment facility. At least one (1) school and health facility can be found in each village. All villages have access to road networks, but the road surface is unpaved. Villagers commonly travel by foot, motorcycle, and bus.

1.5.3.4 Fishery

Tanintharyi region is one of the main fish producing areas in Myanmar, especially along the region coast with more than 10,000 and 1,200 of inshore and offshore fishing vessels respectively. The products are distributed within Myanmar and some exported to Thailand. The main fishery products are dried fish, dried prawn, dried shrimp, and shrimp paste.

In addition, high quality pearl production is also well known in the region. Myanmar government and Japanese technicians started a pearl production in Myeik Archipelago in 1954 and spread out throughout the region.

1.6 HIGHLIGHTS OF KEY IMPACTS AND MITIGATION MEASURES

A summary of key impacts from the ongoing project operations, as well as key mitigation measures, are listed in ***Table 1.2***. This is only a brief summary of the most important impacts and mitigation measures. Full details on all potential impacts from each activity are presented in ***Section 6***, and a list of mitigation measures for each impact is presented in ***Section 7***.

The mitigation measures are employed to reduce the likelihood of the impacts identified, and/or to limit the extent or severity of impact if one does occur. The purpose of the proposed mitigation measures is to manage identified impacts, comply with regulations and ensure that standards of international industry practice are adopted during the execution of all Project activities.

It should be noted that all identified potential impacts can be appropriately managed with the implementation of these mitigation measures, and there are no major residual impacts from Project activities.

Table 1.2 Highlights of Key Potential Impacts and Mitigation Measures

Aspects	Potential Impacts	Mitigation Measures
1. Air Quality	1.1. Deterioration of air quality from dust emissions	1.1.1. Post speed limits on project access roads and enforce vehicle speed limits
		1.1.2. Maintain service tracks and access roads to avoid road deterioration and subsequent dust generation
	1.2. Deterioration of air quality from diesel-fuelled combustion emissions	1.2.1. Ensure all machinery and vehicles are properly maintained and serviced as per maintenance schedule recommended by manufacturer
	1.3. Fugitive emissions during operation phase from pipeline's valves, flanges and intermittent venting at ZBV1 and ZBV2	1.3.1. Inspection and maintenance program will be implemented during the operational phase to control fugitive emissions
2. Noise	2.1. Increase in noise levels due to use of vehicles and machinery	2.1.1. Ensure use of mufflers on diesel/gas driven machinery
		2.1.2. Ensure all machinery and vehicles are properly maintained and serviced as per maintenance schedule recommended by manufacturer
		2.1.3. Limit noisy activities to during daytime where possible.
3. Light	3.1. Increase in light from operations ZOC and ZMS at the nighttime	3.1.1. Ensure adequate night lighting at ZOC and ZMS. 3.1.2. Inspect and maintain programs for night lighting equipment.
4. Soil, Surface Water, Groundwater	4.1. Contamination from inappropriate domestic wastewater (sewage) management	4.1.1. Implement Myanmar Asset Waste Management Procedure
		4.1.2. Maintain existing toilets and septic tanks at permanent manned facilities
		4.1.3. In case domestic wastewater discharge, treat all wastewater discharge to comply with the Industry-Specific requirements in Myanmar's Environmental Quality (Emission) Guidelines (see ***Table 5.1***)
	4.2. Contamination from inappropriate storage or disposal of non-hazardous and hazardous waste	4.2.1. Implement Myanmar Asset Waste Management Procedure

Aspects	Potential Impacts	Mitigation Measures
	4.3. Contamination due to accidental spills of hazardous materials (diesel, paint, lubricating fluids, chemicals, etc)	4.3.1. Implement Myanmar Asset Spill Contingency Plan
		4.3.2. Minimisation of storage of hazardous materials
		4.3.3. Use oil catch pans under vehicles when performing maintenance and, only conduct maintenance on cemented surfaces
		4.3.4. Conduct training of personnel in safe use & handling of hazardous materials
		4.3.5. Provide spill clean-up kits and spill response training
		4.3.6. Regularly inspect fuel and chemical storage areas
		4.3.7. Store all chemicals in secured storage area with impervious (cement or plastic sheet) floor and bund wall
		4.3.8. Handle all chemicals according to their SDS
5. Ecology and Biodiversity	5.1. Habitat degradation due to impacts on environmental resources, vegetation and disturbance of wildlife	5.1.1. Mark project areas clearly and prohibit vehicles from moving off site onto surrounding land
		5.1.2. Identify community assets, i.e. forest resources, river grounds, etc., and ensure that project activities avoid blocking access, or provide alternative access to them
		5.1.3. Provide awareness to project workers and contractors on protected areas and restricted activities there, and impose harsh penalties on anyone breaking regulations
		5.1.4. Prohibit hunting, trapping or fishing by project workers
		5.1.5. Provide training to project personnel on recognition of sensitive receptors and areas (i.e. women, children, elderly, indigenous people, public facilities and resources, protected areas and threatened species, etc), and guidelines on appropriate behaviour.
	5.2. Impact on rare and endangered species	5.2.1. Provide awareness to project workers on rare and endangered species specific to the regions as part of induction programs
		5.2.2. Report if any endangered or rare species are sighted within pipeline ROW to Project Site Manager who will report to the Senior Manager for further action
		5.2.3. Development of additional ecological surveys as necessary in sensitive areas to monitor impact on rare and endangered species
	5.3. Worker activities in Tanintharyi Nature Reserve may threatened significant flora values,	5.3.1. Adhere to conditions/rules regarding use of Access Roads and Access Walkways in TNRP
		5.3.2. Prohibit trees cutting on access walkways
		5.3.3. Provide annual financial support to TNRP project

Aspects	Potential Impacts	Mitigation Measures
6. Socio-Economy	6.1. Potential for increased local employment opportunities (Benefit)	6.1.1. Preferential hiring of locals from "pipeline affected communities" in semi-skilled and unskilled jobs
		6.1.2. Advertise vacancies well in advance of project commencement though appropriate local sources, i.e. Township Labour Office, village head authority house, monastery, etc.
		6.1.3. Ensure recruitment procedures are transparent, public and non-discriminatory
		6.1.4. Provide skills and training opportunities to locals
	6.2. Potential for increased local procurement opportunities (Benefit)	6.2.1. Advertise and give procurement preference to local and national businesses
		6.2.2. Provide awareness on local culture and customs as part of worker induction training, including ethical conduct and appropriate use of force for guards hired to provide security to project facilities
7. Public Participation and Community Relations	7.1. Enhance project benefits	7.1.1. Continue implementation of CSR programme to support local activities (***Annex C***) Initiate or support existing development programs that are catered to the needs of the local and indigenous communities through collaboration with NGOs if any exist in project area. Examples of development programs include micro-credit schemes, bilingual educational programs, health & nutrition programs, water & sanitation programs, etc.
	7.2. Social tension/conflicts	7.2.1. Implement community grievance procedure according to PTTEP Grievance Handling Guideline
		7.2.2. Frequent communication with the nearest communities and sensitive receptors/stakeholders to allow issues to be addressed quickly
8. Accidental Spills and Leakages of Oil and Chemicals	8.1. Various potential impacts, including: • Potential contamination of surface water, groundwater, seawater, soil and/or sediment • Potential secondary impacts on food sources (crops, seafood, livestock), biodiversity, etc.	8.1.1. Implement Myanmar Asset Spill Contingency Plan
		8.1.2. Minimisation of storage of hazardous materials
		8.1.3. Use oil catch pans under vehicles when performing maintenance and, only conduct maintenance on cemented surfaces
		8.1.4. Conduct training of personnel in safe use & handling of hazardous materials
		8.1.5. Provide spill clean-up kits and spill response training
		8.1.6. Regularly inspect fuel and chemical storage areas
		8.1.7. Store all chemicals in secured storage area with impervious (cement or plastic sheet) floor and bund wall
		8.1.8. Handle all chemicals according to their SDS

Aspects	Potential Impacts	Mitigation Measures
9. Pipeline Leakage and Rupture	9.1. Various potential impacts, including: • Potential fire and explosion, impacting safety of workers and public • Contamination of surrounding natural resources • Occupational hazard if natural gas accumulates in one area • Toxicity to aquatic organisms in the immediate vicinity of leakage	9.1.1. Implement Myanmar Asset Emergency Management Plan and provide training on the plan to all employees
		9.1.2. Regularly conduct pipeline inspection and maintenance procedures, including: • ROW surveillance • ROW maintenance • Regular inspection of pipeline integrity by pig • Leakage survey including inspection of pipe coating and insulating joints/flanges • Cathodic protection maintenance and corrosion monitoring
		9.1.3. If compromised pipeline integrity is discovered during regular inspection and maintenance, repair promptly
		9.1.4. Conduct 24-hour monitoring through SCADA: continuous monitoring of system flow parameters (pressure, temperature, flow rate)
		9.1.5. If any abnormal pipeline conditions are observed, implement procedures to isolate and depressurize affected section of pipeline
		9.1.6. Conduct preventative maintenance on fire and gas detection system and firefighting equipment
		9.1.7. Provide an adequate number and types of fire extinguishers, and install fire alarms and windsocks that are audible and visible from permanent facilities
		9.1.8. Conduct fire training and response drills
		9.1.9. Restrict smoking to controlled areas only
		9.1.10. Identify pipeline ROW clearly with warning signs and fencing, including at the landfall
		9.1.11. Inform the public about risks, prevention measures and emergency response
		9.1.12. Encourage community monitoring on pipeline condition by posting signs at strategic locations with contact numbers and address to report any pipeline integrity issues
		9.1.13. Inform public near earthquake zone areas about risks, prevention measures and Public Emergency Response Plan

Aspects	Potential Impacts	Mitigation Measures
10. Accidental Fire or Explosion	10.1. Potential of fire or explosion from ROW work	10.1.1. No grass cutting during dry season
		10.1.2. Prohibit burning of trash and vegetation
		10.1.3. Allow smoking only in designate areas
		10.1.4. Provide fire protection equipment, including fire extinguishers and alarms, on all onshore facilities
		10.1.5. Implement emergency and crisis management plan in case of fire or explosion occurrence
		10.1.6. Conduct regular inspections and drills for fire protection equipment

1.7 MONITORING MEASURES

As detailed in Myanmar's National Environmental Quality Guidelines, "*projects shall engage in continuous, proactive and comprehensive self-monitoring of the project and comply with applicable guidelines and standards. For purposes of these Guidelines, projects shall be responsible for the monitoring of their compliance with general and applicable industry-specific Guidelines as specified in the project EMP and ECC.*"

Monitoring will be required in order to demonstrate compliance with legal limits (i.e. Myanmar's National Environmental Quality Guidelines), and ATL's Project requirements, and will also provide verification of the overall design and effectiveness of the implemented mitigation/control measures. Aspects to be monitored by the Onshore Zawtika project for compliance with EQEG are as follows:

- Air Emission;
- Noise;
- Surface Water Quality;
- Groundwater Quality;
- Soil Erosion and Sedimentation;
- Biodiversity;
- Occupational Health;
- Storm Water Drainage; and
- Sewage.

Details of the environmental monitoring program are presented in ***Table 1.3***.

Table 1.3 Monitoring Measures during Operation Phase

Environmental Aspects	Parameters	Method	Location	Duration / Frequency of Monitoring	Responsibility
1. Air Emission	**Required by EQEG and WHO ambient air quality guideline;** • Hydrogen Sulfide • PM 2.5 • PM 10 • Ozone • NO_2 • SO_2	Method • Samples shall be analyzed according to globally recognized standard e.g.US EPA. Number of samples • 1 sample per station.	• Nearest sensitive receptor or downwind of complaint area (if necessary)	• In case of any complaint/incident, conduct the monitoring as per request of authority (e.g. MOGE)	ATL via Authorized Contractor
	Greenhouse Gas (GHG)	Method • GHG emissions will be calculated by using the volume of all fuel type.	• Operation area	• Monthly summary for GHG	ATL
2. Noise	Noise monitoring are as follows: • Noise contour • Noise dose and • Noise level	Method • Samples shall be analyzed according to Occupational Safety and Health Administration (OSHA), United Stated Department of Labour, Regulation (Standard - 29 CFR), Standard Number 1910.95, Occupational Noise Exposure	• Operation area	• Noise contour survey, conduct within 2 years after starting operation. The survey will be revisited every 5 years or when significant change of operation and the survey will be conducted again only for the area that have the significant change of noise level. • Noise dose, conduct for personnel who is analysed as abnormal hearing from annual health checking. • Noise level, conduct when any complaint raised	ATL via Authorized Contractor

Environmental Aspects	Parameters	Method	Location	Duration / Frequency of Monitoring	Responsibility
3. Surface Water Quality	Parameters to be selectively analyzed for surface water quality are as follows: • pH • Temperature • Conductivity • Dissolved Oxygen • 5-day Biochemical oxygen demand (BOD) • Chemical oxygen demand (COD) • Oil and grease • Total Petroleum Hydrocabon (TPH) • Total coliform bacteria • Total heavy metal	• Monitoring will be collected for analysis according to international guidelines and requirements such as USEPA	• Upstream and downstream of nearest representative surface water	• Every 2 years	ATL via Authorized Contractor
			• Upstream and downstram of area that involve in official and proved complaint/incident that related to company's activity.	• In case of any complaint/incident, conduct the monitoring as per request of authority (e.g. MOGE)	
4. Groundwater Quality	Parameters to be selectively analyzed for groundwater quality are as follows: • pH • Temperature • Conductivity • Dissolved Oxygen • 5-day Biochemical oxygen demand (BOD) • Chemical oxygen demand (COD) • Oil and grease • Total Petroleum Hydrocabon (TPH) • Total coliform bacteria • Total heavy metal	• Monitoring will be collected for analysis according to international guidelines and requirements such as USEPA	• Nearest representative groundwater well for ZOC facility	• Every 2 years	ATL via Authorized Contractor
			• Upstream and downstram of area that involve in official and proved complaint/incident that related to company's activity.	• In case of any complaint/incident, conduct the monitoring as per request of authority (e.g. MOGE)	

Environmental Aspects	Parameters	Method	Location	Duration / Frequency of Monitoring	Responsibility
5. Soil erosion and sedimentation	• Observation of soil erosion or sedimentation cases and landslide while survey along pipeline route	• Visual observation	• ZOC/ZMS • Along pipeline	• Visual checking along pipeline route as ATL plan	ATL personnel
6. Biodiversity	• Observation of wildlife (fauna)	• Visual observation	• ZOC/ZMS • Along the pipeline while ROW inspection	• Summary of observed cases of wildlife every 6 months	ATL
7. Occupational health	• Determined case by case • Injury or incident case	• Determined case by case	• Determined case by case	• Monitor when concerns have been raised	ATL
8. Storm Water Drainage	**Required by EQEG** • Oil & Grease	• Samples will be collected for analysis according to international guidelines and requirements such as USEPA.	• Storm water discharge locations	• 6 Monthly	ATL via Authorized Contractor
9. Sewage	**Required by EQEG[1]** • BOD • COD • Oil and Grease • pH • Total coliform bacteria • Total nitrogen • Total phosphorus • Total suspended solids	• Samples will be collected for analysis according to international guidelines and requirements such as USEPA	• Wastewater discharge locations	• 6 Monthly	ATL via Authorized Contractor

[1] In case of wastewater discharge

1.8 REPORTING REQUIREMENTS

This section outlines the reporting detail concerning Myanmar Authorities requirements as stated in the EIA Procedure. The information stated here will encapsulate a robust monitoring report of the Project that reflects the quality and timely implemention of the operation. Generally, the report would orginate from the Project site to the Project headquarters and to relevant regulatory authorities. The objective of the report is to ensure that the EMP is being implemented effectively.

ATL as the operator of this Project has committed to conducting regular inspections to identify deviations/ non-conformities / unsafe conditions as well as the following:

- Incident, accident and emergency reporting;
- Monitoring and inspection to compare against performance inditcator; and
- Training Programs.

Further explanation of the reporting requirements is detailed in ***Chapter 10***.

1.9 OPERATIONAL SUB PLAN

As part of the EMP report and responsible project implementation, the following sub plans were prepared and executed to accommodate various aspect of the project:

- Emergency Plans (which includes Myanmar Asset's Emergency Management Plan and Myanmar Asset's Crisis Management Plan)
- Waste Management Plan
- Biodiversity Management Plan
- Control and Maintenance Plan
- Community Safety, Security, Health and Environmental Management Plan
- Occupational Health Management Plan / Standard.

Detail of each sub plan is described in ***Chapter 11***.

1.10 CAPACITY DEVELOPMENT AND TRAINING

ATL adheres to Myanmar Asset SSHE Training and Competency Procedure which ensures that:

- SSHE Training and Competency requirements clearly defined are conducted and followed for each position in time.
- SSHE Training and Competency Standard (SSHE-106-STD-340) is followed when arranging trainings and assessing competency.
- Training conducted and competency assessed is recorded and ready for review when required.
- Training history of each individual is recorded for reference.

Further specific requirements within Myanmar Asset SSHE Training and Competency Procedure includes:

- Competency assessment
- Monitoring
- Review and audit

These are further explained in ***Chapter 12***.

1.11 PUBLIC CONSULTATION AND DISCLOSURE

During the public consultations, stakeholders discussed their views and concerns in relation to the exploration drilling project, about which PTTEPI made some responses. Those main concerns and ATL's answers are summarized below:

- Fragility and vulnerability of the Myanmar coastal areas. ATL assures that the entire exploration drilling phase will be carried out according to the rules of the art (Myanmar Asset Spill Contingency Plan and National guidelines (EQEG)), reducing as much as possible the risks of pollution;
- The Myanmar asset's CSR program adopted for the project were developed since 2008 and annual CSR plans are submitted to MOGE and respective departments; and
- Support to local project. In case hydrocarbons are discovered in enough quantity for economic, local people of Myeik wished partnerships for local development (electricity for instance). ATL took notice of the remark.

Public consultation and disclosure to be undertaken during the ESHIA study are presented in ***Chapter 13***. A summary of key activities that were undertaken are described in this section.

1.11.1 Project Disclosure

All project information shall be disclosed to provision the information in an accessible manner (a manner which allows for easy understanding, such as in the local language) to the various stakeholders in Project. Public consultations were undertaken during January 10-11, 2009 across the various stakeholder groups identified. For the potentially affected communities, consultation and disclosure was undertaken in Daminseik area, as described in ***Chapter 13***.

1.11.2 Corporate Social Responsibility (CSR) Activities

There are currently a number of ongoing CSR activities taking place by ATL/PTTEPI under the Zawtika Project. These activities have the objective to uplift quality of life and gain favourable relations from all stakeholders in the operating area. The CSR program for the Zawtika Project consists of 3 main sectors: "Health, Education and Community Development Sector".

The CSR budget for this Project is required to be approved by MOGE annually, ATL will therefore propose approximately 500,000-600,000 USD (about

1,050,000,000 kyats) which is similar amount with previous years; however, this can vary depending on MOGE's approval. The CSR budget used for 2019 was 588,500 USD; therefore, the proposed budget for 2020 onward is nearly 600,000 USD. The budget is planned to be used for continuing the development of work program, which includes but not limited to the following:

- Higher Education Assistance for Development Scholarship
- Educational Program
- Parasite Free School Program
- Construction of Public Infrastructure or Utility
- Waste to Energy Program
- Monastery support
- Community support and Emergency relief
- High Vocational Diploma Scholarship
- Monastery / Cultural Support
- Charitable CSR Activities among Staff & Family, Government, Contractors (including Plantation and environmental related support activities)
- Technical Capability Building and Development Program incorporative with Ministry of Energy and Ministry of Labor

The Zawtika Onshore Gas Transportation System ("the Project") is an existing development operated by Andaman Transportation Limited (ATL), consisting of 71 km onshore gas transportation pipeline, connected from offshore Zawtika pipeline at Mawgyi village (landfall point) to PTT gas pipeline at Ban-I-Tong (Myanmar Thailand border point), Zawtika Onshore Operating Center (ZOC), Zawtika Block Valve #1 and #2 (ZBV1 and ZBV2), and Zawtika Metering Station (ZMS).

An Environmental, Social and Health Impact Assessment (ESHIA) study was undertaken for the Zawtika onshore gas transportation system in September 2009, and a supplementary study (Reroute 2, 3 & 4) was undertaken in May 2013. ESHIA was not required under Myanmar law during that time, therefore Thailand and international ESHIA guidelines and standards were applied to carry out the ESHIA. Zawtika onshore gas transportation system which include Onshore facilities and along the route of the gas Pipeline.To comply with requirements of the Environmental Impact Assessment (EIA) Procedure, promulgated on 29th December 2015, ATL is required to undertake an Environmental Management Plan (EMP) for its current operations, and submit to Ministry of Natural Resources and Environmental Conservation (MONREC) (formerly Ministry of Environmental Conservation and Foresty (MOECAF)/Environmental Conservation Department (ECD) for consideration and approval to obtain an Environmental Compliance Certificate (ECC), for its existing onshore Zawtika Project. Further details of the onshore Zawtika Project are described in ***Section 3***.

2.1 PRESENTATION OF THE PROJECT PROPONENT/PROJECT DEVELOPER

ATL, a subsidiary of PTTEP, is the operator for the Project to carry out petroleum exploration and production activities and related business in Myanmar.

ATL applies the PTTEP's mission which is to operates globally to provide reliable energy supply and sustainable value to all stakeholders with a strong vision of "Energy Partner of Choice" through Competitive Performance and Innovation for Long-term Value Creation. PTTEP's Vision, Mission and Corporate Values Policy are shown in ***Figure 2.1***.

Figure 2.1 PTTEP's Vision, Mission, Corporate Values and Sustainable Development Policy

Vision Mission and Corporate Values

Vision

Energy Partner of Choice through competitive performance and innovation for long-term value creation.

Mission

PTTEP operates globally to provide reliable energy supply and sustainable value to all stakeholders.

Corporate Strategy (EXECUTE and EXPAND)

PTTEP continues the key strategy "EXECUTE & EXPAND" in order to enhance the company's competitive advantage and maintain sustainable growth amid the challenges the industry is facing now and in the future.

Execute	Expand
Create full value from existing assets with the emphasis on increasing production from key assets Maintain cost competitiveness through digital and organizational transformation Accelerate key development projects to increase petroleum reserves Effectively execute the transitions for Bongkot, Erawan and newly acquired assets.	**Coming-Home Strategy**: Focuses investments in Thailand and Southeast Asia **Strategic Alliance Strategy**: Aims to capture investment opportunities in other petroleum prolific areas with strategic alliances **New Business Strategy**: Focuses on technology and energy-related investment opportunities to help sustaining the business

Figure 2.1 ***PTTEP's Vision, Mission, Corporate Values and Sustainable Development Policy (Cont.)***

Corporate Values

Source: PTTEP, 2019

A list of the specific team members of ATL that were involved in the preparation of this EMP report are presented in ***Table 2.1***.

Table 2.1 ***Onshore Zawtika Key Persons for the EMP Study***

Name	Position/Specialization
Udom Arayatanon	Safety, Security, Health and Environmental Manager
Wichean Kaewkong	Senior Environmental Engineer
Zar Chi Saint	Environmental Engineer
Anucha Thippayawarn	Asset Planning Manager
Benjapol Anusasamornkul/Tin Aung	Onshore Facility Manager
Jarong Niyomyaht / Banleng Yaemkong	Onshore Pipeline & Operations Supervisor
Surakrit Bunruang / Kittiporn Treenate	Onshore Safety Supervisor

2.2 PRESENTATION OF ENVIRONMENTAL, SOCIAL AND HEALTH EXPERTS

Environmental Resources Management (ERM-Siam) has been contracted by ATL to prepare this EMP for the operation phase of the Project. This report presents the objectives, methodology and outcomes of the EMP.

ERM is a leading global provider of environmental, health, safety, risk, social consulting, and sustainability-related services. ERM has more than 160 offices in 40 countries and territories and employ more than 5,000 people. ERM has a 40-year track record of excellence on complex and challenging projects.

An overview of the environmental, social and health experts involved with the preparation of this EMP report are presented in ***Table 2.2***, and brief descriptions of their backgrounds are included below.

Table 2.2 Environmental, Social and Health Specialists for the Onshore Zawtika EMP

Organization/ Company	Name	Qualifications	Position/ Specialization
ERM-Siam	Kamonthip Ma-oon	• Executive Study: General Management Programme, Judge Business School, University of Cambridge, UK • MSc. (DIC) in Environmental Engineering and Business Management, Imperial College, London • BEng. in Environmental Engineering, Chulalongkorn University, Thailand	Partner in Charge
	Craig Reid	• BSc (Hons), Marine Biology, University of Stirling, Scotland, United Kingdom, 1997	Myanmar Country Manager
	Sylvia Jagerroos	• MSc Biological Sciences with Environmental Science • BSc Biological Sciences	Environmental Specialist, Project Manager
	Bongkoch Tongsadayu	• M.Sc. in Technology of Environmental Management • B.Sc., Aquatic Science	Environmental Specialist
	Rattinan Thirananthasit	• BSc Social Sciences. Major in Environment and Development	Social Impact Assessment Specialist
	Kanokphorn Chaivoraphorn	• M.A. (Social Development – Social Organization and Development) • B.Sc. (Industrial Chemistry) B.P.H. Major in Occupational Health and Safety	Principal Consultant, Health Specialist
	Busaya Jutatipatai	• MSc (Environmental Management) • BSc (Environmental Science)	Associate Consultant

Partner-In-Charge – Ms. Kamonthip Ma-oon

Ms. Kamonthip Ma-oon is a Partner with the Capital Project Support (CPS) Team at ERM-Siam, based in Bangkok Office.

Kamonthip has extensive experience in managing Environmental and Social aspects for large-scale projects in various sectors i.e. Oil & Gas, Power and Transportation both in Europe and South East Asia regions.

Kamonthip also has key experience as Business Partner to the Clients in Oil & Gas and Power Sectors with her support on Environmental, Social, Health and Safety aspects including EIAs, ESIAs, ESMPs, EM&As, Resettlement to satisfy local requirement and applicable international standards i.e. IFC PS, WB, ADB SPS, as well as providing advice on EHS Risk Management.

Myanmar Country Manager – Craig Reid

Mr Reid is a Partner with over fifteen years' experience in environmental management at ERM. Mr Reid is the Manager of the Marine Sciences Team in Hong Kong, with overall responsibility for a wide range of projects spanning across sectors including power, oil and gas, infrastructure, utilities, property and mining. Mr Reid is also highly active in Myanmar, providing direct support to ERM's operations there.

Project Manager – Ms. Sylvia Jagerroos

Sylvia Jagerroos, Marine specialist, has over 15 years' experience in the field of Climate Change adaptation, Conservation biology, and Environmental planning and Impact assessment. She has managed several big Environmental and Social cross border projects working as a Team Leader or Project Manager. She has gained valuable expertise in Coral reef assessment, Community participation work and Institutional and Capacity support especially in South East Asia and in the Pacific. Sylvia, she has collaborated with international donors, governments and non-government organizations (NGOs) as well as with the Oil and Gas sector.

Environmental Specialist - Ms. Bongkoch Tongsadayu

Ms. Bongkoch Tongsadayu is a Senior Consultant of Impact Assessment and Planning Team (IAP) based in ERM-Siam office. Bongkoch has 12 years' experience in Environmental Impact Assessment (EIA) for the Onshore Oil &Gas sectors. She conducted various due diligences EIA and Environmental Monitoring and Auditing (EM&A) programs in Thailand. These investigations have covered a wide range of project development including for Oil & Gas sector. Bongkoch was a Project Manager, Project coordinator and Consultant in environmental studies of exploration drilling, flow line and petroleum production for onshore projects about 8 years. Additionally, she has experiences in regulatory review for Initial Environmental Examination (IEE) Study for a gas-fired Co-Generation System (CGS) in Thailand and EIA studies for Petroleum pipeline, Petrochemical industries, Landfill, Power sector and Steel industry.

Social Impact Assessment Specialist – Ms. Rattinan Thirananthasit

Ms. Rattinan Thirananthasit has joined ERM based in Thailand and has worked as part of the Capital Project Support Team. Rattinan graduated from Ritsumeikan Asia Pacific University (APU), Bachelor of Social Science, College of Asia Pacific Studies (International Program), Majoring in Environment and Development with 80% tuition reduction scholarship. Her thesis of work was under the topic of State's policy making and influential social factor on Environmental policies prioritization. Rattinan has interned at The Education for Development Foundation (EDF) as project management coordinator in 2017. Rattinan has support in social aspects, including development of social baseline and social impact assessment (SIA) for ERM's projects.

Health Specialist – Ms. Kanokphorn Chaivoraphorn

Ms. Kanokphorn Chaivoraphorn is a Thailand EIA License Holder (Environmental Expert) and Principal Consultant of ERM with experience in various type of environmental studies, e.g. Environmental Impact Assessment (EIA), Initial Environmental Examination (IEE), Environmental and Safety Assessment (ESA), Code of Practices (CoP) in the Oil &Gas and Power sectors. My experience is including managing large-scale projects e.g. PTTEP EIAs in concession block S1, involving in ESIA for Petrochemical Complex in Southern Vietnam with various stakeholders.

Her expertise includes in detail understanding of regulatory and legislations, Equator Principles, International Finance Corporation (IFC) Performance Standards (PS) and the relevant Environmental, Health, and Safety (EHS) Guidelines and their application to various type of projects including power sector.

Prior to joining ERM, She I worked for Consultants of Technology Co., Ltd. for more over 12 years, completed a number of EIA studies for petrochemical development, metal/non-metal plant, pulp mill, power plant, etc in Thailand, including with Environmental Compliance Audit and Monitoring.

Associate Consultant (General Environmental SME) – Ms. Busaya Jutatipatai

Busaya Jutatipatai is an Assistant Consultant within ERM based in Bangkok, Thailand with a background of environmental science.

Busaya experience almost 5 years in the field of Environmental Impact Assessment (EIA) for the Onshore Oil &Gas sectors, Environmental Examination (IEE) Study and Code of Practices (CoP) for power sector, especially renewable energy e.g. Solar farm, Wind farm, Environmental Monitoring Project, HES Risk Management Process, and other technical support.

3.1 PROJECT OVERVIEW AND BACKGROUND

The Zawtika Onshore Operation is the onshore facility that support the Zawtika Development Project which is a gas field development project located on Block M9 and a small portion of Block M11, owned by Myanma Oil & Gas Enterprise (MOGE). The field lies in the Gulf of Martaban, approximately 225 km south of Yangon and 207 km west of the Myanmar coast.

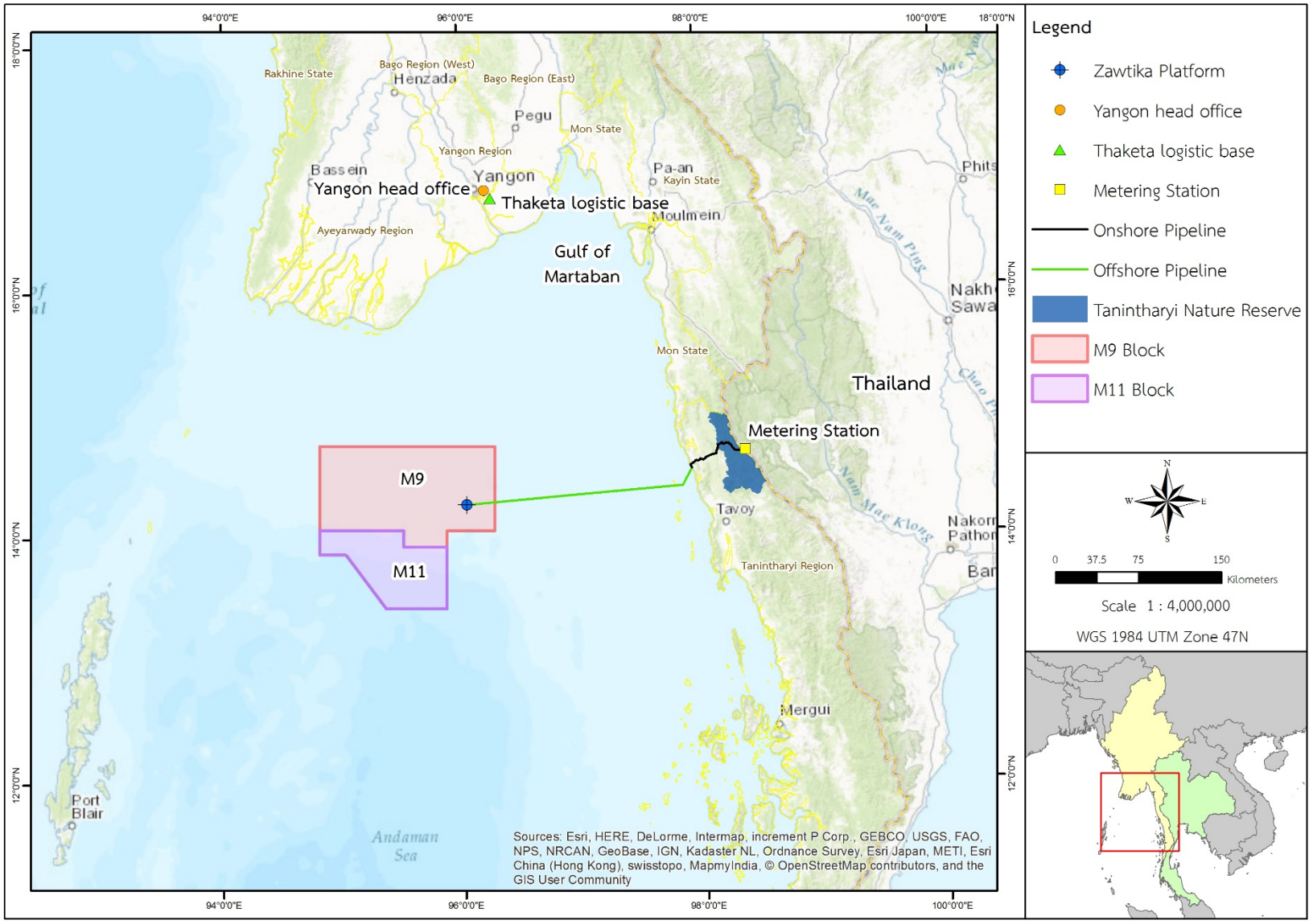
The Zawtika onshore facilities, which is the focus of this EMP, consists of:

- 71 km long onshore gas transportation pipeline connected from offshore pipeline at Mawgyi village (landfall point) to PTT gas pipeline at Ban I Tong (Myanmar-Thailand border point), approximately 38 km from landfall point to Tavoy Bridge (Phase 1) and 33 km from Tavoy Bridge to Ban I Tong (Thai Border) (Phase 2).
- Zawtika Onshore Operating Center (ZOC) covering an area of 285,168 m^2,
- Zawtika Block Valve #1 and #2 (ZBV1 and ZBV2) covering an area of 140 m^2 of each, and
- Zawtika Metering Station (ZMS) covering an area of 39,132 m^2.

The first gas production to Domestic Gas was achieved on 14th March 2014 and Export Gas to Thailand on 5th August 2014, respectively.

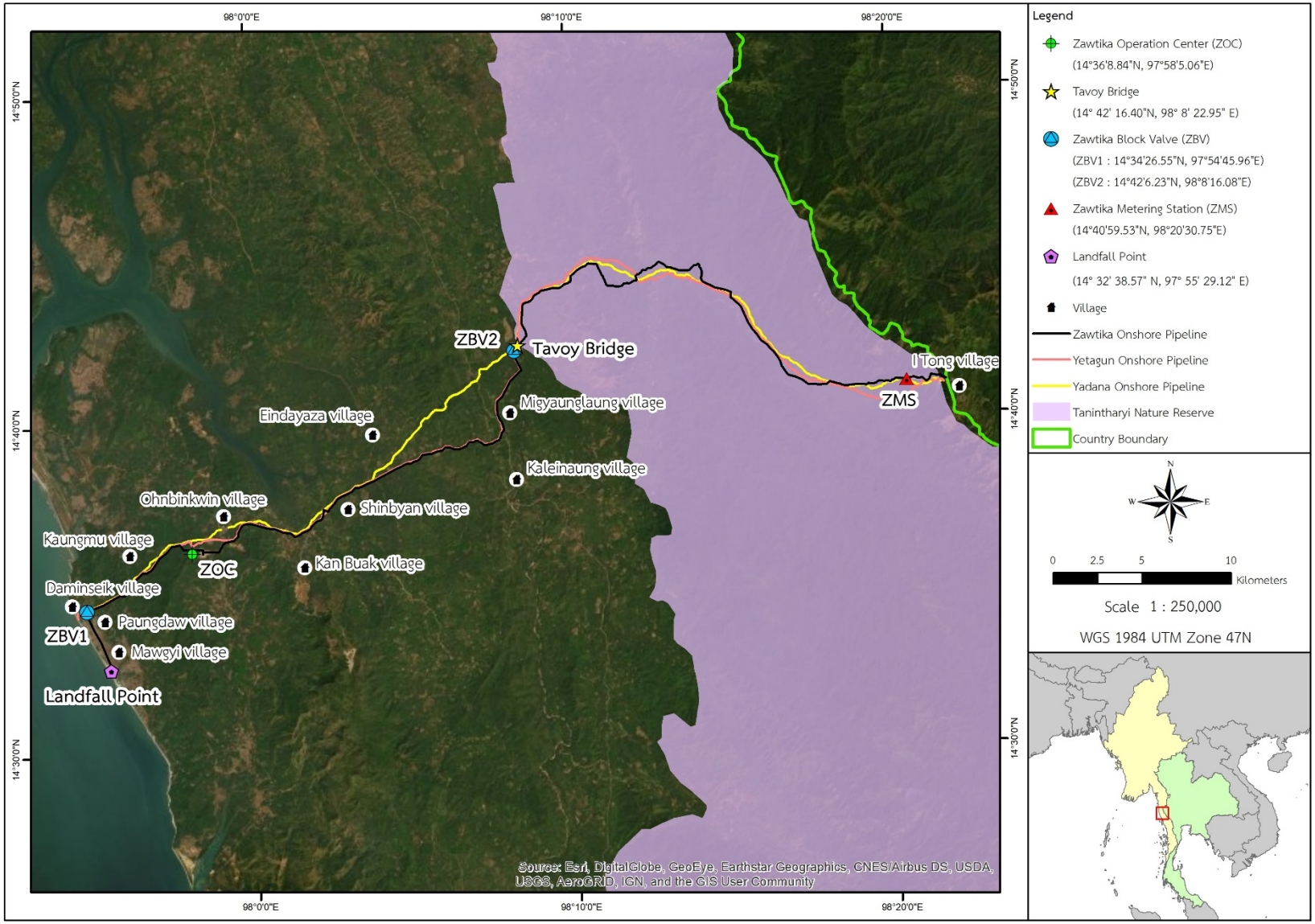
The overview of Zawtika components and location of the onshore facilities are illustrated in ***Figure 3.1*** and ***Figure 3.2***.

Figure 3.1 Overview of Zawtika Development Project



Source: ATL, 2019

Figure 3.2 Location of Zawtika Onshore Facilities



Source: ATL, 2019

The area that has been acquired for the Project consists of the pipeline right-of-way (ROW), ZOC, ZBV1/2 and ZMS. The selection of the pipeline routes was evaluated during a preliminary survey in terms of engineering, economic and environment to avoid community areas, pipe crossing, river crossing, road crossing and impacts to surrounding land uses. A land compensation process was established for private land owners, which was under MOGE approval. There was no resettlement or physical displacement of people or households. The land acquisition for the Project was facilitated by Myanmar local authorities.

From the Dawei or Tavoy bridge up to the Myanmar-Thailand border, the land is in within the Tanintharyi Nature Reserve (TNR), and no residence is allowed. Thus, there is also no resettlement or physical displacement of people and households along the route of pipeline.

As part of the EMP preparation process, an onshore site visit was undertaken by Project team members during 4-5 June 2016 in order to observe and understand:

- Operations of ZOC, ZBV1/2, ZMS, and the Right of Way (ROW);
- Surrounding environmental conditions (i.e. topography, water bodies, local ecology;
- Surrounding social conditions (i.e. transportation, surrounding land use/agriculture, etc.); and
- Mitigation/management measures.

There is operation phase during the site visit period. Output from onshore site visit in 2016 can be summarized below.

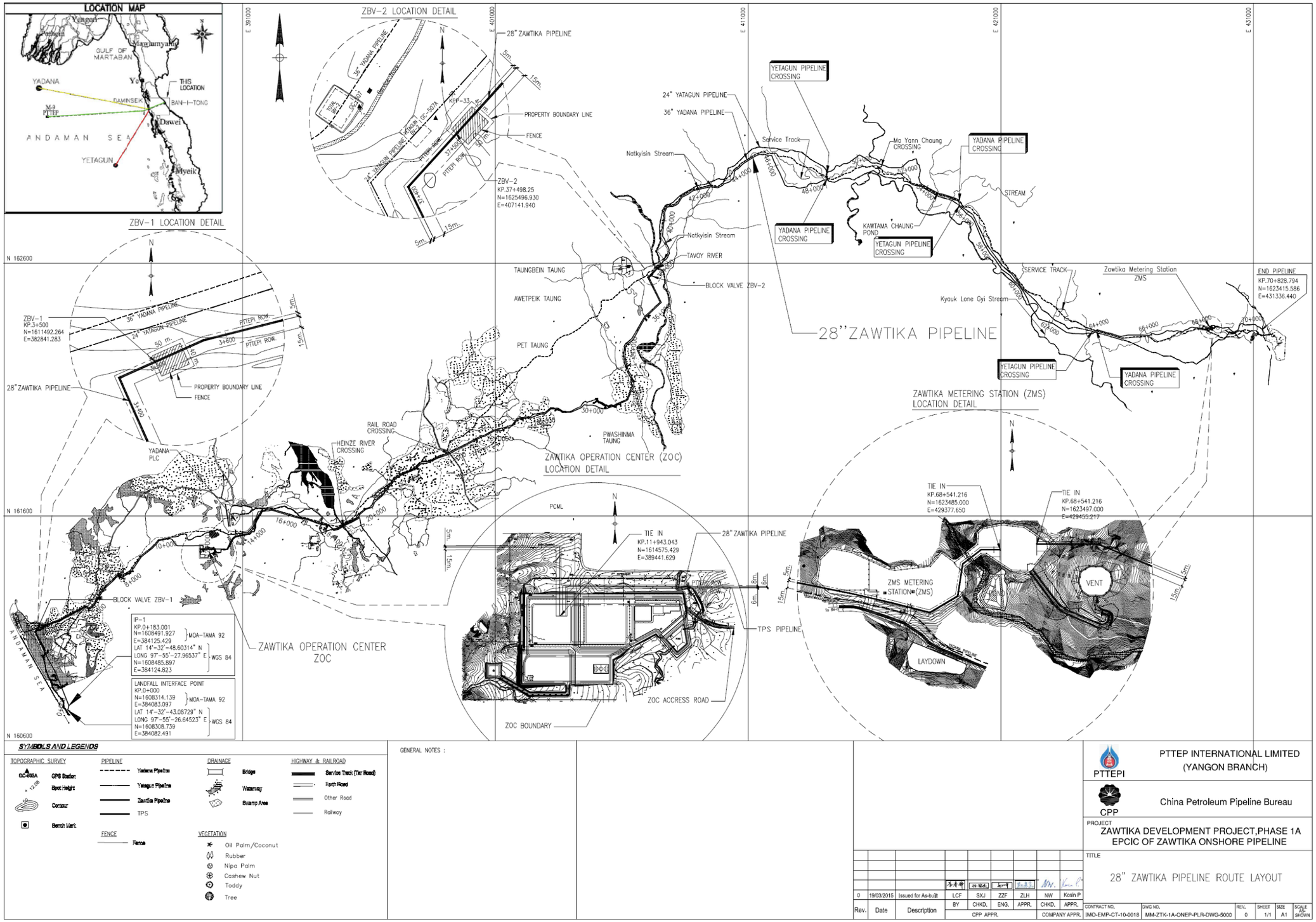
Project Component

Details of the project components include landfall, the Right of Way (ROW) ZOC, ZBV1/2, ZMS, and other facilities were observed during site visit are described in ***Section 3.2***.

3.2 COMPONENTS OF ZAWTIKA ONSHORE GAS TRANSPORTATION SYSTEM

The Zawtika onshore components are mainly comprised of landfall point, onshore pipeline and right of way, Zawtika Onshore Operating Center (ZOC), Zawtika Block Valve #1 and #2 (ZBV1 and ZBV2), and Zawtika Metering Station (ZMS). Descriptions for each component are summarised in the next subsections and the pipeline route layout is shown in ***Figure 3.3***

Figure 3.3 ZTK Pipeline Route Layout



Source: ATL, 2020

3.2.1 *Landfall*

The Zawtika onshore gas transportation system starts from landfall point, Kilometre Pipeline (KP) 0, at Mawgyi village where offshore Zawtika pipeline is connected to onshore Zawtika pipeline, then gas pipeline runs to ZOC, approximately 12 km from the landfall.

Topography of landfall is generally coastal geomorphology, with a broad sandy beach backed by low hills, the majority of which are covered in degraded forest.

Geotubes have been installed at the landfall as an erosion control measure. Two geotubes were placed on the shoreline in parallel to the subsurface onshore pipeline, in order to slow water movement and prevent the sand from being eroded and subsequently exposing the pipeline. The geotubes are regularly inspected and maintained to be in good condition (***Figure 3.5***).

Figure 3.4 Landfall at the Coast of Mawgyi Village

Note: Photo taken during site visit, dated 4th June 2016

3.2.2 *Onshore Pipeline Route and Right of Way (ROW)*

The Zawtika onshore gas pipeline is 28" in diameter and designed to last for 30 years. The pipe was manufactured according to API 5L, is PE coated with pressure requirement at gas metering station of 1,250 psig and is provided with cathodic protection along its entire length. The pipe was buried with at least 2 m cover, with the exceptions of stream crossings and beach zones, where deeper cover was required.

The pipeline right-of-way (ROW) is 71 km long, 20 m width, connecting from landfall point to tie into PTT 42" gas pipeline at Ban-I-Tong (BIT) on Myanmar-Thailand border. It is divided into two phases:

- Phase 1 is located from the landfall point (KP 0) to Tavoy Bridge (KP 38) and lies on private land which was acquired by ATL with a land compensation process under MOGE approval.
- Phase 2 is located from Dawei or Tavoy Bridge (KP 38) to Ban-I-Tong (KP 71) and lies within the Tanintharyi Nature Reserve (TNR), under the approval of the Forest Department of MONREC.

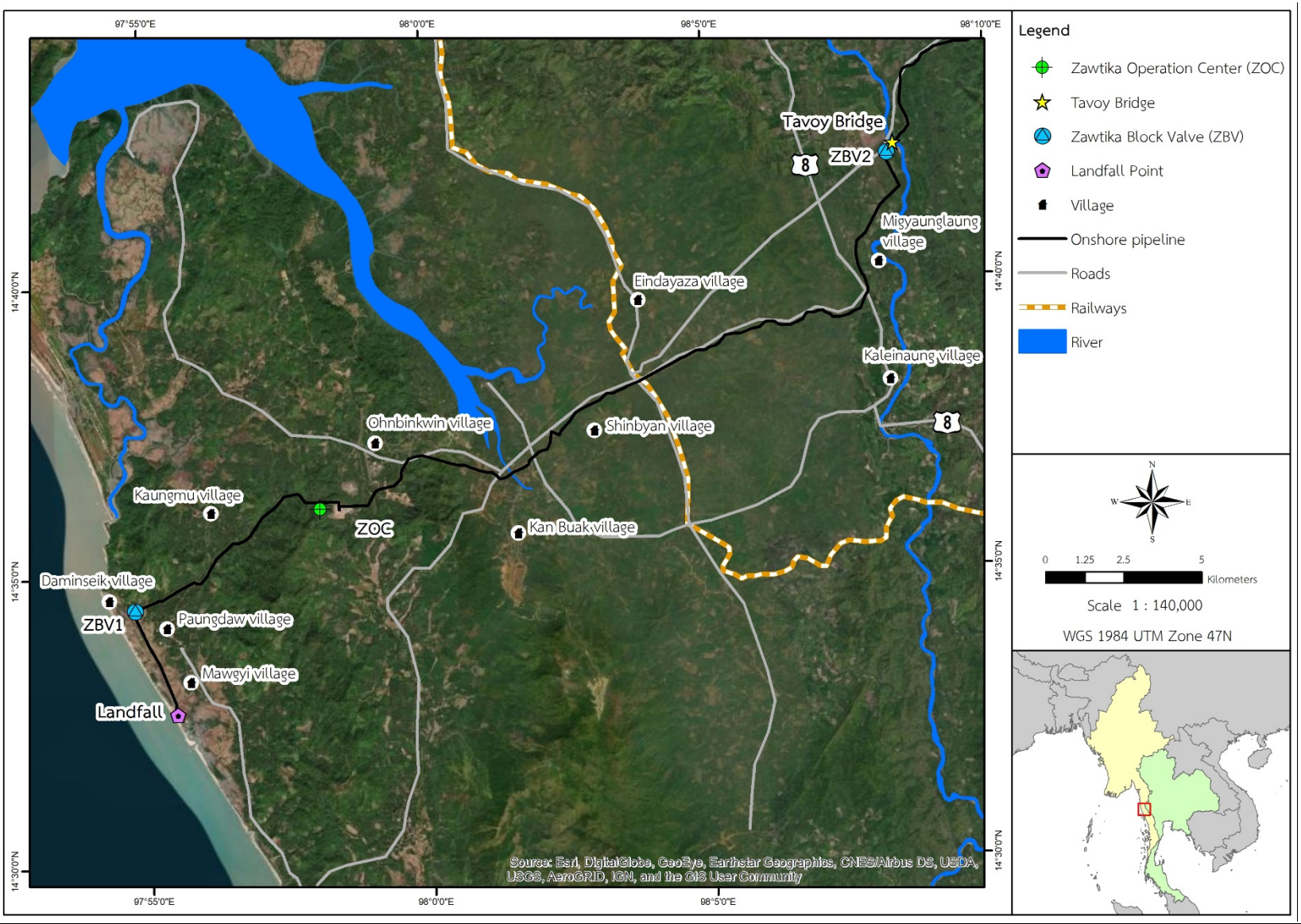
Figure 3.5 and ***Figure 3.6*** show location of ROW Phase 1 and Phase 2, respectively.

The onshore gas pipeline is run parallel with both the Total E&P Myanmar (TEPM) Yadana and the Petronas Carigali (Hongkong) Myanmar Ltd (PCML) Yetagun pipeline from Daminseik village to Thailand border. The distance between the pipelines was designed in compliance with the standards and MOGE approval.

The ROW is regularly inspected and maintained by ATL, including cutback of vegetation and monitoring the revegetation progress (***Figure 3.7***).

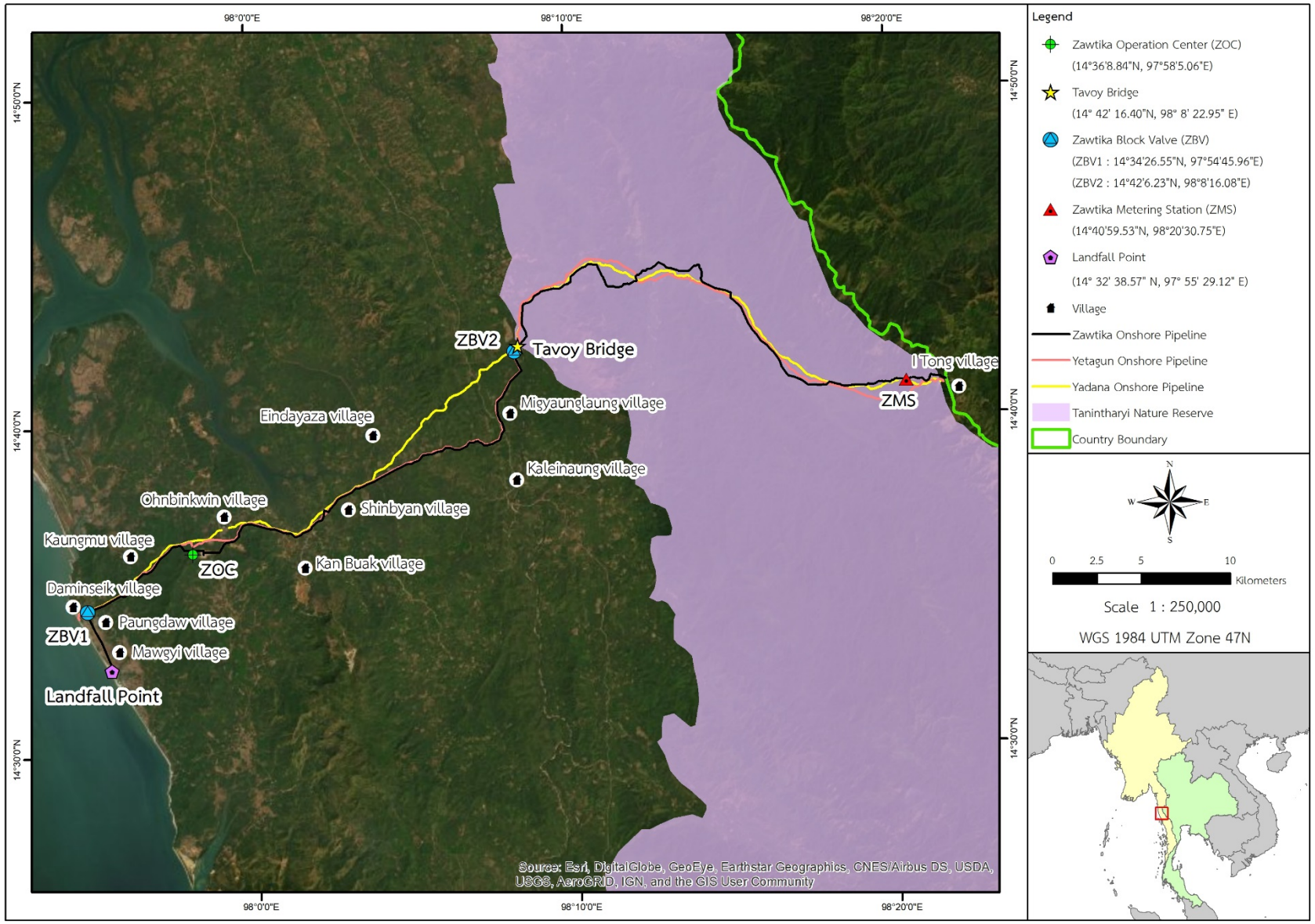
The satellite imagery was used to define the land uses area. The output includes a detailed land class analysis identifying areas of agriculture (plantation), forest type, roads, villages and watercourse. Forest area cover 56% of the area, Agriculture cover 28.6% of the area, Village and Built-up Area cover 14.5% of the area, and 0.4% of the area is covered by Water (***Figure 3.8***).

Figure 3.5 Location of ROW Phase 1 (Landfall Point to Tavoy Bridge)



Source: ATL, 2019

Figure 3.6 Location of ROW Phase 2 (Tavoy Bridge to Ban-I-Tong)

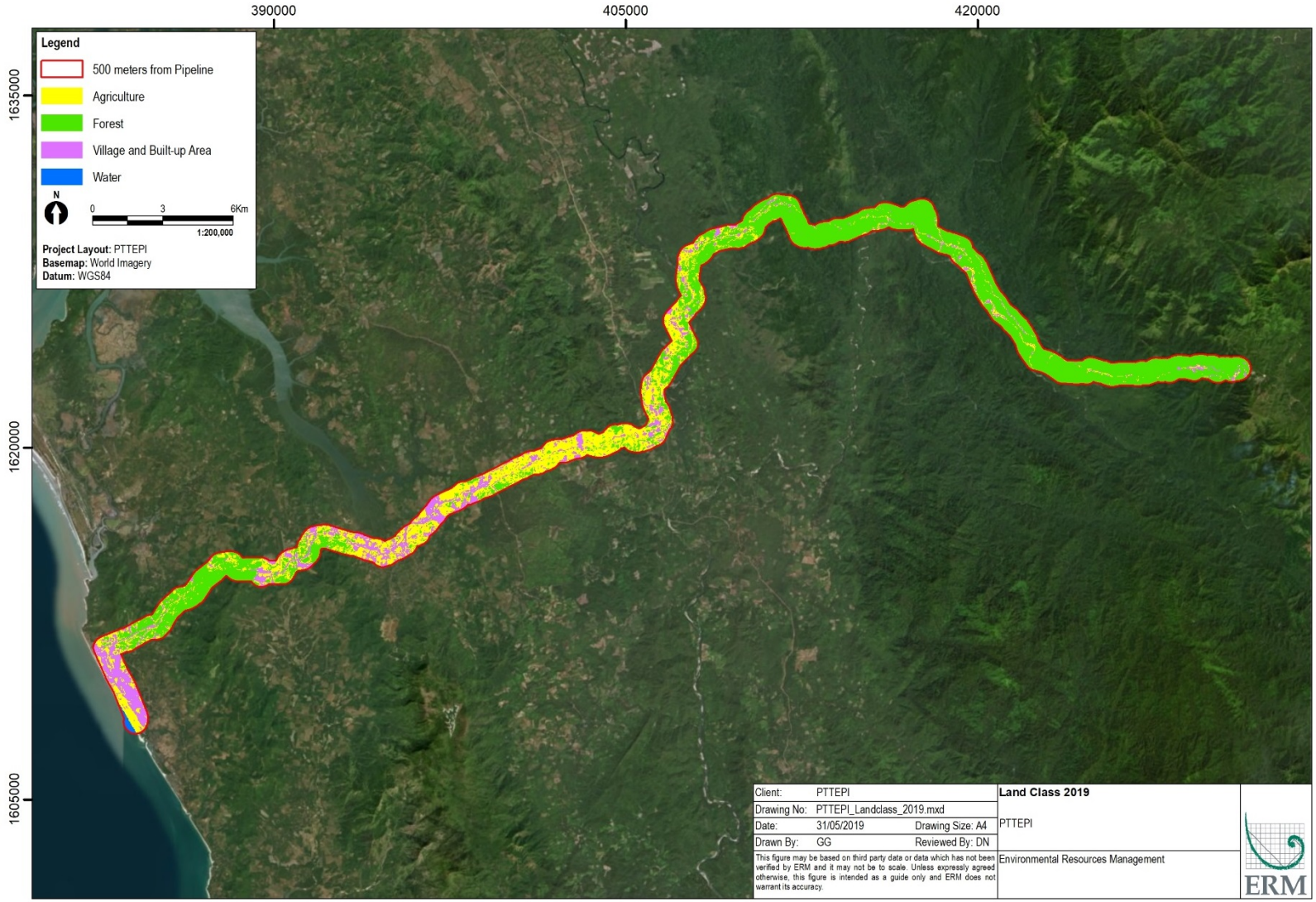


Source: ATL, 2019

Figure 3.7 Vegetation Clearing along Right of Way

Source: ATL, 2016

Figure 3.8 Landuse of the pipeline Phase 1 (Landfall Point to Tavoy Bridge) and Phase 2 (Tavoy Bridge to Ban-I-Tong)



Source: ERM, 2019

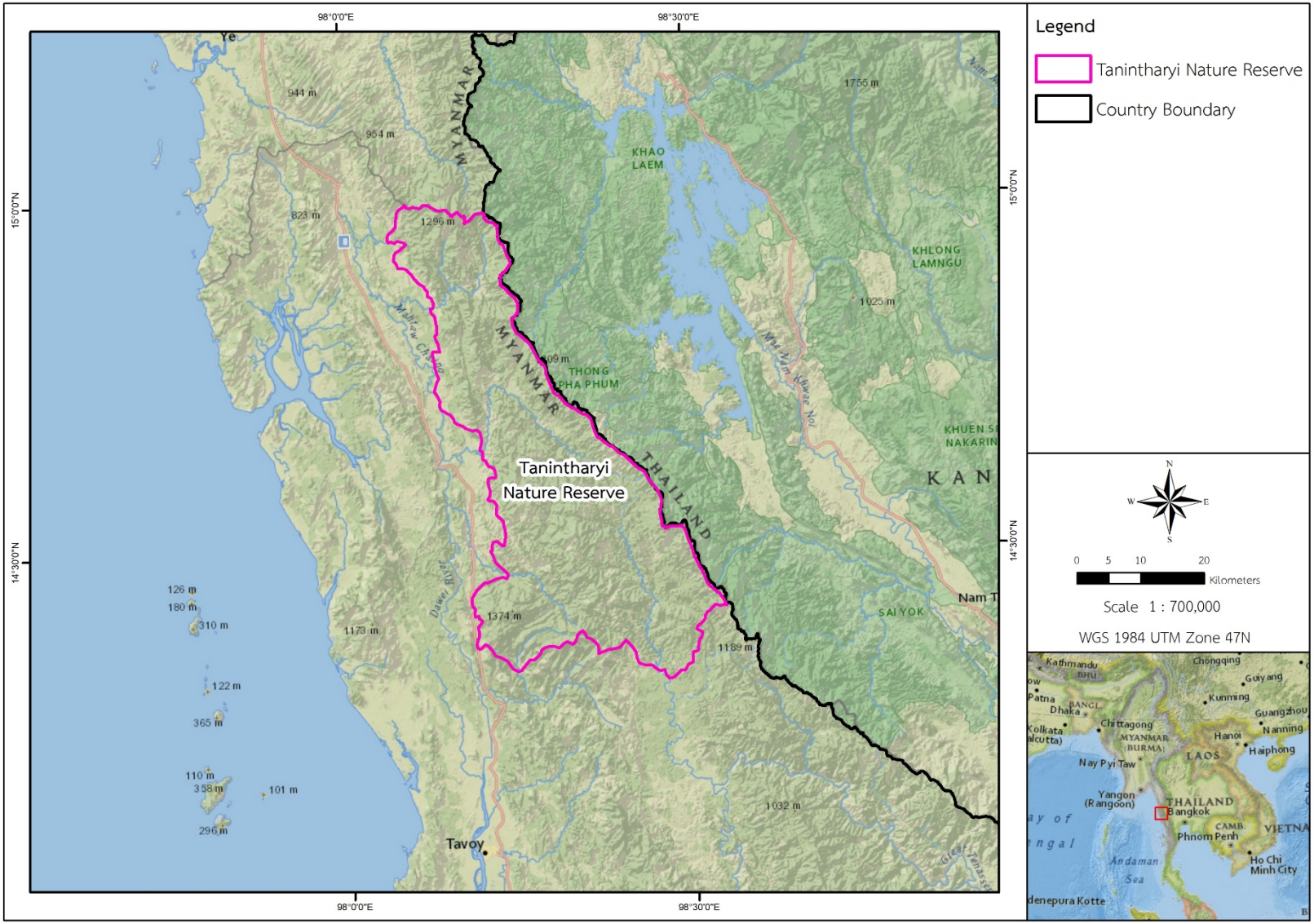
From Tavoy bridge to Ban-I-Tong, the pipeline lies within the Tanintharyi Nature Reserve (TNR). TNR was created with the main purpose of conserving the tropical rain forest and constituent biodiversity in the Tanintharyi region. Over 75% of the area is covered by evergreen forest which supports a rich biodiversity. Checklists of trees, mammals and birds are available. TNR hosts the endangered Gurney's Pitta (Pitta gurneyi) endemic to Thailand and Myanmar, and almost 70 species of mammals, many of which are globally threatened. No tourists allowed to TNR. An overview map of TNR is shown in ***Figure 3.9.***

ATL obtained permission from the Forest Department (FD) and Tanintharyi Nature Reserve Project (TNRP) to enter and carry out activities related to pipeline operations and maintenance in the TNR.

Service tracks, access road and access walkways are established under approval of the TNRP. Service tracks are basically non-public paved roads or tracks, which were constructed by TEPM to carry motorised vehicles to the pipeline's locations. The tracks run in parallel with the TEMP Yanada and PCML Yetagun pipeline routes from Tavoy bridge to Ban I Tong on the Myanmar-Thailand border.

ATL has acquired permission for 16 access roads and 18 access walkways from FD and TNRP. These tracks are being used to access to Zawtika pipelines location from the service tracks mainly for inspection and maintenance purposes, such as grass cutting, RoW patrolling, erosion maintenance and control (***Figure 3.10***). Signs were installed at the entrance (***Figure*** 3.11). Forest vegetation cutting is allowed by TNRP in the access roads and ROW, but not in the access walkways. Locations of access roads and access walkways were also shown in ***Figure 3.6***.

Figure 3.9 Location of Tanintharyi Nature Reserve



Source: the United Nations Environment World Conservation Monitoring Centre (UNEP-WCMC) .2019

Figure 3.10 Access Road and Access Walkways Sign

Source: ATL, 2016

Figure 3.11 Signs were installed at the entrance

Source: ATL, 2016

Tanintharyi Nature Reserve Project (TNRP)

Tanintharyi Nature Reserve Project (TNRP) is a collaborative project between Ministry of Natural Resource and Environmental Conservation (former name is MOECAF), PCML (TPC), TEPM (MGTC) since 2004, and PTTEPI (ATL) joined since 2013. TNRP is a long-term project that contributes to Myanmar's Forest Policy of establishing a 5 per cent protection area of the total country area. The objective of TNRP is to help develop protection and sustainable management of significant ecosystems and endangered wildlife systems, as well as improve the livelihood of local communities. Examples of successful initiatives under TNRP include nature reserve baseline data collection, flora/fauna surveys, development of community forestry programs, development of zoning for effective conservation of reserve, seedling and tree planting programs, and conducting environmental education programmes at schools and communities (PCML, 2014).

Recently, ATL[1] has made annual contributions of USD 150,000 in financial support to TNRP. ATL was added as a member of TNRP according to the Forest Department Regulation. Details of the contributions can be found in the letters presented in ***Annex B.***

[1] Letter issued under PTTEPI

3.2.3 *Zawtika Operating Centre (ZOC)*

Zawtika Operating Centre (ZOC) is located near Onbinkwin village approximately 10 km from the landfall. All operational control of pipeline takes place from ZOC, which receives data from the ZMS via a Fiber Optic Cable. Online data allows monitoring of the complete pipeline from the Zawtika field to the Thailand border. The number of workers at ZOC is approximately 60 persons. An overview photo of the ZOC is shown in ***Figure 3.12***.

Figure 3.12 Photo of ZOC

Source: ATL, 2016 and 2019

ZOC is manned to handle the following activities:

- Regular survey of the onshore pipeline section to the Thailand border;
- Pipeline track maintenance;
- Logistics assistance to the metering station team located near the border; and
- Operating and maintenance of the offshore and onshore pipeline by using a PIG receiver from the offshore line and a PIG launcher connected to the line going to the metering station.

At ZOC, gas is taken off for domestic use in Myanmar at a maximum of 100 MMscfd, the remaining gas of approximately 276 MMscfd is exported to Thailand via ATL pipeline.

ZOC is divided to 3 main areas: process area, utility area and administration & accommodation area.

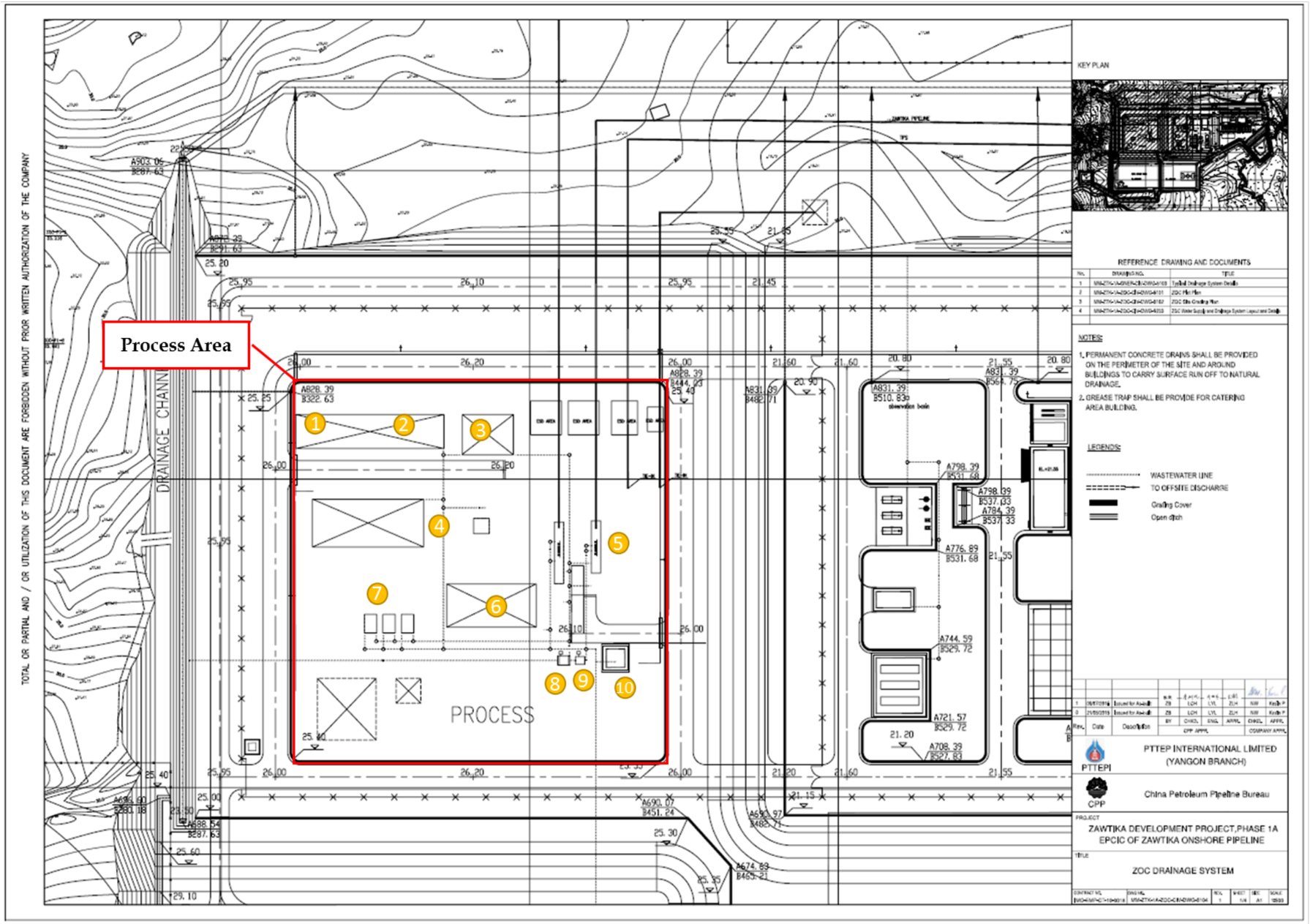
Process area is comprised of the following main components (***Figure 3.13***):

- PIG receiver area
- PIG launcher area
- Flow control valve and high integrity pressure protection system shelter
- MOGE gas pressure regulation and MOGE orifice gas metering system shelter
- Filters/separators pit
- Fuel gas knockout drum
- Depressurizing vent
- Lay down area
- Knockout drum pit
- Fiscal ultrasonic metering system sheltered area
- Wastewater and sewage treatment package
- MOGE tie-in valve
- SCADA.

Utility area is comprised of the following main components (***Figure 3.14***):

- Petrol filling station
- Warehouse
- Fire water pumps
- Control Building
- Treated water storage tank
- Workshop
- Garage
- Raw water tank
- Raw water pump
- Chlorination package
- Water treatment package
- Diesel storage tank
- Drain/condensate sump shelter
- Drain collection pit
- Water dam
- Diesel generator shelter
- Gas generator shelter

Figure 3.13 Layout of ZOC Process Area

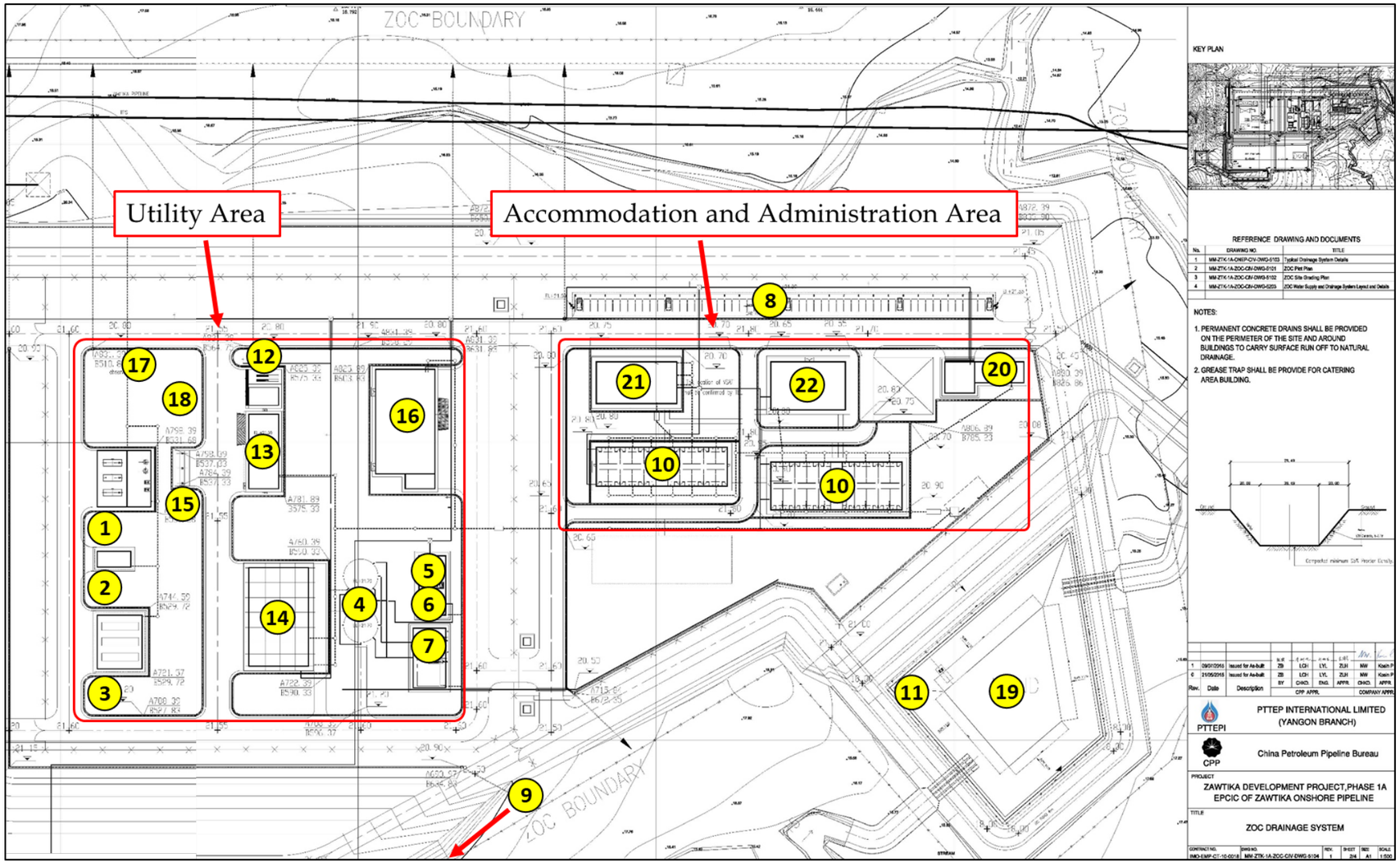


Components in Process area

1. Fuel Gas Skid
2. MOGE Metering
3. MOGE Pressure Regelation
4. Knockout Drum
5. PIG Receiver/Launcher
6. Ultrasonic Meter
7. Filter Separators
8. Pressure Regulator
9. HIPP System
10. Close Drain

Source: ATL, 2016

Figure 3.14 Layout of ZOC Utility, Accommodation and Administration Area



1. Diesel Storage Tank / Transfer Pump and Filter Pit
2. Diesel Generator Shelter
3. Gas Generator Shelter
4. Raw Water Tank
5. Raw Water Pump / Treated Water Storage Tank
6. Water Treatment Package / Chlorination Package
7. Fire Water Pumps
8. Car Park Area
9. Football Field
10. Dormitory
11. Water Dam Pump
12. Garage
13. Workshop
14. Control Building
15. Petrol Filling Station
16. Warehouse
17. Drain/Condensate Sump Shelter
18. Drain Collection Pit
19. Water Dam
20. Guard House
21. Catering Area
22. Administration Office

Source: ATL, 2016

Administration & accommodation area is comprised of the following main components (***Figure 3.14***):

- Guard house
- Catering area
- Dormitory
- Car parking area
- Administration office
- Football field
- Clinic

3.2.4 Zawtika Block Valves (ZBV1 and ZBV2)

There are two main block valve stations along the Zawtika onshore gas pipeline system, located at Daminseik village and Migyaunglaung village (near Tavoy bridge) (as shown in ***Figure 3.15***). Layout of ZBV1 and ZBV2 is shown in ***Figure 3.16*** and ***Figure 3.17***.

