PTTEP

Monitoring Report of M9 West Appraisal and Exploration Drilling in Offshore Block M9

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

SUBMISSION FORM OF MONITORING REPORT

This is the official submission form of Monitoring Report 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 Monitoring Report according to the issued Environmental Compliance Certificate (ECC).

Project Proponent Information

Proponent Name:	**PTTEP International Limited**	Company Registration Number by DICA (if any):	**84 FC**
Contact name of Proponent:	**Hsu Myat Maw**		
Proponent's address for correspondence:	**Vantage Tower, 623 Pyay Road, Kamayut Township, Yangon, Republic of the Union of Myanmar**		
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Project Information

Project Title	**Offshore Block M9 Exploration Drilling**
Project Location (Address)	**Offshore Block M9, Gulf of Martaban, Andaman Sea**
ECC number	

Status of Compliance to ECC conditions

This provides an overview of the project's compliance with the conditions set in the ECC. It shall be summarized in the following table;

No. of ECC conditions	Status of compliance	Remarks

Compliance to the Environmental Management Plan (EMP)

This provides an overview of the compliance to the EMP committed by the proponent during the review of the ECC application. It shall be summarized as in the following Table;

Proposed mitigation measures	Cost	Institutional Plan	Schedule	Guarantees	Remarks

Validation of Project scale and predicted impact

In case of any change of the project scale or parameters of the predicted impacts, the proponent shall provide the status of the changes as in the following table. If the changes are significant, the Ministry may request additional survey to the proponent as to update the issued ECC.

Items (scale, predicted impact)	Scale / Parameters at the survey phase	Actual scale / parameters	Remark

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 that the Monitoring Report are undertaken in a professional manner and in accordance with EIA Procedure Notification No. 616/2015 and any applicable legislations issued or adopted by the Ministry.

Signature: 

Date of submission: (dd/mm/yyyy)

Print name: Hsu Myat Maw

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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):

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Executive Summary

အစီအရင်ခံစာအကျဉ်းချုပ်

REM-UAE ဓာတ်ခွဲခန်းနှင့် အကြံပေးကုမ္ပဏီလိမိတက်သည် ကမ်းလွန် လုပ်ကွက်အမှတ် M9 အနောက်ဘက်ပိုင်းတွင် အကဲဖြတ်ရှာဖွေတွင်းတူးဖော်ခြင်းစီမံကိန်းအတွက် ပတ်ဝန်းကျင်ဆိုင်ရာထိခိုက်မှု လျော့ပါးစေရေး နည်းလမ်းများနှင့် စောင့်ကြည့်စစ်ဆေးခြင်းအစီအစဉ်အား အကောင်အထည်ဖော်ဆောင်ရွက်ရာ၌ လိုက်နာ ဆောင်ရွက်မှုအခြေအနေကို စစ်ဆေးခြင်းပြုလုပ်ခဲ့ပါသည်။

အကဲဖြတ်ခြင်း၏ ရည်ရွယ်ချက်မှာ EIA အစီအရင်ခံစာတွင် ဖော်ပြထားသည့်အတိုင်း သဘာဝ ပတ်ဝန်းကျင်ဆိုင်ရာ ထိခိုက်မှုလျော့ပါးစေရေး နည်းလမ်းများနှင့် စောင့်ကြည့်စစ်ဆေးခြင်းအစီအစဉ်၏ အကျိုးထိရောက်မှုကို အကဲဖြတ်ဆန်းစစ်ရန် ဖြစ်ပါသည်။ အစီရင်ခံစာတွင် ဖြစ်ပေါ်နိုင်ခြေရှိသော ပြဿနာများ (သို့မဟုတ်) အခက်အခဲများ ပါရှိ၍ အစီရင်ခံစာမှနေ၍ ထိခိုက်မှုတားဆီးခြင်း နှင့် လျော့ပါးရေးအစီအမံများ ထိရောက်မှုရှိစေရန်အတွက် အကြံပြုချက်များ အဆိုပြုထားပါသည်။

အကဲဖြတ်ခြင်းဖြစ်စဉ်တွင် (၁) PTTEPI မှ အရာရှိများနှင့် တွေ့ဆုံခြင်း၊ (၂) လုပ်ငန်းနေရာသို့သွားရောက် လေ့လာခြင်းနှင့်PTTEPI၏ကိုယ်စားလှယ်များနှင့်တွေ့ဆုံမေးမြန်းခြင်း နှင့် (၃) စာရွက်စာတမ်းအကဲဖြတ်စစ်ဆေးခြင်း တို့ ပါဝင်ပါသည်။

၁။ စီမံကိန်းအကြောင်းအရာ

ကမ်းလွန်လုပ်ကွက် M9 အနောက်ဘက်ပိုင်းတွင် အကဲဖြတ်ရှာဖွေတွင်းတူးဖော်ခြင်းစီမံကိန်းသည် PTTEP ၏ လက်အောက်ခံလုပ်ငန်းဖြစ်သော PTTEP အပြည်ပြည်ဆိုင်ရာလီမိတက် (PTTEPI) မှနေ၍ လုပ်ကိုင်နေသော ဖွံ့ဖြိုးရေးလုပ်ငန်းတစ်ခုဖြစ်ပါသည်။ စီမံကိန်းသည် လုပ်ကွက်အမှတ် M9 တွင် တည်ရှိပါသည်။ အဆိုပြုစီမံကိန်းသည် လုပ်ကွက်အမှတ် M9 ၏ အနောက်ဘက်ပိုင်းတွင် ဟိုက်ဒရိကာဗွန်သိုလှောင်ကန် (hydrocarbon reservoirs) များလည်းပါရှိစေရန် ရည်ရွက်ချက်ဖြင့် အကဲဖြတ်ခြင်း / တူးဖော်ခြင်းတွင်း အများဆုံး ၁၀ တွင်း တူးဖော်ခြင်းနှင့် သက်ဆိုင်ပါသည်။ ၎င်းသည် လက်ရှိဇောတိကစီမံကိန်း ဖွံ့ဖြိုးတိုးတက်မှုကိုလည်း ထပ်မံ၍ အထောက်အပံ့ဖြစ်စေမည်။ အလားအလာရှိသောသိုက်များကို PTTEPI ၏ ယခင်ကမ်းလွန်ငလျင်အစီအစဉ်၏ ရလဒ်တစ်ခုအဖြစ်ဖော်ထုတ်နိုင်ခဲ့ပြီး ၎င်းသည် ဖော်ပြပါ တွင်း ၁၀တွင်း တူးဖော်ရေးအတွက် အခြေအနေ အလားအလာများကို ထောက်ပံ့ပေးခဲ့ပါသည်။ ထို့အပြင်စီမံကိန်းသည် ပန်ဒရိက (Pundarika) နှင့် အောင်ပြည်တန် (Aungpyitan) တွင်း ၂ တွင်း သာ တူးဖော်ရေးလုပ်ငန်းများ ဆောင်ရွက်လျက် ရှိပါသည်။

၂။ ဝန်ဆောင်မှုများနှင့်အသုံးအဆောင်ထောက်ပံ့မှုများ

၂.၁ ထောက်ပံ့ရေး ရေယာဉ်များ

PTTEPI တွင်အဓိက ထောက်ပံ့ရေးရေယာဉ် ၂ စီးရှိသည်။ ရေယာဉ်များသည် ဒီဇယ်အင်ဂျင်များဖြစ်ပြီး တစ်နေ့လျှင် လောင်စာဆီသုံးစွဲမှုနှုန်း ၂၀ mt နှုန်းရှိသည်။ ရေယာဉ်တစ်စင်းစီတွင် ခန့်မှန်းခြေအားဖြင့် အမှုထမ်း ၈ ယောက်မှ ၁၀ယောက်အတွင်း ရှိပါသည်။ ရေယာဉ်များသည် စီမံကိန်း ပြင်ဆင်ခြင်း၊ တူးဖော်ခြင်းနှင့် စွန့်ပစ်ခြင်းအဆင့်များ တစ်လျှောက်တွင် အထောက်အကူပြုသွားမည်ဖြစ်ပါသည်။ ထောက်ပို့လုပ်ငန်းများအတွက် M9 အနောက်ဘက်စီမံကိန်းဧရိယာ နှင့် ရနောင်းကမ်းခြေအခြေစိုက်စခန်းအကြားတွင် တစ်လလျှင် အကြိမ်ရေ ၆ကြိမ်မှ ၁၀ ကြိမ်အတွင်း ပြေးဆွဲမှုများပြုလုပ်သွားပါမည်။ ထောက်ပံ့ရေးရေယာဉ်ပေါ် ရှိ စွန့်ပစ်ဆီပမာဏသည် ၀.၂ မှ ၀.၄ ကုဗမီတာအကြားခန့် ထွက်ရှိနိုင်မည်ဖြစ်ပြီး ၎င်းတို့ကို ကမ်းခြေပေါ်သို့ပို့၍ စွန့်ပစ်စေပါမည်။

၂.၂ ကမ်းခြေအခြေစိုက်စခန်း

စီမံကိန်းတွင် ကမ်းခြေအခြေစိုက်စခန်း ၂ ခုရှိပါမည်။ မြန်မာနိုင်ငံရှိ သာကေတကမ်းခြေအခြေစိုက်စခန်းနှင့် ထိုင်းနိုင်ငံ၊ ရနောင်းတွင်တည်ရှိသော ရနောင်းကမ်းခြေအခြေစိုက်စခန်းတို့ဖြစ်သည်။ တွင်းတူးစင်ကိုစင်ကာပူနိုင်ငံမှ ပို့ဆောင်မည် ဖြစ်သည်။ ကမ်းခြေအခြေစိုက်စခန်းများတွင် ခန့်မှန်းခြေအားဖြင့် ၈ - ၁၀ ယောက်ခန့် တာဝန်ထမ်းဆောင်ပါမည်။ ကမ်းခြေအခြေစိုက်စခန်းတွင် ရုံးအဆောက်အအုံ၊ ဂိုဒေါင်၊ ပစ္စည်းသိုလှောင်ရာခြံ၊ ယာယီစွန့်ပစ်ပစ္စည်းနှင့် ဓာတုပစ္စည်းသိုလှောင်ရာနေရာ စသည်တို့ရှိပါသည်။

PTTEPI ၏ကမ်းခြေအခြေစိုက်စခန်းတွင် -

၂.၂.၁ ကုန်လှောင်ရုံ

၂.၂.၂ ပစ္စည်းများထားရှိရာခြံနေရာ

ဤနေရာများကို ထုထည်ကြီးသောပစ္စည်းကြီးများ၊ ပိုက်များနှင့် ရောင်းချသူ (vendor)များက ပို့ဆောင်ထားသော အခြားပစ္စည်းကိရိယာများကို ယာယီသိုလှောင်ရာနေရာအဖြစ် အသုံးပြုပါမည်။ ဤနေရာတွင်သိမ်းဆည်းထားသော ပစ္စည်းများနှင့်ကိရိယာများကို စီမံကိန်းဧရိယာ (သို့မဟုတ်) PTTEPI ၏အခြားလုပ်ငန်းနေရာများသို့ ထောက်ပံ့ရေး ရေယာဉ်များမှတစ်ဆင့် ပို့ဆောင်ပါမည်။

၂.၂.၃ ဓာတုပစ္စည်းများနှင့်စွန့်ပစ်ပစ္စည်းသိုလှောင်သည့်နေရာ

ဤနေရာကို ယာယီစွန့်ပစ်ပစ္စည်းများနှင့်ဓာတုပစ္စည်းသိုလှောင်ရန် အသုံးပြုပါမည်။ တူးဖော်ရေးဆိုင်ရာ ဓာတုပစ္စည်းများကို ညအိပ်သိမ်းဆည်းထားမည်မဟုတ်ဘဲ ၎င်းဓာတုပစ္စည်းများ ကမ်းခြေအခြေစိုက်စခန်းသို့

ရောက်ရှိသည့်နေ့တွင်ပင် ကမ်းလွန်လုပ်ငန်းနေရာများသို့ ပို့ဆောင်သွားပါမည်။ ဤနေရာကို ကမ်းလွန်လုပ်ငန်းများမှ အထွေထွေစွန့်ပစ်ပစ္စည်းများကို ၎င်းတို့ကမ်းခြေအခြေစိုက်စခန်းသို့ ရောက်ရှိသည့်နေ့တွင် ကန်ထရိုက်တာများက စွန့်ပစ်ခြင်းမပြုမီ ယာယီသိုလှောင်ရန်အသုံးပြုပါမည်။

၂.၃ နေရာထိုင်ခင်း

တွင်းတူးဖော်ရေးလုပ်ငန်းစဉ်များ ဆောင်ရွက်နေစဉ်ကာလအတွင်း တွင်းတူးလုပ်သားများအတွက် နေရာထိုင်ခင်းကို တွင်းတူးစင်ပေါ်တွင် ထားရှိပေးသွားမည်ဖြစ်ပါသည်။ ထောက်ပံ့ပစ္စည်းသယ်ဆောင်သည့် ရေယာဉ်များပေါ်၌ လုပ်ကိုင်ရသူများအတွက် အဆိုပါ ရေယာဉ်များပေါ်တွင် နေရာချထားပေးသွားမည် ဖြစ်ပါသည်။

၂.၄ ရေထောက်ပံ့မှုနှင့် သုံးစွဲမှု

စီမံကိန်းအဆင့်တိုင်း၏ စီမံကိန်းလုပ်ဆောင်ချက်များသည် ရေကိုရည်ရွယ်ချက်အမျိုးမျိုးအတွက်အသုံးပြုသည်။ ၎င်းတို့ကို အောက်ပါဇယားတွင် အကျဉ်းချုပ်ဖော်ပြထားပါသည်။

ဇယား (၁) စီမံကိန်းလုပ်ဆောင်မှုများတွင်အသုံးပြုသောရေအမျိုးအစားနှင့် ရေအသုံးပြုမှုပမာဏ

စီမံကိန်းလှုပ်ရှားမှုများ	သောက်သုံးရေအမျိုးအစား	ရေအရင်းအမြစ်	သောက်သုံးရေပမာဏ/တစ်နေ့ (m^3)
ထုတ်လုပ်ရေးတွင်းတူးခြင်း၊ တွင်းတူးခြင်းဆိုင်ရာ မှတ်တမ်းများပြုလုပ်ခြင်းနှင့်ထုတ်လုပ်ရေးတွင်း အတွက်ပြင်ဆင်မှုများပြုလုပ်ခြင်း	တွင်းတူးစင်ပေါ် ရှိ ဝန်ထမ်းများအတွက် သောက်သုံးရေ	ရေဘူး/တွင်းတူးစင်ပေါ် ရှိ ရေထုတ်လုပ်ရေးယူနစ်	၃၁.၂
	ရေယာဉ်များပေါ် ရှိ ဝန်ထမ်းများအတွက် နေ့စဉ်ရေအသုံးပြုမှု	လုပ်ငန်းလည်ပတ်ရေးရေယာဉ်များအတွက် ရေသိုလှောင်ကန်	၁၂.၄

တွင်းတူးဖော်ရေးယူနစ်ရှိရေထောက်ပံ့ရေးစနစ်တွင် နေ့စဉ်သုံးစွဲမှု၏ ၂၀၀% သောပမာဏရှိသည့် ယာဉ်ပေါ်ရေထုတ်လုပ်ရေးယူနစ်များပါဝင်ပါသည်။ တစ်နေ့တာလျှင် ရေထုထည်၄၃.၆ ကုဗမီတာ ထုတ်လုပ်ရပါသည်။ ပင်လယ်တွင်းမှရေကိုစုပ်ယူပြီး သန့်စင်ခြင်း၊ ဆားငန်ရေဖယ်ရှားခြင်း၊ ပိုးသတ်ခြင်းတို့ ပြုလုပ်ပါသည်။ ရေအခြေပြု တွင်းတူးရည်များကို ပင်လယ်ရေကို အသုံးပြုကာ ပြင်ဆင်ပြုလုပ်သွားပါမည်။

၂.၅ စွမ်းအင်ထောက်ပံ့မှု

တွင်းတူးဖော်ရေးလုပ်ငန်းစဉ်များအတွက် တွင်းတူးစက်ထံသို့ လျှပ်စစ်ဓာတ်အားကို ဒီဇယ်အင်ဂျင်ဖြင့် မောင်းနှင်သော လျှပ်စစ်ဓာတ်အားပေးစက် ၆လုံးဖြင့် ထောက်ပံ့ပေးသွားမည် ဖြစ်ပါသည်။ လျှပ်စစ်ဓာတ်အားပေးစက် အပိုတစ်လုံးကို အရေးပေါ်အခြေအနေအတွက်သော်လည်းကောင်း၊ မိန်းဂျင်နရေတာများထဲမှတစ်လုံးအားပြုပြင်မွမ်းမံနေလျှင် သော်လည်းကောင်း အသုံးပြုသွားပါမည်။ လျှပ်စစ်ဓာတ်အားလိုအပ်မှု ပမာဏတူညီသည့် တွင်းတူးစက်များ အသုံးပြုခဲ့သော ယခင်စီမံကိန်းများအရ လောင်စာဆီသုံးစွဲမှုခန့်မှန်းပမာဏမှာ တစ်နေ့လျှင် ၃၅ကုဗမီတာ ဖြစ်ပါသည်။

၂.၆ သယ်ယူပို့ဆောင်ရေး

တွင်းတူးစက်များမှ စက်ကိရိယာများနှင့် ပစ္စည်းများ၊ ဓာတုပစ္စည်းများနှင့် စွန့်ပစ်ပစ္စည်းများကို ကုန်းတွင်းထောက်ပံ့မှုအခြေစခန်းသို့ ထောက်ပံ့ပစ္စည်း သယ်ယူပို့ဆောင်ရေးရေယာဉ်များဖြင့် ပို့ဆောင်ပေးသွားပါမည်။ ခရီးတစ်ကြောင်းလျှင် လူ ၁၂ယောက် တင်ဆောင်နိုင်သော ရဟတ်ယာဉ်များကို အသုံးပြုကာ ဝန်ထမ်းများအား ပို့ဆောင်သွားပါမည်။ စီမံကိန်းဧရိယာသို့ ရဟတ်ယာဉ်ဖြင့် ဝန်ထမ်းများ ပို့ဆောင်ချေပြောင်းရေးမှာ ၁နာရီနှင့် ၁၀မိနစ်ခန့် ကြာမြင့်ပါသည်။

၂.၇ အစိုင်အခဲစွန့်ပစ်ပစ္စည်း သယ်ယူပို့ဆောင်ရေး

အစိုင်အခဲစွန့်ပစ်ပစ္စည်းများကို ကမ်းခြေအခြေစိုက်စခန်းသို့ပို့ဆောင်ပြီးနောက် PTTEPI၏ တူးဖော်ရေးကန်ထရိုက်တာသည် စွန့်ပစ်ပစ္စည်းအမျိုးအစားနှင့်အညီ သက်ဆိုင်ရာစွန့်ပစ်ပစ္စည်းစွန့်ပစ်ရာနေရာသို့ သယ်ယူပို့ဆောင်ရန် စီစဉ်ပါမည်။ ကမ်းခြေအခြေစိုက်စခန်းတွင် စွန့်ပစ်ပစ္စည်းများကို ညသိပ်သိုလှောင်ထားရှိမည်မဟုတ်ပါ။ စွန့်ပစ်ပစ္စည်းစွန့်ပစ်ရာနေရာများသည် ကမ်းခြေအခြေစိုက်စခန်းမှနေ၍ ၅၀ကီလိုမီတာအတွင်းတွင် တည်ရှိပါသည်။ PTTEPI၏ စွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲမှုအစီအစဉ်အရ အန္တရာယ်မရှိသောစွန့်ပစ်ပစ္စည်းများနှင့် အန္တရာယ်ရှိသောစွန့်ပစ်ပစ္စည်းများကို ထပ်မံစွန့်ပစ်ရန် သာကေတကမ်းခြေအခြေစိုက်စခန်းသို့ပြောင်းရွှေ့ပါမည်။

၂.၈ ဓာတုပစ္စည်းသယ်ယူပို့ဆောင်ရေး

ဤတူးဖော်ရေးအစီအစဉ်အတွက်ဓာတုပစ္စည်းများကို ဒေသခံကန်ထရိုက်တာမှ ထောက်ပံ့ပါမည်။ M9 အနောက်ဘက်ပိုင်းတွင် အကဲဖြတ်တွင်းနှင့် ရှာဖွေတွင်းတူးဖော်ခြင်း အစီအစဉ်ကာလအတွင်းတွင် ဒေသခံကန်ထရိုက်တာ၏ သိုလှောင်ရုံ မှ ၅၀ကီလိုမီတာအကျော်တွင်ရှိသော ရနောင်းကမ်းခြေအခြေစိုက်စခန်းသို့ ဓာတုပစ္စည်းများကို ပို့ဆောင်ပါမည်။ ကမ်းခြေအခြေစိုက်စခန်းတွင် စွန့်ပစ်ပစ္စည်းများကို

ညသိပ်သိုလှောင်ထားရှိမည်မဟုတ်ပါ။ ၎င်းတို့ကမ်းခြေအခြေစိုက် စခန်းသို့ရောက်ရှိသည့်နေ့တွင်ပင် ကမ်းခြေအခြေစိုက်စခန်းသို့ ပို့ဆောင်ပါမည်။

ထုတ်လွှတ်ခြင်း၊ စွန့်ထုတ်ခြင်းနှင့် စွန့်ပစ်ပစ္စည်းထွက်ရှိမှုသည် မြန်မာနိုင်ငံရှိသက်ဆိုင်ရာအစိုးရစည်းမျဉ်းများနှင့် ကိုက်ညီအောင်ဆောင်ရွက်ပါမည်။

၃။ တွင်းတူးဖော်ရှာဖွေခြင်းမှ ထုတ်လွှတ်မှုများ၊ စွန့်ထုတ်မှုများနှင့် စွန့်ပစ်ပစ္စည်းထွက်ရှိမှု

၃.၁ လေထုအတွင်းထုတ်လွှတ်မှုများ

၃.၁.၁ တူးဖော်ရေးတူးစင်မှထုတ်လွှတ်မှုများ

ဒီဇယ်ဂျန်နရေတာမီးစက်များကို တွင်းတူးစင်အတွက် လျှပ်စစ်ဓာတ်အားထောက်ပံ့မှုရင်းမြစ်အဖြစ် အသုံးပြုပါမည်။ စီမံကိန်းကာလအတွင်း (တွင်းတစ်တွင်း၌ ရက်ပေါင်း ၄၀) တူးဖော်မည့် စီမံကိန်းလုပ်ဆောင်မှုများအားလုံးအတွက် မီးစက်များသည် တစ်နေ့လျှင် ၂၄ နာရီလည်ပတ်မည်ဖြစ်သည်။ တွင်းတူးစင် ဓာတ်အားပေးစက်ရုံအတွက် ခန့်မှန်းခြေ လောင်စာသုံးစွဲမှုသည် တစ်ရက်လျှင် ၁၁,၁၃၀ လီတာ (သို့မဟုတ်) ၁၁.၁၃ ကုဗမီတာရှိသည်။ အမေရိကန်ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးအေဂျင်စီ(EPA)က သတ်မှတ်ထားသော လေထုညစ်ညမ်းမှုထုတ်လွှတ်ခြင်း ဆိုင်ရာအချက်များစုစည်းမှုအရ မီးစက်များမှ လေထုညစ်ညမ်းမှုဆိုင်ရာထုတ်လွှတ်မှုများအခြေအနေသည် အဆိုးဆုံးတွင်းတူးဖော်မှုအနေဖြင့် နိုက်ထရိုဂျင်အောက်ဆိုဒ်တန်ချိန် ၃၀၇.၂ တန်၊ ဆာလဖာအောက်ဆိုဒ် ၂၀.၄ တန် နှင့် ကာဗွန်မိုနောက်ဆိုဒ် ၆၆.၄ တန်ဖြစ်သည်။

