ADDENDUM
Environmental Impact Assessment (EIA) for Myanmar Onshore Block EP-3 Exploration Drilling Campaign ONGC Videsh Limited




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အကျဉ်းချုပ်အစီရင်ခံစာ

မာတိကာ

၁။ အကျဉ်းချုပ်အစီရင်ခံစာ

၁.၁။ စီမံကိန်းအကြောင်းအရာဖော်ပြချက်

ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းအစီရင်ခံစာကို ပြည်ထောင်စုသမ္မတ မြန်မာနိုင်ငံတော်အစိုးရ သယံဇာတနှင့် သဘာဝ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာနမှ ထုတ်ပြန်ထားသော ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးနည်းဥပဒေများ၊ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်း၊ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဥပဒေ ၂၀၁၂ ခုနှစ်၊ ပြည်ထောင်စုလွှတ်တော်ဥပဒေအမှတ် ၉၊ အပိုဒ် (၄၂) (ခ) နှင့်အညီ ပြင်ဆင်ထားပါသည်။ ပတ်ဝန်းကျင်ထိခိုက်မှု ဆန်းစစ်ခြင်း (EIA) လေ့လာမှုတွင် လိုက်နာရန်လိုအပ်သည့် မြန်မာနိုင်ငံရှိ ဥပဒေများ၊ နိုင်ငံတကာ လမ်းညွှန်ချက်များနှင့် စံချိန်စံညွှန်းများကိုလည်း အကျဉ်းချုပ် ဖော်ပြထားပါသည်။

Oil and Natural Gas Corporation Limited (ONGC)၏ လက်ခွဲကုမ္ပဏီတစ်ခုဖြစ်သော ONGC Videsh Limited (ONGC Videsh) သည် ၂၀၁၃ ခုနှစ် မြန်မာနိုင်ငံ ကုန်းတွင်းလုပ်ကွက် တင်ဒါခေါ်ယူခြင်းတွင် ရေနံနှင့် သဘာဝဓါတ်ငွေ့ ရှာဖွေထုတ်လုပ်ရန် ကုန်းတွင်းလုပ်ကွက်အမှတ် EP-3 အား ဆောင်ရွက်ခွင့် ရခဲ့ပါသည်။ ကုန်းတွင်းလုပ်ကွက်အတွက် ထုတ်လုပ်မှု အပေါ် ခွဲဝေခြင်းစာချုပ် (PSC) ကို မြန်မာ့ရေနံနှင့် သဘာဝဓါတ်ငွေ့လုပ်ငန်း (MOGE)၊ ONGC Videsh Limited နှင့် Machinery & Solutions Company Limited (M&S) တို့သည် ဩဂုတ်လ ၈ ရက် ၂၀၁၄ ခုနှစ်တွင် လက်မှတ်ရေးထိုးချုပ်ဆိုခဲ့ပါသည်။

ONGC သည် ကုန်းတွင်းလုပ်ကွက်အမှတ် EP-3 တွင် ရှာဖွေတူးဖော်ရေးလုပ်ငန်းများကို ဆောင်ရွက်သွားပါမည်။ ထုတ်လုပ်မှုခွဲဝေခြင်းစာချုပ် (PSC) အရ ၂၀၁၆ ခုနှစ် ဧန်နဝါရီလ ၁ ရက်နေ့တွင် စတင်ဆောင်ရွက်ခဲ့သော ပထမအဆင့်တူးဖော်ရေးအဆင့်တွင် အနည်းဆုံးဆောင်ရွက်ရမည့် လုပ်ငန်းအစီအစဉ်မှာ နှစ်ဘက်မြင် ဆိုက်စမစ် အချက်အလက်များကို ရယူခြင်း၊ ဆောင်ရွက်ခြင်း၊ အဓိပ္ပါယ် ဖော်ဆောင်ခြင်းနှင့် ရှာဖွေရေးတွင်း ၂ တွင်း တူးဖော်ခြင်းတို့ ဖြစ်ပါသည်။ ONGC Videsh သည် နှစ်ဘက်မြင် ဆိုက်စမစ်အချက်အလက်များ ရယူခြင်းကို ၂၀၁၈ ခုနှစ် ဖေဖော်ဝါရီလ ပထမအပတ်အတွင်းတွင် အောင်မြင်စွာ ဆောင်ရွက်ခဲ့ပြီးဖြစ်ပါသည်။ နှစ်ဘက်မြင် ဆိုက်စမစ်အချက်အလက်များ တိုင်းတာရေးဆောင်ရွက်ခဲ့ခြင်းနှင့် သီးနှံများ အတွက်နစ်နာကြေးပေးချေခြင်းကိုလည်း ဆောင်ရွက်ပြီးစီးခဲ့ပြီးဖြစ်ကာ ဆိုက်စမစ်အချက်အလက်များ၏ ရလဒ်အပေါ်မူတည်ပြီး ရှာဖွေရေးတွင်း (၂)တွင်းနေရာအား မြန်မာ့ရေနံနှင့်သဘာဝဓါတ်ငွေ့လုပ်ငန်း (MOGE)က အတည်ပြုပေးပြီးဖြစ်ပါသည်။ ကနဦး စမ်းသပ်ရှာဖွေခြင်းအဆင့် ကတိကဝတ်အရ ONGC Videsh သည် ရှာဖွေရေးတွင်း ၂ တွင်းတူးဖော်ခြင်းကို ၂၀၂၁ ခုနှစ်တွင် စတင်ဆောင်ရွက်မည်ဖြစ်ပါသည်။ ONGC Videsh သည် ပထမတွင်း စတင်တူးဖော်ခြင်းလုပ်ငန်းကို ၂၀၂၁ ခုနှစ် ဩဂုတ်လ အတွင်းတွင် ဆောင်ရွက်ရန် စီစဉ်ထားပါသည်။

၁.၂။ စီမံကိန်းအဆိုပြုသူ

ရေနံနှင့် သဘာဝခါတ်ငွေ့လုပ်ငန်း ဝန်ကြီးဌာန၏ ကြီးကြပ်ကွပ်ကဲမှုအောက်တွင်ရှိသော အိန္ဒိယနိုင်ငံအစိုးရ၏ လူထုဗဟိုပြုလုပ်ငန်းဆောင်ရွက်မှု (CPSE) Miniratna Schedule "A" ရှိသော ONGC Videsh သည် အိန္ဒိယနိုင်ငံ ရေနံကုမ္ပဏီ National Oil Company ကို ဦးဆောင်နေသော Oil and Natural Gas Corporation Limited (ONGC) ၏ နိုင်ငံရပ်ခြားတွင် ဆောင်ရွက်သည့် လက်ခွဲကုမ္ပဏီတစ်ခု ဖြစ်ပါသည်။

ကုမ္ပဏီအမည်	ONGC VIDESH LIMITED
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၁.၃။ ဥပဒေ၊ မူဝါဒနှင့် ဖွဲ့စည်းပုံမူဘောင်

ပြည်ထောင်စု သမ္မတမြန်မာနိုင်ငံတော်၏ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေး ဥပဒေ အပိုဒ် ၇ နှင့် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေး နည်းဥပဒေ ပုဒ်မ ၅၂ နှင့် ၅၃ တို့အရ ONGC Videsh သည် အဆိုပါစီမံကိန်းအတွက် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဆိုင်ရာ လိုက်နာဆောင်ရွက်မှု သက်သေခံလက်မှတ် (ECC) ရရှိရန် ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း အစီရင်ခံစာကို ရေးဆွဲရန် လိုပါသည်။

စီမံကိန်းအား နိုင်ငံတကာနှင့် ဒေသတွင်းရှိ စံချိန်စံညွှန်းများ၊ ဥပဒေများနှင့်အညီ အကောင်အထည်ဖော်သွားပါမည်။ မြန်မာနိုင်ငံတွင် ပတ်ဝန်းကျင် ထိန်းသိမ်းရေးအတွက် လိုအပ်သော ဥပဒေများမှာ-

- ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဥပဒေ (၂၀၁၂) (ပုဒ်မ ၇ (ဏ)၊ ၁၄၊ ၁၅၂၉)
- ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးနည်းဥပဒေ (၂၀၁၅) (နည်းဥပဒေ ၆၉)
- ပတ်ဝန်းကျင်ထိခိုက်မှု ဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်း (၂၀၁၅) (အပိုဒ် ၈၇၊ ၁၀၂ မှ ၁၁၀၊ ၁၁၃၊၁၁၅)
- အမျိုးသားအဆင့် ပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်များ (၂၀၁၅)

အသေးစိတ်မူဝါဒများ၊ နည်းဥပဒေများကို ပတ်ဝန်းကျင်ထိခိုက်မှု အစီရင်ခံစာ၏ အခန်း (၃) တွင် ထပ်မံ၍ ဖော်ပြထားပါသည်။

၁.၄။ စီမံကိန်းအကြောင်းအရာနှင့် အခြားနည်းလမ်းများ

၁.၄.၁။ ရည်ရွယ်ချက်

ယခု ဤစီရင်ခံစာ၏ ရည်ရွယ်ချက်မှာ ONGC Videsh မှ ကုန်းတွင်းလုပ်ကွက်အမှတ် EP-3 တွင် အများဆုံး စမ်းသပ် ရှာဖွေတူးဖေါ်သွားမည့် စမ်းသပ်ရှာဖွေရေးတွင်း(၂)တွင်း တူးဖော်ခြင်းလုပ်ငန်းတွင် ပတ်ဝန်းကျင်၊ ကျန်းမာရေးနှင့် ဘေးအန္တရာယ်ကင်းရှင်းရေးဆိုင်ရာအစီအစဉ်များ ဆောင်ရွက်မှုကို ထည့်သွင်းဆောင်ရွက်ရန် ရည်ရွယ်ပါသည်။ စမ်းသပ် ရှာဖွေရေးတွင်း (၂) တွင်းအတွက် ONGC Videsh မှ ငွေကြေးကုန်ကျမှုကို အမေရိကန်ဒေါ်လာ ၅၃.၅၅ မီလီယံ ခန့်မှန်း ထားပါသည်။

ကုန်းတွင်းလုပ်ကွက်အမှတ် EP-3 တွင် စမ်းသပ်ရှာဖွေတူးဖော်ခြင်းလုပ်ငန်း၏ အဓိကရည်ရွယ်ချက်များမှာ-

၁။ ကုန်းတွင်းလုပ်ကွက်အမှတ် EP-3 တွင် ရေနံနှင့် သဘာဝဓါတ်ငွေ့များ တည်ရှိနိုင်မှုကို ရှာဖွေရန်

၂။ ထုတ်လုပ်မှု အပေါ် ခွဲဝေခြင်းစာချုပ် (PSC) ကတိကဝတ်များကို ဆောင်ရွက်ရန်

စီမံကိန်းဖော်ပြချက်အပြည့်အစုံကို ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းအစီရင်ခံစာ၏ အခန်း (၄) တွင် ဖော်ပြထားပါ သည်။

၁.၄.၂။ စီမံကိန်းအား ထိန်းညှိခြင်း

၂၀၁၈ ခုနှစ်တွင် ONGC Videsh သည် ပဲခူးတိုင်းဒေသကြီး သဲကုန်း၊ ပြည်၊ ပေါင်းတည်၊ ပေါက်ခေါင်း၊ နတ်တလင်း မြို့နယ်များပါဝင်သည့် လုပ်ကွက်အမှတ် EP-3 အတွင်းတွင် နှစ်ဘက်မြင်ဆိုက်စမစ် အချက်အလက် တိုင်းတာရေး လုပ်ငန်းအား ၅၆၃ လိုင်းကီလိုမီတာအရှည်အထိ အောင်မြင်စွာတိုင်းတာ ဆောင်ရွက်ခဲ့ပြီးဖြစ်ပါသည်။

ONGC Videsh သည် လုပ်ကွက်အမှတ် EP-3 တွင် အလားအလာရှိသော ရေနံနှင့်သဘာဝဓါတ်ငွေ့ စမ်းသပ်ရှာဖွေရန်နှင့် ထုတ်လုပ်မှုအပေါ် ခွဲဝေခြင်းစာချုပ် (PSC) အရ ဆောင်ရွက်နိုင်ရန် ၂၀၂၀-၂၀၂၁ တွင် တွင်းတူးခြင်းလုပ်ငန်းအား ဆောင်ရွက်ရန် စီစဉ်ထားပါသည်။ မြန်မာနိုင်ငံ၊ ပဲခူးတိုင်းဒေသကြီး သဲကုန်းမြို့နယ်အတွင်းတည်ရှိသော ရှာဖွေရေးတွင်း ၂ တွင်းကို တူးဖော်ဆောင်ရွက်သွားပါမည်။ နဝင်းတွင်းအမှတ်-၁ အတွက် ဆက်သွယ်ရေးလမ်းသည် သဲကုန်းမြို့နယ် အတွင်းရှိ ရန်ကုန်-ပြည် လမ်းမကြီးတလျှောက်ဖြစ်ပါသည်။ ဘုရားမတွင်းအမှတ်-၁ အတွက် ဆက်သွယ်ရေးလမ်းသည် ပေါက်ခေါင်းမြို့နယ်ကို ဖြတ်သွားပါမည်။ ONGC Videsh သည် ပထမတွင်း စတင်တူးဖော်ခြင်းလုပ်ငန်းကို ၂၀၂၂ ခုနှစ် နိုဝင်ဘာလ အတွင်းတွင် ဆောင်ရွက်ရန် စီစဉ်ထားပါသည်။

၁.၄.၃။ စီမံကိန်းဆိုင်ရာ ရွေးချယ်မှုများ

၁.၄.၃.၁။ စီမံကိန်းမလုပ်ဆောင်ခြင်း

အဆိုပြု စမ်းသပ်တူးဖော်ခြင်းစီမံကိန်းကို အကောင်အထည်မဖော်ပါက စီမံကိန်းကြောင့်ဖြစ်ထွန်းလာမည့် စီးပွားရေး အကျိုးမြတ်များ ရရှိနိုင်တော့မည်မဟုတ်ပါ။ ဆုံးရှုံးသွားနိုင်သော အကျိုးအမြတ်များမှာ အောက်ပါအတိုင်း ဖြစ်ပါသည်။

၁. စမ်းသပ်တူးဖော်ခြင်းအတွက် အလုပ်သမားခန့်ထားမှု ကုန်ကျစရိတ်နှင့် စီမံကိန်းကုန်ကျစရိတ်များ။

၂. စီမံကိန်းနေရာမှ ရေနံထုတ်လုပ်နိုင်မှုဆုံးရှုံးခြင်း/နှောင့်နှေးကြန့်ကြာစေခြင်း။

၃. ထုတ်လုပ်မှုအပေါ် ခွဲဝေခံစားခြင်းစာချုပ်မှရရှိလာမည့် မြန်မာနိုင်ငံတော်နှင့် ဒေသဆိုင်ရာအစိုးရများအတွက် နိုင်ငံတော်ဝင်ငွေ ဆုံးရှုံးခြင်း။

၄. အနာဂတ်တွင် ဤဒေသမှရေနံစိမ်းထုတ်လုပ်ဖြန့်ဝေနိုင်မှုရှိလာနိုင်ပါက နိုင်ငံခြားများမှရေနံတင်သွင်းမှုကို အစားထိုးနိုင်မည်ဖြစ်ပါသည်။ ပြင်ပမှ ရေနံစိမ်းတင်သွင်းမှုကြောင့် ကုန်ကျစရိတ် များပြားလာမှု အပါအဝင် သယ်ယူပို့ဆောင်ရေးကဏ္ဍမှတဆင့် မြန်မာနိုင်ငံအပေါ် သက်ရောက်မှုများ ရှိလာနိုင်ပါသည်။

၁.၄.၄။ တွင်းတည်နေရာ

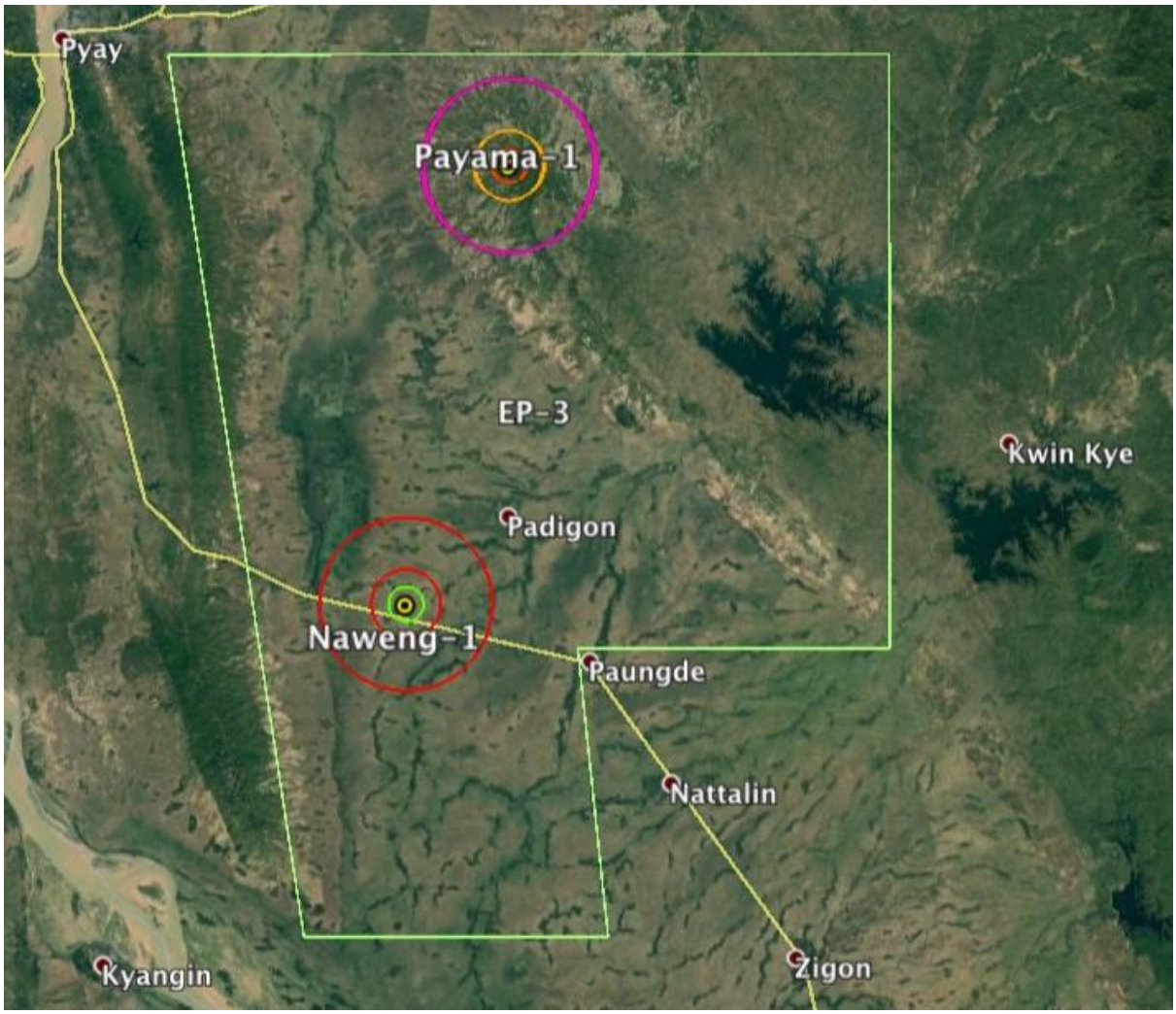
လုပ်ကွက် အမှတ် EP-3 ရှိ စမ်းသပ်တူးဖော်သွားမည့် ရှာဖွေရေးတွင်း ၂ တွင်းကို တည်နေရာ ၂ နေရာတွင် တူးဖော်သွားပါမည်။ တွင်းများ၏ ကိုဩဒိနိတ် တည်နေရာများကို ဇယား ၁-၁ တွင် ဖော်ပြထားပါသည်။

ဇယား ၁-၁ တွင်းကိုဩဒိနိတ်တည်နေရာများ

တွင်း	လတ်တီကျူ့	လောင်ဂျီကျူ့
နဝင်း တွင်းအမှတ်-၁	18° 31' 22.3437"N	95° 24'21.6247"E
ဘုရားမ တွင်းအမှတ်-၁	18° 45′ 1.7997″ N	95° 27′ 45.1252″ E

နဝင်း တွင်းအမှတ်-၁ တွင်း (တွင်းအနက် ၅၂၅၅ မီတာ) ၏ လက်ရှိ အခြေအနေမှာ လယ်ကွင်းများဖြစ်ပြီး မြေယာ ရယူခြင်းကို မြန်မာ့ ရေနံနှင့်သဘာဝဓါတ်ငွေ့လုပ်ငန်း (MOGE) လိုအပ်ချက်များနှင့်အညီ ဆောင်ရွက်သွားပါမည်။ ဘုရားမ တွင်းအမှတ်-၁ (တွင်းအနက် ၂၂၃၀ မီတာ) ၏ လက်ရှိအခြေအနေမှာ ရှားပြင် ကြိုးဝိုင်းတောအတွင်းရှိ အပြောင်ရှင်းထားသော ဧရိယာတွင် တည်ရှိပါသည်။ ဘုရားမ တွင်းအမှတ်-၁ တွင်း မြေနေရာကို MOGE နှင့် သယံဇာတနှင့် သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေး ဝန်ကြီးဌာနလက်အောက်ရှိ သစ်တောဦးစီးဌာန သဘောတူညီချက် အရ ငှားရမ်းသွားမည်ဖြစ်ပါသည်။ တွင်းဒီဇိုင်းနှင့်

နေရာသတ်မှတ်ဆောင်ရွက်ခြင်းများကို ပုံ ၁-၁ တွင် ဖော်ပြထားသည့် အတိုင်း ဆောက်လုပ်မှုအနည်းဆုံး အနေအထားနှင့် ဘေးကင်းလုံခြုံစွာ ဆောင်ရွက်သွားမည်ဖြစ်ပါသည်။



ပုံ ၁-၁ တွင်းတည်နေရာနှင့် စီမံကိန်းရေယာ (၁၀၀၀, ၂၀၀၀ နှင့် ၅၀၀၀ မီတာ)

ONGC Videsh သည် စမ်းသပ်ရှာဖွေရေး တွင်းနှစ်တွင်းကို ကုန်းတွင်းရေနံ တွင်းတူးစက်ကို အသုံးပြုတူးဖော်သွားရန် ရည်ရွယ်ထားပါသည်။ အဆိုပါ တူးဖော်သွားမည့်နေရာများအနီးတဝိုက်တွင် သင့်တော်သောဟိုတယ်များ (သို့မဟုတ်) တည်းခိုခန်းများစသော နေထိုင်နိုင်သည့်နေရာများ မရှိသောကြောင့် ယာယီစခန်းချရန်နေရာကို ရှာဖွေရေးတွင်း အနီးတဝိုက်တွင် တည်ဆောက်သွားပါမည်။

၁.၄.၅။ စီမံကိန်းအချိန်ဇယား

စမ်းသပ်ရှာဖွေရေးတွင်းများကို ပွင့်လင်းရာသီတွင် တူးဖော်သွားပါမည်။ လုပ်ကွက်အမှတ် EP-3 စီမံကိန်း အချိန်ဇယားကို ဇယား ၁-၂ တွင် ဖော်ပြထားပါသည်။

ဇယား ၁-၂ လုပ်ကွက် EP-3 စီမံကိန်းအချိန်ဇယား

လုပ်ငန်းများ	နေ့ရက်	
	နဝင်း တွင်းအမှတ် -၁	ဘုရားမ တွင်းအမှတ် -၁
တွင်းနေရာဆောက်လုပ်ခြင်း	ဧပရယ် - ဇူလိုင် (၂၀၂၂)	ဧပရယ် - စက်တင်ဘာ (၂၀၂၂)
စတင်ဆောင်ရွက်မည့်နေ့	၂၀၂၂ စက်တင်ဘာလ	၂၀၂၂ နိုဝင်ဘာလ
တွင်းတူးကြာချိန်	၁၂၀ ရက်	၃၀ ရက်
အပြီးသတ်ရန်ကြာချိန်	၁၅ ရက်	၁၅ ရက်
တွင်းစမ်းသပ်ကာလ	၁၅ ရက်	၁၅ ရက်

၁.၄.၆။ စမ်းသပ်ရှာဖွေရေးတွင်းတူးဖော်ခြင်းအဆင့်

စီမံကိန်း၏အဓိကလုပ်ငန်းများမှာ တည်ဆောက်ခြင်း၊ တွင်းတူးခြင်း၊ တွင်းစမ်းသပ်ခြင်း နှင့် တွင်းပြီးဆုံးခြင်း၊ တွင်းရပ်ဆိုင်းခြင်း၊ အပြီးသတ်တွင်းပိတ်သိမ်းခြင်း တို့ဖြစ်ပါသည်။

- **တွင်းနေရာအား ပြင်ဆင်ခြင်း**
    - ONGC Videsh သည် နဝင်း တွင်းအမှတ်-၁ တွင်းမြေနေရာကိုဝယ်ယူမည်ဖြစ်ပြီး ဘုရားမ-၁ တွင်း နေရာ ကို ငှားရမ်းဆောင်ရွက်ပါမည်။
    - နဝင်း တွင်းအမှတ်-၁ တွင်းနေရာတွင် ၂၀၀x၂၀၀ မီတာပတ်လည်အတွင်း ယာယီတဲ (နေထိုင်ရန် အတွက်)များနှင့် သိုလှောင်နေရာတည်ဆောက်မည်ဖြစ်ပြီး ဘုရားမ-၁ တွင်းနေရာတွင် ၁၃၀ x ၁၃၀ မီတာပတ်လည်အတွင်း ယာယီစခန်း (နေထိုင်ရန်အတွက်)များနှင့် သိုလှောင်နေရာကို တည်ဆောက်မည် ဖြစ်ပါသည်။
    - တွင်းနေရာသို့ဝင်မည့်တည်ရှိပြီးလမ်းကို လိုအပ်သောအဆင့်မြှင့်တင်ခြင်း ပြုလုပ်မည်။ လိုအပ်ပါက ၆ မီတာ အကျယ်ရှိသော လမ်းသစ်ကို ဖောက်လုပ်သွားပါမည်။
- **တွင်းတူးခြင်း**
    - ကုန်းတွင်း တွင်းတူးစက်ကိုသုံး၍ ရေနုံတွင်းများတူးဖော်သွားပါမည်။
    - တွင်းတူးစက်ကို သယ်ယူပို့ဆောင်သည့်နောက်တွဲယာဉ်ကြီးများဖြင့် တွင်းတူးမည့်နေရာသို့ သယ်ယူ သွားပါမည်။

- ပစ္စည်းကိရိယာများ၊ ခါတုပစ္စည်းများနှင့် စွန့်ပစ်ပစ္စည်းများအပါအဝင် တွင်းတူးဖော်စဉ် ကာလ တလျှောက်လုံး၌ လိုအပ်သည့်အရာများကို သယ်ယူပို့ဆောင်ရေးယာဉ်များဖြင့် ထောက်ပံ့ပို့ဆောင် ပါမည်။

- **တွင်းစမ်းသပ်ခြင်း**
  - တွင်းတူးပြီးနောက် ဟိုက်ဒရိုကာဗွန်ပါဝင်မှုကို သိရှိရန်အတွက် တွင်းအား စမ်းသပ်သွားပါမည်။
  - တွင်းစမ်းသပ်ခြင်းသည် ၄င်းနေရာတွင် အနာဂတ်ထုတ်လုပ်မှုအဆင့်အတွက် အထောက်အပံ့တစ်ခု အနေဖြင့် လိုအပ်ပါသည်။
  - တွင်းစမ်းသပ်ခြင်း လုပ်ငန်းစဉ်တွင် ထုတ်လုပ်ရေးအပ်ပြားများအမျိုးမျိုးအသုံးပြု၍ သဘာဝခါတ်ငွေ့ အား မီးရှို့စမ်းသတ်ခြင်းနှင့် ဒေါင်လိုက် ခါတ်ငွေ့ မီးရှို့စင်တစ်ခု ပါဝင်ပါသည်။

- **တွင်းပြီးဆုံးခြင်းနှင့် ပလပ်ချ၍ အပြီးသတ်တွင်းပိတ်သိမ်းခြင်း**
  - အကယ်၍ ဟိုက်ဒရိုကာဗွန် မတွေ့ရှိပါက တွင်းစမ်းသပ်ခြင်းများ ပြီးဆုံးသောအခါ အဆိုပါတွင်းကို အမြဲတမ်းသီးသန့် ဖြစ်နေ စေရန် ပလပ်ချခြင်းဖြင့် အပြီးသတ်တွင်းပိတ်သိမ်းခြင်းကို ဆောင်ရွက်ရပါသည်။
  - မတူကွဲပြားသော မြေလွှာများမှ အရည်များ မြေပေါ်သို့ တက်မလာစေရန် ကာကွယ်ခြင်း အလို့ငှာတူးဖော်ထားသော တွင်းထဲသို့ ဘိလပ်မြေ ပလပ်များနှင့် စက်သုံး ပလပ်များဖြင့် ပိတ်ဆို့ထားရပါသည်။
  - တွင်းကာ ပိုက်များနှင့် အခြားသော တွင်းတူး ပစ္စည်း များကို တွင်းထဲမှ ထုတ်ယူရပါသည်။
  - ရေနံတွင်းတူးစက်ကို တွင်းနေရာမှ ပြန်လည် ဖယ်ရှားရပါသည်။

- **မြေနေရာပြန်လည်ပြုပြင်ခြင်း**
  - စီးပွားဖြစ် ဟိုက်ဒရိုကာဗွန်များ မတွေ့ရှိပါက စီမံကိန်းလုပ်ငန်းများအဆုံးသတ်ပြီး မြေယာပြန်လည်ပြုပြင်ပြီးနောက် MOGE လုပ်ငန်းစဉ်များအရ MOGE ထံသို့ စီမံကိန်းနေရာကို ပြန်လည်လွှဲပြောင်းရန် အဆင့်သင့်ဖြစ်အောင် ပြန်လည်ပြုပြင်မွမ်းမံပါမည်။

၁.၅။ ပတ်ဝန်းကျင်အခြေအနေဖော်ပြချက်

ပတ်ဝန်းကျင်၊ လူမှုရေးနှင့် ကျန်းမာရေးဆိုင်ရာ အချက်အလက် ကောက်ယူခြင်းကို စီမံကိန်း ဧရိယာတွင် ကောက်ယူသွားမည်ဖြစ်ပြီး စီမံကိန်းလုပ်ငန်းစဉ်များမှ ပတ်ဝန်းကျင်အပေါ် သက်ရောက်နိုင်မှုများကို screening အဆင့်အတွင်း ဖော်ပြသွားပါမည်။ ကနဦးလေ့လာမည့် ဧရိယာသည်စမ်းသပ် ရှာဖွေရေး တွင်းတိုင်း၏ အချင်းဝက် ၅ ကီလိုမီတာအတွင်း ဖြစ်ပါသည်။ ပတ်ဝန်းကျင်အခြေအနေ အပြည့်အစုံဖော်ပြချက်ကို ပတ်ဝန်းကျင်ထိခိုက်မှု အစီရင်ခံစာ၏ အခန်း (၅) တွင် ဖော်ပြထားပါသည်။

၁.၅.၁။ လေ့လာမှုနယ်ပယ်နှင့် အသုံးချနည်းပညာ

နိုင်ငံတကာ ပတ်ဝန်းကျင် စီမံခန့်ခွဲမှု ကုမ္ပဏီ (မြန်မာ) (IEM) နှင့် ပတ်ဝန်းကျင်အရည်အသွေးစီမံခန့်ခွဲမှု ကုမ္ပဏီ (EQM) တို့သည် မြန်မာနိုင်ငံ ပဲခူးတိုင်းဒေသကြီး ပြည်ခရိုင် သဲကုန်းနှင့် ပေါက်ခေါင်းမြို့နယ်များရှိ လုပ်ကွက် EP-3 တွင် ကုန်းတွင်း ပတ်ဝန်းကျင်ဆိုင်ရာအခြေခံနမူနာကောက်ယူခြင်း၊ သဘောထားအမြင်စစ်တမ်းကောက်ယူခြင်းနှင့် လူထုတွေ့ဆုံပွဲ အစည်းအဝေးများကျင်းပခြင်းများကို ပြုလုပ်ခဲ့ပါသည်။ စစ်တမ်းကောက်ယူမှု ရလဒ်များကို ONGC Videsh မှ လုပ်ငန်း ဆောင်ရွက်လျက်ရှိသော လုပ်ကွက် EP-3 ရေနံစမ်းသပ်တူးဖော်ရေးစီမံကိန်း ၏ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း အစီရင်ခံစာတွင် ထည့်သွင်းရေးဆွဲပါမည်။

နိုင်ငံတကာ ပတ်ဝန်းကျင် စီမံခန့်ခွဲမှု ကုမ္ပဏီ(IEM) သည် အောက်ပါလေ့လာဆန်းစစ်ခြင်းများကို ပြုလုပ်ပြီး ဖြစ်ပါသည်။

၁။ ပြည်ခရိုင်၊ သဲကုန်းနှင့် ပေါက်ခေါင်းမြို့နယ် အထွေထွေအုပ်ချုပ်ရေးဦးစီးဌာန၊ သစ်တောဦးစီးဌာန နှင့် မြို့နယ်စည်ပင်သာယာရေးကော်မတီမှ အရာရှိများနှင့်တွေ့ဆုံ၍ ပတ်ဝန်းကျင်၊ လူမှုရေးနှင့် ရှေးဟောင်းသမိုင်းဝင် ဗိသုကာလက်ရာများနှင့် ပတ်သက်သည့် သတင်းအချက်အလက်များ စုံစမ်း မေးမြန်းခဲ့ပါသည်။

၂။ လုပ်ကွက်အတွင်းရှိ မြေပေါ်ရေနမူနာကောက်ယူမှု

၃။ လုပ်ကွက်အတွင်းရှိ မြေအောက်ရေနမူနာကောက်ယူမှု

၄။ လုပ်ကွက်အတွင်းရှိ မြေနမူနာကောက်ယူမှု

၅။ လုပ်ကွက်အတွင်းရှိ လေနမူနာနှင့် ဆူညံသံနမူနာကောက်ယူခြင်း

၆။ ရှေးဟောင်းယဉ်ကျေးမှု ဗိသုကာလက်ရာ စစ်တမ်းကောက်ယူမှု

၇။ မြေအသုံးပြုမှု၊ ဇီဝမျိုးစုံမျိုးကွဲ နှင့် ဂေဟဗေဒဆိုင်ရာ စစ်တမ်းကောက်ယူမှု

၁.၅.၂။ ရုပ်ပိုင်းဆိုင်ရာအခြေအနေများ

၁.၅.၂.၁။ မြေမျက်နှာသွင်ပြင်

ရေနံစမ်းသပ်တူးဖော်ခြင်းစီမံကိန်းများသည် အလယ်ပိုင်းမြေနိမ့် ပို့ချချိုင့်ဝှမ်း၏ တောင်ဘက်စွန်းပိုင်းတွင် တည်ရှိ ပါသည်။ မြေမျက်နှာသွင်ပြင်သည် ချိုင့်ဝှမ်းများ၊ တောင်ကုန်းဒေသများ ရောနှောနေသော ဧရိယာဖြစ်ပါသည်။ လုပ်ကွက် အမှတ် EP-3 သည် အနောက်ဘက်ရခိုင်ရိုးမနှင့် အရှေ့ဘက်ပဲခူးရိုးမကြားရှိ ရောဝတီမြစ်၏ ဘယ်ဘက် (အရှေ့ဘက်) အခြမ်းတွင် တည်ရှိပါသည်။

၁.၅.၃။ ဇီဝဗေဒပတ်ဝန်းကျင်အခြေအနေ

၁.၅.၃.၁။ ဂေဟနေရာများနှင့် ကာကွယ်ထားသော မျိုးစိတ်များ

လုပ်ကွက်အမှတ်EP-3 တည်နေရာကို Olson et al, 2001 အရ ဧရာဝတီခြောက်သွေ့တောအဖြစ် သတ်မှတ်ထားပါသည်။ ဧရာဝတီခြောက်သွေ့တောကို အလယ်ပိုင်းခြောက်သွေ့ဇုန်အဖြစ် သတ်မှတ်ထားသော်လည်း ထိုကဲ့သို့သော ဧရိယာ များကို နိုင်ငံ၏ အချို့နေရာအတော်များများတွင်လည်း တွေ့ရနိုင်ပါသည်။ ဤဒေသကို ရာသီဥတုပူပြင်းမှု၊ အချိန်တို မိုးရွာသွန်းမှု၊ အပေါ်ယံမြေဇီလွှာတိုက်စားမှုဖြစ်စေသော တောင်လေပြင်း တိုက်ခတ်မှုများဖြင့် သတ်မှတ်ပါသည်။ မိုးရေ သည် မြေဆီလွှာနှင့်ကျောက်များကိုပါ တိုက်စားနိုင်သောကြောင့် မြေပြိုမှုများလည်း ဖြစ်ပေါ်စေနိုင်ပါသည်။ (Wikramanayake, et al., 2002)

ဤဂေဟနေရာများရှိ သစ်တောသည် သစ်မာတောများ (အင်တိုင်းတော) ဖြင့် ကြီးစိုးထားပါသည်။ အင်တိုင်းတောများ သည် ကျောက်၊ သဲ (သို့) laterite မြေအမျိုးအစားတွင် ပေါက်ရောက်ပြီး လွှမ်းမိုးထားသော မျိုးစိတ်မှာ Dipterocarpus အမျိုးအစား ဖြစ်ပါသည်။ အင်တိုင်းတောများကို (၁) အပင်မြင့်များ ပေါက်ရောက်သော အင်တိုင်း တောမြင့် (၂) အပင်နိမ့်များပေါက်ရောက်သော အင်တိုင်းတောနိမ့် အဖြစ် သတ်မှတ်နိုင်ပါသည် (Khaing et al, 2019)။ ၎င်းအမျိုးအစား နှစ်မျိုးလုံး တွေ့ရှိရသော်လည်း အပူပိုင်းဒေသတွင် အင်တိုင်းတောနိမ့်များ ပိုပေါက်ရောက်နိုင်ပါသည်။

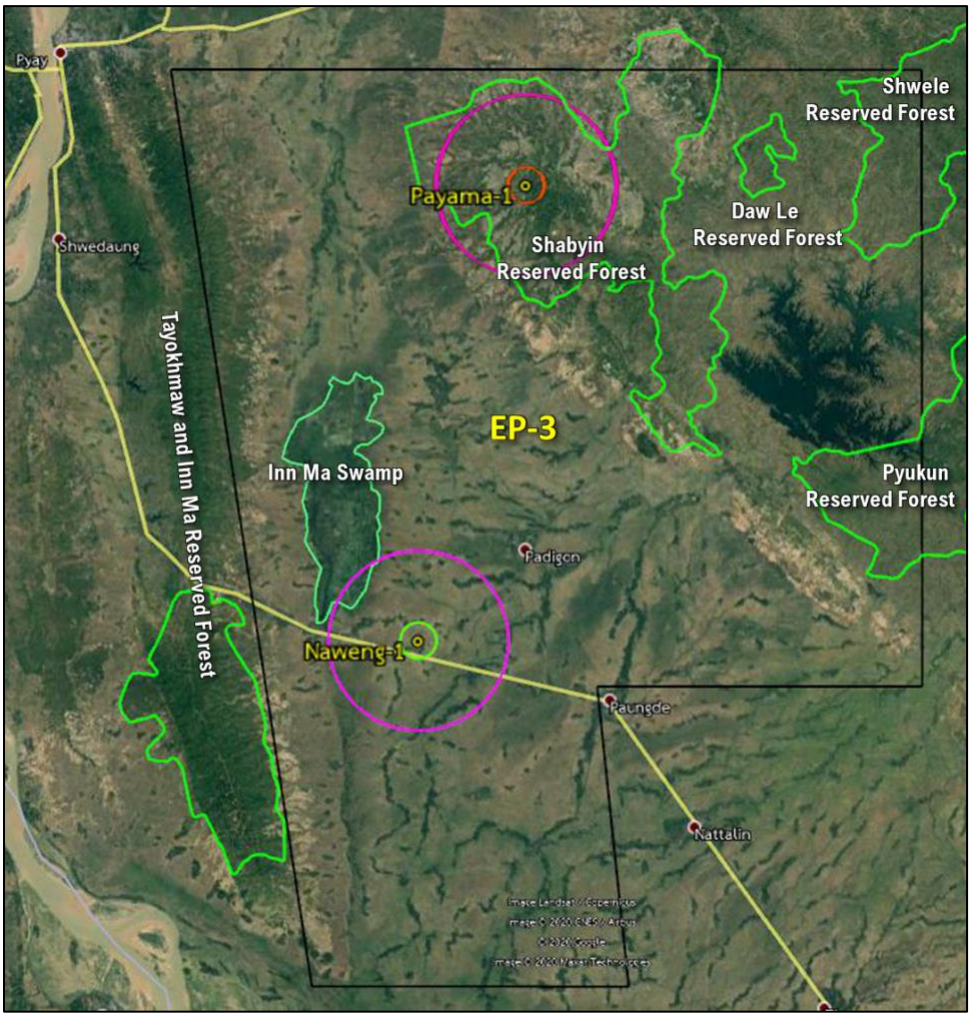
၁.၅.၃.၂။ ကာကွယ်ထားသောနေရာများ

ရေနံလုပ်ကွက် အမှတ် EP -3 တွင် တရားဝင် ကာကွယ်ထားသော သစ်တောကြိုးဝိုင်းများ မရှိပါ။ စီမံကိန်းဧရိယာအနီး ဇီဝမျိုးစုံမျိုးကွဲများ၏ အရေးပါမှု နေရာသည် ဧရာဝတီ မြစ်ကမ်း တစ်လျှောက်ဖြစ်ပါသည်။ ဇီဝမျိုးစုံမျိုးကွဲ အဓိက ဧရိယာများမှာ လုပ်ကွက် အနောက်ဘက်ပိုင်းတွင် တည်ရှိပြီး အဆိုပြုတွင်းတည်နေရာမှ ၂၀ ကီလိုမီတာ အကွာတွင် တည်ရှိပါသည်။ လုပ်ကွက် အမှတ် EP-3 အတွင်းတွင် ရှားပြင်၊ ဒေါလယ်နှင့် ဘွဲ့ကြိုးဝိုင်းတောများ တည်ရှိပြီး ဘုရားမ-၁ တွင်းသည် ရှားပြင်ကြိုးဝိုင်းအတွင်း တည်ရှိပါသည်။

၁.၅.၄။ ထိခိုက်ပျက်စီးလွယ်သော နေရာများ

အဆိုပြုတွင်းနေရာတစ်ခုစီအတွက် ထိခိုက်ပျက်စီးလွယ်သော နေရာများကို အောက်ပါပုံတွင် ဖော်ပြထားပါသည်။
လုပ်ကွက် EP-3 ဧရိယာအတွင်း ထိခိုက်ပျက်စီးလွယ်သော နေရာများမှာ-

- ကျေးရွာများ (ကျောင်း၊ ဘုရား၊ သုသာန်၊ စသည်ဖြင့်)
- ချောင်း၊ တူးမြောင်းများ
- မြစ်များ
- ကာကွယ်ထားသော ဧရိယာများ၊ ကြိုးဝိုင်းတောများ

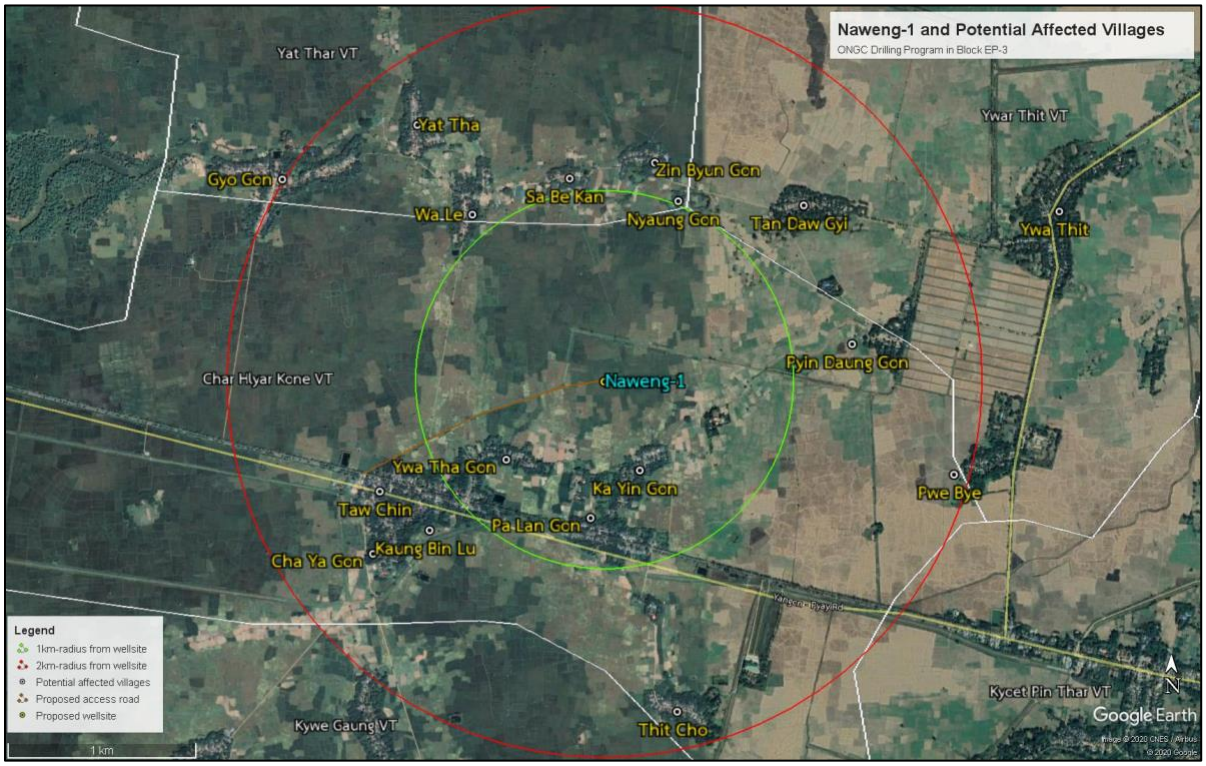


ပုံ ၁-၂ လုပ်ကွက် EP-3 အတွင်းရှိ ကြိုးဝိုင်းတောများ

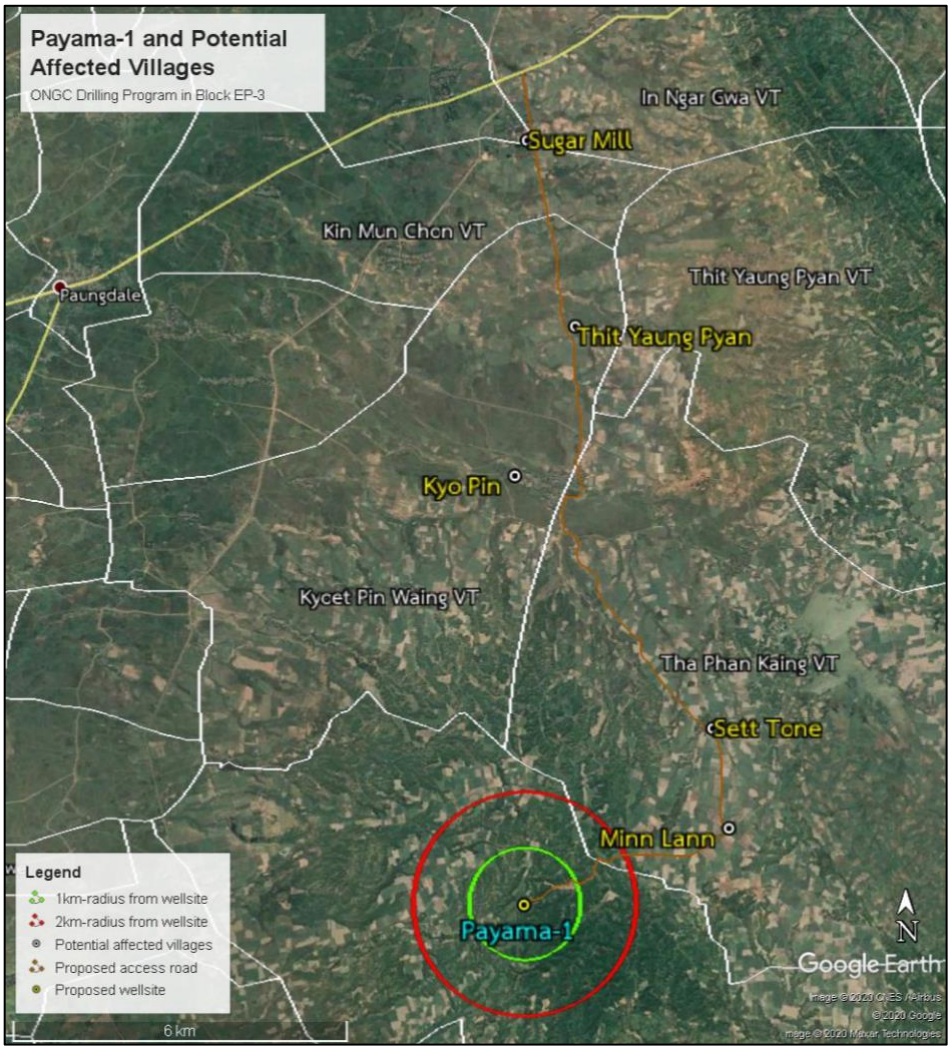
ဧယား (၁-၃) ထိခိုက်နိုင်ခြေရှိသော ကျေးရွာများ

အဆိုပြုတွင်း	ကျေးရွာ	ကျေးရွာအုပ်စု	အဆိုပြုတွင်းမှ အကွာအဝေး (ကီလိုမီတာ)
နဝင်း-၁ **လတ္တီကျွူး** **18°31'22.3437"N** **လောင်ဂျီကျွူး** **95°24'21.6247"E** **X: 754004.96** **Y: 2049730.75**	ထန်းတောကြီး	ရွာသစ်	၁.၄၀
	ညောင်ကုန်း		၁.၀၂
	ဧင်ပြင်းကုန်း		၁.၁၅
	ပျဉ်ထောင်ကုန်း		၁.၃၃
	ပွေးဘိုင်		၁.၉၀
	စပါယ်ကန်	ရက်သာ	၁.၀၆
	ဝါးလဲ့		၁.၁၀

အဆိုပြုတွင်း	ကျေးရွာ	ကျေးရွာအုပ်စု	အဆိုပြုတွင်းမှ အကွာအဝေး (ကီလိုမီတာ)
	ရက်သာ		၁.၅၈
	ဂျိုကုန်း		၁.၉၇
	ကရင်ကုန်း	ချယားကုန်း	၀.၄၂
	ရွာသာကုန်း		၀.၅၃
	တောချင်		၁.၁၇
	သစ်ချို		၁.၆၀
	ဖလံကုန်း		၀.၇၁
	ကောင်းဘင်လု		၁.၂၀
	ချယားကုန်း		၁.၄၀
Payama-1 **Lat: 18°45'1.997"N,** **Long: 95°45.1252"E** **X: 759629.13** **Y: 2075021.51**	ဆက်တုန်း	သဖန်းကိုင်း	၅ ကီလိုမီတာအောက် ဆက်သွယ်ရေးလမ်းပေါ် ရှိ ကျေးရွာများ
	မင်းလမ်း		
	ဂျိုပင်	ကြိုပင်ဝိုင်း	
	သစ်ရောင်းပြန်		



ပုံ ၁-၃ နဝင်း-၁ တွင်းတည်နေရာနှင့် ထိခိုက်နိုင်ခြေရှိသော ကျေးရွာများ



ပုံ ၁-၄ ဘုရားမ-၁ တွင်းတည်နေရာနှင့် ထိခိုက်နိုင်ခြေရှိသော ကျေးရွာများ

၁.၅.၅ လူမှု-စီးပွားရေးအခြေအနေ

၁.၅.၄.၁။ အုပ်ချုပ်ရေး

စီမံကိန်းသည် ပဲခူးတိုင်းဒေသကြီး သဲကုန်း၊ ပေါက်ခေါင်းနှင့် ပြည်မြို့နယ်များအတွင်း တည်ရှိပါသည်။ ပြည်ထဲရေး ဝန်ကြီးဌာနလက်အောက်ရှိ အထွေထွေအုပ်ချုပ်ရေးဦးစီးဌာန (GAD) သည် ဒေသဆိုင်ရာအုပ်ချုပ်ရေးကို အဓိက ဆောင်ရွက်ပါသည်။

၁.၅.၆။ လူဦးရေ

၂၀၁၄ ခုနှစ် လူဦးရေနှင့် သန်းခေါင်စာရင်းအရ ပြည်ခရိုင်၏ လူဦးရေစုစုပေါင်းမှာ ၂၅၁၆၄၃ ဦးဖြစ်ပါသည်။ အဓိက လေ့လာမည့် ဧရိယာသည် သဲကုန်းမြို့နယ်အတွင်း တည်ရှိသောကြောင့် သဲကုန်းမြို့နယ်လူဦးရေကို အဓိကထား လေ့လာသွားပါမည်။

၂၀၁၄ ခုနှစ်တွင် သဲကုန်းမြို့နယ်၏ စုစုပေါင်းလူဦးရေမှာ ၁၃၀၉၅၇ ဦးရှိပြီး လွန်ခဲ့သော ၁၀ နှစ်မှစ၍ မွေးဖွားနှုန်း ကျဆင်းမှုကြောင့် ၂၀၁၇ ခုနှစ်တွင် လူဦးရေ ကျဆင်းခဲ့ပါသည်။ သို့သော်လည်း ၂၀၁၉ ခုနှစ်တွင် ၁၃၄၅၀၅ ဦးအထိ လူဦးရေ ပြန်လည်မြင့်တက်လာခဲ့ပါသည်။ နိုင်ငံအဆင့် UN လူဦးရေ (၂၀၁၉) အရ လူဦးရေတိုးနှုန်းမှာ ၀.၆၃% ဟု ခန့်မှန်းရပါသည်။ မြို့နယ်၏ လူဦးရေသိပ်သည်းဆမှာ ၂၀၁၄ ခုနှစ်တွင် 168.6 persons/sq.km ရှိပြီး ၂၀၁၉ ခုနှစ်တွင် 173.2 person/sq.km အထိ တိုးလာပါသည်။ ၂၀၁၄ ခုနှစ်တွင် အိမ်ခြေမှာ ၃၅၉၅၀ ရှိပြီး အိမ်ခြေစုစုပေါင်း၏ ၂၃.၇% မှာ အမျိုးသမီးဦးဆောင်သော အိမ်ထောင်စုများ ဖြစ်ပါသည်။ ၂၀၁၇ ခုနှစ်တွင် အိမ်ခြေစုစုပေါင်းမှာ ၃၆၄၃၃ ရှိပြီး အိမ်ထောင်စုရှိ ပျမ်းမျှလူဦးရေမှာ ၃.၇ ဦးရှိပါသည်။

၁.၅.၇။ လူမျိုးစု

ဒေသတွင် နေထိုင်သူအများစုမှာ ဗုဒ္ဓဘာသာ ဗမာလူမျိုးများ ဖြစ်ကြပါသည်။ အခြားလူမျိုးစုများဖြစ်ကြသော ချင်း၊ ရခိုင်နှင့် ရှမ်းလူမျိုးစု အနည်းငယ်လည်း နေထိုင်ကြပါသည်။ ဖြေဆိုသူအားလုံးမှာ ဗုဒ္ဓဘာသာဝင်များ ဖြစ်ကြပါသည်။

၁.၅.၈။ စိုက်ပျိုးရေးနှင့် စက်မှုလုပ်ငန်း

လုပ်ကွက်အမှတ် EP-3 ရှိ မြေအသုံးချမှုမှာ စိုက်ပျိုးရေးလုပ်ငန်းများဖြစ်ပြီး အများအားဖြင့် ရေသွင်းစိုက်ပျိုးရသော နေရာများ ဖြစ်ပါသည်။

၁.၅.၉.၁။ ဒေသဆိုင်ရာ လူမှု-စီးပွားရေးအခြေအနေ

လူမှုစီးပွားရေးဆိုင်ရာ ထင်မြင်ယူဆချက်နှင့် သဘောထားအမြင်များကို ၂၀၂၁ ခုနှစ် ဒီဇင်ဘာလ ၁၉ မှ ၂၄ ရက်အတွင်း ကျင်းပခဲ့သော ဒုတိယအကြိမ် လူထုတွေ့ဆုံပွဲကာလအတွင်း သက်ဆိုင်ရာ ကျေးရွာများတွင် ဆောင်ရွက်ခဲ့ပါသည်။

၁.၆။ ထိခိုက်မှုအကဲဖြတ်ခြင်းနှင့် လျော့ချရေးနည်းလမ်းများ

ဖြစ်နိုင်ချေရှိသော ထိခိုက်နိုင်မှုများ အရေးပါခြင်းရှိမရှိကို ဆုံဖြတ်နိုင်ရန် စီမံကိန်း အဆင့်လိုက် ဆောင်ရွက်ချက်များကို သိရှိနားလည်နိုင်သော ပတ်ဝန်းကျင်၊ လူမှုဝန်းကျင်နှင့် ကျန်းမာရေးကဏ္ဍများပါဝင်သော အကျဉ်းချုပ်ဇယား ကိုရေးဆွဲ ၍

ကနဦးအကဲဖြတ်ခြင်းအဆင့်တွင် ထည့်သွင်းသွားပါမည်။ အကယ်၍အရေးပါသော အကြောင်းအရာ အချက်အလက်များရှိပါက အသေးစိတ်အကဲဖြတ်ခြင်းများကို ဆက်လက်ဆောင်ရွက်သွားပါမည်။ အဆိုပြုစီမံကိန်းမှ ပတ်ဝန်းကျင်၊ လူမှုဝန်းကျင်နှင့် ကျန်းမာရေးကဏ္ဍ များအပေါ်ထိခိုက်နိုင်မှုများကို အရေအသွေးနှင့် အရေအတွက်ဆန်းစစ်ခြင်း နှစ်မျိုးလုံးကို ဆောင်ရွက်ခဲ့ပါသည်။ ထိခိုက်နိုင်မှုများအတွက် အသေးစိတ်လေ့လာမှုစံနှုန်းများကို အခန်း ၆ တွင် အကျဉ်းချုပ်ဖော်ပြထားပါသည်။

ထိခိုက်မှုများလေ့လာခြင်းတွင် မျှော်လင့်မထားသော (သို့မဟုတ်) ကြုံတင်စီစဉ်ထားခြင်းမပြုနိုင်သော ဖြစ်ရပ်များကိုလဲ ထည့်သွင်း စဉ်းစားထားပါသည်။ ထိုသို့လေ့လာအကဲဖြတ်ခြင်းတွင် ကြီးမား၍အန္တရာယ်ရှိသော ဥပမာ မီးလောင်ခြင်း ပေါက်ကွဲခြင်း၊ ဆီယိုဖိတ်ခြင်းအပါအဝင်အခြားသော သဘာဝဘေးအန္တရာယ်များဖြစ်သော မြေငလျင်လှုပ်ခြင်း တို့ကိုပါ ထည့်သွင်း ဆန်းစစ်ထားပါသည်။ ဤလေ့လာဆန်းစစ်မှုတွင် ကြီးမား၍အန္တရာယ်ရှိသော ဖြစ်ရပ်များမှ ထိခိုက်နိုင်သော ဖြစ်နိုင်ချေနှင့် သက်ရောက် နိုင်မှုများအပြင် ၎င်းတို့၏အရေးပါမှုနှင့် ထိခိုက်နိုင်သော ဧရိယာများ၏ အရည်အသွေးနှင့် အရေအတွက်တို့ကိုပါ ထည့်သွင်း ဆုံးဖြတ်ရပါသည်။ ထို့နောက် တိကျသေချာသော လိုက်နာဆောင်ရွက်ရမည့် စီမံခန့်ခွဲမှုအစီအစဉ်များကို အဆိုပြုထားပါသည်။ နောက်ဆုံးအနေဖြင့် လိုက်နာဆောင်ရွက်ရမည့် စီမံခန့်ခွဲမှုအစီအစဉ် များလေ့လာသတ်မှတ်ပြီးသောအခါ ကြွင်းကျန် သက်ရောက်မှုများကို လေ့လာအကဲဖြတ်ထားပါသည်။

ရှာဖွေရေးတွင်းတူးဖော်ခြင်းမှ ပတ်ဝန်းကျင်၊ လူမှုဝန်းကျင်၊ ကျန်းမာရေးကဏ္ဍ နှင့် ကြုံတင်မစီစဉ်ထားသော အဖြစ်အပျက်များ၏ ကြွင်းကျန်သက်ရောက်မှုများကို အောက်ပါ ဇယား (၁-၃) မှ ဇယား (၁-၇) တွင် ဖော်ပြထားပါသည်။

ဇယား (၁-၄) ဆောက်လုပ်ခြင်းနှင့်တပ်ဆင်ခြင်းအဆင့်အတွက်အရေးပါသောအချက်များ

အပိုင်းကဏ္ဍ	လုပ်ငန်း	ဖြစ်နိုင်ခြေရှိသည့်သက်ရောက်မှု	ကြွင်းကျန် သက်ရောက်မှု
ရုပ်ဝန်းကျင်ဆိုင်ရာထိခိုက်နိုင်မှုများဆန်းစစ်ခြင်း			
1. မြေမျက်နှာသွင်ပြင်နေအထား	1.1 ရေနုံတွင်းနေရာ နှင့် စခန်းနေရာ တည်ဆောက်ခြင်း	1.1.1 ဒေသန္တရမြေပြင် အနေထား ပျက်ယွင်းခြင်း	နိမ့်သော
2. လေထု အရည်အသွေး	2.1 ရေနုံတွင်းနေရာ နှင့် စခန်းနေရာ တည်ဆောက်ခြင်း	2.1.1 ဖုန်မှုန့်များကြောင့် လေထုအရည်အသွေး ကျဆင်းခြင်း	နိမ့်သော
	2.2 အဆောက်အအုံနှင့် လမ်းဆောက်လုပ်နေစဉ် စက်ယန္တရားများ အသုံးပြုခြင်း	2.2.1 စက်ယန္တရားများကြောင့် လေအရည်အသွေး ကျဆင်းခြင်း	နိမ့်သော
	2.3 အဆောက်အအုံ နှင့်လမ်းဆောက်လုပ်နေစဉ် စက်ယန္တရားများ အသုံးပြုခြင်း	2.3.1 GHGထုတ်လွှတ်ခြင်းကြောင့် ရာသီဥတုအပြောင်းအလဲ ဖြစ်ပေါ်စေခြင်း	နိမ့်သော

အပိုင်းကဏ္ဍ	လုပ်ငန်း	ဖြစ်နိုင်ခြေရှိသည့်သက်ရောက်မှု	ကြွင်းကျန်သက်ရောက်မှု
3. အသံဆူညံမှု	3.1 တည်ဆောက်ခြင်းနှင့် သယ်ယူပို့ဆောင်ခြင်း လုပ်ငန်းစဉ်အတွင်း စက်ယန္တရားများ အသုံးပြုခြင်း	3.1.1 စက်ယန္တရားများကြောင့်အသံဆူညံမှု မြင့်တက်လာခြင်း	နိမ့်သော
4. မြေပေါ်ရေ ဇလဗေဒ	4.1 အဆောက်အအုံ နှင့် လမ်းတည်ဆောက်ခြင်း	4.1.1 မြေပေါ်ရေ ဇလဗေဒ ပြောင်းလဲမှု	နိမ့်သော
5. မြေပေါ်ရေ အရည်အသွေး	5.1 အဆောက်အအုံ၊လမ်းနှင့် ရေနုတ်မြောင်းဆောက်လုပ်ခြင်း	5.1.1 မြေပေါ်ရေအရည်အသွေး ကျဆင်းခြင်း	နိမ့်သော
6. မြေအောက်ရေ အရည်အသွေး	6.1 အန္တရာယ်ရှိသောစွန့်ပစ်ပစ္စည်း၊ အန္တရာယ်မရှိသောစွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲခြင်းနှင့် ဓါတုပစ္စည်းများကိုင်တွယ် အသုံးပြုခြင်း	6.1.1 အမှိုက်များ၊ ဓါတုပစ္စည်းများနှင့် စွန့်ပစ်ရေတို့ကြောင့် မြေအောက်ရေညစ်ညမ်းမှုများ ဖြစ်ပေါ်နိုင်ခြင်း	နိမ့်သော
7. မြေဆီလွှာအရည်အသွေး	7.1 ရေနုံတွင်းနေရာ တည်ဆောက်ခြင်းနှင့် လမ်းဖောက်ခြင်း	7.1.1 ဆောက်လုပ်ရေးလုပ်ငန်းများကြောင့် မြေအရည်အသွေးကျဆင်းခြင်း	နိမ့်သော
ဂေဟစနစ်ဆိုင်ရာထိခိုက်နိုင်မှုများဆန်းစစ်ခြင်း			
8. အပင်နှင့်သတ္တဝါများ	8.1 ရေနုံတွင်းနေရာနှင့်စခန်းနေရာ တည်ဆောက်ခြင်းအတွက် ရှင်းလင်းခြင်း	8.1.1 သဘာဝအနေအထားများ ပျက်စီးယိုယွင်းသွားခြင်း	နိမ့်သော
	8.2 ရေနုံတွင်းနေရာနှင့်စခန်းနေရာ တည်ဆောက်ခြင်း	8.2.1 နေထိုင်ကျက်စားရာအနေအထား ပျက်ယွင်းခြင်း	နိမ့်သော
	8.3 လုပ်ငန်းခွင်မှ စီးထွက်လာသောရေများနှင့် ရေနုတ်မြောင်းများ	8.3.1 ရေနေသတ္တဝါနေထိုင်ကျက်စားရာအ နေအထားပျက်ယွင်းခြင်း	နိမ့်သော
လူမှုဝန်းကျင်အတွက်ထိခိုက်နိုင်မှုများဆန်းစစ်ခြင်း			
9. မြေအသုံးပြုမှု ပြောင်းလဲခြင်း	9.1 လမ်းဖောက်လုပ်ရန်၊ တူးဖော်ရန်နေရာနှင့် စခန်းနေရာ တို့အတွက် မြေနေရာ ဝယ်ယူခြင်း	9.1.1 မူလအသုံးချသည့်ပုံစံ ပြောင်းလဲသွားခြင်း	ကောင်းသော
10. သယ်ယူပို့ဆောင်ခြင်း	10.1 တွင်းတူးစက်ရွေ့ပြောင်းခြင်း၊ယာဉ် နှင့်စက်ယန္တရားများသုံးစွဲခြင်း	10.1.1 ယာဉ်အသွားအလာ အနှောင့်အယှက် ဖြစ်စေခြင်း	အသင့်အတင့်ရှိသော
		10.1.2 လမ်းပျက်စီးစေခြင်း	

အပိုင်းကဏ္ဍ	လုပ်ငန်း	ဖြစ်နိုင်ခြေရှိသည့်သက်ရောက်မှု	ကြွင်းကျန်သက်ရောက်မှု
11. ရေအသုံးချခြင်း	11.1 ဆောက်လုပ်ခြင်းနှင့် နေ့စဉ်သုံးစွဲသည့်ရေတို့ကို ဒေသရှိရေအရင်းအမြစ်မှ အသုံးပြုခြင်း	11.1.1 ရေကိုပြိုင်တူ အသုံးပြုနေရခြင်း	နိမ့်သော
12. မြောင်းများမှရေဖြတ်သန်းစီးဆင်းခြင်း နှင့် ရေကြီးရေလျှံခြင်း	12.1 လမ်းများနှင့် စခန်းနေရာများမှ မိုးရေများ ဖြတ်သန်းစီးဆင်းခြင်း	12.2 ရေဖြတ်သန်းစီးဆင်းမှု ပိုမို များပြားလာခြင်းကြောင့် လမ်းများနှင့် အခြေခံအဆောက်အဦများကို ထိခိုက်နိုင်ခြင်း	လျစ်လျူရှု နိုင်သော
13. စွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲခြင်း	13.1 အန္တရာယ်မရှိသောစွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲခြင်း	13.1.1 လေတိုက်ခြင်းကြောင့် အမှိုက်များပျံ့နှံခြင်း၊ ပိုးမွှားတိရိစ္ဆာန်များရောက်ရှိလာခြင်းကြောင့် ရောဂါများဖြစ်ပွားလာနိုင်ခြင်း	နိမ့်သော
14. လူမှုစီးပွါးဖွံ့ဖြိုးတိုးတက်ခြင်း	14.1 ဆောက်လုပ်ရေးလုပ်ငန်းများအတွက် ထောက်ပံ့မှုများပေးနိုင်ခြင်း	14.1.1 အနီးနားရှိဒေသခံများ အလုပ်အကိုင်နှင့် ဝင်ငွေရရှိနိုင်ခြင်း	ကောင်းသော
	14.2 အလုပ်သမားများရွှေ့ပြောင်းဝင်ရောက်လာခြင်းနှင့် လူအဖွဲ့အစည်းအတွင်း ထိတွေ့ဆက်ဆံခြင်း	14.2.1 အခြားဒေသမှအလုပ်သမားများနှင့် နယ်ခံများအကြား ပဋိပက္ခများ ဖြစ်ပေါ်လာနိုင်ခြင်း	နိမ့်သော
ယဉ်ကျေးမှုဆိုင်ရာထိခိုက်နိုင်မှုများဆန်းစစ်ခြင်း			
15. သမိုင်းဝင် ရှေးဟောင်းသုတေသန ဆိုင်ရာ နှင့် ယဉ်ကျေးမှုဆိုင်ရာ အရင်းအမြစ်များ	15.1 လမ်းဖောက်လုပ်ရန်၊ တူးဖော်ရန်နေရာ နှင့် စခန်းနေရာတို့တည်ဆောက်ခြင်း	15.1.1 သမိုင်းဝင်ရှေးဟောင်းသုတေသနဆိုင်ရာ ကျောက်ဖြစ်ရုပ်ကြွင်းများ စီမံကိန်းဧရိယာတွင် တွေ့ရှိခြင်း	လျစ်လျူရှု နိုင်သော
အမြင်/မြင်ကွင်းဆိုင်ရာထိခိုက်နိုင်မှုများဆန်းစစ်ခြင်း			
16. ခရီးသွားလုပ်ငန်းနှင့် ဖျော်ဖြေရေး	16.1 လမ်းဖောက်လုပ်ရန်၊ တူးဖော်ရန်နေရာ နှင့် စခန်းနေရာတို့တည်ဆောက်ခြင်း	16.1.1 စီမံကိန်းဆောက်လုပ်ရေးလုပ်ငန်းများနှင့်စီမံချက်လုပ်ဆောင်ခြင်းတို့ကြောင့် ခရီးသွားလုပ်ငန်းနှင့် ဖျော်ဖြေရေးအပေါ် အနှောင့်အယှက်ဖြစ်နိုင်ခြင်း	လျစ်လျူရှု နိုင်သော
ကျန်းမာရေးဆိုင်ရာထိခိုက်နိုင်မှုများဆန်းစစ်ခြင်း			

အပိုင်းကဏ္ဍ	လုပ်ငန်း	ဖြစ်နိုင်ခြေရှိသည့်သက်ရောက်မှု	ကြွင်းကျန်သက်ရောက်မှု
17. ပြည်သူလူထုနှင့် လုပ်ငန်းခွင်ကျန်းမာရေး	17.1 လမ်းဖောက်လုပ်ရန်၊ တူးဖော်ရန်နေရာနှင့် စခန်းနေရာတို့တည်ဆောက်ခြင်း	17.1.1 ဖုန်မှုန့်များကြောင့်အသက်ရှူလမ်းကြောင်းဆိုင်ရာရောဂါများဖြစ်ပွါးနိုင်ခြင်း	နိမ့်သော
	17.2 ယာဉ်နှင့်စက်ယန္တရားများသုံးစွဲခြင်း	17.2.1 အလုပ်သမားများအကြားအာရုံရှို့ယွင်းခြင်းနှင့်ပြည်သူလူထုကိုအနှောင့်အယှက်ဖြစ်စေခြင်း	အသင့်အတင့်ရှိသော
	17.3 ဆောက်လုပ်ရေးလုပ်ငန်းများနှင့် သယ်ယူပို့ဆောင်ရေး	17.3.1 ယာဉ်မတော်တဆဖြစ်မှု	နိမ့်သော
	17.4 အန္တရာယ်မရှိသောစွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲခြင်း	17.4.1 အစားအသောက်ကျန်းမာရေး၊ ဝမ်းပျက်ဝမ်းလျော၊အူရောင်ငန်းဗျားနှင့်ငှက်ဖျားရောဂါများဖြစ်ပွါးနိုင်ခြင်း	နိမ့်သော

ဇယား (၁-၅)တွင်းတူးဖော်ခြင်းအဆင့်အတွက်အရေးပါသောအချက်များ

အပိုင်းကဏ္ဍ	လုပ်ငန်း	ဖြစ်နိုင်ခြေရှိသည့်သက်ရောက်မှု	ကြွင်းကျန်သက်ရောက်မှု
ရုပ်ဝန်းကျင်ဆိုင်ရာထိခိုက်နိုင်မှုများဆန်းစစ်ခြင်း			
1. လေထုအရည်အသွေး	1.1. စက်ယန္တရားများ အသုံးပြုခြင်း	1.1.1. ဖုန်မှုန့်များကြောင့် လေအရည်အသွေးကျဆင်းခြင်း	နိမ့်သော
	1.2. စက်ယန္တရားများ အသုံးပြုခြင်း	1.2.1. စက်ယန္တရားများ၏ထုတ်လွှတ်ခြင်းများကြောင့်လေအရည်အသွေး ကျဆင်းခြင်း	နိမ့်သော
	1.3. တွင်းတူးဖော်ခြင်း	1.3.1. ဟိုက်ဒြိုကျင်ဆာလဖိုက် ဓာတ်ငွေ့ကြောင့်လေအရည်အသွေး ကျဆင်းခြင်း	နိမ့်သော
	1.4. စက်ယန္တရားများ အသုံးပြုခြင်း	1.4.1. GHG ထုတ်လွှတ်ခြင်းကြောင့် ရာသီဥတုအပြောင်းအလဲ ဖြစ်ပေါ်စေခြင်း	နိမ့်သော
2. အသံဆူညံမှု	2.1. တွင်းတူးဖော်ခြင်းနှင့် စက်ယန္တရားများ အသုံးပြုခြင်း	2.1.1. ရေနုံတူးဖော်ရေးလုပ်ငန်းများကြောင့် အသံဆူညံမှုမြင့်တက်လာခြင်း	နိမ့်သော

အပိုင်းကဏ္ဍ	လုပ်ငန်း	ဖြစ်နိုင်ခြေရှိသည့်သက်ရောက်မှု	ကြိုးကျန်သက်ရောက်မှု
3. အပူ နှင့် အလင်း	3.1. ယာဉ်များ၊တွင်းတူးစင်၊ စခန်းနေရာနှင့် တွင်းတူးဖော် သည့် နေရာတို့တွင် လုပ်ငန်း ဆောင်ရွက်ရန် မီးထွန်းခြင်း	3.1.1. ညအချိန် လုပ်ငန်းဆောင်ရွက်စဉ် မီးထွန်းခြင်း	လျစ်လျူရှု နိုင်သော
4. မြေပေါ်ရေ အရည်အသွေး	4.1. လုပ်ငန်းခွင်မှစီးထွက်လာသော ရေများ နှင့် ရေနုတ်မြောင်းများ	4.1.1. ရေအရည်အသွေးပြောင်းလဲခြင်း သို့မဟုတ် ညစ်ညမ်းခြင်း	နိမ့်သော
	4.2. တွင်းတူးဖော်ရေး လုပ်ငန်းများမှ ဘေးအန္တရာယ် ရှိသောစွန့်ပစ်ပစ္စည်းများ စွန့်ထုတ်ခြင်း	4.2.1. တွင်းတူးရာမှထွက်ရှိသောစွန့်ပစ်ရေဆိုး များကြောင့် မြေပေါ်ရေ အရည်အသွေး ကျဆင်းခြင်း	နိမ့်သော
5. မြေ အရည်အသွေး	5.1. လုပ်ငန်းခွင်မှစီးထွက်လာသော ရေများ နှင့် ရေနုတ်မြောင်းများ	5.1.1. တွင်းတူးရာမှထွက်ရှိသောရေဆိုးများ ကြောင့် မြေအရည်အသွေး ကျဆင်းခြင်း	နိမ့်သော
6. မြေအောက်ရေ အရည်အသွေး	6.1. ရေလည်ပတ်စီးဆင်းမှု ဆုံးရှုံးခြင်း	6.1.1. တွင်းတူးဖော်ရေးလုပ်ငန်းများကြောင့် မြေအောက်ရေအရည်အသွေး ယိုယွင်းခြင်း	နိမ့်သော
	6.2. အမှိုက်စွန့်ပစ်ကန်များမှမြေကြီးနှင့် ဆည်မြောင်းများ ထဲသို့ စိမ့်ဝင်ခြင်း	6.2.1. မြေအောက်ရေအရည်အသွေး ပျက်စီးယိုယွင်းခြင်း	နိမ့်သော
ဂေဟစနစ်ဆိုင်ရာထိခိုက်နိုင်မှုများဆန်းစစ်ခြင်း			
7. ဒေသန္တရ အပင်များနှင့် တိရစ္ဆာန်များ	7.1. တွင်းတူးလုပ်ငန်းစဉ်များ၊ အလုပ်သမားများနှင့်လူနေ အဆောက်အအုံများ	7.1.1. လုပ်သားများ၏လုပ်ငန်းဆောင်ရွက်မှု ကြောင့်ရေနေသတ္တဝါနေထိုင် ကျက်စားရာအနေအထား ပျက်ယွင်းခြင်း	နိမ့်သော
လူမှုဝန်းကျင်အတွက်ထိခိုက်နိုင်မှုများဆန်းစစ်ခြင်း			
8. သယ်ယူပို့ဆောင်ခြင်း	8.1. လမ်းပေါ်တွင်ယာဉ်နှင့် စက်ယန္တရား ကြီးများ သွားလာခြင်း	8.1.1. လမ်းပိတ်ဆို့မှုနှင့် လမ်းများပျက်စီးခြင်း	အသင့်အတင့်ရှိသော
9. ရေအသုံးချခြင်း	9.1. နေ့စဉ်သုံးစွဲရန်လိုအပ်သည့်ရေကို ဒေသရှိရေအရင်းအမြစ်မှ အသုံးပြုခြင်း	9.1.1. စီမံကိန်းမှရေထုတ်ယူသုံးဆွဲခြင်းကြောင့် ဒေသခံများ၏ရေရရှိမှုကိုသက်ရောက်မှု ဖြစ်စေနိုင်ခြင်း	နိမ့်သော

အပိုင်းကဏ္ဍ	လုပ်ငန်း	ဖြစ်နိုင်ခြေရှိသည့်သက်ရောက်မှု	ကြိုးကျန်သက်ရောက်မှု
10. စွမ်းအင်အသုံးပြုခြင်း	10.1. တွင်းတူးဖော်ခြင်းနှင့် လုပ်ငန်းခွင်အတွက်စွမ်းအင်သုံးစွဲမှု	10.1.1. ဒေသခံများစွမ်းအင်ရရှိမှုကို တိုးလာစေခြင်း(သို့မဟုတ်) လျော့ကျသွားစေခြင်း	လျစ်လျူရှုနိုင်သော
11. စွန့်ပစ်စွည်းစီမံခန့်ခွဲခြင်း	11.1. အန္တရာယ်မရှိသောစွန့်ပစ်စွည်းစီမံခန့်ခွဲခြင်း	11.1.1. အမှိုက်များကြောင့် မီးလောင်မှုအန္တရာယ်ရှိခြင်း၊ လေတိုက်ခြင်းကြောင့် အမှိုက်များပျံ့လွင့်ခြင်း၊ ပိုးမွှားတိရိစ္ဆာန်များရောက်ရှိလာနိုင်ခြင်း ၊မြေပေါ်နှင့်မြေအောက်ရေ ညစ်ညမ်းမှုများကြောင့် ရောဂါများဖြစ်ပွားလာနိုင်ခြင်း	နိမ့်သော
	11.2. အန္တရာယ်ရှိသောစွန့်ပစ်စွည်းစီမံခန့်ခွဲခြင်း	11.2.1. အန္တရာယ်ရှိသောစွန့်ပစ်စွည်းများကြောင့် ပတ်ဝန်းကျင်ကိုထိခိုက်မှုဖြစ်စေခြင်း	နိမ့်သော
	11.3. တွင်းတူးကျစ်စာများနှင့် ဓါတုပစ္စည်းများကိုင်တွယ်ခြင်းနှင့် စွန့်ပစ်ခြင်း	11.3.1. တွင်းတူးရွံ့တွင် ပါဝင်သော ဓါတုပစ္စည်းများကြောင့် ဒေသတွင်းရှိ မြေဆီလွှာနှင့် ရေအရင်းအမြစ် အရည်အသွေးများ ပြောင်းလဲ သွားခြင်း	အသင့်အတင့်ရှိေသာ
12. လူမှုစီးပွါးဖွံ့ဖြိုးတိုးတက်ခြင်း	12.1. အလုပ်အကိုင်အခွင့်အလမ်းများရှိခြင်းနှင့်ဒေသအတွင်းရှိ ပစ္စည်းများဝန်ဆောင်မှုများ သုံးစွဲခြင်း	12.1.1. အလုပ်အကိုင်နှင့် ဝင်ငွေရရှိနိုင်ခြင်း	ကောင်းသော
ကျန်းမာရေးဆိုင်ရာထိခိုက်နိုင်မှုများဆန်းစစ်ခြင်း			
13. ပြည်သူလူထုနှင့် လုပ်ငန်းခွင်ကျန်းမာရေး	13.1. တွင်းတူးစက်၊မီးစက်နှင့် အခြားစက်ယန္တရားကြီးများ	13.1.1. ဆူညံသံများမှ ကျန်းမာရေးထိခိုက်နိုင်မှု	အသင့်အတင့်ရှိသော
	13.2. တွင်းတူးခြင်း ထောက်ပံ့မှုလုပ်ငန်းများနှင့် သယ်ယူပို့ဆောင်ခြင်း	13.2.1. ယာဉ်မတော်တဆဖြစ်မှု	နိမ့်သော

အပိုင်းကဏ္ဍ	လုပ်ငန်း	ဖြစ်နိုင်ခြေရှိသည့်သက်ရောက်မှု	ကြွင်းကျန်သက်ရောက်မှု
	13.3. အန္တရာယ်မရှိသောစွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲခြင်း	13.3.1. အန္တရာယ်မရှိသောစွန့်ပစ်ပစ္စည်းမှကျန်းမာရေးအပေါ်သက်ရောက်နိုင်မှုများ	နိမ့်သော
	13.4. အန္တရာယ်ရှိသောစွန့်ပစ်ပစ္စည်းများကိုင်တွယ်ခြင်းနှင့်စွန့်ပစ်ခြင်း	13.4.1. အန္တရာယ်ရှိသောစွန့်ပစ်ပစ္စည်းမှကျန်းမာရေးအပေါ်သက်ရောက်နိုင်ခြင်း	နိမ့်သော
	13.5. အန္တရာယ်ရှိသောစွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲခြင်း နှင့် ဓါတုပစ္စည်းများကိုင်တွယ်အသုံးပြုခြင်း	13.5.1. တွင်းတူးရွံ့ဓါတုပစ္စည်းများနှင့်တွင်းတူးအမှိုက်များကြောင့်ကျန်းမာရေးထိခိုက်နိုင်မှုများ	နိမ့်သော
	13.6. ဝန်ထမ်းများနှင့် လူနေဆောင်များ	13.6.1. ကူးစက်ရောဂါများကြောင့်ကျန်းမာရေးအပေါ်သက်ရောက်နိုင်မှုများ	အသင့်အတင့်ရှိသော

ဧယား (၁-၆) တွင်းစမ်းသပ်ခြင်းအဆင့်အတွက်အရေးပါသောအချက်များ

အပိုင်းကဏ္ဍ	လုပ်ငန်း	ဖြစ်နိုင်ခြေရှိသည့်သက်ရောက်မှု	ကြွင်းကျန်သက်ရောက်မှု
ရုပ်ဝန်းကျင်ဆိုင်ရာထိခိုက်နိုင်မှုများဆန်းစစ်ခြင်း			
1 လေထုအရည်အသွေး	1.1 စက်ယန္တရားများ အသုံးပြုခြင်း	1.1.1 ဖုန်မှုန့်များကြောင့် လေအရည်အသွေးကျဆင်းခြင်း	နိမ့်သော
		1.1.2 ထွက်ရှိလာသော ဓာတ်ငွေ့ကို မီးရှို့ခြင်း နှင့် ဓာတ်ငွေ့များထုတ်လွှတ်မှုကြောင့် လေအရည်အသွေး ကျဆင်းနိုင်ခြင်း	နိမ့်သော
	1.2 တွင်းစမ်းသပ်ခြင်း (ဟိုက်ဒြိုက္ပျင်ဆာလဖိုက်ဓာတ်ငွေ့ထုတ်လွှတ်ခြင်း)	1.2.1 ဟိုက်ဒြိုက္ပျင်ဆာလဖိုက်ဓာတ်ငွေ့ကြောင့်လေအရည်အသွေးကျဆင်းခြင်း	နိမ့်သော
	1.3 ထွက်ရှိလာသောဓာတ်ငွေ့ကိုမီးရှို့ခြင်း	1.3.1 GHGထုတ်လွှတ်ခြင်းကြောင့် ရာသီဥတုပြောင်းလဲမှု ဖြစ်ပေါ်ခြင်း	နိမ့်သော
2 အသံဆူညံမှု	2.1 တွင်း စမ်းသပ်နေစဉ် အတွင်း ထွက်ရှိလာသောဓာတ်ငွေ့ကို မီးရှို့ခြင်း	2.1.1 တွင်းစမ်းသပ်ခြင်းကြောင့် အသံဆူညံမှု မြင့်တက်လာခြင်း	နိမ့်သော
3 အလင်း နှင့် အပူ	3.1 တွင်း စမ်းသပ်နေစဉ် အတွင်း ထွက်ရှိလာသောဓာတ်ငွေ့ကို မီးရှို့ခြင်း	3.1.1 ထွက်ရှိလာသောဓာတ်ငွေ့ကို မီးရှို့ခြင်းကြောင့်	နိမ့်သော

အပိုင်းကဏ္ဍ	လုပ်ငန်း	ဖြစ်နိုင်ခြေရှိသည့်သက်ရောက်မှု	ကြိုင်းကျန်သက်ရောက်မှု
		ညအချိန်အလင်းရောင် မြင့်တက်လာခြင်း	
4 မြေပေါ်ရေ အရည်အသွေး	4.1 ဘေးအန္တရာယ်မရှိသော စွန့်ပစ်ပစ္စည်းများ စီမံခန့်ခွဲမှု	4.1.1 တွင်းတူးရာမှ ထွက်ရှိသော စွန့်ပစ် ရေဆိုးများကြောင့် မြေပေါ်ရေ အရည်အသွေး ကျဆင်းခြင်း	နိမ့်သော
5 မြေအရည် အသွေး	5.1 ဘေးအန္တရာယ်မရှိသော စွန့်ပစ်ပစ္စည်းများ စီမံခန့်ခွဲမှု	5.1.1 တွင်းတူးရာမှထွက်ရှိသောစွန့်ပစ် ရေဆိုးများကြောင့်မြေအရည်အသွေး ကျဆင်းခြင်း	နိမ့်သော
6 မြေအောက်ရေအ ရည်အသွေး	6.1 ဓါတုပစ္စည်းများ၊ အန္တရာယ်ရှိသော/ အန္တရာယ်မရှိသော စွန့်ပစ်ပစ္စည်းများ	6.1.1 ဖိတ်စင်ခြင်း၊ ယိုဖိတ်ခြင်းများကြောင့် မြေအောက်ရေ အရည်အသွေး ကျဆင်းခြင်း	နိမ့်သော
ဂေဟစနစ်ဆိုင်ရာထိခိုက်နိုင်မှုများဆန်းစစ်ခြင်း			
7 ဒေသန္တရ အပင်များနှင့် တိရစ္ဆာန်များ	7.1 အလုပ်သမားများနှင့် လူနေအဆောက်အအုံများ	7.1.1 အပူ နှင့် အလင်း ကြောင့် ဒေသန္တရ အပင်များနှင့် တိရစ္ဆာန်များ နေထိုင် ကျက်စားမှု ပျက်ယွင်းခြင်း	နိမ့်သော
	7.2 တွင်းစမ်းသပ်နေစဉ်အတွင်း ထွက်ရှိလာသော ဓာတ်ငွေ့ကို မီးရှို့ခြင်း	7.2.1 အပူနှင့်အလင်းကြောင့် ဒေသန္တရ အပင်များနှင့် တိရစ္ဆာန်များ နေထိုင် ကျက်စားမှု ပျက်ယွင်းခြင်း	နိမ့်သော
လူမှုဝန်းကျင်အတွက်ထိခိုက်နိုင်မှုများဆန်းစစ်ခြင်း			
8 သယ်ယူပို့ ဆောင်ခြင်း	8.1 လမ်းပေါ်တွင်ယာဉ်နှင့်စက်ယန္တရားကြီးများ သွားလာခြင်း	8.1.1 ယာဉ်အသွားအလာ အနှောင့်အယှက်ဖြစ်စေခြင်း	အသင့်အတင့်ရှိသော
		8.1.2 လမ်းများပျက်စီးခြင်း	
9 စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲခြင်း	9.1 အန္တရာယ်ရှိသောစွန့်ပစ်ပစ္စည်းနှင့်အန္တရာယ်မရှိ သောစွန့်ပစ်ပစ္စည်းများစီမံခန့်ခွဲခြင်း	9.1.1 အမှိုက်များကြောင့် မီးလောင်မှုအန္တရာယ်ရှိခြင်း၊ လေတိုက်ခြင်းကြောင့် အမှိုက်များပျံ့လွင့်ခြင်း၊ ပိုးမွှားတိရိစ္ဆာန်များရောက်ရှိ လာနိုင်ခြင်း၊မြေပေါ်နှင့်မြေအောက် ရေညစ်ညမ်းမှုများကြောင့် ရောဂါများဖြစ်ပွားလာနိုင်ခြင်း	နိမ့်သော
		9.1.2 အန္တရာယ်ရှိသောစွန့်ပစ်ပစ္စည်းများ	နိမ့်သော

အပိုင်းကဏ္ဍ	လုပ်ငန်း	ဖြစ်နိုင်ခြေရှိသည့်သက်ရောက်မှု	ကြိုင်းကျန်သက်ရောက်မှု
10 လူမှုစီးပွါးဖွံ့ဖြိုးတိုးတက်ခြင်း	10.1 ဝန်ထမ်းများနှင့် လူနေဆောင်များ	10.1.1 အလုပ်အကိုင်အခွင့်အလမ်းနှင့် ဝင်ငွေရရှိနိုင်ခြင်းမှ	ကောင်းသော
ကျန်းမာရေးဆိုင်ရာထိခိုက်နိုင်မှုများဆန်းစစ်ခြင်း			
11 ပြည်သူလူထုနှင့် လုပ်ငန်းခွင်ကျန်းမာရေး	11.1 မီးရှို့၍ ဓါတ်ငွေ့စမ်းသပ်ခြင်း	11.1.1 အနှောင့်အယှက်ဖြစ်နိုင်သောအလင်းရောင်နှင့် အပူတို့နှင့်ထိတွေ့ခြင်း	အသင့်အတင့်ရှိသော
	11.2 မီးရှို့၍ ဓါတ်ငွေ့စမ်းသပ်ခြင်း	11.2.1 အသက်ရှူလမ်းကြောင်းဆိုင်ရာပန်းနာရင်ကြပ်ကဲ့သို့ရောဂါများဖြစ်ပွါးခြင်းနှင့် မီးရှို့၍ ဓါတ်ငွေ့စမ်းသပ်ခြင်းကြောင့် စိတ်ရောဂါများဖြစ်ပွါးနိုင်ခြင်း	အသင့်အတင့်ရှိသော
	11.3 တွင်းတူးခြင်း ထောက်ပံ့မှုလုပ်ငန်းများနှင့် သယ်ယူပို့ဆောင်ခြင်း	11.3.1 ယာဉ်မတော်တဆဖြစ်မှု	နိမ့်သော
	11.4 အန္တရာယ်မရှိသောစွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲခြင်း	11.4.1 အမှိုက်များကြောင့်မြေပေါ်နှင့် မြေအောက်ရေညစ်ညမ်းပြီး ရောဂါများဖြစ်ပွားလာနိုင်ခြင်း	နိမ့်သော
	11.5 အန္တရာယ်ရှိသောစွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲခြင်း	11.5.1 အန္တရာယ်ရှိသောစွန့်ပစ်ပစ္စည်းမှ ကျန်းမာရေးအပေါ်သက်ရောက်နိုင်ခြင်း	နိမ့်သော

ဇယား (၁-၇) တွင်းပိတ်သိမ်းခြင်းအဆင့်အတွက်အရေးပါသောအချက်များ

အပိုင်းကဏ္ဍ	လုပ်ငန်း	ဖြစ်နိုင်ခြေရှိသည့်သက်ရောက်မှု	ကြိုင်းကျန်သက်ရောက်မှု
ရုပ်ဝန်းကျင်ဆိုင်ရာထိခိုက်နိုင်မှုများဆန်းစစ်ခြင်း			
1. မြေမျက်နှာသွင်ပြင် အနေအထား	1.1 စီမံကိန်းနေရာနှင့် လမ်းတံတားအသုံးပြုမှု ရပ်ဆိုင်းခြင်း နှင့် မြေနေရာပြန်လည်ပြင်ဆင်ခြင်း	1.1.1 ဒေသန္တရ မြေမျက်နှာသွင်ပြင်အနေအထား ပျက်ယွင်းခြင်း	နိမ့်သော
2. လေထု အရည်အသွေး	2.1 စက်ယန္တရားများ အသုံးပြုခြင်း	2.1.1 ဖုန်မှုန့်/မိ်းေၾကာင့္ေလအရည္အေသြး က်ဆင္းျခင္း	နိမ့်သော

အပိုင်းကဏ္ဍ	လုပ်ငန်း	ဖြစ်နိုင်ခြေရှိသည့်သက်ရောက်မှု	ကြိုးကျန်သက်ရောက်မှု
		2.1.2 ထွက်ရှိလာသော လောင်စာများကို မီးရှို့ခြင်းကြောင့် လေအရည်အသွေး ကျဆင်းနိုင်ခြင်း	
		2.1.3 GHG ထုတ်လွှတ်ခြင်းကြောင့် ရာသီဥတုအပြောင်းအလဲ ဖြစ်ပေါ်စေခြင်း	
3. အသံဆူညံမှု	3.1 စက်ယန္တရားများ အသုံးပြုခြင်း	3.1.1 စက်ယန္တရားများဖြင့် ပြန်လည်ဖြုတ်သိမ်းခြင်း သယ်ယူပို့ဆောင်ခြင်း တို့ကြောင့် အသံဆူညံမှု မြင့်တက်လာခြင်း	နိမ့်သော
4. မြေပေါ်ရေ ဇလဗေဒ	4.1 ဘေးအန္တရာယ်မရှိသော / ရှိသော စွန့်ပစ်ပစ္စည်းများ စီမံခန့်ခွဲမှု	4.1.1 စက်ယန္တရားများဖြင့် ပြန်လည်ဖြုတ်သိမ်းခြင်းကြောင့် နီးစပ်သောနေရာများတွင် ယာယီရေအရည်အသွေး ကျဆင်းခြင်း	နိမ့်သော
5. မြေပေါ်ရေ အရည်အသွေး	*5.1* မြေနေရာပြန်လည်ပြုပြင်ခြင်း	5.1.1 မြေပေါ်ရေ ဇလဗေဒပြောင်းလဲသွားခြင်း	နိမ့်သော
6. မြေ အရည်အသွေး	6.1 မြေနေရာပြန်လည်ပြုပြင်ခြင်း အတွက် မြေတူးခြင်း	6.1.1 စက်ယန္တရားများဖြင့် ပြန်လည်ဖြုတ်သိမ်းခြင်းကြောင့်	နိမ့်သော
7. မြေအောက်ရေ အရည်အသွေး	7.1 ဘေးအန္တရာယ် မရှိသော / ရှိသော စွန့်ပစ်ပစ္စည်းများ စီမံခန့်ခွဲမှု နှင့် ဓာတုပစ္စည်း ကိုင်တွယ်မှု	7.1.1 စွန့်ပစ် ပစ္စည်းများ ၊ ရေဆိုးများ ၊ ဓာတုပစ္စည်းများကြောင့် မြေအောက်ရေ အရည်အသွေး ကျဆင်းခြင်း	နိမ့်သော
ဂေဟစနစ်ဆိုင်ရာထိခိုက်နိုင်မှုများဆန်းစစ်ခြင်း			
8. ဒေသန္တရအပင်များနှင့် တိရစ္ဆာန်များ	8.1 အလုပ်သမားများ နှင့် လူနေအဆောက်အအုံများ	8.1.1 နယ်မြေဒေသတွင်း နေထိုင်ကျက်စားသော သတ္တဝါများအပြုအမူ ပျက်ယွင်းခြင်း	နိမ့်သော
	8.2 လုပ်ငန်းခွင် စီးထွက်လာသော ရေများ နှင့် ရေနုတ်မြောင်းများ	8.2.2 ရေနေသတ္တဝါနေထိုင် ကျက်စားရာအနေအထား ယာယီပျက်ယွင်းခြင်း	နိမ့်သော
လူမှုဝန်းကျင်အတွက်ထိခိုက်နိုင်မှုများဆန်းစစ်ခြင်း			

အပိုင်းကဏ္ဍ	လုပ်ငန်း	ဖြစ်နိုင်ခြေရှိသည့်သက်ရောက်မှု	ကြိုင်းကျန်သက်ရောက်မှု
9. မြေအသုံးပြုမှု ပြောင်းလဲခြင်း	9.1 လမ်းနေရာများ၊ တွင်းနေရာနှင့် ယာယီတဲနေရာများအတွက် မြေနေရာပြန်လည်ပေးအပ်ခြင်း	*9.1.1* မူလအသုံးချသည့်ပုံစံ ပြောင်းလဲသွားခြင်း	ကောင်းသော
10. သယ်ယူပို့ဆောင်ခြင်း	10.1 လမ်းပေါ်တွင်ယာဉ်နှင့် စက်ယန္တရားကြီးများ အသုံးပြုခြင်း	10.1.1 ယာဉ်အသွားအလာ အနှောင့်အယှက်ဖြစ်စေခြင်း	နိမ့်သော
	10.2 မြေနေရာပြန်လည်ပြုပြင်ခြင်း	10.2.1 လမ်းများပျက်စီးခြင်း	
11. စွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲခြင်း	*11.1* အန္တရာယ်ရှိသောစွန့်ပစ်ပစ္စည်း နှင့်အန္တရာယ်မရှိသော စွန့်ပစ်ပစ္စည်းများစီမံခန့်ခွဲခြင်း	*11.1.1* အမှိုက်များကြောင့်မြေပေါ်နှင့် မြေအောက်ရေညစ်ညမ်းပြီး ရောဂါများဖြစ်ပွားလာနိုင်ခြင်း	နိမ့်သော
12 လူမှုစီးပွားရေး	*12.1* အရာဝတ္ထုများ၊ အန္တရာယ်ရှိသော/ အန္တရာယ်မရှိသော စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှု၊ အလုပ်သမား နေထိုင်မှု။	*12.1.1* အလုပ်အကိုင်နှင့် စီးပွားရေးလုပ်ငန်း၊ ဝန်ဆောင်မှုလုပ်ငန်းများ အခွင့်အလမ်း တိုးလာခြင်း။	ကောင်းသော
ကျန်းမာရေးဆိုင်ရာထိခိုက်နိုင်မှုများဆန်းစစ်ခြင်း			
13. ပြည်သူလူထုနှင့် လုပ်ငန်းခွင်ကျန်းမာရေး	*13.1* အန္တရာယ်မရှိသော စွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲခြင်း	*13.1.1* အန္တရာယ်မရှိသော စွန့်ပစ်ပစ္စည်းများနှင့် ထိတွေ့မှုကြောင့် ညစ်ညမ်းမှုများ ဖြစ်ပေါ် နိုင်ခြင်း	နိမ့်သော
	13.2 အန္တရာယ်မရှိသော စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှု	*13.2.1* အန္တရာယ်မရှိသော စွန့်ပစ်ပစ္စည်းများမှ ညစ်ညမ်းခြင်း။	နိမ့်သော

ဧယား (၁-၈) ကြိုတင်စီစဉ်ခြင်းမပြုနိုင်သောဖြစ်ရပ်များအတွက်အရေးပါသောအချက်များ

အပိုင်းကဏ္ဍ	လုပ်ငန်း	ဖြစ်နိုင်ခြေရှိသည့်သက်ရောက်မှု	ကြိုင်းကျန်သက်ရောက်မှု
1. တွင်းကန်ခြင်း/တွင်းပေါက်ကွဲ ထွက်ခြင်း	1.1 တွင်းတူးဖော်ခြင်း	1.1.1 ဟိုက်ဒရိုကာဗွန်များ ထိန်းချုပ်နိုင်မှု မရှိဘဲ ပန်းထွက်ခြင်း၊ မီးလောင်ခြင်း၊ ပေါက်ကွဲခြင်းတို့ကြောင့် ပတ်ဝန်းကျင်အပေါ် သက်ရောက်မှု ဖြစ်နိုင်ပြီး လူများ	အသင့်အတင့်ရှိသော

အပိုင်းကဏ္ဍ	လုပ်ငန်း	ဖြစ်နိုင်ခြေရှိသည့်သက်ရောက်မှု	ကြိုင်းကျန်သက်ရောက်မှု
		ထိခိုက်ဒဏ်ရာရရှိခြင်း (သို့မဟုတ်) သေဆုံးနိုင်ခြင်း	
2. မီးလောင်ခြင်း သို့မဟုတ် ပေါက်ကွဲခြင်း (ပေါက်ထွက်ခြင်းနှင့် မသက်ဆိုင်)	2.1 လောင်စာဆီသိုလှောင်ခြင်းနှင့် စတင်လောင်ကျွမ်းသည့် အရင်းအမြစ်	2.1.1 တွင်းတူးစက် သို့မဟုတ် စခန်းနေရာ သို့မဟုတ် စက်သုံးဆီသိုလှောင်သည့် နေရာတွင် ပေါက်ကွဲနိုင်ခြင်း သို့မဟုတ် မီးလောင်နိုင်ခြင်း	အသင့်အတင့်ရှိသော
3. လောင်စာဆီ၊ ဓါတုပစ္စည်း၊အန္တရာယ်ရှိသော စွန့်ပစ်ပစ္စည်း များ ယိုဖိတ်မှုဖြစ်ခြင်း	3.1 လောင်စာဆီ၊ ဓါတုပစ္စည်း၊အန္တရာယ်ရှိသော စွန့်ပစ်ပစ္စည်းများ သိုလှောင်ထားရှိခြင်း	3.1.1 မတော်တဆယိုဖိတ်မှုများကြောင့် လေအရည်အသွေး၊ မြေလွှာ အရည်အသွေး၊ မြစ်ချောင်းအင်းအိုင်များ အတွင်းရှိရေ၊ မြေအောက်ရေ၊ ဒေသတစ်ခု အတွင်း ပေါက်ရောက်ကျက်စားသော အပင်နှင့် သတ္တဝါ အစုနှင့်လူသားများကို ထိခိုက်ပြီး သဘာဝပတ်ဝန်းကျင်ကို အန္တရာယ်ဖြစ်နိုင်ခြေ ရှိခြင်း	အသင့်အတင့်ရှိသော
4. သယ်ယူပို့ဆောင်စဉ် မတော်တဆဖြစ်ခြင်း များ	4.1 ယာဉ်နှင့် စက်ယန္တရား ကြီးများ အသုံးပြုခြင်း	4.1.1 ဝန်ထမ်းများ ထိခိုက်ဒဏ်ရာ ရရှိခြင်း သို့မဟုတ် အသက်ဆုံးရှုံးနိုင်ခြေရှိခြင်း၊ နေရာကွက်၍ သဘာဝပတ်ဝန်းကျင် ညစ်ညမ်းမှုဖြစ်ခြင်း	အသင့်အတင့်ရှိသော
5. မြေငလျင်လှုပ်ခတ်ခြင်း	5.1 မြေမျက်နှာပြင် ပြောင်းလဲသွားခြင်း/ ရွေ့လျားမှုများဖြစ်ပေါ်ခြင်း	5.1.1 ရုပ်ပိုင်းအနေအထား ပျက်ယွင်းပြောင်းလဲသွားခြင်း ကြောင့် အဆောက်အဦများ ပြိုကျခြင်း၊ တွင်းမှ ရေနုံပန်းထွက်ခြင်း၊ မီးလောင်ခြင်း၊ ရေနုံများ မတော်တဆ စီးထွက်၍ ယိုဖိတ်မှုများဖြစ်ပွါးနိုင်ခြင်း	အသင့်အတင့်ရှိသော

၁.၇။ ဆင့်ကဲသက်ရောက်မှုများ

ဆင့်ကဲသက်ရောက်မှုများ ဆန်းစစ်ရခြင်း၏ ရည်ရွယ်ချက်မှာ ၄င်းတို့သီးသန့်တစ်ခုတည်းရှိရုံဖြင့် သိသာထင်ရှားသော သက်ရောက်မှုများကို မဖြစ်စေပဲ ယင်းစီမံကိန်း နှင့်/သို့ တခြားစီမံကိန်းများ၏အတိတ်၊ ပစ္စုပ္ပန် (သို့) အနာဂတ်ရှိ လုပ်ငန်းဆောင်ရွက်မှုများမှ သက်ရောက်မှုအချင်းချင်း ပေါင်းစပ်သွားသည့်အခါ ပိုမိုကျယ်ပြန့်ပိုမို သိသာထင်ရှားသော သက်ရောက်မှု(များ)ကို ဖြစ်စေနိုင်သည့် ပတ်ဝန်းကျင်၊ လူမှုရေး သို့ ကျန်းမာရေးဆိုင်ရာ ရှုထောင့်များကို သတ်မှတ် ပေးရန် ဖြစ်ပါသည်။

စီစဉ်ထားသော၊ မစီစဉ်ထားသောစီမံကိန်းဆိုင်ရာလုပ်ငန်းဆောင်ရွက်မှုများကို ဆန်းစစ်ခြင်း/တိုင်းတာသတ်မှတ်ခြင်း သည် ဆင့်ကဲသက်ရောက်မှုများကို ဖြစ်ပေါ်နိုင်ခြေရှိသည့် ပတ်ဝန်းကျင်၊ လူမှုရေး သို့ ကျန်းမာရေးဆိုင်ရာ ရှုထောင့်များကို သတ်မှတ်ပေးရန် အထောက်အကူပေးပါသည်။ ၄င်းတို့တွင် အောက်ပါတို့ ပါဝင်ပါသည်- လူထုနှင့် လုပ်ငန်းခွင် ကျန်းမာရေး၊ လူမှုစီးပွားရေး၊ အမှိုက်စီမံခန့်ခွဲမှု၊ သယ်ယူပို့ဆောင်ရေး၊ အပင်နှင့် သတ္တဝါ (ရေနေအပါအဝင်)၊ မြေအောက်ရေအရည်အသွေး၊ မြေပေါ်ရေအရည်အသွေး၊ မြေထု၊ ဆူညံသံနှင့် လေအရည်အသွေး။ ဆင့်ကဲသက်ရောက်မှုများကို ဖြစ်ပေါ်စေနိုင်သည့် အဓိကလုပ်ငန်းဆောင်တာများမှာ - ဘေးအန္တရာယ်ရှိသောစွန့်ပစ်ပစ္စည်း နှင့် ဘေးအန္တရာယ်မရှိသောစွန့်ပစ်ပစ္စည်း၊ ရေနူတ်မြောင်း၊ ပစ္စည်းများနှင့် ဓာတုပစ္စည်းများ ကိုင်တွယ်ခြင်း၊ လမ်းနှင့် စီမံကိန်းနေရာ တည်ဆောက်ခြင်း၊ ယာဉ်နှင့် ပစ္စည်းကိရိယာ အသုံးပြုမှု၊ အလုပ်သမားများနှင့် နေရာချထားခြင်း နှင့် ကြိုတင်မစီစဉ်ထားသော ဖြစ်ရပ်များ (ပွင့်ထွက်မှု၊ မီးလောင်မှုနှင့် ပေါက်ကွဲမှု၊ ဓာတုပစ္စည်းနှင့်ဘေးအန္တရာယ်ရှိ ပစ္စည်းများ ယိုဖိတ်ခြင်းတို့ ဖြစ်ပါသည်။

ဆင့်ကဲသက်ရောက်မှုများဆန်းစစ်ရခြင်းသည် ဆင့်ကဲသက်ရောက်မှုများ မဖြစ်ပေါ်လာအောင် အဆုံးအဖြတ်ပေးပါ သည်။ ထို့အပြင် အဆိုပါအစမ်းတွင်း(၂)တွင်းတူးဖော်ခြင်းစီမံကိန်းအတွက်လက်ရှိသတ်မှတ်ထားသော လျော့ချရေး နှင့် စောင့်ကြည့်လေ့လာရေး နည်းလမ်းများသည် အခန်း(၇) တွင်အသေးစိတ်ဖော်ပြထားသော ဆင့်ကဲသက်ရောက်မှု များကို ထပ်မံ၍ ကာကွယ်တားဆီး ပေးလိမ့်မည်ဟု ဆုံးဖြတ်ပေးပါသည်။

၁.၈။ ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်

၁.၈.၁။ နိဒါန်း

ထိခိုက်သက်ရောက်နိုင်မှုဆန်းစစ်ရာတွင် အလားအလာရှိသော သိသာထင်ရှားသည့် သက်ရောက်မှုများကို စီစစ် သတ်မှတ်ခဲ့ပါသည်။ သက်ရောက်မှုတစ်ခု ဖြစ်ပေါ်လာပါက ၄င်း၏သက်ရောက်မှုဖြစ်နိုင်ခြေနှင့် သက်ရောက်မှု ပမာဏကို ကာကွယ်တားဆီးရန် နှင့်/သို့ လျော့ချရန် နှင့်/သို့ သက်ရောက်နိုင်မှုနယ်ပယ်ကို ကန့်သတ်ရန် အလို့ငှာ စီမံကိန်း၏

လုပ်ငန်းဆောင်တာ တစ်ခုစီအတွက် စီမံခန့်ခွဲမှုနည်းလမ်းများကို ရေးဆွဲသတ်မှတ်ခဲ့ကြပါသည်။ လိုက်နာကျင့်သုံးရမည့် လမ်းညွှန်ချက်များ၊ စက်ရုံသုံးအလေ့အကျင့်များ၊ ပညာရှင်အဆုံးအဖြတ်များ၊ ဒီဇိုင်းနည်းပညာများနှင့် လုပ်ငန်းစဉ် ထိန်းချုပ်မှုများကို အဆိုပြုထားသော စီမံခန့်ခွဲမှု အစီအစဉ်များတွင် ထည့်သွင်းစဉ်းစားရပါမည်။ ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှု အစီအစဉ်ကို အခန်း(၈) တွင် အသေးစိတ်ဖော်ပြထားပါသည်။ လောင်စာ စီမံခန့်ခွဲမှု အစီအစဉ်၊ ယိုဖိတ်မှု အရေးပေါ် အစီအစဉ်၊ BOCP နှင့် H2S အရေးပေါ် အစီအစဉ်များသည် တွင်းတူးမည့် ကန်ထရိုက်တာအသုံးပြုမည့် ကိရိယာများ၊ အဆောက်အဦးများနှင့် ဖွဲ့စည်းတည်ဆောက်ပုံ အချက်အလက်များ လိုအပ်ပါသည်။ စာချုပ်ချုပ်ဆိုပြီးပါက ပေါင်းကူးစာရွက်စာတမ်း၏ အစိတ်အပိုင်းတခုအဖြစ် အသေးစိတ်အစီအစဉ်များကို တွင်းတူးကန်ထရိုက်တာနှင့် ပူးပေါင်းပြင်ဆင်မည်သွားပါမည်။

ထို့အပြင် ပတ်ဝန်းကျင်နှင့် စီမံကိန်းလုပ်ငန်းဆောင်တာများကို စောင့်ကြည့်လေ့လာဖို့ရန် ပတ်ဝန်းကျင် စောင့်ကြည့်စစ်ဆေးရေး နည်းလမ်းများကို ဒီဇိုင်းရေးဆွဲထားပါသည်။ စောင့်ကြည့်လေ့လာရေးအစီအစဉ်များ၏ ရည်ရွယ်ချက်မှာ - စီမံခန့်ခွဲမှုအစီအစဉ်များ၏ အကျိုးထိရောက်မှုကို လေ့လာတွက်ချက်ရန်၊ မြန်မာ့ဥပဒေများ လမ်းညွှန်ချက်များ စံချိန်စံညွှန်းများကို လိုက်နာမှုအပေါ် ဆန်းစစ်ရန်နှင့် ဖြစ်နိုင်ချေရှိသော ပြောင်းလဲမှု နှင့်/သို့ သက်ရောက်မှုများကို မှတ်တမ်းတင်ဖို့ရန် စီမံကိန်းအကောင်အထည်ဖော်ပြီးနောက်ပိုင်းရှိ ပတ်ဝန်းကျင်အခြေအနေများကို ကနဦးပတ်ဝန်းကျင် အခြေအနေများနှင့် နှိုင်းယှဉ်ရန် တို့ဖြစ်ပါသည်။

၁.၈.၂။ ပတ်ဝန်းကျင်၊ လူမှုရေး၊ ကျန်းမာရေး လျော့ချရေးနှင့် စောင့်ကြည့်စစ်ဆေးရေးနည်းလမ်း များ

အဓိက လျော့ချရေးနည်းလမ်းများနှင့် အသေးစိတ်ဆောင်ရွက်မည့် ကတိကဝတ်များကို ဇယား (၁-၉) တွင်ဖော်ပြထားပြီး တည်ဆောက်ခြင်းနှင့်တပ်ဆင်ခြင်း၊ တွင်းတူးဖော်ခြင်း၊ တွင်းစမ်းသပ်ခြင်း၊ အပြီးသတ်ပိတ်သိမ်းခြင်းနှင့် ကြုံတင်မစီစဉ်ထားသော အဖြစ်အပျက်များကို ဇယား(၁-၁၀) တွင် အကျဉ်းချုပ်ဖော်ပြထားပါသည်။ လူမှုရေးနှင့် ကျန်းမာရေး စောင့်ကြည့်စစ်ဆေးရေး နည်းလမ်းများကို ဇယား (၁-၁၁) တွင် ဖော်ပြထားပါသည်။

ဇယား (၁-၉) အဓိကလျော့ချရေးနည်းလမ်းများနှင့် ကတိကဝတ်ဇယား

ပတ်ဝန်းကျင်ဆိုင်ရာ အချက်များ	လုပ်ငန်း	ဖြစ်နိုင်ခြေရှိသော သက်ရောက်မှုများ	လျော့ချရေးနည်းလမ်းများ	ကြွင်းကျန် သက်ရောက်မှုများ	တာဝန်ရှိသူများ	အချိန်ဇယား
ရုပ်ပိုင်းဆိုင်ရာ ပတ်ဝန်းကျင်ဆိုင်ရာ သက်ရောက်မှု အကဲဖြတ်ခြင်း						
၁။ မြေမျက်နှာသွင်ပြင်	၁.၁ တွင်းနှင့် ယာယီစခန်း တည်ဆောက်မှု	၁.၁.၁ ဒေသမြေမျက်နှာ သွင်ပြင် အပေါ် သက်ရောက်မှု	၁.၁.၁.၁ တွင်းနေရာများနှင့် လမ်းဖောက်လုပ်မှုကိုသာ ကန့်သတ်ရန်။	နိမ့်သော	ONGC Videsh	ဆောက်လုပ်ရေးကာလ တလျောက်လုံး
၂။ လေအရည်အသွေး	၂.၁ တွင်းနှင့် ယာယီစခန်း တည်ဆောက်မှု	၂.၃.၂ ဖုန်မှုန့်များကြောင့် လေအရည်အသွေး ကျဆင်းခြင်း	၂.၃.၂.၁ အထူးသဖြင့် ခြောက်သွေ့ရာသီအတွင်း မြေယာရှင်းလင်းခြင်းကို လျော့ချရန်	နိမ့်သော	ONGC Videsh	ဆောက်လုပ်ရေးကာလ တလျောက်လုံး
			၂.၃.၂.၂ လမ်းနှင့် လုပ်ငန်းခွင်တွင် ယာဉ်မောင်းနှင်သည့်အရှိန်ကို ကန့်သတ်ရန်နှင့် ဖုန်ထမှုကို လျော့ချရန်			
			၂.၃.၂.၃ ဖုန်မှုန့်ပျံ့လွင့်မှုကို ကာကွယ်ရန် ပစ္စည်းများ သယ်ယူရာတွင် မိုးကာ (သို့) ပလပ်စတစ်ဖြင့် အုပ်၍ သယ်ယူရန်။			
			၂.၃.၂.၄ ဖုန်ထခြင်းကို လျော့ချရန် လမ်းများအား ရေဖြန်းရန်။ အနည်းဆုံး တစ်ရက်လျှင် တစ်ကြိမ်၊ အထူးသဖြင့် နွေရာသီတွင် ရေဖြန်းရန်။			
			၂.၃.၂.၅ လိုအပ်လျှင် လုပ်ငန်းခွင်မှမထွက်ခွာမီယာဉ်များ၏ တာယာများကို ဆေးကြောရန်။			
			၂.၃.၂.၆ အလုပ်သမားများအတွက် တစ်ကိုယ်ရေ ကာကွယ်ရေး ပစ္စည်းများ (PPE) ထားရှိပေးရန်။			
			၂.၃.၂.၇ ယာဉ်မောင်းနေစဉ်တွင် ဖုန်မထွက်စေရန် ယာဉ်များတွင် ဖုန်ကာများ အသုံးပြုရန်။			