The block valves are remotely activated from ZOC, and do not require 24-hour manning. They are installed underground and are contained in fenced compounds. The valves are housed in triangular-shaped chain-link enclosures, which were originally designed to deflect potential explosive devices that could have been thrown as acts of terrorism or sabotage.

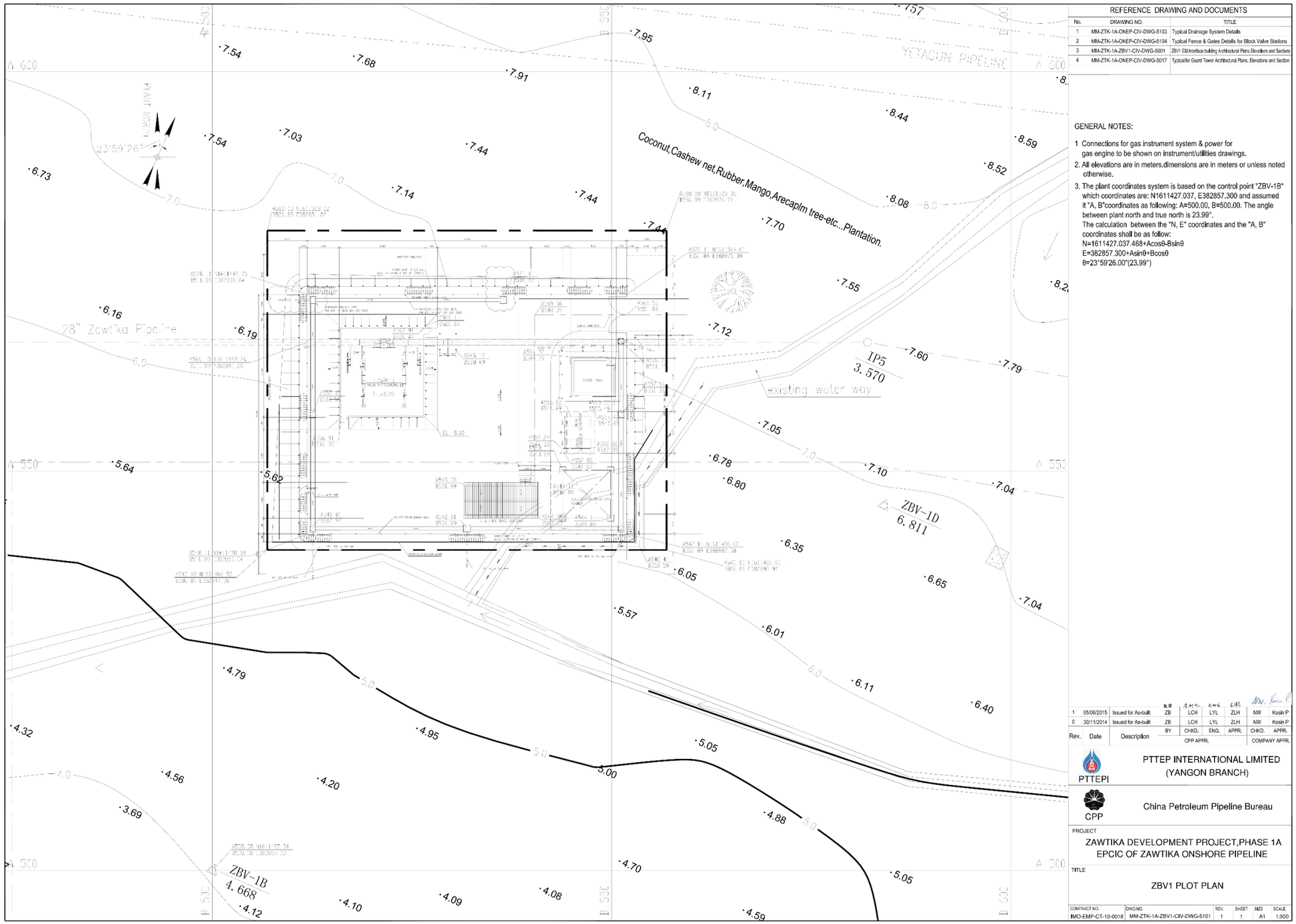
Figure 3.15 Photo of ZBV1&ZBV2

a) Photo of ZBV1

b) Photo of ZBV2

Source: ATL, 2016 and 2019

Figure 3.16 Layout of ZBV1



Source: ATL, 2020

Figure 3.17 Layout of ZBV2

Source: ATL, 2020

3.2.5 *Zawtika Metering Station (ZMS)*

The Zawtika Gas Metering Station (ZMS) is located near the Myanmar-Thailand border. ZMS is manned for the proper operation of the metering system. The station is provided with gas meter, in line chromatograph and metering computer. ZMS is linked to the ZOC by a Fiber Optic Cable in regular situation, and by radio in case of circuit failure. A PIG receiver is installed at the metering station for the operation of an intelligent PIG between the ZOC and ZMS.

ZMS is used to control, inspect and measure transferred gas to meet product specification prior to sale to PTT at the border. Main components at ZMS are similar to ZOC. Photo taken from the ZMS facilities is shown in ***Figure 3.18***.

Figure 3.18 Photo of ZMS

Source: ATL 2016 and 2019

Process area is comprised of the following main components:

- PIG receiver area
- Gas pressure regulation and metering system shelter
- Filters/separators pit
- Fuel gas knockout drum
- Depressurizing vent

Utility area is comprised of the following main components:

- Petrol filling station
- Warehouse
- Fire water pump shelter
- Control building
- Workshop
- Raw water tank
- Water treatment shelter
- Diesel storage tank
- Drain/condensate sump shelter
- Water dam
- Diesel generator shelter
- Gas generator shelter

Accommodation area is comprised of the following main components:

- Guard house
- Catering area
- Dormitory
- Car parking area
- Clinic

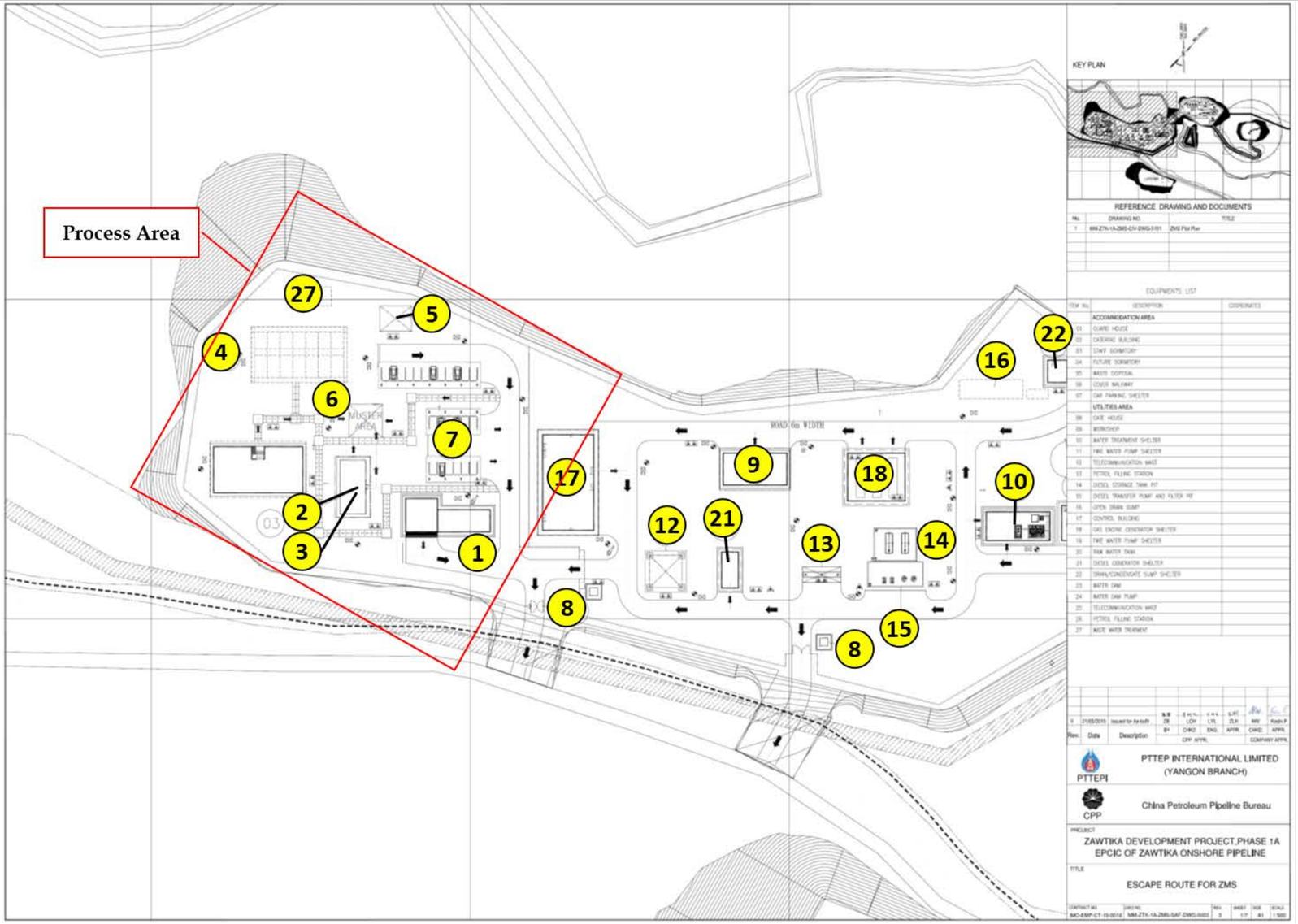
Figure 3.19, ***Figure 3.20*** and ***Figure 3.21*** further described the location of each main components within each area.

3.2.6 Other Areas and Facilities

A number of facilities are required to facilitate Project operation, as follows:

- Helipad: ATL uses existing helipads, that are shared with PCML and TEPM.
- Muster point: It is basically a temporary shelter in the TNRP. ATL will share the muster point with PCML/TEPM.
- Laydown area: ATL established laydown areas near the ZMS for the temporary storage of equipment and supplies during construction. However, the areas are no longer in use during the operation phase.

Figure 3.19 Layout of ZMS Process Area



1 Guard House
2 Catering Building
3 Staff Dormitory
4 Future Dormitory
5 Waste Disposal
6 Cover Walkway
7 Car Park Shelter
8 Gate House
9 Workshop
10 Water Treatment Shelter
12 Telecommunication Mast
13 Petrol Filling Station
14 Diesel Storage Tank Pit
15 Diesel Transfer Pump and Filter Pit
16 Open Drain Sump
17 Control Building
18 Gas Engine Generator Shelter
21 Diesel Generator Shelter
22 Drain / Condensate Sump Shelter
27 Waste Water Treatment

Source: ATL, 2016 and 2019

Figure 3.20 Layout of ZMS Process Area

8 Gate House

23 Water Dam

24 Water Dam Pump

28 Gas Pressure Regulation and Metering System Shelter

29 Fuel Gas Knockout Drum and Superheater Shelter

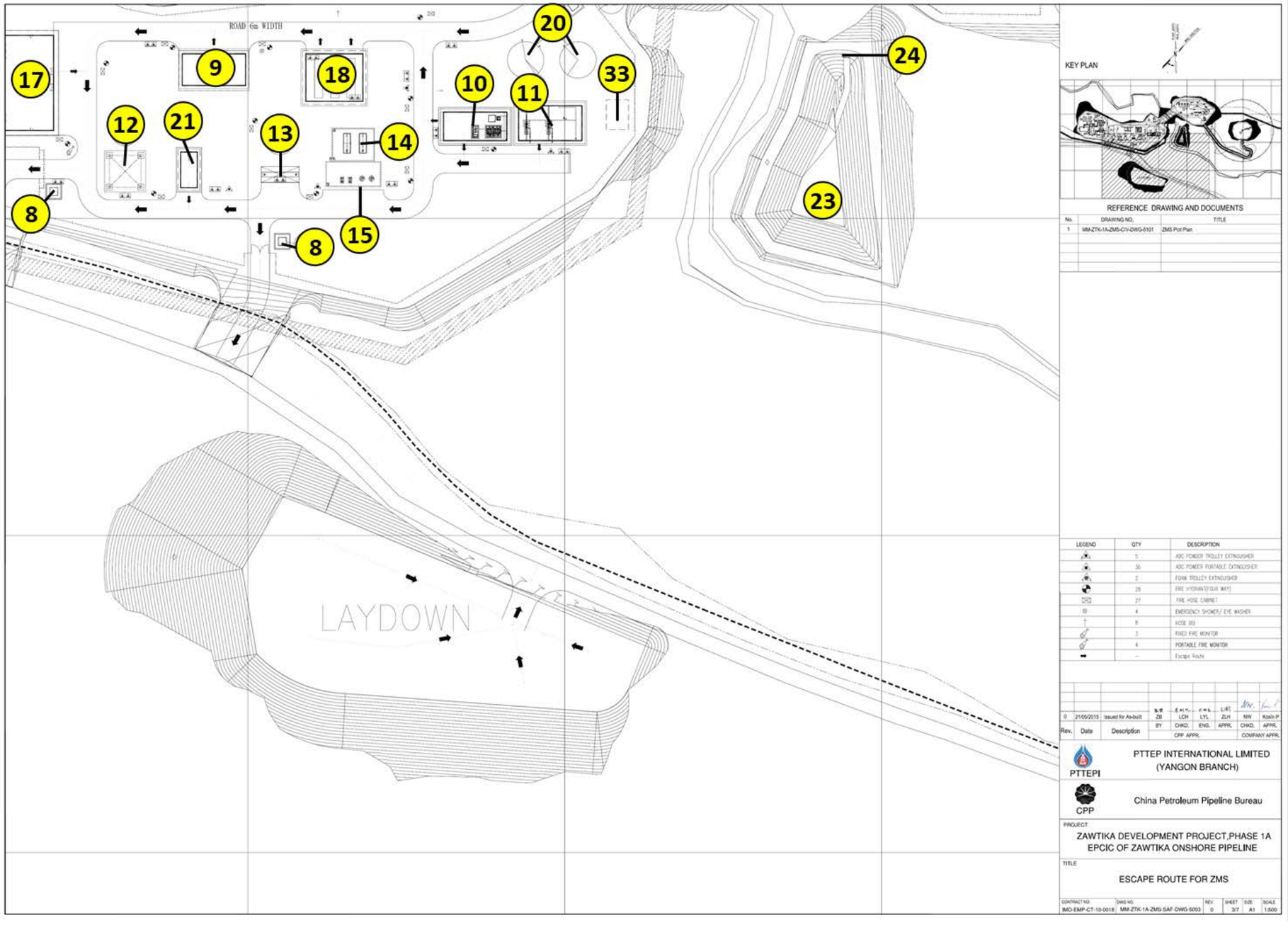
30 PIG Receiver Area

31 Filter / Separator Pit

32 Depressuring Vent

Source: ATL, 2016 and 2019

Figure 3.21 Layout of ZMS Plot Plan



Source: ATL, 2016 and 2019

3.3 EMISSIONS AND EFFLUENT MANAGEMENT

3.3.1 Waste and Wastewater

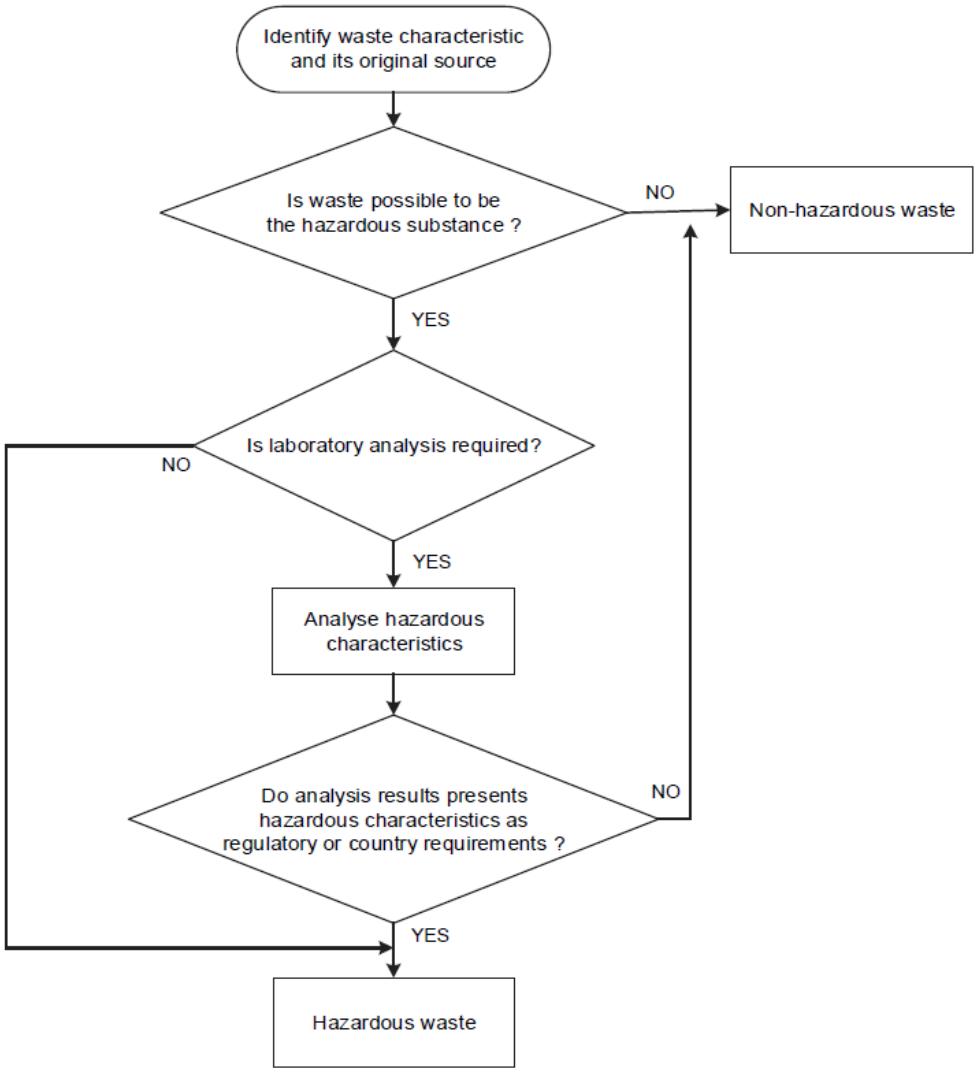
3.3.1.1 Waste Classification

Detail of PTTEP's Myanmar Asset Waste Management Procedure is outlined below.

Waste generated from the Project activities will be classified into 2 main types according to criteria of danger as non-hazardous waste and hazardous waste, as shown in ***Figure 3.22***.

1) Non-hazardous waste is the waste which, although not harmless, present a lower level of risk to human health and the environment, e.g.
   - General waste (burnable) e.g. domestic waste, wood;
   - Recycle waste (office and maintenance) e.g. water bottles, glasses, paper, can and metal scrap); and
   - Biodegradable waste (e.g. food waste, sewage).
2) Hazardous waste is defined as any waste which causes or is likely to cause danger to health or the environment by reason of their chemical activity or toxic, flammable, explosive, corrosive, or other characteristics, whether alone or when coming into contact with other wastes. Hazardous waste is categorized into 2 main types as follows:
   - Wastes creating nuisance due to flammability, reactivity, corrosiveness, radioactive, infection, toxicity for humans & the environment or, e.g. chemical waste and residue, paint, spent and used oil, heavy metal wastes and batteries;
   - Waste containing or contaminated with hazardous substances in concentrations which exceed the standard limit of country regulation or international hazardous waste standard, for example oil concentration or waste containing heavy metal

Figure 3.22 Waste Classification



Source: ATL 2019.

Note: Waste from offshore facility will not be stored in ZOC.

All hazardous and non-hazardous wastes from Zawtika onshore operations are collected and segregated into designated container. Both categories of wastes are temporarily kept at waste storage area, located in Zawtika Onshore Operating Center (ZOC), for further transportation to waste disposal facility. Hazardous wastes are transported to Waste Management facility 1 time per 2-3 months while non-hazardous wastes are transported to DAWEI municipal waste management facility 1-2 times per week. The selected certified Waste Management Facility for this operation is Golden DOWA Eco-System Myanmar Co., Ltd. (located inside the Thilawa Special Economic Zone, the Republic of the Union of Myanmar). In addition, PTTEP received approval letter from both MOGE and ECD to dispose all the hazardous waste from both Zawtika onshore and offshore facility.

No produced water is expected from the Zawtika Onshore operation activities. Additionally, waste from Zawtika Offshore facility will not be stored at ZOC. ZOC will only store waste that is generated from the facility for a maximum 6 months, where it will then be transferred from time to time to the certifiedWaste Management Facility (i.e. Golden DOWA Eco-System Myanmar Co., Ltd.).

The building for temporary waste storage at ZOC is constructed with concrete floor, surrounded with wall/bund and drainage to avoid flying particles or spillage of wastes. The compartment of building has been separated for non-hazardous and hazardous wastes. The volume of wastes in and out will be recorded for further tracking. The total volume of non-hazardous wastes and hazardous wastes generated from Zawtika onshore in 2019 are 54,900 kg and 19,692 kg, respectively. Detail are presented in the table below.

Table 3.1 Waste Generation from Onshore Zawtika Facility

Type of Waste	Waste Name	Weight (kg)
Non-hazardous waste	Food Waste	31,542
	General non-hazardous waste (Mix wastes)	22,198
	Plastic Bottles	1,160
Hazardous waste	Mixed hazardous wastes e.g. contaminated fabric, empty container, etc.	19,692

Source: ATL, 2020

According to the volume of wastes generated in 2019, the estimated volume of non-hazardous and hazardous wastes in 2020 generated from Zawtika onshore are about 4,600 kg and 1,650 kg per month, respectively.

In addition, waste shall be handled, stored and transported in a manner that reduces risks to the environment. Monthly estimated waste generation for each type of wastes as shown in ***Table 3.2.***

Table 3.2 Management of Waste and Monthly Estimated Waste Generation for Onshore Operation

Type of Waste	Waste Management	Montly Estimated Waste Generation (kg/month or stated otherwise)
General non-hazardous waste	• Store in waste storage area. • Send to DAWEI municipal waste management facility.	1,560-3,055
Food waste	• Hand over to local villagers for livestock feeding if there is a demand. If no demand, the waste will be send to approved permitted waste management facility.	2,035-3,065
Recyclable and reusable waste	• Hand over to local villagers for further reuse or recycling shop or other approved permitted waste management facility.	35-162

Type of Waste	Waste Management	Montly Estimated Waste Generation (kg/month or stated otherwise)
Sewage	• Wastewater treatment process is activated sludge process by using a mass of microorganisms cultivated in the treatment process to breakdown organic matter. This process involves air or oxygen into wastewater combined with microorganism to develop a biological floc and reduce the organic matter.	40 m^3/day
Hazardous waste	• Temporarily stored at ZOC and will then be transferred to a qualified or licensed contractor for transportation and appropriate treatment / disposal.	1,474-3,980

Source: ATL, 2019

3.3.1.2 *PTTEPI Waste Management Procedure*

Waste generated from the Project activities will be segregated into 2 main types, according to criteria of danger as non-hazardous waste and hazardous waste.

3.3.1.2(1) *Non-Hazardous Waste*

Non-Hazardous waste is the waste which, although not harmless, present a lower level of risk to human health and the environment. There are 2 types of non-hazardous waste as follows:

1) General non-hazardous wastes from office, catering services, laundry, household, etc. from industrial activities, e.g.

   - General waste (e.g. scrap metal, non-biodegradable waste, gardening waste, construction material);
   - Recyclable or reusable waste (e.g. paper, wood, drinking plastic bottle, glass); and
   - Biodegradable waste (e.g. food waste, sewage).

2) Waste containing or contaminated with hazardous substances in concentrations that, before or after treatment, are considered low enough to meet the specified international or regulatory discharge criteria which do not exceed the standard limit of the country, e.g.

   - Produced water;
   - Produced sand; and
   - Drilled cuttings.

3.3.1.2(2) Hazardous Waste

Hazardous waste is defined as any waste which causes or is likely to cause danger to health or the environment by reason of their chemical activity or toxic, flammable, explosive, corrosive, or other characteristics, whether alone or when coming into contact with other wastes. Forms of hazardous waste include solids, sludge, liquid and containerized gas and hydrocarbon waste.

Hazardous waste shall be categorized into 2 main types as follows:

1) Wastes creating nuisance due to flammability, reactivity, corrosiveness, radioactive, infection, toxicity for humans & the environment or, e.g.

   - General hazardous wastes (e.g. chemical waste and residue, paint, spent and used oil, contaminated packing material, special maintenance waste, contaminated sludge, combustion residue, photocopy machine, PC printers polluting cartridge, medical waste, filter, fluorescent, bulb);
   - Heavy metal wastes (e.g. mercury, arsenic, cadmium); and
   - Batteries.

It is noted that, if there will be a presence of incoming heavy metals from reservoir, the incurred wastes in contact with the incoming gas or fluid shall be considered as being contaminated with the heavy metal (e.g. mercury, arsenic, cadmium), and therefore is classified as hazardous waste which will require specific additional handing and management procedures.

2) Waste containing or contaminated with hazardous substances in concentrations which exceed the standard limit of country regulation or international hazardous waste standard, for example oil concentration or waste containing heavy metal.

3.3.1.2(3) Hazardous and Non-Hazardous Wastes

All hazardous and non-hazardous wastes from Zawtika onshore operations are collected and segregated into designated container. Both categories of wastes are temporarily kept at waste storage area, located in Zawtika Onshore Operating Center (ZOC), for further transportation to waste disposal facility. Hazardous wastes are transported to Waste Management facility 1 time per 2-3 months while non-hazardous wastes are transported to DAWEI municipal waste management facility 1-2 times per week. The selected certified Waste Management Facility for this operation is Golden DOWA Eco-System Myanmar Co., Ltd. (located inside the Thilawa Special Economic Zone, the Republic of the Union of Myanmar).

No produced water is expected from the Zawtika Onshore operation activities. Additionally, waste from Zawtika Offshore facility will not be stored at ZOC. ZOC will only store waste that is generated from the facility for a maximum 6 months, where it will then be transferred from time to time to the certifiedWaste Management Facility (i.e. Golden DOWA Eco-System Myanmar Co., Ltd.).

The building for temporary waste storage at ZOC is constructed with concrete floor, surrounded with wall/bund and drainage to avoid flying particles or spillage of wastes. The compartment of building has been separated for non-hazardous and hazardous wastes. The volume of wastes in and out will be recorded for further tracking. The total volume of non-hazardous wastes and hazardous wastes generated from Zawtika onshore in 2019 are 54,900 kg and 19,692 kg, respectively.

Further detail of hazardous and non-hazardous waste management is explained in ***Section 11.2***.

3.3.1.2(4) Wastewater Treatment

No produced water is expected from the Zawtika Onshore operation activities. Waste from Zawtika Offshore facility will not be stored at ZOC. ZOC will only store waste that is generated from the facility for a maximum 6 months, where it will then be transferred from time to time to the certified Waste Management Facility (i.e. Golden DOWA Eco-System Myanmar Co., Ltd).

Wastewater generated during Project operation is sent to a septic-anaerobic filter tank for treatment. ATL has installed Activated sludge process (AS) wastewater treatment unit for sewage effluent. The influent rate for ZOC and ZMS wastewater treatment system is 60 cubic meter per day. Its size is able to handle domestic wastewater from the Project.

Activated sludge process is the type of wastewater treatment process by using a mass of microorganisms cultivated in the treatment process to breakdown organic matter. This process involves air or oxygen into wastewater combined with microorganism to develop a biological floc and reduce the organic matter.

Activated sludge process appropriate with municipal wastewater, such as residence, office building, school, hotel, restaurant, hospital and so on, which BOD loading is not over than 250 mg/l. The quality of effluent depends on the standard of Myanmar Environmental Quality (Emission) Guideline.

Wastewater treatment units consisting of primary treatment and secondary treatment. Primary treatment consists of grease trap, solid separation tank and equalization tank. Secondary treatment consists of aeration tank, sedimentation tank, chlorination tank, effluent tank and sludge storage tank.

The process of wastewater treatment plant has started with collecting wastewater from all sources as toilets, kitchen, and accommodation. Then, The Activated sludge process (AS) wastewater treatment unit has started their function, the process of wastewater treatment unit for the ZOC and ZMS is difference, the detail as follow:

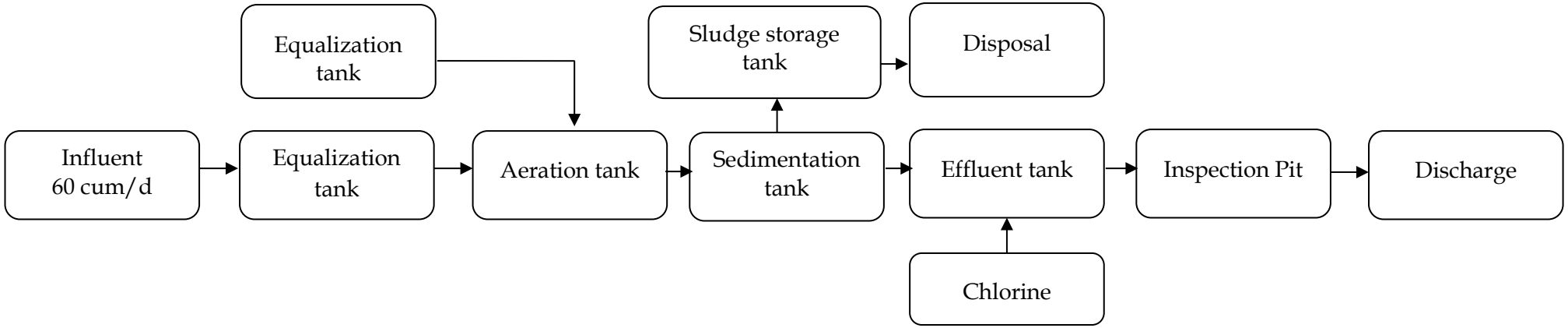
Table 3.3 Wastewater Treatment Unit for ZOC and ZMS.

Wastewater Treatment Unit	Detail	ZOC	ZMS
Septic Tank Main Function	To separate sludge and liquid	✓	✓
Equalization Tank Main Function	To receive wastewater from septic tank, adjust flow rate and condition of wastewater before pumping to aeration tank.	✓	✓
Aeration Tank Main Function	Aerated tank is contained activated sludge which using oxygen to grow and digesting organic matter in wastewater. In aeration tank, it also installed submersible pump to transfer oxygen. Activated sludge process is chemical and mass transfer process which control by microorganism using oxygen and organic matter for growth. The organic digestion rate mostly depends on biological reaction in aerobic process.	✓	✓
Sedimentation Tank Main Function	This function of sedimentation tank is separation of sludge and water by settling the sludge and clear water flow over the weir. Sludge at the bottom of the tank was pumped to sludge holding tank and aerate. Excess sludge was disposed by excess sludge pump.	✓	✓
Effluent Tank Main Function	To collect clear water before drain to public	✓	-
Chlorination Tank Main Function	To feed chlorine for disinfection before drain to public	✓	✓
Sludge Storage Tank Main Function	To collect excess sludge before disposal.	✓	-

Source: ATL 2016 and 2019

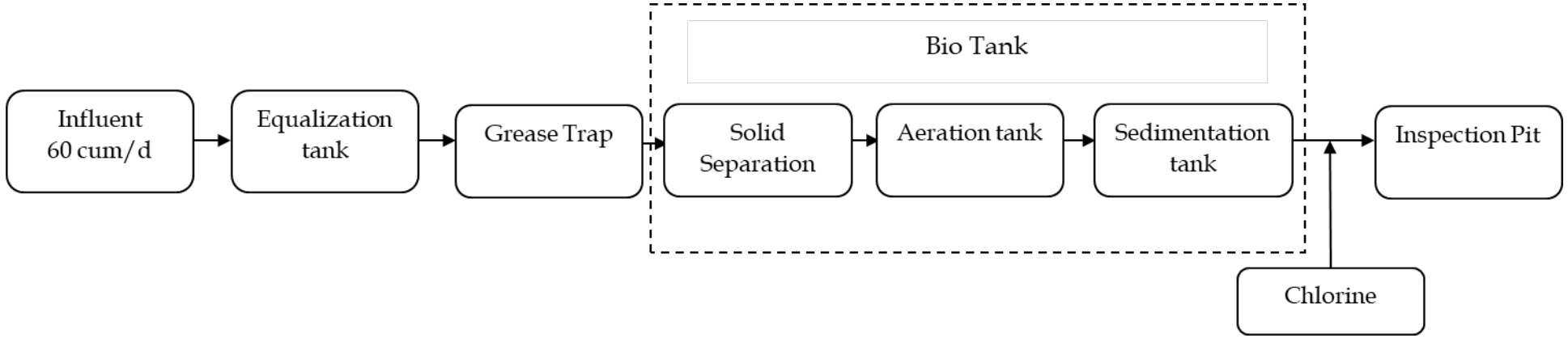
Flow Diagram of Wastewater Treatment of ZOC and ZMS are shown in ***Figure 3.23*** and ***Figure 3.24***, respectively. And the Schematic Design of ZOC and ZMS are shown in ***Figure 3.25*** and F***igure 3.21***, respectively.

Figure 3.23 Flow Diagram of Wastewater Treatment of ZOC



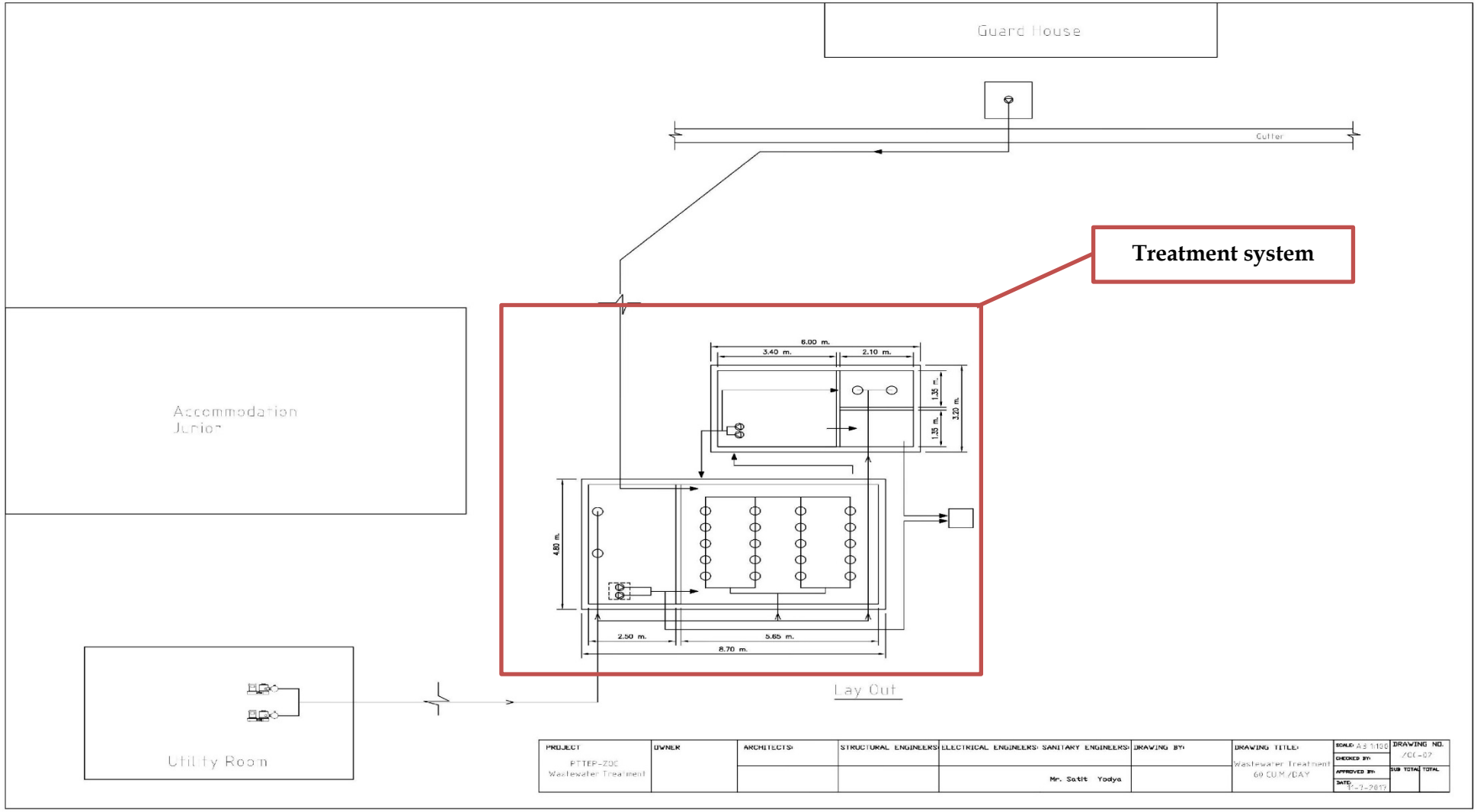
Source: ATL, 2016 and 2019

Figure 3.24 Flow Diagram of Wastewater Treatment of ZMS



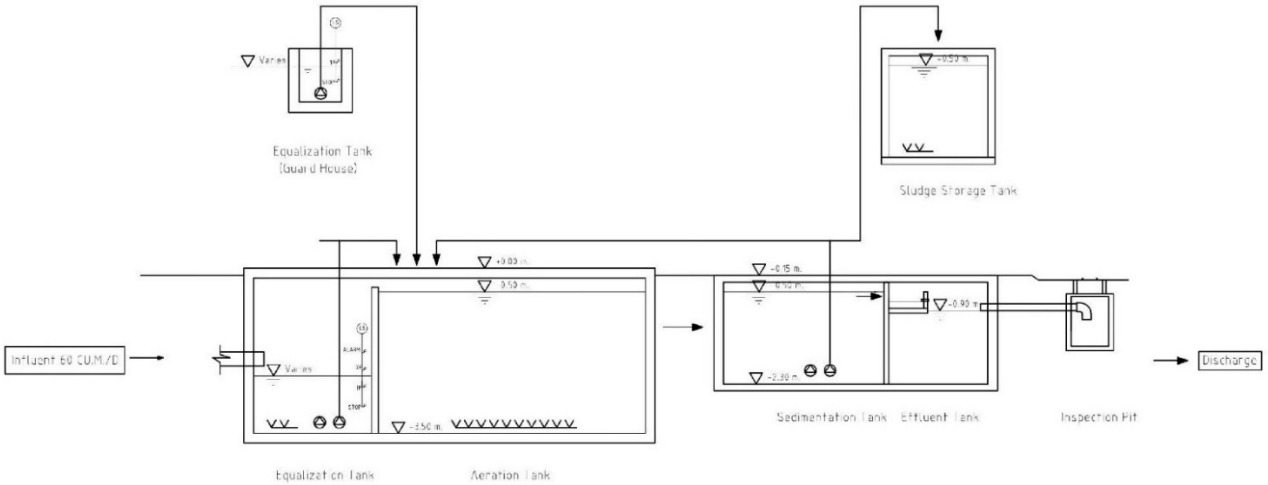
Source: ATL, 2016 and 2019

Figure 3.25 Schematic Design of ZOC



Source: ATL, 2016 and 2019

Figure 3.25 Schematic Design of ZOC (Cont.)

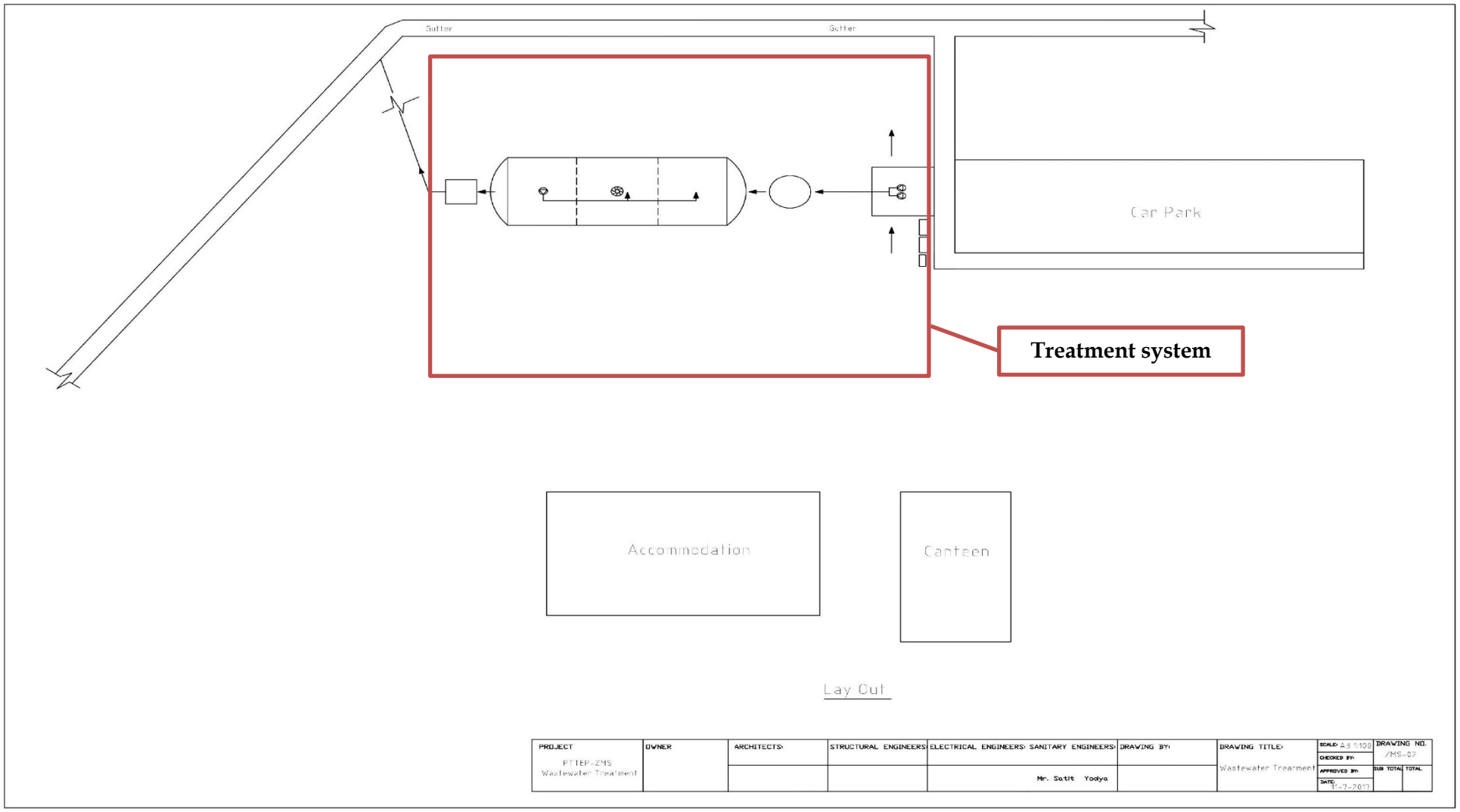


Hydraulic Profile of Wastewater Treatment System

PROJECT	OWNER	ARCHITECTS	STRUCTURAL ENGINEERS	ELECTRICAL ENGINEERS / SANITARY ENGINEERS	DRAWING BY	DRAWING TITLE	SCALE: A3 1:100	DRAWING NO.
PTTEP-ZOC Wastewater Treatment				Mr. Satit Yodya		Wastewater Treatment 60 CU.M./DAY	CHECKED BY:	/CC-03
							APPROVED BY:	SUB TOTAL / TOTAL
							DATE: 17-7-2017	

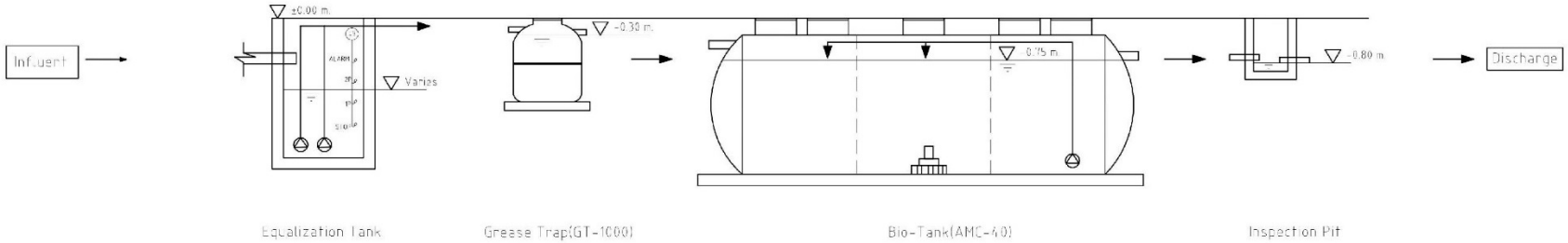
Source: ATL 2016 and 2019

Figure 3.26 Schematic Design of ZMS



Source: ATL 2016 and 2019

Figure 3.26 Schematic Design of ZMS (Cont.)



Hydraulic Profile of Wastewater Treatment System

PROJECT	OWNER	ARCHITECTS:	STRUCTURAL ENGINEERS:	ELECTRICAL ENGINEERS: SANITARY ENGINEERS:	DRAWING BY:	DRAWING TITLE:	SCALE: A3 1/75	DRAWING NO.
PTTEP-ZMS Wastewater Treatment				Mr. Satit Yodya		Wastewater Treatment	CHECKED BY:	/MS-03
							APPROVED BY:	SUB TOTAL / TOTAL
							DATE: 11-7-2017	

Source: ATL 2016 and 2019

3.3.2 *Utilities*

3.3.2.1 *Electricity*

Electricity is supplied by gas generators. Natural gas obtained from Zawtika field is used to generate power by using natural gas generators at the Project site. Diesel generators are used as back-up electrical system that will be operated in case of emergency.

3.3.2.2 *Water Use*

The water uses for ZOC and ZMS is supplied from the water treatment plant, which receives raw water from nearby streams and is stored in two 1,235 m^3 water tanks, each has working capacity at 1,060 m^3. Treated water is distributed to users for domestic use. Sludge produced from the treatment is used as fertilizer for plants on site. Components for Water Use of ZOC and ZMS shown in ***Figure 3.27*** and ***Figure 3.28***. During operations, the water consumption for ZOC and ZMS as follows:

- ZOC: the consumption level is 120 litres/day[1]/ of drinking water and 12 m^3 /day[2]/ water use.
- ZMS: the consumption level is 30 litres/day[1]/ of drinking water and 3 m^3 /day[2]/ water use.

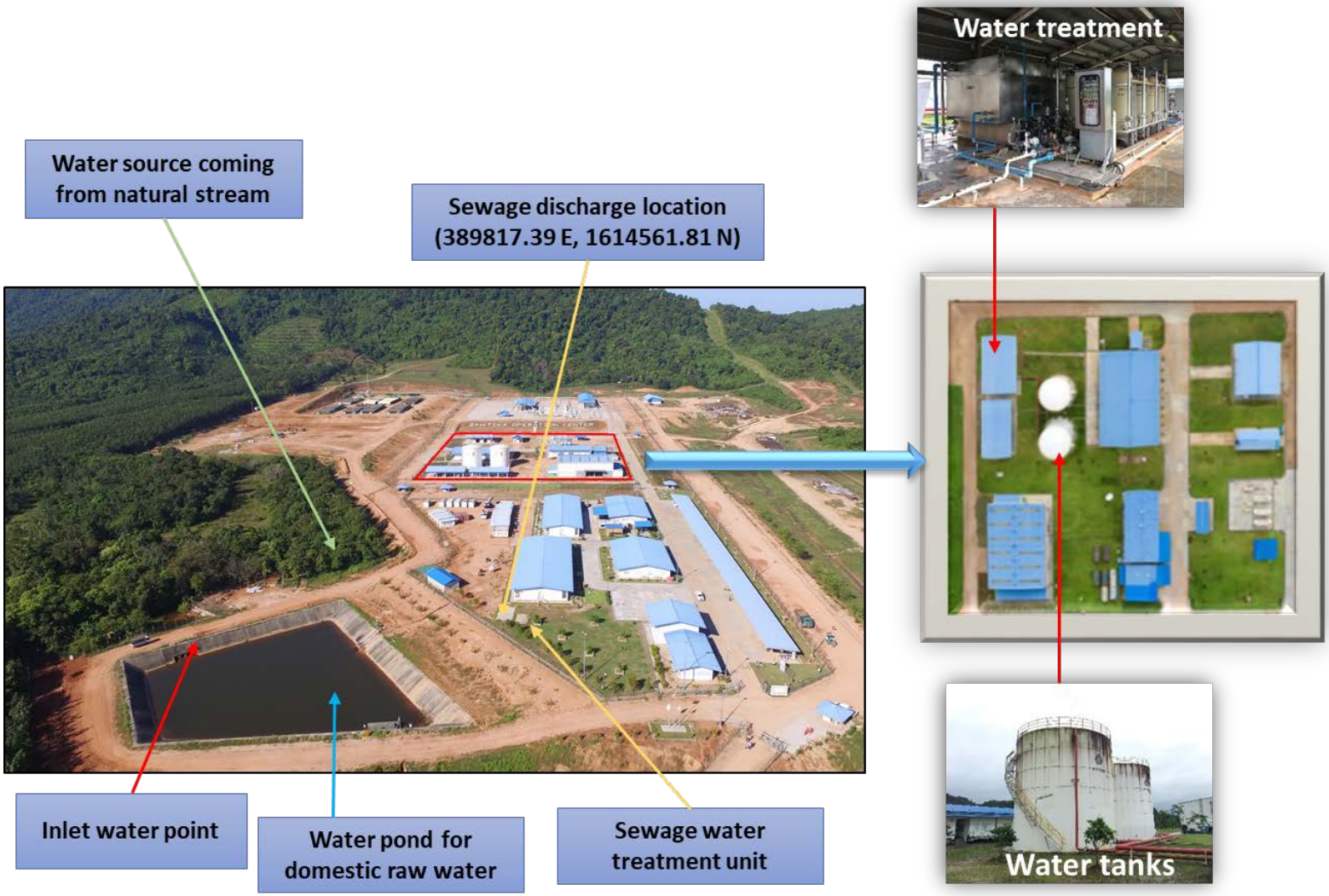
3.3.2.3 *Stormwater Drainage System*

Stormwater runoff from the ZOC and ZMS will be handled through drainage systems. Ditch and grated drains are used to collect and drain the stormwater run-off from the unroofed pervious and impervious areas on the ZOC and ZMS. The edge of the site will be sloped and elevated from the surrounding land. Stormwater falling in the ZOC and ZMS areas will be collected and pass through the stormwater collection points and released into unpaved areas beside the ZOC and ZMS to carry surface runoff to natural drainage. For more detail about catering area building, the grease trap was provided.

Stormwater flow and drainage system from ZOC and ZMS process area, utility area, administration and accommodation area is shown in ***Figure 3.29*** and ***Figure 3.30***.

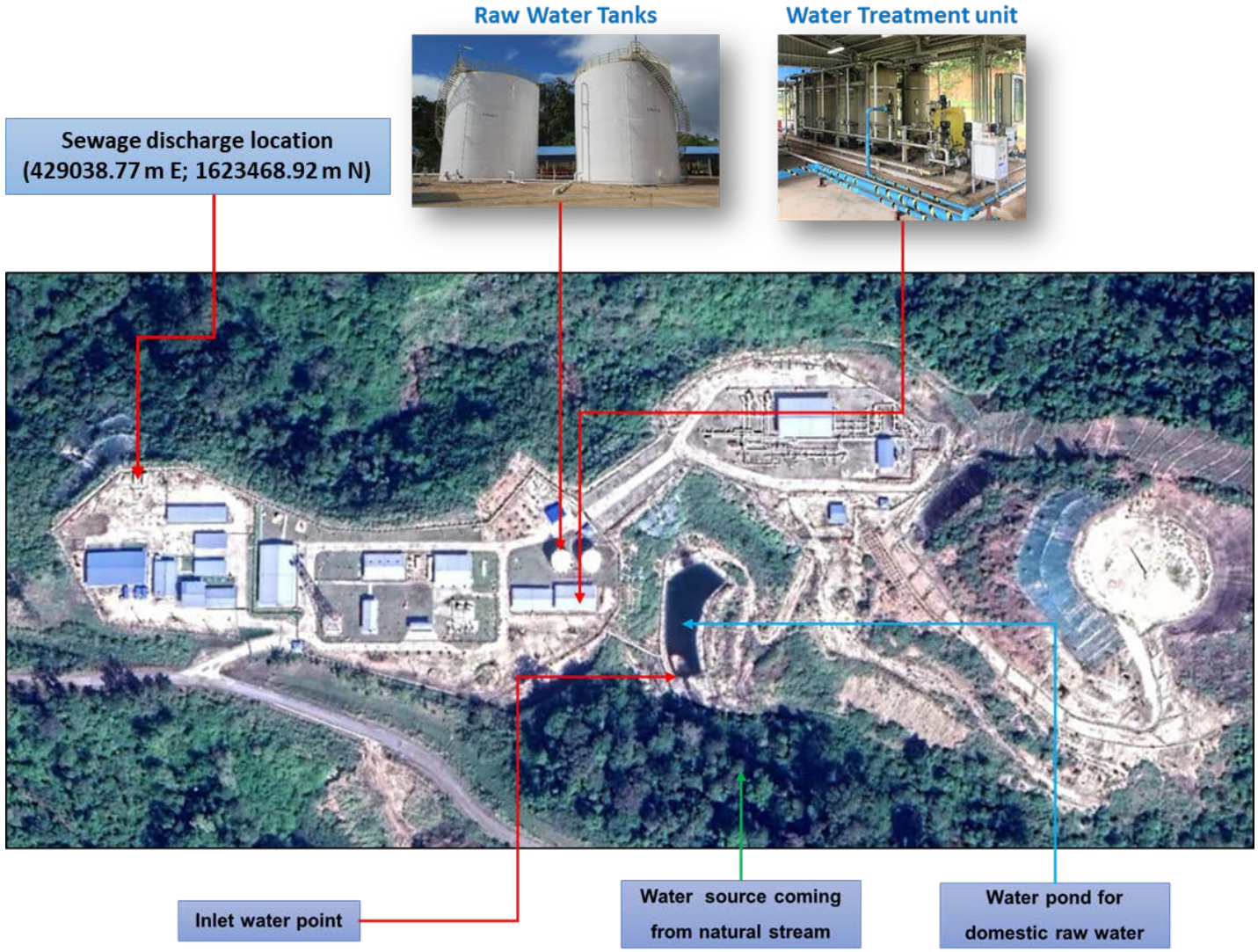
[1] The standard quantity of water intake for adult is 2 litres per day (WHO, The right to water., 2003)
[2] The average consumption level is 200 litres per person (ONEP, 2000)

Figure 3.27 Components for Water Use of ZOC



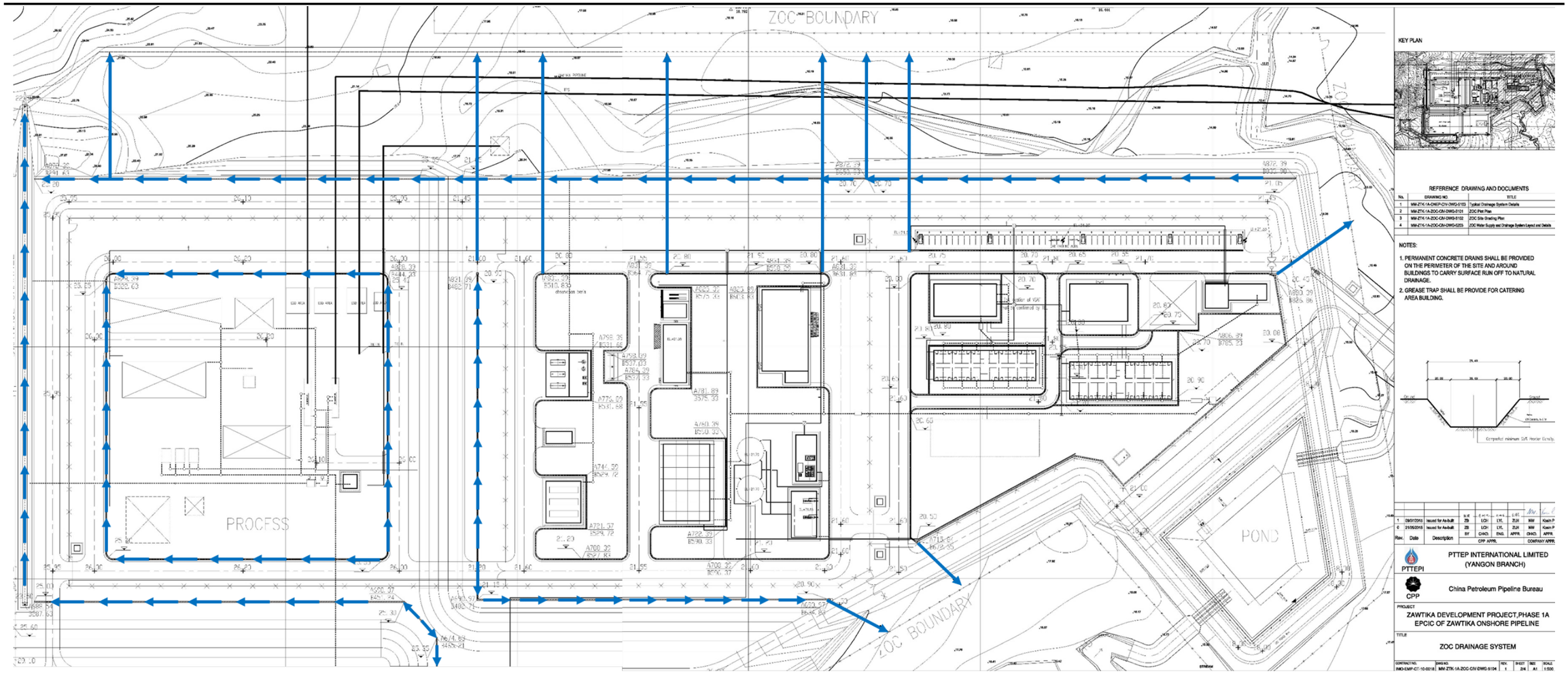
Source: ATL, 2019.

Figure 3.28 Components for Water Use of ZMS



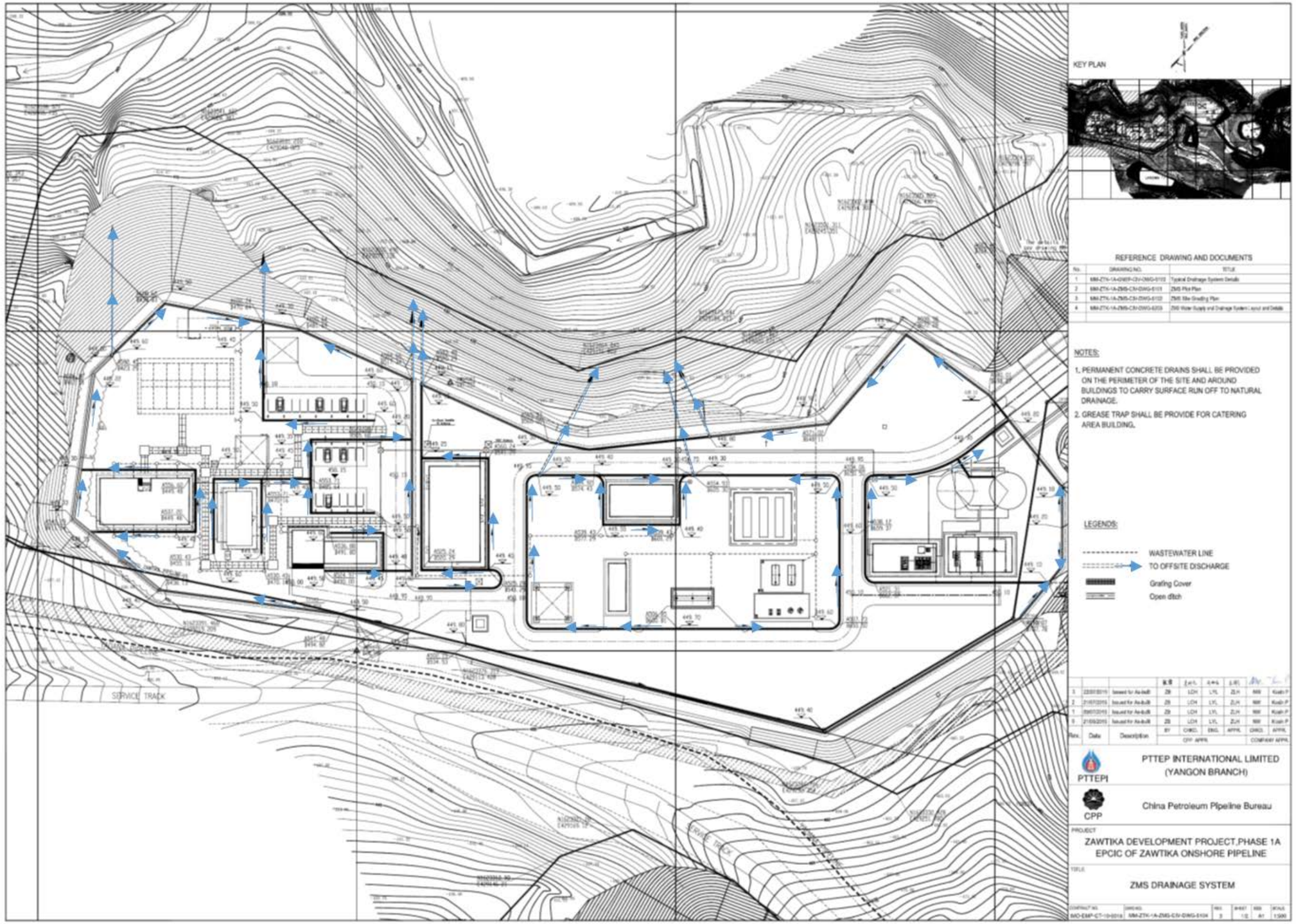
Source: ATL, 2019.

Figure 3.29 Stormwater Flow and Drainage System from ZOC's Process Area, Utility Area, Administration and Accommodation Area



Source: ATL, 2019.

Figure 3.30 Stormwater Flow and Drainage System from ZMS



Source: ATL, 2019.

3.4 DECOMMISSIONING

All fixed equipment will be considered to removed or handover to MOGE at the end of the operational life in compliance with accepted environmental practice and industry standards at the time.

A detailed decommissioning plan for Zawtika field will be prepared and get approved form MOGE prior to decommissioning activities. Therefore, the decommissioining budget will be proposed for further approval depend on the acceptable environmental practice and approval method before ending of project life span.

4.1 PROJECT'S ENVIRONMENTAL, SOCIAL AND HEALTH POLICIES

ATL is a subsidiary company of PTTEP and does not have its own internal policies or procedures. ATL currently follows the relevant policies and procedures of Corporate PTTEP and PTTEP Myanmar Asset for its Zawtika Onshore operations.

ATL management is fully committed to providing a safe, secured and healthy workplace and conducting its operations in a manner that protects the environment. These commitments are in accordance with PTTEP's Vision, Missions, Values and SSHE Policy. Proactive individual involvement, responsibility and accountability are expected of all employees, contractors and third-party personnel. PTTEP Myanmar Asset SSHE Management System (SSHE MS) is designed to align all stakeholders' efforts to enable attainment of these principles.

All levels of line management at ATL are responsible for implementing and maintaining the applied SSHE policy and SSHE MS. Both documents are reviewed and revised at regular intervals.

4.1.1 *PTTEP's SSHE Policy*

PTTEP Corporate Vision and Missions Safety, Security, Health and Environment (SSHE)

Vision

PTTEP will be a leading company that regards SSHE as a license to operate and strives to achieve Safety, Security, Health and Environment (SSHE) excellence by being a zeroincident organization.

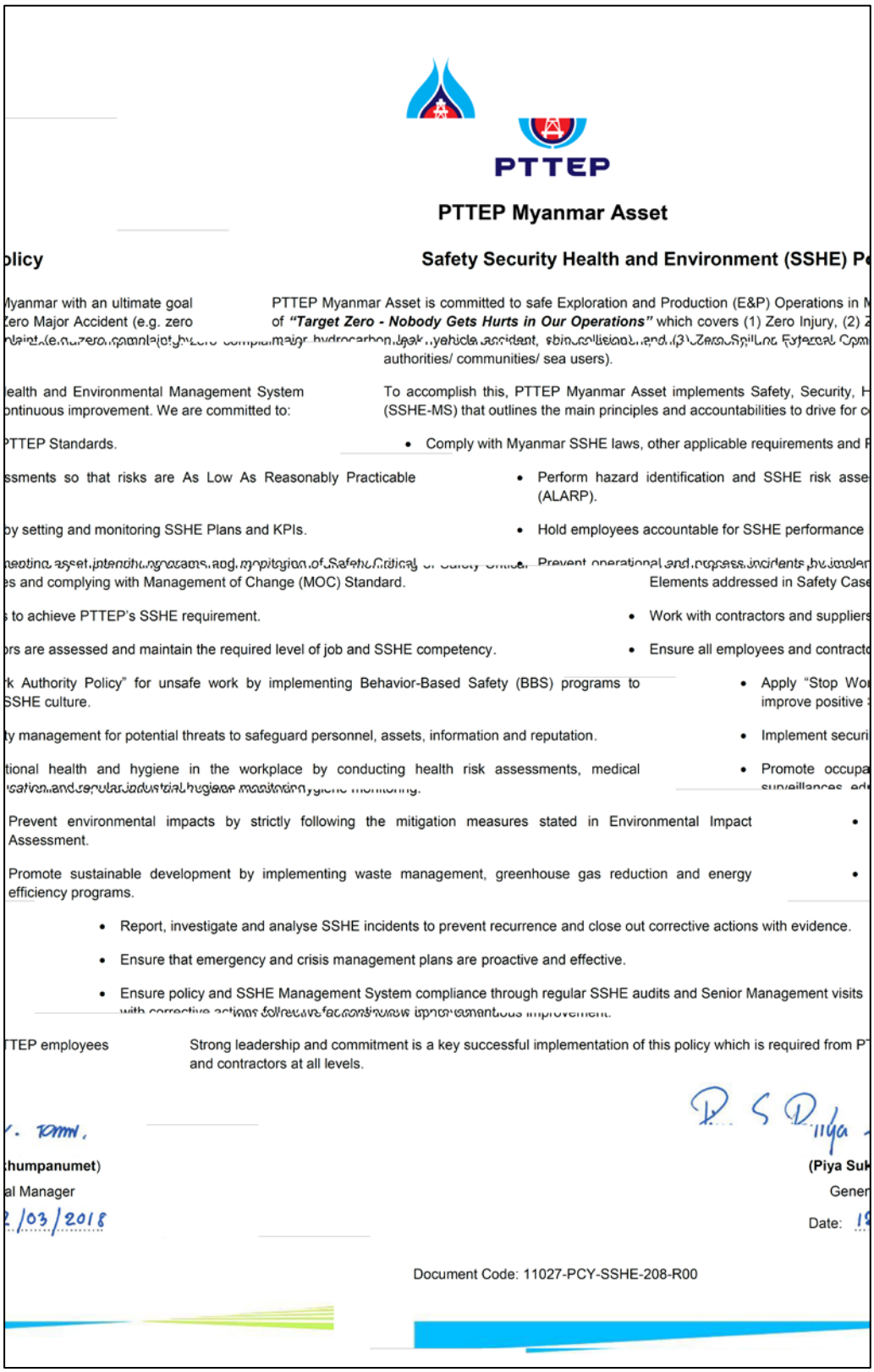
Missions

- *Prevent all incidents through operational and process safety management.*
- *Ensure compliance with and constantly manage and improve our well-established SSHE Management System and its readiness to be able to promptly and effectively respond to emergencies, crises, and security-related events*
- *Help to deliver energy reliably and securely by using proven and environmentally friendly technology and by operating responsibly to ensure PTTEP's sustainable development.*
- *Create a generative SSHE culture that is grounded in leadership at every level of the organization, from management to contractors, where everybody understands the crucial importance of SSHE risks, and uncompromisingly manages any SSHE risks in their own working environment.*
- *Achieve top quartile SSHE performance in exploration and production industry.*

PTTEP Myanmar Asset SSHE Policy

The English and Myanmar versions of the latest PTTEPI's SSHE Policy of 2020 are shown in ***Figure 4.1*** and ***Figure 4.2.***

Figure 4.1 PTTEPI's 2020 SSHE Policy (English Version)



PTTEP

PTTEP Myanmar Asset

olicy **Safety Security Health and Environment (SSHE) Pe**

lyanmar with an ultimate goal Zero Major Accident (e.g. zero

PTTEP Myanmar Asset is committed to safe Exploration and Production (E&P) Operations in M of ***"Target Zero - Nobody Gets Hurts in Our Operations"*** which covers (1) Zero Injury, (2) Z

authorities/ communities/ sea users).

ealth and Environmental Management System ontinuous improvement. We are committed to:

To accomplish this, PTTEP Myanmar Asset implements Safety, Security, H (SSHE-MS) that outlines the main principles and accountabilities to drive for c

PTTEP Standards.

- Comply with Myanmar SSHE laws, other applicable requirements and F

ssments so that risks are As Low As Reasonably Practicable

- Perform hazard identification and SSHE risk asse (ALARP).

by setting and monitoring SSHE Plans and KPIs.

- Hold employees accountable for SSHE performance

es and complying with Management of Change (MOC) Standard.

- Elements addressed in Safety Case

s to achieve PTTEP's SSHE requirement.

- Work with contractors and supplier

ors are assessed and maintain the required level of job and SSHE competency.

- Ensure all employees and contracto

k Authority Policy" for unsafe work by implementing Behavior-Based Safety (BBS) programs to SSHE culture.

- Apply "Stop Wo improve positive

y management for potential threats to safeguard personnel, assets, information and reputation.

- Implement securi

tional health and hygiene in the workplace by conducting health risk assessments, medical

- Promote occupa

Prevent environmental impacts by strictly following the mitigation measures stated in Environmental Impact Assessment.

Promote sustainable development by implementing waste management, greenhouse gas reduction and energy efficiency programs.