၃.၁.၂ ဖန်လုံအိမ်ဓာတ်ငွေ့ (GHG) ထုတ်လွှတ်မှု

M9 အနောက်ဘက်ပိုင်း ရှာဖွေတူးဖော်ရေးစီမံကိန်း၏ တွင်းတူးဖော်ကာလအတွင်း ဖန်လုံအိမ်ဓာတ်ငွေ့ထုတ်လွှတ်မှု ခန့်မှန်းပမာဏ (စွမ်းအင်ထုတ်လုပ်ခြင်း၊ ရေကြောင်းသယ်ယူပို့ဆောင်ရေးနှင့် ကုန်းလမ်းသယ်ယူပို့ဆောင်ခြင်း) မှာ တစ်ကြိမ်လျှင် CO_2 ၆၉၆၀၄.၁ တန် နှင့် ညီမျှသော ထုတ်လွှတ်မှုပမာဏ ဖြစ်ပါသည်။

၃.၁.၃ အမှုန်အမွှား ထုတ်လွှတ်မှု

အခြားလေထုထဲသို့ ထုတ်လွှတ်မှုများသည် ရေယာဉ်များဖြင့် လောင်စာဆီထောက်ပံ့ပို့ဆောင်ခြင်း၊ လွှဲပြောင်းခြင်းလုပ်ငန်းများ အစရှိသောထုတ်လွှတ်မှုအရင်းအမြစ်အမျိုးမျိုးမှ မီသိန်းနှင့် မီသိန်းမဟုတ်သော ဟိုက်ဒရိုကာဗွန်များ၏ အမှုန်အမွှားထုတ်လွှတ်မှုရလဒ်တစ်ခု ဖြစ်ပါသည်။ အမှုန် (ဖုန်မှုန့်) ထုတ်လွှတ်ခြင်းသည် Bulk Handling System အပေါက်များမှ ဘာရိုက် (barite) (သို့မဟုတ်) ဘိလပ်မြေကိုင်တွယ်အသုံးပြုခြင်းကဲ့သို့သော bulk material များ လွှဲပြောင်းမှုများမှထွက်ရှိပါသည်။ HVAC စနစ်များ ပြုပြင်ထိန်းသိမ်းမှုနှင့်

ထိုကဲ့သို့သောပစ္စည်းကိရိယာ များနှင့်ဆက်စပ်သည့် အမှုန့်များမှ အိုဇုန်းလွှာများပျက်စီးစေသောအရာဝတ္ထု(ODS) များထွက်ရှိနိုင်ပါသည်။

ကမ်းလွန်တူးဖော်ရေးလုပ်ငန်းယူနစ်နှင့်ထောက်ပံ့ရေးရေယာဉ်များရှိ လိုင်းပေါ်စွမ်းအင်ထုတ်လုပ်သည့် စက်ပစ္စည်းများမှ အဆက်မပြတ်ထုတ်လွှတ်မှုနှင့်နှိုင်းယှဉ်ပါက အမှုန်ထွက်ရှိမှု ပမာဏသည် သိသာထင်ရှားဖွယ်မရှိချေ။

၃.၂ စွန့်ပစ်ရေ

၃.၂.၁ သန့်ရှင်းရေးလုပ်ငန်းဆိုင်ရာ စွန့်ပစ်ရေ

သန့်ရှင်းရေးလုပ်ငန်းဆိုင်ရာစွန့်ပစ်ရေတွင် တွင်းတူးစင်နှင့်ထောက်ပံ့ရေးရေယာဉ်များပေါ် ရှိ သန့်ရှင်းရေးလုပ်ငန်းနေရာများနှင့် အစားအသောက်ကန်တင်းများမှ စွန့်ပစ်ရေများပါဝင်ပါသည်။ ထောက်ပံ့ရေးရေယာဉ်များများမှ စွန့်ပစ်ရေများကို အနီးစပ်ဆုံးကမ်းခြေမှ ရေမိုင်၁၂မိုင်အကျော်တွင် စွန့်ထုတ်ပါသည်။ တွင်းတူးစင်မှ စွန့်ပစ်ရေ များကို စွန့်ပစ်သန့်စင်ရေးစနစ်သို့ ပို့ဆောင်၍ သန့်စင် ပြီးမှ စွန့်ထုတ်ပါသည်။ စွန့်ထုတ်ရာနေရာသည် အနီးစပ်ဆုံးကမ်းခြေမှ ရေမိုင် ၁၂မိုင်အကျော်တွင်ရှိပါသည်။ ယင်းနည်းလမ်းများသည် MARPOL 73/78 (Annex 4) သတ်မှတ်ချက်များနှင့်အညီ ဆောင်ရွက်ခြင်းဖြစ်ပါသည်။

၃.၂.၂ ရေဆင်းစနစ်

ရေနုတ်မြောင်းရေတွင် ထောက်ပံ့ရေးရေယာဉ်များနှင့်တူးစင်များမှ ballastရေနှင့် ကုန်းပတ်ပေါ်မှရေများပါဝင်ပြီး ၎င်းတို့သည် ဆီ/အမဲဆီတို့ဖြင့် ညစ်ညမ်းနေနိုင်သည်။ ရေနုတ်မြောင်းရေကိုစုဆောင်း၍ တူးစင်ပေါ်နှင့် ထောက်ပံ့ရေးယာဉ်များပေါ်တွင်တပ်ဆင်ထားသော ဆီ/ရေ ခွဲခြားသည့်စက်တွင် သန့်စင်ပါမည်။ ဆီ/ရေ ခွဲခြားသည့် စက်သည် ရေနှင့်ဆီကို ခွဲခြားပေးပြီး ရေကို ပင်လယ်ထဲသို့စွန့်ထုတ်ပါသည်။ သန့်စင်ထားသောရေသည် MARPOL 73/78 Annex 4 (ရေယာဉ်နှင့် သင်္ဘော ရေနုတ်မြောင်းရေ၏ညစ်ညမ်းမှုတားဆီးရေးအတွက် စည်းကမ်းသတ်မှတ်ချက်- ဆီပါဝင်မှုသည် ၁၀၀ ppm အောက်ဖြစ်ပါက အနီးဆုံးကမ်းခြေမှ ရေမိုင် ၁၂မိုင်အကျော်တွင် စွန့်ပစ်ရန်နှင့် ၁၅ ppm အောက်ဖြစ်ပါက ရေမိုင် ၁၂မိုင်အတွင်းစွန့်ပစ်ရန်) သတ်မှတ်ချက်များနှင့်အညီဖြစ်ပါသည်။ ခွဲခြားပြီးသော ဆီနှင့်အမဲဆီများကို ဆီသိုလှောင်ပုံးထဲတွင် စုဆောင်း၍ ကမ်းပေါ်သို့ သယ်ဆောင် ပြီးမှ စွန့်ပစ်စေပါသည်။

၃.၂.၃ တူးဖော်ရေးဆိုင်ရာ စွန့်ပစ်ပစ္စည်း

အကဲဖြတ်တွင်းနှင့်ရှာဖွေတွင်းတူးဖော်ခြင်းအစီအစဉ်မှ လုပ်ငန်းတစ်ခုချင်းစီအတွက် ခန့်မှန်းခြေအားဖြင့် ပုံမှန်တွင်း ၁တွင်းမှ ဖြတ်စ ၅၉၆ m^3 နှင့် နက်ရှိုင်းသောတွင်း ၁တွင်းမှ ဖြတ်စ ၁၀၀၅ m^3 ရှိသည်ဟု ခန့်မှန်းရသည်။ ၎င်းတို့ကို သန့်စင်ပြီးနောက်တွင် နောက်ဆုံးအနေဖြင့် ပင်လယ်ထဲသို့ စွန့်ထုတ်ပါမည်။

PTTEPI သည် SBMကဏ္ဍများအတွက် Cuttings Base Fluid Retention (CBFR) ၏ အများဆုံး ၆.၉% ကို စွန့်ထုတ်မည်။ ခန့်မှန်းခြေအားဖြင့် ရွေးချယ်မှုအပေါ်လိုက်၍ ရေအခြေပြုတွင်းတူးရှာရည်များ၏ အများဆုံး 160 m^3 ပမာဏသည် စွန့်ပစ်ဖြတ်စများပေါ်တွင် ကျန်ရှိပစ္စည်းများအဖြစ်ကျန်ရှိမည်ဖြစ်ပြီး ဒြပ်ပစ္စည်းအခြေပြုတွင်းတူးရှာရည်များ၏ အများဆုံး ၇၅.၂m^3သည် စွန့်ပစ်ဖြတ်စများပေါ်တွင် ကျန်ရှိပစ္စည်းများအဖြစ်ကျန်ရှိမည်ဖြစ်ပါသည်။

ပြန်လည်ရရှိသောရှာရှာများကို ပြန်လည်အသေးခံကာ ရှာရည်လည်ပတ်မှုစနစ်သို့ပြန်လည်ပေးအပ်မည်။ Casing အဖုံးအတွင်းရှိရှာများသည် ထွက်ရှိလာမည်ဖြစ်ပြီး ၎င်းတို့ကို Shaker system မှတစ်ဆင့် ပြန်လည်သန့်စင်ကာ ပြန်လည် အသုံးပြုပါမည်။ တူးဖော်ရေးလှုပ်ရှားမှုပြီးဆုံးသွားသောအခါ ရှာရည်များကို အနာဂတ်လှုပ်ရှားမှုများအတွက် သိမ်းဆည်းထားမည် (သို့မဟုတ်) supplier ထံသို့ ပြန်လည်ပို့ဆောင်မည်။ တွင်းတူးရှာရည်များကို တိုက်ရိုက်စွန့်ပစ်ခွင့် မပြုပါ။ စီမံကိန်းသည် တွင်း၂တွင်း (Pundarika နှင့် Aungpyitan) တွင်းတူးဖော်ခြင်းကို လုပ်ဆောင်လျက်ရှိပြီး ကျန်တွင်းများကိုမူ တူးဖော်ခြင်းမပြုသေးပါ။ M9 အနောက်ဘက်ပိုင်းရှိ တွင်း ၂တွင်း ရှာဖွေတူးဖော်ရေးလုပ်ငန်းများမှ ထွက်ရှိလာသော ဖြတ်စပမာဏကို ဇယား (၂) တွင် ဖော်ပြထားပါသည်။

ဇယား (၂) M9 အနောက်ပိုင်းရှာဖွေရေးလုပ်ငန်းများလည်ပတ်နေစဉ်အတွင်း ထွက်ရှိသောဖြတ်စပမာဏ

တွင်းအမည်	ထွက်ရှိသော WBM ဖြတ်စပမာဏ (တန်ချိန်)	ထွက်ရှိသော SBM ဖြတ်စပမာဏ (တန်ချိန်)
Pundarika	၈၄၈.၆၁	၁၁၁၇.၅၉
Aungpyitan	၈၂၅.၈၇	၁၀၅၀.၇၀

၃.၃ အစိုင်အခဲစွန့်ပစ်ပစ္စည်း

PTTEPI သည် စီမံကိန်းမှထွက်ရှိသည့် အန္တရာယ်ရှိသောစွန့်ပစ်ပစ္စည်းများနှင့်အန္တရာယ်ရှိသောစွန့်ပစ်ပစ္စည်းများကို မှန်မှန်ကန်ကန်နှင့်အန္တရာယ်ကင်းကင်း ကိုင်တွယ်ခြင်းနှင့် စွန့်ပစ်ခြင်းကိုသေချာစေရန် စွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲမှုအစီအစဉ်တစ်ခုကို ရေးဆွဲထားသည်။ ဤအစီအစဉ်သည် PTTEPIမှ စီမံသောဆိုဒ်များအားလုံးနှင့် ကန်ထရိုက်တာများ အပါအဝင် ဝန်ထမ်းအားလုံးအတွက်ဖြစ်သည်။ ဤလုပ်ထုံးလုပ်နည်းတွင် PTTEPI မှထွက်ရှိသော အန္တရာယ်မရှိသော စွန့်ပစ်ပစ္စည်းနှင့်အန္တရာယ်ရှိသောစွန့်ပစ်ပစ္စည်းများအတွက် စွန့်ပစ်ပစ္စည်းအမျိုးအစားသတ်မှတ်ခြင်း၊ မျိုးတူခွဲခြားခြင်း၊ ကိုင်တွယ်ခြင်း၊ ယာယီထားရှိရာဆိုဒ်များ၊

စွန့်ပစ်ပစ္စည်းလွှဲပြောင်းခြင်း၊ သိုလှောင်ခြင်းနှင့် စွန့်ပစ်ခြင်းဆိုင်ရာ စက်လုပ်ငန်းနေရာများ၊ မှတ်တမ်းတင်ခြင်း၊ နှင့် အစီရင်ခံခြင်းဆိုင်ရာ အကြောင်းအရာများပါဝင်ပါသည်။

၃.၃.၁ ထွက်ရှိသည့်စွန့်ပစ်ပစ္စည်းအမျိုးအစားနှင့်ပမာဏ

အဆိုပြုစီမံကိန်းမှထွက်ရှိသော အစိုင်အခဲစွန့်ပစ်ပစ္စည်းများတွင် အန္တရာယ်မရှိသောစွန့်ပစ်ပစ္စည်းနှင့် အန္တရာယ်ရှိသော စွန့်ပစ်ပစ္စည်းများ ပါဝင်ပါသည်။

- **အန္တရာယ်မရှိသောစွန့်ပစ်ပစ္စည်းများ** - ဤအမျိုးအစားတွင် စက္ကူများ၊ ပလတ်စတစ်များ၊ နှင့် အခြားညစ်ညမ်းခြင်းမရှိသော စွန့်ပစ်ပစ္စည်းများ ပါဝင်ပါသည်။ စားကြွင်းစားကျန်စွန့်ပစ်ပစ္စည်းများကို (အချင်း ၂၅ မီလီမီတာ) အောက်သို့ရောက်အောင် အမှုန့်ကြိတ်ဖျက်ဆီး၍ (ကမ်းခြေမှ ၁၂ မိုင်ကျော်ကွာဝေးသော နေရာတွင်) ပင်လယ်ထဲသို့ စွန့်ပစ်သွားပါမည်။ ၎င်းသည် MARPOL ကွန်ဗင်းရှင်း ကျင့်သုံးမှုများနှင့်အညီ ဆောင်ရွက်ခြင်းဖြစ်ပါသည်။ အစားအသောက်မဟုတ်သော စွန့်ပစ်ပစ္စည်းအားလုံးကို စုစည်း၍ သိပ်သည်း အောင် ပြုလုပ်ကာ သာကေတကမ်းခြေအခြေစိုက်စခန်းသို့ ပို့ဆောင်၍ နောက်ဆုံး စွန့်ပစ်သွားပါမည်။

  MARPOL သတ်မှတ်ချက်များနှင့် အညီ မည်သည့်အစိုင်အခဲစွန့်ပစ်ပစ္စည်းကိုမဆို အဏ္ဏဝါပတ်ဝန်းကျင်ထဲသို့ တမင်တကာ စွန့်ပစ်သွားမည် မဟုတ်ပါ။
- **အန္တရာယ်ရှိသောစွန့်ပစ်ပစ္စည်းများ** - ဤအမျိုးအစားတွင် အသုံးပြုပြီးသော ဆီအမျိုးမျိုး၊ ဆီဖြင့်ညစ်ညမ်း နေသောရေ၊ သက်တမ်းလွန် အအေးခံအေးဂျင့်ပစ္စည်းများ၊ မီးလုံးမီးချောင်းများ၊ ဓာတုပစ္စည်းများနှင့် ပျော်ရည်များ၊ ညစ်ညမ်းနေသော အဝတ်များ၊ ဓာတုပစ္စည်းသိုလှောင်ရာပစ္စည်းများ၊ ဘက်ထရီများ၊ အသုံးပြုပြီးသား PPEများ၊ ဆီ (သို့မဟုတ်) ဓာတုပစ္စည်းများဖြင့် ညစ်ပေနေသော အကြွင်းအကျန်ပစ္စည်းများ အစရှိသည်ဖြင့် ပါဝင်ပါသည်။

  အန္တရာယ်မရှိသောစွန့်ပစ်ပစ္စည်းနှင့် အန္တရာယ်ရှိသောစွန့်ပစ်ပစ္စည်းများကို အမျိုးအစား ခွဲခြားထားရှိမည် ဖြစ်ပြီး PTTEPI ၏ စွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲမှုအစီအစဉ်အတိုင်း တူးဖော်ရေးဆိုင်ရာ ကန်ထရိုက်တာက သင့်လျော်စွာ စွန့်ပစ်သွားပါမည်။ စွန့်ပစ်ခြင်းဆိုင်ရာဝန်ဆောင်မှုပေးသောစက်လုပ်ငန်းနေရာများမှာ အောက်ပါ အတိုင်းဖြစ်ပါသည်။

  - ရန်ကုန်မြို့တော်စည်ပင်သာယာရေးကော်မတီ (YCDC) ၏ စွန့်ပစ်အမှိုက်ပုံနေရာများ နှင့် အမှိုက်မီးရှို့စက်
  - DOWA သီလဝါ စွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲမှုလုပ်ငန်း မှ အန္တရာယ်ရှိသောစွန့်ပစ်ပစ္စည်းများ စွန့်ပစ်ရာနေရာ

- ပင်လယ်ပြင်တွင်စွန့်ပစ်ခြင်း (ဥပမာ - ပုပ်သိုးဆွေးမြေ့နိုင်သော စွန့်ပစ်ပစ္စည်းများ၊ ပြန်လည်သန့်စင်မှုလုပ်ထားသော တွင်းတူးရွံ့ရည်များ၊ သတ္တုအမှုန်များ နှင့် သန့်စင်ထားသော အသုံးပြုထားသောရေများ)

M9 အနောက်ပိုင်း တွင်း ၂ တွင်း တူးဖော်ရှာဖွေခြင်းလုပ်ငန်းလှုပ်ရှားမှုများမှထွက်ရှိလာသော အန္တရာယ်မရှိသော စွန့်ပစ် ပစ္စည်းနှင့် အန္တရာယ်ရှိသောစွန့်ပစ်ပစ္စည်းများ၏ ပမာဏကို ဇယား (၃) တွင် ဖော်ပြထားပါသည်။

ဇယား (၃) တွင်း ၂ တွင်း လုပ်ငန်းမှ ထွက်ရှိလာသော စွန့်ပစ်ပစ္စည်းပမာဏ

စွန့်ပစ်ပစည်းအမျိုးအစား	ထွက်ရှိသော စွန့်ပစ်ပစ္စည်းပမာဏ (တန်ချိန်)
အန္တရာယ်မရှိသော စွန့်ပစ်ပစ္စည်း	၆၃.၅၄
အန္တရာယ်ရှိသော စွန့်ပစ် ပစ္စည်း	၂၆.၈၈

၄။ စီမံကိန်း၏ သဘာဝပတ်ဝန်းကျင်ဆိုင်ရာ၊ လူမှုရေးနှင့် ကျန်းမာရေး မူဝါဒများ

PTTEPIစီမံခန့်ခွဲမှုသည် လုံခြုံစိတ်ချရပြီး ကျန်းမာရေးနှင့် ညီညွတ်သော လုပ်ငန်းခွင်တစ်ခုကို အပြည့်အဝ ဖော်ဆောင် ပေးခဲ့ပြီး၊ သဘာဝပတ်ဝန်းကျင်ကို ကာကွယ်စောင့်ရှောက်သော မူများဖြင့် လုပ်ငန်းများ ဆောင်ရွက်ခဲ့ပါသည်။ ယင်းကဲ့သို့ တစိုက်မတ်မတ်ဆောင်ရွက်ချက်များသည် PTTEPI ၏ မျှော်မှန်းချက်၊ ရည်မှန်းချက်၊ တန်ဖိုးများနှင့် SSHE မူဝါဒတို့နှင့် အညီပင် ဖြစ်ပါသည်။ လုပ်သားများ၊ ကန်ထရိုက်တာများနှင့် သက်ဆိုင်ရာ ဌာနဆိုင်ရာ အမှုထမ်းများအားလုံးထံမှ တစ်ဦးချင်းကိုယ်ထူကိုယ်ထ ပါဝင်လှုပ်ရှားမှု၊ တာဝန်ယူမှု၊ တာဝန်သိတတ်မှုတို့ကို မျှော်လင့်ပါသည်။ ဤနိယာမများကို ရရှိစေရန် ပါဝင်ပတ်သက်သူအားလုံးတို့၏ အားထုတ်ဆောင်ရွက်မှုများကို ပေါင်းစည်းစေသည့် ပုံစံဖြင့် PTTEPI SSHE စီမံခန့်ခွဲမှု စနစ်ကို စီစဉ်ထားပါသည်။

PTTEPI ရှိ စီမံခန့်ခွဲမှုအဆင့်အားလုံးတွင် ၎င်းတို့၏ SSHE မူဝါဒနှင့် SSHE စီမံခန့်ခွဲမှုစနစ်တို့ကို အကောင်အထည်ဖော်ဆောင်ရွက်ရန်၊ ထိန်းသိမ်းစောင့်ရှောက်ရန် တာဝန်ရှိပါသည်။ စာရွက်စာတမ်း နှစ်မျိုးစလုံးကို ပုံမှန် ကာလအပိုင်းအခြားများဖြင့် ပြန်လည်ဆန်းစစ်၊ သုံးသပ်ပါသည်။

၅။ လိုက်နာဆောင်ရွက်မှု အခြေအနေ

ရလဒ်များအရ စီမံကိန်းသည် တွင်းတူးဖော်ရေးဆင့်တွင် သဘာဝပတ်ဝန်းကျင်ဆိုင်ရာ ထိခိုက်မှုလျော့ပါးစေရေး နည်းလမ်းများကို ၁၀၀% အပြည့်အဝလိုက်နာဆောင်ရွက်ခဲ့ပါသည်။ မျှော်လင့်မထားသောဖြစ်ရပ်များအတွက် ထိခိုက်မှုလျော့ပါးရေးအစီအမံများကိုလည်း ၁၀၀% အပြည့်အဝလိုက်နာဆောင်ရွက်ခဲ့ပါသည်။

PTTEPI သည် EIA တွင်ဖော်ပြထားသော ထိခိုက်မှုလျော့ပါးရေးအစီအမံများအားလုံးကို လိုက်နာဆောင်ရွက်ခဲ့ပါသည်။ အဓိကဖြစ်ရပ်များကို အောက်တွင် အကျဉ်းချုပ်ဖော်ပြထားပါသည်။

၅.၁ တွင်းတူးဖော်ရေးအဆင့်တွင် သဘာဝပတ်ဝန်းကျင်ဆိုင်ရာ ထိခိုက်မှုလျော့ပါးစေရေး နည်းလမ်းများအား လိုက်နာဆောင်ရွက်မှုရလဒ်