ပတ်ဝန်းကျင်ဆိုင်ရာ အချက်များ	လုပ်ငန်း	ဖြစ်နိုင်ခြေရှိသော သက်ရောက်မှုများ	လျော့ချရေးနည်းလမ်းများ	ကြွင်းကျန် သက်ရောက်မှုများ	တာဝန်ရှိသူများ	အချိန်ဇယား
	၃.၁ တွင်းစမ်းသပ်ရာမှ ဟိုက်ဒရိုကျင် ဆာလဖိုက်ထုတ်လွှတ်ခြင်း။	၂.၃.၃ ဟိုက်ဒရိုကျင် ဆာလဖိုက်ကြောင့် လေထု အရည်အသွေးကျဆင်းခြင်း။	၂.၃.၁.၁ အရေးပေါ်အခြေအနေတွင် တုန့်ပြန်နိုင်ရန် ဓါတ်ငွေ့စမ်းသပ်ကိရိယာအား တပ်ဆင်ရန်။	နိမ့်သော	ONGC Videsh	တွင်းစမ်းသပ် ကာလ တလျောက်လုံး
			၁.၁.၁.၁ ဓါတ်ငွေ့လိုင်း တစ်လျောက် H2S သည် 10 ppm ထက်ကျော်လျှင် သင့်တော်သော လုံခြုံရေးဇုံများ ထားရှိရန် (8 hr TWA)			
			၁.၁.၁.၂အလုပ်သမားအားလုံးသည် H2S တုန့်ပြန်ရေးလုပ်ငန်းစဉ်များကို လေ့ကျင့်ထားရန်။ H2S အသိပညာပေးခြင်းအတွက် တွင်းတူးခြင်းနှင့် လုပ်ငန်းဆိုင်ရာ သင်တန်းများ ဖွင့်ပေးရန်။			
			၁.၁.၁.၃ ဖြစ်နိုင်ပါက တွင်းစမ်းသပ်ကာလ ကို သတ်မှတ်ထားရန်			
၃။ ဆူညံသံ	၃.၁ စက်/အင်ဂျင်နှင့် ကိရိယာများ အသုံးပြုခြင်း။	၃.၁.၁ စက် / အင်ဂျင်များမှ အသံဆူညံမှုများ	၃.၁.၁.၁ ပတ်ဝန်းကျင်ဆိုင်ရာ ထိခိုက်လွယ်သော နေရာများတွင် တွင်းတူးစင်နှင့် ယာဉ်များ သွားလာမှုကို လျော့ချရန်။ (ဥပမာ- သစ်တော၊ ဗိသုကာနေရာများ၊ ရှေးဟောင်းအမွေအနှစ် ဧရိယာများ၊ စသည်ဖြင့်)	နိမ့်သော	ONGC Videsh	ဆောက်လုပ်ရေးကာလ တလျောက်လုံး
			၃.၁.၁.၂ ညအချိန်တွင် ဆောက်လုပ်ရေးလုပ်ငန်းများနှင့် ယာဉ်/တွင်းတူးစင်များ ပြောင်းရွှေ့ခြင်းကို လျော့ချရန်။			
			၃.၁.၁.၃ တွင်းနေရာများ၊ ယာယီတဲနေရာနှင့် လမ်းပန်းဆက်သွယ်ရေးနေရာတွင် သဘာဝပေါက်ပင်များ ရှင်းလင်းခြင်းကိုအနည်းဆုံးဖြစ်အောင် ကန့်သတ်ရန်။			
			၃.၁.၁.၄ စက်ကိရိယာများကို အသုံးမပြုပါက စက်သတ်ထားရန်။			

ပတ်ဝန်းကျင်ဆိုင်ရာ အချက်များ	လုပ်ငန်း	ဖြစ်နိုင်ခြေရှိသော သက်ရောက်မှုများ	လျော့ချရေးနည်းလမ်းများ	ကြွင်းကျန် သက်ရောက်မှုများ	တာဝန်ရှိသူများ	အချိန်ဇယား
			၃.၁.၁.၅ လုပ်ငန်းခွင်တွင် ဆူညံသံများ ဖြစ်ပေါ်သောအခါ အသံကာကွယ်ပစ္စည်းများအသုံးပြုရန်။			
			၃.၁.၁.၆ ဆူညံသံ ဖြစ်ပေါ်စေသော ယာဉ်ကြောပိတ်ဆို့မှုကို ရှောင်ရှားရန် ပို့ဆောင်ရေး အစီအစဉ်ကို အကောင်အထည်ဖော်ရန်။			
			၃.၁.၁.၇ ပစ္စည်းများ အသုံးပြုချိန်တွင် နိမ့်သည့်နေရာတွင်ထားပြီး သယ်ယူရာတွင် ပြုတ်မကျအောင် သတိပြုဆောင်ရွက်ရန်။			
၄။ အပူနှင့် အလင်း	၄.၁ တွင်းစမ်းသပ် ကာလအတွင်း စမ်းသပ်မီးတောက်	၄.၁.၁ စမ်းသပ်ခြင်းမှ ညအချိန် မီးတောက်နှင့် အပူထုတ်လွှတ်မှု	၄.၁.၁.၁ ဓါတ်ငွေ့မီးရှို့စမ်းသတ်ခြင်းကို မီးတောက်လွယ်သော အရာဝတ္ထုများ ဝေးရာတွင် စမ်းသပ်ခြင်း၊	နိမ့်သော	ONGC Videsh	တွင်းစမ်းသပ် ကာလ တလျောက်လုံး
			၄.၁.၁.၂ ဓါတ်ငွေ့မီးရှို့တိုင်ကို တွင်းနယ်နိမိတ်နှင့် လုံလောက်သောအကွာအဝေးတွင်ထားရှိခြင်း။			
			၄.၁.၁.၃ မီးတောက်ခြင်းကို တက်နိုင်သမျှ လျော့ချခြင်း။			
၅။ အပေါ်ယံ ရေအရည်အသွေး	၅.၁ လမ်းနှင့် တွင်းများ/ ယာယီစခန်းများနှင့် လုပ်ငန်းခွင်အတွင်း ရေစီးဆင်းမှု ဆောက်လုပ်ခြင်း။	၅.၁.၁ အပေါ်ယံရေစီးဆင်းမှု ပြောင်းလဲခြင်းနှင့် ရေအရည်အသွေး ကျဆင်းခြင်း။	၅.၁.၁.၁ ရေစီးဆင်းမှုကို အနှောင့်အယှက်ဖြစ်နိုင်သော နေရာများတွင် တွင်းဖောက်ခြင်းကို ရှောင်ရှားရန်။	နိမ့်သော	ONGC Videsh	ဆောက်လုပ်ရေးကာလ တလျောက်လုံး
			၅.၁.၁.၂ သဘာဝ ရေစီးဆင်းမှုကို ထိန်းထားရန် ရေနူတ်မြောင်းများ (မြေအောက်ပိုက်လိုင်း/ တာရိုး) တည်ဆောက်ရန်။ MOGE၊ သစ်တောဦးစီးဌာနနှင့် အထွေထွေအုပ်ချုပ်ရေးဦးစီးဌာနမှ ခွင့်ပြုချက်များ တောင်းခံဆောင်ရွက်သွားပါမည်။			

ပတ်ဝန်းကျင်ဆိုင်ရာ အချက်များ	လုပ်ငန်း	ဖြစ်နိုင်ခြေရှိသော သက်ရောက်မှုများ	လျော့ချရေးနည်းလမ်းများ	ကြွင်းကျန် သက်ရောက်မှုများ	တာဝန်ရှိသူများ	အချိန်ဇယား
၆။ မြေဆီလွှာအရည်အသွေး	၆.၁ လမ်းနှင့် တွင်း / ယာယီစခန်းများ တည်ဆောက်ခြင်း။	၆.၁.၁ ဆောက်လုပ်ရေး ကာလ အတွင်း မြေသိပ်သည်းခြင်း (သို့မဟုတ်) တိုက်စားမှုများကြောင့် မြေဆီလွှာ အရည်အသွေး လျော့ကျခြင်း။	၆.၁.၁.၁ တွင်းနေရာများနှင့် လမ်းများတွင် မြေဆီလွှာသိပ်သည်းခြင်းကို ကန့်သတ်ရန်။	နိမ့်သော	ONGC Videsh	ဆောက်လုပ်ရေးကာလ တလျောက်လုံး
			၆.၁.၁.၂ ဆောက်လုပ်ရေးကာလ အတွင်း လုပ်ငန်းခွင်ဧရိယာများ အနည်းဆုံးဖြစ်စေရန်။			
			၆.၁.၁.၃ ရေစီးရေလာ ကောင်းမွန်စေရန်အတွက် ထိရောက်သော ရေစီးဆင်းမှုထိန်းချုပ်ခြင်းနှင့် ဒီဇိုင်းများရေးဆွဲထားရန်။			
ဂေဟဗေဒဆိုင်ရာ ပတ်ဝန်းကျင်ထိခိုက်မှု ဆန်းစစ်ခြင်း						
၇။ အပင်နှင့် သတ္တဝါများ	၇.၁ လမ်းနှင့် တွင်း / ယာယီစခန်းနေရာများ ဆောက်လုပ်ခြင်းအတွက် မြေယာရှင်းလင်းခြင်း။	၇.၁.၁ သဘာဝပေါက်ပင် ပေါက်ရောက်ရာ နေရာများ အရည်အသွေး လျော့ကျခြင်း (သို့မဟုတ်) ပျက်ဆီးခြင်း။	၇.၁.၁.၁ လုပ်ငန်းဆောင်ရွက်ရန် ဒီဇိုင်းရေးဆွဲရာတွင် တန်ဖိုးရှိသော သဘာဝပေါက်ရောက်ရာ နေရာများကို ရှောင်ရှားရန်။	နိမ့်သော	ONGC Videsh	ဆောက်လုပ်ရေးကာလ တလျောက်လုံး
			၇.၁.၁.၂ စီမံကိန်းဧရိယာ (လမ်း၊ ယာယီစခန်း၊ တွင်းနေရာ)များတွင်သာ သဘာဝပေါက်ပင်များကို ဖယ်ရှားရန်။			
			၇.၁.၁.၃ တွင်းနေရာများကို ရှင်းလင်းစွာ မှတ်သားရန်နှင့် ယာဉ်များကို ပတ်ဝန်းကျင် မြေများတွင် သွားလာခြင်းကို တားမြစ်ထားရန်။			
လူမှုရေးဆိုင်ရာသက်ရောက်မှုအကဲဖြတ်ခြင်း						
၈။ မြေအသုံးပြုမှု	၈.၁ ဆက်သွယ်ရေးလမ်း/ တွင်းနှင့်	၈.၁.၁ ထုံးတမ်းစဉ်လာ အသုံးပြုခြင်းကို ပြောင်းလဲခြင်း။	၈.၁.၁.၁ မြေယာပိုင်ဆိုင်မှု ကော်မတီ၏ ဆုံးဖြတ်ချက်အရ မြေပိုင်ရှင်နှင့် မြေအသုံးပြုသူများအား ပွင့်လင်းမြင်သာစွာ သင့်တင့်သော လျော်ကြေးအား ပေးရန်။	ကောင်းသော	ONGC Videsh	ဆောက်လုပ်ရေးကာလ တလျောက်လုံး

ပတ်ဝန်းကျင်ဆိုင်ရာ အချက်များ	လုပ်ငန်း	ဖြစ်နိုင်ခြေရှိသော သက်ရောက်မှုများ	လျော့ချရေးနည်းလမ်းများ	ကြွင်းကျန် သက်ရောက်မှုများ	တာဝန်ရှိသူများ	အချိန်ဇယား
	ယာယီစခန်းနေရာများ ဆောက်လုပ်ခြင်း။		၈.၁.၁.၂ မြေပိုင်ရှင်များနှင့် ဒေသဆိုင်ရာ အာဏာပိုင်များမှ ခွင့်ပြုချက်များ ရယူရန်။			
			၈.၁.၁.၃ စီမံကိန်း ဆောင်ရွက်မှုများ မစတင်မီ ပတ်ဝန်းကျင်မြေပိုင်ရှင်များ ကို ကြိုတင်အသိပေးထားရန်။			
			၈.၁.၁.၄ စီမံကိန်း ပြီးဆုံးသောအခါ သဘောတူညီချက်အရ မြေယာများကို MOGE သို့ပြန်လည်ပေးအပ်ရန်။			
၉။ ပို့ဆောင်ဆက်သွယ်ရေး	၉.၁ တွင်းတူးစင် ပြောင်းရွှေ့ခြင်းနှင့် ကိရိယာနှင့် ယဉ်များ အသုံးပြုခြင်း။	၉.၁.၁ ယဉ်ကြောပိတ်ဆို့ခြင်း	၉.၁.၁.၁ ယာဉ်များအားလုံးကို ပြုပြင်ထိန်းသိမ်းထားပြီး စီမံကိန်း လုံခြုံစိတ်ချရမှု စံနှုန်းများကို လိုက်နာပါမည်။ ယာဉ်မောင်းများသည် ကျန်းမာရေးကောင်းမွန်ပြီး လိုင်စင်များ ကိုင်ဆောင်ထားရပါမည်။ အရက်သေစာ သောက်စားခြင်း (သို့မဟုတ်) လုပ်ဆောင်ချက်များကို ထိခိုက်နိုင်သော ဆေးဝါးများ သောက်သုံးခြင်းမပြုရန်။	အသင့်အတင့်	ONGC Videsh	ဆောက်လုပ်ရေးကာလ တလျောက်လုံး
			၉.၁.၁.၂ အမြန်နှုန်း ကန့်သတ်ထားခြင်းကို လိုက်နာရန်။			
			၉.၁.၁.၃ ကုန်ပစ္စည်းကြီးများ သယ်ဆောင်ရာတွင် ဒေသဆိုင်ရာ အာဏာပိုင်များကို အကြောင်းကြားပြီး ဟွန်းနှင့်မီးအလင်းရောင်များဖြင့် အချက်ပေးရန်။			
			၉.၁.၁.၄ သွားလာရေးလမ်းများနှင့် လမ်းမကြီးများတွင် ယာဉ်သွားလာမှု အချက်ပြမီးများ(သို့မဟုတ်)အလံများကို တပ်ဆင်ထားရန်။			

ပတ်ဝန်းကျင်ဆိုင်ရာ အချက်များ	လုပ်ငန်း	ဖြစ်နိုင်ခြေရှိသော သက်ရောက်မှုများ	လျော့ချရေးနည်းလမ်းများ	ကြွင်းကျန် သက်ရောက်မှုများ	တာဝန်ရှိသူများ	အချိန်ဇယား
			၉.၁.၁.၅ တိုင်ကြားမှုများကို စစ်ဆေးပြီး ကိုင်တွယ်ဖြေရှင်းရန်။ တိုင်ကြားမှုများကို မှတ်တမ်းတင်ထားပြီး လိုက်နာဆောင်ရွက်ရန်။			
			၉.၁.၁.၆ ဆောက်လုပ်ရေး၊ အဆင့်မြင့်တင်ခြင်း (သို့မဟုတ်) လမ်းဖောက်လုပ်ခြင်းများ မပြုမီ MOGE နှင့် သက်ဆိုင်ရာ အစိုးရဌာနများမှ ခွင့်ပြုချက် ရယူရန်။			
			၉.၁.၁.၇ လေးလံကြီးမားသောကိရိယာများ သယ်ယူပို့ဆောင်ခြင်းမပြုမီ လမ်းအနှစ်ရာယ်အကဲဖြတ်ခြင်းကို ဆောင်ရွက်ရန်။			
၁၀။ စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှု	၁၀.၁ အန္တရာယ်မရှိသော စွန့်ပစ်ပစ္စည်းများ	၁၀.၁.၁ အိမ်သုံးစွန့်ပစ်ပစ္စည်းများ သည် လေဖြင့်လွင့်ပါသွားနိုင် ပြီး ရောဂါများ ဖြစ်ပွားနိုင်ပါသည်။	၁၀.၁.၁.၁ ရေနံတူးဖော်ခြင်း အသိပညာပေးပွဲ အတွက် ONGC Videsh သည် တွင်းတူးမန်နေဂျာနှင့်အတူ စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှုအစီအစဉ်ကို ဆောင်ရွက်ရပါမည်။	အသင့်အတင့်	ONGC Videsh	ဆောက်လုပ်ရေးကာလ တလျောက်လုံး
			၁၀.၁.၁.၂ အန္တရယ်ရှိ စွန့်ပစ်ပစ္စည်းများကို စနစ်တကျ သိလှောင်ပြီး အမှိုက်စွန့်ပစ်ရန် သယ်ယူပို့ဆောင်ခြင်း အတွက် သင့်လျော်ပြီး လုံခြုံစိတ်ချရသော အမှိုက်ပုံးများကို အသုံးပြုရန်။			
			၁၀.၁.၁.၃ အပြည်ပြည်ဆိုင်ရာ စံချိန်စံညွှန်းများအရ သန့်စင်ခြင်းနှင့် စွန့်ပစ်ခြင်းများ ဆောင်ရွက်ရန်။			
			၁၀.၁.၁.၄ စီမံကိန်းဧရိယာတွင် ကောင်းမွန်သော အိမ်သန့်ရှင်းရေး နည်းလမ်းများကို ဆောင်ရွက်ရန်။			

ပတ်ဝန်းကျင်ဆိုင်ရာ အချက်များ	လုပ်ငန်း	ဖြစ်နိုင်ခြေရှိသော သက်ရောက်မှုများ	လျော့ချရေးနည်းလမ်းများ	ကြွင်းကျန် သက်ရောက်မှုများ	တာဝန်ရှိသူများ	အချိန်ဇယား
			၁၀.၁.၁.၅ အိမ်သုံးနှင့် အခြားစွန့်ပစ်ပစ္စည်းများကို ခွဲခြားပြီး အညွှန်းများတပ်၍ ထိန်းသိမ်းထားရန်။			
			၁၀.၁.၁.၆ စွန့်ပစ်ပစ္စည်းများအတွက်အညွှန်းတပ်ထား သော အမှိုက်ပုံးများဖြင့် စွန့်ပစ်ရန်။			
			၁၀.၁.၁.၇ စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှုနှင့် သက်ဆိုင်ရာ ဥပဒေများ၏လိုအပ်ချက်များကို လိုက်နာရန်။			
			၁၀.၁.၁.၈ မိလ္လာကန်များနှင့် မိလ္လာရေလွှဲကန်များကို ဆောက်လုပ်ရန်။			
			၁၀.၁.၁.၉ အန္တရယ်မရှိသော စွန့်ပစ်ပစ္စည်းများကို သတ်မှတ်ထားသော စွန့်ပစ်နေရာသို့ သယ်ယူရပါမည်။			
၁၁။ လူမှု-စီးပွားရေး	၁၁.၁ ဆောက်လုပ်ရေးလုပ်ငန်း များ အတွက် ဆောင်ရွက်မှု	၁၁.၁.၁ အလုပ်အကိုင်/ဝင်ငွေ အခွင့်အလမ်းများ။	၁၁.၁.၁.၁ စီမံကိန်းနေရာမှ အရည်အသွေးပြည့်မီ သော ဒေသခံအလုပ်သမားများ အား ခန့်ထားခြင်း။	ကောင်းသော	ONGC Videsh	ဆောက်လုပ်ရေးကာလ တလျောက်လုံး
			၁၁.၁.၁.၂ အနီးအနားရှိ ကျေးရွာနှင့် မြို့များကို အထောက်အကူပြုနိုင်ရန် ဖြစ်နိုင်ပါက ဒေသထောက်ပံ့မှုနှင့် ဝန်ဆောင်မှုများကို အသုံးပြုဆောင်ရွက်ရန်။			
			၁၁.၁.၁.၃ အထူးသဖြင့် ကျွမ်းကျင်လုပ်သားနှင့် အသင့်အတင့် ကျွမ်းကျင်သော လုပ်သားများအတွက် ဒေသခံလုပ်သားများအား ဦးစားပေးငှားယူရန်။			
			၁၁.၁.၁.၄ စီမံကိန်းဝင်းအတွင်း အလုပ်သမားများကို ကန့်သတ်ထားပြီး ဒေသခံများနှင့် ဆက်ဆံမှုများကို ခွင့်မပြုရန်။	အလယ်အလတ်		

ပတ်ဝန်းကျင်ဆိုင်ရာ အချက်များ	လုပ်ငန်း	ဖြစ်နိုင်ခြေရှိသော သက်ရောက်မှုများ	လျော့ချရေးနည်းလမ်းများ	ကြွင်းကျန် သက်ရောက်မှုများ	တာဝန်ရှိသူများ	အချိန်ဇယား
	၁၁.၂ အလုပ်သမားများနှင့် လူမှုဆက်ဆံရေးများ ရောက်ရှိလာခြင်း။	၁၁.၂.၁ အခြားဒေသမှ အလုပ်သမားများနှင့် ဒေသခံ အလုပ်သမားများကြား အပြင်းပွားမှုများ။	၁၁.၂.၁.၁ နည်းပညာဆိုင်ရာမဟုတ်သော လုပ်ငန်းများအတွက် အရည်အသွေးပြည့်မီ သော ဒေသခံအလုပ်သမားများ ကို ခန့်အပ်ရန်။	နိမ့်သော	ONGC Videsh	ဆောက်လုပ်ရေးကာလ တလျောက်လုံး
၁၂။ စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှု	၁၂.၁ တွင်းတူးစများ၊ နှုန်းအနည်နှင့် ဓါတုပစ္စည်းများကို စွန့်ပစ်ခြင်း။	၁၂.၁.၁ တွင်းတူးရည်များကြောင့် မြေဆီလွှာနှင့် ရေအရည်အသွေး ကျဆင်းခြင်း။	၁၂.၁.၁.၁ တွင်တူးမြေစာများနှင့် အရည်များကို ပတ်ဝန်းကျင်ဧရိယာသို့ မစွန့်ပစ်ရန်။	အလယ်အလတ်	ONGC Videsh	ဆောက်လုပ်ရေးကာလ တလျောက်လုံး
			၁၂.၁.၁.၂ အစိုင်အခဲစွန့်ပစ်ပစ္စည်း ထိန်းချုပ်ကိရိယာများ အသုံးပြုပြီး တွင်းတူးစများနှင့် အရည်ပမာဏကို လျော့ချရန်။			
			၁၂.၁.၁.၃ ဓါတုပစ္စည်းများအားလုံးကို စိတ်ချလုံခြုံသော နေရာတွင် သိုလှောင်ခြင်း။			
			၁၂.၁.၁.၄ အန္တရာယ်ရှိ စွန့်ပစ်ပစ္စည်းများအားလုံးကို MSDS အရ ကိုင်တွယ် သိုလှောင်ခြင်း။			
			၁၂.၁.၁.၅ ဓါတုပစ္စည်းအန္တရာယ် အသိပေးသင်တန်းများကို အကောင်အထည်ဖော်ဆောင်ရွက်ခြင်း။			
			၁၂.၁.၁.၆ PPE အသုံးပြုစေရန် တိုက်တွန်းခြင်း။			
			၁၂.၁.၁.၇ ဓါတုပစ္စည်းများကို လေဝင်လေထွက်ကောင်းသောနေရာနှင့် ထိန်းချုပ် ဧရိယာများတွင်သာ ကိုင်တွယ်ခြင်း။			
			၁၂.၁.၁.၈ လောင်စာဆီသိုလှောင်ကန်များကို နံရံများဖြင့်ကာရံ ထားခြင်း။			

ဇယား (၁-၁၀) စီစဉ်မထားသော အဖြစ်အပျက်များအတွက် လျော့ချရေးနည်းလမ်းများနှင့် ကတိကဝတ်များ

စီစဉ်မထားသော အဖြစ်အပျက်များ							
၁။ ပေါက်ကွဲခြင်း	၁.၂ တွင်းတူးခြင်း	၁.၂.၁ ဟိုက်ဒရိုကာဗွန်၊ မီးလောင်ခြင်း နှင့် ပေါက်ကွဲမှုများအား သက်သာစေခြင်း။	၁.၂.၁.၁ လက်ရှိတွင်းများတွင် တွင်းတိမ်ဓါတ်ငွေ့ အန္တရယ်ကို စစ်ဆေးရန်။ ၁.၂.၁.၂ ပေါက်ကွဲမှုကာကွယ်သည့်တွင်းထိန်းကိရိယာကို တပ်ဆင်ထားပြီး အများဆုံးဖိအားကို ခံနိုင်အောင် ဆောင်ရွက်ထားပြီး လုပ်ငန်းစဉ်များအတိုင်း စမ်းသပ်ထားရန်။ ONGC Videsh ၏ အရေးပေါ် တုန့်ပြန်မှု အစီအစဉ်နှင့် ပေါက်ကွဲမှု အရေးပေါ်အစီအစဉ်များကို လိုက်နာရန်။ ပေါက်ကွဲမှုများကို ကာကွယ်ရန် ONGC Videsh ၏ QHSE ပေါင်းစပ်ထားသော စီမံခန့်ခွဲမှုစနစ် နည်းလမ်းစဉ်နှင့် လုပ်ငန်းလည်ပတ်ထိန်းချုပ်ခြင်းများကို ဆောင်ရွက်ရပါမည်။	အလယ်အလတ်	ပေါက်ကွဲမှုများကို ကာကွယ်ရန် ONGC Videsh ၏ QHSE စီမံခန့်ခွဲမှုစနစ် နည်းလမ်းစဉ်အရ ဆောင်ရွက်ပြီး အရေးပေါ်တုန့်ပြန်မှု အစီအစဉ် ထိန်းချုပ်မှုများကို လိုက်နာဆောင်ရွက်ခြင်း။ အရေးပေါ်အစီအစဉ်များသည် တွင်းတူးမည့် ကန်ထရိုက်တာအသုံးပြုမည့် ကိရိယာများ၊ အဆောက်အဦးများနှင့် ဖွဲ့စည်းတည်ဆောက်ပုံ အချက်အလက်များ လိုအပ်ပါသည်။ ထို့ကြောင့်စီမံခန့်ခွဲမှု အစီအစဉ်များကို ပေါင်းကူးစာရွက်စာတမ်း၏ အစိတ်အပိုင်းတခုအဖြစ် သတ်မှတ်ပြီး တွင်းတူးကန်ထရိုက်တာနှင့် ပူးပေါင်းပြင်ဆင်မည်သွားပါမည်။	ONGC Videsh	စီမံကိန်းကာလ တစ်လျောက်လုံး

၂။ မီး (သို့မဟုတ်) ပေါက်ကွဲထွက်ခြင်း	၂.၂ ဆီသိုလှောင်ခြင်း နှင့် မီးလောင်စေသော အရင်းအမြစ်များ	၂.၂.၁ ဖြစ်နိုင်ခြေရှိသော ပေါက်ကွဲထွက်ခြင်း (သို့မဟုတ်) တွင်းတူးစင် (သို့မဟုတ်) ယာယီတဲနေရာမှ မီးများ (သို့မဟုတ်) လောင်စာများ။	၂.၂.၁.၁ ပေါက်ကွဲမှုများကို ကာကွယ်ရန် ONGC Videsh ၏ QHSE စီမံခန့်ခွဲမှု စနစ် နည်းလမ်းစဉ်နှင့် လုပ်ငန်းလည်ပတ်ထိန်းချုပ်ခြင်းများကို ဆောင်ရွက်ရပါမည်။	အလယ်အလတ်	ပေါက်ကွဲမှုများကို ကာကွယ်ရန် ONGC Videsh ၏ QHSE စီမံခန့်ခွဲမှုစနစ် နည်းလမ်းစဉ်အရ ဆောင်ရွက်ပြီး အရေးပေါ်တုန့်ပြန်မှု အစီအစဉ် ထိန်းချုပ်မှုများကို လိုက်နာဆောင်ရွက်ခြင်း။ အရေးပေါ်အစီအစဉ်များသည် တွင်းတူးမည့် ကန်ထရိုက်တာအသုံးပြုမည့် ကိရိယာများ၊ အဆောက်အဦးများနှင့် ဖွဲ့စည်းတည်ဆောက်ပုံ အချက်အလက်များ လိုအပ်ပါသည်။ ထို့ကြောင့်စီမံခန့်ခွဲမှု အစီအစဉ်များကို ပေါင်းကူးစာရွက်စာတမ်း၏ အစိတ်အပိုင်းတခုအဖြစ် သတ်မှတ်ပြီး တွင်းတူးကန်ထရိုက်တာနှင့် ပူးပေါင်းပြင်ဆင်မည်သွားပါမည်။	ONGC Videsh	စီမံကိန်းကာလ တစ်လျောက်လုံး
			၂.၂.၁.၂ မီးသတ်ဆေးဘူးများ၊ အချက်ပေးအသံများနှင့် အချက်ပြလေလွင့်ပူပေါင်းများ (လုပ်ငန်းခွင်တစ်ခုလုံးမှ မြင်သာစေရန်)				
			၂.၂.၁.၃ ဒေသရှိ မီးသတ်ကားများကို ကြိုတင်စီစဉ်ထားရန်။				
၃။ လောင်စာ၊ ဓါတုပစ္စည်းများ (သို့မဟုတ်) အန္တရာယ်ရှိ	၃.၂ လောင်စာ၊ ဓါတုပစ္စည်းများ၊ အန္တရာယ်ရှိပစ္စည်းများ	၃.၂.၁ လေအရည်အသွေး၊ မြေဆီလွှာအရည်အသွေး၊ မြေပေါ်ရေ၊	၃.၂.၁.၁ ဓါတုပစ္စည်းများ၊ ဟိုက်ဒရိုကာဗွန်နှင့် အန္တရာယ်ရှိပစ္စည်းများ (သို့မဟုတ်) စွန့်ပစ်ပစ္စည်းများကို	အလယ်အလတ်	ဓါတုပစ္စည်းများ၊ ဟိုက်ဒရိုကာဗွန်နှင့် အန္တရာယ်ရှိပစ္စည်းများ	ONGC Videsh	စီမံကိန်းကာလ တစ်လျောက်လုံး

စွန့်ပစ်ပစ္စည်းများ/ ယိုဖိတ်မှုများ	(သို့မဟုတ်) စွန့်ပစ်ပစ္စည်းများ။	မြေအောက်ရေ၊ သက်ရှိသတ္တဝါနှင့် လူများအား ထိခိုက်စေနိုင်သော ယိုဖိတ်မှုအန္တရာယ်။	လုံခြုံစိတ်ချစွာ သိုလှောင်ထားပြီး စိတ်ချရသော ဆောင်ရွက်မှု နည်းလမ်းများကို အသုံးပြုရပါမည်။ ၃.၂.၁ ယိုဖိတ်မှုထိန်းချုပ်ခြင်းနှင့် ပြန်လည်သန့်စင်သော ကိရိယာများကို သိုလှောင်ဧရိယာအနီးတွင် ထားရှိရန်။ ၃.၂.၁.၃ ခါတုပစ္စည်းများ၊ ဟိုက်ဒရိုကာဗွန်နှင့် အန္တရာယ်ရှိ ပစ္စည်းများ (သို့မဟုတ်) စွန့်ပစ်ပစ္စည်းများ ယိုဖိတ်မှုများအတွက် တုန့်ပြန်မှု နည်းလမ်းစဉ်သည် ONGC Videsh ၏ ERP နှင့် ယိုဖိတ်မှု အရေးပေါ်အစီအစဉ်တွင် ပါဝင်ပါမည်။		(သို့မဟုတ်) စွန့်ပစ်ပစ္စည်းများကို လုံခြုံစိတ်ချစွာ သိုလှောင်ထားပြီး စိတ်ချရသော ဆောင်ရွက်မှု နည်းလမ်းများကို အသုံးပြုမည်ဖြစ်ပြီး ONGC Videsh ၏ ERPတွင် ခါတုပစ္စည်းများ၊ ဟိုက်ဒရိုကာဗွန်နှင့် အန္တရာယ်ရှိ ပစ္စည်းများ (သို့မဟုတ်) စွန့်ပစ်ပစ္စည်းများ ဖိတ်စင်ခြင်းအား တုန့်ပြန်မှု ပါဝင်ပါသည်။ အရေးပေါ်အစီအစဉ်များသည် တွင်းတူးမည့် ကန်ထရိုက်တာအသုံးပြုမည့် ကိရိယာများ၊ အဆောက်အဦးများနှင့် ဖွဲ့စည်းတည်ဆောက်ပုံ အချက်အလက်များ လိုအပ်ပါသည်။ ထို့ကြောင့်စီမံခန့်ခွဲမှု အစီအစဉ်များကို ပေါင်းကူးစာရွက်စာတမ်း၏ အစိတ်အပိုင်းတခုအဖြစ် သတ်မှတ်ပြီး		

					တွင်းတူးကန်ထရိုက်တာနှင့် ပူးပေါင်းပြင်ဆင်မည်သွားပါမည်။		
၄။ပို့ဆောင်ဆက်သွယ်ရေး မတော်တဆဖြစ်မှုများ	၄.၂ ယာဉ်နှင့် စက်ပစ္စည်း အသုံးပြုမှု	၄.၂.၁ ဖြစ်နိုင်ခြေရှိသော ဒဏ်ရာရခြင်း (သို့မဟုတ်) သေဆုံးခြင်းများနှင့် ပတ်ဝန်းကျင် ညစ်ညမ်းခြင်း	၄.၂.၁.၁ QHSE စီမံခန့်ခွဲမှုစနစ် နည်းလမ်းစဉ်များကို လိုက်နာရန်။ ၄.၂.၁.၂ ပြင်းထန်သော ထိခိုက်ဒဏ်ရာများ (သို့မဟုတ်) အရေးပေါ်ကိစ္စများအတွက် ပြင်ပဆေးခန်းဝန်ဆောင်မှုများအပါအဝင် ဆေးရုံလွှဲသည့်စနစ်။	အလယ်အလတ်	ပို့ဆောင်ဆက်သွယ်ရေး မတော်တဆဖြစ်မှုများကို တားဆီးရန် ONGC Videsh ၏ QHSE စီမံခန့်ခွဲမှုစနစ် နည်းလမ်းစဉ်ကို အကောင်အထည်ဖော် ဆောင်ရွက်ခြင်း။	ONGC Videsh	စီမံကိန်းကာလ တစ်လျောက်လုံး
၅။ ငလျင်	၅.၂ မြေမျက်နှာပြင်၏ ရုပ်ပိုင်းဆိုင်ရာ ရွေ့လျားမှု	၅.၂.၁ ဖြစ်နိုင်သော ရုပ်ပိုင်းဆိုင်ရာ ပျက်စီးမှုများမှာ အဆောက်အဦးပြိုကျခြင်း၊ ပေါက်ကွဲခြင်း၊ မီး (သို့မဟုတ်) ယိုဖိတ်ခြင်း။	၅.၂.၁.၁ ONGC Videsh ၏ အရေးပေါ်တုန့်ပြန်မှု အစီအစဉ်ကို အကောင်အထည်ဖော် ဆောင်ရွက်ရန်။	နိမ့်သော	ONGC Videsh ၏ အရေးပေါ်တုန့်ပြန်မှု အစီအစဉ်ကို အကောင်အထည်ဖော် ဆောင်ရွက်ခြင်း။	ONGC Videsh	စီမံကိန်းကာလ တစ်လျောက်လုံး

စီမံခန့်ခွဲမှု အစီအစဉ်များကို ပေါင်းကူးစာရွက်စာတမ်း၏ အစိတ်အပိုင်းတခုအဖြစ် သတ်မှတ်ပြီး တွင်းတူးကန်ထရိုက်တာနှင့် ပူးပေါင်းပြင်ဆင်မည်သွားပါမည်။

ဇယား (၁-၁၁) ပတ်ဝန်းကျင်၊ လူမှုရေးနှင့် ကျန်းမာရေးဆိုင်ရာ စောင့်ကြည့်စစ်ဆေးခြင်း

ပတ်ဝန်းကျင်ဆိုင်ရာ အချက်များ	အညွှန်း/ တိုင်းတာသည့် Parameter	လုပ်ငန်းစဉ်	အဆိုပြုကြာချိန်နှင့် စောင့်ကြည့်မှု အကြိမ်အရေအတွက်	တည်နေရာ	အစီရင်ခံခြင်း
လေအရည်အသွေး	• PM-10 • PM-2.5 • NOx, • SOx, • Ozone • H2S	နည်းလမ်း • ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဥပဒေ (၂၀၁၂)နှင့်အတူ ၂၀၁၅ ခုနှစ်တွင် စတင်အသုံးပြုသော အမျိုးသား ပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်များ • WHO လေအရည်အသွေး လမ်းညွှန်ချက် (၂၀၀၆)နှင့် ဖြည့်စွက်ချက်။	ကြာချိန်- တစ်ရက် အကြိမ်အရေအတွက် • ဆောက်လုပ်ရေးကာလ၊ တွင်းတူးခြင်းနှင့် တွင်းစမ်းသပ်ခြင်းအဆင့်များ။ • လေအရည်အသွေးနှင့် ပတ်သက်ပြီး တိုင်ကြားမှုများကို တုန့်ပြန်ရန် (လိုအပ်ပါက) ထပ်မံ၍ လေအရည်အသွေး တိုင်းတာခြင်းကို ဆောင်ရွက်ရပါမည်။	အနီးဆုံး လေအရည်အသွေး တိုင်းတာ သည့် လက်ခံရှိရာနေရာ (သို့မဟုတ်) တိုင်ကြားထားသည့် ဧရိယာ၏ လေတိုက် ရာ အောက်ဘက် (လိုအပ်ပါက)	• OVL သည် လေအရည်အသွေး စောင့်ကြည့်မှု ရလဒ်များကို ၆ လတကြိမ် စစ်ဆေးပြီး ECD မှတဆင့် MONREC သို့ စောင့်ကြည့်စစ်ဆေးမှုအစီရင်ခံစာ တင်ပြရန်။
ဆူညံသံ	• L_{eq}24 hr. • L_{max} • L_{dn}	နည်းလမ်း • နောက်ခံဆူညံသံ၊ ကြွင်းကျန်ဆူညံသံ၊ သီးခြားထွက်နေသော ဆူညံသံအား တိုင်းတာခြင်း၊ အမျိုးအစား (၁) (သို့) (၂) အသံအနိမ့်အမြင့်ကို တွက်ချက်ခြင်းနှင့် ၎င်းတို့အားလုံးသည် IEC စံနှုန်းများနှင့် ကိုက်ညီရပါမည်။ • ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဥပဒေ (၂၀၁၂)နှင့်အတူ ၂၀၁၅ ခုနှစ်တွင်	ကြာချိန်- တစ်ရက် အကြိမ်အရေအတွက် • ဆောက်လုပ်ရေးကာလ၊ တွင်းတူးခြင်းနှင့်တွင်းစမ်းသပ်ခြင်း အဆင့်များ။ • ဆူညံသံနှင့် ပတ်သက်ပြီး တိုင်ကြားမှုများကို တုန့်ပြန်ရန် ထပ်မံ၍ ဆူညံသံ တိုင်းတာခြင်းကို ဆောင်ရွက်ရပါမည်။ (လိုအပ်ပါက)	တွင်းတူးစင်မှ မီတာ ၁၀၀ အကွာ	• OVL သည် ဆူညံသံ အရည်အသွေး စောင့်ကြည့်မှု ရလဒ်များကို ၆ လတကြိမ် စစ်ဆေးပြီး ECD မှတဆင့် MONREC သို့ စောင့်ကြည့်စစ်ဆေးမှုအစီရင်ခံစာ တင်ပြရန်။

ပတ်ဝန်းကျင်ဆိုင်ရာ အချက်များ	အညွှန်း/ တိုင်းတာသည့် Parameter	လုပ်ငန်းစဉ်	အဆိုပြုကြာချိန်နှင့် စောင့်ကြည့်မှု အကြိမ်အရေအတွက်	တည်နေရာ	အစီရင်ခံခြင်း
		စတင်ထိရောက်လာသော အမျိုးသား ပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး (ုထုတ်လွှတ်မှု) လမ်းညွှန်ချက်များ။ • ပြည်သူလူထုအား ဆူညံမှုများကို ကမ္ဘာ့ကျန်းမာရေးအဖွဲ့ (WHO)(၁၉၉၉) လမ်းညွှန်ချက်များနှင့်အညီဆောင်ရွက်ပါမည်။			
တွင်းတူးခြင်းမှ မြေစာများ	• ကလိုရိုက် (WBM အတွက်) • မြေစာပေါ် ရှိ ဆီများ (LTSOBMအတွက်) • ပြဒါး (in stock Barite) • ကတ်ဒမီယန် (in stock Barite)	နည်းလမ်း • ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဥပဒေ (၂၀၁၂) နှင့်အတူ ၂၀၁၅ ခုနှစ်တွင် စတင်ထိရောက်လာသော အမျိုးသား ပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး (ုထုတ်လွှတ်မှု) လမ်းညွှန်ချက်များ။	• မရောနှောမီ/ အမှိုက်ကျင်းထဲသို့ မစွန့်ပစ်မီ တွင်းတူးခြင်းအဆင့် ပြီးဆုံးမှုပေါ်မူတည်၍။	• ဖြတ်စတွင်းများမှ စမ်းသပ်တူးဖော်တွင်းများ	• OVL သည် အရည်အသွေး စောင့်ကြည့်မှု ရလဒ်များကို ၆ လတကြိမ် စစ်ဆေးပြီး ECD မှတဆင့် MONREC သို့ စောင့်ကြည့်စစ်ဆေးမှုအစီရင်ခံစာ တင်ပြရန်။
တွင်းတူးခြင်းအတွက် အသုံးပြုသော ဓါတုပစ္စည်းများ	• ဓါတုပစ္စည်း အမျိုးအစား • အသုံးပြုသည့် ပမာဏ	• ဓါတုပစ္စည်းအမျိုးအစားနှင့် အသုံးပြုသည့် ပမာဏကို နေ့စဉ်မှတ်တမ်းထားရန်။	• တွင်းတူးခြင်း ပြီးဆုံးသောအခါ အစီရင်ခံစာတွင်ထည့်သွင်းဖော်ပြရန်။	• စီမံကိန်းဧရိယာ	• တွင်းတူးကန်ထရိုက်တာသည် တွင်းတူးစဉ် အသုံးပြုသော ဓါတုပစ္စည်းမှတ်တမ်းကို ု OVL သို့ လစဉ်တင်ပြခြင်း။ • OVL သည် အရည်အသွေး စောင့်ကြည့်မှု ရလဒ်များကို ၆ လတကြိမ် စစ်ဆေးပြီး ECD

ပတ်ဝန်းကျင်ဆိုင်ရာ အချက်များ	အညွှန်း/ တိုင်းတာသည့် Parameter	လုပ်ငန်းစဉ်	အဆိုပြုကြာချိန်နှင့် စောင့်ကြည့်မှု အကြိမ်အရေအတွက်	တည်နေရာ	အစီရင်ခံခြင်း
					မှတဆင့် MONREC သို့ စောင့်ကြည့်စစ်ဆေးမှုအစီရင်ခံစာ တင်ပြရန်။
အန္တရာယ်ရှိသော စွန့်ပစ်ပစ္စည်းများနှင့် အန္တရာယ်မရှိသော စွန့်ပစ်ပစ္စည်းများ	• စွန့်ပစ်ခြင်း	• အမျိုးအစားနှင့် စွန့်ပစ်သည့်နေရာအလိုက် စွန့်ပစ်ပစ္စည်းပမာဏကို နေ့စဉ်မှတ်တမ်းထားရန်။	• တွင်းတူးခြင်းအဆင့်	• စီမံကိန်းနေရာအားလုံး	• တွင်းတူးကန်ထရိုက်တာသည် အန္တရာယ်ရှိသော/ အန္တရာယ်မရှိသော စွန့်ပစ်ပစ္စည်း စွန့်ပစ်မှုမှတ်တမ်းကို OVL သို့ လစဉ်တင်ပြခြင်း။ • OVL သည် အရည်အသွေး စောင့်ကြည့်မှု ရလဒ်များကို ၆ လတကြိမ် စစ်ဆေးပြီး ECD မှတဆင့် MONREC သို့ စောင့်ကြည့်စစ်ဆေးမှုအစီရင်ခံစာ တင်ပြရန်။
လူမှုရေး	• တိုင်ကြားခြင်းများ • စောင့်ကြည့်စစ်ဆေးခြင်းနှင့် ဖြေရှင်းခြင်း။	• တိုင်ကြားမှုများကို မှတ်သားခြင်း။ • စောင့်ကြည့်ခြင်း၊ စစ်ဆေးခြင်းနှင့် သင့်လျော်သော ဖြေရှင်းမှုများကို အကောင်အထည်ဖော်ခြင်း။	• အဆင့်အားလုံး	• စီမံကိန်းဧရိယာ၊ စီမံကိန်း ပတ်ဝန်းကျင်ရှိ ပြည်သူလူထုနှင့် သယ်ယူပို့ဆောင်ရေး လမ်းကြောင်းများ။	• တွင်းတူးကန်ထရိုက်တာသည် ကုမ္ပဏီ၏ တိုင်ကြားမှု ဖြေရှင်းနည်းလမ်းများအရ ဆောင်ရွက်မှုများကို OVL သို့ လစဉ်တင်ပြခြင်း။ • OVL သည် ၆ လတကြိမ် စစ်ဆေးပြီး ECD မှတဆင့်

ပတ်ဝန်းကျင်ဆိုင်ရာ အချက်များ	အညွှန်း/ တိုင်းတာသည့် Parameter	လုပ်ငန်းစဉ်	အဆိုပြုကြာချိန်နှင့် စောင့်ကြည့်မှု အကြိမ်အရေအတွက်	တည်နေရာ	အစီရင်ခံခြင်း
					MONREC သို့ စောင့်ကြည့်စစ်ဆေးမှုအစီရင်ခံစာ တင်ပြရန်။
ပြည်သူလူထုနှင့် လုပ်ငန်းခွင်ဆိုင်ရာ ကျန်းမာရေးနှင့် လုံခြုံစိတ်ချရမှု	• မတော်တဆဖြစ်စဉ်များ • မတော်တဆဖြစ်ရပ်များ • လျော့ချရေးနည်းလမ်းများ	• မတော်တဆဖြစ်မှုများ (သို့) ဆောက်လုပ်ရေးကာလအတွင်း မတော်တဆ ဖြစ်နိုင်ခြေများကို မှတ်တမ်းတင်ထားပြီး ထိခိုက်မှု အနည်းအများနှင့် လျော့ချရေးနည်းလမ်းများကို သတ်မှတ်ခြင်း။ • မတော်တဆဖြစ်ရပ်များအတွက် အကျဉ်းချုပ်အစီရင်ခံစာကို ပြုစုခြင်း။	• အဆင့်အားလုံး	• စီမံကိန်းဧရိယာ၊ စီမံကိန်း ပတ်ဝန်းကျင်ရှိ ပြည်သူလူထုနှင့် သယ်ယူပို့ဆောင်ရေး လမ်းကြောင်းများ။	• တွင်းတူးကန်ထရိုက်တာသည် မတော်တဆ ဖြစ်ရပ်များကို OVL သို့ လစဉ်တင်ပြခြင်း။ • OVL သည် ၆ လတကြိမ် စစ်ဆေးပြီး ECD မှတဆင့် MONREC သို့ စောင့်ကြည့်စစ်ဆေးမှုအစီရင်ခံစာ တင်ပြရန်။

၁.၉။ လူထုတွေ့ဆုံဆွေးနွေးခြင်း

၁.၉.၁။ နယ်ပယ်တိုင်းတာသတ်မှတ်ခြင်းအဆင့်လူထုတွေ့ဆုံဆွေးနွေးခြင်း

စီမံကိန်းအကြောင်းအရာများ အသိပေးအကြောင်းကြားရန်နှင့် စီမံကိန်းလုပ်ငန်းများ၊ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းလေ့လာမှုနှင့် လူထုတွေ့ဆုံခြင်းအစီအစဉ်များအတွက် ခွင့်ပြုမိန့် တောင်းခံရန်အတွက် ONGC Videsh၊ M&S နှင့် MOGE တို့သည် IEM၊ EQM တို့နှင့်အတူ ပဲခူးတိုင်းဒေသကြီး ဝန်ကြီးချုပ်ကို ၂၀၂၀ခုနှစ် ဇန်နဝါရီလ ၃ ရက်နေ့တွင် သွားရောက် တွေ့ဆုံ ရှင်းလင်းတင်ပြခဲ့ပါသည်။

အဓိကပါဝင်ပတ်သက်သူများအား စီမံကိန်းလုပ်ငန်းများအကြောင်း သိရှိစေရန်နှင့် ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းနှင့် ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်တို့တွင် ကဏ္ဍတစ်ခုအဖြစ် ထည့်သွင်းစဉ်းစားသွားမည့် လူထုအကြံပြုချက်များနှင့် စိုးရိမ်မှုများကို သိရှိနိုင်ရန်အတွက် ONGC Videsh၊ သည် IEM၊ EQM တို့နှင့်အတူ လူထုတွေ့ဆုံပွဲများကို ကျင်းပခဲ့ပြီးဖြစ်ပါသည်။

IEM (မြန်မာ) သည် အဖွဲ့လိုက်တွေ့ဆုံဆွေးနွေးမှုများကို လုပ်ကွက် EP-3 ကျရောက်နေသော မြန်မာနိုင်ငံ၊ ပဲခူးတိုင်းဒေသကြီး၊ ပြည်ခရိုင် သဲကုန်းမြို့နှင့် ပေါက်ခေါင်းမြို့များတွင် ဆောင်ရွက်ခဲ့ပါသည်။ ပါဝင်ပတ်သက်သူများ၏ ဆွေးနွေး အကြံပြု ချက်များကို ONGC Videsh မှလည်ပတ်ဆောင်ရွက်သည့် လုပ်ကွက်အမှတ် EP-3 ရေနံစမ်းသပ်တူးဖော် ရှာဖွေရေး လုပ်ငန်း၏ EIA TOR တွင် ထည့်သွင်းဖော်ပြသွားပါမည်။

ကွင်းဆင်းလုပ်ငန်းများ မစတင်မီ ခွင့်ပြုချက်နှင့်အကူအညီများ ရရှိနိုင်ရန်အတွက် အကြိုတွေ့ဆုံဆွေးနွေးခြင်းကို ကွင်းဆင်းဆောင်ရွက်မည့် အဖွဲ့များနှင့်အတူ ပြည်ခရိုင်၊ သဲကုန်းမြို့နယ်၊ ပေါက်ခေါင်းမြို့နယ် အုပ်ချုပ်ရေးပိုင်းဆိုင်ရာ တာဝန်ရှိသူများနှင့် ဆောင်ရွက်ခဲ့ပါသည်။ လူထုတွေ့ဆုံဆွေးနွေးပွဲကို ခရိုင်နှင့်မြို့နယ်အဆင့် အုပ်ချုပ်ရေး တာဝန်ရှိ ပုဂ္ဂိုလ်များ ၁၉၂ ဦးနှင့်ကျော် ရွာပေါင်း ၂၁ ရွာမှ ဒေသခံများ တက်ရောက်ခဲ့ကြပါသည်။

ပထမအကြိမ် လူထုတွေ့ဆုံပွဲနှင့် ပါဝင်ပတ်သက်သူများ တွေ့ဆုံဆွေးနွေးပွဲကို ဇယား ၁-၁၂ တွင် ဖော်ပြထားသည့်အတိုင်း ၂၀၂၀ ခုနှစ် ဖေဖော်ဝါရီလတွင် ဆောင်ရွက်ခဲ့ပါသည်။

ဇယား ၁-၁၂ ပထမအကြိမ်လူထုတွေ့ဆုံပွဲအချိန်ဇယား

နေ့ရက်	အချိန်	ကျင်းပရာနေရာ	ပါဝင်ပတ်သက်သူများ/ ကျေးရွာများ	တက်ရောက်သူဦးရေ
ဖေဖော်ဝါရီ ၁၀ ရက်	၁၅:၃၀ – ၁၆:၃၀	ပြည်ခရိုင် အုပ်ချုပ်ရေးရုံး	• ခရိုင်၊ မြို့နယ်အဆင့် အာဏာပိုင်များ • သစ်တောနှင့် ECD • NGOs • CSOs • မီဒီယာများ	၁၂
ဖေဖော်ဝါရီ ၁၁ ရက်	၉:၃၀ – ၁၂.၀၀	ပေါက်ခေါင်းမြို့နယ် အုပ်ချုပ်ရေးရုံး	• မြို့နယ်အဆင့် အာဏာပိုင်များ • သစ်တောနှင့် ECD • NGOs	၁၉

			• CSOs • မီဒီယာများ	
ဖေဖော်ဝါရီ ၁၁ ရက်	၁၃:၀၀ – ၁၆:၃၀	ကြိုပင်ရွာ	• ဆက်တုန်း, • မင်းလမ်း • သစ်ယောင်းပြန်	၉၃
ဖေဖော်ဝါရီ ၁၂ ရက်	၁၀:၃၀ – ၁၂:၀၀	သဲကုန်းမြို့နယ် အုပ်ချုပ်ရေးရုံး	• မြို့နယ်အဆင့် အာဏာပိုင်များ • သစ်တောနှင့် ECD • NGOs • CSOs • မီဒီယာများ	၂၉
ဖေဖော်ဝါရီ ၁၂ ရက်	၁၃:၀၀ –၁၆:၀၀	ချားယားကုန်းရွာ	• ရွာသာကုန်း • တောချင် • သစ်ချို • ဖလံကုန်း • ကောင်းဘင်လု • ကရင်ကုန်း	၂၁
ဖေဖော်ဝါရီ ၁၃ ရက်	၉:၃၀ – ၁၁:၀၀	ရွာသစ်ရွာ	• ထန်းတောကြီး • ညောင်ကုန်း • ဇင်ပြွန်းကုန်း • ပျဉ်ထောင်ကုန်း • ပွေးဘိုင် • စပါယ်ကန် • ဝါးလဲ့ • ရက်သာ • ဂျိုကုန်း	၁၈

၁.၉.၂။ နယ်ပယ်တိုင်းတာသတ်မှတ်ခြင်းအဆင့် အဖွဲ့လိုက်ဆွေးနွေးခြင်းများ

ဤ ၂၁ ရွာသည် အဆိုပြုတွင်းရေိယာမှ သက်ရောက်နိုင်ခြေအရှိဆုံးနှင့် အနီးဆုံး ကျေးရွာများ ဖြစ်ပါသည်။ IEM၏ လူမှုစီးပွားစစ်တမ်းကောက်ယူသည့် အဖွဲ့တွင် အကြီးတန်းလူမှု-စီးပွားဆိုင်ရာကျွမ်းကျင်သူများ၊ ကြီးကြပ်သူနှစ်ဦးနှင့် IEM မှ လေ့ကျင့်သင်ကြားထားသော မြန်မာလူမျိုး နည်းပညာရှင်များ ပါဝင်ပါသည်။

တွေ့ဆုံဆွေးနွေးမှုများနှင့် ကွင်းဆင်းလေ့လာမှုများ မဆောင်ရွက်မီ ONGC Videsh သည် ၎င်းရေိယာတွင် ဆောင်ရွက်မည့် ရှာဖွေရေးတွင်း ၂ တွင်း စမ်းသပ် တူးဖော်သွားမည့် အစီအစဉ်များကို ဒေသခံများအား အသိပေးခဲ့ပါသည်။

အစီးအဝေးကို အောက်ပါအစီအစဉ်အတိုင်းကျင်းပခဲ့ပါသည်။

၁။ လူထုတွေ့ဆုံဆွေးနွေးခြင်း အစည်းအဝေးအား ဖွင့်လှစ်ကြောင်းကြေညာခြင်း

၂။ မိတ်ဆက်ပေးခြင်း

၃။ ဦးမြင့်ကျော်ဦး (မြန်မာ့ရေနံနှင့် သဘာဝဓါတ်ငွေ့လုပ်ငန်း) မှ အဖွင့်အမှာစကားပြောကြားခြင်း

၄။ ဦးကျော်ဇောဟန် (ONGC Videsh) မှ ကုမ္ပဏီအကြောင်းနှင့် စမ်းသပ်ရှာဖွေရေးတွင်းတူးလုပ်ငန်းများ အကြောင်း ရှင်းလင်းတင်ပြခြင်း။

၅။ EQM ကုမ္ပဏီမှ ဒေါက်တာသွဲ့မူမူမြင့်နှင့် Mr. Dylan Jenkins မှ ပတ်ဝန်းကျင်ထိခိုက်မှု ဆန်းစစ်ခြင်း အကြောင်း ရှင်းလင်းတင်ပြခြင်း

၆။ အမေးအဖြေကဏ္ဍ

မြို့နယ်အဆင့်သက်ဆိုင်သူများတွေ့ဆုံပွဲနှင့် ကျေးရွာလူထုတွေ့ဆုံပွဲများမှရရှိသော အဓိကစိုးရိမ်ပူပန်မှုများနှင့် မေးခွန်းများကို ဇယား ၁-၁၃ တွင် အသေးစိတ် ဖော်ပြထားပါသည်။

ဇယား ၁-၁၃ ပထမအကြိမ်လူထုတွေ့ဆုံပွဲမှအဓိကဆွေးနွေးချက်များ

မေးခွန်း/ အကြံပြုချက်	ပြန်လည်ဖြေကြားချက်	လျော့ချရေးနည်းလမ်းများ
ဒေသခံများအတွက် ဘာအကျိုးကျေးဇူးတွေရရှိနိုင်မှာလဲ	စီးပွားဖြစ်ထုတ်ယူသည့်အဆင့်တွင် အစိုးရသည် စီမံကိန်းမှ အကျိုးအမြတ်များ ခွဲဝေရရှိပါမည်။ အစိုးရသည် ယခုစီမံကိန်းမှ ရေနံနှင့်သဘာဝဓါတ်ငွေ့များထွက်ရှိလာပါက စွမ်းအင် အထောက်အပံ့များ ရရှိ နိုင်ပြီး ဒေသခံများ အနေဖြင့် အလုပ်အကိုင်များ ရရှိနိုင်ပါသည်။ CSR လုပ်ငန်းများကို အများအားဖြင့် စီးပွားဖြစ်ထုတ်ယူသည့်အဆင့်တွင် ဆောင်ရွက်ပါသည်။ ဒေသခံလူထုအတွက် စီမံကိန်းမှ အကျိုးအမြတ်များမှာ အလုပ်အကိုင်အခွင့်အလမ်းနှင့် ထုတ်လုပ်သည့် အဆင့်တွင် CSR လုပ်ငန်းများ ဆောင်ရွက်ပေးမှုများ ဖြစ်ပါသည်။ ကျောင်းများတွင် CSR အစီအစဉ်များကို ပေါက်ခေါင်း နှင့် ကြိုပင် ရွာများတွင် ဆောင်ရွက်ထားပြီး ဖြစ်ပါ သည်။ တချို့ရွာများတွင် တံတားများ ဆောက်လုပ် ပေးပြီးဖြစ်ပါသည်။ CSR လုပ်ငန်းများကို ဆိုက်စမစ် လုပ်ငန်းများ ဆောင်ရွက်ခဲ့သော ကျေးရွာများတွင် ဆောင်ရွက်ခြင်းဖြစ်ပါသည်။	• ONGC Videsh ၏ တင်ပြချက်များအပေါ် ပြန်လည် ဖြေရှင်းခြင်း လုပ်ငန်းစဉ် အတိုင်း အကောင်အထည်ဖော်ရန် • သက်ဆိုင်သူများ၏ တင်ပြလာသော စွမ်းအင်နှင့်လျပ်စစ် ကိစ္စရပ်များကို MOGE နှင့်အတူ ဆက်သွယ် ညှိနှိုင်း ဆောင်ရွက်ခြင်း။
စီမံကိန်းလျော်ကြေးပေးခြေခြင်း	မြေယာရယူ/ လျော်ကြေးပေးခြေရေး ကော်မတီကို MOGE၊ မြေစာရင်းဦးစီးဌာနနှင့်	• မြေယာရယူခြင်းလုပ်ငန်းများကို MOGE ဦးဆောင်မှုဖြင့် ဆောင်ရွက်ပါမည်။

	မြို့နယ်အုပ်ချုပ်ရေး ဦးစီးဌာနများနှင့် ဖွဲ့စည်းဆောင်ရွက်သွားပါမည်။ ထို့နောက် ကော်မတီသည် မြေပိုင်ရှင်များနှင့်အတူ လျော်ကြေးကိစ္စများ ဆွေးနွေးပါမည်။ လျော်ကြေးနှုန်းကို အစိုးရနှင့် ဒေသခံလူထုနှင့်အတူ ဆွေးနွေးညှိနှိုင်း ဆုံးဖြတ်သွားပါမည်။	• မြေပိုင်ရှင်နှင့် မြေအသုံးပြုသူများအား သင့်တင့်မျှတသောလျော်ကြေးနှင့် ပွင့်လင်းမြင်သာမှုရှိခြင်း • မြေပိုင်ရှင်နှင့် ဒေသအာဏာပိုင်များထံမှ ခွင့်ပြုချက်များရယူခြင်း။ MOGE သို့ အကျဉ်းချုပ်တင်ပြခြင်း • ပတ်ဝန်းကျင် မြေပိုင်ရှင်များကို စီမံကိန်းလုပ်ငန်းများ မဆောင်ရွက်မီ ၂ ပတ်ကြိုတင်အသိပေးခြင်း • စီမံကိန်းပြီးသွားချိန်တွင် ၆ လအတွင်း မူလပကတိအခြေအနေအတိုင်း ပြန်လည်ဆောင်ရွက်ပေးခြင်း • အမြန်နှုန်းများကို ကန့်သတ်ခြင်း (အဝေးပြေးလမ်းမကြီးတွင် တစ်နာရီ ၈၀ ကီလိုမီတာ၊ ကျောက်လမ်းတွင် တစ်နာရီ ၆၀ ကီလိုမီတာ၊ ကျေးရွာလမ်းများတွင် တစ်နာရီ ၂၀ ကီလိုမီတာ၊ ရန်ကုန်မြို့ပြင် လမ်းများ စီမံကိန်းဧရိယာအတွင်းနှင့် အဓိကလမ်းများတွင် တစ်နာရီ ၈၀ ကီလိုမီတာ) • အကယ်၍ ရေကို မြေအောက်ရေ (သို့) မြစ်များ/ ရေထွက်များ အနီးရှိ ရေလှောင်ကန်များမှ သုံးစွဲ ပါက ဒေသခံများ၏ ရေအသုံးပြုမှုကို မထိခိုက် စေသင့်ပါ။ • ဤစမ်းသပ်တွင်းတူးလုပ်ငန်းစဉ်အတွက် ONGC Videsh ၏ စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှုအစီအစဉ်ကို အကောင်အထည်ဖော် ဆောင်ရွက်သွားပါမည်။
ဒေသခံများ အလုပ်ရရှိရေး	ဆောက်လုပ်ရေးကာလအတွင်း သင့်လျော်သည့် လုပ်ငန်းနေရာများအတွက် ဒေသခံများကို ဦးစားပေးသွားပါမည်။ သို့သော်လည်း တွင်းတူးလုပ်ငန်းများသည် ကျွမ်းကျင် အင်ဂျင်နီယာများ နှင့်ကျွမ်းကျင် ဝန်ထမ်းများ လိုအပ်ပါသည်။	• လုပ်ငန်းကျွမ်းကျင်မှုနှင့် အလုပ်သမား ရရှိနိုင်မှုအပေါ်မူတည်၍ ဆောက်လုပ်ရေး နှင့် တွင်းတူးလုပ်ငန်း ကန်ထရိုက်တာ များမှ အနီးအနားရှိ ဒေသခံများအား ဦးစားပေးအသုံးပြုခြင်း။
စီမံကိန်းမှ မီးဘေးအန္တရာယ်	မီးဘေးအန္တရာယ်လျော့ချရန်အတွက် တွင်းတူးလုပ်ငန်းကို အပြည်ပြည်ဆိုင်ရာ စံနှုန်းများအရ ဆောင်ရွက်သွားပါမည်။	• မီးလောင်ပါက ထိခိုက်မှုများကို လျော့ချရန် အသေးစိတ် စီမံခန့်ခွဲမှု အစီအစဉ်များ အပါအဝင် ONGC VIdesh ၏

		အရေးပေါ်တုန့်ပြန်မှု အစီအစဉ် အတိုင်း အကောင်အထည်ဖော် ဆောင်ရွက်ခြင်း • အရေးပေါ်အစီအစဉ်များသည် တွင်းတူးမည့် ကန်ထရိုက်တာအသုံးပြုမည့် ကိရိယာများ၊ အဆောက်အဦးများနှင့် ဖွဲ့စည်းတည်ဆောက်ပုံ အချက်အလက်များ လိုအပ်ပါသည်။ ထို့ကြောင့်စီမံခန့်ခွဲမှု အစီအစဉ်များကို ပေါင်းကူးစာရွက်စာတမ်း၏ အစိတ်အပိုင်းတခုအဖြစ် သတ်မှတ်ပြီး တွင်းတူးကန်ထရိုက်တာနှင့် ပူးပေါင်းပြင်ဆင်မည်သွားပါမည်။ • ONGC VIdesh နှင့် ၎င်း၏ ကန်ထရိုက်တာများသည် မြို့နယ် မီးသတ်တပ်ဖွဲ့များနှင့် ပူးပေါင်း ဆောင်ရွက်ခြင်း
ဆက်သွယ်ရေးလမ်းများ	ဆောက်လုပ်ရေးလုပ်ငန်းများကို ၂၀၂၀ ခုနှစ် ဆောင်းရာသီအပြီး ဆောင်ရွက်သွားပါမည်။ လမ်းနှင့် စမ်းသပ်တွင်းနေရာ နှစ်မျိုးလုံးကို တည်ဆောက်သွားပါမည်။ ဘုရားမ-၁ တွင်းသို့သွားရာလမ်းတွင် ကြံ့စိုက်ခင်းများ ရှိသောကြောင့် ကြိစက်ပိုင်ရှင်နှင့် တွေ့ဆုံညှိနှိုင်းရန် လိုအပ်ပါသည်။ ဆောက်လုပ်ရေးလုပ်ငန်းသည် ကြံထုတ်လုပ်ငန်းနှင့် တစ်ချိန်တည်း ဖြစ်နေသောကြောင့် ဆောက်လုပ်ရေးကာလအတွင်း ကုန်တင်ကားအများအပြား အသုံးပြုပါမည်။ ထို့ကြောင့် ကြံထုတ်လုပ်ငန်းကို စီမံခန့်ခွဲဆောင်ရွက်ရန် လိုအပ် ပါသည်။ အကယ်၍ ပိုမိုသော ကုန်ကျစရိတ်များ (သို့) အခက်အခဲများရှိပါက ONGC Videsh သည် အခြား ရွေးချယ်နိုင်သည့် ဆက်သွယ်ရေးလမ်းကို ရှာဖွေ ကောင်း ရှာဖွေပါမည်။ ကန်ထရိုက်တာသည် လမ်းဖောက်လုပ်ခြင်းနှင့် စမ်းသပ်တွင်းမြေနေရာ လိုအပ်ပါက မြေဖို့ခြင်း လုပ်ငန်းများ အတွက် လိုအပ်သောမြေသားများကို	• ဆောက်လုပ်ရေး၊ အဆင့်မြင့်တင်ခြင်း (သို့) လမ်းဖောက်ခြင်းလုပ်ငန်းများ မစတင်မီ MOGE နှင့် သက်ဆိုင်ရာ အစိုးရဌာနများမှ ခွင့်ပြုချက်ရယူခြင်း • ONGC Videsh သည် လမ်းအန္တရာယ် ဆန်းစစ်ခြင်းလုပ်ငန်းများကို စက်ကိရိယာကြီးများ မရွှေ့ပြောင်းမီ ဆောင်ရွက်ခြင်း။ • ရွာတွင်းသွားလမ်းများကို လေးလံသော ကုန်ကားများသွားလာနိုင်ရန် အဆင့်မြှင့် တင်ပေးပြီး ပျက်ဆီးမှု များရှိပါက ပကတိ အနေအထားအတိုင်း ပြန်လည်ပြုပြင်ပေး ခြင်း • ကန်ထရိုက်တာ (သို့) ကုမ္ပဏီကြောင့် ဖြစ်သော လမ်းအပျက်အဆီးများကို ပြန်လည်ပြုပြင်ခြင်း။

	အခြားနေရာမှ သယ်ယူမည်ဖြစ်ပြီး အနီးအနားရှိ လယ်ကွင်းများမှ ယူမည်မဟုတ်ပါ။	
ဘုရားမ-၁ သို့သွားရာ အခြားလမ်း- ဒေသခံများသည် လယ်သမားများအတွက် အခြားလမ်းတစ်ခုကို အကြံပြုခဲ့ပါသည်။ (ဇောခိကုန်း၊ အိုင်ဟန့်- သဖန်း ကိုင်း- ကြိုပင်ဝိုင်း)	ဝန်ကြီးဌာနသည် ထိခိုက်မှုအနည်းဆုံးဖြစ်မည့် လမ်းပိုင်းကို ရွေးချယ်ရန် အကြံပြုထားပါသည်။ အကြံပြုချက်အတိုင်း အခြားဆက်သွယ်ရေးလမ်းသည် အားလုံးအတွက် အကျိုးရှိမှုအပေါ်မူတည်ပြီး ထည့်သွင်းစဉ်းစားသွားပါမည်။ လမ်းဆောက်လုပ်ရေးလုပ်ငန်းများ အတွက် ဒေသခံများငှားရမ်းရန်အတွက် တင်ဒါအောင်သော ကုမ္ပဏီများကို တိုက်တွန်းသွားပါမည်။	• သက်ဆိုင်ရာ ဝန်ကြီးဌာနများ၏ ခွင့်ပြုချက်ပေါ်မူတည်၍ ONGC Videsh သည် အခြားလမ်းများကို ထည့်သွင်း စဉ်းစားသွားပါမည်။
လမ်းပိတ်ဆို့မှု- လယ်သမားများ ရိတ်သိမ်းရာသီတွင် လမ်းကြောပိတ်ဆို့မှုများ ရှိနိုင်ပါသည်။ ကြံထုတ်လုပ်မှုကို နိုဝင်ဘာ လနောက်ဆုံးအပတ် အတွင်းတွင်စတင်၍ ဒီဇင်ဘာလကုန်ထိ ဆောင်ရွက်ပါသည်။ လမ်းဖောက်လုပ်ခြင်းသည် တစ်လ ကြာမြင့်မည်ဖြစ်ပြီး လမ်းပိတ်ဆို့မှု များ ရှိနိုင်ပါသည်။ ဆောက်လုပ်ရေးလုပ်ငန်းများကို စက်တင်ဘာနှင့် အောက်တိုဘာလများတွင် ဆောင်ရွက်ပါမည်။ လမ်းဖောက်လုပ်မှု ရှည်လျားပါက ကြံထုတ်လုပ်မှုကို ပိုမိုထိခိုက်နိုင်ပါသည်။	တွင်းတူးခြင်းကို ဒီဇင်ဘာလတွင် စတင်ပြီး ဆောက်လုပ်ရေးလုပ်ငန်းများကို အောက်တိုဘာ/ နိုဝင်ဘာလတွင် အပြီးသတ် နိုင်ရန်အတွက် အစွမ်းကုန်အားထုတ် ဆောင်ရွက်ပါမည်။ လမ်းဖောက်သည့်အခါ လမ်းများကို ပိတ်ဆို့ ဆောင်ရွက်မည်မဟုတ်ဘဲ အပိုင်းလိုက် ဖောက်လုပ်ပြီး လက်ရှိလမ်းကိုအသုံးပြုနိုင်အောင် စီမံဆောင်ရွက် သွားပါမည်။ အကယ်၍ လမ်းဖောက်လုပ်ခြင်းသည် ကြံထုတ် လုပ်ငန်း မစမှီ အပြီးမသတ်နိုင်ပါက လမ်းလွှဲများထားရှိ ဆောင်ရွက်ရန် လိုအပ်ပါသည်။ ကြံလုပ်ငန်း ဆောင်ရွက်စဉ်အတောအတွင်း လမ်းပိတ်ဆို့ထားပါက သကြားစက်ပိုင်ရှင်များသာမက ဒေသခံများအားလုံးပါ အခက်အခဲရှိနိုင်ပါသည်။ အဘယ့်ကြောင့်ဆိုသော် ဤဒေသတွင် သကြားစက် ရှိသောကြောင့် ဖြစ်ပြီး လမ်းပိတ်ဆို့မှုကြောင့် ကြံစိုက်တောင်သူများ၏ ကြံသယ်ယူပို့ဆောင်ရေး အပေါ် သက်ရောက်မှုရှိနိုင်ပါသည်။ လမ်းပိတ်ဆို့မှုကြောင့် ကြံသယ်ယူပို့ဆောင်ရေး ကို ထိခိုက်မှုရှိလာပါက ကုမ္ပဏီသည် ဆုံးရှုံးနစ်နာမှု ရှိသည့် ကြံများအတွက် လျော်ကြေးပေး ကောင်းပေး ရနိုင်ပါသည်။	• ဆောက်လုပ်ရေးလုပ်ငန်များအား ကြံရိတ်သိမ်းချိန်နှင့် မတိုက်စေရန် တတ်နိုင်သမျှ ဆောင်ရွက်ထားပါမည်။ ဒေသလမ်းပိတ်ဆို့မှု မရှိစေရန် အကယ်၍ လိုအပ်ပါက လမ်းခွဲများဆောင်ရွက်ပေးခြင်း။ • လမ်းအသုံးပြုသူများအားလုံး အဆင်ပြေ စေရန်အတွက် လမ်းပိုင်းများ ခွဲ၍ ဆောင်ရွက်သွားပါမည်။ • ဝန်ပိုတင်ဆောင်မှုများအတွက် ဒေသဆိုင်ရာ အာဏာပိုင်များကို သတိပေးအကြောင်းကြားပြီး ယာဉ်တန်း၏ရှေ့တွင် အချက်ပြဟွန်းများ၊ မီးရောင်များနှင့်အတူ အစောင့်အကြပ် များ ထားရှိပါမည်။ • ကြီးမားသော ပြောင်းရွှေ့မှုများ မဆောင်ရွက်မီ ဒေသဆိုင်ရာ အာဏာပိုင် များကို ကြိုတင်အကြောင်းကြားခြင်း။

ပေါက်ခေါင်းတွင် ရေသွင်းဆည်နှစ်ခု ရှိပါသည်။ တွင်းတူးခြင်းမှ ထွက်လာသော တုန်ခါမှုများကြောင့် ဆည်များကို ထိခိုက်နိုင်ပါသလား?	တွင်းနက်လေ တွင်းအကျယ် သေးသွားလေ ဖြစ်ပါသည်။ တွင်း၏ အသေးဆုံး အချင်းမှာ ၇ လက်မ ရှိပြီး တွင်းတူးခြင်းကြောင့် ပတ်ဝန်းကျင်ဧရိယာကို ထိခိုက်စေနိုင်သော တုန်ခါမှုများ မရှိနိုင်ပါ။	• တွင်းဒီဇိုင်းကို အပြည်ပြည်ဆိုင်ရာ ပတ်ဝန်းကျင်တုန်ခါမှု စံသတ်မှတ်ချက်များအတိုင်း ဆောင်ရွက်ခြင်း။
တွင်းတူးခြင်းမှ ရေတွင်းများကို ထိခိုက်နိုင်မှု	တွင်းတူးခြင်းမှ တုန်ခါမှုသည် ရေတွင်းများကို ထိခိုက်မှု မရှိနိုင်ပါ။ တွင်းဝသည် ၇ လက်မသာရှိပြီး တွင်းနံရံကို အင်္ကတေဖြင့် သေချာစွာ ပိတ်ထားမည် ဖြစ်ပါသည်။ ဆည်နှင့် အခြားမည်သည့်အရာကိုမှ ထိခိုက်မှုမရှိနိုင်ပါ။ အတွေ့အကြုံအရ တွင်းတူးလုပ်ငန်းကြောင့် မြေပြိုမှုများ မရှိခဲ့ပါ။ တွင်းများနှင့်ပတ်သက်၍ ပြဿနာတစုံတရာ ရှိ လာပါက ချက်ချင်း အကြောင်းကြားပေးရန် မေတ္တာရပ်ခံပါသည်။	• အနီးဆုံးရပ်ရွာမှ လုံခြုံစိတ်ချရသော အကွာအဝေးတွင် ဆောင်ရွက်ခြင်း (အနည်းဆုံး မီတာ ၅၀၀ အကွာ) • မည်သည့်သတင်းပို့တင်ပြချက်မျိုးကိုမဆို သင့်လျော်စွာ စစ်ဆေးကြပ်မတ် ကိုင်တွယ်ဖြေရှင်းရန်။ သတင်းပို့တင်ပြချက်များ ကိုမှတ်တမ်းတင်ထားပြီး လိုအပ်သလိုဆက်လက် ဆောင်ရွက်ရန်။

၁.၉.၃။ EIA အဆင့် ပြည်သူလူထုတွေ့ဆုံဆွေးနွေးခြင်း

MOGE၊ ECD နှင့်အတူ ONGC Videsh နှင့် IEM/ EQM တို့သည် ဒေသဆိုင်ရာ အာဏာပိုင်များနှင့် ဒုတိယအကြိမ် လူထုတွေ့ဆုံဆွေးနွေးခြင်းကို ပြည်ခရိုင်၊ ပြည်မြို့နယ်တွင် ဆောင်ရွက်ပြီး အဖွဲ့လိုက်ဆွေးဆွေးနွေးမှုများကို သဲကုန်းနှင့် ပေါက်ခေါင်းမြို့နယ်အတွင်းရှိ ၂၁ ရွာတွင် ဆောင်ရွက်ခဲ့ပါမည်။

ဒုတိယအကြိမ်လူထုတွေ့ဆုံပွဲကို ၂၀၂၂ ခုနှစ် ဒီဇင်ဘာလ ၁၉ ရက်မှ ၂၅ ရက်အထိ ဆောင်ရွက်ခဲ့ပါသည်။ ၄င်းကာလအတွင်း တွေ့ဆုံပွဲအတွက် စီစဉ်ခြင်းနှင့် အစိုးရအာဏာပိုင်များဆီမှ သဘောတူညီချက်ရယူခြင်းများကို ဆောင်ရွက်ခဲ့ပါသည်။

MOGE၊ ECD နှင့်အတူ ONGC Videsh နှင့် IEM/ EQM တို့သည် ဒေသဆိုင်ရာ အာဏာပိုင်များနှင့် ဒုတိယအကြိမ် လူထုတွေ့ဆုံဆွေးနွေးခြင်းကို ဆောင်ရွက်မည့် စီမံကိန်းလုပ်ငန်းများကို စီမံကိန်းနှင့် အဓိကပါဝင်ပတ်သက်သူများမှ သိရှိစေရန်နှင့် စီမံကိန်းနှင့်ပတ်သက်သည့် မှတ်ချက်များ စိုးရိမ်ပူပန်မှုများကို EIA နှင့် ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်၏ အစိတ်အပိုင်းတခုအဖြစ် ထည့်သွင်းစဉ်းစား ဆောင်ရွက်သွားပါမည်။

IEM/EQM သည် လုပ်ကွက် EP-3 အတွက် အဖွဲ့လိုက်ဆွေးနွေးမှုများကို မြန်မာနိုင်ငံ၊ ပဲခူးတိုင်းဒေသကြီး၊ ပြည်ခရိုင်၊ သဲကုန်းနှင့် ပေါက်ခေါင်းမြို့များတွင် ဆောင်ရွက်ခဲ့ပါသည်။ စီမံကိန်းသက်ဆိုင်သူများနှင့် ဆွေးနွေး အကြံပြုခြင်းများကို ONGC Videsh မှ ဆောင်ရွက်သော လုပ်ကွက် EP-3 ရေနံတူးဖော်ရေးလုပ်ငန်း၏ EIA TOR နှင့်အညီ ဆောင်ရွက်ထားပါသည်။

ခွင့်ပြုချက်နှင့် ထောက်ခံမှုများ ရရှိရန်အတွက် သက်ဆိုင်သူများနှင့် ညှိနှိုင်းဆွေးနွေးပွဲ မဆောင်ရွက်မီ ကွင်းဆင်းအဖွဲ့သည် အကြို ကွင်းဆင်းဆောင်ရွက်ခြင်းနှင့် ဆွေးနွေးပွဲကို ပြည်ခရိုင်၊ သဲကုန်းနှင့် ပေါက်ခေါင်းမြို့ အာဏာပိုင်များနှင့် ဆောင်ရွက်ခဲ့ပါသည်။

ဒုတိယအကြိမ် လူထုတွေ့ဆုံပွဲနှင့် စီမံကိန်းနှင့်သက်ဆိုင်သူများနှင့် တွေ့ဆုံဆွေးနွေးပွဲများကို အောက်ပါအစီအစဉ်အတိုင်း ဆောင်ရွက်ခဲ့ပါသည်။

<u>ပထမရက် (၂၁-၁၂-၂၀၂၁) ရန်ကုန်မှ ပြည်သို့</u>

၉:၃၀ မှ ၃:၃၀ - အဖွဲ့သည် ရန်ကုန်မှပြည်မြို့သို့ထွက်ခွာ။

၃:၃၀ မှ ၄:၃၀ - ပြည်ခရိုင် အထွေထွေအုပ်ချုပ်ရေးမှူးရုံးတွင် စည်းဝေးတွေ့ဆုံ။

---ပထမရက်ပြီး ---

<u>ဒုတိယရက် (၂၂-၁၂-၂၀၂၁) ပေါက်ခေါင်းမြို့ (ဘုရားမ-၁)</u>

၉:၃၀ မှ ၁၂:၀၀ - ပေါက်ခေါင်းမြို့နယ် အထွေထွေအုပ်ချုပ်ရေးမှူးရုံးတွင် စည်းဝေးတွေ့ဆုံ။

၁:၀၀ မှ ၄:၀၀ - ကြို့ပင်ရွာတွင် စည်းဝေးတွေ့ဆုံ (ကြို့ပင်ဝိုင်း၊ ဆက်တုန်း၊ မင်းလမ်းနှင့် သစ်ရောင်းပြန် ကျေးရွာသူ/သားများ၊ သက်ဆိုင်သူများအား ဖိတ်ကြား)

---ဒုတိယရက်ပြီး ---

<u>တတိယရက် (၂၃-၁၂-၂၀၂၁) သဲကုန်းမြို့</u>

၉:၃၀ မှ ၁၂:၀၀ - သဲကုန်းမြို့နယ် အထွေထွေအုပ်ချုပ်ရေးမှူးရုံးတွင် စည်းဝေးတွေ့ဆုံ။ (ဘုရားမ-၁ နှင့် နဝင်း-၁)

၁:၀၀ မှ ၄:၀၀ - ချယားကုန်းရွာတွင် စည်းဝေးတွေ့ဆုံ (ကန်တော်ကြီး၊ ညောင်ကုန်း၊ ဇင်ပြွန်းကုန်း၊ ပျဉ်ထောင်ကုန်း၊ ရွာသစ်၊ ပွေးဘိုင်၊ စံပါယ်ကန်၊ ဝါးလဲ့၊ ရက်သာ၊ ကြို့ကုန်း၊ တောချဉ်၊ သစ်ချို၊ ဖလန်းကုန်း၊ ကောင်းဘင်လု၊ ကရင်ကုန်း ကျေးရွာသူ/သားများ၊ သက်ဆိုင်သူများအား ဖိတ်ကြား)

အောက်ပါ ဇယား ၁-၁၄ တွင် အစည်းအဝေးတက်ရောက်သူများအား ဖော်ပြထားပါသည်။

ဇယား (၁-၁၄) အစည်းအဝေးတက်ရောက်သူများ

နေ့ရက်	အချိန်	အစည်းအဝေး	သက်ဆိုင်သူများ/ ကျေးရွာများ	တက်ရောက်သူ လူဦးရေ
၂၀၂၁ ခုနှစ် ဒီဇင်ဘာလ ၂၁	၁၅:၃၀ - ၁၇:၃၀	ပြည်ခရိုင် အထွေထွေအုပ်ချုပ်ရေးမှူးရုံး	• ပြည်ခရိုင်အုပ်ချုပ်ရေး • သစ်တောဌာန၊ ပြည်ခရိုင် • စီမံကိန်းဌာန၊ ပြည်ခရိုင် • ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဌာန • စိုက်ပျိုးရေးဌာန	၂၂

နေ့ရက်	အချိန်	အစည်းအဝေး	သက်ဆိုင်သူများ/ ကျေးရွာများ	တက်ရောက်သူ လူဦးရေ
			• ရဲဌာန • ကျန်းမာရေးဌာန • ပညာရေးဌာန • ကျေးလက်ဖွံ့ဖြိုးရေးဌာန • မီးသတ်ဌာန • Settlement and Land Records • မြို့နယ်ဖွံ့ဖြိုးရေးကော်မတီ • မြန်မာ့ရေနံနှင့်သဘာဝဓါတ်ငွေ့လုပ်ငန်း • ONGC • IEM/EQM	
၂၀၂၁ ခုနှစ် ဒီဇင်ဘာလ ၂၂	၀၉:၃၀ - ၁၁:၃၀	ပေါက်ခေါင်းမြို့နယ် အထွေထွေအုပ်ချုပ်ရေးမှူးရုံး	• ပေါက်ခေါင်းမြို့နယ် အုပ်ချုပ်ရေးမှူး • လယ်ယာမြေစီမံခန့်ခွဲရေးနှင့် စာရင်းအင်းဦးစီးဌာန • လူဝင်မှုကြီးကြပ်ရေးဌာန • စိုက်ပျိုးရေးဌာန • မြို့နယ်ဖွံ့ဖြိုးရေးကော်မတီ • TEO • စီမံကိန်းဌာန • မွေးမြူရေးနှင့်ကုသရေးဌာန • ကျေးလက်ဖွံ့ဖြိုးဂေးဌာန • ရဲဌာန • မီးသတ်ဌာန • ကျန်းမာရေးဌာန • သစ်တောဌာန • ကျေးလက်လမ်းဖွံ့ဖြိုးရေးဌာန • မြန်မာ့ရေနံနှင့်သဘာဝဓါတ်ငွေ့လုပ်ငန်း • ONGC • IEM/EQM	၂၃
၂၀၂၁ ခုနှစ် ဒီဇင်ဘာလ ၂၂	၁၅:၃၀ - ၁၇:၃၀	ကြို့ပင်ရွာတွင် စည်းဝေးတွေ့ဆုံ (ကြို့ပင်ဝိုင်း၊ ဆက်တုန်း၊ မင်းလမ်းနှင့် သစ်ရောင်းပြန် ကျေးရွာသူ/သားများ၊ သက်ဆိုင်သူများအား ဖိတ်ကြား)	• မြန်မာ့ရေနံနှင့်သဘာဝဓါတ်ငွေ့လုပ်ငန်း • ONGC • IEM/EQM ကျေးရွာများ (1) ကြို့ပင်ဝိုင်း (2) မင်းလမ်း (3) သစ်ရောင်းပြန် (4) ဆက်တုန်း	၅၆
၂၀၂၁ ခုနှစ် ဒီဇင်ဘာလ ၂၃	၀၉:၃၀ - ၁၁:၃၀	သဲကုန်းမြို့နယ် အထွေထွေအုပ်ချုပ်ရေးမှူးရုံးတွင် စည်းဝေးတွေ့ဆုံ။ (ဘုရားမ-၁ နှင့် နဝင်း-၁)	• သဲကုန်းမြို့နယ် အထွေထွေအုပ်ချုပ်ရေးမှူးရုံး • Settlement and Land Records Dept • စီမံကိန်းဌာန • စိုက်ပျိုးရေးဌာန	၁၅

နေ့ရက်	အချိန်	အစည်းအဝေး	သက်ဆိုင်သူများ/ ကျေးရွာများ	တက်ရောက်သူ လူဦးရေ
			• လယ်ယာမြေစီမံခန့်ခွဲရေးနှင့် စာရင်းအင်းဦးစီးဌာန • ဆက်သွယ်ရေးနှင့်သတင်းအချက်အလက် နည်းပညာ ဦးစီးဌာန • မြန်မာ့ရေနံနှင့်သဘာဝဓါတ်ငွေ့လုပ်ငန်း • ONGC • IEM/EQM	
၂၀၂၁ ခုနှစ် ဒီဇင်ဘာလ ၂၃	၁၅:၃၀ - ၁၇:၃၀	ချယားကုန်းရွာတွင် စည်းဝေးတွေ့ဆုံ (ကန်တော်ကြီး၊ ညောင်ကုန်း၊ ဇင်ပြွန်းကုန်း၊ ပျဉ်ထောင်ကုန်း၊ ရွာသစ်၊ ပွေးဘိုင်၊ စံပါယ်ကန်၊ ဝါးလွဲ၊ ရက်သာ၊ ကြိုကုန်း၊ တောချဉ်၊ သစ်ချို၊ ဖလန်းကုန်း၊ ကောင်းဘင်လု၊ ကရင်ကုန်း ကျေးရွာသူ/သားများ၊ သက်ဆိုင်သူများအား ဖိတ်ကြား)	• မြန်မာ့ရေနံနှင့်သဘာဝဓါတ်ငွေ့လုပ်ငန်း • ONGC • IEM/EQM ကျေးရွာများ (1) ချယားကုန်း (2) ထန်းတောကြီး (3) ညောင်ကုန်း (4) ဇင်ပြွန်းကုန်း (5) ပျဉ်ထောက်ကုန်း (6) ရွာသစ် (7) ပွေးဘိုင် (8) စံပါယ်ကန် (9) ဝါးလွဲ (10) ရက်သာ (11) ကြိုကုန်း (12) ကရင်ကုန်း (13) ရွာသာကုန်း (14) တောချဉ် (15) သစ်ချို (16) ဖလံကုန်း (17) ကောင်းဘင်လု	၁၇ ရွာမှ ၅၁ ဦး

ဆွေးနွေးပွဲများကို အောက်ပါအစီအစဉ်အတိုင်း ဆောင်ရွက်ခဲ့ပါသည်။

(1) လူထုတွေ့ဆုံပွဲအစီစဉ်ဖွင့်လှစ်ခြင်း

(2) MOGE မှတာဝန်ရှိပုဂ္ဂိုလ် ဦးဝင်းနိုင်ဆွေမှ အဖွင့်အမှာစကားပြောကြား

(3) ONGC မှ ဦးကျော်ဇောဟန်မှ စီမံကိန်းအကြောင်းမိတ်ဆက်ပြောကြားခြင်း

(4) ONGC Videsh မှ ဦးကျော်ဇောဟန်မှ ကုမ္ပဏီအကြောင်းနှင့် တွင်းတူးခြင်းလုပ်ငန်းအကြောင်း တင်ပြခြင်း

(5) ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း (EIA) အကြောင်းကို EQM ကုမ္ပဏီမှ ဒေါက်တာ ဒေါ်ဥမ္မာမေတင်လှိုင်မှ တင်ပြခြင်း

(6) မေးခွန်းနှင့် အဖြေများ

ဒုတိယအကြိမ်လုထုတွေ့ဆုံပွဲအတွင်း ကျေးရွာနှင့် မြို့နယ်များရှိ သက်ဆိုင်သူများ၏ မေးခွန်းများနှင့် စိုးရိမ်ပူပန်မှုများကို ဇယား ၁-၁၅ တွင် အသေးစိတ်ဖော်ပြထားပါသည်။ အစည်းအဝေးမှတ်တမ်းများကို နောက်ဆက်တွဲ (၅) တွင် ဖော်ပြထားပါသည်။

ဇယား (၁-၁၅) ဒုတိယအကြိမ် လူထုတွေ့ဆုံပွဲမှ အဓိကရလဒ်များ

အဓိကမေးခွန်း/ မှတ်ချက်များ	ပြန်လည်ဖြေကြားခြင်း	လျော့ချရေးလုပ်ငန်းများ
စီမံကိန်းမှ ဘယ်လိုအကျိုးကျေးဇူးတွေရမှာလဲ	စီမံကိန်းလုပ်ကွက် EP-3 သည် အမေရိကန်ဒေါ်လာ ၇၅ သန်း ရင်းနှီးမြှုပ်နှံထားပြီး လုပ်ငန်း စာချုပ်များအရ လမ်းဖောက်လုပ်ခြင်း၊ ဆောက်လုပ်ရေးလုပ်ငန်းများ၊ စီမံကိန်း ပတ်ဝန်းကျင်ရှိ လမ်းများ အဆင့်မြင့်တင်ခြင်း လုပ်ငန်းများ ရှိသောကြောင့် ဒေသခံများအတွက် အလုပ်အကိုင်အခွင့်အလမ်းများ ရရှိနိုင်ပါသည်။ EP-3 ရှိ တွင်း ၂ တွင်းတွင် ရေနုံနှင့် သဘာဝဓါတ်ငွေ့ ထုတ်လုပ်ခြင်းဆောင်ရွက်ပါက ဒေသခံများအတွက် ထပ်ဆောင်း အခွင့်အလမ်းများနှင့် CSR လုပ်ငန်းများကို တိုးမြင့်သွားရန် မျှော်မှန်း ထားပါသည်။ အလုပ်အကိုင်များရှိမည်ဖြစ်ပြီး OVL သည် အနီးအနားရှိ ကျေးရွာသူ/ သားများကို ဌားရမ်းသွားပါမည်။ လုပ်ငန်းမစမီ လမ်းပြင်ခြင်း၊ ဆောက်လုပ်ရေးလုပ်ငန်းများ စတင်ဆောင်ရွက်ခြင်းများ စီစဉ်ထားသောကြောင့် ၄င်းလုပ်ငန်းများသည် ကျေးရွာလူထုအတွက် အလုပ်အကိုင်များ ရရှိနိုင်ပါသည်။	• စီမံကိန်းအစီအစဉ်များကို ဒေသဆိုင်ရာ လုပ်ငန်းများနှင့် အထောက်အပံ့များကို အသုံးပြုရန် • CSR အစီအစဉ်ကို MOGE နှင့် ဒေသဆိုင်ရာ အဖွဲ့အစည်းများနှင့် ညှိနှိုင်းဆောင်ရွက်သွားရန်။
CSR နဲ့ပတ်သက်ပြီး ဘယ်လိုအစီအစဉ်တွေရှိပါသလဲ	OVL သည် သင်္ကြားစက်ရုံပိုင်လမ်းပိုင်းအား ပြန်လည်အဆင့်မြှင့်တင်ဖေါက်လုပ်ရန်စီစဉ်ထားပါသည်။ အဆင့်မြှင့်တင်ဖေါက်လုပ်သွားမည့်လမ်းပိုင်းအရှည်မှာ ၁၃မိုင်ခန့်ဖြစ်ပြီး၊ လမ်းအကျယ် ၁၈ပေခန့်ဖြစ်ပါသည်။ ထိုကဲ့သို့ပြန်လည်အဆင့်မြှင့်တင်ခြင်းအားဖြင့် ဒေသခံတောင်သူများအတွက် အလွန်အကျိုးရှိမည်ဟု ယုံကြည်ပါသည်။ လမ်းအား တန် ၆၀ ခံနိုင်ဝန်ရှိသည်အထိ အဆင့်မြှင့်တင်မည်ဖြစ်ပါသည်။	• ဆက်သွယ်ရေးလမ်းများကို ဒေသခံလုထုနှင့် သင်္ကြားစက်အတွက် အကျိုးရှိစေရန် ဒီဇိုင်းရေးဆွဲဖောက်လုပ်ရန်
	OVL သည် CSR လုပ်ငန်းများကို ထုတ်လုပ်ရေးကာလမှ စတင်ဆောင်ရွက်ရန် လိုအပ်သည်ဖြစ်သော်လည်း စီးပွားဖြစ်ထုတ်လုပ်ရေးများ မစတင်မီ ဆိုက်စမစ်လုပ်ငန်း ဆောင်ရွက်စဉ် ကာလကတည်းက CSR လုပ်ငန်းများကို စတင်ဆောင်ရွက်နေပြီဖြစ်ပါသည်။	• ထပ်တိုး CSR လုပ်ငန်းများအတွက် OVL သည် MOGE နှင့် ဆွေးနွေးသွားရန်
	လမ်းဖောက်လုပ်ခြင်း ကုန်ကျစရိတ်မှာ သိန်း ၂၀၀၀၀ ကျပ်ခန့် ဖြစ်ပါသည်။	• ဆက်သွယ်ရေးလမ်းများကို ရာသီအားလုံး တွင်အသုံးပြုသွားလာနိုင်ရေးအဆင့်မြှင့်တင်

အဓိကမေးခွန်း/ မှတ်ချက်များ	ပြန်လည်ဖြေကြားခြင်း	လျော့ချရေးလုပ်ငန်းများ
		သွားရန်နှင့် ဒေသခံလူထု၏ ရေရှည်အကျိုးစီးပွားကို မျှော်မှန်း၍ ဆောင်ရွက်သွားရန်။
စီမံကိန်းက ဘယ်အချိန်စတင်ပြီး ဘယ်အချိန်ပြီးမှာပါလဲ	စီမံကိန်းသည် ဆောင်ရွက်ဆဲအဆင့်ဖြစ်ပြီး တွင်းတူးခြင်းလုပ်ငန်းများကို မုတ်သုံရာသီပြီးသည်နှင့် စတင်နိုင်လိမ့်မည်ဖြစ်ကာ ၆လမှ ၈လအထိကြာမြင့်နိုင်ပါသည်။	
အစမ်းတွင်းတွင်းပြီးပါက ၄င်းတွင်းနှင့် အဆောက်အဦးများကို အစိုးရသို့ ပြန်လည်အပ်နှံမှာလား။ ဘယ်လိုအစီစဉ်တွေရှိပါသလဲ။	အစမ်းတွင်းများမှ ရေနံထုတ်လုပ်ရန်အလားအလာရှိပါက ရေနံမြေဖို့ဖြိုးတိုးတက်မှုအား အစိုးရ၏ခွင့်ပြုချက်များ ရယူပြီးမှသာစတင်ဆောင်ရွက်ပါမည်။ စီမံကိန်းတွင် MOGE၏ ထည့်ဝင်မှုများရှိလာမည်ဖြစ်ပြီး ကနဦးရှာဖွေရေးဆင့်တွင်ရင်းနှီးမြှုပ်နှံမှုများနှင့် ပတ်သက်၍ပြန်လည်ပေးချေရန်နှင့် အခွန်ကိစ္စရပ်များကို PSC စာချုပ်ပါအတိုင်းဆောင်ရွက်သွားမည်ဖြစ်ပါသည်။	• လယ်ယာမြေများနှင့် သစ်တောမြေ အသုံးပြုခြင်းများအတွက် လျော်ကြေးများ ဆောင်ရွက်ရန် • OVL သည် ဂေဟဆိုင်ရာ ထိန်းသိမ်းခြင်း အစီအစဉ်ကို အထောက်အပံ့အဖြစ် အပင် ၁၈၀ စိုက်ပျိုးသွားရန်
	အစမ်းတွင်းများကို လယ်ယာမြေနှင့် သစ်တောမြေများတွင်တူးဖော်မည်ဖြစ်သောကြောင့် ၎င်းလယ်ယာမြေ/သီးနှံနှစ်နာမှုများအား သက်ဆိုင်ရာတောင်သူများထံသို့ နစ်နာကြေးများပေးချေသွားပါမည်။ မြို့နယ်/ခရိုင်လယ်ယာမြေစီမံခန့်ခွဲရေးအဖွဲ့နှင့် MOGEတို့က လယ်ယာမြေ/သီးနှံပိုင်ရှင်များနှင့် ညှိနှိုင်းဆွေးနွေးပြီး နောက်ဆုံးအဆိုပြုချက်ကို တိုင်းလယ်ယာမြေစီမံခန့်ခွဲရေးအဖွဲ့သို့တင်ပြသွားမည်ဖြစ်ပြီး ၎င်းကတဆင့် ဗဟိုလယ်ယာမြေစီမံခန့်ခွဲရေးအဖွဲ့ထံဆက်လက်တင်ပြသွားကာ ဗဟိုလယ်ယာမြေစီမံခန့်ခွဲရေးအဖွဲ့၏ ခွင့်ပုံချက်ရရှိပါက ONGC Videsh သည် ထိခိုက်နစ်နာသွားသည့်တောင်သူများအား နစ်နာကြေးများပေးချေသွားပါမည်။	
	သစ်တောမြေများအသုံးပြုခြင်းအတွက် သစ်တောဝန်ကြီးဌာနမှ သတ်မှတ်ထားသည့် ဌာနရမ်းခအတိုင်း အသုံးပြုပြီး ပြန်လည်အပ်နှံသွားပါမည်။ OVL သည် ဂေဟဆိုင်ရာ ထိန်းသိမ်းခြင်း အစီအစဉ်ကို အထောက်အပံ့အဖြစ် အပင် ၁၈၀ စိုက်ပျိုးသွားပါမည်။	
လမ်းသစ် ၃၅၀ မီတာ ဖောက်လုပ်မှာက ပေါက်ခေါင်းမြို့နယ်အတွင်းမှာလား	၃၅၀ မီတာ လမ်းသစ်ကို သဲကုန်းမြို့နယ်အတွင်း ဖောက်လုပ်မည်ဖြစ်ပါသည်။ Myanma Economic Holdings Public Company Limited (EH) ၏ သက်ကြားစက်လမ်းကို ပိုမိုခိုင်မာမှုရှိစေရန် ၆ မီတာခန့် တိုးချဲ့ဖောက်လုပ်သွားပါမည်။ သစ်တော ဧရိယာအတွင်း လက်ရှိ လမ်းဟောင်း ၄ မီတာခန့်ကို လမ်းအကျယ်ချဲ့ထွင်ခြင်း ပြုလုပ်မည်မဟုတ်ပါ။ သို့သော်လည်း ပိုမိုခိုင်မာစေရန် မွန်းမံသွားပါမည်။ ရှင်းပြပြီးသည့်အတိုင်း ကြံစိုက်သည့် လယ်သမားများကို လျော်ကြေးများ ပေးခြေသွားပါမည်။ လမ်းသစ် ၃၅၀	• ဆက်သွယ်ရေးလမ်းကို အရှည် ၃၅၀ မီတာ အကျယ် ၆ မီတာ ဖောက်လုပ်ပြီး တန် ၆၀ ခံနိုင်ဝန်ရှိပါမည်။

အဓိကမေးခွန်း/ မှတ်ချက်များ	ပြန်လည်ဖြေကြားခြင်း	လျော့ချရေးလုပ်ငန်းများ
	မီတာကို လက်ရှိလမ်းဟောင်း အဆုံးနေရာမှ တွင်းနေရာ ရောက်သည်အထိ ဖောက်လုပ်မည်ဖြစ်ပြီး လမ်းအကျယ်မှာ ၆ မီတာ ဖြစ်ပါသည်။	
အမှိုက်စွန့်ပစ်မှုအတွက် ဘယ်လိုစီစဉ်ထားပါသလဲ။	OVL သည် မြန်မာအစိုးရမှ အသိအမှတ် ပြုထားသော နိုင်ငံတကာ ကုမ္ပဏီတစ်ခုနှင့် စာချုပ်ချုပ်ဆိုပါမည်။ စွန့်ပစ်ပစ္စည်းများကို သီလဝါ၊ ရန်ကုန် သို့ သယ်ဆောင်သွားပါမည်။ OVL သည် တွင်းတူးလုပ်ငန်း ပြီးစီးပါက စက်ကိရိယာများ အားလုံး ဖယ်ရှားပြီး မြေယာကို ပြန်လည်ပြင်ဆင် သွားပါမည်။	• စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှုအစီအစဉ်ကို လိုက်နာဆောင်ရွက်ရန်
လက်ရှိ EIA အစီရင်ခံစာက တစ်နှစ်စာပဲ တရားဝင်တာ ဟုတ်ပါသလား။ အစမ်းတွင်းတူးခြင်း အောင်မြင်ပါက အခြား EIA အစီရင်ခံစာ ထပ်ပြုစုမှာလား။	ဤ EIA အစီရင်ခံစာသည် တွင်းစမ်းသပ် ကာလအတွက် ဖြစ်ပါသည်။ ထုတ်လုပ်ရေးအဆင့် ရောက်ပါက တွင်းစမ်းသပ်ကာလနှင့် ထုတ်လုပ်ရေးကာလ ပတ်ဝန်းကျင်ထိခိုက်မှု မတူညီသောကြောင့် OVL သည် EIA အစီရင်ခံစာ အသစ် ထပ်မံပြုစုမည်ဖြစ်ပါသည်။	• တွင်းတူး ရှာဖွေရေးလုပ်ငန်းများ မတိုင်မီ EIA အစီရင်ခံစာအတည်ပြုချက်ကို ရယူရန်။
CSR လုပ်ငန်းအတွက် ဘာအစီအစဉ်တွေရှိပါသလဲ။	လမ်းဖေါက်လုပ်ခြင်းအတွက် သိန်း ၂၀၀၀၀ကျပ်ခန့် ကုန်ကျမှုရှိနိုင်လိမ့်မည်ဖြစ်ပြီး နောက်ပိုင်းCSRလုပ်ငန်းများအ တွက် လာမည့်အစည်းအဝေးတွင် MOGEနှင့် ဆွေးနွေး ဆောင်ရွက်သွားပါမည်။ MOGE၏ ဆွေးနွေးမှုရလဒ်ပေါ် မူတည်၍ ထပ်တိုးCSRလုပ်ငန်းများကို ဆောင်ရွက်သွား ရန် စီစဉ်ထားပါမည်။	• ကနဦး CSR လုပ်ငန်းများအဖြစ် ဒေသခံလူထုကို အကျိုးရှိစေမည့် လမ်းဖောက်လုပ်ခြင်း လမ်းပြုပြင်ခြင်းများ ဆောင်ရွက်သွားရန်
	MOGE သည် ထုတ်လုပ်မှုမှ ရရှိသော အမြတ်ငွေ၏ ၂% ကို CSR အတွက် ရည်ရွယ်ထားပါသည်။ လမ်းဖောက်လုပ်ခြင်း ကုန်ကျစရိတ်မှာ သိန်း ၂၀၀၀၀ ခန့်ရှိပါသည်။	• OVL သည် ထုတ်လုပ်ရေးစတင်သည်နှင့် CSR လုပ်ငန်းများအတွက် MOGE နှင့် တိုင်ပင်ဆောင်ရွက်ရန် • ဆက်သွယ်ရေးလမ်းများကို ဒေသခံလူထု၏ ရေရှည်အကျိုးစီးပွားကို မျှော်မှန်း၍ ဆောင်ရွက်သွားရန်
	အကယ်၍ ဟိုက်ဒရိုကာဗွန်များကို စီမံကိန်း ကာလအတွင်း မတွေ့ရှိပါက မြေယာများ အားလုံးကို သစ်တောဌာနနှင့် MOGE သတ်မှတ်ချက်များအရ လယ်သမားများထံ ပြန်လည် အပ်နှံသွားပါမည်။	• စီမံကိန်းပြီးစီးပါက မြေယာများအား လုံးကို MOGEကချမှတ်ထားသည့် စည်းကမ်းများနှင့်အညီ ပြန်လည်အပ် နှံသွားရန်။
ဤစီမံကိန်းတွင် လူဦးရေဘယ်လောက်များများ ပါဝင်မှာပါလဲ။	စီမံကိန်း လုပ်ငန်းခွင်တွင် ခန့်မှန်းခြေ လူ ၂၀၀ ခန့် ဆောင်ရွက်ပါမည်။	• ဆောက်လုပ်ရေးနှင့် တွင်းတူး ကန်ထရိုက်တာများသည် ကျွမ်းကျင်မှုအပေါ် မူတည်ပြီး အနီးအနား ဧရိယာမှ ဒေသခံများကို ဌားရမ်းသွားရန်။
မီးသတ်တာဝန်ခံ ခန့်အပ်ထားရန် အစီအစဉ်ရှိပါသလား။	ကုမ္ပဏီနှင့် ကန်ထရိုက်တာများ အားလုံးတွင် ကျွန်းမာရေး၊ ဘေးကင်းလုံခြုံရေးနှင့် ပတ်ဝန်းကျင် ဆိုင်ရာ မန်နေဂျာ တစ်ယောက် ထားရှိပါမည်။ မတော်တဆမှု ဖြစ်ပေါ်ပါက ပရိုတိုကောများ ထားရှိ ဆောင်ရွက်ပါမည်။ ECD ကို လုပ်ငန်းခွင် အရေးပေါ်	• မီးလောင်မှု ဖြစ်ပေါ်ပါက ထိခိုက်မှုများကို လျော့ချရန် အေသးစိတ် အစီအစဉ်များ ပါဝင်သော ONGC Videsh ၏ အရေးပေါ် တုန့်ပြန်ရေး အစီအစဉ်ကို အကောင် အထည်ဖော် ဆောင်ရွက်ရန်

အဓိကမေးခွန်း/ မှတ်ချက်များ	ပြန်လည်ဖြေကြားခြင်း	လျော့ချရေးလုပ်ငန်းများ
	တုန့်ပြန်ရေး အစီအစဉ်များ အတွက်လည်း လိုအပ်ပါမည်။ EIA အစီရင်ခံစာတွင် ဒေသခံ မီးသတ်လုပ်ငန်း ပါဝင်မည်ဖြစ်ပြီး ကုမ္ပဏီ၏ HSE အဖွဲ့ကိုလည်း ဒေသခံမီးသတ်တပ်ဖွဲ့နှင့် လိုအပ်သလို တိုင်ပင် ဆောင်ရွက်သွားရန် အကြံပေးသွားပါမည်။	• ONGC Videsh နှင့် ဌာနရမ်းထားသော ကန်ထရိုက်တာများသည် မြို့နယ် မီးသတ်တပ်ဖွဲ့နှင့် ပူးပေါင်း ဆောင်ရွက်သွားရန်
ဤလမ်းပေါ်တွင် ကြံသယ်ရန်အတွက် နေ့စဉ် ယာဉ် ၁၀၀ ခန့် ဖြတ်သန်း သွားလာလျက်ရှိပါသည်။ ၎င်းကြောင့် လမ်းဘက်ခြမ်းရှိ အိမ်များ ဖုန်ထူလျက် ရှိပါသည်။ ဤပြဿနာကို ဘယ်လို ဖြေရှင်းပေးပါမည်လဲ။	စီမံကိန်းအဖွဲ့အား တက်နိုင်သမျှ ယာဉ်များကို လျော့သုံးရန် အကြံပေးထားပါမည်။ အခါသင့်သလို ရေသယ်ယာဉ်များဖြင့် လမ်းရေဖြန်းခြင်း ဆောင်ရွက်သွားပါမည်။	• လမ်းများ ပြင်ဆင်ခြင်း၊ ဖောက်လုပ်ခြင်း မဆောင်ရွက်မီ MOGE နှင့် သက်ဆိုင်ရာ အစိုးရဌာနများမှ ထောက်ခံချက် ရရှိယူရန် • ယာဉ်သွားလာရေး အဆင်ပြေစေရန်နှင့် လမ်းပျက်စီးမှု လျော့ချရန် ဒေသတွင်း လမ်းများကို ပုံမှန် ထိန်းသိမ်းသွားရန် • ကန်ထရိုက်တာ (သို့) ကုမ္ပဏီကြောင့် ဖြစ်ပေါ်လာသော လမ်းပျက်စီးမှုများကို ပြန်လည်ပြင်ဆင်ရန်
စီမံကိန်းပတ်ဝန်းကျင်တွင် ရေနုတ်မြောင်း ဖောက်လုပ်ခြင်းများ ဆောင်ရွက်မှာလား။	တာတမံနှင့် လုပ်ကွက်နေရာ ကြားတွင် ရေမြောင်းစနစ်တခု ဆောင်ရွက်ရန် စီစဉ်ထားပါသည်။ လုပ်ကွက်များကြားတွင် မြောင်းများရှိပြီး မြောင်းပိတ်ကာ မုတ်သုံရာသီအတွင်း ရေလျံနိုင်ခြေ ရှိပါသည်။ ရေနုတ်မြောင်း အသစ်ဆောက်လုပ်မည် ဖြစ်သောကြောင့် ရေကြီး၊ ရေလျံမှုကို လျော့ချနိုင်ပါမည်။ တွင်းတူးခြင်းကို မုတ်သုံရာသီတွင် ဆောင်ရွက်မည် မဟုတ်ပါ။ တွင်းတူးခြင်း လုပ်ငန်းပြီးစီးပါက စက်ကိရိယာများကို လုပ်ငန်းနေရာမှ ဖယ်ရှားသွားပါမည်။	• ရေကြီး ရေလျံမှု လျော့ချရန် ရေနုတ်မြောင်းများကို ဒီဇိုင်းဆွဲ ဆောင်ရွက်ရန် • လမ်းများ ပြင်ဆင်ခြင်း၊ ဖောက်လုပ်ခြင်း မဆောင်ရွက်မီ MOGE နှင့် သက်ဆိုင်ရာ အစိုးရဌာနများမှ ထောက်ခံချက် ရရှိယူရန် • တွင်းတူးရာဖေခြင်း ဆောင်ရွက်စဉ်အတွင်း ကန်ထရိုက်တာ (သို့) ကုမ္ပဏီကြောင့် ဖြစ်ပေါ်လာသော လမ်းပျက်စီးမှုများကို ပြန်လည်ပြင်ဆင်ရန်

၁.၁၀။ နိဂုံး

ပတ်ဝန်းကျင်ဆိုင်ရာ ပြဿနာများအားလုံးကို နိမ့်သော (သို့မဟုတ်) မပြောပလောက်သော အဆင့်အဖြစ် သတ်မှတ်ထားပြီး ဖြစ်နိုင်ခြေရှိသော သက်ရောက်မှုများကို လျော့ချရန် စီမံခန့်ခွဲနိုင်ပါသည်။ အလယ်အလတ်ရှိသော လူမှုရေးဆိုင်ရာ ပြဿနာများအဖြစ် စီမံကိန်းအဆင့်အားလုံးတွင် လူထုတွေ့ဆုံဆွေးနွေးပွဲကာလအတွင်း ပို့ဆောင်ဆက်သွယ်ရေး အပါအဝင် တွင်းတူးနေရာ မီတာ ၅၀၀ ပတ်လည်တွင် ကြံရိတ်သိမ်းချိန်ကာလအတွင်း လမ်းအသုံးပြုမှုများ ပါဝင်ပါသည်။ ဒေသခံလူထုသည် အဆိုပြုတွင်းတူးမည့်နေရာနှင့် နီးကပ်သောကြောင့် ၎င်းလုပ်ဆောင်မှုအားလုံးကို စောင့်ကြည့် စစ်ဆေးရန် လိုအပ်ပါလိမ့်မည်။

ဓါတုရွံ့များနှင့် တွင်းတူးအမှိုက်များအပါအဝင် ကျန်းမာရေးပြဿနာများ၊ ကူးလူးဆက်ဆံရာမှ ဖြစ်ပေါ်နိုင်သော ရောဂါများ၊ ဆူညံသံနှင့် မီးတောက်စမ်းသပ်ထုတ်လွှတ်မှုများကို အလယ်အလတ်အဆင့်အဖြစ် သတ်မှတ်ထားပါသည်။ ဒေသခံလူထုနှင့် နီးသော စီမံကိန်းနေရာများတွင် ၎င်းတို့ကို စောင့်ကြည့်စစ်ဆေးရန် လိုအပ်ပါသည်။ တွင်းတူးနေရာ မီတာ ၅၀၀ ပတ်လည်အနီးတွင် နေထိုင်ကြသော ဒေသခံများ ရှိပါသည်။ ဒေသတွင်းကျန်းမာရေး ဝန်ဆောင်မှု အဆောက်အဦး

များမရှိသောကြောင့် ONGC Videsh သည် အစမ်းတွင်း တူးဖော်မည့် ကာလတစ်လျောက် လုပ်ငန်းခွင်တွင် ဆေးခန်းတစ်ခုထားရှိပါမည်။ စွန့်ပစ်ပစ္စည်းများအားလုံးကို အပြည်ပြည်ဆိုင်ရာ စံနှုန်းများနှင့် ကိုက်ညီစေရန်သီးခြားစွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှုအစီအစဉ်ကို ဆောင်ရွက်ရပါမည်။ ဟိုက်ဒရိုကျင် ဆာလဖိုက်သည် အန္တရာယ်ရှိစေနိုင်ပြီး တပ်ဆင်ခြင်းနှင့် စမ်းသပ်ခြင်းများအတွက် စောင့်ကြည့်စစ်ဆေးသည့် ကိရိယာများ လိုအပ်ပါသည်။ အရေးပေါ်တုန့်ပြန်မှုကိရိယာများ အသုံးပြုရာတွင် လေ့ကျင့်သင်ကြားထားသော သူများဖြင့် ဆောင်ရွက်ရန် လိုအပ်ပါသည်။

ကြိုတင်စီစဉ်မထားသော ဖြစ်ပျက်မှုများကြောင့် ကြွင်းကျန်သက်ရောက်မှု အလယ်အလတ်အဆင့်ရှိနိုင်ပါသည်။ စီစဉ်မထားသော ဖြစ်ပျက်မှုများ မဖြစ်ပေါ်နိုင်အောင် ဆောင်ရွက်ခြင်းသည် လက်ရှိသင်တန်းအစီအစဉ်များနှင့် လုပ်ငန်းခွင် အရေးပေါ်တုန့်ပြန်မှုအစီအစဉ်များနှင့်ဆက်စပ်နေပါသည်။

ပေါက်ကွဲထွက်ခြင်းကို လျော့ချရန် BOP ကို တပ်ဆင်ပြီး စမ်းသပ်ရန် လိုအပ်ပါသည်။ တွင်းတူးခြင်း လုပ်ငန်းစဉ်ကို ဂရုတစိုက် အကောင်အထည်ဖော် ဆောင်ရွက်ရန်လိုအပ်ပါသည်။ မီးဘေးအန္တရာယ်နှင့် ဆက်စပ်နေသော ပေါက်ကွဲမှု ဘေးအန္တရာယ်များအတွက် ပုံမှန်စောင့်ကြည့်စစ်ဆေးခြင်းများ ဆောင်ရွက်ရန် လိုအပ်ပါသည်။ မီးဘေးကြောင့် ပျက်ဆီးမှု များကို လျော့ချနိုင်ရန် မီးသတ်ဆေးဘူးများကိုလည်း ထားရှိပေးရပါမည်။

ဤဒေသသည် ယခင်ကငလျင်ဖြစ်ပေါ်ဖူးပြီး ငလျင်ကြောင့်ဖြစ်ပေါ်လာသော သက်ရောက်မှုများကိုလျော့ချရန် ဒီဇိုင်းများကို ထည့်သွင်းစဉ်းစားရန် လိုအပ်ပါသည်။ ကြိုတင်စီစဉ်မထားသော ဖြစ်ရပ်များအတွက် လုပ်ငန်းခွင် အရေးပေါ် တုန့်ပြန်မှု အစီအစဉ်များ လိုအပ်ပြီး ဖြစ်နိုင်ပါက အစမ်းတွင်း တူးဖော်ခြင်းလုပ်ငန်းမစတင်မီ ဝန်ထမ်းများအားလုံးကို သင်တန်းပို့ချရန်လိုအပ်ပါသည်။

ဒေသခံများအတွက် ကောင်းသော သက်ရောက်မှုများမှာ လမ်းနေရာ၊ တွင်းနေရာနှင့် ယာယီစခန်းနေရာများအတွက် မြေဝယ်ယူခြင်း (သို့) ငှားရမ်းခြင်းများဖြစ်ပါသည်။ ၎အပြင် လမ်းဖောက်ခြင်းအတွက် လိုအပ်သော ဝန်ဆောင်မှုများ၊ အလုပ်အကိုင်အခွင့်အလမ်းများနှင့် ကုန်ပစ္စည်း၊ ဝန်ဆောင်မှုများ အသုံးပြုခြင်း၊ ဝင်ငွေရရှိမှု၊ တွင်းတူးခြင်းပြီးဆုံးပါက မြေယာပြန်လည်ရရှိခြင်း၊ စွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲမှုနှင့် မြေနေရာအား နဂိုမူလအတိုင်း ပြန်လည်ထားရှိခြင်းတို့ ပါဝင်ပါသည်။

OVL ၏ QHSE စံနှုန်းအရနှင့် ထွက်ပေါ်လာသောသက်ရောက်မှုများကိုအခြေခံ၍ သတ်မှတ်ထားသော ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်ကိုအကောင်အထည်ဖော်ဆောင်ရွက်ရန်အတွက် လိုအပ်သောဘတ်ဂျက်ကို အမေရိကန်ဒေါ်လာ ၁၇၀,၀၀၀ ဟု ခန့်မှန်းထားပါသည်။ OVL သည် ၄င်းဘတ်ဂျက်ကို တွင်းတူး ကုန်ကျစရိတ် ထဲတွင်ထည့်သွင်းသွားပါမည်။ သို့သော်လည်း မြန်မာနိုင်ငံရှိပြဋ္ဌာန်းထားသောဥပဒေများနှင့်အညီ၊ လိုအပ်ပါက OVL သည် ထပ်ဆောင်းဘတ်ဂျက်များကို ခွဲဝေအသုံးချသွားပါမည်။

အကြံပြုချက်များ-

အောက်ပါအချက်များကို အကြံပြုထားပါသည်။

- တွင်းတူးနေရာပြင်ဆင်ခြင်းမဆောင်ရွက်မီ သက်ဆိုင်သူများနှင့် တွေ့ဆုံဆွေးနွေးရန် အကြံပြုထားသည်ကို အကောင် အထည်ဖော် ဆောင်ရွက်ရန်။
- လုပ်ငန်းခွင်စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှု အစီအစဉ်ကို ဆောင်ရွက်ရန်။
- ONGC Videsh ၏ အရေးပေါ်တုန့်ပြန်မှု အစီအစဉ်ကို အသုံးချရန်။
- စီမံကိန်းမစတင်မီ အကြံပြုထားသော သင်တန်းအစီအစဉ်များကို ဆောင်ရွက်ရန်။
- ဒေသခံလူထုအား ထိခိုက်မှု မရှိသည်ကို သေချာစေရန် ရယူမည့် ရေအရင်းအမြစ်ကို ဖော်ထုတ်ပြရန်။
- အခန်း (၈) တွင် ဖော်ပြထားသော ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်အတိုင်း လိုက်နာဆောင်ရွက်ရန်။

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1. EXECUTIVE SUMMARY

1.1 Context of the Project

This EIA Report has been prepared in accordance with the Environmental Rules and Associated Environmental Impact Assessment Procedure, issued by the Ministry of Natural Resources and Environmental Conservation (MONREC) under powers conferred on them to do so by sub-section (b) of Section 42 `of the Environmental Conservation Law, according to Notification No. 9/2012 of the Government of the Republic of the Union of Myanmar. All Myanmar legislative requirements and International Guidelines and Standards, which shall be adhered to as a minimum for the EIA study have been summarized and included.

