



Monitoring Report of Zawtika Phase 1C and 1D Development in Block M9 during January – June 2021



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PTTEP

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 **REM-UAE**
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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		

Project Information

Project Title	Zawtika Development Phase of 1C and 1D
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;

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)

Name:

Hsu Myat Maw

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Date received:

Project Identification Number:

The proponent submitted the reports Paper copy Digital copy
with the forms of:

Recorded by:

Additional comments, notes or recommendations (attached if necessary):

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အစီရင်ခံစာအကျဉ်းချုပ်

REM-UAE စာတ်ခွဲခန်းနှင့် အကြံပေးကုမ္ပဏီလီမိတက်သည် စောတိကဖွံ့ဖြိုးမှုလုပ်ငန်း၏ အဆင့် 1C နှင့် 1D အတွက် ပတ်ဝန်းကျင်ဆိုင်ရာ ထိခိုက်မှုလျော့ပါးရေး အစီအမံများနှင့် စောင့်ကြည့်စစ်ဆေးရေး အစီအစဉ် အကောင်အထည်ဖော်မှု နှင့်ပတ်သက်၍ လိုက်နာဆောင်ရွက်မှု အပေါ် စစ်ဆေးခြင်းကို ဆောင်ရွက်ခဲ့ပါသည်။

အကဲဖြတ်ခြင်း၏ ရည်ရွယ်ချက်မှာ ပတ်ဝန်းကျင်ဆိုင်ရာ သက်ရောက်မှုစစ်ဆေးခြင်းအစီရင်ခံစာ (Environmental Impact Assessment- EIA Report) တွင် သတ်မှတ်ဖော်ပြထားသည့် ထိခိုက်မှုလျော့ပါးရေး အစီအမံများနှင့် စောင့်ကြည့်စစ်ဆေးခြင်း အစီအစဉ်များ အပါအဝင် ပတ်ဝန်းကျင်ဆိုင်ရာ စီမံခန့်ခွဲရေး အစီအစဉ်ကို အကောင်အထည်ဖော်မှု ၏ ထိရောက်မှုအခြေအနေကို အကဲဖြတ်ဆန်းစစ်ရန် ဖြစ်ပါသည်။ အစီရင်ခံစာတွင် ဖြစ်ပွားနိုင်ခြေရှိသော ပြသာနာများနှင့် အတားအသီးများကို ဖော်ပြထားပြီး ကာကွယ်တားဆီးခြင်းနှင့် ထိခိုက်မှုလျော့ပါးရေး နည်းလမ်းများအား ပိုမိုထိရောက်မှုရှိစေရန်အတွက် အကြံပြုချက်များကိုလည်း အဆိုပြုဖော်ပြထားပါသည်။

အကဲဖြတ်ခြင်းလုပ်ငန်းစဉ်တွင် (၁) စာရွက်စာတမ်းများကို အကဲဖြတ်ခြင်း၊ (၂) နမူနာ စုဆောင်းခြင်းနှင့် စိစစ်ခြင်းနှင့် (၃) PTTEP အဖွဲ့အနေဖြင့် စီမံကိန်းနေရာများ၏ စာတ်ပုံများကို REM-UAE သို့ ပုံပိုးပေးခြင်းတို့ ပါဝင်ပါသည်။

၁။ စီမံကိန်းအကြောင်းအရာ

PTT အပြည်ပြည်ဆိုင်ရာရှာဖွေရေးနှင့် ထုတ်လုပ်မှုလီမိတက် (PTTEPI) သည် မြန်မာရေနံနှင့် သဘာဝဓာတ်ငွေလုပ်ငန်း (Myanmar Oil and Enterprise) နှင့် Block M9 နှင့် M11 တို့ အတွက် ထုတ်လုပ်မှုများဝေခြင်းစာချုပ် (Production Sharing Contract- PSC) ကို ၂၀၀၃ ခုနှစ် နိုဝင်ဘာလ ၁၂ ရက်နှင့် ၂၀၀၅ ခုနှစ် ဧပြီလ ၂၅ ရက်တို့ တွင် အသီးသီးလက်မှတ်ရေးထိုးခဲ့ပါသည်။ စာချုပ် ရေးသို့မဟုတ် ဖွံ့ဖြိုးရေးနှင့် ထုတ်လုပ်မှုရေးသို့သည် Block M9 တစ်ခုလုံးနှင့် Block M11 ၏ အရှေ့မြောက်ဘက်ရေးသို့သည်။

တင်ပိုဓာတ်ငွေရောင်းချုပ်သော့တူညီချက် (Export Gas Sales Agreement- EGSA) နှင့် ပြည်တွင်း သဘာဝဓာတ်ငွေရောင်းချုပ် သော့တူညီချက် (Domestic Gas Sales Agreement- DGSA)၊ Block M9 နှင့် M11 ရှိ သဘာဝဓာတ်ငွေဆိုင်ရာနောက်ဆက်တဲ့ သော့တူညီချက် (Supplementary Agreement to Gas Terms of Block M9 and M11- SAGT)၊ တင်ပိုသာဝဓာတ်ငွေသယ်ယူပို့ဆောင်ရေးသော့တူညီချက် (Export Gas Transportation Agreement (EGTA) နှင့် ပိုက်လိုင်း အခွင့်အရေးဆိုင်ရာ သော့တူညီချက် (Pipeline Right Agreement- PRA) တို့ အပါအဝင် ဆက်စပ်သော့တူညီချက်များကို ၂၀၁၀ ခုနှစ်၊ ဧပြီလ ၃၀ ရက်နေ့တွင် လက်မှတ်ရေးထိုးခဲ့ပါသည်။ ယော့ယျာတစ်နေ့လျှင် စာချုပ်ချုပ်ဆိုင်သောပမာဏ (DCQ) အနေဖြင့် ၃၀၀ MMSCFD တွင် သော့တူညီထားပြီး ထိုင်းနိုင်ငံသို့တင်ပိုမည့်ဓာတ်ငွေပမာဏမှာ ၂၄၀ MMSCFD ဖြစ်ပြီး ပြည်တွင်းဓာတ်ငွေရေးကွက်အတွက် ၆၀ MMSCFD ဖြစ်ပါသည်။ ၁၅% swing ဖြင့် ယော့ယျာနေ့စဉ် စာချုပ်ချုပ် ဆိုင်သောပမာဏ (CDC) ကို ၃၄၅ MMSCFD

ကိုရရှိရန် ထားရှိပြီး ထိုင်းနိုင်ငံသို့တင်ပို့မည့်ပမာဏနှင့် ပြည်တွင်းခာတ်ငွေ့စွေးကွက်အတွက်လည်း အလားတူအချိုးအစားပမာဏထားရှိပါသည်။

J.II အောက်ထုတ်လုပ်ရေး ဖွံ့ဖြိုးတိုးတက်မှုလုပ်ငန်း

၂၀၁၆ ခုနှစ် အောက်လုပ်ငန်းအစိုးရေးအစိုးအစဉ်အရ စီမံကိန်းကို လုပ်ငန်းအဆင့် Phase 1A, 1B, 1C နှင့် 1D ဟူ၍ အဆင့်လေးဆင့်ခွဲခြားသတ်မှတ်ထားပါသည်။ Phase 1A, 1B နှင့် 1C တို့ကို စတင်ပြီးဖြစ်ပြီး၊ လက်ရှိတွင် လုပ်ငန်းလည်ပတ်လျက်ရှိနေပြီ ဖြစ်ပါသည်။ Phase 1D 1D အတွက်လုပ်ဆောင်မည့် ဖွံ့ဖြိုးတိုးတက်မှုလုပ်ငန်း အစိုးအစဉ်များကိုလည်း စီစဉ်ထားပါသည်။

J.II.1 လုပ်ငန်းအဆင့် 1C (Phase 1C)

- လုပ်ငန်းအဆင့် 1C တွင် ZWP8, ZWP9, ZWP10 နှင့် ZWP11 ဟူ၍ ကမ်းလွန် တွင်း (wellhead platform) (၄) ခု ပါဝင်ပြီး၊ အဆိုပါတွင်း (၄) ခုမှ တွင်းရည်များကို ငှုံးတို့၏ တွင်းကြားပိုက်လိုင်းများမှ တစ်ဆင့် ZPQ သို့ ပို့ဆောင်မည့်ဖြစ်ပါသည်။
- တွင်းများအကြား ဆက်သွယ်ထားသည့် ပိုက်လိုင်း (၄) ခုမှာ အောက်ပါအတိုင်းဖြစ်ပါသည်-
 - ZWP8 မှ IP2 PLEM အထိ (18" 22.5 ကီလိုမီတာ)
 - ZWP9 မှ ZWP7 အထိ (14" 11 ကီလိုမီတာ)
 - ZWP10 မှ IP2 PLEM အထိ (18" 5 ကီလိုမီတာ)
 - ZWP11 မှ IP6PLEM အထိ (18" 15 ကီလိုမီတာ) တို့ဖြစ်ပါသည်။
- ပိုက်လိုင်းအဆုံး (Manifolds) နှစ်ခု (PLEMs) (၂) ခုမှာ
 - IP2 PLEM: 3-inlet subsea PLEM (IP2, IP8 နှင့် IP10 အတွက်)
 - IP6 PLEM: 4-inlet subsea PLEM (IP6, IP11 နှင့် 2 future tie-in) တို့ဖြစ်ပါသည်။
- ပထမဆုံးကမ်းလွန်တွင်းကို ၂၀၁၇ ခုနှစ်၏ စတုတွေသုံးလပတ်အတွင်း တပ်ဆင်ခဲ့ပြီး၊ ၂၀၁၈ ခုနှစ် ဒုတိယသုံးလပတ်တွင် ကမ်းလွန်တွင်းများ၊ ဆက်စပ်ပိုက်လိုင်းများနှင့် PLEM များအားလုံးကို အပြီးသတ် တပ်ဆင်ခဲ့ပါသည်။
- အောက် 1C လုပ်ငန်းအဆင့်၏ ထုတ်လုပ်မှုအဆင့်ကို ၂၀၁၈ ခုနှစ် နိုဝင်ဘာလခန့်တွင် စတင်ခဲ့ပါသည်။

J.II.2 လုပ်ငန်းအဆင့် 1D

- ZWP12, ZWP13, ZWP14, ZWP15, ZWP16, ZWP17, ZWP18 နှင့် ZWP19 ဟူသည့် ကမ်းလွန်ရေနံတွင်း (၈) ခု၊ ငှုံးတို့နှင့်ဆက်စပ်ပိုက်လိုင်းများ နှင့် ပိုက်လိုင်းအဆုံး (Manifolds) (၂) ခုတို့ ပါဝင်ပါသည်။
- ကမ်းလွန်တွင်းများတပ်ဆင်ရန်အတွက် ကွင်းဆင်းအကောင်အထည်ဖော်မှုများကို ၂၀၂၂ ခုနှစ် ဒုတိယ သုံးလပတ်အတွင်း စတင်မည့်ဖြစ်ပါသည်။

၃။ လုပ်ငန်းဆောင်ရွက်မှုစနစ်

ကမ်းလွန်တွင်များမှ တွင်းရည်များ ZPQ ထဲသို့ စီးဝင်ခြင်းဖြင့် လုပ်ငန်းဆောင်ရွက်မှုစနစ်ကို စတင်ပါသည်။ အဆိုပါတွင်းရည်များကို ပင်လယ်ရေဖြင့် အအေးခံမည်ဖြစ်ပြီး၊ ပင်လယ်ရေ အပူချိန်ထက် အနည်းငယ်ပိုသော အပူချိန်သို့ ရောက်သည်အထိ အအေးခံမည်ဖြစ်ပါသည်။ တွင်းအမှတ် (၁) (Wellhead platform WP1) နှင့်ဆက်သွယ်ထားသော bridge မှ တွင်းရည် (well fluid) များကို အခြားတွင်းရည်များနှင့် ရောနောပြီး လေအေးပေးစနစ်ဖြင့် အအေးခံပါသည်။

ယင်းနောက် ဝင်ရောက်လာသောတွင်းရည်များကို ထုတ်လုပ်မှုခွဲထုတ်စက်များ (production separators) အတွင်းသို့ ဖြတ်သန်းစေပြီး၊ ငင်းတို့ကို ဓာတ်ငွေ့၊ ငွေ့ရည်နှင့် ရွှေ့ဗြားတွင်း များအဖြစ် ခွဲခြားပါသည်။ အဆိုပါ separator များမှ ခွဲခြားထားသော ဓာတ်ငွေ့များကို ပထမ အဆင့်ဓာတ်ငွေ့ ကွန်ပရက်ဆာဖြင့် ပါဝင်သောငွေ့ရည်များကို ဖိနိုင်ဖယ်ရှားပြီးနောက် ရေများကို ဖယ်ရှားရန် ဓာတ်ငွေ့မှ ရေဖယ်ရှားရေးယူနစ်သို့ ပို့ဆောင်ပါသည်။ အဆိုပါရေဖယ်ရှားရေးယူနစ် (dehydration unit) မှ ထွက်လာသော ခြောက်သွေ့သည့်ဓာတ်ငွေ့များကို ဒုတိယအဆင့် ဓာတ်ငွေ့ကွန်ပရက်ဆာ တွင် ဖိနိုင်သိပ်သည်းစေပြီး၊ ၂၈ လက်မရှိသည့် ကမ်းလွန်ပို့ကုန်ပို့က်လိုင်းမှတစ်ဆင့် ကုန်းတွင်းလုပ်ငန်းနေရာသို့ ဆောင်ပါသည်။ ခြောက်သွေ့သော ဓာတ်ငွေ့အချို့ကို အခြားလုပ်ငန်းစဉ်များတွင် အသုံးပြုရန်နှင့် ZPQ အတွက် စွမ်းအင်ထုတ်လုပ်ရန်အတွက် လောင်စာအဖြစ် အသုံးပြုရန် ခွဲထားပါသည်။

ဓာတ်ငွေ့များမှ ခွဲထုတ်ထားသော ထုတ်လုပ်အရည်များတွင် ငွေ့ရည် (condensate) နှင့် produced water တို့ ပါဝင်ပါသည်။ condensate ကို WP1 ရှိ မီးခိုးမတွက်သောလောင်းကျေမးစက် (smokeless burner) တွင် လောင်ကျေမးစေပါသည်။

လေ့လာသည့်အောက်များအားလုံးအတွက် ဓာတ်ငွေ့နှင့် ရေ စမ်းသပ်စိစစ်မှုအရ Produced water များတွင် Hg heavy metal မပါရှိသည်ကို တွေ့ရှုရပါသည်။ PTTEPI သည် produced water များအတွက် စိစစ်လေ့လာမှုကို လုပ်ငန်းများ စတင်ချိန်မှစတင်၍ လစဉ်ပြုလုပ်ခွဲပြီး၊ heavy metal များ ကို မတွေ့ရှုရပါ။ သို့ပါ၍ ထုတ်လုပ်မှုခွဲထုတ်စက်များမှ ခွဲထုတ်ထားသော produced water များနှင့် အမြှင့်ဆုံးဒီဇိုင်း ၂၀၀၀၀ bpd ရှိ condensate flash drum မှ ဆီဖယ်ထုတ်သည့် ရေအချို့တွင် ဆီဖယ်ထုတ်သည့် ယူနစ် (de-oiler unit) သို့ ပို့ဆောင်ပြီး၊ လက်ကျိုးငွေ့ရည်များကို ခွဲထုတ်ပြီးသည့်နောက် flash drum သို့ ပြန်လည်ပို့ဆောင်ပါသည်။ ထို့နောက် မြန်မာနိုင်ငံ၏ အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေးလမ်းညွှန်ချက်စံညွှန်း (EQEG) နှင့်အညီ သန္တစင်ပြီး ရေထဲသို့ စွန်ပစ်ပါသည်။

၄။ ထုတ်လွှင့်မှုနှင့် စွန်ထုတ်ပစ္စည်းစီမံခန့်ခွဲမှု

၄.၁။ မီးတောက်

ZQP ကို လုပ်ခြိစိတ်ချုပ်ပြီး ထုတ်လုပ်မှုပစ္စည်းများမှ ပေါ်ထွက်သည့် ဟိုက်ဒရိကာဗွန်ဓာတ်ငွေ့များ စီစဉ်ထားသည့် အတိုင်းနှင့် မမျှော်လင့်ဘဲထွက်ရှိမှုများမှတေားကင်းသည့် HP နှင့် LP ဓာတ်ငွေ့မီးတောက်စနစ်များဖြင့် တပ်ဆင်ထားပါသည်။ HP နှင့် LP စနစ်များအတွက် Flare knock out drum များကို တပ်ဆင်ထားပါသည်။ ပမာဏထိန်းချုပ်မှု

အပေါ် စီစဉ်ထားရှိမှုသည် ပုံမှန်အားဖြင့် အရည်များ အဆက်မပြတ်ထွက်ရှိနိုင်သည့်အတွက် အဖွင့်/အပိတ် (on/off) ထိန်းချုပ်မှုစနစ်ကို အသုံးပြုထားပါသည်။ liquid relief အများဆုံးဖြစ်စေနိုင်ရန်နှင့် liquid knockout အတွက် ဓာတ်ငွေ့ရေးယာ ရရှိနိုင်ရန်တို့အတွက် ပုံမှန်ရေပမာဏကို အတတ်နိုင်ဆုံး နိမ့်ကျအောင်ထိန်းချုပ် ထားပါသည်။ HP နှင့် LP Flare knock out drum တို့မှ ထွက်ရှိလာသောအရည်များကို အလုပ်ပိတ်ထားသည့် drain vessel တွင် စုဆောင်းထားရှိပါသည်။

ကမ်းလွန်တွင်းများအားလုံး (WP1-WP11) တွင် ယာယီ (ရွှေ့ပြောင်းနိုင်သည့်ပုံစံ) flare boom နှင့် တွင်းသန်စင် မှုအတွက် ဓာတ်ငွေ့-အရည် လောင်ကျမ်းစက်တစ်ခုတို့ကို အသီးသီးတပ်ဆင်ထား ပါသည်။ ထို့ပြင် WP အားလုံးရှိ ယာယီလောင်ကျမ်းစက်များတွင် Tie-in အမှတ် (၂) ခု (တွင်း၏ အရှေ့ဖက်၌ တစ်ခု၊ အနောက်ဖက်၌ တစ်ခု) တို့ကို ထားရှိ ပေးထားပါသည်။

၄.၂။ စွန့်ပစ်ပစ္စည်းနှင့် စွန့်ပစ်ရေ

စီမံကိန်းလုပ်ငန်းစဉ်များမှ ထွက်ရှိလာသော စွန့်ပစ်ပစ္စည်းများကို ငါးတို့၏ အန္တရာယ်ရှိနိုင်မှုစုံနှုန်းအရ အန္တရာယ်ရှိ နိုင်သော စွန့်ပစ်ပစ္စည်းနှင့်အန္တရာယ်မရှိနိုင်သော စွန့်ပစ်ပစ္စည်းဟူ၍ အမျိုးအစား (၂) မျိုး ခွဲခြားသတ်မှတ်ထား ပါသည်။

၅။ အများဆုံးရာအသုံးချေနာများ

၅.၁။ လျှပ်စစ်နှင့် စွမ်းအင်အသုံးပြုမှု

ZQP ကို တစ်ယူနစ်လျှင် ၃.၇ MW စွမ်းရည်၍ လောင်စာ (၂) မျိုးသုံး ဓာတ်ငွေ့တာဘိုင် ဓာတ်အားထုတ်လုပ်မှု ယူနစ် (၃) ခုဖြင့် တပ်ဆင်ထားပြီး၊ အဆိုပါတာဘိုင်များမှ ZPQ နှင့် WP1 တို့အတွက် လိုအပ်သည့် စွမ်းအင်အားလုံးကို ထုတ်လုပ်ပေးပါသည်။ အကယ်၍ အဆိုပါယူနစ်များအနက် ယူနစ်တစ်ခုမှ လုပ်ငန်းလည်ပတ်ခြင်းမရှိပါက ဓာတ်အား ရရှိနိုင်ရေးအတွက် လုံလောက်သည့်စွမ်းအင်ကို မောင်းနှင်ပေးနိုင်သည့် ဘက်စုံသုံး ဓာတ်ငွေ့တာဘိုင်များကိုလည်း တပ်ဆင်ထားပါသည်။

ဓာတ်အားထုတ်လုပ်မှုယူနစ် (၃) ခုလုံးအတွက် စွမ်းအင် (၃) မျိုးသုံး (ဓာတ်ငွေ့ငွေ့ရည်နှင့် ဒီဇယ်) ဒီဇယ်းကို ရွှေ့ချယ်ထားပါသည်။ သို့သော ဆက်သွယ်မှုကိုမူ ဓာတ်ငွေ့လောင်စာနှင့် ဒီဇယ်ဖြင့်သာ ပြုလုပ်နိုင်ပါသည်။ ထို့ပြင် အဆိုပါ ဓာတ်အားထုတ်လုပ်မှုယူနစ် (၃) ခုလုံးအတွက် လျှပ်စစ်မောင်တာ သုံးစတင်သည့်စနစ်များကို အသုံးပြုထားပါသည်။

အကယ်၍ တာဘိုင်ဓာတ်အားထုတ်လုပ်စက် ချို့ယွင်းမှုတစ်စုံတရာပေါ်ပေါက်ပါက မရှိမဖြစ်သုံးရန် အဖြစ်အရေးပေါ်ဒီဇယ်သုံးစွမ်းအင် ၁.၂၈ MW ထုတ်လုပ်မှုအတွက် စီစဉ်ထားရှိပါသည်။ ထို့ပြင် ၂၈၀ kW ရှိသာ black start ဒီဇယ်သုံးမီးစက်တစ်ခုကိုလည်း စတင်စနစ်အတွက် ထားရှိပေး ထားပါသည်။