- **လေထုအရည်အသွေး/ရာသီဥတု** - စက်ပစ္စည်းများအားလုံး ပုံမှန်စစ်ဆေးခြင်းနှင့် ကြိုတင်ကာကွယ်ရေး ပြုပြင်ထိန်းသိမ်းခြင်းများကို နှစ်စဉ် PM နှင့် စစ်ဆေးခြင်း အစီအစဉ်များအတိုင်း ဆောင်ရွက်ခဲ့ပါသည်။ ဤစီမံကိန်း၏ PM အစီအစဉ်ကို အထောက်အကူပြုရန် SAP စနစ်ကို အသုံးပြုခဲ့ပါသည်။
- **ရေအောက်ဆူညံမှု** - PTTEPI သည် ဘေးကင်းဇုန်တွင် ရေယာဉ်တိုက်မှုများမဖြစ်စေရန် ရေဒီယိုအော်ပရေတာနှင့် ထောက်ပံ့ရေးရေယာဉ်မှပေးပို့သော ထိခိုက်မှုလျော့ပါးရေးနည်းလမ်းများကို တင်းကျပ်စွာလိုက်နာဆောင်ရွက် ပါသည်။
- **ပင်လယ်ရေ အရည်အသွေးနှင့် နုံးအနည်အနှစ်အရည်အသွေး** - ပင်လယ်ရေနှင့် Water-base Mud (WBM) တို့သည် တွင်းတူးရည်များအနေဖြင့် အဓိကဦးစားပေးများဖြစ်ပါသည်။ တွင်းတူးရည်လည်ပတ်စေခြင်း စနစ်ကို တွင်းတူးရည်များအား ပြန်လည်အသုံးပြုရန် ပုံနှံစွာလည်ပတ်စေခဲ့ပါသည်။ ပတ်ဝန်းကျင်နှင့် လိုက်လျောညီထွေမှုရှိပြီး ပြိုကွဲပျက်စီးလွယ်သောကြောင့် Synthetic-base mud (SBM) ကို နည်းပညာအကြောင်းပြချက်အရ အသုံးပြုခဲ့ပါသည်။ စီမံကိန်းမှအသုံးပြုခဲ့သော ဓာတုပစ္စည်းများနှင့် ဖြတ်စစ္စန့်ပစ်ပစ္စည်းများကို စာရင်းပြုစု ထားရှိပါသည်။ NCB တွင်းတူးစင်၏ ဓာတုပစ္စည်း သိုလှောင်ရာနေရာများ အားလုံး၌ ဓာတုပစ္စည်းများ၏ အဆိပ်အတောက်ဖြစ်စေနိုင်မှုကိုဖော်ပြသော SDS ကို ထားရှိပေးခဲ့ပါသည်။ ဤစီမံကိန်းတွင် အဆိပ်အတောက် နည်းပါးသော ဓာတုပစ္စည်းများကို အသုံးပြုခဲ့ပါသည်။
- **အဏ္ဏဝါဇီဝသက်ရှိများ၊ မျိုးသုဉ်းခါနီး မျိုးစိတ်များ၊ ထိခိုက်လွယ်/ကာကွယ်ထားသော ရေယာများ** - PTTEPI သည် အဏ္ဏဝါဇီဝသက်ရှိများ၊ မျိုးသုဉ်းခါနီး မျိုးစိတ်များ၊ ထိခိုက်လွယ်/ကာကွယ်ထားသော ရေယာများအတွက် ထိခိုက်မှု လျော့ပါးရေးအစီအမံများကို တင်းကျပ်စွာ လိုက်နာအကောင်အထည်ဖော်ဆောင်ရွက်ပါသည်။

- **ငါးလုပ်ငန်းများ** - တွင်းတူးဖော်ခြင်းမစတင်မီတွင် စီမံကိန်းဆိုင်ရာသတင်းအချက်အလက်နှင့် တွင်းတူးရန် အစီအစဉ်များကို PTTEPIမှ သက်ဆိုင်ရာအဖွဲ့အစည်းများအားလုံးထံ သတင်းပေးပို့ခဲ့ပါသည်။ တွင်းတူးစက် တစ်ဝိုက်တွင် သီးခြားဇုန် (၅၀မီတာရှိ) ကို သတ်မှတ်ထားရှိနှင့်ပြီးဖြစ်ပါသည်။ စီမံကိန်းတွင် ယာဉ်အသွားအလာကို အချက်ပြရန် ထောက်ပံ့ရေယာဉ် ၃ စင်းရှိပါသည်။ NCB တွင်းတူးစက်နှင့် ထောက်ပံ့ရေးရေယာဉ်များအနီးတွင် သင့်လျော်သောအချက်ပြမီးများ ထားရှိခဲ့ပါသည်။
- **သဘော်အသွားအလာ** - PTTEPI သည် သင့်လျော်သော မီးလုံးများ၊ အချက်ပြသင်္ကေတများ၊ ဆက်သွယ်ရေးကိရိယာ များ နှင့် အချက်ပြရောင်ပြန်ရေဒါများကို ရေယာဉ်များအားလုံးတွင် တပ်ဆင်ပေးထားပြီး မတော်တဆတိုက်မိမှုများမှ ကာကွယ်ပါသည်။ တွင်းတူးစင်ဘေးတွင် ၅၀၀ မီတာ ဘေးကင်းဇုံလည်း သတ်မှတ်ထားပါသည်။ ထို့အပြင် ရေယာဉ် အသွားအလာကို အချက်ပြရန် ထောက်ပံ့ရေးရေယာဉ်များကို အသုံးပြုပါသည်။
- **စွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲမှု** - NCB တွင်းတူးစက်နှင့် ထောက်ပံ့ရေးရေယာဉ်တို့တွင် စွန့်ပစ်ပစ္စည်း ကွန်တိန်နာများ ထားရှိပေးခဲ့ပါသည်။ ထိုစွန့်ပစ်ပစ္စည်း ကွန်တိန်နာများသို့ မစွန့်ပစ်မီ အညစ်အကြေးများကို အမှိုက်အိတ်များဖြင့် စုဆောင်းခဲ့ပါသည်။ သဘာဝပတ်ဝန်းကျင် ထိခိုက်ခြင်းမှ ကာကွယ်ရန် စွန့်ပစ်ပစ္စည်း ကွန်တိန်နာများကို အဖုံးဖုံးခဲ့ပါသည်။ NCB တွင်းတူးစက်နှင့် ထောက်ပံ့ရေးရေယာဉ်များရှိ စွန့်ပစ်ပစ္စည်းများကို တရားဝင်ခွင့်ပြုမိန့်ရ ကန်ထရိုက်တာမှ စွန့်ပစ်ပေးရန် ကုန်းတွင်းသို့ ရွှေ့ပြောင်းသယ်ဆောင်စေခဲ့ပါသည်။ PTTEPI နှင့် ကန်ထရိုက်တာများသည် MARPOL ၇၃/၇၈ ၏ လိုအပ်ချက်များနှင့် PTTEPI ၏ စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှု လုပ်ငန်းစဉ်ကို လိုက်နာကျင့်သုံးခဲ့ပါသည်။ လုပ်သားများကို ပင်လယ်တွင်းသို့ အမှိုက်များပစ်ချခြင်းမှ တားမြစ်ထားပါသည်။ အစားအစာ စွန့်ပစ်ပစ္စည်းများကို ပင်လယ်တွင်းသို့ မစွန့်ပစ်မီ ၂၅မိုင်မီတာအထိ သေးငယ်သော အရွယ်အစား အထိ ကြိတ်ခွဲရန် အစာကြိတ်စက်များ ထောက်ပံ့ပေးခဲ့ပါသည်။
- **လူမှုစီးပွားရေး** - ဒေသတွင်းကုန်ပစ္စည်းများနှင့် ဝန်ဆောင်မှုများကို အသုံးပြုစေခဲ့ပ့ဲသည်။ ဥပမာ- တွင်းတူးကာလအတွင်း လုပ်ကိုင်ရန် ကန်ထရိုက်တာများထံမှ ဒေသခံလုပ်သားများကို ခန့်အပ်ထားရှိခဲ့ပါသည်။
- **လုပ်ငန်းခွင်ကျန်းမာရေးနှင့် ဘေးကင်းလုံခြုံရေး** - PTTEPI ၏ လုပ်ငန်းခွင်ဆိုင်ရာ ကျန်းမာရေး စီမံခန့်ခွဲမှု စံချိန်စံနှုန်းများကိုပြင်ဆင်ထားရှိပြီး လုပ်သားများနှင့် ကန်ထရိုက်တာများအား ထိုစံချိန်စံနှုန်းများကို လုပ်ငန်းလုပ်ဆောင်စဉ်ကာလတစ်လျှောက်တွင် အကောင်အထည်ဖော်ဆောင်ရွက်စေခဲ့ပါသည်။ PTTEPI ဓာတုပစ္စည်းကိုင်တွယ်ရေးစီမံချက်များကို လိုက်နာဆောင်ရွက်စေရန် သက်ဆိုင်ရာဝန်ထမ်းများအားလုံးကို လုံခြုံစိတ်ချရသော ဓာတုပစ္စည်း ကိုင်တွယ်ရေးသင်တန်း

ပို့ချပေးခဲ့ပါသည်။ စီမံကိန်းဝန်ထမ်းအားလုံးအတွက် တစ်ကိုယ်ရည်ကာကွယ်ရေး ကိရိယာများကို ထောက်ပံ့ပေးနှင့်ပြီးဖြစ်ပါသည်။ PTTEPI SSHE သင်ကြားရေးနှင့် ကျွမ်းကျင်လိမ္မာရေး စံနှုန်းထားများနှင့်အညီ စီမံကိန်းဝန်ထမ်းများ အားလုံးအတွက် လုံခြုံရေးသင်တန်း ပို့ချခဲ့ပါသည်။ PTTEPI ၏ MERP ကို ထောက်ပံ့ပေးနှင့်ပြီး ဖြစ်ပါသည်။ အရေးပေါ်ကိစ္စရပ် ဖြစ်ပေါ်လာပါက လူနာကို ရန်ကုန်မြို့ရှိ ဆေးရုံသို့ ရဟတ်ယာဉ်ဖြင့် ပို့ဆောင်သွားမည် ဖြစ်ပါသည်။ ဓာတုပစ္စည်းသိုလှောင်ရန် နေရာအလုံအလောက်ချထားပေးခဲ့ပါသည်။ ဓာတုပစ္စည်းသိုလှောင်ရာ နေရာအားလုံးတွင် SDS ကိုဖော်ပြပေးထားပါသည်။ သိုလှောင်နေရာ၏ အခြေအနေကို စီမံကိန်းဝန်ထမ်းမှ အချိန်မှန် စောင့်ကြည့်စစ်ဆေးခဲ့ပါသည်။ ယိုဖိတ်မှုများအတွက် အထောက်အပံ့ပေးနိုင်သော ပစ္စည်းကိရိယာများနှင့် ရှေးဦးသူနာပြုပစ္စည်းများကို NCBတွင်းတူးစက်တွင် ထားရှိခဲ့ပြီးဖြစ်ပါသည်။ သောက်သုံးရေ၊ ကန်တင်း၊ ကော်ဖီသောက်ရာနေရာ၊ အိမ်သာ၊ ဆေးလိပ်သောက်ရာနေရာနှင့် နားနေခန်းများစသည့် သန့်ရှင်းရေးစနစ်များနှင့် အခြားအများသုံးနေရာများကို NCB တွင်းတူးစက်များတွင် သင့်တင့်လျောက်ပတ်စွာ ထားရှိခဲ့ပါသည်။ အသံဆူညံမှုများပြားသောနေရာများတွင် ဆူညံသံကာကွယ်ရေး ပစ္စည်းများထားရှိပြီး ဆူညံသံသတိပေးအချက်ပြ စာရွက်ကိုလည်း ကပ်ထားပေးပါသည်။ စီမံကိန်းလုပ်ငန်းများကြောင့် မတော်တဆဖြစ်မှု ၁၀ ခုရှိခဲ့ပြီး ၎င်းတို့မှာ ပိုင်ဆိုင်မှုပစ္စည်းများပျက်စီးခြင်း (သို့) ဆုံးရှုံးခြင်းဖြစ်ရပ် ၅ ခု၊ near miss ဖြစ်ရပ် ၁ ခု၊ ရှေးဦးသူနာပြုဆိုင်ရာဖြစ်ရပ်၃ခု၊ နှင့် Tier 3 LOPC ဖြစ်ရပ် ၁ ခု တို့ဖြစ်ပါသည်။ အလားတူဖြစ်ရပ်များ ထပ်မံမဖြစ်ပွားစေရန် ပြုပြင်ဆောင်ရွက်ရေး အစီအစဉ်များကို အဆိုပြု/ အကောင်အထည်ဖော်ခဲ့ပါသည်။

- **လူထုကျန်းမာရေး** - PTTEPI ၏ လုပ်ငန်းခွင်ဆိုင်ရာ ကျန်းမာရေး စီမံခန့်ခွဲမှု စံချိန်စံနှုန်းများကို ပြင်ဆင်ထားရှိပြီး လုပ်သားများနှင့် ကန်ထရိုက်တာများအား အကောင်အထည်ဖော်ဆောင်ရွက်စေ ခဲ့ပါသည်။ PTTEPI ၏ MERP ကို ထောက်ပံ့ပေးနှင့်ပြီးဖြစ်ပါသည်။ အရေးပေါ်ကိစ္စရပ် ဖြစ်ပေါ်လာပါက လူနာကို ရန်ကုန်မြို့ရှိ ဆေးရုံသို့ ရဟတ်ယာဉ်ဖြင့် ပို့ဆောင်သွားမည် ဖြစ်ပါသည်။

၅.၂ မတော်တဆဖြစ်ရပ်များအတွက် သဘာဝပတ်ဝန်းကျင်ဆိုင်ရာ ထိခိုက်မှုလျော့ပါးစေရေးအစီအမံများ

- **ရေယာဉ်များတိုက်မိခြင်း** - NCB တွင်းတူးစင်တွင် PTTEPI ဧာတိကကမ်းလွန်ရေနံလုပ်ငန်းခွင် အရေးပေါ်တုံ့ပြန်ချက်အစီအစဉ်တွင်ပါရှိသည့်အတိုင်း ရေယာဉ်မတော်တဆတိုက်မိခြင်း အရေးပေါ် တုံ့ပြန်ချက်အစီအစဉ်ကို ထားရှိခဲ့ပါသည်။
- **လောင်စာဆီ၊ ဆီ၊ ဓာတုပစ္စည်း (သို့) အန္တရာယ်ရှိသောစွန့်ပစ်ပစ္စည်း/ပစ္စည်းများလွှင့်စင်ယိုဖိတ်မှု** - NCB တွင်းတူးစင်တွင် PTTEPI ယိုဖိတ်မှု အရေးပေါ်အစီအစဉ်တွင် ပါရှိသည့်အတိုင်း

မတော်တဆယိုဖိတ်မှုများအပေါ် အရေးပေါ်တုံ့ပြန်ချက် အစီအစဉ်ကို ထားရှိခဲ့ပါသည်။ ဆီယိုဖိတ်မှုများကို စီမံကိန်း ဝန်ထမ်းမှ စောင့်ကြည့် မှတ်တမ်းတင်သွားပါမည်။ လက်ရှိတွင် စီမံကိန်းဆောင်ရွက်ချက်များမှ ဆီယိုဖိတ်မှု မရှိပါ။ တွင်းတူးခြင်းလုပ်ငန်းစဉ် အတောအတွင်း ပေါက်ကွဲမှုကာကွယ်ရန် BOP ကိရိယာများကိုချထားပေးခဲ့ပါသည်။ ထို့အပြင် PTTEPI မတော်တဆ ပေါက်ကွဲမှုအပေါ်တုံ့ပြန်ချက် အစီအစဉ်ကို ထားရှိခဲ့ပြီးဖြစ်ပါသည်။

- **ပေါက်ကွဲမှုဖြစ်ပေါ်ခြင်း** - MARPOL ၇၃/၇၈ တွင်ပါရှိသည့်အတိုင်း ဆီယိုဖိတ်မှုများအတွက် အထောက်အပံ့ပေးနိုင်သော ပစ္စည်းကိရိယာများ၊ PTTEPI ယိုဖိတ်မှု အရေးပေါ်အစီအစဉ်၊ PTTEPI ပေါက်ကွဲမှု အရေးပေါ် အစီအစဉ်များကို NCB တွင်းတူးစက်တွင် ထားရှိခဲ့ပြီး ဖြစ်ပါသည်။ PTTEPI SSHE သင်တန်းနှင့် စွမ်းရည်ရှိမှုသတ်မှတ်ချက်အတိုင်း စီမံကိန်းဝန်ထမ်းများအားလုံးကို ဘေးကင်းလုံခြုံရေး သင်တန်းပို့ချခဲ့ပါသည်။
- **အပူပိုင်းဆိုင်ကလုန်း/တိုင်ဖုန်း** - PTTEPI အပူပိုင်းဒေသဆိုင်ရာ ဆိုင်ကလုန်းလုပ်ဆောင်ချက်များ အတိုင်း NCB တွင်းတူးစက်တွင် အပူပိုင်းဒေသဆိုင်ရာ ဆိုင်ကလုန်းအတွက် အရေးပေါ်တုံ့ပြန်ချက် အစီအစဉ် ရေးဆွဲထားရှိခဲ့ပြီးဖြစ်ပါသည်။ အပူပိုင်းဒေသဆိုင်ရာဆိုင်ကလုန်း တိမ်းရှောင်ရေးအတွက် အရေးပေါ် ဇာတ်တိုက်လှုပ်ရှားမှုကို လုပ်သားများအားလုံးထံသင်တန်း ပို့ချပေးပြီး ဖြစ်ပါသည်။
- **မီးလောင်ကျွမ်းခြင်း (သို့) ပေါက်ကွဲခြင်း** - လုပ်ငန်းခွင်ဧရိယာနှင့် လူနေထိုင်ရာ နေရာများ တစ်ဝိုက်တွင် မီးသတ်ပစ္စည်းများ ထားရှိပေးခဲ့ပြီးဖြစ်ပါသည်။ လုပ်ငန်းခွင်ဧရိယာနှင့် လူနေထိုင်ရာနေရာများ နှစ်ခုစလုံးတွင် မီးသတ်အစီအစဉ် တပ်ဆင်ပြသထားပါသည်။ မီးလောင်ကျွမ်းခြင်း (သို့) ပေါက်ကွဲခြင်းများအတွက် အရေးပေါ်အစီအစဉ် ထားရှိခဲ့ပြီးဖြစ်ပါသည်။ ထို့အပြင် အရေးပေါ် ဇာတ်တိုက်လှုပ်ရှားမှုများကို ပုံမှန်ဆောင်ရွက်ခဲ့ပါသည်။

၅.၃ ပတ်ဝန်းကျင်ဆိုင်ရာ လေ့လာစောင့်ကြည့်ခြင်းရလဒ်

စီမံကိန်းသည် ပတ်ဝန်းကျင်ဆိုင်ရာသက်ရောက်မှု စောင့်ကြည့်စစ်ဆေးခြင်းကို အပြည့်အဝ လိုက်နာဆောင်ရွက်ထားပါသည်။ ၎င်းတို့တွင် တွင်းတူးရွံ့ရည်၊ ဖြတ်စ နှင့် စတော့ဘာရိုက်စောင့်ကြည့်စစ်ဆေးခြင်း နှင့် မိလ္လာရေဆိုး စောင့်ကြည့်စစ်ဆေးခြင်းတို့ပါဝင်ပါသည်။

၅.၃.၁ တွင်းတူးရွံ့ရည်၊ ဖြတ်စ နှင့် စတော့ဘာရိုက်စောင့်ကြည့်စစ်ဆေးခြင်း

တွင်းတူးခြင်းလုပ်ငန်းကာလအတွင်း တွင်းတူးရွံ့ရည် နှင့် ဖြတ်စများကို စီမံကိန်းဝန်ထမ်းများမှ နမူနာကောက်ယူခဲ့ပါသည်။ စစ်ဆေးခြင်းရလဒ်များအရ ကလိုရိုဒ် (WBM အတွက်) ပမာဏသည် ၀.၂၁မှ ၀.၃၁ % w/w အတွင်းတွင် ရှိပါသည်။ ဖြတ်စများပေါ် ရှိဆီ (OOC) အတွက် ရလဒ်များမှာ ၀.၀၆ - ၇.၁၁ % OOC (ခြောက်သွေ့ အလေးချိန်) အတွင်းတွင် ရှိပြီး ၎င်းသည် လက်ရှိစက်ရုံများအတွက် IFC EHS

ကမ်းလွန်ရေနံနှင့်သဘာဝဓာတ်ငွေ့လမ်းညွှန်ချက်စံနှုန်းဖြစ်သော Ester base အတွက် ထိန်းချုပ်ကန့်သတ်မှတ် (control limit) ဖြစ်သော 9.4 % နှင့် ကိုက်ညီပါသည်။ ထို့အပြင် ၎ရည်နမူနာများကိုမူ ကုမ္ပဏီ၏နောက်ထပ်ရည်ညွှန်းချက် အချက်အလက်များအတွက်သာ စုဆောင်း၍ အကဲဖြတ်ဆန်းစစ်ခဲ့ပါသည်။ စုစုပေါင်းမာကျူရီ နှင့် စုစုပေါင်း ကဒ်မီယံ (စတော့ဘာရိုက်ရှိ) ကိုလည်း စစ်ဆေးခဲ့ပါသည်။ ရလဒ်များအရ စုစုပေါင်းမာကျူရီ (စတော့ဘာရိုက်ရှိ) ပမာဏသည် 0.511 - 0.540 mg/kg (ခြောက်သွေ့အလေးချိန်) ကြားတွင်ရှိပြီး ကဒ်မီယံ (စတော့ဘာရိုက်ရှိ) ပမာဏသည် စမ်းသပ်စစ်ဆေးမတွေ့ရှိရသော ND အခြေအနေဖြစ်ပါသည်။ ယင်းရလဒ် များကို အမျိုးသားသဘာဝပတ်ဝန်းကျင်ဆိုင်ရာအရည်အသွေး(ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်များနှင့် နှိုင်းယှဉ် ကြည့်သောအခါ အမှတ်များအားလုံးရှိ မာကျူရီ နှင့် ကဒ်မီယံ (စတော့ဘာရိုက်ရှိ) ပမာဏများသည် စံသတ်မှတ်ချက်များနှင့် ကိုက်ညီမှု ရှိသည်ကို တွေ့ရှိရပါသည်။

၅.၃.၂ မိလ္လာရေဆိုးစောင့်ကြည့်စစ်ဆေးခြင်း

မိလ္လာရေဆိုးစောင့်ကြည့်စစ်ဆေးခြင်း ကို REM-UAE က ၂၀၁၉ ခုနှစ် ဒီဇင်ဘာလ ၁၁ ရက်နေ့တွင် NCB Rig ရှိ မိလ္လာရေဆိုးသန့်စင်ရေးစနစ်ရေထုတ်ပေါက်မှ ရယူစစ်ဆေးခဲ့ပါသည်။ ရလဒ်များအရ Thermo Tolerant Coliform Bacteria (FCB)၊ BOD၊ COD နှင့် pH တန်ဖိုးများသည် ၁၆၀၀၀၀MPN/၁၀၀ml၊ ၁၉.၈mg/L ၃၅၆ mg/L နှင့် ၈.၂ အသီးသီးရှိပါသည်။ ၎င်းရလဒ်များကို Resolution of the Marine Environment Protection Committee MEPC.159 (55) နှင့် နှိုင်းယှဉ်ကြည့်ပါက FCB နှင့် COD မှ လွဲ၍ ကျန်ရလဒ်များသည် ကိုက်ညီမှုရှိသည်ကို တွေ့ရှိရပါသည်။ တိုင်းတာမှုညွှန်းကိန်း (ပါရာမီတာ) များအားလုံးသည် မိလ္လာရေဆိုးဆိုင်ရာညစ်ညမ်းမှုတားဆီးရေးအသိအမှတ်ပြု လက်မှတ်ပါ ကန့်သတ်မှတ်များနှင့်ကိုက်ညီမှုရှိစေရန် မိလ္လာရေဆိုးသန့်စင်ခြင်းစနစ်ကို ပိုမိုတိုးတက်ကောင်းမွန်အောင် ဆောင်ရွက်သွားမည်ဖြစ်ပါသည်။

Executive Summary

REM-UAE Laboratory and Consultant Company Limited conducted compliance audit of implementation of environmental mitigation measures and monitoring program for M9 West Appraisal and Exploration Drilling in Offshore Block M9.

The objective of the review was to evaluate the effectiveness of implementation of the Environmental Management Plan, including both mitigation and monitoring measures, defined in the EIA report. Report includes any potential problems or obstacles and propose recommendation for improvement in order to ensure the effectiveness of the prevention and mitigation measures.

The evaluation process includes (1) meeting with PTTEPI personnel, (2) site observation and interview with PTTEPI' representatives, and (3) document review.

1. Project Description

The M9 West Appraisal and Exploration Drilling in Offshore Block M9 Project ("the Project") is an existing development operated by PTTEP International Limited (PTTEPI), a subsidiary of PTTEP. The location of this project is in Block M9. The proposed project concerns the drilling of a maximum of ten appraisal/exploration wells in the western part of block M9 with an objective to confirm the presence of hydrocarbon reservoirs. This would further support the development of the existing Zawtika field. Potential reserves have been identified as a result of PTTEPI's previous offshore seismic program that provides the justification for advancing these 10 well drilling campaigns. In additional, the project already proceeded exploration drilling for 2 wells, Pundarika and Aungpyitan.