ONGC Videsh Limited (ONGC Videsh), a 100% subsidiary company of Oil and Natural Gas Corporation Limited (ONGC), was awarded Block EP-3 to explore and produce hydrocarbon in the Myanmar Onshore Bidding Round 2013. Production Sharing Contract (PSC) for the onshore Block was signed between Myanmar Oil and Gas Enterprise (MOGE), ONGC Videsh Limited and Machinery & Solutions Company Limited (M&S) on 8th August, 2014.

ONGC will conduct an exploration drilling campaign in Block EP-3. As per PSC commitment, Minimum work program for is Acquisition, Processing & Interpretation of 2D seismic data and drilling of 2 exploratory wells in 1st exploration phase, which commenced from 1st January 2016. ONGC Videsh has successfully completed the 2D seismic data acquisition work in the 1st week of February 2018 Also, 2D seismic data processing and Crop compensation have been completed and two wells released by MOGE based on results of seismic data acquisition. ONGC Videsh will start the activities of drilling 2 exploratory wells in 2022 to fulfill the commitment of the initial exploration phase. ONGC Videsh is planning to spud the first well in November 2022.

1.2 Project Proponent

ONGC Videsh Ltd. a Miniratna Schedule “A” Central Public Sector Enterprise (CPSE) of the Government of India under the administrative control of the Ministry of Petroleum & Natural Gas is the wholly owned subsidiary and overseas arm of Oil and Natural Gas Corporation Limited (ONGC), the flagship national oil company (NOC) of India.

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Registration No.	130056245
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Principal Contact Person	Rajiv Nischal, Country Manager
Phone Number	Tel: +95-1-536573,
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Email Address	CM_Myanmar@ongcvidesh.in

1.3 Policy, Legal and Institutional Framework

Under Section 7 of the Environmental Conservation Law and Articles 52 and 53 of the Environmental Conservation Rules of the Republic of the Union of Myanmar, ONGC Videsh is required to undertake an EIA to obtain an Environmental Compliance Certificate (ECC) for the proposed Project.

The Project will be undertaken in line with a number of national and local standards and laws. Local laws relating to EIA include:

- Myanmar Environmental Conservation Laws, 2012 (Section 7(o), 14,15,29)
- Environmental Conservation Rules, 2015 (Regulation 69)
- Environmental Impact Assessment Procedure, 2015 (Section 87,102 to 110,113,115)
- National Environmental Quality (Emissions) Guideline (2015)

Additional details on the policy and regulatory framework are presented in **Chapter 3** of the EIA Report.

1.4 Project Description and Alternatives

1.4.1 Objective

Purpose of this document is to provide an EHS Scoping of ONGC Videsh plan to develop an exploration drilling campaign in onshore Block EP-3 with a maximum of two (2) exploration wells being drilled. Total expected financial implication of ONGC Videsh for drilling of 2 exploratory wells is to be around 53.55 MM USD.

The primary objectives of the onshore exploration drilling project in Block EP-3 are to:

1. Explore the hydrocarbon potential in Block EP-3;
2. Fulfill the PSC commitments.

The full project description is presented in **Chapter 4** of the EIA report.

1.4.2 Project Justification

In 2018, ONGC Videsh successfully acquired about 563 full-fold LKM 2D seismic data in EP3 block in the areas of Thegon, Pyay, Paungde, Paukkhaung and Nattalin Township of Bago Region.

ONGC Videsh is planning to conduct a drilling campaign in 2021 in order to explore petroleum potential in Block EP 3 and fulfill the PSC commitments. This drilling campaign will consist of two (2) exploration drilling wells located in Thegon Township, Bago Region, Myanmar. The access road for Naweng-1 is along an existing roadway directly off the Yangon-Pyay highway in Thegon Township. The access road to Payama-1 crosses the Paukkhaung Township. ONGC Videsh is planning to spud the first well on 1st November 2022.

1.4.3 Project Alternatives

1.4.3.1 No Project

If the proposed exploration project is not implemented, economic benefits generated by the project would not occur. Benefits lost would include the following:

1. Employment generation and project expenditures during exploration drilling;
2. Potential loss/delay of petroleum production from the site;
3. Loss of revenue for the Myanmar and local governments through Production Sharing Contracts (PSC);
4. The future contribution of crude oil from this area would need to be replaced with an equivalent amount sourced from overseas. Importing crude oil from outside Myanmar has associated impacts from transportation (emissions, potentials for spills) as well as cost implications;

1.4.4 Drilling Location

The two exploration wells in Block EP-3 will be drilled in two different locations. The well site coordinates are detailed in **Table 1-1**.

Table 1-1: Well Site Coordinates

Well	Lat	Long
Naweng-1	18° 31' 22.3437"N	95° 24' 21.6247" E
Payama-1	18° 45' 1.7997" N	95° 27' 45.1252" E

The existing condition of the well pad for Naweng-1 (target depth of 5225m) is located in paddy field and the land acquisition will be completed as per MOGE requirements. The existing condition of the well pad for Payama-1 (target depth of 2230 m) well is located in the Sha Byin Reserved Forest Area. The land for Payama-1 well will be rented as per agreement with MOGE and the Forest Department of MONREC. The well pad design and orientation will be designed to offer the safest conditions with lowest construction requirements as shown in **Figure 1-1**.

ONGC Videsh intends to use land-drilling rigs to drill the well sites for this drilling campaign. There is no suitable existing accommodation, such as hotels or guest houses, within a reasonable distance of the proposed well sites, so a temporary camp site will be established within the well sites.

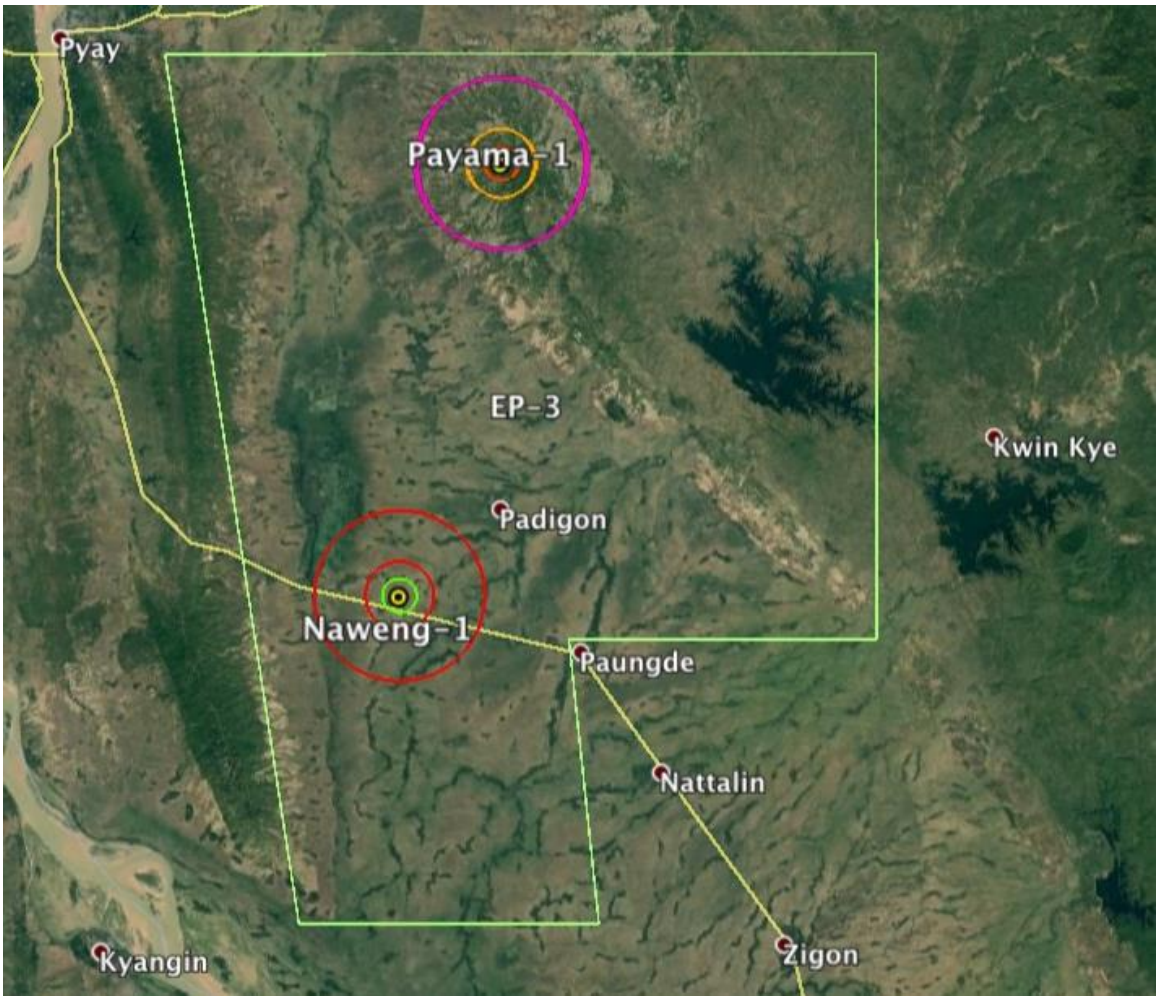

Figure 1-1: Well Site Locations and Project Areas (1000, 2000 & 5000 meters)

1.4.5 Project Schedule

The exploration drilling wells would be drilled during the dry season after the monsoon season. The EP-3 project timeline is shown in **Table 1-2**.

Table 1-2: EP-3 Project Schedule

Activity	Date	
	Naweng-1	Payama-1
Well site construction	April-July (2022)	April-Sept. (2022)
Spud Date	November (2022)	November (2022)
Drilling duration	120 Days	30 Days
Completion duration	15 Days	15 Days
Well testing duration	15 Days	15 Days

1.4.6 Exploration Drilling Phases

Major activities of project consist of Construction Phase, Drilling Phase, Well Testing Phase and Well Completion, Suspension, Abandonment or Contingency Well.

- **Construction Phase**
  - ONGC Videsh will acquire the area for the Naweng-1 wellsite and rent the area for the Payama-1 wellsite construction.
  - The Naweng-1 wellsite will be constructed with area of 200 x 200 m with campsite (accommodation) and store area and the Payama-1 wellsite will be constructed with area of 130 x 130 m with campsite (accommodation) and store area
  - Access road will be upgraded from existing condition or required new construction approx. with 6 m width.
- **Drilling Phase**
  - Wells will be drilled using a land rig
  - The rig will be mobilized to the wellsite by heavy trailer.
  - Several land transportation trucks / trailer will provide support throughout drilling phase, including transportation of materials, equipment, chemicals and wastes.
- **Well Testing Phase**
  - After drilling, the well will be tested to indicate the presence of hydrocarbon
  - Well testing operation is required to support for future production phase in this area
  - Well testing can require burning and flaring of high pressure gas in a vertical flare stake.
- **Well Completion, Plug & Abandonment**
  - In the case of no hydrocarbon discovery, when well testing is finished, the well will be permanently isolated and abandoned.
  - Cement plugs and mechanical plugs are placed in the borehole to seal the well.
  - The equipment and facilities will be removed and retrieved.
  - The drilling rig will be demobilized from wellsite.
  - In the case of a commercial discovery, the field will be developed as per PSC.
- **Restoration Phase**

  After completion of all activities in the event of no commercial hydrocarbon find, then the work site will be restored and made ready to handback to MOGE as per MOGE procedure.

1.5 Description of the Environment

Environmental, Social and Health data collection will focus on the project area and will relate specifically to the issues identified during the screening of how each project activity may impact the environment. The initial study area is within a 5 km radius of each planned exploration drilling well. The complete description of the environment is presented in **Chapter 5** of the EIA report.

1.5.1 Study Limit & Methodology

International Environmental Management (Myanmar) Co. Ltd. (IEM) and Environmental Quality management Co., Ltd (EQM) conducted an onshore environmental baseline sampling program and focus group meetings in Block EP-3 covering Thegon and Phaukkhaung Townships, Pyay District, Bago Region Myanmar. The survey results and analysis will be incorporated into an EIA of EP-3 Petroleum Exploration Drilling project operated by ONGC Videsh.

IEM completed the following:

1. Interviews with Pyay, Thegon and Phaukkhaung General Administrative Department (GAD), Forestry Department and City Development Committee (CDC) officials on environmental, social and historic & archaeological information.
2. 4 samples for surface water in the block
3. 4 samples for groundwater in the block
4. 8 samples for soil in the block
5. 2 ambient air and noise measuring stations in the block
6. Archaeological survey
7. Land use, biodiversity and ecological survey

1.5.2 Physical component

1.5.2.1 Topography

The exploration drilling projects are located on the southern portion of the Central Lowlands physiographic zone. The topography is a mixture of valleys and hilly/mountainous terrain.

Block EP-3 is located in Ayeyarwady valley, which is between the Rakhine Yoma at the west and Bago Yoma at the east, on the left bank of Ayeyarwady River.

1.5.3 Biological components

1.5.3.1 Ecoregion & Protect Species

In Block EP-3, the *Irrawaddy Dry Forest*, found (Olson *et al*, 2001). The Irrawaddy Dry Forest is found in the Central Dry Zone, however, it also occurs in many other regions of the country. This region is characterized by dry weather, a short period of rainfall, and is subjected to southerly winds resulting wind erosion of topsoil. Rain also washes the soil and rock, exposing rock landscapes (Wikramanayake, *et* al., 2002).

The forests in this eco region are dominated by dry dipterocarp (Indaing) forest. The Indaing forest always grows on gravel, sand or laterite soil. It is abundant with few species of *Dipterocarpus*. Indaing forest could be defined to (1) High Indaing, characterized by tall trees, and (2) Low Indaing, characterized by short trees (Khaing *et al,* 2019). Both types are widespread, but the low Indaing is more common in the dry zone.

1.5.3.2 Protected Areas

There are no officially established international protected areas in Block EP-3. A global/national area of biodiversity importance near the project area is the Ayeyarwady River corridor. This key biodiversity areas runs on the west of the Block and is located 20 km. away from the proposed well locations. In EP-3 block, reserved forests such as Sha Byin, Dawle and Bwet exist. The Payama-1 wellsite is located in the Sha Byin Reserved Forest Area.

1.5.4 Sensitive Receptors

The sensitive receptors for each of the proposed well sites have been identified in the Figures below. The sensitive receptors identified in Block EP-3 include:

- Villages (Schools, Pagodas, Cemeteries, etc.)
- Streams / Canals
- Rivers
- Protected Area / Reserved Forests

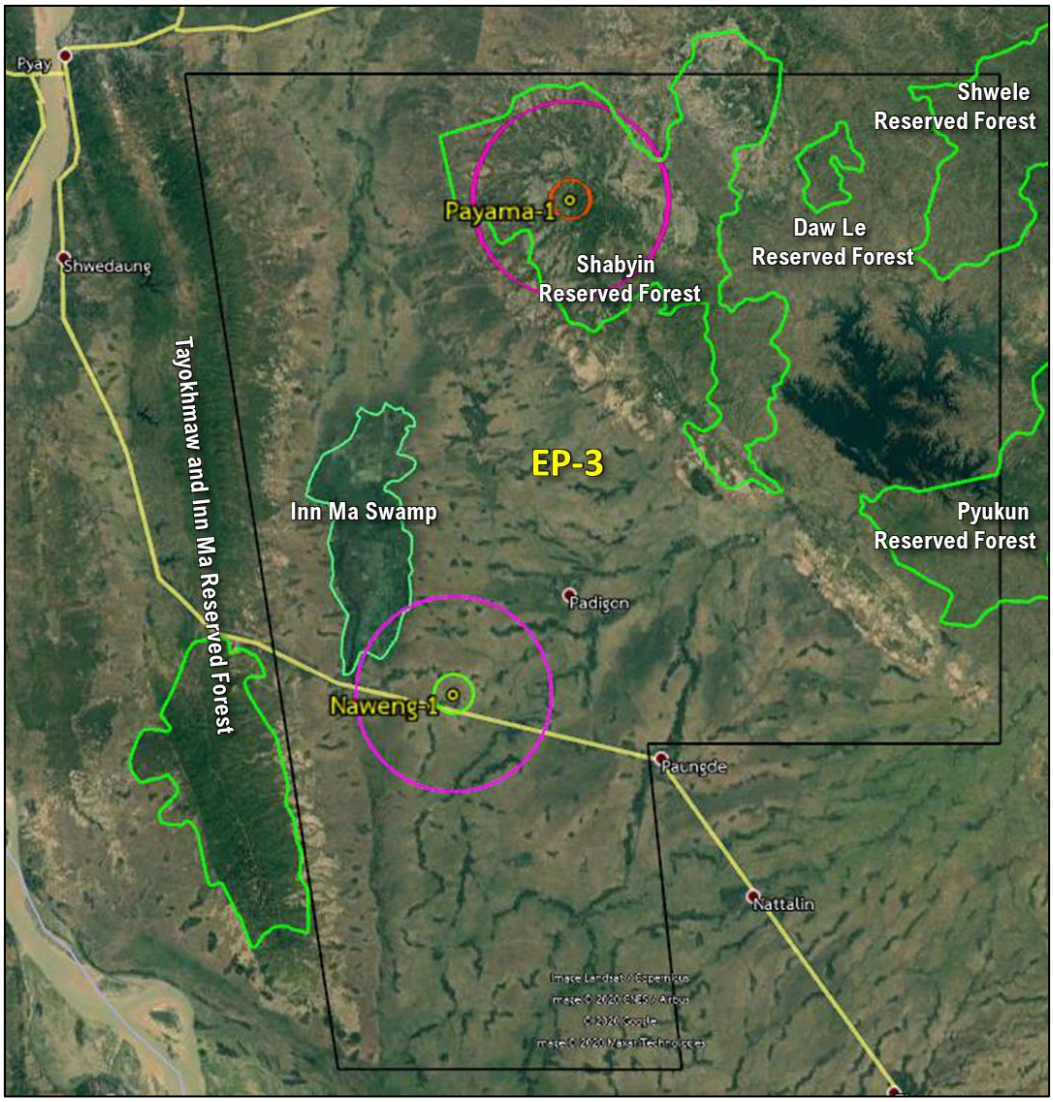

Figure 1-2: Reserved Forest Boundaries in Block EP-3

Table 1-3: Potentially Affected Villages

Proposed well	Village*	Village Tract	Distance (km) from well
Naweng-1 **Lat: 18°31'22.3437"N** **Long: 95°24'21.6247"E** **X: 754004.96** **Y: 2049730.75**	Tan Daw Gyi	Ywa Thit	1.40
	Nyaung Gon		1.02
	Zin Byun Gon		1.15
	Pyin Daung Gon		1.33
	Pwe Bye		1.90
	Sa Be Kan	Yat Tha	1.06
	Wa Le		1.10
	Yat Tha		1.58
	Gyo Gon		1.97
	Ka Yin Gon	Cha Ya Gone	0.42
	Ywa Tha Gon		0.53
	Taw Chin		1.17
	Thit Cho		1.60
	Pan Lan Gon		0.71
	Kaung Bin Lu		1.20
	Cha Ya Gone		1.40
Payama-1 **Lat: 18°45'1.997"N,** **Long: 95°45.1252"E** **X: 759629.13** **Y: 2075021.51**	Sett Tone	Tha Phan Kaing	>5 km but on the access road
	Minn Lann		
	Kyo Pin	Kyoet Pin Waing	
	Thith Yaung Paung		

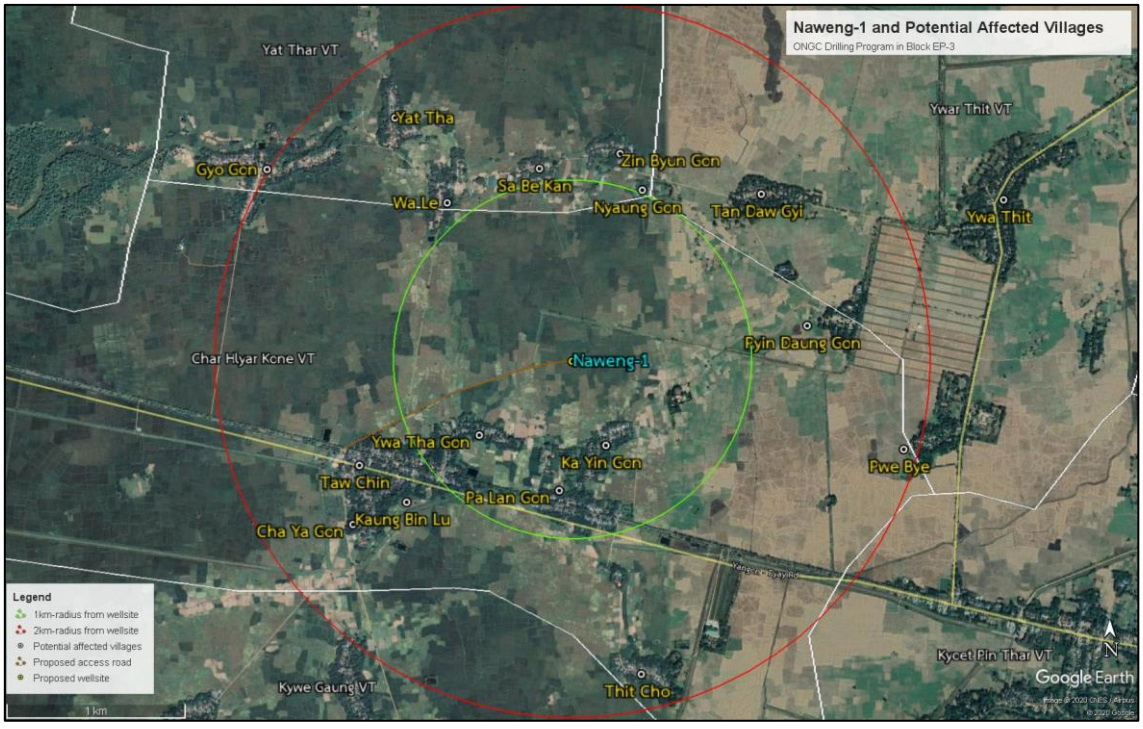

Figure 1-2: Potentially Affected Villages from Naweng-1 Well

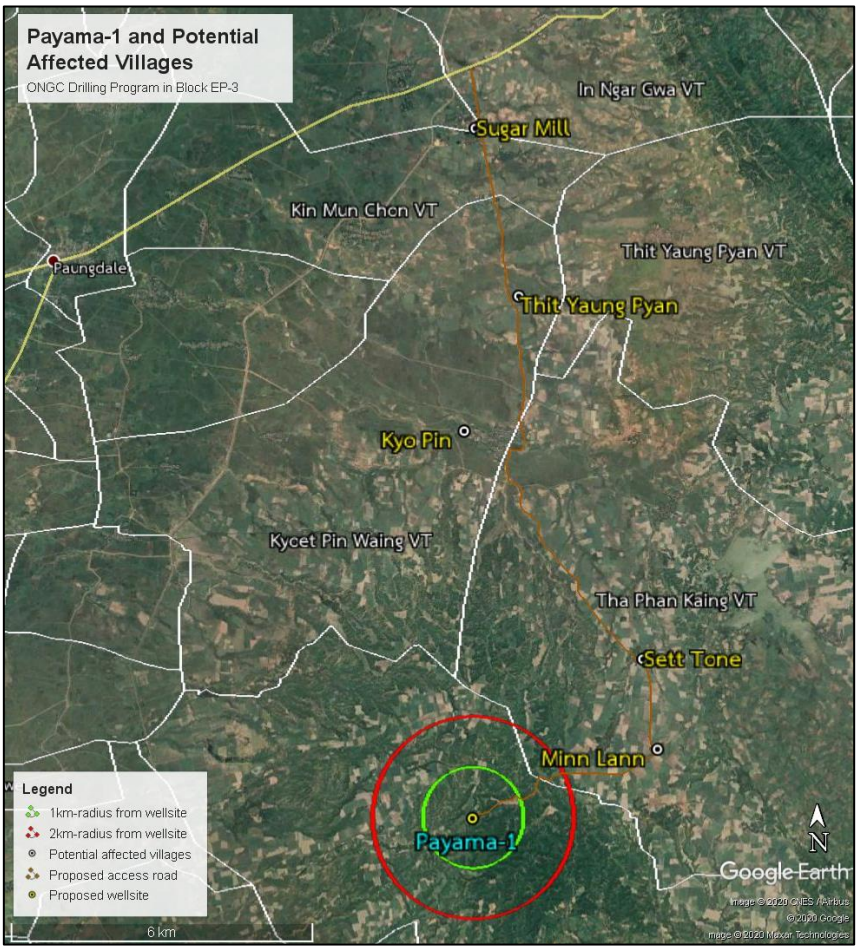

Figure 1-3: Potentially Affected Villages of Payama-1 Well

1.5.5 Socio-economic components

1.5.5.1 Administration & Governance

The project is located in the Thegon and Phaukkaung Townships, Pyay District of the Bago Region. The General Administration Department (GAD) under the Ministry of Home Affairs acts as the backbone of the local administration.

1.5.6 Demographics

According to the 2014 Myanmar Population and Housing Census the population of Pyay District has 251,643 people. Since the location of the study area is primarily in Thegon Township, the demographic characteristics will be discussed for Thegon Township.

Thegon Township has a total population of 130,957 in 2014, which was decreased in 2017 as a result of the declining birth rate over the last 10 years. However in 2019, population has increased to 134,505 population in total. At the National level UN Population (2019) estimated the growth rate at 0.63%. The population density over the township was estimated to be 173.2 person/sq.km in 2019 which has increased from 168.6 persons/sq.km in 2014. There were 35,950 households in 2014, 23.7% of which was a female-headed household, and there were 36,433 households in 2017. Each household had 3.7 members as an average.

1.5.7 Ethnicity

The Region is made up mostly of Buddhist Bamars. There are some very small minorities of other ethnic groups, including Chins, Rakhine, Kayin and Shan. All respondents are Buddhist.

1.5.8 Agriculture and Industry

Land use in Block EP-3 study area is dominated by agricultural activities particularly with dry land cultivation along with irrigated cropland.

1.5.8.1 Local Socio-Economic Context

Socio-economic **Opinion & Attitude Survey** in relevant villages was conducted during the 2nd Public consultation meetings that were held from 19-24 December 2021.

1.6 Impact and Risk Assessment and Mitigation Measures

An initial screening assessment of project activities consisted of developing a summary matrix of project activities against environmental, social and health parameters to determine if potential impacts were considered significant or not. If any issues were considered significant, then these were assessed in more detail. Qualitative and quantitative analyses were conducted to assess potential impacts on environmental, social or health receptors that may be caused by the proposed project activities. The impact analysis criteria are summarized in **Chapter 6**.

The impact assessment also included an assessment of unplanned events. The assessment examines the potential of the project to result in major hazardous events (such as a fire or oil spill from a blow-out) or environmental hazards to impact the project and the environment (such as earthquakes). The risk assessment includes a qualitative and a quantitative evaluation of risks to help further define the probability and potential consequences of these major hazardous events, and to evaluate the significance and the areas that might be impacted by these events. Specific systems for the further management of the significant risks are then proposed. Residual risk was determined after management measures were defined.

The residual risk rankings of the impact assessment of the Exploration Drilling on environmental, social, health and unplanned aspects are summarized below in Table 1-4: Construction and Installation Phase Significance Rankings4 to

Table 1-8: Unplanned Events Residual Risk Rankings8.

Table 1-4: Construction and Installation Phase Significance Rankings

Environmental Factors/Events	Activity	Potential Impacts	Residual Risk
Physical Environmental Impact Assessment			
1. Topography	1.1 Well Site and Camp Construction	1.1.1 Disturbance to local topography	Low
2. Air Quality	2.1 Well Site and Camp Construction	2.1.1 Deterioration of air quality due to dust.	Low
	2.2 Equipment use during Site and Road Construction	2.2.1 Deterioration of air quality due to vehicle emissions.	Low
	2.3 Equipment use during Site and Road Construction	2.3.1 GHG Release contributing to climate change	Low

Environmental Factors/Events	Activity	Potential Impacts	Residual Risk
3. Noise	3.1 Use of machines/engines during construction and transportation	3.1.1 Increase in noise levels from machines/engines	Low
4. Surface Water Hydrology	4.1 Construction of roads and well / camp sites	4.1.1 Alteration of surface water hydrology	Low
5. Surface Water Quality	5.1 Construction of roads and well / camp sites and site runoff and drainage	5.1.1 Degradation of surface water quality from runoff/drainage	Low
6. Groundwater Quality	6.1 Hazardous/Non Hazardous waste management and chemical handling	6.1.1 Contamination of groundwater from waste, chemicals and wastewater	Low
7. Soil quality	7.1 Construction of roads and well / camp sites	7.1.1 Degradation of soil quality through compaction or erosion during construction.	Low
Ecological Environmental Impact Assessment			
8. Flora and Fauna	8.1 Site Clearing for Construction of roads and well / camp sites	8.1.1 Degradation or destruction of natural habitat	Low
	8.2 Construction of roads and well / camp sites	8.2.1 Habitat degradation from construction	Low
	8.3 Site Runoff and Drainage	8.3.1 Habitat degradation of aquatic biota	Low
Social Impact Assessment			
9. Land Use	9.1 Purchase or rental of land access road/well pad and camp site	9.1.1 Change of traditional use.	Positive
10. Transportation	10.1 Rig Movement and Equipment and Vehicle Use.	10.1.1 Disruption of traffic	Medium
		10.1.2 Damage to roads	
11. Water Supply	11.1 Use of water public utility for construction and domestic use	11.1.1 Compete for water use of communities	Low
12. Drainage and Flooding	12.1 Surface runoff from roads, site and camp site	12.1.1 Increase runoff and change local drainage patterns	Low
13. Waste Management	13.1 Non-Hazardous waste management	13.1.1 Domestic waste result in windblown litter, attract vermin and be a vector for disease	Low
14. Socio-Economy	14.1 Services Supply for Construction Activities	14.1.1 Employment/income and procurement opportunities for people, business and services in surrounding area	Positive
	14.2 In-migration of labour and social interaction	14.2.1 Potential conflict between workers from other regions and local communities	Low

Environmental Factors/Events	Activity	Potential Impacts	Residual Risk
Cultural Impact Assessment			
15. Historical, Archaeological and Cultural Resources	15.1 Construction of access road/well pad and camp site	15.1.1 Archaeological/ fossil finds within project area.	Negligible
Visual Impact Assessment			
16. Tourism and Recreational experience	16.1 Well Site, Road and Camp Construction	16.1.1 Disturbance and reduction of tourism and recreational experience	Negligible
Health Impact Assessment			
17. Public and Occupational Health	17.1 Well Site, Road and Camp Construction	17.1.1 Respiratory irritation and Exacerbation of asthma impact from dust	Low
	17.2 Vehicle and Equipment Use during construction	17.2.1 Hearing impairment for workers and annoyance for public.	Medium
	17.3 Construction Activities & Transportation	17.3.1 Traffic Accidents	Low
	17.4 Non-Hazardous Waste Management	17.4.1 Food safety, Increase in vector-borne diseases: malaria, typhus and dengue and others.	Low

Table 1-5: Drilling Phase Significance Rankings

Environmental Factors/Events	Activity	Potential Impacts	Residual Risk
Physical Environmental Impact Assessment			
1. Air Quality	1.1. Vehicle and Equipment Use	1.1.1. Deterioration of air quality due to dust.	Low
	1.2. Vehicle and Equipment Use	1.2.1. Deterioration of air quality due to vehicle emissions.	Low
	1.3. Well Drilling	1.3.1. Deterioration of air quality due to hydrogen sulphide	Low
	1.4. Vehicle and Equipment Use	1.4.1. Climate Change due to GHG	Low
2. Noise	2.1. Well Drilling and Vehicle and Equipment Use	2.1.1. Increase in noise levels during exploration drilling.	Low
3. Heat and Light	3.1. Functional lighting on vehicles and drill rig, camp site and well site during Drilling Wells.	3.1.1. Lighting on the site at night	Negligible
4. Surface Water Quality	4.1. Site Runoff and Drainage	4.1.1. Contamination of surface water from runoff and drainage	Low

Environmental Factors/Events	Activity	Potential Impacts	Residual Risk
	4.2. Hazardous/non-hazardous waste management	4.2.1. Degradation of surface water quality from disposal of domestic sewage and grey water	Low
5. Soil Quality	5.1. Drill site Runoff and Drainage	5.1.1. Contamination of soil from runoff	Low
6. Groundwater Quality	6.1. Loss of circulation during Drilling wells	6.1.1. Groundwater degradation from drilling	Low
	6.2. Infiltration from the waste pit and sub-irrigation field	6.2.1. Deterioration of shallow Groundwater	Low
Ecological Environmental Impact Assessment			
7. Terrestrial Flora and Fauna	7.1. Drilling Activities and Labor and Accommodations	7.1.1. Aquatic biota and habitat disturbed from workers' activities	Low
Social Impact Assessment			
8. Transportation	8.1. Heavy Equipment on Road	8.1.1. Traffic disruption and damage to roads	Medium
9. Water Supply	9.1. Use of public utility for water resources	9.1.1. Water usage of project affects the community's water supply.	Low
10. Power Use	10.1. Power for drilling operations and work camp	10.1.1. Increase or decrease of available power for local community	Negligible
11. Waste Management	11.1. Non-Hazardous waste management	11.1.1. Domestic waste can be a fire hazard, constitute windblown litter, attract vermin, contaminated surface and groundwater and vector for disease	Low
	11.2. Hazardous waste management	11.2.1. Hazard waste contaminate to environment.	Low
	11.3. Handling and Disposal of drill cuttings, sludge and chemicals.	11.3.1. Localized change in water quality and soil quality from chemical composition of drill fluids	Medium
12. Socio-Economy	12.1. Employment opportunities and Use of local goods and services	12.1.1. Employment and income	Positive
Health Impact Assessment			
13. Occupational and Public Health	13.1. Rig, Generators and Equipment	13.1.1. Health impact from noise	Medium
	13.2. Well Drilling Support Activities & Transportation	13.2.1. Traffic Accidents	Low
	13.3. Non-Hazardous waste management	13.3.1. Health impact from Non-Hazardous Waste	Low

Environmental Factors/Events	Activity	Potential Impacts	Residual Risk
	13.4. Handling and Disposal of Hazardous Waste	13.4.1. Health impact from hazardous Waste	Low
	13.5. Hazardous waste management and chemical handling	13.5.1. Health impact from Mud, Chemicals and Drilling Waste	Low
	13.6. Labor and Accommodations	13.6.1. Health impact from Communicable Diseases	Medium

Table 1-6: Well Testing Phase Significance Rankings

Environmental Factors/Events	Activity	Potential Impacts	Residual Risk
Physical Environmental Impact Assessment			
1 Air Quality	1.1 Vehicle and Equipment Use	1.1.1 Deterioration of air quality due to dust.	Low
		1.1.2 Deterioration of air quality due to combustion of diesel fuel and flaring.	Low
	1.2 Well testing releasing hydrogen sulphide	1.2.1 Deterioration of air quality due to hydrogen sulphide	Low
	1.3 Flare Emissions	1.3.1 Climate Change due GHG	Low
2 Noise	2.1 Flaring during Well Testing	2.1.1 Increase in noise levels during well testing.	Low
3 Heat and Light	3.1 Flaring during Well testing	3.1.1 Increase in light at night from flaring	Low
4 Surface Water Quality	4.1 Non-Hazardous waste management	4.1.1 Contamination of surface water from drained domestic waste and grey water	Low
5 Soil Quality	5.1 Non-Hazardous waste management	5.1.1 Contamination of soil from drained domestic waste and grey water	Low
6 Ground Water Quality	6.1 Handling of Chemicals, Hazardous/non-hazardous waste	6.1.1 Degradation of groundwater quality from spills or leaks leaching into water table	Low
Ecological Environmental Impact Assessment			
7 Terrestrial Flora and Fauna	7.1 Labour and Accommodations	7.1.1 Habitat degradation from workers' activities	Low
	7.2 Flaring during Well Testing	7.2.1 Habitat degradation from light and heat	Low
Social Impact Assessment			
8 Transportation	8.1 Vehicle and Equipment Use	8.1.1 Disruption of traffic	Medium
		8.1.2 Damage to roads.	
9 Waste Management	9.1 Hazardous/Non - Hazardous waste management	9.1.1 Domestic waste can be a fire hazard, constitute. windblown litter, attract	Low

Environmental Factors/Events	Activity	Potential Impacts	Residual Risk
		vermin, contaminate surface and groundwater and be a vector for disease	
		9.1.2 Hazard waste i.e. condensate	Low
10 Socio-Economy	10.1Labour and Accommodations	10.1.1 Employment and Income	Positive
Health Impact Assessment			
11 Occupational and Public Health	11.1Flaring	11.1.1 Heat exposure and Nuisance light from Light and heat	Medium
	11.2 Flaring	11.2.1 Increase in respiratory illnesses/diseases, asthma, Disturbance psychological wellbeing from flaring emissions	Medium
	11.3 Well Testing Support Activities & Transportation	11.3.1 Traffic Accidents	Low
	11.4 Non-hazardous waste management	11.4.1 Waste can be a contaminate surface and groundwater and be a vector for disease.	Low
	11.5 Hazardous waste management	11.5.1 Health impacts from Hazardous Waste	Low

Table 1-7: Well Abandonment Phase Significance Rankings

Environmental Factors/Events	Activity	Potential Impacts	Residual Risk
Physical Environment Impact Assessment			
1. Topography	*1.1* Site and Road abandonment and restoration	1.1.1 Disturbance to local topography	Low
2. Air Quality	*2.1* Vehicle and Equipment Use	2.1.1 Deterioration of air quality due to dust.	Low
		2.1.2 Deterioration of air quality due to combustion of diesel fuel.	
		2.1.3 Climate Change due to GHG	
3. Noise	*3.1* Vehicle and Equipment Use	3.1.1 Increase in noise levels from machines/engines during site demolition & restoration and transportation.	Low

Environmental Factors/Events	Activity	Potential Impacts	Residual Risk
4. Surface Water Hydrology	4.1 Hazardous/non-hazardous waste management	4.1.1 Potential contamination from spills or wastewater drainage to nearby water bodies during site restoration	Low
5. Surface Water Quality	5.1 Restore Site	5.1.1 Alteration of surface water hydrology	Low
6. Soil Quality	*6.1* Soil excavation for site restoration	6.1.1 Degradation of soil quality through compaction or erosion during site demolition & restoration.	Low
7. Groundwater Quality	7.1 Hazardous/Non - Hazardous waste management and chemical handling	7.1.1 Contamination of groundwater from waste, chemicals and wastewater	Low
Ecological Environment Impact Assessment			
8. Terrestrial Flora and Fauna	*8.1* Labour and Accommodations	8.1.1 Degradation or destruction of natural habitat and harvesting wild plants / animals	Low
	8.2 Site-Run off and drainage	8.2.1 Potential degradation or destruction of aquatic biota	Low
Social Impact Assessment			
9. Land Use	9.1 Return of Land used for roads, well site and camp site	9.1.1 Change of traditional use.	Positive
10. Transportation	*10.1* Vehicle and Equipment Use	10.1.1 Disruption of traffic.	Medium
	10.2 Site restoration	10.2.1 Damage to roads.	
11. Waste Management	*11.1* Hazardous/non-hazardous waste management	11.1.1 Non-hazardous waste can be a contaminate surface and groundwater and be a vector for disease.	Low
12. Socio Economy	12.1 Handling of Materials, Hazardous/non-hazardous waste management, Labour and accommodation, site restoration	12.1.1 Increase employment/income, opportunities for business and services	Positive
Health Impact Assessment			
13. Public and Occupational Health	13.1 Well Abandonment Support Activities & Transportation	13.1.1 Traffic Accidents	Low
	13.2 Non-hazardous waste management	13.2.1 Exposure to contamination from non-hazardous wastes,	Low

Table 1-8: Unplanned Events Residual Risk Rankings

Environmental Factors/Events	Activity	Potential Impacts	Residual Risk
1. Blowout	1.1 Drilling	1.1.1 Release of uncontrolled volumes of hydrocarbons, Fire and Explosion	Medium
2. Fire or Explosion (not associated with Blowout)	2.1 Fuel Storage and Ignition Sources	2.1.1 Possible explosion or fire of drilling rig or at campsite, or fuel storage area	Medium
3. Fuel, Chemical or Hazardous Waste/Materials Spill	1.1 Storage of Fuel, chemicals, hazardous materials or waste	1.1.1 Potential risk of spills to the environment affecting air quality, soil quality, surface water, groundwater, biota and people	Medium
4. Transportation Accidents	1.1. Vehicle and Equipment Use	1.1.1.Possible injury or death to personnel; and localized contamination of environment	Medium
5. Earthquakes	5.1 Physical shifting of earth's surface	5.1.1 Potential physical disruption cause building collapse, blowouts, fires or spills	Medium

1.7 Cumulative Impacts

The objective of the cumulative impact assessment is to identify those environmental, social or health aspects that may not on their own constitute a significant impact but when combined with impacts from past, present or reasonably foreseeable future activities associated with this and/or other projects, result in a larger and more significant impact(s).

The screening/scoping of planned and unplanned project related activities assisted to identify potential environmental, social, health aspects where cumulative impacts could possibly occur. These areas include: Public and Occupational Health; Socioeconomic; Waste Management, Transportation; Flora and Fauna (including aquatic); Ground Water Quality; Surface Water Hydrology, Surface Water Quality, Soil, Noise and Air Quality. The key activities potentially causing these cumulative effects include: hazardous and non-hazardous waste; site runoff and drainage; handling of materials and chemicals; access roads and site construction; vehicles and equipment use, labour and accommodation and unplanned events (blowout, fire and explosion, chemical/hazardous materials spill).

Our cumulative impact assessment has determined that no cumulative impacts will occur. In addition it is determined that existing defined mitigation and monitoring measures for the planned two (2) well exploration drilling project will further prevent cumulative impacts from occurring as detailed in **Chapter 7**.

1.8 Environmental Management Plan (EMP)

1.8.1 Introduction

In the impact assessment, a number of potentially significant impacts were identified. For each of these project activities, management measures were defined to prevent and/or reduce the likelihood or magnitude of impacts and/or to limit the extent of an impact if one does occur. The proposed

management measures take into account applicable guidelines, industry practices, expert judgement, design techniques, and operational control. The detailed Environmental Management Plan is detailed in **Chapter 8**. The Fuel Management plan, Spill Contingency Plan, BOCP & H2S Contingency Plan require information about the equipment, facilities and organizational structure of the Drilling contractor, hence detailed plans shall be prepared in association with drilling contractor, after the award of contract, as a part of a Bridging document.

In addition, environmental monitoring measures were designed to monitor the environment and project activities. The purpose of these monitoring measures is: to evaluate the effectiveness of the management measures that will be put in place; to assess compliance with Myanmar legislation, guidelines and standards; and to compare environmental conditions after implementation of the project to environmental baseline conditions to document possible change and/or impact.

1.8.2 ESH Mitigation & Monitoring Measures

A summary of the key mitigation measures and specific action commitments are found in **Table 1-9**: Key Mitigation Measures and Commitment List**9**. Unplanned Events Mitigation Measures and Commitment List is found in Table 1-10. Environmental, Social, and Health Monitoring Measures are found in Table 1-11.

Table 1-9: Key Mitigation Measures and Commitment List

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures	Residual Risk	Responsible	Schedule
Physical Environmental Impact Assessment						
1. Topography	1.1 Well & Camp Construction	1.1.1 Disturbance to local topography	1.1.1.1 Limit construction activities to well sites and access roads only.	Low	ONGC Videsh	Throughout Construction Phase duration
2. Air Quality	2.1 Well Site and Camp Construction	2.3.2 Deterioration of air quality due to dust.	2.3.2.1 Minimize land clearance to a minimum especially during the dry season.	Low	ONGC Videsh	Throughout Construction Phase duration
			2.3.2.2 Limit vehicle speed on access road and site.			
			2.3.2.3 Cover trucks transporting materials with tarpaulins or plastic to prevent any loose material from blowing away and also to prevent dust dispersion.			
			2.3.2.4 Spray water on roads when needed to keep dust down.			
			2.3.2.5 Clean tires of the vehicles before leaving site if needed.			
			2.3.2.6 Provide personal protective equipment to exposed field workers.			
			2.3.2.7 Use vehicles with dust flaps.			
	3.1 Well testing releasing hydrogen sulphide	2.3.3 Deterioration of air quality due to hydrogen sulphide	2.3.3.1 Install Gas Detectors.	Low	ONGC Videsh	Throughout Well Testing Phase duration
			1.1.1.1 If H2S levels exceed 10 ppm in the gas stream, appropriate safety zone to be established (8 hr TWA).			
			1.1.1.2 All crew are instructed and rehearsed in H2S procedures.			
			1.1.1.3 Limit well testing period where possible.			

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures	Residual Risk	Responsible	Schedule
3. Noise	3.1 Use of machines/ engines and equipment	3.1.1 Increase in noise levels from machines/engines	3.1.1.1 Minimize vehicles and rig transportation from sensitive environmental areas.	Low	ONGC Videsh	Throughout Construction Phase duration
			3.1.1.2 Minimize construction activities and vehicle/rig movements in nighttime.			
			3.1.1.3 Limit vegetation removal to a minimum.			
			3.1.1.4 Turn equipment off when not in use.			
			3.1.1.5 Use enclosures when possible to contain noise on site.			
			3.1.1.6 Implement transportation plan to avoid traffic issue that make noise pollution.			
			3.1.1.7 Materials should be lowered when practical and not dropped while transferring			
4. Heat and Light	4.1 Flaring during Well testing	4.1.1 Increase in light at night and heat from flaring	4.1.1.1 Position flare away from sensitive receptors.	Low	ONGC Videsh	Throughout Well Testing Phase duration
			4.1.1.2 Direction the light into wellpad as much as possible.			
			4.1.1.3 Minimize the duration of flaring process when possible			
5. Surface Water Hydrology & Quality	5.1 Construction of roads and well / camp sites and site runoff	5.1.1 Alteration of surface water hydrology and degradation to water quality	5.1.1.1 Avoid construction of well sites in areas that may cause obstacles to water drainage.	Low	ONGC Videsh	Throughout Construction Phase duration
			5.1.1.2 Construct water drainage lines (culverts/causeway) to maintain natural drainage. The required permission will be obtained from MOGE, Forestry Department and Township GAD office.			

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures	Residual Risk	Responsible	Schedule
6. Soil quality	6.1 Construction of roads and well / camp sites	6.1.1 Degradation of soil quality through compaction or erosion during construction.	6.1.1.1 Limit soil compaction only to well sites and access roads.	Low	ONGC Videsh	Throughout Construction Phase duration
			6.1.1.2 Exposed site areas should be kept to a minimum during construction			
			6.1.1.3 Provide effective construction site run-off control and design.			
Ecological Environmental Impact Assessment						
7. Flora and Fauna	7.1 Site Clearing for Construction of roads and well / camp sites	7.1.1 Degradation or destruction of natural habitat	7.1.1.1 High valued habitat to be avoided where practicable in the design process.	Low	ONGC Videsh	Throughout Construction Phase duration
			7.1.1.2 Remove vegetation in project areas only (roads, camp site, well site).			
			7.1.1.3 Mark well sites clearly and prohibit vehicles from moving off site onto surrounding land.			
Social Impact Assessment						
8. Land Use	8.1 Purchase of land access road/well pad and camp site	8.1.1 Change of traditional use.	8.1.1.1 Transparent and fair compensation to land owners and users	Positive	ONGC Videsh	Throughout Construction Phase duration
			8.1.1.2 Ensure all permissions are obtained from landowners and local authorities.			
			8.1.1.3 Notify surrounding landowners before on location and time of project activities.			
			8.1.1.4 Hand back the land to MOGE with agreed condition after project completion.			
9. Transport	9.1 Rig Move and Equipment and Vehicle Use.	9.1.1 Disruption of traffic	9.1.1.1 Ensure all vehicles are in good operating condition and comply with project safety standards. Drivers must be healthy, have valid licenses, and by no means allowed to drink alcohol or take forms of medicine or illicit drugs that can affect performance.	Medium	ONGC Videsh	Throughout Construction Phase duration
			9.1.1.2 Strictly Follow Speed Limits			

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures	Residual Risk	Responsible	Schedule
			9.1.1.3 Notify the local authority on the oversized load and put an escort in front of this convoy with horn and hazard lights.			
			9.1.1.4 Provide traffic signs or flags at junction of access roads and main roads.			
			9.1.1.5 Investigate any complaints and handle appropriately. Keep records of complaints and follow-up.			
			9.1.1.6 Obtain approval from MOGE and/or appropriate government offices before constructing, upgrading or reroute access roads.			
			9.1.1.7 Road Hazard Assessment will be conducted before transporting any large equipment.			
10. Waste Management	10.1 Non Hazardous waste management	10.1.1 Domestic waste result in windblown litter, attract vermin and be a vector for disease	10.1.1.1 ONGC Videsh in association with drilling Contractor shall develop a Waste Management Plan for this drilling campaign	Medium	ONGC Videsh	Throughout Construction Phase duration
			10.1.1.2 Store hazardous waste in appropriately designed areas and safe containers that are suitable for transporting/transferring.			
			10.1.1.3 Ensure treatment and disposal according to accepted international standard.			
			10.1.1.4 Enforce “Good Housekeeping” practices.			
			10.1.1.5 Domestic and general waste to be segregated and stored using suitability labeled.			
			10.1.1.6 Dispose of waste in labelled containers to be sent to Dowa			
			10.1.1.7 Implement requirements for waste management and related laws			
			10.1.1.8 Install septic tanks and soak away pit for holding sewage.			

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures	Residual Risk	Responsible	Schedule
			10.1.1.9 Non-hazardous wastes will be taken to an approved waste site			
11. Socio-Economy	11.1 Services Supply for Construction Activities	11.1.1 Employment/income and procurement opportunities	11.1.1.1 Employ qualified local workers with required skill wherever possible	Positive	ONGC Videsh	Throughout Construction Phase duration
			11.1.1.2 Purchase local supplies and services, whenever possible.			
			11.1.1.3 Terms of contract for recruitment of manpower in these project needs to include emphasis on hiring locals, especially for unskilled and semi-skilled workforce.			
			11.1.1.4 Restrict workers to within project boundaries and do not allow local interaction within the communities.	Medium		
	11.2 In-migration of labour and social interaction	11.2.1 Potential conflict between workers from other regions and local communities	11.2.1.1 Employ qualified local workers.	Positive	ONGC Videsh	Throughout Construction Phase duration
12. Waste Management	12.1 Handling and Disposal of drill cuttings, sludge and chemicals.	12.1.1 Localized change in water quality and soil quality from chemical composition of drill fluids	12.1.1.1 Drill cuttings and adhered fluids will not be discharged to surrounding area.	Medium	ONGC Videsh	Throughout Construction Phase duration
			12.1.1.2 Volume of cuttings and fluids discharged will be minimised through use of solids control equipment.			
			12.1.1.3 Store all chemicals in secured storage area.			
			12.1.1.4 Hazardous wastes materials will be handled and stored in accordance with the corresponding MSDS.			
			12.1.1.5 Implement awareness training on the hazards of the chemicals.			
			12.1.1.6 Enforce use of PPE.			
			12.1.1.7 Handle chemicals only in well-ventilated and controlled areas			
			12.1.1.8 Fuel storage tanks to be surrounded by bund wall.			

Table 1-10: Unplanned Events Mitigation Measures and Committment List

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures	Residual Risk		Responsible	Schedule
Unplanned Events							
13. Blowout	13.1 Drilling	13.1.1 Release of uncontrolled volumes of hydrocarbons, Fire and Explosion	13.1.1.1 Examination of existing wells to identify shallow gas hazards.	Medium	Ensure ONGC Videsh's QHSE Management System Procedures and Emergency Response Plan operational controls are enforced to prevent a blowout/explosion.* As Contingency Plan require information about the equipment, facilities and organizational structure of the Drilling contractor, hence detailed plans shall be prepared in association with drilling contractor, after the award of contract, as a part of a Bridging document.	ONGC Videsh	Throughout project duration
			13.1.1.2 Provide a blowout preventer (BOP) stack that is sized appropriately in proportion to the maximum formation pressure; and test as per procedures.				
			13.1.1.3 Follow ONGC Videsh's Emergency Response Plan and Blow Out Contingency Plan				
			13.1.1.4 ONGC Videsh's QHSE Management System Procedures and operational controls will be in place to prevent a blowout/explosion.				

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures	Residual Risk		Responsible	Schedule
14. Fire or Explosion (not associated with Blowout)	14.1 Fuel Storage and Ignition Sources	14.1.1 Possible explosion or fire of drilling rig or at campsite, or fuel storage area	14.1.1.1 ONGC Videsh QHSE Management System Procedures and operational controls to prevent a fire/explosion.	Medium	Ensure ONGC Videsh's QHSE Management System Procedures and Emergency Response Plan operational controls are enforced to prevent a fire/explosion. As Contingency Plan require information about the equipment, facilities and organizational structure of the Drilling contractor, hence detailed plans shall be prepared in association with drilling contractor, after the award of contract, as a part of a Bridging document.	ONGC Videsh	Throughout project duration
			14.1.1.2 Install fire extinguishers, alarms and windsocks (to be audible and visible from whole site).				
			14.1.1.3 Pre-arranged call out support from local fire brigades				
15. Fuel, Chemical or Hazardous Waste/Materials Spill	15.1 Storage of Fuel, chemicals, hazardous materials or waste	15.1.1 Potential risk of spills to the environment affecting air quality, soil quality, surface water, groundwater, biota and people	15.1.1.1 Chemicals, Hydrocarbons and hazardous materials or waste will be securely stored and use governed by safe operating procedures.	Medium	Chemicals, Hydrocarbons and hazardous materials or waste will be securely stored and use governed by safe operating procedures with Procedures for response to Chemicals, Hydrocarbons and hazardous materials or waste spills will be included in ONGC Videsh's ERP.	ONGC Videsh	Throughout project duration
			15.1.1.2 Spill containment and recovery equipment will be available near storage areas.				
			15.1.1.3 Procedures for response to Chemicals, Hydrocarbons and hazardous materials or waste spills will be included in ONGC Videsh's ERP and Spill Contingency Plan.				

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures	Residual Risk		Responsible	Schedule
16. Transportation Accidents	16.1 Vehicle and Equipment Use	16.1.1 Possible injury or death to personnel; and localized contamination of environment	16.1.1.1 Follow QHSE Management System Procedures.	Medium	Implement ONGC Videsh's QHSE Management System Procedures to prevent transportation accident.	ONGC Videsh	Throughout project duration
			16.1.1.2 Referral system with external medical facilities for serious injuries or emergencies		As Contingency Plan require information about the equipment, facilities and organizational structure of the Drilling contractor, hence detailed plans shall be prepared in association with drilling contractor, after the award of contract, as a part of a Bridging document.		
17. Earthquakes	17.1 Physical shifting of earths surface	17.1.1 Potential physical disruption cause building g collapse, blowouts, fires or spills	17.1.1.1.1 Implement ONGC Videsh's Emergency Response Plan.	Low	Implement ONGC Videsh's Emergency Response Plan.	ONGC Videsh	Throughout project duration

* The management plans will be coordinated with the Drilling Contractor and refined as part of a bridging document.

Table 1-11: Environmental, Social, and Health Monitoring Measures

Factors	Index/Parameter	Procedure	Proposed Duration and Frequency of Monitoring	Location	Reporting
Air Quality	• PM-10 • PM-2.5 • NOx, • SOx, • Ozone • H2S	Method • Myanmar National Environmental Quality (Emission) Guidelines, Effective since 2015 in accordance with The Environmental Conservation Law, 2012, and • WHO Air quality guideline (2006) and amendment.	**Duration:** 1 day continuously **Frequency:** • Once during construction, drilling and testing phases • In case of any complaint regarding air quality, an additional air quality measurement may be conducted in response to specific complaints (if necessary)	Nearest sensitive receptor or downwind of complaint area (if necessary)	• OVL to submit an Environmental Monitoring Report via ECD to MONREC every 6 months including air quality monitoring results.
Noise	• L_{eq}24 hr. • L_{max} • L_{dn}	Method • Measure background noise level, residual noise level, specific noise level and calculation of noise using a Type 1 or 2 sound level meters meeting all appropriate IEC standards • Myanmar National Environmental Quality (Emission) Guidelines, Effective since 2015 in accordance with The Environmental Conservation Law, 2012, and • Following the Guidelines for Community Noise, World Health Organization (WHO), 1999	**Duration:** 1 day continuously **Frequency:** • Once during construction, drilling and testing phases • In case of a complaint regarding noise from project site, an additional noise measurement may be conducted (if necessary)	100 meter from Drill Rig	• OVL to submit an Environmental Monitoring Report via ECD to MONREC every 6 months including noise monitoring results.
Cuttings from drilling (in case of further using cuttings)	• Chloride (for WBM) • Oil on Cuttings (for LTSOBM) • Mercury (in stock Barite) • Cadmium (in stock Barite)	Method • Myanmar National Environmental Quality (Emission) Guidelines, Effective since 2015 in accordance with The Environmental Conservation Law, 2012,	• Upon Completion of Drilling Phase before mixing / burial disposal in waste pit.	• Exploration drilling well	• Drilling Contractor to provide cuttings testing results to OVL • OVL to submit an Environmental Monitoring Report via ECD to MONREC every 6 months.

Factors	Index/Parameter	Procedure	Proposed Duration and Frequency of Monitoring	Location	Reporting
Chemical use for drilling	• Type of chemical • Volume of use	• Daily record type of chemicals and volume used.	• Daily and report after drilling is completed	• Project area	• Drilling Contractor to provide records of chemical use in drilling monthly to OVL. • OVL to submit an Environmental Monitoring Report via ECD to MONREC every 6 months.
Hazardous and Non-hazardous waste	• Manifest Disposal and Tracking Report	• Track waste volume by type and disposal location daily	• During Drilling Phase	• At all project locations	• Drilling Contractor to provide Monthly Environmental hazardous and non-hazardous waste disposal record to OVL. • OVL to submit an Environmental Monitoring Report via ECD to MONREC every 6 months.
Social	• Complaint • Monitoring and solving	• Record complaint • Monitor, investigate and implement suitable solutions	• Throughout all phases	• Project area, community around project area, and transportation route	• Drilling Contractor to Records of grievance in accordance with the community grievance mechanism and provide to OVL monthly. • OVL to submit an Environmental Monitoring Report via ECD to MONREC every 6 months.
Public and Occupational health and safety	• Accidental statistics • cause of accidents • Mitigation measures	• Record accidents or near misses generated during construction by identifying cause(s) and severity of impact(s), as well as operated mitigation measures • Conduct summary report for accident investigation	• Throughout all phases	• Project area, community around project area, and transportation route	• Drilling Contractor to provide Incident reports monthly to OVL. • OVL to submit an Environmental Monitoring Report via ECD to MONREC every 6 months.

1 = Extracted by using Waste Extraction Test Method and Leaching Test Method and also classify that analyzed cuttings is non-hazardous waste or hazardous waste by using analysis method and standard values

1.9 Public Consultation and Disclosure

1.9.1 Scoping Stage Public Consultation

ONGC Videsh, M&S and MOGE along with IEM and EQM conducted a Courtesy Visit with Bago Regional Chief Minister on 3rd January 2020 to ensure higher level awareness of the proposed project and to get approval of project activities, EIA study and Public Consultation plan.

ONGC Videsh together with IEM and EQM completed public consultation meetings to ensure that key stakeholders are aware of the planned project activities and any comments and concerns that have made will be considered as part of the EIA and Environmental Management Plan.

International Environmental Management Co. Ltd. (IEM) conducted focus group meetings in Block EP-3 covering Thegon and Paukkhaung Townships, Pyay District, Bago Region Myanmar. The stakeholder consultation recommendations will be incorporated into the EIA TOR of EP-3 Petroleum Exploration Drilling project operated by ONGC Videsh.

Prior to initiating the fieldwork, a preliminary meeting was held between the field team and the Pyay District & Thegon / Paukkhaung Township Authorities prior to stakeholder meetings being conducted to obtain support and approval. Totally 192 people from the district and township administrations and 21 villages attended and involved in this Public Consultation.

The first public consultation and stakeholder meetings were conducted in February 2020 as per the schedule in **Table 1-12**.

Table 1-12: 1st Public Consultation Schedule and Stakeholders

Date	Time	Meeting Venue	Stakeholders Covered/Villages	Number of Attendees
Feb 10th	15:30 – 16:30	Pyay District Administrative Office	• District & Township Level Authorities • Forestry & ECD • NGOs • CSOs • Media	12
Feb 11th	9:30 – 12.00	Paukkhaung Township Administrative Office	• Township Level Authorities • Forestry & ECD • NGOs • CSOs • Media	19
Feb 11th	13:00 – 16:30	Kyo Pin Village	• Sett Tone, • Minn Lann • Thith Yaung Paung	93
Feb 12th	10:30 – 12:00	Thegon Township Administrative Office	• Township Level Authorities • Forestry & ECD • NGOs • CSOs • Media	29
Feb 12th	13:00 – 16:00	Cha Ya Gone Village	• Ywa Tha Gon • Taw Chin, • Thit Cho, • Pan Lan Gon, K • Kaung Bin Lu • Ka Yin Gon	21

Date	Time	Meeting Venue	Stakeholders Covered/Villages	Number of Attendees
Feb 13th	9:30 – 11:00	Ywa Thit Village	• Tan Daw Gyi • Nyaung Gon • Zin Byun Gon • Pyin Daung Gon • Pwe Bye • Sa Be Kan • Wa Le • Yat Tha • Gyo Gon	18

1.9.2 Scoping Stage Focus Group Meetings

The 21 villages selected were the closest sensitive receptors to the potentially affected well site area. IEM's Socio-Economic survey team consisted of the Senior Socio-Economic Expert, two supervisors, and Myanmar local technicians who were trained by IEM.

At the meetings prior to conducting the meetings and surveys, the villagers were informed that ONGC Videsh was planning to conduct exploratory drilling for two wells in the area.

The meetings included the following agenda:

1. Opening of Public Consultation meeting
2. Introduction to ONGC Videsh personnel
3. Introductory speech by MOGE representative U Myint Kyaw Oo,
4. Presentation about company and drilling operation by U Kyaw Zaw Han, rep of ONGC Videsh
5. Presentation about Environmental Impact Assessment (EIA) by Dr. Twae Mu Mu Myint, (EQM) and Mr. Dylan Jenkins (IEM)
6. Question and Answer

The stakeholders at the township meeting and at the villages raised two main concerns and questions as detailed in **Table 1-13.**

Table 1-13: Key Points from 1st Public Consultation Meetings

Question / Comment	Response	Mitigation Measures
What are the benefits for local people?	Government will get profit sharing from the project at economic production phase. From this project, government will get energy support and local people will get job opportunities through contractors. CSR are usually conducted in economic production phase of Oil and Gas. Project benefits for local community include job opportunities and at production phase, implementation of CSR programs. CSR program to schools are already given in Pauk-Khaung and Kyo-Pin-Wine villages. Bridges are also provided in some villages. CSR is conducted in the villages where seismic surveys were conducted.	• Implement ONGC Videsh's complaint handling process. • Liaise with MOGE for energy and electricity issue from stakeholders.
Project Compensation	A land acquisition / compensation committee will be organized including MOGE, Land Settlement and Records Department and Township GAD. Then,	• The land acquisition process shall be led by MOGE • Transparent and fair compensation to land owners and users

Question / Comment	Response	Mitigation Measures
	the committee will discuss with land owners for compensation. Compensation rate will be specified considering both government and local people.	• Ensure all permissions are obtained from landowners and local authorities. Provide summary to MOGE. • Notify surrounding landowners 2 weeks before on location and time of project activities. • Restoration of land to its original state within 6 months of project completion. • Follow speed limits of 80 km/hour on highways (unless otherwise posted), 60 km/hour on lateritic roads, 20 km/hour in villages or communities, and 80 km/hour on paved roads outside Yangon within the project site and on main roads. • Potable water and industrial water, if taken by tube wells or tanker from nearby reservoirs/rivers, should not affect the availability of water to locals. • ONGC Videsh in association with drilling contractor shall develop a Waste Management Plan for this drilling campaign.
How about the local job opportunities?	Villagers may be hired for suitable positions during the construction by contractors. However, the drilling requires many skilled engineers and skilled positions.	• Efforts to Ensure construction and drilling contractors hire local labor based on the skill and availability from the nearby area.
What is the risk of fire from the project?	Drilling will be according to international standard to reduce fire risk.	• Implement ONGC VIdesh's Emergency Response Plan including specific management procedures to mitigate the impacts if a fire occurs. As Contingency Plan require information about the equipment, facilities and organizational structure of the Drilling contractor, hence detailed plans shall be prepared in association with drilling contractor, after the award of contract, as a part of a Bridging document. • ONGC Videsh and employed contractors to coordinate with local Township firefighting facilities.
Access Road	The construction is for the road and well pad both. The road to Payama-1 is owned by the sugar cane production. So need to meet and get agreement with sugar mill. The construction is same time as the sugar extraction so many trucks will be used during the construction time. So need to ensure we manage for sugar cane operations. In case of excessive cost or difficulty in getting permissions ONGC Videsh may look for alternate access route	• Obtain approval from MOGE and appropriate government offices before constructing, upgrading or reroute access roads. • Upgrade local road to support overload trucks and restore any damage to roads regularly. • Restore any damage to roads that is caused by contractors or Company

Question / Comment	Response	Mitigation Measures
	The contractor will bring all soil / fill from other areas and construction the road and pad without taking soil from nearby paddy field.	
Alternative Access route to Payama-1 - Villagers suggest an alternative route to the sugar cane road (Baw Di Gone- I Hnauk -Tha Phan Kine- Kyo Pin Wine) which is suitable for farmers.	Ministry suggested choosing the pathway that will have least negative impacts. As you suggested, we will consider and evaluate feasibility of alternate access road route it is beneficial to all stakeholders We will encourage the tender company to employ local people for construction new roads.	• ONGC Videsh to consider alternative route if applicable depending on the approval from relevant Ministries.
Traffic -There will be traffic on roads during harvesting season of farmers. The sugar cane extraction starts from the last week of November to December. The road construction may be one month and cause obstruction. The construction is in September and October. If road construction is longer than may impact the sugar cane structure.	Plan to start drilling by December. All efforts shall be made to complete construction by October/November. We will not close the road. It will be built in sections and lanes and allow existing stakeholders to use the road. Need a diversion road if road is not completed before sugar extraction period. If road is blocked during sugar extraction will be a big problem as only one sugar mill for all villagers in the region. Because there is a sugar factory in this area will be negatively impacted if there is traffic-jam.	• ONGC Videsh to make all possible efforts for access road construction to avoid the sugar cane harvest season and to include diversions if required to not block local traffic. • The road shall be strengthened in lanes and sections for minimum inconvenience to all road users. • Notify the local authority on the oversized load and put an escort in front of this convoy with horn and hazard lights. • Consult with local authority before major movement.
There are two irrigation dams in Pauk-Khaung. Will vibration by the drilling of the deep well impact on the dams?	The deeper the well, the narrower the diameter of the well. Smallest diameter of the well is 7 inches. So, this vibration will not negatively impact to surrounding area.	• The wells will be designed to international standards to limit vibrations to the surrounding areas.
What are the impacts to water wells from the drilling?	The vibration of drilling will not impact to the existing water wells. The wells are sealed with steel and cemented in place. The well hole is only seven inches and complete sealed and stabilized by the concrete. There will be no impact to any thing nearby or the dams which are far away. According to our experience, there were no sand and landslide in the tube wells of every village due to the drilling process. If there are any issues with the wells, please inform us immediately.	• Select drill site locations at safe distances from nearest community (a minimum of 500 m). • Investigate any complaints and handle appropriately. Keep records of complaints and follow-up.

1.9.3 EIA Stage Public Consultation

MOGE, ECD along with ONGC Videsh and IEM/EQM conducted the 2nd stakeholder consultation meetings with local officials for Pyay Township and District, and conducted focus group meetings with 21 villages within the Thegon and Paukkhaung Townships following ECD advised protocol.

The 2nd Public Meetings were held from 19th December to 25th December , 2021. This period includes meeting arrangement and approval with government authorities.

MOGE, ECD along with ONGC Videsh and IEM/EQM completed the 2nd round of public consultation meetings to ensure that key stakeholders are aware of the planned project activities and any comments and concerns that have made will be considered as part of the EIA and Environmental Management Plan.

IEM/EQM conducted focus group meetings in Block EP-3 covering Thegon and Paukkhaung Townships, Pyay District, Bago Region Myanmar. The stakeholder consultation recommendations have been incorporated into the EIA TOR of EP-3 Petroleum Exploration Drilling project operated by ONGC Videsh.

Prior to initiating the fieldwork, a preliminary meeting was held between the field team and the Pyay District & Thegon / Paukkhaung Township Authorities prior to stakeholder meetings being conducted to obtain support and approval.

The 2nd public consultation and stakeholder meetings were conducted as per the following schedule.

DAY 1 (21.12.2021) -Yangon to Pyay

9:30- 3:30 Team mobilizes from Yangon to Pyay. 3:30-4:30 Pyay District Administrative Office Meeting

---END of DAY 1---

Day 2 (22.12.2021) - Paukkhaung Township (For Payama-1)
9:30 - 12:00 Paukkhaung Township Administrative Office Meeting
1:00 - 4:00 Meeting at **Kyo Pin Village** and (invite representatives from Kyo-pin-wine villager, Sett-tone, Minn Lann and Thit-yaung-pyan Villages)

---END of DAY 2---

Day 3 (23.12.2021) - The'gone Township
9:30 - 12:00 Thegon Township Administrative Office Meeting (for both Payama-1 and Naweng-1 wells)
1:00 - 4:00 Meeting at **Char-yar-gone Village** (invite representatives from Kan-taw-gyi, Nyaung-gone , Ywa-tha- gone , Zin-pyun-gone , Pyin-daung-gone , Ywa-thit, Pwe-taing , Sabel-kan , Wa-le , Yet-tha , Gyo-gone, Taw-chin, Thit Cho, Pha-lan-gone, Kaung-bin-lu, Kayin-gone Villages)

The following Table 1-14 identifies the meeting participants.

Table 1-14: Meeting Participants

Date	Time	Meeting	Stakeholders Covered/Villages	Number of Attendees
21 Dec, 2021	15:30 – 17:30	Pyay District Administrative Office Meeting	• Pyay District Administration • Forestry Dept, Pyay District • Planning Dept, Pyay District • ECD • Agriculture Dept. • Myanmar Police • Health Dept. • Education Dept. • Rural Development Dept. • Fire Services Dept • Settlement and Land Records Dept. • City Development Committee • MOGE • ONGC • IEM/EQM	22
22 Dec, 2021	9:30 – 11:30	Paukkhaung Township Administrative Office Meeting	• Head of Pauk khaung Township Admin • Agricultural Land Management and Statistics Dept. • Immigration Dept • Agriculture Dept. • Township Development Committee • TEO • Planning Dept. • Livestock Breeding and Veterinary Dept. • Rural Development Dept. • Myanmar Police • Fire Services Dept. • Health Dept. • Forestry Dept. • Rural Road Development Dept. • MOGE • ONGC • IEM/EQM	23
22 Dec, 2021	15:30 – 17:30	Meeting at **Kyo Pin Village** and (invite representatives from Kyo-pin-wine villager, Sett-tone, Minn Lann and Thit-yaung-pyan Villages)	• MOGE • ONGC • IEM/EQM Villages (1) Kyot Pin Waing (2) Min Lann (3) Thit Yaung Pyan (4) Sat Tone	56 Villagers
23 Dec, 2021	9:30 – 11:00	Thegon Township Administrative Office Meeting (for both Payama-1 and Naweng-1 wells)	• General Administration Dept., Thaegone • Settlement and Land Records Dept • Planning Dept • Agriculture Dept • Agriculture Land Management and Statistics Dept.	15

Date	Time	Meeting	Stakeholders Covered/Villages	Number of Attendees
			• Information and Communications Dept • MOGE • ONGC • IEM/EQM	
23 Dec, 2021	15:30 – 17:30	Meeting at **Char-yar-gone Village** (invite representatives from Kan-taw-gyi, Nyaung-gone , Ywa-tha- gone , Zin-pyun-gone , Pyin-daung-gone , Ywa-thit, Pwe-taing , Sabel-kan , Wa-le , Yet-tha , Gyo-gone, Taw-chin, Thit Cho, Pha-lan-gone, Kaung-bin-lu, Kayin-gone Villages)	• MOGE • ONGC • IEM/EQM Villages (1) Char Yar Kone (2) Htan Daw Gyi (3) Nyaung Gon (4) Zin Byun Gon (5) Pyin Daung Gon (6) Ywa Thit (7) Pwe Bye (8) Sa Be Kan (9) Wa Le (10) Yat Tha (11) Gyo Gon (12) Ka Yin Gon (13) Ywa Tha Gon (14) Taw Chin (15) Thit Cho (16) Pan Lan Gon (17) Kaung Bin Lu	51 people from 17 Villages

The meetings included the following agenda:

1. Opening of Public Consultation meeting
2. Introductory by MOGE representative U Win Naing Swe,
3. Introduction of Personnel by ONGC, U Kyaw Zaw han
4. Presentation about company and drilling operation by U Kyaw Zaw Han, ONGC Videsh
5. Presentation about Environmental Impact Assessment (EIA) by Dr, Ohnmar May Tin Hlaing, (EQM)
6. Question and Answer

The stakeholders at the township meeting and at the villages raised the following concerns and questions during the 2nd Public Meetings as detailed in **Table 1-15**. The meeting minutes are included in **Appendix 5**.

Table 1-15: Key Points from 2nd Public Consultation Meetings

Key Questions / Comment	Response	Mitigation Measures
How will this project benefit local people?	This EP-3 project has 75 million USD investment and we believe that the locals will have work opportunities through our contractors during road construction and site work and improved roads around the vicinity of the project. If the two wells from EP-3 project find oil and gas production, we hope to increase our CSR projects and there will be additional opportunities for the locals. There will be jobs and OVL will be hiring people from nearby villages. We	• Project planning will give preference to the use of local services and supplies. • A CSR Program will be discussed with MOGE and the local communities

Key Questions / Comment	Response	Mitigation Measures
	have also planned to fix up roads and start some construction activities around the wells, so we believe these operations can provide some jobs for the locals even before the project commences.	
Are there any plans for CSR related activities	OVL is planning to enlarge and rebuild the sugarcane factory road (Takyarsat road). The total distance of the road that will be improved for approximately 13 miles. Approximate width of this road is 18 feet. We believe that this improved road will be very beneficial to sugar cane farmers. This road will be improved to withstand 60 tonnes of weight.	• Access roads will be designed to benefit local communities and the sugarcane factory.
	OVL is only required to start its CSR projects when production starts, but we have already started some CSR projects during seismic operation even before we have started commercial production and profiting from the budget	• OVL will discuss with MOGE for more CSR activities.
	The total cost of building roads is approximately 20,000 Lakhs (MMK).	• The access roads being repair for all weather and will be designed for the long-term benefit of local communities
When the project will start and when it will end	The project is in operation and drilling of wells will begin after the monsoon finishes and will last for approximately 6 to 8 months.	
After drilling the test wells, will you be returning these wells and facilities back to the government? What are your plans?	If oil production is achieved from these test wells, then field with be developed after government approval. MOGE is also likely to take a stake in the project and reimburse the investments made during exploration stage, as per their participation as per signed PSC and laws of the Union of Myanmar Royalties and taxes shall be payable as per PSC terms.	• Compensation will be provided for use of farm and forest land. • OVL will plant 1 acre in support of the ecological conservation plan
	The test wells will be drilled on farmland and forests and therefore, the company will be required to reimburse the farmers on the cancelled production of crops from these farmlands. Township administrative body of farmland, district administrative body of farmland and MOGE have negotiated with the existing land and crop owners and the final proposal has been sent to region administrative body of farmland for approval. When final approval is granted by the central administrative body of farmland, ONGC Videsh will pay compensation to the affected farmers as per government approval.	

Key Questions / Comment	Response	Mitigation Measures
	For this project, we will be leasing the forest lands and we will be paying rental fees as dictated by the Ministry of Forestry. OVL too has agreed to replant 1 acre of plants as a part of the ecological conservation plan.	
What proportion of the new 350 m road that will be construction will be in Pauk Khaung Township?	All 350 m of the new road will be in Th~~a~~e ~~K~~Gone township. We are also renovating the 6 m Myanma Economic Holdings Public Company Limited (EH) 's Sugar Cane production road so that it is more durable. We will not be widening the existing old 4 m road of forest area, but we will be renovating it so that it is more durable. As we have previously discussed, we will be compensating the sugar cane farmers. We will start building the new 350 m road from the point, where the existing ~~old~~ road ends until it gets to the location of the wells. This new road will be 6m wide.	• The access road will be constructed for 350 m that is 6m wide and can carry a load of 60 tons
How will Waste Management be arranged?	OVL will contract an international company, approved by Myanmar government to be responsible for waste management. Wastes will be taken to Thilawa, Yangon. OVL will also remove all equipment and rehabilitate the land after drilling is finished.	• Follow waste management plan
Are the current EIA reports only valid for 1 year? Will there be more EIA reports if the test drilling is successful?	This current EIA report is for the test drilling period. OVL will need a new EIA report once the production phase starts because the environmental impacts of the test drilling phase and the production phase are not the same.	• The EIA Report will be approved prior to the Test Well Exploration Drilling Project
What have you planned for the CSR projects?	For now, we will be building the roads that will cost 20,000 Lakhs (MMK) and the future CSR projects will be discussed with MOGE in upcoming meetings. We will be planning additional CSR projects if MOGE requests for more.	• The initial CSR activity will be to construct and improve roads that will also benefit the local communities
	MOGE had also previously planned CSR programs with 2% of the profit we get from production. The total cost of building roads is approximately 20,000 Lakhs (MMK)	• OVL will discuss CSR activities with MOGE once production is started. • The access roads will be designed for the long-term benefit of local communities
	If hydrocarbons are not found during this project, all lands may be released back to the farmers and the Forestry department as per terms of MOGE.	• All lands will be returned upon project completion as per terms of MOGE
How many people will be involved in this project?	We anticipate that there will be around 200 people on site for this project.	• Efforts will be made to ensure construction and drilling contractors hire local labor

Key Questions / Comment	Response	Mitigation Measures
		based on the skill and availability from the nearby area.
Do you have plans to keep a fire safety manager?	We have plans to keep HSE managers from both the company and subcontractors. We also have protocols to follow if an accident occurs. ECD too will require emergency response capabilities on site. The EIA report will also include the contact of local fire service and we will also be advising the company HSE team to talk to the local fire service to arrange support as required.	• Implement ONGC Videsh's Emergency Response Plan including specific management procedures to mitigate the impacts if a fire occurs. As Contingency Plan require information about the equipment, facilities and organizational structure of the Drilling contractor, hence detailed plans shall be prepared in association with drilling contractor, after the award of contract, as a part of a Bridging document. • ONGC Videsh and employed contractors to coordinate with local Township firefighting facilities.
There are about 100 vehicles from the village that will travel on this road to carry sugar cane on a daily basis. This will make the road and houses next to it dusty. How will this issue be managed	We will be advising the project team to reduce the number of vehicles they use as much as possible. Water trucks will occasionally spray the road to reduce dust as much as possible	• Obtain approval from MOGE and appropriate government offices before constructing, upgrading or reroute access roads. • Upgrade local road to support truck movement and restore any damage to roads regularly. • Restore any damage to roads that is caused by contractors or Company
Are any water drainage projects planned around the project site?	We have planned to provide drainage system between dikes and the plots in fields. As there are ditches between the plots and the dikes, these ditches may get filled with water during monsoon season. Ditches also get clogged up easily and this leads to flood in the plots. With the drainage system we provide, there will be reduced flooding in the plots. The drilling of wells will not be operating during monsoon season and once we are done with the drilling works, we will be removing all the equipment from the sites.	• Design roads to ensure proper drainage and flood protection. • Obtain approval from MOGE and appropriate government offices before constructing, upgrading or reroute access roads. • Restore any damage to roads that is caused by contractors or Company during exploratory drilling period. Restoration at site will be conducted.

1.10 Conclusion

All environmental issues are ranked as low or negligible and can be managed to minimize potential impacts. Medium ranked Social issues include Transportation at all phases as during the public meetings communities expressed concern over potential impacts, particularly during sugar cane harvesting period as there are many communities along access roads and some within 500 m of the drill locations. These activities will need to be monitored closely as communities are quite near to a number of the potential drill sites.

Health issues including mud chemicals and drilling waste, communicable diseases, noise and flare emissions are ranked as medium. These will need to be monitored closely at those sites where communities are nearby. There are many communities nearby and some within 500 m of the drill locations. Health service infrastructure is not well developed in the communities and ONGC Videsh will maintain its own clinic onsite during the entire exploration program. A specific waste management plan will be prepared to ensure that all wastes are managed to international standards. Hydrogen Sulphide is a potentially serious issue that requires monitoring equipment to be installed and tested, as well as having personnel trained on use of emergency response equipment.

Unplanned Events have all been ranked as having a medium residual risk. Key to ensuring that unplanned events do not happen is linked to ongoing training programs and a site-specific emergency response plan.

To mitigate the potential for a blowout, a BOP needs to be installed and tested. Drilling procedures need to be carefully implemented. The risk of fire and related explosions requires that regular monitoring and inspection measures are in place, as well as fire extinguishers strategically placed to minimize any damage should a fire occur.

This region has had earthquakes in the past and design considerations need to be taken to minimize the impact of an earthquake should it occur. Site-specific emergency response plans for all unplanned events need to be in place and training conducted for all staff as appropriate prior to the start of the exploration drilling program.

Positive impacts to locals will occur from the purchase or rental of land for access roads, well site and camp site; service supply for construction activities; employment opportunities and use of goods and services; labour income; return of land upon completion of drilling program; handling of materials, hazardous and non-hazardous waste management; and site restoration.

The overall budget required to implement the specific management plans based on the outcomes of the impact assessment and OVL's QHSE standards is **estimated at approximately 175,000 USD.** OVL will allocate it in the drilling budget. However, OVL will allocate additional budget if required to meet the applicable laws in Myanmar.

Recommendations:

The following recommendations are provided:

- Implement recommended stakeholder engagement program before site construction.
- Prepare a site-specific waste management plan.
- Apply ONGC Videsh's Emergency Response Plan.
- Conduct recommended training program prior to project initiation.
- Evaluate water resource potential to ensure it does not impact local community.
- Adopt and implement the EMP provided in **Chapter 8**.

2. INTRODUCTION

2.1 Background

ONGC Videsh Limited (ONGC Videsh), a 100% subsidiary company of Oil and Natural Gas Corporation Limited (ONGC), was awarded Block EP-3 to explore and produce hydrocarbon in the Myanmar Onshore Bidding Round 2013. Production Sharing Contract (PSC) for the onshore Block was signed between Myanmar Oil and Gas Enterpise (MOGE), ONGC Videsh Limited and Machinery & Solutions Company Limited (M&S) on 8th August, 2014. The commencement date for the operations is 1st January 2016. ONGC Videsh Holds PI of 97% and is the Operator of the Block. ONGC Videsh Shall carry 3% PI of M&S up to commencement of commercial Production in the Block.

Referring to promulgation of Myanmar EIA procedure issued in December 2015, all sizes of drilling project is mandatory requirement to conduct Environmental Impact Assessment (EIA) Study and submit to consent authorities for consideration and approval prior to project commencement. ONGC Videsh has selected an environmental consultant, International Environmental Management (Myanmar) Co. Ltd. (IEM) and its local partner Environmental Quality Management (EQM) Co. Ltd. to conduct the EIA Study and prepare EIA Report for this project. The location of Block EP-3) in Myanmar is shown in **Figure 2-1**.

Figure 2-1: Location of Block EP-3

2.2 Overview of Project

ONGC will conduct an exploration drilling campaign in Block EP-3. As per PSC commitment, Minimum work program for is Acquisition, Processing & Interpretation of 2D seismic data and drilling of 2 exploratory wells in 1st exploration phase, which commenced from 1st January 2016. ONGC Videsh has successfully completed the 2D seismic data acquisition work in the 1st week of February 2018. Also, 2D seismic data processing and Crop compensation have been completed and two wells released by MOGE based on results of seismic data acquisition. ONGC Videsh will start the activities of drilling 2 exploratory wells in 2021 to fulfill the commitment of the initial exploration phase. ONGC Videsh is planning to spud the first well on 1st November, 2022

The two exploration wells in Block EP-3 will be drilled in two different locations. The well site coordinates are detailed in **Table 2-1**.

Table 2-1: Well Site Coordinates

Well	Lat	Long
Naweng-1	18° 31' 22.3437"N	95° 24' 21.6247" E
Payama-1	18° 45' 1.7997" N	95° 27' 45.1252" E

The existing condition of the well pad for Naweng-1 (target depth of 5225m) is located in paddy field and the land acquisition will be completed as per MOGE requirements. The existing condition of the well pad for Payama-1 (target depth of 2230 m) well is located in the Sha Byin Reserved Forest Area. The land for Payama-1 well will be rented as per agreement with MOGE and the Forest Department of MONREC.

The ONGC Videsh drilling program will use WBM (Water based mud) & LTSOBM (Low Toxic Synthetic Oil Based Mud) for the drilling campaign.

2.3 Project Proponent

ONGC Videsh Ltd. a Miniratna Schedule "A" Central Public Sector Enterprise (CPSE) of the Government of India under the administrative control of the Ministry of Petroleum & Natural Gas is the wholly owned subsidiary and overseas arm of Oil and Natural Gas Corporation Limited (ONGC), the flagship national oil company (NOC) of India. In October, 2013, ONGC Videsh was awarded two onshore blocks namely EP-3 and B-2 in the Myanmar Onshore Bidding Round 2013. PSCs for these blocks have been signed on 8th August 2014.

Company Name	ONGC VIDESH LIMITED
Registration No.	130056245
Address	Pyay Garden Office Tower, Room (4003) 346/354 Pyay Road, Sanchaung Township, Yangon, Myanmar, Postal Code 11111
Principal Contact Person	Rajiv Nischal, Country Manager
Phone Number	Tel: +95-1-536573,
Fax:	+95-1-536573
Email Address	CM_Myanmar@ongcvidesh.in

2.4 EIA Purpose & Objectives

The purpose of this EIA report is to identify and, to the extent possible, quantify the potential negative impacts and positive benefits of the project with respect to the environment, human use values, quality of life and health. Once these impacts have been identified, prevention, mitigation, and monitoring measures will be proposed to minimize impacts.

The specific objectives of this report are to:

- Identify all planned activities and potential unplanned events;
- Establish an environmental, social and health baseline of the project area;
- Identify and assess potentially significant impacts based on existing conditions to:
    - Physical Resources;
    - Ecological Resources;
    - Human-Use Values;
    - Quality-of-Life Values;
    - Health.
- Identify and recommend mitigation measures to minimise potential impacts;
- Recommend a monitoring plan that can track changes in the existing environmental, social and health conditions over time and to ensure compliance with Myanmar legislation.

2.5 EIA Scope

The environmental, social and health impact assessment report for the Project includes:

- a review of applicable legislation;
- a detailed project description of the planned exploration drilling program;
- an evaluation and description of the existing environmental, social and health conditions;
- an environmental, social and health impact assessment, including both the positive and negative impacts during the construction, the operation and the abandonment period;
- proposed mitigation measures to prevent and or reduce the potential harmful impacts to the nearby environmental, social, and health conditions; and
- proposed monitoring program to monitor the environmental, social and health quality that may be affected by the Project.

2.6 Study Area

The overall study area of the project will cover a 5-km area of the proposed exploration well site areas in Block EP-3. The outline of the study area is shown in **Figure 2-2**.

The block wide study area will be used to identify sensitive receptors in the assessment of impacts on physical resources, biological resources, human use values, and quality of life values. Examples of sensitive receptors are schools, temples, water resources, residential areas, etc.

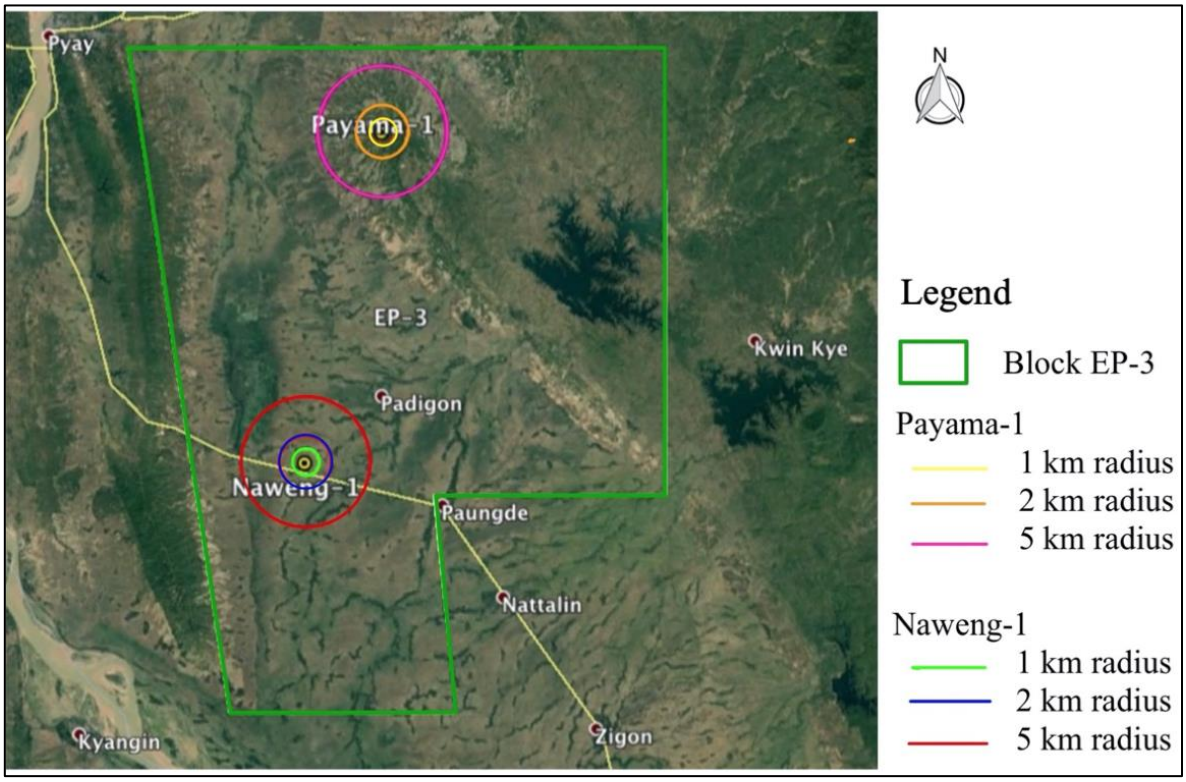

Figure 2-2: Block EP-3 Exploration Drilling Study Areas

2.7 EIA Methodology

The EIA was prepared following the scope outlined in **Section 2.4** and the methodology provided in **Chapter 6: Impact Assessment**.

2.7.1 Data Collection

2.7.1.1 Primary Data Sources

For the baseline survey, a detailed, field sampling plan was developed to supplement the existing secondary database for the Study Area. Data collected for this EIA includes details of the proposed project, environmental baseline, socio-economic setting and health conditions of the potentially affected areas. Data were obtained from primary and secondary sources.

Primary data sources include:

- 1st Public Consultation with villagers on 10 - 13 February, 2020;
- Environmental quality baseline survey for surface water, groundwater quality, and soil survey conducted on 12 – 16 August, 2020;
- Environmental quality baseline survey for noise and air quality survey conducted on 12 – 16 August, 2020;
- Traditional Ecological Knowledge (TEK) surveys with local farmers which focused on a number of ecological indicators regarding biodiversity and ecological status was conducted on 12 – 16 August, 2020;
- Land use, biodiversity and forestry field survey 12 – 16 August, 2020.

Complying with COVID-19 restrictions, the 2nd Public Consultation and socio-economic surveys were completed from 19-24 December, 2021. The following specific work was completed:

- Socio-economic surveys in 21 communities near the proposed well locations;
- 2nd Public Consultation and Focus Group meetings with villagers in 21 communities near the proposed well locations.

2.7.1.2 Secondary Data Sources

Secondary data sources came from literature, relevant authorities in the project area. The secondary data sources are cited throughout this report and listed in the references section.

2.7.2 Policy, Legal and Institutional Framework

A review of all legislation relevant to the undertaking of industrial projects in Myanmar was undertaken during the EIA process. The details are presented in **Chapter 3**.

2.7.3 Project Description

The Project was reviewed in order to gain a full understanding of the project and to compile information on project activities. The Project is described in **Chapter 4**.

2.7.4 Description of the Environment

Environmental, social and health information was collected and evaluated in the following areas:

- **Physical Environment**: geography, climate, air quality, noise, geology, soil, surface water hydrology, surface water quality, groundwater;
- **Biological Environment**: flora, fauna, aquatic biota, threatened/endangered species, protected areas;
- **Human Use Values:** land use, agriculture and industry, fishery and aquaculture, irrigation and agricultural water sources, water supply, wastewater management, solid waste management, transportation, power supply, electricity and communications;
- **Quality-of-Life Values**: local administration, demographics, socio-economy, archaeological resources, tourism;
- **Health**: health services and public health statistics.

The Environmental Setting is described in **Chapter 5.**

2.7.5 Impact Assessment

An initial screening assessment of project activities consisted of developing a summary matrix of project activities against environmental, social and health parameters to determine if potential impacts were considered significant or not. If any issues were considered significant, then these were assessed in more detail. Qualitative and quantitative analyses were conducted to assess potential impacts on environmental, social or health receptors that may be caused by the proposed project activities. The impact analysis criteria are summarized in **Chapter 6**.

The impact assessment also included an assessment of unplanned events. The assessment examines the potential of the project to result in major hazardous events (such as a fire or oil spill from a blow-out) or environmental hazards to impact the project and the environment (such as earthquakes). The risk assessment includes a qualitative and a quantitative evaluation of risks to help further define the probability and potential consequences of these major hazardous events, and to evaluate the significance and the areas that might be impacted by these events. Specific systems for the further management of

the significant risks are then proposed. Residual risk was determined after management measures were defined.

2.7.6 Cumulative Impact Assessment

A cumulative impact assessment was completed to identify those environmental, social or health aspects that may not on their own constitute a significant impact but when combined with impacts from past, present or reasonably foreseeable future activities associated with this and/or other projects, result in a larger and more significant impact(s). The cumulative impact is described in **Chapter 7**.

2.7.7 Mitigation and Monitoring

In the impact assessment, a number of potentially significant impacts were identified. For each of these project activities, mitigation measures were defined to prevent and/or reduce the likelihood or magnitude of impacts and/or to limit the extent of an impact if one does occur. The proposed mitigation measures take into account applicable guidelines, industry practices, expert judgement, design techniques, and operational control.

In addition, environmental monitoring measures were designed to monitor the environment and project activities. The purpose of these monitoring measures is: to evaluate the effectiveness of the mitigation measures that will be put in place; to assess compliance with Myanmar legislation, guidelines and standards; and to compare environmental conditions after implementation of the project to environmental baseline conditions to document possible change and/or impact. The mitigation and monitoring measures are described in **Chapter 8**.

2.7.8 Public Consultation & Disclosure

The proposed project includes drilling and testing petroleum hydrocarbons for 2 exploration wells. The public involvement for this EIA consisted of four parts: meeting with local authorities, focus group meetings, key informant interviews, opinion & attitude surveys with household representatives.

The 1st public involvement was conducted 10 – 13 February covering 21 villages in Block EP-3. The 2nd public involvement meetings and socio-economic survey was conducted covering the same villages as the 1st public involvement meetings, from 19-24 December 2021.

The public involvement & disclosure is described in **Chapter 9**.

2.7.9 Conclusions and Recommendations

The main conclusions of the EIA report, and a summary of recommendations are included in **Chapter 10**.

2.8 Organization of EIA Implementation

The impact assessment was completed by the Myanmar registered consultant companies; International Environmental Management (Myanmar) Co. Ltd. (IEM) and Environmental Quality Management Co. Ltd. (EQM). The IEM & EQM consultant registrations are included in **Appendix 1**.

International Environmental Management Co. Ltd. (IEM) was established in 1992 and has evolved into a leading environmental consulting company solving a wide range of challenges for its private sector clients as well as government and non-government organizations throughout Asia and the Middle East. The IEM team focuses on providing comprehensive services with proven international experience, expertise and extensive project management capabilities in the following disciplines:

- Environmental and Natural Resource Management

- Environmental Site and Impact Assessment
- Environment, Social, Health & Safety Consulting
- Policy, Legislation and Regulatory Requirements
- Consulting Services in Corporate Social Responsibility

IEM is firmly committed to providing the highest quality consulting services tailored to our clients' needs through effective management, appropriate technologies and scientifically proven solutions to promote cost-efficiency and sustainable development goals. Based in Bangkok, Thailand, IEM also has country offices in Cambodia, Hong Kong, Myanmar and Vietnam.

International Environmental Management (Myanmar) Co. Ltd. (IEM)

No.479, Bo Mhu Ba Htoo Road, 48 Ward, North Dagon Township, Yangon, Myanmar

Environmental Quality Management Co. Ltd (EQM) is a professional service company specializing Environmental, Social and Health Impact Assessments (ESHIA). Our workforce consists of experienced, professional and dedicated experts with over 14years progressive responsibility in environment programs and public health care in governmental and non- governmental organizations.

Furthermore, EQM has been carrying out the (ESHIA) projects as the pioneer group since 2009 in Myanmar. EQM is focused on commitment and was established through a partnership approach with our national and international clients.

Environmental Quality Management Co. Ltd
No. (233), Block 23, Sayeepin Lane, Thuwunna, Thingungyun Township, Yangon, Myanmar

2.9 Declaration of EIA Experts

International Environmental Management (Myanmar) Co. Ltd. (IEM) and local specialists Environmental Quality Management (EQM) Myanmar declare this EIA was prepared in accordance with the Environmental Conservation Law (2012), Rules and Procedures under the guidance of the Ministry of Natural Resource and Environmental Conservation.

IEM and EQM endorse and confirm to Environmental Conservation Department:

- The accuracy and completeness of the EIA.
- The EIA has been prepared in compliance with applicable Environmental Conservation Law, Rules and Procedures;
- That all the information contained in the report is accurate and a truthful representation of all findings as relating to the Project.

2.9.1 EIA team

The impact assessment was conducted by Myanmar registered consultant companies IEM and EQM. The EIA team consisted of the individuals described in **Table 2-2**.

Table 2-2: EIA Assessment Team

No.	Name	Background / Expertise	Experience	Responsibility
IEM				
1	Ron Livingston	1979, Master's Degree in Natural Resources Management, University of Manitoba, Winnipeg, Manitoba, Canada. 1976, B.Sc., University of Manitoba, Winnipeg, Manitoba, Canada.	Mr. Livingston has more than 35 years of experience in natural resources and environmental management. Mr. Livingston is an environmental and social expert (registered in Thailand, Cambodia and Myanmar) with extensive experience with seismic, exploration drilling and production EIA project in the Hydrocarbon sector.	Senior Environmental & Social Expert
2	Dylan Jenkins	2008, B.Sc. (Biosystems Engineering), University of Manitoba, Canada	Mr. Dylan Jenkins is a Biosystems Engineer with IEM and responsible for managing environmental impact assessment projects. Mr. Jenkins graduated from the University of Manitoba with a Bachelor of Science in Biosystems Engineering. Mr Jenkins has 10 years of experience working in the geo-environmental engineering	Environmental Analyst / Biodiversity
3	Komgrit Prawatlertudom	2009, B. Sc. (Marine Sciences), Chulalongkorn University, Thailand	Mr. Komgrit Prawatlertudom has 8 years experience as an Environmental Analyst with IEM and responsible for writing environmental impact assessment reports and field sampling. He has working experience in field sampling survey, on shore and offshore.	Environmental Sampling / Aquatic Biology
4	Ubonwan Sintopan	2007, MS. (Natural Resources Management), Asian Institute of Technology, Thailand 2004, B.S. (GEOGRAPHY), Chiang Mai University, Thailand	Ms. Ubonwan Sintopan has 10 years experience as a GIS Technician and Environmental Analyst. At IEM, she is responsible for preparation and support of the environmental impact assessment reports. She has more than 5 years experience in geographic information systems and has worked with GIS data applications, GPS, and Remote Sensing	Environmental Analyst / GIS
EQM				
1	Dr.Ohnmar May Tin Hlaing	2004 -2006, M.Sc in Environmental Engineering and Management, Asian Institute of Technology, Thailand 1986-1996, Bachelor of Medicine and Bachelor of Surgery, Institute of Medicine, Myanmar	Dr. Hlaing has 14 years working experience in the environmental and public health field. Dr. Hlaing's worked the National Government in the public health sector before becoming a consultant. Her direct experience includes chemical and pharmaceutical toxicology as well as poison control. Dr Ohnmar May Tin Hlaing is as an Environmental Health Consultant as well as Managing Director working on the environmental related projects particularly in Environmental, Social and Health Impact Assessments (ESHIA) projects as well as ambient and indoor air quality monitoring projects in Myanmar.	Senior Environmental & Health Expert
2	Dr. Thwae Mu Mu Myint	M.B., B.S (MDY) University of Medicine 2003-2010 Masters of Science in Public Health International Medical University, 2017	Dr. Thwae Mu Mu has over 7 years experiences coordinating socio-economic programs and stakeholder engagement in local and international joint EMP, IEE and ESIA projects in Myanmar. Her role was leading socio-economic surveys, coordinating the	Risk Assessment and hazard Management, Safety and Health

No.	Name	Background / Expertise	Experience	Responsibility
			Governmental Departments in Environmental and Social Considerations of the projects.	
3	U ThihaHtut	2012, Dagon University, Microbiology	Thiha Htut is a Myanmar national and joined Environmental Quality Management (EQM) in 2012. Thiha has over 7 years' experience working as a project coordinator and Stakeholder Engagement Lead for international and local projects in Myanmar. He holds a Bachelor's degree in Microbiology and a Diploma in Geographic Information System (GIS) and Remote Sensing (RS). Thiha was responsible for leading numerous socio-economic and environmental surveys for large scale Oil & Gas and Power projects in the region. He has an extensive understanding of the local context, industry related stakeholders, and community engagement.	Socio-economic Team Leader
4	Daw No No Lwin	2014, Myanmar Maritime University, B.E (Naval Architecture)	Ms. No NoLwin has got about 4 years of experience as an environmental technician working in environmental related projects. She is a graduate of Myanmar Maritime University with a Bachelor of Engineering in Naval Architecture covering environmental engineering. She is also skilled at environmental and socio-economic surveys and organizing stakeholder/public consultation meetings. Her job description also includes preparation and translation of project related documents.	Social surveyor
5	U Ye Naung Tun	2013, University of Forestry, Forestry	Ye Naung Tun is a Myanmar national and joined Environmental Quality Management (EQM) in 2017. Ye Naung Tun has over 3 years' experience working as an environmental technician for international and local projects in Myanmar. He was graduated from university of forestry and Diploma in Geographic Information System (GIS) and Environmental Studies. Ye Naung Tun was responsible for environmental surveys for large scale Oil & Gas and Power projects in the region.	Environmental Technician (Air / Noise)
6	Soe Thu Aung	B.Sc. in Geology from Magway University, Myanmar, 2013	Soe Thu Aung is a Myanmar national and joined Environmental Quality Management (EQM) in 2018. Soe Thu Aung has over 2 years' experience working as an environmental technician for international and local projects in Myanmar. He holds a Bachelor's degree in Geology. Soe Thu Aung was responsible for environmental surveys for large scale Oil & Gas and Power projects in the region.	Environmental Technician (Air / Noise)
7	Pyae Phyo Kyawe	B.Sc Forestry from the University of Forestry, 2014	Pyae Phyo Kywel is a Myanmar national and joined Environmental Quality Management (EQM) in 2018. He have had 1yr working experience	Environmental Technician (Air / Noise)

No.	Name	Background / Expertise	Experience	Responsibility
			as environmental technician and social surveyor for local projects. He was graduated from university of forestry and Diploma in Geographic Information System (GIS).	
8	Zay Zay Ko	B.A (Myanmar 2nd year) from Taungngoo University, Myanmar, 2018	Zay Zay Ko is a Myanmar national and joined Environmental Quality Management (EQM) in 2016. Zay Zay Ko has over 3 years' experience working as an environmental technician for international and local projects in Myanmar. He holds a Certificate of Proficiency in Electrical Fitter (No, (1) Industrial Training Centre, Sinde). Thiha was responsible for assisting environmental surveys for large scale Oil & Gas and Power projects in the region.	Environmental Technician (Air / Noise)

3. POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

This section lists all legislation relevant to the undertaking of industrial projects in Myanmar. The legislation can be divided into the categories as follows:

- ONGC Videsh HSE Policy (summarized in **Section 3.1**)
- Policy & Legal Framework (**Section 3.2**)
- Contractual and other Commitments (**Section 3.3**)
- Institutional Framework (**Section 3.4**)
- Project's Environmental, Social and Health Standards (**Section 3.5**)

3.1 ONGC Videsh HSE Policy

3.1.1 Framework

ONGC Videsh has implemented QHSE Management System at its corporate level and ONGC Videsh has well defined 'Integrated QHSE & Risk Management Policy', whereby Management is committed to compliance to all applicable legal & other requirements; sustainable development; prevention of pollution, injury and ill health apart from other aspects of HSE. The ONGC Videsh QHSE Management System shall be maintained as per internationally recognised standards ISO 9001:2015 (Quality), ISO 14001:2015 (Environment) and ISO 45001:2018(Occupational Health and Safety) or their latest revisions.

3.1.2 HSE Vision

To be a leader in pursuit and attainment of Health, Safety and Environment performance.

3.1.3 HSE Strategic Objective

No accident, no harm to people and promote environment protection.

3.1.4 QHSE Policy of ONGC VIDESH

1. We are committed to maintain highest standards of Quality, Occupational Health, Safety and Environment protection with effective QHSE Management System.
2. We are committed to comply with all applicable requirements and compliance obligations in timely manner, wherever we operate and reside.
3. We are committed to conduct business in an economically, socially, environmentally sustainable manner that is transparent and ethical.
4. We are committed to prevention of injury and ill health and always be alert, equipped and ready to respond to emergencies.
5. We are committed to protection of environment including prevention of pollution, sustainable resource use, climate change mitigation and waste management.
6. We shall assign high importance to training of our employees including contractual employees as per best international practices.

7. We are committed to provide quality products and services.
8. We shall maintain the required processes including setting of objectives and allocate necessary resources for continual improvement of QHSE Management System.

3.2 Policy and Legal Framework

3.2.1 Environmental Policy & Framework

Environmental legislation and arrangements for environmental conservation in Myanmar are developing rapidly. As part of Myanmar's reform process that involves the updating and enforcing environmental policy and legislation. The Framework for Economic and Social Reform (FESR 2013) and the National Comprehensive Development Plan (NCDP 2011-2030) continue Myanmar's goal of environmental conservation.

At present, all laws relating to the environment are being formulated and administered by the sectoral ministries and departments concerned. **Section 3.2.2** provides a list of environmental legislation relevant to the Project activities

3.2.2 National Environmental Legislation

3.2.2.1 Overview

The national legislation applicable to the Project comprises the following sources of law, listed hierarchically in accordance with the Constitution and other laws of Myanmar:

- The Constitution of the Republic of the Union of Myanmar (2008);
- The Myanmar Investment Law (2016);
- Myanmar Environmental Conservation Laws (2012);
- Environmental Conservation Rules (2014);
- Environmental Impact Assessment Procedure (2015);
- National Environmental Quality (Emission) Guideline (2015).

The Constitution of the Republic of the Union of Myanmar (2008);

The latest enacted Constitution of the Republic of the Union of Myanmar (May 2008) provides the most up to date information on governing laws and regulations in Myanmar. The Constitution prevails over any other national legislation or international agreements. The key sections are 21 (a, d), 37 (a, b), 45, Section 347, Section 390.

The Myanmar Investment Law (2016);

The Myanmar Investment Law, enacted in 2016, vastly simplified the process for investment applications and offers a number of tax breaks, incentives, guarantees, rights and protections for business ventures. The Myanmar Investment Commission (MIC) is a government-appointed body formed under the Myanmar Investment Law.

The law includes provisions to restrict or prohibit investment activities which affect public health, the environment and ecosystems, which produce toxic waste or which engage with toxic chemicals; duties of investors to conduct business in such a way as to avoid environmental damage, air and water pollution, in accordance with existing laws as per the following sections. The key sections are 50 (d) 51 (a to f), 65 (e, f, g, i, j, k, l m, o, p, q).

Myanmar Environmental Conservation Laws (2012);

The Environmental Conservation Law (Pyidaungsu Hluttaw Law No. 9 / 2012) Key sections of importance are 7 (o), 14, 15, 24 and 29 related to pollution control and penalties (if) the proponent causes any pollution.

Environmental Conservation Rules (2014);

The Environmental Conservation Rules relating to the Environmental Conservation Law, were enacted on 5 June 2014, contain specific items relating to IEE, EIA and pollution prevention which fall under the powers of the Ministry Natural Resources and Environmental Conservation. The key sections of importance is 69.

Environmental Impact Assessment Procedure (2015);
Environmental Impact Assessment Procedures have been prepared by MONREC under the Environmental Conservation Law, 2012. It requires that the Project proponent has to include in its evaluation environmental, social and health aspects of the environment, and has to identify and assess all adverse impacts and risks for environment, social issues and, if relevant, health that potentially could arise from the Project. Therefore this law will be effectively considered an EIA procedure framework. The key sections are paragraphs 87, 102 – 110, 113, 115, and 117.

Environmental Quality (Emission) Guideline (2015)
MONREC has established environmental quality standards, the National Environmental Quality Standard [Legal Reference: ECL 2012 (Section 2c) and NEQG 2015]. These Guidelines are noted to be the same as that recommended by the IFC General EHS Guidelines (2007) (World Bank Group, 2007) and the IFC sector specific guidelines (World Bank Group, 2015). The key relevant sections are 1, 4, 5, 6, 7, 9, 12 and 13.

3.2.2.2 Environmental Impact Assessment Procedure (2015)

The EIA Procedure for Myanmar was promulgated on 29th December 2015. The Ministry of Natural Recourses and Environmental Conservation (MONREC) implements the procedure. The EIA Procedure sets out the requirements for development, assessment and subsequent monitoring of an EIA. The requirements to conduct an EIA are outlined in the Environment Conservation Law (2012) and Environment Conservation Rules (2014).

Under Myanmar's EIA Procedure, there is a requirement for the undertaking of an IEE or an EIA in order to obtain an ECC for certain development projects.

The project proponent has to comply with CHAPTER VIII. Environmental Compliance Certificate, Conditions and Revisions to Conditions as follows:

Paragraph 87. Upon receipt of the written approval from the relevant authority, the Project Proponent has to commence implementation of the Project strictly in accordance with the conditions attached to the ECC and including the EMP, within such time as may be prescribed by the Ministry.

The project proponent has to comply with the Responsibility for all Adverse Impacts as follows:

Paragraph 102. The Project Proponent has to bear full legal and financial responsibility for:

a) all of the Project Proponent's actions and omissions and those of its contractors, subcontractors, officers, employees, agents, representatives, and consultants employed, hired, or authorized by the Project acting for or on behalf of the Project, in carrying out work on the Project; and

b) PAPs until they have achieved socio-economic stability at a level not lower than that in effect prior to the commencement of the Project, and will support programs for livelihood restoration and

resettlement in consultation with the PAPs, related government agencies, and organizations and other concerned persons for all Adverse Impacts.

Paragraph 103. The Project Proponent has to fully implement the EMP, all Project commitments, and conditions, and is liable to ensure that all contractors and subcontractors of the Project comply fully with all applicable Laws, the Rules, this Procedure, the EMP, Project commitments and conditions when providing services to the Project.

Paragraph 104. The Project Proponent has to be responsible for, and will fully and effectively implement, all requirements set forth in the ECC, applicable Laws, the Rules, this Procedure and standards.

Paragraph 105. The Project Proponent has to timely notify and identify in writing to the Ministry, providing detailed information as to the proposed Project's potential Adverse Impacts.

Paragraph 106. The Project Proponent has to during all phases of the Project (pre-construction, construction, operation, decommissioning, closure and post-closure), engage in continuous, proactive and comprehensive self-monitoring of the Project and activities related thereto, all Adverse Impacts, and compliance with applicable laws, the Rules, this Procedure, standards, the ECC, and the EMP.