၅။ ရေအသုံးပြုမှု

တစ်နာရီလျှင် 1.5 m³ စွမ်းအင်ရှိ (စုစုပေါင်း တစ်နာရီလျှင် 3 m³) reverse osmosis ရေထုတ်ယူ ရေးယူနစ် (J) ခုကို တပ်ဆင်ထားပြီး RO အလွှာကို အသုံးပြု၍ သန္တစင်သည့်ရေချို့ကို ထုတ်လုပ်ပါသည်။ အဆိုပါယူနစ် (J) ခုမှ ထုတ်ယူသော ရေများသည့် သောက်သုံးရန်အတွက်သာမက မျက်စီဆေးခြင်း၊ ဘေးကင်းစီတ်ချွော ရေချိုးနှင့်ခြင်း ကဲသို့ သော အခြားပုံမှန်မဟုတ်သည့် အသုံးပြုမှုများ အတွက်ပါ သင့်လျော်ပါသည်။ ရေချို့ထုတ်လုပ်သည့်ယူနစ်များမှ ရေချို့များကို ရေချို့သို့လောင်ကန်များတွင် သို့လောင်ထားရှိပါသည်။ အဆိုပါသို့လောင်ထားသည့် ရေချို့များကို ရေစိတ်ပိုက် များမှတစ်ဆင့် ဖိအားသုံးရေချို့ကန်များဖြင့် အသုံးပြုသူများအတွက် ဖြန့်ဝေပေးပါသည်။ ရေချို့များ ကို သန္တစင်ပစ္စည်း (Sterilizer) ဖြင့် သန္တစင်ပြီးနောက် သောက်သုံးရန် သင့်တော်သည့် ရေကို ထောက်ပံ့ပေးပါသည်။

၆။ အရေးပေါ်ရပ်တန်မှုစနစ်

ZPQ ကို အပြည့်အဝ အလိုလောက်ဖြစ်သော၊ ပေါင်းစပ်ဟိုထိန်းချုပ်သည့် ထိန်းချုပ်မှုစနစ်/ platform ဖြင့် ပုံစံ ရေးဆွဲထားပါသည်။ ထိန်းချုပ်ခန်းတွင် တာဝန်ရှိသူသည် Process Control System၊ Safety Instrument System နှင့် Fire and Gas System တို့ဖြင့် ZPQ ၏ facilities များ၊ တွင်းများကို ချိတ်ဆက်ထားသည့် bridge များနှင့် ကမ်းလွန်တွင်းများ၏ လုပ်ငန်းချို့ယွင်းမှု တစ်စုံတစ်ရာပေါ်ပေါက်ပါက အဆိုပါထိန်းချုပ်ခန်းမှတစ်ဆင့် စောင့်ကြည့်ခြင်း၊ စစ်ဆေးခြင်းနှင့် ဖြေရှင်းခြင်းတို့ကို ဆောင်ရွက်နိုင်ပါသည်။

ထိန်းချုပ်မှုစနစ်တွင် ZPQ semi-automatic စတင်မှုအစီအစဉ်များနှင့် အလိုအလောက် လုပ်ခြေမျိုးစွာ ရပ်တန်သည့် အစီအစဉ်များကို တပ်ဆင်ထားပါသည်။ ထို့ပြင် ထိန်းချုပ်ခန်းတွင် အရေးကြီးသည့် လုပ်ငန်းစဉ် ပစ္စည်းများ/ စနစ်များကို စောင့်ကြည့်နိုင်ရေးအတွက် CCTV monitor များကို တပ်ဆင်ထားပါသည်။ feed/sales ဓာတ်ငွေ့ပါဝင်မှုကို စောင့်ကြည့်နိုင်ရန်အတွက် အွန်လိုင်းစနစ် သုံး ခွဲခြမ်းစီစဉ်ရေးစက်များကိုလည်း ပုံပိုးထားပါသည်။

၇။ စီမံကိန်း၏ ပတ်ဝန်းကျင်ဆိုင်ရာ၊ လူမှုရေးဆိုင်ရာ နှင့် ကျန်းမာရေးဆိုင်ရာ မူဝါဒများ

PTTEPI စီမံခန့်ခွဲမှုသည် ပတ်ဝန်းကျင်ကို ကာကွယ်ပေးနိုင်သည့် နည်းလမ်းများ ဖြင့် လုပ်ငန်းလည်ပတ်စေရန်နှင့် ဘေးကင်းလုပ်ခြို့စီတ်ချို့ ကျန်းမာသည့် လုပ်ငန်းခွင်ကို ပုံပိုးပေးနိုင်ရန်အတွက် အပြည့်အဝ ကတိကဝဝ်ပြုထားပါသည်။ အဆိုပါကတိကဝဝ်များသည် PTTEPI ၏ စုပေါင်းမျော်မှန်းချက်၊ ရည်မှန်းချက်၊ စံသတ်မှတ်ချက်များနှင့် SSHE မူဝါဒတိုနှင့်အညီထားရှိခြင်းဖြစ်ပါသည်။ PTTEPI မှ ဝန်ထမ်းများအားလုံး၊ စာချုပ်ချုပ်ဆိုထားသူများနှင့် third-party အဖွဲ့အစည်းများမှ တာဝန်ရှိသူများထံမှတက်ကြပြီး တစ်ဦးချင်းစီပါဝင်လို့မှာ၊ တာဝန်ယူမှုနှင့် တာဝန်ခံမှုကိုမျှော်လင့်ပါသည်။ PTTEPI SSHE စီမံခန့်ခွဲမှုစနစ်သည် အဆိုပါအခြေခံမှုများကို ရရှိရန်အတွက် သက်ဆိုင်သူများအားလုံး ၏ ကြိုးပမ်းအားထုတ်မှုများနှင့်လျော်ညီအောင် ရေးဆွဲထားခြင်းဖြစ်ပါသည်။

PTTEPI ၏ စီမံခန့်ခွဲမှုအဆင့်တိုင်းတွင် SSHE မူဝါဒနှင့် SSHE MS တို့ကို အကောင်အထည်ဖော်ခြင်းနှင့် လိုက်နာထိန်းသိမ်းခြင်းတို့အတွက် တာဝန်ရှိပါသည်။ အဆိုပါစာရွက်စာတမ်းများကိုလည်း အလျဉ်းသင့်သကဲသို့ ပြန်လည်သုံးသပ်ခြင်းနှင့် စိစစ်ပြုပြင်ခြင်းတို့ကို ဆောင်ရွက်ပါသည်။

၈။ လိုက်နာဆောင်ရွက်မှုအခြေအနေ

ရလဒ်များအရ စီမံကိန်းအနေဖြင့် ထုတ်လုပ်မှုအဆင့် နှင့် မမျှော်လင့်ထားသည့်ဖြစ်ရပ်များ အတွက် ပတ်ဝန်းကျင်ထိခိုက်မှု လျော့ပါးစေရေး အစီအမံများ ကို အပြည့်အဝ ၁၀၀ ရာခိုင် နှစ်း လိုက်နာဆောင်ရွက်မှု ရှိ ကြောင်း တွေ့ရှိရပါသည်။ လုပ်ငန်းစဉ်များတွင် Not Applicable (NA) အဖြစ်သတ်မှတ်ထားသော အခြေအနေ 23.5% သည် ရှိပါသည်။

PTTEPI သည် EIA တွင် ပြဋ္ဌာန်း ဖော်ပြထားသည့် ထိခိုက်မှုလျော့ပါးသက်သာစေရေးအစီအမံများ ကို လိုက်နာဆောင်ရွက်ခဲ့ပါသည်။ အမိကကိစ္စရပ်များကို အောက်ပါအတိုင်း အကျဉ်းချုပ်ဖော်ပြအပ်ပါသည်။

၈.၁။ ထုတ်လုပ်သည့်အဆင့်/လုပ်ငန်းလည်ပတ်သည့်အဆင့်တွင် ပတ်ဝန်းကျင်ဆိုင်ရာ ကုစားသည့် နည်းလမ်းများကို လိုက်နာဆောင်ရွက်မှုရလဒ်များ

လေအရည်အသွေး - နှစ်စဉ် PM နှင့် စုစုမ်းစစ်ဆေးခြင်းအစီအစဉ် နှင့်အညီ စက်ယန်ရားအားလုံးကို ပုံမှန်စစ်ဆေးခြင်းနှင့် ကြိုတင်ပြုပြင်ထိန်းသိမ်းခြင်းကို ဆောင်ရွက်ပါသည်။ နှစ်စဉ် ညစ်ညမ်းစေသော ပစ္စည်းထုတ်လွတ်မှု စာရင်းအတွက်လည်း လစဉ်မှတ်တမ်းပြုလုပ်ထားရှိပါသည်။ ထိုပြင် လေဝင်လေထွက် (Venting) နှင့် မီးတောက် (Flare) တို့ကိုလည်း Vent and Drain Philosophy HP and LP Flare System Startup တို့နှင့်အညီ ဆောင်ရွက်ပါသည်။ မီးတောက်အသုံးပြုသည့် လုပ်ငန်းစဉ်များအားလုံးမှ လောင်ကျမ်းသည့် စာတိငွေပမာဏကိုလည်း စီမံကိန်းဝန်ထမ်းက နေ့စဉ် မှတ်တမ်းပြုလုပ်ပါသည်။

ပင်လယ်ရေနှင့် နှစ်းအရည်အသွေး - စီမံကိန်းတွင် လုပ်ငန်းလည်ပတ်မှုများကို အထောက်အပံ့ပေးရန် အတွက် MARPOL 73/78 ၅၀ လိုအပ်ချက်များနှင့် ကိုက်ညီသည့် ရေယာဉ် (J) စီးရှိပါသည်။ ဆီဖြင့် ညစ်ညမ်းနေသည့် စွန်ပစ်ရေကို drum တွင် သိုလောင်ထားပြီး စွန်ပစ်ပစ္စည်းစီမံခန့်ခွဲမှု လုပ်ငန်းလိုင်စင်ရရှိထားသည့် ကုန်းတွင်း contractor ဖြင့်စွန်ပစ်ပါသည်။ ရေယာဉ်၏ ကုန်းပတ်နေရာများကို မိုးရေထဲတွင် ဆီနှင့် ဓာတုပစ္စည်း ညစ်ညမ်းမှု မဖြစ်စေရန် အတွက် ဝန်ထမ်းများမှ ပုံမှန်သန့်ရှင်းပေးပါသည်။ ဆီနှင့် ဓာတုပစ္စည်းသိုလောင်သည့် နေရာများအားလုံးအနီးတွင် အရေးပေါ်ယိုစိမ့်မှုတွဲပြန်ရေးကိရိယာများကို ထားရှိပေးထားပါသည်။ အသုံးပြုပြီးသည့် ပစ္စည်းများကို အန္တရာယ်ရှိသော စွန်ပစ်ပစ္စည်းထည့်သည့် ပုံးများတွင် သိမ်းဆည်းပြီး မြန်မာနိုင်ငံ၊ စွန်ပစ်ပစ္စည်းစီမံခန့်ခွဲမှု လုပ်ငန်းလိုင်စင်ရရှိထားသည့် DOWA သို့ ပို့ဆောင်၍ စွန်ပစ်ပါသည်။

အန္တဝါသက်ရှိများနှင့် အန္တဝါဂေဟော - မို့လွှာရေများကို ရေသနစင်စနစ်တွင် သန္တစင်နိုင်ရန် အတွက် စုဆောင်းထားပြီး၊ MARPOL 73/78 နှင့် မြန်မာနိုင်ငံ EQEG မှ သတ်မှတ်ချက်များနှင့် ကိုက်ညီအောင် ထိန်းသိမ်းရန် စောင့်ကြည့်စစ်ဆေးပါသည်။ ရေသနစင်စနစ်၏ ကိရိယာများ အားလုံးကို နှစ်စဉ် PM နှင့် Inspection Plan တို့နှင့် အညီ ပုံမှန်စစ်ဆေးခြင်းကို ဆောင်ရွက်ပါသည်။

ထွက်ရှိလာသောရေများကို စုဆောင်း၍ ZPQ တွင် ပြန်လည်သန့်စင်စေပြီး၊ မြန်မာနိုင်ငံ EQEG ၅၀ သတ်မှတ်ချက်ဖြစ်သည့် TOG တန်ဖိုး ကို ထိန်းချုပ်ရန် နေစဉ်စောင့်ကြည့်စစ်ဆေးပါသည်။ ထွက်ရှိလာသည့် သဲများကို ပုံးတဲ့သို့

စုဆောင်းပြီး၊ မြန်မာနိုင်ငံ၊ စွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲမှု လုပ်ငန်းလိုင်စင် ရရှိထားသည့် DOWA သို့ ပို့ဆောင်၍ စွန့်ပစ်ပါသည်။

အန္တရာယ်ရှိသောစွန့်ပစ်ပစ္စည်းများကို အနီရောင် သီးခြား ကွန်တိန်နားပုံးထဲတွင်လည်းကောင်း၊ အတွေတွေ စွန့်ပစ်ပစ္စည်းများကို အပြာရောင်ပုံးများထဲတွင်လည်းကောင်းထည့်၍ ကုန်းတွင်ပိုင်းသို့ ပို့ဆောင်ကာ စွန့်ပစ်စေပါသည်။ အန္တရာယ်ရှိသော စွန့်ပစ်ပစ္စည်းများစွန့်ပစ်မှု အချက်အလက်များကို မှတ်တမ်းတင် သိမ်းဆည်းထားပါသည်။

ထို့အပြင် အန္တရာယ်မရှိသောစွန့်ပစ်ပစ္စည်းများကို စားကြွင်းစားကျန်များ၊ စက္ခာ၍ ပြန်လည်အသုံးပြု၍ရသော စွန့်ပစ်ပစ္စည်းနှင့် အခြားစွန့်ပစ်ပစ္စည်းများဟူ၍ အမျိုးအစားခွဲခြားပြီး၊ အရောင်အမှတ်အသား ပြုလုပ်ထားသည့် အုံက်ပုံးများသို့ စွန့်ပစ်စေပါသည်။ စားကြွင်းစားကျန်များကို အရွယ်အစား ၂၅ မီလီလီတာအောက်သို့ ရောက်အောင် ဖြေခွဲဖျက်ဆီးပြီး၊ MARPOL 73/78 ပါ လိုအပ်ချက်နှင့်အညီ ပင်လယ်ထဲသို့ စွန့်ပစ်စေပါသည်။ ကုန်းပေါ်သို့ ပို့ဆောင်စွန့်ပစ်သည့် စွန့်ပစ်ပစ္စည်းများအားလုံးကို ပုံမှန်မှတ်တမ်းပြုလုပ်ထားပါသည်။

ငါးဖမ်းလုပ်ငန်း - ZPQ အနေဖြင့် ZPQ နှင့် တွင်း (WP) များမှ ရေရှိမ်း (JG) မိုင်အတွင်း ဧရိယာကို ပုံမှန်စစ်ဆေးမှုများ ပြုလုပ်ပါသည်။ အဆိုပါဧရိယာအတွင်း ခွင့်ပြုထားသည့် ရေယာဉ်များသာ ဖြတ်သန်းသွားလာနိုင်ရန်အတွက် ၅၀၀ မီတာ အန္တရာယ်ကင်းဇုန် (safety zone) ကိုလည်း သတ်မှတ်ထားပါသည်။ အဆိုပါဇုန်ထဲသို့ အခြားရေယာဉ်များ ဖြတ်သန်းလာပါက ZPQ ၏ ရေဒီယိုအခန်းရှိ အချက်ပေးစနစ်သည် အသံမြည်၍ အသိပေးမည်ဖြစ်ပါသည်။ ထို့ပြင် ZPQ နှင့် WP များရှိ အန္တရာယ်ကင်းဇုန်အတွင်း အခြားရေယာဉ်များ ဝင်ရောက်လာပါက အဆိုပါယာဉ်များနှင့် ဆက်သွယ်နိုင်ရန်အတွက် အထောက်အကူပြုရေယာဉ်များကို ထားရှုပါသည်။ ရေယာဉ်များအချင်းချင်း မတော်တဆ ထိတိက်မှုမှ ကာကွယ်နိုင်ရန်အတွက် ZQP နှင့် WP တို့တွင် သင့်လျော်သည့် အချက်ပြမ်းများ နှင့် သတ်ပေး အမှတ်အသားများ ကို တပ်ဆင်ထားရှုပါသည်။

ရေယာဉ်အသွားအလာနှင့် ရေကြောင်းထိန်းသိမ်းခြင်း - ZPQ အနေဖြင့် ZPQ နှင့် တွင်း (WP) များမှ ရေရှိမ်း (JG) မိုင်အတွင်း ဧရိယာကို ပုံမှန်စစ်ဆေးမှုများ ပြုလုပ်ပါသည်။ အဆိုပါ ဧရိယာအတွင်း ခွင့်ပြုထားသည့် ရေယာဉ် များသာ ဖြတ်သန်းသွားလာနိုင်ရန်အတွက် ၅၀၀ မီတာ အန္တရာယ်ကင်းဇုန် (safety zone) ကိုလည်း သတ်မှတ် ထားပါသည်။ အဆိုပါဇုန်ထဲသို့ အခြား ရေယာဉ်များ ဖြတ်သန်းလာပါက ZPQ ၏ ရေဒီယိုအခန်းရှိအချက် ပေးစနစ် သည် အသံမြည်၍ အသိပေးမည်ဖြစ်ပါသည်။ ထို့ပြင် ZPQ နှင့် WP များရှိ အန္တရာယ်ကင်းဇုန်အတွင်း အခြားရေယာဉ် များ ဝင်ရောက်လာပါက အဆိုပါယာဉ်များနှင့် ဆက်သွယ်နိုင်ရန်အတွက် အထောက်အကူပြု ရေယာဉ်များကို ထားရှုပါသည်။ ရေယာဉ်များအချင်းချင်း မတော်တဆ ထိတိက်မှုမှ ကာကွယ်နိုင်ရန် အတွက် ZQP နှင့် WP တို့တွင် သင့်လျော်သည့် အချက်ပြမ်းများ နှင့် သတ်ပေးအမှတ်အသားများကို တပ်ဆင်ထားရှုပါသည်။

ငွေ့ရည် - (Condensate) ငွေ့ရည်လောင်ကျမ်းခြင်းကို Liquid Burner Operation Procedure လုပ်ထံးလုပ်နည်းအတိုင်း ဆောင်ရွက်ပြီး င်းတွင် ဘေးကင်းလုံခြုံရေးဆိုင်ရာလမ်းညွှန်ချက်များပါရှုပါသည်။

လုပ်ငန်းခွင် ကျန်းမာရေးနှင့် လုပ်ခြေား PTTEPI တွင် လုပ်ငန်းခွင်ကျန်းမာရေးစီမံခန့်ခွဲမှု စံနှုန်း (Occupational Health Management Standard) ကို ပြင်ဆင်ထားရှိပြီး၊ အောက်ပါသည်။ ဝန်ထမ်း များအားလုံးသည့် လုပ်ငန်းလုပ်ကိုင်နေချိန်တိုင်းတွင် တစ်ကိုယ်ရည်အကာအကွယ်ပေးသည့်ပစ္စည်း (PPE) များကို သင့်လျော်သကဲ့သို့ ဝတ်ဆင်ကြရပါသည်။ SSHE နှစ်စဉ် လေ့ကျင့်သင်ကြားပေးခြင်း အစီအစဉ်နှင့်အညီ ဘေးကင်း လုပ်ခြေားဆိုင်ရာ လေ့ကျင့်သင်ကြားခြင်းအစီအစဉ်များကို ဆောင်ရွက်ပါသည်။ SSHE Emergency Drill & Exercise Plan နှင့်အညီ အရေးပေါ်ဖြစ်စဉ် သို့မဟုတ် အရေးပေါ်တုံ့ပြန်ရေးဆိုင်ရာ လေ့ကျင့်မှုများ (Emergency Drill) များကို လည်းဆောင်ရွက်ပါသည်။ အသက်ကယ်ခြင်းအစီအစဉ်များဆိုင်ရာ စံနှုန်းသတ်မှတ်ချက်များကိုလည်း Zawtika Offshore Field Emergency Response Plan နှင့် အခြားဆက်စပ် Plan များတွင် အသေးစိတ် သတ်မှတ်ဖော်ပြထားပါသည်။ ထို့ပြင် Offshore Medical Emergency Response Plan (MERP) နှင့် Myanmar Asset Crisis Management Plan တို့ကိုလည်း အကောင်အထည်ဖော် ဆောင်ရွက်လျက်ရှိပါသည်။ ရှေးဦးသူနာပြုဆေးသတ္တာများ နှင့် ဆေးခန်းများကိုလည်း ပုံပိုးထားရှိပြီး၊ ဆေးခန်းတွင် ဆေးသက်ဆိုင်ရာကျွမ်းကျင်သူက ကုသမှုပေးရန် အမြှုပို့ နေပါသည်။ အရေးပေါ်အခြေအနေပေါ်ပေါက်ပါက MERP နှင့်အညီ လူနာကို ဆေးသက်ဆိုင်ရာ ကျွမ်းကျင်သူက ကနိုင်းကုသမှု ပြုလုပ်ပြီး၊ ရန်ကုန်ဖြို့ကြိုး ဆေးရုံသို့ ရဟတ်ယာဉ်ဖြင့် ပို့ဆောင်ပါသည်။ စက်ပစ္စည်း/ကိရိယာများနှင့် လုပ်ငန်း ဆောင်ရွက်ရာတွင် လုပ်ခြို့တ်ချုပ်သည့် နည်းလမ်းများနှင့် ဘေးကင်းလုပ်ခြေားသည့် လုပ်ငန်းဆောင်ရွက်မှုဆိုင်ရာ လုပ်ထုံးလုပ်နည်းများကိုလည်း အကောင်အထည်ဖော်ဆောင်ရွက်ပြီး ဖြစ်ပါသည်။ ဓာတုပစ္စည်းသို့လျောင်သည့် နေရာတိုင်းတွင်လည်း Safety Data Sheet (SDS) များကို ဖော်ပြထားရှိပါသည်။