2. Facilities and Utilities

2.1 Support Vessels

PTTEPI will have two primary support vessels. The support vessels are diesel-engine vessels, which have a fuel consumption rate of 20 mt/day. Each vessel will have approximately 8-10 crewmembers. The vessels will support project activities throughout the preparation, drilling, and well abandonment phases. There will be between 6-10 trips per month for supply runs between the M9 west project area and the Ranong shore base. The estimated volume of dirty oil onboard the supply vessels is around 0.2 - 0.4 m^3 per month, which will be sent onshore for disposal

2.2 Shore Base

There will be two shore bases for the project. The Thaketa Base, in Myanmar and Ranong shore base located in Ranong, Thailand. The drill rig will mobilize from Singapore. There will be approximately 8 - 10 personnel working at the shore bases.

The shore base is equipped with an office building, warehouse, material yard, temporary waste and chemical storage, etc. PTTEPI's shore base contains:

2.2.1 Warehouse

2.2.2 Material yard

The area will be used as temporary storage for bulk material, pipes, and other equipment delivered by vendors. Material and equipment stored here will be delivered to the project area or other areas of PTTEPI's operations via supply vessels.

2.2.3 Chemical and waste storage area

The area will be used for temporary waste and chemical storage. Drilling chemicals will not be stored over night; they will be sent to the offshore operation on the day that the chemicals arrive at the shore base. The area will be used for temporary storage of general waste from offshore operations before being disposed of by contractors on the day that the wastes arrive at the shore base.

2.3 Accommodation

During drilling activities, accommodation for drilling workers will be provided on the drilling rig. Workers working on support vessels will be accommodated in the allocated accommodation on the vessels.

2.4 Water Supply and Usage

The project's activities in each phase utilize water for various purposes as summarized in the table below.

Table 1 Type of water and volume of water use in the project activities.

Project Activities	Type of Potable Water	Water Source	Quantity of Potable Water/Day (m3)
Production well drilling, well logging and production well preparation	Potable water for staff on drilling rig	Bottled water/ water producing unit on drilling rig	31.2
	Daily use water for staff on vessels	Water storage tanks in operational vessels	12.4

The water supply system on the drilling unit typically comprises an on-board water maker unit with a capacity equal to 200% of the daily consumption. The volume generated is in the range of 43.6 m^3/day. Water is pumped from the sea, filtered, desalinized and sterilized. The water based drilling fluids will be prepared with seawater.

2.5 Power supply

Power to the rig for supporting drilling activities will be supplied by 6 generators driven by diesel engines. One spare generator will be used in case of an emergency situation or during service or repair of one of the main generators. Estimated fuel consumption, based on previous projects using rigs with similar power requirements, is 35 m^3/day.

2.6 Transportation

Transportation of materials and equipment, chemicals and waste from drilling rig to the Onshore Support Base will be conducted mainly by material support vessels. A helicopter will be used to transfer staff, with capacity of 12 staff per flight. Staff transfer to the Project area by helicopter takes 1 hour 10 minutes.

2.7 Solid Waste Transportation

After solid wastes are transported to the shore base, PTTEPI's drilling contractor will arrange to transport the wastes to appropriate disposal facilities according to waste type. No wastes will be stored on the shore base over night. The disposal facilities are located no more than 50 km from the shore base. The non-hazardous and hazardous waste will be transferred to Thaketa shore base for further disposal according to PTTEPI's Waste Management Plan.

2.8 Chemical Transportation

A local contractor will be supplying chemicals for this drilling program. During the M9 West appraisal and exploration drilling program, Chemicals will be transported from the local contractor' storage to the Ranong shore base over a 50 km distance. No chemicals will be stored at the shore base; chemical will be transported to the shore base on the day of shipping out.

Emissions, discharges and waste generation will conform to applicable government regulations in Myanmar.

3. Exploration Drilling Emissions, Discharges and Waste Generation

3.1 Air Emission

3.1.1 Drilling Rig Emissions

Diesel generators will be used as a source of power supply for the drilling rig. The generators will operate 24 hr/day throughout all project activities on the rig during the project's duration (40 days per well). Estimated fuel consumption for the rig power plant amounts to 11,130 L/day, or 11.13 m^3/day. Based on a compilation of air pollution emission factors established by the U.S. Environmental Protection Agency (EPA), air pollutant emissions from the generators on the rig during the worst case drilling is 307.2 tons nitrogen oxides, 20.4 tons sulphur oxides and 66.4 tons of carbon monoxide

3.1.2 Greenhouse Gas (GHG) Emissions

Estimated quantity of greenhouse gas emissions from the M9 West Exploration Drilling Project in drilling phase (power generation, marine transportation, and road transportation) are a one-time release of 69,604.1 tonnes CO_2 eq.

3.1.3 Fugitive Releases

Other releases to the atmosphere will arise as a result of fugitive emissions of methane and nonmethane hydrocarbons from a range of sources including, fuel bunkering, transfer operations. Particulate emissions (dust) will also arise during bulk materials transfer operations, such as barite or cement loading, from the bulk handling system vents. Releases of ozone depleting substances (ODS) may arise during maintenance of HVAC systems as well as from fugitive sources associated with such equipment. Compared to the continuous emissions from the online power generation equipment on the offshore drilling unit and supply vessels, quantities of fugitive emissions are unlikely to be significant.

3.2 Wastewater

3.2.1 Sanitary Wastewater

Sanitary wastewater includes wastewater from both the sanitation facilities and the food canteen facilities on the drilling rig and support vessels. Sanitary wastewater from support vessels will be discharged directly to sea at a distance of over 12 nautical miles from the nearest shore. Sanitary wastewater from the drilling rig will be piped to the on-board wastewater treatment system prior to discharge. The discharge location will be at greater than 12 nautical miles from the nearest shore. These methods comply with MARPOL 73/78 (Annex 4) requirements

3.2.2 Drainage

Drainage water consists of ballast water and deck drainage from both support vessels and the drilling rig, and may be contaminated with oil and grease. Drainage water will be collected and treated at the oil/water separator, installed on the rig and both support vessels. The oil/water separator will separate water from oil prior to discharging the water portion to the sea. Treated wastewater shall comply with MARPOL 73/78 Annex 4 requirements, which regulate pollution prevention of vessel and ship drainage (oil content < 100 ppm discharged at more than 12 nautical miles from the nearest shore or not over 15 ppm at less than 12 nautical miles). Separated oil and grease will be collected in an oil container for further onshore disposal.

3.2.3 Drilling Waste

It is estimated that approximately cutting generated 596 m^3 per well for normal well and 1,005 m^3 per well for deep well of cuttings for each of the option will be generated from the appraisal and exploration drilling program, which will be eventually discharged at sea after being treated overboard. Mud will be removed from the cuttings to the extent possible.

PTTEPI will discharge cuttings with a maximum of 6.9% Cuttings Base Fluid Retention (CBFR) for SBM sections. It is estimated that a maximum of 160 m^3 of water based drilling mud will be left as residual on the discharged cuttings or 75.2 m^3 of synthetic based drilling muds will be left as residual on the discharged cuttings depending on the option used.

The recovered mud will be re-conditioned and returned to the mud circulation system. The mud in casings will come out and be treated through the shaker system and reused. After completion of the drilling campaign, the drilling mud will be kept for future campaigns or returned to the drilling mud suppliers. No direct discharge of mud will be allowed.

The project already proceeded exploration drilling for 2 wells (Pundarika and Aungpyitan) while the others have not drilled. The amount of cutting disposed during 2 wells operation of M9 West exploration activities are presented in the Table 2

Table 2 The amount of cutting disposed during operation of M9 West exploration activities

Well name	Amount WBM Cutting Disposed (Ton)	Amount SBM Cutting Disposed (Ton)
Pundarika	848.61	1,117.59
Aungpyitan	825.87	1,050.70

3.3 Solid Wastes

PTTEPI has developed a Waste Management Plan to ensure correct and safe handling and disposal of non-hazardous and hazardous waste generated from the project. This plan applies to all sites managed by PTTEPI and to all personnel including contractors. This procedure deals with waste classification, segregation, handling, temporary sites, waste transfer, storage, and disposal facilities, record and reporting of non-hazardous waste and hazardous waste produced by PTTEPI

3.3.1 Type and Amount of Waste Generated

Solid wastes from the proposed project consist of non-hazardous waste and hazardous waste.

- Non-Hazardous Waste: includes paper, plastic, and other uncontaminated materials. Food wastes will be milled (<25 mm diameter) and discharged into the sea more than 12 miles offshore as per practices of MARPOL Convention. All non-food wastes will be collected for compaction and transport to the Thaketa Support Base for final disposal.

  No solid waste is intentionally disposed of into the marine environment as per MARPOL specification.
- Hazardous Waste: includes all types of used oil, oil-contaminated water, expired cooling agents, fluorescent lights, chemical and expired chemical and solution, contaminated clothes, chemical containers, batteries, used PPE, residual material contaminated with oil or chemical, etc.

  Non-hazardous and hazardous wastes will be segregated and appropriately disposed of by the drilling contractor according to the PTTEPI Waste Management Plan. The waste disposal facilities available wastes as follows;
  - Yangon City Development Committee (YCDC) surface disposal yards and incinerator.
  - Hazardous Waste area a DOWA Thilawa Waste Management Facility.
  - Dumping at sea (e.g. biodegradable waste, treated drilling mud & cutting, blasting grit, treated produced water.)

The quantities of non-hazardous and hazardous wastes generated during 2 wells operation of M9 West exploration activities are presented in the Table 3.

Table 3 Quantities of Waste Generated during 2 wells operation

Waste Type	Quantity of generated waste (Ton)
Non-hazardous waste	63.54
Hazardous waste	26.88

4. Project's Environmental, Social and Health Policies

PTTEPI 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 Corporate Vision, Mission, and Values and PTTEPI's SSHE Policy. Proactive individual involvement, responsibility and accountability are expected of all employees, contractors and third-party personnel. PTTEPI SSHE Management System (SSHE MS) is designed to align all stakeholders' efforts to enable attainment of these principles.

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

5. Compliance Status

The results determined that the project completely complied on the Mitigation Measures during well drilling phase with 100 % and unplanned events are completely complied on the Mitigation 100% also.

PTTEPI complied with all of the mitigation measures prescribed in the EIA. Main issues are summarized below.

5.1 Environmental Mitigation Measures Compliance Result in well drilling phase

- Air Quality / Climate - Routine inspection and preventive maintenance for all machinery were conducted as follow yearly PM and Inspection Plan. SAP system was used to support for the PM plan of this project.
- Underwater Noise - PTTEPI strictly implement and follow mitigation by provided Radio operator and support vessel to monitor safety zone to avoid collision.
- Seawater & Sediment Quality - Seawater and WBM were the priority as drilling fluid at all wells. The mud circulation system was provided to circulate mud for recycling. SBM was used by technical reason. Chemical used and discharge of cutting were recorded by the project.SDS was provided at all chemical storage area of NCB Rig. Low toxicity of chemical was used in this project. And SDS was provided to identify the toxic of chemical.
- Marine Biota, Endangered Species, Sensitive / Protected Areas - PTTEPI strictly implement and follow mitigation measures for impacts to Marine Biota, Endangered Species, Sensitive / Protected Areas
- Fisheries - The project information and drilling plan were informed to all related organizations by PTTEPI before starting of drilling activity. An exclusion zone (radius of 500 m) was already established surrounding the drilling rig. Project has 3 support vessels for warning off traffic. Appropriate lights and warning signals were already provided around the NCB Rig and support vessels.

- Shipping - PTTEPI provided appropriate lights, warning signals, communication tools, and a reflected radar signal on all vessels to prevent accidental collision, established a 500 m safety zone around the drilling rig and also used support vessels to warn off traffic.
- Waste Management - Waste containers were provided at NCB Rig and supply vessel. All waste was collected in garbage bag before drop in waste containers. Waste containers were covered to protect from the environment. The waste from NCB Rig and vessel was transferred to dispose onshore by authorized contractor. PTTEPI followed the requirements of MARPOL 73/78 and PTTEPI's Waste Management Procedure. Crew was prohibited to drop waste into the sea. Food grinder was provided to grind the food waste to 25 mm prior to discharge to sea.
- Socio-economy - Local goods and services such as local workers from contractor were added to work on rig during drilling period
- Occupational Health and Safety - PTTEPI's Occupational Health Management Standard was already prepared and enforced the worker and contractor to implement. All related staffs were already trained about safe handling of the chemicals as follow PTTEPI Chemical handling. Personnel protective equipment were already provided to all project's staffs. Safety training was provided for all project's staffs as follow the PTTEPI SSHE Training and Competency Standard. The PTTEPI's MERP was already provided. In case of emergency, the patients will transfer to the hospital in Yangon by helicopter. Chemical storage area was provided adequately. SDS was attached at all chemical storage area. The condition of storage area was regularly inspected by project's staff. Spill kits and first aid kits were already provided at NCB Rig. The sanitary systems such as drinking water, canteen, coffee corner, toilet and rest area were properly provided at NBC Rig. At high noise level area, the noise protection equipment was already provided on site. There were total 10 cases of incident from project activity in the driiling phase including 5 case of property damage or loss, 1 cases of near miss, 3 cases of first aid case and 1 case of Tier 3 LOPC. Corrective actions were proposed/implemented to prevent reoccurrence

- Public health - PTTEPI's Occupational Health Management Standard was already prepared and enforced the worker and contractor to implement. The PTTEPI's MERP was already provided. In case of emergency, the patients will transfer to the hospital in Yangon by helicopter.

5.2 Environmental Mitigation Measures Compliance Result in Unplanned Events

- Collision - The emergency response plan for vessel collision was already provided at NCB Rig as follow the PTTEPI Zawtika Offshore Field Emergency Response Plan.

- Fuel, Oil, Chemical or Hazardous Waste /Materials Spill - The emergency response plan for accidental spills was already provided at NCB Rig as follow the PTTEPI Spill Contingency Plan. Oil spill case will be monitoring and recording by project's staff. Currently, oil spill case was not found from project operation. The BOP equipment was provided for blowout prevention during drilling activity. Moreover, the PTTEPI Blowout Contingency Plan was already provided.

- Blowout - The Spill kits, PTTEPI Spill Contingency Plan and PTTEPI Blowout Contingency Plan were already provided at NCB Rig as follow MARPOL 73/78. Safety training was provided for all project's staffs as follow the PTTEPI SSHE Training and Competency Standard.

- Tropical cyclone / Typhoon - The emergency response plan for tropical cyclone was already provided at NCB Rig as follow the PTTEPI Tropical Cyclone Procedure. The emergency drill for tropical cyclone escape was already trained to all staff.

- Fire or Explosion - The fire fighting equipments were already provided around the operation and living area. The fire plan was attached on both of operation and living area. Emergency plan for fire or explosion was already provided. Moreover, emergency drill was performed regularly.

5.3 Environmental Monitoring Result

The project has completely complied the environmental impact monitoring as specified in EIA, including Mud, Cutting and Stock Barite Monitoring and Seawage monitoring.

5.3.1 Mud, Cutting and Stock Barite Monitoring

Mud and Cuttings were collected during drilling by project staff. The results found that Chloride (for WBM) are in range of 0.21 - 0.31 %w/w. For oil on cutting (OOC), The results of oil on cutting are in range of 0.06 - 7.11% OOC (dry weight) which meet the control limit of 9.4 % for Ester base, refer to IFC EHS Offshore Oil and Gas Guideline) for Existing Facilities. In addition, the sample of mud were collected and analyszed just for further reference by company. For total mercury and total cadmium (in stock barite) were analyzed, The results found that total Mercury (in stock barite) was vary from 0.511 - 0.540 mg/kg (dry weight) and Cadmium (in stock Barite) was ND. When compared the results with National Environmental Quality (Emission) Guidelines found that Mercury and Cadmium (in stock barite) at all station are complied with the standard.

5.3.2 Sewage Monitoring

Sewage monitoring was conducted by REM-UAE Laboratory and Consultant Company Limited on December 11, 2019 from sewage treatment system discharge point at NCB Rig. The result found that Thermo Tolerant Coliform Bacteria (FCB), BOD, COD and pH were 160,000 MPN/100ml, 19.8 mg/L, 356 mg/L and 8.2 respectively. When compared sewage monitoring results with Resolution of the Marine Environment Protection Committee MEPC.159 (55) found that all parameter meets the MEPC.159 (55) except FCB and COD. The performance of sewage treatment system has to be considered and improved to ensure that all parameters will meet the control limit as per their Sewage Pollution Prevention Certificate.

Chapter 1

Introduction

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Introduction

1.1 Introduction

The M9 West Appraisal and Exploration Drilling in Offshore Block M9 Project ("the Project") is an existing development operated by PTTEP International Limited (PTTEPI), a subsidiary of PTTEP. The location of this project is in Block M9. The proposed project concerns the drilling of a maximum of ten appraisal/exploration wells in the western part of block M9 with an objective to confirm the presence of hydrocarbon reservoirs. This would further support the development of the existing Zawtika field. Potential reserves have been identified as a result of PTTEPI's previous offshore seismic program that provides the justification for advancing this 10 wells drilling campaign. In additional, the project already proceeded exploration drilling for 2 wells, Pundarika and Aungpyitan.

According to the Environmental Impact Assessment Procedure (EIA) issued by Ministry of Natural Resources and Environmental Conservation (MONREC) – Notification No.616/2015 the project is classified as an EIA type economic activity. Therefore, International Environmental Management Co. Ltd. (IEM) and local partner Environmental Quality Management Co. Ltd. (EQM) have been contracted by PTTEPI to prepare an environmental impact assessment report (EIA) for the proposed exploration drilling project ("the Project"). The Environmental Impact Assessment (EIA) Report of the Project was submitted to Myanma Oil and Gas Enterprise (MOGE) and Environmental Conservation Department (ECD) on 18th February 2019, according to the submission letter no. PTTEPI. 13253/01-3604/2018 (Appendix A-1). After that ECD called reviewed team meeting on 6th September 2019 and requested PTTEPI to revise the EIA report. Then PTTEPI submitted the revised EIA report on 5th November 2019 (Appendix A-2). EIA report was approved on 18th June 2020 by MOGE and 11th June 2020 by ECD according to the approval letter number MD – (100) 3/6 (1246) 2020 and EIA-2/ Peteroleum (1294/2020) respectively (Appendix A3).

As per commitment in EIA Report, PTTEPI has the responsibility to follow the environmental mitigation and monitoring measures including submits the monitoring report to MOGE and ECD. Therefore, PTTEPI, as the project owner, has assigned a qualified third party, REM-UAE Laboratory and Consultant Company Limited to perform compliance audit of the mitigation measures and perform the monitoring at frequency specified in the EIA's environmental management plan and report the results to MOGE and ECD as prescribing in EIA.

1.2 Objective

The main objectives of this report are:

1) To evaluate the effectiveness of implementation of the Environmental Management Plan, including both mitigation and monitoring measures, defined in the EIA report
2) To report any potential problems or obstacles and propose recommendation for improvement in order to ensure the effectiveness of the prevention and mitigation measures.

1.3 Project Location

PTTEPI was granted the petroleum Production Sharing Contract (PSC) for offshore Block M9, owned by Myanma Oil & Gas Enterprise (MOGE). PTTEPI is an Operator of Production Sharing Contract (PSC) of Block M9, which is located in the Gulf of Martaban. Block M9 is located in the Gulf of Martaban, Andaman Sea, at approximately 300 km from the south Yangon and 230 km west of Dawei.The water depth in the block ranges from approximately 50 to 800 m. The coordinates of Block M9 as shown in Table 1-1.

Table 1-1 Coordinates of Block M9

Corner point	Coordinates (UTM Datum WGS 1984)	
	East (X)	North (Y)
A	372579.95	1621791.57
B	526918.12	1621473.25
C	526997.77	1547740.56
D	483801.37	1547731.44
E	483792.28	1533323.39
F	445688.58	1533375.42
G	445719.02	1547783.91
H	372202.84	1548045.6

Remark : PTTEPI, 2019

The coordinates of ten potential wells are presented in Table 1-2. And the potential location of the ten appraisal/exploration wells within the Block M9 as shown in Figure 1-1.

Table 1-2 Coordinates of ten potential wells

Stations	Coordinates (UTM Datum WGS 1984)				Well Name
	Latitude (N)	Longitude (E)	East (X)	North (Y)	
ST.1	14° 25' 17.370" N	94° 55' 51.250" E	708169	1595216	-
ST.2	14° 20' 44.800" N	94° 56' 26.920" E	709308	1586847	Aungtagun-1 (ATG-1)
ST.3	14° 20' 0.140" N	95° 12' 21.570" E	737931	1585730	-
ST.4	14° 19' 51.230" N	95° 7' 37.620" E	729423	1585377	Uppala-1 (UPL-1)
ST.5	14° 12' 53.230" N	95° 1' 36.570" E	718714	1572431	Aungpyitan (APT-1)
ST.6	14° 13' 49.540" N	95° 6' 28.280" E	727446	1574240	-
ST.7	14° 5' 7.080" N	94° 57' 23.470" E	711244	1558038	-
ST.8	14° 5' 37.430" N	95° 17' 4.620" E	746675	1559291	-
ST.9	14° 7' 36.180" N	95° 12' 29.260" E	738379	1562862	Pundarika-1 (PDK-1)
ST.10	14° 8' 23.210" N	94° 49' 52.510" E	697668	1563957	-

Remark: PTTEPI, 2019

1.4 Status of Current Operations

Current operation of M9 West Appraisal and Exploration Drilling in Offshore Block M9 is in drilling phase, the progress of project is summarized as below (Table 1-3 and Figure 1-2)

Table 1-3 Operational status of the M9 West Appraisal and Exploration Drilling in Offshore Block M9 Project

Stations	Well Name	Current Status
ST.1	-	not start yet
ST.2	Aungtagun-1 (ATG-1)	not start yet
ST.3	-	not start yet
ST.4	Uppala-1 (UPL-1)	not start yet
ST.5	Aungpyitan(APT-1)	Drilling Completed
ST.6	-	not start yet
ST.7	-	not start yet
ST.8	-	not start yet
ST.9	Pundarika-1 (PDK-1)	Drilling Completed
ST.10	-	not start yet

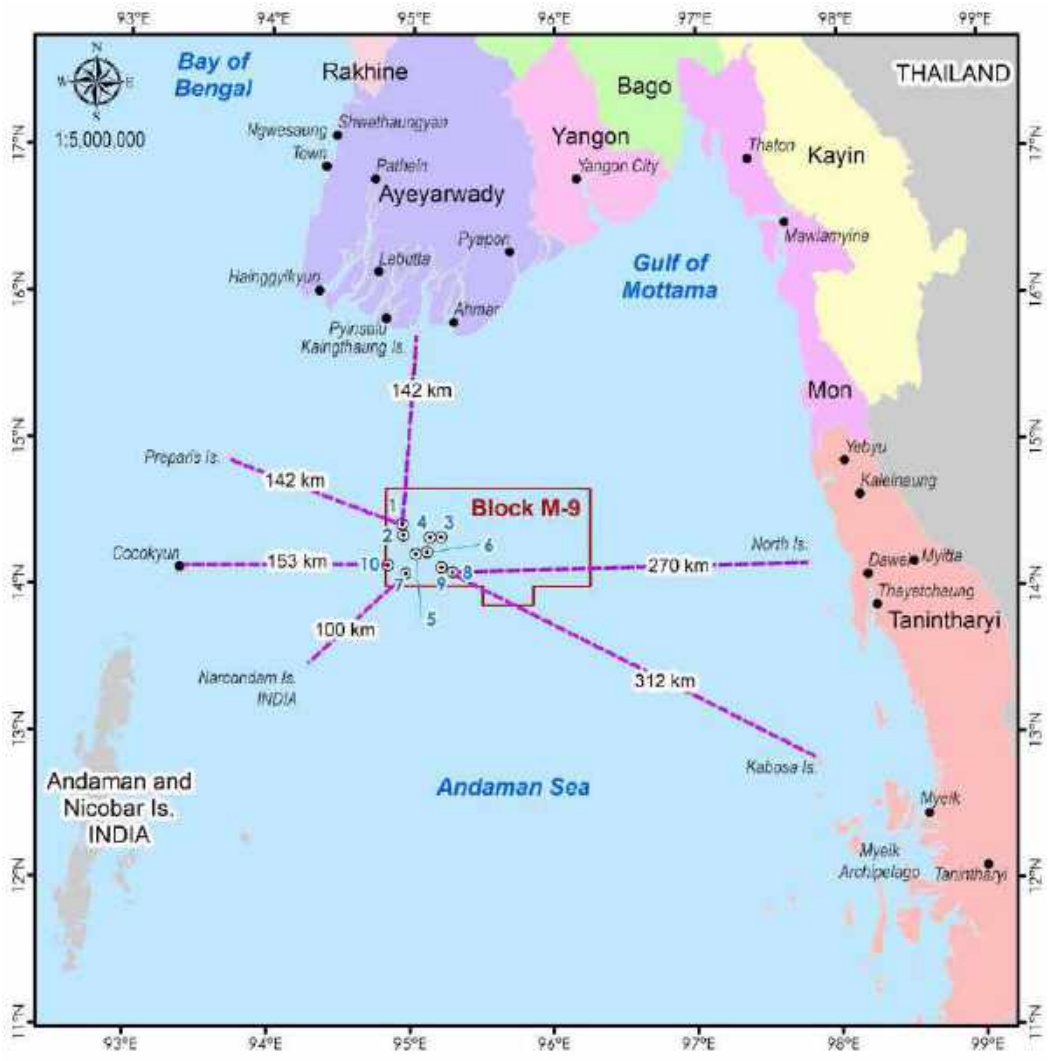


Figure 1-1 The potential location of the ten appraisal/exploration wells within the Block M9