- Report, investigate and analyse SSHE incidents to prevent recurrence and close out corrective actions with evidence.
- Ensure that emergency and crisis management plans are proactive and effective.
- Ensure policy and SSHE Management System compliance through regular SSHE audits and Senior Management visits

TEP employees

Strong leadership and commitment is a key successful implementation of this policy which is required from P and contractors at all levels.

humpanumet)

(Piya Suk

al Manager

Gener

2/03/2018

Date: 1

Document Code: 11027-PCY-SSHE-208-R00

Souce: PTTEPI, 2020

Figure 4.2 PTTEPI's 2020 SSHE Policy (Myanmar Version)

PTTEP

ပိတိတီအီးပီ ကုမ္ပဏီ (မြန်မာ့ စီမံကိန်း)

ဘေးအန္တရာယ်ကင်းရှင်းရေး၊ လုံခြုံရေး၊ ကျန်းမာရေးနှင့် သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေး ဆိုင်ရာမူဝါဒ (SSHE)

ပိတိတီအီးပီ မြန်မာစီမံကိန်းသည် ရေနံနှင့်သဘာဝဓာတ်ငွေ့ ရှာဖွေတူးဖော်ရေးနှင့် ထုတ်လုပ်ရေး (E&P) လုပ်ငန်းများ ဆောင်ရွက်ရာတွင် ကုမ္ပဏီ၏ မည်သည့် လုပ်ငန်းခွင်အတွင်းမဆို မည်သူတစ်ဦးတစ်ဦးမှ ထိခိုက်မှု လုံးဝမရှိစေရန်၊ သာဓက အနေဖြင့် ၁။ ဒဏ်ရာအနာတရ ထိခိုက်မှု လုံးဝမရှိစေရ ၂။ ကြီးမားသည် ယျက်ခီးဆုံးရှုံးမှုကို ဖြစ်စေနိုင်သော ဟိုက်ဒရိုကာဗွန်ဓာတ်ငွေ့ ယိုစိမ့်မှု၊ ယာဉ်တိုက်မှု၊ ရေယာဉ်တိုက်မှုများ လုံးဝ မရှိစေရ ၃။ ရေနံဆီ၊ ဆီ (သို့မဟုတ်) ဓာတုအရောင်များ ယိုဖိတ်မှု၊ သို့မဟုတ် အာဏာပိုင်များ၊ ကုမ္ပဏီပြင်ပ အဖွဲ့ အစည်းများမှ တိုင်တန်းမှု များ လုံးဝ မရှိစေရန်။

ဤသို့ လုပ်ငန်းများ ပြီးမြောက်အောင်မြင်စေရန် ပိတိတီအီးပီ မြန်မာကုမ္ပဏီသည် ဘေးကင်းလုံခြုံရေး၊ ကျန်းမာရေးနှင့် သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဆိုင်ရာ စီမံခန့်ခွဲမှုစနစ်ကို အကောင်အထည်ဖော်ဆောင်ရွက်ဂျက်ရှိသည်။ ဤစီမံခန့်ခွဲမှုစနစ်သည် အစဉ်မပြတ်တိုးတက်မှုရှိစေရန်အတွက်ဝန်းအားပေးဆောင်ရွက်ရမည် အဓိကအခြေခံအချက်များဖြစ်သည်။ ဝန်ထမ်းများနှင့်အတူ ကန်ထရိုက်တာများသည် -

- မြန်မာနိုင်ငံရှိ ပြဋ္ဌာန်းထားသော ဥပဒေများနှင့်အခြားလိုက်နာရမည့်လိုအပ်ချက်များ၊ ပိတိတီအီးပီ၏ စံနှုန်းများ အတိုင်း လိုက်နာကျင့်သုံးခြင်း။
- အန္တရာယ်များကိုဖော်ထုတ်ခြင်း၊ ဘေးအန္တရာယ်ကင်းရှင်းရေး၊ လုံခြုံရေး၊ ကျန်းမာရေး၊ သဘာဝပတ်ဂန်းကျင်ထိန်းသိမ်းရေး(SSHE) စသည်တို့နှင့် သက်ဆိုင်သည့် အကဲဖြတ်ချင့်ချိန်ခြင်းတို့ကို လုပ်ဆောင်ခြင်းဖြင့် ကျိုးကြောင်းဆက်ဆံရေးဆိုင်ရာ အန္တရာယ်များကို နည်းနိုင်သမျှနည်းစေမည့် လက်တွေ့ကျင့်သုံးနိုင်သည့် နည်းလမ်းများအား အသုံးပြုခြင်း။
- ဘေးအန္တရာယ်ကင်းရှင်းရေး၊ လုံခြုံရေး၊ ကျန်းမာရေးနှင့် သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဆိုင်ရာ ရေးဆွဲထားသောအစီအစဉ်များနှင့် အဓိကလုပ်ဆောင်မှုဆိုင်ရာ ညွှန်ကြားချက်များကို ချမှတ်စောင့်ကြည့်ခြင်းအားဖြင့် ပန်ထမ်းများ၏လုပ်ဆောင်ရွက်များအတွက် ကိုယ်တိုင်တာဝန်ယူတာဝန်ခံမှုရှိစေခြင်း။
- ဘေးအန္တရာယ်ကင်းရှင်းရေးဆိုင်ရာ သာဓကလေ့လာမှုများ (safety cases)တွင် ဖေါ်ပြထားသော အန္တရာယ်ကင်းရှင်းမှုအတွက်အရေးကြီးသည့်ပစ္စည်းများ၏ ကြံ့ခိုင်မှုကိုစောင့်ကြည့်စစ်ဆေးခြင်း။ ထုတ်လုပ်မှုလုပ်ငန်းစဉ်တွင်လည်ပတ်နေသည့်ပစ္စည်းအစိပ်အပိုင်းများ၏ကြံ့ခိုင်မှုအတွက် ချမှတ်ထားသည့်အစီအစဉ်များကို လိုက်နာဆောင်ရွက်ခြင်း နှင့် မှုလပစ္စည်း၊ လုပ်ငန်းစဉ်၊ စံနှုန်းမသွေဖီမည့်လုပ်ငန်းများကိုစီမံထိန်းချုပ်ထားသည့်စံနှုန်းများ(MOC)အား လိုက်နာဆောင်ရွက်ခြင်းဖြင့် လုပ်ငန်းခွင်ဆိုင်ရာ နှင့် ထုတ်လုပ်မှုဆိုင်ရာ မတော်တဆမှုများကို ကြိုတင်ကာကွယ်နိုင်ခြင်း။
- ပိတိတီအီးပီ၏ ဘေးအန္တရာယ်ကင်းရှင်းရေး၊ လုံခြုံရေး၊ ကျန်းမာရေးနှင့် သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေး(SSHE)ဆိုင်ရာ လိုအပ်ချက်များပြီးမြောက်အောင်မြင်ရန် ကုမ္ပဏီ၏ ကန်ထရိုက်တာများ၊ ပစ္စည်းပေးသွင်းသူများနှင့် စီမံဆောင်ရွက်ခြင်း။
- ဝန်ထမ်းများနှင့်ကန်ထရိုက်တာများအား ၎င်းတို့၏သက်ဆိုင်ရာလုပ်ငန်းအဆင့်အလိုက်ရှိရမည့် ဘေးအန္တရာယ်ကင်းရှင်းရေး၊ လုံခြုံရေး၊ ကျန်းမာရေး၊ သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေး(SSHE)ဆိုင်ရာ လိုအပ်သည့်ကျွမ်းကျင်မှုများကို စဉ်ဆက်မပြတ်လေ့လာအကဲဖြတ်ခြင်း၊ ၎င်းတို့၏အရည်အသွေး ဆက်လက်ထိန်းသိမ်းပေးခြင်း။
- အပြုသဘောဆောင်သော SSHE အလေ့အထကောင်းများတိုးတက်လာစေရန် အပြုအမူအခြေခံသောဘေးအန္တရာယ်ကင်းရှင်းရေး (BBS – Behavioral-Based Safety) ညွှန်ကြားချက်များကိုလိုက်နာခြင်းဖြင့် အန္တရာယ်ရှိသည့်လုပ်ငန်းအားရပ်တန့်ခွင့်ရှိသည့်မူဝါဒကို ကျင့်သုံးခြင်း။
- ကုမ္ပဏီပိုင်ဆိုင်သည့် ပစ္စည်း၊ အဆောက်အအုံများ၊ လူ၊ သတင်းအချက်အလက်နှင့် ကုမ္ပဏီ၏ဂုဏ်သိက္ခာအပေါ် အလားအလာရှိသော မြိမ်းခြောက်မှုများကို ကာကွယ်ပေးရန်အတွက် လုံခြုံရေးဆိုင်ရာ စီမံခန့်ခွဲမှုစနစ်ကို ကျင့်သုံးခြင်း။
- လုပ်ငန်းခွင်အတွင်းကျန်းမာရေးနှင့်သန့်ရှင်းရေးအဆင့်မြင့်တင်ရန် ကျန်းမာရေးနှင့်ပတ်သတ်သည့်ဘေးအန္တရာယ်များကိုအကဲဖြတ်ချင့်ချိန်ခြင်းအသိပညာပေးခြင်းနှင့် ပုံမှန်ကျန်းမာရေးစစ်ဆေးမှုတို့ကို လုပ်ဆောင်ခြင်းဖြင့် အထောက်အကူပြုခြင်း။
- သဘာဝပတ်ဝန်းကျင်အားထိခိုက်မှုမရှိစေရန် ပတ်ဂန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းအစီရင်ခံစာတွင်ပါရှိသော အန္တရာယ်ဖြစ်စေနိုင်သည့် အကျိုးသက်ရောက်မှုတို့ကို လျော့နည်းစေသည့် စီမံချက်တို့ကို တိကျစွာလိုက်နာဆောင်ရွက်ခြင်းဖြင့် သဘာဝပတ်ဝန်းကျင်ထိခိုက်မှုကို နည်းနိုင်သမျှနည်းအောင် ဆောင်ရွက်ခြင်း။
- စဉ်ဆက်မပြတ်တိုးတက်မှုအတွက် စွန့်ပစ်ပစ္စည်းများကို စနစ်တကျကိုင်တွယ်ဖြေရှင်းသည့်အစီအစဉ်ကိုလိုက်နာခြင်းဖြင့် စွန့်ပစ်ပစ္စည်းများကိုလျော့နည်းစေခြင်း၊ ဖန်လုံအိမ်အာနိသင်ကိုလျော့နည်းစေခြင်း။ စွမ်းအင်များကိုထိရောက်စွာအသုံးပြုခြင်းနှင့် သဘာဝအရင်းအမြစ်များကို ထိန်းသိမ်းခြင်း။
- ဘေးကင်းလုံခြုံရေး၊ကျန်းမာရေး၊သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးနှင့်သတ်ဆိုင်သည့်မတော်တဆမှုများကိုကာကွယ်ရန်နှင့်အလားတူထိခိုက်မှုမျိုးထပ်မံမဖြစ်ပွားစေရန် ယင်းတို့ကို အစီရင်ခံခြင်း၊ စစ်ဆေးခြင်း၊ ထိခိုက်မှုဖြစ်စေသည့် အခြေခံအကြောင်းရင်းကိုစီစစ်ခြင်း၊ ပြင်ဆင်ရမည့် အချက်များကို အကိုးအကားအထောက်အထားနှင့်တကွ ပြင်ဆင်လုပ်ဆောင်ခြင်းဖြင့် တားဆီးကာကွယ်ခြင်း။
- အရေးပေါ်အခြေအနေနှင့် ကပ်ဆိုက်ရောက်ခြင်းတို့အတွက် ရေးဆွဲထားသော စီမံခန့်ခွဲမှုအစီအစဉ်များအား ထိရောက်မှုရှိ မရှိကို သေချာစွာစစ်ဆေးထားခြင်း။
- စဉ်ဆက်မပြတ်တိုးတက်စေရန်အတွက် လုပ်ငန်းခွင်များသို့ အကြီးတန်းစီမံခန့်ခွဲသူများမှ ပုံမှန်ကွင်းဆင်းစစ်ဆေးခြင်းဖြင့် မြှင့်တင်ဆောင်ရွက်ရမည့်အချက်များ၊ ဘေးအန္တရာယ်ကင်းရှင်းရေးလုံခြုံရေးကျန်းမာရေးသဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးစီမံခန့်ခွဲမှုစနစ်နှင့် ချမှတ်ထားသည့်ပေါ်လစီ(မူဝါဒ)အားလိုက်နာကျင့်သုံးမှု ရှိ မရှိကို သေချာစေခြင်း။

ဝိုင်မာသောဓေါင်းဆောင်မှု၊ တာဝန်ယူမှုသည် ချမှတ်ထားသည့် ဤပေါ်လစီ(မူဝါဒ)အား ပိတိတီအီးပီဝန်ထမ်းများနှင့်ကန်ထရိုက်တာများမှ လိုက်နာကျင့်သုံးစေသည့် အဓိကကျသည့်သော့ချက်ဖြစ်သည်။

(ဦးရဲ စွမ်းဇာနည်မဲ့ ဒဲ)
အထွေထွေမန်နေဂျာ
နေ့စွဲ 12/03/2018

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4.1.2 *PTTEP Myanmar Asset's Environmental, Social and Health Management System*

4.1.2.1 *Roles and Responsibilities*

Role of PTTEP Myanmar Asset

As well as having overall responsibility for the Project, PTTEP Myanmar Asset also have responsibility for monitoring the performance of all contractors. Where the mitigation measures do not result in the achievement of the objectives, PTTEP Myanmar Asset will work with contractor(s) to refine the measures.

The responsibility for implementation of the environmental monitoring and for the associated reporting lies with the PTTEP Myanmar Asset Representative. It is expected that this person would be present during the Project activities and will have responsibility for safety and environment on site.

Roles of Contractors

Contractors will be responsible for ensuring compliance with all relevant legal requirements, PTTEP Myanmar Asset procedures, as well as adherence to all environmental controls and mitigating measures.

Contractors will also be responsible under the contract for minimizing the potential environmental, social and health impacts of all contracted activities.

Contractors will need to demonstrate to the satisfaction of PTTEP Myanmar Asset how compliance with the mitigation measures will be ensured. They will also be expected to show to demonstrate commitment to the mitigation measures in all levels of their management structure.

4.1.2.2 *Supporting Management Plans*

SSHE Management System Manual

The objective of PTTEP Myanmar Asset SSHE Management System is to serve as a practical interpretation of the Company's SSHE policy with respect to their moral obligations for SSHE issues for all persons working on, visiting or affected by operations at sites for which PTTEPI has responsibility.

The manual covers details on the areas specified in ***Table 4.1***. The document is designed to serve as a comprehensive guide for all Operational Assets to develop its own SSHE management system and related documents. This document also provides an overview of the SSHE management system approach.

PTTEP Myanmar Asset primary SSHE documents are included in ***Annex A.*** Additional SSHE documents are available from PTTEP Myanmar Asset upon request as needed.

Table 4.1 Corporate PTTEP and PTTEP Myanmar Asset SSHE Management System Standards

Document Code	Document
PTTEP Corporate Documents	
-	PTTEP SSHE Policy
-	PTTEP Sustainable Development Policy
11038-STD-SSHE-000-R05	Corporate SSHE Management System
11038-STD-SSHE-101-R02	SSHE Roles and Responsibilities Standard
11038-STD-SSHE-303-R06	SSHE Communications Standard
11038-STD-SSHE-305-R05	SSHE Training and Competency Standard
11003-STD-SSHE-350-004-R03	SSHE Regulatory Compliance Standard
11038-STD-SSHE-401-R06	SSHE Risk Management Standard
SSHE-106-STD-500	Emergency and Crisis Management Standard
11038-STD-SSHE-510-010-R04	Permit to Work Standard
11038-STD-SSHE-520-009-R01	Environmental Management Standard
SSHE-106-STD-530	Security Management Standard
SSHE-106-STD-540	Operational Safety Management Standard
11003-STD-SSHE-550-003-R03	Corporate SSHE Plan Standard
SSHE-106-STD-560	Occupational Health Management Standard
SSHE-106-STD-580	PTTEP Personal Protective Equipment Standard
11003-STD-SSHE-590-005-R02	Chemical Management Standard
11038-STD-SSHE-600-011-R06	Incident Management Standard
11038-STD-SSHE-701-R05	Audit and Review Standard
11003-GDL-SSHE-561-005-R01	Fitness to Work Guideline
SSHE-106-STD-310	SSHE Contractor Management Standard
PTTEP Myanmar Asset Documents	
11027-PCY-SSHE-208-R00	PTTEP Myanmar Asset SSHE Policy
Myanmar-SSHE-11027-PCY-207	Myanmar Asset Use of Electrical Equipment
11027-PDR-SSHE-340-007-R01	Myanmar Asset SSHE Management System
11027-PDR-SSHE-340-003-R01	SSHE Training & Competency -Procedure
Myanmar 13036-PDR-078	PTTEP SSHE Requirements for Contractor
11027-PDR-SSHE-503/01-R02	Myanmar Asset Waste Management Procedure
11027-PDR-SSHE-501/03-R02	Myanmar Asset Spill Contingency Plan
11027-PDR-SSHE-501-005-R00	Myanmar Asset Crisis Management Plan
11027-PDR-SSHE-507-R04	Myanmar Asset Tropical Cyclone Procedure
11027-PDR-SSHE-306/01-R03	Myanmar Asset Compliance Obligations Procedure
11027-PDR-SSHE-502-006-R01	Myanmar Asset Emergency Management Plan
Myanmar-0550-PDR-008	PTTEP Crisis Communication Plan
Myanmar-SSHE-11027-PDR-508	Fitness to Work Procedure
Myanmar-SSHE-11027-PDR-516	Offshore Helicopter Emergency Landing Procedure
11027-PDR-SSHE-530-004-R00	Myanmar Asset Security Management Procedure
11027-PDR-SSHE-564-002-R00	Myanmar Asset Alcohol and Drugs Testing Procedure

Document Code	Document
12140-GDL-009-R00	Grievance Handling Guideline

4.1.2.3 *Contractor Management*

ATL requires its contactors to comply with Corporate PTTEP "SSHE Contractor Management Standard". The contractor is also required to carry out an SSHE Risk Assessment of their work and present a specific SSHE work plan. Workers must be formally trained in the general and specific SSHE issues at the site.

4.2 *POLICY AND LEGAL FRAMEWORK*

This section of the EMP report details the policy and legal framework for the Project, covering national requirements as well as applicable international treaties and conventions. The intent is to lay out the regulatory and non-regulatory performance requirements for all stages of the Project.

4.2.1 *Overview of Myanmar Legislation*

4.2.1.1 *The Constitution*

The latest enacted Constitution (May 2008) provides information on governing laws and regulations in Myanmar. The Constitution takes precedence over any other national legislation or international agreements. The general provisions of the Constitution that relate to the Project are the requirement for Myanmar citizens to assist in:

- Preservation and safeguarding of cultural heritage;
- Environmental conservation;
- Striving for development of human resources; and
- Protection and preservation of public property.

4.2.1.2 *Administrative Divisions of Myanmar*

Myanmar is divided into twenty-one (21) main administrative subdivisions, which include:

- Seven states;
- Seven regions (Note that regions were previously referred to as "divisions", prior to August 2010);
- Five self-administered zones;
- One self-administered division; and
- One union territory.

This Project is located in Tanintharyi Region, which is located in southeastern Myanmar. Tanintharyi Region comprises ten (10) townships spread over three districts: Dawei District, Kawthoung District and Myeik District.

The administrative subdivisions are detailed in ***Table 4.2***, and an administrative map is presented in ***Figure 4.3***.

Table 4.2 Administrative Regions of Myanmar

Name	Capital	Population	Area (Km²)
Ayeyarwady Region	Pathein	6,184,829	35,032
Bago Region	Bago	4,867,373	39,404
Chin State	Hakha	478,801	36,019
Kachin State	Myitkyina	1,689,441	89,042
Kayah State	Loikaw	286,627	11,732
Kayin State	Pa-an	1,574,079	30,383
Magway Region	Magwe	3,917,055	44,821
Mandalay Region	Mandalay	6,165,723	30,888
Mon State	Mawlamyaing	2,054,393	12,297
Rakhine State	Sittwe	3,188,807	36,778
Sagaing Region	Sagaing	5,325,347	93,702
Shan State	Taunggyi	5,824,432	155,801
Tanintharyi Region	**Dawei**	**1,408,401**	**43,345**
Yangon Region	Yangon	7,360,703	10,170
Naypyidaw Union Territory	Naypyidaw	1,160,242	70,571
Danu Self-Administered Zone	Pindaya	N/A	N/A
Kokang Self-Administered Zone	Laukkai	N/A	N/A
Naga Self-Administered Zone	Lahe	N/A	N/A
Pa-O Self-Administered Zone	Hopong	N/A	N/A
Pa Laung Self-Administered Zone	Namhsan	N/A	N/A
Wa Self-Administered Division	Hopang	N/A	N/A

Source: United Nation Population Fund (UNFPA), 2014, Myanmar Information Management Unit (MIMU), 2015

States and regions are divided into districts. Districts consist of townships, which are composed of towns, wards and village-tracts. Village-tracts are groups of adjacent villages. The administrative structure of the states, regions and self-administering bodies is defined in the Constitution.

Each region and state have a Regional/State Government, consisting of a Chief Minister, Ministers and an Advocate General. Legislative authority resides with the State/Regional "Hluttaw" (a parliament or legislative body), which are made up of elected civilian members and representatives of the military.

The Constitution states that Naypyidaw is a Union Territory under the direct administration of the President. The Naypyidaw Council, led by a Chairperson, carries out general functions on behalf of the President. The Chairpersons of the Naypyidaw Council are appointed by the President and include civilians and representatives of the military.

Self-Administered Zones and Self-Administered Divisions are administered by a Leading Body, which is headed by a Chairperson, and has executive and legislative powers. The Leading Body consists of elected State/Regional Hlutttaw members and military personnel.

Figure 4.3 Myanmar States/Regions and Townships

Source: Myanmar Information Management Unit, 2019

4.2.1.3 *Myanmar Protected Areas*

The first legal instrument related to protected areas, which designated a wildlife sanctuary in the environs of the Royal Mandalay City, was promulgated in 1859. The first piece of wildlife legislation to be enacted was the Wild Elephant Protection Act of 1879. The Forest Act of 1902 gave responsibility for wildlife management to the Forest Department. Legislation specific to wild animals followed in 1927, and broader legislation followed nine years later with the Wildlife Protection Act of 1936. This provided for designation of wildlife sanctuaries with species-specific conservation objectives. Legislation was revised in 1994 with issue of the Protection of Wildlife and Wild Plants and Conservation of Natural Areas Rules, 2002. The Protection of Biodiversity and Conservation Areas Law, 2018. The Forest Law 2018. The 1994 Law, which was issued by the State Law and Order Restoration Council, provides for:

- A Committee for the Protection of Wildlife and Wild Plants and Conservation of Natural Areas, which is to serve as an advisory body to the Minister of Forestry; supervise implementation of the Law; give guidance in matters of research, conserving species in danger of extinction and international cooperation;
- Categories of 'natural areas' and zoological and botanical gardens, their declaration and uses;
- Categories of protected wild animals (almost the same as provided for under earlier law): completely protected, normally protected and seasonally protected;
- Hunting licences;
- Establishment of zoological and botanical gardens;
- Registration of ownership of completely protected animals or trophies thereof;
- Administrative actions;
- Appeals; and
- Offences and penalties.

The categories of so-called 'natural areas' are defined in the Law described above as:

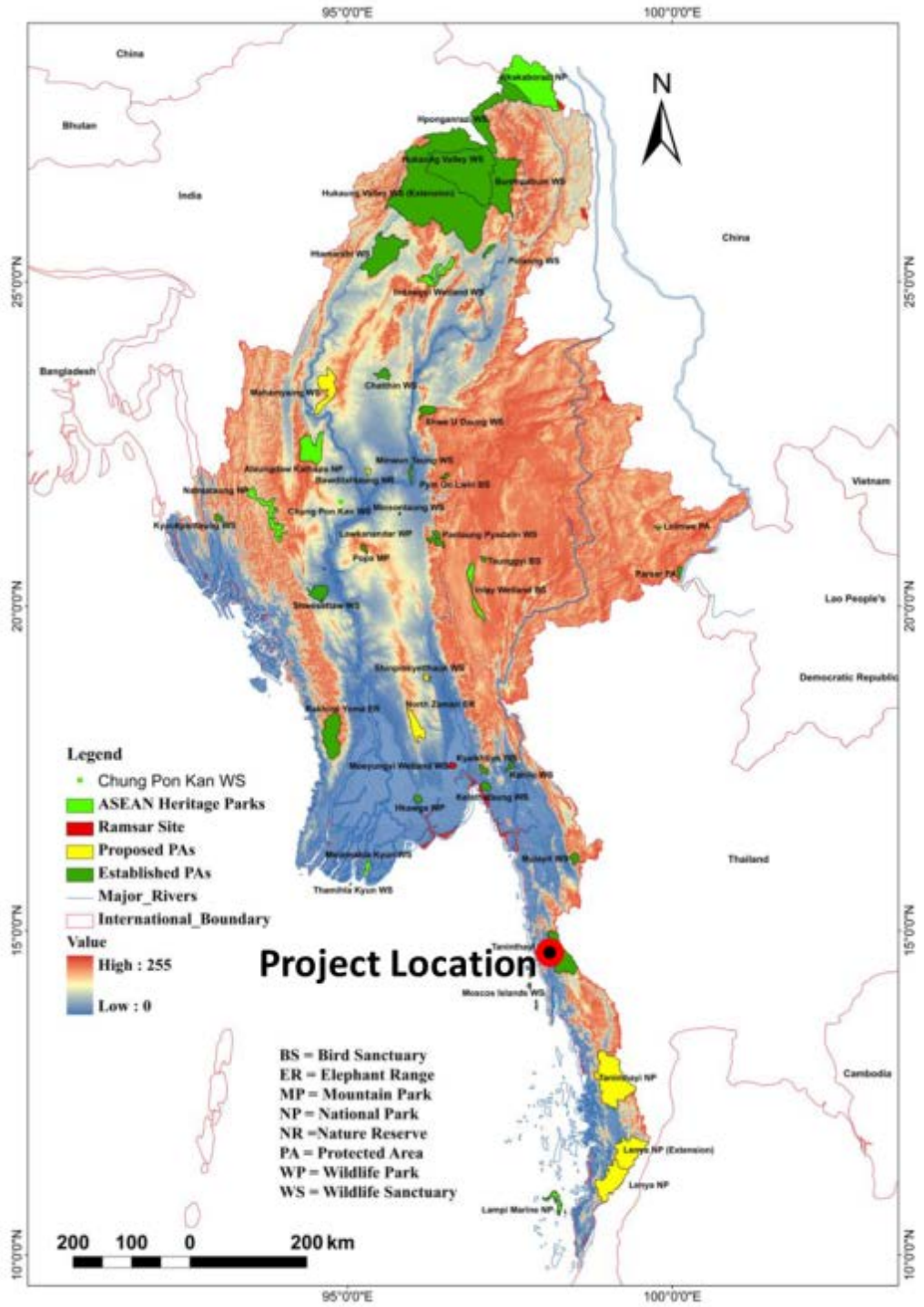
- Scientific Nature Reserve;
- National Park;
- Marine National Park;
- Nature Reserve;
- Wildlife Sanctuary;
- Geo-Physically Significant Reserve; and
- Other Nature Reserve Determined by the Minister.

A total of 43 protected areas have been established or proposed in Myanmar and are shown in Figure 4.4. The nearest protected areas to the Project are Tanintharyi National Park (proposed), and Tanintharyi Nature Reserve; the pipeline passes through this reserve, as discussed in Section 3. Details of these protected areas are shown in Table 4.3.Table 4.3 Protected Areas near the Project

No	Name	National Designation	Year Established	Location and Coordinates	Area (km²)	Distance to Project (Km)	Key Species Protected
1	Tanintharyi N.P *	National Park	2002 (Proposed)	Tanintharyi Region, Tanintharyi Township, 12°41'N, 99° 04'E	2,072	180	Sambar Deer, Asian Elephant, Barking Deer, Serow, Red Goral, Leopard, Birds Spp.
2	Tanintharyi Nature Reserve *	Nature Reserve	2005	Tanintharyi Region, Yebyu and Tavoy Townships, 14°36'N, 98° 17'E	1,700	0	Gurney's Pitta, Elephant

Source: Myanmar Protected Areas: Context, Current Status and Challenges, 2011

Figure 4.4 Protected Areas in Myanmar and Project Location



Source: Fifth National Report to the United Nations Convention on Biological Diversity, Ministry of Environmental Convention and Forestry, March 2014

4.2.1.4 EMP Requirements

4.2.1.4(1) General EMP Requirement

The following article mentions the general requirements for development of an EMP:

EIA Procedures, Article 3

Pursuant to Section 21 of the Law and Articles 52, 53 and 55 of the Rules, all Projects and Project expansions undertaken by any ministry, government department, organization, corporation, board, development committee and organization, local government or authority, company, cooperative, institution, enterprise, firm, partnership or individual (and/or all Projects, field sites, factories and businesses including expansions of such Projects, field sites, factories and businesses identified by the Ministry, which may cause impact on environmental quality and are required to obtain Prior Permission in accordance with Section 21 of the Law, and Article 62 of the Rules) having the potential to cause Adverse Impacts, are required to undertake IEE or EIA or to develop an EMP, and to obtain an ECC in accordance with this Procedure.

4.2.1.4(2) EMP Requirements for Existing Projects and Changes to Existing Projects

In addition, there are particular articles relevant to existing projects, as well as changes to projects, which is directly applicable to the Zawtika facilities:

EIA Procedures, Article 8

Any Project already in existence prior to the issuance of the Procedure, or the construction of which has already commenced prior to the issuance of the Rules, and which, in either case, shall be required to undertake, within the timeframe prescribed by the Department, an environmental compliance audit, including on-site assessment, to identify past and/or present concerns related to that Project's Environmental Impacts, and to:

a) develop an EIA or IEE or EMP;

b) obtain an ECC; and

c) take appropriate actions to mitigate Adverse Impacts in accordance with the Law, the Rules, and other applicable laws.

It is noted that Article 8 of the EIA Procedures indicates there may also be requirement for IEE or EIA for projects already in existence. This determination is ultimately up to the discretion of MONREC (formerly MOECAF) on a project-by-project basis. However, the further elaboration in Articles 9 and 11 below indicate that an EMP alone may be sufficient to obtain the ECC, so long as any project changes or expansions are not large enough to warrant new IEEs or EIAs themselves.

EIA Procedures, Article 9

Any Project already in existence prior to the issuance of the Rules, or the construction of which has already commenced prior to the issuance of the Rules, shall be required to carry out an IEE or EIA as determined by the Ministry in accordance with this Procedure in respect of any proposed extension or expansion of such Project which would increase the Project size or production or would necessitate additional construction, renovation, installation or other extension or expansion related activities, if the nature and scale of such extension or expansion are such that, regarded as an independent Project without reference to the nature or scale of the Project already in existence or under construction, they would have been subject to the requirement to carry out an IEE or EIA. If no IEE or EIA is required to be carried out in respect of such Project extension or expansion, then the EMP and ECC for such Project shall be revised as necessary within the timeframe prescribed by the Department to take into consideration such extension or expansion.

EIA Procedures, Article 11

Any expansion in respect of a Project implemented after the issuance of the Rules and which does not require an IEE or EIA (as the case may be), but such expansion would cause that Project to require an IEE or EIA (as the case may be), then the Department shall determine whether an IEE or EIA (as the case may be) of that Project shall be required and/or whether an updated, revised EMP shall be required, and then report to the Ministry.

It is also noted that future revisions to EMPs may be required, as prescribed in Article 101 of the EIA Procedures below:

EIA Procedures, Article 101

In case the Department finds that changes to the Project, the Project site or Adverse Impacts of the Project warrant revisions to the EMP, Construction Phase EMP, or Operational Phase EMP as the case may be, then the Department may require the Project Proponent to prepare and submit a revised EMP, Construction Phase EMP, or Operational Phase EMP, as the case may be to the Department for review and approval.

4.2.1.4(3) Authority of MONREC (formerly MOECAF) for Determining EMP Requirements

As noted in Article 24 of the EIA Procedures, the final decision of whether an EMP is required for a particular project is to be determined by MONREC (formerly MOECAF).

EIA Procedures, Article 24

The Ministry shall also make a determination whether an EMP shall be required in respect of any Project.

4.2.1.4(4) Review and Approval Process

With regards to the review and approval process after submission of the EMP to MONREC (formerly MOECAF), this is clearly stated in Articles 80 and 81 below. It is also noted that MONREC (formerly MOECAF) may, after review of the EMP, determine that an IEE or EIA is required for the Project.

Article 80

Upon completion of its review of the EMP, the Ministry shall;

a) approve the EMP, subject to any conditions it may prescribe, and issue an ECC; or

b) require that the Project carry out an IEE or EIA, citing the reasons for this decision and informing the Project Proponent of its decision; and, in either case

c) publicly disclose its decision.

Article 81

The Department shall deliver the final decision of the Ministry within thirty (30) working days of receipt of an EMP. If the Ministry requires an EMP to be amended, then the due date for delivery of the Ministry's decision shall be extended accordingly.

4.2.1.4(5) Report Format

The report format for an EMP is clearly described within the *Myanmar Administrative Instruction of Environmental Impact Assessment Procedure*, under *Annex 5 "Format for an Environmental Management Plan"*.

4.2.1.4(6) Environmental Standards

The *Myanmar National Environmental Quality Emission Guidelines (2015)* provide the basis for regulation and control of noise and vibration, air emissions, and liquid discharges from various sources in order to prevent pollution for purposes of protection of human and ecosystem health. These guidelines will provide the basis for compliance determination when implementing mitigation and monitoring requirements for the EMP. These are discussed further in ***Section 5 – Governing Parameters***.

4.2.1.5 Other Project-Relevant Legislation in Myanmar

A number of other laws exist in Myanmar which, either directly or indirectly, relate to environmental and social management, however these laws are general in nature and refer primarily to good practice recommendations. The Project Proponent will follow the below project-related laws. ***Table 4.4*** provides a list of major environmental laws relevant to the Project, and key project-relevant legislation is discussed below.

Table 4.4 Myanmar Legislation and Relevance to Project

Relevant Laws, Rules and Regulations	Relevant Sections	Commitments
POLICIES AND STRATEGIES		
The National Environment Policy, 2019	-	This new National Environmental Policy provides long-term, strategic guidance for government organizations, civil society, the private sector and development partners on the achievement of environmental protection and sustainable development objectives in Myanmar. It requires the mainstreaming of environmental protection into planning and decision-making at all levels of government and in all sectors. Its detailed principles respect livelihood needs and development objectives while at the same time recognizing the full value of our ecosystems and the implications of our changing climate. This Policy ensures that environmental protection continues to be a central objective in Myanmar's sustainable development without losing sight of the importance of a pragmatic approach based on an awareness of the constantly evolving world around us. This National Environmental Policy will serve as a guide in mapping out detailed action plans for environmental protection and sustainable development, and set the direction for the on-going implementation and enhancement of relevant laws and policies. The Project Proponent commits to comply and implement the project as per this policy requirement and to ensure the project set this policy up as a guiding principle for the project's environment policy.
Myanmar Agenda 21, 1997 and National Sustainable Development Strategy for Myanmar, 2009	-	With a view to implementing a National Environment Policy (NEP), the National Commission for Environmental Affairs (NCEA) formulated Myanmar Agenda 21 in 1997 under the guiding principles established at the United Nations Conference on Environment and Development (UNCED), held in Rio de Janeiro in 1992. The Agenda 21 provided the first framework for integrating environmental considerations into national development plans in Myanmar. The purpose of Agenda 21 is to mobilize and focus national efforts to achieve sustainable development, and is intended to have the following functions. The Project Proponent commits; a) To define the choices, set the goals and targets, and establish the standards for sustainable development in Myanmar; b) To illuminate the environmental and ethical dimensions underlying the choices to be made and goals to be achieved in sustainable development; c) To analyze the ecological, economic and social issues in the country in a comprehensive and integrated fashion, clarifying the links between them, identifying the policy gaps, and showing how to reduce conflicts between environment and development; d) To identify and evaluate options for addressing priority issues, problems and opportunities, including the identification of appropriate programmes for legal reform, development of economic instruments, institutional development, capacity-building and other measures; e) To set out sectoral and cross-sectoral policies and plans which rationalize the responsibilities for sustainable development, reduce duplication, close gaps, prevent or reduce conflicts, and take advantage of compatibilities and synergies among sectors and interest groups;

Relevant Laws, Rules and Regulations	Relevant Sections	Commitments
		f) To improve decision-making and policy formulation through better information and analytical techniques, and by enabling those most affected by decisions to participate in the decision-making process; g) To develop understanding and build consensus so that decisions have strong support; h) To identify, promote and support actions leading to sustainable development and to reduce, abate and put a stop to actions impeding sustainable development; i) To identify and apply practices which sustain the resource base of the economy, achieve sustainable levels of resource use, restore degraded natural resources, make use of unused or under-used resource potential, improve the efficiency of existing resource use, and diversify the use or seek substitution of existing resources; j) To determine priorities for action, evaluating costs and benefits and the trade-offs between the different concerns affecting all levels of society; k) To provide a basis for the allocation and optimal use of limited resources; l) To develop and strengthen institutions for sustainable development; and m) To build up the capacity of institutions and the population of the country to handle complex and inter-related issues through frameworks which integrate environmental concerns with planning. Subsequently in 2007, the NCEA developed the National Sustainable Development Strategy (NSDS) for Myanmar. It incorporated the aspirations of the Agenda 21 as well as Myanmar's Millennium Development Goals. The NSDS was approved in 2009 and served as the main guiding principal on environmental protection in the country. Specific strategies are outlined under each goal. For example, the goal for Sustainable Management of Natural Resources suggests strategies for forest resource management, sustainable energy production and consumption, biodiversity conservation, sustainable freshwater resources management, sustainable management of land resources, sustainable management for mineral resources utilization, etc. The aim of NSDS is to achieve sustainable development through three sectors, focused on natural resource management, economic development, and social development. Relevant government ministries are expected to institutionalize NSDS principles into their sectoral development through short-term, medium-term and long-term actions. Although much of the NSDS guidelines are for adoption and integration into the government legislation and regulation body, some are targeted at the private sector, such as the polluter pay principle, and reduction of energy consumption and greenhouse gas emission from industries.

Relevant Laws, Rules and Regulations	Relevant Sections	Commitments
Myanmar Climate Change Policy, 2019	-	The purpose of the policy is to provide guidance on promoting climate change adaptation and mitigation actions, integrating these actions in national and sectoral priorities and taking decisions on enhancing business opportunities for sustainable, low carbon and climate resilient development in Myanmar. To achieve the purpose, Myanmar will be guided, inter alia, by the following guiding principles. The Project Proponent commits for; • Sustainable development - Develop sustainably to meet the needs of the present without compromising the ability of future generations to meet their own needs, by ensuring the promotion of an economically, socially and environmentally sustainable future and a fair and equitable society; • Precaution - Take cost-effective measures to avoid, minimise and protect from environmentally harmful consequences where there are threats of serious or irreversible damage even if there is a lack of full scientific certainty; • Prevention - Take anticipatory action to prevent or minimise environmental damage before it occurs by avoiding, prohibiting or controlling threatening activities; • Environmental integrity - Promote, protect and conserve the natural environment and recognise its complete and intrinsic value, whether tangible or non-tangible, economic or non-economic, to the natural, cultural and spiritual heritage of Myanmar; • Shared responsibility and cooperation - Encourage, support and embrace the common and shared responsibility of all people for the protection, conservation, and equitable sharing of benefits and resources of the environment, and encourage wide cooperation across sectors and stakeholders at all levels, including the private sector. • Inclusiveness - Engage all people at all levels in decision-making and action, by supporting and embracing their diverse social, economic and cultural perspectives, participation and contributions without discrimination, particularly with respect to gender, ethnicity and age, in order to equitably share the benefits and opportunities of climate change adaptation, mitigation and low-carbon, climate-resilient development; • Good governance - Adopt transparent, participatory, and responsive processes to ensure that decision-making at all levels is inclusive, equitable, and accountable to all people in Myanmar, in accordance with the rule of law; • Climate justice and equity - Promote and protect the rights of the people of Myanmar, in particular the poorest, most vulnerable and marginalised segments of society, including indigenous peoples, all ethnic groups, local communities, women, children, the elderly, and persons with disabilities to live in a healthy environment and a fair, equitable and sustainable society; • Gender equality and women's empowerment - Promote and protect gender equality and women's equal rights through strengthening gender-responsive climate change policy concerning adaptation, mitigation, finance, technology development and transfer and capacity building, and ensuring full and equal participation of women in decision-making. The Government of the Republic of the Union of Myanmar will take sector-relevant measures to implement this Policy and achieve its purpose by taking the comprehensive actions primarily in the six sectoral clusters. Among them, the following are related to the Project.

Relevant Laws, Rules and Regulations	Relevant Sections	Commitments
		Healthy ecosystems; • Ensure that actions undertaken under Myanmar's national polices on environment, land use and forestry, including Myanmar's National Environmental Policy integrate climate change adaptation and mitigation considerations and are complementary to and/or support actions under this Policy; • Promote sustainable natural resource management, preserve, conserve, and rehabilitate biodiversity and natural ecosystems in order to ensure the provision of ecosystem services, recognising their contribution to climate change adaptation and mitigation, the benefits they generate to the people and Myanmar's high dependence on the quality and availability of ecosystem services; • Adopt environmentally sound technologies and good management practices, including ecosystem-based adaptation interventions, to improve and maintain the health and resilience of all ecosystems, including forest, water, land, coastal ecosystems and air quality in the face of future climate change impacts; • Enhance greenhouse gas sinks and reservoirs, and promote the reduction of greenhouse gas emissions from deforestation and forest degradation through sustainable management of forests and land use planning, based on the best available science; **Low-carbon and resilient growth;** • Ensure that actions undertaken under Myanmar's Green Economy Framework and energy policies integrate climate change adaptation and mitigation considerations, are complementary to and/or support actions under this Policy, and encourage public-private partnerships to support a green economy; • Ensure that the energy, transport and industry sectors, including infrastructure, are well-integrated among each other, reliable, sustainable and resilient to current and future climate change impacts, recognising that they are vital to Myanmar's economic growth; • Decouple Myanmar's continued growth from increasing greenhouse gas emissions and contribute to the global climate change mitigation effort through sustainable, low-carbon energy, transport, industrial, and waste management systems, while ensuring that Myanmar's social and economic development needs are met; iv. Promote and prioritise sustainable and renewable energy sources and energy efficiency, in order to meet Myanmar's growing energy needs and ensure energy security in a low-carbon manner; • Ensure equitable access to affordable, reliable, sustainable, and modern energy for all as a pathway to inclusive and sustainable development and eradicating poverty; • Promote sustainable natural resource extraction through transparent and responsible investments which are consistent with climate change adaptation and mitigation priorities, while generating local employment and economic benefits and protecting the environment and public health; • Ensure that urban and inter-city transportation networks and infrastructure are sustainable, low carbon and climate-resilient for all modes of transport, in particular for mass transit;

Relevant Laws, Rules and Regulations	Relevant Sections	Commitments
		• Increase the productivity and resource-efficiency of the industrial sector, an important sector for Myanmar's economy, through low-carbon growth and by developing competitive and innovative green industries, recognising the relative importance of this sector for Myanmar's economy, including its potential for job creation **Resilient urban and rural settlements:** • Ensure that actions undertaken under Myanmar's national, sub-national, and local policies and plans on urban and rural settlements, including national building regulations, township and local development plans and land-use plans, integrate climate change adaptation and mitigation considerations and are complementary to and/or support actions under this Policy; • Ensure that human settlements are planned and developed in a climate-resilient manner and incentivise low-carbon approaches, while promoting long-term inclusivity, liveability, economic development and a high quality of life in rural and urban areas, recognising the interdependencies between urban and rural areas and the potential impact of climate change on rural urban migration, food security, water supply and livelihoods; • Ensure the active involvement of city, township and village stakeholders in identifying climate change challenges at local level, and devise plans, strategies and practical actions to adapt to climate change, mitigate its effects, and develop in a sustainable low carbon manner; • Ensure that territorial spatial planning at regional, district, city, township and village level fully addresses current and future climate-related risks and opportunities, and regularly assess and mitigate these risks in a timely and equitable manner through inclusive and participatory assessment and planning processes which take into account and strengthen local knowledge and capacities, including in land-use planning, rural and urban planning and city or township specific disaster risk management plans and actions. The Project Proponent commits to comply and implement the project as per this policy requirement and to ensure the project set this policy up as a guiding principle for the project's environment policy.
Myanmar's National Biodiversity Strategy and Action Plan 2015-2020	-	The Project Proponent commits to be aware of the legislation. This is relevant to national government.
Myanmar Climate Change Strategy and Action Plan (MCCSAP)	-	The Project Proponent commits tobe aware of the legislation. This is relevant to national government.
Waste Management Strategy and Action Plan for Myanmar (2017-2030)	-	The Project Proponent commit to follow the below guiding principles: • Zero Waste: Emphasise waste prevention as opposed to end of-pipe waste management. • Waste Hierarchy: Prioritises actions for waste management. This consists of the 3Rs including Reduce - reducing waste that is generated and which is directed to the landfill (including composting); Reuse - repairing products that can be repaired, or finding alternative uses for waste; and Recycle - returning waste with recoverable value for re-processing.

Relevant Laws, Rules and Regulations	Relevant Sections	Commitments
		• Resource Conservation: Promoting the most efficient use of resources, including resource recovery and waste avoidance. • Polluter-pays Principle: Those responsible for causing pollution or generating solid waste should pay the cost for dealing with the pollution, or managing the solid waste (collection and disposal) in order to maintain ecological health and diversity • Precautionary Principle: A lack of scientific data/information certainty should not be used as a reason for not acting to prevent serious or irreversible environmental damage or degradation. • Proximity Principle: Waste should be dealt with as close to the source of generation as possible. This reduces transportation costs, as well as risks of contamination of the environment during transport. • Consultation principle: The importance of all levels of Government consulting and working with people and organisations throughout the development and implementation of waste management strategies and action plans. Shared Responsibility: Zero Waste is a shared responsibility and requires partnerships and collaborations between all sectors of government, industry, research institutions, NGO's, and the general community
Disaster Management Laws and Rules, 2013	Section 13 - 18	The Project Proponent commits: • To undertake functions after laying down the plan in accord with the natural disaster management plans in order to reduce damage and losses that are likely to be caused by disaster • To provide preparatory measures for natural disaster risk reduction before natural disaster • To provide preparatory measures to be organised before natural disaster in the area where is likely to strike natural disaster • To provide preventive measures to be carried out in the area where is likely to strike natural disaster before it happens • To carry out emergency response actions including search and rescue • To carry out rehabilitation and reconstruction activities after disaster
National Energy Policy, 2014	Chapter 3, Section 4	The national energy policy aims to systematically explore the available energy resources of the county in order to supply the demand of the country and to export as value added products for surplus resources, thus ultimately targeting to sustainably improve the living standard of the country people. It mentions national energy policy, energy sector development plan, energy and electric power sector restructuring program, energy sector framework and strategy and work program. The Project Proponent shall commit to implement the project to support this policy.

Relevant Laws, Rules and Regulations	Relevant Sections	Commitments
The Constitution of the Republic of the Union of Myanmar, 2008	Section 37 (a)(b) , 45, 390	The Constitution of the Union of Myanmar is the supreme law of the country and has provisions regarding the protection of the environment in Myanmar. The Project Proponent commits to comply as these following three Articles in the Constitution provide a basis for legalising and institutionalising environmental health impact assessment and social impact assessment. The Project Proponent commits that: • The Union is the ultimate owner of all lands and all natural resources above and below the ground, above and beneath the water and in the atmosphere in the Union; The Union shall enact necessary law to supervise extraction and utilization of State owned natural resources by economics forces; • The Union shall protect and conserve natural environment; • Every citizen has the duty to assist the Union in carrying out the following matters: o Preservation and safeguarding of cultural heritage; o Environmental conservation; o Striving for development of human resources; and o Protection and preservation of public property.
ENVIRONMENTAL LAWS		
Environmental Conservation Law, 2012	Section 7(o), 14,15, 29	The Project Proponent commits to comply with the following: • That MONREC has the right to manage a proponent to (1) provide compensation for environmental impact and contribute funds, (2) the need for prior permission from MONREC for businesses that have been categorized for potentially causing impact on the environment and (3) the right to issuing permit with terms and conditions relating to environmental conservation. • To treat, emit, discharge and deposit substances which cause pollution in the environment in accordance with stipulated environmental quality standards. That the owner or occupier of any business, material or place which causes a point source of pollution have to install or use an on-site facility or controlling equipment in order to monitor, control, manage, reduce or eliminate environmental pollution. If it is impracticable, it has to be arranged to dispose the wastes in accordance with environmentally sound methods. • To not violate any prohibition contained in the rules, notifications, orders, directives and procedures under the Environmental Conservation Law.
Environmental Conservation Rules, 2014	Section 69(a) (b)	The Project Proponent commits: • Not to emit, cause to emit, dispose, by any means, the pollutants and the hazardous waste or material (stipulated as such under the Law) at any place which may affect the public directly or indirectly. • Not to damage the ecosystem and the natural environment which is changing due to such system, except for carrying out with the permission of MONREC in the interest of the people.

Relevant Laws, Rules and Regulations	Relevant Sections	Commitments
Environmental Impact Assessment Procedure, 2015	Section 87, 102(a)(b),103, 104, 105, 106, 107, 108, 110, 113, 115, 117	The EIA Procedure sets out the procedures for completing an IEE, EIA and/or EMP in Myanmar. This includes information on project categorisation, responsibilities of project developers and ministries, EIA review, monitoring and auditing, amongst other issues. The Project Proponent commits to bear full legal and financial responsibility: • For their actions and omissions and those of its contractors, subcontractors, officers, employees, agents, representatives, and consultants employed, hired, or authorised by the Project acting for or on behalf of the Project, in carrying out work on the Project; and • To support programs for livelihood restoration and resettlement in consultation with the PAPs, related government agencies, and organizations and other concerned persons for all Adverse Impacts until PAPs have achieved socio-economic stability at a level not lower than that in effect prior to the commencement of the Project. **For EMP**, the Project Proponent commits to: • Implement the EMP, all Project commitments, and conditions, ensure that all contractors and subcontractors of the Project comply fully with all applicable Laws, the Rules, this Procedure, the EMP, Project commitments and conditions when providing services to the Project. • Be responsible for, and fully and effectively implement the requirements and conditions set forth in ECC, applicable Laws, Rules, EIA Procedure and standards. • Maintain the Project commitments and conditions when providing services to the Project and inform the Ministry with detailed information as to the propose project's potential adverse impacts. **For monitoring and reporting**, Project Proponent commits to: • Notify and identify in writing to the Ministry, providing detailed information as to the proposed Project's potential Adverse Impacts. • Engage in continuous, proactive, and comprehensive self-monitoring of the Project and activities related thereto, all Adverse Impacts, and compliance with applicable laws, Rules, EIA Procedure, standards, the ECC, and the EMP during all phases of the Project (pre-construction, construction, operation, decommissioning, closure and post-closure). • Notify and identify in writing to the Ministry for any breaches of his obligations or other performance failures or violations of the ECC and EMP as soon as reasonably possible and in any event, in respect of any breach which would have a serious impact or where the urgent attention of the Ministry is or may be required, to undertake within not later than twenty-four (24) hours, and in all other cases within seven (7) days of the Project Proponent becoming aware of such incident. • Submit monitoring reports to the Ministry not less frequently than every six (6) months, as provided in a schedule in the EMP, or periodically as prescribed by the Ministry.

Relevant Laws, Rules and Regulations	Relevant Sections	Commitments
		• Make sure the monitoring report publicly available on the Project's website, at public meeting places (e.g. libraries, community halls) and at the Project offices within ten (10) days of completing a monitoring report as contemplated in Article 97 and Article 98 in accordance with the EMP schedule • Submit a digital copy of a monitoring report within ten (10) days upon receiving the request from an organization or a person, via email or as may otherwise be agreed upon with the requestor for the request of any organisation or person. **For the purposes of monitoring and inspection, the event of emergency**, the Project Proponent commits to: • Grant the ministry and/or its representatives, at any time during normal working hours, access to the Project's offices and to the Project site and any other location at which the Project activities or activities related to the Project are performed; • Grant, from time to time as and when the Ministry may reasonably require, the Ministry access to the Project's offices and to the Project site and any other location at which the Project activities or activities related to the Project are performed. • Grant full and immediate access to the Ministry at any time as may be required by the Ministry in the event of an emergency, or where, in the opinion of the Ministry, there is or may exist a violation or risk of violation of the compliance by the Project with all applicable environmental and social requirements. Ensure that the Ministry's rights of access can extend to access by the Ministry to the Project's contractors and subcontractors. **For the Conditions and Revisions to Conditions prescribed in Environmental Compliance Certificate**, the Project Proponent commits to commence the implementation of the Project in accordance with the conditions attached to the ECC and including the EMP, within such time as may be prescribed by the Ministry upon receipt of the written approval from the relevant authority.
Environmental Quality (Emissions) Guidelines (EQEG), 2015	-	The Project Proponent commits to comply with the EQEG guidelines and its setting out for emission standards for air, noise, and effluent discharges for sector specific operations. The Project Proponent considers this emissions standards in its environment impact assessment and environmental management plan.
Development Committee Law, 1993	-	This law provides provisions relating to environmental sanitation, pollution of air and water, and public health. The Project Proponent commits to consider any respective township development committee laws. Within this remit, state and region governments have the authority to pass their own Development Affairs Laws as the guiding basis. Starting in late 2012, all 14 state and region governments developed their own Development Affairs Laws, which can effectively be considered their 'municipal laws'. Considering this common origin, the 14 state and region laws are quite similar in terms of basic structure and provisions. The only notable differences concern TDAC (Township Development Affairs Committee) structures and processes and fines and penalties.

Relevant Laws, Rules and Regulations	Relevant Sections	Commitments
Protection of Biodiversity and Protected Areas Law, 2018	Section 39 (d) (e),	The Project Proponent commits to comply the stipulation that there may be charge with fine or imprisonment or both if guilty of: • Polluting soil, water and air intentionally. • Damaging the watercourse or poisoning water. • Electrification, using chemical or explosive materials with a Protected Area. • Disposing or handling chemical waste and poisoning materials in the conservation area.
The Forest Law, 2018	Section 12 (a) (c)	The Forest Law is enacted by Pyihtaungsu Hluttaw in September, 2018. It empowers, to declare for the reserved forest for the maintaining a sustained yield of the forest produce, to manage the forest land. The Project Proponent commits (section 12): a) to apply approval from the Ministry if desirous to implement the development work or economic project within a forest land and forest covered land. c) to comply the Environmental Conservation Law and the stipulations from respective Laws for whoever desirous to undertake as in sub-section (a).
AQUATIC RESOURCES		
The Law related to Aquaculture, 1989		The law aims at propagation of fish species, and the breeding of fish through different stages of growth in natural or artificial waters. The Project Proponent commits that no person from the project shall obstruct navigation and flowing of water or pollute the water within the fisheries' waters or abet such acts.
Myanmar Port Authority Law, 2015	Section 19(a)(b), 23(b), (74), (78(b), 80(a,c), 83	The Project Proponent commits; • Not to build or operate any kind of wharf, shipyard, dry dock and slip way without an operation license within a port limit. (section 74) • Not to operate any business of supplying fuels and other requirements to vessels by a private vessel businessman without an operation licence permitted under this law; • Not to carry out the business of towing, tugging, dredging or salvaging of a vessel by a private businessman without an operation licence permitted under this law; **Concerning water pollution or destruction to the environmental resources, the Project Proponent commits** • Not to cause oil spill or discharge of sludge from the petroleum tanker, oil tanker and chemical tanker navigated within a port limit, or from oil test wells, oil wells and oil pipelines or from collision or grounding of vessels; • Not to discharge, dispose or cause to fall dangerous materials, toxic materials, garbage, sludge and waste from the vessels, above and underwater natural resource exploration rigs and structures within a port limit; • Not to discharge, dispose or cause to fall other materials which cause obstacle to the navigation, from the vessels, into a port; • Not to fail to comply with any order or directive issued by the Myanmar Port Authority, by the person assigned duty by the Myanmar Port Authority or by the port conservator.

Relevant Laws, Rules and Regulations	Relevant Sections	Commitments
Freshwater Fisheries Law, 1991	Section 40	The Project Proponent commits to comply the law by not causing harassment of fish and other aquatic organisms or pollution of the water in a freshwater fisheries waters.
Protection of Wildlife and Protected Areas Rule, 1995	-	Provisions for the protection of biodiversity through the protection of natural habitats and wildlife. The new rule is in the draft. If the new rules is enacted, this will be repealed. This rules list a number of protected species in Myanmar.
SECTOR SPECIFIC AND INDUSTRY		
Myanmar Investment Law, 2016	Section (50)(d), (51), (65), 73	The stipulation to register the land lease contract at the office of Registry of Deeds in accordance with the Registration Act. To mention appointment, replacement, providing employment of staff and workers, ensuring to comply the entitlements and rights in the labour laws and rules, settling dispute regarding human rights issues. The Project Proponent commits to comply with the following stipulation: • To respect and comply with the customs, traditions, and traditional culture of the ethnic groups; • To inform the Commission if natural mineral resources or antique objects are found that are not related to the investment permitted; • Not to make any significant alteration of topography or elevation of the land on which is entitled to lease or to use, without the approval of the Commission; • To abide by applicable laws, rules, procedures and best standards practiced internationally for this investment so as not to cause damage, pollution, and loss to the natural and social environment and not to cause damage to cultural heritage; • To list and keep proper records of books of account and financial statement and necessary financial matters relating to the investments performed by permit or endorsement in accordance with internationally and locally recognised accounting standards; • To close and discontinue the investment only after the payment of compensation to employees in accordance with applicable laws for any breach of employment contracts, closure of investment, sale and transfer of investment, discontinuation of investment, or reduction of workforce; • To pay wages and salaries to employees in accordance with applicable laws, rules, procedures, directive and so forth during the period of suspension of investment for a credible reason; • To pay compensation and indemnification in accordance with applicable laws to the relevant employee or his successor for injury, disability, disease or death due to the work; • To supervise foreign experts, supervisors and their families, who employ in their investment, to abide by the applicable laws, rules, orders and directives, and the culture and traditions of Myanmar; • To respect and comply with the labour laws; • To have the right to sue and to be sued in accordance with the laws; • To pay effective compensation for loss incurred to the victim, if there are damage to the natural environment and socioeconomic losses caused by logging or extraction of natural resources which are not related to the scope

Relevant Laws, Rules and Regulations	Relevant Sections	Commitments
		of the permissible investment, except from carrying out the activities required to conduct investment in a permit or an endorsement; • To allow the Commission to inspect in any places, when the Commission informs the prior notice to inspect the investment; • To take in advance permit or endorsement of the Commission for the investments which need to obtain prior approval under the Environmental Conservation Law and the procedures of environmental impact assessment, before undertaking the assessment, and shall submit the situation of environmental and social impact assessment to the Commission along the period of activities of the investments which obtained permit or endorsement of the Commission. The stipulation: The investor shall insure the types of insurance stipulated in the provision of the rules at any insurance enterprise which is entitled to carry out insurance business within the Union.
Myanmar Investment Rules, 2017	Section 202, 203, 206, 212,	The Project Proponent commits; • To comply with all terms and conditions in the permit and other applicable laws when the investment is carried out. • To fully assist while negotiating with the Authority for settling the grievances of the local community that have been effected due to Investments. • To appoint expert foreigner as senior manager, technical and operational expert or advisor according to subsection (a) of the section 51 of the Law. • To obtain the permit or tax exemption or relief to insure the relevant insurance out of the following types of the insurance at any insurance business entitled to carry out insurance business within the Union based on the nature of the business: Property and Business Interruption Insurance; Engineering Insurance; Professional Liability Insurance; Bodily Injury Insurance; Marine Insurance; or Workmen Compensation Insurance; Life Insurance; Fire Insurance.
Notifications for Investment, 2013	-	Although the law does not specifically define legislation for EIAs, Notification 1/2013 provides a categorization of the business activities in which foreigners will be allowed to engage. Under this, "oil & gas" projects fall under "Category 4: activities allowed only following an Environmental Impact Assessment".
The Import and Export Law, 2012	Section 7	The Project Proponent, as a license holder, commits to comply not to violate the conditions contained in the license.
Myanmar Insurance Law, 1993 (amended in 2015)	Section 15, 16, 18, 19	The Project Proponent commits to comply with the followings; • Owners of motor vehicles shall effect compulsory Third Party Liability Insurance with the Myanma Insurance. • An entrepreneur or an organization operating an enterprise which may cause loss to State-owned property or which may cause damage to the life and property of the public or which may pollution to the environment shall effect compulsory General Liability Insurance with the Myanma Insurance.

Relevant Laws, Rules and Regulations	Relevant Sections	Commitments
		• State Organizations and enterprises which have fifty percent and above of the capital investment subscribed by the State, shall effect insurance only with the Myanma Insurance, if the class of Insurance they desire to effect is of the class which is accepted by the Myanma Insurance • Economic Organizations which have been formed under a permit under the Union of Myanma Foreign investment Law shall effect only with the Myanma Insurance the classes of insurance which the Myanma Insurance determines from time to time. However from amongst the classes of insurance which the said Economic Organizations are to effect the Ministry of Finance and Revenue may exempt from effecting insurance of any class or more than one class, in the interest of the State.
Myanmar Companies Law, 2017	Section 43(a), 49	The Project Proponent commits: • To register as per requirements for an overseas corporation. • To comply as per requirements for the registration of overseas corporation
Myanmar Engineering Council Rules (2013)	Section 20, 24, 25, 37, 31 (a)	The Project Proponent commits to comply with the following.: • Engineering Discipline Accreditation Working Committee- The executive committee shall form the Working Committee with a member of the executive committee as chairman and the Council Members not more than 15 as members and shall assign the duties to the Committee • Working Committee for Sustainable Engineering Teaching Program-The executive committee shall form this Working Committee with an executive member as a chairman and the Council Members not more thanl5 as members and shall assign the duties to the Committee • Working Committee for Accreditation and Assessment of Engineering Companies and Organizations- The executive committee shall form the Working Committee with an executive member as a chairman and the Council Members not more than 15 as members and shall assign the duties to the Committee. • Working Committee Meeting - The coordination meetings of the Working Committee shall be convened as and when necessary.
Petroleum and Petroleum Product Law, 2017	Section 7(a) (c), 8(a)(c)(e)(f) (j)(k), 9(a)(d), 10(a)(b)(d), 13, 32, 33	The Ministry of Commerce shall carry out, among others, the following functions relating to any Petroleum and Petroleum product: • Issuing licences relating to import or export; • Determining procedures, and conditions relating to import or export; The Ministry shall carry out, among others, the following functions relating to any Petroleum and Petroleum product: • Issuing licences relating to refining, transit, transport by pipeline, sale and distribution, inspection, and testing; Issuing joint licence or compound licence for carrying out more than a type of business activities; • Determining procedures and conditions, relating to refining, transit, transport by pipeline, sale and distribution, inspection and testing; • Determining standard and quality of receptacles for transport, and procedures and conditions for the pipelines;

Relevant Laws, Rules and Regulations	Relevant Sections	Commitments
		• Determining and prohibiting portion and volume of toxic chemicals and metal chemicals that may damage the machineries, to be contain in any petroleum and petroleum product, which do not contain in the prohibition and restrictions under the existing laws; • Determining procedures and conditions to have correctness in standard, quality and measurement; • Determining procedures and conditions necessary to appropriately supervise petroleum and petroleum product business activities; The Ministry of Transport and Communications shall carry out, among others, the following functions relating to any petroleum and petroleum product; • Issuing licence to vehicles, vessels and barges that carry any petroleum and petroleum product; • Taking action, as necessary, in accordance with the existing laws if it occurs spill or accident in carrying out import, export, transport, and sale and distribution of petroleum and petroleum product by water; The Project Proponent commits to comply by displaying a danger warning sign in the shape of easily visible words or signs on a pipeline which is used for the transportation of petroleum or petroleum products, receiving the inspection of the petroleum or petroleum products business or container or transportation vehicle, machine, watercraft and pipeline by an authorized officer or organization. The Project Proponent commits also to comply to immediately notify and give the necessary information of the accident if there is an explosion or fire caused by any types of petroleum and petroleum products business or there is potential cause for a fire near the storage place of petroleum and petroleum products.
The Oilfields Act (1918) (amended in 1919, 2010)		This act provides clarification on activities within the oil and gas industry, and provides the Government with the power to define and alter limits of any notified oilfield. In addition, the Government may make rules for regulating all matters connected with many operations related to the extraction of oil and/or gas. The Project Proponent commits to comply guidance and issues such as preventing oil and gas wastes, reporting of fires, accidents and other occurrences and regulating the collection and disposal of both oil and gas.
Oilfields (Labour & Welfare) Act (1951) (amended in 1953) and Ministry of Electricity and Energy (MOEE) order No. 356/2019	-	For the labours' working hours: • Higher physical danger risk establishment (e.g. an oil rig): 8 hours/day or 40 hours/week, • Medium physical danger risk establishment (e.g. factory, oilfield, open mine): 8 hours/day or 44 hours/week. • If factory work is part of a continuous process (i.e. technical reasons): admissible 48 hours/week, 10 hours a day Max. 6 days/week (i.e. Sunday = weekly holiday). • For Overtime: 2x normal pay rate. Work on weekly holiday = alternative day off within a period of 2 months. In Practice, the Project Proponent commits to comply with the MOEE direction of (Order No. 356/2019) as follows Due to the nature of business and in order to be in line with the international best practices, Ministry of Electricity and Energy, applying its authority as per 1951 Oilfield Act, Clause 42 Subclause 1 and with agreement of Union Government, issue an order below on Working Hours, Holidays and Rest Days and Overtime entitlement of employees who work in Yadana, Yetagun, Shwe and Zawtika fields:

Relevant Laws, Rules and Regulations	Relevant Sections	Commitments
		• Normal working hours of the employees shall be 12 hours a day • Employees shall work on rotational basis with 28 consecutive days on shift and 28 consecutive days off shift. Employees shall be entitled to full basic salary during off shift. • Rest period (off shift) specified in above no. 2 shall include weekends and public holidays. • If employees have to work more than the working hours specified in no. 1, employees shall be entitled to overtime pay as per the employment agreement and calculated as per the applicable laws.
Prevention from Danger of Hazardous Chemical and Associated Materials Rule (notification No 85/2015-2016)	Section 61 (a)	For organizations and licence holders who store the chemical and related substances to abide by the following facts for safety, the Project Proponent commits to comply with the following; • Installing the fire protection system in building to be stored in accordance with prescribed provisions of the Department of Fire Brigade and being the building which is constructed to correspond for storing the chemical and related substances; • Sticking the warning sign according to hazard class, and keeping the safety equipment at the stored places; • Storing only after checking certainly to the chemical and related substances which are kept completely with the pictogram, and packing system by the importers and possessors; Regarding the safety, the Project Proponent commits to: • Use only the registered restricted or conditional chemical and related substances; • Not use the unregistered, without labelled, unknown, damaged or expired chemical and related substances.
Prevention from Danger of Hazardous Chemical and Associated Materials Law, 2013	Section 8, 13, 15, 16, 17, 20, 22, 23, 27	For Any person, who wants to do the business of chemical and associated materials, to apply to the central body for the acquisition of the license, attached with the management plan for the environmental conservation in accord with the stipulations". For License holder to apply to the central supervising body in accord with the stipulation for the relevant chemicals and associated materials using for his chemicals and associated materials business" for a certificate. For the registered certificate holder to abide by the regulations contained in the registered certificate and shall follow the order and directives issued from time to time by the central supervising body". The Project Proponent commits to comply with the requirements: • Before works, license holder to be inspected by the relevant supervising and inspection team for safety and machinery/equipment check and • The persons who are discharging the duty to be asked to attend foreign training or preventative trainings conducted by government departments and organizations. The Project Proponent commits to; • Follow the license regulations, • Follow directives on safe handling and shall ask workers to strictly follow • Shall provide necessary safety equipment and issue free personal protective equipment to workers,

Relevant Laws, Rules and Regulations	Relevant Sections	Commitments
		• Provide training in occupational safety • Determine the hazard to the environment, people and animals • Provide fit for work medical check-up and keep records • Send permission letter to Department of Township Administration if the chemicals and associated material are permitted to store • Acquire in advance guidance and agreement from fire service department if using inflammable materials or explosives • Transport only the permitted amount of chemicals in accordance with prescriptive stipulations • Obtain approval of central supervising body if transporting chemical and associated material from the permitted region to any other region • Abide and operate in accordance with related environmental laws to avoid impacts and damage to the environment. For the license holder to have insurance in accordance with stipulations in case of compensation is required for losses related to people, animals and environment. For the registered certificate holder shall apply again for using chemical which are not in the registered list. The Project Proponent commits to: • Classify the hazard level of chemicals and related substances in advance • Show Material Safety Data Sheet and warning signage • Provide safety equipment, personal protective equipment and training on their use • Possess, transport, store, use and discharge chemicals and related materials in accordance with stipulations, • Not import or export chemicals and related materials banned by the central supervising board.
The Water Power Act, 1927	Section 3	The Project Proponent commits to comply with prohibitions on the pollution of public water; and provisions for the use of water in the pursuit of energy production and mining in a manner which does not harm land, watersheds or "localities". This law states that there is a license requirement for the use of public water for mining activity or energy; When rules made under this Act prescribe licenses for the use of any public water for obtaining energy or for mining operations, no person shall use, or attempt to use, any such water for any such purpose, or pollute or obstruct the flow of any such water, or discharge therein any mining refuse, except under and in accordance with the terms of such license or any grant, lease, or license from the President of the Union of, or in respect of, any land.

Relevant Laws, Rules and Regulations	Relevant Sections	Commitments
Factories Act, 1951 (amended in 2016)	Chapter 3, 4 and 5	This law lays down the provisions for the proper disposal of waste and effluents in factories; treatment of waste water; regulations for health and cleanliness in factories, and the prevention of hazards. The Project Proponent commits to comply with the following; • For Health (Chapter 3): to arrange clean and free from any odors, solid waste and any seepage, to provide temperate and good ventilations, to well manage the particulate matters and emissions, to set up a moisture level that may be comfortable, not to populate in the factory, to get enough light, to provide clean drinking water, to provide toilets, • For Safety (Chapter 4): to arrange protection for machinery, to care and assign duty to operate the running machines, to obey the direction for appointing youth in high risk machines, to arrange precautionary measure relating to emission that may harm, to prepare plan for fire, to maintain, re-build, re-assemble the factory and machine for the safety. • For worker accommodation (Chapter 5), to support first aid kids, to create a better environment for living, shops for worker, rest rooms, and nursery.
Control of Smoking and Consumption of Tobacco Product Law, 2006	Section 6 (a) (b) (j) (l), Section 9 (a) (b) (c)	The Project Proponent commits: • To comply with the following non-smoking areas; o Hospital buildings, offices, compounds and other buildings in the compound except staff houses and apartments in the hospital compound; o Medical treatment centres and clinics; o Elevators and escalators; o Air-conditioned public room • To comply with the following duties o To keep the caption and mark referring that it is a non-smoking area at the place mentioned in section 6 in accordance with the stipulations. o Arrange the specific place where smoking is allowed as mentioned in section 7, and keep the caption and mark also referring that it is a specific place where smoking is allowed, in accordance with the stipulations. o To accept the inspection when the supervisory body comes to the place for which he is responsible
The Law amending the Narcotic Drugs and Psychotropic Substances Law, 2018	-	The Project Proponent commits to be aware of this guidelines in terms of employment.
Myanmar Fire Force Law, 2015	Section 25	The Project Proponent commits: • To obtain the opinion of the Fire Services Department for the purpose of fire precaution and prevention, when laying down plans for construction for town, village and downtown or village development plans.

Relevant Laws, Rules and Regulations	Relevant Sections	Commitments
		• To comply the stipulations for the factory, workshop, highway bus, airport, jetty, hotel, motel, guest house, collective-owned building, market, work-site or business exposed to fire hazard of the owner or manager; • Not fail to form a reserve fire brigade • Not fail to provide materials and apparatuses for fire safety; in conformity with the directive of the Fire Services Department.
Motor Vehicle Law, 2015	Chapter 1, 2(v)	The Project Proponent commits to comply the stipulations: • For reducing environmental pollution caused by motor vehicles • For the right of the Department to issue directives, the standards, guidelines for the purposes of importing, manufacturing, assembling, maintaining to be safe in accident and environment conservation. To take actions to conserve the green environment and the reduction in pollution of air, water, land and noises caused by motor vehicles.
Yangon City Development Committee Law, 2014 (amended in 2018)	-	It has stated that the committee has the right to: • To corporate for the inspection with the concerning authority and • To stipulate orders for the carriage, storage of chemical and related substances for not harming to public health and life • To manage the waste regarding for the hazardous. There it has been prohibited for disposing chemical and its related substances in areas, which are not being allowed in the City Development area and mentioned offenses and penalties. The Project Proponent commits to comply the stipulations and undertake the necessary proceeding as per this law and notification issued by the committee.
CULTURAL HERITAGE		
Protection and Preservation of Cultural Heritage Regions Law, 2019	Section 46	Section 46. For the National interest, concerning the exploration for oil, natural gas, gemstones and minerals. The Project Proponent commits to comply with the following; • It is prohibited to undertake in the area being confirmed for world cultural heritage region and national cultural heritage region. • Apart from the region prescribed in sub-section (a), it can undertake in other cultural heritage region with the approval of government. • In undertaking in a region as per sub-section(b), it needs to resettle cultural heritage object (monuments) that can be impacted in accordance with the international good practice.
Protection and Preservation of Antique Objects Law, 2015	Section 12, 13	For person who finds any object which has no owner or custodian, needs to inform the relevant Ward or village-tract administrator if he knows or it seems reasonable to assume that the said object is an antique object. For a procedure to inform and the responsibility to inspect whether it is a real ancient monument or not and keep or cause to protect as may be necessary in accordance with the stipulation

Relevant Laws, Rules and Regulations	Relevant Sections	Commitments
Protection and Preservation of Ancient Monuments Law, 2015	Section 12, 13, 15, 20	Project Proponent commits to comply with the stipulations: • For a person who finds an ancient monument over one hundred years old under the water or above ground to promptly inform the relevant Ward or Village-Tract Administrative Office. • For procedure to inform and the responsibility to inspect whether it is a real ancient monument or not and keep or cause to protect as may be necessary in accordance with the stipulation. To apply prior permission from the Department before implementing extending towns, wards and villages; • Constructing or extending or repairing new buildings including hotels, factories and residential buildings or fencing or extending a fence; • Digging to search petroleum, natural gas, gem or mineral, piping petroleum and natural gas, constructing factories, connecting national grid, constructing communication tower, constructing or extending infrastructures such as road, bridge, airfield, irrigation and embankment; • Connecting underground electric cable, communication cable and other underground works; • Digging or extending wells, lakes, cannels and ponds; • Gold sieving, digging, burning bricks, digging well, lake, creek, ditch, gully, pit digging, refilling, levelling, mining, quarry, gravel digging and unearth sand, removing the mounds and hills which can damage the physical feature of the land; • Placing and fencing ancient monuments in a private compound and area; • Constructing a building which is not consistent with the terms and conditions stipulated according to the region by the Ministry near and at the surrounding of an ancient monument. For prohibitions not to damage to an ancient monuments within the specified area of an ancient monument without a written prior permission by carrying out: • Taking photo, video, film or copying and modelling an ancient monument stipulated as a listed ancient monument for commercial purposes; • Using machines which causes vibration within the specified place of an ancient monument and running various types of vehicles; • Cultivating, gardening, breeding, fencing by blocking nearby an ancient monument or doing any other act which can affect an ancient monument; • Emission of gas such as hot-air balloon which can affect an ancient monument; • Landing and taking off and, flying airplane and helicopter which can directly or indirectly affect an ancient monument; • Discarding chemical substance and rubbish which can affect an ancient monument and the environment.

Relevant Laws, Rules and Regulations	Relevant Sections	Commitments
PUBLIC HEALTH		
Public Health Law, 1972	Section 3, 5	The Project Proponent commits to cooperate with the authorized person or organization in line with the stipulations: • To abide by any instruction or stipulation for public health. • To accept any inspection, anytime, anywhere if it is needed.
Protection and Prevention of Communicable Disease Law, 1995	Section 3, 4(a), 9, 11	This law is for the Department of Health to carry out immunisations and health education activities related to communicable diseases. The Project Proponent commits to comply with the following; • The public shall abide by the measures undertaken by the Department of Health in case when a Principal Epidemic Disease or a Notifiable Disease occurs. • For all responsible persons, to prepare report for an outbreak of a communicable disease to the nearest Health Officer. • For Health Officer, to undertake investigations and medical examinations to prevent the control the spread of Principal Epidemic Disease.
LABOUR LAW		
Labour Organisation Law, 2011	Section 17, 18, 19, 20, 21, 22	This Law was enacted, to protect the rights of the workers, to have good relations among the workers or between the employer and the worker, and to enable to form and carry out the labour organizations systematically and independently. The Project Proponent commits to comply with the following; • That Labour Organisations are free to organise and negotiate workers' rights when not meeting labour laws. • That Labour Organisations may demand re-appointment of worker if cause of dismissal is related to labour organisation membership or activities or not conform to labour laws. • That Labour Organisations have the right to send representatives to conciliation tribunals. • That Labour Organisations have the right to participate and discuss workers' rights and interests with government and employers • That Labour Organisation have the right to participate in collective bargaining in accordance with labour laws. • That Labour Organisation may take collective actions in accordance with the relevant procedures, regulations and law.
Minimum Wages Law, 2013	Section 12 (a-e), 13 (a-g)	This Law was enacted to meet with the essential needs of the workers, and their families, who are working at the commercial, production and service, agricultural and livestock breeding businesses and with the purpose of increasing the capacity of the workers and for the development of competitiveness. The Project Proponent commits to comply with the following; • For the employer not to pay wage less than the minimum wage stipulated, do not have the right to deduct any other wage

Relevant Laws, Rules and Regulations	Relevant Sections	Commitments
		• For the employer to inform rates of minimum wage relating to the business, allow the entry and inspection of the inspection officer, give the sick worker holiday for medical treatment in accord with stipulation and give holiday for the matter of funeral of the family of worker without deducting from the minimum wage.
Employment and Skill Development Law, 2013	Section 5, 14, 15, 30	For the agreement, the Project Proponent commits to include training and probation period as prescribed in: • If the employer has appointed the employee to work for an employment, the employment agreement shall be made within 30 days. But it shall not be related with government department and organization for a permanent employment. • If pre training period and probation period are stipulated before the appointment the said trainee shall not be related with the stipulation of sub-section (1). For particulars, the Project Proponent commits to be included in the employment agreement: • The type of employment; • The probation period; • Wage, salary; • Location of the employment; • The term of the agreement; • Working hour; • Day off, holiday and leave; • Overtime; • Meal arrangement during the work hour; • Accommodation; • Medical treatment; • Ferry arrangement to worksite and travelling; • Regulations to be followed by the employees; • If the employee is sent to attend the training, the limited time agreed by the employee to continue to work after attending the training; • Resigning and termination of service; • Termination of agreement; • The obligations in accord with the stipulation of the agreement; • The cancellation of employment agreement mutually made between employer and employee; • Other matters; • Specifying the regulation of the agreement, amending and supplementing; • Miscellaneous.

Relevant Laws, Rules and Regulations	Relevant Sections	Commitments
		For the worksite regulations contained in the employment agreement to be in compliance with any existing law and the benefits of the employee not to be less than those of the any existing law. For the employment agreement, the Ministry can issue the notification for paying the stipulated compensation to the employee by the employer, if the work is completed earlier than the stipulated period or the whole work or any part of it have to be terminated due to unexpected condition or the work has to be terminated due to various conditions. For the employment agreement made under sub-section (a) to be related with daily wage workers, piece rate workers who are appointed temporarily in the government department and organization. For the worksite regulations and benefits contained in the employment agreement mutually made between the employer and employee or among the employees to be amended as necessary, in accord with the existing law. For the employer to send a copy of the employment agreement made between the employer and employee, to the relevant employment and labour exchange office within the stipulated period and to get the approval of it. For the employment agreement made before the enforcement of this law has to be confirmed up to the end of the term of the original agreement. To carry out the training program in accordance with the work requirement in line with the policy of the skill development team to develop the skill relating to the employment for the workers who are proposed to appoint and working at present. To carry out the training for each work or compounding the work individually or group-wise by opening on-job training, training systematically at worksite, sending outside training and training by using information technology system, for arranging the training program to enhance the employment skill of the workers; For appointing the youths of 16 years as apprentices, to arrange the training for technology relating to the employment systematically in accord with the regulations prescribed by the skill development team. For the employer of the industry and service business to put in to the fund monthly as put in fees without fail for the total wages of the subordinates and the supervisors' salary for not less than 0.5%; To put in money paid under the previous sub-section not to be deducted from the wage and salary of the employees.
Settlement of Labour Dispute Law, 2012	Section 38, 39, 40, 51	The Project Proponent commits to comply: • Not to fail to negotiate and coordinate in respect of a complaint within the prescribed period without sufficient cause • Not to alter the conditions of service of workers involved in disputes prior to investigation by tribunals • For no party to strike or lock-out without negotiation, conciliation and arbitration by Arbitration Body. For the employer if commits acts without sufficient cause, to be liable to pay full compensation to workers as determined by Arbitration Body or Tribunal.
Workmen Compensation Act, 1923 (amended in 1955, 1957, 2005)	Section 3	The Project Proponent commits to comply with the stipulations: • For the payment by certain classes of employers to their workmen of compensation for injury by accident.