၂၀၂၁ ခုနှစ်၊ ဇန်နဝါရီလမှ နွေ့နှစ်လအထိ မတော်တဆဖြစ်ရင် (၆) ခုဖြစ်ပွားခဲ့ပြီး၊ ရှေးဦးသူနာပြု ဆိုင်ရာဖြစ်စဉ် (၁) ခု၊ Near Miss ဖြစ်စဉ် (၂) ခု၊ PD ဖြစ်စဉ် (၁) နှင့် LOPC Tier 3 ဖြစ်စဉ် (၁) ခု တို့ ဖြစ်ပါသည်။ အလားတူဖြစ်စဉ်များ ထပ်မံမဖြစ်ပွားစေရန်အတွက် ပြင်ဆင်သည့်လုပ်ငန်းများကို အဆိုပြု/အကောင်အထည်ဖော်ဆောင်ရွက် ထားရှိပါသည်။ အဆိုပါဖြစ်စဉ်များ၏ အကျဉ်းချုပ် မှတ်တမ်းကို နောက်ဆက်တွဲ (D-6) အဖြစ် ဖော်ပြအပ်ပါသည်။

၈.၂။ မမြော်လင့်ထားသည့် ဖြစ်စဉ်များတွင် ပတ်ဝန်းကျင်ဆိုင်ရာ ကုစားသည့်နည်းလမ်းများအပေါ် လိုက်နာဆောင်ရွက်မှုရလဒ်

ရေယာဉ်မတော်တဆဖြစ်ပွားမှု - PTTEP ၏ အရေးပေါ်နှင့်အကျပ်အတည်းအခြေအနေဖြစ်မှုအစီအစဉ် (PTTEPI's Emergency and Crisis Management Plan) ကို အကောင်အထည်ဖော်ထားပြီး ငှါးတွင် ရေယာဉ်များမတော်တဆ ထိတိက်မှုများဖြစ်ပါက လိုက်နာဆောင်ရွက်ရမည့်နည်းလမ်းများ ပါဝင်ပါသည်။ Rig Mobilization ပြီးသည့်နောက်တွင် ပင်လယ်ရေးလုပ်သားများအတွက် သတိပေးစာတွင် အစိုးရအာဏာပိုင်များထံသို့ တင်ပြခဲ့ပြီး ဖြစ်ပါသည်။ ZPQ အနေဖြင့် ZPQ နှင့် တွင်း (WP) များမှ ရေမြင် (၂၄) မိုင် အတွင်း ရေးယာကို ပုံမှန်စစ်ဆေးမှုများ ပြုလုပ်ပါသည်။ အဆိုပါ ရေးယာအတွင်း ခွင့်ပြထားသည့် ရေယာဉ်များသာ ဖြတ်သန်းသွားလာနိုင်ရန် အတွက် ၅၀၀ မီတာ အန္တရာယ်ကင်းမှန် (safety zone) ကိုလည်း သတ်မှတ်ထားပါသည်။ အဆိုပါအန်ထံသို့ အခြား ရေယာဉ်များ ဖြတ်သန်းလာပါက ZPQ ၏ ရေဒီယိုအခန်းရှိ အချက်ပေးစနစ်သည် အသံမြေည်

၍ အသိပေးမည်ဖြစ်ပါသည်။ ထို့ပြင် ZPQ နှင့် WP များရှိ အန္တရာယ်ကင်းစုန်အတွင်း အခြားရေယာ၏များ ဝင်ရောက်လာပါက အဆိုပါယာ၏များနှင့် ဆက်သွယ်နိုင်ရန်အတွက် အထောက်အကြော် ရေယာ၏များကို ထားရှုပါသည်။ မတော်တဆ ရေယာ၏များအချင်းချင်းတိုက်မှုမှ ကာကွယ်နိုင်ရန်အတွက် ZQP နှင့် WP တို့တွင် သင့်လျှော့သည့် အချက်ပြီး များနှင့် သတိပေးအမှတ်အသားများကို တပ်ဆင်ထားရှုပါသည်။

မတော်တဆယ့်ဖိတ်မှု - PTTEPI ၏ Emergency and Crisis Management Plan ကို အကောင်အထည်ဖော်ထားပြီး ငွေးတွင် ဆီ (သို့မဟုတ်) ဓာတုပစ္စည်းများဖိတ်စင်မှုဖြစ်ပေါ်ခဲ့ပါက လိုက်နာဆောင်ရွက်ရမည့် နည်းလမ်းများ ပါဝင်ပါသည်။ ဆီ သို့မဟုတ် ဓာတုပစ္စည်း များ ယိုဖိတ်မှုနှင့်ပတ်သက်၍ တုံ့ပြန်ရေးဆိုင်ရာလေ့ကျင့်မှုများ ကိုလည်း ပုံမှန်ဆောင်ရွက်ပါသည်။ မတော်တဆဖြစ်စဉ်များနှင့် Nearmiss ဖြစ်ရပ်များနှင့် ပတ်သက်၍ စီမံကိန်းဝန်ထမ်းများက မှတ်တမ်းများ ပြုလုပ်ထားရှုပါသည်။ စွန်းပစ်ပစ္စည်းစွန်းပစ်မှု ဆိုင်ရာ လုပ်ထုံးလုပ်နည်းကို လိုက်နာ အကောင်အထည်ဖော် ဆောင်ရွက်လျက် ရှုပါသည်။ ဓာတုပစ္စည်းများကို ငွေးတို့၏ ဓာတ်ဝါယာလက္ခဏာများအရ သီးခြားစီခွဲ၍ သိမ်းဆည်းပါသည်။ လုပ်ငန်းလည်ပတ်သည့်နေရာများတွင် ချောဆီ၊ လောင်စာ၊ သုတေသနးနှင့် အခြားဓာတုပစ္စည်းများကို လိုအပ်သည့်ပမာဏကိုသာ သိလောင်သိမ်းဆည်းထားပါသည်။ ဆီနှင့် ဓာတုပစ္စည်း သိလောင်သည့် နေရာများ အားလုံးတွင် bin သို့မဟုတ် dip tray များကို ပုံပိုးထားရှုပါသည်။ ယိုဖိတ်သည့် ဆီ နှင့် ဓာတုပစ္စည်းများကို drum တွင် စုဆောင်းပြီး၊ မြန်မာနိုင်ငံ၊ စွန်းပစ်ပစ္စည်း စီမံခန့်ခွဲမှု လုပ်ငန်းလိုင်စင်ရရှိထားသည့် DOWA သို့ ပို့ဆောင်၍ စွန်းပစ်ပါသည်။ ရေယာ၏များအချင်းချင်း မတော်တဆ ထိုတိုက်မှုမှ ကာကွယ်နိုင်ရန် အတွက် ZQP နှင့် WP တို့တွင် သင့်လျှော့သည့် အချက်ပြီးများနှင့် သတိပေးအမှတ်အသားများ ကို တပ်ဆင်ထားရှုပါသည်။ စက်ကိုရိယာများအားလုံးကို နှစ်စဉ် PM နှင့် Inspection Plan တို့နှင့်အညီ ပုံမှန်စစ်ဆေးခြင်းကို ဆောင်ရွက်ပါသည်။ Emergency Cyclone Procedure ကို အကောင်အထည်ဖော်လျက်ရှိပြီး၊ SSHE Emergency Drill and Exercise Plan နှင့်အညီ အရေးပေါ်တုံ့ပြန်ရေးဆိုင်ရာ လေ့ကျင့်ခြင်းများကို ဆောင်ရွက်ပါသည်။ ဓာတုပစ္စည်းသိလောင်သည့် နေရာတိုင်းတွင်လည်း Safety Date Sheet (SDS) များကို ဖော်ပြထားရှုပါသည်။ အန္တရာယ်ရှိသော စွန်းပစ်ပစ္စည်းများကို အနီရောင် သီးခြား ကွန်းတိန်နာပုံးထဲတွင်လည်းကောင်း၊ အထွေထွေ စွန်းပစ်ပစ္စည်းများကို အပြာရောင်ပုံးများထဲတွင်လည်းကောင်းထည့်၍ ကုန်းတွင်းပိုင်းသို့ပို့ ဆောင်ကာ စွန်းပစ်ပေါ်သည်။ အန္တရာယ်ရှိသော စွန်းပစ်ပစ္စည်း စွန်းပစ်မှုဆိုင်ရာ အချက်အလက်များကို သိမ်း ဆည်းမှတ်တမ်းထားရှုပါသည်။ ထိန်းချုပ်ခန်းများတွင်လည်း ထိန်းချုပ်ရေးခလုတ် (control valve) ကို တပ်ဆင် ထားရှုပြီး၊ စောင့်ကြည့်စစ်ဆေးမှုများ ပြုလုပ်လျက်ရှုပါသည်။ နှစ်စဉ် PM နှင့် Inspection Plan တို့နှင့်အညီ ကြည့်ရှု စစ်ဆေးခြင်းကို ပုံမှန်ဆောင်ရွက်ပါသည်။

အပူပိုင်းဆိုင်ကလုန်း - အပူပိုင်းဆိုင်ကလုန်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်း (Tropical Cyclone Procedure) ကို အကောင်အထည်ဖော်ထားပါသည်။ ထို့ပြင် SSHE Emergency Drill and Exercise Plan နှင့်အညီ အရေးပေါ်တုံ့ပြန်ရေးဆိုင်ရာ လေ့ကျင့်ခြင်းများကို ဆောင်ရွက်ပါသည်။

မီးလောင်ကျမ်းခြင်း သို့မဟုတ် ပေါက်ကွဲခြင်း - စီမံကိန်းဒရိယာများတွင် မီးသတ်ပစ္စည်းများနှင့် အချက်ပေးကိရိယာများကို တပ်ဆင်ထားရှိပြီး တာဝန်ရှိသူများက ပုံမှန်ကြည့်ရှုစစ်ဆေးခြင်းကို ဆောင်ရွက်ပါသည်။ SSHE Emergency Drill and Exercise Plan နှင့်အညီ အရေးပေါ် တုံ့ပြန်ရေးဆိုင်ရာ လေ့ကျင့်ခြင်း (Drill) များကို ဆောင်ရွက်ပါသည်။ မီးလောင်ကျမ်းခြင်းနှင့် ပေါက်ကွဲမှုဖြစ်စဉ်များအတွက် PTTEPI ၏ Emergency and Crisis Management Plan ကို အကောင်အထည်ဖော်ထားရှိပါသည်။ မီးသတ်ရေစနစ်ကိုလည်း တာဝန်ရှိသူက ပုံမှန် ကြည့်ရှုစစ်ဆေးပါသည်။ ငွေ့ရည်လောင်ကျမ်းခြင်းကိုလည်း Liquid Burner Operation Procedure တွင် ဖော်ပြထားသည့် ဘေးကင်းလုံးခြုံသည့် ညွှန်ကြားချက်များနှင့်အညီ ဆောင်ရွက်ပါသည်။ Burner package ၏ လေအသုံးပြုမှုကို Liquid Burner Operation Procedure နှင့်အညီ သင့်တော်သည့် လေစီးဝင်မှုရရှိစေရန်အတွက် တာဝန်ရှိသူက ပုံမှန် စစ်ဆေးပါသည်။ ဓာတ်ငွေ့ထောက်လှန်းခြင်း စနစ်ကိုလည်း WP-1 တွင် တပ်ဆင်ထားပြီး တာဝန်ရှိသူက စစ်ဆေးခြင်းကို ပုံမှန်ဆောင်ရွက်ပါသည်။ သတိပေးသည့်စနစ် (alarm) ကို ထိန်းချုပ်ခန်းမှ စောင့်ကြည့်လေ့လာပါသည်။ burner ရေးယာတွင် CCTV တပ်ဆင်ထားပြီး ထိန်းချုပ်ခန်းမှ စောင့်ကြည့်ပါသည်။

၈.၃။ ပတ်ဝန်းကျင်ဆိုင်ရာစောင့်ကြည့်လေ့လာခြင်းရလဒ်

ပတ်ဝန်းကျင်ဆိုင်ရာ စောင့်ကြည့်စစ်ဆေးခြင်းရလဒ်များအာရ စီမံကိန်းသည် ပတ်ဝန်းကျင်ဆိုင်ရာ ထိခိုက်မှ လျော့ပါးစေရေးနည်းလမ်းများနှင့် စောင့်ကြည့်စစ်ဆေးခြင်းအစီအစဉ် ကို ၁၀၀ ရာခိုင်နှုန်း လိုက်နာ ဆောင်ရွက်မှု ရှိသည်ကို တွေ့ရပါသည်။

(၁) မိုးလှာရေဆိုးစောင့်ကြည့်လေ့လာခြင်း

မိုးလှာရေဆိုးစောင့်ကြည့်လေ့လာခြင်းကို REM-UAE ဓာတ်ခွဲခန်းနှင့် အကြံးပေး ကုမ္ပဏီလီမိတက်က ၂၀၂၁ ခုနှစ်၊ နေ့နံပါရီလ ၁၉ ရက်နေ့တွင် ZPQ ရှိ မိုးလှာရေဆိုးသန်စင်သည့်စနစ်မှ ရေစွန်ထုတ် သည့်နေရာတွင် ဆောင်ရွက်ခဲ့ပါသည်။ စောင့်ကြည့်လေ့လာမှုရလဒ်အာရ ပါရာမိတာများ အားလုံးသည် National Environmental Quality (Emission) Guidelines တွင် အသေးစိတ်ပြဋ္ဌာန်းဖော်ပြထား သည့် MARPOL 73/78 နှင့် ကိုက်ညီမှုရှိသည်ကို တွေ့ရှိရပါသည်။

(၂) ထွက်ရှိလာသည့်ရေ (Produced water) စောင့်ကြည့်လေ့လာခြင်း

ထွက်ရှိလာသောရေစောင့်ကြည့်စစ်ဆေးခြင်းကို ၂၀၂၁ ခုနှစ်၊ နေ့နံပါရီလမှ ဇန်နဝါရီလ အတွင်း ZPQ ရှိ သန်စင်သည့် စနစ်မှ ရေစွန်ထုတ်သည် နေရာတွင် ဆောင်ရွက်ခဲ့ပါသည်။ အဆီ (oil) နှင့် ချောဆီ (grease) တို့ ရလဒ်များသည် အမျိုးသားပတ်ဝန်းကျင်အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်များနှင့် နှင့် ကိုက်ညီမှု ရှိကြောင်း တွေ့ရှိရပါသည်။

(၃) ထွက်ရှိလာသည့်သဲ (Produced sand) စောင့်ကြည့်လေ့လာခြင်း

ထွက်ရှိလာသော သဲ (produced sand) ကို သင့်တော်သည့်ပုံး (UN Drum) တွင် စုဆောင်းပြီး၊ မြန်မာနိုင်ငံ၊ စွန်ပစ်ပစ္စည်းစီမံခန့်ခွဲမှု လုပ်ငန်းလိုင်စင်ရရှိထားသည့် DOWA သို့ ပို့ဆောင်၍ စွန်ပစ်ပစ္စည်းပါသည်။

Executive Summary

REM-UAE Laboratory and Consultant Company Limited conducted compliance audit of implementation of environmental mitigation measures and monitoring program for Zawtika Development Phase 1C and 1D.

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) document review (2) sample collection and analysis and (3) PTTEP team supporting site photos to REM-UAE.

1. Project Overview

PTT Exploration and Production International Limited (PTTEPI) signed the Production Sharing Contract (PSC) of Block M9 and Block M11 with Myanma Oil & Gas Enterprise (MOGE) on November 12, 2003 and July 25, 2005, respectively. Contract Area or Development and Production Area are the same area of a whole of Block M9 and small part in the North Eastern area of Block M11.

The Export Gas Sales Agreement (EGSA) and associated agreements including the Domestic Gas Sales Agreement (DGSA), Supplementary Agreement to Gas Terms of Block M9 and M11 (SAGT), Export Gas Transportation Agreement (EGTA), and Pipeline Right Agreement (PRA) were signed on 30th July 2010. The Overall Daily Contractual Quantity (DCQ) is agreed at 300 MMSCFD with 240 MMSCFD for the export gas to Thailand and 60 MMSCFD for the domestic gas market, 15% swing to reach the Overall Contractual Daily Capacity (CDC) of 345 MMSCFD with the same proportion for exporting to Thailand and domestic gas market.

2. Zawtika Production Development

Based on 2016 Zawtika Field Development Plan, the Zawtika development project is divided into 4 phases comprising of Phase 1A, 1B, 1C, and 1D. Phase 1A, 1B and 1C have already been installed and are currently operational, whereas Phase 1D is planned future development activities.

2.1 Phase 1C

- Consists of 4 remote wellhead platforms namely ZWP8, ZWP9, ZWP10 and ZWP11. The well fluid from 4 wellhead platforms will be processed to ZPQ via their intra-field pipelines.
- Four (4) Intra-field Pipelines:
 - ZWP8 to IP2 PLEM (18" 22.5 km)
 - ZWP9 to ZWP7 (14" 11 km)
 - ZWP10 to IP2 PLEM (18" 5 km)
 - ZWP11 to IP6PLEM (18" 15 km)

- 2 Pipeline End Manifolds (PLEMs).
 - IP2 PLEM: 3-inlet subsea PLEM (for IP2, IP8 and IP10)
 - IP6 PLEM: 4-inlet subsea PLEM (for IP6, IP11 and 2 future tie-in)
- The first wellhead platform to be installed in Q4 of 2017 and completed all wellhead platforms, associated pipelines and PLEM installation in Q2 of 2018.
- The production phase of Zawtika 1C was started around November 2018.

2.2 Phase 1D

- consists of 8 remote wellhead platforms namely ZWP12, ZWP13, ZWP14, ZWP15, ZWP16, ZWP17, ZWP18, and ZWP19 including their associated pipelines with 2 pipeline end manifolds (PLEMs).
- Field implementation for installation of Wellhead Platforms will start at Zawtika Field in Q2 2022.

3. Processing System

The process starts with well fluids from remote wellhead platforms flowing into the ZPQ. They are cooled by seawater and arrive marginally above seawater temperature. Well fluids from bridge connected wellhead platform (WP1) are cooled (by air cooler system) before being mixed with the rest of the well fluids.

The incoming well fluids then pass through the production separators, where they are separated into gas, condensate and water streams. Separated gas from separators is compressed in the 1st stage gas compressor to remove some condensate prior to delivery to gas dehydration, where water is removed. Dry gas passed from the dehydration unit is cooled and compressed at 2nd stage gas compressor train and passed to the 28" offshore export pipeline to the onshore section. Some of dry gas is diverted to be used as fuel for other processes and power generation supplied for the ZPQ.

Production liquids separated from the gas consist of condensate and produced water. Condensate will be burned using smokeless burner at WP1.

Regarding produced water, there is no heavy metal Hg, As from gas and water analysis for all the explored areas. PTTEPI has conducted monthly produced water analysis since the beginning of their operations, and no heavy metals have been found. As such, produced water separated from the production separators and some from the condensate flash drum at the maximum design of 20,000 bpd is being sent to a de-oiler unit to separate residual condensate back to flash drum prior to tipping overboard with the treated water to meet the Myanmar's National Environmental Quality Guidelines (EQEG) Standards.

4. Emission and Effluent Management

4.1 Flaring

ZPQ is equipped with HP and LP gas flare systems that cater for safe and reliable disposal of planned and unplanned releases of hydrocarbon gas from the production facilities. Flare knock out drums are provided on the HP and the LP systems. The configuration of level control is on/off gap level control, as normally no continuous liquid is expected. The normal liquid level is controlled to be as low as practically possible to

maximise the available volume for any liquid relief and also the gas area to improve liquid knock-out. Liquids from both HP and LP flare knock out drum are collected in closed drain vessel.

At all wellhead platforms (WP1-WP11), a temporary (removable type) flare boom and a gas-liquid burner for well clean up is provided. Two tie-in points (one at East and one at West sides of the platform) are provided for the temporary burner on all of the WPs.

4.2 Waste and Wastewater

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

5. Utilities

5.1 Power and Energy Use

ZPQ is equipped with 3 dual fuel gas turbine power generation units, each of 3.7 MW site rated capacity, which supply all required power to ZPQ and WP1. Multiple gas turbine driven units with adequate capacity to ensure availability of power when a unit is not operational are provided.

A treble fuel design (fuel gas, condensate and diesel) for all three power generation units has been selected, but the connection is made for fuel gas and diesel only. Electric motor start systems are provided for all three power generators.

Emergency diesel power generation of 1.28 MW is provided for essential load in case of turbine generator trip. A black start diesel generator of 280 kW is also provided for initial start.

5.2 Water Use

Two reverse osmosis water production units with capacity of 1.5 m³/hr, total 3 m³/hr are provided for fresh water production using RO membrane. The water produced by these units is suitable for consumption, plus other intermittent uses, such as eyewash, safety shower, etc. Fresh water from the fresh water units is supplied and stored in fresh water storage tanks. The stored fresh water is then transferred via pumps to the pressurized fresh water vessel for distribution to various users. Potable water suitable for drinking is supplied after treatment of freshwater by a sterilizer.

6. Emergency Shutdown System

ZPQ is designed to provide fully automatic, integrated and centralized platform/ process control. The control room operator is able to monitor, detect, and handle process upsets from the control room through Process Control system (PCS), Safety Instrument System and Fire and Gas System (SIS and FGS) for facilities on ZPQ, the bridge connected wellhead platform and remote wellhead platforms.

The ZPQ semi- automatic start- up sequences and automatic safe shutdowns are implemented in the control system. Closed circuit television (CCTV) monitors are provided in the control room to monitor critical process equipment/ systems. Online analyzers are provided to monitor the content in the feed/sales gas.

7. 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.