Paragraph 107. The Project Proponent has to notify and identify in writing to the Ministry any breaches of its obligations or other performance failures or violations of the ECC and the EMP as soon as reasonably possible and in any event, in respect of any breach which would have a serious impact or where the urgent attention of the Ministry is or may be required, within not later than twenty-four (24) hours, and in all other cases within seven (7) days of the Project Proponent becoming aware of such incident.

Paragraph 108. The Project Proponent has to submit monitoring reports to the Ministry not less frequently than every six (6) months, as provided in a schedule in the EMP, or periodically as prescribed by the Ministry.

Paragraph 109. The project proponent has to submit the report according to paragraph 109 of Environmental Impact Assessment Procedure (2015).

The project proponent has to comply with Paragraph 113. For purposes of monitoring and inspection, the Project Proponent:

a) has to grant to the Ministry and/or its representatives, at any time during normal working hours, access to the Project's offices and to the Project site and any other location at which the Project activities or activities related to the Project are performed; and

b) from time to time as and when the Ministry may reasonably require, has to grant the Ministry access to the Project's offices and to the Project site and any other location at which the Project activities or activities related to the Project are performed.

Paragraph 115. In the event of an emergency, or where, in the opinion of the Ministry, there is or may exist a violation or risk of violation of the compliance by the Project with all applicable environmental and social requirements, the Project has to grant full and immediate access to the Ministry at any time as may be required by the Ministry.

Paragraph 117. The Project Proponent has to further ensure that the Ministry's rights of access hereunder will extend to access by the Ministry to the Project's contractors and subcontractors.

3.2.2.3 National Environmental Quality (Emission) Guideline, 2015

The project proponent has to comply with Paragraph 5.

The project proponent has to ensure emissions comply with General and industry-specific Guidelines as set out in Annex 1 – Emissions Guidelines for any project subject to EIA Procedure, as adopted by the Ministry, in order to protect the environment and to control pollution in the Republic of the Union of Myanmar.

The project proponent has to comply Paragraph 7

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

The project proponent has to comply Paragraph 12.

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

The project proponent has to comply Paragraph 13

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

3.2.3 Project-Relevant Laws

All legislative requirements, which shall be adhered to as a minimum for the EIA study, include but not limited to:

- Myanmar Investment Law, 2016, Section 50 (d), 51 (a to f), 65 (e, f, g, i, j, k, l, m, o, p, q) and 73
- Environmental Conservation Law, 2012, Section 7(o) 14,15, 24, 29
- Environmental Conservation Rule, 2014, Rule 69
- Environmental Impact Assessment Procedure, 2015 (Section 87,102 to 110,113,115)
- National Environmental Quality (Emissions) Guideline (2015)

The legislative approval requirements for the project are listed in **Table 3-1**.

Table 3-1: Required Permissions for Project under Myanmar Legislation

S. N.	Legislation	Permission Required	Purpose	Name of Issuing Authority
1	Myanmar Investment law (Pyidaungsu Hluttaw No. 40/2016)	Investment Permit	Foreigners investing in Myanmar must apply for an investment permit from the Myanmar Investment Commission (MIC), (through the Directorate for Investment and Company, DICA).	MIC
2	Myanmar Investment Rules, (Notification no.35/ 2017.)	Investment Permit	The rules state that an investor must submit a project proposal to the MIC to receive an investment permit.	MIC, DICA
3	The Environmental Conservation Law (ECL) (Pyidaungsu Hluttaw No. 9/12)	Environmental Compliance Certificate (ECC);	The Environmental Conservation Law (ECL) assigns MONREC the mandate to develop and implement a system of environmental and social environmental assessment. Companies must obtain and EEC	MONRE/ECD
4	Prevention of Hazard from Chemicals and Related Substances Law (Pyidaungsu Hluttaw Law No, 28/2013)	Chemical storing, using, importing and/or disposing Permit	Any business that is storing, using, importing and/or disposing of prescribed chemicals must apply to the Central Supervisory Board for a license.	MOI Central Leading Board & Central Supervisory Board
5	Petroleum Products Law (Pyidaungsu Hluttaw Law No, 20/2017)	Laws and Permits for downstream activities (import, storage, transportation etc.)	Any person desirous to transport or store non-dangerous petroleum and petroleum products locally, shall obtain license if it is more than 500 gallons.	Myanmar Petrochemical Enterprise (MPE).

Other relevant government agencies/ requirements including:

- The Protection of Rights of National Race Law, 2015, Section 5
- The Petroleum and Petroleum Products Law, 2017, Section 10 (a, d), 15, 16, and 31 (a, d)
- Public Health Law, 1972, Section 3 and 5
- The Prevention and Control of Communicable Disease Law, 1995, Section 3, 4, 9 and 11.
- The Control of Smoking and Consumption of Tobacco Product Law, 2006, Section 9
- The Myanmar Fire Force Law, 2015, Section 25
- Shops and Establishments Law, 2016, Section 13 to 17, 21 and 24
- The Protection and Prevention of Antique Objective Law, 2015, Section 12
- The Protection and Prevention of Ancient Monument Law, 2015, Section 12, 15 and 20
- The Protection and Prevention of Cultural Heritage Area, 2015, Section 20, 23 and 29(b)
- The Employment and Skill Development Law, 2013, Section 5, 14 and 30 (a and b)
- Oil Fields (Labour & Welfare) Act, 1951
- The Workmen Compensation Act, 1923, Section 10 (a, b) and 11

- The Labour Organization Law, 2011, Section 17 to 22
- The Settlement of Labour Disputes Law, 2012, Section 38, 39, 40 and 51
- Minimums Wages Law, 2013, Section 12, 13 (b, c, d), 43 (e, f, g)
- Payment of Wages Law, 2016, Section 3, 4, 5, 7, 13, and 14
- Social Security Law, 2012, Section 11(a), 15, 18(b), 48(b), 49 and 75
- Leaves and Holidays Act, 1951
- Industrial use Explosive Substance, 2018, Section 6(c), 7(c), 12,13,15,16 and 18
- Land Acquisition Act 1894
- The Vacant, Fallow and Virgin Lands Management Law, 2012, Section 16 and 19
- The Conservation of Water Resources and Rivers Law, 2006, Section 8, 11, 19 and 24
- The Motor Vehicles Law, 2015 and Rules, 1987
- Myanmar Insurance Law, 1993, Section 15 and 16
- Forest Law, 2018, Section 12(a)
- The Protection of Biodiversity and Conservation Areas Law, 2018, Section 39 (d, e) and 41 (a, b)
- The Underground Water Act, 1930, Section 3 and 6(a)
- The Prevention of Danger of Hazardous Chemical and related Substances Law, 2013, Section 16,17,23 and 27
- Import and Export Law, 2012, Section 7
- Myanmar Engineering Council Law, 2013
- State-Owned Economic Enterprises Law, 1989
- Occupational Health and Safety Law (The Pyidaungsu Hluttaw Law No. 8/2019)

3.2.4 International Environmental Conventions, Protocols and Agreements

Myanmar has ratified several international and regional conventions. Those relevant to the project are provided in Error! Reference source not found..

Table 3-2: International and Regional Agreements and Conventions

No.	Conventions	Year (Ratified/ Acceded/Accepted)	
Environment			
1	Plant Protection Agreement for the Southeast Asia and Pacific Region, Rome 1956	1959 (Ratified)	Conservation of Natural Resources
2	ICAO: ANNEX 16 to the Convention on International Civil Aviation Environmental Protection Vol. I and II, Aircraft Noise and Aircraft Engine Emission	Accession	Noise Requirements for Helicopters
3	Vienna Convention for the Protection of the Ozone Layer, Vienna 1985	Accession 16th Sep 1998 (Vienna) & Accession 24th Nov 1993 (Montreal)	Limit the use of ozone depleting substances
4	Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal	Entered into force 6th April 2015	Restrict the movement of hazardous materials

No.	Conventions	Year (Ratified/ Acceded/Accepted)	
5	Montreal Protocol on Substances that Deplete the Ozone Layer, Montreal 1987	1993 (Ratification)	Limit the use of ozone depleting substances
6	London Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer, London 1990	1993 (Ratification)	Limit the use of ozone depleting substances
7	United Nations Framework Convention on Climate Change (UNFCCC), New York 1992	1994 (Ratification)	Reduction in GHG emissions
8	Convention on Biological Diversity, Rio de Janeiro 1992	1994 (Ratification)	Protection of International Biodiversity
9	The Convention Concerning the Protection of the World Cultural and Natural Heritage, Paris 1972	1994 (Acceptance)	Protection of World Heritage Areas
10	Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), Washington DC 1973; and as amended in Bonn, Germany 1979	1997 (Accession)	Protection of Endangered Species of Wild Fauna and Flora
11	ASEAN Agreement on Conservation of Nature and Nature Resources, Kuala Lumpur, 1985	1997 (Signatory)	Conservation of Natural Resources
12	Kyoto Protocol to the Convention on Climate Change, Kyoto 1997	2003 (Accession)	Reduction in GHG emissions
13	ASEAN Agreement on Trans-boundary Haze Pollution	2003 (Ratification)	Restrict the movement of hazardous materials
14	Stockholm Convention on Persistent Organic Pollutants (POPs), 2001	2004 (Accession)	Restrict the use of POPs
15	Ramsar Convention on Wetlands of International Importance	2005 (Accession)	Conservation of Important Bird Areas
16	Establishment of ASEAN Regional Centre for Biodiversity	2005 (Signatory)	Conservation of Biodiversity
17	Declaration on ASEAN Heritage Parks	2003 (Signatory)	Protected Areas
Social, Labour and Health			
18	Universal Declaration of Human Rights (UNDHR)	signed	International Labour Law Requirements
19	Convention on the Rights of the Child	1991 (acceded)	
20	Convention on Elimination of All Forms of Discrimination against Women (CEDAW)	1997 (acceded)	
21	Relevant ILO Conventions in force in Myanmar: • C1 Hours of Work (Industry) • C14 Weekly Rest (Industry) • C2 Unemployment Convention, 1919 (No. 2) • C6 Night Work of Young Persons (Industry) Convention, 1919 (No. 6) • C11 Right of Association (Agriculture) Convention, 1921 (No. 11)		

No.	Conventions	Year (Ratified/ Acceded/Accepted)	
	• C14 - Weekly Rest (Industry) Convention, 1921 (No. 14) • C17 Workmen's Compensation (Accidents) • C18 - Workmen's Compensation (Occupational Diseases) Convention, 1925 (No. 18) • C19 Equality of Treatment (Accident Compensation) • C21 - Inspection of Emigrants Convention, 1926 (No. 21) • C26 - Minimum Wage-Fixing Machinery Convention, 1928 (No. 26) • C29 Forced Labour Convention • C42 Workmen's Compensation (Occupational Diseases) Revised 1934 • C52 Holidays with Pay • C63 Convention concerning Statistics of Wages and Hours of Work, 1938 (No. 63) Excluding Parts III and IV • C87 Freedom of Association and Protection of the Right to Organize • C182 - Worst Forms of Child Labour		

3.2.5 International Standards & Guidelines

The Project will also follow International Environmental guidelines and standards including World Bank /IFC (International Finance Corporation) Guidelines & Industry Standards as detailed in Error! Reference source not found.

Table 3-3: International Guidelines

Applicable International Standards & Guidelines	
1	Equator Principles (2013)
2	International Financial Cooperation/ World Bank (IFC/WB) General Environmental Health and Safety (EHS) Guidelines (April 30, 2007) including sub-sections: •Environmental •Occupational Health and Safety •Community Health and Safety •Construction and Decommissioning
3	IFC Environmental, Health, and Safety Guidelines for Onshore Oil and Gas Development (2017).
4	IFC Performance Standards on Environmental and Social Sustainability (2012);
5	IFC/EBRD Guidance on Workers' Accommodation (2009)

3.3 Contractual and other Commitments

The project proponent and EIA consultant (IEM and EQM) endorses and confirms to Environmental Conservation Department:

- The accuracy and completeness of the EIA.
- The EIA has been prepared in compliance with applicable Environmental Conservation Law, Rules and Procedures.
- That all the information contained in the report is accurate and a truthful representation of all findings as relating to the Project.

The project proponent and its contractor and subcontractor will comply with EIA commitment, Environmental Management Plan that described in the EIA and all applicable Myanmar Laws & regulation requirements and all necessary international laws and Standards.

The project proponent commitments are detailed in **Table 3-4**.

Table 3-4: Project Relevant Commitment List

Laws and Regulations description
The Environment Conservation Law, 2012
The project proponent has to comply **Section 7, Subsection {o)** of the law and will pay compensation if the project proponent causes environmental impacts. **The project proponent has to comply with Section 14.** The project proponent when causing a point source of pollution will treat, emit, discharge and deposit the substances which cause pollution in the environment in accord with stipulated environmental quality standards. **The project proponent has to comply with Section 15.** If the project proponent causes a point source of pollution they have to install or use an on-site facility or controlling equipment in order to monitor, control, manage, reduce or eliminate environmental pollution. If it is impracticable, it has to be arranged to dispose the wastes in accord with environmentally sound methods. **The project proponent will comply Section 24**. The project proponent has to allow The Ministry to conduct inspection whether or not it is performed in conformity with such terms and conditions or inform the relevant Government departments, Government organizations to carry out inspections. **The project proponent will comply Section 29**. Project proponent has to not violate any prohibition contained in the rules, notifications, orders, directives and procedures issued under this Law.
Environmental Conservation Rules, 2014
The project proponent has to comply with Rule 69. If the project proponent does not comply according to section 69, the project proponent will be prosecuted according to Environmental Conservation Law, Section 31.
Myanmar Investment Law, 2016
The project proponent has to comply with Chapter (12) Rights to Use Land, Section 50 as follows: (d) The project proponent has to register the land lease contract at the Office of Registry of Deeds in accordance with the Registration Act. **The project proponent has to comply with Chapter (13), Section 51 as follows:** (a) may appoint of any citizen who is a qualified person as senior manager, technical and operational expert, or advisor in his investment within the Union in accordance with the laws; (b) has to appoint them to replace, after providing for capacity building programs in order to be able to appoint citizens to positions of management, technical and operational experts, and advisors; (c) has to appoint only citizens for works which does not require skill; (d) has to appoint skilled citizen and foreign workers, technicians, and staff by signing an employment contract between project proponent and employee in accordance with the labor laws and rules; (e) has to ensure to obtain the entitlements and rights in the labor laws and rules, including minimum wages and salaries, leave, holidays, overtime fees, damages, compensation of the workman, social welfare, and other insurance related to workers in stipulating the rights and duties of employers and employees and occupational terms and conditions in the employment contract; (f) has to settle disputes arising among employers, among workers, between employers and workers, and technicians or staff in the investment in accordance with the applicable laws. **The project proponent has to comply with Chapter (16) Responsibilities of Investors, Section 65 as follows:** (e) has to immediately inform the Commission if it is found that natural mineral resources or antique objects and treasure trove not related to the investment permitted above and under the land on which the investor is entitled to lease or use and not included in the original contracts. If the Commission allows, the project proponent has to continue to carry out the investment in such land, and if not allowed, the the project proponent has to transfer and carry out, by obtaining the permission, at the substituted place which is selected and submitted by him; (f) has to close and discontinue the investment only after payment of compensation to employees in accordance with applicable laws for any breach of employment contracts, closure of investment, sale and transfer of investment, discontinuation of investment, or reduction of workforce;

Laws and Regulations description
(g) has to abide by the applicable laws, rules, procedures and best standards practiced internationally for this investment so as not to cause damage, pollution, and loss to the natural and social environment and not to cause damage to cultural heritage; (i) has to close and discontinue the investment only after payment of compensation to employees in accordance with applicable laws for any breach of employment contracts, closure of investment, sale and transfer of investment, discontinuation of investment, or reduction of workforce; (j) has to pay wages and salaries to employees in accordance with applicable laws, rules, procedures, directives and so forth during the period of suspension of investment for a credible reason; (k) has to pay compensation and indemnification in accordance with applicable laws to the relevant employee or his successor for injury, disability, disease and death due to the work; (l) has to supervise foreign experts, supervisors and their families, who employ in its investment, to abide by the applicable laws, rules, orders and directives, and the culture and traditions of Myanmar; (m) has to respect and comply with the labor laws; (n) has to have the right to sue and to be sued in accordance with the laws; (o) has to pay effective compensation for loss incurred to the victim, if there is damage to the natural environment and socioeconomic losses caused by logging or extraction of natural resources which are not related to the scope of the permissible investment, except from carrying out the activities required to conduct investment in a Permit or an Endorsement. (p) has to allow the Commission to inspect in any places, when the Commission informs the prior notice to inspect the investment; (q) has to take in advance a Permit or an Endorsement of the Commission for the investments which need to obtain prior approval under the Environmental Conservation Law and the procedures of environmental impact assessment, before undertaking the assessment. Such investments has to be submitted the situation of environmental and social impact assessment to the Commission during the permitted investment period. **The project proponent has to comply with Chapter 17 Insurance, Section 73 as follows:** The project proponent has to insure the types of insurance stipulated in the provision of the rules at any insurance enterprise that is entitled to carry out insurance businesses within the Union.
Petroleum and Petroleum Products Law, 2017
The Petroleum and Petroleum Products Law (the "PPPL") 2017 was enacted by Pyaydaungsu Htuttaw as Pyaydaungsu Htuttaw Law No. 20/2017 on 1st August 2017 to repeal the Petroleum Act 1934. The PPPL contains the provisions on import and export, transportation, storage, refinery, distribution, inspection and testing of petroleum and petroleum products and issuance of relevant licenses. Licenses for exportation, importation, transportation, transit, storage, refinery, distribution, testing of petroleum and any petroleum products must be obtained from the MOEE, other relevant Ministries and any business related with the petroleum products cannot be operated without a relevant license. The Relevant sections are 10 (a, d), 15 ,16, and 31 (a, d) Section 10. The project proponent has to receive permission and licenses from The Ministry of Natural Resources and Environmental Conservation to carry out the following functions relating to any petroleum and petroleum product; (a) issuing licence for the right to store for the storage tanks and warehouses; (d) if it occurs environmental impacts in carrying out petroleum and petroleum product business activities, taking action, as necessary , in accordance with the existing laws of on-site inspection; Section 15. The project proponent desirous to transport or store non-dangerous petroleum and petroleum products locally, has to obtain licence if it is more than 500 gallons. However, in storing 500 gallons and less, receptacle not exceeding 200 gallons has to be used. Section 16. The project proponent may without obtaining licence, store, import or transport any dangerous petroleum and petroleum product not exceeding six gallons not intended for sale. Section 31: The Project proponent (a) has to not violate any prohibition contained in the rules, regulations, bye-laws, notifications, orders, directives, procedures and conditions or fail the duty to implement;

Laws and Regulations description
(d) has to not have the right to carry out without undertaking the environmental impacts, in operating petroleum and petroleum product business activities;

Public Health Law, 1972	
Section 5	The project proponent has to accept any inspection, anytime, anywhere if it is needed.
Section 9	The project proponent will comply with Clause 9, Subsection 1 of Section 3. The project proponent has to provide required infrastructure relating to environmental health, such as garbage disposal, use of water for drinking and other purposes, radioactivity, protection of air from pollution, sanitation works and food and drug safety for all works.
The Prevention and Control of Communicable Disease Law, 1995 and Amendment of Prevention and Control of Communicable Diseases Law, 2011	
Section 3	In order to prevent the outbreak of Communicable Diseases, the project proponent has to work with the Department of Health shall to implement required activities under this section.
Section 4	The project proponent has to comply with the measures undertaken by the Ministry of Health and the Department of Health under section 3 in respect of prevention of the occurrence and spread of communicable disease and control thereof."
Section 9	If the project proponent notices occurrence of any of the following matters, the project proponent has to report immediately to the nearest health department or hospital: (a) enmasse death of animals including chicken and birds (b) (b) rat fall; (c) suspicion or occurrence of epidemic disease; occurrence of notifiable disease."
Section 11	The project proponent in order to prevent and control the spread of a Principal Epidemic Disease has to allow the the Health Officer to undertake the measures detailed in Section 11.
The Control of Smoking and Consumption of Tobacco Product Law, 2006	
The Control of Smoking and Consumption of Tobacco Product Law (No. 05/2006)	
Chapter VI - Functions and Duties of Person-in-charge	
Section 9	The project proponent has to establish a smoking area and establish notice board for non-smoking area, and to accept the inspection of Ministry of Health as follows: (a) keep the caption and mark referring that it is a non-smoking area at the place mentioned in section 6 in accordance with the stipulations. (b) arrange the specific place where smoking is allowed as mentioned in section 7, and keep the caption and mark also referring that it is a specific place where smoking is allowed, in accordance with the stipulations. (c) supervise and carry out measures so that no one can smoke at the non-smoking area. (d) accept the inspection when the supervisory body comes to the place for which they are responsible.
The Myanmar Fire Force Law, 2015	
The Myanmar fire force law, 2015 covers requirements for fire fighting and fire protection.	

Laws and Regulations description	
The project proponent has to comply with Chapter 11, Section 25 as follows:	
Section 25	The project proponent has to implement the management of fire sub-station and required equipment to ensure (a) No absence for organizing separate fire force (b) No absence to set ready for fire safety equipment

Shops and Establishments Law, 2016

Section 13, Project proponent has to ensure that on their project site:

(a) Nobody under the age of 14 shall be allowed or required to work at a shop or at an establishment.

(b) Nobody under the age of 16 shall be allowed to work more than the designated work time at a shop or at an establishment.

Section 14, Project proponent has to ensure that on their project site:

(a) Anyone who is over 14 and under 16 may work with the permission of a doctor stating in a recommendation letter that the person is fit to work. However, this person shall not be allowed to work more than 4 hours per day.

(b) Nobody over 14 and under 16 shall be allowed or required to work from 6:00 pm to 6:00 am.

(c) Nobody over 14 and under 16 shall be allowed or required to work at another shop or establishment on the same day after working at a shop or establishment.

(d) No worker under 18 shall be allowed or required to perform work of a dangerous type or work at a dangerous workplace.

(e) Anyone between 16 and 18 shall, with the recommendation of a doctor, be allowed to work at workplaces where it is safe and there is no impact on the mental and physical development, provided that this person has finished proficiency training for the relevant job, is able to understand and follow the directives for health and safety at the workplace, and is fit and healthy.

Section 15, The project proponent-

(a) Has to designate at least one day per week as off-day for the worker at the respective shop or establishment.

(b) Has to not deduct the rightful salary of the worker for the off-day under sub-section (a).

Section 16, The project proponent has to pay the salary not later than 7 consecutive days after the salary payment period of the worker at the shop or establishment.

Section 17, The project proponent

(a) Has to calculate and pay the overtime fees in compliance with the agreed overtime payments based on the worked overtime hours.

(b) Has to not request overtime work without paying overtime fees according to sub-section (a).

Section 21, In the cases of this law, the project proponent

(a) Has to arrange the respective documents, lists, contracts, evidence, forms and samples to be inspected by the inspector.

(b) Has to, upon request, submit the registration book kept under this law and the rules, evidence of being the owner or documents regarding the business of any shop or establishment to the inspector.

Laws and Regulations description	
Section 24, The project proponent has to comply with the following at every shop and establishment. (a) Has to arrange for cleaning, good ventilation, and health. (b) Has to arrange for fresh air and sufficient light. (c) Has to arrange for it not being louder than the specified noise level. (d) Has to arrange for the prevention of overheating [literal translation] and the prevention of fire hazards. (e) Has to arrange for sufficient first aid boxes and medicine for the employees according to the provisions.	
The Protection and Prevention of Antique Objective Law, 2015	
The Protection and Preservation of Antique Objects Law (No. 43/2015) covers requirements for the finding of antique objects.	
Section 12	If the project proponent finds any object which has no owner or custodian, has to promptly inform the relevant Ward or Village-Tract Administrator if they knows or if it seems reasonable to assume that the said object is an antique object.
The Protection and Prevention of Ancient Monument Law, 2015	
The Protection and Preservation of Ancient Monuments Law (No. 51/2015). The project areas are not near any protected or Ancient Monuments including the Zarli Mountain.	
Section 12	If the project proponent who finds who an ancient monument of over one hundred years old and above or under the ground or above or under the water which has no owner or custodian knows or it seems reasonable to assume that the said monument is an ancient monument, they have to promptly inform the relevant Ward or Village-Tract Administrative Office.
Chapter VII. Applying for prior Permission, Scrutiny and Issue	
Section 15	If the project proponent aiming at realizing any of the following within the specified area of an ancient monument has to apply to get prior permission to the Department: (a) constructing or extending or repairing new buildings including hotels, factories and residential buildings or fencing or extending a fence; (b) digging to search petroleum, natural gas, gem or mineral, piping petroleum and natural gas, constructing factories, connecting national grid, constructing communication tower, constructing or extending infrastructures such as road, bridge, airfield, irrigation and embankment; (c) connecting underground electric cable, communication cable and other underground works; (d) gold sieving, digging, burning bricks, digging well, lake, creek, ditch, gully, pit digging, refilling, levelling, mining, quarry, gravel digging and unearth sand, removing the mounds and hills which can damage the physical feature of the land;
Chapter VIII Prohibitions	
Section 20	The project proponent will not carry out any of the following acts which are assumed to cause damage to an ancient monument within the specified area of an ancient monument or of a listed ancient monument without obtaining written prior permission: (a) using machines which causes vibration within the specified place of an ancient monument and running various types of vehicles; (b) cultivating, gardening, breeding, fencing by blocking nearby an ancient monument or doing any other act which can affect an ancient monument; (c) emission of gas such as hot-air balloon which can affect an ancient monument; (d) landing and taking off and, flying aeroplane and helicopter which can directly or indirectly affect an ancient monument; (e) discarding chemical substance and rubbish which can affect an ancient monument and the environment.

Laws and Regulations description	
State-Owned Economic Enterprises Law, 1989 (amended 97)	
This law sets out economic enterprises to be carried out soley by the government, as well as the rights of carrying out other economic enterprises, and the right to form organizations. Chapter III - Right of carrying out other Economic Enterprises Section 1 – The project proponent has the right to carry out any economic enterprise other than those prescribed under Section 3 to be carried out solely by the Government. Chapter V Offences and Penalties 1. If the project proponent is convicted of an offence of carrying out, without the permission of the Government, any economic enterprise prescribed under Section 3 to be carried out solely by the Government they will be punished with imprisonment for a term which may extend to a period of 5 years and may also be liable to a fine. Furthermore, property both moveable and immoveable relating to the economic enterprise may be confiscated. 2. If the project proponent is convicted of an offence of violating an order or any condition notified under section 4 or section 5 they will be punished with imprisonment for a term which may extend to a period of 3 years and may also be liable to a fine.	
The Employment and Skill Development Law, 2013	
Employment and Skill Development Law (No 29/2013). The key sections are 5, 14, and 30 (a and b).	
Section 5	The project proponent has to employ according to Section 5 of the Employment and Skill Development Law (No 29/2013)..
Section 14	The project proponent has to carry out the training program in accord with the work requirement in line with the policy of the skill development team to develop the skill relating to the employment for the workers who are proposed to appoint and working at present.
Section 30	(a) The project proponent has to put in to the fund monthly as put in fees without fail for the total wages of the subordinates and the supervisors' salary for not less than 0.5%; (b) The project proponent has to ensure that put in money paid under subsection (a) has to not be deducted from the wage and salary of the employees.
Oil Fields (Labour & Welfare) Act, 1951	
Project Proponent has to comply with the worker welfare requirement stipulated in The 1951 Oilfields (Labour & Welfare) Act. This act prescribes a wide range of protection measures for O&G workers, covering health, safety and worker welfare issues. It also covers working hours, holidays and extensive prescriptions on employing children as well as setting up an inspection service, complemented by a range of penalties but it is unclear whether there has been inspection and enforcement of these basic provisions.	
The Workmen Compensation Act, 1923 (amended 2005)	
Workman's Compensation Act (1923) Amended by Law No 4/2005	
Section 10 (a, b) and 11	The project proponent has to compensate for death and injury during the working hours according to Workman's Compensation Act (1923) Amended by Law No 4/2005.
Labour Organization Law, 2012	
The Labour Organization Law, (No. 07/2011) and The Labour Organization Rules, 2012 were enacted to protect the rights of the workers, to have good relations among the workers or between the project proponent and the worker, and to enable to form and carry out the labour organizations systematically and independently.	
Section 17 to 22	The project proponent has to:

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	• Recognize the labour organizations • Allow the member of executive committee assigned by the labour organization to perform their duty not exceeding two days per month • Assist as much as possible if the labour organizations requests help which is in the interest of the factory's workers.
The Settlement of Labour Dispute Law, 2012	
Settlement of Labour Dispute Law (No. 05/2012) Amended by Law No. 40/2014 was enacted for the settlement of labour disputes:	
Section 38	No project proponent will fail to negotiate and coordinate in respect of the complaint within the prescribed period without sufficient cause.
Section 39	No project proponent will alter the conditions of service relating to workers concerned in such dispute at the consecutive period before commencing the dispute within the period under investigation of the dispute before the Arbitration Body or Tribunal, to affect the interest of such workers immediately.
Section 40	No project proponent will proceed to lock-out or strike without accepting negotiation, conciliation and arbitration by Arbitration Body in accord with this law in respect of a dispute.
Section 51	If the project proponent, in the course of settlement of dispute, commits any act or omission, without sufficient cause, which by causing a reduction in production resulting so as to reduce the workers' benefits has to be liable to pay full compensation in the amount determined by the Arbitration Body or Tribunal. Such money has to be recovered as the arrear of land revenue.
Minimums Wages Law, 2013	
The Minimum Wages Law, No. 07/2013 was enacted on 22nd March 2013 (The Minimum Wages Rules, 2013). Section 12 (d) of the law provides that the project proponent has to pay the minimum wage to the workers working in the commercial, production business and service in cash.	
Section 12	The project proponent: (a) has to not pay wage to the worker less than the minimum wage stipulated under this Law; (b) may pay more than the minimum wage stipulated under this Law; (c) has to not have the right to deduct any other wage except the wage for which it has the right to deduct as stipulated in the notification issued under this Law; (d) has to pay the minimum wage to the workers working in the commercial, production and service business in cash. Moreover, if the specific benefits, interests or opportunities are to be paid, it may be paid in cash or partly in cash and partly in property, with prevailing regional price, jointly according to the desire of the worker;
Section 13	The project proponent: (b) Has to prepare and maintain the lists, schedules, documents and wages of the workers correctly; (c) Has to report the lists, schedules and documents prepared and maintained under sub- section(b) to the relevant department in accord with the stipulations; (d) Has to accept the inspection when summoned by the inspection officer. Moreover, he has to produce the said lists and documents upon asking to submit;
The Minimum Wages Rules, 2013 include: Chapter 9 - The power and obligations of the project proponent	
Section 43	The project proponent: (e) before fixing of the minimum wage by the National Committee under this rule, if his remuneration is less than the prescribed amount, he should be paid up to the full amount;

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	(f) part time, hourly job employees has to be paid the prescribed minimum wage for the working hours; (g) for the salary employees one day day-off has to be allowed in a week. If he has to work on the off day, overtime wage has to be paid in accord with the existing law;
Payment of Wages Law, 2016	
Payment of Wages Law (No 17/2016) covers the following requirements:	
Chapter 2	
Section 3 Section 4 Section 5	Section 3 The project proponent has to pay for salary either Myanmar Kyats or Foreign Cash permitted by National Bank of Myanmar. When delivery the salary (b) If the project proponent needs to pay the other opportunities or advantages, they can pay cash together with other materials according employee's attitude. Section 4 When the contract finish, the project proponent has to to pay the salary (not more than one month) to employees. For the permanent worker, has to pay per monthly. If more than 100 employees, has to pay within the 5 days from the end of month. If fire the employees, has to pay salary within two days after fire. When employee dies due to the accident, has to pay money as an insurance to employee's family within two days.
Chapter 3	
Section 7 Section 13 Section 14	Project proponent has to comply with all sections covering all the issue of deducted salary based on different categories. According to Chapter 3, Section 7, the project proponent can deduct: (a) Can deduct from wages for absences except when such absence is during a public holiday or entitled leave, according to the law. (b) Accommodation charges and transportation charges, meal allowances, charges for water and electricity, taxes and errors in payment shall be allowed for deduction. (c) Can deduct from pre-issued, expensed and saved (or) contributed amount according to the law upon the employee contract. (d) The Employer can deduct with the judgment of the Court of Arbitrator Jury Council. According to Chapter 3, Section 11, the project proponent can also deduct for: (a) Direct damage which is either intentional or due to negligence or due to the failure of the employee concerned with company property to take proper care. (b) A breach of the employment contract or breech of any rules for which a fine had been previously set. No other deductions are allowed, except those covered above by Sections 7 and 11 of Chapter 3. Furthermore, according to Chapter 3, Section 10, no deductions shall ever be allowed for any workers under the age of 16. Section 14. If an Employee carries out overtime work, the project proponent has to ensure he/she is allowed the presiding overtime rate as set by the Law.

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Social Security Law, 2012	
The objectives of the Social Welfare Law (2012) and accompanying Social Welfare Rules (2014) include providing workers with the right to draw back some of the contributions paid by employers and workers as savings in accordance with the stipulations, and to obtain the right to continue medical treatment, family assistance benefit, superannuation benefit, survivors' benefit, unemployment benefit, the right to residency and ownership of housing after retirement in addition to health care and pecuniary benefit for sickness, maternity, death, employment injury of the workers. Project proponent will comply with all social security requirements for drilling worker including foreign experts.	
Section 11	The Social Welfare Law (2012) requires the project proponent establishments to comply with the provisions for compulsory registration with the social security system and benefits (indicated in the Social Welfare Law) if they employ a minimum number of workers as determined by the Ministry of Labour in co-ordination with the Social Security Board: Industries which carry out business whether or not they utilize mechanical power or a certain kind of power; businesses of manufacturing, repairing and servicing; or engineering businesses, factories, warehouses and establishments.
Section 15	The project proponent has to ensure it meets the requirements of the social security funds
Section 18	(b) The project proponent has to deduct contributions to be paid by worker from his remuneration and pay to the social security fund together with contribution to be paid by him. The employer shall also bear the expenses for such contribution.
Section 48 (b)	(b) The employers may effect insurance by registering voluntarily for insurance of the workers who are not applied to provisions of compulsory registration for employment injury benefit insurance system, by paying stipulated contribution to employment injury benefit insurance fund.
Section 49	(a) The project proponent and insured persons of establishments where the project proponent had registered compulsorily in accordance with sub-section (a) of section 48 or where the project proponent had registered voluntarily in accord with sub-section (b) of section 48 who have paid contribution to employment injury benefit fund has to not apply to the provisions contained in the Workmen's Compensation Act as regards the employment injury benefit; (b) The insured persons who has effected insurance for employment injury benefit in accord with sub-sections (a) and (b) of section 48 has to be entitled only to the employment injury insurance benefits contained in this Law.
Section 75	The propoject proponent: (a) has to prepare and keep the following records and lists correctly and submit to the relevant township social security office in accord with the stipulations: (i) records and lists of workers' daily attendance; (ii) records on appointment of new workers, employing worker by changing of work, termination, dismissal and resignation; (iii) records on promotion and paying remuneration ; (iv) records and lists of employer, manager, and administrator and records on change of them; (b) has to inform the relevant township social security office if the following matters arise: (i) changes in number of workers and address of establishment; (ii) change of employer, change of business, suspension of work, and close-down of work; (iii) employment injury, decease and contracting diseases; (c) has to submit records of work and lists if requested by inspectorate or official assigned by the Social Security Head Office and various levels of Regional Social Security Office under this Law.

Laws and Regulations description	
Leaves and Holidays Act, 1951	
The Leave and Public Holiday Act, 1951 Amended by Law No. 06/2006 and No. 30/2014 . The project proponent has to allow the leaves and holidays defined by the national governments.	
•The Protection of Rights of National Race Law, 2015	
This law has provisions for equal treatment and considerations for various ethnicities and races within Myanmar. If the project impacts Indigenous Peoples the proponent must provide complete, accurate and precise information about the Project proposed for their areas as per Section 5 of The Protection of Rights of National Race Law, 2015.	
Industrial Use Explosive Substance, 2018	
Section 6 (c) Project Proponent has to apply to the Ministry to build a munitions dump. Section 7: Project Proponent has to receive permission for importing, transfer and transport, storage, using and possessing of occupational explosive substances. Section 12: The License is valid for 1 year from manufacturing date. Section 13: If the project proponent wants to extend the license for storage of occupational explosive substances, he/ she has to apply to chief inspector 30 days before expired date. Section 15: The Project proponent: (a) Has to store the occupational explosive substances in defined limited amount systematically (b) Has to be monitored by chief inspector or inspector occasionally. (c) Has to inform to both nearest police station and chief inspector in line with the time, if there were missing, burning, blowing out, breaking down, injury or death of people. (d) Has to pay license fees to Ministry. Section 16: The project proponentwho gets permission- (a) Has to store the occupational explosive substances in munitions dump that have license. (b) Has to perform prior the required protection for transfer and transport, usage, possessing of occupational explosive substances. Section 18: The project proponent who gets permission cannot deny for inspection and monitoring by chief inspector or inspector.	
Fresh Water Fisheries Law, 1991	
Section 40	The project proponent will not cause harassment of fish and other aquatic organisms or pollution of the water in a freshwater fisheries water.
The Motor Vehicles Law, 2015 and Rule, 1987 and Rule 1987	
The project proponent has to comply with the noise, traffic and exhaust sections of the Motor Vehicle Law No. 55/15	
Myanmar Insurance Law, 1993	
Requires any business which may pollute the environment to effect compulsory general liability insurance.	
Section 15	The project proponent has to ensure all motor vehicles effect compulsory Third Party Liability Insurance with the Myanmar Insurance.
Section 16	The project proponent operating an enterprise which may cause loss to State-owned property or which may cause damage to the life and property of the public or which may cause pollution to the environment has to effect compulsory General Liability Insurance with the Myanmar Insurance.

Laws and Regulations description	
Forest Law, 2018	
Section 12: The project proponent has to within a forest land and forest covered land at the disposal Government if: (a) is desirous of carrying out any development work or economic scheme has to obtain the prior approval of Ministry;	
Biodiversity & Protected Area Law. 2018	
Section 39. If the propjet proponent commits any of the following acts, on conviction be punished with imprisonment for a term which may extend to maximum 3 years or with fine which may extend to minimum Kyats 200,000 or maximum Kyats 500,000 or with both- (d) Causing water and air pollution, causing damage to a water-course or putting poison in the water in a natural area, passing through the electric current, and using chemicals and explosive substances. (e) Possessing or disposing of pollutants or mineral pollutants in a natural area. Section 41. If the project proponent commits any of the following acts shall, on conviction be punished with imprisonment for a term which may extend to minimum 3 years to maximum 10 years or with fine- (a) Killing, hunting or wounding, collecting, selling a completely protected wild animal or animals controlled in national trade without permission, possessing or transporting or transferring such wild animal or any part thereof or blood of such animals or product deriving from the parts of such animals without permission; (b) Extracting, collecting a completely protected natural plants or plants controlled in national trade or destroying, collecting, possessing, selling, transferring and transporting such plant or any parts thereof or product deriving from the parts of such plant without permission.	
The Underground Water Act, 1930	
The Underground Water Act, 1930 provides measures for systematic and sustainable use of underground water and prohibitions on accessing and using underground water without a license Whereas it is expedient to conserve and protect underground sources of water supply in the Union of Burma; it is hereby enacted as follows:	
Section 3	Project proponent has to not sink a tube for the purpose of obtaining underground water except under and in accordance with the terms of a licence granted by the water officer.
Section 6	(a) The project proponent has to comply with the President of the Union rules in regard to: a) prescribing the conditions subject to which licences may be granted by the water officer under section 3;
The Farmland Law, 2012 (Section 30)	
Section 30	In respect of the application to utilize the farmland for other purposes in the interest of the public: (a) The Central Farmland Management Body shall give permission to utilize the paddy land for other purposes, with the recommendation of the Region or State Farmland Management Body; (b) The respective Region or State Government shall give permission to utilize the farmland for other purposes except paddy land, with the recommendation of the Region or State Farmland Management Body
Land Acquisition Act, 1894	
	Land acquisition for a company may be carried out where it is “likely to prove useful to the public.” In these cases the Government has the responsibility for carrying out the acquisition and distributing the compensation; however, the company acquiring the land has to provide the compensation. Compensation is based on the market value of the land and also possible damage incurred by the private landowner, such as loss of crops and firewood or the cost of changing residence and place of business. Land in-

Laws and Regulations description	
	kind can also be provided in place of monetary compensation (Section 6). These losses should take place "in consideration of the compulsory nature of the acquisition" (Section 23). The Law sets out basic procedures governing land acquisition, including a preliminary investigation, and a procedure for notification of persons interested in the land. The Law also includes provision for objections to the land acquisition, in which the objector is granted the 'opportunity of being heard', where the objections raised may be further explained. However, the President's decision on the objection is final, in practice giving him/her wide discretionary powers (Section 5).
The Vacant, Fallow and Virgin Lands Management Law, 2012 (amended September 11, 2018)	
Section 16, The project proponent who has the right to cultivate or utilize vacant, fallow and virgin lands shall; (a) carry out only the type of business permitted and affiliated economic enterprises. (b) reclaim and carry out the permitted land until the completion of business according to the stipulation within 4 years starting from the day of permission. For the lapse of the prescribed period due to natural disasters or unstable situation, central committee may revise the stipulated term. c) not mortgage, gift, sell, lease or transfer by other means or divide the permitted Vacant, Fallow and Virgin Lands without the permission of the Union Government. (d) pay up the land revenue for vacant, fallow and virgin lands, which he has the right to cultivate or utilize . (e) comply with the conditions relating to the right to cultivate or utilize the vacant, fallow and virgin lands prescribed by the Central Committee. (f) not extract other natural resources above or below the ground except the permitted business. (g) when acquiring the required land area from the land permitted in the event of finding the natural resources within the permitted land and the Government is desirous to extract commercially, shall return as directed by the Union Government. 19. The project proponent has to comply with the Central Committee right to acquire the required minimum land area from the permitted vacant, fallow and virgin lands if one of the following conditions arises: (a) if the ancient cultural heritages are found in the permitted vacant, fallow and virgin lands; (b) if infrastructure project or special project is required to be implemented for the interest of the State; (c) if different resources other than the permitted type of metal is found in the permitted vacant, fallow and virgin lands for the mineral production business; (d) if the mineral resources are found in the vacant, fallow and virgin lands permitted to carry out the business contained in Section 4, Sub- section(a), (b) and (c).	
The Protection and Prevention of Cultural Heritage Area, 2015	
The Protection and Preservation of Cultural Heritage Region Law, 1998 Amended by Law. No.1/2009 Provisions to protect ancient sites and regions and cultural heritage areas from any adverse impacts due to industrialization, tourism and urbanization.	
Section 20	The project proponent can not carry out any of the following in the cultural heritage region: (a) destroying an ancient monument; (b) willfully altering the original ancient form and structure or original ancient workmanship of an ancient monument; (c) excavating to search for antiquities; (d) exploring for petroleum, natural gas, precious stones or minerals.

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Section 23	The project proponent can not plough and cultivate or carry out any activity which may cause damage to the cultural heritage within the boundary notified by the Department in the cultural heritage region.
Section 29	(b) If any circumstance arises for the drilling of petroleum or natural gas and mining of precious stones or minerals in the cultural heritage region for the benefit of the State, the project proponent the request has to submitted to the Government and permission has to be requested and obtained.
The Prevention of Danger of Hazardous Chemical and related Substances Law, 2013 (Section 16,17,23,27)	
The Prevention of Hazard from Chemicals and Related Substances Law was enacted on 26th August 2013. The objectives of this Law include: protecting natural resources from decrease and loss, and safeguarding living things from endangerment caused by chemical and chemical related substances; and systematically controlling safety in carrying out approved chemical and associated materials businesses. The Law requires continuous development of worksite safety, health and environmental conservation. The Prevention of Hazard from Chemicals and Related Substances Law (2013) defines Chemical as: imposing danger to the health or life of man or animal or chemical element, chemical compound and chemical mixture which cause bad consequences to the environment naturally or appearing after created by man. This definition includes the vapour, liquid, waste materials of oily and solid which act chemically and technically.	
Section 16	The project proponet who has obtained a licence:- (a) has to abide the licence regulations; (b) has to perform to abide strictly the instructions for being safety in using the chemical and related substances by himself and also the persons who serve the work; (c) has to keep the required safety equipment enough in the chemical and related substances businesses, furthermore has togrant the personal protection equipment and dresses free of charge to the working persons; (d) has to make the course of training and study and instruction if necessary to the working persons for using the occupational safety equipment, the personal protection equipment and the dresses systematically in the chemical and related substances business; (e) has to be inspected by the respective Supervisory Board and Boards of Inspection in respect of whether or not the hazard may impact on the Human Being and Animals' health and the environment; (f) has to make medical check up the working persons who will work in the chemical and related substances business and has to permit to serve in that work after obtaining the recommendation that his health is suitable for that work. This medical check up records have to be kept systematically; (g) has to send the copy of informative letter of the permission to the respective Department of Township Administration, if the hazardous chemical or related substances are permitted to store; (h) has to acquire in advance the guidance and agreement of the respective Department of Fire Brigade, if the business that is worried to fire hazard is operated by using the fire hazard substances or the explosive substances; (i) has to transport only the permitted amount of the chemical and related substances in accordance with the prescriptive stipulations, if they are transported in local; (j) has to take the permission from the Central Supervisory Board if the chemical and related substance is altered and transferred from one place to any other place which contained in the license; (k) has to abide and perform in accordance with the related environmental laws not to impact and damage to the environment in operating the chemical and related substances business.
Section 17	The project proponent who has obtained a licence, has to put the insurance in accordance with the prescriptive stipulations to be able to pay the compensation, if the impact and damage is occurred on the Human Being and Animals or the environment in respect of the chemical and related substances businesses.

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Section 23	The project proponent who has obtained the registration certificate:- (a) has to apply to register again, to the Central Supervisory Board if the chemical and related substances, which are not contained in the registered list, are used; (b) has to inform and submit the unused chemical and related substances list to the Central Supervisory Board, although which are contained in the registered list.
Section 27	The project proponent who has obtained the licence to be complied the following matters to control and decrease the hazard of the chemical and related substances:- (a) classifying the hazard level to protect in advance the hazard according to the properties of the chemical and related substances; (b) expressing the Material Safety Data Sheet and Pictogram; (c) providing the safety equipments, the personal protection equipments to protect and decrease the accident and attending to the training to be used systematically; (d) performing in accordance with the stipulations in respect of transporting, possessing, storing, using, discharging the chemical and related substances; (e) not being imported or exported the chemical and related substances banned by the Central Supervisory Board and the machinery and equipments which are used them.
Import and Export Law, 2012	
Chapter IV Prohibitions	
Section 7	Project Proponent who obtained any license has to not violate the conditions contained in the license.
Myanmar Engineering Council Law, 2013	
The objectives of this Law are as follows: (a) to uphold and upgrade the dignity, ethics and quality of the Myanmar citizen engineers, graduate technicians and technicians who are practising engineering works; (b) to explore using engineering technology and information technology combined the good methods, research and development activities by which the natural resources and human resources of the State may be beneficially applied with least impact on environment; (c) to carry out guidance and supervision, and to take necessary actions for fulfillment of the requirements of stipulated technical standard, proper method, free from danger, keeping ethic and being dutiful in the fields of engineering and technology education, researches and services; (d) to service engineering and technology ielated functions and duties beneficial for the State assigned by the relevant Ministry and relevant organizations The project proponent has to ensure the employment of the person who has certificate related with the project activities under the requirements of Myanmar Engineering Council Law (2013).	
The Conservation of Water Resources and Rivers Law, 2006	
The Conservation of Water Resources and Rivers Law (2006) was promulgated on 2nd October 2006. The aims of this Law are as follows: • To conserve and protect the water resources and rivers system for beneficial utilisation by the public; • To ensure smooth and safe waterways navigation along rivers and creeks; • To contribute to State economic development through improving water resources and river systems; and • To protect environmental impact.	
Section 8	The project proponent has to ensure no person: (a) carry out any act or channel shifting with the aim to ruin the water resources and rivers and creeks. (b) cause the wastage of water resources wilfully.

Laws and Regulations description	
Section 11	The project proponent has to ensure no person: (c) dispose of engine oil, chemical, poisonous material and other materials which may cause environmental damage, or dispose of explosives from the bank or from a vessel which is plying, vessel which has berthed, anchored, stranded or sunk. (d) catch aquatic creatures within river-creek boundary, bank boundary or waterfront boundary with poisonous materials or explosives.
Section 19	The project proponent has to ensure no person dispose of any substance into the river-creek that may cause damage to waterway or change of watercourse from the bank or vessel which is plying, vessel which has berthed, anchored, stranded or sunk.
Section 24	The project proponent has to ensure no person: (a) violate the conditions relating to navigation of vessels in rivers and creeks prescribed by the Directorate for conservation of water resources, rivers and creeks. (b) violate the conditions prescribed by the Directorate so as not to cause water pollution and change of watercourse in rivers and creeks.
Ward and Village Tract Administration Law, 2012	
Project proponent has to comply with the Ward and Village Tract Administration Law and inform the lists of person that live in exploration and campsite to the relevant ward/village offices.	
Health the Care Waste Management Guideline	
Project Proponent has to manage all medical wastes / clinical wastes management in compliance with the Health the Care Waste Management Guideline once stipulated by Ministry of Health and Sports	
Occupational Health and Safety Law (The Pyidaungsu Hluttaw Law No. 8/2019)	
Section 4.	This Law applies to the following Industries/Businesses owned by government departments or organizations, cooperatives, national citizens or foreigners in private or joint venture: (h) oil and gas Industry/Business;
Section 12.	The Employer (Project Proponent) must, in accordance with the stipulations of the Ministry: (a) appoint the Person In-charge for Occupational Safety and Health to closely supervise safety and health of Workers in line with the type of Industry/Business; and (b) form the respective Occupational Safety and Health Committee in line with the type of Industry/Business comprising equal number of Employer and Worker representatives to become safe and healthy Workplace on condition that the number of Workers in his/her Industry/Business exceeds the number determined by the Ministry for that purpose. The Occupational Safety and Health of female Workers shall be considered according to the nature of Industry/Business when forming such Occupational Safety and Health Committee.
Section 26.	The Employer (Project Proponent) must be responsible to: - (a) arrange as required to assess the risks of Workplace, Process and machines and materials used thereat; (b) arrange as required to assess the likelihood of occurrence of hazards at the Workplace and to the environment; (c) arrange to have Workers medical checked-up by the Recognized Doctor in accordance with stipulations whether they suffer from any Occupational Disease; (d) arrange to improve the Workplace until it is safe and good for health based on the findings as per sub-sections (a), (b) and (c); ©SCM Legal Limited. (e) provide Workers with sufficient number of personal protective clothing, materials and facilities prescribed and approved by the Department on free of charge basis and cause Workers to wear them while working;

Laws and Regulations description	
	(f) prescribe precautionary plans and plans for emergency; (g) provide a clinic, appoint the Registered Doctors and nurses and provide medicines and supporting equipment for any Industry/Business where the number of Workers is not less than the number determined by the Ministry; (h) make necessary arrangements for managers, Workers and members of the Occupational Safety and Health Committee including (Employer) himself/herself to attend Occupational Safety and Health training courses stipulated by the Ministry in accordance with their departments or types of work; (i) make necessary arrangements to enable immediate reporting to the Person In-charge for Occupational Safety and Health or manager in case where a Worker suffers an Occupational Accident or his/her life or health is likely to be in danger; (j) arrange to prevent any persons in the Workplace from Occupational Safety and Health risks occurred due to materials, machines or wastes used in the Workplace or Process; (k) immediately stop the Process, evacuate Workers and conduct necessary rescue plans if any Occupational Accident is about to occur. If possible, Workers will be relocated to another appropriate safe Workplaces; (l) display Occupational Safety and Health instructions, danger signs, notices, posters and signage for directions in accordance with stipulations; (m) arrange to be complied with precautions when entering restricted hazardous Workplaces; (n) arrange to disseminate Occupational Safety and Health manuals and guidelines issued by the relevant Ministries for knowledge, technology, information and skills not only to Workers but also to related persons or raise their awareness or knowledge thereof; (o) lay down the fire safety plan, perform fire drilling and train Workers to use fire extinguishers systematically; (p) allow the Chief Inspection Officer and Inspection Officers to enter Workplaces, inquire, request documents and information or seize exhibits; (q) cause Workers to work only for the specified working hours if they have to work in Hazardous Industry/Business and Workplace; and (r) Incur the expenses for Occupational Safety and Health matters.
Section 27.	No Employer (Project Proponent) must dismiss or demote a Worker: - (a) during any period before a medical certificate is issued by the Registered Doctor for occupational injury or by the Recognized Doctor for contact with Occupational Disease; (b) because the said Worker has addressed a complaint for hazardous or health detrimental condition; ©SCM Legal Limited. (c) because the said Worker has conducted the responsibilities of Occupational Safety and Health Committee; or (d) because the said Worker has refused to work in any condition where an Occupational Accident or Occupational Disease is about to occur.
Section 28.	If any Worker who has been injured due to an Occupational Accident or contacted with Occupational Disease is not covered under the Social Security Law 2012, the Employer (Project Proponent) must pay for medical expenses to check the extent of capacity reduction and class of disability of such Worker.
Section 29.	The Employer (Project Proponent): - (a) can prohibit or restrict any Worker to work if he/she does not meet the health standards due to medical check-up results done by the Registered Doctor in accordance with the needs and nature of the Industry/Business; (b) must, without delay, employ any Worker who has been prohibited or restricted to work subject to sub-section (a) in his/her original position or at the relevant Workplace upon his/her submission of health improvement evidence; and (c) must make necessary arrangements in the Workplace in order not to damage health of female Workers who are pregnant or breast-feed.

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Section 49.	No Employer (Project Proponent): - (a) shall fail to comply with an order to close the Workplace temporarily in accordance with Section 18; (b) shall fail to comply with the conditions prescribed under Section 20 sub-section (b); (c) shall fail to comply with the instructions issued by the Inspection Officer in accordance with Section 21 sub-section (a); (d) shall ask Workers to work for more than the specified hours in accordance with Section 26 sub-section (q); or (e) shall fail to pay for Occupational Safety and Health expenses subject to Section 26 sub- section (r).

3.4 Institutional Framework

The aim of this Chapter is to describe the Administrative and political divisions of Myanmar.

3.4.1 Administrative Divisions

Myanmar is a multi-ethnic country composed of over 130 ethnic groups, and viewing macroscopically, in the central part of the country from north to south along Ayeyarwady River resides the largest group covering 70% of the total population, Bamar, and in mountainous area in east and west reside most of the minorities.

Myanmar has a three levels administrative structure, as described below.

The first level subdivision includes:

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

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

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

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

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

ONGC Videsh Limited (ONGC Videsh), a 100% subsidiary company of Oil and Natural Gas Corporation Limited (ONGC), was awarded Block EP-3 to explore and produce hydrocarbon in the Myanmar Onshore Bidding Round 2013. Production Sharing Contract (PSC) for the onshore Block was signed between Myanmar Oil and Gas Enterpise (MOGE), ONGC Videsh Limited and Machinery & Solutions Company Limited (M&S) on 8th August, 2014. ONGC will conduct an exploration drilling campaign in Block EP-3. The EP-3 Block is located at the Bago region of The Republic of Union of Myanmar. The Block is located 250 km northwest of Yangon. Within the Bago region the block is located at the Pyay and Thayarwady Districts.

Following five townships are being covered by the proposed Block:

- Thegon
- Pyay
- Paungde
- Paukkhaung
- Nattalin

3.5 Project's Environmental, Social and Health Standards

3.5.1 Discharge Standards

MONREC has established environmental and health quality standards, the National Environmental Quality (Emission) (NEQG) Guidelines [Legal Reference: ECL 2012 (Section 2c) and NEQG 2015] were promulgated on December 29th, 2015. The Guidelines are largely based on International Finance Corporation (IFC) Environmental Health and Safety (EHS) Guidelines, and contain regulations and control of various environmental parameters, including noise and vibration, air emissions, and effluent discharges, from various sources and activities. ECD / MONREC have indicated that the discharge standards shown in **Table 3-5** are applicable for Onshore Oil and Gas activities.

These are in accordance with international standards.

Table 3-5: Myanmar Discharge Standards Applicable to Onshore Oil and Gas activities

Guideline	Standard
Drilling fluids and cuttings	Treatment and disposal in accordance with applicable standards provided in the General EHS Guidelines
Produced sand	Treatment and disposal in accordance with applicable standards provided in the General EHS Guidelines
Produced water	Treatment and disposal in accordance with applicable standards provided in the General EHS Guidelines for discharge to surface waters or to land: – Total hydrocarbon content 10 mg/L – pH 6-9 – Biochemical oxygen demand 25 mg/L – Chemical oxygen demand 125 mg/L – Total suspended solids 35 mg/L – Phenols 0.5 mg/L – Sulfides 1 mg/L – Heavy metals (total)a 5 mg/L – Chlorides 600 mg/L (average), 1,200 mg/L maximum
Hydrotest water	Treatment and disposal in accordance with applicable standards provided in the General EHS Guidelines for discharge to surface waters or to land, apply standards specified for Produced Water
Completion and well work-over fluids	Treatment and disposal in accordance with applicable standards provided in the General EHS Guidelines For discharge to surface waters or to land: – Total hydrocarbon content 10 mg/L − pH 6-9
Storm water drainage	Storm water runoff should be treated through an oil / water separation system able to achieve oil and grease concentration of 10 mg/L
Cooling water	The effluent should result in a temperature increase of no more than 3°C at edge of the zone where initial mixing and dilution take place; where the zone is not defined, use 100 m from point of discharge
Sewage	Treatment as per General EHS Guidelines, including discharge requirements
Air emissions	Treatment as per General EHS Guidelines Emission concentrations as per General EHS Guidelines, and: – Hydrogen sulfide 5 mg/Nm^3

a Heavy metals include: Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Silver, Vanadium and Zinc

The Environmental, Health, and Safety (EHS) Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP). They are designed to provide relevant industry background and technical information. The EHS Guidelines contain the performance levels and measures that are generally considered to be achievable in new facilities by existing technology at reasonable costs (Environmental Health and Social Guidelines, IFC 2007).

Table 3-6: Applicable IFC EHS Guidelines

Environmental topic	Applicable EHS Guidelines
Air quality	Section 1.1 provides guideline applies for facilities or projects that generate emissions to air at any stage of the project life-cycle. It presents information about common techniques for emissions management. This guideline provides an approach to the management of significant sources of emissions, including specific guidance for assessment and monitoring of impacts. Additional information on approaches to emissions management in projects located in areas of poor air quality, where it may be necessary to establish project-specific emissions standards are included. These Guidelines include the following key recommendations: • facilities and projects should avoid, minimize, and control adverse impacts to human health, safety, and the environment from emissions to air; • impacts should be estimated through qualitative or quantitative assessments by the use of baseline air quality assessments and atmospheric dispersion models to assess potential ground level concentrations; • the dispersion model applied should be internationally recognized, or comparable (examples of acceptable emission estimation and dispersion modelling approaches for point and fugitive sources are reported in these guidelines); • emissions from point sources should be avoided and controlled according to good international industry practice (GIIP) applicable to the relevant industry sector, depending on ambient conditions, through the combined application of process modifications and emissions controls (examples are provided in these guidelines); • a monitoring system should be implemented. For ambient air quality IFC refers to WHO Guidelines (Air Quality Guidelines Global Update, 2005.)
Noise and vibration emissions	Section 1.7 provides standards for daytime and night time noise emissions (for residential and industrial environments, WHO 1999) and recommends that noise prevention and mitigation measures are implemented with regard to predicted noise levels at sensitive receptors. Noise monitoring may be carried out for the purpose of establishing the existing ambient noise levels in the area of the proposed facility or for verifying operational phase noise levels. A key priority should be the implementation of noise control measures at source; the selected methods will depend on the source type and the proximity of sensitive receptors, and can include: equipment selection, acoustic enclosures, vibration isolation, traffic route selection, other.
Wastewater and Liquid effluent quality	Section 1.3 provides guidelines applied for projects that have either direct or indirect discharge of process wastewater or wastewater from utility operations. Section 1.3 provides guidelines for treatment approaches of process wastewater and wastewater from utility operations. These Guidelines include the following key recommendations: • points of discharge, rate of discharge, chemical use, dispersion and environmental risk should be considered in a disposal plan; • discharges should be planned away from environmentally sensitive areas, with specific attention to high water tables, vulnerable aquifers, wetlands, and community receptors, including water wells and intakes.

Environmental topic	Applicable EHS Guidelines
Waste management	Section 1.6 provides guidelines for projects/facilities that generate, store, or handle any quantity of industrial hazardous or not hazardous waste. Section 1.6 provides appropriate guidelines for hazardous waste storage, transport, treatment and disposal, in order to prevent harm to health, safety and environment. These Guidelines include the following key recommendations: • waste management should be addressed through a Waste management system that addresses issues linked to waste minimization, generation, transport, disposal, and monitoring; • in addition to the implementation of waste prevention strategies, the total amount of waste may be significantly reduced through the implementation of recycling plans; • if waste materials are still generated after the implementation of feasible waste prevention, reduction, reuse, recovery and recycling measures, waste materials should be treated and disposed and all measures should be taken to avoid potential impacts to human health and the environment.
Drill Cuttings	Section 1.1 Drilling Fluids and Drilled Cuttings Feasible alternatives for the treatment and disposal of drilling fluids and drilled cuttings should be evaluated and included in the planning for the drilling program. Alternative options may include one, or a combination of, the following: • Injection of the fluid and cuttings mixture into a dedicated disposal well; • Injection into the annular space of a well; • Storage in dedicated storage tanks or lined pits prior to treatment, recycling, and / or final treatment and disposal; • On-site or off-site biological or physical treatment to render the fluid and cuttings non-hazardous prior to final disposal using established methods such as thermal desorption in an internal thermal desorption unit to remove NADF for re- use, bioremediation, landfarming, or solidification with cement and / or concrete. Final disposal routes for the non- hazardous cuttings solid material should be established, and may include use in road construction material, construction fill, or disposal through landfill including landfill cover and capping material where appropriate. In the case of landfarming it should be demonstrated that subsoil chemical, biological, and physical properties are preserved and water resources are protected; • Recycling of spent fluids back to the vendors for treatment and re-use. Consider minimizing volumes of drilling fluids and drilled cuttings requiring disposal by: • Use of high efficiency solids control equipment to reduce the need for fluid change out and minimizing the amount of residual fluid on drilled cuttings; • Use of slim-hole multilateral wells and coiled tubing drilling techniques, when feasible, to reduce the amount of fluids and cuttings generated. Pollution prevention and control measures for spent drilling fluids and drilled cuttings should include: • Minimizing environmental hazards related to residual chemicals additives on discharged cuttings by careful selection of the fluid system. • Careful selection of fluid additives taking into account technical requirements, chemical additive concentration, toxicity, bioavailability and bioaccumulation potential; • Monitoring and minimizing the concentration of heavy metal impurities (mainly mercury and cadmium) in barite stock used in the fluid formulation.

3.5.2 Ambient Environmental Legislation and Guidelines

Ambient air quality in this report will be compared to the following Legislation and Guidelines:

- Myanmar National Environmental Quality (Emission) Guidelines, Effective since 2015 in accordance with The Environmental Conservation Law, 2012[1],
- WHO Air quality guideline (2006) and amendment.

Ambient noise level in this report will be compared to the following Legislation and Guidelines:

- Myanmar National Environmental Quality (Emission) Guidelines, Effective since 2015 in accordance with The Environmental Conservation Law, 2012,
- WHO Guideline for community noise (1999).

There are no standards for ambient environmental soil quality in the Myanmar under the National Environmental (Emission) Guidelines (2015). In the absence of local standards, soil quality results were compared against the internationally recognized agency, Canadian Council of Ministers of the Environment (CCME) as following;

- Standard for Coarse Grained Agricultural Soil from Canadian Council of Ministers of the Environment. 2007. Canadian soil quality guidelines for the protection of environmental and human health
- Canadian Council of Ministers of the Environment, CANADA-WIDE STANDARDS for PETROLEUM HYDROCARBONS (PHC) IN SOIL, 2008

There are no standards for ambient surface water quality in the Myanmar under the National Environmental (Emission) Guidelines (2015). In the absence of local standards, water quality results were compared against the internationally recognized agency, Canadian Council of Ministers of the Environment (CCME) and US EPA as follows:

- IFC Environmental, Health, and Safety (EHS) Guidelines
- National Environmental Quality Guidelines (NEQG)
- Canadian Water Quality Guidelines for the Protection of Aquatic Life (Freshwater)
- CA WQG (Irrigation) – Canadian Water Quality Guidelines for the Protection of Agriculture (Irrigation)

There are no standards for ambient groundwater quality in the Myanmar under the National Environmental (Emission) Guidelines (2015). In the absence of local standards, groundwater quality results were compared against the internationally recognized agencies, as follows:

- Myanmar National Drinking Water Quality Standards (2019)
- US EPA - National Primary Drinking Water Regulations and National Secondary Drinking Water Regulations, published by the USEPA, May 2009.
- UK Drinking Water Standards from Water Supply (Water Quality) Regulations 2000, (SI 2000/3184) (as amended).
- Ontario Soil, Ground Water and Sediment Standards for Ontario, Use under Part XV.1 of the Environmental Protection Act, April 15, 2011, Canada
- European Union Drinking Water Standards (1998)
- IFC Environmental, Health, and Safety (EHS) Guidelines
- National Environmental Quality Guidelines (NEQG)

[1] The Pyidaungsu Hluttaw Law No. 9/2012

4. PROJECT DESCRIPTION AND ALTERNATIVE SELECTION

4.1 Project Background

4.1.1 Introduction

ONGC Videsh Limited (ONGC Videsh), a 100% subsidiary company of Oil and Natural Gas Corporation Limited (ONGC), was awarded Block EP-3 to explore and produce hydrocarbon in the Myanmar Onshore Bidding Round 2013. Production Sharing Contract (PSC) for the onshore Block was signed between Myanmar Oil and Gas Enterprise (MOGE), ONGC Videsh Limited and Machinery & Solutions Company Limited (M&S) on 8th August, 2014 ONGC Videsh will start the activities of drilling 2 exploratory wells in 2021 to fulfill the commitment of the initial exploration phase. ONGC Videsh is planning to spud the first well on 1st November, 2022. The exploration well will be drilled as a standard well with conventional drilling methods. ONGC Videsh intends to use land-drilling rigs to drill the well sites for this drilling campaign.

4.1.2 Purpose and Objectives of Project

ONGC Videsh plans to drill two (2) exploration drilling wells located in Thegon Township, Bago Region, Myanmar. The access road to Payama-1 crosses the Paukkhaung Township area, Bago Region, Myanmar. The two exploratory wells in the depth range of 2100m (MSL TVD) –5200m (MSL TVD) in Block EP-3. The total estimated lifespan of the Project would be 6 to 7 months (drilling of 2 exploratory wells). Total expected financial implication of ONGC Videsh for drilling of 2 exploratory wells is to be around 53.55 MM USD.

The primary objectives of the onshore exploration drilling project in Block EP-3 are to:

1. Explore the hydrocarbon potential in Block EP-3;
2. Fulfill the PSC commitments.

4.1.3 Geological Prognosis

Block EP-3 lies in the Pyay Embayment (sub-basin) of Central Myanmar Basin. The Block has an area of approximately 1650 Sqkm. The structural pattern generated in this region is the resultant of the oblique subduction of the Indian Plate beneath the Burmese Platelet. The subduction resulted into the westward propagating Indo-Burmese accretionary prism. The area is thus characterised by almost NNW-SSE elongated en-echelon anticlines, some of which are prolific producers. These anticlines are separated by broad synclines (**Figure 4-1**).

It is in proximity to Pyay oil field in west. Proven Middle Miocene clastics Play is the primary target. Secondary reservoir target is Lower Miocene Pyawbwe clastics & carbonates. Block has a discovery well Shwegu-2 with test production of around 1.1-1.2 MMScfd of Gas/ Condensate. There is Gas show in other well (Shwegu-1) in Upper Miocene Sands. Both the wells have been Plugged and Abandoned due to non-commerciality.

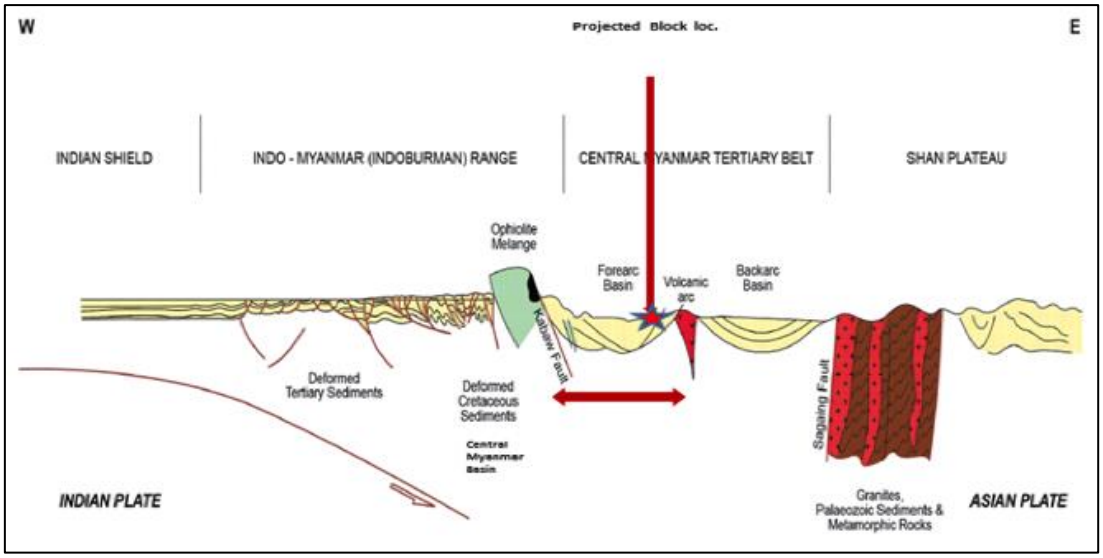


Figure 4-1: General tectonics of the region and Block EP-3 location

4.1.4 History and Petroleum Activity within Block EP-3

The Block has had the previous oil & gas exploration activities (**Figure 4-2**):

- 35 no. of New 2D lines (562 LKM).
- 12 Old 2D lines (260 LKM)
- 4 wells (Shwegu -1, 2, 3, 4)

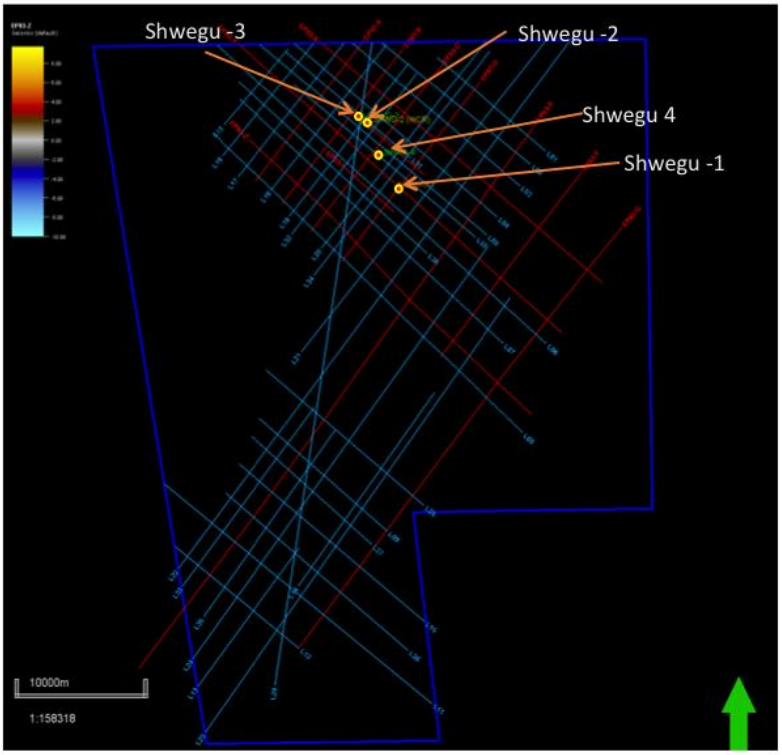


Figure 4-2: Previous Exploration Activities in Block EP-3

ONGC Videsh successfully acquired about 563 full-fold LKM 2D seismic data in EP-3 block in the areas of Thegon, Pyay, Paungde, Paukkhaung and Nattalin Township of Bago Region as shown in **Figure 4-3**.

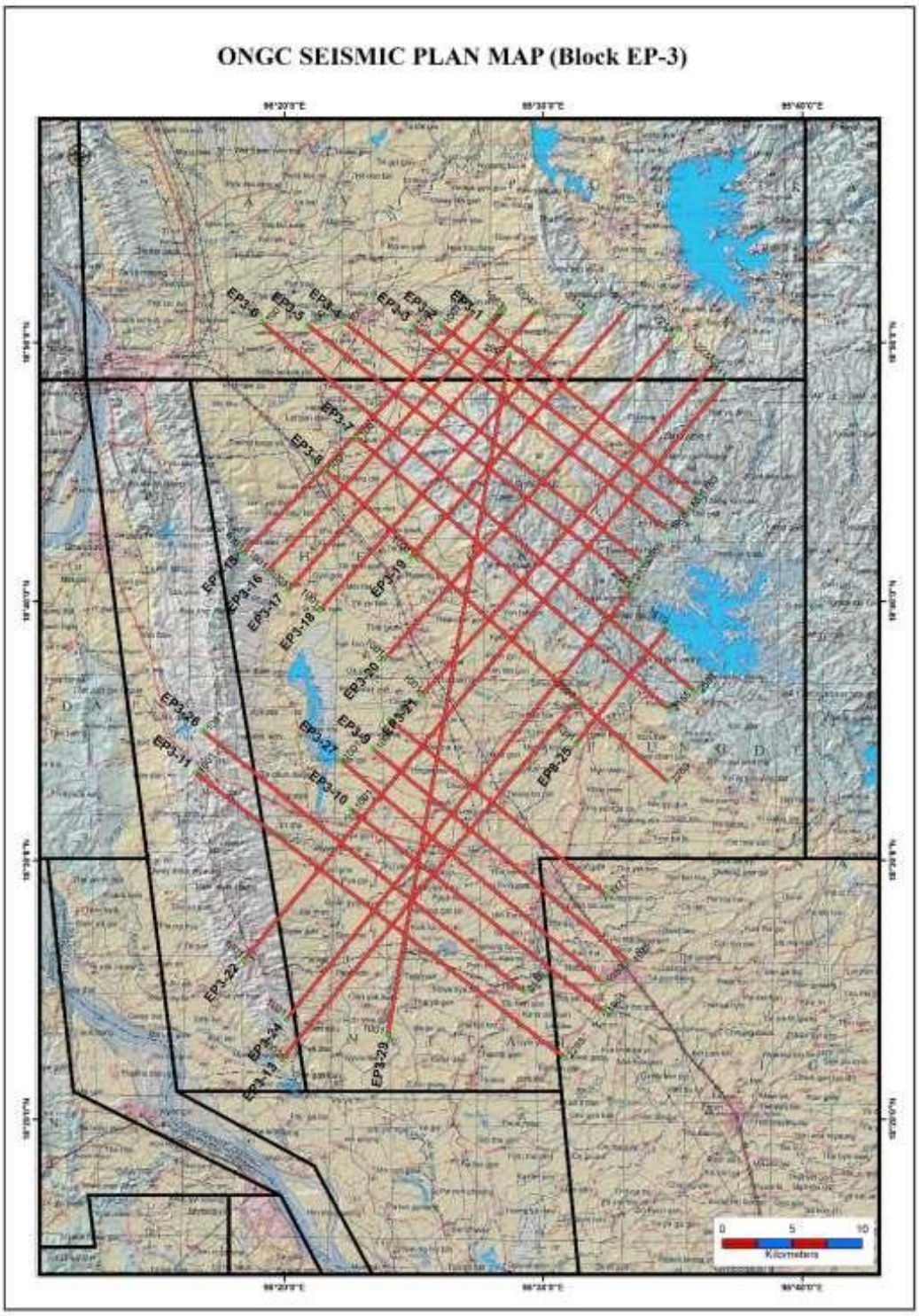


Figure 4-3: ONGC Videsh Seismic Program Layout

4.1.4.1 Production History

There is no production history for this block.

4.1.4.2 Previous ESIA Study carried by ONGC Videsh for Seismic Survey

The EISA field works for seismic activities was carried out from January 2015 through a systematic identification and evaluation of the potential impacts (effects) of a proposed project relative to the physical biological and socioeconomic components of the environment. ONGC Videsh received the EIA approval from MIC/ MOGE / MONREC on July 2017.

During Seismic data acquisition ONGC Videsh has taken all relevant mitigation measure in line with the ESIA and no adverse potential impacts were observed post Seismic Survey. The 2D Seismic data acquisition report incorporating ESIA compliance and monitoring has been submitted to MOGE in June 2018.

4.1.5 Project Need and Justification

In 2018, ONGC Videsh successfully acquired about 563 full-fold LKM 2D seismic data in EP3 block in the areas of Thegon, Pyay, Paungde, Paukkhaung, and Nattalin Townships of Bago Region.

ONGC Videsh is planning to conduct a drilling campaign in 2021 in order to explore petroleum potential in Block EP 3 and fulfill the PSC commitments. This drilling campaign will consist of two (2) exploration drilling wells located in Thegon Township, Bago Region, Myanmar. The access road for Naweng-1 is along an existing roadway directly off the Yangon-Pyay highway in Thegon Township. The access road to Payama-1 crosses the Paukkhaung Township. ONGC Videsh is planning to spud the first well by on 1st November, 2022.

Myanmar has proven natural gas reserves of 22.5 trillion cubic feet as of 2019.[1] Gas production in 2018 was over 1.75 billion cubic feet per day. With 50m scf per day from onshore fields and 1.75bn scf per day from offshore blocks, of which 400m scf per day was used for domestic consumption, while the remainder was exported to Thailand and China. Total Natural gas output in 2018 totalled 17.8bn cu metres.

The oil production stood at approximately 12,000 barrels per day (bpd); however, consumption was more than twice as much, at 29,000 bpd. The oil production in Myanmar has fallen by 29.4% from an average of 17,000 bpd in 2013 to 12,000 bpd in 2018. Myanmar has an estimated 16.6trn scf of natural gas and some 139 m barrels of crude oil trapped under the seabed as reserves, the country still has significant oil and gas potential. [2]

Myanmar faces energy access and security challenges. The International Energy Agency has calculated that Myanmar has the poorest level of energy access in all of the Asia-Pacific, and Myanmar is the least developed economy in Southeast Asia. Only 13 percent of the country's population have access to the national electricity grid, approx. 26 per cent have access to electricity, and almost 95 percent of its people depend on solid fuels such as wood and rice husks for cooking and heating.[3]

Secure energy supplies will be important to Myanmar's future development. The Ministry of Electric and Energy has set the basis of Myanmar's energy policy framework —

(i) fulfilling domestic energy requirement
(ii) implementing sustainable energy development;
(iii) promoting the wider use of new and renewable sources of energy;
(iv) promoting energy efficiency and conservation;

[1] BP, "BP Statistical Review of World Energy" (June 2011).
[2]https://oxfordbusinessgroup.com/overview/reserve-exploration-projects-pipeline-and-moves-improve-supply-chain-aim-make-use-untapped-potentialaccessed on Sept 15, 2020
[3] UNDP, "Accelerating Energy Access for All in Myanmar" (2013), Executive Summary.

(v) promoting use of alternative fuels;
(vi) implementing effective utilization of discovered crude oil and natural gas resources in the interest of the entire nation; and (vii) promoting more private participation.[4]

ONGC Videsh, as the operator of the Myanmar onshore petroleum PSC, is striving to develop and produce oil from its potential reservoirs located within Block EP-3.

4.2 Project Location

4.2.1 Block EP-3

The EP-3 Block is located at the Bago region of The Republic of Union of Myanmar. The Block is located 250 km northwest of Yangon. Within the Bago region the block is located at the Pyay and Thayarwady Districts.

Following five townships are being covered by the proposed Block:

- Thegon
- Pyay
- Paungde
- Paukkhaung
- Nattalin

Major portion of the Block is located within Thegon, Pyay, Paungde and Paukkhaung Township areas, few areas at the southeast and northwest of the Block is included under Nattalin township area.

The coordinates of EP-3 Block are provided in **Table 4-1**.

Table 4-1: Block EP-3 Bounding Coordinates

Reference Points	Latitude (Northing)	Longitude (Easting)
1	18°48'29.86"	95°16'29.98"
2	18°48'29.87"	95°40'15.94"
3	18°29'59.99"	95°40'15.95"
4	18°29'59.99"	95°29'60.00"
5	18°20'59.98"	95°31'00.12"
6	18°20'59.97"	95°21'00.00"

[4] Myanmar Ministry of Electric and Energy, "Regional Energy Cooperation" (accessed 15 July 2014).

The location of Block EP-3 in Myanmar is shown in **Figure 4-4**.

Figure 4-4: Location of Block EP-3

4.2.2 Drilling Location

The two exploration wells in Block EP-3 will be drilled in two different locations. The well site coordinates are detailed in **Table 4-2** and **Figure 4-5**.

Table 4-2: Well Site Coordinates

Well	Lat	Long	Target Depth (MD)
Naweng-1	18° 31' 22.3437"N	95° 24'21.6247"E	5225 m
Payama-1	18° 45' 1.7997" N	95° 27' 45.1252" E	2230 m

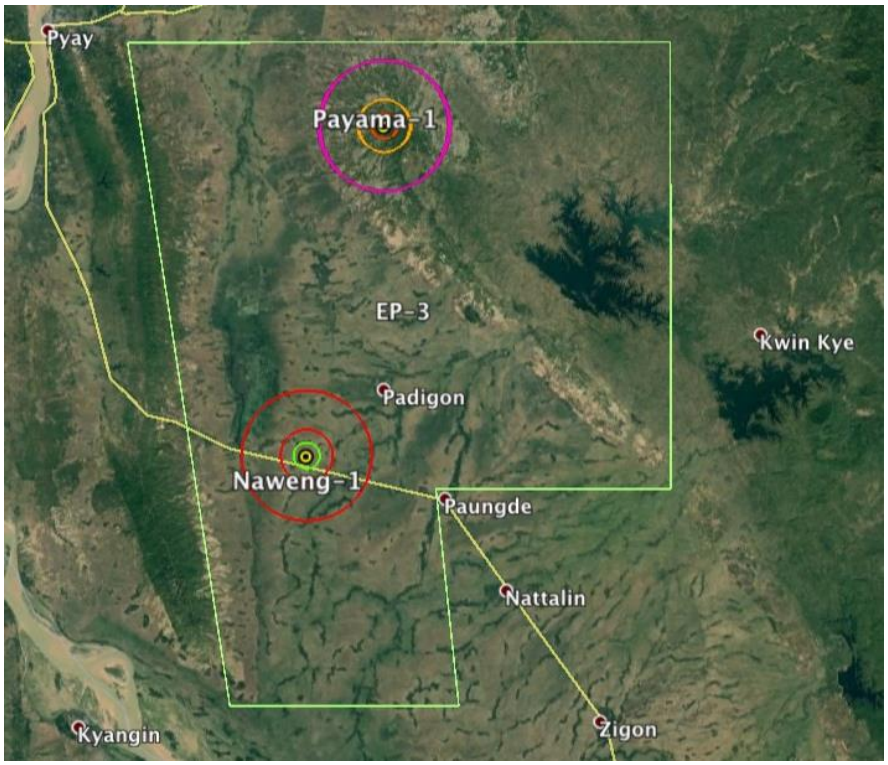


Figure 4-5: Well Site Locations and Project Areas (1000, 2000 & 5000 meters)

The existing condition of the well pad for Naweng-1 location is in a paddy field during the wet season only and the land acquisition will be completed as per MOGE requirements. The existing condition of the well pad for Payama-1 is located in an existing cleared area used for peanuts in the wet season only in the Sha Byin Reserved Forest Area. The reserved forest is highly disturbed with most of the area planted for crops and sugar cane plantations.

The land for Payama-1 location is proposed to be rented as per agreement with MOGE and the Forest Department of MONREC. The well pad design and orientation will be designed to offer the safest conditions with lowest construction requirements.

Figure 4-6: Naweng-1 well pad area existing land condition


Figure 4-7: Payama-1 well pad area existing land condition

4.3 Project Schedule

The exploration drilling wells would be drilled during the dry season after the monsoon season. In order to take care of flooding issue OVL plans to drill post monsoon on 1st November, 2022, so there is no risk of flooding at that time. The monsoon season of Myanmar starts from May until October. Some references stated that monsoon starts from Mid-May to October, and others stated that it starts from late May to October.

Information from the previous journals state that flooding occurs especially during the monsoon season. However, July and August are the months when the serious flooding occurrs. (see references: https://www.britannica.com/place/Myanmar/Climate; http://bytelife.altervista.org/monsoon.htm; https://reliefweb.int/disaster/fl-2019-000081-mmr.

The EP-3 project timeline is shown in **Table 4-3**.

Table 4-3: EP-3 Project Schedule

Activity	Date	
	Naweng-1	Payama-1
Well site construction	April-July (2022)	April-Sept. (2022)
Spud Date	November (2022)	November (2022)
Drilling duration	120 Days	30 Days
Completion duration	15 Days	15 Days
Well testing duration	15 Days	15 Days

Source: ONGC Videsh, 2022

4.4 Project Alternatives

4.4.1 No Project

If the proposed exploration project is not implemented, economic benefits generated by the project would not occur (**Section 4.1.5**). Benefits lost would include the following:

- Employment generation and project expenditures during exploration drilling;
- Potential loss/delay of petroleum production from the site;
- Loss of revenue for the Myanmar and local governments through Production Sharing Contracts (PSC);
- The future contribution of crude oil from this area would not be available to support Myanmar's future energy needs and national reserves.

4.4.2 Project

4.4.2.1 Well Site and Access Road Selection Process

The location of well sites in Block EP-3 was selected based on the data from 2D seismic acquisition and its interpretation, general site criteria, engineering criteria, economic criteria, and environmental, social and health criteria as summarized in **Table 4-4**.

4.4.2.1.1 General Criteria

The general criteria include an evaluation of Geology, Location, Topography, Land Use and Significant sensitive areas and Infrastructure for the project. The exploration drilling project will explore the location, extent and characteristics of petroleum reservoirs. This project will select the location to drill exploration wells based on geological data and seismic interpretation data in the area. The most promising location to find petroleum reservoirs based on geological and seismic information will be defined as the ideal location, most suitable for understanding the target petroleum reservoir and most likely to find promising petroleum reservoirs. The ideal location is then evaluated for other constraints, such as steep terrain, land use, sensitive areas and distance from roads.

4.4.2.1.2 Engineering Criteria

Engineering criteria for well site selection regard the following factors: Minimize difficult terrain (such as drilling in steep topography, rocky areas, etc.), Maximize use of existing local access road, Minimize logistical issues (including engineering safety concerns), Minimize drilling distance to reservoir (preferably conventional straight hole) and Minimize overall length of access road construction if needed.

4.4.2.1.3 Economic Criteria

The site selection process incorporates the assessment of the economic value of a potential petroleum hydrocarbon reservoir and its commercial worth against the cost of the investment (including Land Cost Compensation for land, Renting Rig, Construction, Operation and Maintenance costs) for alternate well locations.

4.4.2.1.4 Environment, Social and Health Criteria

Environmental, social and health criteria evaluated to select well site locations are: location as far away as possible from environmental and social sensitive areas. An "ideal" well site location should be located at least 1 km from any large community and near a transportation network or access route that can accommodate transport of the drilling rig. The shortest distance for access road construction must

be considered and well site must not be located within reserved area such as national park, wildlife sanctuary, watershed area, reserved forest, historical park, etc. In case it is necessary to use such an area, the project proponent must operate strictly in accordance with applicable laws and regulations of the relevant government agencies.

Table 4-4: Well Site Selection Criteria

Environmental, Social and Health Considerations	**Physical Resources**
	Minimize use of sensitive terrain/soil (e.g. wetland/erosive soil)
	Maximize use of existing highways and access roads
	Minimize number of river, waterway, and canal crossings
	Minimize use of existing river, waterway and canal crossings
	Ecological Resources
	Minimize impact on natural sensitive terrestrial environment
	Minimize impact on natural sensitive aquatic environment
	Minimize impact on national parks, forest reserves, wildlife sanctuaries
	Human Use Values
	Minimize impact on transportation
	Minimize impact on water resources structure (river, waterway and canal crossing)
	Minimize impact on low level row crops (e.g., vegetable, sesame, beans and pulses)
	Minimize impact on paddy fields
	Minimize impact on orchards and forest plantations (e.g., mango, coconut, mixed orchard)
	Minimize impact on aquaculture
	Minimize impact on livestock operations (e.g., swine)
	Quality-of-Life Values
	Minimize impact on population centres, settlements
	Minimize impact on individual buildings and residences in ROW
	Minimize visual impacts
	Minimize impact on cultural/religious resources
	Health
	Minimize potential for construction accidents
	Minimize potential for operation accidents (settlements)
	Minimize anxiety of local people
	Minimize impact on water resources structure (river, waterway and canal crossing)
Engineering Design Considerations	Minimize waterway crossings
	Minimize difficult terrain (steep, rocky, etc.)
	Maximize use of existing ROW access
	Minimize logistical issues
	Engineering design (minimize drilling distance to reservoir)
	Minimize overall length of access road construction
	Subsurface hazard evaluation (formation pressure prediction, shallow gas, etc.)
Economic Factors	Land compensation cost
	Construction cost
	Operation and Maintenance cost

4.4.2.2 Camp Site Selection

The camp site selection is based on the land availability and the workers requirements. Typically the camp site can be established next to the well pad area. Since the program will drill multiple well site locations (2 well sites) that are located far away from each other; the camp sites will be established next to each well pad area.

4.4.2.3 Drilling Phase Alternatives

4.4.2.3.1 Type of Rig

Rig types are still under evaluation. ONGC Videsh intends to use two land drilling rigs for this drilling campaign. A land drilling rig is the only suitable type of drilling equipment for the proposed project.

The selection criteria for drilling rigs are:

- Availability
- Cost
- Rig Capability
    - Rig criteria are mostly related to the well depth requirements which consider:
        - Derrick
        - Drawworks
        - Mud Pumps
        - Drillstring
        - Mud System
        - Surface Equipment Limitation (BOP, Wellhead etc.)
        - QHSE MS
        - Track records
        - Experience

4.4.2.3.2 Type of Drilling Method

The wells will be drilled with a conventional hole size. A conventional hole size hole is required because of the depths being drilled, the type of formations being drilled, the kinds of pressures expected, and for hole stability. The final section of the well will be drilled using an 8-1/2-inch drill bit in the reservoir section. However, provision of slim hole drilling will be kept as contingency in case of 8-1/2 inch hole could not reach target depth due to down hole drilling complications or geological challenges.

4.4.2.3.3 Type of Flaring

Associated gas brought to the surface with crude oil during oil production is sometimes disposed of at onshore facilities by venting or flaring to the atmosphere. Flaring or venting are also important safety measures used on onshore oil and gas facilities to ensure gas and other hydrocarbons are safely disposed of in the event of an emergency, power or equipment failure, or other plant upset condition.

Continuous venting of associated gas is not considered current good practice and should be avoided. The associated gas stream should be routed to an efficient flare system, although continuous flaring of gas should be avoided if feasible alternatives are available. Before flaring is adopted, feasible alternatives for the use of the gas include gas utilization for on-site energy needs, export of the gas to a neighboring facility or to market, gas injection for reservoir pressure maintenance, enhanced recovery using gas lift, or gas for instrumentation. Due to the remote location of the proposed well sites the alternative options are currently not feasible, therefore the project will implement measures to minimize

flare volumes, with the elimination of continuous production- associated gas flaring as the preferred goal. In case of discovery of hydrocarbon, gas may have to burnt, but only for a very short period during testing of the well to determine the hydrocarbon potential.

The flare system will be a vertical flare stack of appropriate height conforming to national/international standard. Oil Industry Safety Directorate (OISD), India, STD-106 states that the flare stack is to be located at a **minimum distance of 90 meters** from public roads and property. Maximum flare height as per API 521 shall be 45 feet.

4.4.2.3.4 Type of Mud

Many types of drilling fluids are used on a day-to-day basis worldwide. Some wells require that different types be used at different parts in the hole, or that some types be used in combination with others. However, the following two types of mud systems will be used for this drilling campaign as follows:

- Water-based mud (WBM): A most basic water-based mud system begins with water, and then clays and other chemicals are incorporated into the water to create a homogenous blend resembling something between chocolate milk and a malt (depending on viscosity). The clay (called "shale" in its rock form) is usually a combination of native clays that are suspended in the fluid while drilling, or specific types of clay that are processed and sold as additives for the WBM system. The most common of these is bentonite, frequently referred to in the oilfield as "gel". Gel likely makes reference to the fact that while the fluid is being pumped, it can be very thin and free-flowing (like chocolate milk), though when pumping is stopped, the static fluid builds a "gel" structure that resists flow. When an adequate pumping force is applied to "break the gel", flow resumes and the fluid returns to its previously free-flowing state. Many other chemicals (e.g. potassium formate) are added to a WBM system to achieve various effects, including: viscosity control, shale stability, enhance drilling rate of penetration, cooling and lubricating of equipment.
- Oil-based mud (OBM): Oil-based mud can be a mud where the base fluid is a petroleum product such as diesel fuel. Oil-based muds are used for many reasons, some being increased lubricity, enhanced shale inhibition, and greater cleaning abilities with less viscosity. Oil-based muds also withstand greater heat without breaking down. The use of oil-based muds has special considerations. These include cost and environmental considerations.

The ONGC Videsh drilling program will use WBM (Water based mud) & LTSOBM (Low Toxic Synthetic Oil Based Mud) for the drilling campaign.

4.4.2.3.5 Type of Drilling Cuttings Treatment

The largest waste stream from the exploration drilling program is the drilled cuttings removed from the wellbore and spent drilling fluids. Drilling fluids are circulated downhole and routed to a solids control system at the surface facilities where fluids can be separated from the cuttings so that they may be recirculated downhole leaving the cuttings behind for disposal. These cuttings contain a proportion of residual drilling fluid. According to the IFC On-shore Oil and Gas Guidelines, the feasible alternatives for the treatment and disposal of drilling fluids and drilled cuttings include:

- Storage in dedicated storage tanks or lined pits prior to treatment, recycling, and / or final treatment and disposal;
- On-site or off-site biological or physical treatment to render the fluid and cuttings non-hazardous prior to final disposal using established methods such bioremediation, land farming, or solidification with cement and / or concrete. Final disposal routes and location for the non-hazardous cuttings solid material will be determined by the licensed waste management contractor;

The treated cuttings will be deposited as per the method followed by Waste Management Company for both WBM and LTSOBM mud, where they are to be temporarily held before sending wastes to DOWA waste facility.

4.4.2.4 Summary

The well locations were approved by MOGE after technical discussion based on geological data, seismic data and interpretations. This is discussed in section 4.5.1.15.

A survey company was selected to study the feasibility of the access roads based on well site and access road criteria.

For Naweng-1 well, there is only one access road that avoids other paddy lands and houses in village area. This new access road will be constructed for long term use to benefit the villagers.

For Payama-1 well initially, three road options to access the well locations were considered. These three options were then compared to the selection criteria noted below and approved by the forest department.

(i) **Minimize impact on Shabyin reserve forest -** Using the existing crop extraction road minimizes damage to the forest area as **only 350 meters with 6 feet width** needs to be newly **constructed.** The other two options approaching from west and south will require a minimum of 4 to 6 kilometers of road to be newly constructed in the forest area.

(ii) **Minimize impacts of canal crossings** - The final road access selection will not be crossing any canal (avoiding various canals and bridges). The other two options considered would require crossings in two or three locations along the main canal from South Naweng Dam and sub-canals (photos below).

(iii) ONGC Videsh has given a commitment to build an ecological park and has compensated for tree loss as per requirement of forest department.

4.5 Exploration Drilling

4.5.1 Layout and Facilities in Well Site Area

4.5.1.1 Drilling Rig

ONGC Videsh intends to use two (2) typical land-drilling rigs for this drilling campaign. The typical specifications of the rigs are:

- Rig capacity for Naweng -1: Capable to drill 6000m with 5 1/2" drill pipe.
- Rig capacity for Payama-1: Capable to drill 2500m with 5/5 1/2" drill pipe.
- Mast Height 130 to 150 ft
- Max Static Hook load up to 750 Ton for Naweng-1 and 350 Ton for Payama-1
- Substructure Height up to 30 ft
- Support Equipment: 3 nos Mud Pumps.
- Mud Tanks: 6 to 8 nos, with Volume 320 to 475 m^3.
- Shale Shaker: Minimum 3 nos. (Linear/elliptical two stage) with flow rate upto 1200GPM.
- Desander: 2 Nos Cones with Flow rate up to 800 GPM
- Desilt with Mud Cleaner: 20 cones with flow rate upto 700 GPM
- Top Drive: 750 Tons for Naweng-1 and 350 Tons for Payama-1 Ton
- Engine & Generator: 4 Nos.
- BOP Stack Naweng -1: 15000PSI &
- BOP Stack Payama -1: 10000PSI

The rig's Draw works capacity for Naweng -1: Minimum 2500 HP and the rig's Draw Works capacity for Payama -1: Minimum 1200HP. The rig is powered by four diesel driven generator sets and each rated 1100 KVA for Naweng-1 and 750 KVA for Payama-1 to supply the rig site with power. An example of a land drilling rig and auxiliary equipment are shown in **Figure 4-8**.

Onshore Rig Example

Typical Mud Tanks

Shaker

Lined Cuttings Pit

Source: ONGC Videsh, 2020

Figure 4-8: Example Rig and Equipment

4.5.1.2 Pad Layout

The well pad size for Naweng-1 is 200 m x 200 m (40,000 m^2) and the well pad size for Payama-1 is 130 m x 130 m (16,900 m^2).The well pad includes a rig area, campsite (accommodation), campsite office space and storage area. There will be two main access roads that are 6 meters wide and two emergency exits for personnel. The field Office will be at the well sites. Drilling Contractor will provide all require containers. Permanent construction will be limited.

The main facilities at the rig pad are shown in **Table 4-5**. Example onshore rig facilities are shown in **Figure 4-9**.

Table 4-5: Drilling Facilities Overview

Description	Quantity	Remark
Amount of upgrading/repair the access road	Less than 2 Km	Estimated for the whole project
Cellar Size	Naweng-1 & Payama -1: 3m x 3m x 3m	Based on one well
Drilling Waste Pit with geomembrane liner	6,000 m^3	Based on one well
Water Pit with geomembrane liner	2,000 m^3	Based on one well
Fuel storage	300 mm height	Bund wall complete with one layer of plastic membrane
Chemical storage	10 x 10 m	Ground with geomembrane liner / concrete pad and chemicals Covered with Tarpoline, as drilling will be conducted during dry season only. Chemicals to be stored in flood proof warehouse during rainy season.
Drilling Fluid (Mud) storage	64 m^3 each tank X 5 units	Rectangular Steel tanks, up to 320 m^3 in total

Geomembrane lined and bunded dry powder mud chemical storage area

Perimeter drain with weir and oil trap

Concrete rig and storage pad with segregated drainage channel

Campsite in background (generators on rig concrete pad in foreground)

Source: Pictures provided by IEM, 2018

Figure 4-9: Photos of a Typical Exploration Drilling Well Site and Facilities

4.5.1.3 Cellar and Well Pad

Within the drill pad, a hole will be dug and lined with 250 mm thick concrete to form the inline cellar with dimensions of 3 x 3 x 3 m deep. This forms the rig "cellar", into which is fitted a short length of 30 inch steel pipe, extending 6 to 12 metres into the ground; this is the "conductor pipe" that acts as a guide to the drill bit and drill string while drilling the uppermost portion of the well. The cellar also houses the wellhead and the blow out preventers.

A reinforced concrete rig pad, measuring approximately 20 m by 20 m will be constructed around the cellar. This acts as the foundation upon which the drilling rig sits on. An additional concrete pads will be constructed for the generators, fuel tanks mud tanks and mud pumps. All concrete areas will drain into the waste pit. To avoid the waste pits contaminated with oil from any emergency spill on the drill pad, the engineering team will add the oil separator unit on both sides of gutter to trap oil before flowing down to the cutting pit.

4.5.1.4 Waste Pit

A lined waste pit capacity to contain waste & unwanted fluids will be constructed onsite. The pit will be lined with a high-density polyethylene (HDPE) 2mm thick impermeable geomembrane liner to form an impermeable barrier. The cuttings overflow from shale shaker, cuttings will be seperated through dryer, to dry the cuttings as much as possible before it is collected. Dryer also can prevent spillage if there are any problem occurred to rig shaker. Keeping the collected cuttings as dry as possible also minimized the leakage during transport to final disposal facility. As for the WBM, unwanted water base mud will be discharged to waste pit, dewatering will be used to clarify the WBM, it can be re-used to mix mud or for cleaning the rig. By recycle the liquid waste, this eliminated the unnecessary liquid waste volume from the operations. Leftover clarify liquid waste can be pumped again in to the well through the drilling string at lost zone.

The possibly contaminated runoff water from concrete drill pad and shaker area will drain to the waste pit. To avoid the waste pit contaminated with oil from any emergency spill on the drill pad, the engineering team will add the oil separator unit on both sides of drain gutter to trap oil before flowing down to the waste pit.

The estimated typical amount of runoff during a rainstorm varies according to the month of the year. Runoff from the rig pad enters the waste pit. The pit is sufficient in size to contain any runoff from storms. It is not expected that discharge of water will be required unless there is unusually prolonged storm activity. The waste pit has a maximum holding capacity of 6,000 m^3. The waste pit can therefore contain much more rainfall than the rainfall intensity of a ½-hr duration storm.

Nothing hazardous is stored in the waste pit; however, the pit level is monitored to ensure it does not overflow. The reverse situation (a rapid decrease in the water level in the pit) would indicate a leak in the pit and action would be taken to fix it.

4.5.1.5 Mud Tanks

The drilling mud will be contained in steel mud tanks. These are rectangular shaped tanks with 320 m^3 capacities. The mud tanks are preferred to mud pits to ensure a closed system. After the cuttings pass through the shale shakers the cuttings are placed in the lined cuttings pit and the mud system is recirculated in the mud tanks and closed drilling mud system.

4.5.1.6 Hazardous Pit

A Hazardous pit will be constructed on site to hold any hazardous materials. This pit will be 400 m^3 and lined with high-density polyethylene (HDPE) to store LTSOBM cutting. All hazardous material

will be removed at the end of drilling and disposed of at a licensed. Waste Management Company facility.

4.5.1.7 Well Site Drainage and Flood Prevention System

4.5.1.7.1 During Civil Works

During construction, a civil engineering contractor will be required to survey the road to be upgraded and the driveway to be constructed. The contracted civil engineer will determine and recommend if culverts or additional ditches are necessary to manage surface water runoff.

4.5.1.7.2 During Drilling in Well Pad (drilling) area

The concrete drill pad and shaker area made of concrete, which prevents leakage of contaminated water to the surrounding area. Machines within the drilling pad area that could potentially release contaminated water include skip tank, cuttings pit, cement mixer, and drilling rig. Runoff within the drilling area will be drained via drainage gutter into the cuttings pit, which will accumulate all of the runoff and contaminated water generated within the drilling area. Therefore, contaminated water from this area will go through a large oil trap and end up in the cuttings pit and won't escape to contaminate surrounding areas.

The cuttings pit will be constructed at the drilling area and is lined with an impervious liner to keep all the water used/released within the drilling area. The cuttings pit has volume of 6,000 m^3.

The volume of runoff from the well site will be calculated from the volume of the heaviest rainfall within 30 minutes with a month's equivalent rainfall in one hour. The volume of the cuttings pit (6,000 m^3) is much more than the volume of the extremely heavy runoff. Therefore, the cuttings pit has the capacity to retain all the runoff within the drilling area even under heavy rainfall. The level of water in the cuttings pit will be monitored regularly. If water level in the cuttings pit is high, it will be pumped into another container (such as a tanker truck) to make sure that the water will not overflow from the pit. The contaminated water, cuttings and mud will be treated onsite as per IFC emission standards by an authorized Waste Management Company before disposal.

4.5.1.8 Chemical and Equipment Storage Areas

Mud chemicals shall be stored in a covered and concreted warehouse before transportation to the drilling site. The warehouse shall be at drill sites Naweng-1 / Payama-1. Mud and cementing chemicals will be stored with tarpaulin covers or roof to protect the mud and cementing chemicals from rain. Hazardous chemicals will be segregated from the main chemicals and kept in appropriate containers. The area will have a berm to protect from accidental spills. However, the drilling chemicals are mostly dry powder materials, so the risk of spill is low. All Hazardous chemicals will be segregated from the main chemicals and kept in appropriate containers as per the manufacture's recommendations. Spill Kits will be provided onsite to ensure the readiness of preparation in case of spills. Other storage areas such as parts, equipment and repair shops will be contained in converted portable 40-foot containers or the steel baskets. These containers will sit on concrete blocks. Workshop for vehicles maintenance will be in a bunded area fitted with oil trap/separator to stop oil spills. The site will have spill kits available to be used if any accidental spill happens during operations. The mud chemicals are all dry powder so spill or leakage is low, spill kits will be used for any oil or liquid spills.

4.5.1.9 Fuel Storage Area

The fuel tanks (2 tanks approximate 40 m3 capacity each) will be stored above the ground and set on concrete foundations within the rig pad. The fuel tank area will be surrounded with an impervious dike made of brick wall and cement plaster to contain any spillage, in accordance with good international industry practice including the Environmental, Health and Safety general Guidelines of IFC. The

volume of the dike area surrounding the fuel tanks shall be equal to the cumulative volume of the fuel storage tanks with provision for a 15 cm freeboard.

The Fuel for the project (mainly diesel) will be locally procured. The quality of fuel and the sulphur content is defined by Myanmar fuel standards and is supplied by Myanmar authorized companies.

HSD (High Speed Diesel) will be used for running the power packs. Estimated quantity to be consumed during the entire project is 1568 KL.

The site will have spill kits available to be used if any accidental fuel spill happens during operations. ONGC Videsh has an oil spill contingency plan if there is any accidental release. Detailed plan shall be prepared in association with drilling contractor, after the award of contract, as a part of a Bridging document.

4.5.1.10 Water Supply

It is estimated that a total of 50 m^3/day of industrial grade fresh (non-potable) water will be required during the drilling operation (to be used as makeup water for the drilling mud, cement mixing and losses).

For Naweng-1 well site, either water will be supplied by a deep tube well drilled onsite / a nearby deep tube well available or transported by tanker / by pumping through water pipeline to drilling well site from the nearest local reservoir with the consultation/direction of Thegon Township GAD.

For Payama-1 wellsite, water will be supplied by either a deep tube well drilled onsite with the consultation of Paukkhuang Township GAD or transported by tanker / by pumping through water pipeline to drilling wellsite from the old Shwe Lay dam under the direction & approval of the Ministry of Agriculture, Livestock and irrigation, or transported by tanker / by pumping through water pipeline to drilling well site from the nearest local reservoir with the consultation of Paukkhaung Township GAD.

The industrial water will be stored on the well site in a ground storage pit 30 m x 20 m x 3.5 m deep for a maximum capacity of 2,000 m^3 or as an alternative to store industrial water in steel tanks.

4.5.1.11 Power Supply

Estimated fuel consumption is 8 m^3 per day during drilling. All electrical power for the well site, drilling rig and associated equipment will be provided by four diesel fuelled generator sets. Estimated total fuel usage is 960 m^3 (based on 120 days of drilling). During well testing phase, power consumption is minimal (i.e., only power for instruments and lights is required which can be powered from the work camp generators).

4.5.1.12 Flare Stack

The flare system will be a vertical flare stack of appropriate height conforming to national/international standard. The nearest community will be located over 300 m away (for all the proposed well sites); thus, impact from light and sound from the flare stack is designed to be minimal. A safety zone will be established around the flare with security fencing. API 521 is to be followed for Flaring system management. Further, Oil Industry Safety Directorate (OISD), India, STD-106 states that the flare stack is to be located at a **minimum distance of 90 meters** from public roads and property. Maximum flare height as per API 521 shall be 45 feet

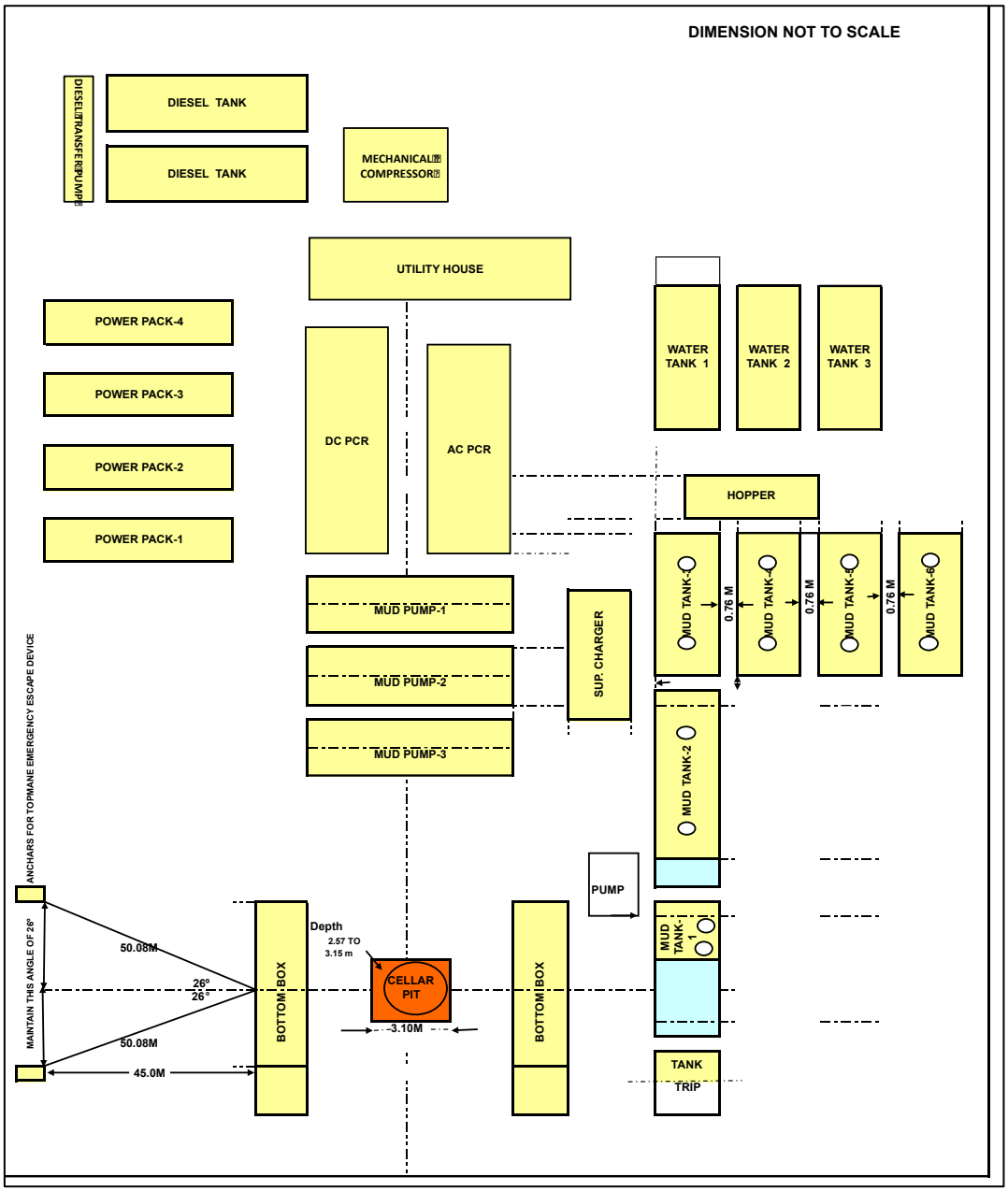
The reservoir fluids will be burned. The produced water will be separated and directed into the wastewater pit.

4.5.1.13 Field Office

A field office will be located at the rig site. The field office will consist of container units located in a safe area outside the main well pad working area.

4.5.1.14 Layouts

The typical well site layout to be used for Naweng-1 and Payama-1 is shown in **Figure 4-10**. A civil design engineer under the drilling contract will complete the actual well pad designs.



Source: ONGC Videsh, 2020

Figure 4-10: A Typical Well Site Layout Schematic

4.5.1.15 Access Roads

ONGC Videsh will use existing local roads for transportation as much as possible to each well site. However, due to the well sites being located in agricultural areas, ONGC Videsh will need to improve existing roads and construct new access roads to connect the well sites to the existing main roads for transportation of drilling rig and drilling equipment. The access roads will be designed as single lane, un-surfaced road, constructed of compacted laterite and selected material. The roads will be designed for gross trailer weight of 60 tons, width of 6 m side slopes of 2:1, constructed with 200 mm of compacted laterite and 200 selected materials.

The well locations were approved by MOGE after technical discussion based on geological data, seismic data and interpretations (**Appendix 6**: MOGE Approval Letters for Well Locations and Names).

A survey company was selected to study the feasibility of the access roads based on well site and access road criteria.

For Naweng-1 well, there is only one access road that avoids other paddy lands and houses in village area. This new access road will be constructed for long term use to benefit the villagers. The starting point to Naweng-1 well location is from Yangon – Pyay Main road between mile post (150/7 – 150/8) near Cha Yar Gon Village. This access road is a rural network road to Wa Le Village and OVL uses this access road for 0.38 Kilometer and then diverts to the well location area for 0.9 Kilometer. The total length of the access road is 1.28 Kilometer.

For Payama-1 well initially, three road options to access the well locations were considered. These three options were then compared to the selection criteria noted below and approved by the forest department. **(Appendix 6** - Forest Department Approval Letter for Payama-1 Well Access Road).

(iv) **Minimize impact on Shabyin reserve forest** - Using the existing crop extraction road minimizes damage to the forest area as **only 350 meters with 6 feet width** needs to be newly **constructed.** The other two options approaching from west and south will require a minimum of 4 to 6 kilometers of road to be newly constructed in the forest area.

(v) **Minimize impacts of canal crossings** - The final road access selection will not be crossing any canal (avoiding various canals and bridges). The other two options considered would require crossings in two or three locations along the main canal from South Naweng Dam and sub-canals (photos below).

(vi) **Construct Ecological Park** - ONGC Videsh has given a commitment to build an ecological park and has compensated for tree loss as per requirement of forest department (**Appendix 6** – Provisions to Forest Department for Use of Payama-1 Site).

The distances from the existing road to the proposed well locations are provided in **Table 4-6**.

Table 4-6: The Distance from Exiting Road to the Proposed Well Location

Well site	Length of Road Upgrading
Naweng-1	• Upgrade approximately 1.28 km of access road
Payama-1	• Existing rural earthen road – upgrade for about 15 km • Existing sugar cane extraction old road – upgrade for approximately 4.84 km. • Newly constructed access road – approximately 350 m

The proposed well locations can be accessed by car from the existing roads. But most of the earth roads cannot be used in the rainy season. ONGC Videsh will obtain permission from the relevant local authorities and landowners prior to construction to upgrade access roads with tentative locations as shown in **Figure 4-11, Figure 4-12 and Figure 4-13**: Access Road Location for Payama-1. The access road upgrading / construction plan for Payama-1 is detailed in **Figure 4-14**.