Relevant Laws, Rules and Regulations	Relevant Sections	Commitments
		• For the liability for compensation of employer's, amount of compensation, compensation to be paid when due and penalty for default, method of calculating wages, review, commutation of half-monthly payments, payment of a lump sum amount, distribution of compensation, compensation not to be assigned, attached or charged, notice and claim, power to require from employers statements regarding fatal accidents, reports of fatal accidents and serious bodily injuries, medical examination, contracting, remedies of employer against stranger, compensation to be first charge on assets transferred by employer, special provisions relating to masters and seamen. • For any updating for revising the monetary amount as per the amendment law.
Payment of Wages Law, 2016	Section 3, 4, 5, 7 (ii), 8, 9, 10, 14	The Project Proponent commits that salaries are to be paid at the end of the month or, depending on the size of the employing enterprise, between 5-10 days before the end of the month. The employer is permitted and required to withhold income tax and social security payments. Other deductions, e.g. for absence, may only be withheld in accordance with the law. • The Project Proponent commits; to pay for salary either Myanmar Kyats or Foreign Cash permitted by National Bank of Myanmar. When delivery the salary • If the employer needs to pay the other opportunities or advantages, he can pay cash together with other materials according employee's attitude. • For finishing the contract, employer need to pay the salary (not more than one month) to employees. For the permanent worker, need to pay per monthly. If more than 100 employees, need to pay within the 5 days from the end of month. If fire the employees, need to pay salary within two days after fire. When employee dies due to the accident, need to pay money as an insurance to employee's family within two days. • For the employer to report to the Department with evidence of payment at later date agreed with the employee if the employer has difficulties to pay wages on time because of significant events (e.g. natural disaster). • For the employer to deduct expense which are allowance for accommodation and ferry service arranged by the employer, meal allowance, electricity charges, water service charges and income taxes liable to be paid by workers and cash paid in excess under mistake, which are not included in the expression of wages under this Law and not to deduct from the wages of the worker except the deduction as per Section 7. • For any deducting from the salary due to the employees' absence, the total cut salary not to be more than 50 % of his salary. • For overtime work, to allow the presiding overtime rate as set by the Law.

Relevant Laws, Rules and Regulations	Relevant Sections	Commitments
Leaves and Holidays Act, 1951	Section 4	The Project Proponent commits; • For employee to be granted to pay public holidays as announced by the Government in the Myanmar Gazette. On average, Myanmar has 26 public holidays per year, depending on the date of the variable holidays. • For additional rules to apply in accordance with other laws, such as the Social Security Law (2012) for employees contributing to the Social Security Fund. • To grant earned leave with average wages or average pay for a period of ten consecutive days by his employer during the subsequent period of twelve months to every employee who has completed a period of twelve months continuous service.
Social Security Law, 2012	Section 11 (a)(b), 15(a), 16 (a), 18(b), 48(a), 49(a)(b), 51(a)(b), 53(a), 54(a)(b), 75	For compulsory registration for social security system and benefits, the following establishments can be applied if they employ minimum number of workers and above determined by the Ministry of Labour in co-ordination with the Social Security Board: • Production industries doing business whether or not they utilize mechanical power or a certain kind of power, works of production, repairing or services, or engineering works, mills, warehouses, establishments; • Government departments, Government organizations and regional administrative organizations doing business; • Development organizations; • Financial organizations, • Companies, associations, organizations and their subordinate departments and branch offices doing business; • Shops, commercial establishments, public entertaining establishments; • Government departments and Government organizations doing business or transport businesses owned by regional administrative body, and transport businesses carried out with the permission of such department, body or in joint venture with such department or body; • Construction works carried out for a period of one year and above under employment agreement; • Works carried out with foreign investment or citizen investment or joint ventured businesses; • Works relating to mining and gemstone contained in any existing law; • Works relating to petroleum and natural gas contained in any existing law; • Ports and out-ports contained in any existing law; • Works and organizations carried out with freight handling workers; • Ministry of Labour and its subordinate departments and organizations; Establishments determined by the Ministry of Labour from time to time, in co-ordination with the Social Security Board and with the approval of the Union Government; that they shall be applied with the provisions of compulsory registration for Social Security System and benefits contained in this Law. For provisions of compulsory registration under sub-section (a) to continue to be applied by this Law even though any of the following situations occurs if it continues to carry out such work. The Project Proponent commits for;

Relevant Laws, Rules and Regulations	Relevant Sections	Commitments
		• Carrying out work by employing under stipulated minimum number of workers but more than one worker; • Changing the employer or changing the type of business. • The Social security fund, to include the funds for health and social care, family assistant, invalidity benefit, superannuation benefit and survivors' benefit, unemployment benefit, other social security fund for social security system of compulsory registration and contribution stipulated by the Ministry of labour, other social security fund and social security housing plan fund. • Arranging insurance for the workers to enable to enjoy social security benefits by contributing to the social security fund. • The employer to deduct contributions to be paid by worker from his wages together with contribution to be paid by him and pay to the social security fund and in such case he can incur the expense. • The employer to effect insurance by registering for employment injury benefit insurance system contained in section 45 at the relevant township social security office and pay contribution to employment injury benefit fund in accord with stipulations in order that workers applied to provisions of compulsory registration may obtain the employment injury benefits. • The inapplicability to the Workmen's compensation act. • The employer (a) to pay contribution monthly to Employment Injury Benefit Fund at the rates stipulated under section 50. Moreover he shall also bear the expenses for paying as such; (b) to pay defaulting fee stipulated under section 88, in addition to the contribution if fails to contribute after effecting insurance for employment injury benefit. • The employers and workers (a) to co-ordinate with the Social Security Board or insurance agency in respect of keeping plans for safety and health in order to prevent employment injury, contracting disease and decease owing to occupation and in addition to safety and educational work of the workers and accident at the establishment; • The employer (a) to report to the relevant township social security office immediately if a serious employment accident occurs to his insured worker. There shall not be any delay without sufficient cause to report as such. (b) A team of officers and other staff who inspect the establishments, if it is found out the employment injury, death, and contracting disease, shall report to the relevant township social security office in accord with the stipulations. • Feeping records of work and lists.
Occupational Safety and Health Law, 2019	Section 12(a) (b), 16, 17, 18, 19, 20, 21, 22, 23, 26, 27, 34, 36	The Project Proponent commits: • To appoint the occupational safety and health responsible person in order to closely inspect for the safe and health of workers as per types of business defined by Ministry of Labour, Immigration and Population. • To organize the Safety and Health Committee in accordance with the stipulations of the Ministry including the equal numbers of representative from employees and employers for the purposes to implementing the working

Relevant Laws, Rules and Regulations	Relevant Sections	Commitments
		environment, which is in safe and healthy for the business where the number of workers are not less than the number stipulated by the Ministry. In this case, the committee will be formed for the considerations. • To support the inspection officer responsible for occupational safety and health and comply the instructions. • To comply and care the right and responsibilities of the inspection officer as per section 17, 18, 19, 20, 21, 22 and 23) • To arrange properly, manage as per requirement for accessing potential hazard, provide the physicians, supports the personnel protective covering, material in free. • Not to dismiss or demote for the complains concerning the potential health and occupational hazards, undertaking the duty for the occupational health and safety committee, not working for the unsafe in health • To undertake to inform the heavy accident arising, to submit the report of approved physicians and inform to the department in case of infected the occupation disease or toxic due to the materials use or operations process. • To care the responsibilities of inspection officers and prohibitions for not removing, adding, altering without the approval of inspection officer for the occupational accident outbreak
NATIONAL RACE		
Law protecting Ethnic Right, 2015	Section 5	For the Equal right between the Ethnics living in Myanmar. It enacted that if an ethnic loose the right, he can complain to the Regional or State Government to get the equal chance and find the equal right. That project matters shall be informed, coordinated and undertaken in consultation with ethnic groups if projects are in areas with ethnic groups. The Project Proponent also commits to comply the Succeeding laws to protect the right of Myanmar nationals. **Monogamy Law (2015):** Concerning all those who are living in Myanmar, Myanmar Citizens who live outside of Myanmar, and foreigners who marry Myanmar citizens while living in Myanmar for preventing misconducting marriages. **Buddhist Women Special Marriage Law (2015):** Concerning the marriage between Buddhist Woman and other religious man. There prescribed the legal procedure, the conditions to be complied by non-Buddhist husband, the customs for dividing property when divorcing. **Religious Conversion Law (2015):** This is enacted for the freedom to convert from one religion to another, or a person without a religion has the freedom to convert to a religion. There prohibited to apply for a religious conversion with an intent to insult, disrespect, destroy, or abuse a religion. **Population Control Healthcare Law (2015):** this is for alleviate poverty, provide adequate quality healthcare, and ensure that family planning improves maternal and child health in the country. This Empowers region or state government that concerned with the special zone for healthcare to form region or state population control healthcare group to implementing the task as per the directives of the Ministry and region or state government and the Union Territory Governing body

4.2.2 *International Conventions*

A list of Project-relevant international treaties of which Myanmar is a signatory is provided in ***Table 4.5***. Project proponent will conduct the Project according to the following international conventions signed by Myanmar.

Table 4.5 International Conventions Ratified by Myanmar

No.	Conventions	Year (Ratified/ Acceded/ Accepted)	Relevance to the Project
Environment			
1	Plant Protection Agreement for the Southeast Asia and Pacific Region, Rome 1956	1959 (Ratified)	The Project may impact plant as part of the construction and operation / maintenance process.
2	Vienna Convention for the Protection of the Ozone Layer, Vienna 1985	1993 (Ratification)	Not relevant to the Project as the Project will not use any ozone depleting substances.
3	Montreal Protocol on Substances that Deplete the Ozone Layer, Montreal 1987	1993 (Ratification)	Not relevant to the Project as the Project will not use any ozone depleting substances.
4	London Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer, London 1990	1993 (Ratification)	Not relevant to the Project as the Project will not use any ozone depleting substances.
5	United Nations Framework Convention on Climate Change (UNFCCC), New York 1992	1994 (Ratification)	The Project will form part of Myanmar's total emissions output.
6	Convention on Biological Diversity, Rio de Janeiro 1992	1994 (Ratification)	The Project will be undertaken in onshore habitats.
7	The Convention Concerning the Protection of the World Cultural and Natural Heritage, Paris 1972	1994 (Acceptance)	The Project will be undertaken in onshore location whereby world cultural and natural heritage may be present.
8	International Tropical Timber Agreement (ITTA), Geneva 1994	1996 (Ratification)	The Project will be undertaken in onshore habitats.
9	United Nations Convention to Combat Desertification in Those Countries Experiencing Serious Drought, Paris 1994	1997 (Accession)	The Project will be undertaken in onshore habitats with alteration to landscape characteristics.
10	Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), Washington DC 1973; and as amended in Bonn, Germany 1979	1997 (Accession)	The Project may potentially impact fish and mammals that are protected (such as dugong, whale, whale shark, dolphin, giant clam and turtle).
11	Kyoto Protocol to the Convention on Climate Change, Kyoto 1997	2003 (Accession)	The Project will form part of Myanmar's total emissions output.
12	ASEAN Agreement on Transboundary Haze Pollution	2003 (Ratification)	The Project may generate hazardous wastes.

No.	Conventions	Year (Ratified/ Acceded/ Accepted)	Relevance to the Project
13	Stockholm Convention on Persistent Organic Pollutants (POPs), 2001	2004 (Accession)	The Project may generate organic pollutants.
14	Ramsar Convention on Wetlands of International Importance	2005 (Accession)	There are Ramsar site in Myanmar but none of them are near the Project.
15	Establishment of ASEAN Regional Centre for Biodiversity	2005 (Signatory)	The Project will be undertaken in onshore habitats and may impact the biodiversity.
16	Declaration on ASEAN Heritage Parks	2003 (Signatory)	There are Heritage Parks in Myanmar but none of them are near the Project.
17	The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal	2015 (Acceptance, and Entry into Force)	The Project may generate hazardous wastes.
Social, Labour and Health			
18	Universal Declaration of Human Rights (UNDHR)	Signed	The Project will involve people.
19	Convention on the Rights of the Child	1991 (acceded)	The Project will involve people.
20	Convention on Elimination of All Forms of Discrimination against Women (CEDAW)	1997 (acceded)	The Project will involve both men and women.
21	Relevant ILO Conventions in force in Myanmar • C1 Hours of Work (Industry) • C14 Weekly Rest (Industry) • C17 Workmen's Compensation (Accidents) • C19 Equality of Treatment (Accident Compensation) • C26 Minimum Wage Fixing Machinery • C29 Forced Labour Convention • C42 Workmen's Compensation (Occupational Diseases) Revised 1934 • C52 Holidays with Pay • C87 Freedom of Association and Protection of the Right to Organize		The Project will comply with the recommendations for workers.

4.3 STATEMENT OF COMMITMENTS

ATL as a subsidiary of PTTEPI will at all times comply fully with the commitments, mitigation measures, and plans that have been presented in this EMP Report.

ATL as a subsidiary of PTTEPI shall fully implement the EMP, all Project commitments, and conditions, and is liable to ensure that all contractors and subcontractors of the Project comply fully with all applicable Laws, including the Environmental Conservation Law (2012), Environmental Conservation Rules and Environmental Impact Assessment Procedure (2015), as well as the EMP, Project commitments and conditions.

ATL, PTTEP and ERM hereby confirm that:

(1) The EMP Report is accurate, consolidated and complete;

(2) The EMP has been conducted in accordance with relevant laws, including the EIA Procedure (2015).

(3) The Project will fully follow the commitments, mitigation measures and plans set out in this EMP Report.

Myanmar's National Environmental Quality (Emission) Guidelines (EQEG) were promulgated on December 29th, 2015. The Guidelines are largely based on International Finance Corporation (IFC) Environmental Health and Safety (EHS) Guidelines and provide the basis for regulation and control of various environmental parameters, including noise and vibration, air emissions, and effluent discharges, from various sources.

Relevant excerpts from the guidelines are as follows:

"*6. Provisions of the general and applicable industry-specific Guidelines shall be reflected in project environmental management plan (EMP) and environmental compliance certificate (ECC) and together constitute a project's commitment to take necessary measures to avoid, minimize and control adverse impacts to human health and safety, and the environment through reducing the total amount of emissions generation; to adopting process modifications, including waste minimization to lower the load of pollutants requiring treatment; and as necessary, to apply treatment techniques to further reduce the load of contaminants prior to release or discharge.*

7. Recognizing that these Guidelines are intended to prevent pollution through reducing the mass of pollutants emitted to the environment, dilution of air emissions and effluents to achieve maximum permitted values is not acceptable. Specified guideline values should be achieved, without dilution, at least 95 percent of the time that a project is operating, to be calculated as a proportion of annual operating hours.

8. Further reference should be made by projects to applicable industry-specific IFC EHS guidelines for advice on means of achieving guideline values set out in Annex 1.

9. As specified in the EIA Procedure, all projects are obliged to use, comply with and refer to applicable national guidelines or standards or international standards adopted by the Ministry. These Guidelines will henceforth be applied by the Ministry in satisfying this requirement until otherwise modified or succeeded by other guidelines or standards.

…

11. While these Guidelines generally apply to all projects subject to the EIA Procedure, it is the prerogative of the Ministry to decide how the Guidelines should be applied to existing projects as referred to in the EIA Procedure, as distinguished from new projects. At the Ministry's discretion less stringent levels or measures than provided for in these Guidelines may be specified as appropriate, and a timeframe agreed for a project to fully comply with these Guidelines.

12. As specified in the EIA Procedure, projects shall engage in continuous, proactive and comprehensive self-monitoring of the project and comply with applicable guidelines and standards. For purposes of these Guidelines, projects shall be responsible for the monitoring of their compliance with general and applicable industry-specific Guidelines as specified in the project EMP and ECC.

13. Air emissions, noise, odor, and liquid / effluent discharges will be sampled and measured at points of compliance as specified in the project EMP and ECC. "

A summary of environmental standards that are relevant to the Project are shown below.

5.1 INDUSTRY-SPECIFIC REQUIREMENTS FOR ONSHORE OIL AND GAS DEVELOPMENT

A list of standards specific to onshore oil and gas development is shown in ***Table 5.1***.

Table 5.1 Effluent and Emission Standards for Onshore Oil and Gas Development

Parameter	Guideline
Storm water drainage	Storm water runoff should be treated through an oil/ water separation system able to achieve oil and grease concentration of 10 mg/l
Sewage	Holding and discharge to municipal or centralized wastewater treatment systems or onboard treatment to achieve: - 5-day Biochemical oxygen demand 30 mg/l - Chemical oxygen demand 125 mg/l - Oil and grease 10 mg/l - pH 6-9 - Total coliform bacteria 400/100 ml - Total nitrogen 10 mg/l - Total phosphorus 2 mg/l - Total suspended solids 50 mg/l
Air Emissions	Achieve WHO ambient air quality guidelines, and apply the following guideline value to emissions: - Hydrogen sulfide 5 mg/Nm^{3c}

Note:
[a] Heavy metal include: Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Silver, Vanadium and Zinc
[b] Standard unit
[c] Milligrams per normal cubic meter at specified temperature and pressure

As part of the EMP preparation process, an onshore site visit was undertaken by Project team members during 4-5 June 2016 in order to observe and understand:

- Operations of ZOC, ZBV1/2, ZMS, and the Right of Way (ROW);
- Surrounding environmental conditions (i.e. topography, water bodies, local ecology;
- Surrounding social conditions (i.e. transportation, surrounding land use/agriculture, etc.); and
- Mitigation/management measures.

There is operation phase during the site visit period. Output from onshore site visit in 2016 can be summarized below.

Surrounding environmental conditions

Detail of description of surrounding environment of the Project include physical (i.e. geography and geology, climate and meteorology, ambient air quality and ambient noise level, surface water quality and hydrology, soil and groundwater quality), biological (i.e. ecoregion, topography and vegetation, key biodiversity areas, endemic bird areas, tiger conservation landscapes, forest, wildlife and aquatic ecology) and socio-economic (i.e. demographic profile, socio-economic activities, infrastructures and utilities and fishery) components are described in ***Section 6.1***.

The environmental condition observation during site visit includes topography, water bodies, local ecology. The Project team visited the Tavoy Bridge which the pipeline lies within the Tanintharyi Nature Reserve (TNR).

The Zawtika onshore pipeline area is characterized by undulating terrain and low-lying hills with steep slopes in several areas. The Project Proponent provided the sediment barriers to protect soil erosion from rainfall and surface runoff in particular land with a high hill slope. No land slide was found along the pipeline during site visit, presented in the ROW had not significant impact to topography and geographical.

The climatic conditions of Myanmar is influenced by its location, topography of the land and sea and upper-air circulation which ultimately leads to the four (4) seasons/periods, these are:

- Hot season or pre-monsoon period;
- Rainy season or monsoon period;
- Post-monsoon season; and
- Dry season.

Myanmar is vulnerable to cyclones originated in the Bay of Bengal during pre- and post-monsoon seasons (from April to May and from October to November, respectively). Additionally, the Arakan Coast (northwest of the Project Area), is more likely to be struck by cyclone during autumn trasitional season, while Gulf of Martaban is rarely impacted. Cyclone-related disaster is found in this region every 3 to 4 years.

Air quality baseline monitoring survey from previous study found that the surrounding area has a relatively good ambient air quality condition.

Noise baseline monitoring survey from previous study found that the surrounding area ambient noise level is within the EQEG respective standard. Most noise sources around the project site are from human activity and transportation.

Surface water quality survey from previous study shows that most test parameters complied with the relevant standards. However, some parameters such as BOD and Total Coliforms were determined to exceed the standard guideline values. Potential for this is from improper management and release of sewage and waste as well as biomass decomposition (from wood debris).

The main water features around the Project Area are Heinze River, Dawei (Tavoy) River and Zinba River as well as their tributaries.

Soill baseline survey from previous study found that all tested parameters compiled with the Thailand's Soil Quality Standards.

Groundwater quality survey from previous study found that most tested parameters were within the relevant standard with the exception of pH, colour and Arsenic. This is potentially from human activities related to chemicals used for farming purposes.

The Zawtika onshore gas pipeline route showed that large number of rivers and streams are running in the forests. The well-known rivers are Mayan River, Dawei River, Meke River, Zinba River. During site visit, the Project team visited the Dawei River nearby the Tavoy Bridge, the Project team did not find any installation nearby the water body and any river morphology changing.

Service tracks, access road and access walkways are established under approval of the TNRP. The tracks run in parallel with the pipeline routes from Tavoy Bridge to Ban I Tong on the Myanmar-Thailand border.

During Zawtika onshore gas pipeline project implementation, the Project had cooperated with Taninthayi Nature Reserve Project (TNRP) which is under Forest Department via MOGE for the facilities that are located in the TNRP's area. ATL (PTTEPI) had proposed to enter into the TNRP project and proposed to commence the contribution. The ATL proposal had been agreed by Forest Department and approved by MOE since December 2012. The first contribution was started since the 3rd phase of TNRP project as per detail in **Annex B.**

The vegetation clearance was limited in the ROW area only (refer to ***Figure 3.7***)

Figure 6.1 Dawei River nearby Tavoy Bridge during the site visit.

Note: Photo taken during site visit, June 2016

Surrounding social conditions

The social condition observation during site visit includes transportation, surrounding land use/agriculture. Land use of Phase 1 (from the landfall point (KP 0) to Dawei or Tavoy Bridge (KP 38)) found residential and agriculture area. Land use of Phase 2 (from Dawei or Tavoy Bridge (KP 38) to Ban-I-Tong (KP 71)) is primarily forest due to this phase was lied within the Tanintharyi Nature Reserve (TNR).

During the site visit is in the Operation Phase, have not any construction, there are no effects to local communities and road users in terms of nuisance from dust and traffic noise, accidents, road damage and obstruction.

The following section describes the existing environmental conditions within the onshore Zawtika area. The information provided is based on a review of secondary data from previous ESHIA Zawtika Onshore Gas Transportation System, 2009 and published sources as well as available PTTEPI and ERM and in-house literature.

6.1 *PHYSICAL COMPONENTS*

This section presents the physical setting of the Project Study Area and includes a discussion of the following parameters:

- Geography and Geology;
- Climate and Meteorology;
- Ambient Air Quality and Ambient Noise Level;
- Surface Water Hydrology and Quality;
- Soil; and
- Groundwater Quality.

Each of the above aspects are discussed below.

6.1.1 Geography and Geology

6.1.1.1 Geological Setting

General geographical condition of the Zawtika onshore gas pipeline corridor comprises both upland and low-lying areas and includes a series of linear relief features running north-west to south-east between the coast and Thai border. The western section is characterised by low-lying lands which are subject to seasonal flooding.

To the east of the Heinze River, the land rises to around two-hundred (200) m forming the western watershed of the Dawei River. The next significant upland range divides the Dawei from the Zinba, Meke and Mayan Rivers to the east and is characterised by relatively low-lying hills reaching up to between one-hundred (100) and three-hundred (300) m. The Zawtika onshore gas pipeline route traverses the range at the Thitka pass at an altitude of one-hundred-ninety (190) m. Further to the east, the border range forms a natural barrier with Thailand, reaching average heights of around six-hundred (600) m with the highest point at Palan Taung (1,455 m).

The landscape type and elevation along the Zawtika onshore gas pipeline route are divided into two (2) main patterns as follows:

Phase I: Landfall at Daminseik to the Tavoy Bridge

At Phase I, the Zawtika onshore gas pipeline will go with alternative two (2) (along with the Yetagun route). The pipeline starts at the landfall area of the Daminseik coast. The general coastal geomorphology has low relief, with a broad sandy beach backed by low hills, the majority of which are covered in degraded forest. Next to the landfall is the sand dunes, which separate the rice paddies to the east from the Andaman Sea and is the location of the fishery community of Daminseik. Many kinds of plantations and farming areas (i.e. coconut, betel nut, cashew nut, palm oil, etc.) are also found next to the sand dunes along the pipeline until the Dawei River.

The terrain conditions are generally flat with some parts having low hills. The elevation slowly rises from 0.3 m above mean sea level (MSL) at the landfall to approximately one-hundred-sixty (160) m above MSL when cross small hills near the Yadana and the Yetagun Operating Centers and then drops to 1.5 m above MSL at the Heinze River crossing point. From the Heinze River, the elevations vary from 1.5 m to one-hundred-forty (140) m when crossing a small hill at ZKP 26 before dropping to twenty (20) m at the Dawei River crossing point.

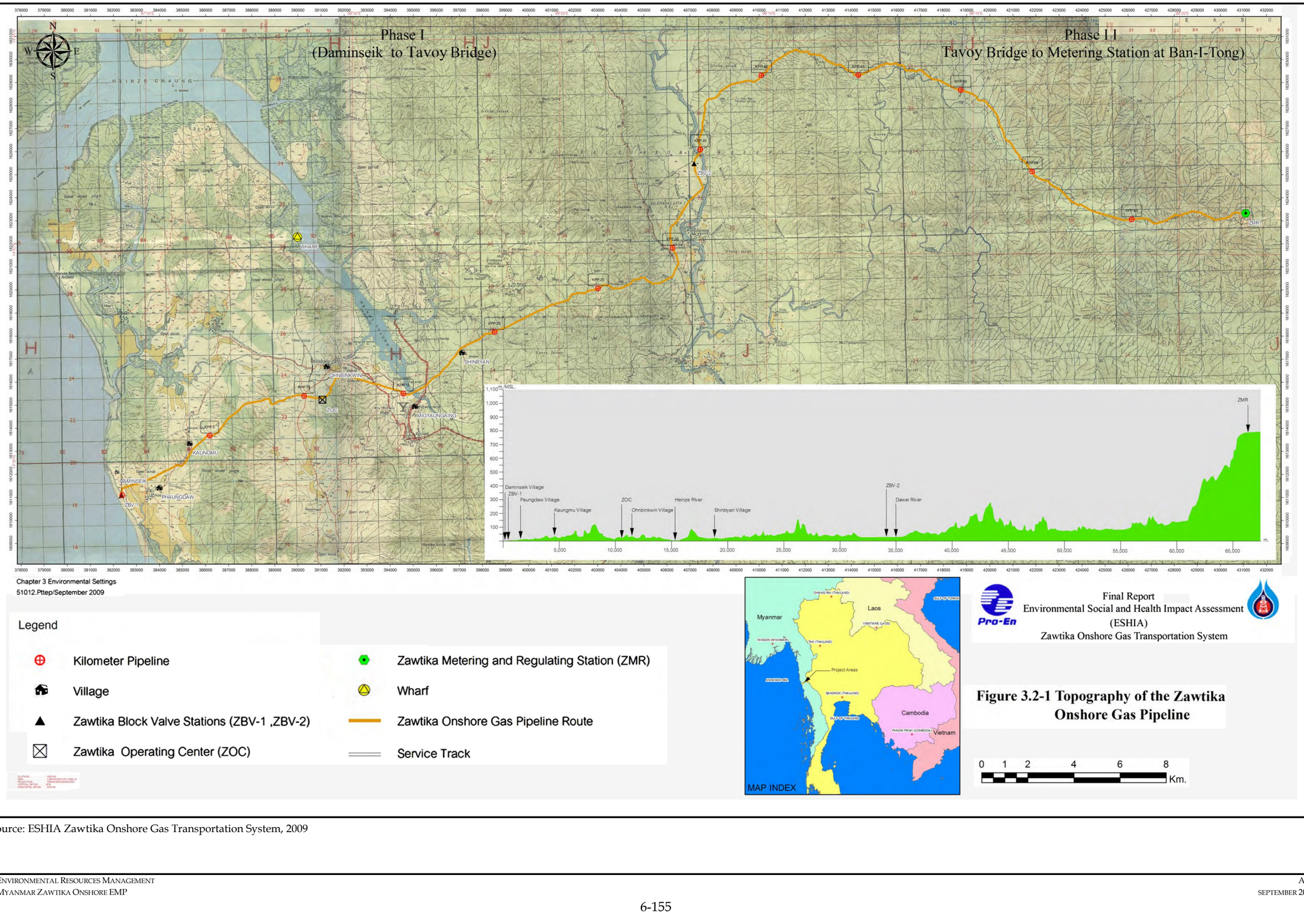
Phase II: the Tavoy Bridge to Ban-I-Tong

The Zawtika gonshore as pipeline at phase II will go in parallel with the Yadana and the Yetagun. From the Tavoy Bridge, the pipeline traverses through the upland area of the Heinze and Kalainaung National Reserved Forests until it reaches the Myanmar-Thailand border at Ban-I-Tong.

The terrain conditions are high and undulating land alternating with rolling lands west of the Thitka Taung (Mountain) and the steeply dissected lands of the Thitka Taung. The elevation varies from twenty (20) m above MSL at the Dawei River crossing to two-hundred-seventy (270) m above MSL when cross Shaka Taung at ZKP. 42 and then drops to 90m above MSL at USB 114, ZKP 55. From this point, the elevation rapidly rises through a mountain range that borders with Myanmar and Thailand to the highest point of nine-hundred (900) m above MSL at Ban-I-Tong.

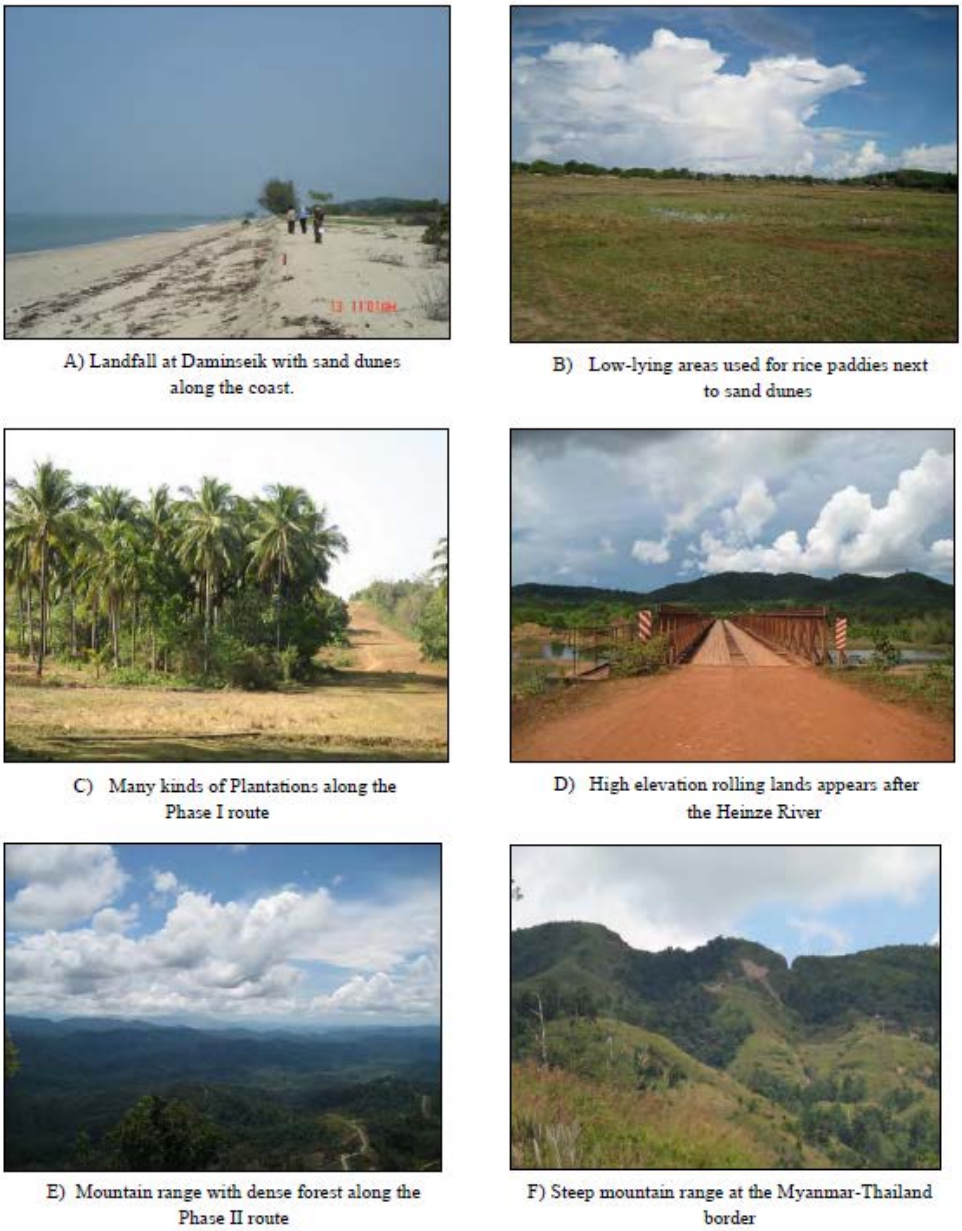
Existing geographical conditions of the proposed Zawtika gas pipeline route is shown in ***Figure 6.2*** and ***Figure 6.3***

Figure 6.2 Topography of the Zawtika Onshore Gas Pipeline



Source: ESHIA Zawtika Onshore Gas Transportation System, 2009

Figure 6.3 ***Existing Geographical Conditions Along the Zawtika Onshore Gas Pipeline Route***



A) Landfall at Daminseik with sand dunes along the coast.

B) Low-lying areas used for rice paddies next to sand dunes

C) Many kinds of Plantations along the Phase I route

D) High elevation rolling lands appears after the Heinze River

E) Mountain range with dense forest along the Phase II route

F) Steep mountain range at the Myanmar-Thailand border

Source: ESHIA Zawtika Onshore Gas Transportation System, 2009

6.1.1.2 Geology

6.1.1.2(1) General Geology of Myanmar

The Sino-Myanmar Ranges (Kachin-Shan-Tenasserim Highlands, "Eastern Highlands") represent the largest tectonic unit in Myanmar and occupies the East part of the country. Their main components are consolidated, partially low-graded metamorphic, Paleozoic and Mesozoic sediments of the Burmese Malayan Geosyncline and substratum consisting of Precambrian crystalline rock of the Mogok Series and of the pre-Uper Cambrain Chaung Magyi Group. Cretaceous sediments occur chiefly in the West part of this tectonic domain, while Late Tertialy and Quaternary sequences surround its West marginal blocks and form the filling of intramonate basins igneous rocks are represented by various generations of acidic and basic intrusive and acidic, intermediate and basic extrusive rocks.

As a whole, Myanmar can be divided into five (5) physiographic regions: the northern mountains; the western ranges; the eastern plateau; the central basin and lowlands and the coastal plain, so this Project Area is in the eastern highlands.

6.1.1.2(2) Geology of Project Area

Most of the areas are following the regional Faults. The main strata is composed of Carboniferous – Granite Stratum - Quaternary. At least six (6) major Granitoid plutons in the Tanintharyi Basin intruded the metasedimentary rocks of the Mergui Group (Carboniferous). Many smaller Granitoid bodies up to 3-4 km across are observed at the margin of the major Granitoid Pluton.

The Granitoids of this area is widely considerable in grain size and texture but very uniform in mineral composition. This essentially consists of abundant quartz, orthoclase frequently as large megacrysts, plagioclase, microcline and biotite. Hornblende is rarely present and then only in small quantities.

6.1.1.3 Earthquakes and Tsunamis

According to a literature review, Myanmar is seismologically unstable and vulnerable to earthquakes due to its location in the active Alpide seismotectonic belt and the young Alpine-Himalayan-Sumatran orogenic belt[1]. Historic records show that at least fifteen (15) major earthquakes with magnitudes M≥7.0 Richter scale (RS) have occurred in Myanmar in the last hundred years.

The important active faults which cause an influence on Thailand are namely: faults in the west region of Thailand-east of Myanmar i.e. Sagaing fault and Pan Luang Fault. Both faults run continually in the west-south direction of Thailand, consisting of Muey fault (Muey-U Thai or Ping). In the north region of Thailand,

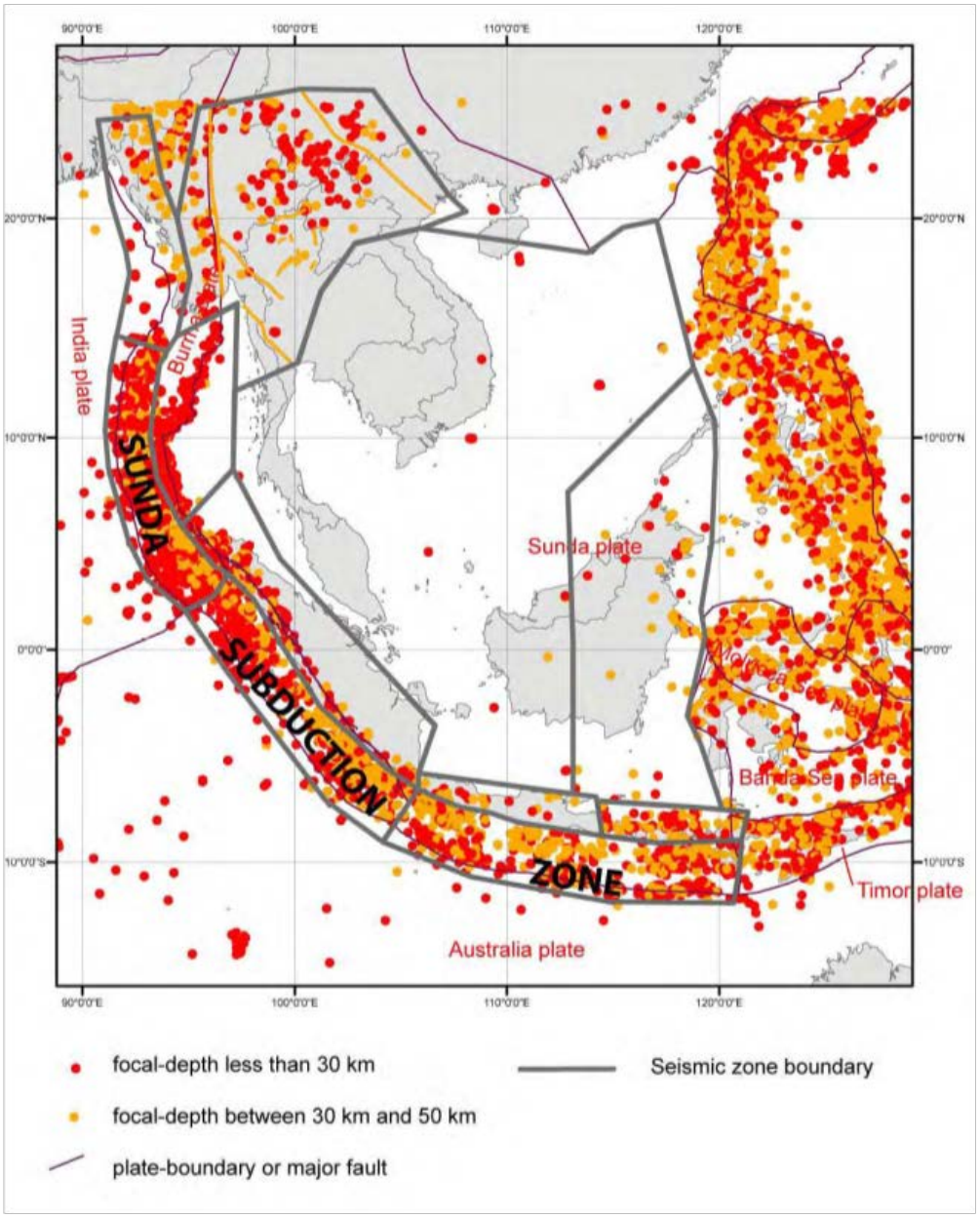
[1] Theilen and Pararas-Carayannis (2009) Op cit.

there are many active faults i.e. Sri Sawat Fault, Three Pagoda Fault Mae Ping Fault Zone and Pan Laung Fault.

Recent earthquakes include one (1) in April 2016 near Mawtaik on the India and Sunda (Eurasia) plates at 6.9 magnitude, as well as a magnitude 6.8 earthquake that occurred on the Sagaing fault in Myanmar on November 11, 2012[1]. The Sagaing fault is a major fault in Southeast Asia between the India and Sunda (Eurasia) plates. This strike-slip fault (side-to-side motion) is part of a broad zone of deformation that includes the India-Asia collision zone to the north and extension of the Andaman Sea to the south. The November 11 earthquake and its four aftershocks (with magnitudes ranging from M-5 to M-5.8) occurred north of the city of Mandalay, along a stretch of the Sagaing fault. A map of earthquakes in the SE Asian region is shown in ***Figure 6.4*** and a historical earthquake map of Myanmar is shown in ***Figure 6.5***.

[1] http://www.earthobservatory.sg/news/strong-quake-myanmar#.U4wB1ncxXmQ, Accessed May 2014

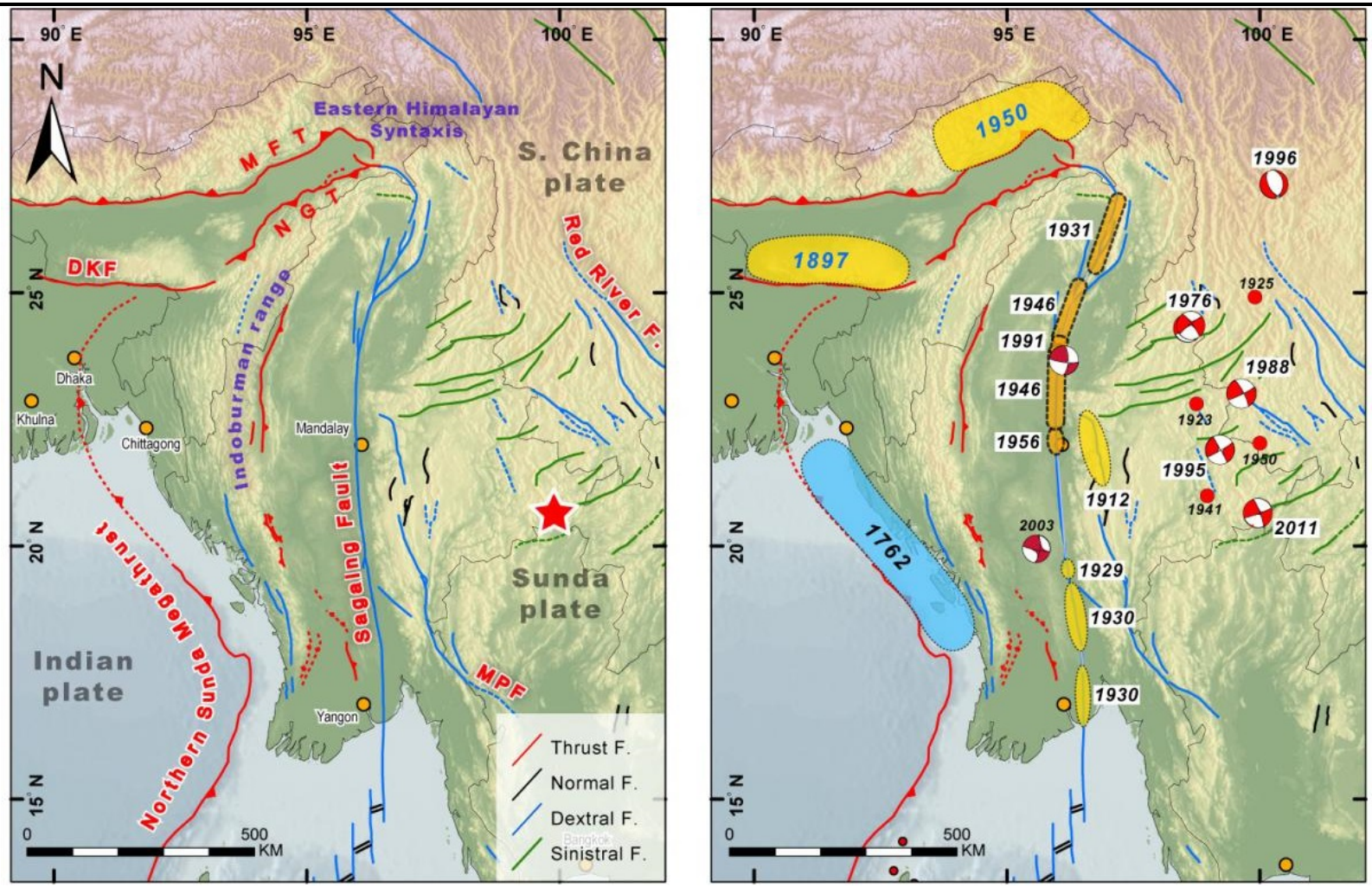
Figure 6.4 Map of Earthquakes with Shallow-Focus Epicenter for Period 1965-2005



Source: USGS[1]

[1] http://www.usgs.gov/

Figure 6.5 Neotectonic Map of Myanmar



Source: http://www.earthobservatory.sg/news/strong-quake-myanmar#.U4wB1ncxXmQ , Accessed October 2016.

Note: The coloured patches show estimated rupture patches of older earthquakes, while the "beach-ball" symbols show earthquakes recorded by seismometers in modern times. The "beach ball" represents a focal mechanism, which shows an estimate of motion along the earthquake fault.

- Left - Main tectonical features around the Sagaiing fault
- Right - Major earthquake since the 18th century

6.1.2 *Climate and Meteorology*

The climatic conditions of Myanmar are influenced by location, topography, influence of the land and sea and upper-air circulation and this leads to seasonal variation which is divided into four (4) seasons or periods as follows[1],[2]:

- **Hot season or pre-monsoon period**: this season extends from the beginning of March to the middle of May. The main characteristic is the excessive heat and high temperature for the whole country. Mean monthly temperature is 26.6-30 °C in the coastal area (Note; Project Area is in this zone), 29.4-32.2 °C in the central area and 15.8-26.6 °C in the eastern highland and lowland area of the northern Myanmar. The amount of rainfall in the coastal area during this period is 24.77 inches at Myeik, 14.41 inches at Yangon, 16.41 inches at Kyaukpyu and 17.79 inches at Sittwe.

- **Rainy season or monsoon period**: this season is from the middle of May to the end of September. During the monsoon period, the temperature is lower than it should be due to a large amount of rainfall, influenced by the arrival of the southwest monsoon. The temperatures are about 26.6°C in the coastal area 26.6-29.4°C in central and 15.8-26.6 °C in the eastern highland and lowland area of northern Myanmar. The amount of rainfall is much different from other seasons, more than hundred-forty (140) inches at Rakhine coast, northern Tanintharyi (Note; Project Area is in this division), Mon and southern Kayin, over hundred-twenty (120) inches at northern most part, 40-100 inches in delta area and decrease less than twenty (20) inches in central area.

- **Post-monsoon season**: this period covers October and November. The temperatures are about 26.7°C in Rakhine coast and Tanintharyi, 26.67-29.4°C in lower Myanmar, 23.9-28.3°C in central Myanmar and 18.3-23.9°C in the eastern highland. The decrease of temperature is due to the southward retreat of the summer monsoon and the incoming of northerly winds or winter monsoon. Generally, rainfall during this season is less than ten (10) inches except in the Rakhine and Tanintharyi coasts.

- **Dry season**: this season is from the beginning of December to the end of February. During this season, temperature ranges between 18.3-33.9 °C in the Rakhine coast, 18.3-26.7 °C in lower Myanmar and Mon-Tanintharyi coast, 18.3-23.9°C in the central Myanmar and 12.8-18.3°C in the eastern highlands. Rainfall is about two (2) inches in the northern Myanmar but less than 1 inch over the rest of the country. In Tanintharyi Division, Myeik receives over two (2) inches in February.

[1] Khin Shwe Win, 1976

[2] ESHIA Zawtika Onshore Gas Transportation System, 2009

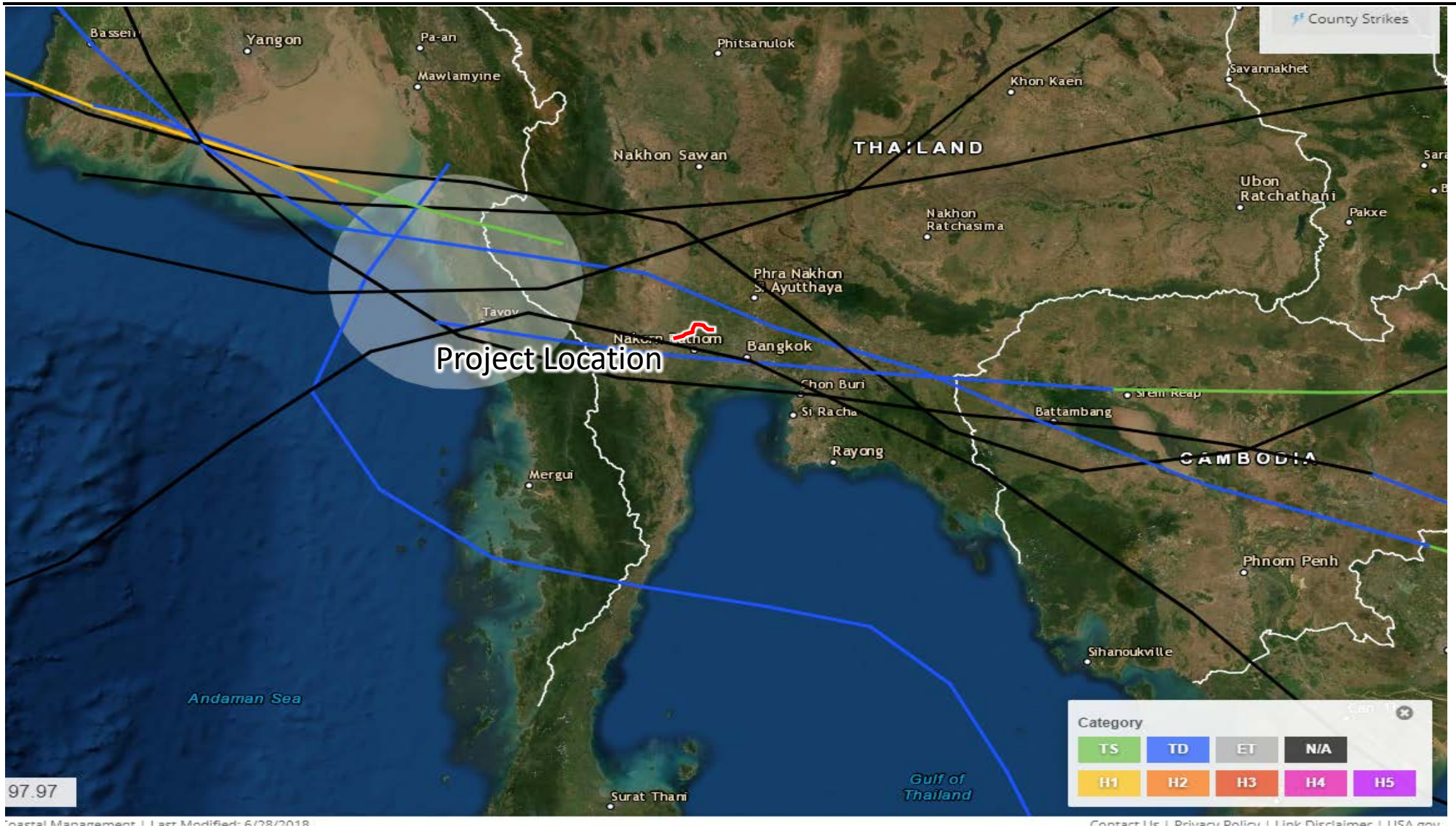
6.1.2.1 *Tropical Storms and Cyclones*

Myanmar is particularly vulnerable to cyclones originating in the Bay of Bengal during pre- and post-monsoon seasons from April to May and from October to November respectively. These cyclones result in heavy rains, floods and storm surges, especially in the coastal region of Rakhine State.

The Arakan Coast, northwest of the Project Area, is more likely to be struck by a cyclone during the autumn transitional season, but the Gulf of Martaban is rarely affected. Cyclone-related disasters occur in this region every 3 to 4 years, generating flood in the low-lying and densely populated Ayeyarwady river delta region, and other coastal regions along the Gulf of Martaban.

Figure 6.6 shows historical cyclone tracks in the vicinity of Project Area.

Figure 6.6 Historical Cyclone Track within two-hundred (200) km of Project Location (1952 - 2013)



Source: http://www.csc.noaa.gov/hurricanes, 2019

6.1.3 *Ambient Air Quality and Ambient Noise Level*

6.1.3.1 *Ambient Air Quality*

A field survey was conducted to study ambient air quality and ambient noise level for ESHIA Zawtika Onshore Gas Transportation System in 2009. The measurement was carried out at the designated stations selected from sensitive receptors located within an area of one (1) km along the Zawtika onshore gas proposed pipeline route.

Three (3) designated monitoring stations were set at schools located in communities along the pipeline as follows (***Table 6.1*** and ***Figure 6.6***):

Table 6.1 Ambient Air Quality and Noise Level Monitoring Stations

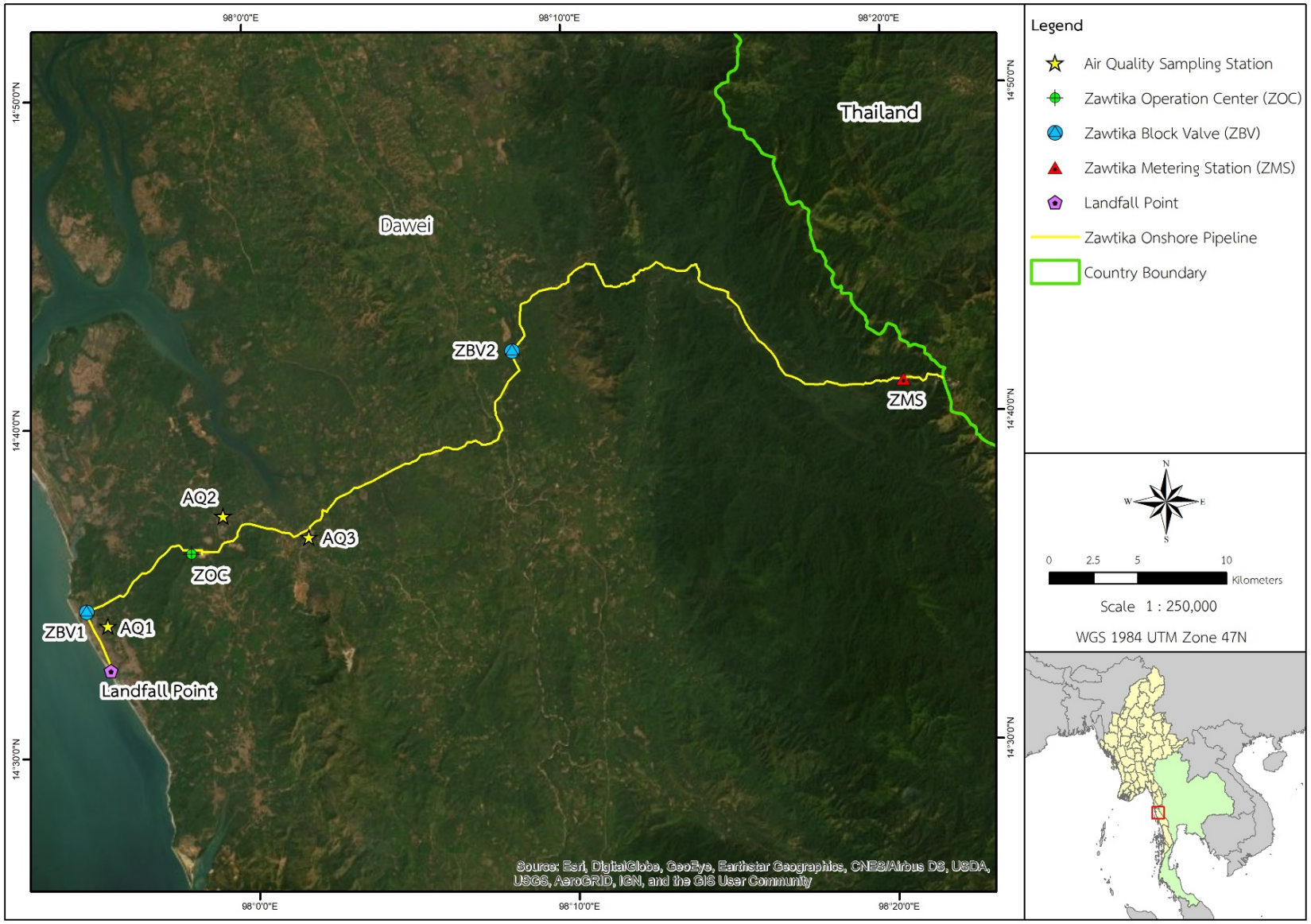
Monitoring stations	Geography Coordinates		Projected Coordinates (WGS 84)		
	North	East	UTM	East (x)	North (Y)
Station 1 : Phaungdaw High School	3° 25' 14.93''	108° 56' 55.71'	47P	0384057	1610685
Station 2 : Ohnbinkwin High School	3° 28' 45.61''	108° 00' 03.01'	47P	0390695	1616671
Station 3 : Migyaungaing Primary School	3° 31' 19.13''	108° 59' 29.13'	47P	0395480	1615370

Source: United Analyst and Engineering Consultant Company Limited (UAE), 2009

The measurement results from three (3) monitoring stations found that the twenty-four (24) hours average concentrations of Total Suspended Particles (TSP) and Particulate Matters to be less than ten (10) microns (PM-10) were detected at 0.167, 0.170, 0.129 mg/m^3 and 0.096, 0.120, 0.092 mg/m^3 respectively. The detected values were lower than the Thailand's Ambient Air Quality Standards recommended by the National Environmental Board at 0.33 mg/m^3 and 0.12 mg/m^3 for TSP and PM-10 respectively. Moreover, only standards value was available for PM_{10} under National Environmental Quality Emission Guidelines (Myanmar EQEG, 2015) which is 50 µg/m^3 (0.05 mg/m^3) averaging over 24-hour whereby all three (3) monitoring results are above this standard.

Therefore, based on the AQI and EQEG, it is concluded that the ambient air quality in this area was still in relatively good condition and was not creating a significant negative health impact to people living in the community. This is due to limited significant potential sources of air pollution in this area.

Figure 6.7 Air Quality and Noise Level Monitoring Location



Source: ERM, 2019

6.1.3.2 *Ambient Noise Level*

The existing noise levels in terms of Leq 24 and Lmax from the measurement during 12-16 January 2009 at three (3) sampling stations were in a range of 57.6-67.1 dB(A) and 92.2-96.4 dB(A) respectively, which were within the Thailand's Noise Level Standards as well as the Myanmar EQEG for industrial and commercial site (70 dB(A) for one hour Laeq during daytime and night time).

The major noise source at the project site was from human activities, mostly from school activity and transportation.

6.1.4 ***Surface Water Quality and Hydrology***

6.1.4.1 *Surface Water Quality*

A field survey was conducted to study surface water hydrology and quality for ESHIA Zawtika Onshore Gas Transportation System in 2009. Fifteen (15) designated sampling stations were selected at available surface water bodies along the pipeline as follows (***Table 6.2***, ***Table 6.3*** and ***Figure 6.8***).

According to the results, most values complied with the Thailand's Surface Water Quality Standard, the Notification of the National Environmental Board No.8, 1994 (B.E. 2537) Class 1 and 2, except Biochemical Oxygen Demand (BOD) values at Wharf, and Phenol at Wharf, NK 1, USB 95 and USB 130 which exceeded the Standard. Additionally, only Total Coliforms (at all sampling stations) were found to exceed the National Drinking Water Quality Standards Myanmar 2019 (standard requires Total Coliforms concentration to be zero (0)), where this was found to occur at all sampling locations. Moreover, there were four (4) water samples that had pH value lower than the Myanmar standard.

The high concentration of BOD at Wharf may possibly be from human activities observed during the sampling period i.e. vessel washing, ballast water vessels, sewage vessels and toilets. Moreover, it was recorded that water quality condition during the sampling period appeared to be poor, with some wood debris. Therefore, the exceeded BOD was most likely due to the above reasons.

Coliforms are expected to be found in area where there is improper waste management facilities which is the case for this Project Area. Human and animal faeces contains bacteria which can raise the concentration of Total Coliforms in water and this is likely the reasoning for presence of Coliforms in surface water samples.

The other exceeded value compared to the Standard was Phenol at four (4) stations; Wharf, NK 1, USB 95 and USB 130. However, human activities or a factory which is common cause of Phenol was not observed close to those four (4) stations. In fact, Phenol can be found in nature in some foods, human and

animal wastes and decomposing organic material (ATSDR[1], 2006), these can be the result of the exceeded measurements.

Comparison of heavy metals at each sampling station, all were within the Standards. In addition, the Organochlorine Pesticides were low and also complied with the Standard at all sampling stations.

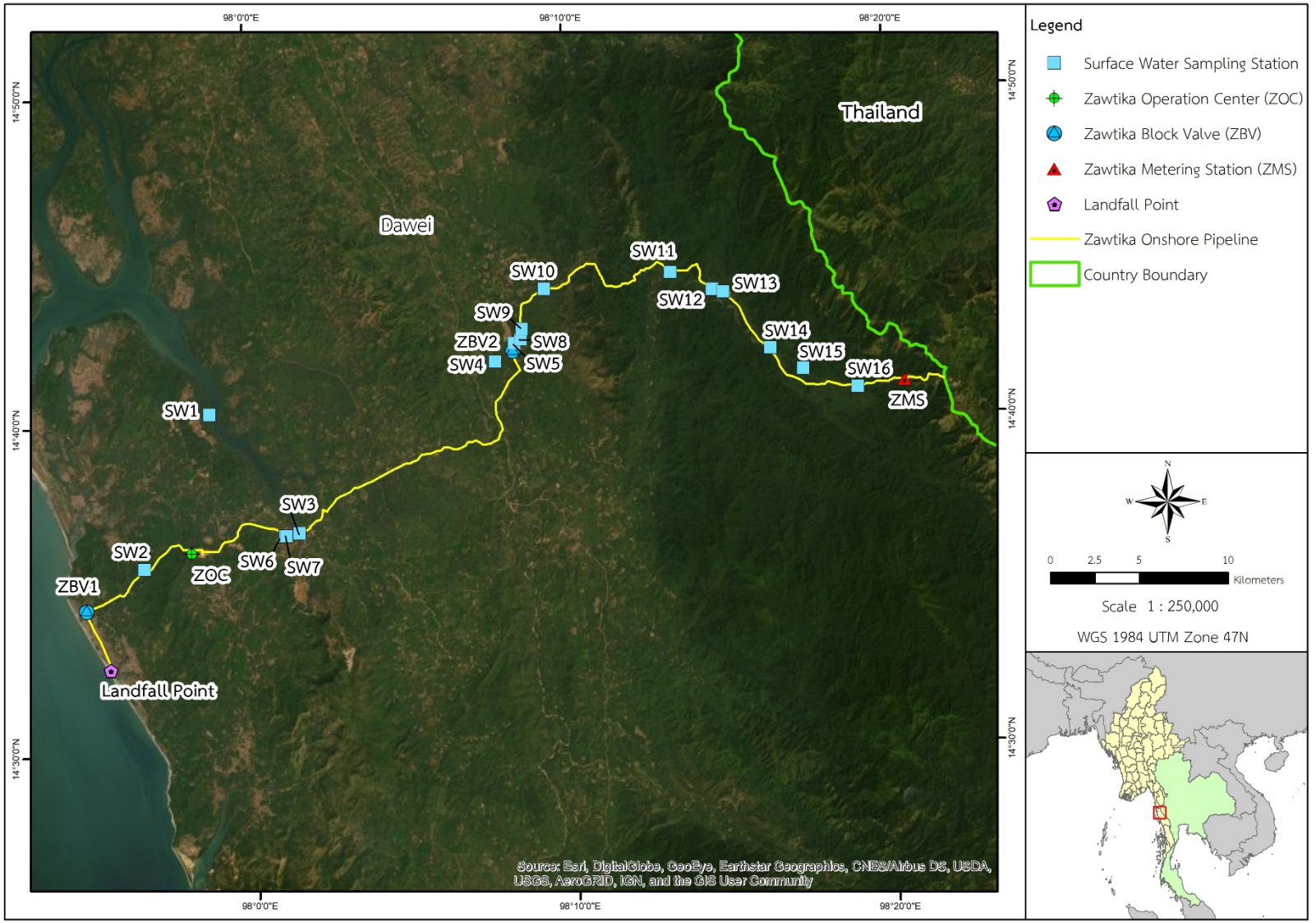
[1] Agency for Toxic Substances and Disease Registry, 2006

Table 6.2 Surface Water Quality Sampling Stations

Sampling stations	Geography Coordinates		Projected Coordinates (WGS 84)		
	North	East	UTM	East (x)	North (Y)
SW1 Wharf	3° 28' 23.03''	109°03' 11.37''	47 P	0390055	1622392
SW2 Near KP 5	3° 26' 22.16''	108° 58' 35.41''	47 P	0386188	1613786
SW3 Heinze Bridge	3° 31' 02.44''	108° 59' 36.77''	47 P	0394951	1615615
SW4 USB 67	3° 36' 59.05''	109° 04' 39.16''	47 P	0406185	1624966
SW5 Dawei or Tavoy Bridge	3° 37' 33.77''	109° 05' 11.28''	47 P	0407280	1625960
SW6 Pond 1 at Base Camp	3° 30' 36.10''	108° 59' 32.18''	47 P	0394128	1615480
SW7 Pond 2 at Base Camp	3° 30' 38.70''	108° 59' 31.79''	47 P	0394209	1615467
SW8 NK 1	3° 37' 45.29''	109° 05' 18.46''	47 P	0407642	1626181
SW9 NK 2	3° 37' 47.63''	109° 05' 37.00''	47 P	0407722	1626761
SW10 USB 75	3° 38' 28.80''	109° 06' 48.31'	47 P	0409033	1628981
SW11 USB 95	3° 42' 16.64''	109° 07' 14.62''	47 P	0416152	1629724
SW12 USB 99A	3° 43' 31.34''	109° 06' 43.79''	47 P	0418471	1628731
SW13 USB 100B	3° 43' 51.18''	109° 06' 38.59''	47 P	0419088	1628561
SW14 USB 114	3° 45' 15.26''	109° 04' 56.97''	47 P	0421672	1625347
SW15 USB 121	3° 46' 13.44''	109° 04' 20.11''	47 P	0423473	1624171
SW16 USB 130	3° 47' 51.63''	109° 03' 46.36''	47 P	0426523	1623078

Source: United Analyst and Engineering Consultant Company Limited (UAE), 2009

Figure 6.8 Surface Water Quality Sampling Stations



Source: ERM, 2019

Table 6.3 Surface Water Quality Results

Parameter	Unit	Analytical Results																
		SW1 Wharf	SW2 Near KP 5	SW3 Heinze Bridge	SW4 USB 67	SW5 Dawei or Tavoy Bridge	SW6 Pond 1 at Base Camp	SW7 Pond 2 at Base Camp	SW8 NK 1	SW9 NK 2	SW10 USB 75	SW11 USB 95	SW12 USB 99A	SW13 USB 100B	SW14 USB 114	SW15 USB 121	SW16 USB 130	DL
pH	-	7.4	5.7	6.9	6.6	6.9	6.6	6.7	6.2	6.2	5.9	6.5	6.6	6.4	6.9	7.4	6.9	1
Temperature	°C	25.3	22.6	24.4	20.2	21	25.2	26	22.7	21.4	21.3	21.7	19.9	19.2	20.2	22.4	20.2	-
Conductivity	µmho/cm	41,520	17.8	18,110	34.3	39.5	10.6	19.4	14.8	15.1	12.9	15.4	21.3	19	39	27.4	16.2	0
Colour	Platinum-Cobalt	5	5	5	25	10	5	20	5	10	5	ND	ND	ND	ND	5	ND	5
Turbidity	NTU	46.8	0.8	30	2.2	1.7	1.7	1.6	1.3	2.1	1.6	0.2	0.4	0.3	0.6	1	0.5	0.1
Dissolved Oxygen (DO)	mg/L	7	7	7.8	7.7	8.9	8.6	8.8	7.2	7.7	8.6	8.6	8.8	8.9	9	9.5	9.5	0.5
Biochemical Oxygen Demand	mg/L	3.1	ND	1.4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
Nitrate Nitrogen	mg/L NO_3^- N	0.03	ND	0.03	ND	0.05	0.04	ND	0.08	0.07	0.07	0.03	0.03	0.05	0.07	0.05	0.04	0.02
Ammonia Nitrogen	mg/L NH_3 N	0.06	0.1	0.13	0.07	0.1	0.1	0.08	0.12	0.16	0.11	0.08	0.06	0.03	0.04	ND	ND	0.02
Phosphate	mg/L NH_3 N	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.03
Phenol	mg/L PO_3^-	0.006	ND	ND	ND	ND	ND	ND	0.013	ND	ND	0.006	0.005	0.005	ND	ND	0.007	0.005
Copper (Cu)	mg/L Cu	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.003
Nickel (Ni)	mg/L Ni	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.005
Manganese (Mn)	mg/L Mn	0.105	ND	0.398	0.018	0.02	0.02	0.009	0.127	0.106	0.007	ND	0.016	0.007	0.025	0.008	ND	0.005
Zinc (Zn)	mg/L Zn	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.005
Cadmium (Cd)	mg/L Cd	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.003
Hexalavent Chromium (Cr^{6+})	mg/L Cr^{6+}	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.006
Lead (Pb)	mg/L Pb	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Mercury (Hg)	mg/L Hg	ND	ND	0.0008	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2E-04

Parameter	Unit	Analytical Results																
		SW1 Wharf	SW2 Near KP 5	SW3 Heinze Bridge	SW4 USB 67	SW5 Dawei or Tavoy Bridge	SW6 Pond 1 at Base Camp	SW7 Pond 2 at Base Camp	SW8 NK 1	SW9 NK 2	SW10 USB 75	SW11 USB 95	SW12 USB 99A	SW13 USB 100B	SW14 USB 114	SW15 USB 121	SW16 USB 130	DL
Arsenic (As)	mg/L As	ND	ND	0.0023	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3E-04
Cyanide (CN^-)	mg/L CN^-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.001	ND	ND	ND	ND	ND	0.001
Total Coliform Bacteria (TCB)	MPN/100 mL	490	790	4,900	130	33	1.8	23	33	23	110	21	130	230	140	49	330	< 1.8
Faecal Coliform Bacteria (FCB)	MPN/100 mL	490	230	1,700	79	23	ND	4.5	17	7.8	49	ND	14	49	110	7.8	7.8	< 1.8
Organochlorine Pesticides																		
α-BHC	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.004
□-BHC	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.004
ψ-BHC	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.004
□-BHC	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.004
Heptachlor	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.004
Aldrin	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.004
Heptachlor Epoxide	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.004
Endosulfan I	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.008
p,p-DDE	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.008
Dieldrin	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.008
Endrin	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.008
Endosulfan II	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.008
p,p-DDD	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.012
Endrin Aldehyde	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.012
Endosulfan Sulphate	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.012
p,p-DDT	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.012
Sample Condition 1/		C/BS	C/BS	C/YS	CY/YS	C/YS	C/YS	CY/WS	C/YS	C/YS	C/YS	C/CL	C/BS	C/BS	C/BS	C/BS	C/BS	-
Water Quality Index		93.93	87.7	87.43	93.2	93.4	92.8	92.9	91.7	92.12	90.2	91.25	92.44	91.12	92.60	94.34	92.68	-
Water Quality		Very Good	Good	Good	Very Good	Very Good	Very Good	Very Good	Very Good	Very Good	Very Good	Very Good	Very Good	Very Good	Very Good	Very Good	Very Good	-
Classification of Water Source		1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	-

Source: Final Report, Environmental Social and Health Impact Assessment (ESHIA), Zawtika Onshore Gas Transportation System (2009)

Remarks: 1/ C = Clear, BS= Brown Sediment, YS = Yellow Sediment, CY = Clear Yellow, WS = White Sediment, CL = Colourless
ND = Non-Detectable

DL = Detection Limit
Class 1: Extra clean fresh surface water resources using for

(1) Consumption which requires ordinary water treatment processes before use.
(2) Conservation, not necessary pass through water treatment processes require only ordinary process for pathogenic destruction.
(3) Ecosystem conservation where basic organisms can breed naturally.

Class 2 Very clean fresh surface water resources used for

(1) Consumption which requires ordinary water treatment processes before use.
(2) Aquatic organism conservation.
(3) Fisheries.
(4) Recreation.

6.1.4.2 *Surface Water Hydrology*

There are many surface water sources which crossover with Zawtika onshore gas pipeline route. Based on the preliminary survey report (GEOCOMP, July 2008), there are six (6) river and twenty-three (23) stream crossings throughout the sixty-five (65) km proposed pipeline route from Daminseik to Ban-I-Tong.

However, the principal surface water features are Heinze River, Dawei (Tavoy) River and Zinba River as well as their tributaries.

Heinze River

The Heinze River is about fifteen (15) km long and gradually gets wider as it approaches the mouth of the sea in the north, the width at the pipeline crossing point is approximately fifty (50) m. The river is formed by three (3) large creeks and numerous smaller water courses which flow into the sea through a funnel-shaped estuary between low hills to the east and west. The northern banks of the estuary rise steeply to an elevation of three-hundred-and-five (305) m. The southern banks lie some 2.8 km to the south. The estuary and creeks are navigable by small craft and are fringed by tidal mangrove forest. The mangrove forest is degraded in some areas.

Dawei River

The Dawei River stretches for some one-hundred-ninety-two (192) km from Tanintharyi Coast to the western mountain range separating Myanmar and Thailand. The river flows north to south through Dawei town which stands on the left bank about fifty-two (52) km north of Dawei point, upstream from the town, the river traverses a broad plain and its course is impeded by sandbanks and alluvial islands which change constantly in form and positions.

Zinba River

The Zinba River originated from many small streams from the mountain range bordering Myanmar and Thailand. The river is divided into upper Zinba and lower Zinba but both flow to Dawei River in the east. The pipeline route itself runs along the valley of the upper Zinba but does not cross it.

6.1.5 ***Soil***

6.1.5.1 *Soil Type*

Land Use Bureau of Myanmar has categorized soil type in Myanmar to twenty-four (24) major soil types according to the system of soil classification conducted by the International Soil Science Society and FAO/UNESCO. Soil type in the Project Area, which is located in Tanintharyi Division, is classified as Red-brown Forest Soils and Mountain Red-brown Forest Soils [Acisol (rhodic) & Cambisols (chromic)] and Complex o Meadow, Bog, and Alluvial Soils of river valleys (Gleysols & Fluvsols) (shown in ***Figure 6.9***).