8. Compliance Status

The results determined that the project completely complied on the Mitigation Measures for production phase and the unplanned events with 100% for the activities that have situation, however there are 23.5% of activity for unplanned event that do not have the situation which was identified as Not Applicable (NA).

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

8.1 Environmental Mitigation Measures Compliance Result in Production/Operation Phase

- **Air Quality** - Routine inspection and preventive maintenance for all machinery were conducted as per annual PM and Inspection Plan. Annual pollutant release inventory was recorded monthly basis. Moreover, venting and flare were performed as per the Vent and Drain Philosophy, and HP and LP Flare System Startup. The volumes of gas flared for all flaring events were daily recorded by project staff.
- **Seawater & Sediment Quality** - Project has 2 vessels for support operation activities, both were complied with the requirements of MARPOL 73/78. Oil-contaminated wastewater was collected in the drum for disposal by onshore contractor, the license waste management service. Deck of vessel was regularly clean by staff to minimize oil and chemical contamination in rainwater. Emergency spill response equipment was provided near all oil and chemical storage area. After usage all were kept in the hazardous waste container and sent to dispose by DOWA, the license waste management service in Myanmar.
- **Marine Life and Marine Ecology** - Sewage was collected to treat at treatment system and monitored to control all parameters as requirements of MARPOL 73/78 and Myanmar's EQEG. All equipment of water treatment system were regularly inspected as per the annual PM and Inspection Plan.

Produced water was collected to treat at ZPQ and monitored everyday to control TOG value as per requirements of Myanmar's EQEG. Produced sand was collected in the container and sent to dispose at onshore by DOWA, the license waste management service in Myanmar.

Hazardous waste was collected in the red container separated from the general waste which was collected in the blue ones, all containers were sent to dispose at onshore. The manifest for hazardous waste disposal was kept and recorded.

Furthermore, non-hazardous wastes were segregated as food waste, paper, recycle waste and other waste and kept in the bins attached with colour code. The food waste was grinded to a size less than 25 mm before discharge into the sea as per the requirements under MARPOL 73/78. All wastes were recorded regularly when sent to dispose at onshore.

- **Fishing** - ZPQ regularly observed an area of 24 nautical miles from ZPQ and WPs. A 500m safety zone was established to ensure only permit vessel can operate in this area. When other vessel moves into the safety zone, the alarm in the radio room at ZPQ was warned. In addition, support vessels were used to contact with other vessels when they move into the safety zone around ZPQ and WPs. The appropriate lights and warning signals were already provided on ZPQ and WPs and all vessels to prevent accidental collision.
- **Shipping and Navigation** - ZPQ regularly observed an area of 24 nautical miles from ZPQ and WPs. A 500m safety zone was established to ensure only permit vessel can operate in this area. When other vessel moves into the safety zone, the alarm in the radio room at ZPQ was warned. Support vessels were used to contact with other vessels when they move into the safety zone around ZPQ and WPs. The appropriate lights and warning signals were already provided on ZPQ and WPs and all vessels to prevent accidental collision.

Condensate burning was performed as per the Liquid Burner Operation Procedure which the safety instructions was clarify in this document.

- **Occupational Health and Safety** - PTTEPI's Occupational Health Management Standard was prepared and applied for Zawtika project. All staffs wear appropriate PPE at all working time. The safety training schedule was performed as per SSHE annual training plan. The safety case or emergency drill was performed as per SSHE Emergency Drill & Exercise Plan. Life saving program standard was specified in Zawtika Offshore Field Emergency Response Plan and others related plan. Offshore Medical Emergency Response Plan (MERP) and Myanmar Asset Crisis Management Plan were already implemented. First-aid kits and medic room were provided. The medic was stand by at medic room for medical treatment. In case of emergency, the patient will be pre-treatment by medic and will sent to the hospital in Yangon by helicopter as per The Offshore Medical Emergency Response Plan (MERP). Safety method for working with machines/ equipment and procedure for safety operation were already implemented. The SDS was attached at all chemical storage area.

There were total 6 cases of incident during January to June 2021 including 1 case of first aid case (FAC), 2 cases of Near Miss, 1 case of PD and 1 case of LOPC Tier 3. Corrective actions were proposed/implemented to prevent reoccurrence. The summary of incident record as shown in Appendix D-6.

8.2 Environmental Mitigation Measures Compliance Result in Unplanned Events

- **Vessel collision** - PTTEPI's Emergency and Crisis Management Plan was implemented which the procedures in the event of an accidental vessel collision was included. The notice to mariner was already submitted to government authorities after rig mobilization. ZPQ regularly observed an area of 24 nautical miles from ZPQ and WPs. A 500m safety zone was established to ensure only permit vessel can operate in this area. When other vessel moves into the safety zone, the alarm in the radio room at ZPQ was warned. Support vessels were used to contact with other vessels when they move into the safety zone around ZPQ and WPs. The appropriate lights and warning signals were already provided on ZPQ and WPs and all vessels to prevent accidental collision.
- **Accidental Spills** - PTTEPI's Emergency and Crisis Management Plan was already implemented which the oil or chemical spills was included. The exercise of oil or chemical spills was regularly performed. The incident and nearmiss record was collected by project staffs. Waste management procedure was already implemented and followed. The chemical was separated to store according to their characteristics. The lubricants, fuels, paints and other chemicals were stored only necessary amounts at operation area. The bun or dip tray was already provided at all oil and chemical storage area. Any spilled oil and chemical was collected into drum and sent to dispose by DOWA, the license waste management service in Myanmar. The appropriate lights and warning signals were already provided on ZPQ, WPs and all vessels to prevent accidental collision. Routine inspection and preventive maintenance for all machinery were conducted as per annual PM and Inspection Plan. The Tropical Cyclone Procedure was implemented including the emergency drill was performed as per the SSHE Emergency Drill & Exercise Plan. The SDS was attached at all chemical storage area. Hazardous waste was collected in the red container separated from the general waste which was collected in the blue ones, all containers were sent to dispose at onshore. The manifest for hazardous waste disposal was kept and recorded. The control valve was already installed and monitored by control room. The inspection was performed regularly as per the annual PM and Inspection Plan.
- **Tropical cyclone** - The Tropical Cyclone Procedure was implemented. Also, the emergency drill was performed as per the SSHE Emergency Drill & Exercise Plan.
- **Fire or Explosion** - The firefighting equipment and alarm were provided in the area and regularly inspected by operators. The emergency drill was performed as per the SSHE Emergency Drill & Exercise Plan. PTTEPI's Emergency and Crisis Management Plan was implemented in case of fire or explosion occurrence. The firewater system was regularly inspected by operator. Condensate burning was performed as per the Liquid Burner Operation Procedure which the safety instructions was clarify in this document. The air consumption of the burner package was checked by operator to ensure adequate air flow as per the Liquid Burner Operation Procedure. The gas detection system was installed at WP-1 and regularly checked by operator. The alarm was monitored by control room. The CCTV was already installed at burner area and monitored by control room.

8.3 Environmental Monitoring Result

The results of Environmental Impact Monitoring determined that the project completely complied with 100%.

1) Sewage Monitoring

Sewage monitoring was conducted by REM-UAE Laboratory and Consultant Company Limited on January 19, 2021 from sewage treatment system discharge point at ZPQ. The result found that all of parameters complied with MARPOL73/78 as specified in National Environmental Quality (Emission) Guidelines.

2) Produced Water Monitoring

Produced water monitoring at ZPQ was conducted from Produced Water treatment system discharged point during January to June 2021. The results found that oil and grease were complied with National Environmental Quality (Emission) Guidelines.

3) Produced Sand Monitoring

Produced sand was collected in the proper container (UN drum) and sent to dispose at onshore facility which is DOWA, the license waste management service in Myanmar.

Chapter 1

Chapter 1 Introduction

1.1 Introduction

The Zawtika Project is a gas field development project located in Block M9 and a small portion of Block M11 in the Gulf of Martaban (also known as the Gulf of Moattama), Myanmar. The existing development of Zawtika Project has thus far covered Phase 1A, Phase 1B and Phase 1C.

Following the success of Phase 1A and 1B and 1C Development, PTTEPI plans to develop Zawtika Phase 1D by installation of 8 remote wellhead platforms at nearby area of Phase 1A, 1B and 1C in Block M9.

Details of each development phase are outlined as follows:

- Phase 1A and 1B consists of ZPQ (Processing platform integrated with Living Quarter module), a bridged-link wellhead platform ZWP1, other remote wellhead platforms namely ZWP2, ZWP3, ZWP4, ZWP5, ZWP6 and ZWP7, associated intra-field sealines and 230 km offshore gas transportation pipeline.
- Phase 1C consists of 4 remote wellhead platforms namely ZWP8, ZWP9, ZWP10 and ZWP11 including their associated pipelines with 2 pipeline end manifolds (PLEMs). The first platform to be installed in Q4 of 2017. The production phase of Zawtika 1C was started around November 2018.
- Phase 1D consists of 8 remote wellhead platforms namely ZWP12, ZWP13, ZWP14, ZWP15, ZWP16, ZWP17, ZWP18, and ZWP19 including their associated pipelines with 2 pipeline end manifolds (PLEMs). Field implementation for installation of Wellhead Platforms will start at Zawtika Field in Q2 2022.

The Environmental Impact Assessment (EIA) Report of Zawtika Development Phase 1C and 1D was approved by MOGE and ECD according to the approval letter number MD 100 3/6 (2338) 2018 and (Forest)3(2)/16(D) (3207/2018), respectively (Appendix A). As per commitment in Environmental Impact Assessment (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 EIA and report the results to MOGE and ECD as prescribing in EIA.

In this monitoring report is an environmental impact monitoring and mitigation measures implementation compliance report which covered of Zawtika Phase 1C production period.

1.2 Objective

The main objectives of this report are:

- To evaluate the effectiveness of implementation of the Environmental Impact Assessment, including both mitigation and monitoring measures, defined in the EIA report; and

- 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 Briefly Information of the Project

1.3.1 General Information and Background

1)Project Name: Zawtika Development Phase 1C and 1D
2)Project Location: Block M9 and a small portion of Block M11 in the Gulf of Martaban
3)Project Owner: PTTEP International Limited (Yangon Branch)
4)Report Preparation: REM-UAE Laboratory and Consultant Company Limited
5)Production Period: Zawtika Phase 1 C Start in November 2018

1.4 Project Overview

1.4.1 Concession Background

PTTEP International Limited (PTTEPI) signed the Production Sharing Contract (PSC) of Block M9 and Block M11 with Myanmar Oil & Gas Enterprise (MOGE) on November 23, 2003 and July 25, 2005, respectively. Contract Area or Development and Production Area are the same area of a whole of Block M9 and Block M11.

The Export Gas Sales Agreement (EGSA) and associated agreements including the Domestic Gas Sales Agreement (DGSA), Supplementary Agreement to Gas Terms of Block M9 and M11 (SAGT), Export Gas Transportation Agreement (EGTA), and Pipeline Right Agreement (PRA) were signed on July 30, 2010. The Overall Daily Contractual Quantity (DCQ) is agreed at 300 MMSCFD with 240 MMSCFD for the export gas to Thailand and 60 MMSCFD for the domestic gas market, 15% swing to reach the Overall Contractual Daily Capacity (CDC) of 345 MMSCFD with the same proportion for exporting to Thailand and domestic gas market.

1.5 Project Location

1.5.1 Concession Area

The Zawtika Project is located in the Gulf of Moattama offshore Myanmar, covering an area of 12,306 km² which includes the entire area of 11,746 km² of Block M9 and 560 km² of Block M11. The field lies approximately 300 km south of Yangon and 290 km west of Dawei on the Myanmar coast.

1.5.2 Administrative Boundaries

Zawtika project is located in Block M9 and small portion of Block M11. Block M9 lies approximately 300 km from Yangon, 192 km from the nearest coast towards Yangon, 178 km west of the nearest coast in Tanintharyi Region, and 114 km south of Ayeyarwady Region. Block M11 is located in the south of Block M9, Gulf of Martaban. It is approximately 188 km south of the Deltaic Coastal Zone and 265 km west of Dawei. The project location is indicated on the Figure 1-1.

PTTEPI engaged with various local authorities, including Yangon Region, Tanintharyi, and Mon Regional Offices. Based on these discussions, it is expected that Yangon Region, Tanintharyi Region, and Mon State were the most relevant administrative locations in terms of potential impacts from the Project.

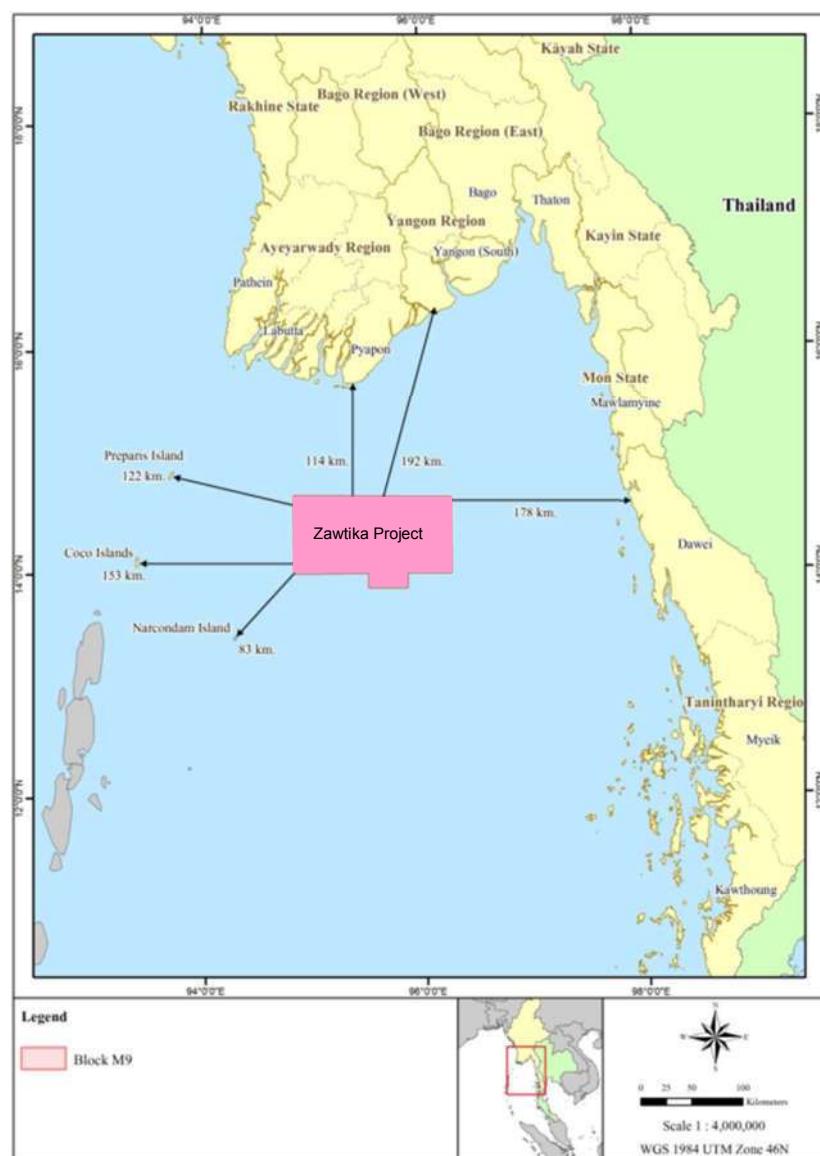


Figure 1-1 Distance of Zawtika Project to Nearest Land

Source: Environmental Impact Assessment (EIA) Report of Zawtika Development Phase 1C and 1D, PTTEPI International Limited (PTTEPI)

1.6 Zawtika Production Development

Based on 2016 Zawtika Field Development Plan, the Zawtika development project is divided into 4 phases comprising of Phase 1A, 1B, 1C, and 1D. Phase 1A and 1B have already been installed and are currently operational as per another EMP, whereas Phase 1C has operated in November 2018 and 1D has not start yet. This monitoring report is therefore focusing only on Zawtika Phase 1C operation activities. An overview of phase 1C are described below.

1.6.1 Phase 1C

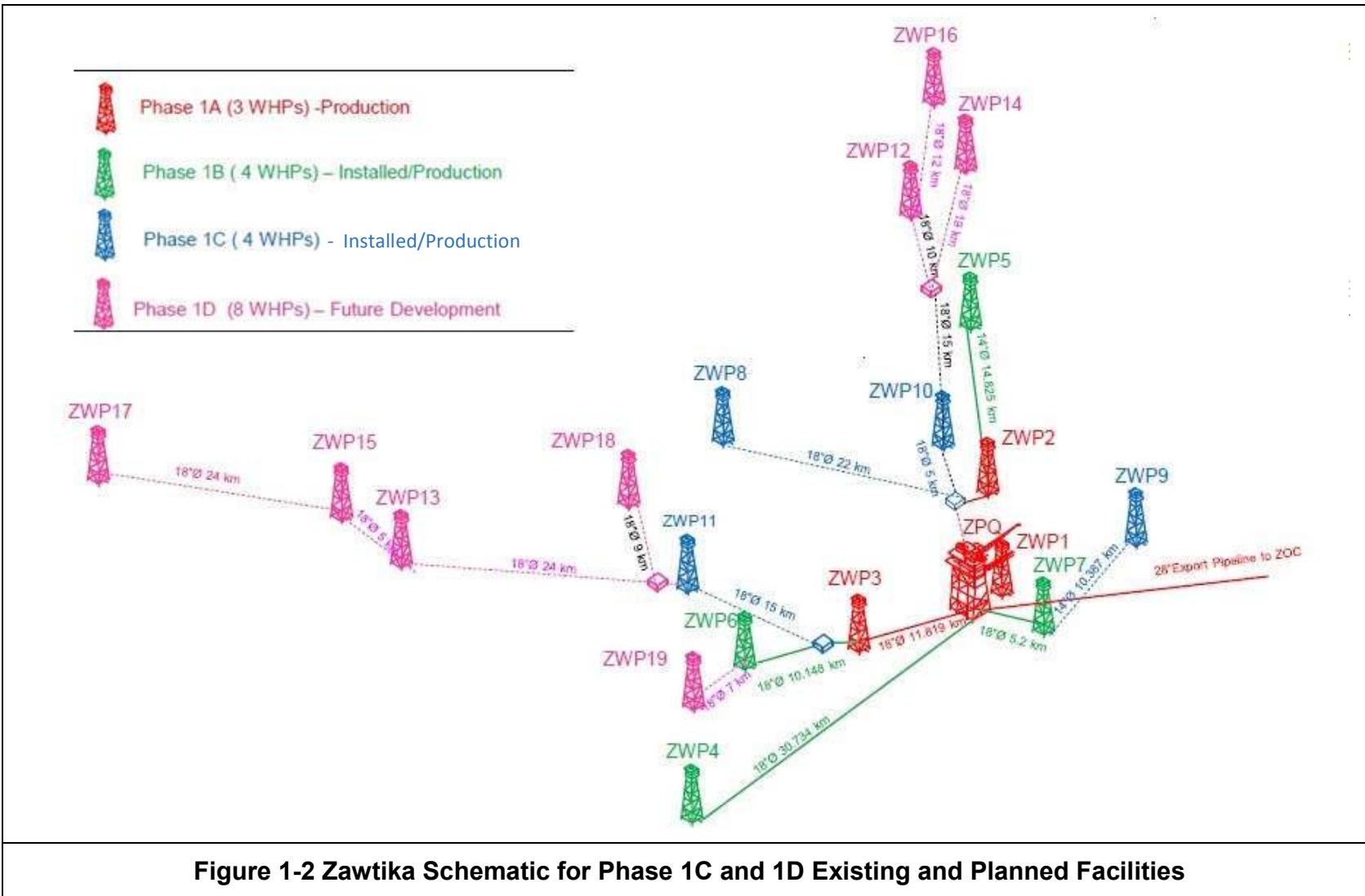
- Consists of 4 remote wellhead platforms namely ZWP8, ZWP9, ZWP10 and ZWP11. The well fluid from 4 wellhead platforms were processed to ZPQ via their intra-field pipelines.
- Four (4) Intra-field Pipelines:
 - ZWP8 to IP2 PLEM (18" 22.5 km)
 - ZWP9 to ZWP7 (14" 11 km)
 - ZWP10 to IP2 PLEM (18" 5 km)
 - ZWP11 to IP6PLEM (18" 15 km)
- 2 Pipeline End Manifolds (PLEMs).
 - IP2 PLEM: 3-inlet subsea PLEM (for IP2, IP8 and IP10)
 - IP6 PLEM: 4-inlet subsea PLEM (for IP6, IP11 and 2 future tie-in)
- The first wellhead platform installed in Q4 of 2017 and completed all wellhead platforms, associated pipelines and PLEMs installation in Q2 of 2018.

Coordinates of each remote wellhead platform are shown in Table 1 - 1. Zawtika Schematic Network for Phase 1C and 1D (both existing and planned) is shown in Figure 1-2.

Table 1-1 Coordinates of WPs in Zawtika Phase 1C

Remote Wellhead Platform	Coordinates (WGS 84)	
	X	Y
Phase 1C		
ZWP8	482763	1582946
ZWP9	516403	1574219
ZWP10	502268	1582048
ZWP11	479513	1569987

Source: Environmental Impact Assessment (EIA) Report of Zawtika Development Phase 1C and 1D, PTTEPI International Limited (PTTEPI)



Source: Environmental Impact Assessment (EIA) Report of Zawtika Development Phase 1C and 1D, PTTEPI International Limited (PTTEPI)

1.7 Status of Current Operations

Due to Phase 1D has not start yet, Table 1-2 and Figure 1-3 will show only current operation of Phase 1C.

Table 1-2 Operational status of the Zawtika Offshore Development Project

Facility/ WP	Current Status
Phase 1C	
ZWP8	Production
ZWP9	Production
ZWP10	Production
ZWP11	Production

Remark: PTTEPI, (Dated on May 27, 2020)

1.8 Components of Zawtika Offshore Facilities

Descriptions for each component for Zawtika offshore development are summarized in below subsections.