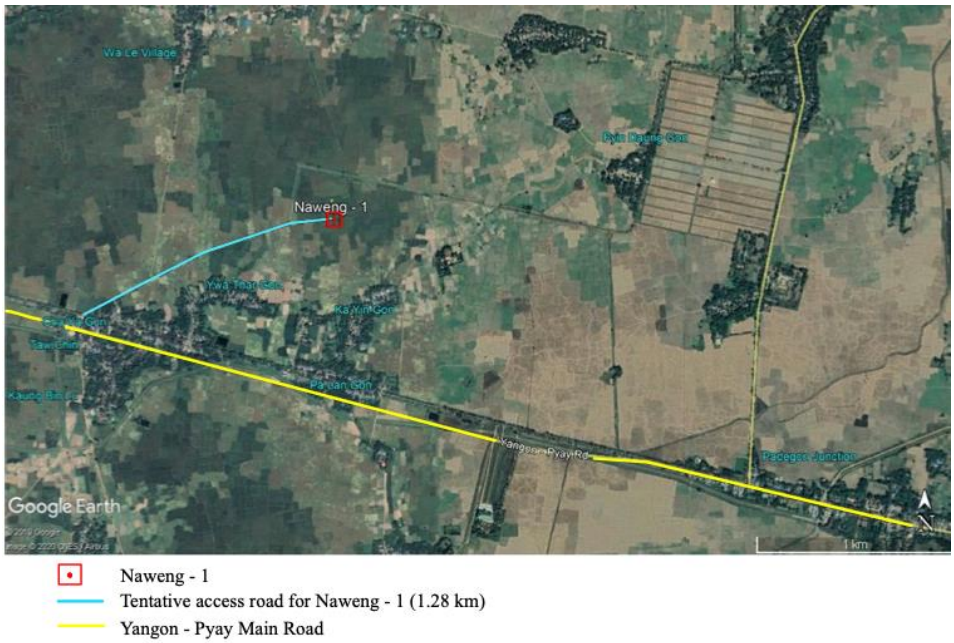


Figure 4-11: Tentative Access Road Location for Naweng-1

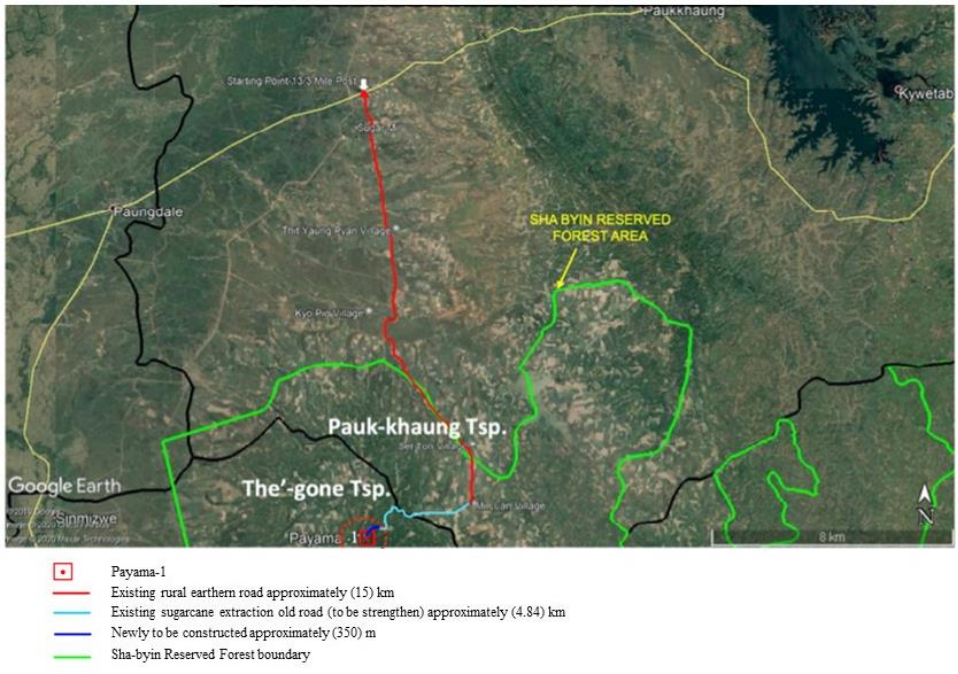


Figure 4-12: Access Road Location for Payama-1

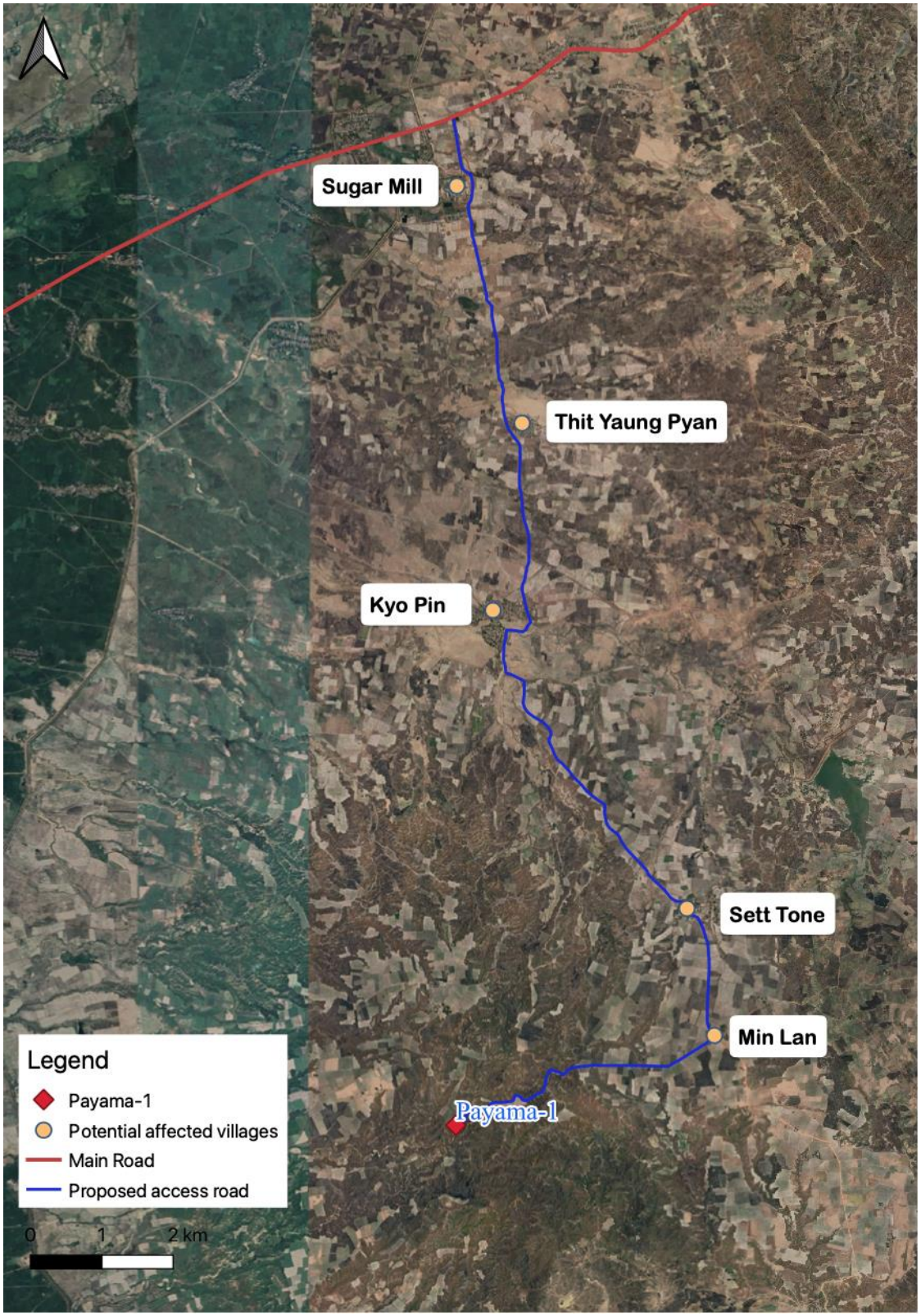
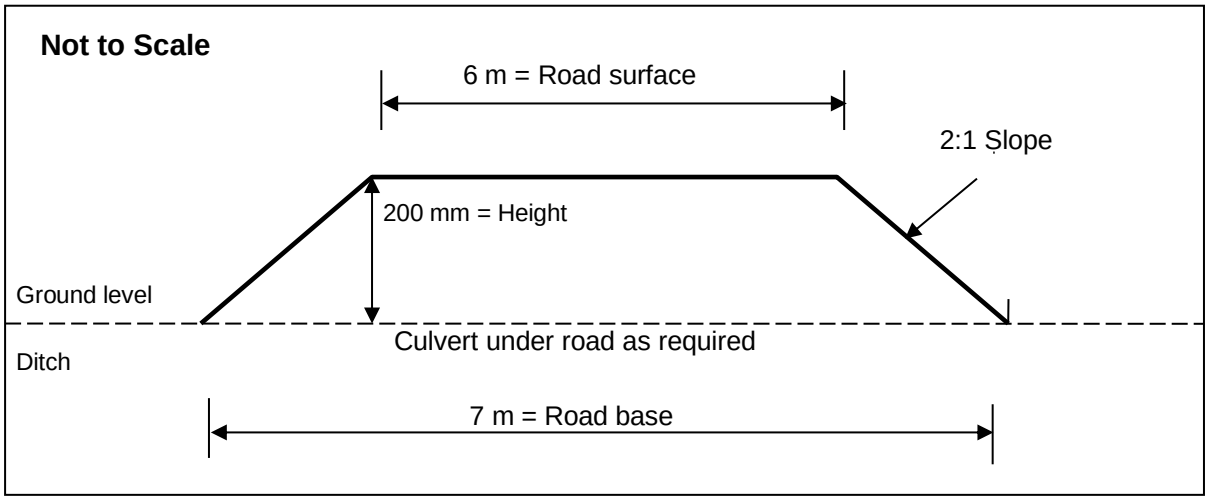


Figure 4-13: Access Road Location for Payama-1



Source: ONGC Videsh, 2020

Figure 4-14: Longitudinal-Section of Proposed Access Road

4.5.2 Layout and Facilities in Basecamp, Campsite and Accommodation Areas

There is no suitable existing accommodation, such as hotels or guesthouses, within a reasonable distance of the proposed well sites, so a temporary camp site will be established near to the well sites.

The planned campsites will be inside each of the well site locations. The area of the camp site is about 50 m x 40 m per drill site. The campsite will have its own cooking, freezer food storage, laundry and sanitation facilities.

Accommodation for workers may consist of rental houses in nearby village, local hotels, or be provided in a temporary onsite camp.

The accommodation will be fitted with required utilities and facilities (sanitation, water, sewage, waste pit, electricity grounding and internet connection), as well as waste collection and segregation points as per international oil field practices.. The campsite will be industry-standard, consisting of container-based sleeping and living quarters, messing and recreation facilities, with a capacity to accommodate up to 110 including ONGC personnel & its associates per drill site camp. Of these personnel, efforts shall be made to hire personnel locally to the maximum extent depending upon work requirement and available skill manpower. Duty pattern will be as per local applicable rules & regulations.

The rig crew and service personnel work 12-hour shifts and are rotated from duty on a maximum 28-day schedule, as is standard industry practice. Essential management and supervision staff will be accommodated at the well site. These will include the two Drilling Supervisors, the MOGE representative, the Well-Site Geologist, the Tool Pusher, and the Night Pusher. The site will also have up to 2 additional sleeping quarters to accommodate visits by the Drilling Manager and Drilling Engineer and other specialists normally based in Yangon.

ONGC Videsh will also ensure that a fulltime doctor will stay at the site 24 hours a day, 7 days a week during the drilling phase. MOGE provides at its discretion an on-site representative, who observes operations and provides advice on compliance with Myanmar regulations.

4.5.2.1 Potable Water

During the civil works phase, the drinking/consumption water (~300 liters daily bottled) will be trucked to the camp and another 200 liters to be used for hygienic purposes either to be sourced from water well or to be trucked.

During the exploration drilling phase, the drinking/consumption water (~600 litres of water bottled) will be required daily and another 600 liters to be used for hygienic purposes either to be sourced from water well or to be trucked as well.

For Naweng-1 well site, either water will be supplied by a deep tube well drilled onsite / a nearby deep tube well available or transported by tanker / by pumping through water pipeline to drilling well site from the nearest local reservoir with the consultation/direction of Thegon Township GAD.

For Payama-1 wellsite, water will be supplied by either a deep tube well drilled onsite with the consultation of Paukkhuang Township GAD or transported by tanker / by pumping through water pipeline to drilling wellsite from the old Shwe Lay dam under the direction & approval of the Ministry of Agriculture, Livestock and irrigation, or transported by tanker / by pumping through water pipeline to drilling well site from the nearest local reservoir with the consultation of Paukkhaung Township GAD.

4.5.2.2 Drainage Control within Camp Site

Any rainwater runoff from the work camp pad will be discharging offsite. There are no potentially harmful chemicals stored at the camp site that could drain offsite. The fuel tank for the camp generator will be placed on an impermeable membrane and berm to contain potential fuel leaks.

There will be spill kits and absorbents at the campsite site to clean up any potential fuel or oil spills during vehicle maintenance or use.

4.5.2.3 Camp Site Sewage System

A set of concrete septic tanks will be built into the work camp pad at the outer edges. They will have a combined capacity of 8000 litres (8 m^3). No pump out of septic sludge is required as the concrete septic tanks and any sewage sludge will be left in ground onsite at the end of the drilling campaign.

Wastewater from the campsite, including both grey water and black water, will be treated separately. Grey water will be treated in a soak pit and Black water will be treated in septic tank and soak pit.

A waste management plan will be prepared that defines waste types, disposal methods and locations consistent with waste management laws and regulations.

4.5.2.4 Campsite Power

The campsite power will be a container type with the power being generated from portable diesel engine generator. The engine will be running 24 hours a day to power up the lighting, equipment and other necessity. For cooking, cylinder gas also to be considered.

All power for the base camp site will be provided by diesel-fuelled generators. Expected fuel consumption is 0.5 m^3 per day during full accommodation. On-site fuel storage capacity will consist of one 25 m^3 tank. Estimated total fuel usage is about 60 m^3 (based on 120 days of drilling).

4.5.3 Stages of Operation

Major activities of project consist of Construction Phase, Drilling Phase, Well Testing Phase and Well, Abandonment. The activity chart of the project is shown in **Figure 4-15**.

1. **Construction Phase**

   Details are preparation and construction of the drilling area, access road construction, rig and equipment installation and elements of the drill area.

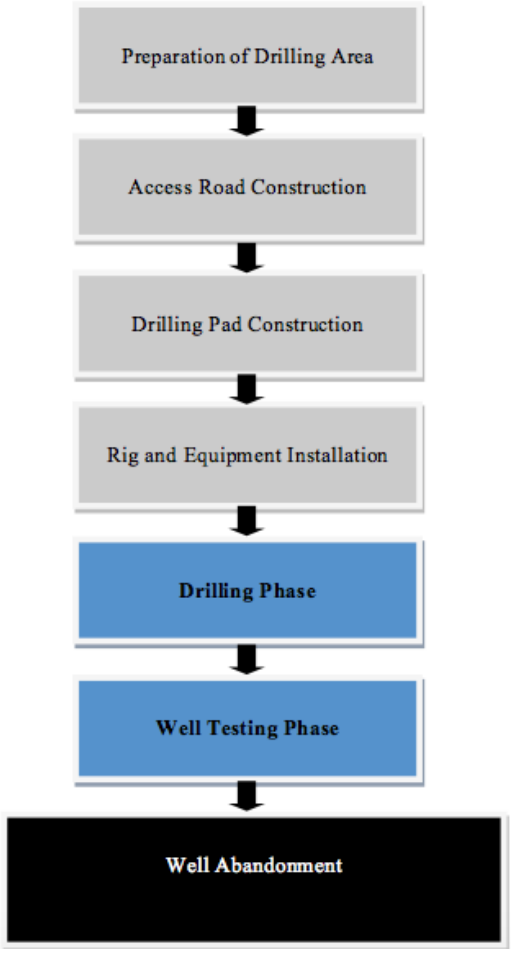
2. **Drilling Phase**

   Details are hole and casing design, drilling exploration methodology, types and components of drilling mud, drilling mud volume, volume of cutting from drilling and wire line logging.

3. **Well Testing Phase**

   Details are well testing equipment installation, well testing operation, waste management from well testing operation.

4. **Well, Abandonment**



Note

Construction Phase
Drilling Phase
Well Testing Phase
Well Abandonment

Figure 4-15: Activity chart of project

4.5.3.1 Construction and Rig Installation Phase

4.5.3.1.1 Well Site and Central Camp Site and Access Road

Each well site will have a similar construction plan. The well sites and central campsite will be levelled and elevated by cut and fill methods and compacted using bulldozers, dump trucks, water trucks and graders. The compacted pad will be approximately 500 mm thick.

A barbed wire fence to keep animals and unauthorized persons from entering the site will surround the well pad and central campsite pad areas. Security guards will also be employed and stay on each site 24 hours per day, 7 days per week throughout rig mobilization, set up, drilling and well testing until the site is abandoned

Dimensions of the well site and accommodation camp site to be constructed are summarised in **Table 4-7**.

Table 4-7: Dimensions of Well Pad and Work Camp Pad

Item	Dimensions	Area	Estimated Fill
Each Site			
Naweng-1 Well site, Campsite & Storage Area	200 m x 200 m x (500 mm thick)	40,000 m^2	20,000 m^3 (1)
Payama-1 Well site, Campsite & Storage Area	130 m x 130 m x (500 mm thick)	16,900 m^2	8,450 m^3 (1)

(1) Estimate based on an average of 500 mm thick

All of the materials to be used for constructing the well site and facilities are to be provided by the civil engineering contractor. This contract will be issued to a vendor to be selected from MOGE approved vendor list as per MOGE and ONGC Videsh's policy.

The civil engineering contractor will obtain fill materials from local extraction sites operating under permit from the relevant local authorities.

It will be the responsibility of the civil engineering contractor to source the fill materials and the materials must also be of a high quality grade for use as un-surfaced road building material and acceptable to ONGC Videsh for construction of the well pad.

4.5.3.1.2 Rig Installation

ONGC Videsh intends to use a typical land rig for this drilling campaign. One drilling rig will be used for the entire campaign. The drilling rig will be mobilized onsite overland with approximately 130 truck loads are required to mobilize the drilling rig. The following rig components will be mobilized and installed on site:

1) Hoisting system consists a derrick and platform or derrick floor used for clinging and installing the drilling equipment to the tower. The drilling equipment include crown block handed on a cable which use to raise and lower a drill string in the well.

2) Rotating system consists of a hydraulic top drive to spin, raise and lower the drill string equipped with a drill bit.

3) Mud & Cuttings circulating system - During drilling operation, drilled cuttings and fluids are removed from the well. Mud is added to the pipe and flows out at the hole of drill bit to: carry cuttings to the surface, transmit power and lubrication to the drill bit; exert a hydrostatic head to help prevent caving or sloughing of the formation; prevent flow of formation fluids into the borehole; and maintain dense materials such as cuttings and barite in suspension in the borehole to maintain downward pressure in the well.

4) Mud mixing unit consist of mud mixing tank and mud pump. The equipment functions as chemical mixing unit for mud.

5) Cementing unit consists of cement mixing tank, cement storage tank and cement pump. The equipment functions as chemical mixing unit for cement. Cement will be used to prevent fluid infiltration to borehole.

6) Power system

Rig may be located far from main power supply (Electric Transmission Line). Therefore, three units of diesel electric generator must be installed in the rig to supply electricity.

7) Wireline logger

A mobile truck-mounted wireline logging unit will be used for geophysical tests. (Wireline logging)

8) Mud Logging

Mud Logging will continuously monitor the drilled well by determining inner borehole condition and surface parameters.

9) Drilling mud laboratory

Drilling mud laboratory will be equipped with drilling mud testing equipment.
For rig installation, cranes will be used and the process will take approximately 7 days.

4.5.3.2 Drilling Operations Phase

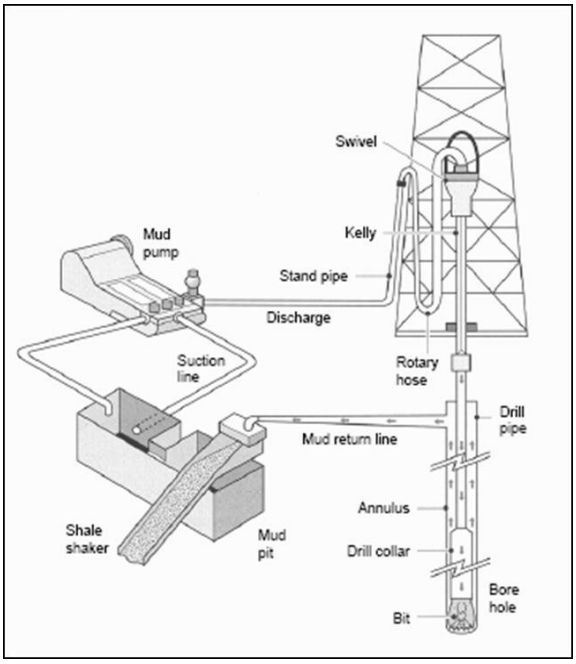
All operations on these wells will be carried out in accordance with the appropriate international API standards, ONGC Videsh Drilling Management System, copies of which will be at the rig site and must be read and understood by everyone involved in these well operations.

Drilling operations and associated services will be conducted on a 24-hour basis. Drill crews will work alternate 12-hour shifts rotated from duty on a maximum 28-day schedule, as is standard industry practice.

The basic steps of drilling an exploration well are summarized below.

- Drilling the Hole - The drill string is a series of long, hollow steel pipes, which can be screwed together. The drill bit, which has a larger diameter than the drill string, is the cutting tool and is screwed to the end of the drill string. A hoist system within a derrick over the well allows the drill string to be assembled and broken down into manageable sections.
- Drilling Fluids System - The drill string and bit are lubricated and cooled by a drilling fluid, commonly referred to as mud. This mud is stored in large steel tanks beside the rig, from where it is pumped down through the drill string.
- Mud Cleaning Equipment - When the drilled cuttings are brought to the surface with the drilling fluids, they will first pass through a mud treatment system commonly consisting of shale shakers. This comprises of a vibrating frame fitted with a series of fine mesh screens, which separate the vast majority of the drill cuttings from the drilling mud. A typical drilling schematic is provided in **Figure 4-16**.
- Casing and Cementing - Various sections of the hole will be drilled at different diameters, with the size of the borehole decreasing with depth. Each section of the hole will be lined with thick steel tubing, known as casing, which will be fully cemented in place. This ensures that the hole remains stable and that the surrounding geological formations, in particular those that may act as fresh water aquifers, are not contaminated. This casing also helps in the process of controlling

the pressure of any gas that the well might penetrate, as it is prevented from flowing into shallower, less pressurised formations.



Source: ONGC Videsh, 2020

Figure 4-16: Typical Drilling Rig and Mud System

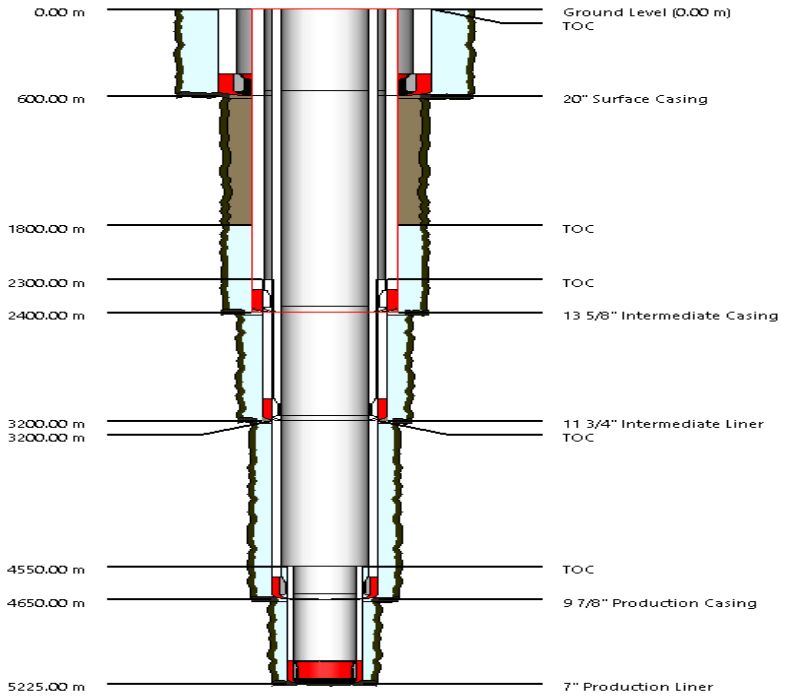
4.5.3.2.1 Hole and Casing Design

The well design for each well will have 4 bore hole sizes of 26-inch (0.660 m), 17½-inch (0.445 m), 12 ¼-inch (0.311 m) and 8 ½-inch or 6 ¼-inch (0.216 m). The general hole and casing dimensions are summarized in **Table 4-8**. The preliminary hole and casing schematic diagrams for EP-3 wells are shown in **Figure 4-18**. However, these are subject to change slightly based on the operational criteria and geological requirements.

Table 4-8: Hole and Casing Design for each Well

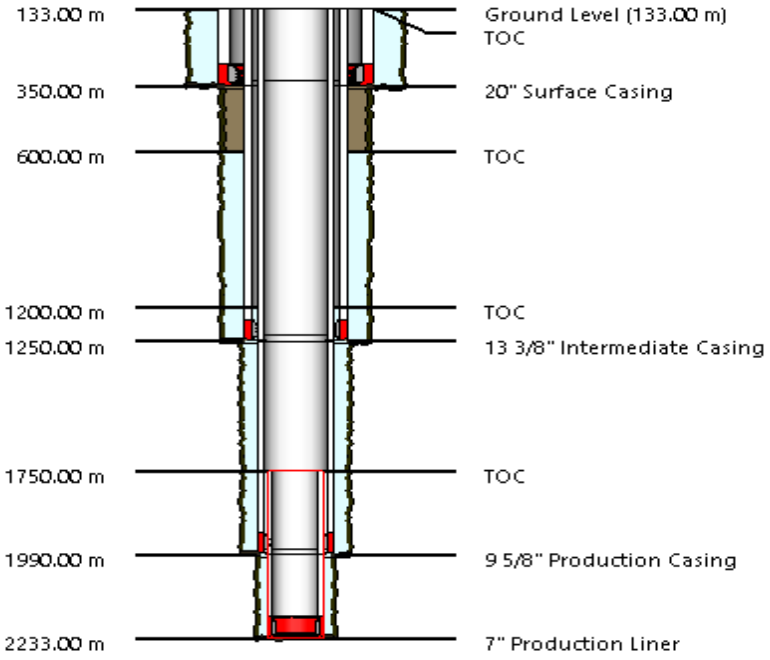
Well sites	Interval	Hole Diameter (inches)	Casing / Liner Size (inches)	True Vertical Depth	
			External	Naweng-1 (m)	Payama-1 (m)
Wells 1-2	Conductor	35-45”	30”	24	24
	Surface	26	20”	0-600	0-350
	Intermediate	17.5	13 5/8 – 13 3//8	0-2400	0-1250
	Intermediate Liner	14 1/2	11 ¾”	2300-3200	-
	Production	12.25	9 7/8”	0-4650	-
	Production	12.25	9 5/8”	-	0-1990
	Production Liner	8.5	7”	4550-5225	1890-2233
	Production Liner (Contingency)	6	5”	TBC	TBC

Source: ONGC Videsh, 2020



Source: ONGC Videsh, 2020

Figure 4-17: Preliminary casing schematic for Naweng-1



Source: ONGC Videsh, 2020

Figure 4-18: Preliminary casing schematic for Payama-1

4.5.3.2.2 Drill Exploration Process

Drilling and Casing

- **26-inch Hole-** The well drilling operations will begin by drilling a 26-inch (0.660 m) hole from surface to the designated depth. This section will be drilled with a basic water-based mud system. Hi-viscosity mud sweeps will be pumped to clean the hole during connections. A 20-inch surface casing will be run and cemented to surface. A surface blowout prevention (BOP) stack will be installed before drilling the next section. No shallow gas is expected in this project.
- **17 ½-inch Hole** - A 17 ½-inch hole will then be drilled to the designated depth. This section will be drilled with a High Performance Water Based Mud (HPWBM) or Low Toxic Synthetic Oil Based Mud (LTSOBM). The 13 3/8" casing string will be run and set to the designated depth.
- **12 ¼-inch Hole** – The 12 ¼" -inch hole will then be drilled to the designated depth. This section will be drilled with a Low Toxic Synthetic Oil Based Mud (LTSOBM) system as the previous section. The 9 5/8" / 9 7/8" casing string will be run and set to the designated depth.
- **8 ½ and/or 6" -inch Hole** - The 8 ½-inch hole (the reservoir section) will be drilled with Low Toxic Synthetic Oil Based Mud (LTSOBM). A 7-inch production liner will run and set to the designated depth. The 5-inch production liner will be used as a contingency in case of short land 7-inch liner due to down hole complications

Technical or operational constraints

Technical/operational constraints would be pipe stuck, lost circulation, clay swelling, hole pack-off, well kick, hole wash out and hole ballooning. However high temperature and high pressure are not expected on these wells.

Drill Cuttings

Drill cuttings are formation particles generated by the drill bit during the drilling process and vary in size from small slivers (less than 10 mm in length) to dispersed clays and ultra fine particulates (less than 0.002 mm). The exact nature of the cuttings will depend on the geological formations drilled though. After being processed by the Solids Removal Equipment (shale shakers) the drill cuttings are sent to the cuttings pit. The estimated cuttings volume is about 1500 m^3 per well. However this could vary according to each hole section TD.

Drilling Mud

Mud performs a number of functions. Apart from carrying cuttings to the surface, it: transmits power and lubrication to the drill bit; exerts a hydrostatic head to help prevent caving or sloughing of the formation; prevents flow of formation fluids into the borehole (which could lead to a blowout); and maintains dense materials such as cuttings and barite in suspension in the borehole to maintain downward pressure in the well, when circulation is interrupted (as when adding a new joint of drill-pipe).

Many types of drilling fluids are used on a day-to-day basis worldwide. Some wells require that different types be used at different parts in the hole, or that some types be used in combination with others. The ONGC Videsh's campaign is planning to use High Performance Water Based Mud (HPWBM) and Low Toxic Synthetic Oil Based Mud (LTSOBM) to drill the wells.

Estimated mud volume is about 1,900 m^3 per well. However this could vary according to each hole section TD. (**Table 4-9**)

Mud and cuttings wastes will be sent to an authorized Waste Management Company, the licensed waste facility for landfill and disposal.

Drilling fluids will be circulated in a closed loop system to recycle the drilling mud and contain all wastes. A summary of MSDS for the drilling muds are included in **Table 4-9**: LTSOBM Drilling Mud Plan. Full MSDS sheets are to be provided at the work site.

Table 4-9: LTSOBM Drilling Mud Plan

Section	Mud type	Chemical	Total Mud Volumes (m^3)
26" x 20"	**HPWBM**	Barium Sulphate	450
		Bentonite	
		Starch	
		Caustic Soda	
		Sodium Bicarbonate	
17-1/2" x 13-3/8"	**LTSOBM**	Base Fluid	550
		Primary Emulsifier	
		Secondary Emulsifier	
		Organophilic Clay	
		Gilsonite	
		Calcium Hydroxide	
		Polymeric Blend350	
		Fresh Water	
		Calcium Chloride	
		CaCo3 Fine	
		CaCo3 Medium	
		CaCo3 Coarse	
		Barite	
12 ¼" x 9-5/8"	**LTSOBM**	Base Fluid	400
		Primary Emulsifier	
		Secondary Emulsifier	
		Organophilic Clay	
		Gilsonite	
		Calcium Hydroxide	
		Polymeric Blend	
		Fresh Water	
		Calcium Chloride	
		CaCo3 Fine	
		CaCo3 Medium	
		CaCo3 Coarse	
		Barite	
8 ½" x 7"and/or 6-1/8" x 4-1/2"	**LTSOBM**	Base Fluid	275
		Primary Emulsifier	
		Secondary Emulsifier	
		Organophilic Clay	

Section	Mud type	Chemical	Total Mud Volumes (m^3)
		Gilsonite	
		Calcium Hydroxide	
		Polymeric Blend	
		Fresh Water	
		Calcium Chloride	
		$CaCo_3$ Fine	
		CaCo3 Medium	
		CaCo3 Coarse	
		Barite	
8 ½" x 7"and/or 6-1/8" x 4-1/2"	**Brine**	Potassium Chloride Salt	225
		Corrosion inhibitor (liquid)	
		Oxygen Scavenger (sulfer free)	
		Biocide	

Cementing Chemicals

The cementing chemicals are used downhole to cement the casing in place. These chemicals are not used in the mud system and will not be released to the pits. They are mixed and cemented in place in the drill hole. The common cementing chemicals are listed below:

1. D047 – Antifoam
2. D206 – Defoamer
3. D065 – Dispersant solid
4. D075 – Extender
5. D080 – Dispersant liquid
6. D081 – Retarder
7. D153 – Anti-settling agent
8. D167 – Fluid loss control agent powder
9. D168 – Fluid loss control agent/Gas block agent liquid
10. D193 – Fluid loss control agent liquid
11. D207 – Fluid loss control agent powder
12. D182 – Spacer agent
13. D208 – Viscosifier/free water control agent
14. D500 – GasBLOK agent
15. D600G – HT GasBLOK agent
16. D801 - Retarder
17. D907 – Cement
18. F103 – Surfactant
19. F110 – Surfactant
20. S001 – Accelerator
21. U066 – Solvent

The cementing chemical HSE information are detailed in **Table 4-11**.

Table 4-10: Health and Safety Information for the Additives to the Water-Based & Low Toxic Synthetic Oil Based Mud

Product Name Chemical Name	Hazards Identification	Toxicological Information	Environmental Precautions	Storage Requirement	Spill Clean Up Methods	Transport Information
Barium Sulphate	• Not regarded as a health or environmental hazard under current legislation. • Contains a small quantity of quartz. IARC Monographs, Vol.68, 1997 concludes that there is sufficient evidence that inhaled crystalline silica (quartz or crystobalite) from occupational sources causes cancer in humans. IARC classification group 1.	• Dust may irritate respiratory system or lungs. Harmful: danger of serious damage to health by prolonged exposure through inhalation. • May cause discomfort if swallowed. • Powder may irritate skin. • Particles in the eyes may cause irritation. • Contains small quantity of quartz. Prolonged inhalation of high concentration may damage respiratory system. Because of quantity and composition, the health hazard is small.	• Do not allow to enter drains, sewers or watercourses.	• Store in original containers. • Keep containers securely sealed. • Store in a cool, dry, well-ventilated area. • Store away from incompatible materials and foodstuff containers. • Protect containers against physical damage and check regularly for leaks. • Observe manufacturer's storing and handling recommendations.	• Shovel into dry containers. Cover and move the containers. Flush the area with water. May be slippery when wet.	• Not covered by international regulation on the transport of dangerous goods (IMDG, IATA, ADR/RID).
Bentonite (clay)	• Not regarded as a health or environmental hazard under current legislation. • Contains a small quantity of quartz. IARC Monographs, Vol.68, 1997 concludes that there is sufficient evidence that inhaled crystalline silica (quartz or crystobalite) from occupational sources causes cancer in humans. IARC classification group 1.	• Dust may irritate respiratory system or lungs. Harmful: danger of serious damage to health by prolonged exposure through inhalation. • May cause discomfort if swallowed. • Powder may irritate skin. • Particles in the eyes may cause irritation. • Contains small quantity of quartz. Prolonged inhalation of high concentration may damage respiratory system. Because of quantity and composition, the health hazard is small.	• Do not allow to enter drains, sewers or watercourses.	• Observe manufacturer's storing and handling recommendations.	• Shovel into dry containers. Cover and move the containers. Flush the area with water. May be slippery when wet.	• Not covered by international regulation on the transport of dangerous goods (IMDG, IATA, ADR/RID).

Product Name Chemical Name	Hazards Identification	Toxicological Information	Environmental Precautions	Storage Requirement	Spill Clean Up Methods	Transport Information
Starch	• NON-HAZARDOUS SUBSTANCE and NON-DANGEROUS GOODS according to the Criteria of NOHSC, and the ADG Code.	• The material may produce mild skin irritation; limited evidence or practical experience suggests.	• Prevent dust cloud. • Prevent, by any means available, spillage from entering drains or water course.	• Store in an indoor fireproof cabinet or in a room of noncombustible construction. • Provide adequate portable fire-extinguishers in or near the storage area	• Remove all ignition sources • Clean up all spills immediately • With clean shovel (preferably non-sparking) place material into clean, dry container and cover loosely. • Move containers from spill area. • Control personal contact by using protective equipment.	• The product is not covered by international regulation on the transport of dangerous goods (IMDG, IATA, ADR/RID).
Caustic Soda (sodium hydroxide)	• CONSIDERED A DANGEROUS SUBSTANCE ACCORDING TO DIRECTIVE 1999/45/EC AND ITS AMENDMENTS. • Reacts violently with water. • Causes severe burns. • Risk of serious damage to eyes. • Classification: R14/34/41	• The material can produce severe chemical burns within the oral cavity and gastrointestinal tract following ingestion. • The material can produce severe chemical burns to the eye following direct contact. • Vapours or mists may be extremely irritating. • The material can produce severe chemical burns following direct contact with the skin.	• Do not allow to enter drains, sewers or watercourses.	• Store in original containers. • Keep containers securely sealed. • Store in a cool, dry, well-ventilated area. • Store away from incompatible materials and foodstuff containers. • Protect containers against physical damage and check regularly for leaks. • Observe manufacturer's storing and handling recommendations. • DO NOT store near acids, or oxidising agents. • No smoking, naked lights, heat or ignition sources.	• Remove all ignition sources. • Avoid contact with skin and eyes with personal protective equipment. • Use dry clean up procedures and avoid generating dust. • Place in a suitable labelled container for waste disposal.	• CORROSIVE • ICAO/IATA, ADR/RID, IMDG Class: 8

Product Name Chemical Name	Hazards Identification	Toxicological Information	Environmental Precautions	Storage Requirement	Spill Clean Up Methods	Transport Information
Sodium Bicarbonate	• Not regarded as a health hazard.	• Toxic dose 1-LD50: 4220 mg/kg (oral rat). • Dust may irritate respiratory system or lungs. • May cause gastric distress, nausea and vomiting if ingested. • Powder may irritate skin. • Particles in the eyes may cause irritation and smarting.	• Do not allow to enter drains, sewers or watercourses.	• Store in original containers. • Keep containers securely sealed. • Store in a cool, dry area protected from environmental extremes. • Store away from incompatible materials and foodstuff containers. • Protect containers against physical damage and check regularly for leaks. • Observe manufacturer's storage and handling recommendations contained within this SDS.	• Shovel up and place in a labelled sealable container for subsequent safe disposal. Flush the area with water.	• Not covered by international regulation on the transport of dangerous goods (IMDG, IATA, ADR/RID).
Primary Emulsifier	• Hazardous substance, Non-dangerous goods • May cause of lung damage if swallowed.	• Discomforting to the gastro-intestinal tract and maybe harmful if swallowed in quantity. • Disconforting to the upper respiratory tract. • Inhalation hazard is increased at higher temperatures. • Acute effects from inhalation of high concentrations of vapour are pulmonary irritation.	• Prevent spillage from entering drains or water course.	• Store in original containers. • Keep containers securely sealed. • Store in a cool, dry, well-ventilated area. • Store away from incompatible materials and foodstuff containers. • Protect containers against physical damage and check regularly for leaks. • Observe manufacturer's storing and handling recommendations.	• Clean up all spills immediately. • Contain and absorb spill with sand, earth, inert material or vermiculite. • Place in a suitable labelled container for waste disposal.	• Not covered by international regulation on the transport of dangerous goods (IMDG, IATA, ADR/RID).

Product Name Chemical Name	Hazards Identification	Toxicological Information	Environmental Precautions	Storage Requirement	Spill Clean Up Methods	Transport Information
Secondary Emulsifier	• Considered a dangerous substance according to directive 1999/45/EC and its amendments. • Can become highly flammable in use. • Irritating to eyes and skin.	• This is caused of irritant effects range from minimal to severe depended on the surfactant characteristic, concentration and contact time. • Entry into the blood-stream may produce systemic injury with harmful effects.	-	• Store in original containers. • Keep containers securely sealed.	• Remove all ignition sources • Clean up all spills immediately. • Clear area of personnel and move upwind.	• Not covered by international regulation on the transport of dangerous goods (IMDG, IATA, ADR/RID).
Organophilic Clay	• NON-HAZARDOUS SUBSTANCE and NON-DANGEROUS GOODS according to the Criteria of NOHSC, and the ADG Code.	• The dust may produce eye discomfort and abrasive eye inflammation.	• Avoid generating dust. • Prevent spillage from entering drains, sewers, or water courses.	• Store in original containers. • Keep containers securely sealed. • Store in a cool, dry, well-ventilated area. • Store away from incompatible materials and foodstuff containers. • Protect containers against physical damage and check regularly for leaks. • Observe manufacturer's storing and handling recommendations.	• Clean up all spills immediately. • Use dry clean up and avoid generating dust. • Place in clean drum then flush area with water.	• Not regulated for transport of dangerous goods: UN, IATA, IMDG
Gilsonite	• Hazardous substance, Non-dangerous goods	-	-	• Keep dry. • Store in a cool, dry place. • Protect containers against physical damage. • Keep containers securely sealed. • Check regularly for spills and leaks.	• Clean up all spills immediately. • Place in suitable containers for disposal.	• Not regulated for transport of dangerous goods: UN, IATA, IMDG

Product Name Chemical Name	Hazards Identification	Toxicological Information	Environmental Precautions	Storage Requirement	Spill Clean Up Methods	Transport Information
Calcium Hydroxide	• May be corrosive to metals. • Causes severe skin burns and eye damage. • Causes serious eye damage.	• Vapours or mists may be extremely irritating. • Eye contact with calcium hydroxide may result in severe irritation and pain.	• Prevent spillage from entering drains or water courses. • DO NOT discharge into sewer or waterways.	• Store in original containers. • Keep containers securely sealed. • Store in a cool, dry, well-ventilated area. • Store away from incompatible materials and foodstuff containers. • Protect containers against physical damage and check regularly for leaks. • Observe manufacturer's storage and handling recommendations contained within this SDS. • DO NOT store near acids, or oxidising agents • No smoking, naked lights, heat or ignition sources.	• Check regularly for spills and leaks. • Clean up all spills immediately. • Use dry clean up procedures and avoid generating dust. • Place in a suitable, labelled container for waste disposal.	• CORROSIVE • ICAO/IATA, ADR/RID, IMDG Class: 8
Polymeric Blend	• NON-HAZARDOUS SUBSTANCE and NON-DANGEROUS GOODS according to the Criteria of NOHSC, and the ADG Code.	• Not normally a hazard due to non-volatile nature of product.	• Prevent runoff into drains.	• Store in original containers. • Keep containers securely sealed. • No smoking, naked lights or ignition sources. • Store in a cool, dry, well-ventilated area. • Store away from incompatible materials and foodstuff containers. • Protect containers against physical damage	• Clean up all spills immediately. • Contain and absorb spill with sand, earth, inert material or vermiculite. • Wipe up. • Place in a suitable labelled container for waste disposal.	• Not regulated for transport of dangerous goods: UN, IATA, IMDG

Product Name Chemical Name	Hazards Identification	Toxicological Information	Environmental Precautions	Storage Requirement	Spill Clean Up Methods	Transport Information
				and check regularly for leaks. • Observe manufacturer's storing and handling recommendations		
Calcium Chloride	• May cause eye, skin and respiratory tract irritation. • May cause gastric distress, nausea and vomiting if ingested.	• May produce severe irritation to the eye causing pronounced inflammation. • Repeated or prolonged exposure to irritants may produce conjunctivitis. • May cause skin irritation after prolonged or repeated exposure	• Prevent large spills from entering into soil, ditches, sewers, waterways and/or groundwater.	• Store at moderate temperatures in dry, well-ventilated area. • Keep in original container.	• Avoid generating and spreading of dusts. • Shovel into dry containers. • Cover and move the containers. • Flush the area with water. • Do not contaminate drainage or waterways.	• Not regulated for transport of dangerous goods: UN, IATA, IMDG
Calcium Carbonate	• Not regarded as a health or environmental hazard	• Dust may irritate respiratory system or lungs. • May cause discomfort if swallowed. • Powder may irritate skin. • Particles in the eyes may cause irritation. • Contains a small quantity of quartz. Prolonged and repeated exposure by inhalation to concentrations of crystalline silica exceeding the maximum exposure limit may lead to chronic lung disease such as silicosis. Because of quantity and composition, the health hazard is small.	• Do not allow to enter drains, sewers or watercourses.	• Store in original containers. • Keep containers securely sealed.	• Avoid generation and spreading of dust. Shovel up and place in a labelled sealable container for subsequent safe disposal	• The product is not covered by international regulation on the transport of dangerous goods (IMDG, IATA, ADR/RID).

Table 4-11: Health and Safety Information for the Cementing Chemicals

Product Name Chemical Name	Hazards Identification	Toxicological Information	Environmental Precautions	Storage Requirements	Spill Clean Up Methods	Transport Information
D047 – Antifoam	• Not classified as hazardous substance.	• Inhalation of vapours in high concentration may cause irritation of respiratory system. • May cause slight irritation. • Prolonged contact may cause redness and irritation. • Ingestion may cause stomach discomfort.	• Not be allowed to enter drains, water courses or the soil.	• Keep containers tightly closed in a dry, cool and well-ventilated place. • Keep away from open flames, hot surfaces and sources of ignition • Store away from incompatibles, Strong oxidising agents	• Absorb with earth, sand or other non-combustable material and transfer to containers for later disposal. • After cleaning, flush away traces with water.	• The product is not covered by international regulation on the transport of dangerous goods (IMDG, IATA,ADR/RID/ADG).
D206 – Defoamer	• Classification according to EU Directives 67/548/EEC or 1999/45/EC	• Inhalation of vapours in high concentration may cause irritation of respiratory system. • May cause slight irritation. • Prolonged contact may cause redness and irritation. • Ingestion may cause stomach discomfort.	• The product should not be allowed to enter drains, water courses or the soil.	• Keep containers tightly closed in a dry, cool and well-ventilated place. • Protect from freezing Store below 86F (30C). • Incompatible with oxidising agents and materials which react with water.	• Absorb with earth, sand or other non-combustable material and transfer to containers for later disposal. • After cleaning, flush away traces with water.	• The product is not covered by international regulation on the transport of dangerous goods (IMDG, IATA,ADR/RID/ADG).
D065 – Dispersant solid	• WARNING • H232 - May form combustible dust concentrations in air.	• Inhalation of vapours in high concentration may cause irritation of respiratory system. • Dust may cause mechanical irritation. • Prolonged contact may cause redness and irritation. • Ingestion may cause stomach discomfort.	• The product should not be allowed to enter drains, water courses or the soil.	• Keep containers tightly closed in a dry, cool and well-ventilated place. • Keep away from direct sunlight. • Protect from moisture • Use specially constructed containers only.	• Avoid generating or breathing dust. • Take up mechanically and collect in suitable container for disposal. • After cleaning, flush away traces with water.	• The product is not covered by international regulation on the transport of dangerous goods (IMDG, IATA,ADR/RID/ADG).

Product Name Chemical Name	Hazards Identification	Toxicological Information	Environmental Precautions	Storage Requirements	Spill Clean Up Methods	Transport Information
D075 – Extender	• Classification according to EU Directives 67/548/EEC or 1999/45/EC	• Inhalation of vapours in high concentration may cause irritation of respiratory system. • May cause slight irritation. • Prolonged contact may cause redness and irritation. • Ingestion may cause stomach discomfort.	• The product should not be allowed to enter drains, water courses or the soil.	• Ensure adequate ventilation. Keep airborne concentrations below exposure limits. • Keep containers tightly closed in a dry, cool and well-ventilated place. • Avoid contact with: Aluminum Zinc Metals • Avoid frost. Keep at >32°F / 0°C • Use specially constructed containers only • Do not use steel or aluminum tools or equipment	• Absorb with earth, sand or other non-combustable material and transfer to containers for later disposal. • After cleaning, flush away traces with water.	• Not regulated for transportation by DOT, TDG, IMDG and ICAO/IATA.
D080 – Dispersant liquid	• Chronic aquatic toxicity in Category 2 • HAZARDOUS SUBSTANCE and DANGEROUS GOODS, classified as Hazardous according to the criteria of NOHSC.	• Inhalation of vapours in high concentration may cause irritation of respiratory system. • May cause slight irritation. • Prolonged contact may cause redness and irritation. • Ingestion may cause stomach discomfort.	• The product should not be allowed to enter drains, water courses or the soil.	• Keep containers tightly closed in a dry, cool and well-ventilated place. Store in original container • Do not freeze Store above 0°C • Avoid contact with: Oxidizing agents Acids	• Absorb with earth, sand or other non-combustable material and transfer to containers for later disposal. • After cleaning, flush away traces with water.	• Hazardous to the environment • ICAO/IATA, ADR/RID, IMDG Class: 9
D081 – Retarder	• Not classified as hazardous substance.	• May cause irritation of respiratory tract. • May cause temporary eye irritation. • May cause pain, redness, discomfort. • Ingestion may cause stomach discomfort.	• The product should not be allowed to enter drains, water courses or the soil.	• Keep containers tightly closed in a dry, cool & well-ventilated place. • Keep away from direct sunlight & away from strong acids or oxidising agents	• Absorb with earth, sand or other non-combustable material and transfer to containers for later disposal. • After cleaning, flush away traces with water.	• Not regulated for transportation by DOT, TDG, IMDG and ICAO/IATA.

Product Name Chemical Name	Hazards Identification	Toxicological Information	Environmental Precautions	Storage Requirements	Spill Clean Up Methods	Transport Information
D153 – Anti-settling agent	• Serious health hazard • H373 - May cause damage to organs through prolonged or repeated exposure.	• Inhalation of dust may cause shortness of breath, tightness of the chest, a sore throat and cough. • May cause respiratory irritation. • Repeated or prolonged inhalation of crystalline silica dust can cause delayed lung injury, and other diseases, including silicosis and lung cancer. • Dust may cause mechanical irritation. • Repeated exposure may cause skin dryness or cracking. • Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhoea.	• The product should not be allowed to enter drains, water courses or the soil.	• Keep containers tightly closed in a dry, cool and well-ventilated place. • Protect from moisture • Avoid contact with: Hydrofluoric acid (HF) Strong oxidising agents	• Vacuum up. • Avoid generating dust. • Put into suitable containers for disposal. • After cleaning, flush away traces with water.	• Not regulated for transportation by DOT, TDG, IMDG and ICAO/IATA.
D167 – Fluid loss control agent powder	• WARNING • May form combustible dust concentrations in air	• Inhalation of dust may cause shortness of breath, tightness of the chest, a sore throat and cough. • Dust may cause mechanical irritation. • Repeated exposure may cause skin dryness or cracking. • Not an expected route of exposure. Ingestion may cause stomach discomfort.	• The product should not be allowed to enter drains, water courses or the soil.	• Keep away from open flames, hot surfaces and sources of ignition. • Keep containers tightly closed in a dry, cool and well-ventilated place.	• Sweep up and shovel into suitable containers for disposal. • After cleaning, flush away traces with water.	• Not regulated for transportation by DOT, TDG, IMDG and ICAO/IATA.

Product Name Chemical Name	Hazards Identification	Toxicological Information	Environmental Precautions	Storage Requirements	Spill Clean Up Methods	Transport Information
D168 – Fluid loss control agent/Gas block agent liquid	• NON-HAZARDOUS SUBSTANCE. • NON-DANGEROUS GOODS.	• Inhalation of vapours in high concentration may cause irritation of respiratory system. • May cause slight irritation. • Prolonged contact may cause redness and irritation. • Ingestion may cause stomach discomfort.	• The product should not be allowed to enter drains, water courses or the soil.	• Keep containers tightly closed in a dry, cool and well-ventilated place • Store above freezing temperature • Store away from incompatibles	• Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. • After cleaning, flush away traces with water.	• Not regulated for transportation by DOT, TDG, IMDG and ICAO/IATA.
D193 – Fluid loss control agent liquid	• Health hazard/Hazardous to the ozone layer • May cause an allergic skin reaction	• May cause allergic skin or respiratory reactions in sensitive individuals or those with pre-existing skin or respiratory conditions. • May cause irritation of respiratory tract. • May cause redness, itching, and pain. • Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhoea.	• The product should not be allowed to enter drains, water courses or the soil.	• Keep containers tightly closed in a dry, cool and well-ventilated place. • Store above 0°C • Avoid extreme temperatures. • Protect from freezing	• Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. • After cleaning, flush away traces with water.	• Not covered by international regulation on the transport of dangerous goods (IMDG, IATA,ADR/RID/ADG).
D207 – Fluid loss control agent powder	• No classified physical hazards. • May cause mechanical irritation to eyes.	• May cause mechanical irritation. • Accidental ingestion of small amounts is not expected to cause adverse effects. • Inhalation of dust may cause shortness of breath, tightness of the chest, a sore throat and cough.	• Keep out of waterways. • Prevent entry into sewage.	• Keep material dry. • Provide appropriate exhaust ventilation at places where dust is formed. • Take precautionary measures against static discharges.	• Sweep up and shovel into suitable containers for disposal.	• Not covered by international regulation on the transport of dangerous goods (IMDG, IATA,ADR/RID/ADG).

Product Name Chemical Name	Hazards Identification	Toxicological Information	Environmental Precautions	Storage Requirements	Spill Clean Up Methods	Transport Information
D182 – Spacer agent	• Not classified as hazardous substance.	• Inhalation of dust may cause shortness of breath, tightness of the chest, a sore throat and cough. • Dust contact with the eyes can lead to mechanical irritation. • Repeated exposure may cause skin dryness or cracking. • Ingestion may cause stomach discomfort	• The product should not be allowed to enter drains, water courses or the soil.	• Keep containers tightly closed in a dry, cool and well-ventilated place • Keep away from open flames, hot surfaces and sources of ignition • Keep away from direct sunlight Incompatible with oxidising agents.	• Sweep up and shovel into suitable containers for disposal. • Take precautionary measures against static discharges. • After cleaning, flush away traces with water.	• Not covered by international regulation on the transport of dangerous goods (IMDG, IATA,ADR/RID/ADG).
D208 – Viscosifier/free water control agent	• Not classified as hazardous substance.	• Inhalation of dust in high concentration may cause irritation of respiratory system. • Dust contact with the eyes can lead to mechanical irritation. • Prolonged contact may cause redness and irritation. • Ingestion may cause stomach discomfort.	• The product should not be allowed to enter drains, water courses or the soil.	• Keep containers tightly closed in a dry, cool and well-ventilated place. • Keep away from open flames, hot surfaces and sources of ignition • Keep away from direct sunlight Store away from incompatibles	• Avoid generating or breathing dust. • Product is slippery if wet. • Sweep up and shovel into suitable containers for disposal.	• Not covered by international regulation on the transport of dangerous goods (IMDG, IATA,ADR/RID/ADG).
D500 – GasBLOK agent	• HAZARDOUS SUBSTANCE • NON-DANGEROUS GOODS. • Skin sensitisation, Category 1 • Health hazard / Hazardous to the ozone layer	• Inhalation of vapours in high concentration may cause irritation of respiratory system. • Contact with eyes may cause irritation. • May cause sensitisation by skin contact. • Ingestion may cause stomach discomfort.	• The product should not be allowed to enter drains, water courses or the soil.	• Keep containers tightly closed in a dry, cool and well-ventilated place • Protect from freezing • Keep at 41 - 131°F / 5 - 55°C	• Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. • After cleaning, flush away traces with water.	• Not covered by international regulation on the transport of dangerous goods (IMDG, IATA,ADR/RID/ADG).

Product Name Chemical Name	Hazards Identification	Toxicological Information	Environmental Precautions	Storage Requirements	Spill Clean Up Methods	Transport Information
D600G – HT GasBLOK agent	• Not classified physical hazards.	• Swallowing large amounts may be harmful.	• Keep out of waterways	• Avoid freezing. Freezing may destroy emulsion. • Keep away from direct sunlight.	• Put into suitable containers for disposal.	• Not covered by international regulation on the transport of dangerous goods (IMDG, IATA,ADR/RID/ADG).
D801 - Retarder	• Not classified physical hazards.	• Inhalation of vapours in high concentration may cause irritation of respiratory system. • May cause slight irritation. • Prolonged contact may cause redness and irritation. • Ingestion may cause stomach discomfort.	• The product should not be allowed to enter drains, water courses or the soil.	• Keep containers tightly closed in a dry, cool and well-ventilated place. • Do not freeze Keep away from direct sunlight	• Absorb with earth, sand or other non-combustable material and transfer to containers for later disposal. • After cleaning, flush away traces with water.	• Not covered by international regulation on the transport of dangerous goods (IMDG, IATA,ADR/RID/ADG).
D907 – Cement	• Health hazard / Hazardous to the ozone layer • Corrosive • Skin corrosion/irritation, Category 2 • Serious eye damage/eye irritation, Category 1 • Specific target organ toxicity (single expose), Category 3	• Inhalation of dust may cause shortness of breath, tightness of the chest, a sore throat and cough. May cause allergy or asthma symptoms or breathing difficulties if inhaled. • Causes serious eye damage. • Causes skin irritation. • Ingestion may cause irritation to mucous membranes.	• The product should not be allowed to enter drains, water courses or the soil. • Prevent entry to sewage.	• Keep containers tightly closed in a dry, cool and well-ventilated place • Protect from moisture • Store away from incompatibles, Powdered aluminum Acids Oxidizing agents	• Do not dry sweep dust. Wet dust with water before sweeping or use a vacuum to collect dust. • Pick up and transfer to properly labelled containers. • Keep in suitable, closed containers for disposal. • Clean contaminated surface thoroughly. • After cleaning, flush away traces with water.	• Not covered by international regulation on the transport of dangerous goods (IMDG, IATA,ADR/RID/ADG).

Product Name Chemical Name	Hazards Identification	Toxicological Information	Environmental Precautions	Storage Requirements	Spill Clean Up Methods	Transport Information
F103 – Surfactant	• Health hazard/Hazardous to the ozone layer • Corrosive • Flammable • Acute toxicity - Oral, Category 4 • Skin corrosion/irritation, Category 2 • Serious eye damage/eye irritation, Category 1 • Specific target organ toxicity - Single exposure, Category 3	• Inhalation of vapours in high concentration may cause irritation of respiratory system. May cause drowsiness or dizziness. • Causes serious eye damage. • Causes skin irritation. Components of the product may be absorbed into the body through the skin. • Harmful if swallowed.	• The product should not be allowed to enter drains, water courses or the soil.	• Keep containers tightly closed in a dry, cool and well-ventilated place Keep away from direct sunlight Keep away from open flames, hot surfaces and sources of ignition • Protect from freezing • Store above 0°C • Store away from incompatibles, Strong oxidising agents Strong bases Aluminium	• Take precautionary measures against static discharges. Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. • Use clean non-sparking tools to collect absorbed material. • Ground and bond containers when transferring material. After cleaning, flush away traces with water.	• Flammable • ICAO/IATA, ADR/RID, IMDG Class: 3
F110 – Surfactant	• DANGER • Flammable Liquid • **HMIS classification:** - Health: **3** - Flammability: **3** - Physical hazard: **0**	• Severe eye irritation. • Causes pain and redness. • Prolonged or repeated contact may cause mild burn. • Severe skin irritation. • May cause headache, narcosis. • May cause dizziness, nausea, vomiting, diarrhea.	• Prevent further leakage or spillage. • Keep out of waterways.	• Keep away from heat, sparks, and flame. • Store out of direct sunlight in well-ventilated area. • Keep container closed when not in use. • Use with adequate ventilation.	• Contain with dikes. • Use explosion proof equipment to recover. • Remove all sources of ignition. • Soak up residual on inert absorbant (sand). • Put in steel or plastic drum approved for flammables.	• Flammable • IMDG/IMO, ICAO/IATA, TDG: Class 3, Toxic 6.1.
S001 – Accelerator	• Serious eye damage/eye irritation, Class 2 • Health Hazard/Hazardous to ozone layer.	• Inhalation of dust may cause shortness of breath, tightness of the chest, a sore throat and cough. • Causes serious eye irritation. • May cause skin irritation and/or dermatitis. • Ingestion may cause gastrointestinal irritation,	• The product should not be allowed to enter drains, water courses or the soil.	• Keep containers tightly closed in a dry, cool and well-ventilated place • Avoid: High temperatures. • Avoid contact with water and moist air.	• Avoid generating or breathing dust. Sweep up and shovel into suitable containers for disposal. • After cleaning, flush away traces with water.	• Not covered by international regulation on the transport of dangerous goods (IMDG, IATA,ADR/RID/ADG).

Product Name Chemical Name	Hazards Identification	Toxicological Information	Environmental Precautions	Storage Requirements	Spill Clean Up Methods	Transport Information
		nausea, vomiting and diarrhoea.				
U066 – Solvent	• Health hazard / Hazardous to the ozone layer • Acute oral toxicity, Category 4 • Acute dermal toxicity, Category 4 • Acute inhalation toxicity - Vapour, Category 4 • Skin corrosion/irritation, Category 2 • Serious eye damage/eye irritation, Category 2	• Harmful by inhalation. • Causes serious eye irritation. • Harmful in contact with skin. May be absorbed through the skin in harmful amounts. Irritating to skin. • Harmful if swallowed.	• The product should not be allowed to enter drains, water courses or the soil. • Keep out of waterways.	• Keep containers tightly closed in a dry, cool and well-ventilated place • Keep away from open flames, hot surfaces and sources of ignition • To avoid ignition of vapours by static electricity discharge, all metal parts of the equipment must be grounded • Keep away from direct sunlight Incompatible with oxidising agents	• Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. • After cleaning, flush away traces with water.	• Not covered by international regulation on the transport of dangerous goods (IMDG, IATA,ADR/RID/ADG).

4.5.3.2.3 Wireline Logging Operations

A series of petrophysical logs will be run to identify the rock properties and hydrocarbon potential. The petrophysical tools are lowered into the well using a cable and winch. Some of the wireline tools run in the hole will contain a radioactive source. High safety standards are employed while handling and storing the source on the surface. It is stored in a lead container in a dedicated area away from personnel and the main working area.

In logging the well, typically four main types of equipment are used:

- The downhole instrument (which measures the data),
- The computerized surface data acquisition system (to store and analyze the data),
- The cable or wireline (which serves as both mechanical and data communication link with the downhole instruments), and
- The hoisting equipment to raise and lower the instruments.

The downhole instruments (also known as tools or sondes) are first lowered to the bottom of the well, then slowly retrieved, probing the formations continually by using various non-destructive techniques. This process provides a continuous stream of data up the wireline to the surface computer. Data are recorded on a "log" that displays information about the formation as a function of depth.

Well logs are used to:

1. Define physical rock characteristics such as lithology, porosity, pore geometry, and permeability;
2. Identify productive zones of hydrocarbons;
3. Determine the depth and thickness of zones;
4. Distinguish between oil, gas and water zones in a reservoir; and
5. Determine facies relationships.

A wireline logging operation will run into the borehole via cable in order to inspect the potential for hydrocarbon, geological condition and record geophysical properties of the formation and fluids in the bore: e.g. Electricity Conductivity (EC), porosity, resistivity, density, radioactive property etc. In some cases, samples of fluids will be taken in order to appraise potential of the petroleum reservoir. Wireline logging will take about 3-4 day for each section.

During the wireline logging operation, the following measurements are made: gamma rays log, resistivity log, density log and neutron log. Gamma rays will be used to identify rock type – a low ratio indicates sandstone, a high ratio indicates claystone. Neutron rays will be used to search for the volume of reflected fraction. Some fraction is absorbed by Hydrogen in the formation cavity. If a high ratio is found, it indicates the formation has low density or may have high porosity. Determination of EC in the formation, the equipment will generate electric current into the formation which will make the fluids act as a conductive. If a reading is low, it indicates the formation is a water bearing formation. If the reading is high, it indicates the formation may contain gas or oil. Results of the wireline operation are displayed in a graph format which requires interpretation to obtain information on type of petroleum and rock, porosity, density, and etc. which can determine if the well contains water, productive oil or natural gas.

The logging program tentatively planned for the wells is described below:

One logging run will be performed for 12 ¼" - 8 ½" and 7" hole.

Run 1: Induction-Density-Neutron-Spectral Gamma Ray-Caliper-Head Tension.

4.5.3.3 Well Testing

Oil and gas well testing (also known as drill stem testing) are performed at various stages of drilling, completion and production. Test objectives can be as simple as identification of produced fluids and reservoir productivity to the characterization of reservoir features. Current technology improvements in downhole sensors and better control of down-hole environment have significantly increased capabilities of well testing operation. A typical well testing arrangement is shown in **Figure 4-19**.

Generally, well tests are conducted to:

- ✓ Identify produced fluids
- ✓ Measure reservoir pressure & temperature
- ✓ Obtain representative samples, surface and downhole for PVT analysis
- ✓ Determine well productivity and flow performance i.e. productivity index, skin
- ✓ Obtain hydrocarbon composition and impurities i.e. Mercury, CO2 and H2S

There are two (2) main categories of drill stem test:

- ✓ **Open Hole Drill Stem Test** - provides rapid and economical means to quickly assess production potential of the formation. This technique requires hole to be in a very good condition and highly consolidated. Packer still needs to be set in casing/liner if annulus hydraulic operated tools are chosen. Mini drill stem test using straddle packer can be an alternative to full bore drill stem test.

- ✓ **Cased Hole Drill Stem Test**- also known as full-bore drill stem test. This technique utilizes pressure controlled system to eliminate the need for pipe manipulation. Moreover, services such as thru tubing perforating, slickline conveyed sampling and production logging can readily be programmed into the test sequence even as contingency measures.

4.5.3.3.1 Well Test Equipment

Well testing equipment consists of mainly four (4) parts:

1. Perforation

Perforating gun is a critical part of the well testing process which essential for better well productivity an operating efficiency. Two (2) basic perforating techniques are available for well test job:

- ✓ **Thru Tubing Gun** - Guns are lowered into the well thru test string using either wireline or coiled tubing. Mostly applicable for add-on perforation job.

- ✓ **Casing Gun** - Large diameter guns are lowered as part of the test string bottom-hole assembly in a conventional well test. The perforation guns may be lowered with wireline or DST string. The tubing convey perforation may be shoot and pulled or shoot and drop, as per the well requirement.

2. Drill Stem Test (DST) Tools

A set of drill stem test tools consist of down-hole hardware used for temporary completion of a well. They are run to provide a safe and efficient method of controlling formation during the well test operation. Basic tool functions cover well isolation, down-hole circulation, down-hole shut-in, pressure test, emergency shut-in / circulation and as gauge carrier.

DST tools are designed for a wide range of operating environments and to perform different functionalities.

- ✓ Retrievable / Permanent / seal bore Packer
- ✓ Downhole Test Valve
- ✓ Flow/ Control head
- ✓ Reverse Circulation Valve
- ✓ Slip Joint
- ✓ Hydraulic Jar
- ✓ Safety Joint
- ✓ Sub Surface safety valve
- ✓ Safety Valve
- ✓ Gauge Carrier
- ✓ Downhole sampler

3. Surface Well Test Equipment

Produced fluids during well test are normally handled using temporary production facilities / surface testing package. This equipment needs to be assembled and designed to safely and reliably fulfil a wide range of operations:

- ✓ Pressure control and shutting in the well
- ✓ Separate produced fluids into gas, oil and water phases allowing all constituents to be measured
- ✓ Allow representative samples of produced fluids to be taken
- ✓ Dispose of produced fluids in an environmentally acceptable manner
- ✓ Data acquisition

Each of surface components must be designed for expected operating conditions.

- ✓ Flowhead
- ✓ Choke Manifold
- ✓ Coflex hose
- ✓ Oil Storage tankHeater / Heat Exchanger
- ✓ Test Separator
- ✓ Gauge / Surge Tank
- ✓ Pumps and Manifolds
- ✓ Emergency Shutdown System
- ✓ Surface Safety Valve
- ✓ Burner head or vertical flare stack

4.5.3.3.2 Well Test Design

Design and implementation of well testing program has to be in line with the latest standard. Stringent safety requirements, environmental concerns and a greater need for cost efficiency require the entire testing sequence from design to data evaluation be conducted intelligently. Proper test design, correct handling of surface effluents, high performance gauges, flexible down-hole tools and perforating systems, well site validation and comprehensive interpretation are keys to successful well testing.

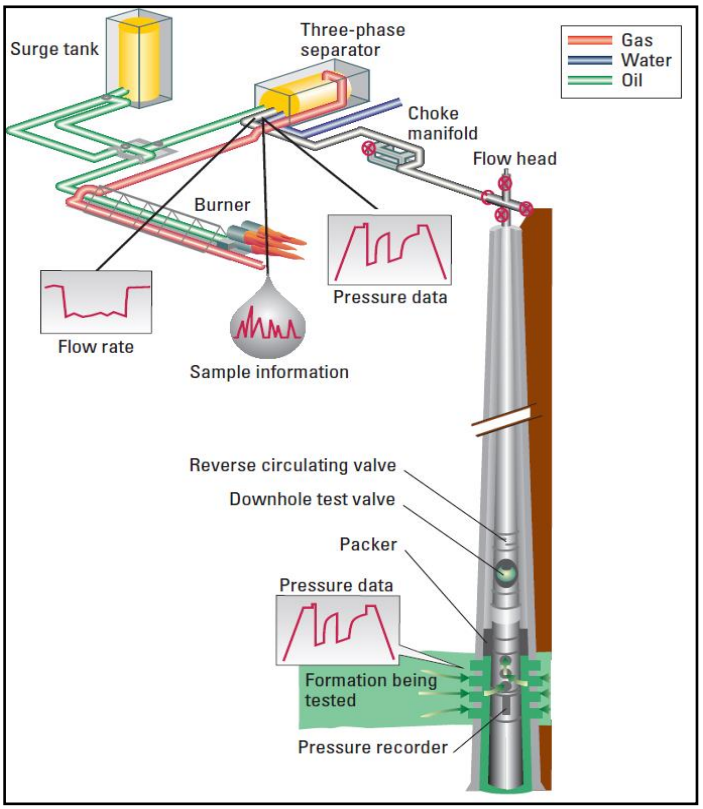
Types of well or reservoir data will drive the type of well test to be run i.e. conventional drill stem test, underbalanced drill stem test, etc. Later, sequence of flow and shut-in are determined with various flow rate and realistic duration as to generate the expected interpretation patterns. Different types of well tests can be achieved by altering production rates and shut-in well at downhole / surface.

- ✓ Initial Flow & Initial Build-up
- ✓ Clean-up Flow
- ✓ Main Flow (draw down test)
- ✓ Main Build-up (build-up test)
- ✓ Sampling Flow (bottom hole sampling)
- ✓ Multi Rate Test (recommended for oil testing)
- ✓ Modified Isochronal Test (recommended for gas testing)
- ✓ Maximum Flow

Diagnostic plots of simulated data should be examined to determine when essential features will appear i.e. wellbore storage effects, duration of infinite acting radial flow, emergence of external boundary effects, constant pressure boundary and etc. Final step of test design process is to select instrumentation and equipment for data acquisition.

In summary, surface and down-hole equipment should be versatile to allow for safe and flexible operations. Among of the key factors to consider:

- ✓ Controlling down-hole environment to minimize wellbore storage
- ✓ Combining perforation and testing technique to minimize rig time
- ✓ Choosing reliable down-hole recorders to ensure successful and good quality data retrieval
- ✓ Selecting surface equipment to safely handle expected rates and pressures
- ✓ Environmentally sound disposal of produced fluids



Source: ONGC Videsh, 2020

Figure 4-19: Well Testing Set-Up with Horizontal Flare Burner

4.5.3.3.3 Flaring

If it is decided to test the well (DST) a significant quantity of gas could be flared from the well. The actual flow rate of the reservoir at this location is a parameter which the drilling of the well is intended to determine. The rate of gas production will range between 060 mmscfgd (60 mmscfgd being the maximum handling of the testing processing equipment).

4.5.3.4 Blowout Preventative Measures

A complex series of valves, known as the "blowout preventer" (BOP), is attached to the top of the conductor below the derrick floor. All further casing strings are also attached into this blowout preventer. These are powerful hydraulically-activated valves and rams that can be closed around the drill pipe to isolate the well bore should unexpectedly high formation pressure be encountered. If formation pressure exceeds the hydrostatic head of the drilling mud, it may cause the well to flow strongly, referred to as a "kick". A kick can also occur if a highly permeable formation, such as a naturally fractured limestone, is encountered and a large volume of mud is suddenly lost into the formation.

The blowout preventer is the primary safety mechanism for well control. The series of valves act independently and when closed in an emergency form a series of increasingly secure barriers that isolate the well so that a plan of action can be developed to bring it back under control.

Maximum expected surface pressure for the project prospect wells is expected to be not exceeding 11000psi. ONGC Videsh will use a 2000 psi rated 21-1/4" BOP and a 10,000 to 15,000 psi BOP with double ram preventers in the 13-5/8" & 11" sections.

ONGC Videsh as part of its QHSE MS system has a Blowout Contingency Plan (BOCP) for Myanmar operations. This BOCP defines the procedures that are to be used in the event of a well control emergency occurring in their onshore exploration drilling.

Blowout Preventer (Example)

Source: ONGC Videsh , 2020

4.5.3.5 Well Abandonment

4.5.3.5.1 Commercial Failure, Well Abandoned

After completion of the well testing operation, the wells will be permanently abandoned, and the well site restoration work commenced immediately. The requirements for the physical abandonment will follow best industry practices and as per ONGC Videsh PPGUA. The following procedure for plugging and abandoning the well bore will ensure that the land is returned as near as possible to its original state.

The procedure for abandonment and restoration of such a well site is long established and is a relatively routine operation. The well abandonment will follow normal industry practices and procedures, conforming to all international regulations. A section of the 7" casing will be filled with heavy kill weight mud and a cement plug will be put in position, 30m below top of liner lap and 30m above as one 60m long plug. (Minimum length) After curing/thickening time, the position of the plug will be confirmed physically by tagging with the cementing string. It will then be pressure tested. Then a 30m (Minimum length) cement plug will be spotted at surface. Wellhead will then be removed, and casing will be cut off at bottom of cellar. A steel plate will be welded on the top of the cut off casing. The cellar will then be removed, and the cellar back filled with clean soil.

The well site will then be cleared of all equipment and cleaned up. The rig cellar will be removed, and a steel plate welded on top of stump, a minimum 3 m below ground level. The concrete rig pad, other foundations and the water pit will be broken up and all material removed off site for disposal as normal building rubble. The Civil Work Contractor will have stripped and stockpiled the top 500 mm topsoil layer while constructing the well site area.

Once campaign finished, the surface of the well pad, consisting of compacted fill will be broken up and the contours of the site restored to their original levels then the civil work contractor will remove all borrowed soil from well site and put back the topsoil to the well site area to restore to original condition.

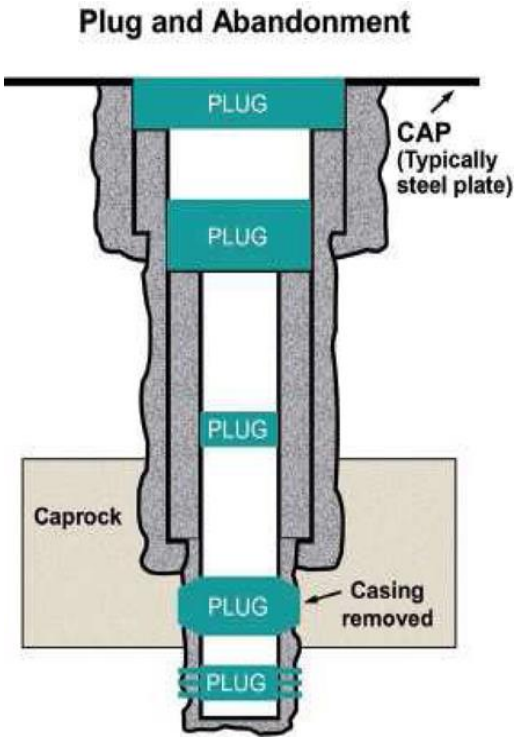


Figure 4-20: Example Plug and Abandonment Plan

4.5.3.5.2 *Contingency Wells*

During drilling of the well, technical issues may occur that require the exploration well to be re-drilled. A contingency well would be in the form of a sidetrack or a new hole next to the first hole within the same pad built for the well. Examples of some technical issues that could require drilling of a contingency well are tools or drill string lost down hole; surface casing collapse or weakened; unexpected hydrocarbon reservoir encountered shallower than objective; poor quality reservoir. Although these issues are unlikely to occur, a second or third contingency well may have to be drilled from the well pad to meet the objectives of this project.

The technical issue encountered would be reviewed and ONGC Videsh would evaluate the best option to overcome the issue. Drilling a contingency well is just one of many possible options but would be a worst case and last resort scenario.

4.5.4 Workforce

The workforce active on the project will vary with time, depending on the phase of the operation. Up to 100 to 110 personnel could be employed for this exploration drilling project. An estimate of the number of personnel active during each phase is provided in **Table 4-12**.

Table 4-12: Estimated Work Force

Project Phases	Number of Personnel
Construction Phase	60 – 80
Drilling, Testing Operations Phase	100 – 110
Well Testing Phase	20-30
Well Abandonment Phase	15 - 25

The site construction and abandonment or restoration phases will be conducted using a civil engineering contractor and their local staff. The ration of skilled and unskilled workers during the construction phase will be 20: 80 with an expected number of local hires of between 40 – 50 persons.

During drilling operations, the ratio of skilled and unskilled workers will be 30: 70 with an expected number of local hires of between 40 – 50 persons. The expected number of local hires will be 20 MOGE staff. Where possible it is ONGC Videsh's company policy to encourage the hiring of local staff.

4.5.5 Transportation

The rig and equipment transportation route is via the Yangon-Tharrawaddy-Pyay (Route 2). Then proceed to Well Site areas. The type of transportation for equipment is heavy truck with 1-2 day travel duration.

The overview of transportation requirements for the drilling program is detailed in **Table 4-13**.

Table 4-13: Transportation Requirements for Drilling Program

Description	Quantity	Remark
Estimated number of round trips for rig equipment	130	Based on previous onshore campaign in Myanmar.
Estimated number of round trips for drilling support equipment (Including casing, chemical and etc)	100	One well is about 50 trips.
Estimated number of round trips for personnel	100	One well is about 50 trips.
Transport Requirement & Route for produced oil	-	Produced oil will go to MOGE production facilities.

4.5.6 Emissions, Discharges and Waste Generation

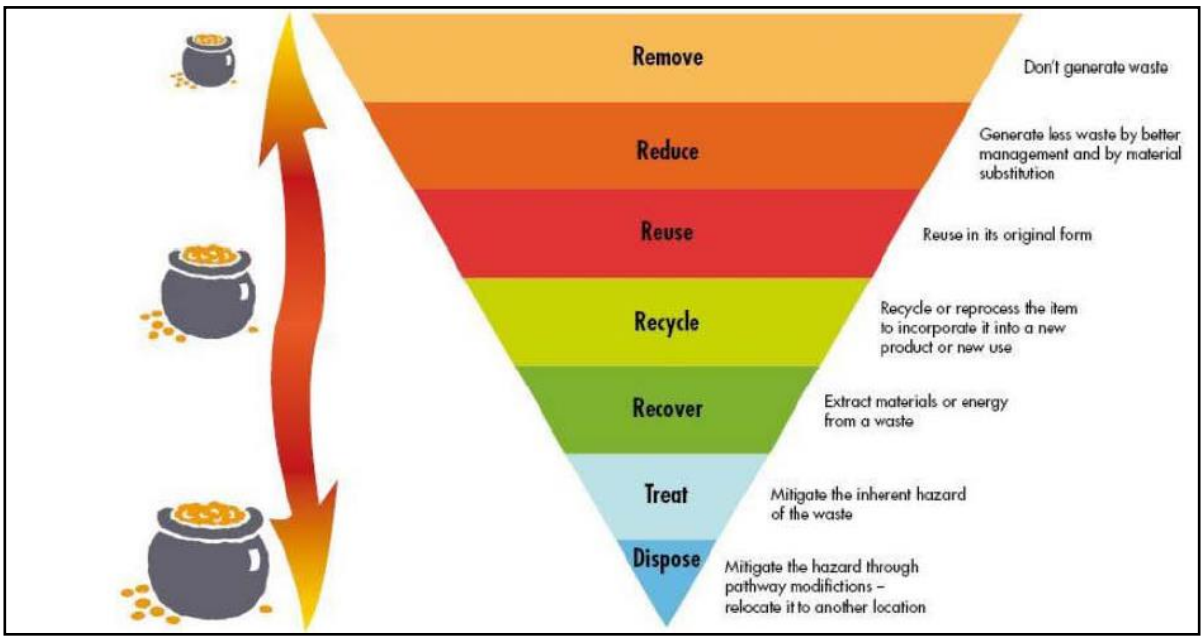
Emissions, discharges and waste generation will conform to applicable government regulations in Myanmar such as Myanmar Environmental Conservation Law (2012).

All wastes produced will be assessed and classified by type prior to treatment, transport, disposal or recycling. Wastes are classified as:

- Drilling Mud and Cuttings
- Wastewater (effluent);
- Hazardous waste (e.g., chemical waste, waste oil etc.);
- Non-hazardous solid waste (e.g., wood, paper, steel, food waste etc
- Air emissions.
- Noise
- Fluids Produced from the Separators During Drilling and Testing

4.5.7 Waste Classification

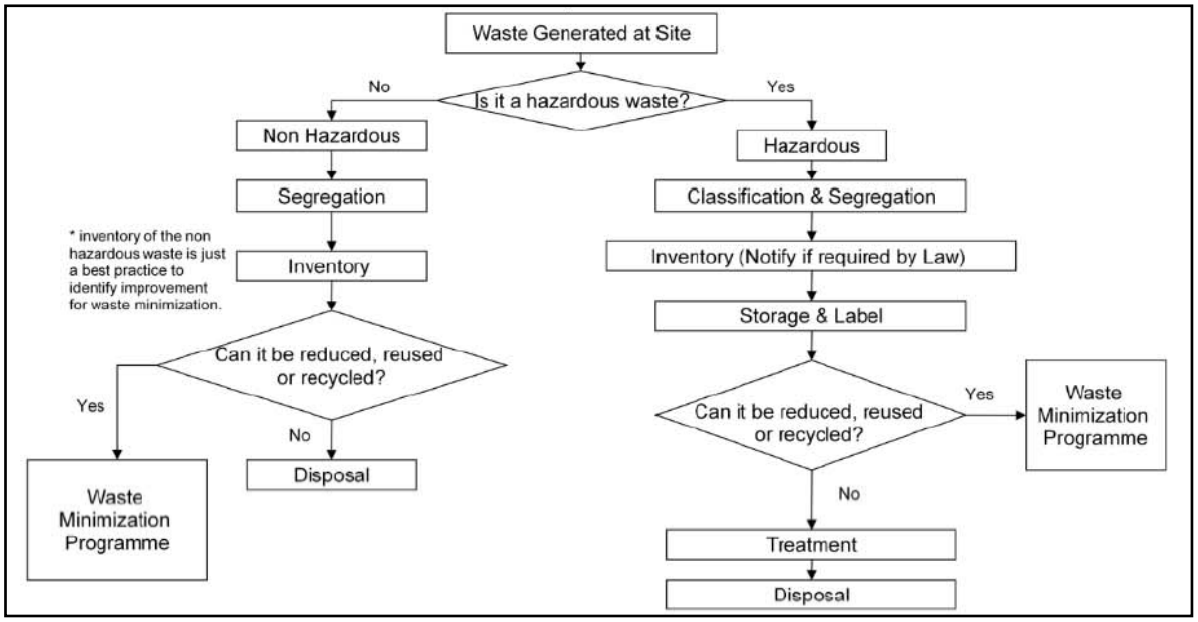
The waste management will follow the best practices shown in **Figure 4-21**.



Source: ONGC Videsh, 2020

Figure 4-21: Waste Management Best Practice

All wastes will be classified and segregated before responsible disposal. The classification and segregation process is shown in **Figure 4-22**.



Source: ONGC Videsh, 2020

Figure 4-22: Waste Classification and Segregation Process

4.5.7.1 Containers

All wastes will be collected, stored, and segregated in arranged containers. All provided containers will be as follows:

- Install adequately in the working area, accommodation and office area,
- Make from durable materials compatible with the waste to be collected, leakage proof, sturdy, stable and easily handled,
- Prevent the ingress of animals, escaping odor and place under cover to avoid leachate,
- Medical or clinical waste shall be separated from other wastes because, they may contain infectious agents and potentially toxic substance for example sharp objects shall be packed in puncture-proof containers.

Containers used for medical waste shall be marked prominently with universal warning signs and/or the word “Medical waste”. Used needles and syringes represent a particular threat as failure to dispose of them safely may lead to recycling and repacking. Where possible, management of medical/clinical wastes should be integrated into existing healthcare waste management system.

4.5.7.2 Waste Drilling Mud and Cuttings

The major waste products from the drilling operations are used drilling mud and cuttings. As described in earlier sections the drilling rig equipment contains a standard closed mud circulation and treatment system, that takes the drilling mud as it leaves the well bore, removes the cuttings and suspended fine solids, and returns the cleaned mud to the rig’s holding tanks for reuse. The subsequent treatment and disposal of the cuttings and drilling mud are discussed below.

Estimated mud volume from previous projects is about 1,900 m^3 per well and the estimated cutting volume is about 1,500 m^3 per well. However, this could vary according to each hole section TD.

4.5.7.2.1 Waste Drilling Mud

Some of the drilling fluid portion will be lost to porous rocks, such as sandstones, and some of the additive solids will be lost to form a mud-cake along the wall of the hole. The volume of these "losses" cannot be calculated accurately as they depend on the local geology. The solid and liquid phases are separated on-site by industry standard physical and chemical means (shaking, centrifuging and flocculation).

At the end of drilling campaign the left over mud will be sent back to mud contractor for reuse or disposal. If the well is actually abandoned rather than completed as a producer, some of this mud will be used to make the kill weight spacer between the cement plugs.

4.5.7.2.2 Waste Drilling Solids

Waste cuttings disposal and management will be done at DOWA waste management facility by a Licensed Waste management contractor.

4.5.7.3 Wastewater

The wastewater and sewage will be collected in a concrete-lined closed sewage tank with a capacity of 8 m^3 (8,000 litres) and equipped with degreasers to reduce the organic load. It is estimated that some 3-4 m^3 (3,000 to 4,000 litres) of combined sewage and wastewater will be produced each day during maximum manned operations. The sites grey water to be discharged to an infiltration field if site conditions allow for the proper installation of an infiltration field.

The design of the disposal of the clarified outflow will consider specific techniques, such as sub-irrigation, if site conditions allow. The septic tank(s) will be:

- properly designed to treat the estimated maximum daily rate of wastewater and installed in accordance with local regulations and guidance to prevent any hazard to public health or contamination of land, surface or groundwater;
- well maintained to allow effective operation;
- installed in areas of stable soils that are nearly level, well drained, and permeable, with enough separation between the drain field and the groundwater table or other receiving waters.

Septic storage tanks will be located away from areas with a high water table (i.e. floodplain areas) or from water abstraction wells.

The settled sludge in the septic tank will be vacuumed out by tanker trucks as required and the contents sent by transporter to the DOWA licensed waste treatment site. At the end of operations during closure of the camp the septic storage tank and its contents on site will be removed and sent for disposal at the DOWA licensed facility.

In case of rainfall during drilling operation, runoff may happen from the well site. The well site area will drain into the cuttings pit which will be designed to contain the runoff from the well site combined with rain falling on the waste pit during extreme heavy rain. The pit will be enclosed by an earth embankment to prevent the excess water drain into the pit.

4.5.7.4 Solid Wastes

4.5.7.4.1 Non Hazardous Waste

Both the well site and the accommodation campsite will generate non-hazardous waste, consisting of "domestic" garbage such as food scraps, plastic packaging, paper, cardboard, tin cans and glass. In addition there will be "industrial" waste such as wooden cases, large glass containers, ferrous and non-ferrous metal items, plastic and metal drums and containers, plastic and cardboard packaging. The amount of non-hazardous waste from the workers is expected to be 1 kg / per person / day. Therefore,

the generated non-hazardous waste for each phase; construction: 80 kg/day, Drilling: 110 kg/day, Well testing: 30 kg/day and Site restoration: 25 kg/day.

General waste will be separated on-site to facilitate recycling. This waste will be stored in separate skips to be transported off site for recycling, reuse, treatment and/or disposal.

All wastes shall be handled and stored in a manner that reduces the risk of escape to the environment. Wastes either at the source or after collection that require different treatments or disposal systems shall be segregated as much as possible at source for collection, storage, transportation, and disposal.

A waste management plan will be prepared that defines waste types, disposal methods and locations consistent with waste management laws and regulations. All general waste (solid waste) will be disposed as per local Pyay Township municipal regulations.

4.5.7.4.2 Hazardous Waste

The well site and accommodation campsite combined will generate a low volume of hazardous waste. The estimated amount of hazardous waste based on previous projects is expected to be 500 kg per month. Those items that have been identified from previous drilling operations are:

a) Medical Waste
b) Used lubricating oil
c) Used hydraulic oil
d) Filters contaminated with oil
e) Drums and containers used for oil or chemical transportation and storage
f) Mud additive chemicals
g) Rags, paper, plastics and other materials contaminated with oil

All materials brought onto the well site and accommodation campsite will be logged and all sources of potential toxic waste will be identified by the relevant supplier or contractor. Equipment or materials containing heavy metals, such as batteries, will be identified and a special container designated for their disposal as waste. All used chemical and lubricant containers will be collected in separate containers.

It is assumed that there will be only chemical/mud/additive containers and batteries. Some will be reused and the rest shall be returned to where they came from. Waste cuttings disposal and management will be done at DOWA waste management facility by a Licensed Waste management contractor. A detailed waste management plan can be found in Chapter 8.

Medical or clinical waste will be separated from other wastes because, they may contain infectious agents and potentially toxic substance for example sharp objects shall be packed in puncture-proof containers. The medical waste will then be transferred to Yangon for disposal of at an approved waste disposal area (YCDC) or DOWA waste management facility.

The drilling contractor is to ensure appropriate and safe storage until this waste is picked up by the waste transporter and taken to the DOWA Waste Management Facility.

4.5.7.4.3 Fluids Produced from the Separators during Testing

Should testing be conducted, the produced reservoir fluids will be separated at the surface. The gas portion will be flared while the liquid portion will be separated into water and a condensate-water emulsion. The water portion will be stored in the cuttings pit. The condensate-water emulsion will be moved to a series of settling tanks where natural buoyancy of the emulsion breaks down, separating the water and condensate phases further. The separated water will be stored in the cuttings pit and the remaining condensate and emulsion will be collected in storage tanks for disposal.

The expected condensate-to-gas ratio is 5 bbl (0.795 m^3) per 1 mmscfg. Based on a worst case of a 10 mmscfgd during a LTP test for 30 days (for both wells) – equating to an average condensate production of 50 bbl (7.95m^3) per day, the total condensate production potential could be 1,100 bbl (175 m^3).

Condensate will be decanted from the settling tanks and stored to await disposal.

4.5.7.5 Air Emissions

The air emissions from the well site would be from the following sources:

1. Dust
2. Combustion emissions

4.5.7.5.1 Dust

During construction and upgrading of access roads and well site construction, the main air quality issue will be control of dust. Standard operating procedures require the civil engineer contractor to ensure daily or as required sprinkling of water on all non-sealed surfaces to subdue the amount of dust. The standard operation procedure will also limit the speed of traffic on site and to restrict speed of traffic on portions of the road that have not yet been sealed. Daily consultations by the construction contractor with the local villages will ensure that any significant problems are identified and resolved.

The handling and storage of bulk drilling mud additives, including barite, bentonite, calcium carbonate and cement powder will result in relatively minor fugitive dust emissions. Any emissions will be reduced significantly by the standard procedure of equipping all silos with bag filters.

4.5.7.5.2 Combustion Products

Combustion products from the proposed exploration drilling project consist of diesel combustion and flaring emissions.

Diesel Combustion

Diesel combustion from the on-site electrical power generation units and from vehicles will emit greenhouse gases. The amount of emissions will vary with time, depending on the operational activity and power demand. The emissions from diesel consumption for two well sites are provided.

Flaring

If it is decided to test the well (DST or LPT), a significant quantity of gas could be flared. The actual flow rate of the reservoir at this location is a parameter which the drilling of the well is intended to determine.

The rate of gas production will range between 0-30 mmscfgd (30 mmscfgd being the maximum handling of the rig's processing equipment). If a DST found less than 5 mmscfgd an LTP test would unlikely proceed. If an LTP test is to proceed, the drilling rig would be demobbed and a smaller well testing package brought in to conduct the LTP test. During an LPT test flaring would be conducted at various rates and sustained rates combined with shutin's to observe pressure build ups and flowed again. The data gathered is used to establish reservoir characteristics. The maximum flow during an LPT tests generally never exceed 10 mmscfgd. Thus a worst case scenario flaring is a sustained flow rate of 10 mmscfgd for 15 days.

The overall greenhouse gas emissions from flaring at the well sites are provided in **Table 4-14**.

Table 4-14: Greenhouse Gas Emissions per Well

Project Phase	Activity	One Time CO_2 Release (ton CO_2)
Site Preparation	Granular Fill Transport	6.0
Drilling	Drilling rig mobilization	24.8
	Equipment and Supplies	10.3
	Drill cuttings transport	43.5
	Transport (fuel, water, personnel)	13.0
	Heavy equipment use	1,299.5
	Generator to power drilling rig and camp site	1,298.4
Testing Activity	Flaring	10,320.5
Abandonment and Restoration	Heavy Equipment and transportation.	378.70
Total per well		13,394.7

Total

This entire project is estimated to generate a worst case maximum of 26,789.4 tonnes of CO_2 equivalent for two well site, based on 60 days (120 days total) of drilling per well including 15 days of flaring for each well site. Air emissions and their impacts are discussed in the **Chapter 6 - Impact Assessment**.

4.5.7.6 Noise

During the civil work phase, noise will primarily be generated from project vehicles, generators, and construction equipment such as bulldozer, backhoe, grader, dump trucks and others. (**Table 4-15**)

Table 4-15: Noise Level from Construction and Drilling Equipment

Source	Maximum dB(A) at source	Number of Sources at one time
Bulldozer	85	1
Backhoe	80	1
Grader	85	1
Compactor	82	1
Heavy trucks (dump trucks)	88	1
Water truck (Lmax truck)	84	1
Jack-hammer	80	1
Drilling Rig (auger)	85	1
Generator (for drilling & testing)	81	4
Flue gas.	77.6	1

Source: US Federal Highway Administration, US Department of Transportation, 2008; reference distance 50 ft (15.24 m); (http://ops.fhwa.dot.gov/wz/workshops/accessible/Schexnayder_paper.htm)

During drilling phase, noise will be generated from project vehicles, generators and drilling operations. Noise will be generated from equipment and flaring during well testing operations. Potential impacts from noise during the well abandonment phase will be virtually identical to those in the construction phase. The same mitigation measures should be applied, and the impact significance will be similar.

4.5.7.7 Summary of Waste Inventories

A summary listing of wastes generated by this proposed project is provided in **Table 4-16**.

Table 4-16: Waste Inventory (per Well Site)

Waste Type	Estimated Quantity	Disposal Plan
1) Drill cuttings	1500 – 2500 m^3 per well	Cuttings of WBM & LTSOBM will be dried onsite using drier. The dilution of WBM will be treated through TFM (Total Fluid Management System). The dried cuttings and any drilling fluid waste will be transported by authorised Waste Management Company to DOWA waste management facility for disposal.
2) Drilling Mud (WBM and LTSOBM)	1900 m^3 per well	Drilling Mud will be re-used at next well site and at the end of drilling campaign any waste mud will be returned to Mud Contactor for re-use or disposal. No unused drilling mud will be disposed of on site.
3) Unused chemicals	N/A	Returned to supplier or kept for future drilling campaigns.
4) Domestic waste	Construction: 50 kg/day Drilling: 130 kg/day Well abandonment: 30 kg/day Site restoration: 25 kg/day	**Biodegradable waste** (food waste) will be segregated and transferred to local government waste disposal facilities (like YCDC in Yangon)**.** **Recycle and General Non-Hazardous waste except recycle and biodegradable waste** shall be transferred to local government waste disposal facilities (like YCDC in Yangon) or disposed at a site approved by Local Authority.
5) Industrial waste (scrap metal, plastic, paper, wood, glass etc.)	N/A	Recyclable or reusable waste to be sold or donated. Other non-recyclable or reusable waste will be transferred to local government waste disposal facilities (like YCDC in Yangon).
6) Hazardous waste	Drilling: 500 kg/month	**Medical or clinical waste** shall be transferred to Yangon for disposal at approved location by YCDC or authorized medical provider. **General Hazardous Waste** - Transported to Yangon for disposal at approved location by an authorized Waste Management Company facility
7) Sanitary wastewater	Construction: ~3 m^3/day Drilling: ~7.8 m3/day Well abandonment: ~1.8 m^3/day Site Restoration: ~1.5 m^3/day	**Grey water** will be treated in soak pit. **Black water** will be treated in septic tank and soak pit**.**

4.5.8 Safety, Security, Health and Environment Management

4.5.8.1 ONGC Videsh QHSE Policy

Framework

ONGC Videsh has implemented QHSE Management System at its corporate level and ONGC Videsh has well defined 'Integrated QHSE & Risk Management Policy', whereby Management is committed to compliance to all applicable legal & other requirements; sustainable development; prevention of pollution, injury and ill health apart from other aspects of HSE. The ONGC Videsh QHSE Management System shall be maintained as per internationally recognised standards ISO 9001:2015 (Quality), ISO 14001:2015 (Environment) and ISO45001:20182018 (Occupational Health and Safety) or their latest revisions.

HSE Vision

To be a leader in pursuit and attainment of Health, Safety and Environment performance.

HSE Strategic Objective

No accident, no harm to people and promote environment protection.

QHSE Policy of ONGC VIDESH

1. We are committed to maintain highest standards of Quality, Occupational Health, Safety and Environment protection with effective QHSE Management System.
2. We are committed to comply with all applicable requirements and compliance obligations in timely manner, wherever we operate and reside.
3. We are committed to conduct business in an economically, socially, environmentally sustainable manner that is transparent and ethical.
4. We are committed to prevention of injury and ill health and always be alert, equipped and ready to respond to emergencies.
5. We are committed to protection of environment including prevention of pollution, sustainable resource use, climate change mitigation and waste management.
6. We shall assign high importance to training of our employees including contractual employees as per best international practices.
7. We are committed to provide quality products and services.
8. We shall maintain the required processes including setting of objectives and allocate necessary resources for continual improvement of QHSE Management System.

4.5.8.2 QHSE Management System Manual

ONGC Videsh's QHSE Management System Manual objective is to serve as practical interpretation of Company QHSE policy with respect to their moral obligations for QHSE issues for all persons working on, visiting or affected by operations at sites for which ONGC Videsh has responsibility.

The document is designed to serve as a comprehensive guide for all Operational Assets to develop its own QHSE management system and related documents. This document also provides an overview of QSHE management system approach.

A project specific HSE plan shall be developed by the drilling contractor considering environmental, health & safety and social risk identification and associated mitigation programme.

In addition to aforesaid measures, the drilling contractor to ensure the protection of project workers and staffs' health & safety and assurance of safe drinking water supply, good hygiene and sanitation practices and necessary protection aids with regular medical service facilities. All occupational health and safety practices to follow applicable HSE guidelines/standards of Myanmar Government guidelines/standards and ONGC Videsh.

4.5.8.3 Potential for Accidents, Hazards and Emergencies

ONGC Videsh will ensure the contractor will have an Emergency Response Plan that includes response procedures for blowout, fire, earthquake, medical emergency, release of hazardous/toxic substances, etc. ONGC Videsh has an Emergency Response Plan (ERP) that will be updated specifically for each well site operations and site specific location.

This ERP is considered a standard E&P Emergency Management System and is based on Industry accepted standards and practices (e.g. ISO, BCI, EMI, BS etc.). Topics of the ERP are outlined in **Table 4-17.**

Table 4-17: Emergency Response Plan

Main Sections	Topics
Procedure & Responsibilities	h) Drilling Superintendent i) On-Scene Commander j) PIC (Person-In-Charge)
Emergency Organisation	k) Introduction l) Emergency Response Philosophy m) Overview of the Response Organisation
Emergency Arrangements And Facilities	n) Major gas release / H_2S o) Explosion / fire p) Accommodation fire q) Blow-out r) Oil spill land s) Hazmat spill t) Helicopter incident u) Man missing v) Loss or damage of radioactive source w) Traffic accident x) Medevac y) Bomb threat / terrorist act z) Fatality aa) On-scene Commander Field Arrangements and facilities
Risk Management	bb) Major Hazards - Emergency Plans

The Emergency Response Procedures are detailed in **Section 8.13, Emergency Response Plan**.

4.5.8.4 Gas, Smoke and Fire Detection Systems

The following detection systems are installed at each drilling site.

- H_2S Monitoring System (portable and fixed)
- Combustible Gas Monitoring System (portable and fixed)
- Explosimeters
- CO_2 Gas Detectors (portable)
- O_2 Meter (portable)

- Fire/Smoke Detectors
- Fire detectors/alarms

4.5.8.5 Fire Fighting Systems

4.5.8.5.1 Rig Site

The rig site will be equipped with firefighting systems designed for different purposes. The first is a comprehensive set fire extinguishers and the second is sufficient water storage for firefighting purpose.

In the event of a large fire beyond the control of the designated crew fire team members on site, then necessary efforts must be made to seek professional fire fighting services.

Fire Extinguishers

A comprehensive set of dry chemical all-purpose fire extinguishers will be positioned around the well site, within accommodation cabins, equipment cabins, adjacent to equipment units and around the rig floor:

- The majority of these will be standard size 9 kg hand portable extinguishers, suitable for containing or extinguishing minor fires.
- A set of larger 25 kg extinguishers will be positioned strategically around the rig site to act as back-up in case of a larger fire or prolonged containment is required.
- A set of spare extinguishers will be kept at both the dry storage area and the equipment store.
- Diesel portable fire pump.
- Hi-combat mobile foam unit.

The rig contractor will be responsible for ensuring that all extinguishers are serviced and certified before mobilisation and periodically checked during the operation. ONGC Videsh's rig manager will be responsible for verifying this process.

The rig contractor is responsible for training their crew in fire fighting techniques and to hold regular practice drills. ONGC Videsh's rig manager will be responsible for verifying this process.

4.5.8.5.2 Accommodation Camp Site

A comprehensive set of dry chemical all-purpose fire extinguishers will be positioned around the accommodation camp site, within all accommodation cabins, utility cabins and adjacent to equipment units:

- The majority of these will be standard size 9 kg hand portable extinguishers, suitable for containing or extinguishing minor fires.
- A set of larger 25 kg extinguishers will be positioned strategically around the site to act as back-up in case of a larger fire or prolonged containment is required.
- A set of spare extinguishers will be stored on the site.

The rig contractor, who is also providing the accommodation camp trailers and equipment, will be responsible for ensuring that all extinguishers are serviced and certified before mobilisation and periodically during the operation.

The rig contractor is responsible for training their crew in fire fighting techniques and to hold regular practice drills.

4.5.9 Land Compensation

The land compensation plan together with the associated procedures note that the land acquisition / rental for the well sites and access roads will be according to MOGE's official formation order for Land Acquisition / Rental for drilling a Land Compensation committee will be established.

The land for the project sites and access roads will be leased or bought under the name of MOGE from the owners as per mutual agreement between ONGC Videsh, MOGE and the owners.
LAQ team is organized by the Regional Government as per Myanmar law through general administrative offices (**Appendix 6:** LAQ Team Organized by Bago Regional Government**).**

For Naweng-1
Naweng-1 well location is on farmland. Therefore, this land acquisition will go through as per Farmland Law (2012) and Farmland Acts (2012) starting from township administrative body of farmland by meeting and negotiating with the farmland owners through the established LAQ team. The regional government has established the LAQ team (Referred Appendix-6). The township administrative body of farmland has already calculated the land & crop compensation, as per calculation form no. 12 as per act no. 66 of Farmland Acts (2012) with consent of affected farmers and sent to regional administrative body of farmland through district administrative body of farmland. Once final approval of Myanmar government authorities is received, compensation shall be made.

All landowners are from Char-yar-gone group of villages, The'gone township. The list of the land owner and affected acre of each are shown in below tables, (Along the existing road (on .38+.78=1.16Km).

Sr.	Owner Name	Land Area (Acre)
1	Daw Aye Than	0.020
2	U Soe Thein	0.044
3	U Aung Myint	0.078
4	U Thar Wa	0.049
5	U Myint Swe-1	0.077
6	U Kyi Aye	0.003
7	U Aye Thein	0.035
8	U Maung Kyu	0.052
9	U Maung Maung Myint	0.026
10	Daw Than Sein	0.077
11	U Thein Zaw	0.060
12	U Myint Swe-2	0.031
13	U Hlaing Myint Aung	0.018
14	U Aye Min Naing	0.014
15	U Hla Han	0.036
16	U Kyi Lwin	0.007
17	U Nay Min Tun	0.016
Sub-Total		**0.573**

Along the road way to well site (on 0.02Km)

Sr.	Owner Name	Land Area (Acre)
1	U Nay Min Tun	0.103
2	U Thein Saung	0.064
3	U Min Min Tun	0.059
	Sub-Total	**0.226**

Well Area (200 x 200 m)

Sr.	Owner Name	Land Area (Acre)
1	U Moe Zaw	0.336
2	U Maung Htay	1.761
3	U Naing Win	1.261
4	U Thein Htay	2.600
5	U Win Ngwe	3.180
6	U Ko Htay	0.028
7	U Hla Han	0.216
8	U Nay Min Tun	0.022
9	U Kyaw Min Tun	0.079
10	U Min Min Tun	0.250
11	U Thein Saung	0.160
Sub-Total		**9.893**
Grand Total		**10.692**

For Payama-1 Well

OVL Videsh has obtained approval for use of reserve forest lands from the Forest Department through a negotiation process. As part of the agreement OVL Videsh will construct and Ecological Park as compensation for any trees lost during project construction or operations.

Approved by Forest Department. (see Appendix 6 - Forest letter, challans, CT, establishment plan included the commitment to negotiate with the crop owners for Payama-1).

5 DESCRIPTION OF THE SURROUNDING ENVIRONMENT

5.1 Setting the Study Limits

5.1.1 Introduction

This section presents the existing environmental, social, economic and health conditions of the project area, including physical and biological resources, human use values, and quality-of-life values.

The project Study Area is focused on the proposed exploration drilling wells in Block EP-3 for the purpose of describing baseline environmental, socio-economic and health conditions potentially affected by the project and affecting the project (**Figure 5-1**). Where appropriate for the purpose of establishing context, data and observations from the region are also referenced.

Block EP-3 is mostly located in Pyay District, Bago (West) Region and partially in Nattalin, Ayeyarwady Region. Major administrative in Block covered Thegon, Paungde, Paukkhaung and Pyay Township. The exploration drilling wells are located in the Thegon and Paukkhaung Townships, located in the Pyay District. Pyay District is a district of the Bago Regional government in central Myanmar. The total area of this block is approximately 1,650 Sq. Km and is located 250 km northwest of Yangon.

Block EP-3 is located on the southern portion of the Central Lowlands physiographic zone. The topography is a mixture of valleys and hilly/mountainous terrain. Geologically Block EP-3 is situated in fore-arc domain at the center of Pyay Embayment.

5.1.2 Scope of Study

The environmental setting of the Project consists of physical (earth, air, water, acoustic), biological, and human components. The human component includes land use, demographics, socio-economic, cultural and quality of life aspects. The study is focused on the conditions found within the block, however, broader regional information is provided where it provides relevant context to the assessment.

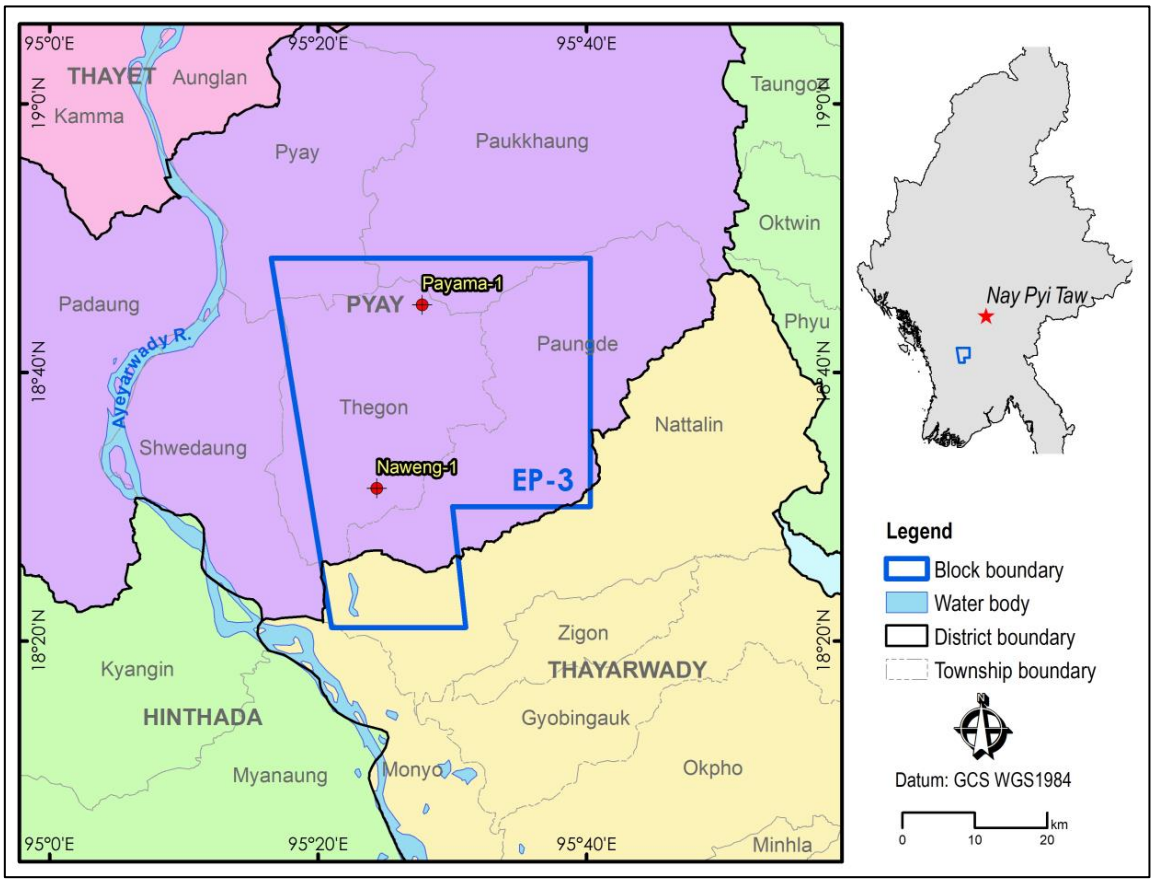


Figure 5-1: Project Location

5.2 Methodology for Data Collection and Analysis

5.2.1 Data Sources

5.2.1.1 Primary Data

For the baseline survey, a detailed, field sampling plan was developed to supplement the existing secondary database for the Study Area. Data collected for this EIA includes details of the proposed project, environmental baseline, socio-economic setting and health conditions of the potentially affected areas. Data were obtained from primary and secondary sources.

Primary data sources include:

- 1st Public Consultation with villagers on 10 - 13 February, 2020;
- Environmental quality baseline survey for surface water, groundwater quality, and soil survey conducted on 12 – 16 August, 2020;
- Environmental quality baseline survey for noise and air quality survey conducted on 12 – 16 August, 2020;
- Traditional Ecological Knowledge (TEK) surveys with local farmers which focused on a number of ecological indicators regarding biodiversity and ecological status was conducted on 12 – 16 August, 2020;
- Land use, biodiversity and forestry field survey 12 – 16 August, 2020.

- The 2nd Public Consultation and socio-economic surveys were conducted from 19-24 December, 2021 and covered the same 21 communities near the proposed well locations;

A total of 21 communities were selected to participate for public consultation in the block (**Table 5-1** and **Table 5-2**).

Table 5-1: 1st Public Consultation Schedule and Stakeholders

Date	Time	Meeting Venue	Stakeholders Covered/Villages	Number of Attendees
Feb 10th	15:30 – 16:30	Pyay District Administrative Office	• District & Township Level Authorities • Forestry & ECD • NGOs • CSOs • Media	12
Feb 11st	9:30 – 12.00	Paukkhaung Township Administrative Office	• Township Level Authorities • Forestry & ECD • NGOs • CSOs • Media	19
Feb 1st	13:00 – 16:30	Kyo Pin Village	• Sett Tone, • Minn Lann • Thith Yaung Paung	93
Feb 12nd	10:30 – 12:00	Thegon Township Administrative Office	• Township Level Authorities • Forestry & ECD • NGOs • CSOs • Media	29
Feb 12nd	13:00 – 16:00	Cha Ya GoneVillage	• Ywa Tha Gon • Taw Chin, • Thit Cho, • Pan Lan Gon, K • Kaung Bin Lu • Ka Yin Gon	21
Feb 13th	9:30 – 11:00	Ywa Thit Village	• Tan Daw Gyi • Nyaung Gon • Zin Byun Gon • Pyin Daung Gon • Pwe Bye • Sa Be Kan • Wa Le • Yat Tha • Gyo Gon	18

Table 5-2: 2nd Public Consultation Schedule and Stakeholders

Date	Time	Meeting	Stakeholders Covered/Villages	Number of Attendees
21 Dec, 2021	15:30 – 17:30	Pyay District Administrative Office Meeting	• Pyay District Administration • Forestry Dept, Pyay District • Planning Dept, Pyay District • ECD • Agriculture Dept. • Myanmar Police • Health Dept. • Education Dept. • Rural Development Dept. • Fire Services Dept • Settlement and Land Records Dept. • City Development Committee • MOGE • ONGC • IEM/EQM	22
22 Dec, 2021	9:30 – 11:30	Paukkhaung Township Administrative Office Meeting	• Head of Pauk khaung Township Admin • Agricultural Land Management and Statistics Dept. • Immigration Dept • Agriculture Dept. • Township Development Committee • TEO • Planning Dept. • Livestock Breeding and Veterinary Dept. • Rural Development Dept. • Myanmar Police • Fire Services Dept. • Health Dept. • Forestry Dept. • Rural Road Development Dept. • MOGE • ONGC • IEM/EQM	23
22 Dec, 2021	15:30 – 17:30	Meeting at **Kyo Pin Village** and (invite representatives from Kyo-pin-wine villager, Sett-tone, Minn Lann and Thit-yaung-pyan Villages)	• MOGE • ONGC • IEM/EQM Villages (1) Kyot Pin Waing (2) Min Lann (3) Thit Yaung Pyan (4) Sat Tone	56 Villagers

Date	Time	Meeting	Stakeholders Covered/Villages	Number of Attendees
23 Dec, 2021	9:30 – 11:00	Thegon Township Administrative Office Meeting (for both Payama-1 and Naweng-1 wells)	• General Administration Dept., Thaegone • Settlement and Land Records Dept • Planning Dept • Agriculture Dept • Agriculture Land Management and Statistics Dept. • Information and Communications Dept • MOGE • ONGC • IEM/EQM	15
23 Dec, 2021	15:30 – 17:30	Meeting at **Char-yar-gone Village** (invite representatives from Kan-taw-gyi, Nyaung-gone , Ywa-tha- gone , Zin-pyun-gone , Pyin-daung-gone , Ywa-thit, Pwe-taing , Sabel-kan , Wa-le , Yet-tha , Gyo-gone, Taw-chin, Thit Cho, Pha-lan-gone, Kaung-bin-lu, Kayin-gone Villages)	• MOGE • ONGC • IEM/EQM Villages (1) Char Yar Kone (2) Htan Daw Gyi (3) Nyaung Gon (4) Zin Byun Gon (5) Pyin Daung Gon (6) Ywa Thit (7) Pwe Bye (8) Sa Be Kan (9) Wa Le (10) Yat Tha (11) Gyo Gon (12) Ka Yin Gon (13) Ywa Tha Gon (14) Taw Chin (15) Thit Cho (16) Pan Lan Gon (17) Kaung Bin Lu	51 people from 17 Villages

Primary data collected during the field survey included the following:

- Surface water samples
- Groundwater samples (from water wells)
- Local perception of water quality
- Air quality samples
- Soil samples
- Baseline Noise Measurements
- Flora and fauna (habitat and presence based on observations and local knowledge)
- Land Use and landscape observations
- Infrastructure and services

- Socio-economic and demographic data
- Health and Health Care Data
- Cultural heritage/archaeology

The geographical scope of the baseline survey provided an overview of site conditions believed representative of the Block EP-3 exploration drilling program.

The specific methodologies and results from the analyses performed for Block EP-3 are discussed in the corresponding sections in this report.

5.2.1.2 Secondary Data

Secondary data sources came from literature, and relevant authorities in the project area. The secondary data sources are cited throughout this report, and listed in the references section.

5.2.2 Laboratory Analysis

All samples were sent to ALS Life Sciences Division in Hong Kong and EQM Laboratory for analysis.

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5.3 Physical Components

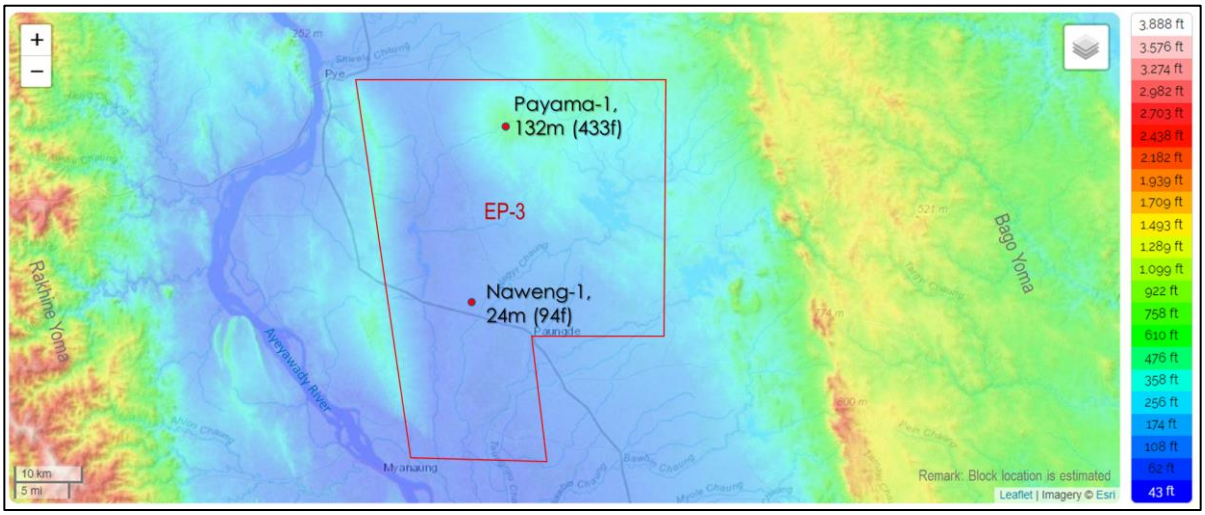
5.3.1 Topography

The main geographic features of Myanmar can be divided into five physiogeographic zones, consisting of the northern mountains, the western ranges, the eastern plateau, the central basin and lowlands, and the coastal plains[1], characterized by elongated north-south topographic trends.

The exploration drilling project in Block EP-3 are located on the southern portion of the Central Lowlands physiographic zone. The topography is a mixture of valleys and hilly/mountainous terrain.