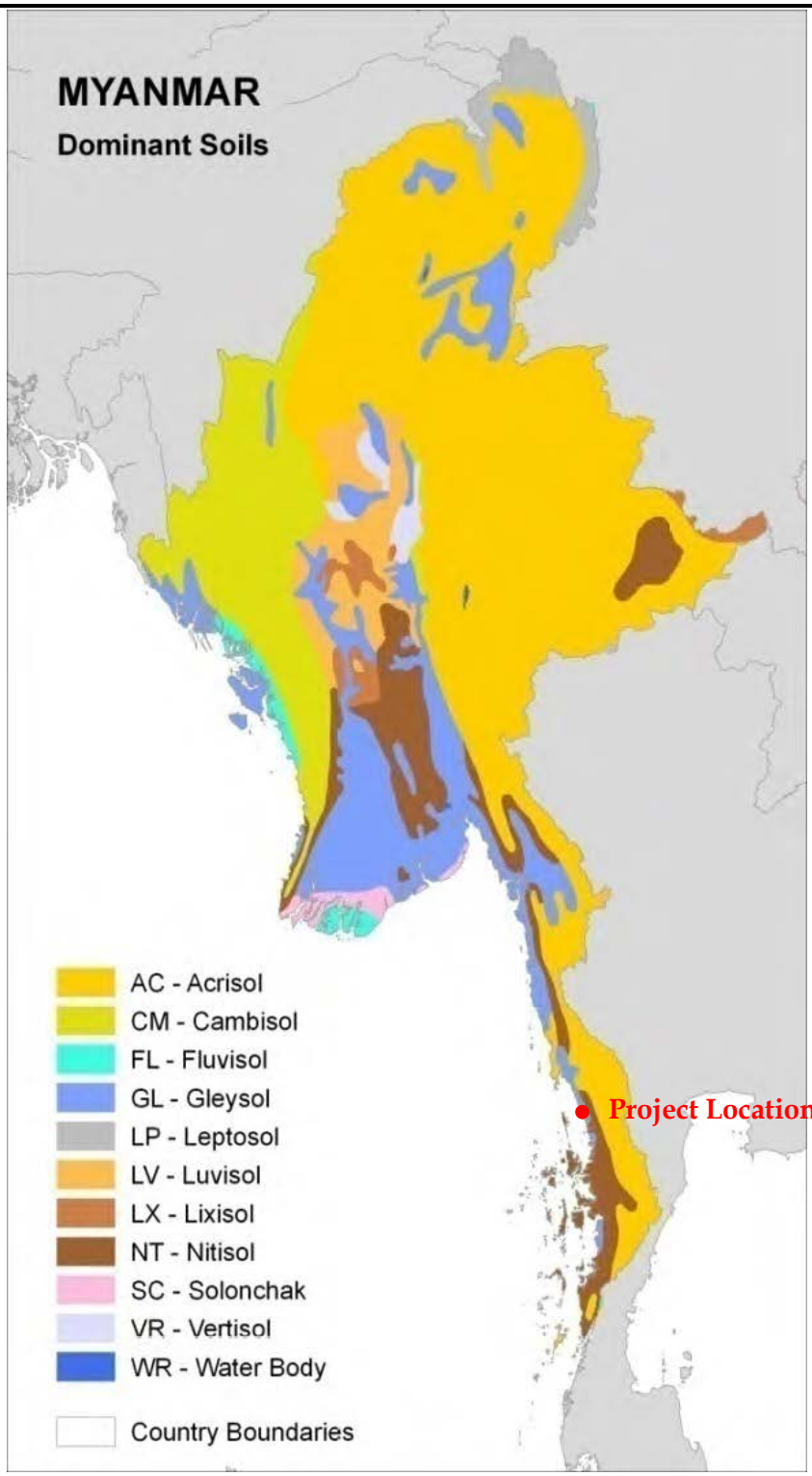
6.1.5.2 Soil Quality

A field survey was conducted to study groundwater quality for ESHIA Zawtika Onshore Gas Transportation System in 2009. Twenty-three (23) designated sampling stations were selected within one (1) km along the proposed pipeline route as follows (***Table 6.4*** and ***Figure 6.10***):

According to soil quality sampling results, all parameters complied with the Thailand's Soil Quality Standards. Volatile Organic Compounds (VOC) were non-detectable for all samples. Some heavy metals, i.e. Cadmium (Cd), Hexavalent Chromium (Cr^{6+}), and Selenium (Se) were non-detectable for all samples as well.

The results (***Table 6.5***) also confirmed that the soils resource in the Project Area was uncontaminated by any human activity.

Figure 6.9 Dominant Soil Type in Myanmar



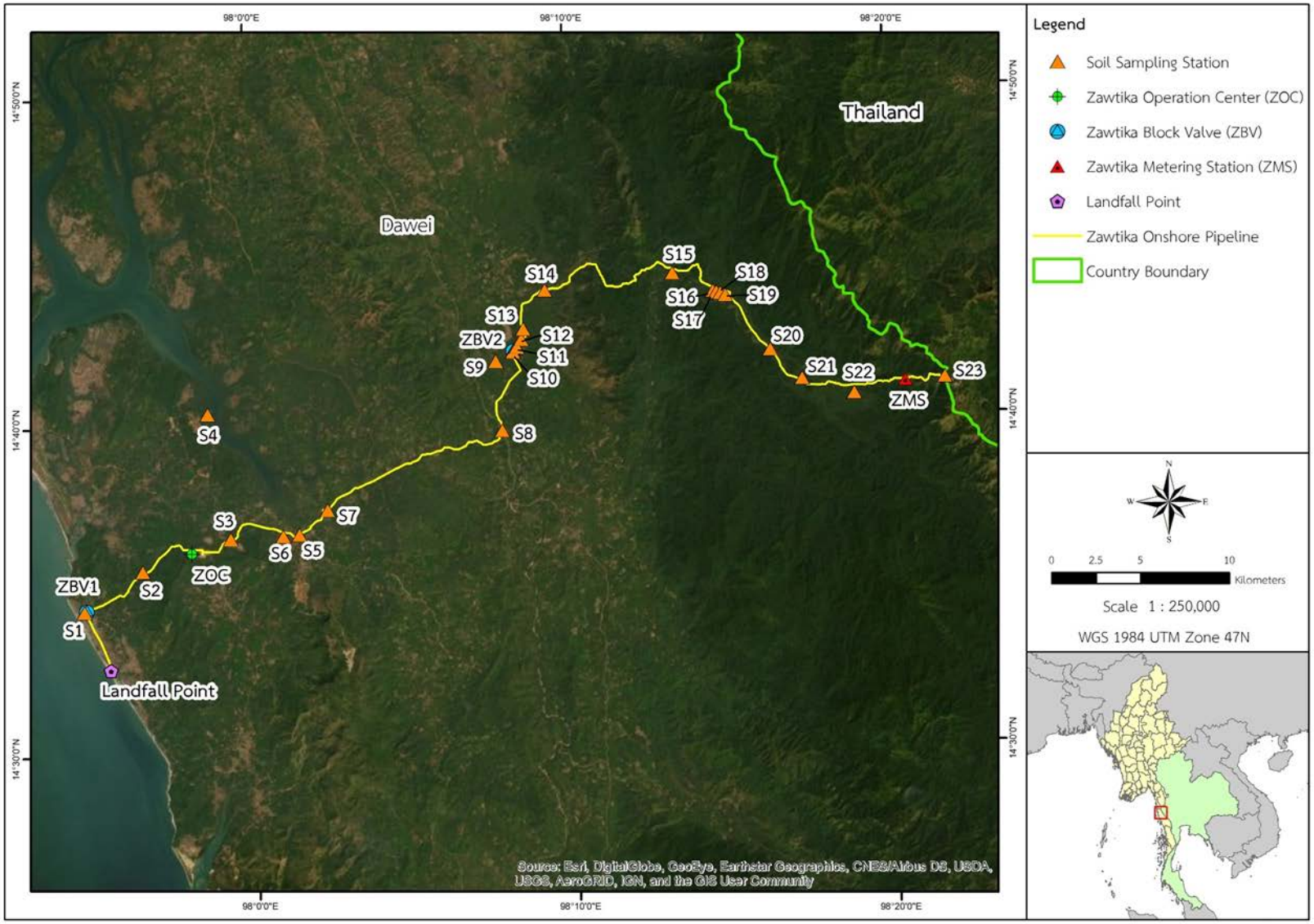
Source: https://reliefweb.int/sites/reliefweb.int/files/resources/329CF8B14D479D85852574560063A495-2-fao_NTR_mmr080527.pdf

Table 6.4 Soil Sampling Stations

Sampling stations	Geography Coordinates		Projected Coordinates (WGS 84)		
	North	East	UTM	East (x)	North (Y)
S1 Zawtika Block Valve Station-1 (ZBV-1)	3° 24' 32.47''	108° 57' 19.88''	47 P	0382741	1611456
S2 Zawtika Gas Pipeline Route St.1 (near KP 5)	3° 26' 18.23''	108° 58' 30.70''	47 P	0386064	1613640
S3 Zawtika Operating Center (ZOC)	3° 28' 57.88''	108° 59' 27.73''	47 P	0391063	1615374
S4 Wharf	3° 28' 19.02''	109° 03' 11.30''	47 P	0389930	1622391
S5 Heinze Bridge	3° 31' 01.57''	108° 59' 33.86''	47 P	0394923	1615524
S6 Base Camp	3° 30' 32.65''	108° 59' 31.15''	47 P	0394020	1615449
S7 Zawtika Gas Pipeline Route St.2 (near KP 18)	3° 31' 52.63''	115° 00' 17.50	47 P	0396531	1616874
S8 Zawtika Gas Pipeline Route St.3 (near KP 29)	3° 37' 09.46''	115° 02' 35.43''	47 P	0406464	1621086
S9 USB 67	3° 36' 58.89''	115° 04' 39.90''	47 P	0406180	1624989
S10 Zawtika Block Valve Station-2 (ZBV-2)	3° 37' 30.30''	115° 04' 56.21''	47 P	0407166	1625489
S11 Dawei or Tavoy Bridge	3° 37' 36.74''	115° 05' 04.35''	47 P	0407370	1625742
S12 NK 1	3° 37' 45.29''	115° 05' 18.46''	47 P	0407642	1626181
S13 NK 2	3° 37' 49.14''	115° 05' 37.02''	47 P	0407769	1626761
S14 USB 75	3° 38' 28.77''	115° 06' 45.54''	47 P	0409031	1628894
S15 USB 95	3° 42' 18.38''	115° 07' 13.84''	47 P	0416206	1629699
S16 USB 99A	3° 43' 31.09''	115° 06' 40.72''	47 P	0418462	1628635
S17 USB 99B	3° 43' 37.24''	115° 06' 38.65''	47 P	0418653	1628568
S18 USB 100A	3° 43' 44.87''	115° 06' 36.28''	47 P	0418890	1628491
S19 USB 100C	3° 43' 53.46''	115° 06' 33.32''	47 P	0419157	1628395
S20 USB 114	3° 45' 12.94''	115° 04' 55.06''	47 P	0421599	1625288
S21 USB 121	3° 46' 09.95''	115° 04' 02.03''	47 P	0423357	1623606
S22 USB 130	3° 47' 43.43''	115° 03' 35.70''	47 P	0426263	1622747
S23Zawtika Metering and Regulating Station (ZMR)	3° 50' 26.70''	115° 04' 02.96''	47 P	0431367	1623540

Source: United Analyst and Engineering Consultant Company Limited (UAE), 2009

Figure 6.10 Soil Sampling Stations



Source: ERM, 2019

Table 6.5 Soil Quality Results

Parameter	Unit	Analytical Results												STD 1/	DL
		S1 ZBV-1	S2 Zawtika Gas Pipeline Route St.1 (near KP 5)	S3 ZOC	S4 Wharf	S5 Heinze Bridge	S6 Base Camp	S7 Zawtika Gas Pipeline Route St.2 (near KP 18)	S8 Zawtika Gas Pipeline Route St.3 (near KP 29)	S9 USB 67	S10 ZBV-2	S11 Dawei Bridge	S12 NK 1		
Volatile Organic Compounds															
Benzene	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	15	1
Carbond Tetrachloride	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.3	1
1,2-Dichloroethane	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	7.6	1
1,1-Dichloroethylene	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.2	1
cis-1,2-Dichloroethylene	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	150	1
trans-1,2- Dichloroethylene	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	210	1
Dichloromethane	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	210	1
Ethylbenzene	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	230	1
Styrene	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1,700	1
Tetrachloroethylene	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	190	1
Toluene	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	520	1
Trichloroethylene	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	61	1
1,1,1-Trichloroethane	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1,400	1
1,1,2-Trichloroethane	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	19	1
Total Xylenes	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	210	1
Heavy Metals															
Arsenic (As)	mg/kg	0.716	2.45	25	11.4	19.9	8.64	13.2	4.01	2.18	2.92	3.44	2.9	27	0.100
Cadmium and compounds (Cd)	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	810	0.600
Hexavalent Chromium (Cr^{6+})	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	640	0.600
Lead (Pb)	mg/kg	3.27	7.81	8.43	5.18	28.8	9.01	16.3	4.33	5.93	10	22.8	22.4	750	3.10
Manganese and compounds (Mn)	mg/kg	31.1	145	618	62.2	26.3	232	20.4	336	111	211	445	2,023	32,000	0.500
Mercury and compounds (Hg)	mg/kg	0.441	ND	0.234	0.595	0.958	0.204	ND	ND	ND	ND	ND	ND	610	0.100
Nickel, soluble salts (Ni)	mg/kg	4.21	3.71	11.1	6.13	2.81	10.7	4.76	6.98	4.28	7.24	13.6	10.5	41,000	2.00
Selenium (Se)	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10,000	0.100
Copper (Cu)	mg/kg	1.81	0.973	17.2	7.35	5.18	13.8	4.2	8.14	4.72	6.68	12.6	15.3	2/	0.600
Zinc (Zn)	mg/kg	6.87	8.74	26.7	32.6	13.5	18	13.2	14.4	11.5	16.2	43	32	2/	0.700

Source: Final Report, Environmental Social and Health Impact Assessment (ESHIA), Zawtika Onshore Gas Transportation System (2009)

Remarks: 1/ Soil Quality Standards Type II for Other purposes, Notification of the National Environment Board No. 25, B.E. 2547 (2004)
2/ The value is not specified in the standard

Table 6.5 Soil Quality Results (cont.)

Parameter	Unit	Analytical Results											STD [1/]	DL
		S13 NK 2	S14 USB 75	S15 USB 95	S16 USB 99A	S17 USB 99B	S18 USB 100A	S19 USB 100C	S20 USB 114	S21 USB 121	S22 USB 130	S23 ZMR		
Volatile Organic Compounds														
Benzene	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	15	1
Carbond Tetrachloride	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.3	1
1,2-Dichloroethane	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	7.6	1
1,1-Dichloroethylene	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.2	1
cis-1,2-Dichloroethylene	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	150	1
trans-1,2- Dichloroethylene	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	210	1
Dichloromethane	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	210	1
Ethylbenzene	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	230	1
Styrene	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1,700	1
Tetrachloroethylene	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	190	1
Toluene	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	520	1
Trichloroethylene	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	61	1
1,1,1-Trichloroethane	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1,400	1
1,1,2-Trichloroethane	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	19	1
Total Xylenes	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	210	1
Heavy Metals														
Arsenic (As)	mg/kg	7.71	1.27	3.54	3.82	17.5	8.33	1.78	4.61	15.8	8.52	20.2	27	0.100
Cadmium and compounds (Cd)	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	810	0.600
Hexavalent Chromium (Cr^{6+})	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	640	0.600
Lead (Pb)	mg/kg	26.7	22.9	16.9	21.2	27.5	21.2	24.8	48.7	7.73	33.8	61.6	750	3.10
Manganese and compounds (Mn)	mg/kg	1,113	37.7	224	620	805	871	298	322	54.1	524	270	32,000	0.500
Mercury and compounds (Hg)	mg/kg	ND	ND	ND	ND	ND	ND	ND	0.879	0.437	0.950	0.720	610	0.100
Nickel, soluble salts (Ni)	mg/kg	17.3	6.54	4.34	5.32	15.4	7.73	2.97	6.82	7.90	14.7	5.97	41,000	2.00
Selenium (Se)	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10,000	0.100
Copper (Cu)	mg/kg	15.9	4.86	4.62	3.88	24.5	16.2	5.24	8.14	33.7	18.8	6.56	2/	0.600
Zinc (Zn)	mg/kg	30.4	24.3	22.4	28.7	42.3	24.2	30.4	32.4	15.2	68.0	17.0	2/	0.700

Source: Final Report, Environmental Social and Health Impact Assessment (ESHIA), Zawtika Onshore Gas Transportation System (2009)

Remarks: 1/ Soil Quality Standards Type II for Other purposes, Notification of the National Environment Board No. 25, B.E. 2547 (2004)
2/ The value is not specified in the standard

6.1.6 Groundwater Quality

A field survey was conducted to study groundwater quality for ESHIA Zawtika Onshore Gas Transportation System in 2009. Five (5) designated sampling stations were selected from village or household wells in communities located within one (1) km along the proposed pipeline route as follows (***Table 6.6***, ***Table 6.7*** and ***Figure 6.11***):

According to the results, most values complied with Thailand's Groundwater Quality Standard for Drinking Purposes, Suitable Allowance and Maximum Allowance concentrations, the Notification of the Ministry of Industry No. 12 B.E. 2542 (1999) issued under the Groundwater Act B.E. 2520 (1977) and Thailand's Groundwater Quality Standard, the Notification of the National Environment Board No. 20, B.E. 2543, except pH values at all sampling stations and colour and Arsenic values at Groundwater well in Daminseik which exceeded the standard. pH values at all sampling stations also exceeded Myanmar National Drinking Water Guideline (2019).

With regards to pH values which were found to be lower than the maximum band of allowance, those stations are most likely to have a contaminated source such as human activities (i.e. chemicals farming). Moreover, type of the strata of soil is an important cause that can potentially cause decreases of pH values.

Moreover, heavy metals at each sampling station, most tested values complied with the Thailand standards, except Arsenic (As) at groundwater well in Daminseik which exceeded the Thailand's Groundwater Quality Standard for Drinking Proposes, suitable allowance but still within the maximum band of allowance values. However, Arsenic at each sampling stations complied with the Thailand's Groundwater Quality Standard, the Notification of the National Environment Board No. 20, B.E. 2543 of ≤ 0.01 mg/L.

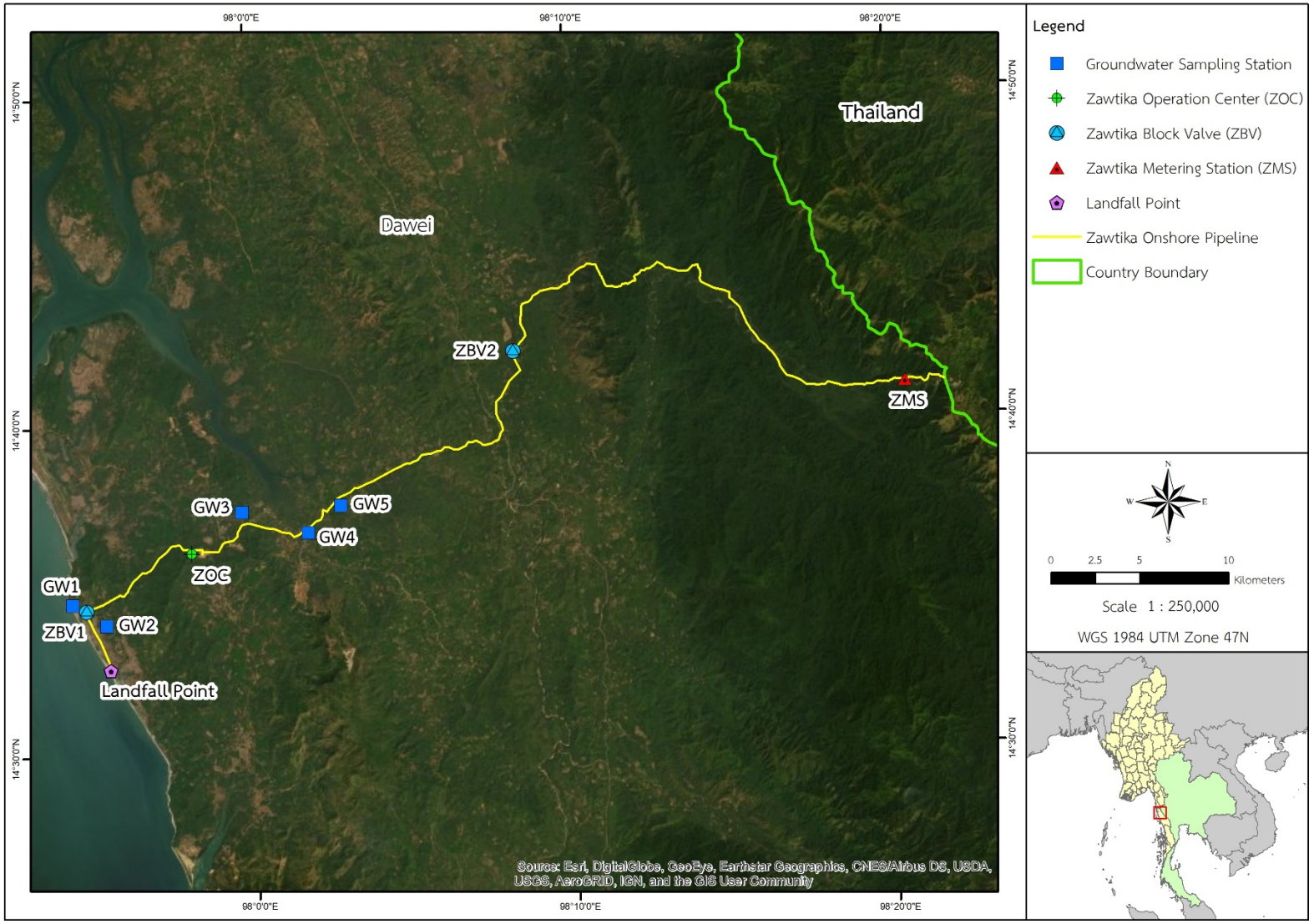
From the sampling result, groundwater from all five (5) villages was not suitable for drinking, but it can be used for other consumption such as bathing and washing. Most of the groundwater at each station was used for consumption only, except Ohnbinkwin and Shinbyan which used groundwater for both consumption and drinking.

Table 6.6 Groundwater Quality Sampling Stations

Sampling stations	Geography Coordinates		Projected Coordinates (WGS 84)		
	North	East	UTM	East (x)	North (Y)
GW1 Groundwater well at Daminseik	3° 24' 11.80''	108° 57' 32.88''	47 P	0382101	1611870
GW2 Groundwater well at Phaungdaw	3° 25' 18.83''	108° 56' 54.54''	47 P	0383991	1610649
GW3 Groundwater well at Ohnbinkwin	3° 29' 19.30''	109° 00' 15.73''	47 P	0391748	1616870
GW4 Groundwater well at Migyaungaing	3° 31' 18.66''	108° 59' 37.14''	47 P	0395457	1615621
GW5 Groundwater well at Shinbyan	3° 32' 17.32''	109° 00' 25.65''	47 P	0397304	1617121

Source: United Analyst and Engineering Consultant Company Limited (UAE), 2009

Figure 6.11 Groundwater Quality Sampling Stations



Source: ERM, 2019

Table 6.7 Groundwater Quality Results

Parameter	Unit	Analytical Results					Standards 1/		Standard 2/	Detection Limit
		Daminseik	Phaung daw	Ohnbinkwin	Migyaungaing	Shinbyan	Suitable Allowable	Maximum Allowable		
pH at 25.0 °C	-	**5.9****	**4.8****	**3.8****	**5.7****	**5.4****	7.0 – 8.5	6.5 – 9.2	-	1.0
Temperature	°C	25.0	24.9	24.2	24.6	25.6	-	-	-	-
Odour	-	None	None	None	None	None	-	-	-	-
Colour	Platinum-Cobalt	40**	ND	ND	ND	nD	5	15	-	5
Turbidity	NTU	1.5	0.3	0.3	0.5	0.7	5	20	-	0.1
Total Dissolved Solids	mg/L	89.5	31.5	35.5	54.2	ND	≤ 600	1,200	-	25.0
Iron (Fe)	mg/L Fe	0.132	0.020	0.014	0.048	0.027	≤ 0.5	1.0	-	0.010
Chloride (Cl)	mg/L Cl	15.9	4.40	3.91	12.4	ND	≤ 250	600	-	1.0
Manganese (Mn)	mg/L Mn	0.035	ND	0.020	0.010	ND	≤ 0.3	0.5	≤ 0.5	0.005
Sulphate	mg/L SO_4^{2-}	10.1	ND	ND	ND	ND	≤ 200	250	-	0.3
Nitrate	mg/L NO_3^-	6.94	3.94	1.84	1.85	0.14	≤ 45	45	-	0.09
Total Hardness	mg/L $CaCO_3$	31.2	4.0	4.0	26.1	14.1	≤ 300	500	-	4.0
Non Carbonate Hardness	mg/L $CaCO_3$	13.0	2.50	ND	6.00	0.50	≤ 200	250	-	0
Fluoride	mg/L F^-	0.14	0.22	0.16	0.08	0.04	≤ 0.7	1.0	-	0.02
Cadmuim (Cd)	mg/L Cd	ND	ND	ND	ND	ND	None	0.01	-	0.002
Hexavalent Chromium	mg/L Cr^{6+}	ND	ND	ND	ND	ND	-	-	≤ 0.05	0.006
Copper (Cu)	mg/L Cu	ND	ND	ND	ND	ND	≤ 1.0	1.5	≤ 1.0	0.006
Selenium (Se)	mg/L Se	ND	ND	ND	ND	ND	None	0.01	≤ 0.01	0.0005
Lead (Pb)	mg/L Pb	ND	ND	ND	ND	ND	None	0.05	≤ 0.01	0.010
Mercury (Hg)	mg/L Hg	ND	ND	ND	ND	ND	None	0.001	≤ 0.001	0.0002
Nickel (Ni)	mg/L Ni	ND	ND	ND	ND	ND	-	-	≤ 0.02	0.005
Zinc (Zn)	mg/L Zn	0.009	ND	ND	ND	ND	≤ 5.0	15	≤ 5.0	0.005
Arsenic (As)	mg/L As	**0.0005***	ND	ND	ND	ND	None	0.05	≤ 0.01	0.0003
Volatile Organic Compoinds										
Benzene	µg/L	ND	ND	ND	ND	ND	-	-	≤ 5	2
Carbon Tetrachloride	µg/L	ND	ND	ND	ND	ND	-	-	≤ 5	2
1,2-Dichloroethane	µg/L	ND	ND	ND	ND	ND	-	-	≤ 5	2
1,1-Dichloroethylene	µg/L	ND	ND	ND	ND	ND	-	-	≤ 7	2
Cis-1,2- Dichloroethylene	µg/L	ND	ND	ND	ND	ND	-	-	≤ 70	10
Trans-1,2-Dichloroethylene	µg/L	ND	ND	ND	ND	ND	-	-	≤ 100	10
Dichloromethane	µg/L	ND	ND	ND	ND	ND	-	-	≤ 5	2
Ethylbenzene	µg/L	ND	ND	ND	ND	ND	-	-	≤ 700	10
Styrene	µg/L	ND	ND	ND	ND	ND	-	-	≤ 100	10

Parameter	Unit	Analytical Results					Standards 1/		Standard 2/	Detection Limit
		Daminseik	Phaung daw	Ohnbinkwin	Migyaungaing	Shinbyan	Suitable Allowable	Maximum Allowable		
Tetrachlorothylene	µg/L	ND	ND	ND	ND	ND	-	-	≤ 5	2
Toluene	µg/L	ND	ND	ND	ND	ND	-	-	≤ 1,000	10
Trichloroethylene	µg/L	ND	ND	ND	ND	ND	-	-	≤ 5	2
1,1,1-Trichloroethylene	µg/L	ND	ND	ND	ND	ND	-	-	≤ 200	10
1,1,2-Trichloroethylene	µg/L	ND	ND	ND	ND	ND	-	-	≤ 5	2
Total Xylenes	µg/L	ND	ND	ND	ND	ND	-	-	≤ 10,000	10
Sample Condition		Clear Yellow, Yellow Sediment	Clear and Colourless	Clear and Colourless	Clear and Colourless	Clear and Colourless	-	-	-	-

Source: Final Report, Environmental Social and Health Impact Assessment (ESHIA), Zawtika Onshore Gas Transportation System (2009)

Remarks: 1/ Groundwater Quality Standard for Drinking Proposes, Suitable Allowance and Maximum Allowance Concentrations, Notification of the Ministry of Industry No. 12 B.E. 2542 (1999) Issued under in the Groundwater Act B.E. 2520 (1977)

2/ Groundwater Quality Standard, Notification of National Environment Board No. 20, B.E. 2543

- = Not specified in the Standard

ND = Non-Detectable

* = Not compiled with the siotable allowable standard; ** = Not compiled with the maximum allowances

6.2 BIOLOGICAL COMPONENTS

This section describes the biological environment of the Study Area. The discussion is limited to the biological components of the environment likely to be present in the Study Area and potentially affected by the Project activities, as follows:

- Ecoregion;
- Forest;
- Topography and Vegetation;
- Wildlife; and
- Aquatic Ecology.

Each of the above are discussed in the following sections.

6.2.1 *Ecoregion*

Ecoregion is defined by IUCN as "a geographical area presenting similarities and links to particular ecology and culture which defined coherent entity."[1]

Southern Myanmar is represented by five (5) ecoregions[2], namely the Myanmar Coastal Rain Forests[3], Tenasserim-South Thailand semi-evergreen rain forests[4], Irrawaddy Freshwater Swamp Forests[5], Myanmar Coastal Mangroves[6], and Mizoram-Manipur-Kachin Rain Forests[7]. However, the ecoregion that is within interest of the Project Area are the Myanmar Coastal Rain Forests and Tenasserim-South Thailand semi-evergreen rain forests. The two (2) ecoregions are described in the following sub-sections.

6.2.1.1 *Myanmar Coastal Rain Forests*

This ecoregion is low in endemism but contains a rich fauna and flora, largely as a result of its lush vegetation, extensive range of habitats from mangroves to mountains. This ecoregion provides habitat to several threatened and endangered species such as the tiger (*Panthera tigris*), Asian elephant (*Elaphas maximus*), cloaded leopard (*Pardofelis nedulosa*), leopard (*Panthera pardus*), Asiatic golden cat (*Felis temmincki*), and gaur (*Bos gaurus*). The ecoregion also

1/ IUCN Definitions – English. URL: https://www.iucn.org/downloads/en_iucn__glossary_definitions.pdf

2/ Han, U.S., Khaing, S.T. (2018). Southeastern Asia: Southern Myanmar. World Wildlife Fund (WWF). Retrieved from: https://www.worldwildlife.org/ecoregions/im0116

3/ Than, U.T., Wikramanayake, E. (2018). Myanmar Coastal Rain Forests. World Wildlife Fund (WWF). Retrieved from: https://www.worldwildlife.org/ecoregions/im0132

4/ Loucks, C., Carpenter, C., and Maxwell, J. F. (2020). Indochina: Myanmar, Thailand, and Malaysia. World Wildlife Fund (WWF). Retrieved from: https://www.worldwildlife.org/ecoregions/im0163

5/ Han, U.S., Khaing, S.T. (2018). Irrawaddy Freshwater Swamp Forests. World Wildlife Fund (WWF). Retrieved from: https://www.worldwildlife.org/ecoregions/im0116

6/ Han, U.S., Khaing, S.T. (2018). Myanmar Coastal Mangroves. World Wildlife Fund (WWF). Retrieved from: https://www.worldwildlife.org/ecoregions/im1404

7/ Than, U.T., Wikramanayake, E. (2018). Mizoram-Manipur-Kachin Rain Forests. World Wildlife Fund (WWF). Retrieved from: https://www.worldwildlife.org/ecoregions/im0131

contains more than three-hundred-fifty (350) bird species, none of which are considered ecoregional endemics.

The area of this ecoregion is approximately 25,700 square miles (66,562.7 km^2). Most of the seasonal evergreen forest and almost all the freshwater swamp of this ecoregion has been cleared for agriculture.

6.2.1.2 *Tenasserim-South Thailand semi-evergreen rain forests*

These ecoregions cover the transition zone from continental dry everygreen forests common in the north to semi-evergreen rainforests to the south. Therefore, containing some of the highgest diversity of both bird and mammal species found in the Indo-Pacific region[1].

A general location and description of this ecoregion can be described as mountainous, semi-evergreen rain forests of the southern portion of the Ternasserim Range that seperates Myanmar and Thailand. Annual precipitation increases towards southern area of this ecoregion with shorter length and intensity of the premonsoon drought decreases[2].

Currently, the existing protected area system includes 22 reserves that cover 11,530 km^2, where most of this is located within Thailand. Some part of this ecoregion in Myanmar has been designated as protected area however there are also still large block of intact evergreen forest habitat remains that are not protected[3].

6.2.2 ***Forest***

Myanmar is rich in forest because of its variety of climates. Forests grow from area of tidal swamps at sea level up to an altitude of 12,000 feet. The types of forest depend on climate, topography, soil and other factors such as fresh water, salt water, etc. Classification of forest type in Myanmar has been attempted by many foresters and bionists. At present, forests types in Myanmar are classified as eight (8) dominant types and are described in the following sub-sections:

6.2.2.1 *Tidal Forests*

Tidal Forests are mainly found along the coast of Ayeyarwady delta, in the central parts of Rakhine and Tanintharyi coast and also intertidal creeks, as these forests are able to grow in mud brought down by rivers. The composition of the forest depends mainly on two (2) factors; the salinity of the water and the duration of the inundation. Tidal forests consist of four (4) types:

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1 Loucks, C., Carpenter, C., and Maxwell, J. F. (2020). Indochina: Myanmar, Thailand, and Malaysia. World Wildlife Fund (WWF). Retrieved from: https://www.worldwildlife.org/ecoregions/im0163

2 Loucks, C., Carpenter, C., and Maxwell, J. F. (2020). Indochina: Myanmar, Thailand, and Malaysia. World Wildlife Fund (WWF). Retrieved from: https://www.worldwildlife.org/ecoregions/im0163

3 Loucks, C., Carpenter, C., and Maxwell, J. F. (2020). Indochina: Myanmar, Thailand, and Malaysia. World Wildlife Fund (WWF). Retrieved from: https://www.worldwildlife.org/ecoregions/im0163

- Lower Mangrove Forest;
- Tree Mangrove Forest;
- Salt Water Heritiera (Kanazo) Forest; and
- Fresh Heritiera (Kanazo) Forest.

6.2.2.2 Beach and Dune Forests

This type of forest occurs all along the coast where wide sandy beach is located. It also occupied sandy bars on the sea facing the estuaries. The soil consists of sea sand with lime from shell fragments but it lacks in mineral food. The soil is coarse, porous and dry at the surface, but with high water. Rainfall varies within wide limits and the area is often faced with strong winds.

6.2.2.3 Swamp Forests

There are three sub-type forest that are classified under Swamp Forests, these are:

- Delta Fresh Water Swamp Forest (Konbyaik) – these are found on clayey flats at the head of deltas on higher levels The areas are overwhelmed during the monsoon, but not by the tide water during the rest of the year;
- Tropical Valley Fresh Water Swamp Forest (Myaing) – these occupies on low-lying alluvial land usually near rivers and lakes such as in depressions of old river beds. The areas are not permanent swamps but are under water during the rainy season. Rainfall in this area usually exceeds fifty (50) inches but the water table never falls below 12-15 feet; and
- Moist Riparian Forest – these occurs in a narrow fringe on new sandy alluvium in the banks of the larger rivers. Pyinma is the most typical tree of this type, with smaller trees, shrubs and grass between.

6.2.2.4 Evergreen Forests

There are two (2) sub-type forest that are classified under Evergreen Forests, these are:

- Tropical Wet Evergreen Forest – this type occupies Tanintharyi, Mon, Kayin, Lower Myanmar, Rakhine, northwestern Chin, Upper Chindwinn drainage area, Central Kachin area, and Thanlwin drainage area. The Tropical Rain forest or Giant Evergreen Forest (also known as Dipterocarp Forest) is found mainly in Sounthern Tanintharyi. This area has a rainfall of over hundred-twenty (120) inches, well distributed throughout the year, and a sufficiently retentive soil on the slopes. The characteristics are the presence, of a large number of species, of unbroken and dense canopy, of abundant epiphytes, of climbers and generally the absence of ground vegetable; and

- Tropical Semi-Evergreen Forest – this type occurs in V-shaped area from northern Kayin via southern Bago Yoma to parts of Southern Rakhine, South-western Chin area, inverted V-shaped area from northern Chin via Central Chindwinn drainage area and Sounthern Kachin to Northwestern Shan. Tropical Semi-Evergreen and Moist Deciduous Forests. The dry season is well marked, and annual rainfall is about eighty (80) inches.

6.2.2.5 Mixed Deciduous Forests

These forests occupy thirty-nine (39) percent of the forested area. The most valuable timbers are extracted from these forests and there are three (3) sub-type forest classified under Mixed Deciduous Forests, these are:

- Moist Upper Mixed Forest – this type covers large area in Bago Yomas and extends westwards to the lower foothills of Rakhine Yomas and chin Hills. In the south, it occupies Lower Thanlwin drainage area. In the north, it occupies Katha, Bhamo and Myitkyina areas. In the east, it is found along the western edge of Shan Highlands. The usual habitat is hilly and the slopes are well-drained that shows a good quality of soil. Rainfall varies from sixty (60) inches to eighty (80) inches and it has a higher rainfall on certain places;
- Lower Mixed Forest – this type occurs on lower ground of alluvial or clayey soils. The rainfall is eighty (80) inches or more. It is a closed high forest. Some trees rise up to the height of one-eighty (180) feet. These predominantly are letpan, yon, baing and sit. The highest percentage of kjun (teak) occurs in this forest of Myanmar; and
- Dry Upper Mixed Forest – the drier type of Upper Mixed Forest is found on the ridge tops. The usual annual rainfall is 40-50 inches. This forest type is found on the central part of Bago Yomas, and on the fringe of Dry Zone. It is also found around the Indaing Forest, and locally on low lying dry sites.

6.2.2.6 Dry Forests

These forests are found in areas where the rainfall is under fifty (50) inches. All the Dry Forests are found in Dry Zone of Central Myanmar where it covers approximately ten (10) percent. There are three sub-type forest classified under dry forests, these are:

- Than-dahat Forest – this type covers the areas of usually clay soil with a rainfall of thirty-five (35) to forty (40) inches. The two (2) principal species are than and dahat. The forest is of poor quality with low branched trees widely spread. The height of the tree rarely exceeds thirty (30) feet. Shrubby bushes and low grass cover the ground. Other species are cutch, thitsanwin, palan, zaunggyan, thamon and thanatka. In some sites, myinwa is present;

- Thorn Forest - in drier areas, thorny species such as sha (cutch), htanaung and zi are found. The trees have short boles and low branching crowns nearly touching each other. A thin grass growth and some shrubs are also found; and
- Aukchinsa- thinwin Forest – this is a rare type of forest that comprised aukchinsa, sha, thinwin, and the trees are scattered. Stunted myinwa and grasses.

6.2.2.7 Deciduous Dipterocarp (Indaing) Forests

These types of forests cover five (5) percent of the forest area and there are three (3) sub-type forest classified under Deciduous Dipterocarp Forests, these are:

- Indaing High Forest – this type occupies drier parts of lower and upper Myanmar, but locally in regions of high rainfall, although it is able to grow on recent sandy alluvium in the valleys of the main rivers;
- Semi-indaing Forest – this habitat has an annual rainfall of about fifty (50) inches and upward. The soil is sandy or gravelly or late rite. This type of forest is a transition between Dry Mixed Deciduous Forest and Indaing Forest and commonly found on low ridge tops. The main species are ingyin, thitya, in, taukkyan, teak, pyinkado, nabe, zibyu and kabaung; and
- Indaing Scrub Forest – this type is found on sites with rainfall of twenty-five (25) inches as well as that of eighty (80) inches. Soil is the most important factor. Soils are shallow and coarse sandy and lateritic. Indaing Scrub also occurs on ridges in dry and exposed sites. The growth is much inferior, and the scrub is from twenty-five (25) feet to fifty (50) feet high.

6.2.2.8 Hill and Temperate Evergreen Forests

These types of forests cover twenty-six (26) percent of the forest area and there are three (3) sub-type forest classified under Hill and Temperate Evergreen Forests, these are:

- Sub-Tropical Wet Hill Forest – the transition from Tropical Evergreen Forest to Sub-Tropical Wet Hill Forest is assumed to occur at about 3,000 feet (height);
- Sub-Tropical Hill Savannah - This type is found on the Shan plateau and ridge tops at heights between 2,500 and 5,000 feet; and
- Temperate and Alpine Forest-Temperate Forest covers on the higher hills of northern Myanmar from about 5,000 feet upwards. The forest is broken up by stretches of grasslands. The forest is a closed temperate, but certain deciduous species are present.

6.2.3 *General Description on Topography and Vegetation*

Tanintharyi region has an area of 43,344 square kilometer (16,736 square miles) and the vast land area is covered by Evergreen Forest. Tanintharyi receives 3,000 to 4,000 mm of rain each year and normally it rains from May to October. The length of the mainland coast is about 1,200 km.

A survey was conducted for ESHIA Zawtika Onshore Gas Transportation System in 2009 and it was found that along the pipeline route there are a number of rivers and streams. Some of the well-known rivers are Mayan River, Dawei River, Meke River, Zinba River. Some of streams found are important for the wildlife animals including tigers such as khotamar stream, Natkyizin stream, kyauklone-gyi stream and ethi stream. The well-known mountains close to the study area include Thitkha Taung, Mayan Taung, Nahi Taung, Banni Taung, Meke Taung and Ma-Lwe Taung.

In this study, the surrounding of the Zawtika onshore gas pipeline includes the northern parts of the Tanintharyi region including Heinze- Kaleinaung reserved forests and Luwaing reserved forest. The Zawtika pipeline was observed in the Heinze and Kaleinaung reserved forests. These three (3) reserved forests have an approximate area of about 1,300 square miles. Most part of the reserved forests are undisturbed due to the security condition, lack of road access, steep mountain ranges and extremely thick moist forest with dense undergrowth.

6.2.3.1 *Forest Types*

The "Tanintharyi Nature Reserve" extensively lies in the Heinze and Kaleinaung reserved forests. The reserves are situated between latitudes 15° 7' 30" and 14° 30' North and longitudes 97° 55' and 98° 30' East in the extreme north of the Tanintharyi forest Division. The reserves are bordered with Myanmar/Thai borderline at the east. The area of Heinze and Kaleinaung reserves has approximately six-hundred-and-fourteen (614) square miles. The climate of this area may be described as wet and generally intermediate between that of Myanmar and the Malay Peninsula rather than that of Myanmar proper.

The forest cover includes giant evergreen forest and sub-evergreen forest. Giant evergreen forest is probably the most important type in these reserves, not only because it occupies a relatively greater area than any other type but also because it supports the existence of diverse fauna. Giant evergreen predominates on all the highest hills, ridges and spurs up to an elevation of about 3,000 feet and in the eastern portion of the area near the Thai/Myanmar border it occurs in very extensive homogeneous blocks.

6.2.3.2 *Species Distribution*

A field survey was studied for the ESHIA Zawtika Onshore Gas Transportation System in 2009 and recorded a total of three-hundred-sixty-six (366) plant species throughout the entire area. Most of them were tree (117 species or 32 %), shrub (63 species or 17 %), herb (51 species or 14 %) and small tree (35 species or 9.5 %) (as shown in ***Table 6.8***). Most vegetation species (304 species or 83 % of total) were observed on secondary forest including woodland and grassland areas because it is a major habitat found along the study area.

Table 6.8 Summary of Plant Species Recorded Along the Pipeline Route for ESHIA Zawtika Onshore Gas Transportation System (2009)

Vegetation Type	Vegetation Observed	
	Number of Species	Percentage
Climber	29	8
Shrub	63	17
Herb	51	14
Tree	117	32
Small tree	35	9.5
Epiphyte	5	1.4
Fern	6	1.6
Aquatic	4	1.1
Grass	22	6
Orchid	1	0.3
Bamboo	2	0.5
Climber/Creeper	17	5
Shrub/Climber	8	2
Shrub/Creeper	1	0.3
Shrub/Small tree	2	0.5
Shrub/Tree	3	0.8
Total Species	**366**	**100.0**

Source: the ESHIA Zawtika Onshore Gas Transportation System, 2009

6.2.3.3 *Threatened Species*

A field survey was studied for the ESHIA Zawtika Onshore Gas Transportation System in 2009 and six (6) threatened plant species were recorded during the study period. The threatened plan species were observed mostly as part of the primary forest, and these were:

- Kanyin-byu (*Dipterocarpus alatus* Roxb.);
- Kanyin (*Dipterocarpus costatus* Gaertn. f.);
- Kanyin (*Dipterocarpus grandiflorous* Blanco);
- Kanyin (*Dipterocarpus kerrii* King);
- Kanyin (*Dipterocarpus turbinatus* Gaertn. f.); and
- Thingan (*Hopea odorata* Roxb.).

6.2.4 *Key Biodiversity Areas*

KBAs are defined by the Key Biodiversity Areas Partnership[1] as sites that contribute significantly to the global persistence of biodiversity, applicable to terrestrial, freshwater, and marine ecosystems[2]. Sites qualify as global KBAs if they meet one or more of eleven (11) criteria as defined by the Partnership, grouped into the following five categories: threatened biodiversity, geographically restricted biodiversity, ecological integrity, biological processes and irreplaceability. 3 KBAs that are within Myanmar have been identified within the Project Area and the 50 km buffer zone are listed in ***Table 6.9*** and a map showing location of these KBAs is presented in ***Figure 6.12***.

Table 6.9 KBAs Identified within the Project Area, Myanmar and fifty (50) km Buffer Zone

Area Name	IBA[a]	Distance and Direction
Taninthayi Nature Reserve	No	Within
Moscos Kyun	No	21 km Southwest of Project
Myinmoletkhat	No	32 km South of Project

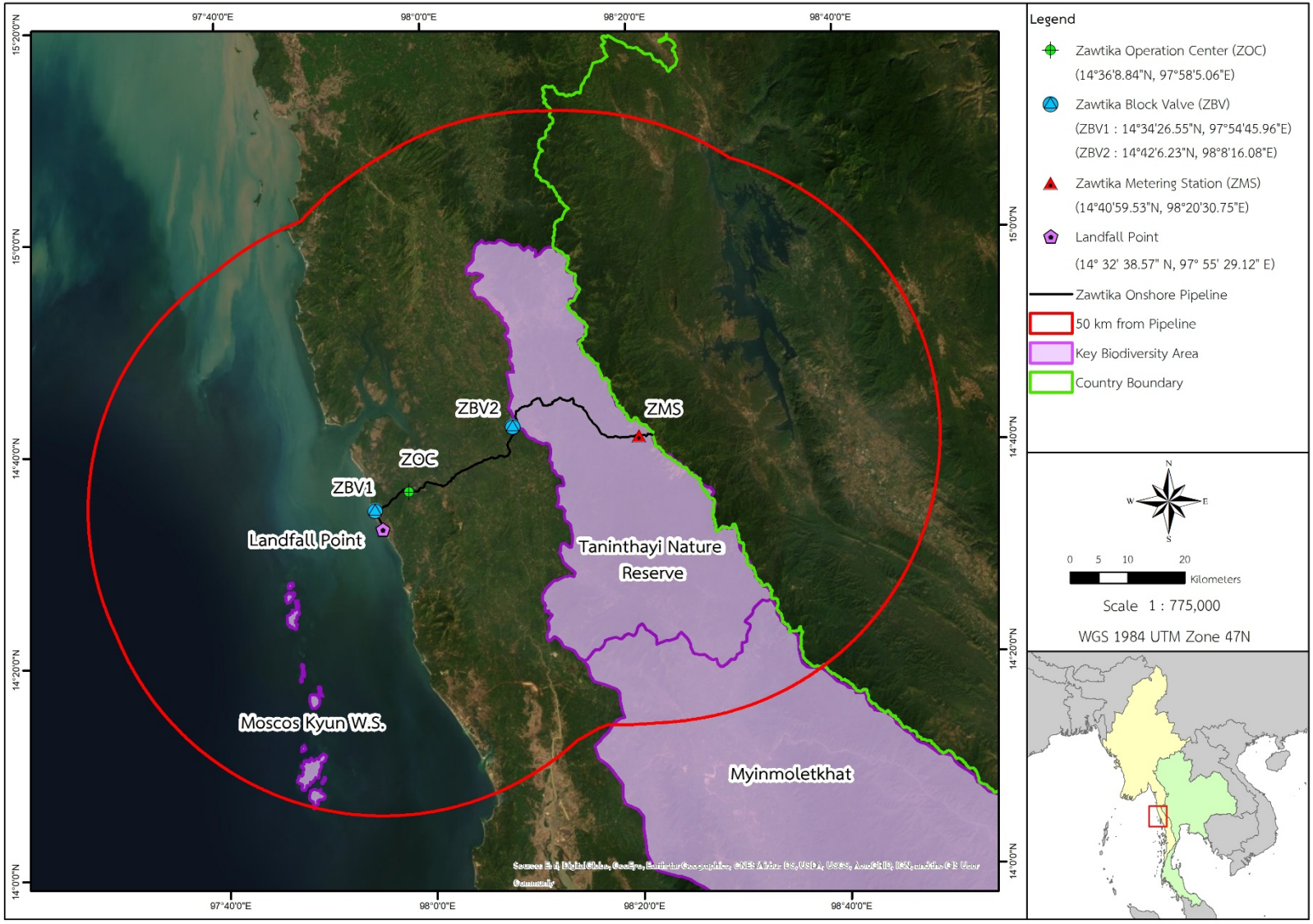
Source: IBAT, 2019

Note: [a] Further identification if the KBA is also an Important Bird and Biodiversity Area (IBA)

[1] Key Biodiversity Partnership comprises a consortium of 12 conservation NGOs including BirdLife International, IUCN, Amphibian Survival Alliance, Conservation International, Critical Ecosystem Partnership Fund, Global Environment Facility, Global Wildlife Conservation, NatureServe, Rainforest Trust, Royal Society of the Protection of Birds, WWF and Wildlife Conservation Society.

[2] BirdLife International (2018) What are KBAs and how are they identified? Retrieved from: http://www.keybiodiversityareas.org/what-are-kbas

Figure 6.12 KBAs within Myanmar and 50 km buffer zone from the Project Area



Source: ERM, 2020

6.2.4.1 *Protected Areas*

According to the IUCN, a protected area is "A clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values"[1]. It should be noted that the Tanintharyi Nature Reserve was recently classified as an ASEAN Heritage Park.

Protected areas that have been identified within the Project area and the fifty (50) km buffer zone are listed in ***Table 6.10***.

Table 6.10 Protected Areas Identified within the Project Area, Myanmar and fifty (50) km Buffer Zone

Area Name	Designation	IUCN Category	Distance and Direction
Taninthayi N.R.	Nature Reserve	Ia	Within

Source: IBAT, 2019

Note: IUCN Category
Ia – Strict Nature Reserve;
Ib – Wilderness Area;
II – National Park;
III – Natural Monument or Feature;
IV – Habitat / Species Management Area;
V – Protected Landscape / Seascape / Area;
VI – Protected Area with sustainable use of natural resources.

6.2.4.2 *Important Bird and Biodiversity Area*

An important bird and biodiversity area (IBA) is an area that is globally important for the conservation of bird populations. There are no IBA in Myanmar that is within the 50 km buffer zone.

6.2.4.3 *Alliance for Zero Extinction Sites*

The Alliance for Zero Extinction Sites (AZE) works to increase the population of endangered and critically endangered species[2]. This method involves eliminating human threats such as commercial exploitation, disease, and introduction of invasive species. The National Alliance for Zero Extinction is a form of partnership between government agencies and non-governmental organizations, in compliance with national commitments under the United Nations (UN) Convention on Biological Diversity.

[1] IUCN (2008) Protected Areas. International Union for Conservation of Nature. Retrieved April 11, 2019, from: https://www.iucn.org/theme/protected-areas/about

[2] Alliance for Zero Extinction (2018) 2018 Global AZE Map. Retrieved from: http://zeroextinction.org/site-identification/2018-global-aze-map/

Tanintharyi Nature Reserve, which is located within the Project Area, is identified as an AZE; species that triggered this status includes the Tiger (*Panthera tigris*), and the Thin Thin's Stream Toad (*Ansonia thinthinae*).

6.2.5 *Endemic Bird Areas*

Endemic Bird Areas (EBAs) are regions that represent natural areas of bird endemism where the distribution of two or more restricted-range bird species overlap, where restricted-range refers to a breeding range of no more than 50,000 km^2 [1]. There are no EBAs located within the Project area or the fifty (50) km buffer zone. The closest EBA to the Project Area is the Irrawaddy plains, approximately three-hundred-sixty (360) km, with a total area of 160,000 km^2 [2].

6.2.6 *Tiger Conservation Landscapes*

Tigers are large carnivores that occur at low densities and require large home ranges to harbour viable populations[3]. Much of the global conservation policy on endangered species is focused on land allocation schemes for supporting tiger populations, in addition to promoting and maintaining connectivity among fragmented landscapes and populations. Tiger Conservation Landscapes (TCLs) are defined as identified connected areas of suitable tiger habitat that can support at least five (5) adult tigers and where tiger presence has been confirmed in the past decade[4].

A large TCL exists within Myanmar, which extends from the central down to the southern regions. This TCL is also transboundary, covering the western bordering areas of Thailand. The Project is also located within this TCL.

A map showing TCL with respect to the Project Area is presented in ***Figure 6.13***.

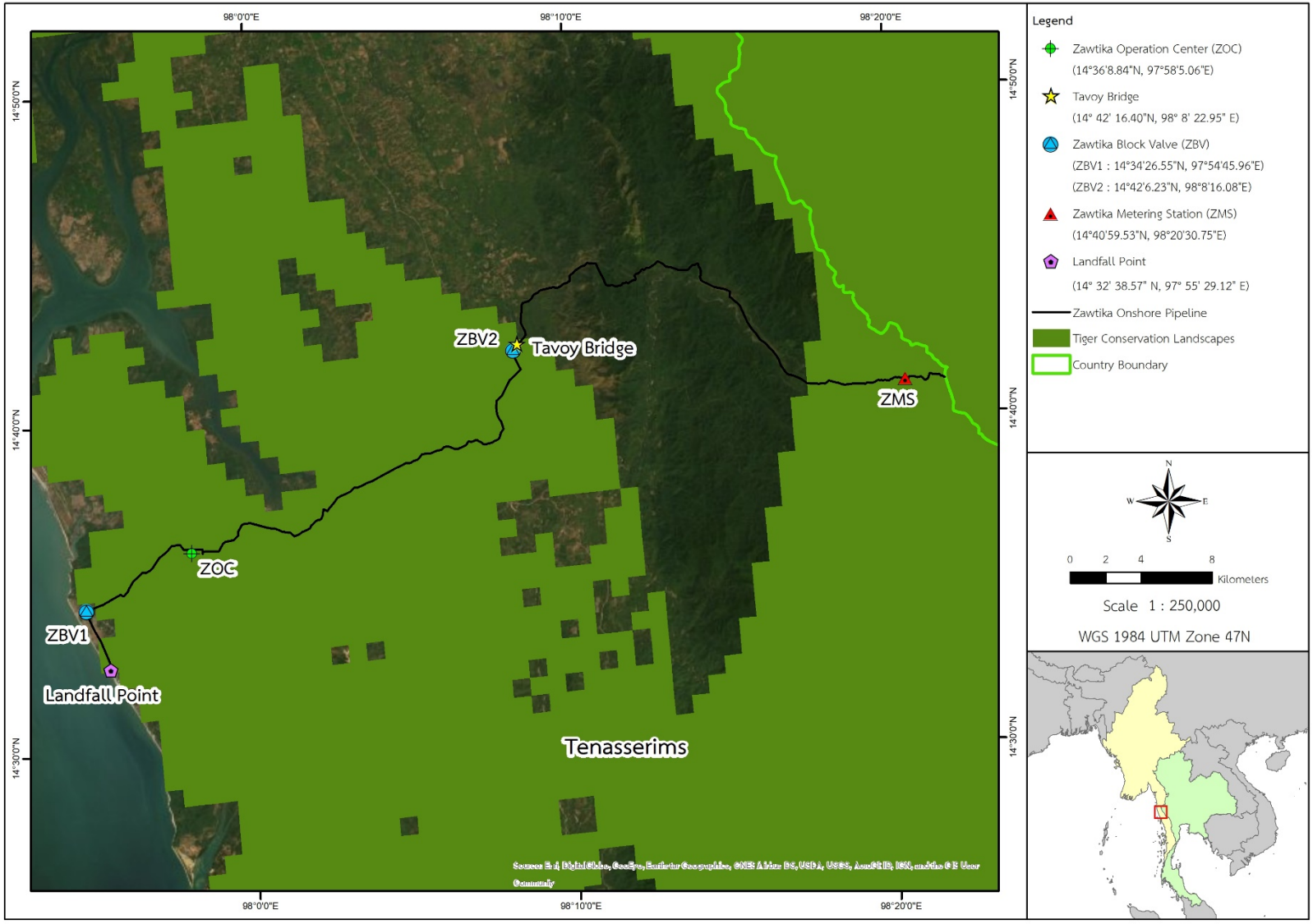
[1] BirdLife International (2018) EBA Summary. Retrieved from http://datazone.birdlife.org/eba

[2] BirdLife International (2019) Irrawaddy plains. Retrieved April 18, 2019 from: http://datazone.birdlife.org/eba/factsheet/136

[3] Linkie, M., Wibisono, H.T., Martyr, D.J. & Sunarto, S. (2008) *Panthera tigris* ssp. *sumatrae*. The IUCN Red List of Threatened Species 2008: e.T15966A5334836. http://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T15966A5334836.en

[4] O'Brien, E. Sanderson, J. Seidensticker and M. Songer (2006) Setting Priorities for the Conservation and Recovery of Wild Tigers: 2005‐2015. A User's Guide. WWF, WCS, Smithsonian, and NFWF-STF, Washington, D.C. ‐ New York. Retrieved from: https://c402277.ssl.cf1.rackcdn.com/publications/639/files/original/TCL_UserGuide2006.pdf?1378820490

Figure 6.13 TCLs within Myanmar and 50 km buffer zone from the Project Area



Source: ERM, 2020

6.2.7 *Wildlife*

A field survey was studied for the ESHIA Zawtika Onshore Gas Transportation System in 2009 to identify the wildlife condition of the Project Area. The follow sub-sections detail findings of each type of wildlife.

6.2.7.1 *Large Mammals*

Twelve (12) species of large mammals were found from the survey, four (4) of them, i.e. Elephant (*Elephas maximus)*, Tiger (*Panthera tigris)*, Banteng (*Bos javanicus)* and Malayan Sun Bear (*Helarctos Malayanus*), were Endangered (E) species, five (5) were Vulnerable (V), one (1) was Near Threatened (NT) and two (2) were not listed according to the IUCN red-list.

6.2.7.2 *Small Mammals*

A total of fourth-four (44) small mammal species were recorded during the survey periods. Most small mammals were not in the IUCN red-list. Only two (2) species of Pangolin (*Manis javanica*) and White-handed gibbon (*Hylobates lar*) were Endanger species and Mouse deer Tragulus napu was Near Threatened species.

Some species like slow loris, different kinds of monkeys, cats, pangolin and porcupine were found mainly in the primary forest whereas squirrels, shrews, bats and rats except red spiny rat were found not only in the forests but also in agricultural lands and around human habitation area.

6.2.7.3 *Reptiles and Amphibians*

A total of eighteen (18) reptilian species and thirteen (13) amphibian species were recorded during the survey period.

Among the recorded reptilian species, the yellow tortoise (*Indotestudo elongate*) is listed as endangered species. Indian black turtle (*Melanochelys trijuga*) is also recorded as Near Threatened species and Asian giant softshell turtle (*Pelochelys bibroni*) as vulnerable species.

In the present study, only turtle and tortoise species are found as threatened species. It is predicted that there will not be an adverse impact on the reptilian species by the Zawtika onshore gas pipeline because the species are secretive and mobile in their habit.

6.2.7.4 *Birds*

A total of one-hundred-and-fifty-nine (159) bird species, which belong to thirty-seven (37) families and ninety-three (93) genera, were recorded along the Zawtika onshore gas pipeline area.

In the present study, one (1) threatened (T) species (i.e. Bucerotidae Rufous-necked Hornbill *Aceros nipalensis*) was recorded in primary forest and four (4) near threatened species (NT) were recorded (i.e. Great hornbill *Eurystomus*

orientalis; Blyth's Kingfisher *Alcedo meninting*; Brown-winged Kingfisher *Pelargopsis amauroptera*; Asian Golden Weaver *Ploceus hypoxanthus*).

6.2.8 *Aquatic Ecology*

A field survey was studied for the ESHIA Zawtika Onshore Gas Transportation System in 2009 and five (5) out of seven (7) surface water sampling stations were selected for fish and plankton & benthic survey. The follow sub-sections detail findings of the aquatic ecology.

6.2.8.1 *Fish*

According to fish sampling results from all stations, a total of eight fish species were found during the study period with a total length of 7.4-22 cm and 5-100 g of body weight.

The dominant species were *Opsarius pulchellus* and *Danio aequipinnatus*. All fish are common species and frequently found in rocky gorges streams in this area. In addition, all species are not in the International Union of conservation or Nature and Natural Resources (IUCN) red list.

6.2.8.2 *Plankton*

From the survey, the findings show that the abundance of phytoplankton and zooplankton at brackish water stations (Wharf and Heinze Bridge) were higher than freshwater stations.

The average total density of phytoplankton was 1,524,983 cells/m^3 and zooplankton was 93,622 cells/m^3. *Nitzschia* sp. and *Tintinnopsis* sp. were the dominant species of phytoplankton and zooplankton respectively.

6.2.8.3 *Benthic Fauna*

Considering benthic sampling, the average total density was sixty-three (63) individuals/m^2. *Ophiogomphus* sp. and *Ephemera* sp. were dominant species. Most species were insect larva which are usually found in rapid flowing fresh water.

6.3 SOCIO-ECONOMIC COMPONENTS

The social conditions of the entire concession block and its vicinity (hereinafter referred to as the "Study Area") will be described in this section are based primarily on a desktop review of existing information from Myanmar Information Management Unit and PTTEP: Environmental, Social and Health Impact Assessment (ESHIA), Zawtika Onshore Gas Transportation System in September 2009.

The Study areas will cover the following villages in Yebyu Township, Dawei District, and Tanintharyi Region:

- Daminseik;
- Phaungdaw;
- Kaunghmu;
- Ohnbinkwin;
- Mighaungaing; and
- Shinbyan

6.3.1 *Demographic Profile*

6.3.1.1 *Tanintharyi Region*

According to Myanmar Information Management Unit (MIMU), the total population for Tanintharyi Region in 2015 was 1,408,401 people, with twenty-four percent (24%) urban population and seventy-six percent (76%) rural population.

Tanintharyi Region is sparsely populated due to its mountainous terrain with the majority of the population living either near the coast or along the rivers and tributaries.

The majority of residents in Tanintharyi were Bamar, although some self-identify as sub-groups such as the Dawei/Tavoyan. Likewise, while nearly all Tanintharyi inhabitants speak Myanmar language, various local dialects are also found. Buddhism is the dominant religion in Tanintharyi, although Islam and Christianity are also observed, particularly in Karen communities[1].

[1] Department of population, Ministry of labour, immigration and population. (May 2015). The 2014 Myanmar Population and Housing Census: Tanintharyi Region. Retrieved on October 24, 2019 from https://myanmar.unfpa.org/sites/default/files/pub-pdf/Tanintharyi%20Region%20Census%20Report%20-%20ENGLISH.pdf

6.3.1.2 *Yebyu Township*

The total population for Yebyu Township in 2015 was 100,768 people (50.4% males and 49.6% female), with 4.7% urban population and 95.3% rural population. There are four (4) wards and twenty-seven (27) tracts in the Township. The total number of private households was 22,073 with 28.4% of female-headed households[1].

A brief demographic overview of Tanintharyi Region and Yebyu Township is summarised in ***Table 6.11***.

Table 6.11 Demographic Overview of Tanintharyi Region and Yebyu Township

Attribute	Tanintharyi Region	Yebyu Township
Total Population	1,408,401	100,768
Area	43,344.91 km^2	2,447 km^2
Population Density (persons per km^2)	32.5	41.2
Gender Ratio	99 males per 100 females	102 males per 100 females
Rural Population	76%	95.3%
Urban Population	24%	4.7%
Median age (years)	24	25.4
Mean household size (persons)	4.8	4.3
Literacy rate (persons aged 15+)	92.8%	84.4%
Unemployment rate, age 15-64	4.6%	6.9%

Source: Census data by MIMU, 2017

6.3.1.3 *Daminseik Village*

Located close to the proposed landfall site on Tanintharyi coast. Daminseik is the starting point of the Zawtika onshore gas pipeline.

Daminseik is a village tract (extended community) ruled by Phaungdaw village. In 2009, there was about 1,200 people living in one-hundred-ten (110) households. Most villages comprise of mainly working age people with a higher proportion of women. Majority of people are Buddhists. The main ethnic group in the community is Mons.

Each household settled close together as a group of houses. Majority of houses have one (1) floor with high basement and are made of natural materials, i.e. bamboo, nipa leaves with some from ceramic, brick and steel.

[1] Department of population, Ministry of labour, immigration and population. (October 2017). The 2014 Myanmar Population and Housing Census: Yebyu Township Report. Retrieved on October 24, 2019 from https://themimu.info/sites/themimu.info/files/documents/TspProfiles_Census_Yebyu_2014_ENG.pdf

6.3.1.4 *Phaungdaw Village*

In 2009, there was about 3,840 people living in four-hundred-and-fifty-five (455) households. Most of the population is in working age and the female population are slightly higher than the male. Majority of people are Buddhists.

Most houses are made from wood and concrete with one (1) floor and high basement or two (2) floors.

6.3.1.5 *Kaunghmu Village*

Kaunghmu, is a village tract ruled by Phaungdaw. In 2009, there was about eight-hundred-fifty (850) people living in two-hundred-thirty (230) households. Female population was slightly higher than the male.

Majority of houses are made from wood and natural material with one (1) floor and high basement or two (2) floors. Some houses are made from brick and concrete

6.3.1.6 *Ohnbinkwin Village*

A community with 2,700 people in five-hundred-fifty (550) households. Most of the population are local Myanmar people with Karen as a minority. Female population is slightly higher than the male.

Most houses are one (1) floor with high basement made of natural materials. Two floors household made from wood and concrete can also be seen.

6.3.1.7 *Mighaungaing Village*

In 2009, there was about 2,350 people living in four-hundred (400) households. Female population was slightly higher than the male.

House pattern are one (1) floor and two (2) floors house style with no basement, constructed from natural materials, wood, and concrete.

6.3.1.8 *Shinbyan Village*

Shinbyan is a Karen Christian village, ruled by Eindayaza village. In 2009, there was about two-hundred-seventy (270) people in forty-three (43) households. Female population is equal to the male.

Majority of houses are made from natural materials with one (1) floor and high basement.

6.3.2 *Socio-economic Activities*

6.3.2.1 *Tanintharyi Region*

Main economic activities in the region are agriculture, fishery, rubber, pearl, and palm oil production.[1]

Agriculture is the primary sources of livelihood in the rural area of the region. The main crops are rice, betel nut, coconut, rubber, dhani, tapioca, rambutan, durian, and mangosteens. The region is now promoting development of food processing and food distribution sector to add more value to raw material and agriculture products in the region such as palm oil, and coconut products.[35]

The region is the focus area for rubber production with twenty percent (20%) of the country's rubber farmers. [35]

Palm oil production is considered as a special project as Tanintharyi is the only location in Myanmar with proper condition for the plantation of palm oil. More than 140,000 hectares of palm oil has been planting in the region.[35]

6.3.2.2 *Daminseik Village*

Main occupations in the community are fisherman, commerce and general wage labour (e.g. fishery, construction, and agriculture labour). Each household own at least one (1) small fishing boat. Most fish catches are delivering to market in Kanbauk or nearby community with some for household consumption.

6.3.2.3 *Phaungdaw Village*

Main occupations in the community are farmer, retail owner, and some as a wage labourer in Thailand. Main crops are orchards, coconut, betel nuts, cashew nuts and rubber. Some household participate in rice and vegetable growing, and animal farm (poultry, pigs and sheep). Most products are for trading and self-consumption.

6.3.2.4 *Kaunghmu Village*

The main occupations in the community are farmer and wage labourer. Common crops are coconuts, betel nuts, rubber, and rice. Products are trade (at Kanbauk) and kept for self-consumption.

[1] (2018). Tanintharyi Region Economic Overview. *Thaibizmyanmar.* Retrieved on October 25th, 2019 from http://www.thaibizmyanmar.com/en/thai-myanmar/Non-paper%20-%2025%20Jan%202018%20-%20Overview%20of%20Tanintharyi%20Region.pdf

6.3.2.5 Ohnbinkwin Village

The main occupations of this community are farmer and wage labourer in local villages and Thailand. Main crops are coconuts, betel nuts and rubber. Products are trade (at Kanbauk) and kept for self-consumption.

6.3.2.6 Mighaungaing Village

The main occupations of this community are retail owner, farmer, wage labourer, and fisherman. Main crops are cashew nuts, coconuts, palm oil, and rubber. Livestock raising (pig and poultry) is also found. Products are commonly trade to Dawei and Yangon.

6.3.2.7 Shinbyan Village

The main occupations of this community are farmer and wage labourer. Most workers worked in rubber plantations, palm oil, and paddy fields owned by the government.

6.3.3 Infrastructures and Utilities

6.3.3.1 Tanintharyi Region

Main transportation in the region are rail service between Tanintharyi-Yangon, a port of one concrete jetty for feeder vassels from Dawei, and Myeik airport. A deep-water port planned in Dawei (Tavoy), which will also include a highway and railway between the harbour and Bangkok is expected in 2020.[1]

6.3.3.2 Daminseik Village

Water sources in the community come from shallow wells and tap water sourced from mountains, which are used for drinking and domestic use. An antiseptic is added to all wells twice a month by the public health officer.

No wastewater collection or waste treatment system were available in the community. Wastewater is usually disposing to the ground. Solid waste is dealt by waste incinerator once a week.

Electricity is supply by thirty (30) kW diesel generators for six (6) hours per day, with fifty percent (50%) help of fuels subsidization from the government.

Road surface is unpaved. People usually travel by bus, foot, and boat.

One (1) primary school and one (1) resource-learning centre are available. Secondary school can be found at Phaungdaw village. Only one (1) health

[1] (2018). Tanintharyi Region Economic Overview. *Thaibizmyanmar*. Retrieved on October 25th, 2019 from http://www.thaibizmyanmar.com/en/thai-myanmar/Non-paper%20-%2025%20Jan%202018%20-%20Overview%20of%20Tanintharyi%20Region.pdf

service centre is available. For serious health case, people will attend Ohnbinkwin health centre or Kanbauk Hospital.

6.3.3.3 Phaungdaw Village

Water source in the community is shallow wells (average depth of ten (10) m) which are used for drinking and domestic use. Most household have a latrine with washing water.

There is no wastewater collection or waste treatment system in the community. Wastewater is disposing to the ground. Solid waste is dealt through burning and animal feed (food waste).

Electricity is supply by a twenty (20) kW diesel generators for three (3) hours per day and limited to one-hundred-twenty (120) households. About two-hundred (200) household do not have access to electricity.

Road surface is unpaved. People usually travel by motorcycle, bus, and cart.

One (1) high school one (1) resource-learning centre are available. Two (2) health centres can be found in the community.

6.3.3.4 Kaunghmu Village

Water sources in the community are from public water wells and shallow wells with the average depth of (ten) 10 m. Most household have a latrine with washing water.

There is no wastewater collection or waste treatment system in the community. Wastewater is disposing to the ground. Solid waste is dealt through burning and animal feed (food waste).

Electricity is supply by diesel generators for three (3) hours per day with some generators owned by the villagers.

Road surface is unpaved. People usually travel by bus.

One (1) primary school and one (1) health service centre are available.

6.3.3.5 Ohnbinkwin Village

Main source of water is the tap water from the reservoirs in the mountains. Some household also source water from shallow wells (average depth of 5-6 m). Antiseptic is added to the wells once a week. Most household have a latrine with washing water.

There is no wastewater collection or waste treatment system in the community. Wastewater is disposing to the ground. Solid waste is dealt through burning and animal feed (food waste).

Electricity is supply by government's diesel generators for three (3) hours per day.

Road surface is unpaved. People usually travel by motorcycle, car and bus.

One (1) elementary school, primary school and high school are each available in the community. Primary school is free of charged but high school will charge students grade 5-11 for 1,000 kyats per year. One (1) health facility is available for basic treatment.

6.3.3.6 Mighaungaing Village

Main source of water is the tap water from the reservoirs in the mountains and public wells. Water quality is considered good. Most household have a latrine with washing water.

There is no wastewater collection or waste treatment system in the community. Wastewater is disposing to the ground. Solid waste is dealt through burning and animal feed (food waste).

Electricity is supply by village headman's diesel generators.

Road surface is unpaved. People usually travel by motorcycle, car and bus.

Two (2) primary schools are available in the community. No health facility is found. Common diseases are malaria and haemorrhagic fever.

6.3.3.7 Shinbyan Village

Main source of water is water wells. Some well is separated for drinking with antiseptic added. Most household have a latrine with washing water.

There is no wastewater collection or waste treatment system in the community. Wastewater is disposing to the ground. Solid waste is dealt through burning and animal feed (food waste).

Electricity is supply by generators, which are owned by few households. Others will have to pay for electricity when needed.

Road surface is unpaved. People usually travel by foot and motorcycles.

One (1) primary school can be found in the community. One (1) health facility is available for basic treatment such as Malaria and ARI (Acute Respiratory Infection).

*6.3.4 **Fishery***

The Department of Fisheries (DoF) has instituted two fishing zones - inshore and offshore, which offer protection to fisheries resources as follows:

- **Inshore fisheries –** this includes fishing grounds from lowest tide level, up to about forty-eight (48) feet (15 m) depth, which generally is from five to ten nautical miles from the coast. Small boats of less than thirty (30) feet and twelve (12) HP (Horse power), including traditional boats, are used in this zone; and

- **Offshore fisheries** – this includes the fishing grounds from the demarcation line of inshore fisheries out to the edge of the EEZ. Vessels over thirty-feet and/or engine power more than twelve (12) HP are used in offshore fisheries. Large-scale fishing such as bottom trawling, purse seining, surrounding, drift netting and long lining are common in offshore fishing. In order to properly administer and monitor fisheries activities, the DOF has divided Myanmar's offshore fisheries into one-hundred-forty (140) grid blocks of 30x30 nautical miles each. The main types of fish gear used for marine fisheries in Myanmar are composed of commercial gears such as trawl nets, purse seines, drift nets and gill nets as well as traditional gear including hook and line, cast net, bag nets, trammel gill net, lift net and traps.

Tanintharyi region is one of the main fishes producing areas in Myanmar, especially along the region coast with more than 10,000 and 1,200 of inshore and offshore fishing vessels respectively. The products are distributed within Myanmar and some exported to Thailand. The main fishery products are dried fish, dried prawn, dried shrimp, and shrimp paste.[1]

In addition, high quality pearl production is also well known in the region. Myanmar government and Japanese technicians started a pearl production in Myeik Archipelago in 1954 and spread out throughout the region[36].

Recently the concern of depletion of fish stocks from overfishing are raising. Therefore, many businesses have begun to develop the aquaculture production for shrimp and soft-shell crabs for future economic growth[36].

6.3.4.1 Seasonality of Fishing

Dry Season (November to April): November to April is the best season for fishing in terms of weather condition. With good weather conditions, fishing boats are able to travel greater distances a safer manner during this dry winter season. Fishing takes place during this period in shallow-water, across the continental slope and in deep-water.

Rainy Season (May to October): Fishing during the rainy season is difficult for offshore fishing due to poor weather conditions. From June to August 2015, only 50% of the offshore fishing vessels were allowed by the DoF to go fishing. The closed period and also percentage of vessels allowed to fish are reported to vary between years.

For inshore fishing by small boats, the best period of fishing in terms of catch value is reported to be from April to October and the exact window appears to be varied across villages.

[1] (2018). Tanintharyi Region Economic Overview. *Thaibizmyanmar.* Retrieved on October 25th, 2019 from http://www.thaibizmyanmar.com/en/thai-myanmar/Non-paper%20-%2025%20Jan%202018%20-%20Overview%20of%20Tanintharyi%20Region.pdf

An Environmental, Social, and Health Impact Assessment (ESHIA) was carried out for the Zawtika Onshore Gas Transportation System for PTTEP International Limited (PTTEPI) by Pro-En Technologies, Ltd., in September 2009 and submitted to MOGE for record and reference shortly thereafter. Most of the impacts identified within this ESHIA focused on activities in the construction phase. Since the construction phase has already been completed, and the Project is currently in the operation phase, impacts during construction are not within the scope of this EMP.