1.8.1 Zawtika Processing and Living Quarter Platform (ZPQ)

ZPQ is an integrated living quarters and processing platform, located in a water depth of approximately 140 m in Blocks M9, Gulf of Martaban. This facility receives gas from Zawtika wellhead platforms (WP1- WP11) and then sends the gas onwards to processing facilities prior to transporting onshore via a 28" diameter export pipeline. The offshore pipeline is connected to the onshore pipeline at the landfall point in Mawgyi village. ZPQ installations will be permanently manned around the clock. The ZPQ has a maximum onboard capacity of 165 personnel.



Figure 1-3 Zawtika Processing and Living Quarter Platform (ZPQ)

Source: From <https://multimedia.pttep.com>

1) ZPQ Processing Facilities

The processing facilities on the ZPQ can be categorized into the following groups:

- **Receiving Facilities** including pig receivers and manifolds to receive well fluids from remote wellhead platforms, wellhead coolers (either air cooler or seawater cooler) to cool the production fluids received from the bridge connected wellhead platform (WP-1) and the 3 phase Inlet Separator to remove the gas from well fluids, condensate from the water phase, and to absorb pipeline. There is no mercury removal, H₂S, or CO₂ removal system.
- **Gas Processing Facilities**
 - 1st Stage Gas Compression: The gas from the inlet separator is compressed to approximately 58 barg (841 psig) by three 1st Stage Gas Compression trains. Each train includes a suction scrubber, a discharge cooler (Air cooling) and a gas turbine driven centrifugal compressor.
 - Glycol Dehydration and Regeneration: The gas will be dehydrated after the 1st stage of compression. The dehydration specification is 5 lb/MMscf based giving a margin below the 7 lb/MMscf sales gas specification.
 - 2nd Stage Gas Compressor: The export gas is compressed further using three compression trains and metered (not fiscal meter) before being exported to ZOC onshore via an export subsea pipeline.
- **Condensate System:** The condensate is treated to remove the light ends and water via heating and a low pressure 3 phase separator and then routed to storage after cooling. The system includes an electric heater at flash vessel, and stabilized condensate is stored at the condensate storage vessel prior to burning at WP-1 (via smokeless burner), or alternatively utilizing for glycol regeneration package for fuel burner.
- **Produced Water Treatment:** Produced water from the inlet separator is treated for removal of sand, suspended solid particulate matter and associated hydrocarbon removal before being disposed overboard to the sea. Produced water is discharged overboard with maximum oil in water of 40 ppm, and complies with Myanmar's National Environmental Quality (Emission) Guidelines (EQEG) Management methods for produced water at Zawtika are discussed in Table 1-3.
- **Produced Sand Management** – Produced sand, removed from pigging operations, is generated at Zawtika in quantities of approximately 40 tons/year. Produced sand management is discussed in Table 1-3.

2) Living Quarter Module (LQM)

ZPQ also supports a Living Quarters Module (LQM) located on the west side of the platform at upper deck level. LQM is a self-contained four level building including helideck, designed for a single lift prior to topsides loadout. This module is designed for permanently accommodating 88 people and temporarily accommodating up to 128 people (during platform commissioning, shutdown and major maintenance activities).

1.8.2 Zawtika Wellhead Platform (WP)

Currently, there are 11 WPs (WP 1-11) in Zawtika field. They are automated for unmanned operations, with personnel presence required for replenishing consumables (e.g., corrosion inhibitor, diesel etc.), maintenance and restart following emergency shut down only. Sufficient operating data is communicated to ZPQ to monitor the status of safety and production critical systems.

WP1 is bridge linked to ZPQ, while WP2 to WP11 are structurally identical remote wellhead platforms. Remote platform access is by means of helicopter or boat during daylight hours and in calm conditions. The frequency of regular visits to the remote wellhead platforms is once every 2 weeks, depending on operations' activities. During drilling / wire line /well services, the remote facilities are temporarily manned.



Figure 1-4 Zawtika Wellhead Platform (WP)

Generic layout of ZPQ and WP is provided in Figure 1-5 and Figure 1-6.

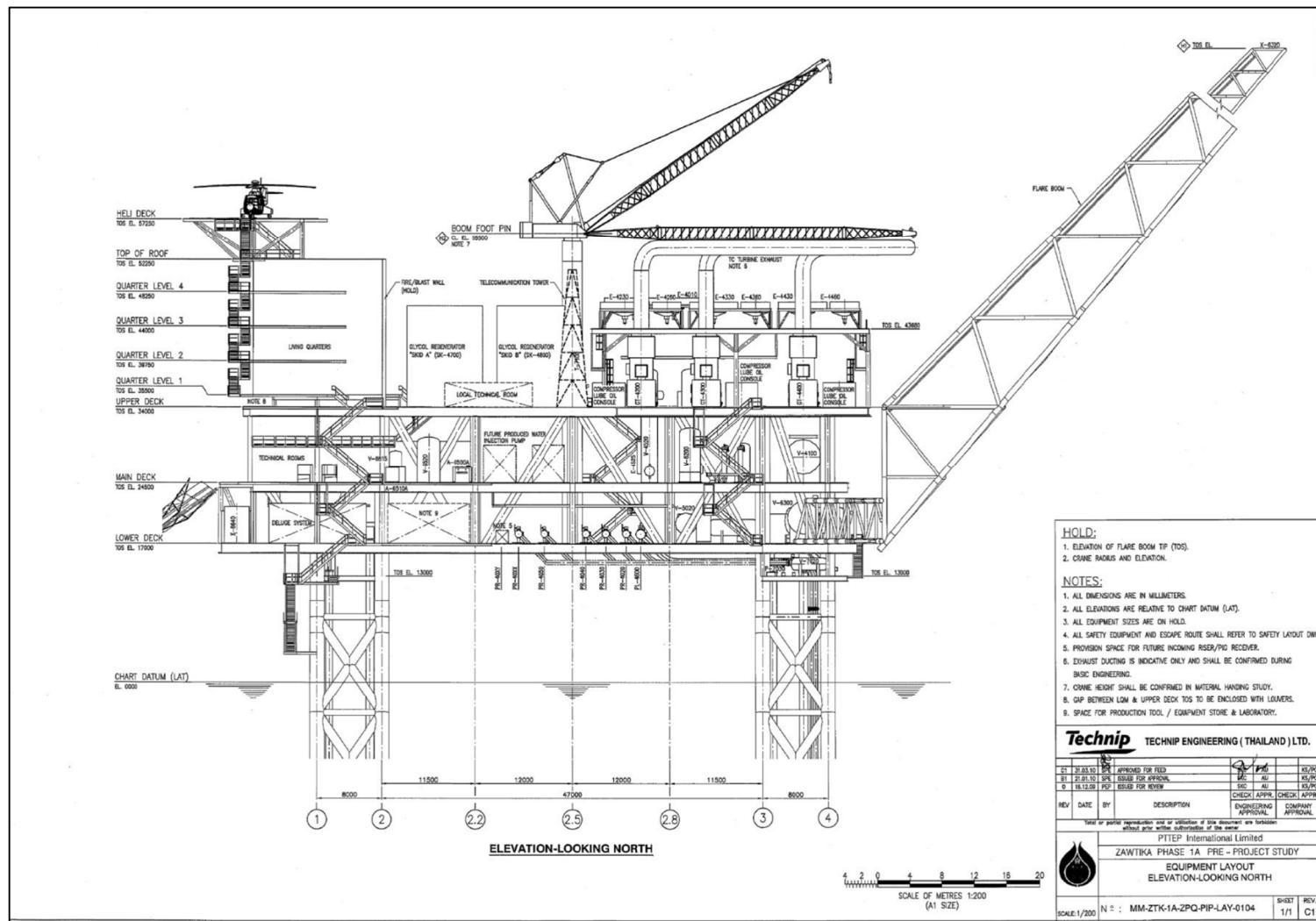


Figure 1-5 Generic Layout of ZPQ

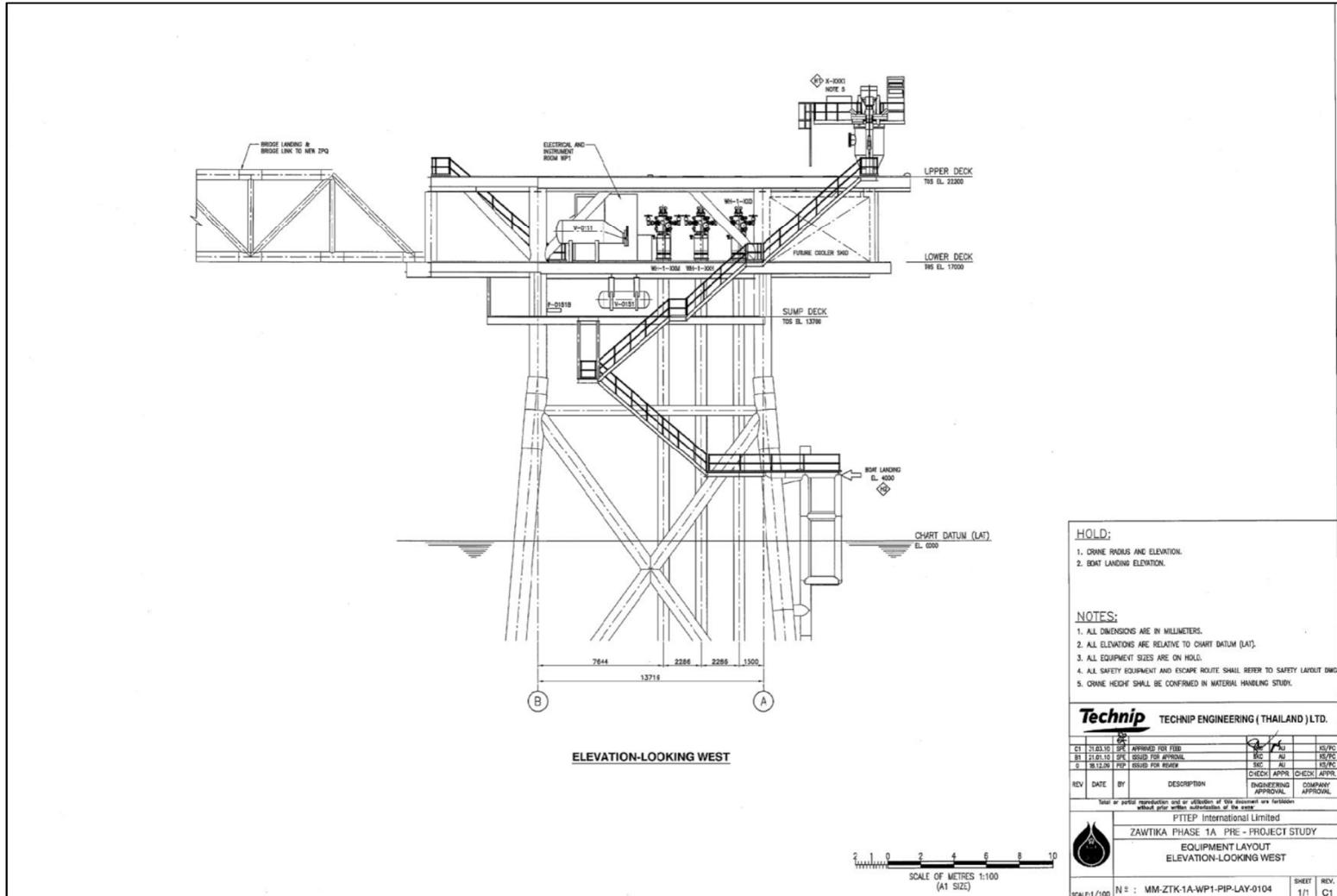


Figure 1-6 Generic Layout of WP

1.8.3 Zawtika Offshore Gas Transportation System

The Zawtika offshore gas pipeline system comprises of the following pipeline networks:

- Six Intra-field Sealines
 - 18" Sealine from WP2 to ZPQ with approximately length of 10.8 km;
 - 18" Sealine from WP3 to ZPQ with approximately length of 11.05 km;
 - 18" Sealine from WP4 to ZPQ with approximately length of 30 km;
 - 14" Sealine from WP5 to WP2 with approximately length of 14.5 km;
 - 18" Sealine from WP6 to WP3 with approximately length of 10 km; and
 - 18" Sealine from WP7 to ZPQ with approximately length of 5 km.
- Gas Export Pipeline
 - 28" Offshore Gas Export Pipeline from ZPQ to land fall point near Mawgyi village with approximately length of 230 km.

For Zawtika Phase 1C

- Consists of 4 remote wellhead platforms namely ZWP8, ZWP9, ZWP10 and ZWP11. The well fluid from 4 wellhead platforms were processed to ZPQ via their intra-field pipelines.
- Four (4) Intra-field Pipelines:
 - ZWP8 to IP2 PLEM (18" 22.5 km)
 - ZWP9 to ZWP7 (14" 11 km)
 - ZWP10 to IP2 PLEM (18" 5 km)
 - ZWP11 to IP6PLEM (18" 15 km)
- 2 Pipeline End Manifolds (PLEMs).
 - IP2 PLEM: 3-inlet subsea PLEM (for IP2, IP8 and IP10)
 - IP6 PLEM: 4-inlet subsea PLEM (for IP6, IP11 and 2 future tie-in)

The design life of the intra-field sealines and export pipeline are 30 years. The design of the pipeline system complies with the requirements of the latest editions of ASME B31.8 and International Codes and Standards.

1.8.4 ZPQ Processing System

The overall processing scheme for the ZPQ is shown in Figure 1-7. The process starts with well fluids from remote wellhead platforms flowing into the ZPQ. They are cooled by seawater and arrive marginally above seawater temperature. Well fluids from bridge connected wellhead platform (WP1) are cooled (by air cooler system) before being mixed with the rest of the well fluids.

The incoming well fluids then pass through the production separators, where they are separated into gas, condensate and water streams. Separated gas from separators is compressed in the 1st stage gas compressor to remove some condensate prior to delivery to gas dehydration, where water is removed. Dry gas passed from the dehydration unit is cooled and compressed at 2nd stage gas compressor train and passed to the 28" offshore export pipeline to the onshore section. Some of dry gas is diverted to be used as fuel for other processes and power generation supplied for the ZPQ.

Production liquids separated from the gas consist of condensate and produced water. Condensate will be burned using smokeless burner at WP1.

Regarding produced water, there is no evidence of heavy metal Hg, As from gas and water analysis for all the explored areas. PTTEPI has conducted monthly produced water analysis since the beginning of their operations, and no heavy metals have been found. As such, produced water separated from the production separators and some from the condensate flash drum at the maximum design of 20,000 bpd is being sent to a de-oiler unit to separate residual condensate back to flash drum prior to tipping overboard with the treated water to meet the Myanmar's National Environmental Quality (Emission) Guidelines (EQEG).

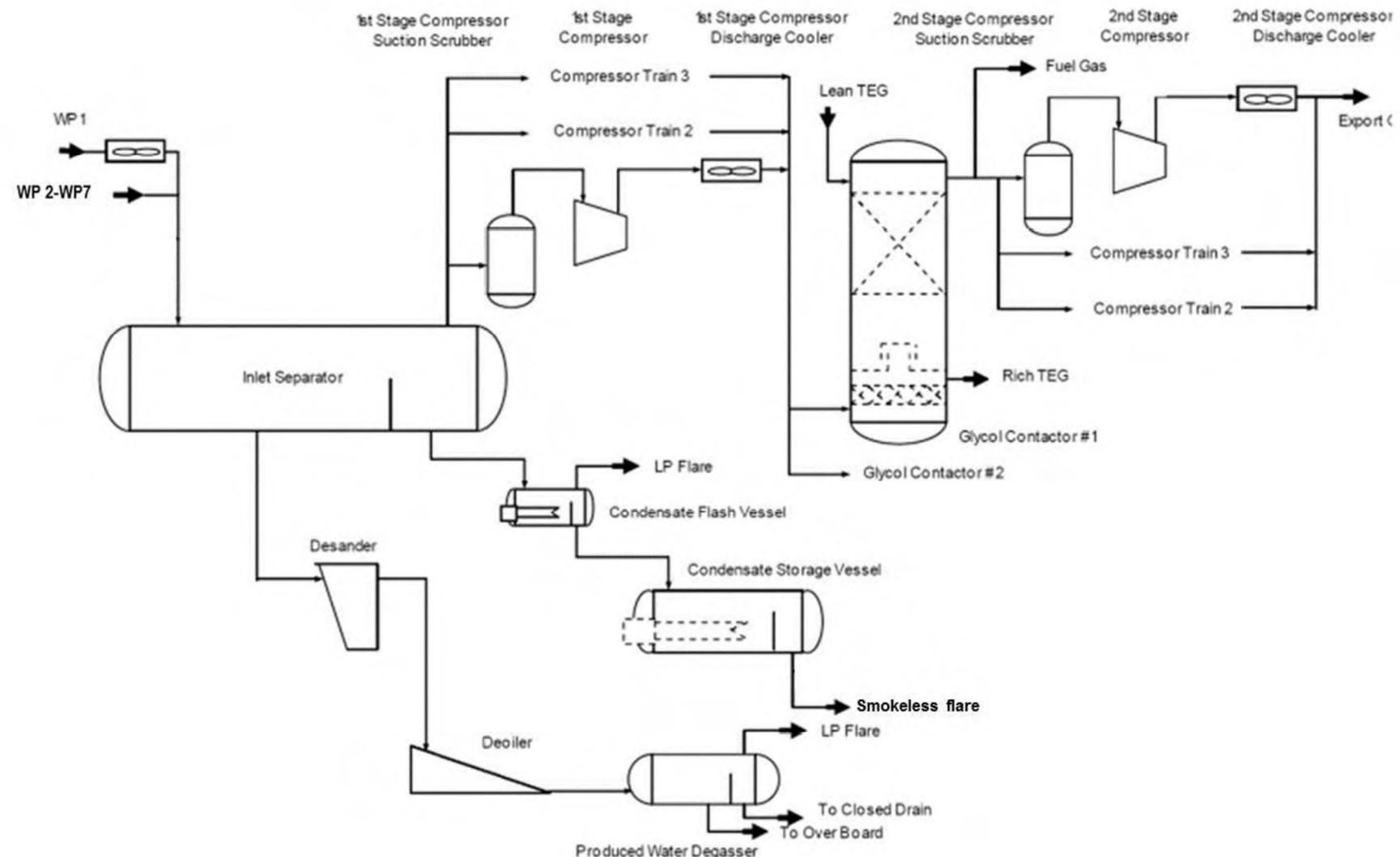


Figure 1-7 Simplified Diagram of ZPQ Processing System

1.8.5 Emission and Effluent Management

1) Flaring

ZPQ is equipped with HP and LP gas flare systems that cater for safe and reliable disposal of planned and unplanned releases of hydrocarbon gas from the production facilities.

The HP and LP flare tip are mounted on inclined boom away from platform to avoid excessive radiation on platform. HP flare tip is Sonic type and sub sonic LP flare tip is pipe flare. Design of HP and LP tip ensure stable operation of smokeless flare and flame lift off. Flare tip is designed to avoid atmospheric air ingress and flame lick during normal plant operations when only pilots are lit and strong winds are prevalent.

Flare knock out drums are provided on the HP and the LP systems. The configuration of level control is on/off gap level control, as normally no continuous liquid is expected. The normal liquid level is controlled to be as low as practically possible to maximize the available volume for any liquid relief and also the gas area to improve liquid knock-out. Liquids from both HP and LP flare knock out drum are collected in closed drain vessel.

At all wellhead platforms (WP1-WP11), a temporary (removable type) flare boom and a gas-liquid burner for well cleanup is provided. Two tie-in points (one at East and one at West sides of the platform) are provided for the temporary burner on all of the WPs.

PTTEPI has also installed a smokeless burner at WP1, primarily for the disposal of excess condensate.

1.8.6 Waste and Wastewater

1) PTTEPI Waste Management Procedure

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

(1) Non-Hazardous Waste

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

- General non-hazardous wastes from office, catering services, laundry, household, etc. from industrial activities, e.g.
 - General waste (e.g. scrap metal, non-biodegradable waste, gardening waste, construction material);
 - Recyclable or reusable waste (e.g. paper, wood, drinking plastic bottle, glass); and
 - Biodegradable waste (e.g. food waste, sewage).
- Waste containing or contaminated with hazardous substances in concentrations that, before or after treatment, are considered low enough to meet the specified international or regulatory discharge criteria which do not exceed the standard limit of the country, e.g.
 - Produced water and
 - Produced sand

(2) Hazardous Waste

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

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

- Wastes creating nuisance due to flammability, reactivity, corrosiveness, radioactive, infection, toxicity for humans & the environment or, e.g.
 - General hazardous wastes (e.g. chemical waste and residue, paint, spent and used oil, contaminated packing material, special maintenance waste, contaminated sludge, combustion residue, photocopy machine, PC printers polluting cartridge, medical waste, filter, fluorescent, bulb);
 - Heavy metal wastes (e.g. mercury, arsenic, cadmium); and
 - Batteries

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

- Waste containing or contaminated with hazardous substances in concentrations which belong exceed the standard limit of country regulation or international hazardous waste standard, for example oil concentration or heavy metals containing waste. Laboratory analysis of its waste component shall be applied to properly classify this type of waste. Furthermore any waste that belong to any category in the country regulation.

Details on PTTEPI's waste management procedures according to its type are provided in Table 1-3.