Block EP-3 is located in the Ayeyarwady valley, which is between the Rakhine Yoma at the west and Bago Yoma at the east, on the left bank of Ayeyarwady River. In the valley, Ayeyarwady River runs to the south and forms a large floodplain while Bago Yoma extends parallelly. Bago Yoma and their northern extension is a line of extinct volcanoes. The small crater lakes and eroded cones could be found through it range. (Hadden, 2008) (**Figure 5-2**)

Naweng-1 is located on the floodplain of Ayeyarwady river at about 25m height levelling to nearly slope. While Payama-1 is located on the top of the hill at about 132m height, with slope 3.3% at average and 9.5% at maximum. There are intermittent streams flowing to the surrounding undulating plain. (**Figure 5-3** and **Figure 5-4**)



Source: Modified from Topography of Bago Region from https://en-us.topographic-map.com/maps/da4h/Bago-Region/

Figure 5-2: Topography of Block EP-3

[1] Michael Arthur Aung-Thwin David I. Steinberg Maung Htin Aung (2018) *Myanmar*. Retrieved from Encyclopedia Britannica: https://www.britannica.com/place/Myanmar. Access on 26 Jan 2018

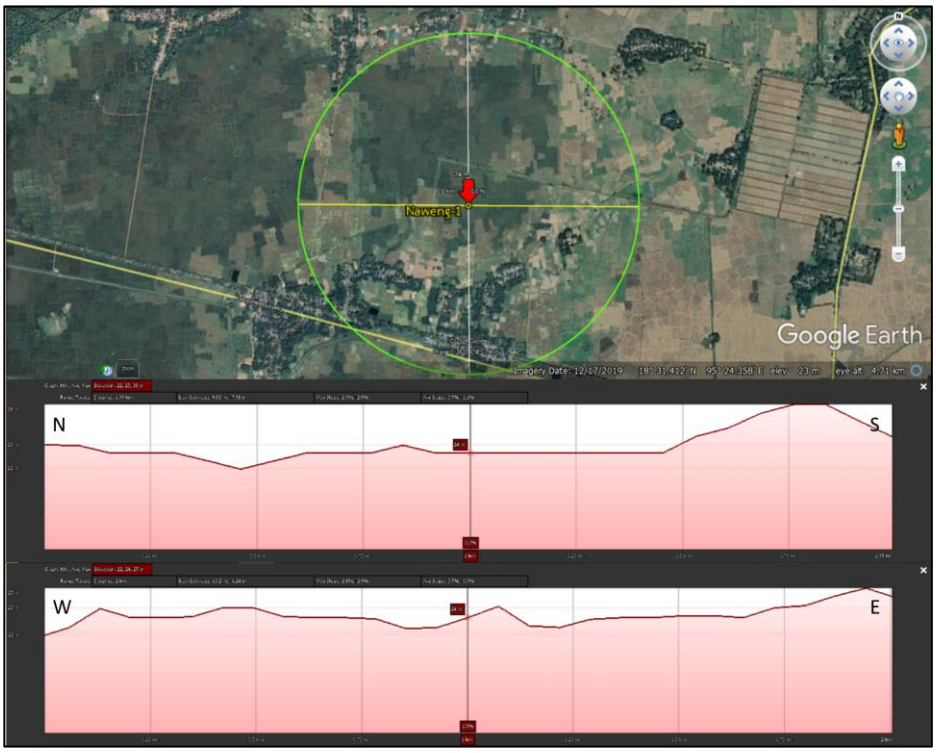


Figure 5-3: Topographic Profile of Naweng-1 well (1km Radius from well)

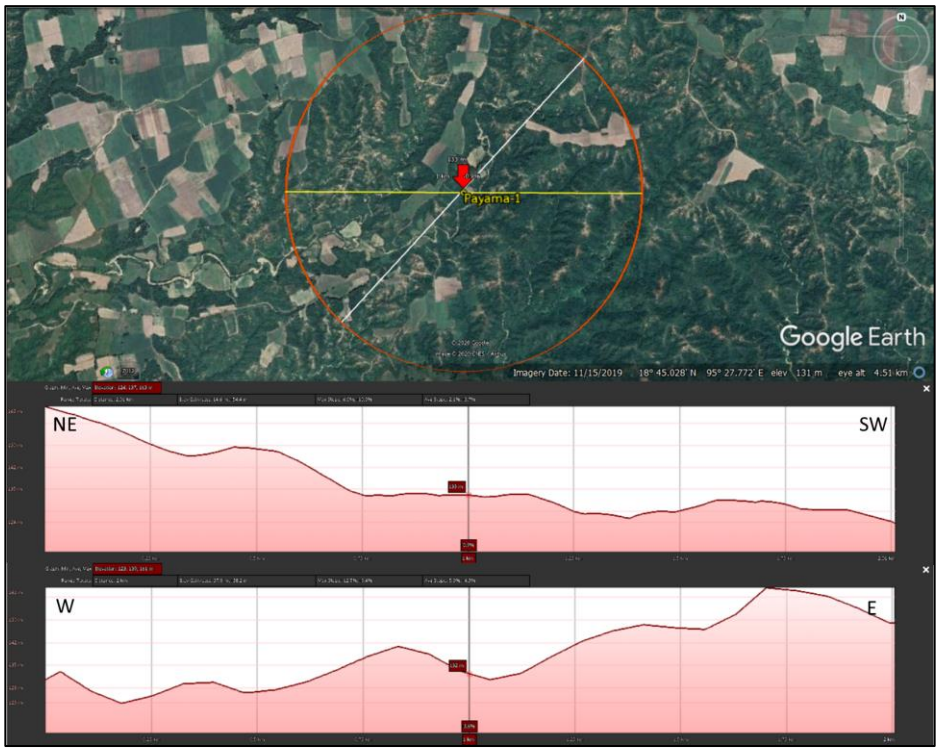


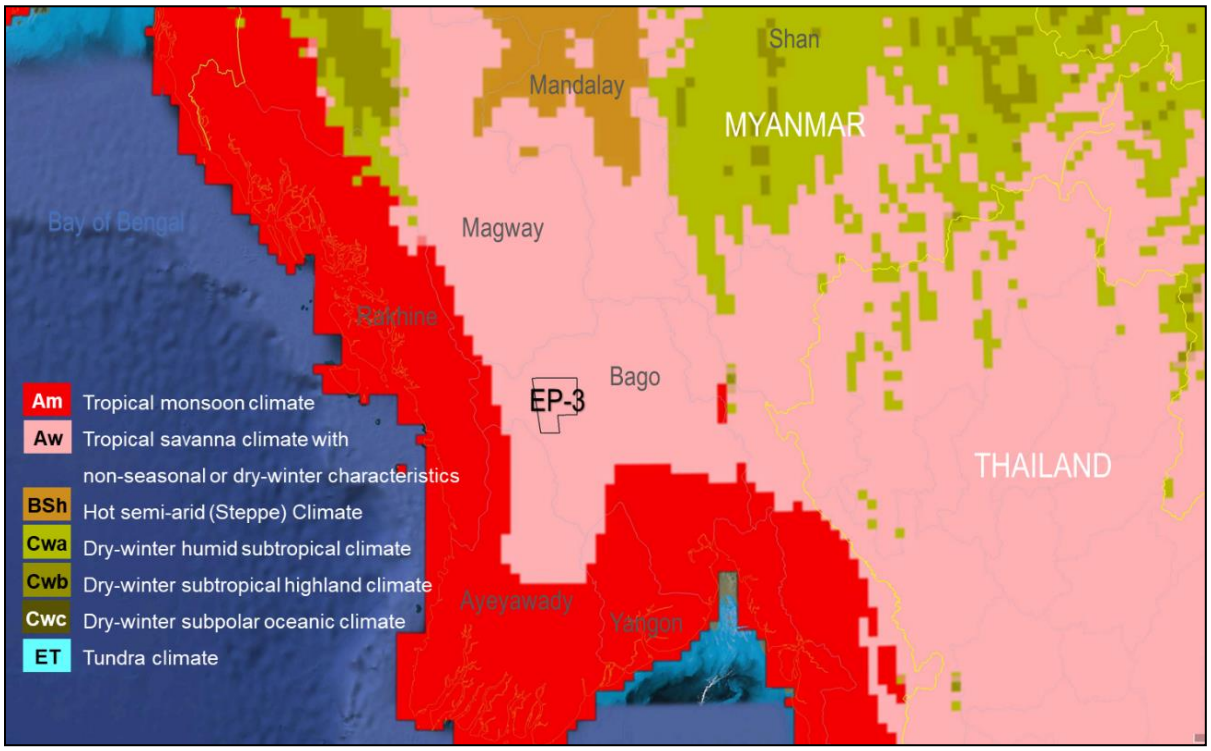
Figure 5-4: Topographic Profile of Payama-1 well (1km Radius from well)

5.3.2 Climate and Air quality

The climate of Myanmar is controlled by the monsoon circulation system of South East Asia resulting in tropical monsoon climate but it is also influenced by the presence of major landforms. The mountain ranges generally run north-south acts as effective climate barriers for the southwest monsoon (approx. end of May through October) in the summer and the northeast monsoon in the winter (approx. December through April). Therefore this condition causes the difference climate zone in regions.

Focusing Bago region, according to Köppen and Geiger this region, the climate is dominated by Aw: Tropical savanna climate with dry winter.

The weather in Myanmar can be divided generally into three seasons consisting of (1) Winter or Northeast monsoon season (November - February), (2) Summer or Hot weather season (March - Mid May), and (3) Rainy or Southwest monsoon season (Mid May - October).



Source: Modified from Climate Change & Infectious Diseases (2017)

Figure 5-5: Climate in Upper Myanmar according to Köppen-Gieger Climate classification

5.3.2.1 Temperature and Precipitation

Pyay weather station is the closest weather station located in Pyay Town. This station is representative of weather condition of the study area.

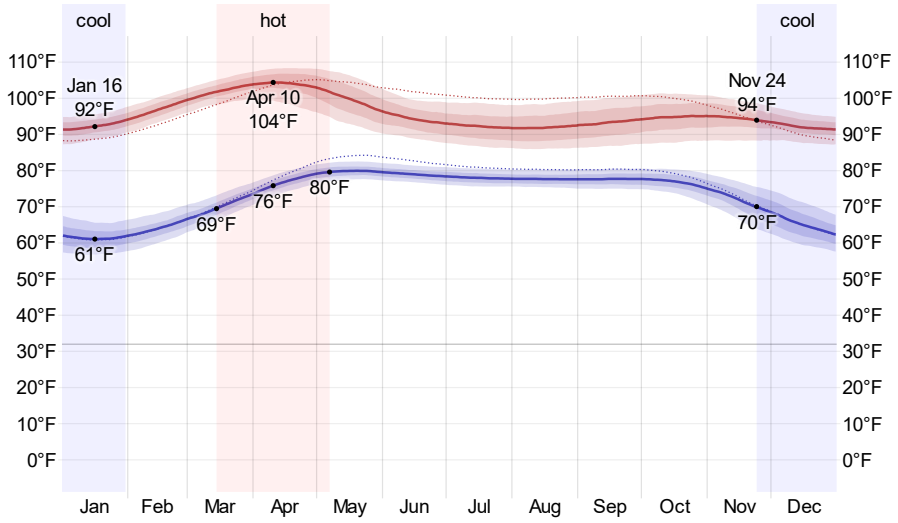
Latest weather, temperature and precipitation data from Pyay Station can be found at https://weatherspark.com/y/112371/Average-Weather-in-Pyay-Myanmar-(Burma)-Year-Round, 2021. This report illustrates the typical weather in Pyay, based on a statistical analysis of historical hourly weather reports and model reconstructions from January 1, 1980 to December 31, 2016.

5.3.2.2 Average Temperature in Pyay

The *hot season* lasts for *1.8 months*, from *March 14* to *May 7*, with an average daily high temperature above *102°F*. The hottest month of the year in Pyay is *April*, with an average high of *104°F* and low of *77°F*.

The *cool season* lasts for *2.2 months*, from *November 24* to *January 30*, with an average daily high temperature below *94°F*. The coldest month of the year in Pyay is *January*, with an average low of *61°F* and high of *92°F*.

Average High and Low Temperatures in Pyay



The daily average high (red line) and low (blue line) temperature, with 25th to 75th and 10th to 90th percentile bands.

The thin dotted lines are the corresponding average perceived temperatures.

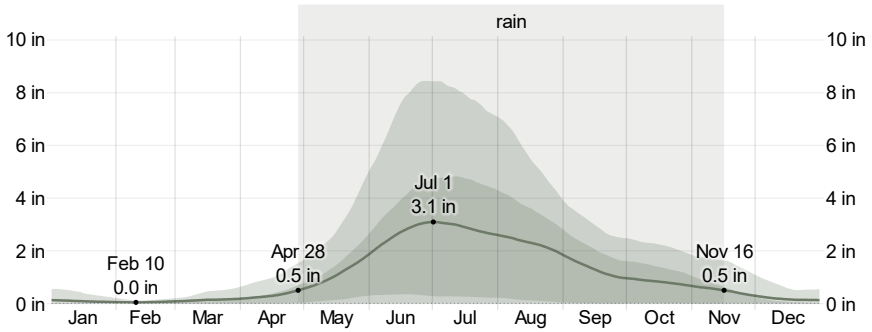
Average	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
High	92°F	97°F	102°F	104°F	100°F	94°F	92°F	92°F	93°F	95°F	94°F	92°F
Temp.	75°F	79°F	85°F	90°F	89°F	86°F	84°F	84°F	85°F	85°F	83°F	78°F
Low	61°F	64°F	70°F	77°F	80°F	79°F	78°F	78°F	78°F	77°F	72°F	65°F

5.3.3 Rainfall

To show variation within the months and not just the monthly totals, we show the rainfall accumulated over a sliding 31-day period centered around each day of the year. Pyay experiences *significant* seasonal variation in monthly rainfall.

The *rainy* period of the year lasts for *6.6 months*, from *April 28* to *November 16*, with a sliding 31-day rainfall of at least *0.5 inches*. The month with the most rain in Pyay is *July*, with an average rainfall of *2.9 inches*.

The *rainless* period of the year lasts for *5.4 months*, from *November 16* to *April 28*. The month with the least rain in Pyay is *February*, with an average rainfall of *0.0 inches*.

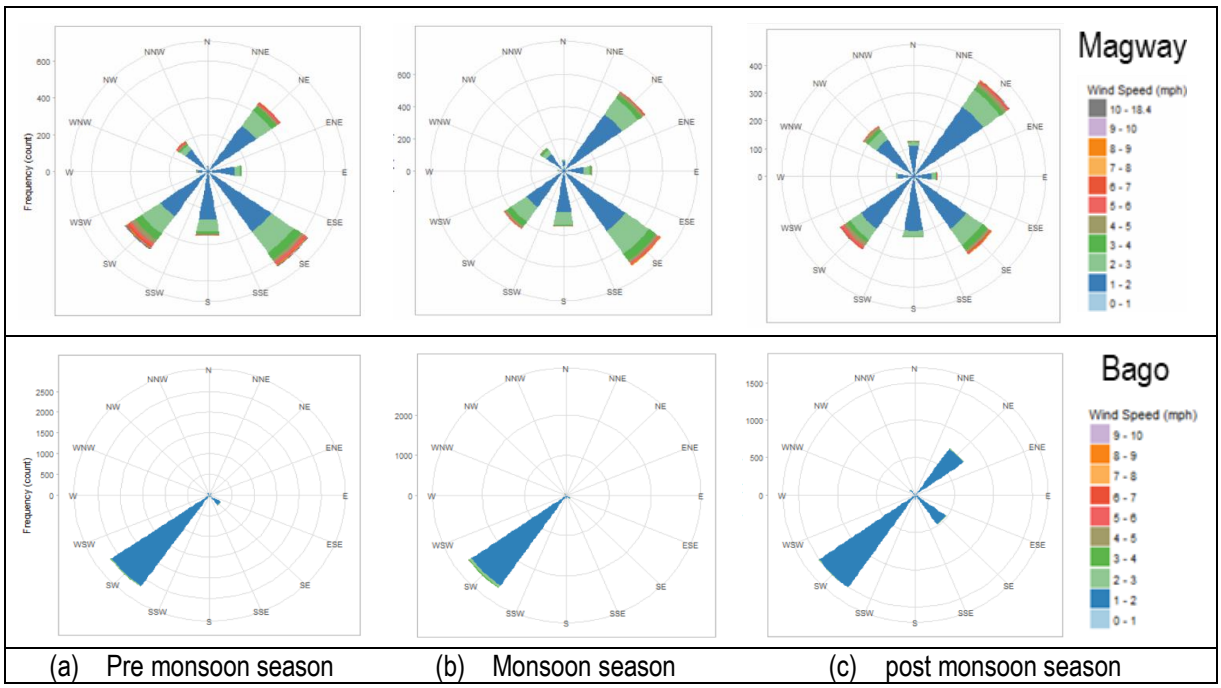


The average rainfall (solid line) accumulated over the course of a sliding 31-day period centered on the day in question, with 25th to 75th and 10th to 90th percentile bands. The thin dotted line is the corresponding average snowfall.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rainfall	0.1″	0.0″	0.1″	0.3″	1.1″	2.7″	2.9″	2.3″	1.3″	0.8″	0.5″	0.2″

5.3.3.1 Wind

Dominant wind patterns in the study area are driven primarily by regular southwest monsoon wind in the rainy season and northeast monsoon wind in the winter or cold-dry season. These wind patterns are mediated by more mountainous terrain to the West and East. Localized meteorological conditions are also influenced by diurnal thermal cycles and cloud cover. Maximum sustained wind speeds can approach 30 km/hr (18.4 mph) under certain conditions. At Pyay station, wind data was not recorded, therefore the wind rose of Magway and Bago may represent the wind speed and direction in the study area. **(Figure 5-6)**



Source: Lai Lai Aung, *et al* (2017)

Figure 5-6: Wind rose of Magway (150km N) and Bago (170km S)

5.3.3.2 Air Quality

Air quality monitoring stations were deployed in the 5km-radius of the proposed drilling well during August 13-15 to collect ambient air monitoring data along with meteorological data on wind speed, wind direction, temperature and relative humidity. These data are compared with the Myanmar and WHO standards.

5.3.3.2.1 Methodology for Study

The air quality sampling methodology used for this project is described as follows:

The air monitoring survey used the HAZ-SCANNER EPAS Wireless Environmental Perimeter Air Monitoring System (EPAS) which is factory calibrated with the appropriate USEPA certified target gas and correlated with USEPA methods. (Ref: Code of Federal Regulation 40CFR part 53).

The survey monitored 24hr continuously except battery change after 8hr interval. The parameters which were monitored included:

1) Particulates: TSPM, PM10
2) Gases: NO_2, SO_2, CO, VOC, NH_3, H_2S, and Atomic Radiation
3) Meteorology: Temperature, Relative Humidity, Wind Speed, Wind Direction and Relative Humidity

5.3.3.2.2 Sampling Location

Two ambient air-sampling locations were set at Cha Ya Gone village and Sett Tone village, which were the nearest representative receptors to the proposed drilling locations.

The current conditions, sampling locations, and sampling stations are presented in **Table 5-3**, **Figure 5-7** and **Figure 5-8**, respectively.

Table 5-3: Air Sampling Locations for EP-3 Drilling Program in August, 2020

Station	Village	Coordinates (GCS WGS84)		Start Date	End Date
		Latitude	Longitude		
A&N_01	Cha Ya Gone village	18°31'3.90" N	95°24'16.20"E	14/8/2020	15/8/2020
A&N_02	Sett Tone village	18°46'39.65"N	95°29'45.96"E	13/8/2020	14/8/2020

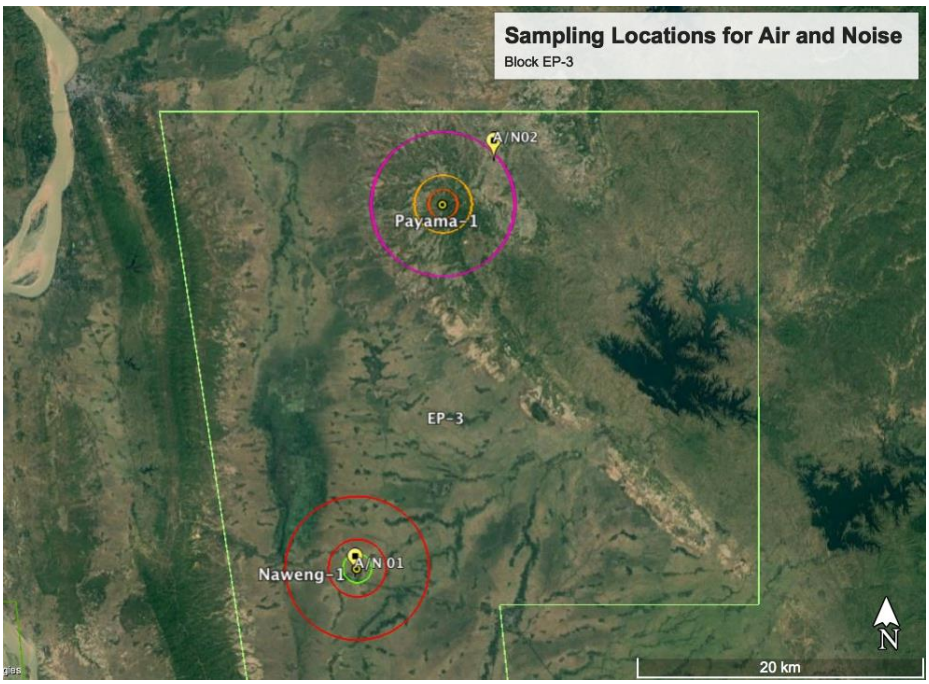
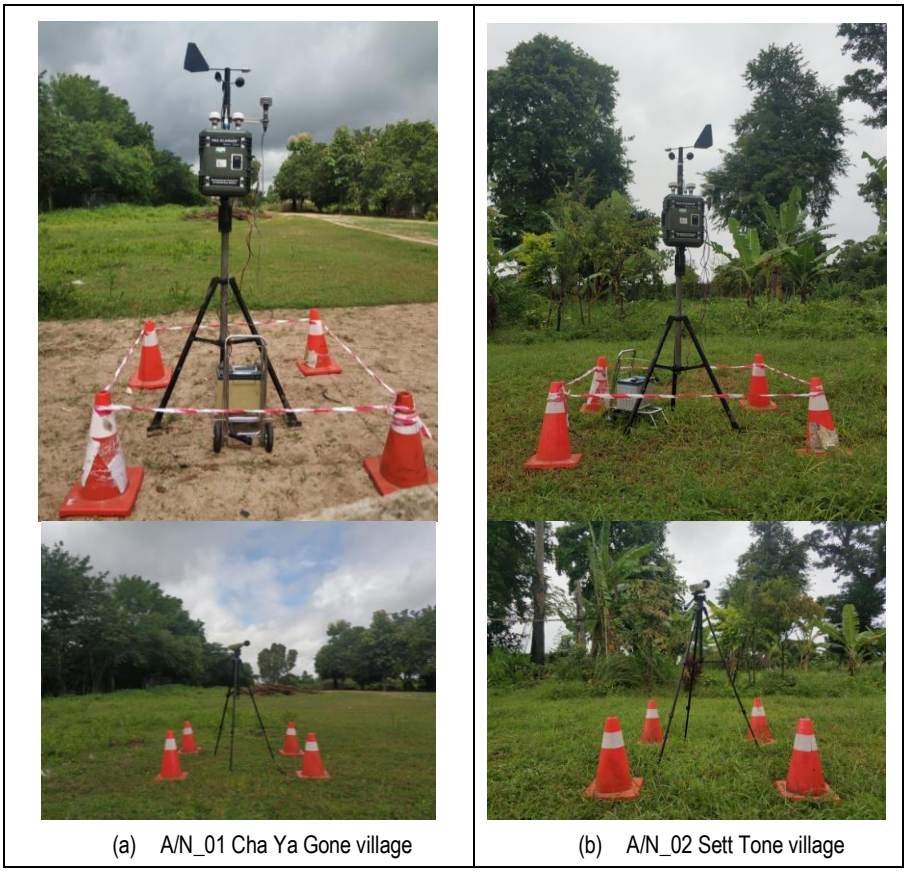


Figure 5-7: Air Sampling Locations for EP-3 Drilling Program in August 2020



(a) A/N_01 Cha Ya Gone village

(b) A/N_02 Sett Tone village

Figure 5-8: Ambient Air and Noise Sampling Stations

5.3.3.2.3 *Comparing Air Quality Legislation and Guidelines*

Ambient air quality in this report will be compared to country and WHO guideline as it available to each parameter as listed below:

1) Myanmar National Environmental Quality (Emission) Guidelines, Effective since 2015 in accordance with The Environmental Conservation Law, 2012[2],
2) WHO Air quality guideline (2006) and amendment.

5.3.3.2.4 *Result of Study*

Local Climate

The onsite meteorology data during the one week monitoring period starting from August 13-15, 2020 measured by the EPAS monitoring station indicates Temperature, Relative Humidity, Wind speed and Wind direction. **Table 5-4** presents the wind direction that generally comes from the east to the south. The wind direction generally comes from the east-south east and south-south west at the point named A/N_1 and A/N_2, respectively. Generally, average ambient temperature was ***24-30 degree Centigrade***, with a wind direction of ssw and east and relative humidity was ***100%*** during the monitoring period.

Table 5-4: Meteorology data obtained from Baseline Survey

Elements* (unit)	Station	A/N_1	A/N_2
	Village	Cha Ya Gone	Sett Tone
Temp (°C)	Avg.	25	26
	(min.-max.)	(24-28)	(24-30)
Wind direction		East-South East	South-South West
Relative humidity (%)	Avg.	100	100
	(min-max)	(100-100)	(100-100)

Remark: Measurement duration was 24hrs

Summary of Air Quality Results

WHO air quality guidelines (updated 2005) and Myanmar Environmental Quality Standards (2015) which were designed as limits for protection of public health, welfare and environment were used to compare with the results of the baseline survey and to determine the existing baseline status of air quality at the locations within the proposed project areas (well - sites).

The selected villages where the air quality samples were collected were generally small to medium–sized, in agriculture-based areas. The baseline data gathered at these locations were considered to be representative and typical of other nearby locations. The variation in ambient air concentration will be more or less similar due to the same topography, land use and meteorological conditions.

The results from the baseline survey indicate that the 24-hour average levels of both $PM_{2.5}$ and PM_{10} met the WHO guideline. Air quality for the air pollutants all met guidelines. The full details are included in **Appendix 2**.

[2] The Pyidaungsu Hluttaw Law No. 9/2012

Table 5-5: Ambient Air Quality in 2km-radius of Drilling Wells

Substance*	Unit	Station	A/N_1	A/N_2	Myanmar EQG (2015)	WHO AQG (2006)
		Village	Cha Ya Gone	Sett Tone		
Gas quality						
NO_2	µg/m³	Avg. (1hr)	73	103	200 µg/m³	200 µg/m³
		Avg. (24hr)	60	58	(1hr)	(1hr daily max)
SO_2	µg/m³	(Min - Max)	(2-75)	(16-119)	-	-
		Avg. (24hr)	7	3	20 µg/m³	20 µg/m³
		(Min - Max)	(3-9)	(0-5)	(24hr)	(24hr)
CO	µg/m³	Avg. (1hr)	424	175	N/A	N/A
		Avg. (8hr)	104	61	-	-
		Avg. (24hr)	76	54	-	-
		(Min.-Max.)	(0-1272)	(0-229)	-	-
VOC	ppb	Avg. (24hr)	1	0	N/A	N/A
		(Min - Max)	(0-17)	(0-0)	-	-
NH_3	ppm	Avg.(24hr)	13	16	N/A	N/A
		(Min - Max)	(0-26)	(0-35)	-	-
O_3	µg/m³	Avg.(8hr)	2	2	100 µg/m³	100 µg/m³
		Avg.(24hr)	1	2	(8hr daily max)	(8hr daily max)
		(Min.-Max.)	(1-4)	(1-30)	-	-
Particulates						
PM2.5	µg/m³	Avg.(24hr)	7	4	25 µg/m³	25 µg/m³
		(Min - Max)	(1-14)	(1-59)	(24hr)	(24hr)
PM10	µg/m³	Avg.(24hr)	10	6	50 µg/m³	50 µg/m³
		(Min - Max)	(2-83)	(2-59)	(24hr)	(24hr)

Remark: * Measurement duration was 24hrs

N/A - Not available

5.3.4 Noise

5.3.4.1 Methodology for Study

The internationally recognised 'A' weighting scale (dBA) was used so that the measured noise corresponds roughly to the overall level of noise that is heard by the average human. 24-hour equivalent noise (L_{eq}) were taken every 5 minutes for one day, sound level Baseline noise was measured using a sound level meter model SL-4023SD.

5.3.4.2 Sampling station

Ambient noise monitoring surveys for exploration drilling program in EP-3 were also undertaken in Cha Ya Gone village and Sett Tone village (same location with Air Quality) during August 13-15, 2020. **(Table 5-3)**

5.3.4.3 Comparing Noise Level Guideline

Ambient noise level in this report will be compared to country and WHO guideline as it available to each parameter as listed below;

1) Myanmar National Environmental Quality (Emission) Guidelines, Effective since 2015 in accordance with The Environmental Conservation Law, 2012,
2) WHO Guideline for community noise (1999).

5.3.4.4 Results

The Ambient noise measurement data recorded in each community is summarized in **Table 5-6**.

Ambient noise measurements taken EP-1 had 24-hour equivalent noise levels ranged from 39 dB (A/N_1) to 49 dB (A/N_2). The average ambient noise levels, day time and night time noise levels met the criteria of the Myanmar EQG and WHO Guidelines. The full details are included in **Appendix 3**.

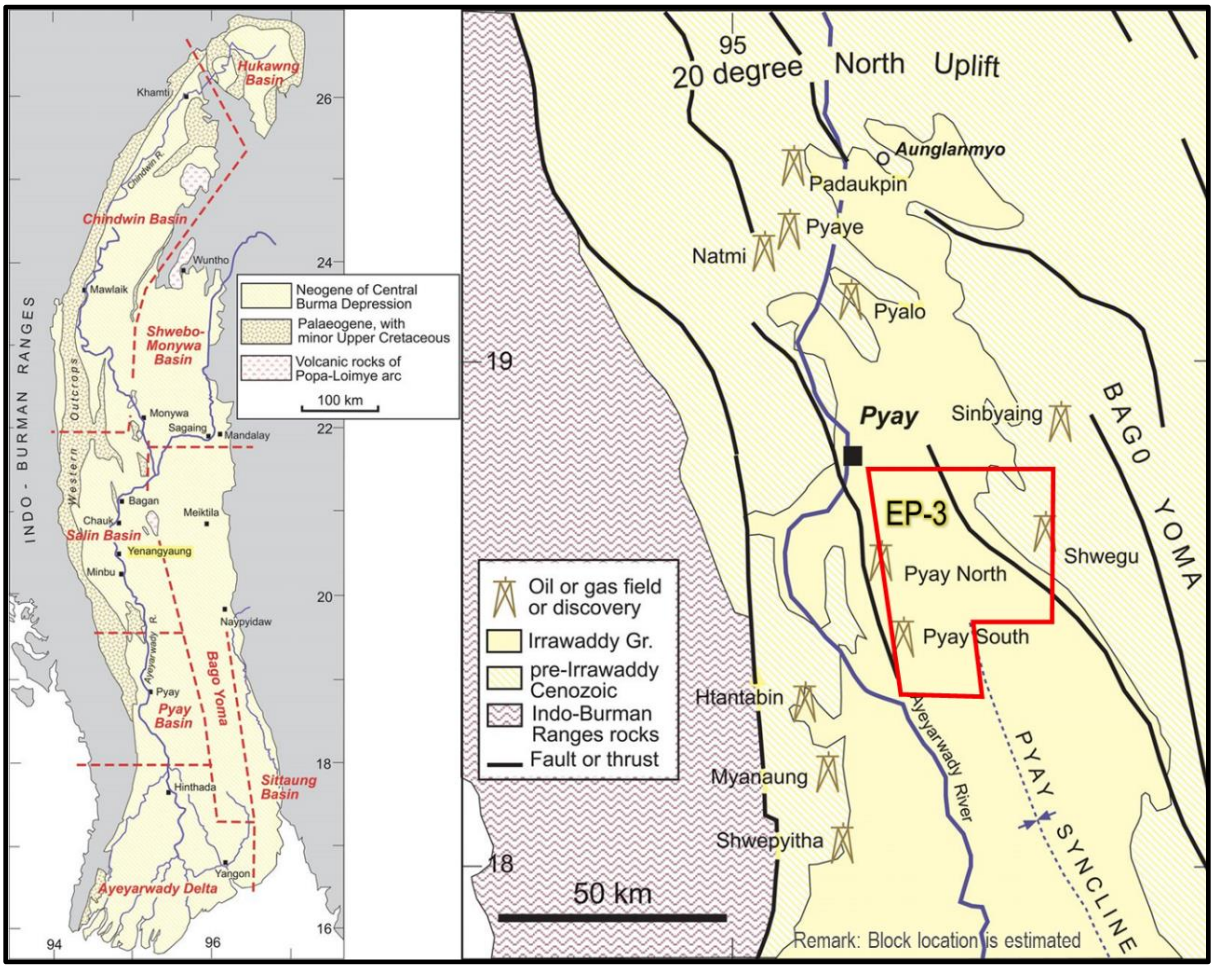
Table 5-6: Average Ambient Noise Level in 2km-radius of Drilling Wells

Station[/1]	Community	L_{eq}	$L_{eq\text{-}Day}$	$L_{eq\text{-}Night}$	L_{min}	L_{max}
1	Cha Ya Gone Village	39	41	26	21	66
2	Sett Tone Village	49	51	36	22	60
Myanmar EQG[/2]		**N/A**	**55**	**45**	**N/A**	**N/A**
WHO Guideline[/2]		**50**	**N/A**	**40**	**-**	**-**

Remark: [/1] Receptor is residential
[/2] Maximum allowable ambient noise levels 1hour Leq (dBA)

5.3.5 Geology

Block EP-3 is located in the north Burma geologic province which is bounded on the north and west by the Indo-Burman Range and Rakhine Yoma and on the east by the Sino-Burman Ranges, Shan Plateau, and Tenasserim Ranges. The Bago Yama extended auxiliary from north to south divided the province to greater Ayeyarwady valley in the west and smaller Sittaung valley in the east. Block EP-3 falls in Ayeyarwady valley which consisted of 4 major petroleum basins such as Chinwin Basin, Salin Basin, Pyay (Prome) Embayment and Ayeyarwady Delta. The area described is a complex back-arc/fore-arc basin in the Central Burma Depression. At this point, Block EP-3 block situated in fore-arc domain at the center of Pyay Embayment (**Figure 5-9**).

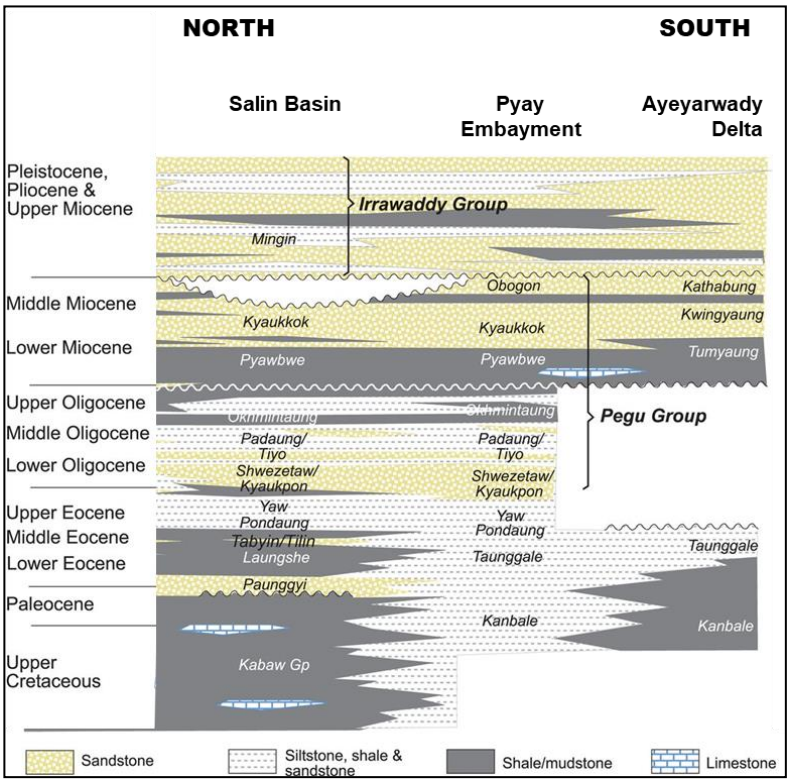


Source: Ridd and Racey, 2015

Figure 5-9: Geologic Map of Pyay Embayment

Pyay basin is the southern continuation of the Salin Basin and the south edge of basin ends at the northern edge of the Ayeyarwady delta which is to the south by the Gulf of Mottama. The stratigraphy of the basin was simplified as presented in **Figure 5-10**. The anticline folds accompanied by trust and normal cross fault resulting the gas appearing is more common in this basin. The Pyay anticline contains the longest oil and gas field in the basin which is about 23km. Sands in the Pyawbwe and Kyaukkok Formation, thickness 1,050 - 2,500m and 390 – 1,250m respectively (Bender, 1983), are the principle oil and gas reservoir (Mitchell, 2017).

Currently, there were 115 exploration wells drilled in Pyay basin and 37% were dry. Most of them (17%) discovered gas while 5% discovered oil, and 5% discover both oil and gas. (Racey, 2018)



Source: Modified from Ridd and Racey, 2015

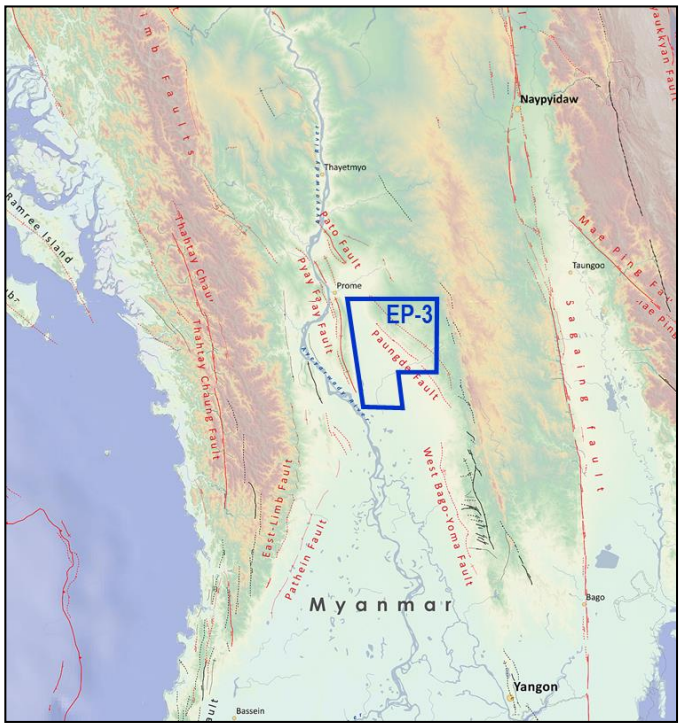
Figure 5-10: Generalized Stratigraphy of The Central Burma Depression From Salin Basin (N) To Ayeyarwady Delta (S)

5.3.5.1 Potential Geohazards (Tectonic Summary)

Present-day deformation and earthquakes in Myanmar and adjacent parts of Southeast Asia are driven by the northward movement of the Indian subcontinent as it collides with the Eurasian plate. Myanmar, on the eastern side of this collisional zone, lies east of the boundary between the Indian plate to the west, and the Sunda plate to the east (USGS, 2012). According to Wang *et al* (2014) geomorphologically evident active faults and folds of the Myanmar region comprise three major systems; (1) Indo-Burma Range, (2) Sagaing Fault, and (3) Shan domain. It can be seen that Pray Embayment falls at the east of Indo-Burman Range, between 18.3-18.8°N, on the margin of Sundra block which continues to Sagaing Fault.

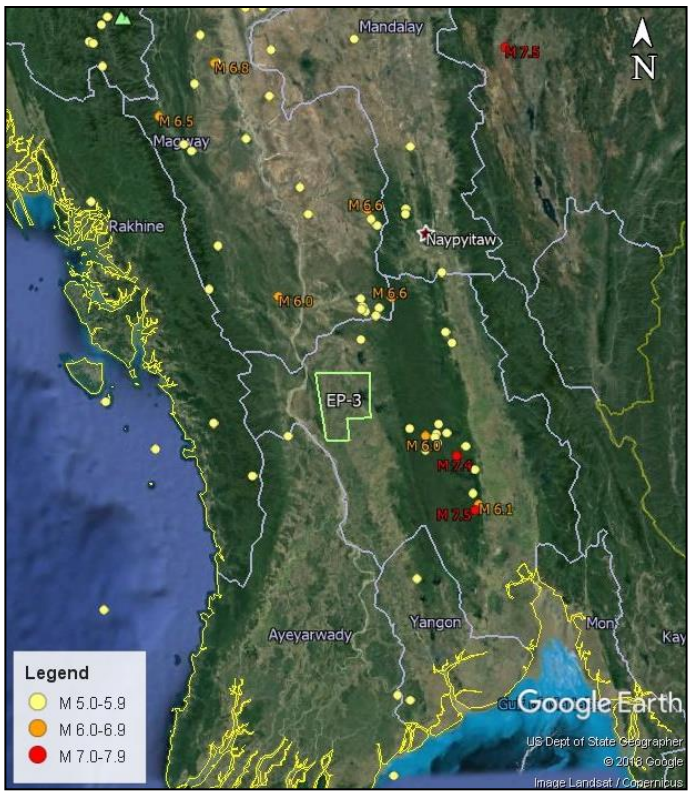
Between Indo-Burman Range and Sagaing Fault, Bago Yoma exists from N to S, acts similarly as the central axe of Central Lowland. In Ayeyarwady valley which is on the west of Sagaing Fault, further from Bago Yoma, several active faults and folds were identified. In Block EP-3, Paungde fault absences on the east from NNW to SSE. Nearby area, Pyay fault absence on the of side the western edge of block, West Bago-Yoma fault absences at the SW from block while at NW of block several active faults extended northward from Pyay fault (**Figure 5-11**).

Wang *et al* (2014) also noted that several active reverse faults between Thayet and Yangon could generate large earthquakes along the floodplain of the Ayeyarwady River. The West-Bago Fault possibly generate maximum magnitude Mw 7.2 to 7.3 for earthquakes near the Ayeyarwady flood plain north of Yangon. The Paduang Fault could produce a Mw 7.3 to 7.4 earthquake in the vicinity of Pyay. The latest earthquake in this area was M6.0 occurred on 12 January 2018. The epicenter is at 18.363°N, 96.080° E, 10 km depth, and 72 km E away from proposed exploration wells.



Source: Wang *et al*, 2014

Figure 5-11: Structural Map showing the faults ralative to Block EP-3



Source: USGS (2019)

Figure 5-12: 100 years - Historical Earthquakes Greater Than M5 in Upper Myanmar

5.3.6 Soil

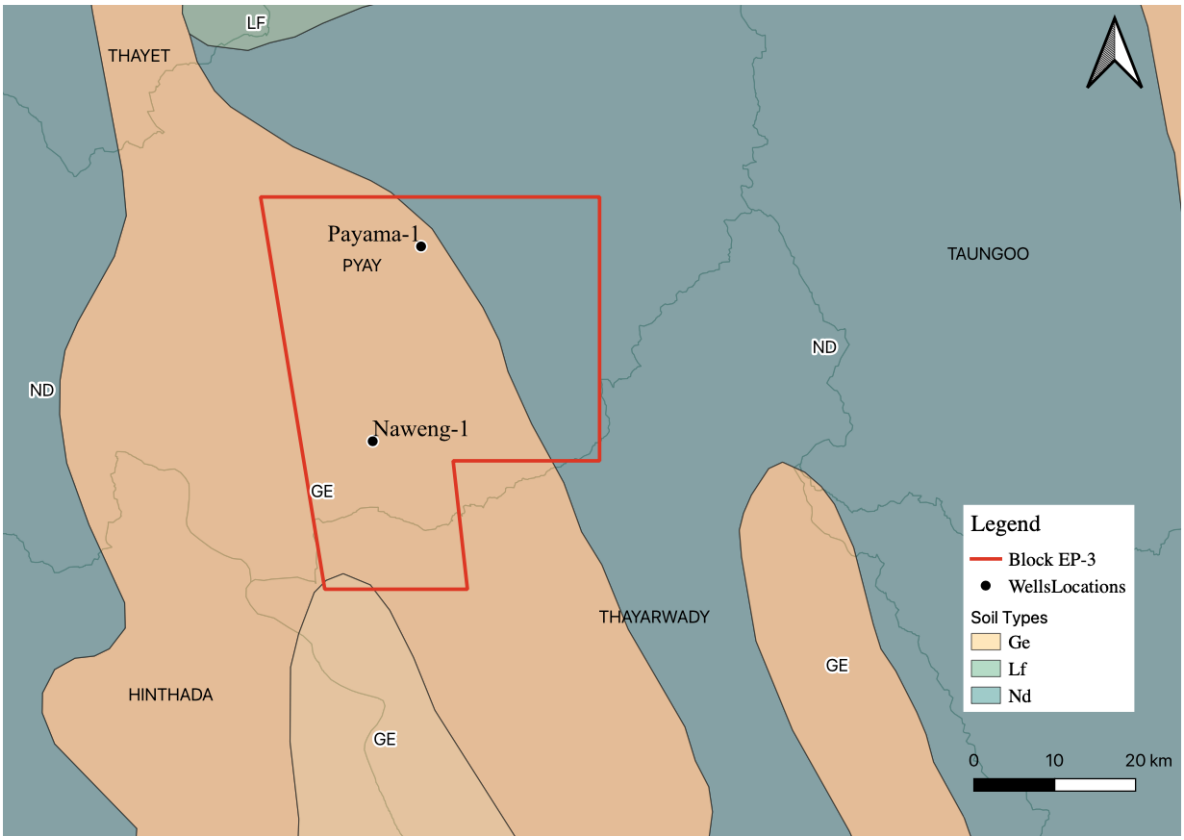
Interpretation of the distribution of soil types in Block EP-3 was based on the Asian Development Bank Environment Operations Center which is based on the UNFAO Digital Soil Map of the World V3.6. A limited field sampling program was focused primarily on agricultural soils within the study area.

5.3.6.1 Soil Classification

Based on Asian Development Bank/ Environment Operations Center (www.gms-eoc.org) based on UN FAO Digital Soil Map of the World V 3.6 (www.fao.org/geonetwork), May 2021 (**Figure 5-13**), soil in the study area is classified as Ge – Eutric Gleysols and Lf – Ferric Luvisols (ref. https://www.fao.org/3/as360e/as360e.pdf).

Luvisols are widespread, especially in temperate climates, and are generally fertile. Luvisols are widely used for agriculture. The parent materials of the Luvisolic soils are typically well supplied with base cations such as calcium and magnesium and have loamy or clay dominated soil textures.

Gleysols are soils with clear signs of excess wetness. They have a wide range of unconsolidated materials, mainly fluvial, marine and lacustrine sediments of Pleistocene or Holocene age, with basic to acidic mineralogy. They are found in depression areas and low landscape positions with shallow groundwater. Gleysols are used for arable cropping.



Source: Asian Development Bank/ Environment Operations Center (www.gms-eoc.org) based on UN FAO Digital Soil Map of the World V 3.6 (www.fao.org/geonetwork), May 2021

Figure 5-13: Soil Map of Block EP-3

5.3.6.2 Soil Quality

5.3.6.2.1 *Methodology for Baseline Study*

During sample collection, the following procedure was followed: Each hand-augured hole was dug to approximately 15 cm depth. During sample collection, soil samples were collected according to the standard procedure named Test Methods of Evaluating Solid Waste, Physical/Chemical Methods (SW-846) Method 5035 (US EPA) and kept in a cooling box at -4°C and sent to an accredited laboratory for characterization. Parameters tested included basic soil chemistry as well as hydrocarbons and metals.

The sampling locations are shown in **Figure 5-14** and current condition present in **Table 5-7**.

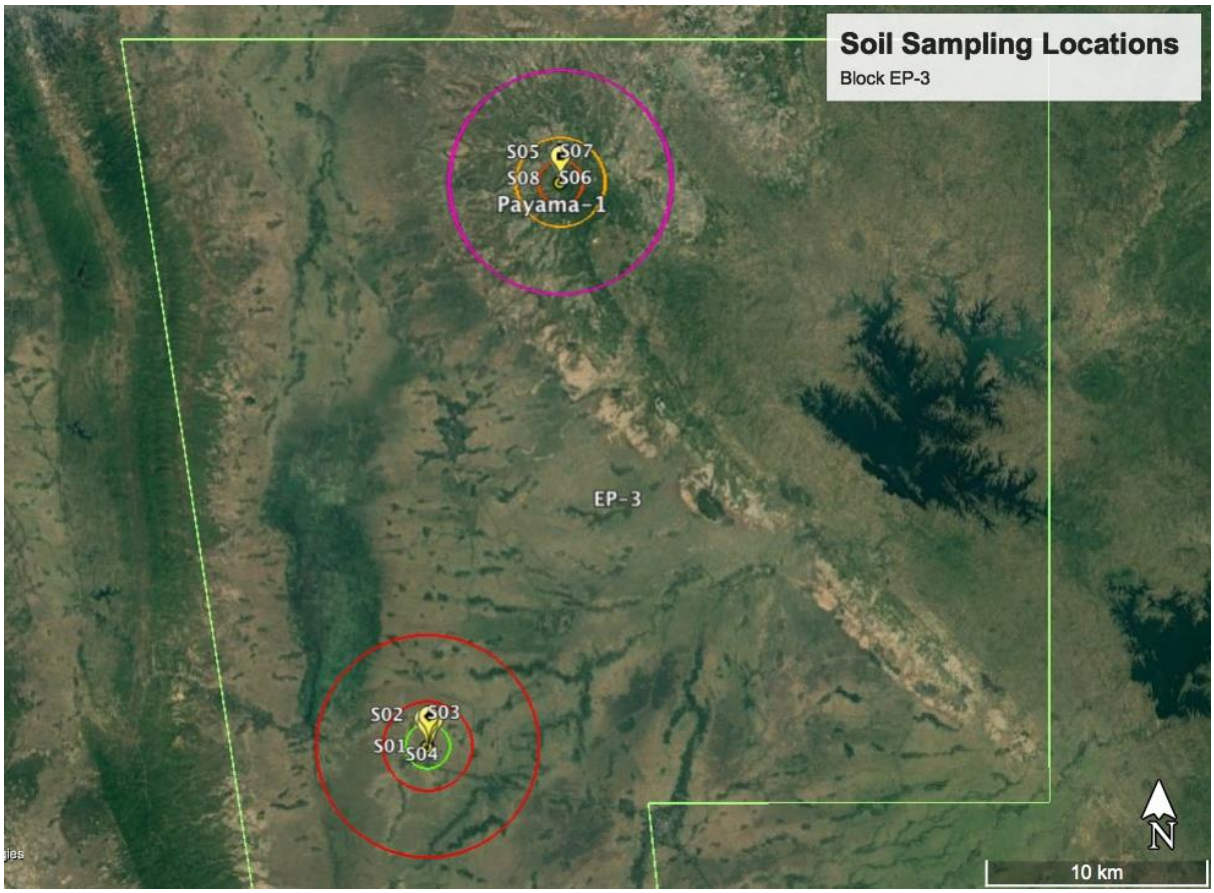


Figure 5-14: Soil Sample Locations

Table 5-7: Soil / Sediment Sample Locations

ID	Date	Location (Degrees, Minutes, Second)		Photograph	Note / Land Use
		North	East		
S01	14/8/2020	18°31'16.6"N	95°24'21.1"E		Agricultural Land
S02	14/8/2020	18°31'23.8"N	95°24'16.6"E		Agricultural Land
S03	14/8/2020	18°31'27.0" N	95°24'23.0" E		Agricultural Land
S04	14/8/2020	18°31'21.7" N	95°24'29.5”E		Agricultural Land
S05	13/8/2020	18°45'01.3"N	95°27'44.94"E		Agricultural Land
S06	13/8/2020	18°45'02.4"N	95°27'44.1" E		Agricultural Land

ID	Date	Location (Degrees, Minutes, Second)		Photograph	Note / Land Use
		North	East		
S07	13/8/2020	18°45'0.2.9" N	95°27'45.8" E		Agricultural Land
Se08	13/8/2020	18°45'01.7"N	95°27'45.5 E		Agricultural Land

Each hand-augured hole was dug to approximately 15 cm depth. During sample collection, soil samples were collected according to the standard procedure and kept in a cooling box at -4°C and sent to an accredited laboratory for characterization. (**Table 5-8**) Parameters to be tested included basic soil chemistry as well as hydrocarbons and metals.

Table 5-8: Laboratory Services For Soils Analysis Provided to Project

Laboratory	Parameters
ALS Hong Kong Laboratory	pH, Soil texture, Salinity, Conductivity, Chloride, Total Petroleum Hydrocarbon (TPH), Total PAH , Total DDT, Total PCBs, Heavy Metals (Arsenic (As), Cadmium (Cd), Chromium (Cr), Copper (Cu), Lead (Pb), Mercury (Hg), Nickel (Ni), Silver(Ag), Vanadium (V), Zinc (Zn)

5.3.6.2.2 *Comparing Guideline*

There are no standards for environmental soil and sediment quality in the Myanmar under the National Environmental (Emission) Guidelines (2015). In the absence of local standards, soil quality results were compared against the internationally recognized agency, Canadian Council of Ministers of the Environment (CCME) as following;

- Standard for Coarse Grained Agricultural Soil from Canadian Council of Ministers of the Environment. 2007. Canadian soil quality guidelines for the protection of environmental and human health
- Canadian Council of Ministers of the Environment, CANADA-WIDE STANDARDS for PETROLEUM HYDROCARBONS (PHC) IN SOIL, 2008
- Ontario Soil, Ground Water and Sediment Standards for Ontario, Use Under Part XV.1 of the Environmental Protection Act, 9-Mar-04, Canada

5.3.6.2.3 *Results*

Soil

Soils at 4 sampling points (S01-S04) were all consistent in being predominantly sandy SILT/Clay, with the other samples were predominately SAND. The pH values were varied in the range of 5.6-6.8. At point S06 and S08, the pH values were slightly acidic and lower than the recommended range according to the CA Standard. All soil samples were free of hydrocarbon contamination (TPH and PAH), DDT and Total PCBs. (**Table 5-9**)

With the exception of Chromium (Cr) and Nickel (Ni), metals data shows that all values are below standards for agricultural purposes. Chromium (Cr) was found above standards for agricultural use at location S02 and Nickel (Ni) was found above standards for agricultural use at location S03 and S04. These areas are agricultural areas consisting of cultivated, uncultivated and feeding Ground Land that may have become contaminated by the accumulation of heavy metals and metalloids through land application of fertilizers, animal manures sewage sludge, pesticides, wastewater irrigation, or atmospheric deposition.[3]

Table 5-9: Summary of Soil Quality Results For Block EP-3

Parameter	Unit	Block EP-3								Standard*	
		S01	S02	S03	S04	S05	S06	S07	S08	Source	Limit
pH	-	6.3	6.6	6.2	6.8	6.2	5.7	6.3	5.6	CA	6-8
Soil Texture**	-	reddish brown, slightly sandy SILT/CLAY with plant debris	Reddish brown, slightly sandy SILT/CLAY	Reddish brown, slightly sandy SILT/CLAY	Reddish brown, slightly sandy SILT/CLAY	Reddish brown, clayey, silty, gravelly SAND	Brown, silty SAND	Brown, very gravelly SAND	Brown, gravelly, clayey, silty SAND	N/A	-
· % gravel	%	0	0	0	0	8	1	45	5	N/A	-
· % sand	%	8	11	10	17	80	86	50	84	N/A	-
· % silt	%	71	67	69	66	7	9	2	6	N/A	-
· % clay	%	21	22	21	17	5	4	3	5	N/A	-
EC	µS/cm	39	29	23	28	10	6	11	8	CA	2000
Salinity	g/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	N/A	-
Moisture Content	%	23	22.6	23.1	21.9	11.5	10.9	11.8	10.7	N/A	-
Chloride	mg/kg	310	330	380	370	50	50	60	50	N/A	-
Total Metals	mg/kg	309	379	294	285	97	48	52	53	N/A	-
Arsenic (As)	mg/kg	3.9	5	3.5	3.4	3.8	2	1.8	1.9	CA	12
Cadmium (Cd)	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	CA	-
Chromium (Cr)	mg/kg	61.5	**76.5**	60.6	56.4	28.4	10.5	16.1	14.4	CA	64
Copper (Cu)	mg/kg	25.6	31.6	23.7	23.3	2.7	1.61	1.48	1.72	CA	63
Lead (Pb)	mg/kg	14.5	16.9	13.9	13.7	8.16	4.04	2.91	3.41	CA	70
Mercury (Hg)	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	CA	6.6
Nickel (Ni)	mg/kg	90.4	113	**84.9**	**83.1**	21.9	13.5	8.79	11.8	CA	50
Silver (Ag)	mg/kg	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	CA	20
Vanadium	mg/kg	44.6	54.7	43.9	40.6	19.3	9.2	13.2	11	CA	130
Zinc (Zn)	mg/kg	68.6	81.6	63.4	64.2	12.8	6.7	7.6	8.4	CA	200
PAHs	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	N/A	N/A
DDT	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	CA	0.7
Total PCBs	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	CA	0.5
TPH											
TPH C6-C9	mg/kg	<2	<2	<2	<2	<2	<2	<2	<2	CCME	30
TPH C10-C14	mg/kg	<50	<50	<50	<50	<50	<50	<50	<50	CCME	150
TPH C15-C28	mg/kg	<100	<100	<100	<100	<100	<100	<100	<100	CCME	300
TPH C29-C36	mg/kg	<100	<100	<100	<100	<100	<100	<100	<100	CCME	2800

Remarks: CA -Standard for Coarse Grained Agricultural Soil from Canadian Council of Ministers of the Environment. 2007. Canadian soil quality guidelines for the protection of environmental and human health: 2Summary tables. Updated September, 2007. In: Canadian environmental quality guidelines, 1999, Canadian Council of Ministers of the Environment, Winnipeg.

CCME -Canadian Council of Ministers of the Environment, CANADA-WIDE STANDARDS for PETROLEUM HYDROCARBONS (PHC) IN SOIL, 2008

CA* - Ontario Soil, Ground Water and Sediment Standards for Ontario, Use Under Part XV.1 of the Environmental Protection Act, April 15, 2011, Canada

[3]S. Khan, Q. Cao, Y. M. Zheng, Y. Z. Huang, and Y. G. Zhu, "Health risks of heavy metals in contaminated soils and food crops irrigated with wastewater in Beijing, China," Environmental Pollution, vol. 152, no. 3, pp. 686–692, 2008.

5.3.7 Surface Water

5.3.7.1 Hydrology and Flooding

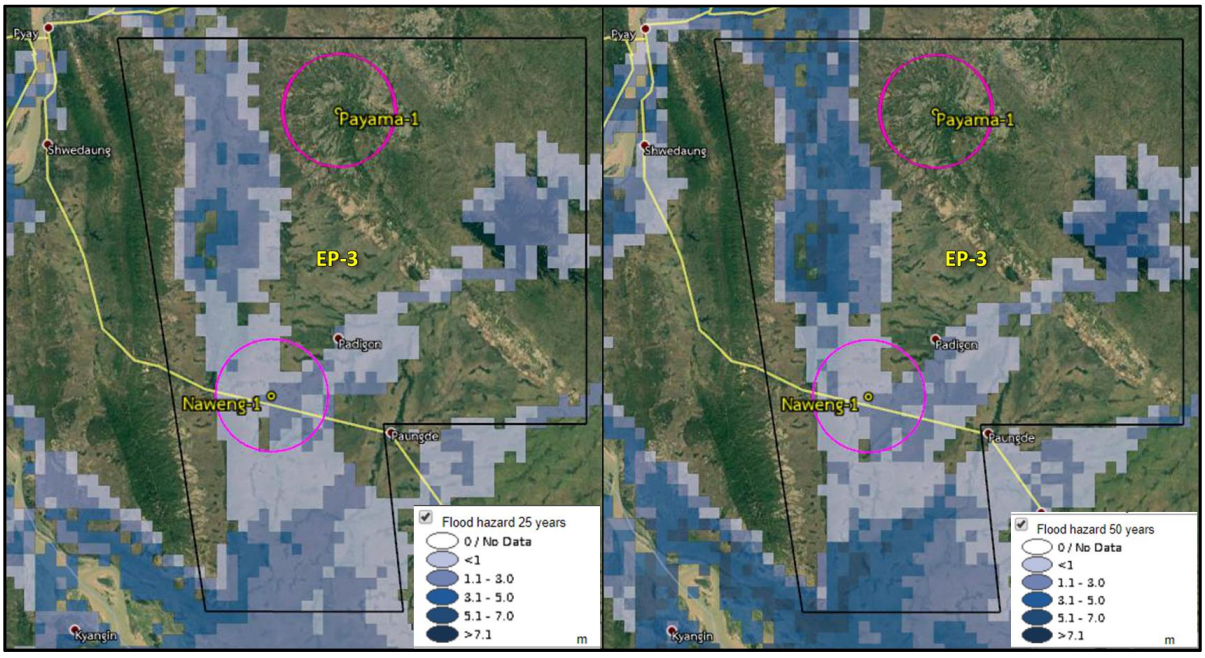
Block EP-3 is defined onshore in lower Ayeyarwady basin. On the west bank of Ayeyarwaddy River, the study area is level to nearly level along the Ayeyarwady major river, then gradually rise up to rolling plain and final at highland in Bago Yoma to the east.

Natural surface water is from seasonal gullies and intermittent streams in small valleys, from Bago Yoma highland, which receives rainwater then flows westward to the lowland alternating cultivated area only in wet season. Due to lack of water, irrigation system has been developed to support sufficiently agricultural areas which is away from Ayeyarwaddy River.

In 2019, four reservoirs including distribution network in Bago (west) were improved named North Na Win irrigation system, South Na Win irrigation system, Wegyi irrigation system, and Taung Nyo irrigation system. These irrigation systems are lined up from north to south respectively. The water for cultivated areas in Block EP-3 was supplied from South Na Win Dam and Wegyi Dam, partially rainwater in wet season.

Regarding flood prone, in general, the catchment areas of major rivers in the north and central zone are prone to riverine floods. In Ayeyarwady basin, the flooding occurs when intense rain persists for at least 3 days over northern Myanmar. the flooding in the lower Ayeyarwady and the delta is by the coincident of flood from Chindwin with upper Ayeyarwady floods (Union of Myanmar & ADPC, 2009).

Although Block EP-3 is away from Ayeyarwady River and barriered parallelly by Prome Hills, at Pyay, tributary of Ayeyarwady overflow to stream network in flood plain end up at the lowest in Inma Swamp. Some areas also have waterlogged. According to the UNISDR, BlockEP-3 partially prone to flood in 25 year-return period. Naweng-1 location was possibly flooded about 1m in depth whiles Payama-1 location falls on the hills**. (Figure 5-15)**.



Source: UNISDR (2015) Risk Data Platform

Figure 5-15: Flood Prone Area in Block EP-3

5.3.7.2 Surface Water Quality

5.3.7.2.1 *Methodology for Study*

As standard operation procedure, a clean sampling dipper was used for all samples in order to avoid sample contamination from other sources.

Before sample collection, the appropriate measures including wearing of disposable and powder less gloves and rinsing of sampling dipper with clean water was carried out in order to equilibrate to the sample environment and make sure that all cleaning-solution residues had been removed. The water sampling dipper is immersed to approximately 1m depth into the flowing stream and then filled into the sample bottles.

The sample bottles were partially filled and rinsed with the water to be sampled (rinse water). In order to avoid suspended sand particles, water for rinsing was collected at the edge of the stream in an area of low-flow turbidity and then drained. The surface water quality sampling was conducted near the well site locations. (**Table 5-10**) The sampling locations are shown in **Figure 5-16**.

As sampling was conducted in the rainy season the landscape surface water was generally restricted to impoundments, seasonal drainage canals, rivers and streams. In general, either a grab pole or in some cases a bucket was used for collecting water in ponds or flowing water bodies (Direct immersion of meters and dipping sample bottles was used in others). During sample collection, water samples were collected according to the standard procedure and kept in a cooling box with ice.

The Total dissolved solid (TDS), electrical conductivity (EC), Dissolved Oxygen (DO), Temperature and pH value were measured on-site at the sampling stations and again at the laboratory along with other parameters. **(Figure 5-16)**

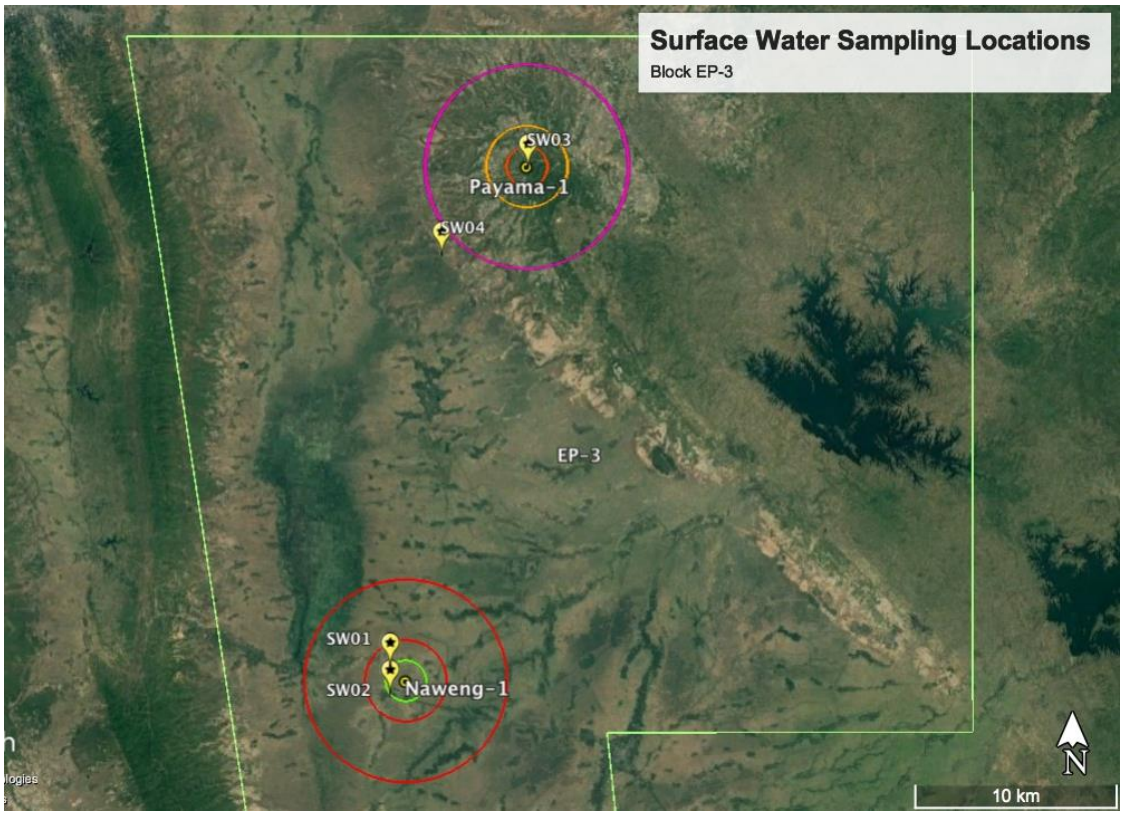


Figure 5-16: Surface Water Sampling Locations

Table 5-10: Surface Water Sampling Locations

ID	Date	Location		Photograph	Note
		North	East		
SW-01	15.8.2020	18°31'44.6"N	95°23'55.0"E		Wa Lee village
SW-02	14.8.2020	18°31'01.4"N	95°23'55.0"E		Cha Ya Gone village
SW-03	13.8.2020	18°45'08.2"N	95°27'48.6"E		Water reservoir Northeast of wellsite
SW-04	13.8.2020	18°42'39.8"N	95°25'21.4"E		irrigation water canal

Table 5-11: Laboratory Services for Surface Water Samples Collected Provided to Project

Laboratory	Parameters
ALS Hong Kong Laboratory	Oil and grease, Total coliform bacteria, Cyanide (free), Cyanide (total), Heavy metals (Arsenic (As), Cadmium (Cd), Copper (Cu), Chromium (Cr hexavalent), Total Chromium (Cr), Iron (Fe), Lead (Pb), Mercury (Hg), Nickel (Ni), Selenium (Se), Silver (Ag), Zinc (Zn), Barium (Ba)
EQM Laboratory	Temperature, pH, DO, 5-day Biochemical oxygen demand, Ammonia, Chemical oxygen demand, Chloride, Chlorine (total residual), Sulphide, Total phosphorus, Total suspended solids, Total nitrogen, Phenols, Fluoride

*Analytical Methods followed to Standard Methods for the Examination of water and Wastewater, recommended by APHA-AWWA-WEF.

5.3.7.2.2 *Comparing Guideline*

There are no standards for environmental water quality in the Myanmar under the National Environmental (Emission) Guidelines (2015). In the absence of local standards, water quality results were compared against the internationally recognized agency, Canadian Council of Ministers of the Environment (CCME) and US EPA as follows:

- Canadian Water Quality Guidelines for the Protection of Aquatic Life (Freshwater)
- CA WQG (Irrigation) – Canadian Water Quality Guidelines for the Protection of Agriculture (Irrigation)
- IFC Environmental, Health, and Safety (EHS) Guidelines
- National Environmental Quality Guidelines (NEQG)

5.3.7.2.3 *Results*

As the surface water quality results in **Table 5-12**, pH most of the surface water parameters were within water quality standards. The Total coliform bacteria was detected above the standard at SW02 and SW03. These two sampling point were a small water impound and a water reservoirs; therefore the high levels are attributed to livestock, and animal fecal matter contaminating the water over the standard.

Table 5-12: Summary of Surface Water Quality Results For Block EP-3

Parameter	Unit	EP-3				Standard	
		SW01	SW02	SW03	SW04	Source	Limits
pH	S.U.a	7.23	7.13	6.49	6.73	IFC/ NEQG	6.0 to 9.0
Temperature	°C	29.51	30.36	22.82	30.66	-	-
Conductivity	µS/cm	129	125	113	373	-	-
TDS	mg/l	65	62	57	186	CA*	500-3500
Salinity	PSU	0.06	0.06	0.05	0.18	-	-
DO	mg/l	9.4	8.29	9.33	6.33	-	-
TSS	mg/l	<10	<10	<10	15	IFC / NEQG	35
Chlorine (total residual)	mg/l	0.03	0.02	0.07	0.02	IFC/NEQG	0.2
Cyanide (free)	mg/l	<0.01	<0.01	<0.01	<0.01	CA	5
Cyanide (total)	mg/l	<0.10	<0.10	<0.10	<0.10	IFC / NEQG	1
Fluoride	mg/l	0	0	0	0	IFC / NEQG	20
Ammonia	mg/l	0.08	0.21	0.5	0.04	IFC / NEQG	10
Total Nitrogen	mg/l	0.7	0.96	1.66	0.97	IFC / NEQG	10
Total Phosphorus	mg/l	0.086	<0.016	0.016	<0.016	IFC / NEQG	2
Sulphide	mg/l	<0.040	<0.040	<0.040	<0.040	IFC/NEQG	1
Chloride	mg/l	0.8	1.2	<0.5	3	IFC/NEQG	600
Hex. Chromium (Cr^{6+})	µg/l	<20	<20	<20	<20	IFC / NEQG	100
Oil and grease	mg/l	<5	<5	<5	----	IFC / NEQG	10
COD	mg/l	23	40	30	<20	IFC / NEQG	125
BOD (BOD_5)	mg/l	1	1	0	0	IFC / NEQG	25
Phenols (as Phenol)	µg/l	<0.10	<0.10	<0.10	<0.10	IFC / NEQG	0.5
Total Metals	mg/l	<1	<1	<1	<1	IFC / NEQG	10
Arsenic (As)	µg/l	<10	<10	<10	<10	CA	5

Parameter	Unit	EP-3				Standard	
		SW01	SW02	SW03	SW04	Source	Limits
Barium	µg/l	1	4	29	9	-	-
Cadmium (Cd)	µg/l	<0.2	<0.2	<0.2	<0.2	CA*	5.1
Total Chromium (Cr)	µg/l	<1	<1	<1	<1	CA	8.9
Copper (Cu)	µg/l	<1	<1	1	<1	CA	700
Lead (Pb)	µg/l	<1	<1	<1	<1	CA*	200
Mercury (Hg)	µg/l	<0.5	<0.5	<0.5	<0.5	CA*	3
Nickel (Ni)	µg/l	<1	2	5	1	CA*	200
Selenium (Se)	µg/l	<5	<5	<5	<5	CA*	50
Silver (Ag)	µg/l	<1	<1	<1	<1	IFC / NEQG	500
Zinc (Zn)	µg/l	<10	<10	<10	<10	CA	30
Iron (Fe)	µg/l (mg/1)	<50	120	<50	<50	CA	300
Total coliform bacteria	CFU/100m L	120	**14000**	**3400**	160	IFC / NEQG	<400

Remarks: Oil & Grease container for SW04 was damaged during transport to lab
Analytical Methods followed to Standard Methods for the Examination of water and Wastewater, recommended by APHA-AWWA-WEF
CA - Water Quality Guideline for the Protection of Freshwater Aquatic Life, Canadian Council of Ministers of the Environment,
CA* - Water Quality Guideline for the Protection of Agriculture, Canadian Council of Ministers of the Environment
IFC - Environmental, Health, and Safety (EHS) Guidelines, GENERAL EHS GUIDELINES and Myanmar Environmental Quality (Emission) Guidelines
NEQG – National Environmental Quality Guideline

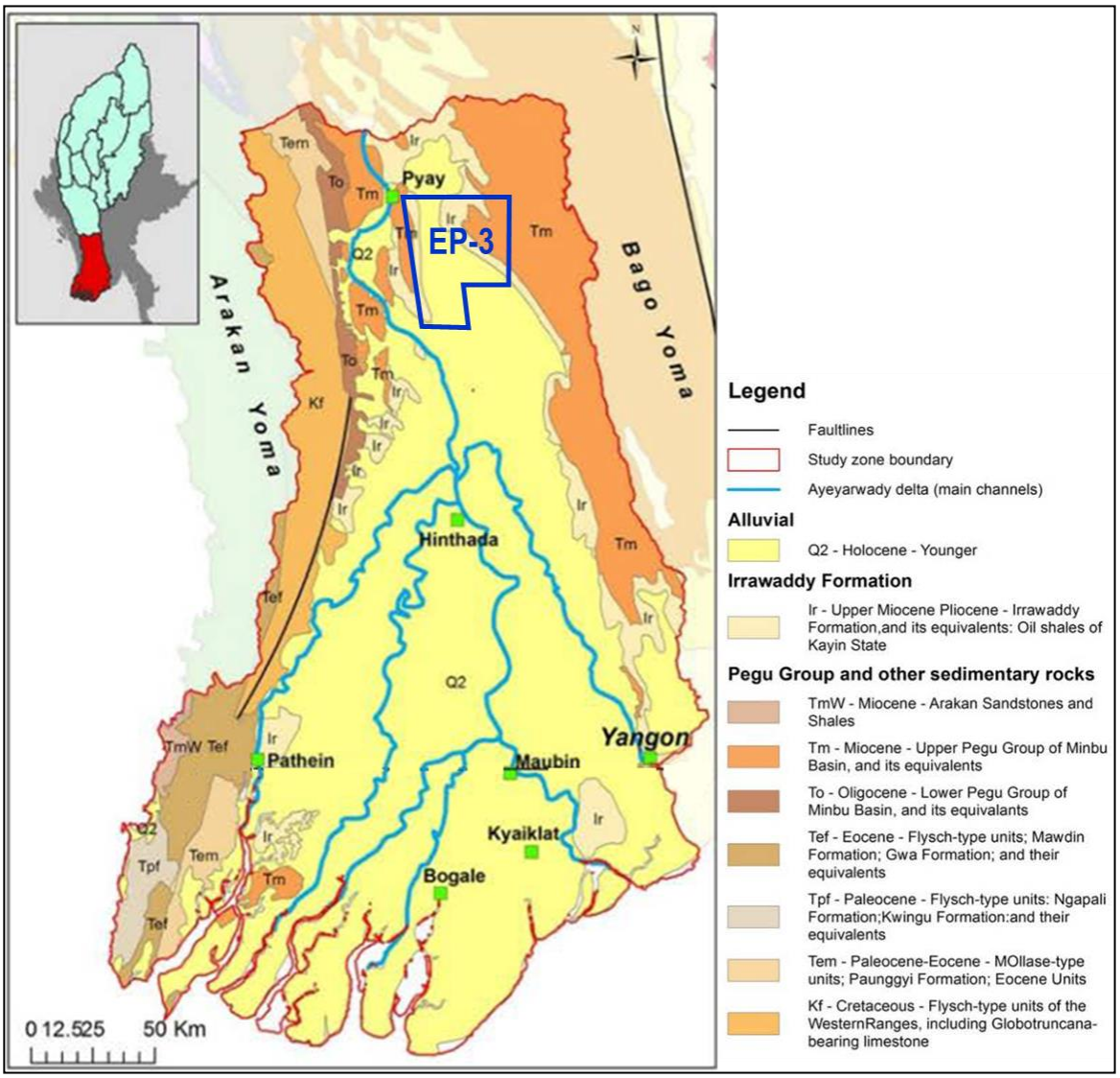
5.3.8 Groundwater

5.3.8.1 Hydrogeology

Groundwater sources in Ayeyawady basin was defined into 5 zones; Upper Ayeyarwady, Upper Chindwin, Western Hills, Lower Chindwin, Middle Ayeyarwady, Shan Plateau, Mu, Lower Ayeyarwady, and Ayeyarwady Delta (Durey, 2017). According to the geology of the zone, the aquifers in the delta were unconfined which composed of; (1) Holocene – Younger Alluvial Aquifer as majority, (2) Irrawaddy Formation, (3) Sedimentary in Pegu Group, and (4) Other sedimentary rock.

Block Ep-3 located in Ayeyarwady Delta Groundwater Zone (**Figure 5-17**). Alluvial aquifer appears mostly in Block at the center then wider at the south. At the western and eastern edges, Irrawaddy formation was identified in strip along the foothill of Prome Hills and Bago Yoma. At highland of hills, Upper Pegu Group was identified.

Generally, the alluvial aquifer extends to depths of 10 to 50 m below the surface. It was reported that 10 cm (4") diameter tube wells tapping alluvium aquifers provided 1.8 - 2.5 L/s of yield and up to 4.5 L/s in the vicinity of a stream. Moreover alluvial fans in the vicinity of the hills of Rakhine Yoma in the west and Bago Yoma in the northeast might provide higher yields due to lower clay content.



Source: Modified from Viossanges, M., R. Johnston and L. Drury (2017) in SOBA 2.1

Figure 5-17: Major Aquifers of Myanmar Relative to Block EP-3

5.3.8.2 Groundwater quality

5.3.8.2.1 *Methodology*

Sample bottles and sampling dipper were washed and cleaned with purified water as well as deionized water three times to ensure that no contamination remains. A checklist was followed for the list of water parameters to be tested, and to label sample parameters, including site identification code and inclusion of field date and time on the bottles. Before sample collection, appropriate measures including wearing of disposable and powder less gloves and rinsing of sampling dipper with clean water was carried out, and to equilibrate to the sample environment and to make sure that all cleaning-solution residues have been removed.

Ground-water-sampling method was adapted to site-specific conditions. Dug well water was collected by the bucket currently being used for the dug well (metal, plastic, wood). Then water in the bucket was collected by sampling dipper and transferred into sample bottles.

For tube wells, the sample was taken at the closest access to water from the well before the water enters any treatment or distribution system. Water was collected at the outflow and flushed (hand pump and compressor pump for shallow well and deep well respectively) for a few minutes prior to sampling in order to remove any stagnant water in the well casing and to ensure that at least 95 percent of the water sample originates from the aquifer formation being sampled. Then water was transferred to sampling plastic bucket and then filled into the bottles by using sampling dipper.

The sample bottles were partially filled and rinsed with the water to be sampled (rinse water). For bacteriological analysis, the preconditioned sterile glass bottles were used directly from the analytical laboratory.

The Total dissolved solid (TDS), electrical conductivity (EC) and pH values were measured on-site at the sampling stations and again at the laboratory along with other parameters.

The Groundwater quality sampling was conducted near the well site location. (**Table 5-13**). After sample collection, sample bottles were kept in a cooling box with ice/ice packs/ice chests until the laboratory. (**Table 5-14**) The sampling locations are shown in **Figure 5-18**.

Table 5-13: Groundwater Sampling Locations

ID	Date	Location		Photograph	Note
		North	East		
GW-01	14.8.2020	18°31'01.6"N	95°23'58.7"E		Cha Ya Gone village
GW-02	14.8.2020	18°31'51.1"N	95°24'55.6"E		Tan Taw Gyi village
GW-03	13.8.2020	18°45'43.0"N	95°29'48.0"E		Min Lan village
GW-04	13.8.2020	18°46'44.6"N	95°29'35.3"E		Sett Tone village

Table 5-14: Laboratory Services for Groundwater Sample Analysis Provided to Project

Laboratory	Parameters
ALS Hong Kong Laboratory	Oil and grease, Total coliform bacteria, Cyanide (free), Cyanide (total), Heavy metals (Arsenic (As), Cadmium (Cd), Copper (Cu), Chromium (Cr hexavalent), Total Chromium (Cr), Iron (Fe), Lead (Pb), Mercury (Hg), Nickel (Ni), Selenium (Se), Silver (Ag), Zinc (Zn), Barium (Ba)
EQM Laboratory	Temperature, pH, DO, 5-day Biochemical oxygen demand, Ammonia, Chemical oxygen demand, Chloride, Chlorine (total residual), Sulphide, Total phosphorus, Total suspended solids, Total nitrogen, Phenols, Fluoride

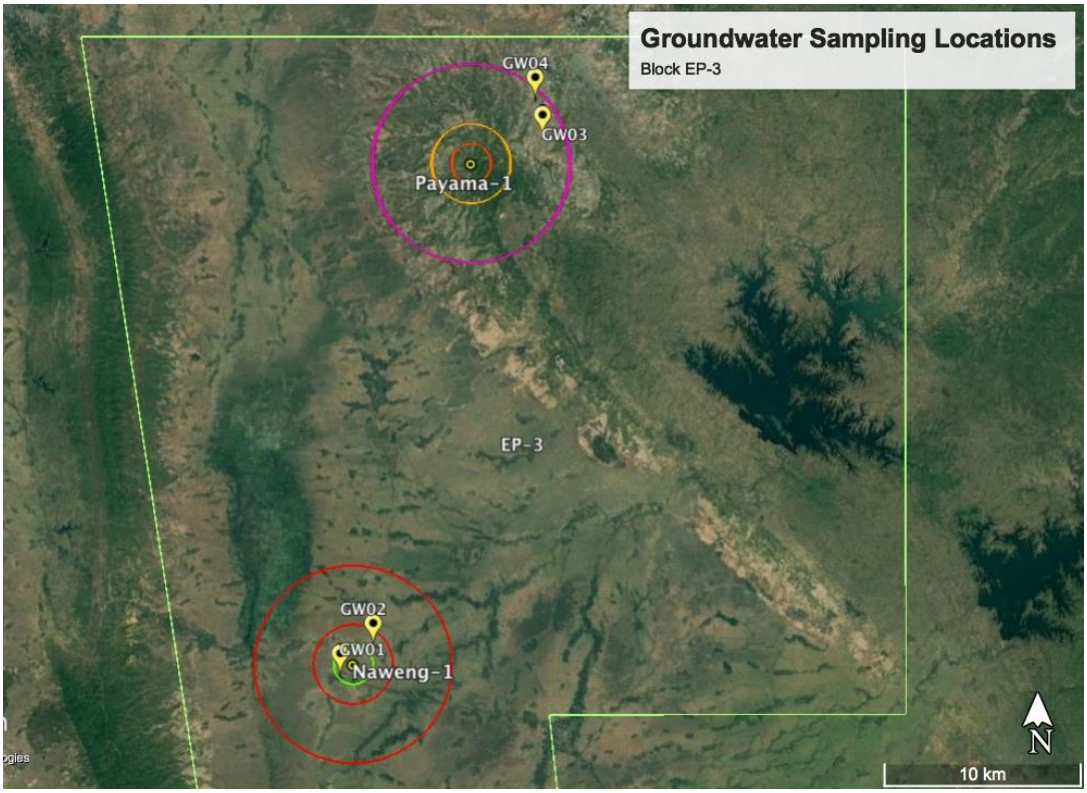


Figure 5-18: Groundwater Sample Locations

5.3.8.2.2 *Comparing Guideline*

There are no standards for environmental groundwater quality in the Myanmar under the National Environmental (Emission) Guidelines (2015). In the absence of local standards, groundwater quality results were compared against the internationally recognized agencies, as follows:

- US EPA - National Primary Drinking Water Regulations and National Secondary Drinking Water Regulations, published by the USEPA, May 2009.
- UK Drinking Water Standards from Water Supply (Water Quality) Regulations 2000, (SI 2000/3184) (as amended).
- Ontario Soil, Ground Water and Sediment Standards for Ontario, Use under Part XV.1 of the Environmental Protection Act, April 15, 2011, Canada
- European Union Drinking Water Standards (1998)
- IFC Environmental, Health, and Safety (EHS) Guidelines
- National Environmental Quality Guidelines (NEQG)

5.3.8.2.3 *Results*

Groundwater is the principal source of potable domestic water supply in EP-3. Groundwater is being exploited for domestic water. Impoundments are used primarily for watering livestock and some domestic use.

For the groundwater results shown in **Table 5-15**, groundwater pH at all sampling points were with the recommended range except GW03 which was slightly acidic with a pH of 6.04 than the recommended US EPA standard. The TDS was above the US EPA recommended drinking water standard at GW02, this is most likely the natural for the area. The high TDS appears to be caused naturally by evaporation, precipitation or rock weathering processes in the aquifers.

Heavy metal concentration at all sampling points was within standard levels, except Iron (Fe) concentration at GW03 that was higher than US EPA standards (300 µg/l). High Iron (Fe) levels are attributed to natural geological weathering in the area.

Total coliform bacteria levels were detected at all locations above the EU standards. This fecal contamination is attributing the construction of the wells and potential contamination from villages in the area.

Table 5-15: Summary of Ground Water Quality Results For EP-3 Baseline Survey

Parameter	Unit	EP-3				Standard	
		GW01	GW02	GW03	GW04	Source	Limits
pH	-	6.94	6.87	**6.02**	6.58	US EPA	6.5-8.5
Temperature	°C	27.72	27.04	26.13	28.99	-	-
Conductivity	µS/cm	1015	2163	183	276	UK	2500
TDS	mg/l	507	**1081**	92	138	MNDWQS	1,000
Salinity	PSU	0.5	1.10	0.09	0.13	-	-
DO	mg/l	7.93	7.92	5.26	5.74		
TSS	mg/l	<10	<10	<10	14	IFC / NEQG	35
Chlorine (total residual)	mg/l	0.02	0.06	0.11	0.04	IFC / NEQG	0.2
Cyanide (free)	mg/l	<0.01	<0.01	<0.01	<0.01	CA	5
Cyanide (total)	mg/l	<0.10	<0.10	<0.10	<0.10	MNDWQS	0.07
Fluoride	mg/l	0	0	0	0	MNDWQS	1.5
Ammonia	mg/l	0.15	0.11	0.07	0.07	MNDWQS	1.5
Total Nitrogen	mg/l	<0.5	<0.5	<0.5	3.56	WHO	50
Total Phosphorus	mg/l	0.075	0.072	0.039	0.044	IFC / NEQG	2
Sulphide	mg/l	<0.040	<0.040	<0.040	<0.040	IFC / NEQG	1
Chloride	mg/l	22.8	5.2	3.9	25	MNDWQS	250
Hex. Chromium (Cr^{6+})	µg/l	<20	<20	<20	<20	US EPA	<100
Oil and grease	mg/l	<5	<5	<5	<5	IFC / NEQG	10
COD	mg/l	<20	<20	<20	<20	IFC / NEQG	125
BOD (BOD_5)	mg/l	1	2-	3	0	IFC / NEQG	30
Phenols (as Phenol)	µg/l	<0.10	<0.10	<0.10	0.13	IFC / NEQG	0.5
Total Metals	mg/l	<1	<1	3	<1	IFC / NEQG	10
Arsenic (As)	µg/l	<10	<10	<10	<10	MNDWQS	50
Barium	µg/l	29	<1	1	115	MNDWQS	700
Cadmium (Cd)	µg/l	<0.2	<0.2	<0.2	<0.2	MNDWQS	3
Total Chromium (Cr)	µg/l	<1	<1	<1	1	MNDWQS	50

Parameter	Unit	EP-3				Standard	
		GW01	GW02	GW03	GW04	Source	Limits
Copper (Cu)	µg/l	<1	<1	<1	<1	MNDWQS	200
Lead (Pb)	µg/l	<1	<1	<1	<1	MNDWQS	10
Mercury (Hg)	µg/l	<0.5	<0.5	<0.5	<0.5	MNDWQS	1
Nickel (Ni)	µg/l	<1	<1	2	3	MNDWQS	70
Selenium (Se)	µg/l	<5	<5	<5	<5	MNDWQS	40
Silver (Ag)	µg/l	<1	<1	<1	<1	IFC / NEQG	500
Zinc (Zn)	µg/l	<10	<10	<10	<10	MNDWQS	3,000
Iron (Fe)	µg/l	<50	<50	**3180**	<50	MNDWQS	1,000
Total coliform bacteria	CFU/100mL	**15000**	**6900**	**340**	**1100**	EU	0

Analytical Methods followed to Standard Methods for the Examination of Water and Wastewater, recommended by APHA-AWWA-WEF.

Standard from: MNDWQS - Myanmar National Drinking Water Quality Standards (2019)
USEPA - National Primary Drinking Water Regulations and National Secondary Drinking Water Regulations, published by the USEPA, May 2009.
UK - UK Drinking Water Standards from Water Supply (Water Quality) Regulations 2000, (SI 2000/3184) (as amended).
CA – Ontario Soil, Ground Water and Sediment Standards for Ontario, Use Under Part XV.1 of the Environmental Protection Act, 9-Mar-04, Canada
EU – European Union Drinking Water Standards (1998)
IFC – Environmental, Health, and Safety (EHS) Guidelines, GENERAL EHS GUIDELINES
NEQG – National Environmental Quality Guideline
WHO – World Health Organization Drinking Water Standards

5.4 Biological Components

5.4.1 Approach and Methodology of the Study

The EP-3 Biodiversity Site Reconnaissance and Assessment was carried out in two parts:

1) Review and synthesis of secondary data on local biodiversity, significant supporting habitat and landscape features in the project area of influence.

   Secondary sources included:

   a. Biodiversity databases relevant to the area[4].
   b. Satellite imagery of vegetation cover and land use in the project area.
   c. Available information on Regional and Local Protected Areas or Sites: description, designation criteria (including boundaries, status, legal requirements, etc) and mapping
   d. IUCN listings of Threatened species according to the IUCN Red List.
   e. Information on endangered wildlife species listed as protected wild animals, in respect of their categories under the Forest Department Notification No. 583/94 (26 October 1994)
   f. Information on presence of endemic, migratory and congregatory species and/or key (highly threatened and/or unique) ecosystems in the project area of influence
   g. Information on key species ecology including distribution, habitat requirements, and sensitivities.

[4] http://www.iucnredlist.org/
https://species.wikimedia.org/wiki/Main_Page
Endemics : http://lntreasures.com/burma.html
Flora and Fauna International : http://www.fauna-flora.org/explore/myanmar/
Biodiversity and Nature Conservation Association : https://myanmarbiodiversity.org/

h. Available information on culturally important and iconic species that may be present.
i. Available information on the potential presence of alien invasive species;

2) Collection of primary data within the seismic survey study area. Primary data was obtained using the following techniques:
   a. Field biodiversity reconnaissance surveys of representative habitat types within the study area. Two areas of what were considered representative habitats dominated by native vegetation were subject to reconnaissance level biodiversity inspections and forest inventory 20 m x 20 m flora plots by the survey team. These four areas provided broad coverage near the ONGC Videsh well site areas. The present survey was practically constrained such that intensive, multi-season transect-based techniques to confirm the presence of species which typically occur at low density, are rare or uncommon were not feasible. Data collection on the occurrence of less common species relied instead on local ecological knowledge interviews as discussed below. Ground surveys for rare plants were not undertaken.
   b. Ecological knowledge interviews involving local residents were undertaken to tap into local knowledge and observation on species, seasonality, migration, etc. This activity was supported by reference to species photographs and drawings. Photographs included wildlife species, which were Critically Endangered and Endangered, which had some potential to have historically occurred in the broad area. A list of field guides used during the interviews is provided in the References section of this report.

      Local knowledge is invaluable in providing long-term observation of biodiversity and ecological change in an area. Observations of species types which are not subject to routine harvest or which are not in conflict with the local population are less reliable than those that are.

      The communities proximate to the well site areas are detailed in **Table 5-16**.

Table 5-16: Ecological & Biodiversity Interview Locations

Date	Public Consultation Meeting Venue	Villages cover for PC
14th August	Sett Tone village	Sett Tone village Kyo Pin wine village Min Lan village
16th August	Cha Ya Gone village	Cha Ya Gone village Htan Taw village

   c. Review of species habitat requirements relative to available satellite imagery and ground reconnaissance date.
   d. Mapping of Natural and Modified[5] habitats according to IFC Performance Standard 6 - Biodiversity Conservation and Sustainable Natural Resource Management; and of possible critical habitats, if any.

[5] **Modified habitats** are areas that may contain a large proportion of plant and/ or animal species of non-native origin, and/ or where human activity has substantially modified an area's primary ecological functions and species composition. Modified habitats may include areas managed for agriculture, forest plantations, reclaimed coastal zones, and reclaimed wetlands. **Natural Habitats** are areas composed of viable assemblages of plant and/or animal species of largely native origin, and/or where human activity has not essentially modified an area's primary ecological functions and species composition.

Mitigation measures were developed to be consistent with IFC Performance Standard 6 - Biodiversity Conservation and Sustainable Natural Resource Management and related Guidance Notes[6].

Globally threatened status of Fauna species were categorized using The IUCN Red List of Threatened Species as shown in below:

Status	Code
Critically Endangered	(CR)
Endangered	(EN)
Vulnerable	(VU)
Near threatened	(NT)
and Least Concern	(LC)

Source: IUCN Red List of Threatened Species, Version 3.1. Accessed from www.iucnredlist.org on 01 November 2016.

5.4.2 Land Cover

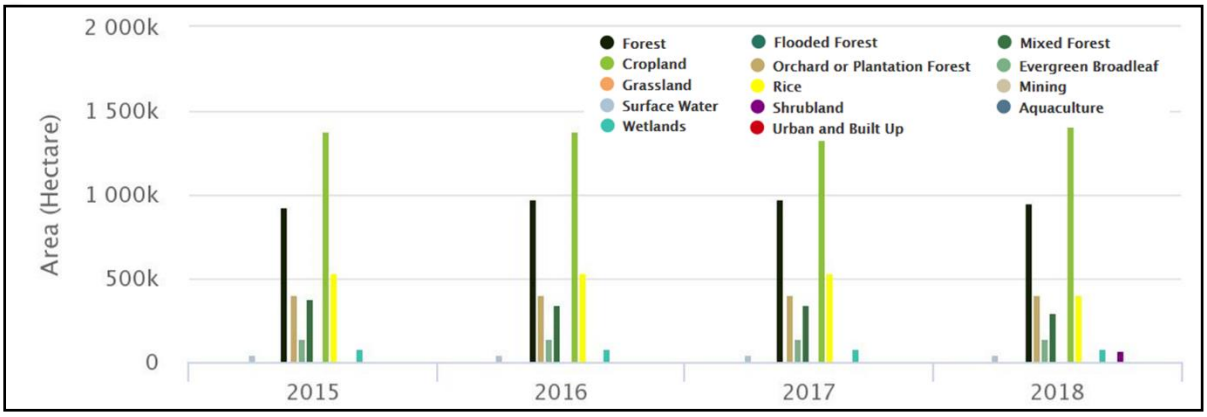
According to the Land Cover Portal, land cover in Bago Region was classified as following table. From 2015 the forest, in total excluding the plantation, in Bago gradually declined. The cropland increased but not for rice. The bare land increased 6 times of area in 2015.

Table 5-17: Land Cover in Bago Region (2015-2018) and Block EP-3 (2018)

Land cover types	Bago Region				Block EP-3	
	2015	2016	2017	2018	2018	%
Flooded Forest	5.00	5.00	5.00	3.00	0.00	0.00
Forest	933,358.67	971,044.45	972,743.76	954,207.30	2,162.78	1.32%
Evergreen Broadleaf	144,491.49	144,252.74	143,603.27	138,471.34	3.05	0.002%
Mixed Forest	379,346.66	342,045.39	341,068.55	294,039.40	2.71	0.002%
Orchard/Plantation Forest	405,486.82	405,403.93	405,340.93	407,949.91	294.34	0.18%
Urban and Built Up	4,135.92	4,135.92	4,135.92	4,160.53	66.68	0.04%
Cropland	1,379,766.50	1,379,772.25	1,379,774.25	1,506,281.11	151,595.47	92.65%
Rice	531,453.08	531,457.33	531,457.33	406,034.61	11.69	0.01%
Mining	2,519.84	2,519.84	2,519.84	2,528.60	0.00	0.00
Barren	6,330.11	6,331.11	6,331.11	5,711.42	20.33	0.01%
Grassland	451.20	453.20	453.20	690.91	0.00	0.00
Shrubland	12,191.23	12,114.36	12,102.36	75,203.86	1,040.51	0.64%
Wetlands	85,768.52	85,769.52	85,769.52	85,934.56	1,630.87	1.00%
Aquaculture	1,095.13	1,095.13	1,095.13	1,013.75	180.46	0.11%
Surface Water	45,582.96	45,582.96	45,582.96	49,752.80	6,621.10	4.05%
Total	**3,931,983.13**	**3,931,983.13**	**3,931,983.13**	**3,931,983.10**	**163,630.00**	**100.00%**

Source: ADPC (2018) From Land Cover Portal

[6] http://www.ifc.org/wps/wcm/connect/a359a380498007e9a1b7f3336b93d75f/Updated_GN6-2012.pdf?MOD=AJPERES



Source: ADPC (2018) From Land Cover Portal

Figure 5-19: Land Cover Change 2015 - 2018

Land cover in the Block EP-3 as of 2018 consisted of:

(1) Cropland - a major cover in the block. It covers all of the flat area on the left bank of Ayeyarwady River to the foothill of Bago Yamas for 92.5% of the block area and only 0.01% was rice field,

(2) Forest – forest could be found only on the hills. There are four types of forest classified: forest, evergreen broadleaf, mixed forest and flooded forest. Forest in central lowland are usually alternating with scrubland and small parcel croplands. In total there was only 1.35% of forest in Block EP-3,

(3) Surface water – beside Ayeyarwady River, there are four dams developed in Bago (west). One of them, Wegyi Dam, located in the Block EP-3 covering about 4% of area,

(4) (4) Wetland – at the lowest point of the project area, water overflow from tributary of Ayeyarwady River into network of small canals and end up in In Ma become a large swamp in dry season. The wetland was about 1% of block area; and

(5) Others – such as scrubland (0.64%), urban area (0.4%), orchard (0.18%), aquaculture (0.11%), and bare land (0.1%).

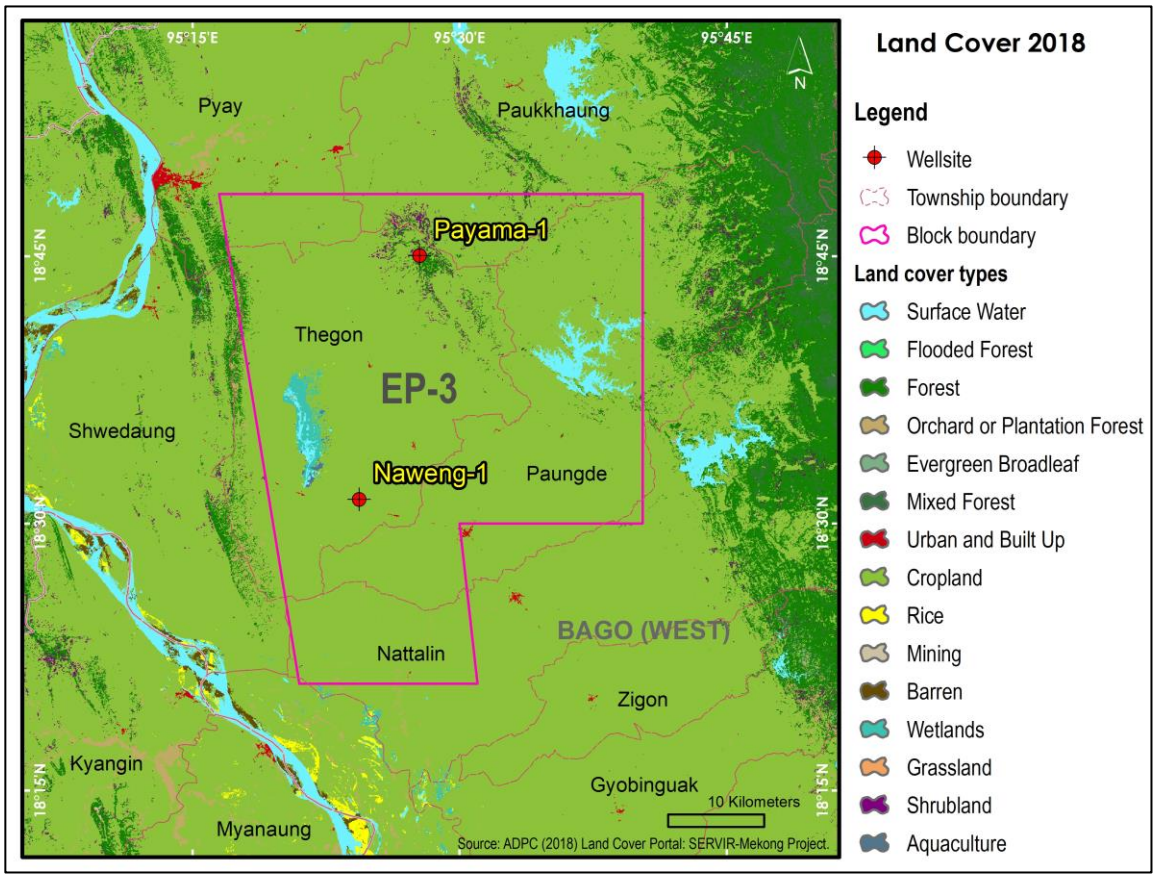


Figure 5-20: Land Cover in Block EP-3 as of 2018

5.4.2.1 Land Use for Thegon Township

The following table shows the acre of land used depending on the land type.

Table 5-18: Land Use for Thegon Township

No	Land Type	Area (Acre)
1	Total Agricultural land	99026
	(a) Paddy Land	85035
	(b) Farm Land	10786
	(c) Kaing Land	113
	(d) Horticulture Land	3092
2	Pasture land	213
3	Industrial Land	93
4	Urban Area	1015
5	Village Area	6768
6	Other Land	28591
7	Reserved Forest and Public Protected Area	36499
9	Areas that cannot be cultivated	19712
Total		**191917**

5.4.2.2 Land Use for Paukkhaung Township

The following table shows the acre of land used depending on the land type.

Table 5-19: Land Use for Paukkhaung Township

No	Land Type	Area (Acre)
1	Total Agricultural land	100469
	(a) Paddy Land	42093
	(b) Farm Land	56871
	(c) Kaing Land	1458
	(d) Horticulture Land	47
2	Industrial Land	35897
3	Urban Area	572
4	Village Area	3672
5	Other Land	79059
6	Reserved Forest and Public Protected Area	156234
7	Untouched forest	17178
8	Untouched land	51390
9	Areas that cannot be cultivated	36479
Total		**480950**

5.4.3 Biological Ecoregions

According to **Figure 5-21**, Block EP-3 area is dominated by Irrawaddy dry forest type and partially covered by Irrawaddy Moist deciduous forests.

The Irrawaddy dry forest type: In central Myanmar, the Irrawaddy dry forests are a tropical dry broadleaf forest ecoregion. The ecoregion is found in parts of the Irrawaddy, Sittaung, and Salween river basins, where annual rainfall is less than 800 mm.

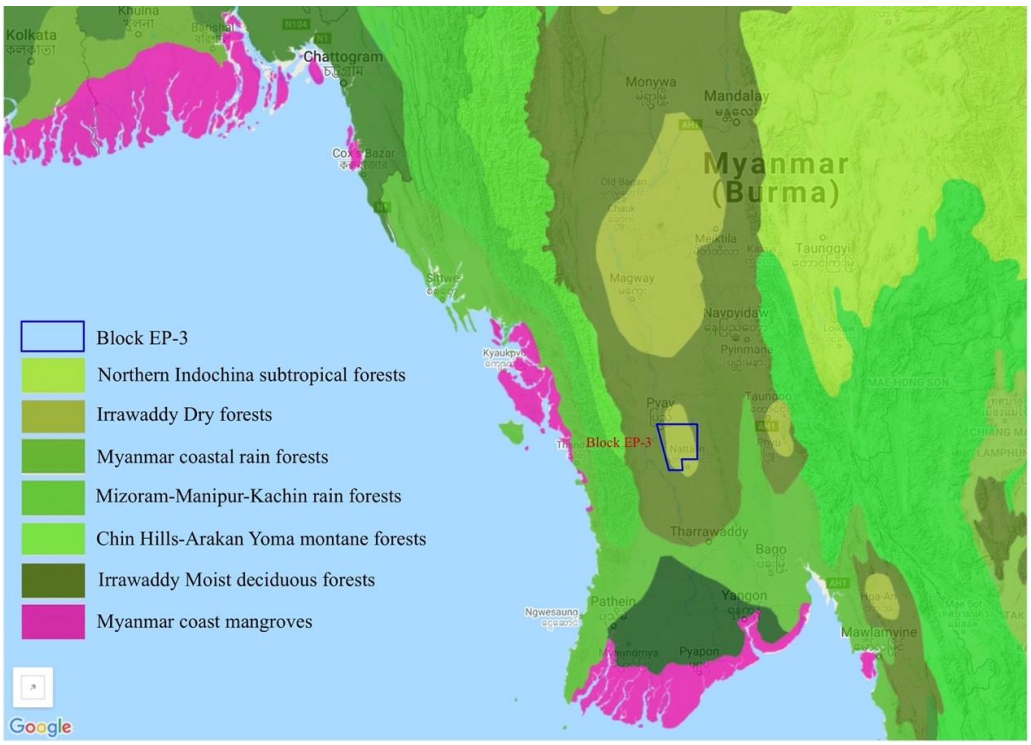
Teak (Tectona hamiltoniana) dominates the dry mixed deciduous forest, also known as Than Dahat forest, with Terminalia oliveri, Senegalia catechu, and Bauhinia racemosa. Indaing, a dry deciduous dipterocarp forest with an understory of herbs and grasses, is an open-canopied woodland. Dipterocarpus tuberculatus, Shorea siamensis, Shorea obtusa, and Shorea oblongifolia are among the most common Dipterocarps. There are also trees in the pea family (Fabaceae), such as Afzelia, Pterocarpus, Dalbergia, Xylia, and Sindora. High Indaing is a densely forested area with trees reaching up to 20 meters in height. Low Indaing is made up of tall bushes and small trees, and it is generally the result of high Indaing being cut and burned repeatedly.

The ecoregion is home several medium-sized and small mammals, including Indian muntjac (Muntiacus muntjak), Eld's deer (Cervus eldi), sambar deer (Cervus unicolor), Indian hog deer (Hyelaphus porcinus), Indian jackal (Canis aureus indicus), rhesus macaque (Macaca mulatta), western hoolock gibbon (Hoolock hoolock), and jungle cat (Felis chaus). Larger mammals, including Indian elephant and tiger, have been extirpated from the ecoregion.

The Irrawaddy moist deciduous forests type: this forest type is a tropical moist broadleaf forest ecoregion in central Myanmar. The ecoregion encompasses the Irrawaddy River's center basin and the Salween River's lower basin. The ecoregion is defined by high tree woods that fall down their leaves throughout the dry season. The majority of the forests in the ecoregion have been converted to cultivation.

Dominant tree species are teak (Tectona grandis) and Pyinkado (Xylia xylocarpa var. kerrii), with Terminalia tomentosa, Terminalia belerica, Terminalia pyrifolia, Homalium tomentosum, Bombax insigne, Gmelina arborea, Lannea grandis, Lannea coromandelica, Pterocarpus macrocarpus, Millettia pendula, Berrya ammonilla, Mitragyna rotundifolia, and species of Vitex. The evergreen canopy forests are interspersed with stands of bamboo, and occasional large evergreen trees.

The ecoregion is home to several large mammals, including Asian elephant (Elephas maximus), gaur (Bos gaurus), Himalayan black bear (Selenarctos thibetanus), sun bear (Helarctos malayanus), Sambar deer (Cervus unicolor) Mainland serow (Capricornis milneedwardsii), Indian hog deer (Hyelaphus porcinus), dhole (Cuon alpinus), Asian golden cat (Catopuma temminckii), marbled cat (Pardofelis marmorata), leopard cat (Prionailurus bengalensis), masked palm civet (Paguma larvata), binturong (Arctictis binturong), spotted linsang (Prionodon pardicolor), and capped langur (Trachypithecus pileatus).



Data source: "Map of Ecoregions 2017". Resolve, using WWF data. Retrieved September 14, 2019

Figure 5-21: Bioregion in Central Myanmar

5.4.4 Potential for Species of Concern in Block EP-3

Block EP-3 is located on the left bank of Ayeyarwady River, bounded with Bago Yoma on the east. Wildlife habitats have been converted to agricultural lands over extensive area on the flood plain of Ayeyarwady River including highland along foothills of Bago Yoma while Prome Hills become tourist attraction. Communities were diffusely settled.

Degraded forests alternating cultivated areas on the hills can be seen clearly from Satellite. Intact forest could be found only as pockets in the Bago Yoma. Most of large mammals have been extirpated from the region, could be found only in the protected areas and scarcely found outside the PA. (Zöckler, 2018 in SOBA 4.5). Discontinued corridor breaks the habitat and inhibits it traveling.

The endangered species that may occur are listed in **Table 5-20**.

Table 5-20: Endangered Animals May Occurred

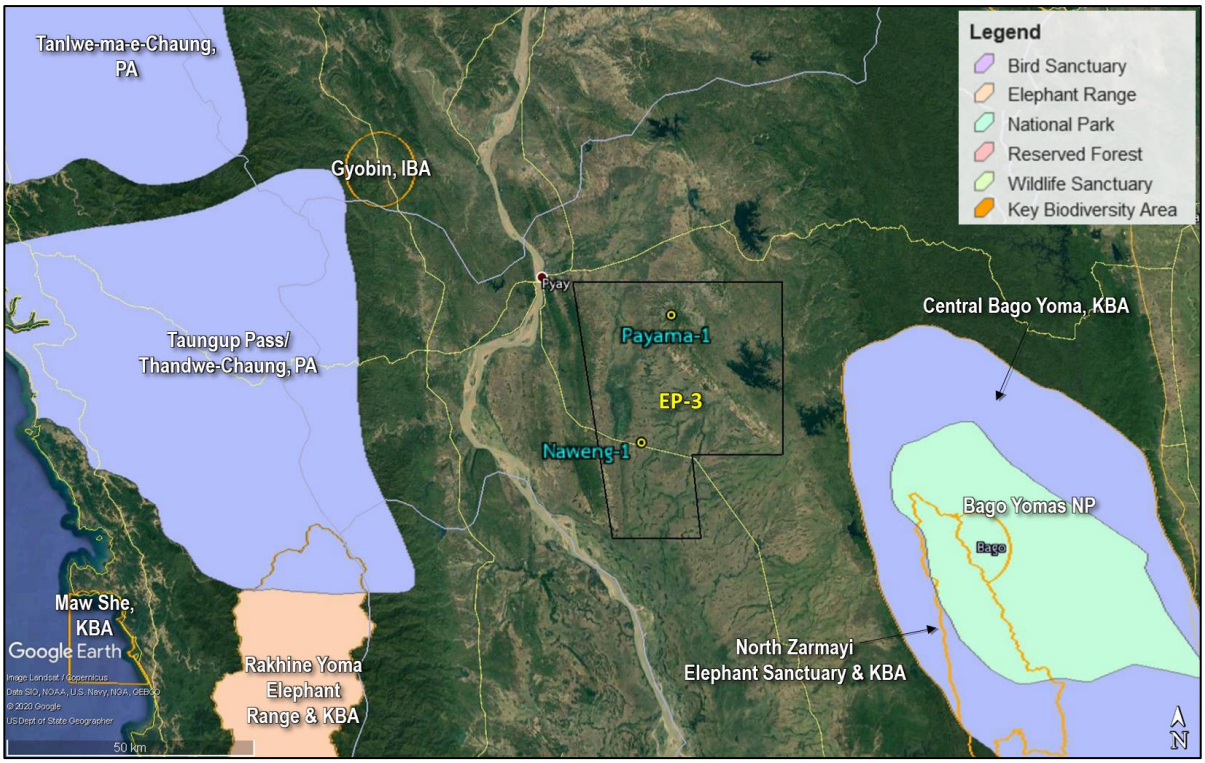
Common Name	Scientific Name	IUCN Threatened Status	Area of Presence
Birds			
Hooded Treepie	*Crypsirina cucullata*	NT	Dry zone on the plains of the Ayeyarwady and Sittaung Rivers *Endemic to eco region
Jerdon's Minivet	*Pericrocotus albifrons*	NT	Shrubland/grassland/Central Myanmar/Ayeyarwady basin except delta
River Tern	*Sterna aurantia*	NT	Ayeyarwady River, Pyay
Burmese Bushlark	*Mirafra microptera*	LC	Upper Ayeyarwady Basin from Thayet to Khata
Burmese Collared Dove	*Streptopelia xanthocycla*	LC	Shrubland/Central Myanmar/ Ayeyarwady basin except delta
Pale-eyed Bulbul	*Pycnonotus davisoni*	LC	Inland wetland/shrubland/Ayeyarwady Delta/Bago Yoma to Lower Shan Plateau/Rakhine Yoma
White-throated Babbler	*Chatarrhaea gularis*	LC	Ayeyarwady basin *Endemic to eco region
Mammals			
Eld's deer	*Rucervus eldii*	EN	Pyay [in block]
Asian elephant	*Elephas maximus*	EN	North Zarmayi Elephant PA/Bago Yoma NP
Dhole	*Cuon alpinus*	EN	Bago Yoma NP
Clouded leopard	*Neofelis nebulosa*	VU	Bago Yoma NP/ Bago Yoma Range
Gaur	*Bos gaurus*	VU	Bago Yoma NP/ Bago Yoma Range
Popa soft-furred Rat	*Millardia kathleenae*	LC	Popa Mountain/ flood plain from Yamethin to Shwebo *Endemic to eco region
Reptiles			
Yellow tortoise	*Indotestudo elongata*	CR	Bago Yoma NP
Burmese peacock softshell turtle	*Nilssonia formosa*	EN	Upper Ayeyarwady basin, Magway *Endemic to Myanmar
Voris' Mud Snake	*Enhydris vorisi*	EN	Yangon, inland wetland
Burmese eyed turtle	*Morenia ocellata*	VU	Bago Yoma NP
Burmese python	*Python bivittatus*	VU	Country wide
Giant Asian pond turtle	*Heosemys grandis*	VU	Inland freshwater, Southeast Asia, excep t island countries
King cobra	*Ophiophagus hannah*	VU	Wide
Asian leaf turtle	*Cyclemys dentata*	NT	Inland freshwater, wide
Burmese Narrow-headed Softshell Turtle	*Chitra vandijki*	NE	Inland wetland
Amphibian			
Blunt-headed burrowing frog	*Glyphoglossus molossus*	NT	Bago Yoma to Shan Plateau, Eastern Myanmar to Western Thailand

Source: Wikramanayake, *et* al. (2002), Zöckler (2018) in SOBA 4.5 and IUCCN (2019)

5.4.5 Protected Areas

In 2019, according to the World Database of Protected Areas (UNEP-WCMC, 2019), a total of 48 protected areas (PA) of Myanmar have been established. The latest PA is Irrawaddy Dolphin Protected Area, in Sagaing, has been established in 2018. In national level, the PAs in Myanmar are categorized as follows: (1) National Park, (2) Wildlife Sanctuary, (3) Bird Sanctuary, (4) Nature Park, (5) Nature Reserve, (6) Geo-features Significant Area, and (7) Marine National Park. Beside this, reserved forests (RF) have been designated officially over in country as well as protected public forest.

There was not officially established international protected areas in Block EP-3. A global/national area of biodiversity importance near the project area is the Ayeyarwady River corridor. This key biodiversity areas runs on the west of the Block and is located far away from the proposed well locations for at least 20 km. In EP-3 block, reserved forest such as Sha Byin, Dawle and Bwet exist. The Payama-1 well is located Sha Byin Reserved Forest Area as shown in **Figure 5-23**. The In Ma Swamp is also located in Block EP-3 to the northwest of Naweng-1 wellsite. However, the In Ma Swamp is around 5 km away from the Naweng-1 wellsite.