The only identified significant impacts that were associated with the operation phase in the previous ESHIA were those to Social Components, and Occupational Health and Safety. Although this may have been a sufficient assumption for the purposes of the ESHIA, there are some additional potential minor impacts during the operation phase that need to be considered for the preparation of this EMP. A summary of potential impacts during the operation phase are presented in ***Table 7.1*** below.

Table 7.1 Summary of Potential Impacts during Operation Phase

Aspects	Potential Impacts
Environmental Resources	
1. Air Quality	1.1. Deterioration of air quality from dust emissions
	1.2. Deterioration of air quality from diesel-fuelled combustion emissions
	1.3. Fugitive emissions during operation phase from pipeline's valves, flanges and intermittent venting at ZBV1 and ZBV2.
2. Noise	2.1. Increase in noise levels due to use of vehicles and machinery
3. Light	3.1. Increase in light from operations ZOC and ZMS at the night time
4. Soil	4.1. Soil compaction from transportation and ROW maintenance activities
	4.2. Soil erosion from rainfall and surface runoff in particular land with a high hill slope
	4.3. Contamination of soil from inappropriate domestic wastewater (sewage) management
	4.4. Contamination of soil from inappropriate storage or disposal of non-hazardous and hazardous waste
	4.5. Contamination of soil due to accidental spills of hazardous materials (diesel, paint, lubricating fluids, chemicals, etc)

Aspects	Potential Impacts
5. Surface Water	5.1. Deterioration of surface water quality from sedimentation caused by erosion and/or re-suspension of sediments
	5.2. Altered hydrology and drainage system due to erosion, potentially causing increased flooding
	5.3. Contamination of surface water from inappropriate storage or disposal of non-hazardous and hazardous waste
	5.4. Contamination of surface water from accidental spills of hazardous materials (diesel, paint, lubricating fluids, chemicals, etc)
6. Groundwater	6.1. Contamination of groundwater from inappropriate domestic wastewater (sewage) management
	6.2. Contamination of groundwater from inappropriate storage or disposal of non-hazardous and hazardous waste
	6.3. Contamination of groundwater from accidental spills of hazardous materials (diesel, paint, lubricating fluids, chemicals, etc)
7. Ecology and Biodiversity	7.1. Habitat degradation due to impacts on environmental resources, vegetation and disturbance of wildlife
	7.2. Impact on rare and endangered species
	7.3. Worker activities in Tanintharyi Nature Reserve may threaten significant flora values,
8. Landscape and Visual Impacts	8.1. Change in appearance of natural surroundings due to presence of pipeline infrastructure and ROW, particularly in TNR
9. Transportation	9.1. Traffic accidents
	9.2. Damage to roads
10. Water Supply	10.1. Reduction of water supply available to the public
11. Socio-Economy	11.1. Potential for increased local employment opportunities (Benefit)
	11.2. Potential for increased local procurement opportunities (Benefit)
12. Public Participation and Community Relations	12.1. Enhance project benefits
	12.2. Social tension/conflicts
Health Resources	
13. Public Health	13.1. Introduction or increase in spread of diseases/illnesses
	13.2. Impacts to public safety
14. Occupational Health and Safety	14.1. Workplace accidents and injuries
15. Spills and Leakages of Oil and Chemicals	15.1. Various potential impacts, including: • Potential contamination of surface water, groundwater, seawater, soil and/or sediment • Potential secondary impacts on food sources (crops, seafood, livestock), biodiversity, etc.

Aspects	Potential Impacts
16. Pipeline Leakage and Rupture	16.1. Various potential impacts, including: • Potential fire and explosion, impacting safety of workers and public • Contamination of surrounding natural resources • Occupational hazard if natural gas accumulates in one area • Toxicity to aquatic organisms in the immediate vicinity of leakage
17. Accidental Fire or Explosion	17.1. Potential of fire or explosion from ROW work

This section outlines the mitigation measures that are to be employed to reduce the likelihood of the impacts identified in ***Section 6***, and/or to limit the extent or severity of impact if one does occur. The purpose of the proposed mitigation measures is to manage identified impacts, comply with regulations and ensure that standards of international industry practice are adopted during the execution of all Project activities.

The majority of the most significant impacts of the Project have already been mitigated through the implementation of mitigation measures incorporated in the Project design. For example, the selection of the proposed pipeline route, to avoid community areas, steep mountain ranges, dense forests and to minimise crossing of water bodies, will minimise effects to terrestrial and aquatic ecology, hydrology and local communities; the adoption of appropriate engineering design measures, suited to a humid tropical environment, will also help to minimise damaging effects to surface and groundwater, soils and agricultural land, using of cathodic corrosion protection for pipeline to minimise loss of pipeline material and extend lifespan of pipeline.

8.1 MITIGATION MEASURES DURING OPERATION PHASE

This section will focus on the mitigation measures that will be implemented during the Project's operation phase, such that potential adverse impacts are reduced to As Low As Reasonably Practical (ALARP). The recommended mitigation measures are presented in ***Table 8.1.***

For construction phase, the Project has already followed the prescribed measures in the original ESHIA.

Table 8.1 Mitigation Measures during Operation Phase

Aspects	Potential Impacts	Mitigation Measures	Specific Action	Project Location	Responsible Party
Environmental Resources					
1. Air Quality	1.1. Deterioration of air quality from dust emissions	1.1.1. Post speed limits on project access roads and enforce vehicle speed limits	Set the speed limits for project vehicle	ROW (Service Track) ZOC ZMS	ATL
		1.1.2. Maintain service tracks and access roads to avoid road deterioration and subsequent dust generation	Regularly maintain the project tracks and roads	ROW (Service Track) ZOC ZMS	ATL
	1.2. Deterioration of air quality from diesel-fuelled combustion emissions	1.2.1. Ensure all machinery and vehicles are properly maintained and serviced as per maintenance schedule recommended by manufacturer	Conduct routine inspection of machinery as per maintenance schedule	All Project Areas	ATL
	1.3. Fugitive emissions during operation phase from pipeline's valves, flanges and intermittent venting at ZBV1 and ZBV2	1.3.1. Inspection and maintenance program will be implemented during the operational phase to control fugitive emissions	Implement inspection and maintenance program	ROW ZOC ZMS ZBV 1 and 2	ATL
2. Noise	2.1. Increase in noise levels due to use of vehicles and machinery	2.1.1. Ensure use of mufflers on diesel/gas driven machinery	Use mufflers on diesel/gas driven machinery	ROW ZOC ZMS ZBV 1 and 2	ATL
		2.1.2. Ensure all machinery and vehicles are properly maintained and serviced as per maintenance schedule recommended by manufacturer	Maintenance all machinery as per maintenance schedule.	ROW ZOC ZMS ZBV 1 and 2	ATL
		2.1.3. Limit noisy activities to during day time where possible.	Provide PPE to workers working on high level noise activities.	All Project Areas	ATL

Aspects	Potential Impacts	Mitigation Measures	Specific Action	Project Location	Responsible Party
3. Light	3.1. Increase in light from operations ZOC and ZMS at the night time	3.1.1. Ensure adequate night lighting at ZOC and ZMS. 3.1.2. Inspect and maintain programs for night lighting equipment.	• Set up proper night light at ZOC and ZMS. • Conduct preventive maintenance program for night light.	ZOC ZMS	ATL
4. Soil	4.1. Soil compaction from transportation	4.1.1. Mark project areas clearly and prohibit vehicles from moving off site onto surrounding land	Clearly mark the project area for the project vehicles	All Project Areas	ATL
	4.2. Soil erosion from rainfall and surface runoff in particular land with a high hill slope	4.2.1. Inspect and maintain existing erosion and sediment control measures	Inspect and maintain: • Sediment barriers and/or filtering material to prevent runoff and erosion • Gabion boxes, geotextile, and rip rap (rock piles) to maintain slope stability • Re-vegetated areas • Sand-filled geo-textile at landfall to prevent erosion of sand at beach where onshore and offshore pipeline connect	All Project Areas	ATL
		4.2.2. If new sources of erosion or sedimentation are observed along the pipeline ROW or at any of the permanent facilities, additional erosion and sediment controls, such as the above in **Item 4.2.1**, will be implemented	Implemented the sediment control measures mentioning above when detecting new sources of erosion or sedimentation.		
	4.3. Contamination of soil from inappropriate domestic wastewater (sewage) management	4.3.1. Implement Myanmar Asset Waste Management Procedure	**Hazardous Waste** • Separate hazardous waste from general waste and store in proper labelled container and storage area according to types of wastes.	All Project Areas	ATL

Aspects	Potential Impacts	Mitigation Measures	Specific Action	Project Location	Responsible Party
			• Hazardous waste shall be stored separately in the hazardous waste containers then transfer to certified or qualified waste management facilities for disposal. • Hazardous wastes must be stored in a safe and durable container, suitable for transfer, and be placed in a location far from ignition sources until disposal/treatment. • Prohibit any discharge of hazardous waste into the sea. • Used oil and oil-contaminated waste shall be stored separately with labels for disposal. • Ensure manifest of hazardous waste is kept. • Hazardous waste shall be temporary stored at ZOC waste storage. When the waste storage area nearly full, inform to waste contract holder for further communicate with waste disposal contractor to collect waste at ZOC for final disposal.		

Aspects	Potential Impacts	Mitigation Measures	Specific Action	Project Location	Responsible Party
			Non-Hazardous Waste • Segregate non-hazardous waste including food waste, paper, aluminium can, glass, rag and other wastes in separate containers or proper areas. • Separate and store each type of waste (separate non-hazardous waste and hazardous waste) into appropriate containers having clear labels. General non-hazardous waste will be transferred to municipal waste management facility (e.g. DAWEI) or other licensed waste managent facility. • For ZOC, food waste shall be handed over to local villagers for livestock feeding if there is a demand. If no demand, this waste shall be delivered to licensed waste management facility. • Domestic sewage shall be treated to meet EQEG emission limit and discharged to environment. • Keep the records of waste inventories including types and quantities updated.		

Aspects	Potential Impacts	Mitigation Measures	Specific Action	Project Location	Responsible Party
			• Recyclable and reusable waste shall be handed over to local villagers for further reuse or recycling shop for further process, as appropriate. • Hazardous waste shall be disposed at approved waste disposal facilities. Otherwise the disposal method shall be discussed and agreed with Myanmar Asset SSHE department.		
		4.3.2. Maintain existing toilets and septic tanks at permanent manned facilities	Maintain the condition and hygiene of the existing toilets and septic tanks at permanent facility as proper	ZOC ZMS	ATL
		4.3.3. In case domestic wastewater discharge, treat all wastewater discharge to comply with the Industry-Specific requirements in Myanmar's Environmental Quality (Emission) Guidelines (see ***Table 5.1***)	Treat all domestic wastewater discharge according to Myanmar requirement	ZOC ZMS	ATL

Aspects	Potential Impacts	Mitigation Measures	Specific Action	Project Location	Responsible Party
	4.4. Contamination of soil from inappropriate storage or disposal of non-hazardous and hazardous waste	4.4.1. Implement Myanmar Asset Waste Management Procedure	See **Item 4.3.1**	All Project Areas	ATL
		4.4.2. Enforce "Good Housekeeping" practices	• See **Item 4.3.1** • Waste will be handled, stored and transported in a manner that reduces risks to the environment. Different treatment or procedures are provided according to its type.	ZOC ZMS ZBV 1 and 2	ATL
		4.4.3. Segregate and store waste in appropriate, secure, properly labelled containers. Segregate hazardous materials and waste from non-hazardous wastes. Keep waste manifest.	• Store waste in the secure container with proper label. • Separate hazardous waste and material from the non-hazardous.	ZOC ZMS ZBV 1 and 2	ATL
		4.4.4. Dispose of waste in labelled containers or waste bins for possible recycling	Labelled all dispose waste	ZOC ZMS ZBV 1 and 2	ATL
		4.4.5. Hazardous waste generated from the Project will be temporarily stored at ZOC, and will then be transferred to a qualified or licensed contractor for transportation and appropriate treatment / disposal	Store waste properly at ZOC before transferred to a licensed contractor for proper treatment/ disposal	ZOC	ATL
	4.5. Contamination of soil due to accidental spills of hazardous materials (diesel, paint, lubricating fluids, chemicals, etc)	4.5.1. Implement PTTEPI's Myanmar Asset Spill Contingency Plan	PTTEPI's Myanmar Asset Spill Contingency Plan will be implemented during the operational phase	All Project Areas	ATL
		4.5.2. Minimisation of storage of hazardous materials	Minimise the storage of hazardous material as practical to reduced risk of spill/leakage	ZOC	ATL

Aspects	Potential Impacts	Mitigation Measures	Specific Action	Project Location	Responsible Party
		4.5.3. Use oil catch pans under vehicles when performing maintenance and, only conduct maintenance on cemented surfaces	• Conduct maintenance on designated area • Use of oil catch pans under vehicles during maintenance	ZOC ZMS	ATL
		4.5.4. Conduct training of personnel in safe use & handling of hazardous materials	Conduct training of personnel in safe use & handling of hazardous materials	All Project Areas	ATL
		4.5.5. Provide spill clean-up kits and spill response training	Provide spill clean-up kits and spill response training	ZOC ZMS ZBV 1 and 2	ATL
		4.5.6. Regularly inspect fuel and chemical storage areas	Regularly inspect fuel and chemical storage areas for any possible leakage	ZOC ZMS ZBV 1 and 2	ATL
		4.5.7. Store all chemicals in secured storage area with impervious (cement or plastic sheet) floor and bund wall	Store all chemicals in secured storage area with impervious (cement or plastic sheet) floor and bund wall	ZOC ZMS ZBV 1 and 2	ATL
		4.5.8. Handle all chemicals according to their SDS	Handle all chemicals according to their SDS	All Project Areas	ATL
5. Surface Water	5.1. Deterioration of surface water quality from sedimentation caused by erosion and/or re-suspension of sediments	5.1.1. Inspect and maintain existing erosion and sediment control measures	Inspect and maintain: • Sediment barriers and/or filtering material to prevent runoff and erosion • Gabion boxes, geotextile, and rip rap (rock piles) to maintain slope stability • Re-vegetated areas Sand-filled geo-textile at landfall to prevent erosion of sand at beach where onshore and offshore pipeline connect	All Project Areas	ATL

Aspects	Potential Impacts	Mitigation Measures	Specific Action	Project Location	Responsible Party
		5.1.2. If new sources of erosion or sedimentation are observed along the pipeline ROW or at any of the permanent facilities, additional erosion and sediment controls, such as the above in **Item 5.1.1**, will be implemented	Implemented the sediment control measures mentioning above when detecting new sources of erosion or sedimentation.	All Project Areas	ATL
	5.2. Altered hydrology and drainage system due to erosion, potentially causing increased flooding	5.2.1. Implement all mitigation measures for **Item 5.1** above	See **Item 5.1.1-5.1.2**	All Project Areas	ATL
	5.3. Contamination of surface water from inappropriate domestic wastewater (sewage) management	5.3.1. Implement all mitigation measures for **Item 4.3** above	See **Item 4.3.1-4.3.3**	All Project Areas	ATL
	5.4. Contamination of surface water from inappropriate storage or disposal of non-hazardous and hazardous waste	5.4.1. Implement all mitigation measures for **Item 4.4** above	See **Item 4.4.1-4.4.5**	All Project Areas	ATL
	5.5. Contamination of surface water from accidental spills of hazardous materials (diesel, paint, lubricating fluids, chemicals, etc)	5.5.1. Implement all mitigation measures for **Item 4.5** above	See **Item 4.5.1-4.5.8**	All Project Areas	ATL
6. Groundwater	6.1. Contamination of groundwater from inappropriate domestic wastewater (sewage) management	6.1.1. Implement all mitigation measures for **Item 4.3** above	See **Item 4.3.1-4.3.3**	All Project Areas	ATL
	6.2. Contamination of groundwater from inappropriate storage or disposal of non-hazardous and hazardous waste	6.2.1. Implement all mitigation measures for **Item 4.4** above	See **Item 4.4.1-4.4.5**	All Project Areas	ATL

Aspects	Potential Impacts	Mitigation Measures	Specific Action	Project Location	Responsible Party
	6.3. Contamination of groundwater from accidental spills of hazardous materials (diesel, paint, lubricating fluids, chemicals, etc)	6.3.1. Implement all mitigation measures for **Item 4.5** above	See **Item 4.5.1-4.5.8**	All Project Areas	ATL
7. Ecology and Biodiversity	7.1. Habitat degradation due to impacts on environmental resources, vegetation and disturbance of wildlife	7.1.1. Mark project areas clearly and prohibit vehicles from moving off site onto surrounding land 7.1.2. Identify community assets, i.e. forest resources, river grounds, etc., and ensure that project activities avoid blocking access, or provide alternative access to them	• Clearly mark the project area for the project vehicles • Prevent project activities from blocking community access to community assets	All Project Areas	ATL
		7.1.3. Provide awareness to project workers and contractors on protected areas and restricted activities there, and impose harsh penalties on anyone breaking regulations	• Ensure awareness about protected area and restricted activities on workers. • Impose harsh penalties on those who break the regulation	All Project Areas	ATL
		7.1.4. Prohibit hunting, trapping or fishing by project worker 7.1.5. Provide training to project personnel on recognition of sensitive receptors and areas (i.e. women, children, elderly, indigenous people, public facilities and resources, protected areas and threatened species, etc), and guidelines on appropriate behaviour.	• Prohibit workers from hunting, trapping, or fishing • Provide training to all workers about sensitive receptors and areas with behaviour guideline	All Project Areas	ATL

Aspects	Potential Impacts	Mitigation Measures	Specific Action	Project Location	Responsible Party
	7.2. Impact on rare and endangered species	7.2.1. Provide awareness to project workers on rare and endangered species specific to the regions as part of induction programs 7.2.2. Report if any endangered or rare species are sighted within pipeline ROW to Project Site Manager who will report to the Senior Manager for further action	• Ensure awareness to project workers about rare and endangered species • Report if any endangered or rare species are found within the project area or ROW.	All Project Areas	ATL
		7.2.3. Development of additional ecological surveys as necessary in sensitive areas to monitor impact on rare and endangered species	Development of additional ecological surveys as necessary in sensitive areas to monitor impact on rare and endangered species	All Project Areas	ATL
	7.3. Worker activities in Tanintharyi Nature Reserve may threatened significant flora values,	7.3.1. Adhere to conditions/rules regarding use of Access Roads and Access Walkways in TNRP 7.3.2. Prohibit trees cutting on access walkways 7.3.3. Provide annual financial support to TNRP project	• Adhere to condition/rules regarding the use of access roads and walkways in TNRP • Prohibit trees cutting on access walkways • Provide annual financial support to TNRP project	ROW	ATL

Aspects	Potential Impacts	Mitigation Measures	Specific Action	Project Location	Responsible Party
Social Resources					
8. Landscape and Visual Impacts	8.1. Change in appearance of natural surroundings due to presence of pipeline infrastructure and ROW, particularly in TNR	8.1.1. ROW has already been rehabilitated. Regularly survey and maintain current vegetation at rehabilitated pipeline corridor	Regularly survey and maintain vegetation at rehabilitated pipeline corridor	ROW	ATL
9. Transportation	9.1. Traffic accidents	9.1.1. Ensure all vehicles are properly maintained and serviced as per maintenance schedule recommended by manufacturer 9.1.2. Use of experienced drivers 9.1.3. Development and implementation of transport safety programs for drivers 9.1.4. Strictly enforce alcohol and drug policy and impose penalties 9.1.5. Record all incidents and near misses	• Conduct routine inspection and maintenance of machinery as per maintenance schedule. • Use experience drivers • Implement transport safety programs for drivers • Strictly enforce alcohol and drug policy and impose penalties • Record all near misses and incidents	All Project Areas	ATL
	9.2. Damage to roads	9.2.1. Restore any damage to roads caused by Project activities or Project vehicles	Restore any damage to roads caused by the project	All Project Areas	ATL
10. Water Supply	10.1. Reduction of water supply available to the public	10.1.1. Ensure that project will not be in competition with local use of water 10.1.2. Promote program for efficient use of water	• Ensure that the project use of water did not impose water scarcity with the local • Promote efficient use of water practices	All Project Areas	ATL

Aspects	Potential Impacts	Mitigation Measures	Specific Action	Project Location	Responsible Party
11. Socio-Economy	11.1. Potential for increased local employment opportunities (Benefit)	11.1.1. Preferential hiring of locals from "pipeline affected communities" in semi-skilled and unskilled jobs	hiring of locals from "pipeline affected communities" in semi-skilled and unskilled jobs	All Project Areas	ATL
		11.1.2. Advertise vacancies well in advance of project commencement though appropriate local sources, i.e. Township Labour Office, village head authority house, monastery, etc.	Announce job vacancies positions in advance through local sources.	All Project Areas	ATL
		11.1.3. Ensure recruitment procedures are transparent, public and non-discriminatory	Ensure transparent recruitment procedures.	All Project Areas	ATL
		11.1.4. Provide skills and training opportunities to locals	Provide training to locals	All Project Areas	ATL
	11.2. Potential for increased local procurement opportunities (Benefit)	11.2.1. Advertise and give procurement preference to local and national businesses	Support local business by sourcing material from local and national business.	All Project Areas	ATL
		11.2.2. Provide awareness on local culture and customs as part of worker induction training, including ethical conduct and appropriate use of force for guards hired to provide security to project facilities	Provide awareness on local culture and customs as part of worker induction training	All Project Areas	ATL

Aspects	Potential Impacts	Mitigation Measures	Specific Action	Project Location	Responsible Party
12. Public Participation and Community Relations	12.1. Enhance project benefits	12.1.1. Continue implementation of CSR programme to support local activities (***Annex C***) 12.1.2. Initiate or support existing development programs that are catered to the needs of the local and indigenous communities through collaboration with NGOs if any exist in project area. Examples of development programs include micro-credit schemes, bilingual educational programs, health & nutrition programs, water & sanitation programs, etc.	• Continue CSR programme • Initiate or support development programs that catered to the local need	All Project Areas	ATL
	12.2. Social tension/conflicts	12.2.1. Implement community grievance procedure according to PTTEP Corporate's Grievance Handling Guideline 12.2.2. Frequent communication with the nearest communities and sensitive receptors/stakeholders to allow issues to be addressed quickly	• Implement PTTEP Corporate's Grievance Handling Guideline • Frequently communicate with related community and sensitive receptor for good relationship	All Project Areas	ATL
Health Resources					
13. Public Health	13.1. Introduction or increase in spread of diseases/illnesses	13.1.1. Implement Myanmar Asset Waste Management Procedure	See **Item 4.3.1**	All Project Areas	ATL
		13.1.2. Provide dedicated health workers and on-site health clinics to provide services to project workers and if necessary, a referral to nearby hospitals	• Provide health workers and clinics on-site • Provide a referral to nearby hospitals	All Project Areas	ATL
		13.1.3. Provide awareness on health to workers as part of worker induction training	Provide awareness on health training to all workers	All Project Areas	ATL

Aspects	Potential Impacts	Mitigation Measures	Specific Action	Project Location	Responsible Party
		13.1.4. Implement integrated vector control programs at permanent facilities (i.e. fumigation for mosquitoes)	Implement vector control measurements (i.e. fumigation for mosquitoes)	ZOC ZMS	ATL
		13.1.5. Safe containment and use of chemicals and fuel according to SDS to be provided in storage areas	Provide SDS for all chemicals present on site	ZOC ZMS ZBV 1 and 2	ATL
		13.1.6. Ensure workers and contractors are properly qualified regarding transport, use and disposal of hazardous materials	Hired or trained workers for qualification of transport, use, and disposal of hazardous material	All Project Areas	ATL
	13.2. Impacts to public safety	13.2.1. Inform communities about Myanmar Asset Emergency Management Plan, including actions to take or reporting in case of accidents	Inform communities about Myanmar Asset Emergency Management Plan in detail	All Project Areas	ATL
		13.2.2. Establish land markers and fences to prevent potential land encroachment or unauthorized digging in pipeline safety zones	Set up warning signs, lighting, and fences as proper to warn locals of the pipeline safety zones	Landfall ROW	ATL
14. Occupational Health and Safety	14.1. Workplace accidents and injuries	14.1.1. Implement PTTEP Occupational Health Management Standard and Myanmar Asset SSHE Training and Competency Procedure	PTTEP Occupational Health Management Standard, Myanmar Asset SSHE Training and Competency Procedure, and Personal Protective Equipment Standard will be implemented in operation phase	All Project Areas	ATL
		14.1.2. Ensure all machinery and vehicles are properly maintained and serviced as per maintenance schedule recommended by manufacturer	Maintenance all machinery as per maintenance schedule.	All Project Areas	ATL

Aspects	Potential Impacts	Mitigation Measures	Specific Action	Project Location	Responsible Party
		14.1.3. Provide regular safety and awareness training, including review of incidents and near misses records and prevention of new incidents	Conducted safety and awareness training that include the review incidents and near misses' records	All Project Areas	ATL
		14.1.4. Ensure operators and skilled work is carried out by properly trained, qualified and authorized personnel	Ensure all skilled workers are trained and qualified through training and job selection process.	All Project Areas	ATL
		14.1.5. Ensure provision of personal protective equipment to workers	Provide PPE to workers as proper	All Project Areas	ATL
		14.1.6. Provide first aid equipment, and train all personnel in first aid	Provide first aid equipment, and train all personnel in first aid	All Project Areas	ATL
		14.1.7. Install warning signs in potentially hazardous areas	Install warning signs in potentially hazardous areas	All Project Areas	ATL
		14.1.8. Post speed limits on project access roads and enforce vehicle speed limits	Enforce speed limits on project roads and vehicle.	All Project Areas	ATL
		14.1.9. Coordinate with nearby hospital in order to transfer patients in case of emergency	Cooperate with the nearest health center/hospital to immediately support response to emergency events	All Project Areas	ATL
Unplanned Events					
15. Spills and Leakages of Oil and Chemicals	15.1. Various potential impacts, including: • Potential contamination of surface water, groundwater, seawater, soil and/or sediment • Potential secondary impacts on food sources (crops, seafood, livestock), biodiversity, etc.	15.1.1. Implement Myanmar Asset Spill Contingency Plan	Implement Myanmar Asset Spill Contingency Plan	All Project Areas	ATL
		15.1.2. Minimisation of storage of hazardous materials	Minimise the storage of hazardous material as practical to reduced risk of spill/leakage		
		15.1.3. Use oil catch pans under vehicles when performing maintenance and, only conduct maintenance on cemented surfaces	• Conduct maintenance on designated area • Use of oil catch pans under vehicles during maintenance	ZOC ZMS	ATL

Aspects	Potential Impacts	Mitigation Measures	Specific Action	Project Location	Responsible Party
		15.1.4. Conduct training of personnel in safe use & handling of hazardous materials	Conduct training of personnel in safe use & handling of hazardous materials	All Project Areas	ATL
		15.1.5. Provide spill clean-up kits and spill response training	Provide spill clean-up kits and spill response training	ZOC ZMS ZBV 1 and 2	ATL
		15.1.6. Regularly inspect fuel and chemical storage areas	Regularly inspect fuel and chemical storage areas for any possible leakage	ZOC ZMS ZBV 1 and 2	ATL
		15.1.7. Store all chemicals in secured storage area with impervious (cement or plastic sheet) floor and bund wall	Store all chemicals in secured storage area with impervious (cement or plastic sheet) floor and bund wall	ZOC ZMS ZBV 1 and 2	ATL
		15.1.8. Handle all chemicals according to their SDS	Handle all chemicals according to their SDS	All Project Areas	ATL
16. Pipeline Leakage and Rupture	16.1. Various potential impacts, including: • Potential fire and explosion, impacting safety of workers and public • Contamination of surrounding natural resources • Occupational hazard if natural gas accumulates in one area • Toxicity to aquatic organisms in the immediate vicinity of leakage	16.1.1. Implement Myanmar Asset Emergency Management Plan and provide training on the plan to all employees. The objective of this Management Plan is to: • Define roles and responsibilities of Emergency Management Team (EMT) • Determine incident action plan, resources, and processes before, during, and after emergency situation.	16.1.2. Implement Myanmar Asset Emergency Management Plan and provide training on the plan to all employees. The following details are included within this Management Plan: • Emergency Management Organisation and Team • Team Roles and Responsibility • Notification and Communication • Activation and Deactivation	All Project Areas	ATL

Aspects	Potential Impacts	Mitigation Measures	Specific Action	Project Location	Responsible Party
			• Key Activities and Processes of Emergency Management Team • Emergency Management Room and Facilities (including Emergency Management Room, Crisis Communication Room, Relative Response Room) • End of Emergency and Incident Investigation • Training and Exercises		
		16.1.3. Regularly conduct pipeline inspection and maintenance procedures	Regularly conduct pipeline inspection and maintenance procedures, including: • ROW surveillance • ROW maintenance • Regular inspection of pipeline integrity by pig • Leakage survey including inspection of pipe coating and insulating joints/flanges • Cathodic protection maintenance and corrosion monitoring	ROW	ATL

Aspects	Potential Impacts	Mitigation Measures	Specific Action	Project Location	Responsible Party
		16.1.4. If compromised pipeline integrity is discovered during regular inspection and maintenance, repair promptly	Repair abnormal pipeline when detected	ROW	ATL
		16.1.5. Conduct 24-hour monitoring through SCADA: continuous monitoring of system flow parameters (pressure, temperature, flow rate)	Monitor the system flow parameter (pressure, temperature, flow rate) 24-hour	All Project Areas	ATL
		16.1.6. If any abnormal pipeline conditions are observed, implement procedures to isolate and depressurize affected section of pipeline	When detecting abnormal pipeline, implement procedures of isolating and depressurizing the affected pipeline.	All Project Areas	ATL
		16.1.7. Conduct preventative maintenance on fire and gas detection system and firefighting equipment	Conduct preventative maintenance on fire and gas detection system and firefighting equipment as proper	All Project Areas	ATL
		16.1.8. Provide an adequate number and types of fire extinguishers, and install fire alarms and windsocks that are audible and visible from permanent facilities	Provide good amount of fire extinguishers, fire alarms, and windsocks	All Project Areas	ATL
		16.1.9. Conduct fire training and response drills	Conduct fire training and response drills as frequent as proper	All Project Areas	ATL
		16.1.10. Restrict smoking to controlled areas only	Determined smoking area and apply strict penalty	All Project Areas	ATL
		16.1.11. Identify pipeline ROW clearly with warning signs and fencing, including at the landfall	Clearly identify pipeline ROW with warning signs and fencing. Apply the same measure with landfall	ROW	ATL
		16.1.12. Inform the public about risks, prevention measures and emergency response	Regularly inform public about risks, prevention measures and emergency response through proper information channel	All Project Areas	ATL

Aspects	Potential Impacts	Mitigation Measures	Specific Action	Project Location	Responsible Party
		16.1.13. Encourage community monitoring on pipeline condition by posting signs at strategic locations with contact numbers and address to report any pipeline integrity issues	See **Item 16.1.12**	All Project Areas	ATL
		16.1.14. Inform public near earthquake zone areas about risks, prevention measures and Public Emergency Response Plan	Inform public near earthquake zone areas about risks, prevention measures and Public Emergency Response Plan	All Project Areas	ATL
17. Accidental Fire or Explosion	17.1. Potential of fire or explosion from ROW work	17.1.1. No grass cutting during dry season unless the grass height is higher than 1.5m	• See **Item 16.1.4** • See **Item 17.1.1-17.1.3** • To protect the pipeline from corrosion, the following methods are applied to the Zawtika onshore gas pipeline: o Corrosion Protection - Coat and Weld - Cathodic Protection o Emergency Shutdown System • Install warning signs in potentially hazardous areas • Determined smoking area and apply strict penalty	ROW	ATL
		17.1.2. Prohibit burning of trash and vegetation		ROW	ATL
		17.1.3. Allow smoking only in designate areas		ROW	ATL
		17.1.4. Carry out routine inspection and preventive maintenance		ROW	ATL
		17.1.5. Provide fire protection equipment, including fire extinguishers and alarms, on all onshore facilities		ROW	ATL
		17.1.6. Implement Emergency and Crisis Management Plan in case of fire or explosion occurrence		ROW	ATL
		17.1.7. Conduct regular inspections and drills for fire protection equipment		ROW	ATL

8.2 MITIGATION AND MANAGEMENT MEASURES OBSERVED DURING THE SITE VISIT.

Based on interviews and observations during onshore site visit, detail of an implementation of mitigation and management measures, found during onshore site visit can be summarized below.

- Air Quality
  - The service tracks and access roads to Zawtika pipelines location was maintained to avoid road deterioration and subsequent dust generation. The service tracks mainly for inspection and maintenance purposes, such as grass cutting, RoW patrolling, erosion maintenance and control (refer to ***Figure 3.10*** in ***Section 3.2.2***).
- Soil and Surface Water
  - The Project Proponent provided the sediment barriers to protect soil erosion from rainfall and surface runoff in particular land with a high hill slope.
  - Inspect and maintain:
    - Sediment barriers and/or filtering material to prevent runoff and erosion.
    - Gabion boxes, geotextile, and rip rap (rock piles) to maintain slope stability.
    - Re-vegetated areas.
    - Sand-filled geo-textile at landfall to prevent erosion of sand at beach where onshore and offshore pipeline connect
- Water Supply
  - The water use is supplied from the water treatment plant, which receives raw water from nearby streams and did not impose water scarcity with the local.
- Waste Management
  - Wastes generated on site were collected and classified as:
    - Recyclable and reusable waste
    - Non-hazardous wastes; and
    - Hazardous wastes
  - Waste was separated and store in proper labelled container and storage area according to types of wastes.
- Pipeline Leakage and Rupture
  - To protect the pipeline from damage, during the site visit, ERM observed the Anodes for Cathodic Protection for Pipeline (as shown in ***Figure 8.1***)

Figure 8.1 Anodes for Cathodic Protection for Pipeline

Source: ATL, 2019

- Clearly identify pipeline ROW with warning signs and fencing. Apply the same measure with landfall.
- Install warning signs in potentially hazardous areas

- Occupational Health and Safety
  - Proper PPE were provided to workers.
  - Install warning signs in potentially hazardous areas.
  - Enforce speed limits on project roads and vehicle.
  - Safe containment and use of chemicals and fuel according to SDS to be provided in storage areas and handle all chemicals according to their SDS.
  - Provide first aid equipment
  - Install warning signs in potentially hazardous areas

Figure 8.2 ***Observation for the implementation of key mitigation measures during the site visit.***

Water Treatment System

Waste Storage Building

Classified waste generated on site

Note: Photo taken during site visit, June 2016

Figure 8.2 Observation for the implementation of key mitigation measures during the site visit. (Cont.)

Sediment barriers to prevent runoff and erosion

Provide first aid equipment

Note: Photo taken during site visit, June 2016

Figure 8.2 ***Observation for the implementation of key mitigation measures during the site visit. (Cont.)***

SDS station

Store the chemicals on cement floor with SDS

Install warning signs in potentially hazardous areas

Note: Photo taken during site visit, June 2016

8.3 EXISTING ENVIRONMENTAL, SOCIAL AND HEALTH MITIGATION MEASURES

ATL already has in place a number of existing mitigation measures as part of the Project's ongoing onshore operations. During the site visit to the Onshore Zawtika Project, dated 4th-5th June 2016, ERM observed a number of these measures, and they are summarized in ***Table 8.2***.

Note that this is not an exhaustive list and is only meant to demonstrate the directly observed mitigation measures in ongoing operations. As part of the scope of this EMP, these measures have been reviewed and updated where necessary, and supplemented with additional relevant measures to ensure that ATL maintains a robust environmental management plan. Full details on all recommended mitigation measures for this EMP are presented in ***Section 7***.

Table 8.2 Existing Mitigation Measures

Aspect	Existing Mitigation Measures	Location
Soil Erosion and Sedimentation Control / Landslide Protection	• A range of different types of erosion controls are provided to slow down surface water and reduce erosion. Erosion control methods include: - Using geotube, geocell, gabion basket, matting, etc. - Revegetation • Regularly inspect and maintain erosion control to ensure it is in good condition.	ZOC, ZMS and ROW
Water Supply	• Raw water is treated by onsite water treatment system before distributed to users for domestic use.	ZOC, ZMS
Wastewater	• Storm water drainage has been installed. • Oil skimmer has been installed, and oil removal is periodically conducted. • Domestic wastewater is treated by septic tank and infiltration in soak pit. • Water effluent at ZOC and ZMS is monitored every 6 months at intake, outflow post-treatment.	ZOC, ZMS
Waste Management	• Waste segregation has been implemented according to types of waste. • Non-hazardous wastes are transferred to municipal waste management facility or licensed waste management facility.	ZOC, ZMS
Hazardous Materials Handling and Storage	• Spill kits are located throughout all permanent facilities. • Concrete pads and bunds are installed at all refuelling and waste storage areas. • Hazardous chemicals are stored in secure, separated enclosures.	ZOC, ZBV, ZMS
Protected Areas	• Regular patrolling is undertaken along ROW. • Trees are prohibited from being cut on access walkways along ROW. • Fences have been installed surrounding ZMS to protect animals.	ROW ZMS
Fire Prevention Measures	• Grass cutting is not undertaken in TNR area in dry season because grass pile from cutting can cause fire. Grass cutting can only take place in rainy and winter season. • Fire extinguishers are installed inside offices and dangerous areas.	ROW ZOC, ZMS, and ZBV1/2
Local Employment	• Local workforce is employed for non-skilled, administration, driver, logistics, etc.	-
Socio-Economy	• Annual financial support is provided to TNRP. • CSR programme has been implemented in surrounding communities.	-
Accident Prevention	• Vegetation is periodically cut back along ROW, and revegetation progress is monitored. Grass height in the ROW is maintained to be below 30 -50 cm from the ground. • Remaining gas in pipeline is routed to vent stack in case of emergency.	ROW ZOC, ZMS
Occupational Health and Safety	• Wash stations have been installed throughout all permanent facilities.	ZOC, ZMS, ZBV 1/2

As detailed in the Myanmar's Environmental Quality Guidelines, "*projects shall engage in continuous, proactive and comprehensive self monitoring of the project and comply with applicable guidelines and standards. For purposes of these Guidelines, projects shall be responsible for the monitoring of their compliance with general and applicable industry-specific Guidelines as specified in the project EMP and ECC.*"

Monitoring will be required in order to demonstrate compliance with legal limits (i.e. Myanmar's Environmental Quality (Emission) Guidelines), and ATL's Project requirements, and will also provide verification of the overall design and effectiveness of the implemented mitigation/control measures. Details of the environmental monitoring program as follows Myanmar EQEG requirements are presented in ***Table 9.1***.

The monitoring program is based on comparison of physical environmental quality parameters with those captured during the environmental baseline sampling program of the EIA Study. Therefore, the locations and parameters are aligned with those from the baseline sampling program from the Project's Scoping Report, and complemented with any additional requirements as per Myanmar's Environmental Quality Guidelines.

Note that, based on monitoring results, in the future ATL may decide to (or be required to) implement changes to the Project design or existing mitigation measures, in order to achieve compliance. In this case, the EMP will be updated as necessary.

Table 9.1 Monitoring Measures during Operation Phase

Environmental Aspects	Parameters	Method	Location	Duration / Frequency of Monitoring	Responsibility
1. Air Emission	**Required by EQEG and WHO ambient air quality guideline;** • Hydrogen Sulfide • PM 2.5 • PM 10 • Ozone • NO_2 • SO_2 **Greenhouse Gas (GHG)**	Method • Samples shall be analyzed according to globally recognized standard e.g.US EPA. Number of samples • 1 sample per station. Method • GHG emissions will be calculated by using the volume of all fuel type.	• Nearest sensitive receptor or downwind of complaint area (if necessary) • Operation area	• In case of any complaint/incident, conduct the monitoring as per request of authority (e.g. MOGE) • Monthly summary for GHG	ATL via Authorized Contractor ATL
2. Noise	Noise monitoring are as follows: • Noise contour • Noise dose and • Noise level	Method • Samples shall be analyzed according to Occupational Safety and Health Administration (OSHA), United Stated Department of Labour, Regulation (Standard - 29 CFR), Standard Number 1910.95, Occupational Noise Exposure	• Operation area	• Noise contour survey, conduct within 2 years after starting operation. The survey will be revisited every 5 years or when significant change of operation and the survey will be conducted again only for the area that have the significant change of noise level. • Noise dose, conduct for personnel who is analysed as abnormal hearing from annual health checking. • Noise level, conduct when any complaint raised	ATL via Authorized Contractor

Environmental Aspects	Parameters	Method	Location	Duration / Frequency of Monitoring	Responsibility
3. Surface Water Quality	Parameters to be selectively analyzed for surface water quality are as follows: • pH • Temperature • Conductivity • Dissolved Oxygen • 5-day Biochemical oxygen demand (BOD) • Chemical oxygen demand (COD) • Oil and grease • Total Petroleum Hydrocabon (TPH) • Total coliform bacteria • Total heavy metal	• Monitoring will be collected for analysis according to international guidelines and requirements such as USEPA	• Upstream and downstream of nearest representative surface water	• Every 2 years	ATL via Authorized Contractor
			• Upstream and downstram of area that involve in official and proved complaint/incident that related to company's activity.	• In case of any complaint/incident, conduct the monitoring as per request of authority (e.g. MOGE)	
4. Groundwater Quality	Parameters to be selectively analyzed for groundwater quality are as follows: • pH • Temperature • Conductivity • Dissolved Oxygen • 5-day Biochemical oxygen demand (BOD) • Chemical oxygen demand (COD) • Oil and grease • Total Petroleum Hydrocabon (TPH) • Total coliform bacteria • Total heavy metal	• Monitoring will be collected for analysis according to international guidelines and requirements such as USEPA	• Nearest representative groundwater well for ZOC facility	• Every 2 years	ATL via Authorized Contractor
			• Upstream and downstram of area that involve in official and proved complaint/incident that related to company's activity.	• In case of any complaint/incident, conduct the monitoring as per request of authority (e.g. MOGE)	
5. Soil erosion and sedimentation	• Observation of soil erosion or sedimentation cases and landslide while survey along pipeline route	• Visual observation	• ZOC/ZMS • Along pipeline	• Visual checking along pipeline route as ATL plan	ATL personnel
6. Biodiversity	• Observation of wildlife (fauna)	• Visual observation	• ZOC/ZMS • Along the pipeline while ROW inspection	• Summary of observed cases of wildlife every 6 months	ATL
7. Occupational health	• Determined case by case • Injury or incident case	• Determined case by case	• Determined case by case	• Monitor when concerns has been raised	ATL

Environmental Aspects	Parameters	Method	Location	Duration / Frequency of Monitoring	Responsibility
8. Storm Water Drainage	**Required by EQEG** • Oil & Grease	• Samples will be collected for analysis according to international guidelines and requirements such as USEPA.	• Storm water discharge locations	• 6 Monthly	ATL via Authorized Contractor
9. Sewage	**Required by EQEG[1]** • BOD • COD • Oil and Grease • pH • Total coliform bacteria • Total nitrogen • Total phosphorus • Total suspended solids	• Samples will be collected for analysis according to international guidelines and requirements such as USEPA	• Wastewater discharge locations	• 6 Monthly	ATL via Authorized Contractor

[1] In case of wastewater discharge

10 REPORTING REQUIREMENTS

This section outlines the reporting frequencies and types of reports to be prepared for the Project with regards to environmental management, monitoring, and compliance.

A robust reporting system will provide the Project with the necessary feedback mechanisms to ensure quality and timely implementation of the works. The reporting system will ensure regular flow of information from the Project site to the Project headquarters and, as necessary, to regulatory authorities. The reporting system will provide a mechanism to ensure that the measures proposed in the Project's EMP are implemented.

10.1 REPORTING REQUIREMENTS TO MYANMAR AUTHORITIES

There are a number of reporting requirements to Myanmar Authorities, as per the EIA Procedures and Administrative Instruction of Environmental Impact Assessment Procedure. These are summarized in ***Table 10.1***.

Table 10.1 Reporting Requirements to Myanmar Authorities

Report	Requirements	Frequency	Reference
Monitoring Report	• Submit monitoring reports to the Ministry not less frequently than every six (6) months, as provided in a schedule in the EMP, or periodically as prescribed by the Ministry. • Within ten (10) days of completing monitoring report, the Project Proponent shall make such report (except as may relate to National Security concerns) publicly available on the Project's website, at public meeting places (e.g. libraries, community halls) and at the Project offices. Any organization or person may request a digital copy of a monitoring report and the Project shall, within ten (10) days of receiving such request, submit a digital copy via email or as may otherwise be agreed upon with the requestor. • Monitoring reports shall include: a) documentation of compliance with all conditions; b) progress made to date on implementation of the EMP against the submitted implementation schedule; c) difficulties encountered in implementing the EMP and recommendations for remedying those difficulties and steps proposed to prevent or avoid similar future difficulties; d) number and type of non-compliance with the EMP and proposed remedial measures and timelines for completion of remediation; e) accidents or incidents relating to the occupational and community health and safety, and the environment; and f) monitoring data of environmental parameters and conditions as committed in the EMP or otherwise required.	Not less than every 6 months	EIA Procedure, Article 108 and 109
Report in Case of Breach of ECC or EMP	• Notify and identify in writing to the Ministry any breaches of its obligations or other performance failures or violations of the ECC and the EMP as soon as reasonably possible	• In case of any breach which would have a serious impact or where the urgent attention of the Ministry is or may be required, within not later than twenty-four (24) hours of ATL becoming aware of such incident. • In all other cases: within seven (7) days of ATL becoming aware of such incident.	EIA Procedure, Article 107

Report	Requirements	Frequency	Reference
Report of Any Accident or Incident	• Inform appropriate authorities as soon as practicably in the event of any accident or incident. • As per conditions of ECC	As per conditions of ECC	Administrative Instruction of Environmental Impact Assessment Procedure, Annex 5, Page 3
Additional Reporting Requirements as per ECC	• The Ministry may prescribe conditions in the ECC. Such conditions may include additional reporting requirements, such as: o General management documentation, reporting and information disclosure procedures o Monitoring documentation and reporting o Documentation and reporting on (i) parameters and issues that must be documented and reported; (ii) types and methods; (iii) frequency and timing; (iv) quality controls; and (v) recipients;	As per conditions of ECC	EIA Procedure, Article 91

10.2 ATL'S INTERNAL MONITORING AND INSPECTION

ATL conducts internal monitoring and inspection. Inspections are primarily conducted to identify deviations/non-conformities/unsafe conditions. Where identified, temporary corrective measures are implemented or discussed.

Reporting and follow-up are conducted as follows:

- Inspection report issued by the Team Leader;
- Includes corrective action recommendations;
- Draft forwarded to relevant Site SSHE Representative for comments and validation prior to distribution;
- Final Action plan discussed with the relevant Department Head prior to issue; and
- Highlight main findings for report to SSHE Committee.

10.2.1 Incident, Accident and Emergency Reporting

ATL will report all incidents, accidents and emergencies as per their Incident Management Procedure.

10.2.2 Performance Indicators

In general, performance indicators for monitoring and inspection include whether EMP implementation has been undertaken according to the planned arrangements and is being appropriately updated when necessary, as well as whether identified corrective actions and mitigation measures have been appropriately undertaken. Other criteria include whether objectives and targets have been met and whether there are any deviations from the EMP and legal requirements.

The levels of specific environmental and social parameters should be compliant with laws, regulations, standards and guidelines, as applicable, in particular Myanmar's EQEG, commitments of the EMP, as well as the conditions stipulated in the ECC.

10.2.3 Training Programs

ATL has a detailed SSHE Training and Competency Management Standard, which is described in detail in ***Section 12***.

11 OPERATIONAL SUB-PLAN

This Report provides the Environmental Management Plan (EMP) framework for the operation of the Zawtika Onshore Project. This Section provides operational sub plans which will complement the EMP Report by outlining the relevant procedures and processes, which will be applied to the Project to inspect and monitor the compliance and effectiveness of mitigation measures. Additionally, this document will ensure compliance with relevant legal and regulation requirements as well as corporate policies. As per Myanmar EIA Procedure (2015), project specific sub-plans shall be developed and implemented by the Project proponent and associated contractors. Therefore, this document is presented sub plans to comply with the requirements of the Myanmar EIA Procedure.

11.1 OVERALL BUDGET FOR IMPLEMENTING THE EMP

The budget for undertaking the implementation of the commitments stated in the EMP is estimated to be approximately 1 Millilon USD per year in total for the entire Project operation phase which is difficult to sepearte from Operation cost (this excludes monitoring and reporting component). Monitoring and reporting of impacts and mitigation measures is estimated to be approximately 50,000 USD (about 105,000,000 Kyats) per year.

Detail of budget for each operational sub-plans will be provided in the following sub-sections.

11.2 MANAGEMENT AND MONITORING SUB-PLANS

A number of operational management sub-plans will be developed and implemented in order to reduce impacts from the execution and operation of the Project. Management and monitoring sub plans will be created to support the operation of the Project by considering Project activities, contractor involvement and Project Proponent support. The Contractor and Project Proponent shall ensure the HSE team, which includes but is not limited to, a qualified and licensed Environmental Manager and Environmental Coordinators and a registered third party consultant in order to effectively and fully implement the environmental management and monitoring sub-plans.

The following sub-plans will be developed and implemented throughout the operation phase of the Zawtika Onshore Project:

- Biodiversity Management Plan;
- Community Safety, Security, Health, and Environmental (SSHE) Management Plan;
- Control and Maintenance Plan;
- Emergency Management Plan;
- Occupational Health Management Plan/Standard; and

- Waste Management Plan.

*11.2.1 **Biodiveristy Management Plan***

11.2.1.1 Objectives

The Biodiversity Management Plan (BMP) is developed to:

- Maintain or improve biodiversity values during the Project operation; and
- Determine risks and impacts prior to the commencement of Project activities.

The BMP should focus on identifying, evaluating, and conserving the relevant aspects of biodiversity, and should serve to avoid and mitigate impacts to biodiversity related aspect.

11.2.1.2 Legal Requirements

The Biodiversity Management Plan will be undertaken in accordance with the IFC Performance Standard 6 Guidance Note as well as the TNRP management plan (further detail of the TNRP is provided in ***Section 11.3***).

11.2.1.3 Implementation Schedule

Biodiversity Management Plan will be implemented throughout the entire operation phase of the Project.

11.2.1.4 Management Actions

The following management actions and mitigation measures for biodiversity will be undertaken to minimise the impact generated by operation of the Project. These actions have been extracted from ***Chapter 8*** and summarised as below:

- Clearly mark the Project area for the Project vehicles;
- Prevent Project activities from blocking community access to community assets;
- Ensure awareness about protected area and restricted activities on workers;
- Impose harsh penalties on those who break the regulations;
- Prohibit workers from hunting, trapping, or fishing;
- Provide training to all workers about sensitive receptors and areas with behaviour guideline;
- Ensure awareness to project workers about rare and endangered species;
- Report if any endangered or rare species are found within the Project area or ROW;
- Development of additional ecological surveys as necessary in sensitive areas to monitor impact on rare and endangered species;

- Adhere to condition/rules regarding the use of access roads and walkways in TNRP (Tanintharyi Nature Reserve Project);
- Prohibit trees cutting on access walkways; and
- Provide annual financial support to TNRP Project.

11.2.1.5 Monitoring Plans

Detail of the monitoring plan for biodiversity management plan, is presented in the below table (***Table 11.1***):

Table 11.1 Monitoring Detail of Biodiversity Management Plan

Monitoring Aspect	Parameters	Method	Location	Monitoring Frequency
Biodiversity	Observation of wildlife (fauna)	Visual observation	• ZOC • Along pipeline ROW	Summary of observed cases of wildlife every 6 months

Source: ATL, 2019

11.2.1.6 Projected Budget and Responsibilities

ATL together with other operators funded the Tanintharyi Nature Reserve Project (TNRP) by contributing 150,000 USD (about 315,000,000 kyats) annually to support the Biodiversity Management and forest reservation under the control of Forest Department. Therefore, the Biodiversity Management Plan are under direct supervision of the forest department whereby operators can engage with suggestions and opinion during meetings. In addition, ATL also use Operational budget for ROW maintenance.

11.2.2 Community Safety, Security, Health and Environment Management Plan

11.2.2.1 Objectives

The objective of a community Safety, Security, Health, and Environmental (SSHE) Management Plan is to provide a clear procedures and processes which will be conducted throughout the Project operation to monitor and measure the effectiveness of mitigation and management plans implementation. This will aim to reduce the negative impacts towards the community health and safety while maximizing area for positive contribution.

This management plan will be implemented throughout the Project operation phase.

11.2.2.2 Legal Requirements

The SSHE management plan will be conducted with consideration to the following laws and regulations:

- Public Health Law, 1972;
- Protection and Prevention of Communicable Disease Law, 1995;
- Labour Organisation Law, 2011;
- Minimum Wages Law, 2013;
- Employment and Skill Development Law, 2013;
- Settlement of Labour Dispute Law, 2012;
- Workmen Compensation Act, 1923;
- Payment of Wages Law, 2016;
- Leaves and Holidays Act, 1951; and
- Social Security Law, 2012.

Other internal requirements and policies that will govern the conduct of this management plan includes:

- PTTEP Myanmar Asset Safety, Security, Health and Environment (SSHE) Policy whereby states their commitment to safe Exploration and Production (E&P) Operations in Myanmar with an ultimate goal of "Target Zero – Nobody Gets Hurts in Our Operations" which covers (1) Zero Injury, (2) Zero Major Accident (e.g. zero major hydrocarbon leak, vehicle accident, ship collision), and (3) Zero Spill or External Complaint (e.g. zero complaint by authorities/ communities/ sea users).

11.2.2.3 Implementation Schedule

Community SSHE Management Plan will be implemented throughout the entire operation phase of the Project.

11.2.2.4 Management Actions

The following management actions and mitigation measures for community SSHE will be undertaken to minimise the impact generated by operation of the Project. These actions have been extracted from ***Chapter 8*** of the EMP Report and summarised as below:

- Hiring of locals from "pipeline affected communities" in semi-skilled and unskilled jobs;
- Announce job vacancies positions in advance through local sources;
- Ensure transparent recruitment procedures;
- Provide training to locals;
- Support local business by sourcing material from local and national business;

- Provide awareness on local culture and customs as part of worker induction training;
- Continue CSR programme (more details can be found in Annex C and Annex D);
- Initiate or support development programs that catered to the local need;
- Implement PTTEP Corporate's Grievance Handling Guideline (see Section 13.2.2 of the EMP Report);
- Develop and implement a waste management plan to ensure adequate and legally acceptable control and management of transport and responsible disposal of all waste onsite and offsite are in place;
- Frequently communicate with related community and sensitive receptor for good relationship;
- Provide health workers and clinics on-site;
- Provide a referral to nearby hospitals;
- Provide awareness on health training to all workers;
- Implement vector control measurements (i.e. fumigation for mosquitoes);
- Provide Safety Data Sheet (SDS) for all chemicals present on site;
- Hired or trained workers for qualification of transport, use, and disposal of hazardous material;
- Inform communities about Myanmar Asset Emergency Management Plan in detail; and
- Set up warning signs, lighting, and fences as proper to warn locals of access road and the pipeline safety zones.

11.2.2.5 Monitoring Plans

No additional monitoring is proposed for the management plan.

11.2.2.6 Projected Budget and Responsibilities

The SSHE budget including fire control and safety of workplace for this Project is estimated to be approximately 80,000 USD (168,000,000 Kyats) per year.

The responsible party for conducting this management plan is ATL (Andaman Transportation Limited) and/or PTTEP.

*11.2.3 **Control and Maintenance Plan***

11.2.3.1 Objectives

The objective for this plan is to ensure up keeping of all vital Project components to ensure efficient and effective operation, henceforth reducing environmental impacts (such air emission and noise) and minimizing unplanned events related risks. This plan will be developed and implemented as necessary on a case-by-case basis (i.e. intermittently) during the entire operation phase of the Project.

11.2.3.2 Legal Requirements

The control and maintenance plan will be conducted with consideration to the following laws and regulations:

- Oil and Gas exploration drilling, appraisal and Production, 2019;
- Development Committee Law, 1993; and
- Factories Act, 1951.

11.2.3.3 Implementation Schedule

Control and Maintenance Plan will be implemented intermittently throughout the entire operation phase of the Project.

11.2.3.4 Management Actions

The following management actions for control and maintenance plan will be undertaken to minimise the impact generated by operation of the Project. These actions have been extracted from ***Section 11.4*** of the EMP Report and summarised as below:

Corrosion Protection Procedures:

- Coat and Weld
    - To protect against corrosion, the gas pipeline has been externally-coated with 3 layers. The first layer is coated by Power Epoxy (PE), the second layer is coated by Adhesive PE, and the third layer is coated by Polyethylene (PE). Coating must meet with the DIN 30670 standard.
    - Polyethylene (PE) is used for the external pipeline coat, because of the excellent resistance to acids-concentrated, acids-dilute, and alkaline. Therefore, in case of leaks of acid/alkaline from accidents, the pipeline would still resist such corrosion effects.
    - Fusion Bond Epoxy (FBE) is also used for the external pipeline coat because of the excellent resistance to acids-concentrates and acid-dilutes, and alkaline.
- Cathodic Protection
    - To give complete protection from corrosion and to extend the lifetime of the steel pipe, the Cathodic Protection (CP) has been employed for the gas pipeline. The CP is the combination of a sacrificial anode and the impress current that is able to completely protect against corrosion caused from all 4 components as follows:
        - Anode – corroding portion;
        - Cathode – non-corroding portion;
        - Anode and Cathode (Metallic path); and
        - Electrolyte.

- Corrosion occurs when the cation of Fe dissolves into an electrolyte resulting in the anion being deposited on the cation of Fe, which is then released from the anode to the cathode. The released anion will then be deposited on the Hydrogen cation causing corrosion. The CP will release the electricity to coat the steel surface of the pipe and convert to the cathode.

11.2.3.5 Monitoring Plans

No additional specific monitoring plans is proposed for this maintenance plan. However, frequent project component inspection will be conducted and the maintenance/control measures will be undertaken based on a case-by-case assessment.

11.2.3.6 Projected Budget and Responsibilities

The budget for this Control and Maintenance Plan is within the operational cost of the Project.

The responsible party for conducting this plan is ATL (Andaman Transportation Limited).

11.2.4 Emergency Management Plan

11.2.4.1 Objectives

The Plan covers roles, responsibilities, systems and processes that Myanmar Asset's Emergency Management Team (EMT) and Myanmar Asset's Crisis Management Team (CMT) will follow when responding to an emergency or crisis. The Plan covers all operations and activities carried out by ATL including incidents of, but not limited to, the following nature:

- Onshore Operational Incidents;
- Environmental (Spill / Hydrocarbon Leak) incidents;
- Security Incidents;
- Logistics Related Incidents;
- Occupational Health Incidents; and
- ATL Personnel Incidents.

11.2.4.2 Legal Requirements

The Emergency Management Plan will be conducted with consideration to the following laws and regulations:

- Disaster Management Laws and Rules, 2013;
- Environmental Impact Assessment Procedure, 2015;
- Public Health Law, 1972;
- Oil and Gas exploration drilling, appraisal and Production, 2019;

- Prevention from Danger of Hazardous Chemical and Associated Materials Rule (notification No 85/2015-2016);
- Prevention from Danger of Hazardous Chemical and Associated Materials Law;
- Factories Act, 1951 (amended in 2016);
- Myanmar Fire Force Law, 2015;
- Social Security Law, 2012; and
- Occupational Safety and Health Law, 2019.

Other internal requirements and policies that will govern the conduct of this management plan includes:

- Following Myanmar Asset Emergency Management Plan (11027-PDR-SSHE-502-006-R01), the organizational structure of Myanmar Asset emergency and crisis management is categorized into a 3-Tier response level. Myanmar Asset Emergency Management Team will be activated on Tier 2 and/or Tier 3 since the notification and request support from ERT Leader (OSC); and
- Myanmar Asset Emergency Management Plan (11027-PDR-SSHE-502-006-R01)and Myanmar Asset Crisis Management Plan (1102-PDR-SSHE-501-005-R00) applies to the Offshore and Onshore Operational of PTTEP operations in Myanmar as same as and Myanmar Asset Tropical Cyclone Procedure (11027-PDR-SSHE-507-R04) is a significant impact on offshore operations but also onshore work sites and domestic office facilities will be applied.

11.2.4.3 Implementation Schedule

Emergency Management Plan will be implemented throughout the entire operation phase of the Project.

11.2.4.4 Management Actions

Figure 11.1 shows the Myanmar Emergency Management Team organization structure.

PTTEP emergency & crisis organization includes representatives of PTTEPI management team, from all departments. This organization also liaises with PTTEP Corporate, Myanmar Government Authorities and other strategically important stakeholders. In case of any emergencies, all employees, contractors and third party personnel have an emergency role to play as specified in site specific ERP and PTTEPI Emergency & Crisis management plan respectively. The emergency duties range from standing by to directly carrying out emergency response operations. In addition, the communication to the relavent Government Authority in case of emergency or spill events according to the stated law and requirement.

Moreover, Myanmar Asset Spill Contingency Plan, under "International Convention on Oil Pollution Preparedness, Response and Co-operation (OPRC-

1990)" and "National Contingency Plan for Marine Pollution" so any incident must be reported to Department of Marine Administration as following:

Name:	**Myanmar Maritime Police Force,**
Hot Line (24 Hour):	+95 1 555006, +95 9 426564152

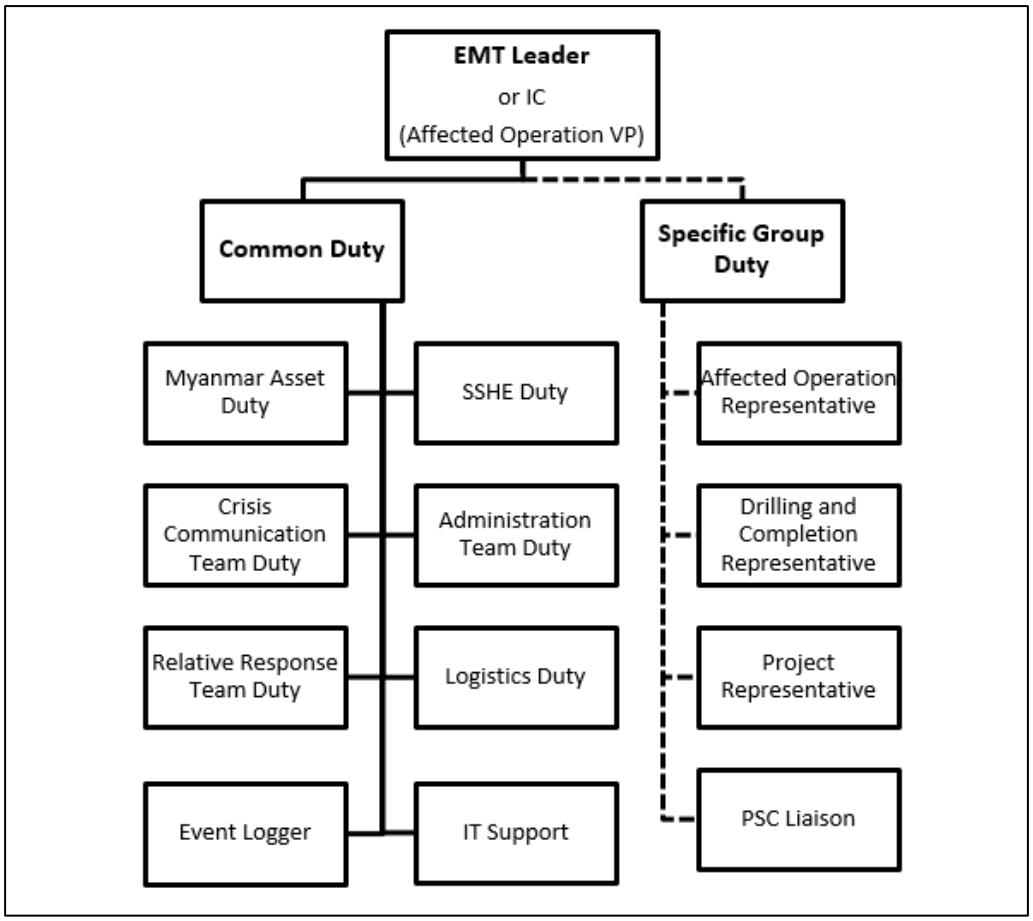
Name:	**Maritime Rescue Coordination Centre**
Address:	Monkey Point Street, Botataung Township, Yangon Myanmar
Telephone:	+95 1 202417
Fax:	+95 1 202417
Email:	mrcc.myanmar2012@gmail.com; mrcc.yangon@mptmail.com.mm

Competent National Authority:	**Department of Marine Administration**
National Contact Point:	Director Maritime Safety, Security and Environmental Protection Division, Department of Marine Administration, Ministry of Transport and Communications
Phone:	Duty Officer (Hot Line): +95 1 9010038 Ph: +95 1 556097, Fax: +95 1 397641
Email:	sse@dma.gov.mm, dma@motc.gov.mm
Address:	No-363/421, Corner of Merchant & Theinbyu Road, Botataung Township, Yangon, Myanmar

Name:	**Marine Environment, Myanmar Port Authority (MPA), Pollution Report**
Address:	Duty Officer (Port Tower)
Phone :	+951 388 068
E-mail :	mpa@mptmail.net.mm

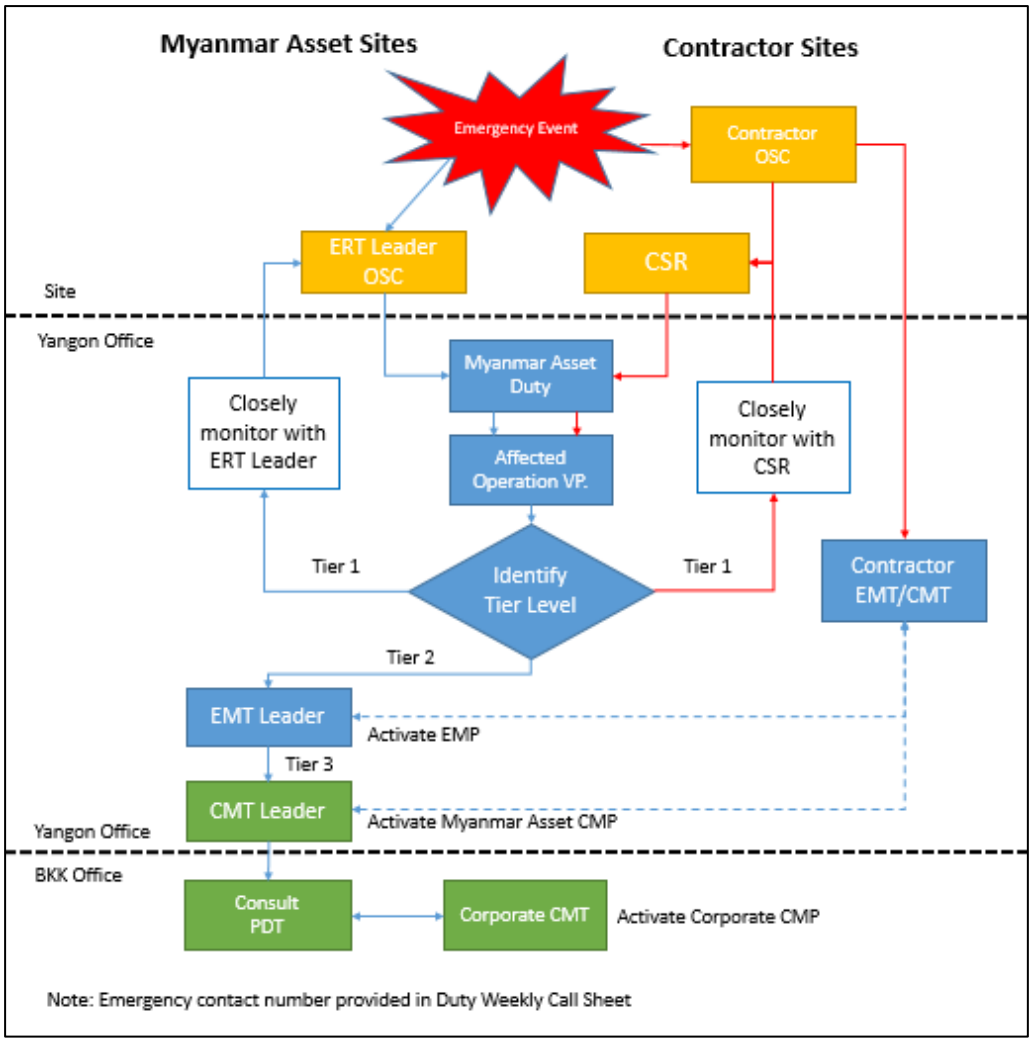
The structure of emergency organization and communication flowchart is shown in ***Figure 11.2*** below.

Figure 11.1 PTTEP Myanmar Emergency Management Team Organization



Source: PTTEP, 2019

Figure 11.2 Notification and Communication Flowchart



Source: PTTEP, 2019

Full details on PTTEPI's emergency plan are provided in PTTEP's SSHE Management System.

The following management actions and mitigation measures for controlling risks and minimizing impact of unplanned events will be undertaken to minimise the aftermath impact of an unplanned event potentially generated by operation of the Project. These actions have been extracted from ***Chapter 8*** of the EMP Report and summarised as below:

- Implement Myanmar Asset Spill Contingency Plan;
- Minimise the storage of hazardous material onsite as practical to reduced risk of spill/leakage;
- Conduct regular maintenance on designated area;
- Use of oil catch pans under vehicles during maintenance and dispose responsibly;
- Conduct regular training (and safety induction for new personnel) of personnel in safe use & handling of hazardous materials;
- Provide sufficient spill clean-up kits and spill response training;

- Regularly inspect fuel and chemical storage areas for any possible leakage;
- Store all chemicals in secured storage area with impervious (cement or plastic sheet) floor and bund wall;
- Handle all chemicals according to their SDS;
- Implement Myanmar Asset Emergency Management Plan and provide training on the plan to all employees;
- Regularly conduct pipeline inspection and maintenance procedures, including:
    - ROW surveillance;
    - ROW maintenance;
    - Regular inspection of pipeline integrity by pig;
    - Leakage survey including inspection of pipe coating and insulating joints/flanges;
    - Cathodic protection maintenance and corrosion monitoring;
- Repair abnormal pipeline when detected;
- Monitor the system flow parameter (pressure, temperature, flow rate) continuously;
- When detecting abnormal pipeline, implement procedures of isolating and depressurizing the affected pipeline;
- Conduct preventative maintenance on fire and gas detection system and firefighting equipment as proper;
- Provide good amount and appropriate type of fire extinguishers, fire alarms, and windsocks;
- Conduct fire training and response drills as frequent as proper;
- Determined smoking area and apply strict penalty;
- Clearly identify pipeline ROW with warning signs and fencing. Apply the same measure with landfall;
- Regularly inform public about risks, prevention measures and emergency response through proper information channel;
- Inform public near earthquake zone areas about risks, prevention measures and Public Emergency Response Plan;
- To protect the pipeline from corrosion, implement effectively the control and maintenance plan;
- Install warning signs in potentially hazardous areas; and
- Emergency Shutdown System – Operation will be shut off when undesired events which related to Pipeline operation occurred, such as if pipeline is destructed by a third person, fire and/or explosion, gas leakage, and a higher pressure or lower pressure that is leading to uncontrollable situation. Shut off operation can be implemented at four areas (ZBV-1, ZOC, ZBV-2, Metering Station):
    - ZBV-1 - Shut off operation can be implemented with 2 principles.
        - Remotely controlled from long distance by SCADA system from ZOC.

- Pipeline breaking detection system will automatically shut off the operation if there is possibility of pipeline destructed.

- ZOC - Operating round the clock with manned monitoring and controlling, which can be shut off under consideration.
- ZBV-2 - Shut off operation can be implemented with 2 principles.
  - Remotely controlled from long distance by SCADA system from ZOC and ZMS.
  - Pipeline breaking detection system will automatically shut off the operation if there is possibility of pipeline destructed.
- Metering Station - The valve hot tap that is controlled from long distance can be shut off from the ZOC.
- Valve is controlled by SCADA from the ZOC. The SCADA can inspect the gas leakage through pressure on-line report. Safety vents will be used in case of emergencies which requires pipeline blow down, and for occasionally pressure venting of pipes and pressure vessels in the operation center and metering station during commissioning and maintenance.

11.2.4.5 Monitoring Plans

The Environmental Plan Report will include the items listed in ***Table 11.2***.

Table 11.2 Environmental Monitoring Recording

Project Activity / Environmental Aspect	Monitoring Measures	Reporting
Incident reporting	Details of any environment or social Incidents	Incident report forms
Accidental Releases and Leaks	Safety record	Safety record
Non-Compliance Reporting	Non-Compliance with EMP	Inspection check sheets

11.2.4.6 Projected Budget and Responsibilities

The budget for the emergency response is within the operational cost of the Project.

The responsible party for conducting this management plan is ATL (Andaman Transportation Limited).

11.2.5 Occupational Health Management Plan/Standard

11.2.5.1 Objectives

The objective of the Occupational Health Management Plan/Standard is to:

- Protect, promote and maintain the health, safety and welfare of people at work;
- Advise on the provision of safe and healthy conditions by informed assessment of the physical and psychological aspects of the working environment;
- Identify and advise management on the causes of occupational disease and injury and the means of their prevention;
- Advise on the rehabilitation and placement in suitable work of those temporarily or permanently incapacitated by illness or injury; and
- Assist in the planning and preparedness of emergency response plans.

11.2.5.2 Legal Requirements

The Occupational Health Management Plan/Standard will be conducted with consideration to the following laws and regulations:

- Oil and Gas exploration drilling, appraisal and Production, 2019;
- Prevention from Danger of Hazardous Chemical and Associated Materials Rule (notification No 85/2015-2016);
- Prevention from Danger of Hazardous Chemical and Associated Materials Law; and
- Occupational Safety and Health Law, 2019.

Other internal requirements and policies that will govern the conduct of this management plan includes:

- PTTEP Myanmar Asset Safety, Security, Health and Environment (SSHE) Policy whereby states their commitment to safe Exploration and Production (E&P) Operations in Myanmar with an ultimate goal of "Target Zero – Nobody Gets Hurts in Our Operations" which covers (1) Zero Injury, (2) Zero Major Accident (e.g. zero major hydrocarbon leak, vehicle accident, ship collision), and (3) Zero Spill or External Complaint (e.g. zero complaint by authorities/ communities/ sea users);
- PTTEP Myanmar Asset SSHE Management System (11027-PDR-SSHE-000-001-R01), whereby this document concentrates on SSHE critical activities, ensuring that at Asset Management levelt hey are identified, properly monitored and controlled. By alignment with the Corporate SSHE MS, this SSHE MS is aligned to industry models and ISO 14001 standards; and
- PTTEP Occupational Health Management Standard (SSHE-106-STD-560).

11.2.5.3 Implementation Schedule

Occupational Health Management Plan/Standard will be implemented throughout the entire operation phase of the Project.

11.2.5.4 Management Actions

The following management actions and mitigation measures for minimizing impact towards occupational health will be undertaken. These actions have been extracted from ***Chapter 8*** and ***Section 11.6*** of the EMP Report and summarised as below:

- PTTEP Occupational Health Management Standard, Myanmar Asset SSHE Training and Competency Procedure, and Personal Protective Equipment Standard will be implemented;
- Maintenance all machinery as per maintenance schedule;
- Conducted safety and awareness training that include the review incidents and near misses' records;
- Ensure all skilled workers are trained and qualified through training and job selection process before working;
- Provide PPE to workers as proper;
- Provide first aid equipment, and train all personnel in first aid;
- Install warning signs in potentially hazardous areas;
- Enforce speed limits on project roads and vehicle;
- Cooperate with the nearest health center/hospital to immediately support response to emergency events;
- Health risk assessment and planning;
- Industrial hygiene and control of workplace exposures;
- Medical emergency management;
- Management of ill health in the workplace;
- Fitness for task assessment and health surveillance;
- Health impact assessment;
- Health reporting and record management;
- Public health interface and promotion of good health; and
- Control of food, water and sanitation issues.