Table 1-3 Management of Waste and Wastewater for Offshore Operation

Type of Waste	Waste Management
General non-hazardous waste	<ul style="list-style-type: none"> • Store in durable container and clearly label. • Transferred to Thaketa Support Base (TKA) then immediately continue delivery to either MOGE or Yangon City Development Committee (YCDC) for final disposal.
Hazardous waste	<ul style="list-style-type: none"> • Stored in hazardous waste skip. • Transfer to TKA and continue to DOWA, certified waste management facilities for final disposal.
Food waste	<ul style="list-style-type: none"> • Grinding onsite in compliance with MARPOL and discharge to sea.
Sewage	<ul style="list-style-type: none"> • Treatment onsite in compliance with MARPOL and discharge to sea.
Produced water	<p>Produced water is managed as follows:</p> <ul style="list-style-type: none"> • Control oil and grease content in discharge water not to exceed 42 mg/l daily maximum as required by Myanmar's National Environmental Quality (Emission) Guidelines (EQEG). • Discharge treated produced water to the sea.

Table 1-3 Management of Waste and Wastewater for Offshore Operation

Type of Waste	Waste Management
	<p><i>(Note: Total Petroleum Hydrocarbon (TPH) onboard analyzer has been provided at ZPQ to ensure that concentration of oil and grease content in water or wastewater is in the discharge limits)</i></p> <p>Zawtika Produced Water Treatment System treats produced water by the following methods:</p> <ul style="list-style-type: none"> • By removing sand and coarse suspended particles in the produced water from Inlet Separator V-4100 during first stage using two (2x50%) Desander Hydrocyclone HC-6100/6105 with the associated Sand Accumulator Vessels V-6110/6115. Desander shall remove about 99% of particulate larger than 10 micron in produced water. • By removing oil in the produced water from Inlet Separator V-4100 during second stage using two (2x50%) Deoiler Hydrocyclones HC-6130/6140. Oil concentration shall not be more than 40 ppmv in treated water. • By removing gas entrained in produced water in the third stage in one (1x100%) Produced Water Degasser V-6150. Initially, this vessel will perform as a degasser and will be designed so that it can be modified later to be an Induced Gas Floatation Vessel by providing gas spray bubble nozzle flanges and an oil skimming weir and condensate trough without hot work requirement. This is a contingency in case the deoiling hydrocyclones do not perform as expected or the oil in water specification is reduced by local authorities in future. (see V-6150 GA drawing in the attachment). • In addition, water clarifier injection facility has provided at ZPQ lower deck area by utilize the existing chemical pump with tubing connection.
Produced sand	<ul style="list-style-type: none"> • Ship back to shore and dispose by DOWA, the certified waste management contractor.

1.8.7 Utilities

ZPQ facilities contain utility and safety systems to support production operations. Details of each group are discussed in the following sections.

1.8.8 Power and Energy Use

ZPQ is equipped with 3 dual fuel gas turbine power generation units, each of 3.7 MW site rated capacity, which supply all required power to ZPQ and WP1. Multiple gas turbine driven units with adequate capacity to ensure availability of power when a unit is not operational are provided.

A treble fuel design (fuel gas, condensate and diesel) for all three power generation units has been selected, but the connection is made for fuel gas and diesel only. Electric motor start systems are provided for all three power generators.

Emergency diesel power generation of 1.28 MW is provided for essential load in case of turbine generator trip. A black start diesel generator of 280 kW is also provided for initial start.

1.8.9 Water Use

Two reverse osmosis water production units with capacity of 1.5 m³/hr, total 3 m³/hr are provided for fresh water production using RO membrane. The water produced by these units is suitable for consumption, plus other intermittent uses, such as eyewash, safety shower, etc. Fresh water from the fresh water units is supplied and stored in fresh water storage tanks. The stored fresh water is then transferred via pumps to the pressurized fresh water vessel for distribution to various users. Potable water suitable for drinking is supplied after treatment of freshwater by a sterilizer.

Desalinated seawater (freshwater) is stored in an atmospheric storage tank. The tanks (2 x 126 m³ compartments) are sized for the following:

- Average daily fresh water consumption 500 litres /man/day; and
- 7 days storage for maximum continuous consumption of 156 personnel at above rate assuming only one 50% water production unit is available.

1.8.10 Emergency Shutdown System

ZPQ is designed to provide fully automatic, integrated and centralized platform/ process control. The control room operator is able to monitor, detect, and handle process upsets from the control room through Process Control system (PCS), Safety Instrument System and Fire and Gas System (SIS and FGS) for facilities on ZPQ, the bridge connected wellhead platform and remote wellhead platforms.

The ZPQ semi-automatic start- up sequences and automatic safe shutdowns are implemented in the control system. Closed circuit television (CCTV) monitors are provided in the control room to monitor critical process equipment/systems. Online analyzers are provided to monitor the content in the feed/sales gas.

1.8.11 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.

1.8.12 PTTEPI's SSHE Policy

1) PTTEP Corporate Vision

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

2) PTTEP Corporate Mission

- Prevent all incidents through proactive personal and process safety management.
- Embed SSHE mindset and leadership at all levels towards a generative SSHE culture.
- Recognize SSHE as a foundation towards competitive performance and innovation for long term stakeholders value creation.

3) PTTEPI 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 analyze 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 are a key successful implementation of this policy which is required from PTTEP employees and contractors at all levels.

1.8.13 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 1-4. 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. PTTEPI's primary SSHE documents are included in Annex A. Additional SSHE documents are available from PTTEPI upon request as needed.

Table 1-4 PTTEPI SSHE Management System Standards

Document Code	Document
11027-PDR-SSHE-340-003-R01	SSHE Training and Competency Management Standard
11003-STD-SSHE_350-004-R93	SSHE Regulatory Compliance Standard
SSHE-106-PDR-310	SSHE Contractor Management Procedure
11027-PDR-SSHE-401-R02	Working in Adverse Weather Procedure (offshore)
11027-PDR-SSHE-502-006-R00	Myanmar Asset Emergency Management Plan
11027-PDR-SSHE-501-005-R00	Myanmar Asset Crisis Management Plan
Myanmar-0550-PDR-008	PTTEP Crisis Communication Plan
Myanmar-SSHE-11027-PDR-506	Offshore Medical Emergency Response Plan (MERP)
11027-PDR-SSHE-507-R05	Myanmar Asset Tropical Cyclone Procedure
Myanmar-SSHE-11027-PDR-508	Fitness to Work Procedure
11027-PDR-SSHE-501/03-R02	Myanmar Asset Spill Contingency Plan

1.9 Environmental Monitoring and Mitigation Measure Implementation Compliance

According to EIA, the environmental mitigation measures implementation which considered environmental issues and essential impacts that may occur were conducted in the production phase of phase 1C during document review and support photos by PTTEP team. The results were described in Chapter 2. The environmental monitoring measures were implemented during January-June 2021 and the results were presented in Chapter 3 and the conclusion was summarized in Chapter 4.

Chapter 2

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 Environmental Management Plan (EMP) as detailed in Appendix B.

Audit was performed at Zawtika Phase 1C and 1D 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.

The REM-UAE Laboratory and Consultant Company Limited will identify the cause of problems, barriers and solutions in case there are any non-complicane with the mitigation measures are found during the audit, however the result of the audit presents that PTTEPI have a hundred 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 Production Phase of Zawtika Phase 1C and 1D

Aspects	Potential Impacts	Mitigation Measures	Location	Period/ Frequency	Status	Details	Recommendation	Remarks/ Reference
Environmental Mitigation Measures								
1. Air Quality	1.1 Air Emissions from combustion due to operation of machines and engines installed at offshore facilities, support and supply vessels.	1.1.1 Carry out routine inspection and preventive maintenance for all machinery as per maintenance schedule/recommended by manufacturers to ensure efficiency of combustion.	WPs All project vessels	Throughout operation period	✓	Routine inspection and preventive maintenance for all machinery were conducted as per annual PM and Inspection Plan.	-	Figure 2-1 Figure 2-2 and Appendix D-5
	1.2 GHG emissions from the Project may add to global warming issue	1.2.1 Conduct annual pollutant release inventory to monitor the GHG emissions from the Project.	ZPQ WPs All project vessels	Throughout operation period	✓	Annual pollutant release inventory was recorded monthly basis.	-	Appendix D-1
	1.3 Air emission from venting and flaring	1.3.1 Avoid continuous venting and non-routine flaring.	ZPQ WPs	Throughout operation period	✓	Venting and flare was performed as per the Vent and Drain Philosophy, and HP and LP Flare System Startup.	-	Figure 2-3 and Appendix D-1
		1.3.2 Utilize excessive gas as much as possible in order to minimize gas flaring.	ZPQ WPs	Throughout operation period	✓	Venting and flare was performed as per the Vent and Drain Philosophy, and HP and LP Flare System Startup.	-	Figure 2-3 and Appendix D-1
		1.3.3 In the event of an emergency or equipment breakdown, send excess gas to flare gas system.	ZPQ WPs	Throughout operation period	✓	Venting and flare was performed as per the Vent and Drain Philosophy, and HP and LP Flare System Startup.	-	Figure 2-3 and Appendix D-1
		1.3.4 Record the volumes of gas flared for all flaring events.	ZPQ WPs	Throughout operation period	✓	The volumes of gas flared for all flaring events were daily recorded by project staff as shown in ZPQ Daily production and flare record.	-	Appendix D-1
	1.4 Air emission from fugitive emissions	1.4.1 Inspection and maintenance program will be implemented during the operational phase to control fugitive emissions.	ZPQ WPs	Throughout operation period	✓	Routine inspection and preventive maintenance for all machinery were conducted as per annual PM and Inspection Plan.	-	Figure 2-1 Figure 2-2 and Appendix D-5

Table 2-1 Environmental Mitigation Measure Implementation Compliance Result Summary in Production Phase of Zawtika Phase 1C and 1D

Aspects	Potential Impacts	Mitigation Measures	Location	Period/ Frequency	Status	Details	Recommendation	Remarks/ Reference
2. Seawater & Sediment Quality	2.1 Discharge of oil-containing wastewater (i.e. bilge water, oil-chemical containing wastewater from engine room and deck drain) from offshore facilities may impact seawater quality	2.1.1 Operate offshore facilities in compliance with the requirements under MARPOL 73/ 78 and PTTEPI's Waste Management Plan (Annex A), including the following: <ul style="list-style-type: none"> o Large operating vessels (over 400 gross tons) shall comply with the requirements of MARPOL 73/78. o Oil contaminated bilge water shall be deoiled (i.e. by oil-water separator) prior to discharge into the sea. Discharge water shall contain less than 15 ppm oil content, as per requirements of MARPOL 73/78 Annex IV. o Oil-contaminated wastewater separated by the Oil Filtering Equipment on vessels over 400 gross tons shall be stored in appropriate drums for disposal onshore as per MARPOL 73/78 requirements. o Maintain the cleanliness of deck to minimize oil and chemical contamination in rainwater. o Provide drip tray to collect runoff from equipment at all operational areas. Contaminated wastewater shall be treated before discharge to meet MARPOL 73/ 78 requirements prior discharge to sea. 	All project vessels	Throughout operation period	✓	Project has 2 vessels for support operation activities, both were complied with the requirements of MARPOL 73/78.	-	Figure 2-4 and Appendix C-1
			All project vessels	Throughout operation period	✓	On the vessels, oil separator was provided for treated the oil contaminated bilge water before discharge into sea. The oil content was controlled as per the requirements of MARPOL 73/78 Annex IV.	-	Appendix C-1
			All project vessels	Throughout operation period	✓	Oil- contaminated wastewater was collected in the drum for disposal by onshore contractor, the license waste management service.	-	Figure 2-5 and Appendix C-2
			All project vessels	Throughout operation period	✓	Deck of vessel was regularly clean by staff to minimize oil and chemical contamination in rainwater.	-	Figure 2-25
			All project vessels	Throughout operation period	✓	The bun or drip tray was provided at all oil and chemical storage area to collect the contaminated water and sent to treat at wastewater treatment system before discharge to sea.	-	Figure 2-5 Figure 2-6 and Appendix C-1

Table 2-1 Environmental Mitigation Measure Implementation Compliance Result Summary in Production Phase of Zawtika Phase 1C and 1D

Aspects	Potential Impacts	Mitigation Measures	Location	Period/ Frequency	Status	Details	Recommendation	Remarks/ Reference
		<ul style="list-style-type: none"> Oil absorbent used in case of spill on deck will be stored onboard and disposed as hazardous waste onshore. 	All project vessels	Throughout operation period	✓	Emergency spill response equipment was provided near all oil and chemical storage area. After usage all were kept in the hazardous waste container and sent to dispose by DOWA, the license waste management service in Myanmar.	-	Figure 2-7 Appendix C-1 and Appendix C-2
	2.2 Discharge of wastewater and sewage from ZPQ, and WPs, and support vessels may impact seawater quality.	2.2.1 Sewage shall be treated by a wastewater treatment system on vessels prior to discharge into the sea when in transportation more than 12 nautical miles (22. 22 km) from the nearest land. Discharged wastewater must meet requirements of MARPOL 73/ 78 and Myanmar's NEQG.	WPs All project vessels	Throughout operation period	✓	Sewage was collected to treat at treatment system and monitored to control all parameters as requirements of MARPOL 73/78 and Myanmar's NEQG.	-	Figure 2-8
		2.2.2 Routine inspection and maintenance of waste water treatment system to ensure its good treatment efficiency.	WPs All project vessels	Throughout operation period	✓	All equipments of water treatment system were regularly inspected as per the annual PM and Inspection Plan.	-	Appendix D-5
	2.3 Discharge of produced water and produced sand may impact seawater quality.	2.3.1 Record produced water volumes daily at each WPs.	ZPQ WPs	Throughout operation period	✓	Produced water volume was daily recorded from all operation areas as shown in ZPQ Daily production and flare record.	-	Appendix D-1
		2.3.2 Send produced water to treatment system onboard prior discharge to sea. Treated produced water shall contain oil and grease less than 42 mg/ l daily, or 29 mg/ l monthly average as required by Myanmar's NEQG.	ZPQ WPs	Throughout operation period	✓	Produced water was collected to treat at ZPQ, produced water monitoring was conducted everyday to control TOG value as per requirements of Myanmar's EQEG.	-	Appendix E-2

Table 2-1 Environmental Mitigation Measure Implementation Compliance Result Summary in Production Phase of Zawtika Phase 1C and 1D

Aspects	Potential Impacts	Mitigation Measures	Location	Period/ Frequency	Status	Details	Recommendation	Remarks/ Reference
		2.3.3 Use Total Petroleum Hydrocarbon (TPH) onboard analyzer to monitor oil and grease content in water or wastewater prior discharge to sea.	ZPQ WPs	Throughout operation period	✓	The TOG/ TPH analyzer was provided at laboratory room on ZPQ to monitor TOG in produced water prior discharge to sea.	-	Figure 2-9 and Appendix C-3
		2.3.4 Follow NEQG regarding produced sand (discharge overboard when % oil concentration less than 1%)	ZPQ WPs	Throughout operation period	✓	Produced sand was collected in the container and sent to dispose at onshore by DOWA, the license waste management service in Myanmar.	-	Figure 2-10 and Appendix C-2
		2.3.5 Ship produced sand back to shore and dispose by the certified and qualified waste management contractor.	ZPQ WPs	Throughout operation period	✓	Produced sand was collected in the container and sent to dispose at onshore by DOWA, the license waste management service in Myanmar.	-	Appendix C-2 and Appendix C-4
	2.4 Project could generate various types of hazardous and non-hazardous wastes. Inappropriate management (including transportation, storage, and disposal) of waste could impact seawater quality.	2.4.1 Operate Project vessels in compliance with the requirements under MARPOL 73/78 and PTTEPI's Waste Management Plan (Annex A), including the following:						
		<ul style="list-style-type: none"> ● Hazardous Waste ○ Separate hazardous waste from general waste and store in proper labelled container and storage area according to types of wastes. 	All project vessels	Throughout operation period	✓	Hazardous waste was collected in the red container separated from the general waste which was collected in the blue ones, all containers were sent to dispose at onshore.	-	Figure 2-5 Figure 2-10 Figure 2-11
		<ul style="list-style-type: none"> ○ Hazardous wastes must be stored in a safe and durable container, suitable for transfer, and be placed in a location far from ignition sources until disposal/ treatment 	All project vessels	Throughout operation period	✓	Hazardous waste container was stored far from the burner area. All containers were sent to dispose at onshore by DOWA, the license waste management service in Myanmar.	-	Figure 2-5 Figure 2-10 Figure 2-11 and Appendix C-2

Table 2-1 Environmental Mitigation Measure Implementation Compliance Result Summary in Production Phase of Zawtika Phase 1C and 1D

Aspects	Potential Impacts	Mitigation Measures	Location	Period/ Frequency	Status	Details	Recommendation	Remarks/ Reference
		<ul style="list-style-type: none"> ○ Prohibit any discharge of hazardous waste into the sea. 	All project vessels	Throughout operation period	✓	All hazardous wastes were prohibited discharge into the sea. They were collected in the container and sent to dispose at onshore by DOWA, the license waste management service in Myanmar.	-	Appendix C-2 and Appendix C-4
		<ul style="list-style-type: none"> ○ Used oil and oil-contaminated waste shall be stored separately with labels for disposal onshore or burned at smokeless WP-1 burner. 	All project vessels	Throughout operation period	✓	All used oil and oil-contaminated wastes were stored in the drum or hazardous waste container. They were sent to dispose at onshore by DOWA, the license waste management service in Myanmar.	-	Figure 2-5 and Appendix C-2
		<ul style="list-style-type: none"> ○ The vessel deck shall be cleaned to minimize the impact from oil and chemical contamination into the sea during periods of rain. 	All project vessels	Throughout operation period	✓	Deck of vessel was regularly clean by staff to minimize oil and chemical contamination in rainwater.	-	Figure 2-25
		<ul style="list-style-type: none"> ○ Oil absorbents are required in the case of a small spill and the used absorbent shall be stored in containers onboard and disposed of onshore. 	All project vessels	Throughout operation period	✓	Emergency spill response equipment was already provided near all oil and chemical storage area. After usage, all were kept in the hazardous waste container and sent to dispose at onshore by DOWA, the license waste management service in Myanmar.	-	Figure 2-7 and Appendix C-2
		<ul style="list-style-type: none"> ○ Dispose hazardous waste at onshore treatment facilities in accordance with the law of Myanmar and PTTEPI's Waste Management Plan (Annex A). 	All project vessels	Throughout operation period	✓	All hazardous wastes were sent to dispose by DOWA, the license waste management service in Myanmar as per PTTEPI's Waste Management Plan.	-	Appendix C-2 and Appendix C-4
		<ul style="list-style-type: none"> ○ Ensure manifest of hazardous waste is kept. 	All project vessels	Throughout operation period	✓	The manifest for hazardous waste disposal was kept and recorded.	-	Appendix C-4

Table 2-1 Environmental Mitigation Measure Implementation Compliance Result Summary in Production Phase of Zawtika Phase 1C and 1D

Aspects	Potential Impacts	Mitigation Measures	Location	Period/ Frequency	Status	Details	Recommendation	Remarks/ Reference
		<ul style="list-style-type: none"> • Non-Hazardous Waste ○ Segregate non- hazardous waste including food waste, paper, aluminium can, glass, rag and other wastes in separate containers or proper areas. 	All project vessels	Throughout operation period	✓	Non- hazardous wastes were segregated as food waste, paper, recycle waste and other waste and kept in the bins attached with colour code.	-	Figure 2-11
		<ul style="list-style-type: none"> ○ Grind food waste to a size less than 25 mm before discharge into the sea at a distance of 12 nautical miles (22.22 km) from shore, in a location that is not located in coral reef area, according to the requirements under MARPOL 73/78. 	All project vessels	Throughout operation period	✓	The food waste was grinded to a size less than 25 mm before discharge into the sea as per the requirements under MARPOL 73/78.	-	Figure 2-12
		<ul style="list-style-type: none"> ○ Separate and store each type of waste (separate non- hazardous waste and hazardous waste) into appropriate containers having clear labels. 	All project vessels	Throughout operation period	✓	Hazardous wastes were collected in the red container separated from the general waste which was collected in the blue ones. At waste storage area was attached with the clearly information board for waste segregation.	-	Figure 2-5 Figure 2-10 and Figure 2-11
		<ul style="list-style-type: none"> ○ Dispose non-hazardous waste at onshore treatment facilities in accordance with the law of Myanmar and PTTEPI's Waste Management Plan (Annex A). 	All project vessels	Throughout operation period	✓	Non- hazardous wastes were sent to dispose at onshore as per PTTEPI' s Waste Management Plan.	-	Figure 2-11 Appendix C-2 and Appendix C-4
		<ul style="list-style-type: none"> ○ Keep the records of waste inventories including types and quantities updated. 	ZPQ All project vessels	Throughout operation period	✓	All waste was recorded regularly when sent to dispose at onshore.	-	Appendix C-5

Table 2-1 Environmental Mitigation Measure Implementation Compliance Result Summary in Production Phase of Zawtika Phase 1C and 1D

Aspects	Potential Impacts	Mitigation Measures	Location	Period/ Frequency	Status	Details	Recommendation	Remarks/ Reference
3. Marine Life and Marine Ecology	3.1 Discharge of oil-containing wastewater (i.e. bilge water, oil-chemical containing wastewater from engine room and deck drain) from vessels and ZPQ and WPs, may impact seawater and sediment quality, which could have secondary impacts to marine ecology and biodiversity.	3.1.1 Implement all mitigation measures for Item 2.1 above.	WPs All project vessels	Throughout operation period	✓	Same as item 2.1	-	Same as item 2.1
	3.2 Discharge of wastewater and sewage from ZPQ, and WPs, and support vessels may impact seawater and sediment quality, which could have secondary impacts to marine ecology and biodiversity.	3.2.1 Implement all mitigation measures for Item 2.2 above.	WPs All project vessels	Throughout operation period	✓	Same as item 2.2	-	Same as item 2.2
	3.3 Discharge of produced water may impact seawater quality, which could have secondary impacts to marine ecology and biodiversity.	3.3.1 Implement all mitigation measures for Item 2.3 above.	ZPQ WPs	Throughout operation period	✓	Same as item 2.3	-	Same as item 2.3