Source: UNEP-WCMC (2019)

Figure 5-22: Protected Area and Key Biodiversity Areas in Central Myanmar

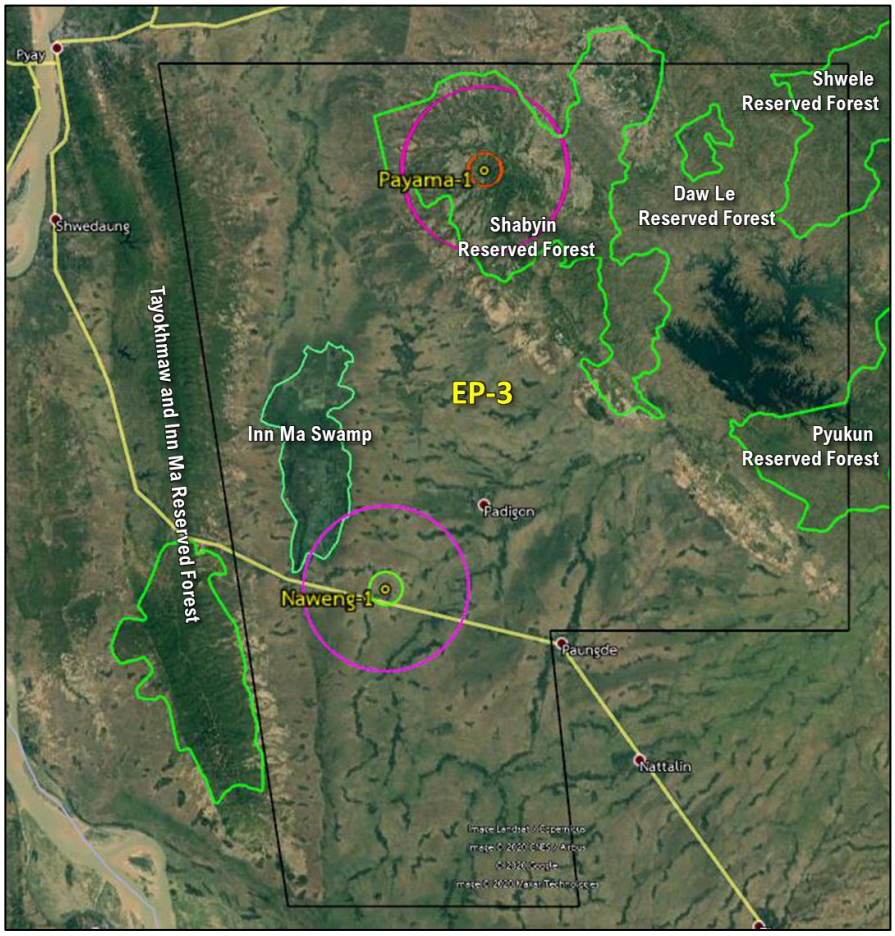


Figure 5-23: Reserved Forest Boundaries in Block EP-3

The biodiversity field survey was carried out starting from 13th August to 16th August 2020. The baseline studies were conducted in order to identify biodiversity as well as ecosystem services. A total of 42 plant species were observed during the survey. The main iconic floras in the exploration block are the more mature ***Dipterocarpus spp***. According to both field surveys and community interviews, 14 species of mammals, 15 species of fish, 28 species of birds and 25 species of reptiles and amphibians were identified.

The threatened species that were identified in the biodiversity site assessment and interviews included:

- **Mammals** - the Kway-aa (*Cuon alpinus* – EN), Shwe Thamin (*Axis porcinus*– EN*)* Kyar-kyaung (*Prionailurus viverrinus* –EN*)*, Sin *(Elephas maximus*– EN*)*, Myauk-hlwal-kyaw (*Hylobates lar* –EN*)*, Phyan *(Cynogale bennettii* – EN), Pa-shu-thin-khway-chat (*Manis javanica* – CR), Ta-yoke-thin-khway-chat (*Manis pentadactyla* – CR).
- **Fish** - One species of Near Threatened (NT) species (*Channa harcourtbutleri*).
- **Birds** - And also four Endanger species (*Pavo muticus, Sittavictoriae, Asarcornis scutulata, Tringa guttifer*)
- **Amphibian and Reptiles -** 3 Endangered Species (*Indotestudo elongate, Manouria emys and Batagur trivittata)* and 1 Critically Endangered species (*Geochelone platynota)*

The rest of the species identified were either not classified, or classified as least concern vulnerable or near threated only. The full details are included in **Appendix 4**.

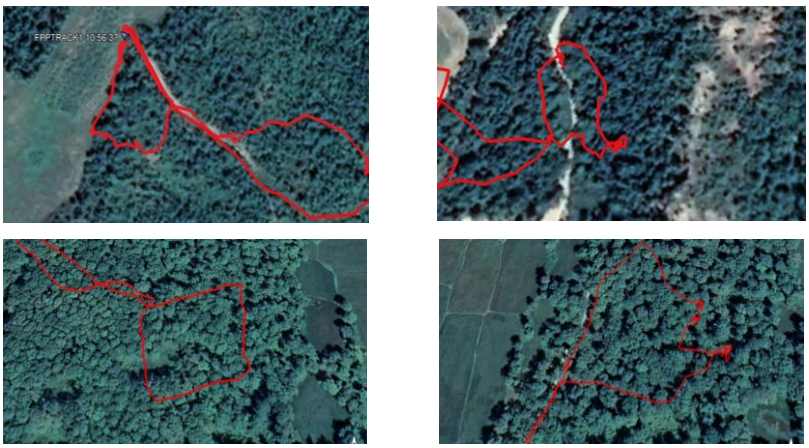


Figure 5-24: Flora Survey Map

5.4.6 Thegon Township Natural Environment

a) Natural Flora

Natural floras that grow in Thegon Township are teak, pyinkado, thityar and some rare medical plant such as bone ma yazar. Other kinds of plants are wild grass, nipa palm and bamboo.

b) Natural Fauna

Natural fauna that habitat in Thegon Township are wild pig, white-tailed deer, wild dog, wild cat, savannah monitor and pangolin.

c) Current Environmental Condition

The current total forest cover in Thegon Township is 34.21%. Among them, the reserved forest cover is 19.03% and there is no non-protected forest in this area.

d) Environmental Conservation

As environmental conservation activities, 36,502 acres of reserved forest are conserved. There are 245 acres of private hardwood plantation, however; there is no teak plantation and no community plantation for firewood.

5.4.7 Paukkhaung Township Natural Environment

a) Natural Flora

Natural flora that grow in Paukkhaung Township are teak, Pyinkado, Padauk, Thinwin, Tamalan, Shar, Thityar, Inngyin and bamboo.

b) Natural Fauna

Natural fauna that habitat in Paukkhaung Township are wild elephant, gaur, elk, deer, hog deer, white-tailed deer, rabbit, climbing goats, wild pig, wild dog, monkey, peacocks, wild cat, pangolin, different types of birds, Burmese python, king cobra, rock python, cobra, turtle, savannah monitor and monitor lizard. Aquatic animals are mrigal carp and murrel.

c) Current Environmental Conditions

The current total forest cover in Paukkhaung Township is 11.42%. Among them, the reserved forest cover is 11.42% and there is no non-protected forest in this area.

d) Environmental Conservation Activities

As environmental conservation activities, 156,215 acres of reserved forest are conserved. There are 3,274 acres of private teak plantation, however; there is no hardwood and community forest plantation.

5.5 Socio-Economic Components

5.5.1 Administration

In Myanmar, states and regions are divided into districts. These districts consist of townships that include towns, wards and village-tracts. Village-tracts are groups of adjacent villages. Block EP-3 is mostly located in Pyay District, Bago (West) Region and partially in Nattalin, Ayeyarwady Region. Major administrative in Block covered Thegon, Paungde, Paukkhaung and Pyay Township (**Figure 5-25**).

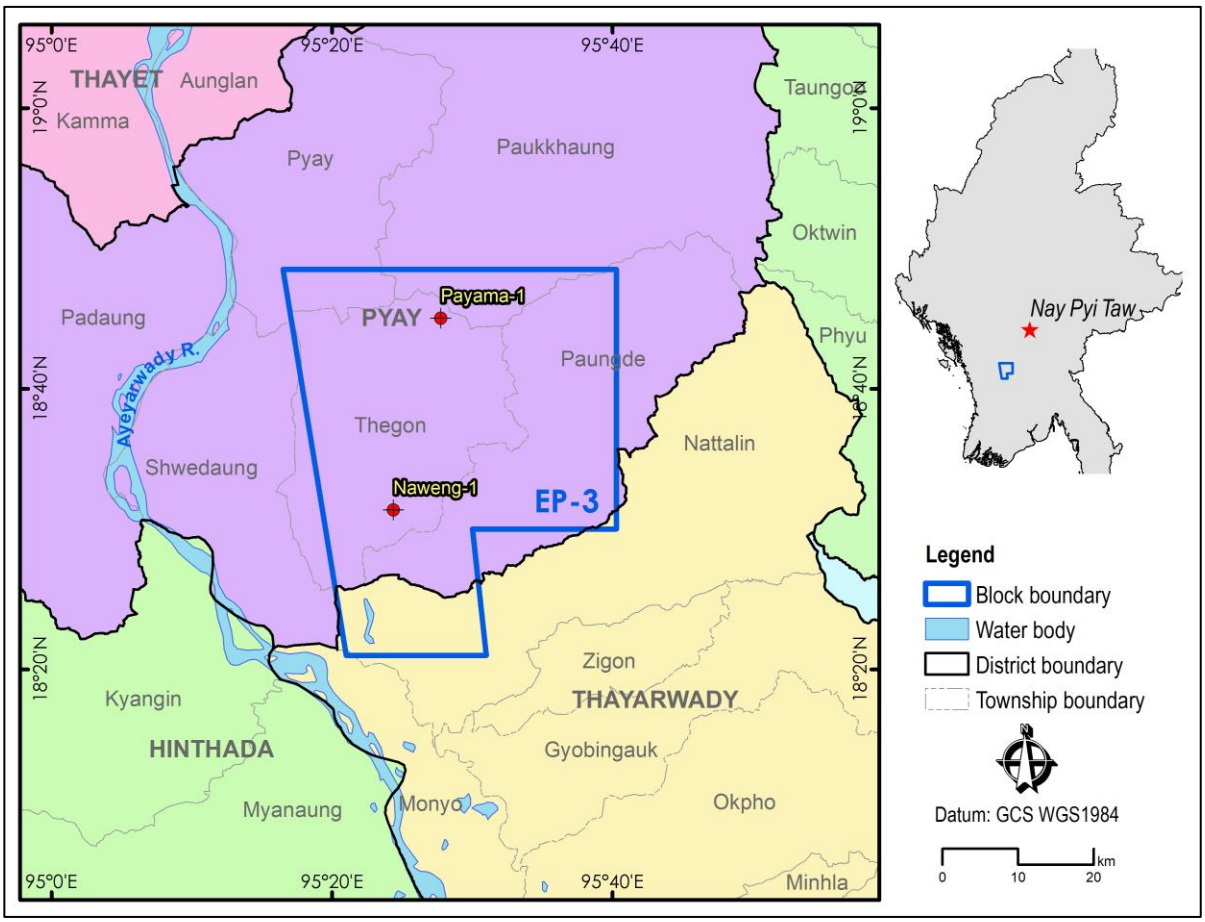


Figure 5-25: Administrative of Bago (West) Region

The proposed well sites, Naweng-1 and Payama-1, are located in Thegon Township. Naweng-1 Well is in Char Hlyar Kone VT while Payama-1 Well is in Sha Byin Reserved Forest as a part of Bago Yoma (**Figure 5-26**).

Within a 5km-radius from proposed wells covers Thegon, Paungde and Paukkhaung Township. The communities located near the proposed well sites are detailed in **Table 5-21** and presented in **Figure 5-27** and **Figure 5-28**. Those villages were considered to be potential affected according to the direct impacts from the proposed well sites such as nuisance noise, flow direction of waterway, access road, etc.

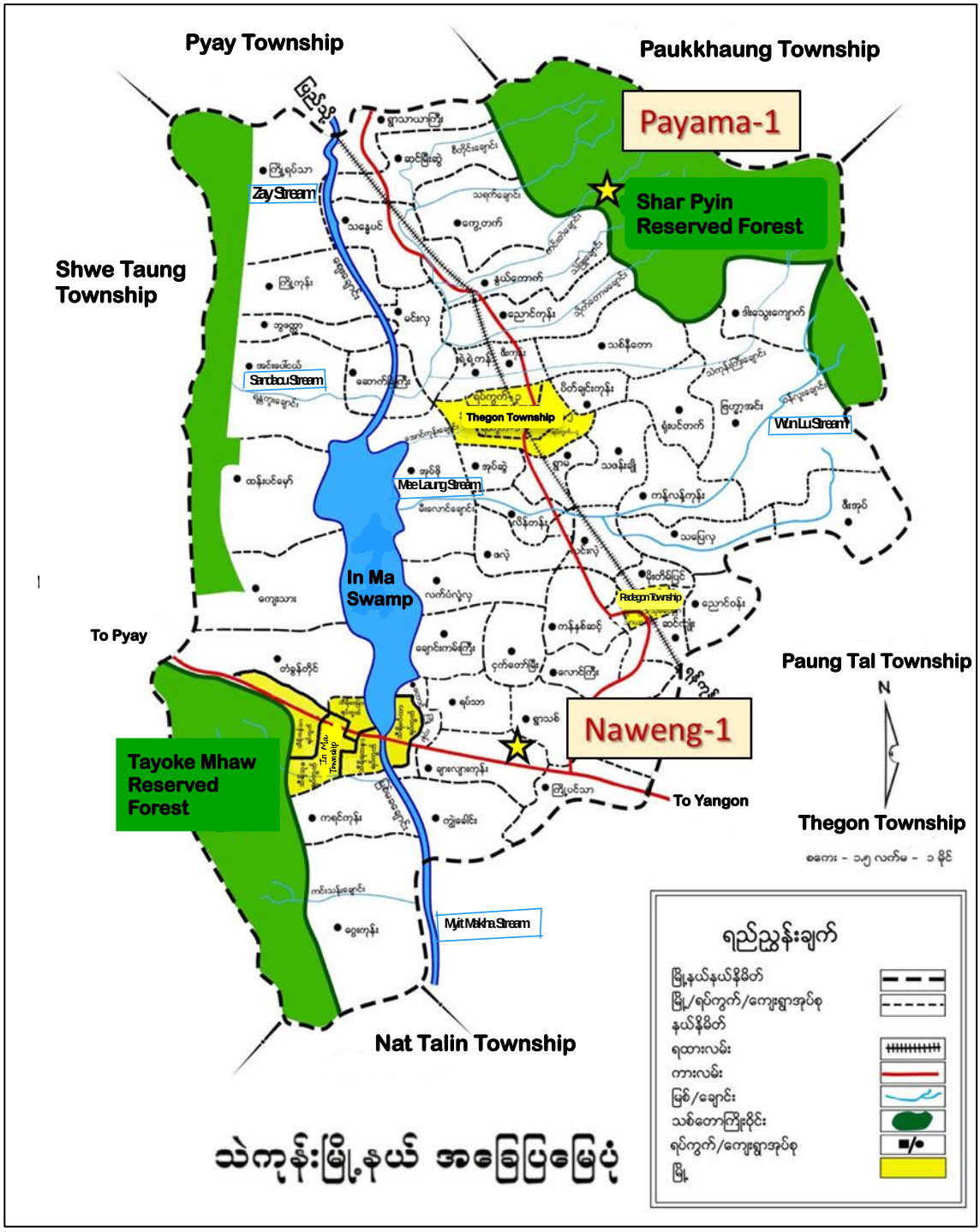


Figure 5-26: Proposed Wells' Locations in Thegon Township

Table 5-21: Potentially Affected Villages

Proposed well	Village*	Village Tract	Distance (km) from well
Naweng-1 **Lat: 18°31'22.3437"N** **Long: 95°24'21.6247"E** **X: 754004.96** **Y: 2049730.75**	Tan Daw Gyi	Ywa Thit	1.40
	Nyaung Gon		1.02
	Zin Byun Gon		1.15
	Pyin Daung Gon		1.33
	Pwe Bye		1.90
	Sa Be Kan	Yat Tha	1.06
	Wa Le		1.10
	Yat Tha		1.58
	Gyo Gon		1.97
	Ka Yin Gon	Cha Ya Gone	0.42
	Ywa Tha Gon		0.53
	Taw Chin		1.17
	Thit Cho		1.60
	Pan Lan Gon		0.71
	Kaung Bin Lu		1.20
	Cha Ya Gone		1.40
Payama-1 **Lat: 18°45'1.997"N,** **Long: 95°45.1252"E** **X: 759629.13** **Y: 2075021.51**	Sett Tone	Tha Phan Kaing	>5km but on the access road
	Minn Lann		
	Kyo Pin	Kyoet Pin Waing	
	Thith Yaung Paung		

Figure 5-27: Potentially Affected Villages from Naweng-1 Well

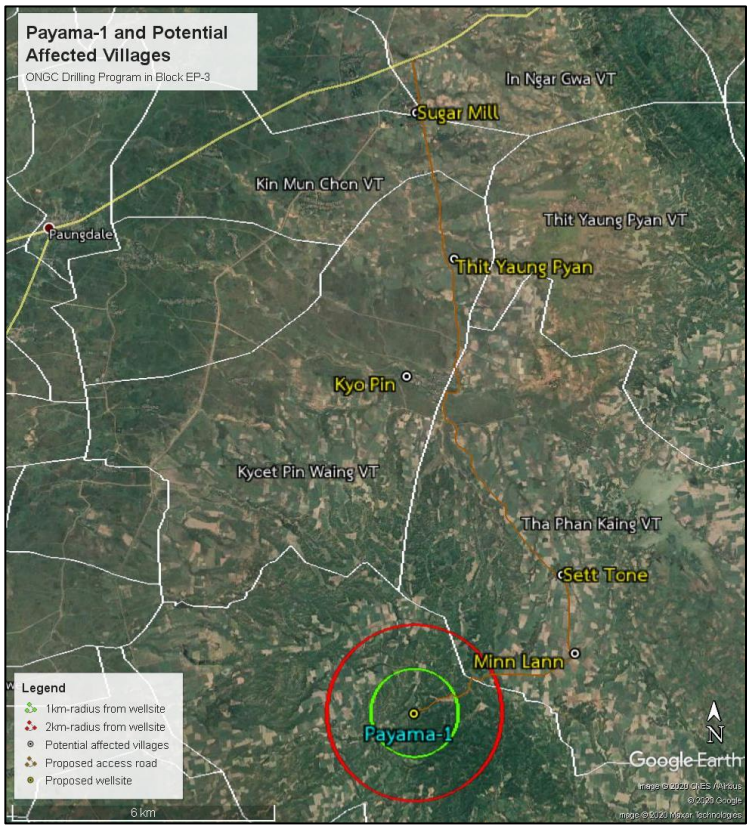


Figure 5-28: Potentially Affected Villages of Payama-1 Well

According to the list, the further socio-economic baseline information will be described covering those villages regarding village-tract and township levels.

5.5.2 Governance

Each state or region has a Regional Government or a State Government consisting of a Chief Minister, other Ministers and an Advocate General. Legislative authority would reside with the State Hluttaw or Regional Hluttaw made up of elected civilian members and representatives of the Armed Forces.

The General Administration Department (GAD) under the Ministry of Home Affairs acts as the backbone of the local administration. Thus, at the township level the overall administration (and coordination functions) falls under the authority of township administrators, who are appointed by the GAD and replaced on a three-year basis. In addition sectorial line ministries deliver services and have departments at the township level and refer to the Union level government. While elections take place for the region/state level parliament (which has limited powers) and for the village tract/ward level (which forms the main point of interaction between the state and its citizens), no elected bodies exist at the township or district levels - although this may change in the future.

The Ward or Village Tract Administration Law of 2012 requires that the VTA/WA be elected from and by the group of 10 household heads. However, the elected VTA/WA is not formally accountable to the local community and reports to the TA, who can assign tasks to the VTA/WA and can dismiss the VTA/WA in case of misconduct. Nevertheless, partly because the developmental role of the VTA/WA has increased and the VTA/WAs have come to be seen as the link between the community at the village tract or ward level and the government at the township level, most of the VTAs/WAs interviewed now feel more accountable to their communities.

The number and size of Civil Society Organisations in Bago Region is still rather limited and so far they play a marginal role in governance. Most organisations are active in health and education, providing direct support to people in need.

5.5.3 Demographics

After the 2014 Myanmar Population and Housing Census, the population has been estimated for the following years. The population of Thegon and Paukkhaung Township are as followings.

Table 5-22: Population of Thegon and Paukkhaung Township

Township/ District	2014 (1)			2017 (2)			2019 (3)		
	No. of Pop.	No. of HH	Pop. Density (per sq.km.)	No. of Pop.	No. of HH	Pop. Density (per sq.km.)	No. of Pop.	No. of HH	Pop. Density (per sq.km.)
Thegon	130,957	35,950	168.6	130,460	36,433	167.9	134,505	N/A	173.2
Paukkhaung	124,856	32,347	65.5	124,856	33,221	63.5	129,807	N/A	66.5
Pyay District	910,902	236,010	119.6	896,506	229,966	117.7	932,317	N/A	122.4

Source: (1) Myanmar Population and Census2014
(2) GAD, 2017, and (3) Projection 2019 from yr2014, from MIMU Township Profiles Dashboard (2019)

Thegon Township has a total population of 130,957 in 2014, then decreasing in 2017 as a result of the declining birth rate since the last 10 years. But in 2019 it possibly increases to population of 134,505 in total according to UNFPA (2019) estimated the national growth rate at 0.63%. The population density over the township was estimated to 173.2 person/sq.km in 2019 increased from 168.6 persons/sq.km in 2014. There were 35,950 households in 2014, and 36,433 households in 2017. Conventional household had 3.6 members as an average.

The people in Thegon Township majorly live in rural areas and only 11.8% living in urban areas in 2014 but increasing to 20.5% in 2017. This is the similar scenario to the country.

Paukkhaung Township is on the northeastern side of the block. ONGC Videsh plans to access to the well site on the dirt road in Tha Phan Kaing VT. In overview, Paukkhaung has a total population of 124,856 in 2014, and possibly increases to 126,807 in 2019 according to the estimated growth rate of 0.63%. The population density over the township was 65.5 person/sq.km in 2014, and in 2019 was estimated increasingly to 66.5 persons/sq.km. There were 32,347 households in 2014, and increased to 33,221 households in 2017. Conventional household had 3.8 members as an average.

The population density of Paukkhaung is slightly distributed, 65.5 persons/sq.km. According to GAD (2017) 88.8% of population in Paukkhaung live in rural while only 11.2% live in urban area which was not change to the 2014 census.

Particular to the villages tracts which was potentially affected from the project actives, the population were:

Table 5-23: Population in Villages Tract In 5 km Radius from Wellsite

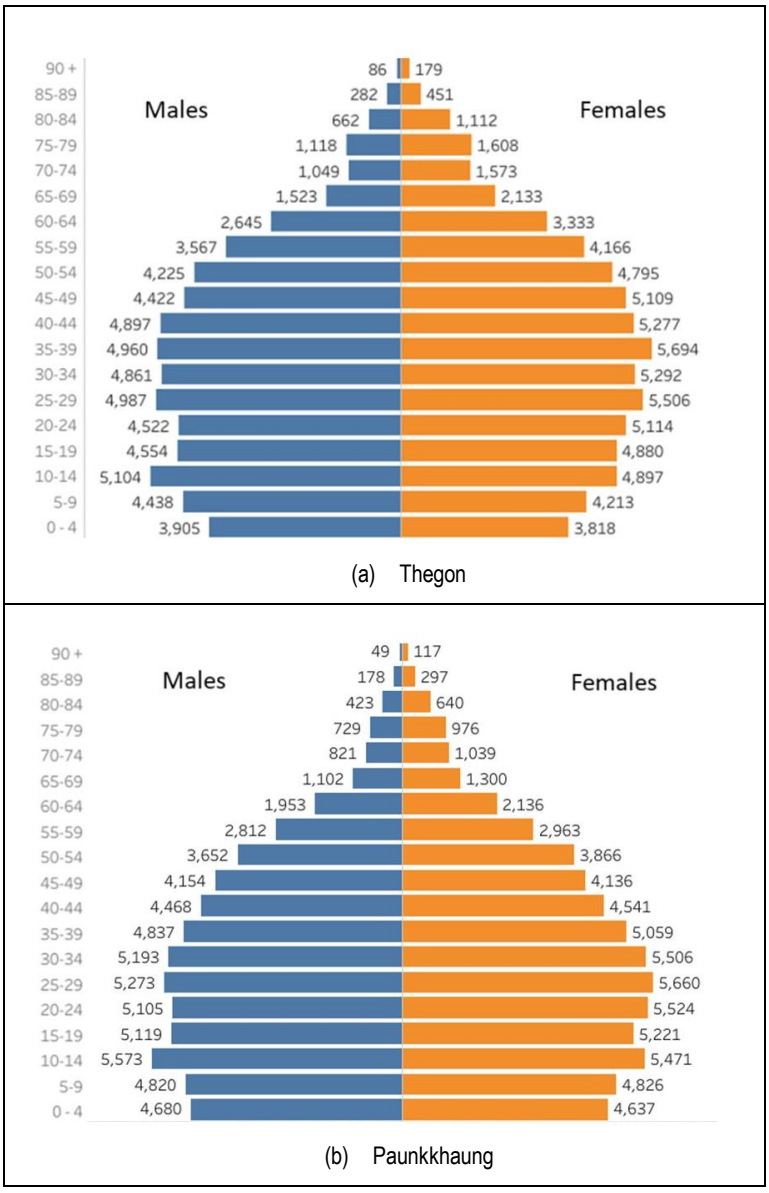
Proposed well	Village Tract	Households	Total	Males	Females
Naweng-1	Ywar Thit	393	1,367	653	714
	Yat Thar	270	859	406	453
	Char Hlyar Kone	607	2,022	935	1,087
Payama-1*	Tha Phan Kaing	1,038	3,974	1,967	2,007
	Kyoet Pin Waing	774	2,901	1,422	1,479

Note *Potential villages tract on the access road
Source: Department of Population, 2017

Population structure, in Thegon there are more females than males with 89 males per 100 females. The female population was greater than male in every age group. Household of 23.7% was headed by female. The birth rate of Thegon has declined over last 10 years which can see the newborns were declined significantly from previous year. The dependent age, children < 14-year-old was 20.4% and elder > 65-year-old was 8.99%.

In Paukkhaung the sex ratio was 95 males per 100 females. The household with female headed was only 16.5%. The birth rate of Paukkhaung has declined as same as Thegon and country. The dependent age, children < 14-year-old was 24.03% and elder > 65-year-old was 6.14%.

The expectation of life at birth particular to the township was not available, but the rate in Bago Region in 2014 was 65.2 years and whilst that of national level at 64.7 years. The female life expectancy was 69.8 years which was higher than that of the males at 60.7 years.



Source: Myanmar Population and Census 2014 from MIMU Township Profiles Dashboard (2019)

Figure 5-29: Population Pyramids of Thegon and Paukkhaung Township in 2014

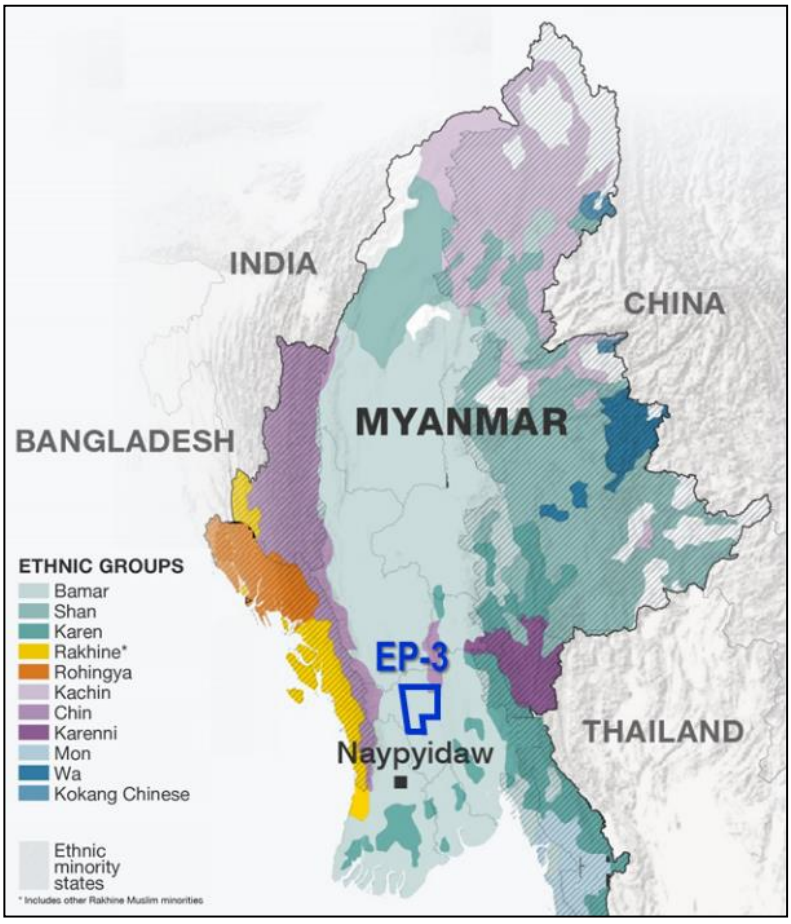
5.5.4 Ethnicity

The Region is made up mostly of Buddhist Bamars. There are some very small minorities of other ethnic groups, including Chins, Rakhine, Kayin and Shan. All respondents are Buddhist.

Most of the Burmese population identify as Buddhist (87.9%) by religion, Christians (6.2%), Muslims (4.3%), and other 1.3%.

Particular to ethnicity, there are very diverse throughout the country. There are 135 ethnic group recognized officially by the government. The major group distribution was presented in **Figure 5-30**.

The majority is Bamar accounted for around 68% of the population. Most of them settled in Central Basin covering Bago (West) Region where the study area is located. Others are minor, listed by greater to smaller population (Smith, 1994, UN, 2019), including the Shan (9%), Karen (7%), Rakhine (3.5%), Chinese (2.5%), Mon (2%), other (8%).



Source: Smith (1994) redrawn by Al Jazeera (2017)

Figure 5-30: Ethnicity Distribution in Upper Myanmar

Ethnicity in Paukkhaung Township

The major race currently living in Paukkhaung Township are Kachin, Kayin, Chin, Mon, Bamar, Rakhine, and Shan. Bamar is the largest national race consisting 88% of Paukkhaung Township total population. The second largest race is Chin ethnic group consisting of 10% with the amount of 12,484 people (**Table 5-24**)(**Figure 5-31**).

Table 5-24: Percentage by Race in Paukkhaung Township

No	Race	Population	Township Population	Percentage
1	Kachin	1	125766	0.00080
2	Kayah	-	125766	-
3	Kayin	1829	125766	1.45429
4	Chin	12484	125766	9.92637
5	Mon	1	125766	0.00080
6	Bamar	111078	125766	88.32117
7	Rakhine	8	125766	0.00636
8	Shan	3	125766	0.00239
Total		**125404**	**125766**	**99.71216**

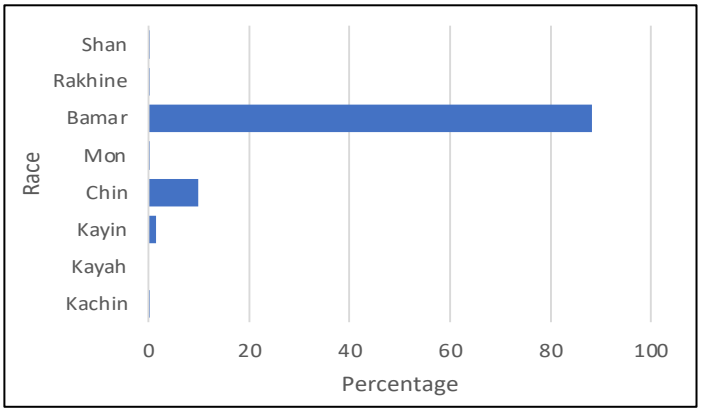


Figure 5-31: Percentage by Race in Paukkhaung Township

Ethnicity in Thegon Township

The major race currently living in Thegon Township are Kachin, Kayin, Chin, Mon, Bamar, Rakhine, and Shan. Bamar is the largest national race consisting 98.5% of Thegon Township total population (Table 5-25)(Figure 5-1).

Table 5-25: Percentage by Race in Thegon Township

No	Race	Population	Township Population	Percentage
1	Kachin	1	131779	0.00076
2	Kayah	0	131779	-
3	Kayin	1552	131779	1.17773
4	Chin	1	131779	0.00076
5	Mon	1	131779	0.00076
6	Bamar	129806	131779	98.50280
7	Rakhine	5	131779	0.00379
8	Shan	4	131779	0.00304
		131370	131779	99.68963

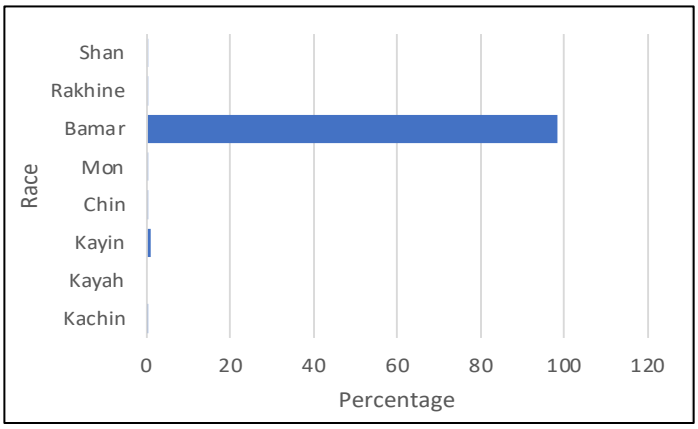


Figure 5-32: Percentage by Race in Thegon Township

5.5.5 Agriculture

Land use in Block EP-3 study area was dominated by agricultural activities particularly dry land cultivation along with irrigated cropland.

Bago Region is the major cultivated area of rice. In 2017/2018 there was 1,167,000 ha of sown area with production of 119,528.36 metric tons.

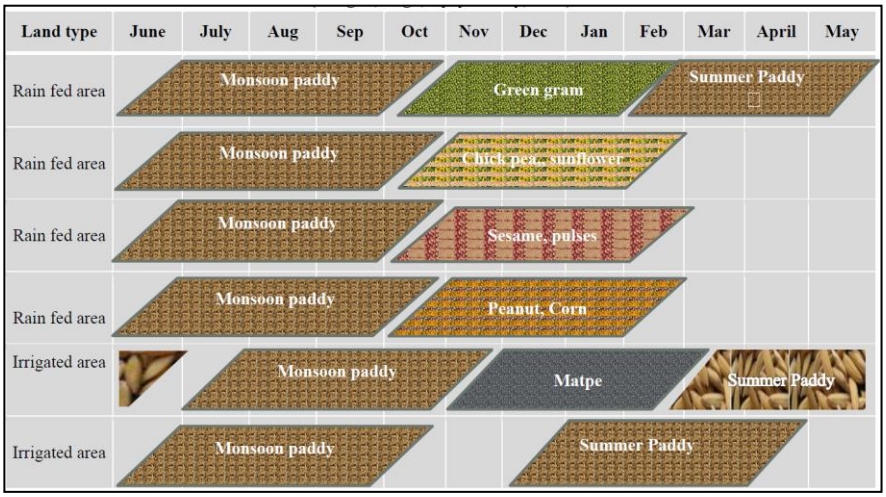


Figure 5-33: Rice based Crop Calendar and cropping pattern in Lower Myanmar (Yangon, Bago, Ayeyarwady, Mon)

Industrial crop farming is fourth important crop in their economy after the farming of cereal, pulses and beans and oilseeds. Industrial crops are cultivated mainly in the flat and undulated area of the Bago (West) Region. Sugarcane accounted for some 45% of total net sown area of industrial crop, with Cotton and Jute contributing around 33% and 22% respectively.

According to the agro-ecological zones, Bago (west) was classified as the Central Lowland. MOALI (2019) reported that there was about 62% of household in Bago (West) raised up the livestock, animals or poultry. The major livestock in region were Drought Cattle (27%) and Pigs (22%). In average each household may has 3.3 Draught Cattle and 2.6 Pigs.

A total 85,031 acres of land is used for agriculture in Thegon Township. The primary ten crops include paddy, peanut, sesame, sunflower, black gram, mung bean, pigeon pea, cotton, sugarcane, and corn.

Detailed information is presented in the following **Table 5-26** .

Table 5-26: Priority Crop Production in Thegon Township

No	Crops	Targeted Acre (2019-2020)		2019-2020			
				Cultivate	Harvest	Rate	Production (Baskets)[1]
1	Paddy	Summer	6007	6081	6081	88.8	539993
		Rainy	82628	82628	79360	73.21	5809946
2	Peanut	Rainy	6774	6826	6829	54.75	373888
		Winter	4656	4656	4656	62.31	290115
3	Sesame	Rainy	5875	5877	5877	10.18	59828
		Winter	2339	2339	2339	12.14	28395
4	Sunflower	-	-	20	20	11.1	222
5	Black gram	-	30624	30629	30629	19.81	606760
6	Mung bean	Rainy	449	449	449	16.68	7489
		Winter	2221	2221	2221	16.33	36269
7	pigeon pea	-	1049	1001	1001	16.78	16797
8	cotton	-	189	39	39	387.54	15114
9	sugarcane	-	8641	8960	4964	22.17	110052
10	corn	-	-	-	-	-	-

[1]Production is in Baskets or tin -Metric 40.9 L or Imperial (9 gallons or 1 and 1/8 bushels.

According to the land use from 2019-2020 GAD data, the cultivated land area of Paungde Township covers 98,603 acres of which 69,153 acres of that is the paddy field (**Table 5-27**).

Table 5-27: Priority Crop Production in Paungde Township

No	Crops	Targeted Acre (2019-2020)		2019-2020			
				Cultivate	Harvest	Rate	Production (Baskets)[1]
1	Paddy	Summer	22000	23642	23642	92.62	2189722
		Rainy	73529	73514	-	-	-
2	Peanut	Rainy	6457	6505	6505	65.89	428614
		Winter	5434	5127	5127	60.24	308850
3	Sesame	Rainy	11439	11461	11461	13.62	156099
		Winter	7627	7649	7649	10.36	79244
4	Sunflower	-	98	-	-	-	-
5	Black gram	-	37529	37591	37591	17.68	664609

No	Crops	Targeted Acre (2019-2020)		2019-2020			
				Cultivate	Harvest	Rate	Production (Baskets)[1]
6	Mung bean	Rainy	605	6842	6842	18.29	125140
		Winter	6224	613	613	18.45	11310
7	Pigeon pea	-	1550	6229	6229	18.27	113804
8	Cotton	-	3885	1570	-	-	-
9	Sugarcane	-	1354	3884	-	-	-
10	Corn	-	-	1130	-	-	-

[1]Production is in Baskets or tin -Metric 40.9 L or Imperial (9 gallons or 1 and 1/8 bushels.

5.5.6 Industry

5.5.6.1 Overview

In Bago Region, many industrial zones have been established, (1) Pyay Industrial Zone including Nawaday Zone, (2) Bago Industrial Complex (foreign zone), (4) Bago Industrial Complex (Local Zone), (5) i-Land Park Myanmar Industrial Park, (6) Inntakaw Industrial Zone, and (7) Daik-U Industrial Area.

5.5.6.2 Pyay Industrial Zone (PIZ)

The nearest to Block EP-3 is Pyay Industrial Zone (PIZ) and others located at Bago City. PIZ is located in Pyay District. In 2014 only 152 from 467 registered enterprises have operated in PIZ, both of old and new zone. Its main products are consumer goods, wooden products, machinery spare parts and food and agro-based products. And on the proposed access road to the Payama-1 Well, there is the In Ngar Gwa Sugar Mill and its worker residents.

5.5.6.3 Thegon Township

Thegon Township is located in Bago Region and it is one of the economically important townships. Agriculture is the crucial business of local people. Thegon Township is located on the way of Yangon-Pyay Railway, Wat Poke- Paung Talal Highway and it has good accessibility. Rice is the main local product of the township and it is exported to Mandalay and Magway Region.

There is no Industry in Thegon Township but cottage industries are running as a family business in Thegon Towenship. The following show the cottage industries of Thegon Township.

No	Township/Town	Category	Quantity
1	Thae Kone	Sewing	25
		Gold smith Industry	5
		confectionery	11
2	Pa Ti Kone	Sewing	8
		Gold smith Industry	11
		Blacksmithing	2
		confectionery	2
3	In Ma	Sewing	20

No	Township/Town	Category	Quantity
		Gold smith Industry	9
		Blacksmithing	2
		confectionery	8
		Traditional weaving	1
Total			**104**

5.5.6.4 Paukkhaung Township

Paukkhaung Township is located in Bago Region and it is one of the economically important townships. Agriculture is the crucial business of local people, moreover; they also do trading. Paukkhaung Township is located on the Pyay-Paukkhaung Township-Taunggu Highway and it has good accessibility. The main products of Paukkhaung Township are rice, sesame, peanut, cotton and bean and, these products are exported to Pyay Township. The products that are imported from Pyay Township are food, machines and other consumer goods.

There is No Industry in PaukkhaungTownship but Private factory and cottage industries are running as a family business in PaukkhaungTownship. The following tables show the Private factory and cottage industries of PaukkhaungTownship.

Private Factory

No	Township/Town	Factory Name	Type	Government\ Private	Labor Force
1	Pauk Khaung	Inn Nga Khwa	Sugar Factory	Private	330

Cottage Industries

No	Township/Town	Category	Quantity
1	Paukkhaung	Sewing	25
		Gold smith Industry	5
		confectionery	11
Total			**104**

The Sugarcane Mill owned by union of Myanmar Economic Holding Ltd. The Sugarcane Mill owns the proposed access road to Payama-1. Therefore, there could be issues with traffic during the sugar cane harvest season. The sugar cane harvest season is from the last week of November to December.

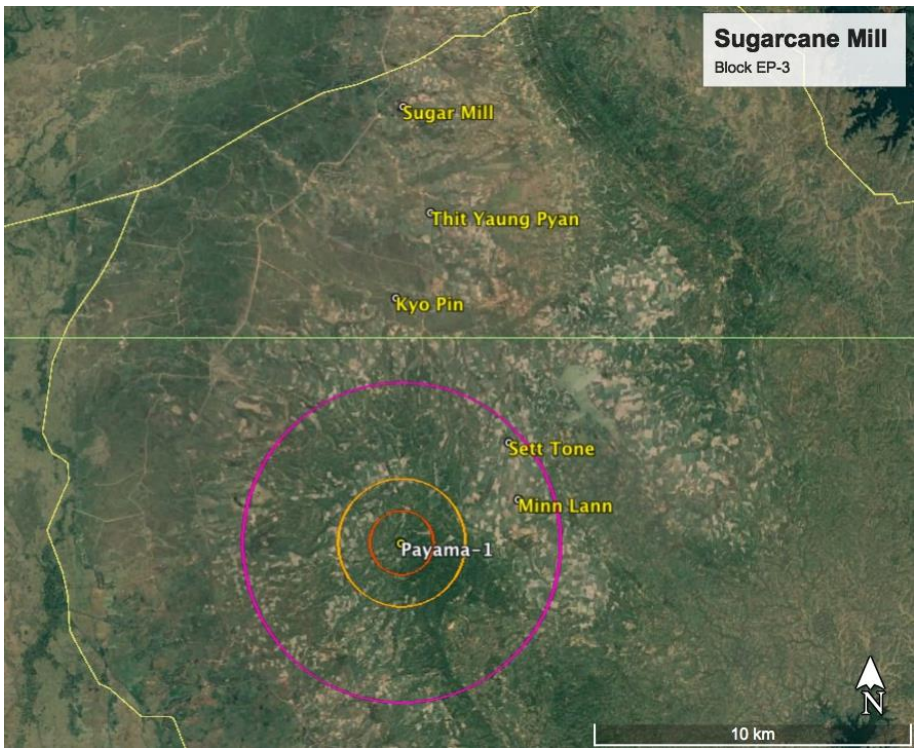


Figure 5-34: Sugarcane Mill in relation to Payama-1 wellsite in Paukkhaung Township

Figure 5-35: Sugarcane Mill in Paukkhaung Township

5.5.7 Fishery and Aquaculture

In 2016, total national fish production was 4,645,020 metric tons. Inland and marine fisheries make up nearly 78% of Myanmar's fish production, at 3,630,600 metric tons, and remain a key contributor to the national fish supply. Aquaculture has grown significantly in the past decade, and has now reached 22% of annual fish production, 1,014,420 metric tons in 2016 (according to government statistics reported to FAO)[7].

Based on data from the Food and Agriculture Organization (FAO), world fisheries production in 2012 was at 158 million MT. Marine capture fisheries accounted for 50 percent of the global production or 79.7 million MT. About 76.2 percent of the production came from 18 countries with China as the top producer[8].

Major fish species cultured include Rohu (*Labeo rohita*), Catla (*Catla catla*), Common carp (*Cyprinus carpio*), Grass carp (*Ctenopharyngodon idellus*), Mrigal carp (*Cirrhinus mrigala*), Silver carp (*Hypophthalmichthys molitrix*), Tilapia (*Tilapia spp.*), Striped catfish (*Pangasius sutchi*), Philippine catfish (*Clarias batrachus*). Recently, DoF successfully cultivated another three species of freshwater fish, namely *Piratus branchatus*, *Notopterus chitala* and *Osphronnemus gouramy*.

Around 90 percent of Myanmar's inland fish farms are located in the delta area across the Ayeyarwady, Yangon, and Bago regions (DOF 2016). Most of these farms are found within a 25–50 km radius of Yangon. Three townships (subdistricts) to the west of Yangon (Maubin, Twantay, and Nyaungdon) account for nearly two-thirds of the delta's pond area.

In Bago Region, the main fishery processing product is fish paste, which is usually made from several types of fish, i.e. barbs (Barbus spp./Puntius spp.), river catfish (Mystus spp.), banded gourami (Trichogaster fasciata), Burmese glassfish (Ambassis baculis) and Malayan flying barb (Esomus malayensis). The highest catch for fish processing was barbs at 448.52 tonnes, followed by river catfish at 270.94 tonnes. The fermented fish paste is manufactured by mixing the fish meat with steamed rice and salt. Afterwards, the mixture is packed using taung zun leaf. The whole process takes about three days.

Also in Bago Region, there is a widely practiced system of local/indigenous aquaculture. The system is a rice field fishery where fish are spawned and feed in the flooded rice fields during the monsoons then moved to ponds as flooding declines for harvesting. The Myanmar system is unique as the trapped fish are fed and brood stock are selected for the next year. The ponds are small, 80% are fewer than 0.25 acres (1112 m^2), but also numerous, ranging from 50 to over 150 per village. The fish trapped in the ponds are fed and then harvested after 5 months. During harvest, 10%–20% of the fish are selected and saved for the next year's brood stock. Harvested fish are primarily black fish (snakehead, catfish and climbing perch), however 15 other species have been identified.

Fish are sold to local township markets, traded with fellow villagers in exchange for harvesting and sold within the village. The ponds are also multiuse, being used for household water, watering animals, and growing trees, fruit trees and vegetables on the pond banks.

Block EP-3 is mostly located in Pyay District, and covers Thegon, Paungde, Paukkhaung and Pyay Townships. In Thegon Township, where both Payama-1 and Naweng-1 wells are located, there were 3,270 acres of fish farms and 627 fishponds in 2019-2020 according to data from the General Administration Department. However, there is no shrimp farming in Thegon Township.

[7] World Fish; Myanmar: https://www.worldfishcenter.org/country-pages/myanmar
[8] FAO fishery country profile: the Union of Myanmar : https://data.opendevelopmentmekong.net/library_record/fao-fishery-country-profile-the-union-of-myanmar

In Pyay Township, there are 55 acres of fish farms and 66 fishponds. The production was 686 viss in 2019-2020.

There is no aquaculture in Paungde or Paukkhaung Townships. The detailed information is summarized in **Table 5-28**.

Table 5-28: Fish Farming in Block EP-3

No	Year	Township	Fish		
			Number of Ponds	Acre	Production (viss)
1	2019-2020	Thegon	627	3269.88	8464
2	2019-2020	Pyay	66	54.719	686
3	2019-2020	Paungde	-	-	-
4	2019-2020	Paukkhaung	-	-	-

Note: Viss is A Burmese unit of measure for weight, approximately 1.63293 kilograms (3.6 pounds).

5.5.8 Waste Management

Myanmar has been facing considerable challenges with the management of waste in the recent past as a result of increasing income and consumption levels, urban growth, and lack of effective waste treatment and disposal methods. Waste management in Myanmar has traditionally been the responsibility of township and city development committees designated within respective States and Regions. Waste collected by respective townships and city development committees is transported to open dumping sites. Recycling activities, if carried out is mostly by the informal sector, which includes waste pickers, waste collectors, and waste dealers.[9]

The Current township waste management system in Myanmar are open dumpsite with open burning. The non-hazardous general wastes can be disposed of at the local waste dump under the approval of the Township CDC. However, all general non-hazardous wastes will need to be managed by an approved hazardous waste Management Company.

Depending on the location, human wastewater and grey water management in Block EP-3 is disposed of variously by: flush/pour systems to piped sewer system/septic tank, pit latrine or open space. Slab toilets, composting toilets, bucket, hanging toilet, hanging latrine are used (DOH, 2010). The CDC has limited liquid waste treatment or management operations.

5.5.9 Irrigation and Agricultural Water Sources

The country has 18.2 million ha of arable land, of which only 13.3 million ha (73%) are cultivated at present. In the monsoon season, only 2.1 million ha of cultivated land are irrigated, while the remaining 11.2 million ha are rain-fed[10]

Irrigated areas were traditionally supplied through weirs for river diversion or dams and tanks, but wells and pumping in rivers have developed quite substantially in recent years (FAO, 1999). Pump irrigation was promoted in the 1980s by programmes implemented by the Agricultural Mechanization Department. Water Resources Utilization Department has been implementing pump irrigation water supply programme using high discharge capacity pumps since 1995. Other types of irrigation water supply include windmills, watermills, watering with buckets, ponds, etc.

Due to lack of water, irrigation system has been developed to support sufficiently agricultural areas which is away from Ayeyarwaddy River.

[9] Waste Management in Myanmar: Current Status, Key Challenges and Recommendations for National and City Waste Management Strategies, IGES 2017
[10] Republic of the Union of Myanmar: Irrigated Agriculture Inclusive Development Project, ADB 2016

In 2019, four reservoirs including distribution network in Bago (west) were improved named North Na Win irrigation system, South Na Win irrigation system, Wegyi irrigation system, and Taung Nyo irrigation system. These irrigation systems are lined up from north to south respectively. The water for cultivated areas in Block EP-3 was supplied from South Na Win Dam and Wegyi Dam, partially rainwater in wet season.

The water resources near the project areas are detailed in **Table 5-29, Figure 5-36** and **Figure 5-37**.

Table 5-29: Water Resources Near Project Areas

Proposed well	Village*	Distance (km) from well
Naweng-1	Inn Ma Swamp	4.0
	Myit Makha Stream	4.8
Payama-1	Shwe Lay Dam	7.0

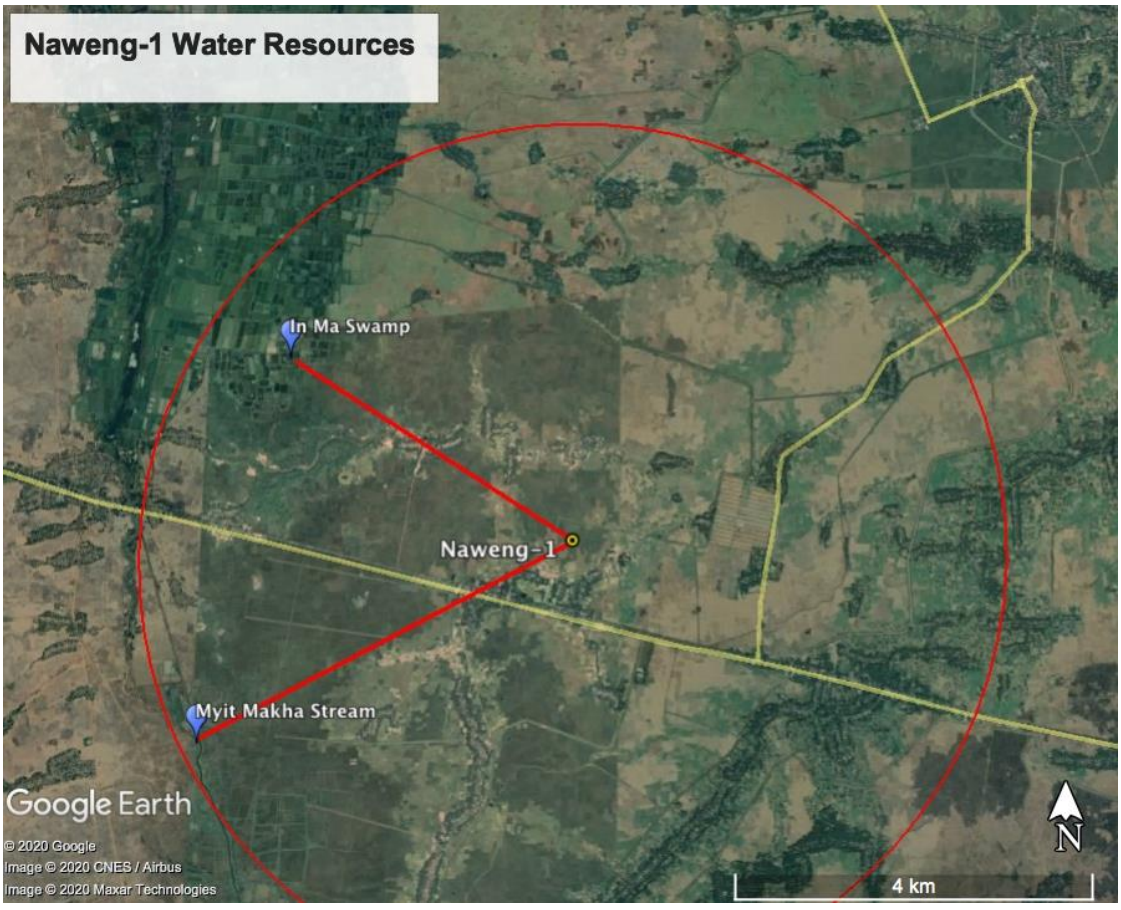


Figure 5-36: Water Resources near Naweng-1 Well

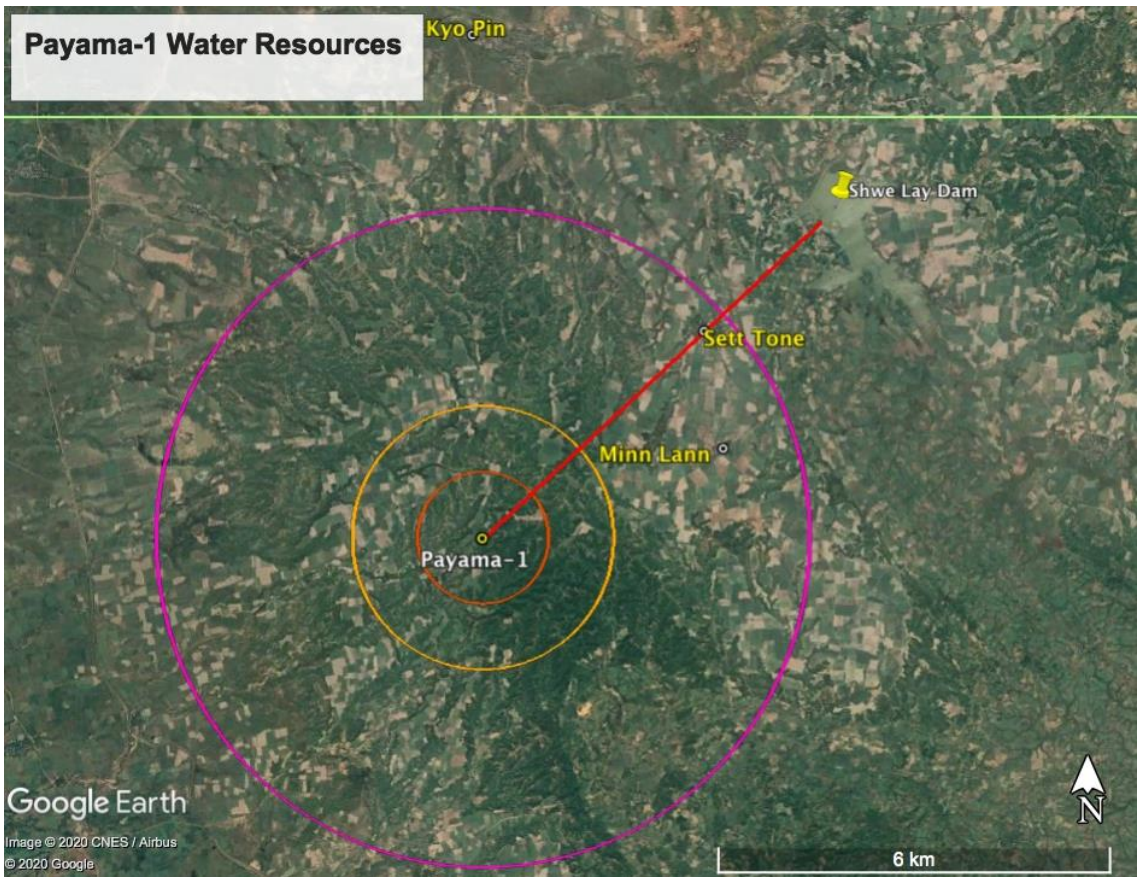


Figure 5-37: Water Resources near Payama-1 Well

5.5.10 Transportation

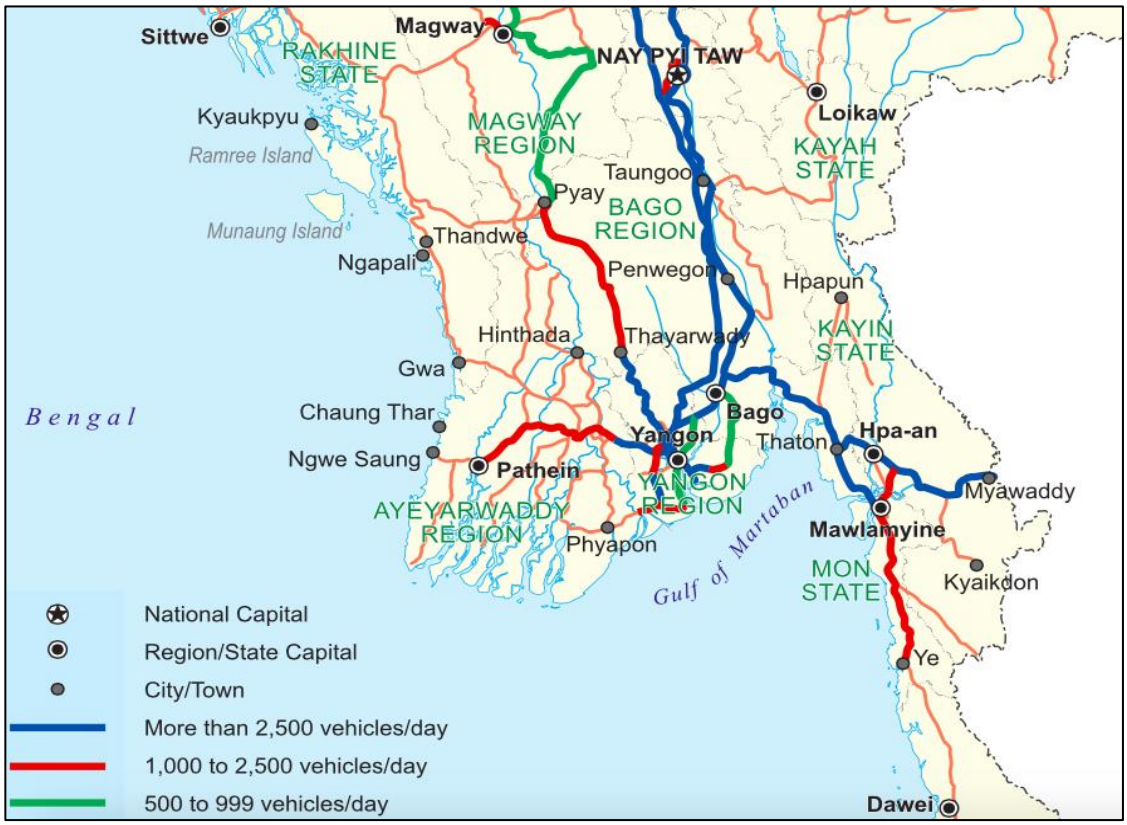
5.5.10.1 Roads

The major mode of transportation in central Myanmar is roads. There are six major highways in Myanmar. As a result, central Myanmar has a sizable road transport network with Mandalay as the major hub. From Mandalay, the network extends into upper Myanmar to Kachin State and China (through Muse in northern Shan State), and to western Myanmar and India, and south to Yangon.

Traffic-related deaths rates are increasing in Myanmar. The rate of fatalities each year increased to 1,853 in 2008, 2,496 in 2011, 3,721 in 2013, and then to 4,313 in 2014. The 4,887 total deaths from 17,384 traffic accidents in 2016 is similar to the 4,375 deaths in 15,859 traffic accidents in 2015.[11] The absolute level of fatalities in Myanmar is still moderate when compared with that of similar countries. The rate of fatalities per 100,000 people was estimated to be 2.5 in 2006. It reached 8.4 in 2014. Despite the increase, this is not currently considered a high rate per 100,000 people on an international comparative basis. In 2010, the Philippines had a fatality rate of 8.3, Indonesia 17.7, Cambodia 17.6, and Thailand experienced a very high rate of 38.8.[12]

The traffic load for Myanmar roadways is shown in **Figure 5-38**. The transportation route will use a variety of roads with traffic levels of over 2,500 vehicles /day near Yangon, and then reducing to below 500 vehicles /day near the project area.

[11] Myanmar Transport Brief, Issue 21, 11 May 2017
[12] Asian Development Bank. Myanmar transport sector policy note: Road safety. Mandaluyong City, Philippines: ADB, 2016.



Source: Source: ADB estimates based on Ministry of Construction highway traffic data. 2013

Figure 5-38: Traffic Load on Myanmar Roadways

The 2014 Census shows that in In Thegon Township, 46.1 per cent of the households have bicycle as a means of transport and it is the highest proportion, followed by 28.1 per cent having motorcycle/moped. In Paukkhaung Township, 38.7 per cent of the households have Cart (bullock) as a means of transport and it is the highest proportion, followed by 32.0 per cent having motorcycle/moped (**Table 5-30**)

Table 5-30: Response of Thegon and Paukkhaung Township in Block EP-3 regarding mode of transportation

Vehicle type	Thegon Township		Paukkhaung Township	
	quantity	%	quantity	%
Car/Truck/van	220	0.4	413	1.3
Motorcycle/moped	13,950	28.1	10,454	32.0
Bicycle	22,914	46.1	7,758	23.7
4-Wheel tract	454	0.9	239	0.7
Canoe/ Boat	1,073	2.2	1,012	3.1
Motor boat	64	0.2	158	0.5
Cart (bullock)	10,943	22.1	12,717	38.7
Total	**49,618**	**100**	**32,751**	**100**

Source: Modified from the 2014 Myanmar Population and Housing Census

Central Myanmar has a relatively well-developed transport system. Driving to Thegon could use the National Highway No.2, Yangon-Pyay Road, which is developed heading north up to central lowland on eastside of Ayeyarwady River and end up in Pyinsi, Mandalay Region, where it meets National Highway No.1. From Yangon to Thegon will take about 5hrs. drive, or if from Nay Pyi Taw will take about 5.5 hrs drive through Thaungoo. This is the best choice with shortest travel time.

5.5.10.2 Railroad

The rail system could connect throughout the country. Thegon could be reached by rail as well. The rail from Yangon to Pyay, and Pyay to Yangon, will take about 10.5hrs which has only one trip per day from both destinations. The rail will arrive Thegon prior to Pyay Station and terminated at this station. There are 4 railway stations in Thegon; Paungde, Padigon, Thegon and Sinmizwa Station from south to north. The bogies and facilities in some classes need updated. The routes to tourist attractions are cleaner and more comfortable.

5.5.10.3 Air

There is no airport in Thegon and nearby districts. The nearest airport is in Magway, which is about 5hrs drive.

5.5.10.4 River Transport

Formerly the traveller could visit Pyay (and Thegon) by sailing on route of Mandaly-Bagan-Pyay-Yangon. Currently there are only local routes and some routes are temporary closed (as of Nov 2019).

5.5.11 Communications

The communications in Thegon Township shows that mobile phones are used by (23.2%) and phone line is used by only 2.4%. The communications in Paukkhaung Township shows that mobile phones are used by (16.9%) and phone line is used by only 3.0%. [13]

5.5.11.1 Thegon Tonwship Transportation

There is no Air and Water Transportation in Thegon Township and the list of transportation ways are as shown in following table.

(A) Railway and Station

No	Railway	Township		Length	Station	
		From	to		Big	Small
1	Yangon – Pyay	Patikone	Sin Mee Swe	13.25	3	1

(B) Bus Station

No	Township/ Town	Bus Gate	Ltinerary	Vehicle Type	No. of Vehicle
1	Thae Kone	Bwa Thit	Thae Kone – Yangon	Express	2
2	Thae Kone	Khine Khnie Phyo	Thae Kone – Yangon	Express	3
3	Thae Kone	Aung Yadanar	Thae Kone – Yangon	Express	1
4	Pa Ti Kone	Yadanar Aung	Pa Ti Kone – Yangon	Express	1
5	Pa Ti Kone	Aung Yadanar	Pa Ti Kone – Yangon	Express	1
6	Pa Ti Kone	Shwe Oh Si	Pa Ti Kone – Yangon	Express	1

[13] 2014 Myanmar Population and Housing Census (2014 MPHC)

5.5.11.2 Paukkhaung Tonwship Transportation

There is no Air, Water and Railway Transportation in Paukkhaung Township and the list of bus transportation are as shown in following table.

(A) Bus Station

No	Township/ Town	Bus Gate	Itinerary	Vehicle Type	No. of Vehicle
1	Pauk Khaung	Kar Lay Gate	Paukkhaung– Pyay	Dyna	40
2		Phone Myat Paing	Paukkhaung– Pyay	Express	2
3		Myo Sat Thit	Paukkhaung– Pyay	Express	2

5.5.12 Power Supply & Electricity

Installed capacity in Myanmar grew by a factor of four during 2000–2014 and reached 4,422 MW in 2014.[14] The Ministry of Electricity and Energy (MOEE) has pledged to provide an additional 3,600 megawatts of electricity within the next four years.[15]

The Shwegyin Dam is in the eastern part Bago Region. It is a 478 metres (1,568 ft) long, 41 metres (135 ft) wide and 0.8 metres (2.5 ft) thick zone-type dam with a water storage capacity of 2,078,417 megalitres. It is equipped with four 18.75-MW Francis vertical shaft turbines that generate 262 million KW hours per year.

The major source of lighting in Thegon Township is from candle (45.5%), followed by Electricity (28.5%), Battery (16.9%) and Solar system (5.1). For household cooking, most of the interviewees either cook with firewood (90.3%) or Electricity (4.8%).[16] The Power Supply & Electricity sources in the township are shown in **Table 5-31**.

Table 5-31: Power Supply & Electricity Sources in Thegon

Source of Lighting								
Electricity	**Kerosene**	**Candle**	**Battery**	**Generator**	**Water mill**	**Solar system/**	**Other**	**Total**
10,261	500	16,372	6,088	543	*	1,823	345	36,292
28.5	1.4	45.5	16.9	1.5	0.1	5.1	1	100%
Type of cooking fuel								
Electricity	**LPG**	**Kerosene**	**Bio Gas**	**Firewood**	**Charcoal**	**Coal**	**Other**	**Total**
1,719	*	25	*	32,447	1,275	65	393	35,924
4.8	<0.1	0.1	<0.1	90.3	3.5	0.2	1.1	100%

Source: Modified from the 2014 Myanmar Population and Housing Census.

The major source of lighting in Paukkhaung Township is from candle (32.2%), followed by Battery (32.3%) and Solar system (16.0%) and electricity (12.9%). For household cooking, most of the interviewees either cook with firewood (93.3%), charcoal (3.1%) and Electricity (2.6%).[17] The Power Supply & Electricity sources in the township are shown in **Table 5-32**.

[14] ADB - Power Sector Development in Myanmar, 2015
[15] News Article, Govt moves to complete five power projects, Access from http://www.elevenmyanmar.com/local/13159 on March 23, 2018
[16] 2014 Myanmar Population and Housing Census (2014 MPHC)
[17] 2014 Myanmar Population and Housing Census (2014 MPHC)

Table 5-32: Power Supply & Electricity Sources in Paukkhaung

Source of Lighting								
Electricity	**Kerosene**	**Candle**	**Battery**	**Generator**	**Water mill**	**Solar system/**	**Other**	**Total**
4,187	696	10,455	10,450	501	*	5,160	894	32,343
12.9	2.2	32.3	32.3	1.5	<0.1	16.0	2.8	100%
Type of cooking fuel								
Electricity	**LPG**	**Kerosene**	**Bio Gas**	**Firewood**	**Charcoal**	**Coal**	**Other**	**Total**
847	*	20	*	30,162	1,008	*	283	32,320
2.6	<0.1	0.1	<0.1	93.3	3.1	<0.1	0.9	100%

Source: Modified from the 2014 Myanmar Population and Housing Census.

5.5.13 Local Socio-Economic Context

IEM conducted stakeholder engagement with local officials for Thegon Township and will conduct focus group meetings and socio-economic surveys in 22 villages within the Thegon Township which are located closest to the potentially affected area of the survey footprint 1km buffer zone distributed throughout the block as well as review of various technical reports, government, and internet research.

The Bago Region economy is strongly dependent on the timber trade. The Taungoo District in the northern end of the Bago Region contains teak and other hardwood resources.

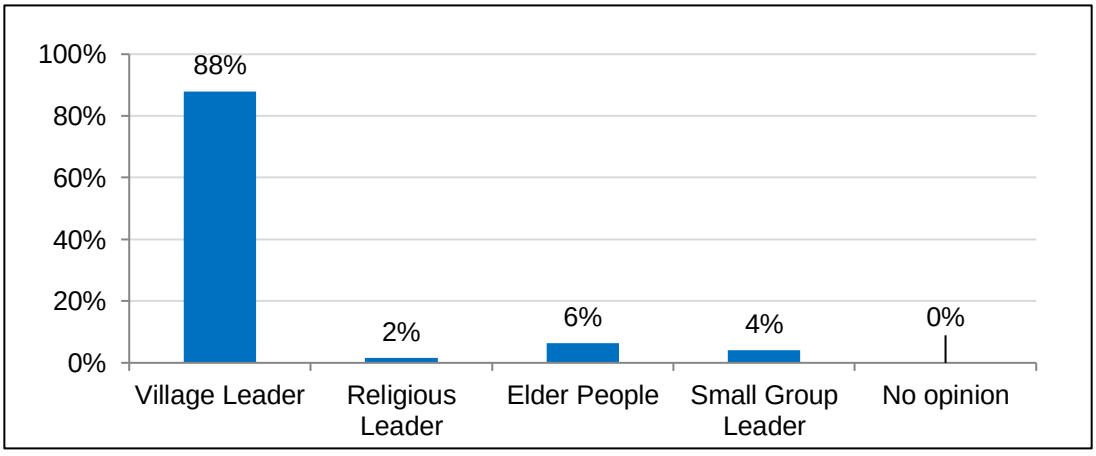
The major crop is rice, occupying over two-thirds of the available agricultural land. Other major crops include betel nut, sugarcane, maize, groundnut, sesamum, sunflower, beans and pulses, cotton, jute, rubber, tobacco, tapioca, banana, Nipa palm and toddy. Industry includes fisheries, salt, ceramics, sugar, paper, plywood, distilleries, and monosodium glutamate.

Pyay is an important trade center for the Ayeyarwady Delta, Central and Upper Myanmar. The main crop is rice, but some cotton and tobacco are grown, while the custard apples are famous. Sugarcane is an important agricultural crop near the proposed Payama-1 wellsite.

5.5.13.1 Community Decisions

At community level, local villagers identified the village leader is responsible for community decision making 88%, while religious leaders (2%), elder people (6%) and small group leaders (4%). (**Figure 5-39**).

Figure 5-39: Responsibility for community decision making in local communities



5.5.13.2 Land & Housing Ownership

The conditions of housing units are important characteristics that indicate the quality of life of the population. The 2014 Census showed that about four out of five households in Myanmar are owners of their housing unit. In urban areas, 66% of households own the housing units where they reside, 20% are tenants while 7% live in housing provided by the Government. In rural areas, 93% of households own the housing units where they reside and 2.4% are tenants.

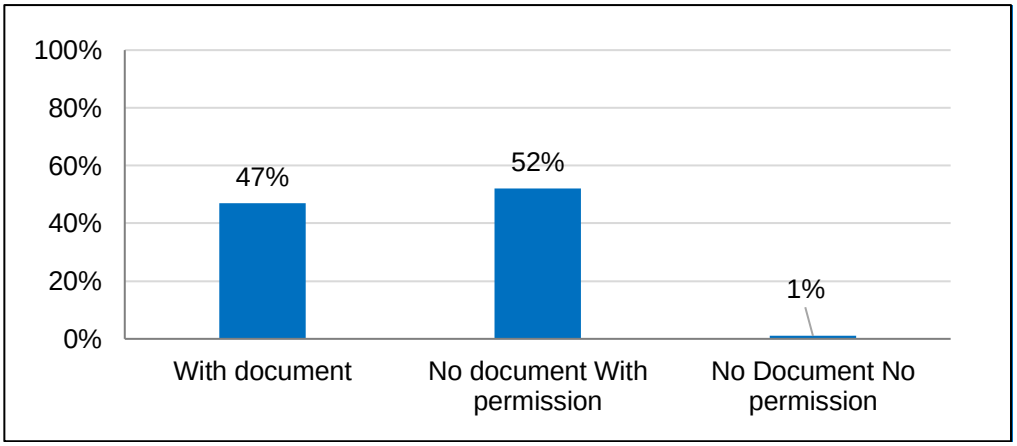
5.5.13.3 Housing

The 2014 Census shows that in Thegon and Paukkhaung Township the houses were often made from wooden and bamboo. From baseline information of Ministry of Immigration and Population showed that approximately 55% live in wooden house, 33% of them live in bamboo house, 5% live in semi-pacca house and 7% live in apartment/condominium or other buildings.

5.5.13.4 Home Ownership

The conditions of housing units are important characteristics which indicate the quality of life of the population. The 2014 Census showed that 77% are owners of their housing, while 11% are renter of their housing in the village's surveys for this project, the majority (88%) of the households surveyed, own the land where they live. The households surveyed show ownership in varied ways: 73% of villagers have documents, 26% have permission but do not have documents, and 1% have neither document nor permission (**Figure 5-40**).

Figure 5-40: Ability to demonstrate land ownership in local communities

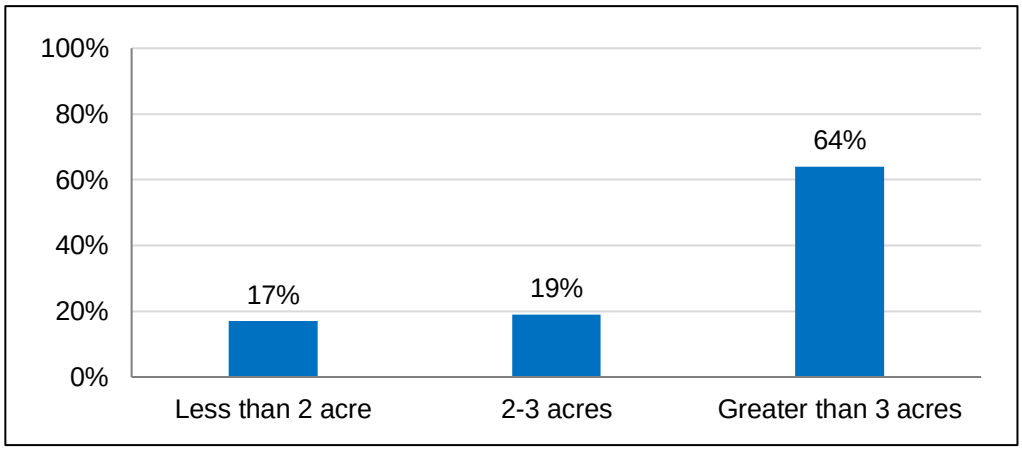


5.5.13.5 Farmland Ownership

Land ownership patterns vary in central Myanmar. In some cases lack of rain has impoverished farmers with the result that lands may be sold and farmers and family members are forced to become tenants and or labour on other larger land holdings simply for survival.

In the community areas surveyed approx. 64% have greater than 3 acres**, 19% have 2-3** acres **and 17% have less than 2 acres** (Figure 5-41)**.** Of this land 86% is cropland and 79% grow rice.

Figure 5-41: Area of farmland owned by households in local communities



5.5.13.6 Income and Employment Near Project Area in EP-3

The survey group indicated that household's had annual household income of 500,000 – 1,000,000 Kyat (44%), while (19%) had annual income of 1 – 2 million Kyat and (16%) had annual income below 500,000 Kyat (Figure 5-42). When asked whether they felt they had sufficient money them indicated that 54% have enough money but no savings, 26% do not have enough, and 20% have enough and have savings.

The primary occupation of those surveyed were farmers (78%) (Figure 5-43). Regarding available labour, 92% of those surveyed indicated that they employ labourers as part of their business, of which 63% come from within the village. The majority 86% of those surveyed felt that larger projects (including oil and gas and infrastructure projects) had not affected labour availability for traditional businesses, while only 14% indicated that it did affect the availability of labour.

Figure 5-42: Annual household income in local communities

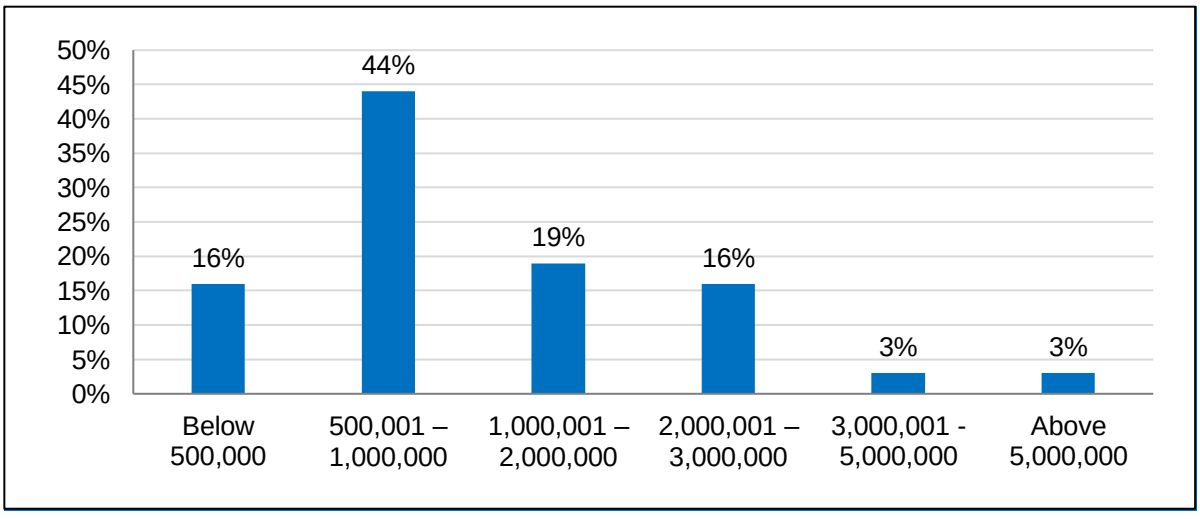
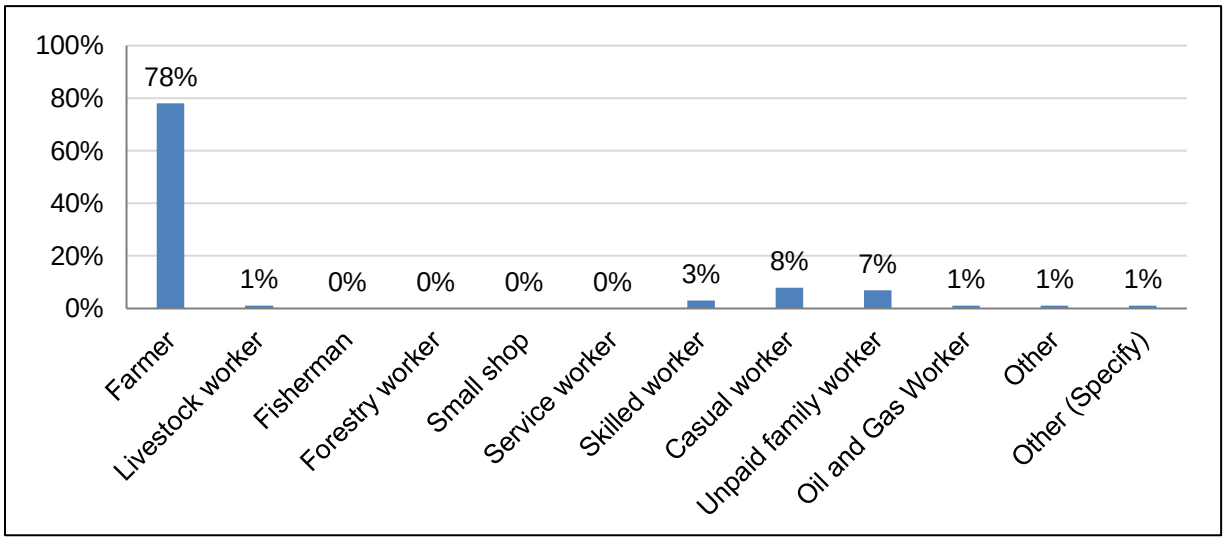


Figure 5-43: Primary occupation in local communities



5.5.13.7 Labour and Migration

In Myanmar, 57% of total population participated in the labor force. 65.9% of population in Thegon participated in labour forces, while 64.3% were employed and 2.5 were not. In Paukkhaung, 66% of population aged 15-64 participated in labor force, while 64.2% were employed but 2.7% were not.

Population who did not participated in labor force, most of them, 55.3% were household worker, 20.8% were fulltime student, 14.5% were elder or retried, and others including ill or disability and did not seek work.

By industrial sector, the population aged 15-64 in Thegon mostly worked in skilled workers in agriculture, forestry and fishery sector 67.4%, followed by hold sales/retailed trades and repair of motor vehicles and motorcycles 6.5% and accommodation and food service activities 5.1%, support and administration services of public and private agencies 3.0%, Scientist and education 2.9%. Other sectors included household and other services, health services, transportation, manufacturing, and mining.

Employed persons aged 15-64 in Paukkhaung were occupied in skilled workers in agriculture, forestry and fishery sector 63.8% as same as Thegon and country, followed by elementary jobs 17.5%, service and sale workers 5.3%, craft and trade workers 3.3%, technician to professionals and managers levels for 3%, and others including clerical support workers, plant and machine operators and assemblers and did not stated.

Labor force Ratio	Labor force participation				Employment				Unemployment			
	Total [1]	Male	Female	Child [2]	Total [1]	Male	Female	Child [2]	Total [1]	Male	Female	Child [2]
Country	57.0	72.5	42.9	12.1	54.7	69.6	41.1	12.5	4.1	4.0	4.2	10.6
Thegon	65.9	84.5	49.4	13.4	64.3	82.7	47.9	N/A	2.5	2.1	3.0	12.4
Paukkhaung	66.0	90.3	42.8	22.3	64.2	88.6	41.0	N/A	2.7	2.0	4.1	8.3

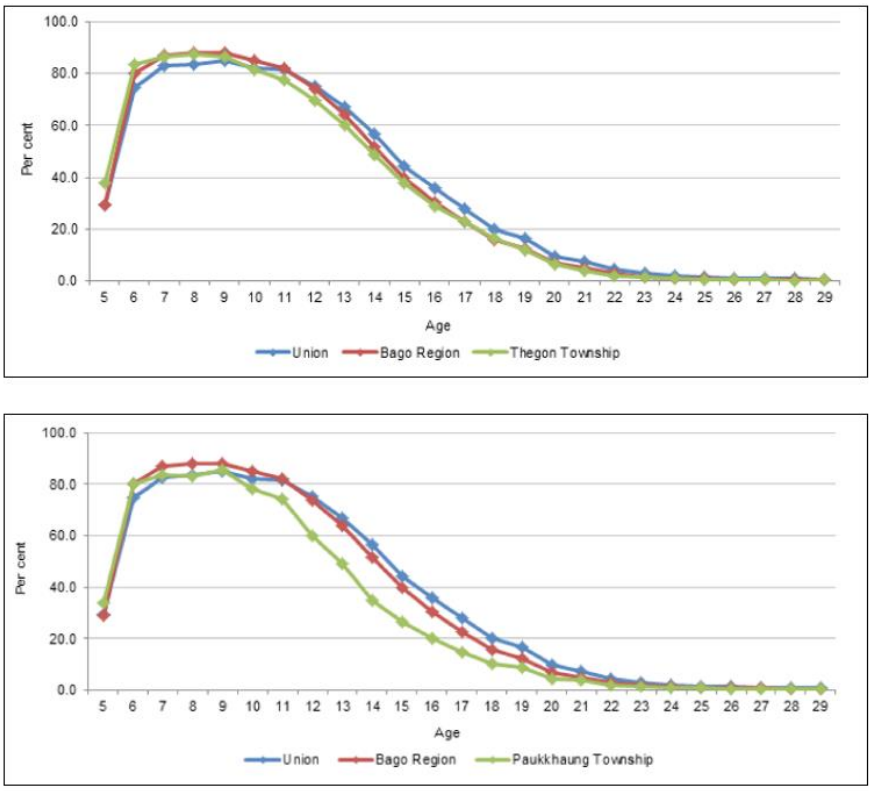
Note: [1] % of population aged 15-64
[2] % of population aged under 15

Migration

There were about 9.3 Million people migrated within country while about 2 million migrated oversea. According to Census 2014, the main reasons for domestic movement were "following family", 40%, and "employment/seeking employment.", 34%. Female were more likely to migrate than male (47%), of such, they moved "following family" as the main reason (49%) while males migrated more for reasons of employment (47%) than females (23%). For oversea migration, the major destination was Thailand which about 70% of movements. There were 790,309 people moved from Bago Region to other regions of country and 169,691 migrated oversea, 4% of international immigrants were from Pyay District. Most of immigrants from Myanmar to Thailand were for employment/seeking employment.

5.5.13.8 Education

There are three types of schools in Myanmar that offer primary education: public, private schools and religious-run schools. The 2014 Census shown the official entry age for primary education in Myanmar was 5 years. Primary school offer for 5-10-year-old which is Grade 1-5. Children aged 5-10 in Bago attend school about 79%, then the number declined extremely after age of 10 (Figure 5-44) while about 11% of population in Bago, 3.7% in Thegon, and 7.4% in Paukkhaung never attend school. In 2017 The average age of school attendance was 6.4. The literacy rate of those aged 15 and over in Thegon Township was 97.8%. It was higher than the literacy rates of Bago Region (94.2%) and the Union (89.5%). Female literacy rate was 97% and for the males it was 98.7%. In 2017 the average years of educational attainment was 6.4 years.

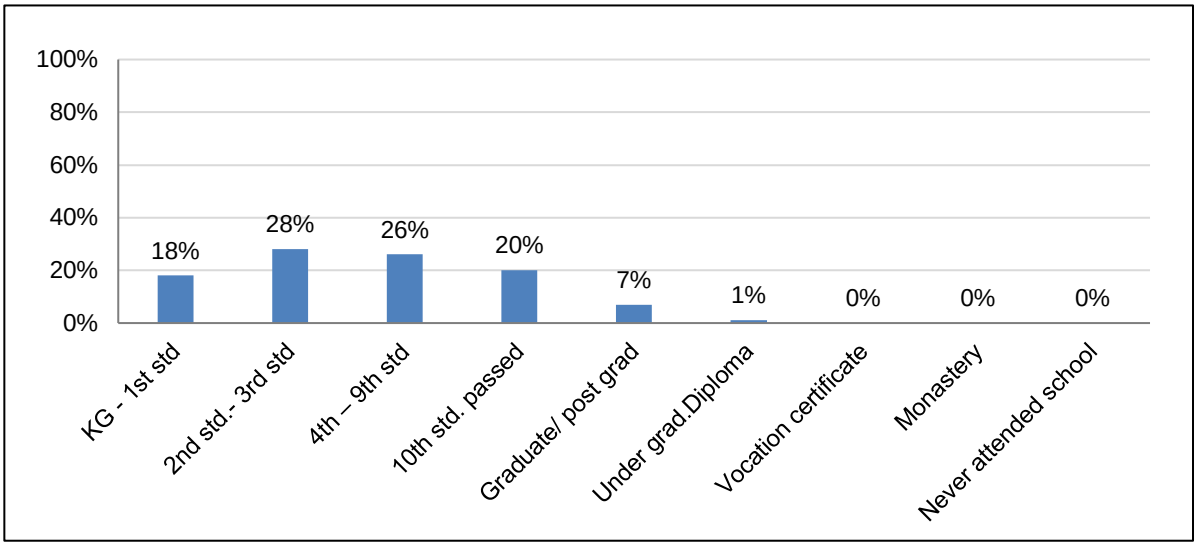


Source: From the 2014 Myanmar Population and Housing Census

Figure 5-44: Availability of access to education in Thegon Township

All respondents (100%) indicated that education was accessible to their family. Approx. 28% of those surveyed had completed 2 – 3 level, while 26% had completed the 4th – 9th level, and 20th had passed the 10th level. Of the total 7% had graduated or had some post graduate education. **(Figure 5-45**)

Figure 5-45: Education levels in local communities



5.5.13.9 Public Health

In 2017, the birth rate of Myanmar was estimated to 17.7 births/1,000 population, the fertility rate was 2.2 children per mother, and the mortality rate was 8.2 deaths per 1,000 population for adult, and 38 infants per 1,000 live birth for infant. And the death rate of infant was estimated declining to 36.8 in 2019 (UN IGME, 2019).

According to the census in 2014 the fertility rate among age between 15-49 was 1.5 in Thegon which was lower than Pyay District, 1.8, Paukkhaung Township, 2.1, Bago Region, 2.4, and country, 2.5, respectively. The infant mortality in Thegon Township was 58 per 1,000 live births and aged under 5 mortality was 68 per 1,000 live births. Of Paukkhaung, the infant mortality rate was 68 per 1,000 live births and aged under 5 mortality was 79 per 1,000 live births. The mortality rates of infant and under 5 of age in Thegon Township were higher than the rates of Pyay District but lower than those in Bago Region and Country level which were 62 and 72 per 1,000 live births respectively. While the rates of Paukkhaung were higher than those of the district and region level.

The disability includes four categories; seeing, hearing, walking and remembering/mental. According to the 2014 census, there were the disabilities, at least one type, of 6,818 persons or 5.2% of population in Thegon Township and 5,435 persons or 4.4% of population in Paukkhaung. Disabilities in seeing it the most, 3,997 / 3,001 persons, secondly in walking, 2,362 / 2,218 persons in Thegon / Paukkhaung respectively. One person may be disabilities in more than one types. The most of disabilities were in the aged over 45.

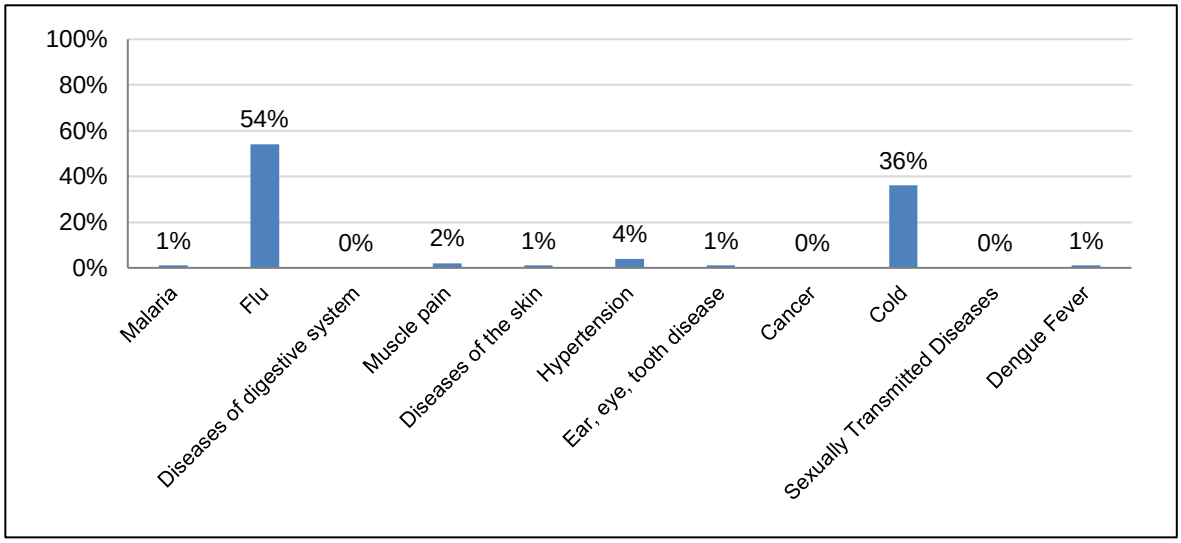
The Ministry of Health and Sports, MoHS, (2018) reported the causes of morbidity and mortality in 3 groups: (1) Communicable Diseases, (2) Non-Communicable Diseases, and (3) External causes (injury and accident) in 2014-2016.

The communicable diseases - there is risk in dengue fever, malaria, typhoid, including HIV/AIDS as listed in top 10 communicable diseases causing morbidity and mortality during 2014-2016. Moreover, Japanese encephalitis and Leptospirosis were warned to tourist.

Actually the first ranges of causes of illness from communicable diseases were Diarrhea and gastroenteritis of presumed infectious origin which occurred in >30% of patient in 2014-2016, and secondly Viral infection of unspecified site which increased every year to >30% in 2016. These diseases were also the causes of in-patient treatment in Bago Region during 2014-2016. The major causes of death in 2014-2016 were Septicemias, caused >30% of deaths as an average and increased up to 45.8% in female in 2016. HIV was ranged in second place for females, 11.6-16.1% while Respiratory tuberculosis, not confirmed bacteriologically or histologically, was the third, 9-11.9%. In males, Respiratory tuberculosis was the second place in 2014-2015 then deceasing in 2016 to 15% while HIV increased from 16.2% in 2014 to 19.1% in 2016.

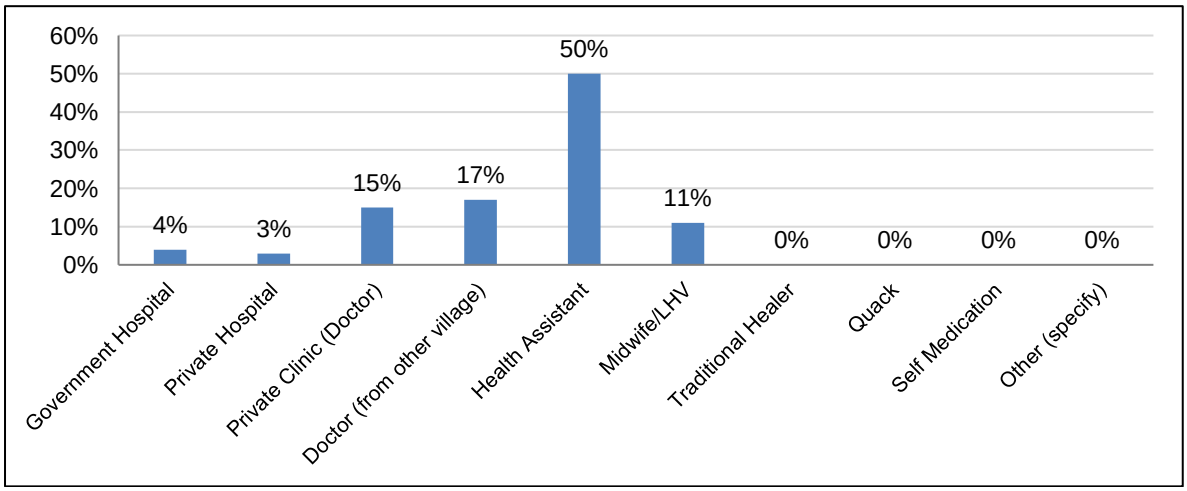
When villagers were asked what common illnesses, the most common illness in each family was Flu (54%), Colds (39%), and hypertension (4%). (**Figure 5-46**)

Figure 5-46: Health conditions in local communities



The primary type of health services being used was health assistant (50%) followed by doctor from another village and a Midwife (17%), 15% from a private clinic doctor. Government hospitals (4%) and Private hospitals (3%) were the other services used. (**Figure 5-47**)

Figure 5-47: Treatment/health services in local communities



5.5.13.10 Health Care

In 2016, there were 1,115 national hospitals and 187 private hospitals reported to the MoHS (MoHS, 2018). The public health service facilities in Myanmar, categorized according to the bed strengths and service delivery pattern, include (1) specialist hospitals, (2) general hospitals, (3) 150- bedded, (4) 100 bedded, (5) 50 bedded, (6) 25 bedded, (7) 16 bedded and (8) station hospitals. Beside the hospital care, Myanmar has the ambulatory care which included (1) urban health center, (2) rural health center and (3) sub center, and (4) maternal and child health clinics.

In Bago Region, there were 109 public and 14 private hospitals. And, as of October 2017, there were 189 rural health centers with 843 sub centers and 35 maternal and child health clinics. There was no specialist hospital in the region. In Pyay District, there is a general hospital in Pyay Town, Pyay General Hospital, which is 45km from Nawaeng-1 Well and 50km from Payama-1 Well. Locally, the hospitals in rural will be small hospitals or station hospitals i.e. Inn-ma (nearest to Naweng-1 Well, 7.5 km), Paukkhaung (30km- the most accessible to Payama-1 Well), Thegon Hospital. The specialist hospitals are available in Magway (4.5hrs drive), Yangon (5.5hrs from Thegon), and Nay Pyi Taw (5.5 hrs drive).

In average the 25-bed hospital had to take care of 1,790 in-patients and 6,950 out-patients per hospital and the general hospital had to take care of 20,400 in-patients and 73,883 out-patients per hospital in 2016.

The human resources of health in country included 16,292 medical doctors and 36,054 nurses working under the management of MoHS. In Bago Region there were 1,033 medical doctors, 2,439 nurses, 49 dentists with 37 dental nurses, 16 pharmacist, 1,279 midwives, 1,353 public health staffs (level I and II) and 409 other types of staffs. Ratio of medical doctors per population was 0.23 per 1,000 in national level which was below WHO recommended number at 1 medical doctor per 1,000 population. The ratio of overall human resources per population was 1.32 per 1,000 (MoHS, 2016 in Saw, 2019). The distribution of medical doctors per 1,000 population in the public sector trended gradually decreasing since 2006. The ratio of medical doctor between urban and rural was widely disparities (Saw, 2019). The health facilities and personnel were presented in following table.

Table 5-33: Health Resources and Personnel Accessible to Study Areas as of 2017

Health Resources/Personnel	Thegon	Paukkhaung	Pyay
Physician	8	7	116
Per population	1:16,510	1:17,621	1:1,944
Nurses	25	19	216
Per population	1:5743	1:6,492	1:1,04
Health assistant	4	7	6
Per population	1:26,416	1:17,621	1:37,600
Hospital/Bed			
General Hospital/ Available beds	-	-	1 - Pyay General hospital/ 296
100-bed Hospital/ Available beds	-	-	-
50-bed Hospital/ Available beds	Paungde Hospital 50	-	-
25-bed Hospital/ Available beds	Thegon Hospital 50	Paukkhaung Hospital 32	Shwedaung Hospital 40
Station Hospital/ Available beds	Inn Ma Station Hospital 30 Padigon 16		-

Source: GAD, 2017, MoHS, 2018.

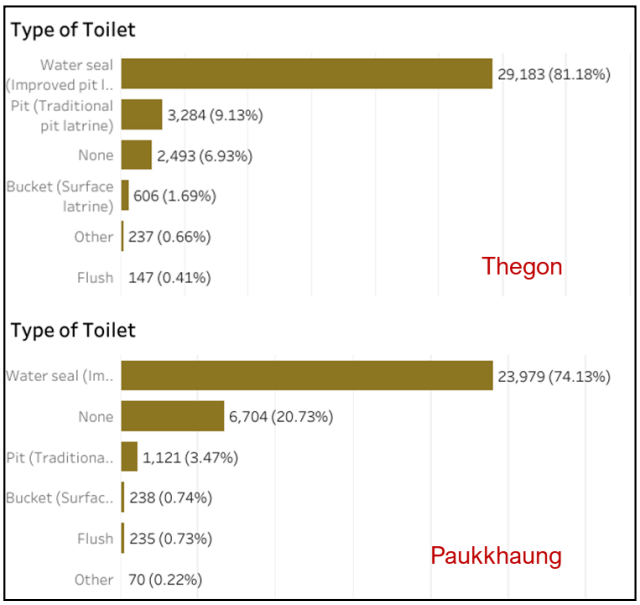
Table 5-34: Public Hospitals Utilization and Services in Country

Types of hospital	Number of hospitals	Sanctioned bed	Available bed	Admission	Out-patient
Station Hospital	694	11,131	12,567	568,313	4,248,136
	Average per hospital	16.04	18.11	818.89	6,121.23
25-bedd Hospital	159	4,000	4,637	284,698	1,105,015
	Average per hospital	25.16	29.16	1,790.55	6,949.78
50-bed Hospital	113	5,650	6,072	339,722	1,336,488
	Average per hospital	50.0	53.73	3,006.39	11,827.32
General Hospital	51	18,300	18,390	1,040,450	3,768,062
	Average per hospital	358.82	360.59	20,400.98	73,883.57

Source: MoHS, 2018

5.5.13.11 Sanitation

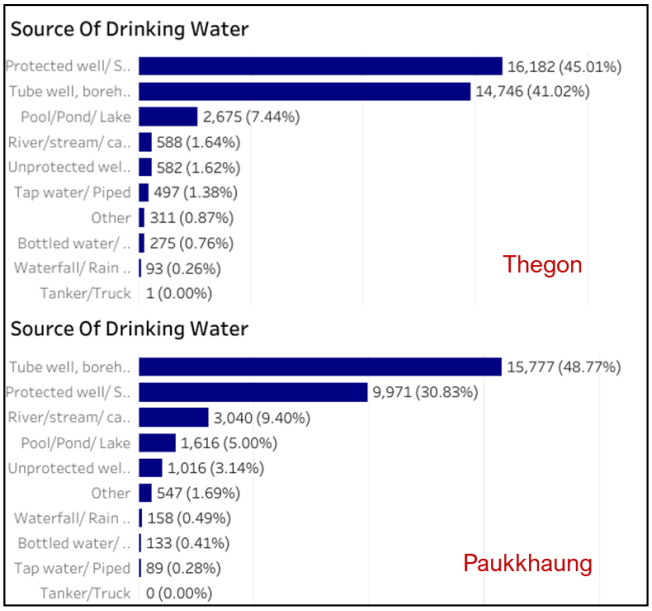
Sanitation toilet - In Thegon the household of 81.59% had improved sanitation toilets, water seal (81.18%) and flush toilet (0.14%). To the same way, household in Paukkhaung of 74.13% had improved sanitation toilets, water seal (74.13%) and flush toilet (0.73%). The households of 7.6% in rural area did not have toilet while 23.2% in Paukkhaung did not have. The proportion of households with improved toilet in Thegon was higher than the one in Bago Region and national which was 74.6% and 74.3% respectively. While the proportion of Paukkhaung was in line with the region and country.



Source: MIMU Population Dashboard (2019) after the 2014 Myanmar Population and Housing Census

Figure 5-48: Type of Toilet in Thegon and Paukkhaung Township

Domestic use and drinking water - The households generally take water from protected well or spring, and tube well or borehole as a source of drinking water for 45.01 and 41.02% in Thegon and 30.83% and 48.77% respectively in Paukkhaung. In total 88.2% of household in Thegon and 80.3% of households in Paukkhaung could have improved drinking water. The household in urban area could access to the improved water more than rural area, 99.1% > 86.7% of Thegon Township and 99%>78% of Paukkhaung Township. However 11.8%& 22% of total household in Thegon and Paukkhaung respectively could not have improved water for drinking. Most of them live in rural area. In country level only 69.5% could have drinking water from improved sources.



Source: MIMU Population Dashboard (2019) after the 2014 Myanmar Population and Housing Census

Figure 5-49: Sources of Drinking Water in Thegon and Paukkhaung Township

5.6 Cultural Components

5.6.1 Cultural Traditions and Historical, Archaeological Resources

The government and people of Myanmar place a very high degree of importance on their cultural traditions, religious and historic sites. Many active Buddhist sites are managed by trustees, sometimes with input from government authorities. Gazetted archaeological sites, such as Bagan, are managed by the Department of Archaeology, National Museum and Library, which is a division of the Ministry of Culture.

Most of historical sites are religion and old kingdom related. The famous are in Pyay Township including Shwesandaw Paya, Akauk Taung, Phayagyi Pagoda, Sehtatgyi Buddha, Shwebonthar Muni Pagoda. The historic sites of old kingdom of Srikasetra include Sri Ksetra World Heritage Site, Hmawza (Srikshetra) Museum and Tharaykhittaya Archaeological Museum. Beside the value of history or archaeology, the previous said sites are also the tourist attractions.

During the archeological and historic site assessment for the project area, the Township Administrator from Thegon and Paukkhaung GAD confirmed that there are no archaeological or historic sites present near the proposed well locations. The well site is located on agricultural and secondary forest land and no historic or archaeological sites are located near the planned project.

5.6.1.1 Cultural Heritage/ Archaeological for Thegon Township

The list of religious buildings and religious person in Thegon Township are as follows:

(A) Religious buildings

No	Township/Town	Status	Pagoda	Temple	Monastery	Nun Monastery	Religious Hall
1	Thegon	4	67	-	117	-	-
2	Pa Ti Kone	2	4	-	58	-	-
3	Inn Ma	2	5	-	73	-	-
Total (Township)		**7**	**76**	**-**	**248**	**-**	**-**

(B) Monks and Nuns

No	Township/ Town	Monk	Younger Monk	Nun
1	Thegon	362	172	75
2	Pa Ti Kone	134	59	5
3	Inn Ma	156	112	14
Total (Township)		**651**	**343**	**94**

(C) Well Known Pagodas

No	Township/ Town	Name of Pagodas	Location
1	Thegon	Kan Thar Yar Yae Lae Kun Pagoda	Ward (2)
		Moe Kaung Kyauk Taw Gyi Pagoda	Ywa Ma Village Tract
		Phaung Taw Oo Pagoda	Ward (4)
		Mya Thein Tan Pagoda	Ward (4)
		Shwe Phone Shein Pagoda	Ward (4)
2	Pa Ti Kone	Shwe Kyaung Saung Pagoda	Zee Oak Village Tract
3	Inn Ma	Shwe Kyaung Gyi Pagoda	Thiriyadanar Ward
Total (Township)		**7 Pagodas**	

(D) Well Known Monasteries

No	Township/Town	Monastery Name	Head of Monk (Name)	Location
1	Thegon	Thi Ta Gu	U Nandar Mar La	Ward (4)
		Taung Lay Su Taw Ya	A Shin Zar Nay Ya	Thit Ni Taw
Total (Township)		**2 Monasteries**		

(E) Other Religious Buildings

No	Township/Town	Christian		Muslim		Hindu		Chinese Temple	
		Urban	Village	Urban	Village	Urban	Village	Urban	Village
1	Thegon	-	-	1	-	-	-	-	-
2	Pa Ti Kone	1	-	1	-	1	-	-	
3	Inn Ma	-	-	1	-	-	-	-	-
Total (Township)		**1**	**-**	**3**	**-**	**1**	**-**	**-**	**-**

(F) Historical Buildings and Places

There are no historical buildings and places in Thegon Township.

5.6.1.2 Cultural Heritage/ Archaeological for Paukkhaung Township

The list of religious buildings and religious person in Paukkhaung Township are as follow.

(A) Religious buildings

No	Township/Town	Status	Pagoda	Temple	Monastery	Nun Monastery	Religious Hall
1	Paukkhaung	-	34	-	252	2	1
Total (Township)		**-**	**34**	**-**	**252**	**2**	**1**

(B) Monks and Nuns

No	Township/ Town	Monk	Younger Monk	Nun
1	Paukkhaung	420	130	30
Total (Township)		**420**	**130**	**30**

(C) Well Known Pagodas

No	Township/ Town	Name of Pagodas	Location
1	Paukkhaung	Lay Myat Na Pagoda	No (3) Ward
		Shwe Ta Lune Pagoda	Myo Kone Village
Total (Township)		**2 Pagodas**	

(D) Well Known Monasteries

There are no well-known monasteries in this township.

(E) Other Religious Buildings

No	Township/Town	Christian		Muslim		Hindu		Chinese Temple	
		Urban	Village	Urban	Village	Urban	Village	Urban	Village
1	Paukkhaung	2	32	1	-	-	-	-	-
Total (Township)		**2**	**32**	**1**	**-**	**-**	**-**	**-**	**-**

(F) Historical Buildings and Places

There are no historical buildings and places in Paukkhaung Township.

5.7 Visual Components

5.7.1 Tourist Attractions and Recreational Area

Thegon Township is not a popular attraction or recreational area, most of the people travel to Pyay which is principal town in this area. Pyay is situated around 290 km north of Yangon and is part of Myanmar's many ancient capitals. The hilltop located in the centre of the town, is one of the biggest pilgrimage sites in Myanmar. There are also various world heritage sites such as the ancient Pyu Ancient capital of Sri Ksetra. It was designated as UNESCO World Heritage Site since 2014. The Shwesandaw Pagoda is the landmark of Pyay. Shwe San Daw means the Golden Hair Relics and is situated on the eastern bank of Ayeyarwaddy River. Other tourism sites in Pyay include the distinctive Akauk Taung Buddha cliff carvings, also set on the Irrawaddy River. The Shwe Myet Man Paya or more widely known as Buddha with Golden Spectacles.

The natural recreation areas nearby the Block EP-3 are Bago Yoma National Park and North Zarmayi Elephant Sanctuary.

In country overview, the number of visitors is increasing yearly, and the government has been encouraging tourism. The total number of tourists arriving in Myanmar during 2016-2019 is shown in **Table 5-35**. The statistics for 2020 were not available, however, Myanmar's tourist arrivals is likely to be reduced in 2020 by the COVID-19 outbreak due to the travel restrictions imposed.

Table 5-35: Number of International Tourist Arrivals in Myanmar, 2016-2019

Year	Tourists			
	Total	by Air	by Sea	by Land
2016	2,907,207	1,224,755	47,841	1,634,611
2017	3,443,133	1,321,006	41,942	2,080,185
2018	3,551,428	1,344,841	53,257	2153330
2019	4,360,000	N/A	N/A	N/A

Source: Ministry of Hotels and Tourism (2010)

There are no tourist attractions of note in Block EP-3 near the proposed well site locations.

6. IMPACT AND RISK ASSESSMENT & MITIGATION MEASURES

6.1 Impact and Risk Assessment Methodology

An Environmental Impact Assessment (EIA) seeks to identify and, to the extent possible, quantify the potential negative impacts and positive benefits of a proposed project with respect to the environment (physical, ecological, human use, quality of life, and health values). Once these impacts have been identified, prevention, mitigation, and monitoring measures are proposed to prevent and/or mitigate possible negative impacts and enhance positive impacts. An Environmental, Social, and Health Impact Assessment process incorporates a number of key steps as shown in **Figure 6-1** and discussed in detail in the following sections:

- Exploration Drilling Project – **Chapter 4**
- Environmental, Social and Health Setting – **Chapter 5**
- Stakeholder Involvement – **Chapter 9**
- Screening and Scoping – **Chapter 6**
- ESH Impact Assessment – **Chapter 6**
- Prevention & Mitigation Measures – **Chapter 6**
- Environmental, Social and Health Management Plan **– Chapter 8**

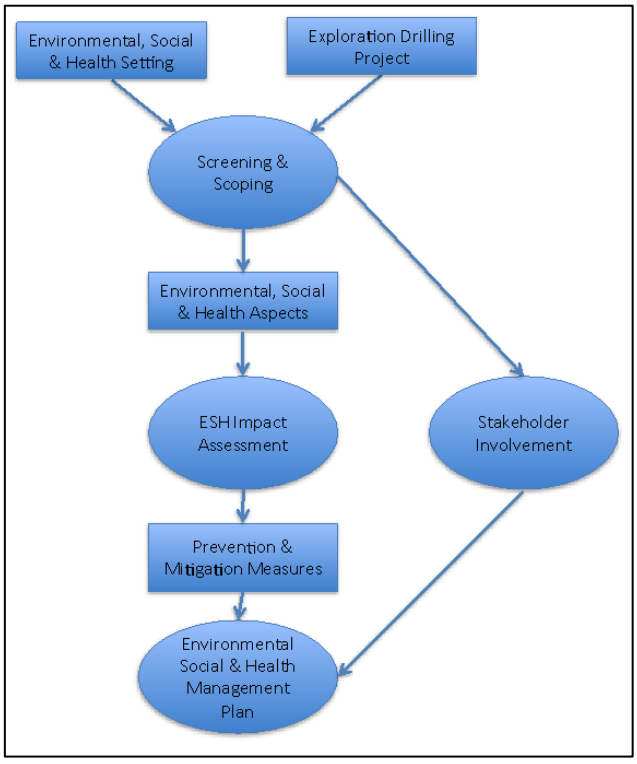


Figure 6-1: Method for Environmental, Social, and Health Impact Assessment

The assessment approach is risk-based, with the objective to make a conclusion on the level of risk development activities will pose to environmental, socio-economic and health receptors. This section describes the impact assessment process undertaken to evaluate the level of risk to environmental, socio-economic and health receptors from activities associated with the planned exploration drilling program. This description provides an account of the identification of potential impacts and benefits and the evaluation of their significance (scale of Risk Ranking). The EIA methodology applied is modified from Adapted from Nigel Rossouw (2003); Sippe (1999); and United Nations University (2007).

Activities associated with exploration drilling program are assessed to systematically identify potential impacts and the associated level of risk. This process assists in prioritising the development of management measures to achieve an overall acceptable level of risk.

Environmental Impact Assessment Terminology

Defining Impacts

Direct (or primary) – impact that results from a direct interaction between some feature of a planned action and the receiving environment (e.g. between an effluent discharge and receiving water quality)

Secondary – impact that follows on from the primary interactions between the project and its environment as a result of subsequent interactions within the environment (e.g. loss of part of a habitat affects the viability of a species population over a wider area)

Indirect – impact that result from other developments or activities that are encouraged to happen as a consequence of the original development (e.g. a new development stimulates a requirement for improved road access).

Cumulative – impacts that act together to affect the same environmental resource or receptor. Several types can be identified:

i. **Temporal**: a series of impacts that occur year in year out, that in themselves are not important, build up to the point that they become important.

ii. **Accumulative**: the overall effect of different types of impact (e.g. air pollution + noise + traffic + visual blight) on a single receptor (e.g. a community or a habitat) where each singly may not be important but combined they are.

iii. **Additive**: where impact from the planned activity occurs at the same time as impact from activities being undertaken by other parties (these may be already occurring, committed developments for the future or developments that may happen in the foreseeable future).

iv. **Interactive**: where two different types of impact (which may not in themselves be important) react with each other to create a new impact (that might be important).

v. **Synergistic**: where two impacts interact together (e.g. changes in air quality with respect to two different pollutants) to create an impact that is greater than the sum of their parts.

Permanent: Impact that occurs once in the development of a project and causes a permanent change in the affected receptor or resource (e.g. the felling of old growth forest as a result of occupation of a site, the diversion of a watercourse).

Short-term: impact that is predicted to last only for a limited period (e.g. during construction, seismic studies, drilling or decommissioning) but will cease on completion of the activity, or as a result of mitigation/ reinstatement measures and natural recovery.
Long-term: impact that will continue over an extended period (e.g. noise from operation of a development, impact from operational discharges or emissions). This includes impact that may be intermittent or repeated rather than continuous over an extended time period (e.g. repeated seasonal disturbance of species as a result of well operations, impact results from annual maintenance activities).

Non-normal Impact: impact that result from unplanned events – incidents – within the project (e.g. breakdowns, failures) or in the external environment affecting the project (e.g. flood, seismic activity, landslip). In these cases the assessment should take into account of the probability of the event.

Local: impact that affects locally important environmental resources or a single habitat/biotype.

Regional: impact that affects regionally important environmental resources or is felt at a regional scale as determined by administrative boundaries, habitat type.

National: impact that affects nationally important environmental resources or affects an area that is nationally important or protected.

International: impact that affects internationally important environmental resources such as areas protected by International Conventions.

Trans-boundary: impact that is experienced in one country as a result of activities in another.

Source of impact – as an interaction between the proposed activity and an Environment, Social or Health component

Negative impact – negative change from the existing situation due to the above interaction

Benefit – any positive change from the existing situation due to the above interaction

Mitigation – the actions undertaken by Project Proponent to maximize benefits and to minimize any potential negative impact.

Activity - Work associated with the Development during construction, commissioning, operation and decommissioning. For exampling: drilling, road construction

Aspect - Associated with each activity are a number of aspects (or stressors). These are components of an activity that may have a potential to impact on the biological, socio-economic or cultural environment. For example: emissions, waste, noise.

Significance/Risk Ranking - The level of impact associated with an aspect.

Likelihood - The probability or frequency of an environmental impact actually occurring.

Residual significance/risk level - The level of significance/risk after the application of preventative and mitigation measures.

Risk - The chance of something happening that will have an impact on objectives.

6.1.1 Screening

Screening of issues is an important first step in an EIA. The purpose of the screening step is to review all proposed project activities in order to identify potential environmental, social and health issues.