Remark: PTTEPI, 2019

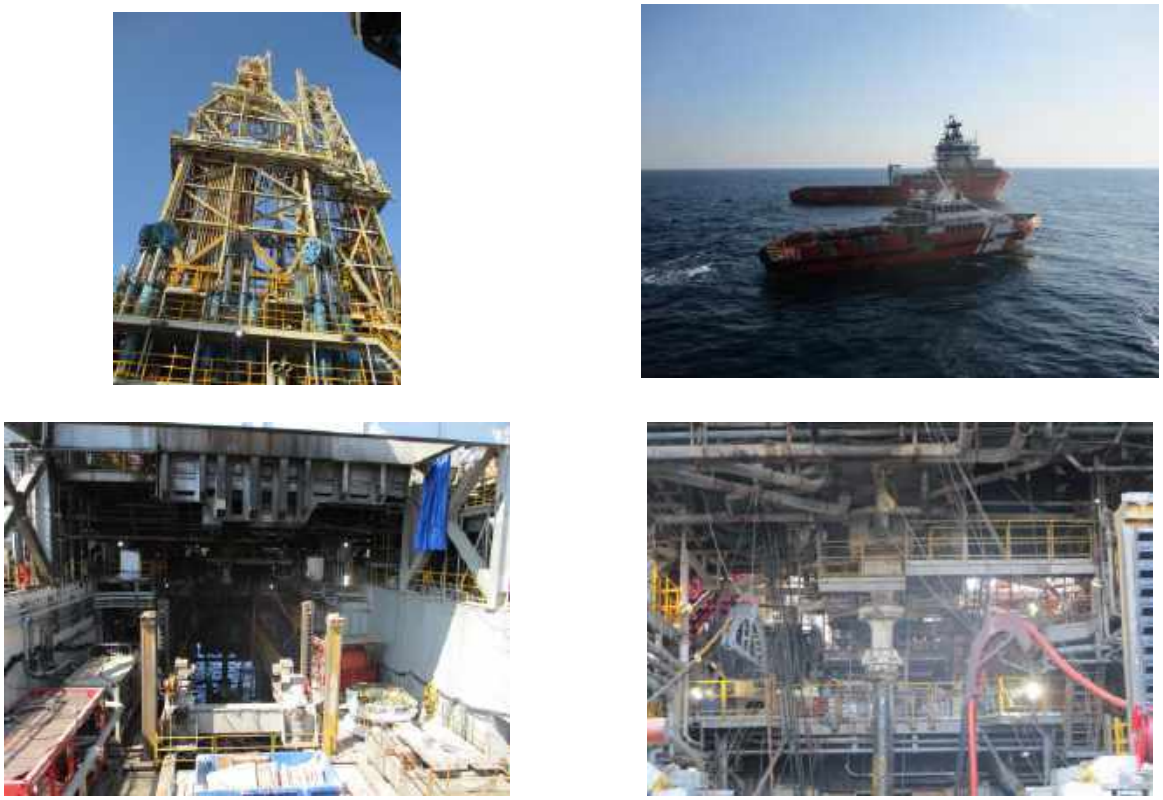


Figure 1-2 Current condition of M9 West Appraisal and Exploration Drilling in Offshore Block M9 Project in Drilling Phase

1.5 Components of Project's Facilities

1.5.1 Facilities and Utilities

1) Support Vessels

PTTEPI will have two primary support vessels. The support vessels are diesel-engine vessels, which have a fuel consumption rate of 20 mt/day. Each vessel will have approximately 8 - 10 crewmembers. The vessels will support project activities throughout the preparation, drilling, and well abandonment phases. There will be between 6-10 trips per month for supply runs between the M9 west project area and the Ranong shore base. The estimated volume of dirty oil onboard the supply vessels is around 0.2 - 0.4 m^3 per month, which will be sent onshore for disposal.

2) Shore Base

There will be two shore bases for the project. The Thaketa Base, in Myanmar and Ranong shore base located in Ranong, Thailand. The drill rig will mobilize from Singapore. There will be approximately 8 - 10 personnel working at the shore bases. The shore base is equipped with an office building, warehouse, material yard, temporary waste and chemical storage, etc. PTTEPI's shore base contains:

1. Warehouse:
2. Material yard: The area will be used as temporary storage for bulk material, pipes, and other equipment delivered by vendors. Material and equipment stored here will be delivered to the project area or other areas of PTTEPI's operations via supply vessels.
3. Chemical and waste storage area: The area will be used for temporary waste and chemical storage. Drilling chemicals will not be stored over night; they will be sent to the offshore operation on the day that the chemicals arrive at the shore base. The area will be used for temporary storage of general waste from offshore operations before being disposed of by contractors on the day that the wastes arrive at the shore base.

3) Accommodation

During drilling activities, accommodation for drilling workers will be provided on the drilling rig. Workers working on support vessels will be accommodated in the allocated accommodation on the vessels.

4) Water Supply and Usage

The project's activities in each phase utilize water for various purposes as summarized in the Table 1-4.

Table 1-4 Type of water and volume of water use in the project activities.

Project Activities	Type of Potable Water	Water Source	Quantity of Potable Water/Day (m^3)
Production well drilling, well logging and production well preparation	Potable water for staff on drilling rig	Bottled water/ water producing unit on drilling rig	31.2
	Daily use water for staff on vessels	Water storage tanks in operational vessels	12.4

The water supply system on the drilling unit typically comprises an on-board water maker unit with a capacity equal to 200% of the daily consumption. The volume generated is in the range of 43.6 m^3/day. Water is pumped from the sea, filtered, desalinized and sterilized. The water based drilling fluids will be prepared with seawater.

5) Power supply

Power to the rig for supporting drilling activities will be supplied by 6 generators driven by diesel engines. One spare generator will be used in case of an emergency situation or during service or repair of one of the main generators. Estimated fuel consumption, based on previous projects using rigs with similar power requirements, is 35 m^3/day.

6) Transportation

Transportation of materials and equipment, chemicals and waste from drilling rig to the Onshore Support Base will be conducted mainly by material support vessels. A helicopter will be used to transfer staff, with capacity of 12 staff per flight. Staff transfer to the Project area by helicopter takes 1 hour 10 minutes.

7) Solid Waste Transportation

After solid wastes are transported to the shore base, PTTEPI will arrange to transport the wastes to appropriate disposal facilities according to waste type. No wastes will be stored on the shore base over night. The disposal facilities are located no more than 50 km from the shore base. The non-hazardous and hazardous waste will be transferred to Thaketa shore base for further disposal according to PTTEPI's Waste Management Plan.

8) Chemical Transportation

A local contractor will be supplying chemicals for this drilling program. During the M9 West appraisal and exploration drilling program, Chemicals will be transported from the local contractor' storage to the Ranong shore base over a 50 km distance. No chemicals will be stored at the shore base; chemical will be transported to the shore base on the day of shipping out.

1.5.2 Exploration Drilling Emissions, Discharges and Waste Generation

Emissions, discharges and waste generation will conform to applicable government regulations in Myanmar.

1) Air Emission

1.1) Drilling Rig Emissions

Diesel generators will be used as a source of power supply for the drilling rig. The generators will operate 24 hr/day throughout all project activities on the rig during the project's duration (40 days per well). Estimated fuel consumption for the rig power plant amounts to 11,130 L/day, or 11.13 m^3/day. Based on a compilation of air pollution emission factors established by the U.S. Environmental Protection Agency (EPA), air pollutant emissions from the generators on the rig during the worst case drilling is 307.2 tons nitrogen oxides, 20.4 tons sulphur oxides and 66.4 tons of carbon monoxide

1.2) Greenhouse Gas (GHG) Emissions

Estimated quantity of greenhouse gas emissions from the M9 West Exploration Drilling Project in drilling phase (power generation, marine transportation, and road transportation) are a one-time release of 69,604.1 tonnes CO_2 eq.

1.3) Fugitive Releases

Other releases to the atmosphere will arise as a result of fugitive emissions of methane and nonmethane hydrocarbons from a range of sources including, fuel bunkering, transfer operations. Particulate emissions (dust) will also arise during bulk materials transfer operations, such as barite or cement loading, from the bulk handling system vents. Releases of ozone depleting substances (ODS) may arise during maintenance of HVAC systems as well as from fugitive sources associated with such equipment. Compared to the continuous emissions from the online power generation equipment on the offshore drilling unit and supply vessels, quantities of fugitive emissions are unlikely to be significant.

2) Wastewater

2.1) Sanitary Wastewater

Sanitary wastewater includes wastewater from both the sanitation facilities and the food canteen facilities on the drilling rig and support vessels. Sanitary wastewater from support vessels will be discharged directly to sea at a distance of over 12 nautical miles from the nearest shore. Sanitary wastewater from the drilling rig will be piped to the on-board wastewater treatment system prior to discharge. The discharge location will be at greater than 12 nautical miles from the nearest shore. These methods comply with MARPOL 73/78 (Annex 4) requirements

2.2) Drainage

Drainage water consists of ballast water and deck drainage from both support vessels and the drilling rig, and may be contaminated with oil and grease. Drainage water will be collected and treated at the oil/water separator, installed on the rig and both support vessels. The oil/water separator will separate water from oil prior to discharging the water portion to the sea. Treated wastewater shall comply with MARPOL 73/78 Annex 4 requirements, which regulate pollution prevention of vessel and ship drainage (oil content < 100 ppm discharged at more than 12 nautical miles from the nearest shore or not over 15 ppm at less than 12 nautical miles). Separated oil and grease will be collected in an oil container for further onshore disposal.

2.3) Drilling Waste

It is estimated that approximately cutting generated 596 m^3 per well for normal well and 1,005 m^3 per well for deep well of cuttings for each of the option will be generated from the appraisal and exploration drilling program, which will be eventually discharged at sea after being treated overboard. Mud will be removed from the cuttings to the extent possible.

PTTEPI will discharge cuttings with a maximum of 6.9% Cuttings Base Fluid Retention (CBFR) for SBM sections. It is estimated that a maximum of 160 m^3 of water based drilling mud will be left as residual on the discharged cuttings or 75.2 m^3 of synthetic based drilling muds will be left as residual on the discharged cuttings depending on the option used.

The recovered mud will be re-conditioned and returned to the mud circulation system. The mud in casings will come out and be treated through the shaker system and reused. After completion of the drilling campaign, the drilling mud will be kept for future campaigns or returned to the drilling mud suppliers. No direct discharge of mud will be allowed.

The project already proceeded exploration drilling for 2 wells (Pundarika and Aungpyitan) while the others have not drilled. The amount of cutting disposed during 2 wells operation of M9 West exploration activities are presented in the Table 1-5

Table 1-5 The amount of cutting disposed during operation of M9 West exploration activities

Well name	Amount WBM Cutting Disposed (Ton)	Amount SBM Cutting Disposed (Ton)
Pundarika	848.61	1,117.59
Aungpyitan	825.87	1,050.70

3) Solid Wastes

PTTEPI has developed a Waste Management Plan to ensure correct and safe handling and disposal of non-hazardous and hazardous waste generated from the project. This plan applies to all sites managed by PTTEPI and to all personnel including contractors. This procedure deals with waste classification, segregation, handling, temporary sites, waste transfer, storage, and disposal facilities, record and reporting of non-hazardous waste and hazardous waste produced by PTTEPI

3.1) Type and Amount of Waste Generated

Solid wastes from the proposed project consist of non-hazardous waste and hazardous waste.

1. Non-Hazardous Waste: includes paper, plastic, and other uncontaminated materials. Food wastes will be milled (<25 mm diameter) and discharged into the sea more than 12 miles offshore as per practices of MARPOL Convention. All non-food wastes will be collected for compaction and transport to the Thaketa Support Base for final disposal. No solid waste is intentionally disposed of into the marine environment as per MARPOL specification.

2. Hazardous Waste: includes all types of used oil, oil-contaminated water, and expired cooling agents, fluorescent lights, chemical and expired chemical and solution, contaminated clothes, chemical containers, batteries, used PPE, residual material contaminated with oil or chemical, etc.

Non-hazardous and hazardous wastes will be segregated and appropriately disposed of by the drilling contractor according to the PTTEPI Waste Management Plan. The waste disposal facilities available wastes as follows;

- Yangon City Development Committee (YCDC) surface disposal yards and incinerator,
- Hazardous Waste area a DOWA Thilawa Waste Management Facility,
- Dumping at sea (e.g. biodegradable waste, treated drilling mud & cutting, blasting grit, treated produced water.)

The quantities of non-hazardous and hazardous wastes generated during 2 well s operation of M9 West exploration activities are presented in the Table 1-6.

Table 1-6 Quantities of Waste Generated during 2 wells operation

Waste Type	Quantity of generated waste (ton)
Non-hazardous waste	63.54
Hazardous waste	26.88

1.5.3 Project's Environmental, Social and Health Policies

PTTEPI 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 Corporate Vision, Mission, and Values and PTTEPI's SSHE Policy. Proactive individual involvement, responsibility and accountability are expected of all employees, contractors and third party personnel. PTTEPI SSHE Management System (SSHE MS) is designed to align all stakeholders' efforts to enable attainment of these principles.

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

PTTEPI'S SSHE Policy

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).

To accomplish this, PTTEP Myanmar Asset Implements Safety, Security, Health and Environmental Management System (SSHE-MS) that outlines the main principles and accountabilities to drive for continuous improvement. We are committed to:

- Comply with Myanmar SSHE laws, other applicable requirements and PTTEP Standards.
- Perform hazard identification and SSHE risk assessments so that risks are as low as Reasonably Practicable (ALARP).
- Hold employees accountable for SSHE performance by setting and monitoring SSHE Plans and KPIs.
- Prevent operational and process incidents by implementing asset integrity programs and monitoring of Safety Critical Elements addressed in Safety Cases and complying with Management of Change (MOC) Standard.
- Work with contractors and suppliers to achieve PTTEP's SSHE requirement.
- Ensure all employees and contractors are assessed and maintain the required level of job and SSHE competency.
- Apply "Stop Work Authority Policy" for unsafe work by implementing Behavior-Based Safety (BBS) programs to improve positive SSHE culture.
- Implement security management for potential threats to safeguard personnel, assets, information and reputation.
- Promote occupational health and hygiene in the workplace by conducting health risk assessments, medical surveillances, education and regular industrial hygiene monitoring.
- 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 with corrective actions follow up for continuous improvement.

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

1.5.4 PTTEPI'S Environmental, Social and Health Management System

The objective of PTTEPI' s SSHE MS 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 1-7. 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. Additional SSHE documents are available from PTTEPI upon request as needed.

Table 1-7 PTTEPI SSHE Management System Standards

Item	Document Code	Document
1	11027-PDR-SSHE-340-007-R01	Myanmar Asset SSHE Management System
2	11027-PDR-SSHE-340-003-R01	SSHE Training and Competency Procedure
3	11027-PDR-SSHE-564-002-R00	Myanmar Asset Alcohol and Drugs Testing Procedure
4	Myanmar 13036-PDR-078	PTTEPI SSHE Requirements for Contractors
5	Myanmar-0550-STD-014	SSHE Regulatory Compliance Standard
6	Myanmar-SSHE-11027-PDR-508	Fitness to Work Procedure
7	11027-PDR-SSHE_503/01-R02	Myanmar Asset Waste Management Procedure
8	11027-PDR-SSHE-502-006-R01	Myanmar Asset Emergency Management Plan
9	11027-PDR-SSHE-501-005-R00	Myanmar Asset Crisis Management Plan
10	11027-PDR-SSHE-530-004-R00	Myanmar Asset Security Management Procedure
11	11027-PDR-SSHE-501/03-R02	Myanmar Asset Blowout Contingency Plan
12	11027-PDR-SSHE-501/03-R02	Myanmar Asset Spill Contingency Plan
13	11027-PDR-401-R02	Working in Adverse Weather Procedure (offshore)
14	Myanmar-0550-PDR-008	PTTEP Crisis Communication Plan
15	Myanmar-SSHE-11027-PDR-506	Offshore Medical Emergency Response Plan (MERP)
16	11027-PDR-SSHE-507-R05	Myanmar Asset Tropical Cyclone Procedure
17	Myanmar-SSHE-11027-PDR-516	Offshore Helicopter Emergency Landing Procedure

1.5.5 Environmental Monitoring and Mitigation Measure Implementation Compliance

According to EIA, the environmental mitigation measures implementation audit which considered environmental issues and essential impacts that may occur were conducted in the drilling phase of the project in 2019 by REM-UAE, as the environmental consultant of the project together with the representation from PTTEPI. The results were described in Chapter 2. The environmental monitoring measures were implemented on December 8 -12, 2019 and the results were presented in Chapter 3 and the conclusion was summarized in Chapter 4.

Chapter 2

Environmental Mitigation Measures Implementation Compliance Audit

Chapter 2

Environmental Mitigation Measures Implementation Compliance Audit

Environmental Mitigation Measures Implementation Compliance audit was carried out by REM-UAE Laboratory and Consultant Company Limited together with representatives from PTTEPI. The audit conducted against the mitigation measures specified in EIA as detailed in Appendix B.

Audit was performed at Block M9, Drilling Rig Noble Clyde Boudreaux (NCB) and document checking by setting 4 levels of evaluation as follows;

- Completely complied on the Mitigation Measures (✓) refers the project can complete comply with the measure without any barriers.
- Mostly complied on the Mitigation Measures (✓) refers the project can mostly comply with the measure without any barriers.
- Do not complied on the Mitigation Measures (×) refers the project cannot comply with the measure because of some barriers.
- Do not have situation follows the Mitigation Measures (**NA**) refers during the project operations do not have any of situation follow the Mitigation Measures.

Although, if the project does not comply with the mitigation measures, REM-UAE Laboratory and Consultant Company Limited will identify the cause of problems, barriers and solutions ways. But from the audit, it was found that PTTEPI have a hudred percent (100%) comply with the mitigation measures. The details are shown in Table 2-1 to Table 2-2 as followed;

Table 2-1 Environmental Mitigation Measure Implementation Compliance Result Summary in Drilling Phase of M9 West

Aspects	Activity	Potential Impacts	Mitigation Measures	Status	Details	Remarks / Reference
Environmental Mitigation Measure						
Physical Resources						
1. Air Quality / Climate	1.1 Crew / Materials Transport 1.2 Offshore Fuel Storage & Handling 1.3 Energy Use	1.1.1 Deterioration of air quality due to emissions and GHG Release contributing to climate change	1.1.1.1. Routine inspection and preventive maintenance as per maintenance schedule / recommended by manufacturers to ensure efficiency of combustion.	✓	- Routine inspection and preventive maintenance for all machinery were conducted as follow routine PM and Inspection Plan. SAP system are used for support the PM plan of this project.	Figure 2-1, Figure 2-2
2. Underwater Noise	2.1 Drilling	2.1.1 Increased underwater noise from underwater drilling	2.1.1.1 During drilling, radio operator will be checking time by time to perform visual observations for endangered marine animals around rig area from the support vessels.	✓	- The project's radio operator has regulary observed around rig area from the control room. However, since the project started drilling in Pundarika and Aungpyitan well (September 2019 until January 2020), endangered marine animals were not found.	Figure 2-3
			2.1.1.2 Support vessels will not travel greater than 6 knots within 300 m of a whale, if sighted, (caution zone) and approach no closer than 100 m from a whale.	✓	- Since The project started drilling in Pundarika and Aungpyitan well, The project did not find any whale.	-

Table 2-1 Environmental Mitigation Measure Implementation Compliance Result Summary in Drilling Phase of M9 West

Aspects	Activity	Potential Impacts	Mitigation Measures	Status	Details	Remarks / Reference
			2.1.1.3 Vessel bridge crew to maintain continuous visual watch of any hazards (including marine mammals and marine turtles).	✓	- The project provided staff for all vessels to invigilate any hazards and to avoid vessel collision with marine animals. However, since the project started drilling in Pundarika and Aungpyitan well marine mammals and marine turtles were not found.	Figure 2-3 and 2-4
			2.1.1.4 Avoid vessel collision with marine mammals and turtles.	✓	- The project's radio operator has regulary observed around rig area from the control room. The project also provided staff for all vessels to invigilate any hazards and to avoid vessel collision with marine animals. However, since the project started drilling in Pundarika and Aungpyitan well marine mammals and marine turtles were not found.	Figure 2-3 and 2-4
			2.1.1.5 Record observed endangered marine animals found in project area.	✓	- Since The project started drilling in Pundarika and Aungpyitan well, endangered marine animals were not found in project area. However, the project's radio operator has regulary observed around rig area from the control room.	Figure 2-3 and 2-4

Table 2-1 Environmental Mitigation Measure Implementation Compliance Result Summary in Drilling Phase of M9 West

Aspects	Activity	Potential Impacts	Mitigation Measures	Status	Details	Remarks / Reference
3. Seawater &Sediment Quality	3.1 Offshore Fuel Storage & Handling 3.2 Hazardous Materials Handling and Storage 3.3 Wastewater Disposal 3.4 Non-Hazardous And Hazardous Waste Handling and Storage 3.5 Mud & Cuttings	3.1.1 Deterioration due to spill of fuel / chemicals / drilling mud 3.1.2 Degradation due to sediment disturbance, mud & cutting disposal 3.1.3 Degradation from other discharges	3.1.1.1 Each vessel greater than 400 gross tons will comply with all MARPOL73 / 78 fuel storage, waste treatment and disposal regulations.	✓	- All of the project's vessel that bigger than 400 gross tons comply with all MARPOL73 / 78 fuel storage, waste treatment and disposal regulations.	Appendix E-1
			3.1.1.2 Provide appropriate lights and warning signals on all vessels to prevent accidental collision.	✓	- Appropriate lights and warning signals were already provided around the NCB Rig and support vessels.	Figure 2-5
			3.1.1.3 Comply with all International Maritime Organization (IMO) standards regarding vessel seaworthiness and maritime safety.	✓	- The project's operation has completed with all International Maritime Organization (IMO) standards regarding vessel seaworthiness and maritime safety. Also insist firmly to contractor to comply with this standards. For example, food grinder was provided to grind the food waste to 25 mm before discharge to sea, Effective wastewater treatment system was provided to make quality of the wastewater discharge meets the criteria of MARPOL 73 / 78.	Figure 2-13 and Appendix F
			3.1.1.4 Regularly monitor safety zone within 500 m-radius surrounding drilling rig to prevent any accidents.	✓	- The project has provided buoy to mark the boundary of safety zone, 500 m-radius surrounding drilling rig, and has regularly monitored the safety zone to prevent any accidents from the control room also. However, since the project started drilling in Pundarika and Aungpyitan well	Figure 2-3

Table 2-1 Environmental Mitigation Measure Implementation Compliance Result Summary in Drilling Phase of M9 West