11.2.5.5 Monitoring Plans

Detail of the monitoring plan for Occupational Health Management Plan, is presented in the below table (***Table 11.3***):

Table 11.3 Monitoring Detail of Occupational Health Management Plan

Monitoring Aspect	Parameters	Method	Location	Monitoring Frequency
Occupational Health	• Determined case-by-case • Injury or incident case	Determined case-by-case	Determined case-by-case	Monitor when concerns has been raised

Source: ATL, 2019

11.2.5.6 Projected Budget and Responsibilities

The budget for this procedure is within the operational cost of the Project.

The responsible party for conducting this management plan is ATL (Andaman Transportation Limited).

11.2.6 Waste Management Plan

11.2.6.1 Objectives

A Waste Management Plan will be prepared to outline the methods and practices to meet the requirements of this EMP and applicable regulations.

The objectives of the plan are to:

- Ensure waste is managed in a controlled and appropriate manner in compliance with statutory requirements concerning the management of waste;
- Ensure resources are recovered where possible and safe to do so, for re-use and recycling;
- Detail responsibilities, both offshore and onshore (supply bases) for waste management;
- Outline the appropriate handling, storage, transportation and disposal of waste; and
- Describe the recording and tracking for all wastes generated (i.e. waste manifest).

11.2.6.2 Legal Requirements

The Waste Management Plan will be conducted in accordance with Myanmar National Environmental (Quality) Emission Guidelines (2015).

Additionally, the Waste Management Plan will be conducted with consideration to the following laws and regulations:

- Myanmar Agenda 21 (1997);
- Environmental Conservation Law (2012);
- Environmental Conservation Rules, (notification no. 50/2014);

- Environmental Impact Assessment Procedure, (notification no 616/2015);
- National Environmental Quality (Emissions) Guidelines, (notification no. 615/2015);
- Petroleum exploration, drilling, appraisal and production law (2019);
- The Oilfields Act (1918) (amended in 2010);
- Conservation of Water Resources and Rivers Law (2006);
- The Protection of Biodiversity and Conservation Areas Law 2018;
- Freshwater Fisheries Law, 1991;
- Waste Management Strategy and Action Plan for Myanmar (2017-2030);
- Factories Act, 1951; and
- The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (2015).

Other internal requirements and policies that will govern the conduct of this management plan includes:

- PTTEP Myanmar Asset Waste Management Procedure (11027-PDR-SSHE-503/01-R02) where it aimed to provide compulsory requirement for effective waste management covers waste management planning, classification, segregation, packing, labelling, storing, transportation, treatment, disposal and reporting. The requirement shall be applied to non-hazardous, hazardous waste and Naturally-Occurring Radioactive Materials (NORM) waste which are generated from PTTEP Myanmar Asset sites;
- PTTEP Myanmar Asset Safety, Security, Health and Environment (SSHE) Policy whereby states their commitment to safe Exploration and Production (E&P) Operations in Myanmar with an ultimate goal of "Target Zero – Nobody Gets Hurts in Our Operations" which covers (1) Zero Injury, (2) Zero Major Accident (e.g. zero major hydrocarbon leak, vehicle accident, ship collision), and (3) Zero Spill or External Complaint (e.g. zero complaint by authorities/ communities/ sea users); and
- PTTEP Myanmar Asset SSHE Management System (11027-PDR-SSHE-000-001-R01), whereby this document concentrates on SSHE critical activities, ensuring that at Asset Management level they are identified, properly monitored and controlled. By alignment with the Corporate SSHE MS, this SSHE MS is aligned to industry models and ISO 14001 standards.

11.2.6.3 Implementation Schedule

Waste Management Plan will be implemented throughout the entire operation phase of the Project.

11.2.6.4 Management Actions

The following management actions and mitigation measures for controlling and managing waste generated from the Project operation will be undertaken. These actions have been extracted from ***Chapter 8*** of the EMP Report and summarised as below:

General

- Treat all domestic wastewater discharge according to Myanmar requirement;
- Waste will be handled, stored and transported in a manner that reduces risks to the environment. Different treatment or procedures are provided according to its type;
- Store waste in the secure container with proper label;
- Separate hazardous waste and material from the non-hazardous;
- Labelled all dispose waste; and
- All the waste shall be temporarily stored at ZOC waste storage building (as shown in ***Figure 11.3***). Hazardous waste will be transferred to approved waste management facilities by land transportation while non-hazardous waste will be sent to dispose at onsite waste incinerator or at approved waste disposal facilities.

Hazardous Waste

- Separate hazardous waste from general waste and store in proper labelled container and storage area according to types of wastes;
- Hazardous waste shall be stored separately in the hazardous waste compartment at ZOC waste storage building then transfer to certified or qualified waste management facilities for disposal;
- Hazardous wastes must be stored in a safe and durable container, suitable for transfer, and be placed in a location far from ignition sources until disposal/treatment;
- Prohibit any discharge of hazardous waste into the sea;
- Used oil and oil-contaminated waste shall be stored separately with labels for disposal;
- Ensure manifest of hazardous waste is kept; and
- Hazardous waste shall be temporary stored at ZOC waste storage. When the waste storage area nearly full, inform to waste contract holder for further communicate with waste disposal contractor to collect waste at ZOC for final disposal.
- At present ATL is using DOWA (see ***Figure 11.4*** and ***Figure 11.5*** for location, layout, operation and transport route to DOWA) to dispose Hazardous waste and it may change depend on the future waste disposal facilities availiability. If there are any changes likely to occur, ATL will informed MOGE and other relevant authorities.

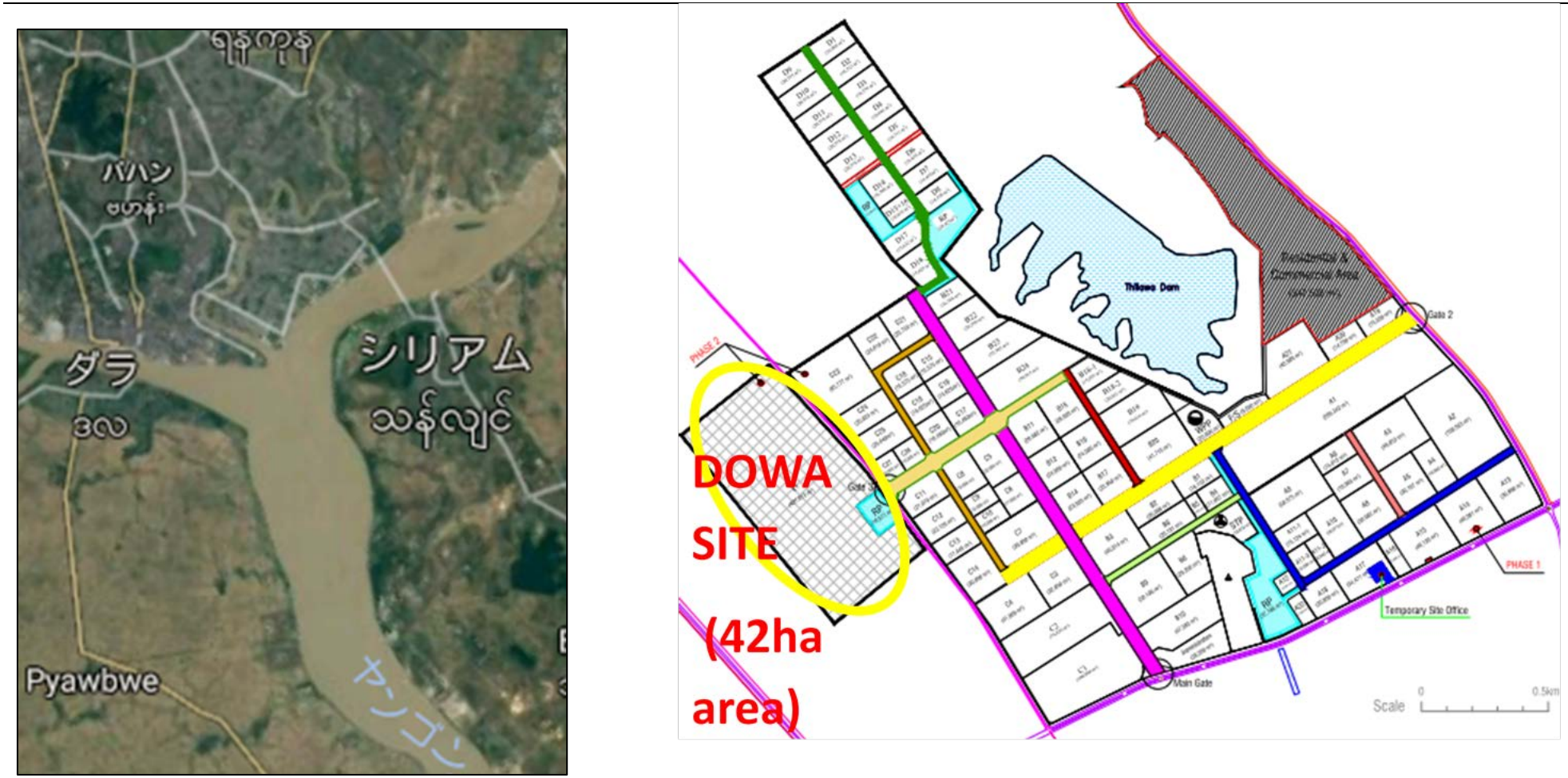
Non-Hazardous Waste

- Segregate non-hazardous waste including food waste, paper, aluminium can, glass, rag and other wastes in separate containers or proper areas;
- Separate and store each type of waste (separate non-hazardous waste and hazardous waste) into appropriate containers having clear labels;
- General non-hazardous waste will be transferred to municipal waste management facility (e.g. DAWEI) or other licensed waste management facility;
- For ZOC, food waste shall be handed over to local villagers for livestock feeding if there is a demand. If no demand, this waste shall be delivered to licensed waste management facility;
- Domestic sewage shall be treated to meet EQEG emission limit and discharged to environment;
- Keep the records of waste inventories including types and quantities updated;
- Recyclable and reusable waste shall be handed over to local villagers for further reuse or recycling shop for further process, as appropriate.

Figure 11.3 Zawtika Onshore Waste Storage Location

Source: ATL, 2019

Figure 11.4 Location, Layout and Landfill Operation of DOWA Waste Management Facilities

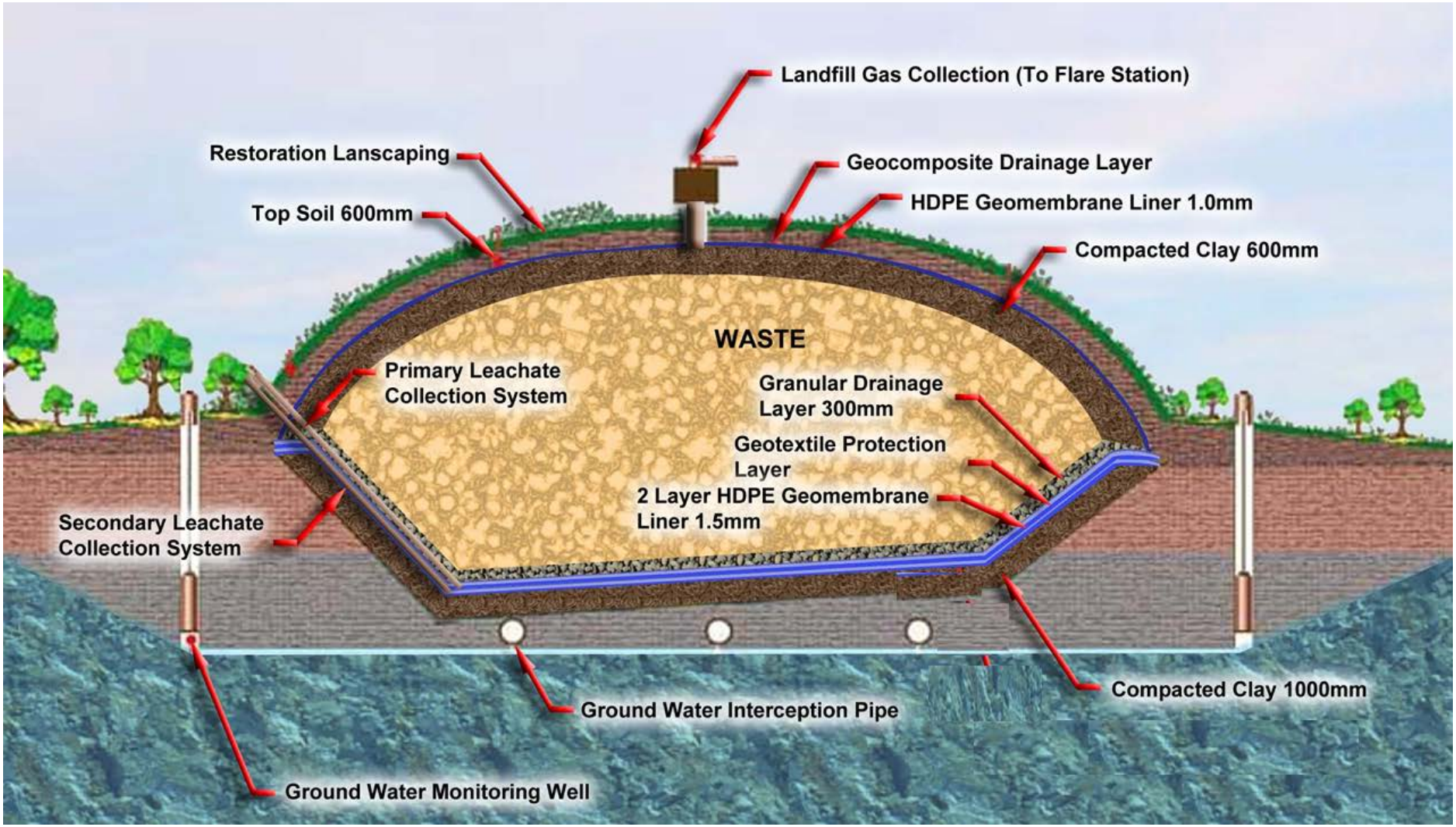


Source: DOWA, 2019

Figure 11.4 Location, Layout and Landfill Operation of DOWA Waste Management Facilities (Cont.)

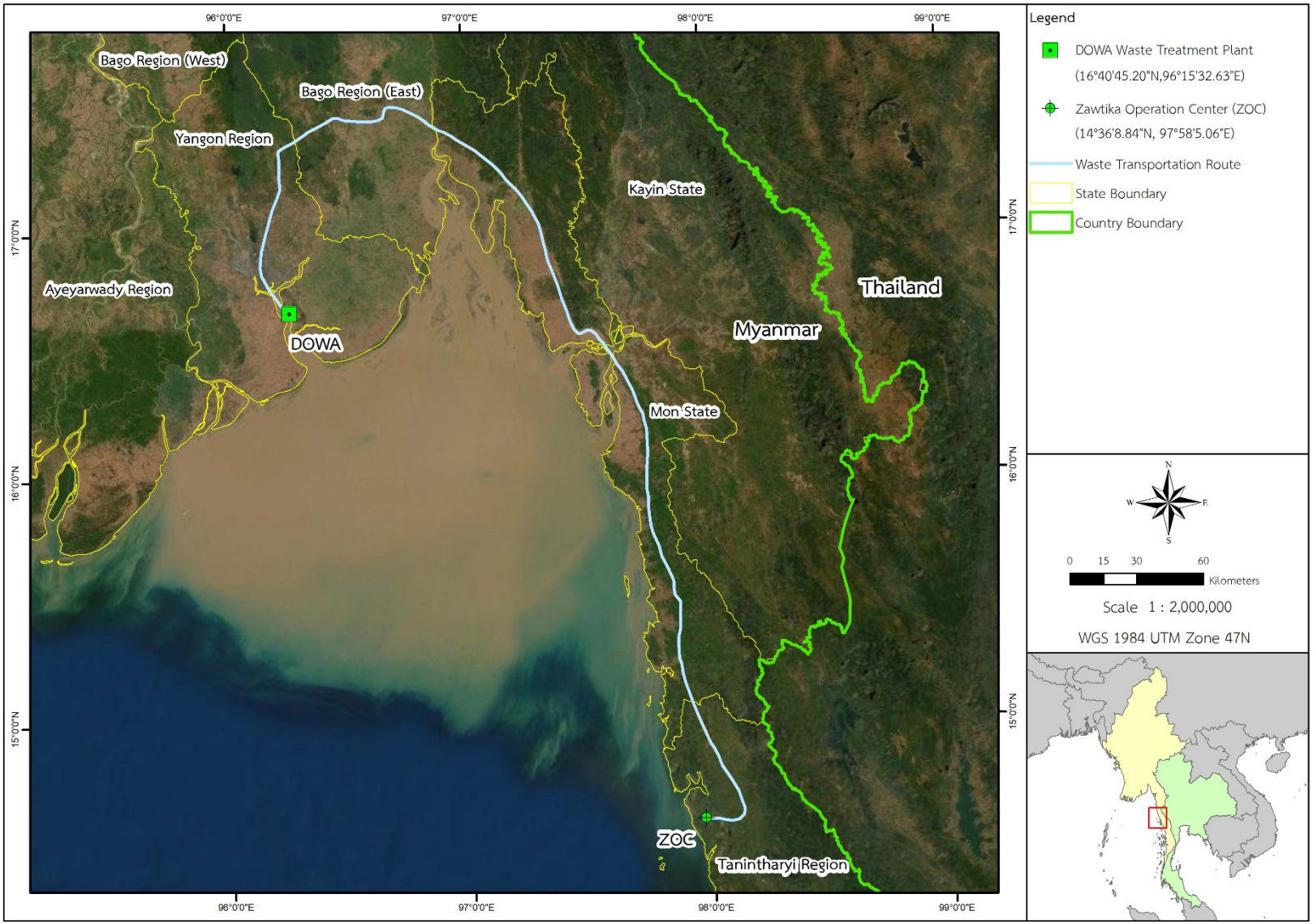
Source: DOWA, 2019

Figure 11.4 Location, Layout and Landfill Operation of DOWA Waste Management Facilities (Cont.)



Source: DOWA, 2019

Figure 11.5 Zawtika Onshore Waste Transportation Route



Source: ATL, 2019

11.2.6.5 *Monitoring Plans*

Detail of the monitoring plan for waste management plan, is presented in the below table (***Table 11.4***):

Table 11.4 Monitoring Detail of Waste Management Plan

Type of Waste	Waste Name	Frequency	Monitor
Non-hazardous waste	Food Waste	Monthly	• Generation Volume • Storage Unit • Disposal
	General non-hazardous waste (Mix wastes)		
	Plastic Bottles		
Hazardous waste	Mixed hazardous wastes e.g. contaminated fabric, empty container, etc.		

Source: ATL, 2019

11.2.6.6 *Projected Budget and Responsibilities*

The budget for this Waste Management Plan is within the operational cost of the Project.

The responsible party for conducting this management plan is ATL (Andaman Transportation Limited) via an authorized contractor.

ATL has an SSHE Training & Competency Standard**.** The purpose of this SSHE Training and Competency Standard is to ensure that:

- SSHE Training and Competency requirements defined for each position are appropriate to the workplace, job and risks involved.
- Ensure that these requirements are translated into reality by developing an appropriate programme of competency assessment and training.
- Ensure that personnel competency standards are established, and personnel competencies assessed against those standards.

There are the following specific requirements within ATL's Training and Competency Standard:

- For all persons working onshore and visitor are required to attend induction training which are able to evaluate and screen personnel attending the introduction and to determine their abilities to behave safely and responsibly on site. The information to be communicated on induction should include, but not limited to, the followings;
    - Compliance with PTTEP SSHE Policy and SSHE MS is mandatory
    - Familiarization with alarm types, access and egress routes and mustering Procedures.
    - Emergency response: how to respond in the emergency/crisis, mustering and evacuation plan, etc.
    - Where to go and who to contact if they have a concern.
    - The importance of Behavior Base Safety (BBS)
    - Awareness of and compliance with local rules, regulations, practices and Procedures, where applicable such as,
        - reporting of all hazards, incidents and near misses;
        - Pre-job safety discussions and hazard analysis;
        - Substance abuse;
        - No smoking policy;
        - Use of Personal Protective Equipment (PPE)
        - Wearing of seatbelts;
        - Access to restricted area; and
        - Permit To Work (PTW)
- All persons working at Onshore Production location (Category C) which are require for each position training requirement.
- E-learning is in many cases the preferred training method for routine SSHE training.
- Where they exist, OPITO Competence Standards are the basis for the training and competence requirements within ATL. Attention is drawn to OPITO Guidance for 'Effective Management of Competence and Training in Emergency Response in the Oil and Gas Industry.

13 PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

13.1 SUMMARY OF PREVIOUS PUBLIC CONSULTATION CONDUCTED DURING ESHIA

As part of the ESHIA carried out by Pro-En Technologies, Ltd., in September 2009, public consultation activities were conducted. Details of these activities are presented in this section.

13.1.1 *Purpose of the Public Consultation*

The purpose of the Public Consultation activities was to:

- Understand the general social, and health conditions and quality of life of local people (focusing on relevant stakeholders) in the study area (approximately 1 km radius);
- Provide stakeholders with information to gain an understanding of the project and to qualify and quantify socially sensitive receptors; and
- Assess potential positive and negative impacts of the project on social and health conditions and to propose mitigation measures to minimize or eliminate impacts.

13.1.2 *Methodology and Approach*

The public consultation activities were conducted during January 10-17 2009. Activities primarily consisted of focused group discussion meetings with the targeted communities, in-depth interviews with key informants of each community, community visits and interviews with questionnaires for household level.

13.1.2.1 *Study Area*

The study area focused on all communities located within a 1 km radius of the Zawtika onshore pipeline route (ROW). In total, public consultation covered six communities located in Phase I of the Project, as follows:

- Daminseik
- Phaungdaw
- Kaunghmu
- Ohnbinkwin
- Mighaungaing
- Shinbyan

All of the following villages are located in Yebyu Township and Kaleinaung sub-Township, Dewai District, Tanintharyi Region. More details about socio-economic baseline will be describe below.

Yebyu Township

Yebyu Township have the total area of 2,447 Km^2 with the total population of 100,768 people. The average household size is about 4 person per household.

The literacy rate (the ability to read and write) of those over age 14 was 84.4% with higher rate for male than female. This is considered as low when compared with other townships in the region.

The labour force participation rate (aged 15-64) is about 67.9% with only 47% for female. The unemployment rate is 6.9%. The most common occupation in the township is skills agricultural, forestry and fisher workers (47.8%), and elementary occupation (18.6%) e.g.

In term of utilities, most household use firewood (71.5%) and charcoal (26.9%) as main energy for cooking. For lighting, the most common sources are private generator (38.8%) and candle (26.6%). The main source of drinking and non-drinking water is from both protected and unprotected well/spring. Water seal toilet is mostly found in the township (65.6%).

More than half of the total household are using motorcycle as a main mode of transportation (51.6%). The number of households that have access to mobile phone, computer, and internet are low while radio and television are more common.[1]

Kaleinaung sub-Township

Kaleinaung Township have the total area of 1,659 Km^2 with the total population of 21,865 people. The average household size is about 5 person per household.

The literacy rate (the ability to read and write) of those over age 14 was 80.1% with higher rate for male than female. This is also considered as low when compared with other townships in the region.

The labour force participation rate (aged 15-64) is about 68.7% with only 44% for female. The unemployment rate is low with 2.5%. The most common occupation in the township is skills agricultural, forestry and fisher workers (70%).

In term of utilities, most household use firewood (77.7%) as main energy for cooking. For lighting, the most common sources are candle (40%) and private generator (33.9%). The main source of drinking and non-drinking water is from waterfall and rainwater which considered as unimproved source. Water seal toilet is mostly found in the township (73.4%).

[1] Department of population, (Oct, 2017) The 2014 Myanmar population and housing census tanintharyi region, dawei district yebuy township report. *MIMU*. Retrieved on 12 July from https://themimu.info/sites/themimu.info/files/documents/TspProfiles_Census_Yebyu_2014_ENG.pdf

Most household are using motorcycle as a main mode of transportation (42%). Television is commonly found in the township. However, about 44.7% have no access to any amenities such as radio, television, mobile phone, and internet.[1]

13.1.2.2 Stakeholder Identification

Prior to conducting the survey, key stakeholders were identified based on project location and potential impacts from project activities in order to ensure that the samples were representative.

Based on screening and stakeholder identification, the following key stakeholders were focused on for the consultation activities:

- Community leaders of each target community.
- Key informants of the community (School master, Doctor)
- Government agencies such as MOGE and Tanintharyi Nature Reserve Project (TNRP), Forest Department at Gantgaw taung.
- Total E&P Myanamr Limited (TEPM) and Petronas Carigali Myanmar Limited (PCML) community development teams.
- Head of households in six local communities and owners of local commercial units that are located within a radius of 1 km along the proposed pipeline and project facilities area.

13.1.2.3 Population Size and Sample Distribution

Sample size was statistically analyzed from a total number of households in each target community or from 1,788 households. The Taro Yamane method (1970) was applied to estimate sample size. The number of samples in each community was determined depending on zone of influence or location of each target community along the Zawtika onshore gas pipeline route. The number of samples collected from each community is shown in ***Table 13.1***.

[1]Department of population, (Oct 2017) The 2014 Myanmar population and housing census tanintharyi region, dawei district kaleinaung sub-township report. *MIMU*. Retrieved on 12 July from https://themimu.info/sites/themimu.info/files/documents/TspProfiles_Census_Kaleinaung_2014_ENG.pdf

Table 13.1 Number of Samples Collected from Each Community

Community	Number of Household	Number of Target Samples		
		Sampling proportion (%)	No. of Samples as planned (±10%)	No. of Samples collected
Daminseik	110	20	72-88	96
Phaungdaw	455	15	54-66	86
Kaunghmu	230	15	54-66	70
Ohnbinkwin	550	20	72-88	96
Mighaungaing	400	15	54-66	79
Shinbyan	43	15	54-66	61
Total	**1,788**	**100**	**360-400**	**478**

13.1.2.4 Field Survey

The field survey during public consultation primarily consisted of focus group meetings and interviews with questionnaires, as follows:

1. Focused Group Meeting

   This method was used with the concerned community leaders, referred to as Village Peace and Development Chairman (VPDC) of each target community and the key informants in each community such as school masters, teachers, doctors and related local government agencies.

   The focused group meetings were conducted during January 10 - 17 2009 in order to disseminate project information, obtain cooperation and support in terms of community data and information and a sharing of viewpoints on the project.

   The topics discussed and information disseminated during the consultation meetings with stakeholders included project Information, socio-economic data, environmental/ cultural resources, health data and opinion/suggestion including recommendations to the project operation.

2. Interview with Questionnaire

   Interviews were performed with the head of the households and the owner of the commercial units in each target community. The survey was performed using a social and health questionnaire.

   Structure of the questionnaire consisted of personal description of interviewee, Description of household member, Description of land, house and settlement, Description of household occupation and economy, Public health and use of local amenities and Marketing survey.

13.1.2.5 Data Evaluation and Analysis

Data from the survey was analyzed by SPSS software. The results were interpreted using indepth interview data to describe the existing socio-economic and health conditions of each community.

13.1.3 ***Summary of Consultation Activities Carried Out***

A schedule of the public consultation activities carried out is shown in ***Table 13.2***.

Table 13.2 Details of Field Activities for Public Consultation

Date	Location	Activity/ Focus Group
11 Jan 09	Daminseik	1. Village Peace and Development Chairman (VPDC) and master of Daminseik post primary school. 2. In-depth interview with villagers such as fishermen and rubber tree agriculturalists.
	Paungdaw	1. VPDC. 2. In-depth interview with villagers.
12 Jan 09	Paungdaw	-
	Kaunghmu	1. VPDC. 2. In-depth interview with villagers such as rubber tree, coconut, betel nut agriculturalists.
	Daminseik	-
13 Jan 09	Ohnbinkwin	1. VPDC. 2. Doctor of Ohnbinkwin Health Center. 3. Master of A Ta Ka Keaw Ohnbinkwin School and High Branch School. 4. In-depth interview with villagers such as rubber tree, coconut, betel nut, agriculturalists. 5. Meeting with Tanintharyi Natural Reserve Project (TNRP) Steering Committee of Forestry Office at Gantgaw taung village.
	Paungdaw	-
14 Jan 09	Mighaungaing	1. VPDC. 2. Master of Mighaungaing School. 3. In-depth interview with villager such as fisherman and rubber tree, coconut, betel nut agriculturalist. 4. Meeting with Total E&P Myanmar at Gantgaw taung campsite.
15 Jan 09	Shinbyan	1. VPDC. 2. Master of Mighaungaing School. 3. In-depth interview with villager such as farmers and agriculturalist.
	Mighaungaing	-
16 Jan 09	Shinbyan	-
	Kanbuak	1. Visit Kanbuak Hospital
17 Jan 09	Kaunghmu	-

13.1.4 Summary of the Results from Public Consultation

The public consultation activities were conducted with input and coordination from all stakeholders such as community leaders, school masters, doctors/ public health officers, government agencies from MOGE and TNRP, TEPM, and head of households in six local communities.

The socio-economic and health survey on a household level, was performed by interview with questionnaires during January 10 - 17 2009. The findings are summarized as follows:

13.1.4.1 Population Characteristics and Social Conditions

1) Gender and Age
- Most of the respondents were male (59 %) rather than female (41 %),
- Most of them are within an age range of 41-50 years old and 31-40 years old with an average of 42.1 years old.

2) Household status and structure
- The respondents are household leaders (57.11 %), spouses (27.4 %) and sons / daughters (12.34 %) and the rest are other household members.
- The averge household number of the respondents is 5.3 people per household; 2.7 and 2.3 people per household are male and female members respectively. Approximately 1:1 is the ratio of male and female.

3) Marital status
- Most of the respondents are married (74.06 %), some are single (17.57 %) and the remaining are divorce or widowhood.

4) Religion
- The majority of the respondents are Buddhist (87.8 %) except the respondents from Shinbyan, who are mostly Christian (90.16 %).
- Only 2.53 % of the respondents are Muslim, all are from Mighaungaing.

5) Education
- Almost half of the respondents (47.91 %) are educated to elementary level (grade 1-4). Only 21.9 % and 10.67 % graduated at primary (grade 5-8) and secondary (grade 9-13) levels (high school) respectively and the remaining are educated to high vocational level and bachelor's degree.
- Concerning educational information of household members, on average 2.9 people per household are educated to elementary school, 2.1 people to primary school, only1.7 people to secondary school level, 1.6 people to college or university and 1.8 people are uneducated.

13.1.4.2 Economic Conditions

1) Employment
- Most of the respondents (87.49 %) are employed in many different careers (see **2) occupations**), only 2.51 % of the respondents are unemployed.
- Concerning household members, on average of 1.9 persons per household are employed and 2.7 people are unemployed.
- The ratio of employed and unemployed members is 2:3.

2) Occupations

- Most respondents are general wage labourers (36.82 %), agriculturalists (25.9 %).
- Other careers include merchinist, fisherman, housewives, teachers, drivers, mechanics, gold smiths and tailors.
- Only fishermen are found in 3 villages, which are Daminseik, Mighaungaing and Ohnbinkwin. Other careers are found at all 6 villages.

3) Income

- Most of the respondents have debts (73.85 %), only 5.23 % have income more than their expenses.

4) Descriptions of some occupations

- **Fishery group**
  - The respondents from 3 villages, i.e. Daminseik, Mighaungaing and Ohnbinkwin, are fishermen. Most of them have conducted coastal fishing (88.52 %) and deepsea fishing (11.48 %), respectively and none do freshwater fishing.
  - Regarding fishing equipment, most used fish net, purse seine (78.26 %) and floating seine (21.74 %) respectively.
  - Fishery products are sold at community freshmarkets (61.63%), middlemen (25.58%), at other village, at their own house and at shops.
  - Concerning fishery problems, half of the respondents have had accidents from fishing activity that have reduced their fishing opportunities, a lack of fund to buy fishing equipment and a decline in fish stocks.
- **Agricultural group**
  - All villages in the study area are involved in agricultures. Most agricultural products are rubber, coconuts, betel nuts, palm oil, cashew nuts and rice. Most are sold at community freshmarkets (51.43%), to middlemen, delivered to Kanbauk or Dawei and to industry (rubber) and etc.
  - Concerning agricultural problems, most of the respondents specified that the main problems are lack of investment funds (40 %), insufficient water (20 %), shortage of fertilizer (14.29%), lack of circulating funds (11.43 %) respectively.

5) Marketing behavior

- Most respondents go to market everyday (47.7 %), once a week (31.17 %), more than twice a week (12.76 %) and every month (8.37 %).
- Considering each community, itwas found that the respondents from Shinbyan, Daminseik go to market once a week because both communities are situated in a remote area far away from the Kanbauk freshmarket.

13.1.4.3 Health Conditions

1) Behaviour of alcohol consumption

- Most of the respondents do not drink alcohol (88.91 %). For those who do drink alcohol, they do not know their frequency of drinking (34.62 %), drink once a week (26.92 %), drink 2-3 times a week (17.31 %) and everyday (15.38 %).

2) Illness

- Regarding illness in the respondent's household, most respondents (82.22 %) confirmed that none had been ill in their households in the past year. The minority (17.78 %) that reported that they had been ill said it was caused by the following diseases.

Cause of illness Yes	(%)
1. Malaria	37.62
2. Heart and circulatory system disease	13.86
3. Digestive system disease	11.88
4. Respiratory system disease	9.9
5. Eye and ear system disease	6.93
6. Dental disease and tooth decay	6.93
7. Other disease	5.94
- Liver disese	
- Illness	
8. Disease/accident from working	1.98
9. Road accident from transportation	1.98
10. Skin and allergic	1.98
11. Parasitic disease	0.99
Total	**100**

13.1.4.4 Environmental and Occupational Health Problems

Most of the respondents have encountered dust problems caused by transportation (60.88 %), problems with insects (28.24 %), odor (17.57 %), quality of drinking and using water, etc.

13.1.4.5 Feedback, recommendations and suggestions

Feedback, recommendations and suggestions from all participants regarding environmental, social and health mitigation measures are summarized as follows:

- All six (6) target communities located nearby the Project area had a positive attitude towards the Project. Having experience from TEPM and Petronas, they expected the Project would give them long-term support for their communities regarding public health services, education, jobs, infrastructure systems, water supply, etc.
- It was determined that dissemination of project information to communities was to be conducted via VPDC, public health officers and teachers. Stakeholders also requested for continuous support to their communities for annual festivals/traditions, electricity, public health and trade.
- Stakeholders had some concerns about land compensation, crop compensation and safety measures in case of gas leaks.

ATL/PTTEPI took the above points into consideration when preparing mitigation measures for the Project.

13.2 ONGOING AND FUTURE CONSULTATION

Currently the Project is in the operation phase. There are a number of ongoing consultation activities that maintain good relationship and understanding with the surrounding communities. These ongoing activities include project information disclosure, grievance procedure, and corporate social responsibility (CSR) activities, which are summarized as follows.

13.2.1 Project Information Disclosure

ATL's Project Information Disclosure for this project will provide information on environmental, social and health as per regulatory requirements.

ATL will disclose any reports or documentation (such as this EMP) on their company website if required by Myanmar authorities. MONREC will also disclose all EMP, IEE and EIA reports on their website accordingly.

13.2.2 Grievance Procedure

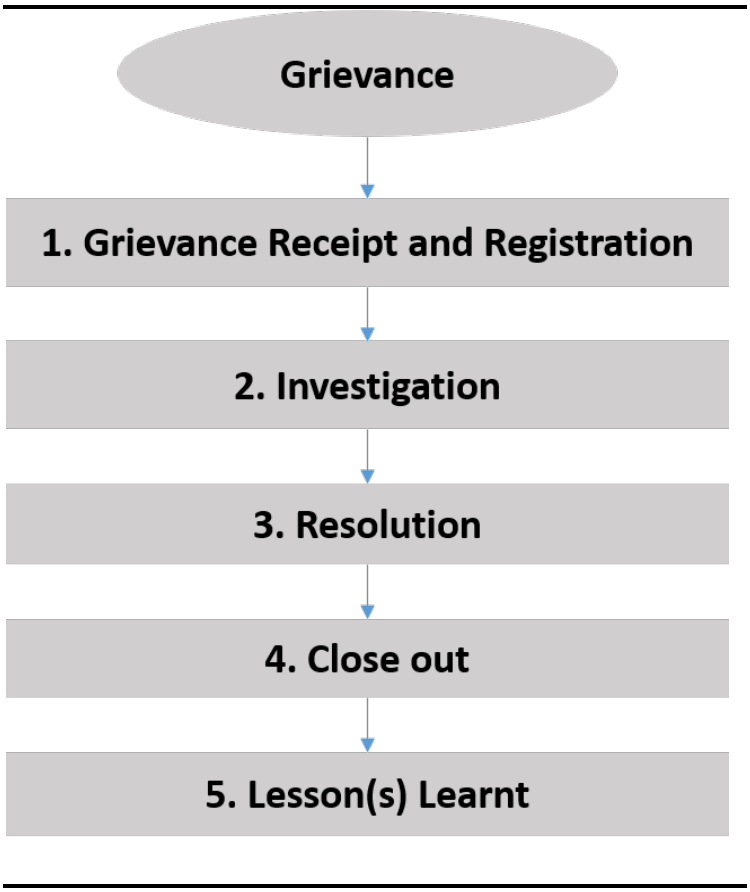
The aim of Grievance Handling Guideline is to establish a formal process allowing people, communities or groups to raise complaints regarding any impact related to activities of ATL, and also to ensure that these complaints are addressed and resolved appropriately.

The Guideline included many topics from personnel roles and responsibilities, grievance process and registration to the investigation, resolution, and closeout process (Accepted or Rejected).

There is two (2) forms of data collection in the grievance handling process. On one hand, the Grievances will be recorded all grievance throughout the process in the Grievance Record Form. On the other hand, the grievance management process will be record with PTTEP web-based Incident Management System (IMS). The tool will track and record all the processes from the grievance registration to closeout.

The Grievance Handling Process is presented below (***Figure 13.1***)

Figure 13.1 Grievance Handling Process



Source: PTTEP, 2019, modify by ERM, 2019

This Grievance Handling Guideline is applied to all of PTTEP's assets, domestic and international, and covers the entire lifecycle of the assets or operations from inception through decommissioning and abandonment.

13.2.3 *Corporate Social Responsibility (CSR) Activities*

There are currently a number of ongoing CSR activities taking place by ATL/PTTEPI under the Zawtika Project. These activities have the objective to uplift quality of life and gain favourable relations from all stakeholders in the operating area. The CSR program for the Zawtika Project consists of 3 main sectors: "Health, Education and Community Development Sector".

The CSR budget for this Project is required to be approved by MOGE annually, ATL will therefore propose approximately 500,000-600,000 USD (about 1,050,000,000 kyats) which is similar amount with previous years; however this can vary depending on MOGE's approval. The CSR budget used for 2019 was 588,500 USD; therefore, the proposed budget for 2020 onward is nearly 600,000 USD. The budget is planned to be used for continuing the development of work program, which includes but not limited to the following:

- Higher Education Assistance for Development Scholarship
- Educational Program
- Parasite Free School Program

- Construction of Public Infrastructure or Utility
- Waste to Energy Program
- Monastery support
- Community support and Emergency relief
- High Vocational Diploma Scholarship
- Monastery / Cultural Support
- Charitable CSR Activities among Staff & Family, Government, Contractors (including Plantation and environmental related support activities)
- Technical Capability Building and Development Program incorporative with Ministry of Energy and Ministry of Labor

The above listed work program and budget will be implemented based on approval from MOGE.

Full details of the program can be found in ***Annex C.*** All CSR activities from 2009-2018 are conducted in compliance with MOGE's Guidelines for Implementation of CSR Programmes ***Annex D***.

13.2.4 Work Plan and Implementation Schedule

13.2.4.1 Schedule

As stated, construction phase for the Project has already been completed in 2014. Currently the Project is in the operation phase.

The first gas production to Domestic Gas was achieved on 14th March 2014 and Export Gas to Thailand on 5th August 2014, respectively. The operation phase will be counted on 30 years since the first gas was operated. Thus, the operation phase will be during 2014-2043.

Currently ATL has no plan for expansion or amendment of the Zawtika Onshore Facilities.

13.2.4.2 Costs for Implementation

The costs for the implementation of mitigation measures are included within the operation and preventive maintenance cost, and therefore not possible to individually specify, but ATL has estimated the cost to be over 1 million USD per year for all mitigation measures implementation, and 50,000 USD per year for monitoring program.

Moreover, ATL has also made contributions to TNRP (Thanintharyi National Reserve Project) for 150,000 USD annually. In addition, the total contribution on CSR from 2009-2018 was 4,591,729 USD and the used CSR budget for 2019 was 588,500 USD.

The planned CSR covered a varied area within Myanmar (e.g. the operating areas, and Yangon). The type of project is be divided into four categories: basic needs, education, culture, and environment.

Example of the projects from each category are as follows:

Parasite Free School Program: a basic needs theme project with the objective to reduce parasite infection rate of the students in the project area. About 5,000 students in 35 schools benefit from the program. The program also won Stevie Award in 2016.

Technical Capability Building and Development: an education theme project with the objective to increase the supply of local skilled workers for Myanmar's development. The project initiated by corporate with the Skill Training Center (Yankin) focusing on three training courses: welding, electrical and Air con installation, and National Skill Standard Authority (NSSA) level (2) assessment occupation. About 900 labours has been trained.

Annual Kathina and Monastery Support: a cultural theme project that provide fund raising activities for monastery and cultural and tradition activities. Natural Resources Preservation Support Program: an environment theme program through financial supporting to Tanintharyi Natural Resource Project (TNRP): tree plantation project.

More details about CSR project were present in ***Annex C*** and ***Annex D***.

Revision Notes for Comments from ECD

Comment no.	Comment	Additional ECD Findings	Additional ECD Comments	Responses and Revisions
0. Executive Summary				
0.1.	It was suggested to include the summary of policy, legal and institutional framework and description of the environment in the executive summary.	It was included in section 1.4 and 1.5.		• Revised by rearranging the executive summary sections to align with the flow of the main report • Added and revised sections as follows: o 1.1 Introduction o 1.2 Summary of Project Proponent o 1.3 Description of Project o 1.4 Policy, Legal and Institutional Framework o 1.5 Description of Surrounding Environment o 1.6 Highlights of Key Impacts and Mitigation Measures o 1.7 Monitoring Measures o 1.8 Sub Plan o 1.9 Capacity Development and Training o 1.10 Public Consultation and Disclosure
1. Introduction				
1.1.		In Page (3-45), the statement: "ESIA was conducted according to the Thailand and International Guideline" and the sentence: "An Environmental……along the route of pipeline" is needed to state under the introduction title.	In Page (3-45), to state the sentence: "An Environmental…….along the route of pipeline" under the introduction title.	• Revised in chapter 2 and section 3.1 • Revised by adding sentence as ECD commented
2. Project Information				
2.1.	It was suggested to include the areas of ZBV1, ZBV2, ZOC and ZMS	In page (3-42), followings were stated. • ZBV1, ZBV2 = 140 m^2 • ZOC = 285,168 m^2 • ZMS=39,132 m^2		• Revised in section 3.2 • Revised by adding the pipeline route layout in figure 3.4 • Added ZBV 1 and ZBV 2 layout in section 3.2.4

Comment no.	Comment	Additional ECD Findings	Additional ECD Comments	Responses and Revisions
2.2.	To include the Phase 1 pipeline length (from landfall to Tarvoy bridge) and Phase 2 pipeline length (from Tarvoy bridge to Ban I Taung) To state the land usage along the Phase 1 pipeline (from landfall to Tarvoy bridge) (eg-forest, farmland)	In page (3-42): Approximately 37 km from landfall point to Tavoy Bridge and 35 km from Tavoy bridge to Ban I Tong (Thai Border)	Total is 71 km Phase 1 + Phase 2 = 37 + 35= 72 There is slightly difference and please to correct it.	• Revised in section 3.1 • Revised by aligning the total distance with the breakdown distances
2.3.		In Page 3-59, Tanintharyi Nature reserve Project (TNRP), it was stated Ministry of Environmental Conservation and Forestry.	To correct as Ministry of Natural Resource and Environmental Conservation.	• Revised in section 3.1 • Revised by correcting the naming to Ministry of Natural Resources and Environmental Conservation
2.4.	To change the Figure 3.10 layout of ZOC Process Area with another figure showing the scale with clear visibility	It was stated that there are three areas such as process area, utility area and administration & accommodation area in ZOC. In Figure 3.4, process area was stated.	If the utility area, administration & accommodation area included in Figure 3.14 – Layout of ZOC Process Area, it is needed to label them.	• Revised in section 3.2.3 (figure 3.15) • Revised by including label of each components in ZOC
2.5.	To correct the figure (2) from Figure 3.11. To include the photos taken at each location for Zawtika Block Valves (ZBV1 & ZVB2)	It was included in Fig 3.15.		• Added ZBV 1 and ZBV 2 layout in section 3.2.4
2.6.	• To state the wastewater amount from processing stage, treatment system and final discharge point by classifying ZOC and ZMS. • To state the wastewater route to the storage location by Flow Chart. (To classify ZOC and ZMS). • To state the Capacity to clean the sewage and tank size.	• Those were included in section 3.3.1. • In Page (3-69), it was stated that BOD did not exceed 250 mg/l and discharged in line with Myanmar Environmental regulation. • There is no statement about the capacity to clean the sewage and tank size.	- In Page 3-69, to change "Myanmar Environmental regulation" into "Myanmar Environmental Quality (Emission) Guideline" - In section 3.3.1, to include the Figure 3.23 by labelling wastewater treatment location and final discharge point with their coordinates. - To include the capacity to clean the sewage and tank size	• Revised in section 3.3.1 • Revised by changing to the name "Myanmar Environmental Quality (Emission) Guideline)" • Revised by adding wastewater treatment location and final discharge point in section 3.3 • Revised by including capacity to clean the sewage and tank size in section 3.3
2.7.	To include the storm water drainage system with flow chart	Stormwater drainage system was stated in section 3.4.3, and components for water use of ZOC was stated in Fig 3.23. However, there is no clear flow chart.	To state the flow water management discharged from ZOC's process area, utility area, administration & accommodation area with Fig 3.23 and flow chart.	• Revised in section 3.4.3 (but is now moved to section 3.3.2.3 under sub plan chapter) • Revised by adding sewage discharge location
2.8.	To state the waste production amount for each one.	It was included in Table 3.2.		• Revised in section 3.3.1 • Revised by adding information on the waste production amount

Comment no.	Comment	Additional ECD Findings	Additional ECD Comments	Responses and Revisions
2.9.	To include the water intake point and amount of water usage (1 day or 1 year) for ZOC and ZMS	- ZOC: the consumption level is 120 liters/day1/of drinking water and 12 m3/day2/water use. - ZMS: the consumption level is 30 liters/day 1/of drinking water and 3m3 /day2/water use.		• Revised in section 3.3.2.3 • Revised by checking this information is presented in the EMP Report
3. Maps and Figures				
3.1.	• In Figure 3.2, to state the project location (ZBV1, ZOC, ZBV2, ZMS) with coordinates. • To include the main roads, river route and railway along the pipeline in Figure 3.4 • To include the Tavoy bridge location with coordinate in figure 3.5 • In figure 3.7, to state the Tanintharyi Natural Reserve by the clear map • Access road and access walkways figures from Figure 3.8 are needed to change with clear visibility ones • Layout Plan of ZOC and ZMS process areas were needed to show with the scale of clear visibility	• Figure 3.2 to 3.10		• Revised in chapter 3 • Revised by adding additional layout of the facilities
4. Policy, Legal and Institutional Framework				
4.1.	To check whether the population of each region, state and self-administered Zone is in line with the 2014 census data and to state the data source.	Table 4.2 was updated.		• Revised in section 4.2.1.2 • Table 4.2 was updated
4.2.	• In Table 4.4, not to include the withdraw law and project unrelated laws and regulations. • Related with the stated laws and regulations, it was suggested to review and to be sure the updated laws and regulations. (Remark: if it is needed, to refer the https://www.mlis.gov.mm)	Project related laws were included in Table 4.4. However, there is no section for each law which show the project proponent will follow.	• In the project related laws, it is needed to include the sections for each law which show the project proponent will follow. (Remark: Instead of "Table 4.4 Project-Relevant Legislation in Myanmar", to include that "the project proponent will follow the following project relate laws". • To check if the protected area conservation law, 2003 was withdrawn or not.	• Revised in section 4.2.1.5 • Revised by adding statement in section 4.2.1.5 and removing unrelated laws

Comment no.	Comment	Additional ECD Findings	Additional ECD Comments	Responses and Revisions
4.3.		PTTEP's SSHE Policy was included in section 4.1.1	To change with the PTTEP's SSHE policy which was signed by responsible person from PTTEP.	• Revised Annex A to include PTTEP's SSHE policy which was signed by a responsible person from PTTEP
4.4.		Updated laws and regulations were not included in section 4.2.1.4 - Myanmar Protected Areas.	To include the Forest law 2018, the Protection of Wildlife and Wild Plant and Conservation of Natural Areas Rules 2002, the protection of Biodiversity and Conservation Areas law 2018.	• Revised in section 4.2.1.3 • Revised by adding the relevant law as commented by ECD • Revised by adding the Forest Law, 2018 in section 4.2.1.5, table 4.4
4.5.		In Table 4.5, the relation between international conventions ratified by Myanmar and project was not included.	- In Table 4.5, to include the relation between international conventions ratified by Myanmar and project (please refer offshore EMP) (Remark: To include: "Project proponent will conduct the project according to the following international conventions signed by Myanmar" in section 4.2.2 International Conventions.	• Revised in section 4.2.2 • Revised by adding relevancy of the Project to the international conventions • Revised by adding statement as commented by ECD
5. Description of Surrounding Environment				
5.1.	To measure the surface water quality, ground water quality, air quality and noise around the ZOC and ZMS and to compare them with reliable standard.	Results of surface water quality, soil quality and ground water quality were included in the summary.	- To include surface water quality results with table - To include the soil quality results with table - To include the ground water quality results with table	• Revised in section 6.1.4.1, 6.1.5.2 and 6.1.6 • Revised by adding results of surface water, soil and groundwater quality as table
5.2.	Followings recorded in onshore site visit are needed to include under the existing environment section- • Surrounding environmental conditions (i.e. topography, water bodies, local ecology) • Surrounding social conditions (i.e. transportation, household condition, surrounding land use/agriculture, etc.). • Current mitigation/management measures	Stated in page (3-45 & 3 – 46) of chapter 3 project Description	Statements from "Chapter 3 -Projection Description, page (3-45 & 3-46)" are needed to combine with the current statement from "chapter 6 – Description of surrounding environment".	• Revised in section 3.1 • Revised by adding summary of surrounding environmental conditions • Site visit findings and surrounding environmental and social condition and current mitigation/ management measures is provided in Chapter 6

Comment no.	Comment	Additional ECD Findings	Additional ECD Comments	Responses and Revisions
5.3.	To state the social, and health conditions and quality of life of local people from 1 km radius that were studied during public consultation.	It was included in section 6. Socio-economic components.		• Confirmed chapter 6 included information of local people in 1 km.
5.4.		- In Table 6.6 and Table 6.7, KBAs Identified within the Project Area and fifty (50) km Buffer Zone and KBAs from Thailand were included. - Although KBAs was mentioned in Table title, it was stated as IBA in Table.	- To review the KBAs from Thailand - To correct the IBA in Table - To include the map of KBAs for the related pipeline area within Myanmar	• Revised in section 6.2.4 • Revised by removing irrelevant KBAs and IBAs (not in Myanmar) • Revised IBA table • Revised by updating and adding maps of TCLs, KBAs
5.5.		In section 6.2 Biological components, biologicals from project unrelated area were included. (eg ; Is there relation between Mizoram-Manipur-Kachin Rain Forests and project area?)	To include the project related biological components.	• Revised in section 6.2.2 • Revised by removing irrelevant forests
5.6.		In 6.2.3.2 Important Bird and Biodiversity Area, it was found that Khao Laem national park, Khuen Sri Nakarin National Park are located in Thailand.	To include the reason that these statements are needed to include in this EMP or not. (Remark: if it is not needed to include, please delete)	• Revised in section 6.2.4.2 • Revised by removing the irrelevant IBA and adding statement to confirm this in the text
5.7.		It is needed to include the 6.2.5 Tiger Conservation landscapes on map.	To include the 6.2.5 Tiger Conservation landscapes on map.	• Revised in section 6.2.6 • Revised by adding map
5.8.		6.2.1.1 Myanmar Coastal Rain Forests, 6.2.1.2 Irrawaddy Freshwater swamp Forests, 6.2.1.3 Myanmar Coastal mangroves, 6.2.1.4 Mizoram-Manipur-Kachin Rain Forests, 6.2.6.1 Tidal Forests, 6.2.6.2 Beach and Dune Forests, 6.2.6.3 Swamp Forests, 6.2.6.4 Evergreen Forests, 6.2.6.5 Mixed Deciduous Forests, 6.2.6.6 Dry Forests, 6.2.6.7 Deciduous Dipterocarp (Indaing) Forests, 6.2.6.8 Hill and Temperate Evergreen Forests were included.	- To include these items in a group - To include the project related protected areas, reserved forest and protected public forest clearly	• Revised in section 6.2.2 • Revised by grouping them together and removing irrelevant content

Comment no.	Comment	Additional ECD Findings	Additional ECD Comments	Responses and Revisions
6.	**Impact and Mitigation Measures**			
6.1.	It was suggested to include the action plan to mitigate the potential impacts	It was stated in Table 8.1.		• This is included in chapter 8
6.2.	It was suggested to analyse the natural risk and man-made risk during operation phase and to include those as additional section.	- Unplanned Events are stated in page (8-169) - Mitigation Measures for pipeline leakage and Rupture and "Implement Myanmar Asset Emergency Management Plan (Annex A) in Specific Action were included	To extract the main facts from Myanmar Asset Emergency management Plan (Annex A)	• Revised in chapter 8 • Revised by including key points of the Myanmar Asset Emergency Management Plan
6.3.		"Mitigation and Management Measures" were stated with figures from Page 3-48 to Page 3-50.	- Not to state the "Mitigation and management measures"(from Page 3-48 to 3-50) under the chapter 3 – Project Description - To include the "Mitigation and management measures" under the reliable section of chapter 7 (or) other relevant chapter	• Revised in section 8.1 • Revised by moving mitigation and management measures to section 8.1
6.4.		It was found that existing environmental, social and health mitigation measures were included in page (3-82 & 3-83), section 3.6. It should be included under Chapter 7.	To replace the "existing environmental, social and health mitigation measures" from section 3.6 to the relevant section under Chapter 7.	• Revised in section 8.2 • Revised by moving existing environmental, social and health mitigation measures to section 8.2
7.	**Monitoring Program**			
7.1.	In the monitoring plan, it was suggested to include the monitoring frequency, location and plan related with noise, storm water drainage, sewage, air emission, solid waste (hazardous & Non-hazardous), water quality (surface and ground water), soil erosion & sedimentation, biodiversity, occupational health and safety, employment and training.	- It was found that monitoring measures will be conducted for stormwater drainage and sewage in Table 9.1. - There is no exact location of Monitoring. - In Table 9.1, air emission, solid waste (hazardous & non-hazardous), Water quality (surface & ground), soil erosion & sedimentation, biodiversity, occupational health and safety and employment & training were not included.	- To include the location of monitoring with coordinate point (or) labeling in figure - In Table 9.1, to include the air emission, solid waste (hazardous & non-hazardous), Water quality (surface & ground), soil erosion & sedimentation, biodiversity, occupational health and safety and employment & training - To include the organization, roles and responsibilities of main responsible persons of ATL who will implement the EMP and Monitoring program	• Revised in chapter 9 • Revised by adding further information to the monitoring plan as commented by ECD

Comment no.	Comment	Additional ECD Findings	Additional ECD Comments	Responses and Revisions
8.	**Waste Management Plan**			
8.1.	• In Environmental management Plan of Onshore Zawtika Onshore Gas Transportation System, it is needed to analyse if there is storage, cleaning and transportation for the produced water, produced and and drilling cuttings from offshore operation • If there is no storage, cleaning and transportation for the waste from offshore operation, it is not needed to state • Discharged plan of non-hazardous and hazardous waste from onshore operation (ZOC, ZMS, TKA) and PTTEPI Yangon Office are needed to state with flow chart and Table. (eg: from ZMS to ZOC, from TKA to final disposal (YCDC).	• Emission and effluent management was stated in section 3.3 and PTTEP's Myanmar Asset Waste Management procedure was stated in Annex A. • There is no statement about the waste storage and discharge status for offshore operation waste	- To state and explain about waste storage and discharge status at ZOC (waste from offshore operation) in the response table and to include in waste management plan. - To combine the waste management plan with statements from section 3.3 - emissions and effluent management. - In the waste management plan, related with hazardous waste, it is needed to separate by section for types, amount, storage, transportation and final discharge. (Remark: as per the EIA procedure 63 (j) 6, it is needed to state as sub-plan.	• Revised in section 11 • Revised by adding information on waste and waste management plan • Revised by moving waste management plan to be under operational sub-plan chapter (Chapter 11)
8.2.	It was suggested to include the amount of non-hazardous and hazardous waste (1 day or 1 month)	It was included in Table 3.2.		• This is included in section 11 and section 3.3.2
9.	**Emergency Response Plan**			
9.1.	As the report is EMP for onshore Zawtika Onshore Gas Transportation System, it was suggested to prepare the tropical storm emergency plan for the impacts of Zawtika Operation Center (ZOC), Zawtika Metering Station and onshore pipeline.	Emergency plan was stated in chapter 11 and Myanmar Asset's Emergency Management Plan and Myanmar Asset's Crisis Management Plan (the Plan), Tropical Cyclone Procedure was stated in ***Annex A***.	- For the chapter 11, emergency plan, it is needed to state the sub-plan according to EIA Procedure 63 (h) (6) - In Myanmar asset's Emergency Management Plan, Myanmar Asset Spill Contingency Plan, it is needed to include the information how to inform the relevant Myanmar government department if there is emergency, spill.	• Revised in section 11 • Revised by moving Emergency Plan to be under section 11.2.4.4 and adding communication protocol between PTTEP and relevant government department in case of emergency or spill events • Added emergency contact information of Myanmar authorities in case of spills (in section 11.2.4.4)
9.2.	It was suggested not to include if there is no relation with offshore field emergency plan in this EMP.	Emergency plan was stated in chapter 11 and Myanmar Asset's Emergency Management Plan and Myanmar Asset's Crisis Management Plan (the Plan), Tropical Cyclone Procedure was stated in ***Annex A***		• Confirmed that emergency plan is included in chapter 11

Comment no.	Comment	Additional ECD Findings	Additional ECD Comments	Responses and Revisions
10. Corporate Social Responsibilities (CSR)				
10.1.	It was suggested to include the CSR plan for health, education and socioeconomic development which were conducted since 2016	CSR program for the Zawtika Project was included in Annex C.	To include the potential plan and estimated budget for the CSR	• Revised in section 13.2.3 • Revised by adding estimated budget, potential plans and development work program.
10.2.	It was suggested to include the budget for the CSR related with proposed project	2019 budget was included	To include the potential plan and annual estimated budget for the CSR	
10.3.			To include how the CSR activities are supported for the community development.	
11. Training Programs				
11.1.		In 10.2.3 Training programs, there is a sentence "ATL has a detailed SSHE Training and Competency Management Standard, which is described in detail in Section 11." However, that standard was not included in section 11.	To include the training programs.	• This is included in chapter 12 (Capacity Development and Training)
12. Biodiversity Management Plan				
12.1.		To include the Biodiversity management Plan as the proposed project is passed through the TNR	"To include the Biodiversity Management Plan which state the Tanintharyi Nature Reserve (TNR) Project and Biodiversity management process along the pipeline.	• Revised in section 11.2 • Revised by adding information about Tanintharyi Nature Reserve Project (TNRP) and contributions from PTTEP
13. Community Health, Safety, Environmental and Security Management Plan				
13.1.		As the Zawtika Onshore Project is long-term project, community health, safety, environmental and security management plan are needed.	"To include the community health, safety, environmental and security management plan are needed.	• Revised in section 11.2 • Revised by adding information with regards to Community Safety, Security, Health and Environmental Management Plan
14. Management Plan for Soil Erosion and Sedimentation Control/ Landslide Protection				
14.1.		Sediment Control System was stated in Figure 3.4	Sediment control are needed to state as sub-plan in figure 3.4	• Revised in chapter 9 • Revised by adding soil erosion and sedimentation in chapter 9. Soil erosion monitoring measures is provided in table 8.2 and table 9.1 and to avoid repetition, the detail will only be provided once in the report (will not be described in the sub plan section (chapter 11)).

Comment no.	Comment	Additional ECD Findings	Additional ECD Comments	Responses and Revisions
15. Control and Maintenance Plan				
15.1.		Control and Maintenance was stated in section 3.5.	Control and maintenance statements are needed to change as sub-plan in section 3.5	• Revised in section 11.2 • Revised by moving Control and Maintenance plan to be under chapter 11 (Operational Sub-Plan)
16. General				
16.1.		It was found that the word "Example" from Fig 3.8, Fig 3.13. Fig 3.15, Fig 3.16 is needed to delete if the figures are real ones for the proposed project.	To delete the word "Example" if the figures are real ones for the proposed project.	• Revised throughout the Report • Revised by removing the word "Example" where necessary

Revision Notes
Responding to Comments from ECD for approved EMP Report of Zawtika Onshore Development Project

Comment no.	ECD's Comment	Responses and Revisions
1.	ECD mentioned in the approval letter that monitoring budget is planned to be 1,500,000 kyats per year.	• Monitoring budget is 50,000 USD (105,000,000 Kyats) per year, mentioned in section 11.1.
2.	ECD mentioned in the approval letter that CSR budget is planned to be 2,000,000 kyats per year.	• CSR budget is 500,000-600,000 USD (1,050,000,000 Kyats) per year, mentioned in section 13.2.3.
3.	ECD suggested to include the decommissioning budget in kyats and to include when the final report 6 copies submit to ECD.	• A detailed decommissioning plan for Zawtika field will be prepared and get approved form MOGE prior to decommissioning activities. Therefore, the decommissioining budget will be proposed for further approval depend on the acceptable environmental practice and approval method before ending of project life span, mentioned in section 3.4
4.	ECD suggested to include Fire prevention and Safety of workplace budget in Kyats and to include when the final report 6 copies submit to ECD.	• Fire prevention and safety of workplace budget information are provided in section 11.2.2.6.
5.	ECD suggested to include plantation budget in Kyats and to include when the final report 6 copies submit to ECD.	• The budget related to the plantation has been proposed under items below o Annual financial support to TNRP project 150,000 USD (about 315,000,000 kyats) as detail in section 11.2.1.6 o CSR budget which is approximately 500,000-600,000 USD (about 1,050,000,000 kyats) as detail provided in section 13.2.3.
6.	ECD suggested to include mitigation measure implementation budget in Kyats and to include when the final report 6 copies submit to ECD.	• Mitigation measure implementation budget information are provided in section 11.1
7.	ECD suggested to provide commitment letter which include the following: - Project Proponent will implement environmental mitigation measure from EMP - The EMP is complete and accurate.	• The commitment letter which includes the ECD comments have been provided in the EMP report by putting before Table of Content.
8.	EMP mentioned that this project passed through TNRP and MOSCO island, therefore, to provide the approval letter from Forest Department to pass through the area when the final report 6 copies submit to ECD.	• Zawtika Onshore Development project only passing through the TNRP area. There is no any facility located in or passing through the MOSCO island. • During Zawtika onshore gas pipeline project implementation, the Project had cooperated with Taninthayi Nature Reserve Project (TNRP) which is under Forest Department via MOGE for the facilities that are located in the TNRP's area. ATL (PTTEPI) had proposed to enter into the TNRP project and proposed to commence the contribution. The ATL proposal had been agreed by Forest Department and approved by MOE since December 2012. The first contribution was started since the 3rd phase of TNRP project as per detail in **Annex E.**
9.	According to the Environmental Conservation Rules, Article 29, 30 and 31, to provide funding to ECD from the natural resources production business when EMP funding guideline implemented.	ATL have noted on the information.
10.	ECD requested to submit 6 hard copies of the revised EMP according to the comments in the approval letter within 30 days from signed date (22nd August 2022)	ATL have noted on the information and submitted the revised EMP report to MOGE for further submission to ECD as per required timeline.

ANNEX A

Myanmar Asset SSHE Management System

PTT Exploration and Production Public Company Limited

Myanmar Asset
SSHE Management System

Document Code: 11027-PDR-SSHE-000-001-R01

Revision 1

May 2018

Approval Register	
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Document Code	11027-PDR-SSHE-000-001-R01
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THIS DOCUMENT WILL BE REVIEWED EVERY **5 YEARS** FROM DATE OF APPROVAL OR REVISED EARLIER IF NECESSARY.

Revision History			
Rev.	Description of Revision	Authorized by	Date
0	New (Myanmar-SSHE-11027-MNL-000)	PMM/S	July 2016
1	Revise Myanmar Asset SSHE Management System to be aligned with ISO14001:2015 requirement, cover all operations in Myanmar, and supersede Myanmar-SSHE-11027-MNL-000, ZPQ SSHE MS Rev.0 (Myanmar-1006-WI-001-ZTK-FSAF-I-001) and ZOC SSHE MS Rev.1 (SSHE-13265-MNL-007)	PMM/S	May 2018

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1.0 PURPOSE

PTTEP operates under a common set of business principles. Supported by policies, standards and business controls and implemented through the organization structure. In support of the business principles there is a Corporate PTTEP Safety, Security, Health and Environment (SSHE) Commitment and Policy which requires every PTTEP Asset to manage Safety, Security, Health and Environment in a systematic manner by having a Safety, Security, Health and Environment Management System (SSHE MS) in place.

Myanmar Asset has established a Myanmar Asset specific SSHE Management System in line with the Corporate SSHE Management System Document 11038-STD-SSHE-000.

The Myanmar Asset SSHE MS concentrates on SSHE critical activities, ensuring that at Asset Management level they are identified, properly monitored and controlled. By alignment with the Corporate SSHE MS, this SSHE MS is aligned to industry models and ISO 14001 standards.

This SSHE MS also covers activities of main contractors engaged with the Asset. Key Contractors should have their own SSHE MS aligned with the Myanmar Asset SSHE MS and as defined in the Safety Cases and Contract Bridging Documents.

The Myanmar Asset SSHE MS documents the systems used for managing SSHE in the Myanmar Asset Operations. It refers to rather than repeats, existing procedures and systems for managing the various aspects of SSHE. It therefore provides an overview and principal source of reference for SSHE aspects to be used by:

- The Management Team for Myanmar Asset level activities which are not covered by specific SSHE Cases, such as planning, design, data analysis, etc.
- Existing Staff to increase SSHE awareness
- New Staff to become familiarised with the Myanmar Asset SSHE MS
- Contractors to ensure alignment between their SSHE MS and the Myanmar Asset SSHE MS

Corporate Standards and Procedures are mandatory to be followed. Only when there is a conflict with National Laws and standards, Myanmar Asset will deviate from the standard and document the deviation.

2.0 SCOPE

The scope of the Myanmar Asset SSHE MS applies to all the processes and activities associated to the Myanmar Asset business operating in Offshore M3, M9, M11, MD7 and Onshore MOGE3 concessions, as well as the operating of Zawtika Offshore and Onshore Project.

Within Myanmar Asset processes and activities, those identified by the Hazard & Effect Management Process (HEMP) as vital to ensure asset integrity, prevent incidents and/or to prevent/control/mitigate the potential adverse SSHE effects, are considered SSHE critical activities. SSHE Critical activities are also those that could cause deviations from National Legislations and /or Asset and Corporate Standards.

Where contractors are used to perform specific activities, it is the responsibility of the Myanmar Asset to determine through Mode of Contract assessment whether the Myanmar Asset SSHE MS will apply to those activities. The same conditions apply to all sub-contracted personnel. In all circumstances, the Myanmar Asset will attempt to positively influence SSHE aspects of the work as far as practicable.

3.0 REFERENCES

3.1 PTTEP SSHE CONTROLLING DOCUMENTS

Document Number	Document Title
11038-STD-SSHE-000	SSHE Management System

3.2 OTHER REFERENCE DOCUMENTS

Document Number	Document Title
OGP Report No. 6.36/210	International Association of Oil and Gas Producers (OGP), Guidelines for the development and application of health, safety and environmental management systems
ISO14001:2015	Environmental management systems – Requirements with guidance for use

4.0 DEFINITIONS

Terminology	Description
As Low As Reasonably Practicable (ALARP)	A term used to define tolerable risk acceptance only where risk reduction is impractical or cost benefit analysis is carried out and a judgment is made that the cost of further risk reduction is grossly disproportionate when compared to the actual risk reduction that would be achieved.
SSHE Management System (MS)	A comprehensive guide to the PTTEP SSHE management system and the associated SSHE standards, which are issued to address all of its elements, and provide an overview of the approach.
SSHE Policy	The highest level document containing a formal statement of principles that identifies PTTEP expectations in managing SSHE.
SSHE Standard	Sets the minimum requirements for the way risks and opportunities are managed and for the result to be achieved. It defines WHAT is to be realised in terms of processes, activities and the required results and deliverables. A standard may serve to clarify how a policy is to be implemented, or to set expectations when major risks or opportunities require common treatment across the organisation
SSHE Procedure	An activity description that describes the purpose and scope of an activity, the responsibilities of those performing it and the tasks or steps that are needed to achieve a satisfactory result. • A procedure defines WHO does WHAT, WHEN and with what RESULT. • A description HOW to do an activity may be put within a procedure if brief, otherwise a specification or work instruction should be created and referenced from the procedure. If there is a SSHE Standard the procedure shall be in compliance.

Terminology	Description
Work Instruction	Describes, briefly and succinctly, HOW an activity or task is properly executed. A work instruction can only exist where it supports a procedure or activity description
Supporting Documents	Associated documents supporting the implementation of the SSHE management system. These documents must be consistent with the SSHE policy, SSHE management system manual, standards and procedures.
Tool	A form, template or computer programme used to perform the tasks in a procedure or work instruction. A Tool enables an activity to be executed as prescribed
Guideline	Provides guidance on to develop required procedure or work instruction to manage a work process or carry out an activity or task. A guideline is normally based on established good practices in the organisation or industry.

4.1 LANGUAGE

In this document, the words may, should, and shall have the following meanings:

May	**Indicates a possible course of action**
Should	**Indicates a preferred course of action**
Shall	**Indicates a course of action with a mandatory status**

4.2 ORGANISATION AND DEPARTMENTS

In this document, the terms Corporate, Division and Asset have the following meanings:

Corporate	Refers to the PTTEP Business Groups hierarchically above Asset level, and located in the PTTEP headquarters, Bangkok.
Group	Refers to a corporate level Business Group. These may have associated Divisions, Departments, or operational Assets within their hierarchy.
Division	A Business Group may have one or more distinct groups within its hierarchy. These are referred to as Divisions.
Myanmar Asset	Refers to an operational Asset, site, or location within PTTEP Business Groups in Myanmar Country.
Department	A subgroup within a Business Group, Division or Asset.

4.3 COMMON ACRONYMS

Set out below are common specific terms presented in alphabetical order:

CEO	Chief Executive Officer

EVP	Executive Vice President
SVP	Senior Vice President
CSH	Safety , Security, Health and Environment Division
SSHE	Safety, Security, Health and Environment
MS	Management System
SLA	Services Level Agreement
ALARP	As Low As Reasonably Practicable
ATS	SSHE Action Tracking System
SAP	PTTEP SAP Database
IMS	Incident Management System
PDT	Production Asset Group

5.0 ROLES AND RESPONSIBILITIES

5.1 OWNERSHIP OF THE DOCUMENT

The owner of Myanmar Asset SSHE Management System is the Myanmar Asset SVP (the General Manager), with responsibilities for:

- Approval and issuing the SSHE Management System and its revisions
- Ensuring effective implementation of the standard
- Assuring leadership and commitment.

5.2 CUSTODIAN OF THE DOCUMENT

The custodian of SSHE Management System is the Myanmar Asset SSHE Manager with responsibilities for:

- Keeps the Myanmar Asset SSHE MS aligned with the corporate SSHE MS
- Ensuring the SSHE Management Objectives are understood
- Advising Line Functions/departments on implementation
- Initiating periodic revision
- Updating personnel of the updates when issued.
- Maintaining revision history and document status register

6.0 SSHE MS ELEMENTS

Myanmar Asset manages each of these elements to insure continuous improvement in its SSHE Performance and the achievement of SSHE Objectives.

6.1 LEADERSHIP AND COMMITMENT

Myanmar Asset Management recognises the need for SSHE risk management and are committed to achieve high SSHE standards. They lead and motivate all staff and contractors to adopt high SSHE

standards, provide resources to identify eliminate or reduce and manage SSHE risks in balance with business performance, to effectively achieve the Myanmar Asset and PTTEP Corporate objectives.

The commitment is demonstrated through management visibility; SSHE targets setting and informed involvement in SSHE issues. Examples of this commitment are:

- Monthly SSHE Management Committee meetings dedicated to discuss the performance, incident investigation results, SSHE Plan status
- Attendance and chairing SSHE meetings with contractors.
- Management participation in inspections, audits investigations and reviews.
- Communicating SSHE matters to contractors
- Promoting SSHE topics at Myanmar Asset meetings, newsletters and other publications
- Setting Myanmar Asset SSHE targets in line with Corporate SSHE Targets and cascading them down to the departments and sections.

For detailed activities see the Myanmar Asset's SSHE Plan.

6.2 POLICY AND STRETEGID OBJECTIVES

6.2.1 MYANMAR ASSET SSHE POLICY

Myanmar Asset SSHE Policy is cascaded from the Corporate SSHE Policy. The Policy is communicated to PTTEP SSHE Corporate and is reviewed periodically or if the Management Review Process identifies the need for a change to the policy.

As part of the policy dissemination process; the Myanmar Asset SSHE Policy:

- Is available in Myanmar language and English,
- Is displayed at company facilities and contractors offices on site,
- Is included in the SSHE induction to new staff,
- Is contained in every invitation to tender, in all contract requests and is provided to all Myanmar Asset contractors,
- Is available on Myanmar Asset website.

Apart from SSHE Policy, Myanmar Asset has other SSHE related policies as follows:

- Stop Work Authorization Policy
- Alcohol and Drugs Policy
- Driver Seat Belts Authorization Policy
- Use of Electrical Equipment Policy

6.2.2 MYANMAR ASSET SSHE STRATEGIC OBJECTIVES

Strategic objectives are documented in the Myanmar Asset Business Plan and are reviewed annually by top management. The Myanmar Asset strategic objectives are as a minimum in line with the PTTEP Corporate strategic objectives.

Effective SSHE Management enables these objectives to be achieved in an efficient and responsible way. SSHE objectives have equal status to Myanmar Asset primary business objectives. It is the line management's responsibility to implement these objectives.

The Myanmar Asset SSHE Commitment also establishes the following strategic objectives:

- To achieve zero Lost Time Incidents with in our operations.
- To comply with the applicable SSHE Laws and regulations and international standards
- To have Top Quartile IOGP SSHE performance.
- To protect the environment
- To have identified all risks and have managed them to ALARP

6.3 ORGANIZATION, RESOURCES AND DOCUMENTATION

6.3.1 ORGANISATION AND RESOURCES

Organisation

Myanmar Asset supports the SSHE MS by ensuring the availability of human resources necessary to meet the SSHE objectives and targets.

The Myanmar Asset has defined an organization that allows it to achieve SSHE targets and its business objectives. The organizational chart is illustrated in Figure 1.