Table 2-1 Environmental Mitigation Measure Implementation Compliance Result Summary in Production Phase of Zawtika Phase 1C and 1D

Aspects	Potential Impacts	Mitigation Measures	Location	Period/ Frequency	Status	Details	Recommendation	Remarks/ Reference
	3.4 Project could generate various types of hazardous and non-hazardous wastes. Inappropriate management (including transportation, storage, and disposal) of waste could impact seawater and sediment quality, which could have secondary impacts to marine ecology and biodiversity.	3.4.1 Implement all mitigation measures for Item 2.4 above.	WPs All project vessels	Throughout operation period	✓	Same as item 2.4	-	Same as item 2.4
Social Mitigation Measures								
4. Fishing	4.1 Reduced fishing area due to presence of platforms and ZPQ.	4.1.1 Establish 500 m safety zone around the ZPQ and WPs.	WPs All project vessels	Throughout operation period	✓	ZPQ regularly observed an area of 24 nautical miles from ZPQ and WPs. A 500m safety zone was established to ensure only permit vessel can operate in this area. When other vessel moves into the safety zone, the alarm in the radio room at ZPQ was warned.	-	Figure 2-13 and Figure 2-14
		4.1.2 Use support vessels to warn off traffic.	WPs All project vessels	Throughout operation period	✓	Support vessels were used to contact with other vessels when they move into the safety zone around ZPQ and WPs.	-	Figure 2-4
		4.1.3 Provide appropriate lights and warning signals on ZPQ and WPs and all vessels to prevent accidental collision.	WPs All project vessels	Throughout operation period	✓	The appropriate lights and warning signals were already provided on ZPQ and WPs and all vessels to prevent accidental collision.	-	Figure 2-15

Table 2-1 Environmental Mitigation Measure Implementation Compliance Result Summary in Production Phase of Zawtika Phase 1C and 1D

Aspects	Potential Impacts	Mitigation Measures	Location	Period/ Frequency	Status	Details	Recommendation	Remarks/ Reference
		4.1.4 Develop and communicate a Grievance Mechanism for fishing community to report grievance regarding Project activities	Fishing Community	Throughout operation period	✓	The PTTEPI Grievance Handling Guideline was already provided to respond the complaint issue from project activities.	-	
5. Shipping and Navigation	5.1 The presence of the offshore facilities and may obstruct navigation.	5.1.1 Implement all mitigation measures for Item 4.1 above.	WPs All project vessels	Throughout operation period	✓	Same as Item 4.1	-	Same as Item 4.1
Health Mitigation Measures								
6. Occupational Health and Safety	6.1 Injuries or illness due to exposure to harmful substances or accident	6.1.1 Implement relevant components of PTTEPI's SSHE Management System (Annex A), including the following: <ul style="list-style-type: none"> ○ Implement PTTEPI's Occupational Health Management Standard. ○ Ensure that all employees wear appropriate PPE and implement PTTEPI's Personal Protective Equipment Standard. ○ Personnel will be provided with safety training to ensure that all workers practice under safety operation and regulation of work, as per PTTEPI's SSHE Training & Competency Standard. ○ Implement PTTEPI's Safety Case Standard. 	ZPQ WPs All project vessels	Throughout operation period	✓	PTTEPI's Occupational Health Management Standard was prepared and applied for Zawtika project.	-	-
			ZPQ WPs All project vessels	Throughout operation period	✓	All staffs wear appropriate PPE at all working time.	-	Figure 2-16
			ZPQ WPs All project vessels	Throughout operation period	✓	The safety training schedule was performed as per SSHE annual training plan.	-	Appendix D-3
			ZPQ WPs All project vessels	Throughout operation period	✓	The safety case or emergency drill was performed as per SSHE Emergency Drill & Exercise Plan.	-	Appendix D-4

Table 2-1 Environmental Mitigation Measure Implementation Compliance Result Summary in Production Phase of Zawtika Phase 1C and 1D

Aspects	Potential Impacts	Mitigation Measures	Location	Period/ Frequency	Status	Details	Recommendation	Remarks/ Reference
		<ul style="list-style-type: none"> ○ Implement PTTEPI's Life Saving Program Standard. 	ZPQ WPs All project vessels	Throughout operation period	✓	Life saving program standard was specified in Zawtika Offshore Field Emergency Response Plan and others related plan.	-	-
		<ul style="list-style-type: none"> ○ Implement PTTEPI's Offshore Medical Emergency Response Plan (MERP). 	ZPQ WPs All project vessels	Throughout operation period	✓	The Offshore Medical Emergency Response Plan (MERP) was already implemented.	-	-
		<ul style="list-style-type: none"> ○ Implement PTTEPI's Crisis Communications Plan. 	ZPQ WPs All project vessels	Throughout operation period	✓	The Myanmar Asset Crisis Management Plan was already implemented.	-	-
		6.1.2 Provide first-aid kits and first-aid rooms on ZPQ.	ZPQ WPs All project vessels	Throughout operation period	✓	First- aid kits and medic room were already provided. The medic was stand by at medic room for medical treatment.	-	Figure 2-17
		6.1.3 Provide proper sanitary systems including drinking water, potable water, toilet, and waste management.	ZPQ WPs All project vessels	Throughout operation period	✓	The proper sanitary systems including drinking water, potable water, toilet, and waste management were already provided.	-	Figure 2-18
		6.1.4 Cooperate with the nearest health center/hospital in order to immediately support response to emergency events, as per PTTEPI's MERP (Annex A).	ZPQ WPs All project vessels	Throughout operation period	✓	In case of emergency, the patient will be pre-treatment by medic and will sent to the hospital in Yangon by helicopter as per The Offshore Medical Emergency Response Plan (MERP).	-	-
		6.1.5 Safety method for working with machines/equipment	ZPQ WPs All project vessels	Throughout operation period	✓	Safety method for working with machines/ equipment were implemented.	-	Appendix D-2
		6.1.6 Procedure for safety operation	ZPQ WPs All project vessels	Throughout operation period	✓	The procedure for safety operation was already implemented.	-	Appendix D-2

Table 2-1 Environmental Mitigation Measure Implementation Compliance Result Summary in Production Phase of Zawtika Phase 1C and 1D

Aspects	Potential Impacts	Mitigation Measures	Location	Period/ Frequency	Status	Details	Recommendation	Remarks/ Reference
		6.1.7 Provide SDS for all chemicals	ZPQ WPs All project vessels	Throughout operation period	✓	The SDS was attached at all chemical storage area.	-	Figure 2-19
	6.2 Injuries due to working in noisy areas	6.2.1 Carry out routine inspection and preventive maintenance for all machinery as per maintenance schedule/ recommended by manufacturers.	ZPQ WPs All project vessels	Throughout operation period	✓	Routine inspection and preventive maintenance for all machinery were conducted as per annual PM and Inspection Plan.	-	Figure 2-1 Figure 2-2 and Appendix D-5
		6.2.2 Provide personal protection equipment (PPEs/ ear muff/ ear plug) to workers working on high level noise activities.	ZPQ WPs All project vessels	Throughout operation period	✓	The appropriate PPEs were already provided to workers working on high level noise activities.	-	Figure 2-16
		6.2.3 Provide warning labels/ signs and limit working duration in high noise area.	ZPQ WPs All project vessels	Throughout operation period	✓	The warning signs were already provided at high noise area.	-	Figure 2-20

Table 2-2 Environmental Mitigation Measure Implementation Compliance Result Summary in Unplanned Events of Zawtika Phase 1C and 1D

Aspect	Potential Impact	Mitigation Measures	Location	Period/ Frequency	Status	Details	Recommendation	Remarks/ Reference
1. Vessel Collision	1.1 Collisions could potentially occur during transport of materials and rig tow-out.	1.1.1 Implement PTTEPI's SSHE Management System, including the following: o In case of vessel collision, follow PTTEPI's Emergency and Crisis Management Plan, including procedures in the event of an accidental vessel collision.	All project vessels Drilling rig	Throughout project duration	✓	PTTEPI's Emergency and Crisis Management Plan was implemented which the procedures in the event of an accidental vessel collision was included.	-	-
		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 (i. e. Department of Fisheries, Ministry of Livestock, Fisheries and Rural Development, and Myanmar Navy).	All project vessels Drilling rig	Throughout project duration	✓	The notice to mariner was already submitted to government authorities after rig mobilization.	-	Appendix D-7
		1.1.3 Establish 500 m safety zone around WPs;	All project vessels Drilling rig	Throughout project duration	✓	ZPQ regularly observed an area of 24 nautical miles from ZPQ and WPs . A 500m safety zone was established to ensure only permit vessel can operate in this area. When other vessel moves into the safety zone, the alarm in the radio room at ZPQ was warned.	-	Figure 2-13 and Figure 2-14
		1.1.4 Use support vessels to warn off traffic.	All project vessels Drilling rig	Throughout project duration	✓	Support vessels were used to contact with other vessels when they move into the safety zone around ZPQ and WPs.	-	Figure 2-4
		1.1.5 Provide appropriate lights and warning signals on all vessels to prevent accidental collision.	All project vessels Drilling rig	Throughout project duration	✓	The appropriate lights and warning signals were already provided on ZPQ and WPs and all vessels to prevent accidental collision.	-	Figure 2-15

Table 2-2 Environmental Mitigation Measure Implementation Compliance Result Summary in Unplanned Events of Zawtika Phase 1C and 1D

Aspect	Potential Impact	Mitigation Measures	Location	Period/ Frequency	Status	Details	Recommendation	Remarks/ Reference
2. Accidental Spills	2.1.4 Accidental spills of drilling fluids, chemicals, or diesel fuel could occur throughout all Project phases, and they may directly affect surface water quality, and indirectly affect sediment quality and marine ecology.	2.1.1 Implement the relevant components of PTTEPI's SSHE Management System, including the following: <ul style="list-style-type: none"> o PTTEPI Emergency and Crisis Management Plan (in case of oil or chemical spills). o PTTEPI Spill Contingency Plan. o PTTEPI SSHE Training & Competency Standard. o PTTEPI Incident Management Standard. o PTTEPI Waste Management Plan. 	Drilling rig ZPQ WPs All project vessels	Throughout project duration	✓	<ul style="list-style-type: none"> • PTTEPI's Emergency and Crisis Management Plan was already implemented which the oil or chemical spills was included. • The exercise of oil or chemical spills was regularly performed. • The incident and nearmiss record was collected by project staffs. • The waste management procedure was already implemented and followed. 	-	Appendix D-3 Appendix D-6
		2.1.2 Each vessel greater than 400 gross tons will comply with all fuel storage, waste treatment and disposal regulations/ procedures (MARPOL 73/78 requirements, PTTEPI and contractor procedures).	Drilling rig ZPQ WPs All project vessels	Throughout project duration	✓	Project has 2 vessels for support operation activities, both were complied with the requirements of MARPOL 73/78.	-	Figure 2-4 and Appendix C-1
		2.1.3 Comply with all Myanmar and International Maritime Organization (IMO) regulations or standards regarding vessel seaworthiness and maritime safety.	Drilling rig ZPQ WPs All project vessels	Throughout project duration	✓	Project has 2 vessels for support operation activities, both were complied with the requirements of MARPOL 73/78.	-	Figure 2-4 and Appendix C-1
		2.1.4 Separate and store chemicals according to their characteristics.	Drilling rig ZPQ WPs All project vessels	Throughout project duration	✓	The chemical was separated to store according to their characteristics.	-	Figure 2-26

Table 2-2 Environmental Mitigation Measure Implementation Compliance Result Summary in Unplanned Events of Zawtika Phase 1C and 1D

Aspect	Potential Impact	Mitigation Measures	Location	Period/ Frequency	Status	Details	Recommendation	Remarks/ Reference
		2.1.5 Store only necessary amounts of lubricants, fuels, paints, and other chemicals.	Drilling rig ZPQ WPs All project vessels	Throughout project duration	✓	The lubricants, fuels, paints and other chemicals were stored only necessary amounts at operation area.	-	Figure 2-26
		2.1.6 In case an oil spill accident on the drilling rig, must recover and properly clean the oil contaminated area (such as clean with absorbent etc.) and collect all materials contaminated with oil to dispose of onshore.	Drilling rig ZPQ WPs All project vessels	Throughout project duration	NA	There is no oil spill accident reported for the production phase during Jan-Jun 2021.	-	-
		2.1.7 The ZPQ, WPs and rig shall be provided with drip tray to prevent oil and chemical spills. Any spilled oil and chemical will be collected into a sealed container.	Drilling rig ZPQ WPs All project vessels	Throughout project duration	✓	The bun or dip tray was already provided at all oil and chemical storage area. Any spilled oil and chemical was collected into drum and sent to dispose by DOWA, the license waste management service in Myanmar.	-	Figure 2-5 and Figure 2-26
		2.1.8 Regularly monitor safety zone within 500 m radius surrounding ZPQ, WPs and rig to prevent any accidents.	Drilling rig ZPQ WPs All project vessels	Throughout project duration	✓	ZPQ regularly observed an area of 24 nautical miles from ZPQ and WPs. A 500m safety zone was established to ensure only permit vessel can operate in this area. When other vessel moves into the safety zone, the alarm in the radio room at ZPQ was warned.	-	Figure 2-5
		2.1.9 Provide appropriate lights and warning signals on all vessels to prevent accidental collision.	Drilling rig ZPQ WPs All project vessels	Throughout project duration	✓	The appropriate lights and warning signals were already provided on ZPQ, WPs and all vessels to prevent accidental collision.	-	Figure 2-15

Table 2-2 Environmental Mitigation Measure Implementation Compliance Result Summary in Unplanned Events of Zawtika Phase 1C and 1D

Aspect	Potential Impact	Mitigation Measures	Location	Period/ Frequency	Status	Details	Recommendation	Remarks/ Reference
		2.1.10 Conduct routine inspections for any leakage and damages, and preventative maintenance of equipment/facilities used in fluid storage (fuel, oil, chemicals, etc).	Drilling rig ZPQ WPs All project vessels	Throughout project duration	✓	Routine inspection and preventive maintenance for all machinery were conducted as per annual PM and Inspection Plan.	-	Appendix D-5
		2.1.11 Conduct exercises according to Emergency Response Plan and Tropical Storm Emergency Plan.	Drilling rig ZPQ WPs All project vessels	Throughout project duration	✓	The Tropical Cyclone Procedure was implemented including the emergency drill was performed as per the SSHE Emergency Drill & Exercise Plan.	-	Appendix D-3
		2.1.12 Use the appropriate well Plug & Abandonment method in order to prevent the leakage of petroleum hydrocarbons and other compounds from well.	Drilling rig ZPQ WPs All project vessels	Throughout project duration	✓	The Plug & Abandonment (P&A) Guideline was implemented to prevent the leakage of petroleum hydrocarbons and other compounds from well.	-	-
		2.1.13 Ensure proper training in the use and handling of the relevant chemicals and standard safety procedures implemented by all contractors.	Drilling rig ZPQ WPs All project vessels	Throughout project duration	✓	The Chemical Management Standard was implemented. Also, the training was regularly performed as per the SSHE Training Plan.	-	Appendix D-3
		2.1.14 Provide spill clean up kits.	Drilling rig ZPQ WPs All project vessels	Throughout project duration	✓	Oil absorbent kits was provided near all oil and chemical storage area.	-	Figure 2-7
		2.1.15 Handle all chemicals according to their SDS.	Drilling rig ZPQ WPs All project vessels	Throughout project duration	✓	The SDS was attached at all chemical storage area.	-	Figure 2-19
		2.1.16 Store, separate, transport and dispose of waste using appropriate procedures and disposal facilities.	Drilling rig ZPQ WPs All project vessels	Throughout project duration	✓	Hazardous waste was collected in the red container separated from the general waste which was collected in the blue ones, all containers were sent to dispose at onshore.	-	Figure 2-11 and Appendix C-4

Table 2-2 Environmental Mitigation Measure Implementation Compliance Result Summary in Unplanned Events of Zawtika Phase 1C and 1D

Aspect	Potential Impact	Mitigation Measures	Location	Period/ Frequency	Status	Details	Recommendation	Remarks/ Reference
		2.1.17 Ensure manifest of hazardous waste is kept 2.1.18 Install an appropriate control valve for pipe work relating to chemical and fuel transfer. Perform valve inspection and conduct a pressure test as required.	Drilling rig ZPQ WPs All project vessels	Throughout project duration	✓	The manifest for hazardous waste disposal was kept and recorded.	-	Appendix C-4
			Drilling rig ZPQ WPs All project vessels Shore base	Throughout project duration	✓	The control valve was already installed and monitored by control room. The inspection was performed regularly as per the annual PM and Inspection Plan.	-	Figure 2-21, Figure 2-22 and Appendix D-5
3. Well Blowout	3.1 A blowout can result in the release of hydrocarbons (oil or gas) into the sea and surrounding environment at high pressure, potentially impacting seawater/sediment quality, marine life and marine ecology, occupational health and safety, and public health.	3.1.1 Implement the relevant components of PTTEPI's SSHE Management System, including the following: <ul style="list-style-type: none"> o PTTEPI's Blowout Contingency Plan. o In case of oil or chemical spills, follow PTTEPI's Emergency and Crisis Management Plan. o PTTEPI's Spill Contingency Plan. o PTTEPI's SSHE Requirement for Contractor. o PTTEPI's SSHE Training and Competency Management Standard. o PTTEPI's Incident Management Procedure. o PTTEPI's Offshore Medical Emergency Response Plan (MERP). o PTTEPI's Crisis Communication Plan and Crisis Management Plan. 3.1.2 Install blowout preventer and shear ram appropriately.	Drilling rig WPs	Throughout project duration	NA	No drilling activity for the production phase during Jan-Jun 2021.	-	-

Table 2-2 Environmental Mitigation Measure Implementation Compliance Result Summary in Unplanned Events of Zawtika Phase 1C and 1D

Aspect	Potential Impact	Mitigation Measures	Location	Period/ Frequency	Status	Details	Recommendation	Remarks/ Reference
		3.1.3 Employ experienced drilling contractors that have well maintained equipment and train their employees regarding inspection and prevention of blowouts.	Drilling rig WPs	Throughout project duration	NA	No drilling activity for the production phase during Jan-Jun 2021.	-	-
		3.1.4 Ensure that drilling contractors develop and maintain emergency plans, have equipment that are readily available for use, and their personnel are trained to respond to oil spill.	Drilling rig WPs	Throughout project duration	NA	No drilling activity for the production phase during Jan-Jun 2021.	-	-
		3.1.5 Monitor down-hole pressure at all times.	Drilling rig WPs	Throughout project duration	NA	No drilling activity for the production phase during Jan-Jun 2021.	-	-
		3.1.6 Conduct regular trainings and spill response drills at least once a year.	Drilling rig WPs	Throughout project duration	NA	No drilling activity for the production phase during Jan-Jun 2021.	-	-
		3.1.7 Prepare and maintain oil spill response equipment for Tier I spill that is ready to use at all times.	Drilling rig WPs	Throughout project duration	NA	No drilling activity for the production phase during Jan-Jun 2021.	-	-
4. Tropical Cyclone	4.1 Tropical cyclones represent a threat to the safety of offshore personnel and could result in multiple fatalities and damage to assets.	4.1.1 Implement PTTEPI's Tropical Revolving Storm Procedure and Emergency and Crisis Management Plan (Annex A).	Drilling rig ZPQ WPs All project vessels	Throughout project duration	✓	The Tropical Cyclone Procedure was implemented. Also, the emergency drill was performed as per the SSHE Emergency Drill & Exercise Plan.	-	Appendix D-3

Table 2-2 Environmental Mitigation Measure Implementation Compliance Result Summary in Unplanned Events of Zawtika Phase 1C and 1D

Aspect	Potential Impact	Mitigation Measures	Location	Period/ Frequency	Status	Details	Recommendation	Remarks/ Reference
5. Fire or Explosion	5.1 Fire or explosion could potentially impact air quality, health and safety concerns to PTTEPI's employees and contractors, and damage to structures. Secondary impacts from release/spill of chemicals could occur to seawater/sediment quality, ecology and biodiversity.	5.1.1 Provide fire protection equipment, including fire extinguishers and alarms, on all offshore facilities.	Drilling rig ZPQ WPs All project vessels Shore base	Throughout project duration	✓	The firefighting equipments and alarm were provided in the area and regularly inspected by operators.	-	Figure 2-23, Figure 2-24 and Appendix D-5
		5.1.2 Conduct regular inspections and drills for fire protection equipment.	Drilling rig ZPQ WPs All project vessels Shore base	Throughout project duration	✓	The firefighting equipments and alarm were provided in the area and regularly inspected by operators. The emergency drill was performed as per the SSHE Emergency Drill & Exercise Plan.	-	Figure 2-1, Figure 2-23, Figure 2-24 and Appendix D-4
		5.1.3 Implement Emergency and Crisis Management Plan (Annex A) in case of fire or explosion occurrence.	Drilling rig ZPQ WPs All project vessels Shore base	Throughout project duration	✓	PTTEPI's Emergency and Crisis Management Plan was implemented in case of fire or explosion occurrence.	-	