Aspects	Activity	Potential Impacts	Mitigation Measures	Status	Details	Remarks / Reference
					(August 2019) until December 2019, there are no accidents around drilling rig.	
			3.1.1.5 Regularly patrol by support vessels to observe leaks, spills and determine potential causes.	✓	- The project has provided staff on support vessel to regularly patrol any leaks, spills and determine potential causes. However, since the project started drilling in Pundarika and Aungpyitan well (August 2019) until December 2019, leaking and spilling were not occur.	Figure 2-4
			3.1.1.6 Use Blowout Preventer-BOP to control blowout.	✓	- The BOP equipment was provided for blowout prevention during drilling activity. Moreover, the PTTEPI Blowout Contingency Plan was already provided.	Figure 2-6
			3.1.1.7 Drill cuttings will comply with IFC environmental, health and safety guidelines for offshore oil and gas development (2015).	✓	- The project comply with IFC environmental, health and safety guidelines for offshore oil and gas development (2015).	-
			3.1.1.8 A Drill Cuttings and Fluid Plan will be submitted to ECD.	✓	- The project already submitted a Drill Cuttings and Fluid Plan to ECD together with EIA. - Drill Cuttings and Fluid Plan	Figure 2-7
			3.1.1.9 PTTEPI will maintain a list of indicative Drilling Chemicals.	✓	- PTTEPI has maintained list of indicative Drilling Chemicals as Material Safety Data Sheet (MSDS) on rig, especially, in	Figure 2-8 and Appendix D

Table 2-1 Environmental Mitigation Measure Implementation Compliance Result Summary in Drilling Phase of M9 West

Aspects	Activity	Potential Impacts	Mitigation Measures	Status	Details	Remarks / Reference
					chemical using and storage area to informative staff about the potential hazards (health, fire, reactivity and environmental) and how to work safely with the indicative Drilling Chemicals.	
			3.1.2.1 Select the appropriate drilling method to reduce the amount of drilling mud and cuttings discharged.	✓	- The mud circulation system was provided to circulate mud for recycling	Figure 2-9
			3.1.2.2 Use low toxic & biodegradable mud system that will rapidly degrade in the natural environment.	✓	- SBM was used by technical reason. However, the mud circulation system was provided to circulate mud for recycling.	Figure 2-9 and Appendix D
			3.1.2.3 Discharge all the cuttings overboard through a caisson.	✓	- The project has complied and also used mud circulation system for recycle mud to the process and reduce discharge.	Figure 2-9
			3.1.2.4 Maintain effectiveness of mud and cuttings treatment unit by routine PM program.	✓	- PM plan was provided to maintain effectiveness of mud and cuttings.	Figure 2-2
			3.1.2.5 For NADF mud chemicals: disposed ship-to-shore, no discharge to sea.	✓	- The project did not discharge any mud to sea but use mud circular system to circulate mud in drilling's precess	Figure 2-9

Table 2-1 Environmental Mitigation Measure Implementation Compliance Result Summary in Drilling Phase of M9 West

Aspects	Activity	Potential Impacts	Mitigation Measures	Status	Details	Remarks / Reference
			3.1.2.6 For the cuttings the discharge to sea will follow the requirements of IFC 2015 offshore guidelines. The mud & cuttings will treated in cuttings dryers to meet the requirements for discharge at sea of 6.9% on wet cuttings.	✓	- Cuttings were discharged at 15 m below sea surface to limit area of cuttings dispersion in the sea.	Figure 2-9
			3.1.2.7 Comply with all International Maritime Organization (IMO) standards regarding vessel seaworthiness and maritime safety.	✓	- The project's operation has completed with all International Maritime Organization (IMO) standards regarding vessel seaworthiness and maritime safety. Also insist firmly to contractor to comply with this standards. For example, food grinder was provided to grind the food waste to 25 mm before discharge to sea, Effective wastewater treatment system was provided to make quality of the wastewater discharge meets the criteria of MARPOL 73 / 78.	Figure 2-13 and Appendix F
			3.1.3.1 The drilling rig shall be equipped with bund wall to prevent oil and chemical spills. Any spilled oil and chemicals will be collected into a sealed container.	✓	- The project provide bund wall for chemicals storage area, chemical containers, machinery and joints of any pipes to prevent oil and chemical spills and provide emergency spill kits also.	Figure 2-10

Table 2-1 Environmental Mitigation Measure Implementation Compliance Result Summary in Drilling Phase of M9 West

Aspects	Activity	Potential Impacts	Mitigation Measures	Status	Details	Remarks / Reference
			3.1.3.2 Support vessels will divert contaminated water from different parts of ship to treatment before drainage to the sea.	✓	- The project provide waste water treatment for all support vessels for treatment before drainage to the sea.	Appendix F
			3.1.3.3 Store, separate, transport and dispose of waste following PTTEPI's Waste Management Procedure.	✓	- The project strictly follow PTTEPI's Waste Management Procedure to store, separate, transport and dispose of waste by provide separation bins for store and support waste separation and also provide waste compacter to compress volume of waste before ship to shore.	Figure 2-11, 2-12 and Appendix E-1
			3.1.3.4 Provide effective wastewater treatment system to ensure that the quality of the wastewater discharge meets the criteria of MARPOL 73 / 78.	✓	- Effective wastewater treatment system was provided to make quality of the wastewater discharge meets the criteria of MARPOL 73 / 78.	Appendix F
			3.1.3.5 Food waste must be shredded to smaller than 25 mm before discharge to sea.	✓	- The project already provided food grinder and assigned staff to take food waste to shred by food grinder before discharge to sea everyday.	Figure 2-13

Table 2-1 Environmental Mitigation Measure Implementation Compliance Result Summary in Drilling Phase of M9 West

Aspects	Activity	Potential Impacts	Mitigation Measures	Status	Details	Remarks / Reference
Biological Resources						
4. Marine Biota, Endangered Species, Sensitive / Protected Areas	4.1 Crew / Materials Transport 4.2 Offshore Fuel Storage & Handling 4.3 Wastewater Disposal 4.4 Hazardous Materials Handling and Storage 4.5 Presence of Equipment and Facilities 4.6 Rig Placement 4.7 Mud & Cuttings	4.1.1 Toxicity effects from oil / hazardous material spill and blowout 4.1.2 Aquatic Biota an Endangered marine animals migrate from the survey area	4.1.2.1 Comply with all International Maritime Organization (IMO) standards regarding vessel seaworthiness and maritime safety.	✓	- The project's operation has completed with all International Maritime Organization (IMO) standards regarding vessel seaworthiness and maritime safety. Also insist firmly to contractor to comply with this standards. For example, food grinder was provided to grind the food waste to 25 mm before discharge to sea, Effective wastewater treatment system was provided to make quality of the wastewater discharge meets the criteria of MARPOL 73 / 78.	Figure 2-13 and Appendix F
			4.1.2.2 Provide an effective wastewater treatment system to ensure that the quality of the wastewater discharge meets the criteria of MARPOL 73 / 78.	✓	- Effective wastewater treatment system was provided to make quality of the wastewater discharge meets the criteria of MARPOL 73 / 78.	Appendix F
			4.1.2.3 Food waste must be shredded to smaller than 25 mm before discharge to sea.	✓	- The project already provided food grinder and assigned staff to take food waste to shred by food grinder before discharge to sea everyday.	Figure 2-13

Table 2-1 Environmental Mitigation Measure Implementation Compliance Result Summary in Drilling Phase of M9 West

Aspects	Activity	Potential Impacts	Mitigation Measures	Status	Details	Remarks / Reference
			4.1.2.4 Regularly monitor the safety zone (500 m-radius surrounding drilling rig) to prevent any accidents.	✓	- The project provide buoy to mark the boundary of safety zone, 500 m-radius surrounding drilling rig , and use software for regularly monitor that safety zone to prevent any accidents also.	Figure 2-14
			4.1.2.5 Regularly patrol by support vessels to observe leaks, spills and determine potential causes.	✓	- The project has provided staff on support vessel to regularly patrol any leaks, spills and determine potential causes. However, since the project started drilling in Pundarika and Aungpyitan well leaking and spilling were not occur.	Figure 2-5
			4.1.2.6 Comply with all fuel storage, waste treatment and disposal regulations / procedures (MARPOL 73 / 78 regulations and PTTEPI standards / procedures).	✓	- The project complied with all fuel storage, waste treatment and disposal regulations / procedure (MARPOL 73 / 78 regulations and PTTEPI standards / procedures).	Figure 2-11, 2-12 and Appendix E-1
			4.1.2.7 Store, separate, transport and dispose of waste following PTTEPI's Waste Management Plan.	✓	- The project strictly follow PTTEPI's Waste Management Procedure to store, separate, transport and dispose of waste by provide separation bins for store and support waste separation and also provide waste compacter to compress volume of waste before ship to shore.	Figure 2-11, 2-12 and Appendix E-1

Table 2-1 Environmental Mitigation Measure Implementation Compliance Result Summary in Drilling Phase of M9 West

Aspects	Activity	Potential Impacts	Mitigation Measures	Status	Details	Remarks / Reference
			4.1.2.8 Avoid transportation near areas with endangered marine animals.	✓	- The project's radio operator has regulary observed around rig area from the control room. The project also provided staff for all vessels to invigilate any hazards and to avoid vessel collision with marine animals. However, since the project started drilling in Pundarika and Aungpyitan well, endangered marine animals were not found.	Figure 2-3 and 2-4
			4.1.2.9 During drilling, radio operator will be checking time by time to perform visual observations for endangered marine animals around rig area from the support vessels.	✓	- The project's radio operator has regulary observed around rig area from the control room. However, since the project started drilling in Pundarika and Aungpyitan well, endangered marine animals were not found.	Figure 2-3 and 2-4
			4.1.2.10 Support vessels will not travel greater than 6 knots within 300 m of a whale, if sighted,(caution zone) and approach no closer than 100 m from a whale.	✓	- Since the project started drilling in Pundarika and Aungpyitan well, the project did not find any whale.	Figure 2-3

Table 2-1 Environmental Mitigation Measure Implementation Compliance Result Summary in Drilling Phase of M9 West

Aspects	Activity	Potential Impacts	Mitigation Measures	Status	Details	Remarks / Reference
			4.1.2.11 Vessel bridge crew to maintain continuous visual watch of any hazards (including marine mammals and marine turtles).	✓	- The project provided staff for all vessels to invigilate any hazards and to avoid vessel collision with marine animals. However, since the project started drilling in Pundarika and Aungpyitan well marine mammals and marine turtles were not found.	Figure 2-5
			4.1.2.12 Avoid vessel collision with marine mammals and turtles.	✓	- The project's radio operator has regulary observed around rig area from the control room. The project also provided staff for all vessels to invigilate any hazards and to avoid vessel collision with marine animals. However, since the project started drilling in Pundarika and Aungpyitan well marine mammals and marine turtles were not found.	Figure 2-5
			4.1.2.13 Record observed endangered marine animals found in project area.	✓	- Since The project started drilling in Pundarika and Aungpyitan well, the project was not finding any endangered marine animals project area.	Figure 2-3
			4.1.2.14 Use Blowout Preventer-BOP to control blowout.	✓	- The BOP equipment was provided for blowout prevention during drilling activity. Moreover, the PTTEPI Blowout Contingency Plan was already provided.	Figure 2-6

Table 2-1 Environmental Mitigation Measure Implementation Compliance Result Summary in Drilling Phase of M9 West

Aspects	Activity	Potential Impacts	Mitigation Measures	Status	Details	Remarks / Reference
Social Mitigation Measures						
5. Fisheries	5.1 Crew / Materials Transport 5.2Wastewater Disposal 5.3Presence of Equipment and Facilities 5.4Drilling & Completion of Wells 5.5Mud & Cuttings	5.1.1 Impacts from fishing area restriction, tainting or contamination of fish from spills, discharges, and collisions 5.1.2 Accidental collision	5.1.1.1 Implement PTTEPI's Grievance Mechanism.	✓	- The project already provided PTTEPI's Grievance Mechanism. However, since the project started drilling in Pundarika and Aungpyitan well, there was no any Complaints.	-
			5.1.1.2 Establish a 500 m safety zone around the drilling rig.	✓	- The project provide buoy to mark the boundary of safety zone, 500 m-radius surrounding drilling rig, and use software for regularly monitor that safety zone to prevent any accidents also.	Figure 2-14
			5.1.1.3 Use support vessels to warn off traffic.	✓	- The project has provided support vessels to warn traffic.	Figure 2-4
			5.1.1.4 Provide appropriate lights and warning signals on all vessels to prevent accidental collision.	✓	- Appropriate lights and warning signals were already provided around the NCB Rig and support vessels.	Figure 2-5

Table 2-1 Environmental Mitigation Measure Implementation Compliance Result Summary in Drilling Phase of M9 West

Aspects	Activity	Potential Impacts	Mitigation Measures	Status	Details	Remarks / Reference
6. Shipping	6.1 Crew / Materials Transport 6.2 Presence of Equipment and Facilities	6.1.1 Increased shipping traffic 6.1.2 Accidental collision established a 500 m safety zone around the drilling rig.	6.1.1.1 Established a 500 m safety zone around the drilling rig.	✓	- The project provide buoy to mark the boundary of safety zone, 500 m-radius surrounding drilling rig , and use software for regularly monitor that safety zone to prevent any accidents also.	Figure 2-14
			6.1.1.2 Use support vessels to warn off traffic.	✓	- The project has provided 3 support vessels to warn traffic.	Figure 2-4
			6.1.1.3 Provide appropriate lights, warning signals, communication tools, and a reflected radar signal on all vessels to prevent accidental collision.	✓	- Appropriate lights and warning signals were already provided around the NCB Rig and support vessels.	Figure 2-5
7. Waste Management	7.1 Non-Hazardous and Hazardous Waste Handling and Storage 7.2 Wastewater Disposal 7.3 Mud and Cuttings	7.1.1 Direct impact on seawater quality, seabed sediment, and marine organism 7.1.2 Indirect impact on fisherman 7.1.3 Pressure on existing waste management facilities	7.1.1.1 Store, separate, transport and dispose of waste following PTTEPI's Waste Management Plan.	✓	- The project strictly follow PTTEPI's Waste Management Procedure to store, separate, transport and dispose of waste by provide separation bins for store and support waste separation and also provide waste compacter to compress volume of waste before ship to shore.	Figure 2-11, 2-12 and Appendix E-1
			7.1.1.2 Do not drop any non-food solid waste into the sea.	✓	- 'Stop Dropprd Objects' sign were provided to warn staff to not drop any non-food solid waste into the sea.	Figure 2-5

Table 2-1 Environmental Mitigation Measure Implementation Compliance Result Summary in Drilling Phase of M9 West

Aspects	Activity	Potential Impacts	Mitigation Measures	Status	Details	Remarks / Reference
			7.1.1.3 Store hazardous waste in containers that are durable and safe for transport / transfer. Also, store them in areas away from fire sources.	✓	- Hazardous waste was collocted in containers that are durable and safe for transport / transfer. Also, store them in isolated area away from fire sources.	Figure 2-11, 2-12 and Appendix E-1
			7.1.1.4 Record and examine the type and quantity of waste.	✓	- The project has examined and recorded the type and quantity of waste everyday.	Figure 2-16
			7.1.1.5 Ensure records of hazardous waste are kept.	✓	- The project has kept the records of hazardous waste in the control room.	Figure 2-16
Quality of Life Values						
8. Socio-Economy	8.1 Shore Base Support 8.2 Offshore Fuel Storage & Handling 8.3 Hazardous Materials Handling and Storage	8.1.1 Employment in come and procurement opportunities for people, business and services in surrounding area	8.1.1.1 Enhance utilization of local goods and services as much as possible	✓	- The contractor purchased 50% of foods / consumers products from local area in Myanmar and other 50% from other countries.	Figure 2-17 and Appendix G

Table 2-1 Environmental Mitigation Measure Implementation Compliance Result Summary in Drilling Phase of M9 West

Aspects	Activity	Potential Impacts	Mitigation Measures	Status	Details	Remarks / Reference
	8.4 Non-Hazardous and Hazardous Waste Handling and Storage 8.5 Labour, Equipment Services Supply					

Table 2-2 Health Mitigation Measure Implementation Compliance Result Summary in Drilling Phase of M9 West

Aspects	Activity	Potential Impacts	Mitigation Measures	Status	Details	Remarks / Reference
Health Mitigation Measures						
Health						
1. Occupational Health	1.1 Air Quality 1.2 Hydrogen Sulfide 1.3 Noise 1.4 Chemicals 1.5 Wastewater 1.6 Non-Hazardous Waste 1.7 Hazardous Waste 1.8 Accidents at Work Site 1.9 Transportation	1.1.1 Possible impact to occupational health from accidents, exposure to air pollutants, noise, exposure to fuel / chemicals / waste or contamination from accidental spills, concern and stress about accidents, spills, wastes, noise, etc. 1.1.2 Injuries or illness due to unsanitary conditions	1.1.1.1 Implement PTTEPI's SSHE Management System.	✓	- PTTEPI's SSHE Management System was already prepared and enforced the worker and contractor to implement.	Appendix C-1
			1.1.1.2 Implement strict mitigation measures for impacts on air and noise.	✓	- The project has implemented mitigation measures for impacts on air and noise strictly.	-
			1.1.1.3 Provide personal protective equipment (PPE) for all workers.	✓	- Personal protective equipment (PPE) were provided for all workers sufficiently	Figure 2-18
			1.1.1.4 Provide first-aid kits and first-aid rooms on vessels and at the shore base.	✓	- Fist-aid kits and Medical rooms were already provided on all vessels including at the shore base.	Figure 2-19
			1.1.1.5 Cooperate with the nearest health center / hospital in order to immediately support response to emergency events.	✓	- The project already contact with hospital in Yangon and provided Offshore Medical Emergency Response Plan (EMRP) on rig.	Figure 2-20
			1.1.1.6 Implement steps of operation for occupational, health, and	✓	- The project has strictly implemented all step of operation	Figure 2-15, 2-16

Table 2-2 Health Mitigation Measure Implementation Compliance Result Summary in Drilling Phase of M9 West

Aspects	Activity	Potential Impacts	Mitigation Measures	Status	Details	Remarks / Reference
			safety; and the protection and controlling of accidents : - Safety method for working with machines / equipment - Procedure for safety operation - Procedure for work permission - Provide SDS for all chemicals - Comply with all fuel storage, waste treatment and disposal regulations (MARPOL 73/78 regulations and PTTEPI standards / procedures) - Compliance monitoring system and record for hazardous wastes		for occupational, health, and safety; and the protection and controlling of accidents by provide HSE training and also HSE e-learning for staff. In addition, The project has provided safety information, work permission procedure and SDS on rig. The project also has complied with fuel storage, waste treatment and disposal regulations by stroe fuel in isolated area, manage rig's waste according to PTTEPI's Myanmar Asset Waste Management Procedure and regulary monitor and record quantity of waste.	2-21, 2-22 and Appendix C-1
			1.1.1.7 Provide a suitable work environment.	✓	- The project had good housekeeping to make a suitable work environment for staffs.	Figure 2-23

Table 2-2 Health Mitigation Measure Implementation Compliance Result Summary in Drilling Phase of M9 West

Aspects	Activity	Potential Impacts	Mitigation Measures	Status	Details	Remarks / Reference
			1.1.1.8 Provide fire protection equipment and manual for emergency management at project site.	✓	- The project has already provide equipment and manual for emergency management at project site.	Figure 2-22
			1.1.1.9 Set a 500 m safety zone around the project area and provide boats to notify fishing boats and commercial vessels to avoid entering the operation area.	✓	- The project provide buoy to mark the boundary of safety zone, 500 m-radius surrounding drilling rig ,use software for regularly monitor that safety zone and provide boats to notify fishing boats and commercial vessels to avoid entering the operation area.	Figure 2-14
			1.1.1.10 Provide safety measures relating to chemical hazards. - Store chemicals in closed containers and place in a chemical storage area with good ventilation. - Provide chemical protection equipment for workers handling chemicals and check the equipment usage of workers, such as respiratory protection devices, chemical protection gloves, dust	✓	- The project has complied with this measure by Store chemicals in closed containers and place in an isolated area, provided chemical protection equipment for workers handling chemicals and check the equipment usage of workers, such as respiratory protection devices, chemical protection gloves, dust protection glasses, and safety suite and also provided eye wash in chemical storage area, drilling rig area, and solid control system area.	Figure 2-1, 2-2, 2-15, 2-18 and 2-25

Table 2-2 Health Mitigation Measure Implementation Compliance Result Summary in Drilling Phase of M9 West

Aspects	Activity	Potential Impacts	Mitigation Measures	Status	Details	Remarks / Reference
			protection glasses, and safety suite. - Provide eye wash in chemical storage area, drilling rig area, and solid control system area.			
			1.1.2.1. Provide appropriate sanitation at working locations such as clean water and consumer goods.	✓	- The project has provided sanitation at working locations by keep good housekeeping and also has provide clean water and goods for staffs.	Figure 2-23 and 2-24
			1.1.2.2. Prepare sanitary housing for workers and provide health management systems and sanitation facilities with an adequate number of workers.	✓	- The project has provided adequate sanitary housing for workers and provide health management systems and sanitation facilities with an adequate number of workers	Figure 2-30
2. Public Health	2.1 Transportation	2.1.1 Health and Safety potentially affected by accident or injuries	2.1.1.1. Implement PTTEPI's Grievance Mechanism.	✓	- The project already provided PTTEPI's Grievance Mechanism. However, since the project started drilling in Pundarika and Aungpyitan well there was no any Complaints.	-

Table 2-2 Health Mitigation Measure Implementation Compliance Result Summary in Drilling Phase of M9 West

Aspects	Activity	Potential Impacts	Mitigation Measures	Status	Details	Remarks / Reference
		2.1.2 Reduced psychological wellbeing from concern regarding exposure or perceived exposure to hazard	2.1.1.2. At least 30 days prior to rig mobilization, coordinate with MOGE, who will then issue "Notice to Mariner" regarding project activities to appropriate parties.	✓	- The project already coordinate with MOGE to issue "Notice to Mariner" about project activities to appropriate parties before rig mobilization 30 days.	Appendix A-2
			2.1.1.3. A liaison officer and Myanmar translator will be on the rig during all operations.	✓	- The project has provided liaison officer and Myanmar translator for 24 hours on rig during all operations	Figure 2-26 and 2-27
			2.1.1.4. Establish 500 m safety zone around the drilling rig.	✓	- The project provide buoy to mark the boundary of safety zone, 500 m-radius surrounding drilling rig and use software for regularly monitor that safety zone and provide boats to notify fishing boats and commercial vessels to avoid entering the operation area.	Figure 2-14
			2.1.1.5. Use support vessels to warn off traffic.	✓	- The project has provided 3 support vessels to warn traffic.	Figure 2-4
			2.1.1.6. Provide appropriate lights and warning signals on all vessels to prevent accidental collision.	✓	- Appropriate lights and warning signals were already provided around the NCB Rig and support vessels.	Figure 2-5

Table 2-3 Environmental Mitigation Measure Implementation Compliance Result Summary in Unplanned Events

Aspects	Activity	Potential Impacts	Mitigation Measures	Status	Details	Remarks / Reference
Unplanned Events						
1. Collision	1.1 Ship Transportation	1.1.1 Possible collisions causing release of fuel / chemicals / wastes causing contamination of the sea, damage to vessels and possible injury and or loss of life	1.1.1.1 At least 30 days prior to rig mobilization, coordinate with MOGE, who will then issue "Notice to Mariner" regarding project activities to appropriate parties. (i.e. Department of Fisheries, Ministry of Livestock and Fisheries, and Marine Police Force)	✓	- The project already coordinate with MOGE to issue "Notice to Mariner" about project activities to appropriate parties before rig mobilization 30 days.	Appendix A-2
			1.1.1.2 A liaison officer and Myanmar translator will be on the rig during all operations.	✓	- The project provided liaison officer and Myanmar translator for 24 hours on rig during all operations	Figure 2-26 and 2-27
			1.1.1.3 Establish 500 m safety zone around the drilling rig.	✓	- The project already established 500 m safety zone around the drilling rig by using bouy.	-
			1.1.1.4 Use support vessels to warn off traffic.	✓	- The project has provided 3 support vessels to warn traffic.	Figure 2-4
			1.1.1.5 Provide appropriate lights and warning signals on all vessels to prevent accidental collision.	✓	- Appropriate lights and warning signals were already provided around the NCB Rig and support vessels.	Figure 2-5