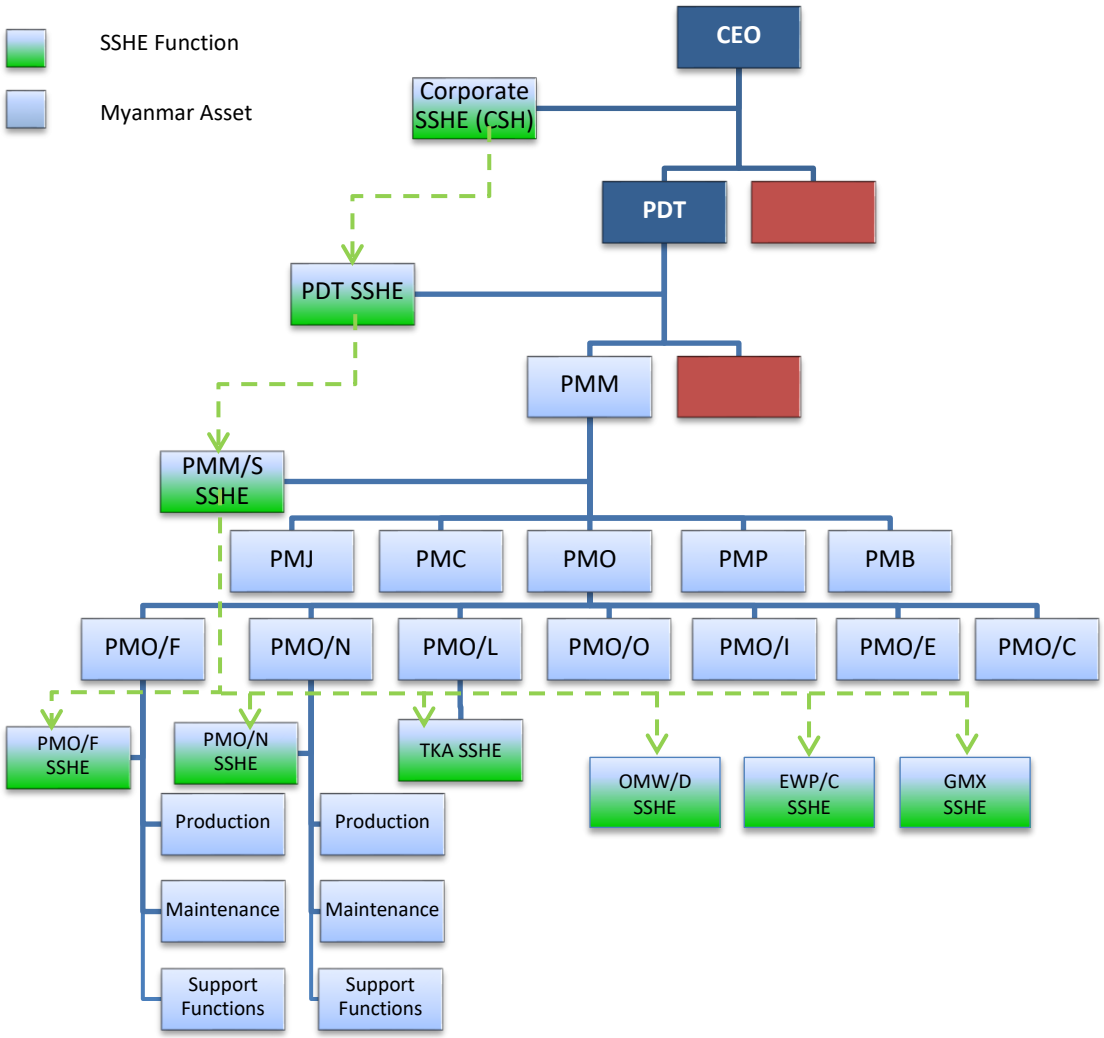

Figure 1: Myanmar Asset Organization

All position job descriptions have clearly identified when they are Safety Critical and what the Roles, responsibilities and accountabilities are for the position.

The SSHE Manager has access to the Corporate SSHE Division TSH for all SSHE related issues.

The Corporate SSHE department acts in support of the line for all SSHE MS related matters, providing expert advice as and when requested.

SSHE Roles and Responsibilities follow the requirements as stipulated in Corporate SSHE Roles and Responsibilities Standard, 11038-STD-SSHE-101.

Vice President Production Operations (PMO) or his/her delegate are assigned as Myanmar Asset SSHE Management Representative or MR by position.

Resources

Myanmar Asset is committed to maintaining an adequate level of resources to effectively implement the SSHE MS.

The risks inherent in operations, emergency procedures, shifts, leave and competency levels are all taken into account when determining resourcing levels.

The SSHE department is staffed with professionals specialised in, Safety, Security, Health and Environment disciplines, to advise and support Line Management.

Financial resources are assigned from the annual budget approved by the EVP.

6.3.2 CONTRACTOR MANAGEMENT

Some 75 to 80 % of all activities are executes by contractors. The Myanmar Asset considers contractor management to be a SSHE critical issue. SSHE issues are handled proactively in all phases of the contract process to ensure contractors manage SSHE in line with The Myanmar Asset SSHE commitment and Policy.

The Myanmar Asset uses the PTTEP Corporate SSHE Standards and Procedures for SSHE Contractor Management.

By following the SSHE Contractor Management Procedure, SSHE-106-PRD-310, all SSHE risks will be assessed, controlled and monitored throughout the lifetime of the contracts.

The SSHE Contractor Management documentation and tools to be used are:

Document Number	Document Title	Information
SSHE-106-STD-310	SSHE Contractor Management Standard	High level document stating the minimum requirements.
SSHE-106-PRD-310	SSHE Contractor Management Procedure	Detailed description how to implement the minimum SSHE requirements into the contracting process and into the
SSHE-106-GDL-311	Contract SSHE Plan Guideline	Information on what can and should be in the Contract SSHE Plan
PTTEP Tool	Contractor SSHE Capability Assessment Questionnaire	OGP Standard Questionnaire for a consistent approach to evaluate contractors.

Document Number	Document Title	Information
PTTEP Tool	Contractor SSHE Capability Questionnaire evaluation tool (XLS)	OGP based evaluation of SSHE Capability Questionnaire against Standard benchmarks with a. banding Scoring system: • Red denotes 'capability is below PTTEP's SSHE requirement' • Amber denotes 'capability conditionally meets PTTEP's SSHE requirements' • Green denotes 'capability unconditionally meets PTTEP's SSHE requirements'

6.3.3 COMMUNICATION

Myanmar Asset Communications are managed in line with the requirements as stipulated in the SSHE Communication Standard, SSHE-106-STD-320.

6.3.3.1 INTERNAL COMMUNICATION OF SSHE ISSUES

The key objective for internal communication of SSHE issues is to ensure that employees, contractors, partners and other interested parties are aware of:

- The SSHE MS and its requirements.
- Their roles and responsibilities in achieving compliance with defined policies, objectives and targets.
- The SSHE hazards / risks (including significant environmental aspects and impacts) associated with jobs and activities, their identification, evaluation, the preventive, control and recovery associated measures.
- Emergency Preparedness, Response and Management.
- The Myanmar Asset SSHE performance against targets.
- Lessons learnt from incidents investigation; audits and inspections made and management review process.

Significant effort is put into measuring KPIs and compiling statistics. Feedback to staff on SSHE performance is documented and provided using the SSHE indicators section in the SSHE web site or on site notice boards. Verbal feedback is given by Line Managers at monthly function / departmental SSHE meetings and SSHE committee meetings.

6.3.3.2 HIERARCHY OF SSHE MEETINGS

There is a hierarchy of SSHE meetings and information flows within the organization.

- At Corporate level: A Quarterly SSHE Steering Committee Meeting chaired by the CEO.
- At Myanmar Asset level: A Quarterly SSHE Management Committee Meeting is conducted by the Management Team Meeting chaired by the GM.
- Contract Holders conduct Monthly SSHE Meetings with Contractors to review SSHE plan execution and performance.
- Monthly Operation SSHE Committee Meeting chaired by Site or Field Manager for ZPQ, ZOC, Drilling and Thaketa Supply Base.

- Quarterly SSHE Meeting for Yangon Office chaired by VP Business Support
- All employees (company and contractor) are made aware of their SSHE responsibilities during their induction. Records of the SSHE induction process shall be maintained.

Myanmar Asset SSHE Management Committee

The SSHE Management Committee is a central body with the Asset chaired by the Asset SVP (General Manager). It meets on a quarterly basis and comprises of the following members or their nominated deputies:

- SVP (GM)
- All VPs in Myanmar Asset
- All Managers in Myanmar Asset
- Myanmar Asset SSHE Manager

Other SSHE Engineers/Advisors or functional Supervisors or Line representatives will participate as necessary

The Purpose and activities of the SSHE Management Committee is:

- To review and assure SSHE Legal Compliance
- To review the SSHE MS to ensure its continuing suitability, adequacy and effectiveness. This review is documented.
- To review the SSHE Policy and Security Standard.
- To review and approve the SSHE Risk Assessments of the business.
- To review and approve the Myanmar Asset Annual SSHE Plan and Audit Plan and ensure that it will address the management of SSHE risks to the business, will identify the deficiencies and will achieve the desired SSHE performance if implemented effectively.
- To review and agree the necessary resources to achieve the effective implementation of the SSHE plan.
- Recognition and award the SSHE Employee of the month
- To identify SSHE trends and review high potential incidents and ensure lessons learned' are considered and actions taken on corporate/Asset management level on a business risk level.
- To promote continual improvement of SSHE management and performance.
- To review Management SSHE inspections, SSHE audit status and follow up
- To review and agree and Asset wide SSHE initiatives.

The Myanmar Asset SSHE Manager has been designated to act as meeting secretary; he/she will accordingly issue the meeting minute. Once approved the minutes are distributed to each committee member.

Committee members are responsible for ensuring interfacing with the SSHE department and for disseminating relevant SSHE information to line staff via function / departmental SSHE meetings.

Operation/Site SSHE Meetings

Each operation/site holds a monthly meeting, in which SSHE and other operational issue are discussed, including:

Objectives and activities:

- To stimulate effective two-way communication on SSHE issues between management and personnel e.g. for the review of policies and procedures.
- To engage all staff in the implementation of SSHE management.
- To recognize and nominate SSHE Employee of the Month to the SSHE Committee Meeting.
- To serve as SSHE advisory bodies to management and promoting suggestions for improvement.
- To monitor measures taken for the prevention of accidents, their implementation and adherence.
- To organize inspections and audits focused on unsafe, unhealthy or environmentally unfriendly practices.
- To review SSHE plan and progress, reports of inspection and audits.
- To monitor follow-up of accidents and incidents (including security) that have occurred.
- To endeavour to secure the co-operation of all persons in the promotion of SSHE.
- To advise on SSHE training, instructions and guidance of Supervisor and workers.

Daily Operations Meetings

Operations SSHE issues are raised and discussed at Daily Operations Meeting. SSHE issues shall be communicated amongst the Operation team.

Toolbox Meetings

These are brief, informal meetings, held by supervisors and work groups at the beginning of the job, day or work period to discuss the job in hand, main hazards/aspects and the cause of incidents, poor working habits and share their own experiences.

Formal contractor meetings

Regular SSHE meetings are held between operations staff and SSHE critical contractors, as defined in the Safety Cases to reinforce awareness on SSHE issues. Meetings are chaired and supported by line staff. Meetings are held once a month and the topics discussed are recorded. Minutes of meeting are distributed to all participants:

Topics discussed include:

• Current Myanmar Asset SSHE concerns	• New legislation / Regulations
• New Hazards caused by changes in operations.	• SSHE issues related to facilities and equipment standards
• Lessons learnt from incidents	• SSHE promotional activities
• Competence and training	• Near Miss incidents and unsafe acts
• Quality improvement	• Progress against SSHE Plan

Key contractors are required to attend Myanmar Asset SSHE Management Committee chaired by the SVP or Operations VP/Manager (Includes Drilling) and the SSHE Manager at which performance against SSHE plans is reviewed.

For specific SSHE critical or complex activities, such as major plant shutdown, major maintenance activity, project works or upgrades, dedicated SSHE meetings are held.

SSHE News letters

The SSHE department periodically publishes informative bulletins that are posted on all notice boards with in the asset and its contractors.

Newsletters cover specific safety, security, health and environmental concerns. Aside from general information, extraordinary bulletins are prepared if a particular SSHE issue of interest requires coverage and publication.

6.3.3.3 EXTERNAL COMMUNICATION OF SSHE ISSUES

External communication can be a planned program (e.g. community engagement for new projects, public consultation for new EIA/IEE/EMP study, etc.) or unplanned event (external complaint). For external complaint or customer complaint, prompt investigation and response action are required to ensure that the case is seriously attended. The communication is also included;

- Weekly and monthly reports to Myanma Oil and Gas Enterprise (MOGE) which contain updates to the Myanmar Asset SSHE plan and SSHE activity highlights.
- Weekly and monthly reports to Corporate SSHE on SSHE performance/ statistics and incidents via Notification of Incident (NOI) and Incident Management System IMS.
- External communication of SSHE issues in PTTEP website e.g. Myanmar Asset SSHE Policy, disclosure of EIA/IEE/EMP study.

6.3.4 DOCUMENTATION MANAGEMENT

The Myanmar Asset operates within the PTTEP SSHE standards, procedures and guidelines. The PTTEP SSHE standards, procedures and guidelines have been used to develop the Myanmar Asset's own SSHE document. The PTTEP SSHE Corporate documentation is integrated within Myanmar Asset's SSHE MS, either directly or by way of incorporation in Asset's own standards and procedures. Where PTTEP Standards and Procedures cannot be applied, the reasons for deviation are documented and all other available measures, temporary or otherwise, to reduce risk exposure are considered and evaluated. A full list of PTTEP Corporate SSHE Documentation is given in link Corporate SSHE Document.

The Corporate SSHE Department is responsible for maintaining an up to date SSHE reference Library of all applicable SSHE standards (National, International, PTTEP and Asset)

The Asset takes these requirements into account when setting SSHE objectives and when defining Asset SSHE Standards.

The line will be notified by Email when changes to Standards are made. It is the lines responsibility to assess what the changes mean to the Asset and its operations to ensure compliance or derogation.

The SSHE department is responsible for developing and reviewing SSHE standards and procedures, in conjunction with line personnel. It is the lines responsibility to write detailed procedures to manage the activities safely. Changes in, or additions to, SSHE legislation, industry and Group standards/guidelines are reviewed within the SSHE department and incorporated into SSHE standards and procedures as appropriate. All changes to standards reflecting the need for a more basic change in the Asset SSHE MS structure are notified by the appropriate Line Manager to the SSHE Management Committee for review and authorization. These changes are then documented and communicated to end users.

The Asset makes applicable SSHE documents available to Contactors.

All Controlled documents within the Asset are controlled via the Document Management System described in the PTTEP Corporate SSHE Standards and Production Asset Group Procedures.

- SSHE Document Management Standard, 11038-STD-SSHE-304
- SSHE Document Control, 10012-PDR-SSHE-330-002

A series of Standard document templates for Myanmar Asset generated document are available on the web.

The objective of the Myanmar Assets document control system is to ensure:

- Mandatory requirements are clearly communicated to all relevant personnel.
- Documents can be identified with appropriate company, function or activity.
- Documents are periodically reviewed, revised as necessary and approved for adequacy by authorised personnel prior to re-issue.
- Document change and modification procedures are defined and understood.
- Current versions of documents are available at those locations where they are needed.
- When obsolete, documents are promptly removed from all points of issue and point of use.

Documentation is maintained in an orderly and legible manner. It is dated (with dates of revision), readily identifiable and retained for a specific period. Controlled documents are registered on the web as following link Myanmar Asset SSHE Document.

SSHE Documentation

The hierarchy of documentation as pictured in figure 2.

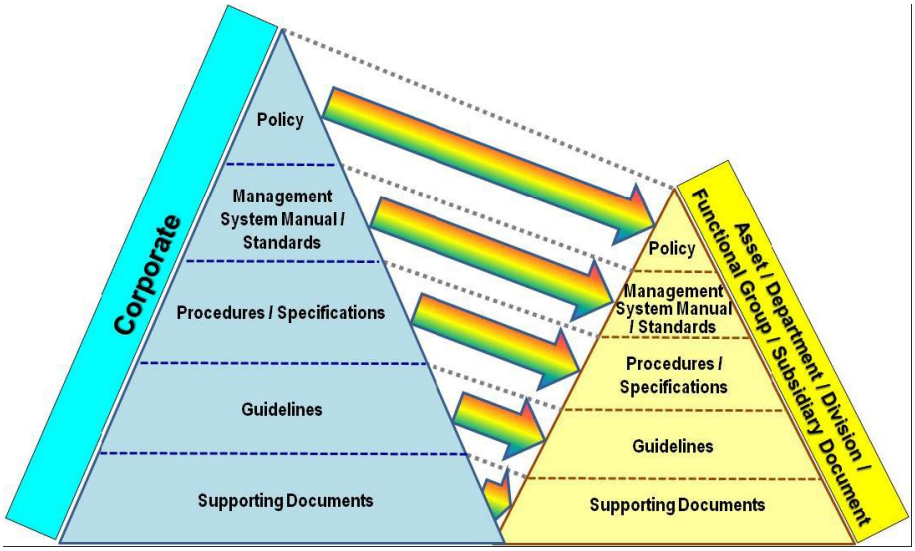

Figure 2: SSHE Documentation Hierarchy

SSHE MS documentation can be viewed as a series of explanations or statements of how the SSHE management system requirements are applied by the Myanmar Asset**. Figure 2** shows the levels of management system documentation.

- The SSHE Policy statement officially states the Myanmar Asset's position on SSHE matters.
- The SSHE MS (this document) provides the description of the management system itself. The Safety Cases demonstrate the SSHE MS is working effectively at selected facilities and operations.
- The standards, plans, procedures, Site Standing Instructions (SSIs), work instructions, guidelines, reports and reviews describe how components of the management system are carried out.

6.3.5 TRAINING AND COMPETENCE

It is important that the competence of employee and contractor is regularly evaluated and necessary training programs are made available to them to ensure that all personnel are competent to perform their tasks and control the associated risks effectively.

All sections under the Myanmar Asset are responsible to implement the competence assurance system established by PTTEP Corporate Human Resources (HR) Department.

SSHE Training requirements follow SSHE Training and Competency Standard, SSHE-106-STD-340 and SSHE Training and Competency Procedure, 11027-PDR-SSHE-340-003.

All Training records are available in the training database of HR (e-HR) and maintained for each employee whilst remaining within the company employment.

At the site level some specific training needs or training courses for key personnel related to safety critical activity defined in the each site training and competence procedure.

6.3.6 REGULATORY COMPLIANCE AND STANDARD

Compliance to related SSHE legislations and other requirements is one of the key expectations of the SSHE Policy follows SSHE Regulatory Compliance Standard, Myanmar-13253-STD-014.

It is essential to establish a channel to access to and identify the related legislations and other requirements for effective implementation. Compliance to the related legislations and other requirements need to be regularly checked/audited. Any nonconformity needs to be raised whereas the corrective and preventive actions are to be seriously taken. Results of the compliance audit need to be presented to the management of Myanmar Asset for followed up and close-out.

6.4 EVALUATION AND RISK MANAGEMENT

The Hazards and Effects Management process (HEMP) is applied to current and new activities as a means of assessing SSHE risks to the Myanmar Asset.

The purpose of this process is to identify, evaluate and determine effective controls for the Safety, Security, Health and Environmental **hazards, aspects** and **effects** associated with The Myanmar Asset activities, where:

- A **hazard** is defined as anything that has the potential to cause harm, including ill health and injury to people (Myanmar Asset staff, contractor personnel & third parties), damage to assets/property, products or the environment, production losses or increased liability, and the potential for social/cultural disruption.
- An environmental **aspect** is defined as any element of an organization's activities, products or services that interacts with the environment.
- An **effect** is usually an adverse impact on people, the environment, property, or company reputation. Effect also includes adverse or beneficial impacts to environmental, social, or cultural systems, either directly or indirectly.

The process is applicable to all business processes in the life cycle of an operation from conception to abandonment. The tools and techniques available are applied in a logical and rigorous way, setting acceptance criteria and screening against them as the process proceeds. The arrangements identified as necessary to manage assessed threats and potential consequences and effects are then incorporated in the design phase, for existing operations it is necessary to verify that what is in place is suitable and sufficient. If not, remedial actions are taken and all necessary procedures are incorporated into the SSHE MS.

The principles **of identify, assess, control and recover** are the bases of HEMP, with the individual stages summarised in the following steps:

- Identify hazards, aspects and potential effects
- Assess risks
- Establish risk reduction measures to prevent or **control** incidents and/or to mitigate effects, **recovery** preparedness.
- Compare with objectives and performance criteria to demonstrate that risks are reduced to As Low As Reasonably Practicable (ALARP).
- Record Hazards and Effects

The HEMP studies to be applied to facilities design, construction, modification and abandonment is included in the SSHE Risk Management Standard, SSHE-106-STD-400.

The Myanmar Asset uses Annex D of ISO 17776: 2000(E) *"Petroleum and natural gas industries-Offshore production installations - Guidelines on tool and techniques for hazard identification and risk assessment"* as guidance to identify hazards associated with the activity.

6.4.1 IDENTIFICATION OF HAZARDS AND ASPECTS

In the context of this manual, the following terms are synonymous; "environmental aspect" and "environmental hazard"; "significant environmental aspect" and "major environmental hazard".

The identification of major SSHE hazards is based on the operational experience of the Companies Staff and their advisors and contractors, in conjunction with available and risk-based studies.

Line management is responsible for involving staff in the hazard identification and assessment process. Identified hazards are analysed in detail in the Safety Cases and registered in the hazard register database named Risk and Environmental Aspect Assessment (REA) on PDT SSHE webpage: http://doa-sshe/SSHE_SS/Index follows PDT SSHE instruction;

- Hazard Analysis and Risk Assessment Instruction, SSHE-300-WI-400

The Hazard Register is reviewed following:

- Revision / update of a Safety Case
- Any major change in the Myanmar Asset operations
- Any significant findings from incident investigation, reviews, audits, inspections, job safety analyses, etc.

The hazard register is updated to include any new/revised hazards. The following techniques are applied to ensure the early identification, review and documentation of hazards and their effects in the Myanmar Asset operations:

Technique	Description	Reference
HAZID	Performed during development / initiation phase of all major projects to provide early identification and assessment of HSE hazards related to the project. HAZIDs are the responsibility of Project Managers & Asset Holders.	HAZID Study Guideline SSHE-106-GDL-411
HAZOP	Performed during the definition phase of all major projects, once drawings of an adequate quality are available for review. It is the responsibility of the Project Manager & Asset Holder to determine whether a project requires a HAZOP and the level	HAZOP Study Guideline SSHE-106-GDL-412

Technique	Description	Reference
	of detail of the HAZOP. The reasons for deciding **not** to perform a HAZOP for a major project must be documented.	
QRA	Performed whenever there is a requirement to quantitatively demonstrate risk reduction to ALARP. QRA may be performed in conjunction with cost benefit analysis. The decision to perform QRA lies with the Asset Holder.	QRA Guideline SSHE-106-GDL-404
PTR	Project Technical Safety reviews are done prior to the end of every Project Engineering phase for all major projects. (PTR 1,2,3 and 4)	PTR Guideline SSHE-106-GDL-703
OTR	Operations Technical Review Performed during operations and is mandatory to be done very 3 years	OTR Guideline SSHE-106-GDL-705
HRA	Health Risk Assessments are performed in accordance with Corporate guidelines and are the responsibility of line management with support from the Occupational Health Advisor.	Health Risk Assessments Guideline SSHE-106-GDL-403
EIA	Environmental Impact Assessments are performed according to established corporate guidelines and national law requirements. These studies are conducted with the support from the Corporate Environment Management Department	Environmental Aspect Identification and Evaluation Guideline SSHE-106-GDL-401
SRA	Security Risk and Threat analysis and Assessment are performed in accordance with Corporate guidelines and are the responsibility of line management with support from the Security Advisors from the Corporate Safety Department	Security Risk and Threat analysis and Assessment Guideline SSHE-106-GDL-402

6.4.2 RISK ASSESSMENT AND SCEENING CRITERIA

Qualitative Risk Evaluation

Once hazards, aspects and effects have been identified, they are assessed for their overall risk level and in the case of environmental aspects, for their significance.

Risk is defined as the product of the likelihood and consequence of an event. The Myanmar Asset uses the PTTEP Risk Assessment Matrix (RAM) for risk assessment. The matrix can be used for risk assessment of relatively simple activities or where the exposure of the workforce, public, environment or the asset is relatively straightforward to assess. Within the matrix, risks are identified as high risk (RED Area), Medium risk (Yellow Area) and Low risk (Green Area).

Risk assessments are used to rank hazardous scenarios and prioritise development of controls and are made on the basis of the information available from:

- Audits and reviews
- Analysis of incidents to date for Company
- Analysis of PTTEP statistics
- Analysis of occupational exposure standards and environmental standards
- Legal and PTTEP requirements

The Myanmar Asset operations are high risk. It is imperative that controls are fully implemented and that every effort is made to reduce risk.

Quantitative Risk Evaluation

For quantitative risk evaluation, area risk, Individual Risk (of fatality) Per Annum (IRPA) is calculated and is compared against the criteria in Table 1.

Table 1 Risk Acceptance Criteria – Individual Risk, per year

Risk Regions	Employees / Contractors	Public
High Risk	> $1x10^{-3}$	> 1×10^{-4}
Medium Risk *Goal for old facilities: 5×10^{-4} ** Goal for new facilities 10^{-5}	1×10^{-6} <Risk< 1×10^{-3}	1×10^{-6} <Risk< 1×10^{-4}
Low Risk	< 1×10^{-6}	< 1×10^{-6}

Demonstration of ALARP

To reduce risk to a level which is as low as reasonably practicable (ALARP) involves balancing reduction in risk to a level, objectively assessed, where the trouble, difficulty and cost of further reduction measured become unreasonably disproportionate to the additional risk reduction obtained, as illustrated in Figure 3

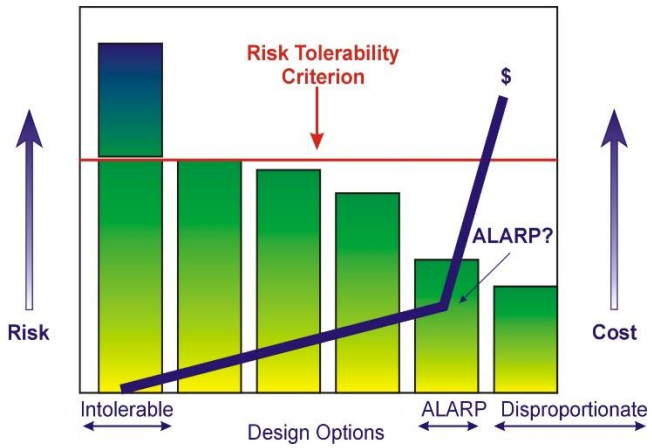

Figure 3: Demonstration of ALARP

The risks are managed in the Asset primarily by flowing means:

The Individual risk Criteria are set for risk tolerability to demonstrate ALARP and acceptance using Table 1.

The risk Matrix is used to define areas of tolerable risk within the Myanmar Asset. Three key levels of risk are indicated on the matrix

- Low(Green) - Manage for continuous improvement
- Medium (Yellow) - Incorporate risk reduction measures
- High (Red) - Intolerable

In the first instance the HEMP process is used to provide a qualitative demonstration of ALARP. A series of hazardous scenarios are envisaged for which a preliminary risk assessment is performed (the “uncontrolled” scenario assessment).

Depending on the risk assessment level and following the consideration of assurance options, controls are established to prevent the scenario from being realised.

These controls are primarily derived from standards, procedures and judgement based on experience.

Rather than specify a pre-defined number of controls for a given risk level, the Myanmar Asset prefers to judge each scenario on a case by case basis. Two controls may be sufficient for one scenario, but a different scenario with the same risk assessment may require several controls to be in place before management is satisfied that ALARP has been demonstrated. The first criteria that the Myanmar Asset specifies is that the controls put in place have the effect of bringing the risk level out of the intolerable region. For this reason a second risk assessment is performed on each scenario following the establishment of controls (the "controlled" scenario assessment). The difference in distribution of risk assessments for "uncontrolled" and "controlled" hazardous scenarios provides a clear visualisation of risk reduction and allows management to identify those risks which require more rigorous analysis (e.g. QRA, cost benefit analysis).

Any operation with a "controlled" risk assessment that lies in the intolerable region of the risk assessment matrix cannot be carried out; in these cases alternative methods for carrying out the operation will be investigated, if no alternative ways of operating are permissible, then management decides whether to proceed or not. In such cases, this decision must be documented.

6.4.3 SAFETY CASES

Safety Cases are an important part of the SSHE MS. The corporate standard for Safety Cases Standard, 11038-STD-SSHE-420-008 has been used with the preparation of the site and activity specific safety cases to demonstrate:

- A systematic and implemented SSHE MS is in place to ensure compliance with PTTEP policies, relevant legislation and commitment and continuous improvement,
- Hazards and Effects Management Process (HEMP) aspects identified as significant are suitably controlled with recovery and preparedness measures in place and that the risks are managed to ALARP.
    - All Major Accident Events have been identified and have mitigation measures in place to reduce the risk.
    - All Safety Critical Elements have been identified and have a Performance Standards in place which can be monitored and maintained.

The Hazard and Effects Management Process (HEMP) is applied to support demonstration of risk control.

The Myanmar Asset has the following Safety Cases

- Zawtika Offshore Operational Safety Case
- Zawtika Onshore Operational Safety Case

The remedial action plan is included in the Safety Cases where shortfalls were identified when producing and reviewing the Safety Case.

All Drilling Rigs Contracted shall have a Safety Case.

The barriers safeguarding against Major Accident Events (MAE) are monitored through the MAE Prevention Tool.

6.4.4 ASSET INTEGRITY MANAGEMENT

The Myanmar Asset is developed and designed to provide technical integrity and is maintained to preserve technical integrity and operational performance as out lined in the assets safety case.

Technical integrity of Myanmar Asset is achieved when under specific operating conditions:

- The is no foreseeable risk of failure to endanger the safety of personnel, the environment or asset value
- SSHE hazards/risk associated with the asset are reduced to ALARP

In practise this is achieved by the application of effective HEMP controls that include technical standards, procedures and work instructions.

6.4.4.1 TECHNICAL DESIGN INTEGRITY

All equipment and installations are designed according to Myanmar legislation, PTTEP and other industry standards for use within a specified operational envelope. System boundaries are defined along with the system function and operating parameters. Design specifications and operating parameters together form the basis for operational and maintenance tasks.

The Myanmar Asset technical design standards are defined in:

- PTTEP Engineering General Specifications
- Installations Basis of Design
- Assets Safety Concept Document

The roles and responsibilities and authorities of designated Technical Authorities, Discipline Engineers and the technical Operations forum in approving a facility design, construction or modification activity is described in PTTEP DAS chapter IX Technical Authority and Technical Authorities Recommended Practice, CMS-12060-RPR-407.

6.4.4.2 MAINTAINING TECHNICAL INTEGRITY & OPERATIONAL PERFORMANCE

For technical Integrity safeguarding systems, Failure Modes & Effects Analysis / Reliability Centred Maintenance determines the applicable maintenance tasks and are managed through the Asset Reliability and Integrity Management Standard, ARIM-0842-STD-001.

Figure 4 below is a simplified overview of the Asset Integrity process.

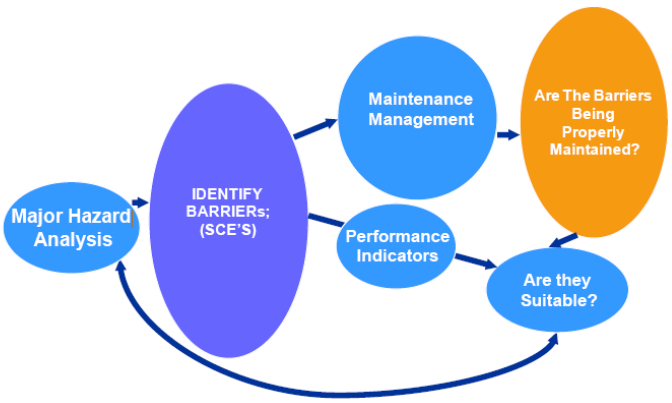

Figure 4: Simplified Asset Integrity Process

The Myanmar Asset is responsible to ensure the compliance with the technical integrity performance standard set out in the ARIMS and the Process Safety Management Standard SSHE-106-STD-440-007

The ARIMS Dash Board is used to demonstrate the technical integrity of all facilities at any given time.

6.4.5 PROCESS SAFETY

The corporate Process Safety Management Standard, 11038-STD-SSHE-440-007 highlights all the Process Safety Elements which are applicable to the Myanmar Asset in table *Table 1: Guidance of Application of Process Safety through Asset Lifecycle*. Process Safety Event Indicators are captured and are monitored.

The Engineering Corporate Management System describes how Process Safety aspects are incorporated into the designs and how Asset integrity is managed through the ARIMS is followed.

The Major Accident Event Prevention Tool Guideline SSHE-106-GDL-432 has been used to develop a line of sight for the monitoring the health of Main Accident Event barriers.

These barriers have been identified in the bow ties of the safety cases.

6.4.6 RISK TO REPUTATION

Reputation risk issues depend to a large degree on societal issues and perceptions. Myanmar Asset relies on firmly established communication channels end External Relations management to ensure that potential risks to reputation are identified as early as possible in order to avoid problems. The establishment of effective communications systems is an integral part of reputation risk management.

6.5 PLANNING AND OPERATION CONTROL

6.5.1 MYANMAR ASSET SSHE PLAN

The Myanmar Asset develops an annual SSHE and Audit Plan (derived from the annual Business Plan and the Corporate SSHE Plan) that integrates actions in support of strategic objectives and implementation / monitoring / continuous improvement of the SSHE MS, including the Safety Cases. The Myanmar Asset SSHE Manager manages the preparation of the Myanmar Assets SSHE plan, in conjunction with the management of Myanmar Asset.

Objectives and targets from previous year are reviewed in the light of the previous year's performance; significant environmental aspects; legal, financial, commercial operational requirements; technological options and view from interested parties. Results from monitoring programs and internal audits are used to measure performance against targets established in the SSHE Plan. The Myanmar Asset Senior Vice President (the General Manager), endorses the Myanmar Asset SSHE Plan.

See detailed requirements in Corporate SSHE Plan Standard, 11003-STD-SSHE-550-003

FUNCTION SSHE PLAN

Each site/operation produces a SSHE Plan cascaded down from the Myanmar Asset SSHE Plan, which is included in the annual Asset Operations Plan. Site/Operation Managers are responsible for the preparation of SSHE Plans and for ensuring timely closeout of action Items. Progress of action items is reported to the Myanmar Asset Manager on a regular basis to ensure that stated objectives are achieved.

Targets for Key performance indicators are set at the beginning of each year after evaluation of KPI statistics for the previous year.

The requirements for ISO 14001 and other ISO standards the asset maintains are integrated in the SSHE Plan.

6.5.2 OPERATIONAL CONTROL

6.5.2.1 PROCEDURES AND WORK INSTRUCTIONS

The developed specific standards, procedures, guidelines and work instructions for SSHE critical operations or activities have been developed to ensure adequate controls are in place and to support the implementation of the SSHE MS in the workplace.

Those which are important for the control of critical activities fall under the controlled documents classification and in consequence are registered in the document management system and issued in each function website.

PDT SSHE : http://doa-sshe/Documentation/

Myanmar Asset : http://rgn-imasshe/documentation/Index

ZPQ : http://zpq-sshe/Home/

ZOC : http://zoc-sshe/Home/

The SSHE critical activities and operations are included in the Safety Cases.

To facilitate the access to SSHE procedures and guidelines to contractors and facilities with no access to the asset intranet, the SSHE documentation has been provided to all major contractors via contract holders.

All workers are responsible for immediately advising their supervisor of any SSHE concerns. These concerns should be reported to the appropriate Line Manager if sufficiently serious.

This SSHE MS and the Myanmar Asset Standards Procedures and Work Instructions follow the requirements as described in the Corporate Operational Safety Management Standard, SSHE-106-STD-540.

6.5.2.2 EMERGENCY AND CRISIS MANAGEMENT

The Line organization primarily deals with emergency scenarios in conjunction with the Emergency Co-ordinator, the Emergency Response Team and the Duty Manager. Myanmar Asset Emergency Management Plan, 11027-PDR-SSHE-340-005 and Crisis Management Plan, 11027-PDR-SSHE-340-006 are addressed on Myanmar Asset SSHE Document Database.

The Myanmar Assets management team is responsible for conducting scheduled reviews to ensure that the emergency procedures and associated information remain valid and comply with the current operating conditions.

Desktop emergency and crisis drills are performed periodically, including mobilization of the Emergency Control room, to test readiness and crisis management response.

Emergency and Crisis Response Team members who may have to communicate with external parties have been trained to do this.

The Field Manager and Drilling Supervisors co-ordinate and maintain records of weekly facility emergency exercises.

The Myanmar Asset Emergency and Crisis Management Plan are in compliance with the corporate Emergency and Crisis Management Standard, SSHE-106-STD-500.

6.5.2.3 PERMIT TO WORK

The Myanmar Asset use PTTEP Corporate Permit to Work Standard, SSHE-106-STD-510 and Permit to Work Procedure, 10011-PDR-SSHE-510-010 to operate permit to work system throughout its operations. The above standard and procedure describe the authorisation, restrictions, procedures for approval and detailed definitions of permit types. No work may be carried out with or without a permit unless it forms part of an approved work plan and has been authorised to commence.

6.5.2.4 MANAGEMENT OF CHANGE

To ensure that an auditable process is in place to:

- Report and record all non-compliances with established Country statutory requirements, PTTEP policies, standards and procedures
- Report, review evaluate and record all variances from Country statutory requirements, PTTEP policies, standards and procedures
- Report, review evaluate and record all changes to projects and to the Process Safety elements of functional assets.

All planned variances / change requests are evaluated by a multidisciplinary team consisting of technical authorities to verify that all required standards are adhered to and achieved. Approved variance /change requests are incorporated into project Initiation notes and work packs as appropriate.

The Corporate Management of Change Standard, 11038-STD-SSHE-570-012 is the mother document for the management of change.

When a change (Modification or Deviation) in an Operating Asset affects Safety Critical Systems, approval for the change shall be obtained from Management of the Asset for continued operations follows

- PTTEP DAS chapter IX Technical Authority
- Accountability and Ownership of Management of Change CMS-12060-STD-407
- Management of Engineering Modifications for Operating Assets CMS-12060-RPR-404
- Change Management – Projects (Engineering and Construction) CMS-12060-RPR-405
- Management of Deviations for Operating Assets, CMS-12060-RPR-406
- Technical Authorities Recommended Practice, CMS-12060-RPR-407

6.5.2.5 PERSONAL PROTECTIVE EQUIPMENT (PPE)

The Myanmar Asset has purchased and issued PPE as per the requirements of section 6.5 of the corporate Operation Safety Management Standard, SSHE-106-STD-540.

The PPE standard requirements are a standard requirement in the Contractor Requirement Form for managing contractors.

6.5.2.6 CHEMICAL MANAGEMENT

The chemical used in the Myanmar Asset is controlled by “Chemical Owners” in consultation with SSHE Department and/or Site SSHE. Corporate Chemical Management Standard, 11003-STD-SSHE-590-005 is used for the Management of Chemicals (Purchase, storage, transportation and disposal).

PTTEP uses the Chemwatch “Chemgold III” program for tracking chemicals and their Material Data Sheets and emergency response requirements.

6.5.3 SECURITY MANAGEMENT

The primary objectives for security management are to:

- Identify and evaluate the threats to Company personnel and Assets and implement appropriate measures;
- Evaluate the Companies vulnerabilities by a process of continuous assessment of security measures;
- Ensure that Threat Response measures are appropriate and ready for implementation;
- Develop practical, cost-effective and feasible mitigation measures;
- Determine the risks based upon available intelligence and security expertise; and
- Communicate awareness and appreciation of security related issues through education.

Myanmar Asset shall develop, maintain and implement Myanmar Asset Security Management Procedure, 11027-PDR-SSHE-340-004. Key functional Staffs have been briefed on the Security Plan and key aspects of the security requirements have been embedded in the asset and functions SSHE Plans.

The Security focal point for the asset is the SSHE Manager.

Security is managed in line with the requirements of the Corporate Security Management Standard, SSHE-106-STD-530

6.5.4 OCCUPATIONAL HEALTH MANAGEMENT

The purpose of Occupational health management is to:

- Protect, promote and maintain the health, safety and welfare of people at work
- Advise on the provision of safe and healthy conditions by informed assessment of the physical and psychological aspects of the working environment
- Identify and advise management on the causes of occupational disease and injury and the means of their prevention
- Advise on the rehabilitation and placement in suitable work of those temporarily or permanently incapacitated by illness or injury and
- Assist in the planning and preparedness of emergency response plans.

Based on the corporate Occupational Health Management Standard, SSHE-106-STD-560, PDT has developed Hearing Conservation Program (HCP) Procedure, SSHE-300-PDR-560, applies to the Myanmar Asset.

PTTEP Corporate has developed the procedure and guidelines which applicable to the Myanmar Asset covering the following:

- Medical Emergency Management Guideline, 11003-GDL-SSHE-501-003
- Fitness to Work Guideline, 11003-GDL-SSHE-561-005
- Work Related Injury/Illness Case Management Procedure, 11038-PDR-SSHE-562-006
- Site Medical and Health Care Services Guideline, 11038-GDL-SSHE-563-020
- Drugs and Alcohol Guideline, SSHE-106-GDL-564
- HIV/AIDS Management Guideline, SSHE-106-GDL-565
- Industrial Hygiene Monitoring Guideline, SSHE-106-GDL-566

- Medical Surveillance Management Guideline, SSHE-106-GDL-569

The Myanmar Asset does not have its own Occupational Health Specialist but has the required support through the Service Level Agreement with Corporate SSHE division. The Occupational Health management is subject to yearly audits from the Corporate Occupational Health Specialist.

6.5.5 ENVIRONMENT MANAGEMENT

The purpose of Environment Management is to reduce and mitigate the environmental impacts of identified environment aspects as well as achieving the high environmental performances.

The environment management covers Air Emission, Flaring and Venting, Waste and Wastewater discharges, Produced Water Discharges, Energy Efficiency and Biodiversity.

The Myanmar Asset follows the requirements as documented in the corporate Environment Management Standard, 11038-STD-SSHE-520-009.

The Myanmar Asset has implemented the following requirements;

- The environment management requirements as stipulated in the SSHE Policy
- Complies with the Regulatory environment laws
- The assets facilities are ISO 14001 certified
- The assets facilities have been subjected to an Environment Impact Assessment study
- The asset has incorporated the management of environmental aspects in its SSHE Plan
- Has Environmental Management Audits scheduled in its SSHE Plan

The Myanmar Asset develops Waste Management Procedure which complies with Myanmar regulations and PTTEP Corporate guideline. The Myanmar Asset Waste Management Procedure is presented in Waste Management Procedure, Myanmar-SSHE-11027-PDR-510.

PTTEP Corporate has developed the procedures and guidelines which applicable to the Myanmar Asset covering the following:

- Waste Management Procedure, SSHE-106-PDR-521
- Biodiversity and Ecosystem Services Management Guideline, 12002-GDL-SSHE-522-008
- Water Management Guideline, SSHE-106-GDL-523
- Energy Efficiency Guideline, SSHE-106-GDL-524
- Gas Flaring and Venting Reduction Guideline, SSHE-106-GDL-527
- Net Environmental Benefit Analysis Guideline, SSHE-106-GDL-526
- Environmental Baseline Survey and Monitoring Procedure, SSHE-106-PDR-611

The Corporate and the asset environment strategic goals and plans have been embedded in the Myanmar Asset SSHE plan.

6.6 IMPLEMENTATION AND MONITORING

6.6.1 INCIDENT MANAGEMENT

To learn and prevent similar incidents from re-occurrence and to find the root causes, all SSHE incidents are reported according to the Incident Management Standard, 11038-STD-SSHE-600-011.

Details of the all incidents and high potential near misses are electronically input into the PTTEP Incident Management System (IMS) by nominated departmental focal points. The incidents are reported to the

line and authorities in accordance with the reporting requirements mentioned in the standard. Those locations which do not have access to the Intranet use the paper Incident Reporting forms and are scanned and copied to the SSHE department within the required reporting time. The Site SSHE personnel are responsible for the maintenance of records within the IMS. Corporate SSHE is responsible to maintain and develop the IMS.

The Myanmar Asset SSHE department is responsible for ensuring that the appropriate records are kept for;

- Follow-up actions related to incidents / high potential near misses
- Environmental incidents including chemical spills
- Vehicle incidents

In additions the Myanmar Asset SSHE department is responsible for ensuring that the entire Company is provided with adequate feedback regarding incidents, together with corresponding measures to prevent future recurrence. SSHE Newsletters, produced by the Myanmar Asset SSHE department, are used to publish details of incidents that have a high learning value. Copies of news letters are also distributed to contractors.

6.6.1.1 INCIDENT INVESTIGATION

Incidents and near misses with a significant actual or potential severity risk accordingly to the SSHE Risk Assessment Matrix, are investigated following the documents:

- Occupational Illness Cases Identification Guideline,SSHE-106-GDL-601
- Incident Investigation guideline,12148-GDL-SSHE-602-024
- SSHE Incident Reporting Perimeter Guideline (SSHE-106-GDL-603)

Incidents are reviewed on a monthly basis in order to establish root causes and identify actions to reduce the chance of re-occurrence. In addition an RAM assessment is made to determine the risk potential.

It should be noted that in some cases incident investigations conducted by PTTEP may be run in parallel to external investigations by the authorities or insurance companies.

In case of incidents involving contractors an investigation could be made in parallel with the contractor's investigation.

The results of incident investigations are presented to the SSHE Committee and lessons learnt are disseminated to PTTEP and contractor's personnel. In the event of a fatality, a report must be submitted to PTTEP CSH and a review of the effectiveness of remedial actions is carried out 12 months after submission of the investigation report. The results of this review are sent to PTTEP CSH.

Incident investigation reports are approved and signed by the appropriate level of management as specified in the documents mentioned above.

6.6.1.2 COMMUNICATION OF LESSONS LEARNT

Lessons learnt from incidents will be communicated by the corporate PTTEP SSHE division to ensure that the corrective actions from the lesson learnt have been incorporated into the continuous improvement process of relevant functions to prevent similar incident from reoccurrence.

PTTEP SSHE website provides access to all Lessons Learnt publications.

6.6.2 KEY PERFORMANCE INDICATOR AND PERFORMANCE MANAGEMENT

SSHE performance against plans and targets is monitored at various levels within the Myanmar Asset follows the SSHE KPI and Performance Management Standard, SSHE-106-STD-610.

A review of the relevant KPIs performance against the Corporate Plan targets is carried out during the monthly SSHE management Committee meetings (see 6.3.3.2 Hierarchy of SSHE meetings). Each Operation/Site is responsible for initiating the activities required to achieve its target SSHE performance. If targets are not met, appropriate corrective actions are initiated.

Additional pro-active monitoring involves an assessment of the Myanmar Asset's and Contractor's commitment to SSHE by monitoring amongst others the following issues:

- The number of reported incidents and near misses, including High potential near misses and asset defects / Technical Integrity issues, general failure, causes, etc.
- The number of reported Safety Observation Cards.
- Adherence to medical checks and health surveillance (Refer to Fitness to Work Guideline)
- Frequency of management inspections and site visits

Contractor SSHE performance is reviewed in the formal contractors meeting and the yearly and final Contractor SSHE Evaluation report as per the SSHE Contractor Management Procedure.

The Procurement department maintains a database of all contractor SSHE assessments.

6.6.2.1 PERFORMANCE INDICATORS (PROACTIVE AND REACTIVE)

Key performance indicators are an essential part of an effective management system. Tracking of KPIs generates historical performance records from which SSHE performance trends can be derived. Within the Myanmar Asset both active and reactive KPIs are selected such that if one or a number of indicators show adverse trends, corrective action will be initiated. The Myanmar Asset follows PTTEP Corporate SSHE Department's requirements and in setting SSHE targets using the same format of the 7 elements.

Key performance indicators are set annually in the SSHE plans and performance on the most significant KPIs is monitored monthly and documented in the SSHE monthly report and also reported to the Myanmar Asset SSHE Department and Corporate SSHE Department.

See PDT SSHE web site for up to date KPI's and Performances.

6.6.2.2 TASK AND TARGETS

As stated above, SSHE targets for each KPI are defined annually and are specified in the Corporate SSHE plan. Corporate SSHE targets are cascaded down into specific departmental plans.

Achieving the Myanmar Asset performance objectives and targets depends on:

- Maintaining a high level of SSHE awareness in the Myanmar Asset staff and contractors
- Effective Contractor Management
- Performing strategic reviews following changes to the scope of operations & revising plans accordingly.

6.6.2.3 SSHE RECORDS

A record is defined as any type of form that is routinely used to summarize a distinct set or information. Records are established within controlled documents.

The Myanmar Asset maintains SSHE records in hard copy or electronic format in order to demonstrate conformance to SSHE requirements, to meet regulatory requirements and ISO14001 requirements.

No.	Record	Responsible Party	Type
1	Training and Competence	HR Department & Asset SSHE Department	Web Database
2	Control Document	Asset Document Controller & Asset SSHE Department	Web Database
3	Performance Measurement and Monitoring	Asset SSHE Department	Web Database (PDT SSHE Page)
4	Calibration and Maintenance activities and results	Asset Maintenance Department & Asset SSHE Department	Web Database (SAP) SSHE Department Filing
5	Applicable legal and Other requirements compliance evaluations results	Asset SSHE Department	Web Database (PDT SSHE Legislation) (Myanmar Asset SSHE Legislation)
6	Incident Investigation	Asset SSHE Department	Web Database (IMS)
7	Corrective/Preventive Actions	Asset SSHE Department	Web Database (ATS)
8	Internal Audit	Asset SSHE Department	SSHE Department Filing
9	Management Review	Asset SSHE Department	SSHE Department Filing

6.6.2.4 DATA COLLECTION

The data related to the KPIs is provided by the line and collected and reviewed by the SSHE department. The SSHE department is responsible for collating all SSHE data and compiling performance statistics, including monthly summaries. Environmental data is collected and performance calculated as stated in Environmental Performance Reporting procedure, 12002-PDR-SSHE-612-003. Performance statistics are used to identify current trends and take corrective actions as required.

6.6.3 BEHAVIOURAL BASED SAFETY (BBS)

The SSHE policy sets out the Company's goals and to achieve the goals one will need a good Safety Culture. Behaviour Based Safety tools and questionnaires are used to improve and monitor the development of the companies Safety Culture. The Behaviour Based Safety is mentioned in Corporate SSHE Culture Management Standard, 11003-STD-SSHE-620-006. It is the task of all leaders within the Myanmar Asset to promote improvements to the Safety Culture by implementing the BBS process.

BBS guidelines under PDT SSHE are:

- Stop Work Authority, 10012-GDL-SSHE-620-001
- SSHE Award and Recognition,SSHE-300-GDL-311

6.6.4 NON COMPLIANCE AND CORRECTIVE AND PREVENTIVE ACTION

Typically non compliances are identified via incidents reporting and investigation, managerial SSHE inspections, ad hoc SSHE audits and reviews, SSHE MS self-assessment and internal and external SSHE MS audits and reviews. Identified non compliances or observations that could arise in non-compliance are included in the review/audit/inspection reports, corrective/preventive actions are identified and prioritised, an action plan is defined including assigned action parties and completion dates. Actions

are agreed with the activity/process responsible and are included in the Action Tracking System (ATS) tool for follow up and tracking to final closeout.

Management regularly review the status of corrective actions and ensures they are implemented.

6.7 AUDIT AND REVIEW

The Myanmar Asset follows and requirements as stipulated in the Audit and Review Standard, SSHE-106-STD-700 supplemented with local audit and review requirements documented in Audit and Review Procedure, 10012-PDR-SSHE-700-004.

6.7.1 AUDIT PLANNING

The annual SSHE audits and reviews and inspection plan is scheduled in the annual Audit Plan which is aligned with PTTEP Corporate Audit Plan to plan for the independent audits and reviews lead by Myanmar Asset SSHE staff.

The plan usually includes:

- ISO 14001 internal/external audit
- SSHE Compliance Audit
- Occupational Health and Hygiene internal Audit
- EIA Compliance Audit
- Security internal Audit
- Operational Technical Review (Once every 3 years, led by CSH staff)
- Managerial SSHE inspections to facilities and main contractors
- Legal Compliance Audit

The audit plan is a rolling five year plan that is updated on a yearly basis based on risk assessment results. The assurance plan defines the relative criticality, exposure and ranking of audits and reviews. Internal and external resource requirements in terms of man-days are planned over the entire five-year period, together with the timing of audits / reviews.

The Myanmar Asset SSHE Committee is responsible for establishing, reviewing and updating the Audit Plan and for monitoring follow-up against recommendations by means of the follow up action system database.

Each audit is conducted according to specific schedule that is included in the audit terms of reference. Audit schedules are jointly prepared by the lead Auditor and the Auditee.

Contractors are audited by the relevant Contract Holder with the support with of the SSHE Department if required.

Initial entry and continued eligibility of a contractor to work for the Myanmar Asset is dependent upon demonstration of sound SSHE management. The frequency of contractor audits depends on contract duration and scope and is captured in the Contract Monitoring Plan.

6.7.2 MANAGEMENT REVIEW PLANNING AND PROCEDURES

6.7.2.1 SSHE MS MANAGEMENT REVIEW

Results from the SSHE MS and legal compliance self-assessment exercise, incident investigation, audits, inspections, reviews participation and consultation, external interest and complaint, the annual SSHE performance and legal update are used by the management SSHE Committee to conduct a review of the

SSHE MS to address the need for changes to policy, objectives and targets, SSHE management programmes and other elements of the SSHE MS as appropriate.

The annual SSHE MS review is documented as part of the SSHE Committee Meeting minutes.

Review findings and recommendations are incorporated into updated versions of the Myanmar Asset SSHE MS and are cascaded down into the Safety Cases as appropriate.

6.7.2.2 MANAGEMENT SSHE INSPECTIONS

A schedule of cross-functional site SSHE inspections is established and carried out by members of the Myanmar Asset management team. This schedule is established in the annual Myanmar Asset SSHE Plan.

Each Manager assigned to a site inspection is responsible for assembling his own team and for producing a report on the site visit for presentation to the SSHE Committee at the following meeting.

Managers are expected to make use of relevant checklists during site visits to ensure that hazard controls specified are in place and functional.

6.7.2.3 SSHE MS SELF-ASSESSMENT

As stated above an annual SSHE MS Self-Assessment process is conducted to verify the health of the SSHE MS and identify any weakness or concern area. Results from this assessment are used as an input both to the Management review and to the next year SSHE Plan definition.

ANNEX B

Agreement on Financial Support for TNRP

GOVERNMENT OF THE REPUBLIC OF THE UNION OF MYANMAR
MINISTRY OF ENVIRONMENTAL CONSERVATION AND FORESTRY
FOREST DEPARTMENT
TANINTHAYI NATURE RESERVE PROJECT

MGTC

Dispatch No. TNRP/Finance/141-45/2014
Date. 8th April 2014

To

Finance Manager
Andaman Transportation Limited

Subject: **Cash call for 1st year (2013-2014) of 3rd phase of Taninthayi Nature Reserve Project**

Ref : TNRP/ Letter-TNRP/L/300-306/2013 dated 12/3/2013

Dear Sir,

I would like to inform you that in accordance with the decisions of 16th Project Coordinating Committee meeting, the remaining financial contribution of management of TNRP will be under the responsibility of Zawtika Project from 1st April 2013 to 31st March 2014. May I request you to kindly transfer the fund for the Taninthayi Nature Reserve Project to the following bank account.

Name	:	**Taninthayi Nature Reserve Project**
Account No.	:	**FDD-18-0005**
Bank	:	**Myanmar Investment and Commercial Bank**

Please find herewith attached the third cash calls.

With best regards,

8.4.14

(San Aung)
Project Director
Taninthayi Nature Reserve Project
Forest Department

Cc.

1. Director General, Forest Department
2. Director, Andaman Transportation Limited
3. SSHE Manager, Andaman Transportation Limited
4. Director, Budget Division, Forest Department
5. Office copy

Taninthayi Nature Reserve Project
Cash Call for 1st year (2013-2014) of 3rd Phase of TNR project

No.	Particulars	Total Cash Call	Remark
1	**PERSONNEL**		
1.1	External consultancy - project evaluation		
1.2	External consultancy - technical advisor	-	
1.3	National consultancies	4700.00	
	Subtotal - Personnel	**4700.00**	
2	**INVESTMENTS**		
2.1	Office equipment	-	
2.2	Field equipment	3000.00	
2.3	Vehicles	-	
2.4	Facilities construction	18000.00	
2.5	Infrastructure maintenance	19000.00	
	Subtotal - Investments	**33200.00**	
3	**OPERATION COSTS**		
3.1	Nursery practice	1500.00	
3.2	Boundary demarcation	2050.00	
3.3	Patrolling	14600.00	
3.4	Communication	3400.00	
3.5	Vehicle fuel and maintenance	4000.00	
3.6	Training	13000.00	
3.7	logistic support	2500.00	
3.8	Staff allowances	46760.00	
3.9	Field survey/mapping/research	1500.00	
3.10	Public education and awareness program	3000.00	
3.11	Workshops and meetings	4150.00	
3.12	Outreach/ buffer zone development Program	6200.00	
	subtotal - Operating costs	**102660.00**	
4	**CONTINGENCIES**		
4.1	Contingencies, others	2640.00	
	subtotal - Contingencies	**2640.00**	
	Total	**150000**	

Taninthayi Nature Reserved Project

Cash Call for 1st Year of 3rd Phase

		USD
1	Estimated payments	
	Personal	4700.00
	Investment	40000.00
	Operational Costs	102660.00
	Others	2640.00
	Total estimated payment	150000.00
2	**Estimated amount of cash call**	**150000.00**

Please pay **USD 150000** to our bank account as follow;

Beneficiary name:	-	Taninthayi Nature Reserve Project
Bank Account No.	-	FDD-18-0005
Bank address	-	Myanmar Investment and Commercial Bank Yangon, Myanmar
For Value Date	-	8.4.2014

8.4.14

(San Aung)

Project Director

Taninthayi Nature Reserved Project

Forest Department

PTTEP International Limited (Yangon Branch)

PTTEPI.L.GM (IMA/S) 065/11-02/13

Myanmar Assets
Tel. (951) 661814

February 11, 2013

U TINT SWE

Project Director
Tanintharyi Nature Reserve Project
The Republic of the Union of Myanmar
Ministry of Environmental Conservation and Forestry
Forest Department

Subject: **Annually USD 150,000 Financial Support to TNRP projects**

Attachment: MOGE letter No: D(O/S) 3/4/2 (3018) 2012, 26th December 2012.

Dear U Tint Swe,

Regarding to above subject, this is an official confirmation that PTTEPI will make annually USD 150,000 financial support to TNRP project.

In this connection, PTTEPI would like to request TNRP and Forest Department to add PTTEPI as the member of TNRP according to the Forest Department Regulation.

Your kind support and confirmation on this matter is highly appreciated.

Sincerely Yours,

Kanok Intharawijitr
General Manager
PTTEP International Limited (Yangon Branch)

Cc:	Director General	Forest Department
	Director (Offshore)	MOGE
	Managing Director	MOGE
	Director (Engineering)	MOGE

Attachment -1

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မြန်မာရေနံနှင့်သဘာဝဓါတ်ငွေ့လုပ်ငန်း
MYANMA OIL AND GAS ENTERPRISE

FAX : 067-411125
TEL : 411053,411056

PO BOX 1049
BUILDING No.44
NAY PYI TAW, THE REPUBLIC OF THE UNION OF MYANMAR

M.O.G.E.

Letter No: D(O/S) 3/4/2 (3018) 2012
Date: 25. December, 2012

Mr. Kanok Intharawijitr
General Manager
PTTEP International Limited (Yangon Branch)

dock ID 13629
Business Unit: IMA
Date: 27/12/12 Time:
SCANNED

Subject: Approval of Contribution for TNRP
Reference: MOE Letter No - Nyama/Myanmayenan/Sa (284) dated on 20th December, 2012

Dear Mr. Kanok,

Regarding the above subject, MOE has already approved on this issue as per above reference letter.

Therefore, MOGE give an approval to provide contribution USD 150,000 per year for TNRP project. PTTEPI need to negotiate with TNRP and Forest Department to participate as the member of TNRP according to the Forest Department Regulation.

Your understanding and cooperation on this matter will be highly appreciated.

Yours Sincerely,

To - IMA/R
- Kutchava
- IMA/S
For your info and action.
27/12/12

For Managing Director,
(Myo Myint Oo, Director-Offshore)
Myanma Oil & Gas Enterprise

Cc : Director General - Forest Department
Managing Director - MOGE
Director (Engineering) - MOGE
Director (TNRP) - Forest Department

PTTEP International Limited (Yangon Branch)

PTTEPI.L.GM (IMD) 132/27-11/12

Myanmar Assets
Tel. (951) 661814

November 27, 2012

U AUNG HTOO
Managing Director
Myanma Oil and Gas Enterprise
Complex - 44,
Nay Pyi Taw

Subject: **Payment for Environmental Services to TNRP**

Attachment: 1) Minutes of Payments for Environmental Services to TNRP Meeting on 5th November 2012.

Dear U Aung Htoo,

In response to your letter no. D (OS) 3/4/1 (2511) 2012, PTTEPI had arranged a meeting on 5th November 2012 with TNRP, TEPM (MGTC) and PCML (TPC) to discuss the contribution of Payment for Environmental Services (referred to PTTEPI letter no. PTTEPI.L.GM (IMD) 235/31-10/12).

In the meeting, PTTEPI informed their intention to support TNRP Project. The contribution from PTTEPI was agreed to be 150,000 USD per year, commencing in the coming cycle which will begin in April 2013. Attached herewith this letter please find minutes of the meeting for your reference.

We are at your disposal for any inquiry you may have. Again, we are very thankful for your strong and continued support to PTTEPI.

Sincerely yours,

Kanok Intharawijitr
General Manager
PTTEP International Limited (Yangon Branch)

cc: Director (Planning), Myanma Oil and Gas Enterprise
Director (Engineering), Myanma Oil and Gas Enterprise
IMD, IMA/S, IMA/R, EMP, EMP/N, PTTEPI

PTTEP International (Yangon Branch)

MINUTES OF MEETING

Zawtika Project
Payment for Environmental Services to TNRP

The Meeting of Zawtika Project's Payment for Environmental Services to TNRP was held at 14:00 hrs on 5th November 2012 at PTTEPI Office in Yangon. The following personnel attended this meeting.

TNRP

1. U Tint Swe	Project Director
2. U Sein Moe	Project Staff Officer

PTTEPI

1. Mr. Siriphong Fuenglikhit	External Relations Manager
2. Mr. Peter John Brown	SSHE Manager
3. Ms. Kanita Sartwattayu	Development and Production Planning Manager
4. Mr. Pongkit Luksamepicheat	Development Planning Manager
5. Khun Naw Kham	Project Engineer, Onshore Pipeline Construction

TEPM

1. U Saw Hudson	Environmental and Industrial Hygiene Engineer
2. U Myint Oo	Head of Construction

PCML

1. U Yee Mon	Executive, Environment

Discussions took place in the meeting are recorded as follows.

PTTEPI explained objective of the meeting that PTTEPI was instructed by MOGE to discuss with TEPM, PCML and Forest Department regarding the contribution of Payment for Environmental Services for TNRP and report back to MOGE the results of discussion.

PTTEPI informed their intention to enter into the TNRP Project as well and proposed to commence the contribution in the coming cycle which will begin in April 2013.

TNRP explained that it needs to maintain contribution amount from each party at $150,000 annually after the participation of PTTEPI, resulting in the increase of total contributions to TNRP from $300,000 to $450,000 per year. This is because currently TNRP is suffering the loss from exchange rate due to depreciation of US Dollar against Myanmar Kyat ($150,000 per year was determined based on the assumption of 1,000 Kyats per 1 US Dollar.

In addition, TNRP proposed to maintain 4-year term in the next cycle.

PTTEPI, TEPM and PCML accepted that each company will contribute $150,000 annually in the next cycle. All companies also accept the term of 4 years.

TNRP will inform and seek approval about the contribution amount and term duration of the new cycle from Forest Department and will confirm back to PTTEPI, TEPM and PCML.

TEPM explained the current practice that in an alternate year one company will be responsible for project administration and financial management who will make contributions for all and back charge the other company. All companies expect to maintain this practice after participation of PTTEPI. PCML will confirm with their own finance department.

TEPM refered to monthly meeting amoung socio-economic teams of 3 companies to share information and avoid duplicated program. This information will be shared to TNRP in order to avoid duplication with the program of TNRP as well.

TNRP informed that it will arrange a model conceptual workshop on 17th-18th December 2012. Outcome of the workshop will be used to prepare Management Plan and Project Documents for the new program cycle. PTTEPI will participate the workshop.

TNRP informed that, starting from November 2012, it will hire additional staff from Forest Department to monitor Zawtika Construction Project. TNRP requested financial support from PTTEPI for this matter which costs $500 per month from November 2012 to March 2013 (before PTTEPI entering the TNRP contribution). PTTEPI has no objection but will need to confirm with management and revert to TNRP.

The meeting was adjourned at 16:00 hrs.

End of Minutes

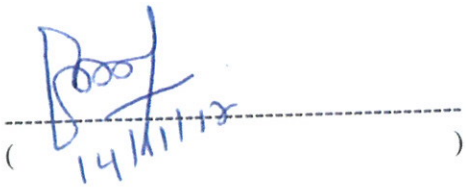
Acknowledged by

(Tint Swe)

Project Director, TNRP

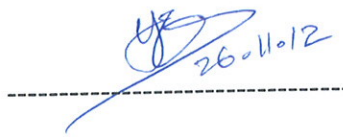
(Siriphong Fuenglikhit)

External Relations Manager, PTTEPI



(Saw Hudson)

Environmental and Industrial Hygiene Engineer



(Yee Mon)

Executive, Environment, PCML

ANNEX C

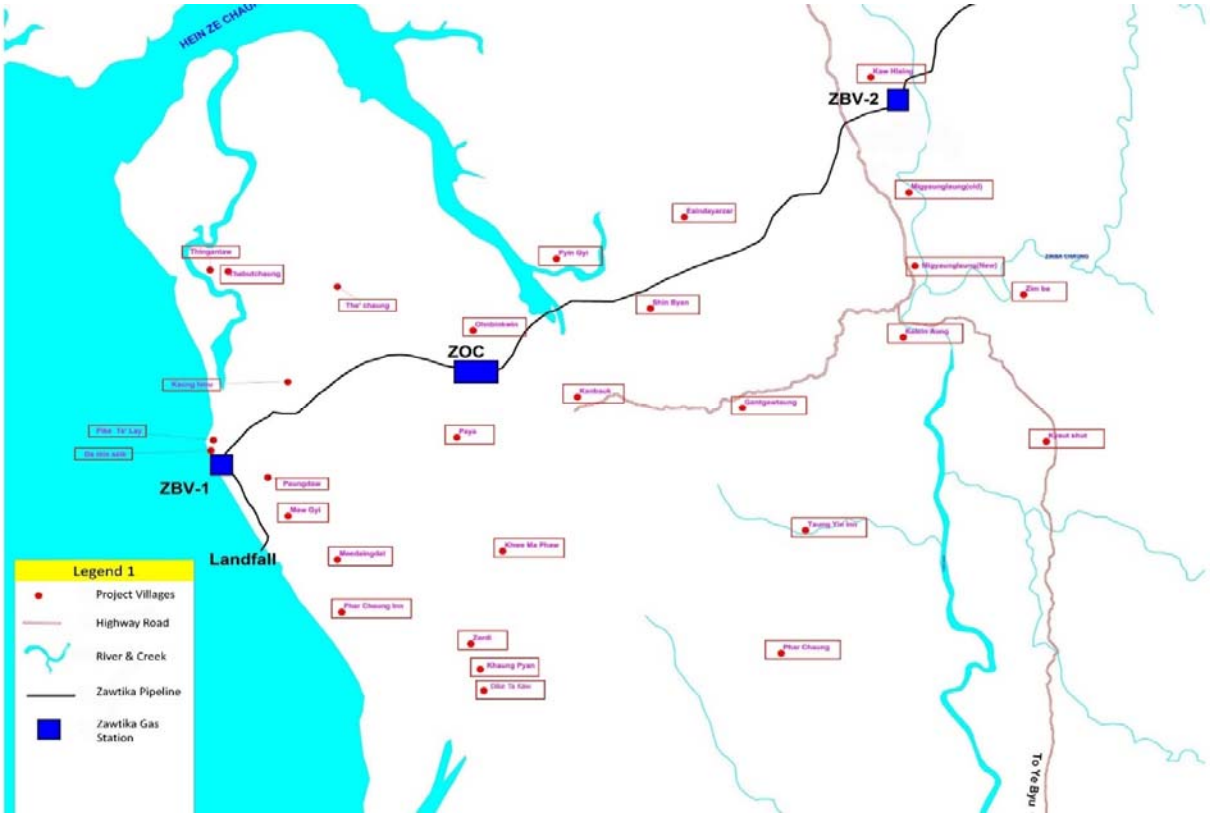
CSR Program for the Zawtika Project

Corporate Social Responsibility – Zawtika (M9)

- **Objective**
  To uplift quality of life and gain favorable relation from all stakeholders in operating area. It consists of 4 mainly Themes in CSR program: **"Basic Needs, Education, Culture and Environment"**

Basic Needs	Education	Culture	Environment
Support Programs: • Parasite Free School • Public Infrastructure Improvement • Waste to Energy (Biogas Support) • Community Support and Emergency Relief	**Support Programs**: • Scholarship (Higher Education Assistance for Development - HEAD) • High Vocational Diploma Scholarship (HVD) • Technical Capability Building and Development	**Support Programs:** • Annual Kathina and Monastery Support	**Support Program:** • Natural Resources Preservation

CSR Project Villages in Operating Area (Total – 29 Villages)



Zawtika CSR Achievements (2009 – 2018)	
Theme	**Support Activities**
Basic Needs	**<u>Parasite Free School Program:</u>** The objective is to reduce parasite infection rate of the schoolchildren in project areas. o Since the beginning of the parasite free school program in 2010, the number of schools covered by the program was gradually increased from 4 to 15, 29 and 35 respectively. The project covered 35 school in all project villages in 2013 and continued to 2014. o 2015 – 2017: Parasite Free Follow up program in 10 schools out of 35 schools. o 2016: Won Stevie Award o 2018 – 2020: Continue the program covering 35 schools along Zawtika pipeline corridor. o Over 5,000 students beneficial from the program. Parasite Free School Activity

<u>Public Infrastructure Improvement Program</u>: The objective is to develop and uplift quality of life of local community by relief of existing problem in the villages.

Public Infrastructure Improvement	Total Supports (2009 – 2018)
School Building	13
Hygienic School Toilet	9
School Clean Drinking Water	20
School Teacher Staff House/ Hospital Staff House	7
Hospital Renovation/ Community Health Center	3
Village Electricity Supply	15
Village Water Supply	3
Road Improvement	6
Bridge	4
Village Crematory Building	1

Infrastructure Improvement Activity

Waste to Energy Program (Biogas Unit Support): The Objective is to minimize the waste problem in the operating area as well as to reduce household expenditure, for example LPG or charcoal for home cooking.

- The first biogas unit as pilot project was installed in 2018.

Biogas Unit Installation Activity

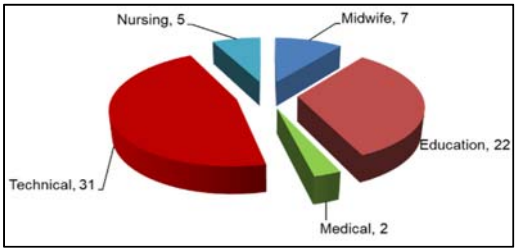
Community Support and Emergency Relief Program: The Objective is to support CSR activities or events initiated by villagers, public organization, and government as well as to release any difficulty in the community caused by natural disaster.

- 2009 – 2018: Total 45 supports were provided.

Community Support and Emergency Relief Activity

Education

<u>Scholarship Program (Higher Education Assistance for Development - HEAD)</u>: The objective is to provide higher education opportunity for students in operating area. The scholarship subject covers; 1) Medication, 2) Nursing, 3) Midwife, 4) Education and 5) Engineering. These 5 subjects are at need for the community and for Myanmar country as a whole.



- 2009 – 2018: Total 67 students were awarded for the scholarship. Among them, over 25 scholars are working with government agency to help support their community and remaining students are continuing the existing scholarship program

HEAD Scholarship Activity

<u>High Vocational Diploma Scholarship (HVD):</u> The objective is to provide full scholarship to students in AEC countries especially in Myanmar and Cambodia to study in Mechanical subject at IRPCT College (IRPCT), Rayong Province, Thailand, to increase skilled manpower to support economic growth of the country, led by PTT Group with co-contributed PTT, PTTEP, PTTGC, TOP and GPSC.

- 2013 – 2018: Total 154 students were supported by this programme and granted 93 students

HVD Scholarship Activity

<u>Technical Capability Building and Development:</u> The objective is to increase the supply of skilled local manpower to support Myanmar's development.

- 2015: Initiated the program incorporate with Skill Training Center (Yankin) started with renovation of training center and continue with training support and NSSA (National Skill Standard Authority) assessment respectively.

- 2015 – 2018: Supported 3 type training courses: Welding, Electrical and Air con installation and NSSA Level (2) assessment occupation: welder, electrician and air-con installer. Over 900 skilled labors had been trained and 300 labors benefitted from the NSSA assessment, with 140,000 hours trained.

Technical Capability Building and Development Activity

Culture	**<u>Annual Kathina and Monastery Support:</u>** The objective is to prolong good culture and preserve valuable tradition across our operational areas via Merit Making and Fund Raising Activities. • 2009 – 2018: Annual Kathina and monastery supports. Monastery Support Activity
Environment	**<u>Natural Resources Preservation Support Program:</u>** The objective is to be part of Natural Resources Preservation via supporting TNRP (Tanintharyi Natural Resource Project), Tree Plantation in operating area. • Supported the TNRP Program 150,000 USD/ Year (under PMM/S budget) Natural Resource Preservation Support Activity

Summary of CSR Expenditures from 2009 - 2018	
Total Expenditures (USD)	**4,591,729**

2019 Approved CSR Programs & Budget			
Block	**Area**	**Work Program**	**Budget (USD)**
Zawtika Project (M9)	Operating Area & Vicinity	• Higher Education Assistance for Development Scholarship • Educational Program • Parasite Free School Program • Construction of Public Infrastructure or Utility • Waste to Energy Program • Monastery support • Community support and Emergency relief • TBC: Street Lighting support (initiated by MOGE)	**588,500**
	Yangon Area	• High Vocational Diploma Scholarship • Monastery / Cultural Support Charitable CSR Activities among Staff & Family, Government, Contractors	
	Other Area in the Republic of the Union of Myanmar	• Technical Capability Building and Development Program incorporative with Ministry of Energy and Ministry of Labor	

ANNEX D

MOGE's Guidelines for Implementation of CSR Programmes

11

No 0107771

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စွမ်းအင်ဝန်ကြီးဌာန

မြန်မာ့ရေနံနှင့်သဘာဝဓာတ်ငွေ့လုပ်ငန်း

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Letter No. MD.3/6(0685) 2014
Dated: 20th February 2014

All Companies

Subject; **Guidelines of implementation of CSR programmes**

Regarding the above mentioned subject, MOGE would like to inform that; all Production Sharing Contract Companies must be implemented CSR programmes base on the guidelines as follows,

(a) Firstly, meet with Village Tract Development Committee and discuss CSR programmes to meet and fulfill the needs of respective region of Project Area.

(b) Then, inform the results of the discussion to local authorities and Regional Governments for their comments and suggestion on the results.

(c) All CSR programmes need to get agreement from relevant ministries.

(d) MOGE have to monitor all the CSR programmes and budgets of each operator in timely manner.

Your understanding and cooperation in this matter is highly appreciated.

Yours Sincerely,

For Managing Director
(Wai Oo, Director- Admin)
Myanma Oil and Gas Enterprise

19/2

CC: Dir (Planning)/(O/S)/All GM