Figure 2-1 Inspection tag on equipment



Figure 2-2 Maintenance activities by project' staffs



Figure 2-3 Flare at ZPQ platform



Figure 2-4 Support vessel of the project



Figure 2-5 Used oil, chemical and hazardous waste storage area



Figure 2-6 Wastewater treatment system



Figure 2-7 Emergency spill response equipment



Figure 2-8 Sewage treatment system



Figure 2-9 TOG/TPH analyzer



Figure 2-10 Produced sand containers



Hazardous waste container



Non-hazardous waste containers

Figure 2-11 Waste containers



Figure 2-12 Food waste grinder



Figure 2-13 Safety zone monitoring display



Figure 2-14 Radio room at ZPQ



Figure 2-15 Light and warning signal at ZPQ and WPs



Figure 2-16 Provided PPE and PPE wearing



First-aid kits



Medical room

Figure 2-17 First-aid kits and medic room



Drinking water and Coffee corner

Figure 2-18 Provided sanitary systems and facilities



Mess room



Toilets



Bedroom



Pool Table



Gym room

Figure 2-18 (Cont.) Provided sanitary systems and facilities



TV room



Washing service

Figure 2-18 (Cont.) Provided sanitary systems and facilities



Figure 2-19 SDS at chemical storage area



Figure 2-20 Warning signs



Figure 2-21 CCTV



Figure 2-22 Control room

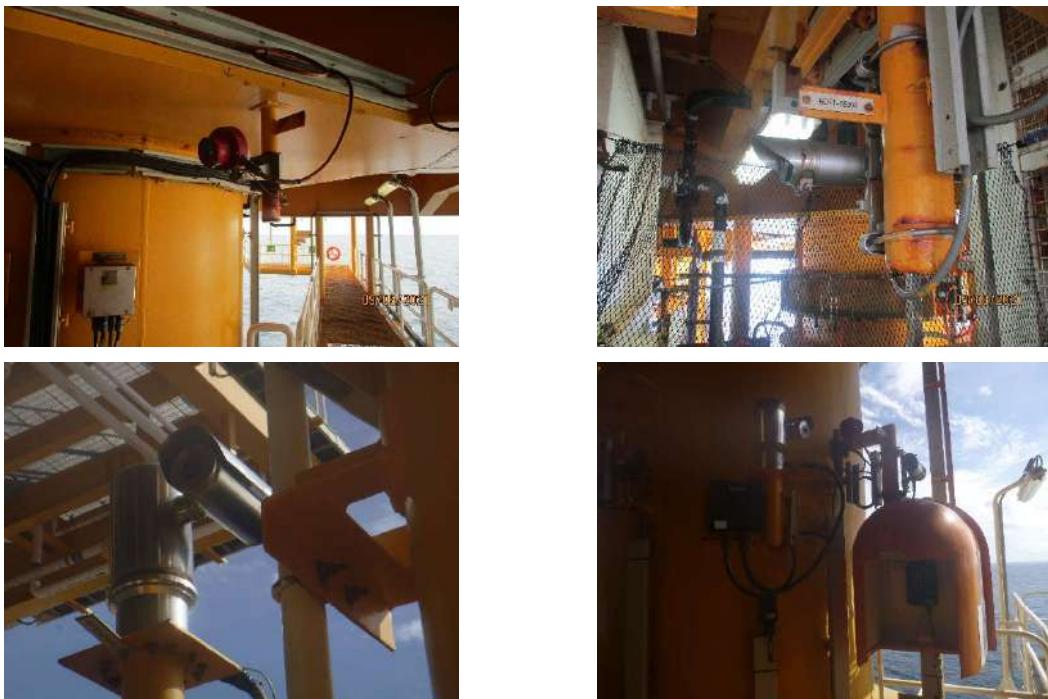


Figure 2-23 Alarm and detector equipment



Figure 2-24 Firefighting equipment



Figure 2-24 (Cont.) Firefighting equipment

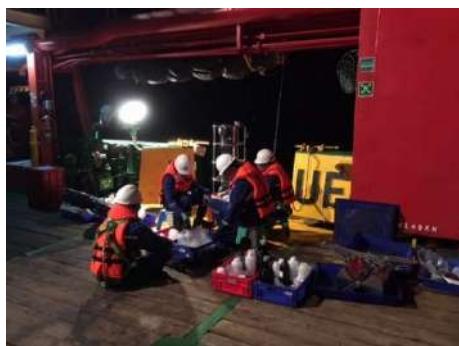


Figure 2-25 Vessel deck



Figure 2-26 Chemical Storage Area

Chapter 3

Chapter 3

Environmental Monitoring Results

Environmental monitoring was conducted as specified in EIA Report 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 Zawtika Phase 1C and 1D Development Project during production phase, the detail is presented as follow;

3.1 Environmental Monitoring Plan

Environmental monitoring for Zawtika Phase 1C and 1D Development Project during production phase is shown in Table 3-1.

Table 3-1 Environmental Monitoring Plan of Zawtika Phase 1C and 1D Development Project during Production Phase

Environmental Quality	Parameter	Period/Frequency	Location	Implemented	
				Complied	Not complied
1. Sewage	<ul style="list-style-type: none"> • pH • BOD • COD • Total Coliform Bacteria 	Once every 6 months	Sampling from sewage water treatment system discharge point	<ul style="list-style-type: none"> • Monitored by REM- UAE Laboratory and Consultant Co., Ltd. on January 19, 2021. The result as shown in Content 3.2.5. 	-
2. Produced water	<ul style="list-style-type: none"> • Oil & Grease 	<ul style="list-style-type: none"> • Monthly summary of volume discharged • Daily onboard Analysis/ Monitoring for Oil and Grease 	Sampling from Produced Water treatment system discharged point	<ul style="list-style-type: none"> • Monitored by REM- UAE Laboratory and Consultant Co., Ltd. during January to June 2021. The result as shown in Content 3.3.5. 	-
3. Produced sand	<ul style="list-style-type: none"> • OOC% (only in case of discharge) 	Analysis/monitoring as required	Sampling from produced sand container	<ul style="list-style-type: none"> • Produced sand was collected in the container and sent to dispose at onshore by DOWA, the license waste management service in Myanmar. The result as shown in Content 3.4.5. 	-

3.2 Sewage Monitoring

Sewage monitoring was conducted by REM-UAE Laboratory and Consultant Company Limited on January 19, 2021 from sewage water treatment system discharge point at ZPQ. The detail as shown in Table 3-2.

Table 3-2 Sewage Water Quality Monitoring Plan

Environmental Quality	Parameter	Location	Period
Sewage	1. pH 2. BOD 3. COD 4. Total Coliform Bacteria	Sewage water treatment system discharge point at ZPQ	January 19, 2021

3.2.1 Sewage Analysis Method

Details of sewage monitoring including parameters and analysis methods are shown in Table 3-3.

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

Parameter	Analysis Method ^{1/}
1. pH	Electrometric Method at Site (SM : 4500-H ⁺ B)
2. BOD	Membrane Electrode Method (SM : 5210 B and 4500-O G)
3. COD	Closed Reflux, Titrimetric Method (SM : 5220 C)
4. Total Coliform Bacteria	Multiple Tube Fermentation Technique (SM : 9221 B)

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

3.2.2 Sewage Monitoring at ZPQ

Sewage samples were collected at effluent from sewage water treatment from project area on January 19, 2021 at discharge point. The sewage water sample was shown in Figure 3-1.



Figure 3-1 Sewage Water Sample from ZPQ

3.2.3 Preservation Methods

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

Table 3-4 Container and Preservation Methods of Sewage Monitoring

Parameter	Container	Preservation Methods*
1. pH	-	Measuring at Site
2. BOD	Polyethylene Bottle 1 L	Refrigerate at $>0^{\circ}\text{C}$, $\leq 6^{\circ}\text{C}$
3. COD	Glass Bottle 250 mL	Add H_2SO_4 to $\text{pH} < 2$ and Refrigerate at $>0^{\circ}\text{C}$, $\leq 6^{\circ}\text{C}$
4. Total Coliform Bacteria	Sterile, Brown Glass Bottle 150 mL	Add 10% $\text{Na}_2\text{S}_2\text{O}_3$ 0.1 mL/100 mL and Refrigerate at $< 10^{\circ}\text{C}$ (above freezing point of water)

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

3.2.4 Sewage Monitoring Result

Referring to analysis number LAA006/2021, sewage sample was conducted on January 19, 2021 during production phase of ZPQ. The result found that all of parameters complied with MARPOL73/78 as specified in National Environmental Quality (Emission) Guidelines. Sewage was collected to treat at treatment system and monitored to control all parameters as requirements of MARPOL 73/78 and Myanmar's EQEG.

From Table 3-5, It was found that the monitoring result in January 2021 was complied with MARPOL73/78 as specified in National Environmental Quality (mission) Guidelines. PTTEPI will continually monitor sewage, as specified in the measure for surveillance of environmental impact from project operation. The analysis results, certificate for laboratory instrument and approval registration certificate of laboratory are shown in Appendix E, F and G.

Table 3-5 Results of Sewage Monitoring at ZPQ

Parameter	Unit	The Results of Sewage Quality	Guideline ^{1/}	Detection Limit
		January 19, 2021		
pH	-	7.0 (25°C)	6-9	-
BOD	mg/L	ND (<2.0)	50	2.0
COD	mg/L	51.6	250	25.0
Total Coliform Bacteria	MPN/100 ml	<1.8	400	1.8
Sample condition				
Water's Colour/Turbid	-	Light Grey/Little Turbid	-	-
Sediment	-	Grey	-	-

Remark: ^{1/} National Environmental Quality (Emission) Guidelines. Compliance with MARPOL 73/78

3.3 Produced Water Monitoring

Produced water monitoring at ZPQ as per specified in EMP was conducted by REM-UAE Laboratory and Consultant Company Limited in production phase. The detail as shown in Table 3-6.

Table 3-6 Produced Water Monitoring Plan

Environmental Quality	Parameter	Location	Period
Produced water	Oil & Grease	Produced Water treatment system discharged point	January 2021 February 2021 March 2021 April 2021 May 2021 June 2021

3.3.1 Produced Water Analysis Method

Details of produced water monitoring including parameters and analysis methods are shown in Table 3-7.

Table 3-7 Parameters and Analyses Methods for Produced Water Monitoring

Parameter	Analysis Method ^{1/}
Oil & Grease	Partition-Gravimetric Method (SM 2017 : 5520 B)

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

3.3.2 Produced Water Monitoring at ZPQ

Produced water monitoring at ZPQ was conducted from Produced Water treatment system discharged point during January to June 2021. The produced water sample from ZPQ was shown in Figure 3-2.



Figure 3-2 Produced Water Sample from ZPQ

3.3.3 Preservation Methods

All samples were preserved with specific procedure and storage as shown in Table 3-8.

Table 3-8 Container and Preservation Methods of Produced Water Monitoring

Parameter	Container	Preservation Methods*
Oil & Grease	Glass wide Mouth Bottle 1 L	Add H_2SO_4 to $\text{pH} < 2$ and Refrigerate $\text{at} > 0^\circ\text{C}, \leq 6^\circ\text{C}$

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

3.3.4 Produced Water Results

Referring to analysis report of produced water which were collected during January to June 2021. The results found that oil and grease were complied with National Environmental Quality Emission Guidelines. Produced water monitoring results were shown in Table 3-9.

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

Table 3-9 The Results of Produced Water Monitoring

Parameter	Unit	The Results of Produced Water						Guideline ^{1/}		Detection Limit
		January 2021	February 2021	March 2021	April 2021	May 2021	June 2021	1 Day	30 Days	
Oil & Grease ^{1/}	mg/L	9	9	12	14	10	14.3	42	29	3
Sample condition										
Water's Colour/Turbid	-	Brown/Turbid	Brown/Turbid	Brown/Turbid	Dark/Turbid	Dark/Turbid	Brown/Turbid	-	-	-
Sediment	-	Brown	Brown	Brown	Dark	Dark	Brown	-	-	-

Remark: ^{1/}Re-inject, discharge to sea maximum one day oil and grease discharge should not exceed 42 mg/L; 30 day average should not exceed 29 mg/L following National Environmental Quality (Emission) Guidelines.

3.4 Produced Sand Monitoring

Produced sand was collected in the proper container (UN drum) and sent to dispose at onshore facility which is DOWA, the license waste management service in Myanmar.

Chapter 4

Chapter 4

Environmental Mitigation Measures Compliance Audit and Environmental Monitoring Conclusion

From the implementation of Environmental Mitigation Measures Compliance Audit and Environmental Monitoring of Zawtika Phase 1C and 1D in Production Period, it was found that the project has implemented the measures as specified in EMP and the results are summarized as following details:

4.1 Environmental Mitigation Measures Compliance Audit and Environmental Monitoring Conclusion

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 Environmental Management Plan.

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

The REM-UAE Laboratory and Consultant Company Limited will identify the cause of problems, barriers and solutions in case there are any non-compliance with the mitigation measures are found during the audit.

The results determined that the project completely complied on the Mitigation Measures for production phase and the unplanned events with 100% for the activities that have situation, however there are 23.5% of activity for unplanned event that do not have the situation which was identified as Not Applicable (NA). The results are shown in Figure 4-1 and Figure 4-2.



Figure 4-1 The Results of Environmental Mitigation Measures Compliance during Production Phase

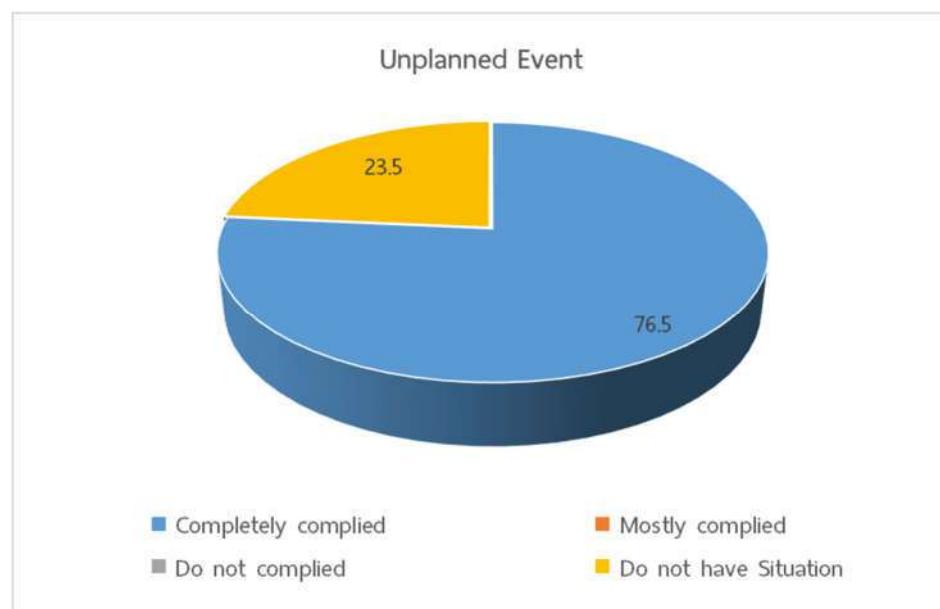


Figure 4-2 The Results of Environmental Mitigation Measures Compliance in Unplanned Events

4.1.1 Environmental Mitigation Measures Compliance Result in Production Phase

- **Air Quality** - Routine inspection and preventive maintenance for all machinery were conducted as per annual PM and Inspection Plan. Annual pollutant release inventory was recorded monthly basis. Moreover, venting and flare were performed as per the Vent and Drain Philosophy, and HP and LP Flare System Startup. The volumes of gas flared for all flaring events were daily recorded by project staff.
- **Seawater & Sediment Quality** - Project has 2 vessels for support operation activities, both were complied with the requirements of MARPOL 73/78. Oil-contaminated wastewater was collected in the drum for disposal by onshore contractor, the license waste management service. Deck of vessel was regularly clean by staff to minimize oil and chemical contamination in rainwater. Emergency spill response equipment was provided near all oil and chemical storage area. After usage all were kept in the hazardous waste container and sent to dispose by DOWA, the license waste management service in Myanmar.
- **Marine Life and Marine Ecology** - Sewage was collected to treat at treatment system and monitored to control all parameters as requirements of MARPOL 73/78 and Myanmar's NEQG. All equipment of water treatment system were regularly inspected as per the annual PM and Inspection Plan.

Produced water was collected to treat at ZPQ and monitored every day to control TOG value as per requirements of Myanmar's EQEG. Produced sand was collected in the container and sent to dispose at onshore by DOWA, the license waste management service in Myanmar.

Hazardous waste was collected in the red container separated from the general waste which was collected in the blue ones, all containers were sent to dispose at onshore. The manifest for hazardous waste disposal was kept and recorded.

Furthermore, non-hazardous wastes were segregated as food waste, paper, recycle waste and other waste and kept in the bins attached with colour code. The food waste was grinded to a size less than 25 mm before discharge into the sea as per the requirements under MARPOL 73/78. All wastes were recorded regularly when sent to dispose at onshore.

- **Fishing** - ZPQ regularly observed an area of 24 nautical miles from ZPQ and WPs. A 500m safety zone was established to ensure only permit vessel can operate in this area. When other vessel moves into the safety zone, the alarm in the radio room at ZPQ was warned. In addition, support vessels were used to contact with other vessels when they move into the safety zone around ZPQ and WPs. The appropriate lights and warning signals were already provided on ZPQ and WPs and all vessels to prevent accidental collision.

- **Shipping and Navigation** - ZPQ regularly observed an area of 24 nautical miles from ZPQ and WPs. A 500m safety zone was established to ensure only permit vessel can operate in this area. When other vessel moves into the safety zone, the alarm in the radio room at ZPQ was warned. Support vessels were used to contact with other vessels when they move into the safety zone around ZPQ and WPs. The appropriate lights and warning signals were already provided on ZPQ and WPs and all vessels to prevent accidental collision.
Condensate burning was performed as per the Liquid Burner Operation Procedure which the safety instructions was clarify in this document.
- **Occupational Health and Safety** - PTTEPI's Occupational Health Management Standard was prepared and applied for Zawtika project. All staffs wear appropriate PPE at all working time. The safety training schedule was performed as per SSHE annual training plan. The safety case or emergency drill was performed as per SSHE Emergency Drill & Exercise Plan. Life saving program standard was specified in Zawtika Offshore Field Emergency Response Plan and others related plan. Offshore Medical Emergency Response Plan (MERP) and Myanmar Asset Crisis Management Plan were already implemented. First-aid kits and medic room were provided. The medic was stand by at medic room for medical treatment. In case of emergency, the patient will be pre-treatment by medic and will sent to the hospital in Yangon by helicopter as per The Offshore Medical Emergency Response Plan (MERP). Safety method for working with machines/ equipment and procedure for safety operation were already implemented. The SDS was attached at all chemical storage area.
- There were total 6 cases of incident during January to June 2021 including 1 case of first aid case (FAC), 2 cases of Near Miss, 1 case of PD and 1 case of LOPC Tier 3. Corrective actions were proposed/implemented to prevent reoccurrence. The summary of incident record as shown in Appendix D-6.

4.1.2 Environmental Mitigation Measures Compliance Result in Unplanned Events

- **Vessel collision** - PTTEPI's Emergency and Crisis Management Plan was implemented which the procedures in the event of an accidental vessel collision was included. The notice to mariner was already submitted to government authorities after rig mobilization. ZPQ regularly observed an area of 24 nautical miles from ZPQ and WPs. A 500m safety zone was established to ensure only permit vessel can operate in this area. When other vessel moves into the safety zone, the alarm in the radio room at ZPQ was warned. Support vessels were used to contact with other vessels when they move into the safety zone around ZPQ and WPs. The appropriate lights and warning signals were already provided on ZPQ and WPs and all vessels to prevent accidental collision.
- **Accidental Spills** - PTTEPI's Emergency and Crisis Management Plan was already implemented which the oil or chemical spills was included. The exercise of oil or chemical spills was regularly performed. The incident and near miss record were collected by project staffs. Waste management procedure was already implemented and followed. The chemical was separated to store

according to their characteristics. The lubricants, fuels, paints and other chemicals were stored only necessary amounts at operation area. The bun or dip tray was already provided at all oil and chemical storage area. Any spilled oil and chemical were collected into drum and sent to dispose by DOWA, the license waste management service in Myanmar. The appropriate lights and warning signals were already provided on ZPQ, WPs and all vessels to prevent accidental collision. Routine inspection and preventive maintenance for all machinery were conducted as per annual PM and Inspection Plan. The Tropical Cyclone Procedure was implemented including the emergency drill was performed as per the SSHE Emergency Drill & Exercise Plan. The SDS was attached at all chemical storage area. Hazardous waste was collected in the red container separated from the general waste which was collected in the blue ones, all containers were sent to dispose at onshore. The manifest for hazardous waste disposal was kept and recorded. The control valve was already installed and monitored by control room. The inspection was performed regularly as per the annual PM and Inspection Plan.

- **Tropical cyclone** - The Tropical Cyclone Procedure was implemented. Also, the emergency drill was performed as per the SSHE Emergency Drill & Exercise Plan.
- **Fire or Explosion** - The firefighting equipment and alarm were provided in the area and regularly inspected by operators. The emergency drill was performed as per the SSHE Emergency Drill & Exercise Plan. PTTEPI's Emergency and Crisis Management Plan was implemented in case of fire or explosion occurrence. The firewater system was regularly inspected by operator. Condensate burning was performed as per the Liquid Burner Operation Procedure which the safety instructions was clarify in this document. The air consumption of the burner package was checked by operator to ensure adequate air flow as per the Liquid Burner Operation Procedure. The gas detection system was installed at WP-1 and regularly checked by operator. The alarm was monitored by control room. The CCTV was already installed at burner area and monitored by control room.

4.2 Environmental Monitoring Conclusion

The results of Environmental Impact Monitoring determined that the project completely complied with 100% as shown in Figure 4-3.



Figure 4-3 The Results of Environmental Monitoring

Sewage Monitoring was conducted by REM-UAE Laboratory and Consultant Company Limited on January 19, 2021 from sewage treatment system discharge point at ZPQ. The result found that all of parameters complied with MARPOL73/78 as specified in National Environmental Quality (Emission) Guidelines.

4.2.1 Produced Water Monitoring

Produced water monitoring at ZPQ was conducted from Produced Water treatment system discharged point during January to June 2021. The results found that oil and grease were complied with National Environmental Quality (Emission) Guidelines.

4.2.2 Produced Sand Monitoring

Produced sand was collected in the proper container (UN drum) and sent to dispose at onshore facility which is DOWA, the license waste management service in Myanmar.