Table 2-3 Environmental Mitigation Measure Implementation Compliance Result Summary in Unplanned Events

Aspects	Activity	Potential Impacts	Mitigation Measures	Status	Details	Remarks / Reference
			1.1.1.6 Provided adequate life-saving equipment as per SOLAS requirement.	✓	- The project already provided adequate life-saving equipment as per SOLAS requirement.	Figure 2-3 and 2-28
			1.1.1.7 Should an incident occur, PTTEPI's Emergency Response Plan would be implemented. Emergency response drills will be held once a year.	✓	- The project already provided PTTEPI's Emergency Response Plan. However, there was no any emergency occur, Emergency response drills has already hold.	Figure 2-29
2. Fuel, Oil, Chemical or Hazardous Waste / Materials Spill	2.1 Storage of Fuel, chemicals, hazardous materials or waste	2.1.1 Potential risk of spills to the environment affecting air quality, surface water quality, sediment quality, biota and people	2.1.1.1 Implement safety procedures as outlined in PTTEPI's Oil Contingency Plan.	✓	- The project already provided PTTEPI's Emergency Response Plan. However, there was no any emergency occur, Emergency response drills has already hold.	Figure 2-29
			2.1.1.2 Implement PTTEPI's Spill Contingency Plan and conduct rehearsal / training for staff to handle oil spill situations.	✓	- The project already provided PTTEPI's Spill Contingency Plan. However, there was no any emergency occur, Emergency response drills has already hold.	Figure 2-29
			2.1.1.3 Ensure that Oil Spill Response service contract with service provider are in places.	✓	- The project has already provided Emergency Spill Kits on rig.	Figure 2-31
			2.1.1.4 Appropriate medical care will be provided, clean-up will be	✓	- The project has provided appropriate medical room and the	Figure 2-32

Table 2-3 Environmental Mitigation Measure Implementation Compliance Result Summary in Unplanned Events

Aspects	Activity	Potential Impacts	Mitigation Measures	Status	Details	Remarks / Reference
			carried out, and incident or accident reports will be filed.		doctor has been on the rig 24 hours. The project also assign staffs to make an incident report by do The Stop Observation Checklist everyday.	
			2.1.1.5 Store all chemicals in secured storage area with impervious (cement or plastic sheet) floor and bund wall. Handle all chemicals according to their SDS.	✓	- The project has store all chemicals in isolated and secure area with bund wall and also provided SDS in this area.	Figure 2-8
			2.1.1.6 Investigate, correct and file incident or accident reports.	✓	- The project has investigated, corrected and reported accident.	Appendix C-2
3. Blowout	3.1 Drilling	3.1.1 Hydrocarbon discharge into the sea, impact to environment	3.1.1.1 Check shallow gas pockets during site survey before rig installation and exploration drilling.	✓	- The project already checked shallow gas pockets during site survey before rig installation and exploration drilling according to the drilling program.	Figure 2-7
			3.1.1.2 Check pressure in drilling well and mud circulation.	✓	- The project regularly check the pressure in drilling well and mud circulation according to PM plan.	Figure 2-2

Table 2-3 Environmental Mitigation Measure Implementation Compliance Result Summary in Unplanned Events

Aspects	Activity	Potential Impacts	Mitigation Measures	Status	Details	Remarks / Reference
			3.1.1.3 Conduct Table Top Oil Spill Response Drill for Tier 3 event and implement the plan in the unlikely event of an occurrence.	✓	- Emergency response drills has already hold including Table Top Oil Spill Response Drill for Tier 3 also. However, there was no unlikely event occurred.	Figure 2-29
			3.1.1.4 Ensure that Oil Spill Response service contract with service provider are in places.	✓	- The project has already provide Spill Kits on the rig.	Figure 2-31
			3.1.1.5 Test and Certify BOP in accordance with API 53.	✓	- The project already tested and certify BOP in accordance with API 53.	Figure 2-6
4. Tropical cyclone / Typhoon	4.1 Weather	4.1.1 Injuries or death 4.1.2 Damage to rig's structure 4.1.3 Impact on environment	4.1.1.1. Implement PTTEPI's Tropical Storm Emergency Plan and Emergency Response Plan.	✓	- The project has implemented PTTEPI's Tropical Storm Emergency Plan and Emergency Response Plan.	-
			4.1.1.1. Conduct drills according to Emergency Response Plan and Tropical Cyclone Procedure.	✓	- The project has provided Emergency Response Plan and Tropical Cyclone Procedure. Emergency response drills has already hold including Tropical Cyclone response also. However, since the project started drilling in Pundarika and Aungpyitan well, there was no unlikely event occurred.	Figure 2-29

Table 2-3 Environmental Mitigation Measure Implementation Compliance Result Summary in Unplanned Events

Aspects	Activity	Potential Impacts	Mitigation Measures	Status	Details	Remarks / Reference
			4.1.1.2. In the unlikely event an accident should occur, the Emergency Response Plan would be implemented, which includes evacuation of personnel during severe circumstances.	✓	- The project already provided PTTEPI's Emergency Response Plan. However, there was no any emergency occurred since the project started drilling in Pundarika and Aungpyitan well	-
5. Fire or Explosion	5.1 Fuel and chemical Storage	5.1.1 Possible explosion or fire on ship or drilling rig causing physical damage and possible injuries or loss of life and contamination of the sea	5.1.1.1 Provide fire protection equipment and manual for emergency management at project site, and provide the appropriate practice complying with mitigation measures.	✓	- Fire protection equipment and manual for emergency management were already provided for all staffs at project site.	Figure 2-33
			5.1.1.2 Implement Emergency Response Plan in case of fire occurrence.	✓	- Emergency Response Plan was alrady prepared. However, since the project started drilling in Pundarika and Aungpyitan well fire were not occur.	Figure 2-31

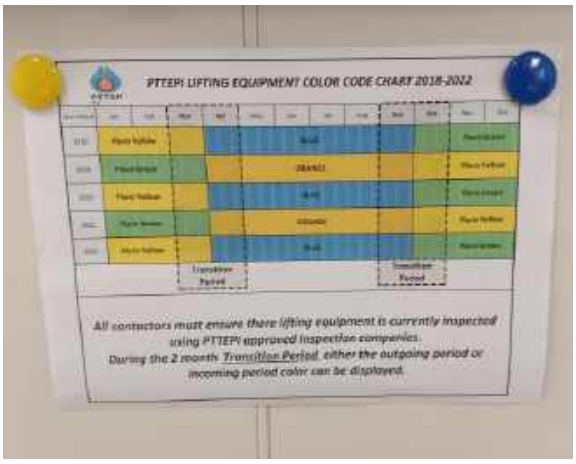


Figure 2-1 Inspection tag on equipment

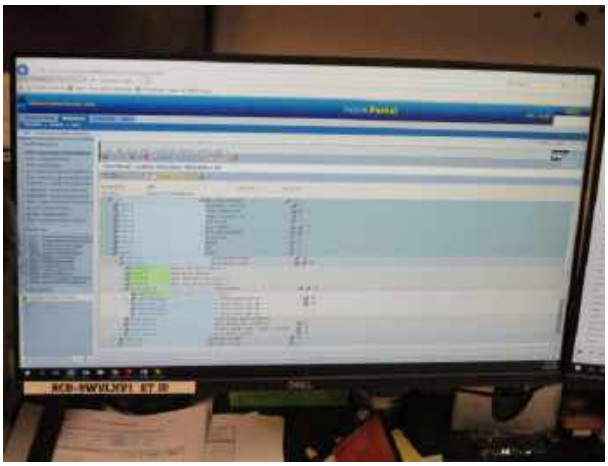


Figure 2-2 Display of SAP System (PM Planning System)

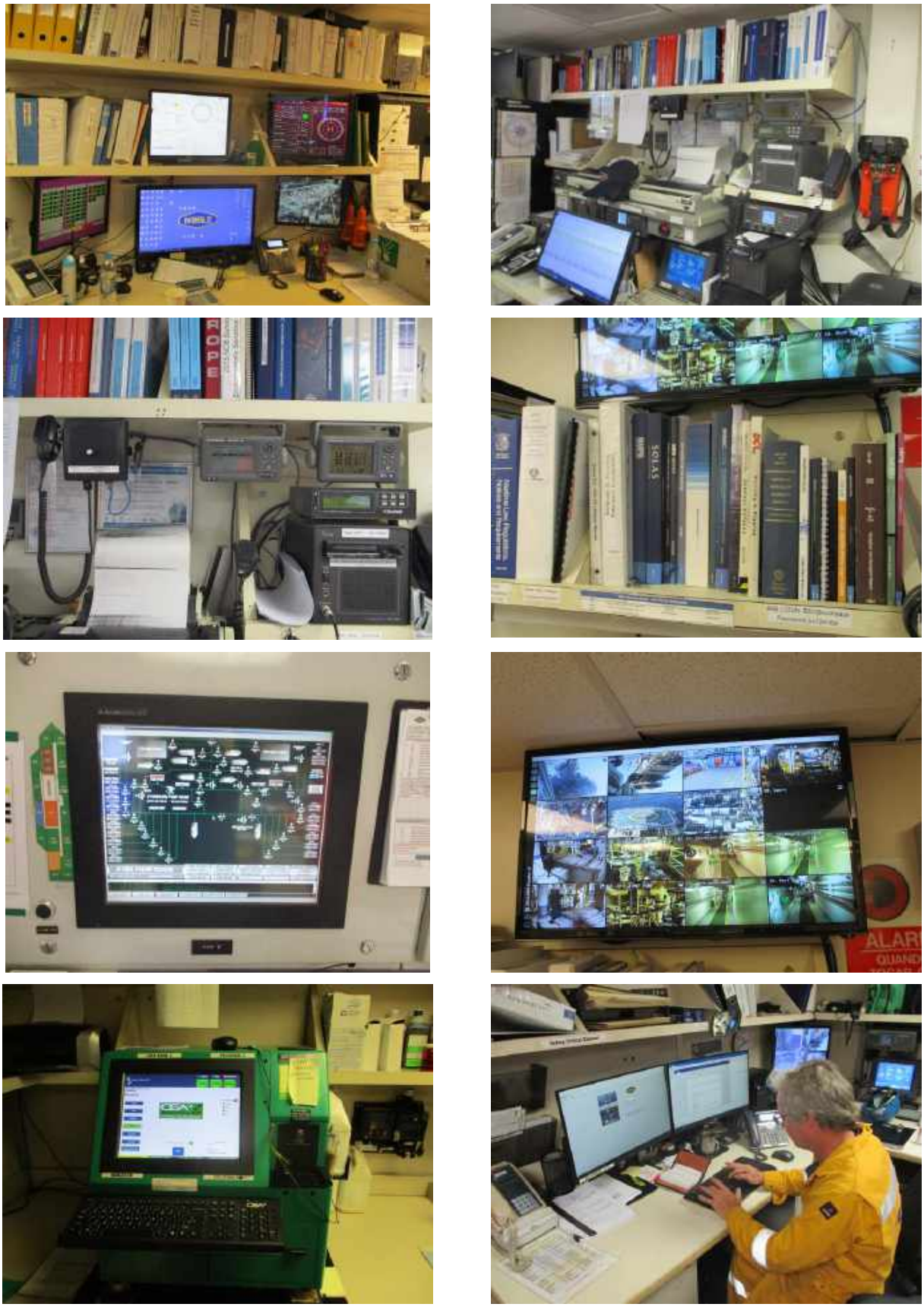


Figure 2-3 Control room on rig

Figure 2-4 Support Vessel of the project

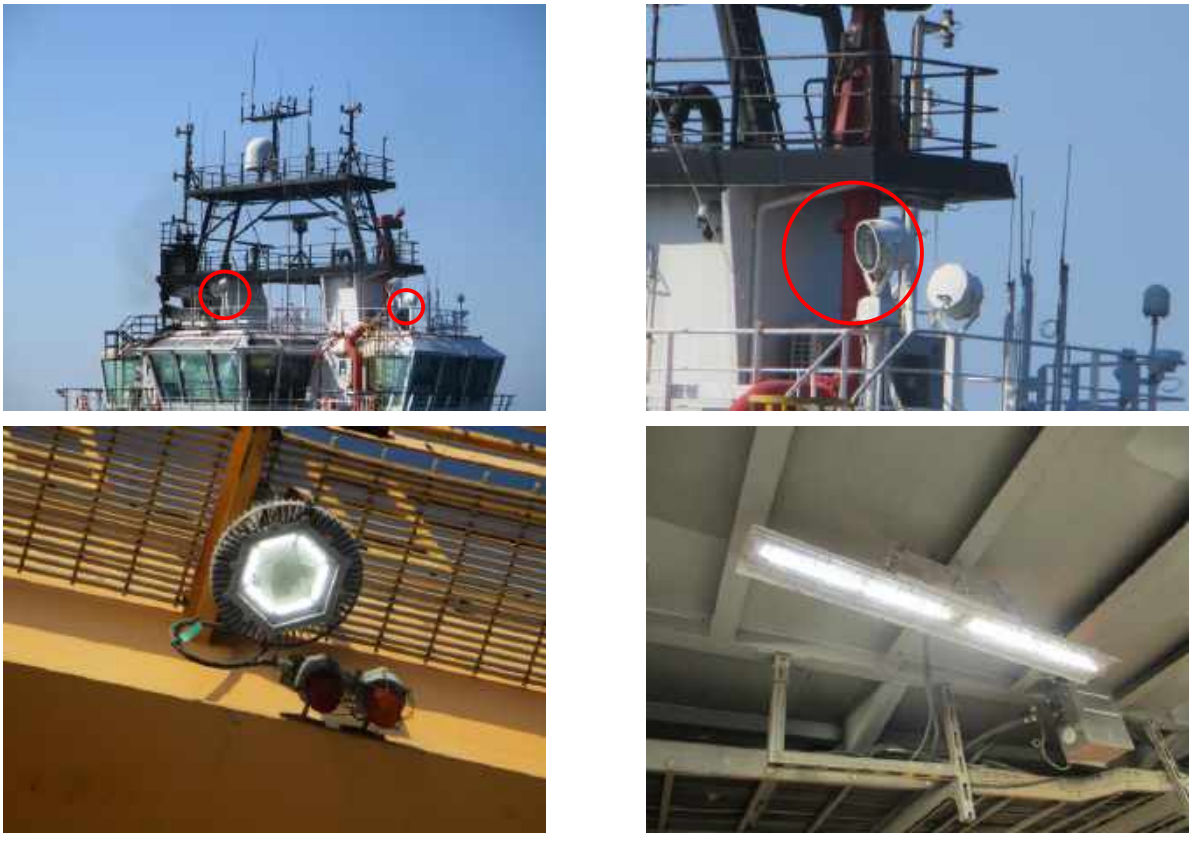


Figure 2-5 Lighting System around NCB Rig and on Support vessels

Figure 2-6 Blowout Preventer-BOP (taken by ROV)

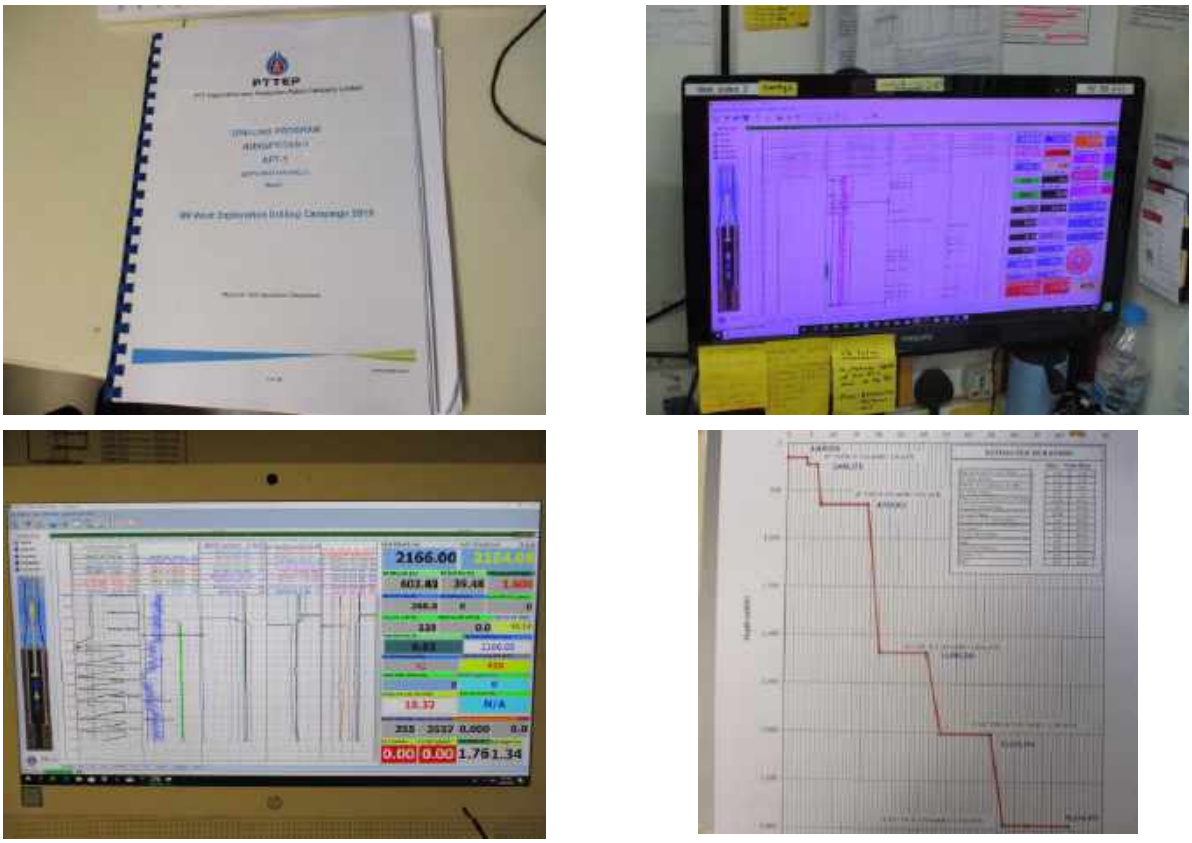


Figure 2-7 Drilling Log

Figure 2-8 Material Safety Data Sheet (MSDS)

Mud Circulation System

Figure 2-9 Mud Circulation System and Degasser


Mud Circulation System


Degasser

Figure 2-9 (cont.) Mud Circulation System and Degasser


Figure 2-10 Bund Wall


Figure 2-10 (cont.) Bund Wall



Figure 2-11 Waste Containers

Figure 2-12 Waste Compactor

Figure 2-13 Food Grinder

Figure 2-14 Monitoring Safety Zone from Rig

Figure 2-15 Hazardous Chemical Area

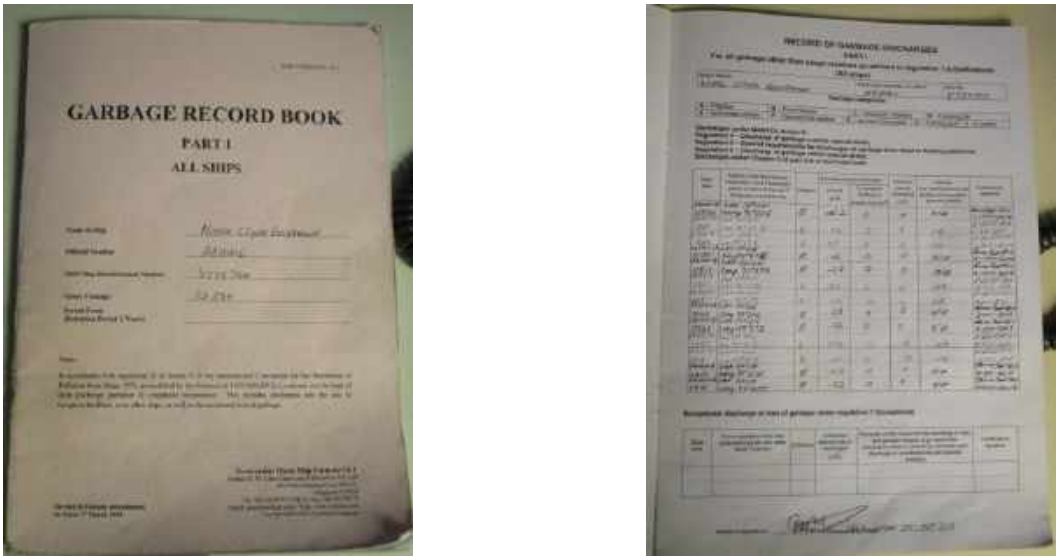


Figure 2-16 Garbage Record Book

Figure 2-17 Example of Local Goods

Figure 2-18 Personal Protective Equipment Wearing

Figure 2-19 Medical Room and Doctor on the rig


Figure 2-19 (cont.) Medical Room and Doctor on the rig

Figure 2-20 MERP Notification for Offshore

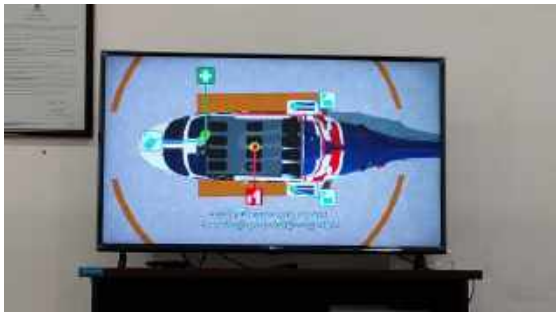
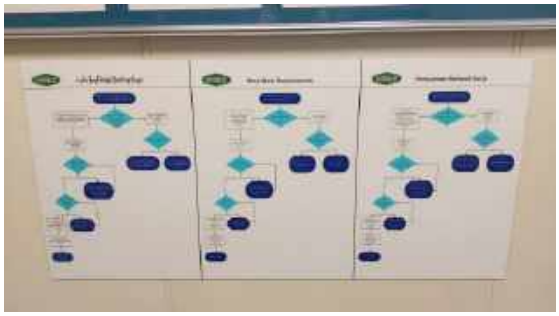
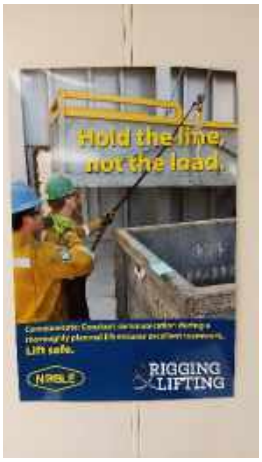



Figure 2-21 HSE Training and E-learning





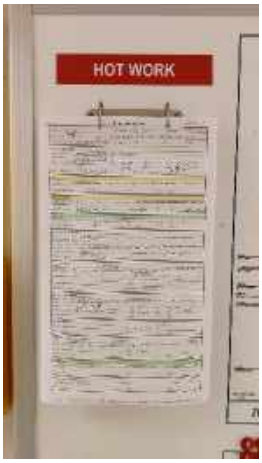


Figure 2-22 Safety Information and Work Permit


Figure 2-23 Work Area


Bedroom for staff


Fitness Room

Figure 2-24 Facilities for staffs on rig

Personal lockers

Sanitary Toilet

Canteen

Figure 2-24 (cont.) Facilities for staffs on rig

Laundry Service

Figure 2-24 (cont.) Facilities for staffs on rig

Figure 2-25 Eye Wash Station on rig

Figure 2-26 liaison officer (MOGE)

Figure 2-27 Myanmar Translator

Figure 2-28 Life Saving Equipment

Figure 2-29 Emergency Drills

Figure 2-30 Sanitary Housing for all staffs

Figure 2-31 Spill Kits

Figure 2-32 Stop Card and Stop Observation Checklist

Figure 2-33 Fire protection equipment

Figure 2-33 (cont.) Fire protection equipment

Chapter 3

Environmental Monitoring Results

Chapter 3
Environmental Monitoring Results

Environmental monitoring was conducted as specify in EIA which the project has assigned REM-UAE Laboratory and Consultant Company Limited to performed the environmental monitoring. This chapter presents the environmental monitoring results of M9 West Appraisal and Exploration Drilling in Offshore Block M9 (Drilling Phase), the detail is presented as follow;

3.1 Environmental Monitoring Plan

Environmental monitoring for M9 West Appraisal and Exploration Drilling in Offshore Block M9 (Drilling Phase) has been implemented with 100% compliance as shown in Table 3-1.

Table 3-1 Environmental Impact Monitoring Plan for M9 West Appraisal and Exploration Drilling in Offshore Block M9 (Drilling Phase)

Environmental Quality	Parameter	Timefrequency /Frequency	Location	Implemented	
				Complied	Not complied
1. Drilling fluids and cuttings (nonaqueous drilling fluid) Characteristics	1.1 Chloride (for WBM) 1.2 Oil on Cuttings (for SBM) 1.3 Mercury (in stock Barite) 1.4 Cadmium (in stock Barite)	Once-off during drilling exploration well SBM and WBM sections	At drilling well location	• Monitored by REM- UAE Laboratory and Consultant Co. ,Ltd during September, 2019 to January, 2020. The result as shown in Content 3.2.3.	-
2. Sewage	1.1 Thermo Tolerant Coliform Bacteria (FCB) 1.2 Biochemical Oxygen Demand (BOD) 1.3 Chemical Oxygen Demand (COD) 1.4 pH	Drilling phase	Drilling Rig	• Monitored by REM-UAE Laboratory and Consultant Co.,Ltd. on December 11, 2019. The result as shown in Content 3.2.3.	-

3.2 Mud, Cutting and Stock Barite Monitoring

Mud, Cutting and Stock Barite monitoring at NCB Rig as specified in EMP was conducted by REM-UAE Laboratory and Consultant Company Limited for M9 West Appraisal and Exploration Drilling in Offshore Block M9 (Drilling Phase) during Septembet 2019 to January 2020. The detail as shown in Table 3-2.

Table 3-2 Mud, Cutting and Stock Barite Monitoring Plan

Environmental Quality	Parameter	Location	Period
Mud, Cutting and Stock Barite	1. Chloride (for WBM)	Sampling from Chemical Storage Area at NCB Rig.	
		- PUNDARIKA-1, 12-1/4" SECTION TD Mud	October 25, 2019
		- PUNDARIKA-1, 12-1/4" SECTION TD Cutting	October 25, 2019
	2. Oil on cuttings (for SBM)	Sampling from Chemical Storage Area at NCB Rig.	
		- PUNDARIKA-1, 14-3/4" X 17-1/2" SECTION TD Mud	October 9, 2019
		- PUNDARIKA-1, 14-3/4" X 17-1/2" SECTION TD Cutting	October 9, 2019
		- PUNDARIKA-1, 14-3/4" X 20" SECTION TD Mud	September 12, 2019
		- PUNDARIKA-1, 14-3/4" X 20" SECTION TD Cutting	September 12, 2019
		- AUNGPYTAN-1, 17" X 20" SECTION TD Mud	November 26, 2019
		- AUNGPYTAN-1, 17" X 20" SECTION TD Cutting	November 26, 2019
		- AUNGPYTAN-1, 14-3/4" X 17-1/2" SECTION TD Mud	December 4, 2019
		- AUNGPYTAN-1, 14-3/4" X 17-1/2" SECTION TD Cutting	December 4, 2019
		- AUNGPYTAN-1, 12-1/4" SECTION TD Mud	December 29, 2019
		- AUNGPYTAN-1, 12-1/4" SECTION TD Cutting	December 29, 2019
		- AUNGPYTAN-1, 8-3/8" SECTION TD Mud	January 7, 2020
		- AUNGPYTAN-1, 8-3/8" SECTION TD Cutting	January 7, 2020

Table 3-2 Mud, Cutting and Stock Barite Monitoring Plan

Environmental Quality	Parameter	Location	Period
	3. Mercury (in stock Barite) 4. Cadmium (in stock Barite)	Sampling from Chemical Storage Area at NCB Rig	
		- PUNDARIKA-1, 14-3/4" X 20" SECTION TD	September 19, 2019
		- AUNGPYTAN-1, 8-3/8" SECTION TD	January 7, 2020

3.2.1 Mud, Cutting and Stock Barite Monitoring Method

Details of Mud, Cutting and Stock Barite monitoring includind parameters and analysis methods are shown in Table 3-3.

Table 3-3 Parameters and Analyses Methods for Mud, Cutting and Stock Barite Monitoring

Parameter	Analysis Method[1/]
1. Chloride (for WBM)	BS 1377 Part 3, 1990
2. Oil on Cuttings (for SBM)	Soxhlet Extraction Method (SM:5520 E)
3. Mercury (in stock Barite)	Acid Digestion and Cold Vapour AAS Method
4. Cadmium (in stock Barite)	Acid Digestion and Direct Air-Acetylene Flame Method

Remark: [1/] BS = British Standard Method
SM = Standard Methods for the examination of water and wastewater, APHA, AWWA, WEF, 23rd edition, 2017
U.S.EPA = Test Methods Evaluating Solid Waste, Physical/Chemical Methods (SW 846), United States Environmental Protection Agency

3.2.2 Presevation Methods

All samples were preserved with specific procedure and storage as shown in Table 3-4.

Table 3-4 Monitoring parameter, container and preservation method for Mud, Cutting and Stock Barite

Parameter	Container	Preservation Method 1/
1. Chloride (for WBM)	Polyethylene Bottle 500 mL	Refrigerate ≤ 6 ^{0}C
2. Oil on Cuttings (for SBM)	Glass Amber 500 mL	Refrigerate ≤ 6 ^{0}C
3. Mercury (in stock Barite)	Polyethylene Bottle 500 mL	Refrigerate ≤ 6 ^{0}C
4. Cadmium (in stock Barite)	Polyethylene Bottle 500 mL	Refrigerate ≤ 6 ^{0}C

Remark: 1/ BS = British Standard Method
SM = Standard Methods for the examination of water and wastewater, APHA, AWWA, WEF, 23rd edition, 2017
U.S.EPA = Test Methods Evaluating Solid Waste, Physical/Chemical Methods (SW 846), United States Environmental Protection Agency

3.2.3 Mud, Cutting and Stock Barite Monitoring Results

- **Chloride in Mud and Cuttings**

Refering to analysis report number T20AD078 - 0001 to T20AD078 - 0002. Mud and Cuttings were collected by project staff. The results of Chloride (for WBM) are in range of 0.21 - 0.31 %w/w. The monitoring results was shown in Table 3-5.

Table 3-5 The Results of Chloride in Mud and Cuttings Monitoring

Station	Date	Sample Condition	Chloride (for WBM) (%w/w)	Guideline1/
1. PUNDARIKA-1, 12-1/4" SECTION TD Mud	October 25, 2019	grey mud	0.31	- 2/
2. PUNDARIKA-1, 12-1/4" SECTION TD Cutting	October 25, 2019	grey cutting	0.21	-

Remark: 1/ National Environmental Quality (Emission) Guidelines.
2/ Maximum Chloride concentration must be less than four time's ambient concentration of fresh of brackish receiving water.

- **Oil on Cuttings (for SBM)**

Refering to analysis report number T20AD078 - 0003 to T20AD078 – 0006 and T20AD078 - 0008 to T20AD078 – 0015. Drilled cutting samples were collected by project staff and concentration of oil on cutting (OOC) was analyzed. The results of oil on cutting are in range of 0.06 – 7.11% OOC (dry weight) which meet the control limit of 9.4 % for Ester base, refer to IFC EHS Offshore Oil and Gas Guideline) for Existing Facilities. In addition, the sample of mud were collected and analyszed just for further reference by company. The analysis result of oil on cutting for M9 West drilling which used the Ester mud type therefore the standard limit is 9.4% as shown in Table 3-6.

The analysis results, certificate for laboratory instrument and approval registration certificate of laboratory are shown in Appendix F, G and H.

Table 3-6 The Results of Chloride in Mud and Cuttings Monitoring

Station	Date	Sample Condition	Oil on Cuttings (for SBM) %OOC (dry weight)	Guideline[1/]
1. PUNDARIKA-1, 14-3/4" X 17-1/2" SECTION TD Mud	October 9, 2019	brown mud	1.41	-
2. PUNDARIKA-1, 14-3/4" X 17-1/2" SECTION TD Cutting	October 9, 2019	brown cutting	0.16	9.4
3. PUNDARIKA-1, 14-3/4" X 20" SECTION TD Mud	September 12, 2019	brown mud	1.85	-
4. PUNDARIKA-1, 14-3/4" X 20" SECTION TD Cutting	September 12, 2019	brown cutting	0.06	9.4
5. AUNGPYTAN-1, 17" X 20" SECTION TD Mud	November 26, 2019	brown mud	3.91	-
6. AUNGPYTAN-1, 17" X 20" SECTION TD Cutting	November 26, 2019	brown cutting	7.11	9.4
7. AUNGPYTAN-1, 14-3/4" X 17-1/2" SECTION TD Mud	December 4, 2019	brown mud	6.69	-
8. AUNGPYTAN-1, 14-3/4" X 17-1/2" SECTION TD Cutting	December 4, 2019	brown cutting	4.02	9.4
9. AUNGPYTAN-1, 12-1/4" SECTION TD Mud	December 29, 2019	brown mud	8.12	-
10. AUNGPYTAN-1, 12-1/4" SECTION TD Cutting	December 29, 2019	brown cutting	1.54	9.4
11. AUNGPYTAN-1, 8-3/8" SECTION TD Mud	January 7, 2020	brown mud	4.93	-

Table 3-6 The Results of Chloride in Mud and Cuttings Monitoring

Station	Date	Sample Condition	Oil on Cuttings (for SBM) %OOC (dry weight)	Guideline[1/]
12. AUNGPYTAN-1, 8-3/8" SECTION TD Cutting	January 7, 2020	brown cutting	0.50	9.4

Remark: [1/] Environmental, Health and Safety Guideline for Offshore Oil and Gas Development, IFC 2015.

- **Total Mercury and Total Cadmium in stock barite**

Refering to analysis report number T20AD078 - 0003 and T20AD078 - 0015. Stock Barite was collected by project staff. Total mercury and total cadmium (in stock barite) was analyzed, The results found that total Mercury (in stock barite) was vary from 0.511 - 0.540 mg/kg (dry weight) and total Cadmium (in stock Barite) was ND. When compared the results with National Environmental Quality (Emission) Guidelines found that total mercury and total cadmium (in stock barite) at all station was complied with the standard. The monitoring results as shown in Table 3-7.

The analysis results, certificate for laboratory instrument and approval registration certificate of laboratory are shown in Appendix F, G and H.

Table 3-7 The Results of Total Mercury and Total Cadmium in Stock Barite Monitoring

Station	Date	Total Mercury (in stock Barite) mg/kg (dry weight)	Total Cadmium (in stock Barite) mg/kg (dry weight)	Sample Condition
1. PUNDARIKA-1, 14-3/4" X 20" SECTION TD	September 19, 2019	0.540	ND	grey powder
2. AUNGPYTAN-1, 8-3/8" SECTION TD	January 7, 2020	0.511	ND	grey powder
Guideline[2/]		**1**	**3**	**-**

Remark: [1/] National Environmental Quality (Emission) Guidelines.

3.3 Sewage Monitoring

Sewage monitoring at NCB Rig as specified in EMP was conducted by REM- UAE Laboratory and Consultant Company Limited for M9 West Appraisal and Exploration Drilling in Offshore Block M9 (Drilling Phase) in December 11, 2019 . The detail as shown in Table 3-8.

Table 3-8 Sewage Water Quality Monitoring Plan

Environmental Quality	Parameter	Location	Period
Sewage	1. Thermo Tolerant Coliform Bacteria (FCB) 2. Biochemical Oxygen Demand (BOD) 3. Chemical Oxygen Demand (COD) 4. pH	Sewage Water Treatment System at NCB Rig	December 11, 2019

3.3.1 Sewage Analysis Method

Details of Sewage monitoring including parameters and analysis methods are shown in Table 3-9

Table 3-9 Parameters and Analyses Methods for Sewage water Quality Monitoring

Parameter	Analysis Method[1/]
1. Thermo Tolerant Coliform Bacteria (FCB)	Multiple Tube Fermentation Technique (SM : 9221 B)
2. Biochemical Oxygen Demand (BOD)	Membrane Electrode Method (SM : 5210 B and 4500-O G)
3. Chemical Oxygen Demand (COD)	Closed Reflux, Titrimetric Method (SM : 5220 C)
4. pH	Electrometric Method at Site (SM : 4500-H^+ B)

Remark: [1/] Based on Standard Methods for the examination of water and wastewater, APHA, AWWA, WEF, 23rd edition, 2017

3.3.2 Sampling Methods for Sewage water

Sewage water samples were collected at Effluent from sewage water treatment system at NCB rig on December 11, as shown in Figure 3-1.

Figure 3-1 Sewage water Monitoring on December 11, 2019.

3.3.4 Preservation Methods

All samples were preserved with specific procedure and storage as shown in Table 3-10

Table 3-10 Container and Preservation Methods of Sewage water Monitoring

Parameter	Container	Preservation Methods*
1. Thermo Tolerant Coliform Bacteria (FCB)	Sterile, Brown Glass Bottle 150 mL	Add 10% $Na_2S_2O_3$ 0.1 mL/100 mL and Refrigerate at > 0 ^oC, < 10 ^oC
2. Biochemical Oxygen Demand (BOD)	Polyethylene Bottle 1 L	Refrigerate at > 0 ^oC, ≤ 6 ^oC
3. Chemical Oxygen Demand (COD)	Glass Bottle 250 mL	Add H_2SO_4 to pH < 2 and Refrigerate at > 0 ^oC, ≤ 6 ^oC
4. pH	Glass wide Mouth Bottle 1 L	Add H_2SO_4 to pH < 2 and Refrigerate at > 0 ^oC, ≤ 6 ^oC

Remark: * Based on Standard Methods for the examination of water and wastewater, APHA, AWWA, WEF, 23rd edition, 2017

3.3.5 Sewage Monitoring Result

Refering to analysis number LAA297/2019, LAA298/2019 and LAA299/2019 sewage water samples were sampled on December 11, 2019 during drilling phase at sewage water system of NCB Rig . The result found that Total Coliform Bacteria, BOD, COD and pH were 160,000 MPN/100ml, 19.8 mg/L, 356 mg/L and 8.2, respectively. The performance of sewage treatment system have to be considered and improved to ensure that all parameters will meet the control limit as per Sewage Pollution Prevention Certificate (Appendix F). The sewage water monitoring results are shown in Table 3-11.

The analysis results, certificate for laboratory instrument and approval registration certificate of laboratory are shown in Appendix F, G and H.

Table 3-11 Results of Sewage water Monitoring

Parameter	Unit	The Results of Sewage Quality	Guideline Value [1/]	Detection Limit
Date of Sampling	*December 11, 2019*			
1. Thermo Tolerant Coliform Bacteria (FCB)	MPN/100 mL	160,000	100	1.8
2. Biochemical Oxygen Demand (BOD)	mg/L	19.8	25	2.0
3. Chemical Oxygen Demand (COD)	mg/L	356	125	25
4. pH	-	8.2 (28 °C)	6-8.5	-
Sample Condition				
Water Colour/Turbid	-	Brown/Turbid	-	-
Sediment	-	Brown	-	-

Remark: [1/] Resolution of the Marine Environment Protection Committee MEPC.159(55)

Chapter 4

Environmental Mitigation Measures Compliance Audit and Environmental Monitoring Conclusion

Chapter 4
Environmental Mitigation Measures Compliance Audit and Environmental Monitoring Conclusion

From the implementation of Environmental Mitigation Measures Compliance Audit and Environmental Monitoring in the drilling phase of M9 Drilling Rig, it was found that the project has implemented the measures as specified in EIA.

Audit and document checking by setting 4 levels of evaluation as follows;

- Completely complied on the Mitigation Measures (✓) refers the project can complete comply with the measure without any barriers.
- Mostly complied on the Mitigation Measures (✓) refers the project can mostly comply with the measure without any barriers.
- Do not complied on the Mitigation Measures (✗) refers the project cannot comply with the measure because of some barriers.
- Do not have situation follows the Mitigation Measures (**NA**) refers during the project operations do not have any of situation follow the Mitigation Measures

Although the project does not comply with the mitigation measures, REM-UAE Laboratory and Consultant Company Limited will identify the cause of problems, barriers and solutions ways. And the results can be summarized as follows.

4.1 Environmental Mitigation Measures Compliance Audit Conclusion

4.1.1 Environmental Mitigation Measures Compliance Result in Drilling Phase

- **Air Quality / Climate -** Routine inspection and preventive maintenance for all machinery were conducted as follow yearly PM and Inspection Plan. SAP system was used to support for the PM plan of this project.
- **Underwater Noise** - PTTEPI strictly implement and follow mitigation by provided Radio operator and support vessel to monitor safety zone to avoid collision.
- **Seawater & Sediment Quality -** Seawater and WBM were the priority as drilling fluid at all wells. The mud circulation system was provided to circulate mud for recycling. SBM was used by technical reason. Chemical used and discharge of cutting were recorded by the project. SDS was provided at all chemical storage area of NCB Rig. Low toxicity of chemical was used in this project. And SDS was provided to identify the toxic of chemical.

- **Marine Biota, Endangered Species, Sensitive / Protected Areas** PTTEPI strictly implement and follow mitigation measures for impacts to Marine Biota, Endangered Species, Sensitive / Protected Areas
- **Fisheries -** The project information and drilling plan were informed to all related organizations by PTTEPI before starting of drilling activity. An exclusion zone (radius of 500 m) was already established surrounding the drilling rig. Project has 3 support vessels for warning off traffic. Appropriate lights and warning signals were already provided around the NCB Rig and support vessels.
- **Shipping** – PTTEPI provided appropriate lights, warning signals, communication tools, and a reflected radar signal on all vessels to prevent accidental collision, established a 500 m safety zone around the drilling rig and also used support vessels to warn off traffic.

- **Waste Management -** Waste containers were provided at NCB Rig and supply vessel. All waste was collected in garbage bag before dispose in waste containers. Waste containers were covered to protect from the environment. The waste from NCB Rig and vessel was transferred to dispose onshore by authorized contractor. PTTEPI followed the requirements of MARPOL 73/78 and PTTEPI's Waste Management Procedure. Crew was prohibited to drop waste into the sea. Food grinder was provided to grind the food waste to 25 mm prior to discharge to sea.

- **Socio- economy** - Local goods and services such as local workers from contractor were added to work on rig during drilling period

- **Occupational Health and Safety** - PTTEPI' s Occupational Health Management Standard was already prepared and enforced the worker and contractor to implement. All related staffs were already trained about safe handling of the chemicals as follow PTTEPI Chemical handling. Personnel protective equipment were already provided to all project's staffs. Safety training was provided for all project' s staffs as follow the PTTEPI SSHE Training and Competency Standard. The PTTEPI's MERP was already provided. In case of emergency, the patients will transfer to the hospital in Yangon by helicopter. Adequate chemical storage area was provided. SDS was attached at all chemical storage area. The condition of storage area was regularly inspected by project's staff. Spill kits and first aid kits were already provided at NCB Rig. The sanitary systems such as drinking water, canteen, coffee corner, toilet and rest area were properly provided at NBC Rig. At high noise level area, the noise protection equipment was already provided on site. There were total 10 cases of incident from project activity in the driiling phase including 5 case of property damage or loss, 1 cases of near miss, 3 cases of first aid case and 1 case of Tier 3 LOPC. Corrective actions were proposed/implemented to prevent reoccurrence.

- **Public health** - PTTEPI's Occupational Health Management Standard was already prepared and enforced the worker and contractor to implement. The PTTEPI's MERP was already provided. In case of emergency, the patients will transfer to the hospital in Yangon by helicopter.

The results determined that the project completely complied on the environmental mitigation measures implementation compliance in Drilling Phase with 100% . The results are shown in Figure 4-1.

Figure 4-1 The Results of 4.1 Environmental Mitigation Measures (Drilling Phase) Compliance Audit

4.1.2 Environmental Mitigation Measures Compliance Result in Unplanned Events

- **Collision** - The emergency response plan for vessel collision was already provided at NCB Rig as follow the PTTEPI Zawtika Offshore Field Emergency Response Plan.

- **Fuel, Oil, Chemical or Hazardous Waste /Materials Spill** - The emergency response plan for accidental spills was already provided at NCB Rig as follow the PTTEPI Spill Contingency Plan. Oil spill case will be monitoring and recording by project's staff. Currently, oil spill case was not found from project operation. The BOP equipment was provided for blowout prevention during drilling activity. Moreover, the PTTEPI Blowout Contingency Plan was already provided.

- **Blowout** - The Spill kits, PTTEPI Spill Contingency Plan and PTTEPI Blowout Contingency Plan were already provided at NCB Rig as follow MARPOL 73/78. The lifting activity was performed as follow NCB Rigging and Lifting Operations. The lifting equipment was inspected as follow yearly PM and Inspection Plan. SAP system was used to support for the PM plan of this project. Safety training was provided for all project's staffs as follow the PTTEPI SSHE Training and Competency Standard.

- **Tropical cyclone / Typhoon** - The emergency response plan for tropical cyclone was already provided at NCB Rig as follow the PTTEPI Tropical Cyclone Procedure. The emergency drill for tropical cyclone response was already trained to all staff.

- **Fire or Explosion** - The fire fighting equipments were already provided around the operation and living area. The fire plan was attached on both of operation and living area. Emergency plan for fire or explosion was already provided. Moreover, emergency drill was performed regularly.

The results determined that the project completely complied on the environmental mitigation measures implementation compliance in unplanned event with 100% . The results are shown in Figure 4-2.

Figure 4-2 The Results of 4.1 Environmental Mitigation Measures (Unplanned Events) Compliance Audit

4.2 Environmental Monitoring Conclusion

4.2.1 Mud, Cutting and Stock Barite Monitoring

- **Chloride in Mud and Cuttings**

Mud and Cuttings were collected by project staff in drilling phase. The results of Chloride (for WBM) are in range of 0.21 - 0.31 %w/w.

- **Oil on Cuttings (for SBM)**

Drilled cutting samples were collected by project staff and concentration of oil on cutting (OOC) was analyzed. The results of oil on cutting are in range of 0.06 - 7.11% OOC (dry weight) which meet the control limit of 9.4 % for Ester base, refer to IFC EHS Offshore Oil and Gas Guideline) for Existing Facilities. In addition, the sample of mud were collected and analyzed just for further reference by company.

- **Mercury and Cadmium in Stock Barite**

Stock Barite was collected by project staff during in December 2019. The results According to National Environmental Quality (Emission) Guidelines maximum chloride concentration must be less than four time's ambient concentration of fresh or brackish receiving water.found that Mercury (in stock barite) was vary from 0.511 - 0.540 mg/kg (dry weight) and Cadmium (in stock Barite) was ND. When compared the results with National Environmental Quality (Emission) Guidelines found that Mercury and Cadmium (in stock barite) at all station are complied with the standard.

4.2.2 Sewage Monitoring

Sewage monitoring was conducted by REM-UAE Laboratory and Consultant Company Limited on December 11, 2019 from sewage treatment system discharge point at NCB Rig. The result found that Thermo Tolerant Coliform Bacteria (FCB), BOD, COD and pH were 160,000 MPN/100ml, 19.8 mg/L, 356 mg/L and 8.2 respectively. When compared sewage monitoring results with Resolution of the Marine Environment Protection Committee MEPC.159 (55) found that Thermo Tolerant Coliform Bacteria (FCB) and COD were not complied with MEPC.159 (55). Nevertheless, the performance of sewage treatment system have to be considered and improved to ensure that all parameters will meet the control limit as per Sewage Pollution Prevention Certificate.

The project has completely complied the environmental impact monitoring as specified in EIA, including Mud, Cutting and Stock Barite Monitoring and Sewage monitoring as shown in Figure 4-3.

Figure 4-3 The Results of Environmental Monitoring