This screening step enables the detailed impact assessment component of this EIA to focus on the key issues that are relevant to people and the environment.

In this report, a matrix checklist was used to screen key issues of environmental, social and health impacts both in a normal situation for each project phase (preparation phase before drilling phase, drilling phase and well abandonment phase) and emergency situation for unplanned events.

6.1.1.1 Screening Methodology

In order to ensure a systematic evaluation of project activities and their possible impact on the environment, a thorough listing of project activities and environmental, social and health elements was obtained by the following means:

- ✓ Consultations with the ONGC Videsh Limited (OVL) planning the project activity;
- ✓ Applying International guidelines for onshore oil and gas exploration;
- ✓ Applying International guidelines for health impact assessment;
- ✓ Applying the World Bank checklist for onshore oil and gas development**;**
- ✓ IFC Environmental, Health, and Safety General Guidelines (2007);
- ✓ IFC Performance Standards on Environmental and social Sustainability (2012); and
- ✓ IEM's experience with similar projects.

Each of the activities carried out during the phases of the project was screened against each resource value, to determine if any impact may occur and therefore requires a more detailed assessment of impact.

6.1.2 Scoping of Environmental, Social, and Health Impacts

The Scoping of the proposed project:

- defines the study area, area of influence, time boundaries, project phases, and potential stakeholders;
- starts the process of understanding the applicable regulations and standards, and their context for Project design and completion of the EIA;
- makes a provisional identification of Environmental Impacts, focusing in particular on the environmental, social and health issues that need to be addressed in subsequent EIA studies;
- provides an indication of the depth and breadth of the subsequent EIA investigations including what baseline data and information are required, what further studies and investigations must be carried out, and how such data collection, studies and investigations shall be undertaken;
- provides an opportunity for consultants, relevant authorities, project developers, and interested and affected parties to express their views and concerns regarding the proposal before an EIA proceeds; and
- identifies potentially affected communities and other stakeholders with an interest in the Project.

6.1.3 Environmental Impact Assessment

6.1.3.1 Assessment of Potential Environmental and Social Impacts

The impacts that result from routine (planned) activities are assessed, as are those that could result from credible accidental or unplanned events within the project scope (e.g. a fuel spill) or in the environment affecting the project.

The approach to assess the significance of potential impacts is discussed briefly below.

Assessment of the level of impact significance requires consideration of the impact level (i.e. magnitude of the environmental effect, its geographical scale and duration) in relation to the receptor sensitivity (i.e. the key receptors and resources considered).

The overall significance is presented through a matrix of sensitivity of the **Receptor Sensitivity** and the **Impact Level**, as shown in **Table 6-1**.

Table 6-1: Significance Matrix for Environmental Impacts

Receptor Sensitivity	Impact Level		
	Low	Medium	High
Low value/sensitivity receptor or resource, impact disturbs degraded area or slightly disturbs area with value for conservation, causes small changes in species and diversity, within standards, small local change in human use and quality of life values over a short-term duration, reversible over short-term.	Negligible	Low	Medium
Medium value/sensitivity receptor or resource, Impact disturbs an area that has a value for conservation or causes change in species diversity. Impact important on a local or regional level, within standards, moderate change in human use and quality of life values at moderate level over a long-term duration, reversible over medium-term.	Low	Medium	High
High value/sensitivity receptor or resource, rare or endangered species or habitat impacted on a national or international level, exceeding standards, large permanent change in human use and quality of life values at a regional level, long-term or no reversible.	Medium	High	High

The impact assessment is based on four categories of impact significance level, as described in **Table 6-2**. These inform the level of mitigation that is considered appropriate to be applied for a given impact.

Table 6-2: Categories of Impact Significance

Significance Level	Definition
High	Impact is classified as high and can cause numerous effects. Major impacts affect an entire population or species in sufficient magnitude to cause a decline in abundance and /or change in distribution. Effects are long-lived and natural recovery may not take place or only in the long term. Large permanent change in human use and quality of life values at a regional and national level. Fatality from an accident or occupational illness. Impacts cannot be managed or resolved by any mitigation measures.
Medium	Impact may result in changes that affect the value of resources and environment. Moderate impacts affect a portion of a population and may bring about a change in abundance and / or distribution but does not threaten integrity of population. Potential for natural recovery in the medium term is good. Impact may affect moderate change in human use and quality of life values at a local and regional level over a long-term duration. Major injury or health effects (including Permanent Partial Disability). Mitigation measures are required to manage or reduce the potential impacts and monitoring measures are required to determine effectiveness of mitigation measures.
Low	Impact may result in changes in resources and environment but this change does not decrease value of these resources and environment. Minor impacts affect individuals within a population over a short period of time. Local change in human use and quality of life values over a short-term duration. Minor injury or health effects (Lost Time Injury). Impact can be managed and resolved by implementation of general mitigation measures.
Negligible	Impact has no effect.

Source: Adapted from Rossouw (2003) and Sippe (1999).

The degree of significance (categories as defined in **Table 6-2**) depends upon the level (i.e. magnitude, extent and duration) of impacts and the sensitivity of the resource value that they may impact. The criteria used to inform the significance ranking of impacts on a qualitative basis, are provided in **Table 6-3**.

Table 6-3: Criteria used to determine Impact Significance

Criteria	Score	Detail
Extent	**3** **2** **1**	• **High –** Are of impact is beyond 5 km and impact extends to regional and national level. • **Medium -** Area of impact is beyond the project area but is in a limited area of 1 - 5 km. • **Low -** Area of impact is in the project area within a radius of 1 km.
Duration	**3** **2** **1**	• **Long Term** - Permanent impact**,** Impact will remain after well abandonment. Impact occurs in long-term duration (> 5 yr.). • **Medium** - Impact can be reversible overtime (1 – 5 yr.), period of impact occurrence is within the project period, Impact occurs over mid-term duration (1 – 5 yr.). • **Short term** - Impact can be quickly reversible (< 1 yr.), Period of impact occurrence is less than the project period, Impact occurs in short-term duration (< 1 yr.).
Magnitude	**3** **2** **1**	• **High –** Exceeds regulatory standards, changes the original structure of the environmental or social system or ecosystem. • **Medium –** Within regulatory standards but changes some factors in the environmental or social system or ecosystem but does not change the structure. • **Low –** Within regulatory standards, with small changes in some factors for the environmental or social system or ecosystem but does not change the structure. • **Negligible –** no detectable impact on the environment or socio-economic conditions. • **Positive –** Impact has a positive effect on the environment or socio-economic conditions.
Receptor Sensitivity	**3** **2** **1**	• **High** – High value/sensitivity receptor or resource, rare or endangered species or habitat impacted on a national or international level, exceeding standards, large permanent change in human use and quality of life values at a regional level, long-term or no reversible. • **Medium** – Medium value/sensitivity receptor or resource, Impact disturbs an area that has a value for conservation or causes change in species diversity. Impact important on a local or regional level, within standards, moderate change in human use and quality of life values at moderate level over a long-term duration, reversible over medium-term. • **Low** – Low value/sensitivity receptor or resource, impact disturbs degraded area or slightly disturbs area with value for conservation, causes small changes in species and diversity, within standards, small local change in human use and quality of life values over a short-term duration, reversible over short-term. • **Negligible** – no detectable sensitivity.

Source: Adapted from Nigel Rossouw (2003); Sippe (1999); and United Nations University (2007)

The above Matrix Method is used to consider the Impact Level and Receptor Sensitivity as follows:

Significance = Impact Level x Receptor Sensitivity

Note: Impact Level is determined using magnitude, extent, and duration of impacts. Receptor Sensitivity is determined using the values of resources and environment that are lost or decreased as a result of the project activities.

Stage 1: Analysis of Impact Level

Analysis of impact level is determined using the sum of magnitude, extent, and duration of the impact.

Impact Level = Magnitude + Extent + Duration

Total Score for Impact Level	Impact Level	Score
7-9	High	3
4-6	Medium	2
1-3	Low	1

Stage 2: Receptor Sensitivity Ranking

Impact Level	Score
High	3
Medium	2
Low	1

Stage 3: Impact Significance Evaluation

Significance Level of Environmental Impact			Impact Level		
			Low	Medium	High
			1	2	3
Receptor Sensitivity	Low	1	Negligible (1)	Low (2)	Low (3)
	Medium	2	Low (2)	Medium (4)	Medium (6)
	High	3	Low (3)	Medium (6)	High (9)

6.1.4 Identification of Management Measures

The first priority of environmental management is always to **prevent adverse impacts**, thereafter management measures with other objectives are considered. Environmental management measures can be varied and the measures themselves can have a variety of objectives.

World Bank guidelines for a best practice approach to the management of environmental and social impacts are presented in **Table 6-4**. Many of the recommendations set out in the design component are designed to meet the criterion for 'avoidance'.

Table 6-4: Primary objectives of mitigation measures for adverse environmental impacts.

First priority is avoidance of negative impacts; the objectives are listed in decreasing order of priority

Avoidance	▪ Avoiding activities that could result in adverse impacts. ▪ Avoiding resources or areas considered as sensitive.
Prevention	▪ Preventing the occurrence of negative environmental impacts and / or preventing such an occurrence having negative environmental impacts.
Preservation	▪ Preventing any future actions that might adversely affect an environmental resource. Typically achieved by extending legal protection to selected resources beyond the immediate needs of the project.
Minimisation	▪ Limiting or reducing the degree, extent, magnitude or duration of adverse impacts. This can be achieved by scaling down, relocating, redesigning elements of a project.
Rehabilitation	▪ Repairing or enhancing affected resources, such as natural habitats or water sources, particularly when previous development has resulted in significant resource degradation.
Restoration	▪ Restoring affected resources to an earlier (and possibly more stable and productive) state, typically 'background / pristine' condition.
Compensation	▪ Creation, enhancement or protection of the same type of resource at another suitable and acceptable location, compensating for lost resources.

Source: The World Bank. Environment Department. January 1999. Environmental Management Plans. Environmental Sourcebook Update. Number 25

For activities where the risk level is higher than low, management measures are required to prevent or mitigate the risk to an acceptable level. Prevention measures are put in place to prevent a hazard or event from occurring such as avoidance or reduction at source and pollution control equipment. Mitigation measures are put in place to prevent or minimise the actual impact. This can include spill response plans, monitoring and offsets.

Measures to prevent or mitigate (reduce) the severity of potentially significant impacts will be developed and linked back to the related activities, and an Environmental Management Plan (EMP) will be prepared. The EMP brings together the environmental, social and health management requirements needed to prevent or reduce potential impacts from activities and accidental events, and will form part of the EIA Report and company commitment to the project.

6.1.5 Residual Impact Significance

Following the identification of potential environmental and social impacts, their significance is assessed, taking into account those proposed mitigation measures already incorporated into the design of the project and, where appropriate, any further mitigation measures that are considered feasible and justified. Mitigation measures are applied to eliminate or reduce the extent, duration and or magnitude of a potential impact to an acceptable level. These remaining impacts are described as residual impacts.

One objective of the IEE/EIA is to understand the significance of these residual impacts that will remain after mitigation measures have been designed into the intended activity and if some form of monitoring or measurement might be justified.

6.1.6 Risk Determination for Unplanned Events

The significance of risk of unplanned events is determined by assessing the potential impact of an activity on the environment, social or health conditions and the likelihood of that risk occurring with effective management measures in place. The residual risk is an indication of the significance of an environmental, social or health impact and the probability of the event occurring, after application of management measures.

Where no meaningful measurable environmental, social or health impact can occur, a rating of negligible has been given. Where a positive impact has been identified a rating of positive impact has been given.

The probability of a specific event occurring can be determined either in terms of historical precedence or by calculation.

The potential Risk Ranking of an event occurring is determined according to the following themes:

- Environment (physical and ecological);
- Social;
- Health;

Impact Risk Ranking levels for each of these has been defined above.

The level of risk is identified using a matrix evaluating probability against impact severity; see Risk Ranking (**Table 6-5**). The risk level can be separated into three levels: low, medium, or high (**Table 6-6**). For each aspect identified a residual risk ranking will be defined.

If the risk is determined to be “medium” or “high”, it needs to be managed to reduce the frequency of occurrence or to mitigate any potential risks to achieve a risk that is low, or if it cannot be mitigated to a low level, to a level that is “As Low As Reasonably Possible” (ALARP). If the risk is determined to

be "high" (i.e. unacceptable), specific actions must be developed to reduce the risk, which may involve a full Quantified Risk Assessment (QRA).

Table 6-5: Risk Assessment Matrix

Probability	Environmental, Social & Health	Consequence (Severity)				
		1	2	3	4	5
		Negligible	Slight	Moderate	High	Very High
1	Very Unlikely	Low Risk	Low Risk	Low Risk	Low Risk	Medium Risk
2	Unlikely	Low Risk	Low Risk	Low Risk	Medium Risk	Medium Risk
3	Possible	Low Risk	Low Risk	Medium Risk	Medium Risk	High Risk
4	Likely	Low Risk	Medium Risk	Medium Risk	High Risk	High Risk
5	Very Likely	Low Risk	Medium Risk	High Risk	High Risk	High Risk

Table 6-6: Risk Ranking

Risk Level	Definition
Low Risk	Low level risk does not require additional management
Medium Risk	The risk must be controlled to prevent increased risk
High Risk	The risk must be managed/ reduced

6.2 Environmental Screening

The Screening Matrix (Error! Reference source not found.) and Results of Screening (**Table 6-8**) identifies Environmental, Social and Health impacts by project phase that may occur as a result of planned project activities and unplanned events.

Each of the potential impacts was assessed qualitatively based on our screening methodology. All project activities were identified and potential impacts on the environment, social or health systems was defined.

Table 6-7: Screening Matrix

Environmental Parameters		Physical Resources								Biological Resources		Social							Cultural		Health	
Project Activities/Events		Topography	Air Quality / GHG emissions	Noise	Heat and Light	Surface Water Hydrology	Surface Water Quality	Ground Water Quality	Soil Quality	Flora & Fauna	Aquatic Flora and Fauna	Land Use	Transportation	Water Supply	Power Supply	Drainage and Flooding	Waste Management	Socio-economic	Cultural-Archaeological	Visual Aesthetics / Tourism	Public Health	Occupational Health and Safety
	Construction/Installation																					
1	Access Road and Site Construction	■	▒	▒		■	▒		▒	▒	▒	■	■			■		▒	■	■	▒	▒
2	Vehicle and Equipment Use		■	▒						▒			■								▒	▒
3	Site Runoff and Drainage						▒		▒	▒	▒					■	▒				▒	▒
4	Handling of Materials and chemicals						▒	▒	▒	▒	▒							▒			▒	▒
5	Use of Public Utility													■				▒				▒
6	Hazardous/Non-hazardous waste management						▒	▒	▒	▒	▒		■				▒	▒			▒	▒
7	Labour and Accommodation									▒			■					■			▒	▒
	Drilling																					
8	Rig Move		■	▒						▒			■					▒			▒	▒
9	Drilling Wells		▒	▒	■			■		▒				■				▒			▒	▒
10	Vehicle and Equipment Use		■	▒						▒			■								▒	▒
11	Site Runoff and Drainage						▒		▒	▒	▒						▒				▒	▒
12	Hazardous/Non-hazardous waste management						▒	▒	▒	▒	▒		■				▒	▒			▒	▒
13	Use of Public Utility													■	■			▒				▒
14	Handling of Materials and chemicals						▒	▒	▒	▒	▒							▒			▒	▒
15	Labour and accommodation									▒			■					■			▒	▒
	Well Testing																					
16	Flaring		■	▒	■					▒										▒	▒	▒
17	Vehicle and Equipment Use		■	▒						▒			■								▒	▒
18	Site Runoff and Drainage						▒		▒	▒	▒										▒	▒
19	Handling of Materials and chemicals						▒	▒	▒	▒	▒						▒	▒			▒	▒
20	Hazardous/Non-hazardous waste management						▒	▒	▒	▒	▒		■				▒	▒			▒	▒
21	Use of Public Utility																	▒				▒
22	Labour and accommodation									▒			■					■			▒	▒
	Well Abandonment and Site Restoration																					
23	Shut in Well																					▒
24	Vehicle and Equipment Use		■	▒						▒			■								▒	▒
25	Site Runoff and Drainage						▒		▒	▒	▒						▒				▒	▒
26	Hazardous/Non-hazardous waste management						▒	▒	▒	▒	▒		■				▒	▒			▒	▒
27	Handling of Materials and chemicals						▒	▒	▒	▒	▒							▒			▒	▒
28	Use of Public Utility																	▒				▒
29	Site Restoration	■	▒	▒		▒			▒	▒	▒	■	■					▒			▒	▒
30	Labour and accommodation									▒			■					■			▒	▒
	Unplanned Events																					
31	Well Blowout		■	■	■				■	▒	▒									■	▒	■
32	Fire or Explosion		■	■	■				■	▒	▒			■						■	▒	■
33	Chemical/Hazardous Waste Spill						■	■	■	■	■	▒					▒				▒	■
34	Transportation Accidents												■								■	■
35	Earthquake																				▒	▒

	No Impact
▒	Potential Impact
■	Probable Impact

Table 6-8: Results of Screening Environmental, Social, and Health Impacts for Exploration Drilling

Indicator	Source of impact		Detail/Reason
	Phase	Activity	
Physical Resources			
Topography	Construction Phase	Access road and Site Construction	Disturbance to local topography
	Drilling Phase	None	None
	Testing Phase	None	None
	Abandonment Phase	Access road and Site abandonment and restoration	Disturbance to local topography
	Unplanned Event	None	
Air Quality/ Climate	Construction Phase	Access Road and Site Construction Vehicle and Equipment Use	Deterioration of air quality from dust and vehicle emissions Greenhouse Gas
	Drilling Phase	Rig Move Vehicle and Equipment Use	Deterioration of air quality from fuel combustion and release of hydrogen Sulfide during the drilling phase Greenhouse Gas
	Well Testing Phase	Flaring of excess gas Vehicle and Equipment Use	Deterioration of air quality from fuel combustion and flaring emissions
	Abandonment Phase	Vehicle and Equipment Use, Site Restoration	Deterioration of air quality from dust, vehicle emissions and Greenhouse Gas
	Unplanned Event	Blowout, Fire and explosion	Release of pollutants to air from blowout or explosion
Noise	Construction Phase	Access road and Site Construction Vehicle and Equipment Use	Noise and vibration from machines and equipment
	Drilling Phase	Rig Move Drilling Wells Vehicle and Equipment Use	Increased noise and vibration
	Well Testing Phase	Flaring Vehicle and Equipment Use	Increased noise from flaring stack and equipment transportation
	Abandonment Phase	Vehicle and Equipment Use Site Restoration	Increased noise and vibration from machines and equipment
	Unplanned Event	Blowout, Fire or Explosion	Increased noise level from blowout and fire or explosion
Heat and Light	Construction Phase	None	None
	Drilling Phase	Drilling Wells	None
	Well Testing Phase	Flaring	Increased light and heat emitted from gas flaring
	Abandonment Phase	None	None
	Unplanned Event	Blowout, Fire and explosion	Increased light and heat emitted from blowout or fire/explosion
Soil	Construction Phase:	Access road and Site Construction	Soil contamination

Indicator	Source of impact		Detail/Reason
	Phase	Activity	
		Site Runoff and Drainage Handling of Materials and chemicals Hazardous/non-hazardous waste management	Erosion, soil disturbance, soil compaction
	Drilling Phase:	Site Runoff and Drainage Hazardous/non-hazardous waste management, Handling of Materials and chemicals	Soil contamination from accidental releases
	Well Testing Phase:	Site Runoff and Drainage Handling of Materials and chemicals Hazardous/non-hazardous waste management,	Soil contamination from accidental releases
	Abandonment Phase	Site Runoff and Drainage Handling of Materials and chemicals Hazardous/non-hazardous waste management, Site Restoration	Soil contamination Return of soil to original state
	Unplanned Event	Well Blowout Fire or explosion Chemical /Hazardous Waste spills	Soil contamination
Surface Water Hydrology	Construction Phase	Access road and Site Construction	Change in water surface flow direction Flow rate of run-off water
	Drilling Phase	None	None
	Testing Phase	None	None
	Abandonment Phase	Site restoration	Return to pre-construction condition
	Unplanned Event	None	None
Surface Water Quality	Construction Phase	Access road and Site Construction Site Runoff and Drainage Handling of materials and chemicals Hazardous/non-hazardous waste management	Increase in erosion and potential contamination from spills or wastewater drainage to nearby water bodies
	Drilling Phase	Site Runoff and Drainage Hazardous/non-hazardous waste management Handling of materials and chemicals	Potential contamination from spills or wastewater drainage to nearby water bodies
	Testing Phase	Site Runoff and Drainage Handling of materials and chemicals Hazardous/non-hazardous waste management	Potential contamination from spills or wastewater drainage to nearby water bodies

Indicator	Source of impact		Detail/Reason
	Phase	Activity	
	Abandonment Phase	Site Runoff and Drainage Handling of materials and chemicals Hazardous/non-hazardous waste management	Potential contamination from spills or wastewater drainage to nearby water bodies
	Unplanned Event	Chemical spills	Potential contamination from spills
Groundwater Quality	Construction Phase	Handling of materials and chemicals Hazardous/non-hazardous waste management	Degradation of groundwater quality from spills or leaks leaching into water table during an unplanned event
	Drilling Phase	Drilling wells Site Runoff and Drainage Handling of materials and chemicals Hazardous/non-hazardous waste management	Degradation of groundwater quality from spills or leaks leaching into water table Drilling impacting groundwater quality
	Testing Phase	Handling of materials and chemicals Hazardous/non-hazardous waste management	Degradation of groundwater quality from spills or leaks leaching into water table during an unplanned event
	Abandonment Phase	Site Runoff and Drainage Handling of materials and chemicals Hazardous/non-hazardous waste management	Degradation of groundwater quality from spills or leaks leaching into water table Well abandonment & restoration impacting groundwater quality
	Unplanned Event	Chemical/Hazardous waste spills	Degradation of groundwater quality from spills leaching into water table
Biological resources			
Flora & Fauna	Construction Phase	Access road and Site Construction Vehicle and Equipment Use Site Runoff and Drainage Hazardous/non-hazardous waste management Handling of materials and chemicals Hazardous/non-hazardous waste management Labour and Accommodation	Degradation or destruction of natural habitat Harvesting of plants and animals by Human activity
	Drilling Phase	Rig Move Drilling wells Vehicle and Equipment Use Site Runoff and Drainage Hazardous/non-hazardous	Harvesting of plants and animals by human activity

Indicator	Source of impact		Detail/Reason
	Phase	Activity	
		waste management Handling of materials and chemicals Hazardous/non-hazardous waste management Labour and Accommodation	
	Testing Phase	Flaring of Gas Vehicle and Equipment Use Site Runoff and Drainage Handling of materials and chemicals Hazardous/non-hazardous waste management Labour and Accommodation	Harvesting of plants and animals by human activity
	Abandonment Phase	Vehicle and Equipment Use Site Runoff and Drainage Hazardous/non-hazardous waste management Handling of materials and chemicals Site Restoration Labour and Accommodation	Degradation or destruction of natural habitat Harvesting of plants and animals by human activity
	Unplanned Event	Blowout, Fire and explosion, Chemical/hazardous waste spills,	Degradation or destruction of natural habitat
Social			
Land Use	Construction Phase	Access road and Site Construction (Change from agricultural to industrial area)	Change in land use (Loss of agricultural activity)
	Drilling Phase	None	
	Testing Phase	None	
	Abandonment Phase	Site restoration	Restoration of land use
	Unplanned Situation	Chemical/Hazardous waste spill	Contamination could restrict land use options
Transportation	Construction Phase	Access Road Construction and Site Construction Vehicle and Equipment Use Hazardous/Non-Hazardous waste management Labour and Accommodation	Increased traffic
	Drilling Phase	Vehicle and Equipment Use Rig Move Hazardous/Non-Hazardous waste management Labour and Accommodation	Increased traffic

Indicator	Source of impact		Detail/Reason
	Phase	Activity	
	Testing Phase	Vehicle and Equipment Use Hazardous/Non-Hazardous waste management Labour and Accommodation	Increased traffic
	Abandonment Phase	Vehicle and Equipment Use Hazardous/Non-Hazardous waste management Site Restoration Labour and Accommodation	Increased traffic
	Unplanned Event	Transportation Accidents	Potential disruption to traffic in case of accident
Water & Power Supply	Construction Phase	Use of public utility	Increased water consumption
	Drilling Phase	Drilling Use of Public Utility	Increased water consumption Increase or decrease of available power for local community
	Testing Phase	None	
	Abandonment Phase	None	
	Unplanned Event	Fire and Explosion	Increased water consumption
Drainage and Flooding	Construction Phase	Access road and Site Construction Site Runoff and Drainage	Change in hydrology resulting in a potential increase in surface flow.
	Drilling Phase	None	
	Testing Phase	None	
	Abandonment Phase	None	
	Unplanned Event	None	None
Waste Management	Construction Phase	Site Runoff and Drainage Hazardous/non-hazardous waste management	Increased stress on local infrastructure
	Drilling Phase	Site Runoff and Drainage Hazardous/non-hazardous waste management	Increased stress on local infrastructure
	Testing Phase	Site Runoff and Drainage Hazardous/non-hazardous waste management	Increased stress on local infrastructure
	Abandonment Phase	Site Runoff and Drainage Hazardous/non-hazardous waste management	Increased stress on local infrastructure
	Unplanned Event	Chemical/Hazardous Waste spills	Increased stress on local infrastructure
Economic			
Socio-Economic	Construction Phase	Access road and Site Construction Handling materials and Chemicals Use of Public Utility Hazardous/non-hazardous waste management Labour and accommodation	Increased employment/income and procurement opportunities for people, business and services in surrounding area Labour in-migration causing conflict with local communities

Indicator	Source of impact		Detail/Reason
	Phase	Activity	
	Drilling Phase	Rig Move Drilling wells Handling of Materials and chemicals Hazardous/non-hazardous waste management Use of Public Utility Labour and accommodation	Increased employment/income and procurement opportunities for people, business and services in surrounding area
	Well Testing Phase	Handling of Materials and chemicals Hazardous/non-hazardous waste management Use of Public Utility Labour and accommodation	Increased employment/income and procurement opportunities for people, business and services in surrounding area
	Abandonment Phase	Handling of Materials and chemicals Hazardous/non-hazardous waste management Use of Public Utility Labour and accommodation Site Restoration	Increased employment/income and procurement opportunities for people, business and services in surrounding area
	Unplanned Event	None	None
Cultural			
Historical/Archaeological Sites	Construction Phase	Access road and Site Construction	Archaeological/ fossil finds within project area.
	Drilling Phase	None	None
	Testing Phase	None	None
	Abandonment Phase	None	None
	Unplanned Event	None	None
Visual			
Attractions/Recreational Areas	Construction Phase	Access road and Site Construction	Change in local environment
	Drilling Phase	None	Disturbance and reduction of tourism and recreational experience
	Testing Phase	Flare	Visual eye sore
	Abandonment Phase	None	None
	Unplanned Event	Blowout, Fire and explosion	Visual eye sore
Health			
Public and Occupational Health	Construction Phase	Access road and Site Construction Vehicle and Equipment Use Site Runoff and Drainage Hazardous/non-hazardous waste management, Handling of Materials and Chemicals Labour and accommodation	Exposure to air pollutants, dust, or noise, exposure to water contaminated by accidental spills, accidents, concern and stress about accidents, spills, wastes, noise, contagious diseases from workers etc.

Indicator	Source of impact		Detail/Reason
	Phase	Activity	
	Drilling Phase	Rig Move Drilling Wells Vehicle and Equipment Use Site Runoff and Drainage Hazardous/non-hazardous waste management, Handling of Materials and Chemicals Labour and accommodation	Exposure to air pollutants, dust, or noise, exposure to water contaminated by accidental spills, accidents, concern and stress about accidents, spills, wastes, noise, contagious diseases from workers etc.
	Testing Phase	Flaring of Gas Vehicle and Equipment Use Site Runoff and Drainage Hazardous/non-hazardous waste management, Handling of Materials and Chemicals Labour and accommodation	Exposure to air pollutants, dust, or noise, exposure to water contaminated by accidental spills, accidents, concern and stress about accidents, spills, wastes, noise, contagious diseases from workers etc.
	Abandonment Phase	Vehicle and Equipment Use Site Runoff and Drainage Hazardous/non-hazardous waste management, Handling of Materials and Chemicals Site Restoration Labour and accommodation	Exposure to air pollutants, dust, noise, exposure to water contaminated by accidental spills, accidents, concern and stress about accidents, spills, wastes, noise, contagious diseases from workers etc.
	Unplanned Event	Well Blowout Fire or Explosion Chemical /Hazardous Waste Spill Transportation Accidents Earthquake	Exposure to air pollutants, dust, noise, exposure to water contaminated by accidental spills, accidents, concern and stress about accidents, spills, wastes, noise, contagious diseases from workers etc.
Occupational Health and Safety	All Phases and activities	All activities	All components and phases of the project have some potential to impact occupational health and safety, due to accidents, exposure to air pollutants, dust, or noise, exposure to water contaminated by accidental spills, concern and stress about accidents, spills, wastes, noise, etc.

The assessment of each aspect addressed in this EIA will include the following components:

- Description of the source and characteristic of the potential impacts.
- Identification of receptors sensitive to potential impacts.
- Description and evaluation of potential impacts.
- Identification of management measures to reduce potential impacts.
- Determinations of the residual significance or risk after management measures are included.
- A summary assessment table with residual significant/risk rankings.

The study area for the environmental impact assessment includes the area within a 1 km and up to a 5 km radius of the project site(s). The study area for the social impact assessment includes the project stakeholders and communities near the project site(s). For the health impact assessment, workers employed for construction, drilling, testing and abandonment, as well as people who live in close proximity to the project site(s), and available health services are included in the assessment.

For each resource value a summary impact evaluation table will be provided as follows (**Table 6-9**):

Table 6-9: Example Impact Evaluation Table

Resource Value	Impact Description				
	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High
Residual Significance	Positive	Negligible	Low	Medium	High

6.3 Sensitive Receptors

The sensitive receptors for each of the proposed well sites have been identified in the Figures 6-2 to 6-5 below. The sensitive receptors identified in Block EP-3 include:

- Villages (Schools, Pagodas, Cemeteries, etc.)
- Streams / Canals
- Rivers
- Protected Area / Reserved Forests

The Payama well site is located in the Shar Pyin reserved forest and the Naweng well site is near the Shwe Kyun Taw reserved forest where teak plantation 147 acres are being grown. The unique features of the forests are the ***In, Htauk Kyant, Bamboo, Kyun Pho and Htauk Kyant*** which are the dominant species in the project area. The regeneration of In trees are found everywhere in the forests.

The dominant tree species in this area are ***Dipterocarpus tuberculatus (In)*** followed by ***Terminalia chebula (Phan Khar), Haplophragma adenophyllum (Phat than) and Xylia xylocarpa (Pyin Ka Doe).***

According to the Figure 6-2, the Payama-1 well site is located in the Shar Pyin reserve forest. Most villages in Myanmar have village forests nearby which in this case is the Shar Pyin reserve forest. The forest type was found to be mostly mixed deciduous in nature. Mostly degraded forests were encountered during the field visit. Sha Byin was designated as reserved forest as part of the UN-REDD Programme. It is an open type forest that local villagers too depend on for forest products.

With respect to the Shar Pyin Reserved Forest it should be noted that to protect the country's natural wealth, while also fulfilling various national and international commitments such as its Nationally Determined Contribution (NDC) and the Sustainable Development Goals (SDGs), Myanmar is taking steps to implement REDD+ actions.

Reducing emissions from deforestation and forest degradation (REDD+) is a mechanism developed by Parties to the United Nations Framework Convention on Climate Change (UNFCCC). It creates a financial value for the carbon stored in forests by offering incentives for developing countries to reduce emissions from forested lands and invest in low-carbon paths to sustainable development. Developing countries would receive results-based payments for results-based actions. REDD+ goes beyond simply deforestation and forest degradation and includes the role of conservation, sustainable management of forests and enhancement of forest carbon stocks.

With the support of the UN-REDD Programme, the government of Myanmar has been implementing the Myanmar UN-REDD National Programme since 2016. Under the programme, FAO has been supporting the government of Myanmar in the improvement of the country's National Forest Monitoring System (NFMS) and the implementation of a National Forest Inventory (NFI).

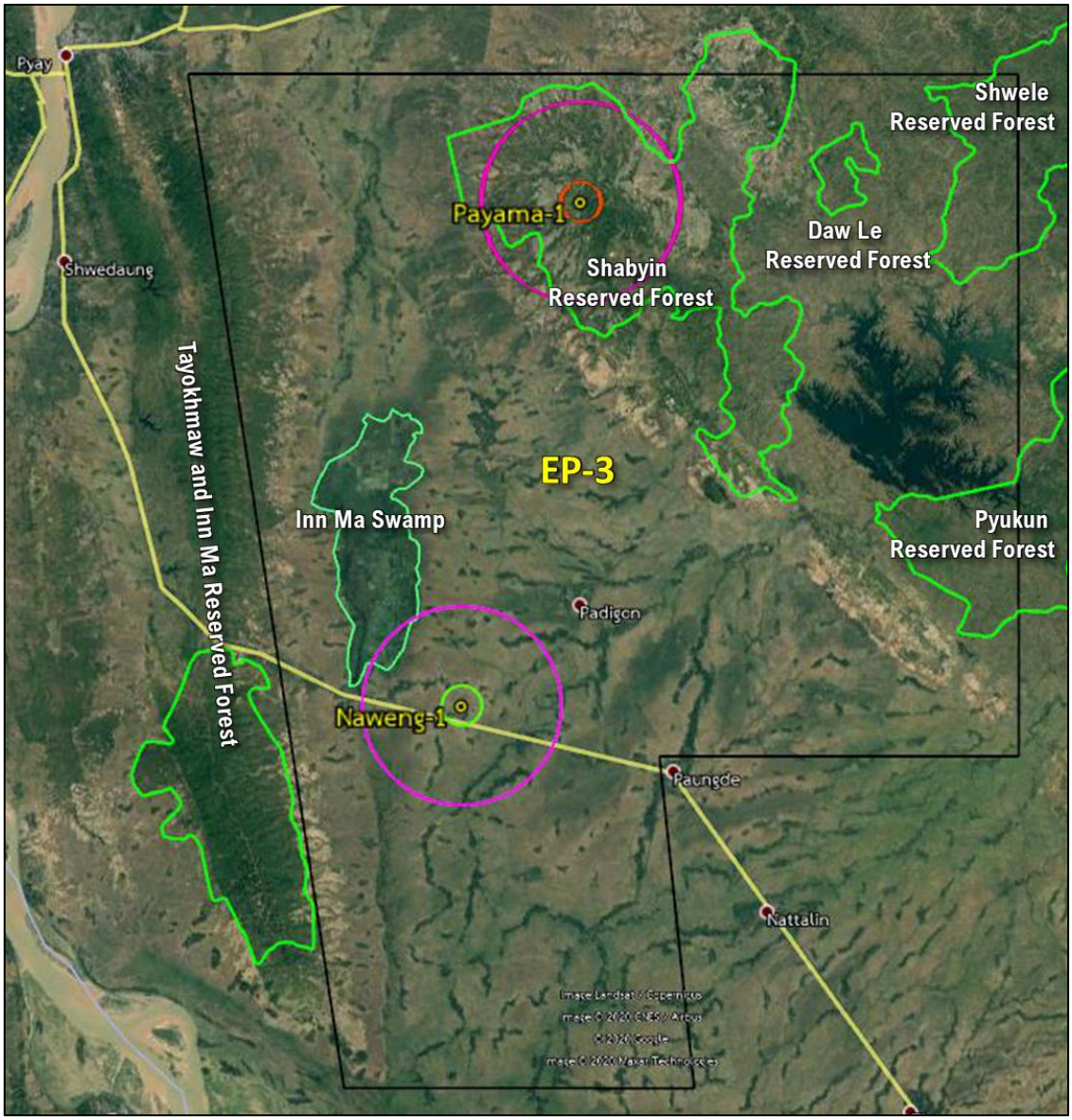


Figure 6-2: Reserved Forest Boundaries in Block EP-3

The following villages have been identified as well as their distance from the proposed wells Table 6-10.

Table 6-10: Potentially Affected Villages

Proposed well	Village*	Village Tract	Distance (km) from well
Naweng-1 **Lat: 18°31'22.3437"N** **Long: 95°24'21.6247"E** **X: 754004.96** **Y: 2049730.75**	Tan Daw Gyi	Ywa Thit	1.40
	Nyaung Gon		1.02
	Zin Byun Gon		1.15
	Pyin Daung Gon		1.33
	Pwe Bye		1.90
	Sa Be Kan	Yat Tha	1.06
	Wa Le		1.10
	Yat Tha		1.58
	Gyo Gon		1.97
	Ka Yin Gon	Cha Ya Gone	0.42
	Ywa Tha Gon		0.53
	Taw Chin		1.17
	Thit Cho		1.60
	Pan Lan Gon		0.71
	Kaung Bin Lu		1.20
	Cha Ya Gone		1.40
Payama-1 **Lat: 18°45'1.997"N,** **Long: 95°45.1252"E** **X: 759629.13** **Y: 2075021.51**	Sett Tone	Tha Phan Kaing	>5 km but on the access road
	Minn Lann		
	Kyo Pin	Kyoet Pin Waing	
	Thith Yaung Paung		

The Figures 6.3 and 6.4 show maps of the villages in relationship to each well. There are no villages within a 5km radius from the Payama-1 well location and therefore no persons are affected by this exploration well. There are five villages along the access road to Payama-1 (Figure 6-4). This access road currently exists and will be upgraded benefiting the local communities in the long term. The impacts are described in Section 6.4.1, page 6-24.

Payama-1 well is located within Shar Pyin Reserved Forest Area, but the well itself is located in a shrubland area. The area nearby within the Reserved Forest is currently used for agriculture. The existing condition of the well pad for Payama-1 is located in an existing cleared area used for peanuts in the wet season only in the Sha Byin Reserved Forest Area. The reserved forest is highly disturbed with most of the area planted for crops and sugar cane plantations.

The existing condition of the well pad for Naweng-1 location is in a paddy field during the wet season only and the land acquisition will be completed as per MOGE and Forestry Department requirements.

The assessment of the impacts from the access road and site construction are discussed in Chapter 6: Impact Assessment, Section 6.4.1.2, on page 6-24. The assessment of dust impacts from site and road construction are discussed in Section 6.4.2.2. The assessment of noise impacts from vehicle and equipment use are discussed in 6.4.3.2. Assessment of impacts from surface water hydrology from access road and site construction are discussed in Section 6.4.4.2. Further these topics are further discussed for each phase of the development.

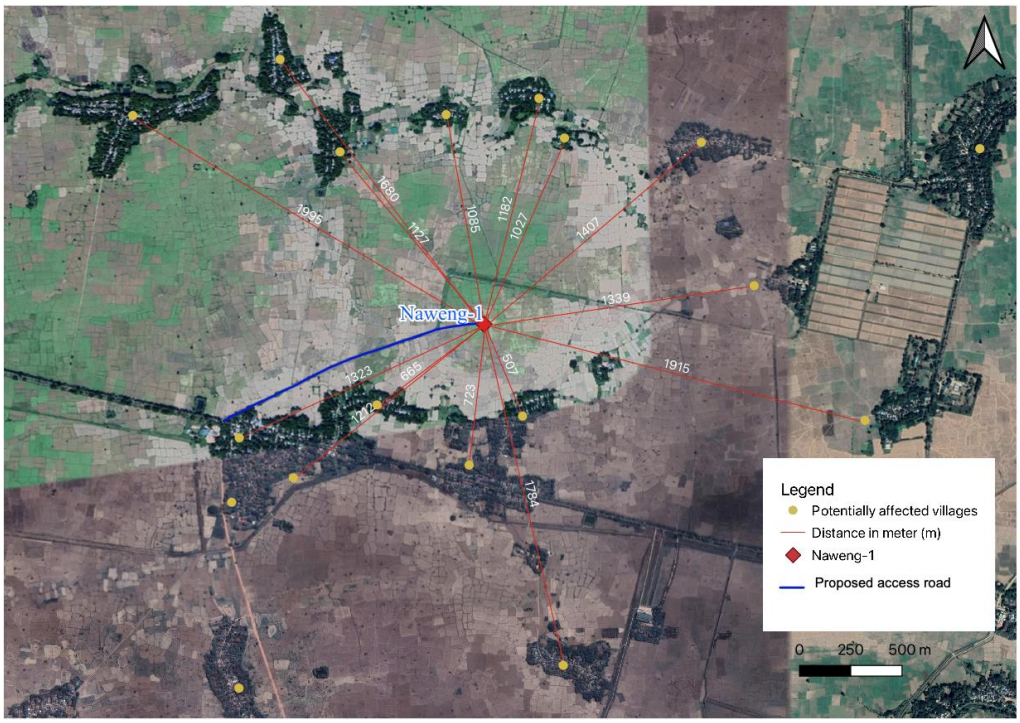


Figure 6-3: Potentially Affected Villages from Naweng-1 Well

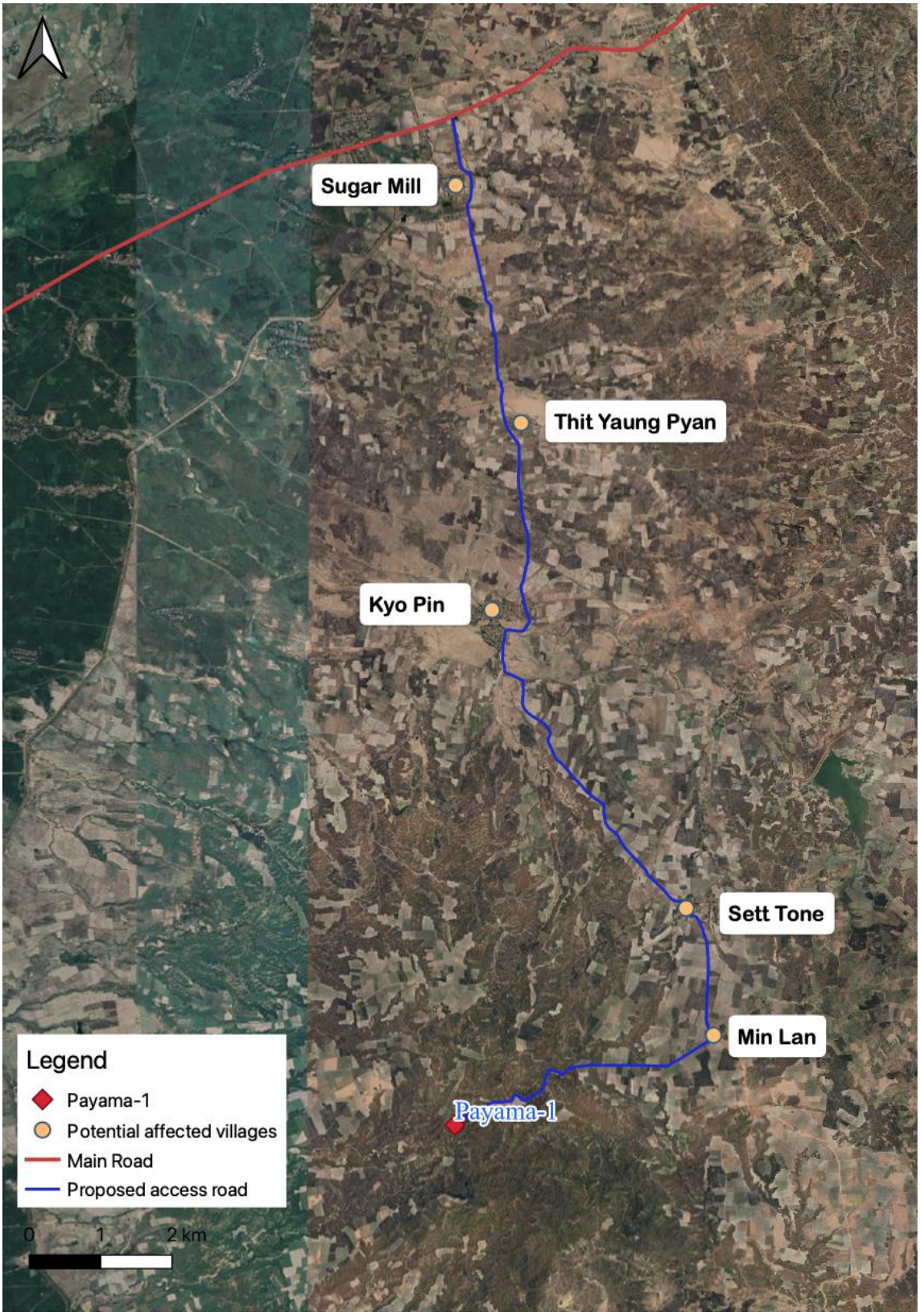


Figure 6-4: Potentially Affected Villages of Payama-1 Well

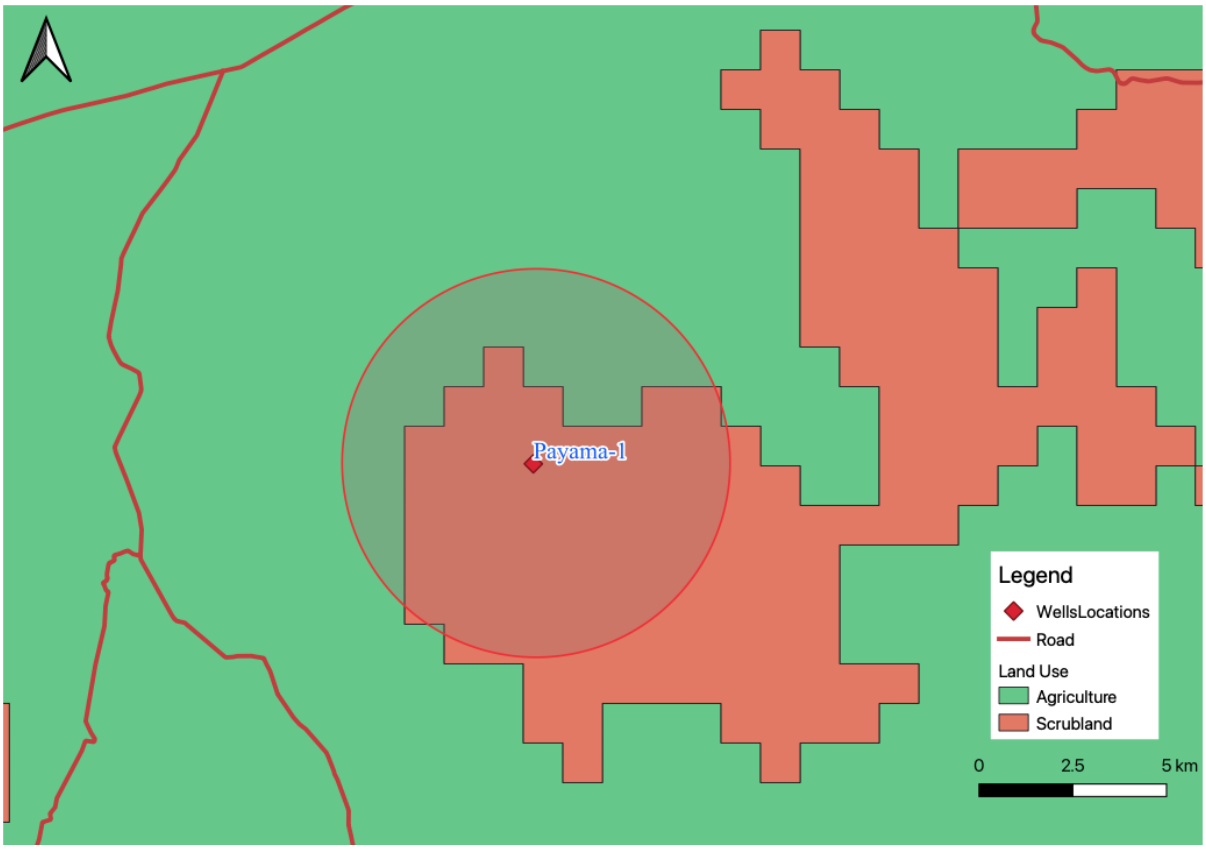


Figure 6-5: Land Use Within a 5 km Radius of Payama-1 Well

6.4 Environmental Impact Assessment during Construction Phase

From the screening process the following must be assessed to determine their impacts during the construction phase:

- Topography
- Air quality
  - Dust
  - Air Emission
  - Greenhouse Gas
- Noise
- Surface Water Hydrology
- Surface Water Quality
- Groundwater Quality
- Soil Quality
- Flora and Fauna
  - Habitat Disruption
  - Aquatic Ecology

6.4.1 Assessment of Impacts to Topography

6.4.1.1 Scope of Assessment

Resource/Receptor	Project Phase	Activity	Impact
Topography	Construction Phase	Access road and Site Construction	Disturbance to local topography

6.4.1.2 Assessment of Impacts from Access Road and Site Construction

The source of impact from the site preparation is caused by soil excavation/filling and construction of access road/well pad activity. The project area mainly consists of farming, agricultural and forested areas with agriculturally dominated communities and access roads. The existing condition of the well pad for Naweng-1 location is in a paddy field during the wet season only and the land acquisition will be completed as per MOGE requirements. The existing condition of the well pad for Payama-1 is located in an existing cleared area used for peanuts in the wet season only in the Sha Byin Reserved Forest Area. The reserved forest is highly disturbed with most of the area planted for crops and sugar cane plantations. There are no villages within a 5km radius from the Payama-1 well location and therefore no persons are affected by this exploration well. There are five villages along the access road to Payama-1.

Each well site will have similar construction plans. The well pad size for Naweng-1 is 200 m x 200 m (40,000 m^2) and the well pad size for Payama-1 is 130 m x 130 m (16,900 m^2). The well pad includes a rig area, campsite (accommodation), campsite office space and storage area. This may vary slightly due to local topography. All new earth access roads will need upgraded to construct as required. The roads will be constructed with a 6 m wide top and 1.5 m side slope with a height of approximately 20 to 30 cm before compaction with granular fill.

Table 6-11: The Distance from Existing Road to the Proposed Well Location

Well site	Length of Road Upgrading
Naweng-1	• 1.215 km upgrading of existing 125 m of new road construction
Payama-1	• Existing rural earthen road – upgrade for about 15.25 km • Existing sugar cane extraction road – upgrade for 4.5 km • Newly constructed access road – 350 m

The project will cause changes to the topography of the well site and surrounding areas. The effect will be limited to the construction areas and access road. The topography of the area within a 5-km radius of the exploration well site will be largely unaffected, because the construction areas for the well site and access road consist of less than 0.1 % of the total area.

6.4.1.3 Significance of Impacts

Without mitigation measures, the impact on topography from soil excavation/filling and construction of access road/well pad activity will be medium in extent, short-term in duration, reversible and of medium magnitude. The impact disturbs an area currently used for agriculture with limited conservation value, and a reserved forest area also currently being used for agriculture with medium conservation value; the receptor sensitivity is rated medium. Given these impact criteria considerations the impact significance to Topography is determined to be a medium.

The Significance Ranking of impacts to topography from soil excavation/filling and construction of access road/well pad activity is rated as **Medium** (**Table 6-12**).

Table 6-12: Sigificance Ranking of impacts to topography

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	**Positive**	**Negligible**	**Low**	**Medium**	**High**
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.4.1.4 *Impact and Risk Mitigation Measures*

Impacts from construction activities on topography can be mitigated through the use of the following measure:

Environment Impact Assessment –Construction and Installation Phase			
1. Topography	1.1 Well Site and Camp Construction	1.1.1 Disturbance to local topography	1.1.1.1 Limit construction activities to well sites and access roads only.

6.4.1.5 *Residual Impacts and Risks*

With these management measures, the extent and magnitude of impacts from a change to topography from soil excavation/filling and construction of access road/well pad activity will be reduced resulting in a residual significance ranked that is **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.4.2 Assessment of Impacts to Air Quality

6.4.2.1 *Scope of Assessment*

Resource/Receptor	Project Phase	Activity	Impact
Air Quality/ Climate	Construction Phase	Access Road and Site Construction Vehicle and Equipment Use	Deterioration of air quality from dust and vehicle emissions Greenhouse Gas

6.4.2.2 *Assessment of Dust Impacts from Site and Road Construction*

Vehicle and Equipment Use

During the construction phase, transport of materials and personnel, site preparation, excavation and movement of earth materials, contact of construction machinery with bare soil, and exposure of bare soil and soil piles to wind may generate fugitive dust.

Vehicles driving on laterite roads or off road will disperse dust: vehicles grind dust into finer particles, and tire rotation and eddy air currents lift particles into the air (Hesketh *et al.*, 1983). Dust dispersion will also be caused by filling and compaction during construction.

According to AP-42 of U.S.EPA (Compilation of Air Pollution Emissions Factors, 1977):

"The level of dust dispersion normally depends on working characteristic, soil humidity, wind speed, and construction period. On site construction with medium activities, 30% of silt and 50% of Precipitation Evaporation Index generates **1.2 tons/acre/month[1] of dust dispersion on average (or 36kg / acres/ day).** These particles **(greater than 10 micron)** will disperse following wind direction and will fall off in the **distance of 6-9 meters from construction site**".

Well site (well site and camp site construction)

There are many communities nearby and a few communities located within a radius of 500 m from the project well sites. For particulate matter smaller than 10 microns, the dispersion distance could be greater than this, and the sensitive receptors are considered to be those within a 2 km radius of the well sites.

The emission rate (Q) and dust concentration (C) can be estimated as follows:

Emission Rate (Q)

The dust emission rate can be estimated according to **Equation** 6-1:

$$Q\left(\frac{mg}{s}\right) = \frac{36\ (kg/acres/day) * \ area\ (acre) * 10^6\left(\frac{mg}{kg}\right)}{24 * 60 * 60\ (\frac{s}{d})} \qquad \textbf{Equation 6-1}$$

The well site for Naweng-1 covers an area of **40,000 m^2** for **well pad, campsite and office**. In addition, the access road needs to be constructed. The Payama-1 well covers **16,900 m^2** for **well pad, campsite and office**

On the basic of above equation, emission at source would be **4116.67 mg/s**

Q = **4116.67** mg/s, Area = 40,000 m^2

Dust Concentration (C)

The dust concentration is estimated by using **Equation 6-2**:

$$C\ (mg/m^3) = \frac{Q\ (mg/s)}{d\ (m) * W\ (m/s) * M\ (m)} \qquad \textbf{Equation 6-2}$$

Where C = Dust Concentration (mg/m^3)
Q = Emissions at Source (mg/s)
d = Width (the smallest dimension is used for worst case scenario) (m)
W = Average maximum wind speed (m/s)
M = Mixing Height (m)

The mixing height data is not available yet in the Meteorology Department in Myanmar. Therefore, this measurement is adopted from the atmospheric simulation models (European Commssion, n.d.). The use of simple default values related to wind speed and stability class as in **Table 6-13**.

[1] http://www.epa.gov/ttn/chief/old/ap42/3rd_edition/ ap42_3rdsup 1_7_aug 1977.pdf

Table 6-13: Default Mixing Heights related to Wind Speed and Stability Class

Atmospheric Stability	Horizontal wind speed, m/s	Default Mixing Height, m
A very unstable	0.5-2	2000
B unstable	0.5-2	1500
C slightly unstable	2-10	1000
D neutral	3-10	750
E stable	2-5	300
F very stable	0.5-3	250
G extremely stable	0.5-1	250

Source: European Commission, n.d.

For this dust impact assessment, the **stable condition** is selected as the **worst case scenario.**

Q = 4116.67 mg/s

d = 200 m

W= 2 m/s (stable wind)

M=300 m (stable wind)

Access Road Construction

All new earth access roads will need upgraded or constructed as required. The roads will be constructed with a 6 m wide top and 1.5 m side slope with a height of approximately 20 to 30 cm before compaction with granular fill.

Table 6-14 shows the distance from the Existing Road to the Proposed Well Locations.

Table 6-14: The Distance from Existing Road to the Proposed Well Location

Well site	Length of Road Upgrading
Naweng-1	• 1.215 km upgrading of existing 125 m of new road construction
Payama-1	• Existing rural earthen road – upgrade for about 15.25 km • Existing sugar cane extraction road – upgrade for 4.5 km • Newly constructed access road – 350 m

Table 6-15 shows the dust construction emitted from the one well site using the equations **Equation** 6-1 and **Equation 6-2**.

Table 6-15: Dust Concentration from Well Site associated Road Construction (one well-site)

Location		Area (m^2)	Area (acre)	Q (mg/s)	d (m)	C ($\mu g/m^3$)	Typical Ambient PM-10 ($\mu g/m^3$)*
Naweng-1	1 Well site	40,000	9.88	4116.67	200	34.31	**(68 - 127)**
Payama-1	1 Well site	16,900	4.18	1741.67	130	22.33	**(68 - 127)**
Drive way (between Off-road and the well site)							
Access road (constructed and upgraded)	Off-road leading to well site	1,000	0.63	115.2	10	19.2	**(68 - 127)**

* Ambient PM-10 concentrations are typical 24hr average baseline values.

The dust concentration resulting from the well site and access road construction is added to the ambient concentration. **The highest combined dust concentration** would be during **construction of the well site area**. However, the increase would be temporary and would not emit all dust emission at the same time.

6.4.2.3 Significance of Impacts

Without mitigation measures the impacts to air quality from nuisance dust are expected to be local in extent, short-term in duration, reversible and of medium magnitude. The impact disturbs an area currently used for agriculture with limited conservation value, and a reserved forest area also currently being used for agriculture with medium conservation value; the receptor sensitivity is rated medium. Given these impact criteria considerations the significance is determined to be Medium.

The Significance Ranking of impacts to air quality from nuisance dust is rated as **Medium**. (**Table 6-16**)

Table 6-16: Sigificance Ranking of impacts to Air Quality from Nuisance Dust

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

In general, the potential impact is estimated for a worst-case scenario; in reality vehicles and equipment will only be used intermittently. Therefore, the emissions will be less than presented above.

Based on the ranking, nuisance dust from the construction phase is considered as medium. Dust emissions from the construction activities are expected to potentially deteriorate the existing status of air quality around the project area especially during the dry season and when winds blow from the construction site to nearby communities.

The impacts would be short-term and limited to localized areas. But, if there were no mitigation measures, dust emissions can cause nuisance close to the construction sites, so would potentially affect construction workers, villagers and the environment.

6.4.2.4 Assessment of Impacts from Vehicle and Equipment Use

During construction, combustion products will be released from vehicles transporting personnel and equipment and construction machinery. Air pollutants come from various sources: fugitives and exhausts, fuel combustion, etc.

Potential concerns are:

- personnel safety
- global greenhouse effect
- ozone depletion
- fire hazards

Gaseous emissions may not deteriorate local air quality but may contribute to the global problems of greenhouse warming and ozone depletion. The primary gaseous emission concerns are hydrocarbons,

nitrogen oxides, sulphur oxides and carbon monoxide, and the contribution they will make to onshore levels of those gases or to existing problems, e.g., photochemical smog. Mercury vapour, sulphur dioxide and carbon monoxide in confined space present serious personnel health threats, while combustible gases may constitute fire hazards.

Fuel use for construction activities causes emission of pollutants. Emissions include CO, CO_2, NO_X and SO_2. Potential impacts of these and engine emissions are summarized in.

Table 6-17: Potential Impacts of Combustion Emissions

Emission Species	Environmental Impact
CO	Contributes indirectly to climate change by enhancing low-level of ozone formation.
CO_2	A GHG. Contributes to climate change.
NO_X	Contributes to the formation of acidic species that can be deposited by wet and dry processes, impacting aquatic and terrestrial ecosystems.
SO_2	Contributes to the formation of acidic species that can be deposited by wet and dry processes, impacting aquatic and terrestrial ecosystems.
CH_4	A GHG. Contributes to climate change. Reactant of ozone. Impact on respiratory system and circulatory system of living creature
N_2O	A GHG. Contributes to climate change.

Based on compilation of air pollution emission factors established by the U.S. Environmental Protection Agency (EPA), air pollutants generated from diesel oil combustion will consist of carbon monoxide, nitrogen dioxide, sulphur dioxide, and methane. Estimated carbon dioxide emissions are discussed under Greenhouse Gases in **Section 6.4.2.6** below.

6.4.2.5 *Significance of Impacts*

Without mitigation measures, the impact from air pollutants will be local in extent, short-term in duration, reversible and of medium magnitude. The impact disturbs an area currently used for agriculture with limited conservation value, and a reserved forest area also currently being used for agriculture with medium conservation value; the receptor sensitivity is rated medium. Given these impact criteria considerations the significance is determined to be Medium.

The Significance Ranking of impacts from air pollutants is ranked **Medium**. (**Table 6-18**)

Table 6-18: Sigificance Ranking of impacts from Air Pollutants

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.4.2.6 *Impacts from GHG Emissions*

Fuel combustion of the machinery during construction and installation phase and transportation of materials and equipment. The sensitive receptors for greenhouse gas emissions are the same as those listed for dust emissions.

The GHG emissions are estimated following the Tier 1 approach of IPCC (2006). GHG emissions are estimated using emission factors and global warming potentials for the three main greenhouse gases (CO_2, CH_4 and N_2O). The estimated GHG emissions for the project is shown in **Table 6-19**.

Total greenhouse gas emissions during the construction and installation phase of the project (2 exploration wells) amounts to 61.6 ton eq CO_2. When compared with available data on Myanmar's national CO_2 equivalent GHG emissions of 219,530,000 tonnes in 2016, including land use change (World Resources Institute, Climate Analysis Indicators Tool (CAIT)), the GHG emissions arising from the proposed activities are insignificant (approximately 0.000028 %), and therefore will not significantly impact the environment.

Table 6-19: Estimated GHG Emissions per Well during Construction and Installation

Project Phase	Activity	One Time CO_2 Release (ton CO_2)
Site Preparation	Granular Fill Transport	6.0
	Drilling rig mobilization	24.8
Total per well		30.8

6.4.2.7 Significance of Impacts

Without mitigation measures, the impact from greenhouse gas emissions during construction are considered to be a global issue, local in extent, short-term in duration, reversible and of low magnitude. The impact disturbs an area currently used for agriculture with limited conservation value, and a reserved forest area also currently being used for agriculture with medium conservation value; the receptor sensitivity is rated medium. Given these impact criteria considerations the significance is determined to be Low.

The Significance Ranking of impacts from GHG emissions is **Low**. (**Table 6-20**)

Table 6-20: Sigificance Ranking of impacts from GHG Emissions

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.4.2.8 Impact and Risk Mitigation Measures

Potential impacts from dust dispersion can be mitigated by application of the following measures:

Environment Impact Assessment –Construction and Installation Phase				
2. Air Quality	2.1 Well Site and Camp Construction	2.1.1 Deterioration of air quality due to dust.	2.1.1.1	Minimize land clearance to a minimum especially during the dry season.
			2.1.1.2	Limit vehicle speed on access road and site to minimize dust formation.

Environment Impact Assessment –Construction and Installation Phase				
			2.1.1.3	Cover trucks transporting materials with tarpaulins or plastic to prevent any loose material from blowing away and also to prevent dust dispersion.
			2.1.1.4	Spray water on roads when needed to keep dust down.
			2.1.1.5	Clean tires of the vehicles before leaving site if needed.
			2.1.1.6	Provide personal protective equipment to exposed field workers.
			2.1.1.7	Use vehicles with dust flaps to prevent dust during driving.
	2.2 Equipment use during Site and Road Construction	2.2.1 Deterioration of air quality due to vehicle emissions.	2.2.1.1	Ensure all machinery and vehicles are properly checked and inspected.
	2.3 Equipment use during Site and Road Construction	2.3.1 GHG Release contributing to climate change	2.3.1.1	Turn off all vehicles and equipment when not in use as well as prohibit vehicles from idling.

6.4.2.9 Residual Impacts and Risks

With these management measures, the magnitude of impacts to air quality from nuisance dust, air pollutants and GHG emissions will be reduced resulting in a residual significance that is **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.4.3 Assessment of Impacts to Noise

6.4.3.1 Scope of Assessment

Resource/Receptor	Project Phase	Activity	Impact
Noise	Construction Phase	Access road and Site Construction Vehicle and Equipment Use	Noise from machines and equipment

6.4.3.2 Assessment of Noise Impacts from Vehicle and Equipment Use

This section assesses the potential impacts of noise from the construction phase to sensitive receptors. The level of noise from project activities that is audible to a receptor (received level) will depend on the following:

- Background (ambient) noise.
- Noise level generated by an activity at the source (source level).
- The distance the receptor is from the noise source (range), and the level of transmission loss between the noise source and the receptor.
- The hearing threshold and frequency sensitivity of the receptor.

During the construction phase, noise will be primarily generated from project vehicles and construction equipment. Maximum noise levels generated by the various pieces of equipment during construction and drilling are listed in **Table 6-21**.

Table 6-21: Noise Level from Construction, Drilling and Testing Equipment

Source	Maximum (Db) at source (dB (A))	Number of Sources at one time
Dump Truck	84	1
Excavator	83	1
Roller Compactor	80	1
Bulldozer	75	1
Grader	75	1
Jack-Hammer	75 – 80	1

Source: British Columbia Ministry of Transportation and Infrastructure, 2012, reference distance 50 ft (15.24 m); (http://www.th.gov.bc.ca/BCHighways/contracts/Reference_Material_Tenders/03901-0001/AW_CEMP_10%20Feb_2012.pdf)

In the construction and installation phase, the possibility to use all the equipment at one time is low. Therefore, noise will be evaluated from a maximum of 3 sources operating at one time (dump truck, excavator and roller compactor).

The impact assessment for noise from project activities evaluates impacts to fauna during the different phases of the project. Noise is expected to be greatest during construction and commissioning due to the higher number of vehicle movements and heavy machinery use.

Noise associated with decommissioning is expected to result primarily from the operation of the heavy machinery required to decommission the facilities and remove infrastructure. Noise impacts are anticipated to be similar to those from construction and commissioning activities. A decommissioning plan will be developed at the time of project decommissioning which will assess noise impacts of associated activities in more detail.

Like humans, the effect of noise on wildlife is highly varied and is dependent on the noise intensity, its frequency, and its duration; the sensitivity of the species or individual affected; and the environment in which the noise is perceived. Sounds exceeding 55 dB are known to cause physiological and behaviour changes in terrestrial fauna (Checker, 1980) and diminishes habitat value and disrupts terrestrial fauna activity (e.g. injury, energy loss, decreased food intake, habitat avoidance, and reproductive loss). Unusual, loud, and/or intermittent noise will generally startle and stress most species of wildlife, although they may quickly get used to continuous noise. Wildlife may avoid the area for varying lengths of time; once the noise stops they will likely return. The area around the well sites provides habitat for many animals and birds temporarily disturbed by the noise of this operation.

Increased stress and/or movement during critical periods, such as nesting, or birthing will generally cause greater adverse effects to wildlife than the same stress outside of such critical times. If nesting birds leave the nest for even a short period of time, their nesting success may be reduced; if they abandon the nest, that nesting attempt will fail.

6.4.3.3 Noise Impacts from Construction

There will be a temporary increase in traffic levels and operation of heavy equipment, which will cause an increase in the noise levels and an increase in disturbance. This will have an impact on the surrounding wildlife (mainly birds), as they will tend to avoid the area.

Noise levels at various distances from these sources were calculated using **Equation 6-3**:

$$L_r = L_w - 20*Log_{10}(D/D_0) \qquad \textbf{Equation 6-3}$$

Where L_r = Sound level at distance D (dB(A))
L_w = Sound level at source D_0 (dB(A))
D = Distance from point source (m)
D_0 = Reference distance where the source noise emission level was measured

(Source: http://www.fhwa.dot.gov/environment/noise/highway/hcn03.htm)

The total noise level from several construction sources is calculated using **Equation 6-4**:

$$Lp_{Total} = 10 * Log_{10}(\sum_{i=1}^{n} 10^{Li/10}) \quad \textbf{Equation 6-4}$$

Where $L_{p\ total}$ = Noise level from n sources
n = Number of sources
Li = Noise level from ith source, dB (A)

Not all construction equipment will be operating at the same time. Using data from **Equation 6-4** for the two noisiest construction machines (dump truck and bulldozer), the total construction noise can be estimated as:

$Leq_{(Total)}=10\ Log\ [(2)(10^{85/10}) + (1)(10^{88/10})] = 91.0dB(A)$ at 50 feet from noise source

The nuisance noise during construction activities is calculated using **Equation 6-5**.

Nuisance Noise = Specific Noise Level- Background Noise Level **Equation 6-5**

Construction noise levels at sensitive receptors using **Equation 6-3** are combined with typical ambient noise measurements equivalent noise levels of 45 dB (A) using **Equation 6-4** into a specific noise level. The construction and specific noise levels at sensitive receptors are shown in **Table 6-22**.

Table 6-22: Noise Calculations from Construction Activities

Proposed well	Village*	Village Tract	Distance (m) from well	Noise at Receptor	Specific	Nuisance
Naweng-1	Tan Daw Gyi	Ywa Thit	1400	50.5	51.6	9.6
	Nyaung Gon		1020	53.3	53.9	11.9
	Zin Byun Gon		1150	52.2	53.0	11.0
	Pyin Daung Gon		1330	51.0	52.0	10.0
	Pwe Bye		1900	47.9	49.7	7.7
	Sa Be Kan	Yat Tha	1060	53.0	53.6	11.6
	Wa Le		1100	52.6	53.3	11.3
	Yat Tha		1580	49.5	50.8	8.8
	Gyo Gon		1970	47.6	49.5	7.5
	Ka Yin Gon	Cha Ya Gone	420	61.0	61.1	19.1
	Ywa Tha Gon		530	59.0	59.1	17.1
	Taw Chin		1170	52.1	52.9	10.9
	Thit Cho		1600	49.4	50.7	8.7
	Pan Lan Gon		710	56.4	56.7	14.7
	Kaung Bin Lu		1200	51.9	52.7	10.7
	Cha Ya Gone		1400	50.5	51.6	9.6
Payama-1	Sett Tone	Tha Phan Kaing	5000	39.5	46.1	4.1

The nuisance noise level during construction can exceed the nuisance noise standard of 10 dB (A) at the Naweng-1 well sites. The estimated noise levels present an absolute worst-case condition. Not all equipment is likely to operate at the same time. In addition, the surrounding trees and other vegetation and the topography are expected to lead to a far more rapid attenuation of noise. Construction activities are expected to last approximately 90 days per well site; noise levels at the sensitive receptors will return to baseline levels upon cessation of construction activities.

6.4.3.4 Significance of Impacts

Without mitigation measures, impacts from noise from Construction to sensitive receptors are expected to be medium in extent, short-term in duration, reversible, of low magnitude. The impact disturbs an area currently used for agriculture with limited conservation value, and a reserved forest area also currently being used for agriculture with medium conservation value; the receptor sensitivity is rated medium. Given these impact criteria considerations the significance ranking is determined to be Medium.

The Significance Ranking of impacts from Noise to sensitive receptors is rated as **Medium** (**Table 6-23**).

Table 6-23: Sigificance Ranking of impacts from Noise to Sensitive Receptors

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.4.3.5 Impact and Risk Mitigation Measures

Impacts from noise can be mitigated through the use of the following mitigation measures:

Environment Impact Assessment –Construction and Installation Phase			
3. Noise	3.1 Use of machines/ engines during construction and transportation	3.1.1 Increase in noise levels from machines/ engines	3.1.1.1 Minimize vehicles and rig transportation from sensitive environmental areas. (e.g. Forest, Archeology area, Heritage area etc.)
			3.1.1.2 Minimize construction activities and vehicle/rig movements in night time.
			3.1.1.3 Limit vegetation removal to a minimum at well site, camp site and access road.
			3.1.1.4 Turn equipment/machinery off when not in use.
			3.1.1.5 Use enclosures when possible to contain noise on site.
			3.1.1.6 Implement transportation plan to avoid traffic issue that make noise pollution.
			3.1.1.7 Materials should be lowered when practical and not dropped while transferring

6.4.3.6 *Residual Impacts and Risks*

With these management measures, the residual significance from the impact of noise to sensitive receptors is **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.4.4 Assessment of Impacts to Surface Water Hydrology

6.4.4.1 *Scope of Assessment*

Resource/Receptor	Project Phase	Activity	Impact
Surface Water Hydrology	Construction Phase	Access Road and Site Construction	Change in water surface flow direction Flow rate of run-off water

6.4.4.2 *Assessment of Impacts from Access Road and Site Construction*

Vegetation removal, construction of campsites and access roads can alter surface water hydrology by reducing interception, evaporation/ transpiration and infiltration, which in turn can increase runoff and change local drainage patterns. Heavy rains can intensify changes in surface water hydrology; these changes are also enhanced on steep slopes.

Construction of the access roads, campsite and well sites for this project will result in some vegetation removal. The area of vegetation removal will be small and site preparation will be conducted on flat terrain. In addition, OVL will install culverts under the access roads if required in order to maintain natural drainage. No changes in surface water hydrology are therefore expected.

Runoff calculation

The calculation of water runoff in this report is conducted to evaluate the adequacy of the drainage system in the project area using the Rational Method, which is used to estimate the water runoff into the drainage system in urban areas and small watershed. ASCE (1992) recommended for areas smaller than 80 hectares[2] (500 acres), while WSDOT says the accuracy of the calculation by the Rational Method is high when applied to an area of 40 hectares (250 acres)[3].

Chu (2010) noted that the Rational Method estimates on the assumption that runoff collection period is equal to the period of rain (Time of concentration = Rainfall duration)[4]. Therefore, a small space has a high possibility that the total collection period is equal to the period of rain, therefore it has a higher accuracy than for a much larger area. The runoff from a single well site is calculated with **Equation 6-6;** which is valid for runoff areas not larger than 25 km^2.

In the project area the wettest month is June with a monthly rainfall of 234.8 mm. Therefore, runoff was calculated using rainfall intensity derived from a worst-case scenario of a month's equivalent of rain intensity in a ½-hr duration storm (234.8 mm/hr).

$$Q = 0.278 \times 10^{-6} CIA$$ **Equation 6-6**

[2] American Society of Civil Engineers, .1992Design and Construction of Urban Stormwater Management Systems. "ASCE Manuals and Reports of Engineering Practice No. 77, WEF Manual of Practice FD- ".20New York, N.Y.
[3] WSDOT Training publication from http://www.wsdot.wa.gov/publications/fulltext/Hydraulics/hhtraining/section02.pdf
[4] Chu, V., 2010, A Self Learning Manual – Mastering Different Fields of Civil Engineering Works (VC-Q-A-Method) from http://www.iemauritius.com/upload/files/a_self-learning_manual_-_mastering_different_fields_of_civil_engineering_works_(vc-q&a_method).pdf

where: Q = runoff, m^3/second
A = area, m^2
I = rainfall density, mm/hour
C = runoff coefficient (**Table 6-24**)

Table 6-24: Runoff Coefficient of Various Catchment Areas

Land Use	Coefficient (C)	Surface	Coefficient (C)
Business		**Streets**	
- Downtown area	0.70-0.95	- Asphalt or concrete	0.70-0.95
- Neighbourhood areas	0.50-0.70	- Bricks	0.70-0.85
Residential		**Roofs**	0.75-0.95
- Single family areas	0.30-0.50	**Lawns (sandy soil)**	
- Multi unit, detached	0.40-0.60	- Flat with 2%slope	0.05-0.10
- Multi unit, attached	0.60-0.75	- 2-7% slope	0.10-0.15
- Suburban	0.25-0.40	- Over 7% slope	0.15-0.20
- Apartments	0.50-0.70	**Lawns (heavy soil)**	
Industrial		- Flat with 2% slope	0.13-0.17
- Light areas	0.50-0.80	- 2-7% slope	0.18-0.22
- Heavy areas	0.60-0.90	- Over 7% slope	0.25-0.35
Parks, cemeteries	0.10-0.25		
Playgrounds	0.20-0.35		
Railroad yard areas	0.20-0.35		
Unimproved areas	0.10-0.30		

Source: Kriangsak Udomsinrot (1994), Environmental engineer, Mitnarakanpim, Bangkok
Thongchai Pansawad (1995), Guideline for wastewater treatment system and rainfall

Pre-Construction-Surface water drainage before the construction of a typical well site for the project can be calculated as follows:

Q (existing condition) = (0.278×10^{-6}) (0.17) (234.8) (40,000) (1800) m^3/s
= 799 m^3 for the ½ hr storm,

with the following parameters inserted into **Equation 6-6**:

A = well site area 40,000 m^2
I = 234.8 mm/h (using a monthly rainfall storm).
C = 0.17 for garden (heavy soil), flat with 2% slope (**Table 6-24**)

Therefore, the volume of runoff for an extreme ½ hour duration storm before a typical well pad is constructed can be calculated with a cofactor of 0.17. The surface water drainage during construction of the project site can be calculated with **Equation 6-6** for construction with a runoff coefficient of 0.30 for unimproved area. The well site area calculations are shown in **Table 6-25**.

Table 6-25: Construction Run-Off Calculations

No	Well site	Area (m^2)	Q (Existing) m^3/s	Q (Construction) m^3/s
1	Nayama-1	40,000	799	1,410
2	Payama-1	16,900	338	596

The distances to sensitive receptors are included in **Table 6-26**.

Table 6-26: Distances to Sensitive Receptors for Each Potential Well Site.

Proposed well	Village*	Village Tract	Distance (km) from well
Naweng-1 **Lat: 18°31'22.3437"N** **Long: 95°24'21.6247"E** **X: 754004.96** **Y: 2049730.75**	Tan Daw Gyi	Ywa Thit	1.40
	Nyaung Gon		1.02
	Zin Byun Gon		1.15
	Pyin Daung Gon		1.33
	Pwe Bye		1.90
	Sa Be Kan	Yat Tha	1.06
	Wa Le		1.10
	Yat Tha		1.58
	Gyo Gon		1.97
	Ka Yin Gon	Cha Ya Gone	0.42
	Ywa Tha Gon		0.53
	Taw Chin		1.17
	Thit Cho		1.60
	Pan Lan Gon		0.71
	Kaung Bin Lu		1.20
	Cha Ya Gone		1.40
Payama-1 **Lat: 18°45'1.997"N,** **Long: 95°45.1252"E** **X: 759629.13** **Y: 2075021.51**	Sett Tone	Tha Phan Kaing	>5km but on the access road
	Minn Lann		
	Kyo Pin	Kyoet Pin Waing	
	Thith Yaung Paung		

Surface Water Runoff to Access Road

The overall landscape around the project well site is flat paddy agricultural lands and open disturbed forestlands. All access roads will be 6 m wide. In consultation with and approval from local authorities the existing earth road will be upgraded and the short access roads to the wellsite will be constructed. Any new access road will incorporate culverts to allow the flow of natural surface drainage and prevent any ponding of water around the earth roads.

Table 6-27: The Distance from Existing Road to the Proposed Well Location

Well site	Length of Road Upgrading
Naweng-1	• 1.215 km upgrading of existing 125 m of new road construction
Payama-1	• Existing rural earthen road – upgrade for about 15.25 km • Existing sugar cane extraction road – upgrade for 4.5 km • Newly constructed access road – 350 m

The maximum area impacted would be Payama-1 well site with an road upgrading length of 19.75 km and a newly constructed access road of 350 m (see **Figures 6-2 to 6-4**).

6.4.4.3 Significance of Impacts

Without mitigation measures, impact on hydrology will be local in extent and transient, short term and of medium magnitude. The impact disturbs an area currently used for agriculture with limited conservation value, and a reserved forest area also currently being used for agriculture with medium

conservation value; the receptor sensitivity is rated medium. Given these impact criteria considerations the significance is determined to be a Medium.

The Significance Ranking of impacts from vegetation removal, construction of well sites and access roads on surface water hydrology is rated as **Medium** (**Table 6-28**).

Table 6-28: Sigificance Ranking of impacts to Surface Water Hydrology

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.4.4.4 Impact and Risk Mitigation Measures

Impacts from runoff can be mitigated through the use of the following measures:

Environment Impact Assessment –Construction and Installation Phase			
4. Surface Water Hydrology	4.1 Construction of roads and well / camp sites	4.1.1 Alteration of surface water hydrology	4.1.1.1 Avoid construction of well sites in areas that may cause obstacles to water drainage.
			4.1.1.2 Construct water drainage lines (culverts/causeway) to maintain natural drainage. The required permission will be obtained from MOGE and all relevant authorities.
			4.1.1.3 Limiting access road gradients to reduce runoff-induced erosion.
			4.1.1.4 Providing adequate road drainage based on road width, surface material, compaction, and maintenance.
			4.1.1.5 Depending on the potential for adverse impacts, installing free-spanning structures (e.g., course way) for road watercourse crossings.
			4.1.1.6 Restricting the duration and timing of in-stream activities to lower low periods, and avoiding periods critical to biological cycles of valued flora and fauna
			4.1.1.7 For in-stream works, using isolation techniques such as berm construction or diversion during construction to limit the exposure of disturbed sediments to moving water.
			4.1.1.8 Minimize areas to be cleared. Use hand cutting where possible, avoiding the use of heavy equipment such as

Environment Impact Assessment –Construction and Installation Phase			
			bulldozers, especially on steep slopes, water and wetland crossings, and forested and ecologically sensitive areas.

6.4.4.5 Residual Impacts and Risks

With these management measures, the magnitude of impacts from vegetation removal, construction of well sites and access roads to surface hydrology will be reduced resulting in a residual significance ranking that is **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.4.5 Assessment of Impacts to Surface Water Quality

6.4.5.1 Scope of Assessment

Resource/Receptor	Project Phase	Activity	Impact
Surface Water Quality	Construction Phase	Access road and Site Construction Site Runoff and Drainage Handling of materials and chemicals Hazardous/non-hazardous waste management	Increase in erosion and potential contamination from spills or wastewater drainage to nearby water bodies

6.4.5.2 Assessment of Impacts from Access Road and Site Construction

Sources of impact on surface water quality from construction of access roads and well site, and site runoff and drainage are soil erosion in the construction area that might wash soil into surrounding surface water and contamination such as machine repairing and changing of lubricating oil.

Some erosion and soil loss are unavoidable during land-disturbing activities. While proper siting and design will help prevent areas prone to erosion from being developed, construction activities will invariably produce conditions where erosion may occur. However, the flat slope of the land and the timing of construction will limit downstream impacts.

6.4.5.3 Assessment of Impacts from Site Runoff and Drainage

Sources of impact on surface water quality during the construction phase include discharge of effluent from worker accommodations, soil erosion in the construction area that might wash soil into surrounding surface water, and contamination from machine repairing and changing of lubricating oil. Impacts from non-hazardous and hazardous wastes spills are discussed in **Section 6.16.4**.

Both runoff volume and suspended solids concentrations can increase during and after construction. For this project, the maximum runoff volume at Naweng-1 wellsite for an extreme rain event increases from 799 m^3 for pre-construction to 1410 m^3 during construction and at Payama-1 wellsite for an extreme rain event increases from 338 m^3 for pre-construction to 596 m^3 during construction (detailed calculation are provided under Surface Water Hydrology, **Section 6.4.4**. The typical suspended solids (SS) concentration from different surfaces is provided in **Table 6-29**.

Table 6-29: Typical Suspended Solids Concentration in Runoff

Source Area	Suspended Solids Concentration
Landscaped area	500 mg/L
Construction site	10,000 mg/L
Unpaved parking	250 mg/L
Detention pond water	10 mg/L

Source: Pitt and Clark. 2002[5]

The overall suspended solids load during construction is substantially higher than before construction. Construction is expected to last 90 days for both well site locations. The Actual maximum annual rainfall will be well below the worst case of a maximum month's equivalent rainfall event of 234.8 mm/hr used to calculate runoff from the project well site.

The typical SS concentrations from different surfaces are combined with the rainfall intensity of a ½-hr duration storm with a return period of 10 years to determine the maximum runoff load in **Table 6-30**.

Table 6-30: Suspended Solids (SS) Runoff from the well site

No	Well site	Area (Sq m)	Q (Existing)	Existing SS Load (kg)	Q (Construction)	Construction SS Load (kg)
1	Naweng-1	40,000	799	400	1,410	14,100
2	Payama-1	16,900	338	169	596	5,960

The calculations indicate that the runoff volume and levels of maximum suspended solids in runoff is potentially much higher during construction than before construction. It should be noted that the values calculated in **Table 6-30** are based on an extreme rainfall. The chance that this extreme event would happen within the construction window for this project is very small.

Any siltation from surface runoff generated during construction activities is unlikely to travel far. Sustained elevated turbidity levels from runoff can reduce transmission of sunlight, thus limiting photosynthesis. In turn, this can reduce the level of oxygen in the water. Organic matter introduced into a watercourse can lead to further deoxygenation as microorganisms decompose the organic matter and result in eutrophication. If oxygen levels fall below the natural DO variability in a system, flora phytoplankton, zooplankton and benthos diversity and abundance could decline.

Erosion from Stream Crossing Construction

The construction of the water crossing infrastructure could allow for mobilization and transport of soil particles may, in turn, result in sedimentation of surface drainage networks, which may result in impacts to the quality of natural water systems and ultimately the biological systems that use these waters.

6.4.5.4 Significance of Impacts

Without mitigation measures, impacts to surface water quality are therefore expected to be local in extent, short-term in duration, reversible, and of medium magnitude. The impact disturbs an area currently used for agriculture with limited conservation value, and a reserved forest area also currently being used for agriculture with medium conservation value; the receptor sensitivity is rated medium. Given these impact criteria considerations the significance is determined to be medium.

[5] Pitt, R. and S. Clark. 2002. Emerging stormwater controls for critical areas. Pp. 104-136. In Wet weather flow in the urban watershed. Technology and Management. Field, R. and D. Sullivan. (Eds)

The Significance Ranking of impacts on surface water quality and aquatic biota from land and habitat disturbance is **Medium**. (**Table 6-31**)

Table 6-31: Sigificance Ranking of impacts to Surface Water Quality and Aquatic Biota

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.4.5.5 Impact and Risk Mitigation Measures

Impacts to water quality and aquatic biota can be mitigated through the use of the following measures:

Environment Impact Assessment –Construction and Installation Phase			
5. Surface Water Quality	5.1 Construction of roads and well / camp sites and site runoff and drainage	5.1.1 Degradation of surface water quality from runoff/ drainage	5.1.1.1 The proposed drill site and campsite will be orientated and designed to minimize areas requiring soil stabilization.
			5.1.1.2 Provide drip pans and absorbents to contain any spillage from vehicle and machinery while transferring fuel or changing of engine oil.
			5.1.1.3 Provide drainage and sediment traps around project area to reduce suspended particles in runoff from the well site and to contain minor oil spills.
			5.1.1.4 Avoid construction of the well pad in areas where such construction obstructs water drainage.
			5.1.1.5 Prohibit workers from cleaning machines/equipment in/near a water source.
			5.1.1.6 Prohibit workers and contractors discharging or discarding project waste, chemicals, and oil into public water sources.
			5.1.1.7 Provide a level storage area for construction materials (such as soil, sand, and stone) to limit soil erosion.
			5.1.1.8 Scheduling construction in dry season to avoid heavy rainfall periods suspending activities during extreme rainfall and high winds to the extent practical.

Environment Impact Assessment –Construction and Installation Phase			
			5.1.1.9 Contouring the access road and causeway infrastructure to minimizing length and steepness of slopes
			5.1.1.10 Mulching and Re-vegetating slopes promptly to stabilize exposed areas
			5.1.1.11 Engineer Designing channels and ditches for post-construction flows
			5.1.1.12 Lining steep channel and slopes (e.g. use jute matting)
			5.1.1.13 Reducing or preventing off-site sediment transport through use of silt fences

6.4.5.6 *Residual Impacts and Risks*

With these management measures, the magnitude of impacts to *surface water quality and aquatic biota from land and habitat disturbance* will be reduced which will result in a residual significance ranking that is **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.4.6 Assessment of Impacts to Ground Water Quality

Resource/Receptor	Project Phase	Activity	Impact
Groundwater Quality	Construction Phase	Handling of materials and chemicals Hazardous/non-hazardous waste management	Degradation of groundwater quality from spills or leaks leaching into water table

6.4.6.1 *Assessment of Impacts from Site Drainage, Hazardous/Non-hazardous Waste Management and Chemical Management*

Activities during construction that may affect groundwater quality include fuel spillage, hazardous/non-hazardous wastes and chemical spills. Contamination of groundwater from drained domestic waste and grey water may also leach into the water table.

During construction fuel will be stored in a bunded area and wastes will be separated and stored in a secure location in appropriate containers. Wastes will ultimately be sent for disposal at a permitted waste disposal facility. Chemicals will be placed on the waterproof concrete cement base, with roof and overflow curb to contain any spills. Any spills will be immediately cleaned up using the spill kits provided on site.

A set of concrete septic tanks will be built into the work camp pad at the outer edges. They will have a combined capacity of 8000 litres (8 m^3). No pump out of septic sludge is required as the concrete septic tanks and any sewage sludge will be left in ground onsite at the end of the drilling campaign. Wastewater from the campsite, including both grey water and black water, will be treated separately. Grey water will be treated in a soak pit and Black water will be treated in septic tank and soak pit.

6.4.6.2 Significance of Impacts

Without mitigation measures, impacts to groundwater quality are therefore expected to be local in extent, short-term in duration and of medium magnitude. The impact disturbs an area currently used for agriculture with limited conservation value, and a reserved forest area also currently being used for agriculture with medium conservation value; the receptor sensitivity is rated medium. Given these impact criteria considerations the significance is determined to be medium.

The Significance Ranking of impacts on groundwater from site drainage, hazardous/non/hazardous waste management and chemical management is **Medium**. (**Table 6-32**)

Table 6-32: Sigificance Ranking of impacts to Groundwater Quality

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.4.6.3 Impact and Risk Mitigation Measures

Impacts to groundwater quality can be mitigated through the use of the following measures:

Resource/Receptor	Project Phase	Activity	Impact
7 Groundwater Quality	7.1 Hazardous/Non-Hazardous waste management and chemical handling	7.1.1 Contamination of groundwater from waste, chemicals and wastewater	7.1.1.1 Prohibit workers from cleaning machines/ equipment in unauthorized locations.
			7.1.1.2 Prohibit workers and contractors discharging or discarding project waste, chemicals, or oil in unauthorized locations.
			7.1.1.3 Install septic tank on each well site for holding sewage and grey water.
			7.1.1.4 Store wastes and chemicals in a secure area that has a hard surface and closed drains.

6.4.6.4 Residual Impacts and Risks

With these management measures, the magnitude of impacts to groundwater from site drainage, hazardous/non/hazardous waste management and chemical management will be reduced which will result in a residual significance ranking that is **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.4.7 Assessment of Impacts to Soil Quality

6.4.7.1 Scope of Assessment

Resource/Receptor	Project Phase	Activity	Impact
Soil	Construction Phase:	Access road and Site Construction Site Runoff and Drainage Handling of Materials and chemicals Hazardous/non-hazardous waste management	Soil contamination Erosion, soil disturbance, soil compaction

6.4.7.2 Assessment of Impacts from Access Road and Site Construction

General construction activities have the potential to result in adverse impacts on soil resources as a result of soil loss due to erosion. Sources of impact on soil properties during construction include soil excavation, land clearing, improvement/construction of access roads, and contamination such as machine repairing and changing of lubricating oil.

The well pad area will be stripped of topsoil and levelled; the subsoil in the area will be covered with a compacted granular fill. If well testing indicates that the oil or gas reserves are not commercially viable to produce, the site will be abandoned.

Without mitigation measures, well and camp site areas might erode during construction phase due to site runoff and drainage. Lower land might be consequently be washed away by soil erosion and surrounded agricultural area might be affected.

6.4.7.3 Significance of Impacts

Without mitigation measures, physical disturbance and soil erosion impacts from soil excavation, land clearing, improvement/construction of access roads, and contamination such as machine repairing and changing of lubricating oil are expected to be low in extent, short-term in duration, reversible and of medium magnitude. The impact disturbs an area currently used for agriculture with limited conservation value, and a reserved forest area also currently being used for agriculture with medium conservation value; the receptor sensitivity is rated medium. Given these impact criteria considerations the impact significance is determined to be a medium impact for environment.

The Significance Ranking of impacts from soil disturbance and soil erosion from soil excavation, land clearing, improvement/construction of access roads, and contamination such as machine repairing and changing of lubricating oil is rated as Medium (**Table 6-33**).

Table 6-33: Sigificance Ranking of impacts to soil disturbance and soil erosion

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.4.7.4 *Impact and Risk Mitigation Measures*

Impacts to soils can be mitigated through the use of the following measures:

Environment Impact Assessment –Construction and Installation Phase			
6. Soil quality	6.1 Construction of roads and well / camp sites	6.1.1 Degradation of soil quality through compaction or erosion during construction.	6.1.1.1 Limit soil compaction to well sites and access roads.
			6.1.1.2 Exposed site areas should be kept to a minimum during construction
			6.1.1.3 Provide effective construction site run-off control and design.

6.4.7.5 *Residual Impacts and Risks*

With these management measures, the magnitude of impacts from soil disturbance and erosion from soil excavation, land clearing, improvement/construction of access roads, and contamination such as machine repairing and changing of lubricating oil will be reduced, resulting in a residual significance ranking that is **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.4.8 Assessment of Impacts to Flora & Fauna

6.4.8.1 *Scope of Assessment*

Resource/Receptor	Project Phase	Activity	Impact
Flora & Fauna	Construction Phase	Access road and Site Construction Vehicle and Equipment Use Site Runoff and Drainage Hazardous/non-hazardous waste management Handling of materials and chemicals Labour and Accommodation	Degradation or destruction of natural habitat Harvesting of plants and animals by Human activity

Sources of potential impact on flora and fauna include access road and site construction, movement of vehicles, equipment and the rig, site runoff and drainage, handling materials and chemicals, hazardous/non-hazardous waste and labor and accommodation. Soil compaction can inhibit root penetration and reduce water infiltration, which can increase runoff and erosion or cause ponding. These conditions limit or inhibit plant growth.

6.4.8.2 *Assessment of Impacts from Site Clearing and Construction of Access Road and Site*

The project area consists of agricultural (i.e., paddy field, sugar cane and crop) and scrubland & forested (i.e., grass and shrubs, mixed deciduous forest/disturbed deciduous forest, dry evergreen forest/disturbed evergreen forest, disturbed deciduous forest, deciduous dipterocarp forest, and dense deciduous forest). Access road and site construction will potentially destroy some flora and fauna habitat.

Each well site will have similar construction plans. The well pad size for Naweng-1 is 200 m x 200 m (40,000 m^2) and the well pad size for Payama-1 is 130 m x 130 m (16,900 m^2). The well site and

accommodation campsite will be levelled and elevated by cut and fill methods and compacted using bulldozers, dump trucks, water trucks and graders.

The source of impact from the site preparation is caused by soil excavation/filling and construction of access road/well pad activity. The project area mainly consists of farming, agricultural and forested areas with agriculturally dominated communities and access roads. The existing condition of the well pad for Naweng-1 location is in a paddy field during the wet season only and the land acquisition will be completed as per MOGE requirements. The existing condition of the well pad for Payama-1 is located in an existing cleared area used for peanuts in the wet season only in the Sha Byin Reserved Forest Area. The reserved forest is highly disturbed with most of the area planted for crops and sugar cane plantations.

The project will cause changes to local habitat of the well site and surrounding areas. The effect will be limited to the construction areas and access road. The habitat of the area within a 5-km radius of the exploration well site will be largely unaffected, because the construction areas for the well site and access road consist of less than 0.1 % of the total area.

Clearance

The area that will be used for the well site will be cleared, covered with laterite to construct the well pad. The project site for Payama-1 wellsite is within the Reserved Forest boundary.

Physical Disturbance

Soil compaction can inhibit root penetration and reduce water infiltration, which can increase runoff and erosion or cause ponding. These conditions limit or inhibit plant growth.

The construction area will be defined, and contractors will be required to stay within the designated area, preventing compaction of soil beyond the access road and the site.

The activities of the project area may affect wildlife such as disturbance to habitat. Transportation will cause an increase in the noise levels and an increase in possible disturbance. The potential impacts from the movement of vehicles and drilling rigs associated with the exploration drilling campaign are:

- Disturbance leading to behavioral changes or displacement of fauna
- Increased likelihood of incidents

The occurrence and intensity of disturbance is highly variable and depends on a range of factors relating to the animal and situation. Some behavioral disturbance may occur for short periods if fauna is present or near access road and project site.

Human activity will be confined to the access road and well sites and will not constitute a new impact on the area, which is already regularly visited by people. Contractors and personnel will not be allowed off site where they could cause unnecessary disturbance to wildlife. In addition, hunting and trapping will be prohibited, and violations are grounds for termination of contract and dismissal.

The well site area is an existing agricultural area and open forest area with limited natural terrestrial flora. As standard practice, OVL will ensure that its staff and contractors will not cut trees or forage in the area surrounding the well sites during any phase of the project. The Naweng-1 well site is within 5 km. of the Inn Ma Swanp and the Payama-1 well site is within the Shabyin Reserved Forest.

6.4.8.3 Assessment of Impacts from Site Runoff and Drainage to Aquatic Biota

Clearance, construction of well site, upgrading of access road/well site and wastewater drainage could affect aquatic biota**.** Runoff water from the project area may affect the surface water quality which may affect the phytoplankton, zooplankton and benthos.

Runoff containing certain chemicals can cause water quality deterioration by increasing nutrient and/or organic matter loads (which can lead to eutrophication of water bodies from organic matter decomposition by micro-organisms), and by introducing toxic material into the water bodies. The potential for impacts from silt in runoff from the well site is minimal once the construction is complete; the suspended solid load following construction is practically identical to the pre-construction load.

The construction of the access roads and well sites may cause impact to the aquatic habitat due to alterations from high suspended sediments from erosion caused by vegetation removal. Sustained elevated turbidity levels from runoff can reduce transmission of sunlight, thus limiting photosynthesis. In turn, this can reduce the level of oxygen in the water. Organic matter introduced into a watercourse can lead to further deoxygenation as the organic matter is decomposed by micro-organisms and results in eutrophication. If oxygen levels fall below the natural DO variability in a system, flora phytoplankton, zooplankton and benthos diversity and abundance could decline.

6.4.8.4 Significance of Impacts

The impact to flora and fauna from access road and site construction, movement of vehicles, equipment and the rig, site runoff and drainage, handling materials and chemicals, hazardous/non-hazardous waste and labor and accommodation will be local in extent, short-term in duration, reversible and of medium magnitude. The impact disturbs an area currently used for agriculture with limited conservation value, and a reserved forest area also currently being used for agriculture with medium conservation value; the receptor sensitivity is rated medium. Given these impact criteria considerations the significance ranking is determined to be Medium.

The Significance Ranking of impacts to terrestrial flora and fauna from clearance of site, installation of rig and drilling equipment, constructing new access roads and physical disturbance is rated as **Medium** (**Table 6-34**).

Table 6-34: Significance Ranking of impacts to terrestrial flora and fauna from access road and site construction, movement of vehicles, equipment and the rig, site runoff and drainage, handling materials and chemicals, hazardous/non-hazardous waste and labor and accommodation.

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.4.8.5 Impact and Risk Mitigation Measures

Impacts to terrestrial flora can be mitigated through the use of the following measures:

Ecological Environment Impact Assessment – Construction and Installation Phase				
7. Flora and Fauna	7.1 Site Clearing for Construction of roads and well / camp sites	7.1.1 Degradation or destruction of natural habitat	7.1.1.1	High valued habitat to be avoided where practicable in the design process.
			7.1.1.2	Remove vegetation in project areas only (roads, camp site, well site).

Ecological Environment Impact Assessment – Construction and Installation Phase				
			7.1.1.3	Mark well sites clearly and prohibit vehicles from moving off site onto surrounding land.
	7.2 Construction of roads and well site/ camp sites	7.2.1 Habitat degradation from construction	7.2.1.1	Minimize noisy construction work and preferably limit it during daytime hours.
			7.2.1.2	Limit vegetation removal to a minimum.
			7.2.1.3	Limit to cut the tree only in well site and access road.
			7.2.1.4	Contractors and personnel will not be allowed off site where they could cause unnecessary disturbance to vegetation or wildlife.
			7.2.1.5	Hunting and trapping will be specifically prohibited.
	7.3 Site Runoff and Drainage	7.3.1 Habitat degradation of aquatic biota	7.3.1.1	Avoid the construction of the well pads in areas where such construction obstructs a water route.
			7.3.1.2	Mark well sites clearly and prohibit vehicles from moving off site onto surrounding land.
			7.3.1.3	Contractors and personnel will not be allowed off site where they could cause unnecessary disturbance to aquatic biota. In addition, fishing will be specifically prohibited.
			7.3.1.4	Provide a suitable storage area for construction materials (such as soil, sand, and stone), chemicals (i.e., paint and thinner), and oil (i.e., fuel and lubricating oil).
			7.3.1.5	Provide drip pans and absorbents at fuel storage area to contain any spillage.
			7.3.1.6	Strictly implement and follow mitigation measures for impacts to soil and surface water hydrology and quality.

6.4.8.6 Residual Impacts and Risks

With these management measures, the residual significance of impacts to flora and fauna from access road and site construction, movement of vehicles, equipment and the rig, site runoff and drainage, handling materials and chemicals, hazardous/non-hazardous waste, and labor and accommodation is determined to be **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.5 Environmental Impact Assessment during Drilling Phase

Key issues identified by the screening process must be assessed to determine their impacts during the drilling phase, including:

- Air quality
  - Dust
  - Air Pollution
  - Hydrogen Sulfide
  - Greenhouse Gas
- Noise
- Heat and Light
- Soil
- Surface Water Quality
- Groundwater quality
- Flora and Fauna

6.5.1 Assessment of Impacts to Air Quality

6.5.1.1 Scope of Assessment

Resource/Receptor	Project Phase	Activity	Impact
Air Quality/ Climate	Drilling Phase	Rig Move Vehicle and Equipment Use	Deterioration of air quality from fuel combustion and release of hydrogen Sulfide during the drilling phase Greenhouse Gas

6.5.1.2 Assessment of Dust Impacts from Vehicle and Equipment Use

Vehicles driving on gravel/dirt roads during the drilling phases will disperse dust. Vehicles grind dust into fine particles lifted into the air by tire rotation and eddy air currents (Hesketh et al., 1983).

Dust dispersion can lead to a temporary deterioration in air quality by increasing TSP (Total Suspended Particulates) and PM_{10} (Particulate Matter <10 microns, units mg/m^3) concentrations.

During transportation of materials and equipment during drilling, sensitive receptors within a 2-km radius of the well sites may be affected by impacts to air quality. These receptors are mostly located in rural area and include:

- Village Households
- Pagodas, Monasteries
- Schools
- Fields

The sensitive receptors near the well site are shown in **Section 6.3**. The closest receptors are Ka Yin Gon village (0.42 km) from the proposed wellsite and Ywa Tha Gonaw Village (0.53 km) and Pan Lan Gon Village (0.71 km) from the respective Naweng-1 well site.

Vehicles driving on laterite roads or off road will disperse dust: vehicles grind dust into finer particles, and tire rotation and eddy air currents lift particles into the air (Hesketh *et al.*, 1983). This dust will temporary affect air-quality in the area depending on the season.

6.5.1.3 Significance of Impacts

Without mitigation measures the impacts to air quality from nuisance dust are expected to be local in extent, short-term in duration, reversible and of medium magnitude. The impact disturbs an area currently used for agriculture with limited conservation value, and a reserved forest area also currently being used for agriculture with medium conservation value; the receptor sensitivity is rated medium. Given these impact criteria considerations the significance is determined to be Medium.

The Significance Ranking of impacts to air quality from nuisance dust is rated as **Medium** (**Table 6-35**).

Table 6-35: Sigificance Ranking of impacts to Air Quality from Nuisance Dust

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

In general, the potential impact is estimated for a worst-case scenario; in reality vehicles and equipment will only be used intermittently. Therefore, the emissions will likely be less than presented above.

Based on the ranking, nuisance dust from the drilling phase is considered as medium. Dust emissions from the drilling activities are expected to potentially deteriorate the existing status of air quality around the project area especially during the dry season and when winds blow from the drill site to nearby communities.

The impacts would be short-term and limited to localized areas. But, if there were no mitigation measures, dust emissions can cause nuisance close to the drill site, so would potentially affect workers, villagers and the environment.

6.5.1.4 Assessment of Impacts from Vehicle and Equipment Use

Air pollutants come from various sources: fugitives and exhausts, fuel combustion, gas and oil processing, evaporation, flaring, waste incineration, refrigerators and freezers, vaporization from drilling muds, etc.

Based on compilation of air pollution emission factors established by the U.S. Environmental Protection Agency (EPA), air pollutants generated from diesel oil combustion will consist of carbon monoxide, nitrogen dioxide, sulphur dioxide, and methane. The major contributor of air pollutants will be the diesel generators on site during drilling. Estimated carbon dioxide emissions are discussed under Greenhouse Gases in **Section 6.5.1.8**.

Drilling Rig Diesel Generators

Diesel generators will be used as a source of power supply for drilling. The generators will operate 24 hr/day throughout a drilling period of 60 days for each well.

Based on compilation of air pollution emission factors established by the U.S. Environmental Protection Agency (EPA), air pollutants generated from diesel oil combustion of 8 m^3/day for the Land Drilling Rig.

This will consist of carbon monoxide, nitrogen dioxide, sulphur dioxide, and methane at estimated concentrations shown in **Table 6-36**.

The total emission values are a worst-case scenario for two wells. The rig is powered by four diesel driven generator sets and each rated 1100 KVA for Naweng-1 and 750 KVA for Payama-1 to supply the rig site with power.

Table 6-36: Air pollution emissions from Drilling per Well

Air Pollutant	Emission Factor (kg/TJ)	Emission of Air Pollutant (tonne/day/well)	Total Emission (tonnes)
Drilling Rig Century Generator and Camp Site – (8 m^3/day/well), 60 days per well			
Nitrogen Oxides (NO_x)	1,896	0.552	**33.1**
Sulphur Oxides (SO_x)	126	0.037	**2.2**
Carbon Monoxide (CO)	410	0.119	**7.14**

*Includes 60 days of drilling/well
Sources: US.EPA, "Compilation of Air Pollution Emission Factors, Volume 1, Stationary Point and Area Sources", Fifth Edition, January 1995; http://www.epa.gov/ttn/chief/ap42/ch03/bgdocs/b03s03.pdf.

6.5.1.5 *Significance of Impacts*

Without mitigation measures, the impact from air pollutants will be local in extent, short-term in duration, reversible and of medium magnitude. The impact disturbs an area currently used for agriculture with limited conservation value, and a reserved forest area also currently being used for agriculture with medium conservation value; the receptor sensitivity is rated medium. Given these impact criteria considerations the significance is determined to be Medium.

The Significance Ranking of impacts from air pollutants is ranked **Medium** (**Table 6-37**).

Table 6-37: Sigificance Ranking of impacts from Air Pollutants

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.5.1.6 *Assessment of Impacts from Hydrogen Sulphide*

Gas produced from the wells is constantly analysed for its composition and for the presence of hydrogen sulphide (H_2S). Hydrogen sulfide is a colorless, flammable, highly toxic gas. US Occupational Safety and Health Administration's (OSHA) occupational standard in the workplace is 10 ppm (8hr. TWA (time weighted average) and 15ppm (15min. STEL (short term exposure limit)); NIOSH IDLH (immediately dangerous to life or health) = 100 ppm. The potential for H_2S is a possibility but unlikely.

H_2S detection and safety equipment is standard issue (see **Section 4.5.7.4**). OVL, in association with drilling contractor will develop a emergency response plan (ERP) to support emergency cases. The drilling contractor shall have H_2S Contingency Plan.

6.5.1.7 *Significance of Impacts*

Without mitigation measures, hydrogen sulphide impacts during drilling will be local in extent, short-term in duration, reversible and of medium magnitude. The impact disturbs an area currently used for agriculture with limited conservation value, and a reserved forest area also currently being used for

agriculture with medium conservation value; the receptor sensitivity is rated medium. Given these impact criteria considerations the significance is determined to be Medium.

The Significance Ranking of impacts from hydrogen sulphide release is rated as **Medium** (**Table 6-38**).

Table 6-38: Sigificance Ranking of impacts from Hydrogen Sulphide

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.5.1.8 *Impacts from GHG Emissions*

The potential sources of deterioration of air quality are fuel combustion from:

- Vehicle Emissions
- Diesel Generators (Drilling Rig and Camp site)

The sensitive receptors for greenhouse gas emissions are the same as those listed for dust emissions.

The GHG emissions are estimated following the Tier 1 approach of IPCC (2006). GHG emissions are estimated using emission factors and global warming potentials for the three main greenhouse gases (CO_2, CH_4 and N_2O). The estimated GHG emissions for the project is shown in **Table 6-39**.

Total greenhouse gas emissions during the project (2 exploration wells) amounts to 5,329.4 tons eq CO_2. When compared with available data on Myanmar's national CO_2 equivalent GHG emissions of 219,530,000 tonnes in 2016, including land use change (World Resources Institute, Climate Analysis Indicators Tool (CAIT)), the GHG emissions arising from the proposed activities are insignificant (approximately 0.0024%), and therefore will not significantly impact the environment.

Table 6-39: Estimated Total GHG Emissions per Well

Project Phase	Activity	One Time CO_2 Release (ton CO_2)
Drilling	Equipment and Supplies	10.3
	Drill cuttings transport	43.5
	Transport (fuel, water, personnel)	13.0
	Heavy equipment use	1299.5
	Generator to power drilling rig and camp site	1,298.4
Total per well		2,664.7

6.5.1.9 *Significance of Impacts*

Without mitigation measures, the impact from greenhouse gas emissions during drilling are considered to be a global issue and of low magnitude. The impact disturbs an area currently used for agriculture with limited conservation value, and a reserved forest area also currently being used for agriculture with medium conservation value; the receptor sensitivity is rated medium. Given these impact criteria considerations the significance is determined to be Low.

The Significance Ranking of impacts from GHG emissions is **Low** (**Table 6-40**).

Table 6-40: Sigificance Ranking of impacts from GHG Emissions

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.5.1.10 *Impact and Risk Mitigation Measures*

Potential impacts from dust dispersion can be mitigated by application of the following measures:

Environment Impact Assessment –Drilling Phase			
1. Air Quality	1.1. Vehicle and Equipment Use	1.1.1. Deterioration of air quality due to dust.	1.1.1.1. Implement construction and installation phase mitigation measures in 2.1 (Ref 6.4.2.8 above)
	1.2. Vehicle and Equipment Use	1.2.1. Deterioration of air quality due to vehicle emissions.	1.2.1.1. Implement construction and installation phase mitigation measures in 2.2 (Ref 6.4.2.8 above)
	1.3. Well Drilling	1.3.1. Deterioration of air quality due to hydrogen sulphide	1.3.1.1. Install Gas Detectors to response during emergency situation.
			1.3.1.2. If H2S levels exceed 10 ppm in the gas stream, appropriate safety zone to be established (8 hr TWA).
			1.3.1.3. All crew are instructed and rehearsed in H2S procedures. Provide training, drill and exercise for H2S awareness.
	1.4. Vehicle and Equipment Use	*1.4.1.* Climate Change due to GHG	1.4.1.1. Implement construction and installation phase mitigation measures in 2.3 (Ref 6.4.2.8 above).

6.5.1.11 *Residual Impacts and Risks*

With these management measures, the magnitude of impacts to air quality from nuisance dust, hydrogen sulphide, air pollutants and GHG emissions will be reduced resulting in a residual significance that is **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.5.2 Assessment of Impacts to Noise

6.5.2.1 *Scope of Assessment*

Resource/Receptor	Project Phase	Activity	Impact
Noise	Drilling Phase	Rig Move Drilling Wells Vehicle and Equipment Use	Increased noise and vibration

6.5.2.2 Assessment of Noise Impacts from Drilling

The compounded noise level will be generated during drilling operations will last for 60 days per well.

During drilling operations, the highest compounded noise level at the site is expected from the drilling rig and two generators working simultaneously. Using **Equation 6-4**, the compounded noise level is:

$$Leq_{(Total)} = 10 \text{ Log } [(10^{81/10}) + (10^{85/10})] = 86.5 \text{ dB (A) at 50 feet from noise source}$$

Drilling activities will last 60 day for each well. Drilling noise levels at sensitive receptors using **Equation 6-3** are combined with a typical ambient noise measurements 24-hour equivalent noise level of 45 dB (A) using **Equation 6-4** into a specific noise level. The drilling noise and specific noise levels at sensitive receptors are shown in **Table 6-41**.

Table 6-41: Noise Calculations during Drilling

Proposed well	Village*	Village Tract	Distance (m) from well	Noise at Receptor	Specific	Nuisance
Naweng-1	Tan Daw Gyi	Ywa Thit	1400	47.2	49.3	7.3
	Nyaung Gon		1020	50.0	51.2	9.2
	Zin Byun Gon		1150	48.9	50.4	8.4
	Pyin Daung Gon		1330	47.7	49.6	7.6
	Pwe Bye		1900	44.6	47.8	5.8
	Sa Be Kan	Yat Tha	1060	49.7	50.9	8.9
	Wa Le		1100	49.3	50.7	8.7
	Yat Tha		1580	46.2	48.6	6.6
	Gyo Gon		1970	44.3	47.7	5.7
	Ka Yin Gon	Cha Ya Gone	420	57.7	57.9	**15.9**
	Ywa Tha Gon		530	55.7	56.0	**14.0**
	Taw Chin		1170	48.8	50.3	8.3
	Thit Cho		1600	46.1	48.6	6.6
	Pan Lan Gon		710	53.1	53.8	**11.8**
	Kaung Bin Lu		1200	48.6	50.2	8.2
	Cha Ya Gone		1400	47.2	49.3	7.3
Payama-1	Sett Tone	Tha Phan Kaing	5000	36.2	45.5	3.5

The project area mainly consists of farming, agricultural and forested areas with agriculturally dominated communities and access roads. The existing condition of the well pad for Naweng-1 location is in a paddy field during the wet season only and the land acquisition will be completed as per MOGE requirements. The existing condition of the well pad for Payama-1 is located in an existing cleared area used for peanuts in the wet season only in the Sha Byin Reserved Forest Area. The reserved forest is highly disturbed with most of the area planted for crops and sugar cane plantations.

The nuisance noise level can exceed the nuisance noise standard of 10 dB (A) at Naweng-1 well site. The estimated noise levels present an absolute worst-case condition: the surrounding trees and other vegetation and the topography will lead to a far more rapid attenuation. Drilling activities are expected to last approximately 60 days for each well; noise levels will return to previous levels upon cessation of drilling activities.

On the well site itself, all workers will be issued with standard safety equipment, including ear protectors, and their use will be strictly enforced where required by regulations in areas with high levels of noise and vibration. This is the standard industry practice on all rigs and part of the routine health and safety procedures.

The assessment of noise impacts from Vehicle and Equipment use during drilling phase is the same as during construction phase in **Section 6.4.3.**

6.5.2.3 *Significance of Impacts*

Without mitigation measures, impacts from noise from Drilling to sensitive receptors are expected to be local in extent, short-term in duration, reversible, of medium magnitude. The impact disturbs an area currently used for agriculture with limited conservation value, and a reserved forest area also currently being used for agriculture with medium conservation value; the receptor sensitivity is rated medium. Given these impact criteria considerations the significance ranking is determined to be Medium.

The Significance Ranking of impacts from Noise to sensitive receptors is rated as **Medium** (**Table 6-42**).

Table 6-42: Sigificance Ranking of impacts from Noise to Sensitive Receptors

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.5.2.4 *Impact and Risk Mitigation Measures*

Impacts from noise can be mitigated through the use of the following mitigation measures:

Environment Impact Assessment –Drilling Phase			
2. Noise	2.1. Well Drilling and Vehicle and Equipment Use	2.1.1. Increase in noise levels during exploration drilling.	2.1.1.1. Install noise barrier at the well site boundary toward nearest community
			2.1.1.2. Ensure use of mufflers on diesel/gas driven machinery.
			2.1.1.3. Ensure all machinery and vehicles are properly checked and inspected.
			2.1.1.4. Equipment to be operated and maintained in accordance with manufacturer specifications.

6.5.2.5 *Residual Impacts and Risks*

With these management measures, the residual significance from the impact of noise to sensitive receptors is **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.5.3 Assessment of Impacts to Heat and Light

6.5.3.1 Scope of Assessment

Resource/Receptor	Project Phase	Activity	Impact
Heat and Light	Drilling Phase	Drilling Wells	Lighting on the site at night

6.5.3.2 Assessment of Light Impacts from Artificial Light Sources

Project components of the exploration program are to be artificially lit to varying extents during all phases of the project, therefore generating light spill. Light emissions will occur from vehicles, drill rig, well site and campsite. Site preparation and abandonment will be carried out in daylight. Hence, light impacts will not be relevant during these project phases. Drilling will be conducted on a 24-hour basis. Lighting on the site will be kept to a minimum and directed so that, consistent with safety and security, as little as possible falls outside the pad area and should be partly or fully hidden by scattered trees, thickets and topography.

Artificial light can disrupt biological processes that rely on natural light for visual cues. Terrestrial fauna that are known to be sensitive to light and may be disorientated, attracted to or repelled by light spill including mammals, reptiles and birds. The amount of light spill emanating from project activities will vary according to the number of light sources, wavelength and intensity of light sources, location of and/or placement of fittings and the method of light switching (rapid or gradual turning on of light sources).

This section discusses the impacts of light spill on ecological receptors identified within or adjacent to the project area.

Light Sources

Sources of artificial light for project will include:

- Functional lighting on vehicles and drill rig, camp site and well site

Functional Lighting

Functional lighting is required on vehicles, drill rigs, campsite and well site at levels that provide a safe working environment for personnel. Lighting typically consists of bright white lights, used in accordance with safety requirements. Working lights will be directed into the site so that impacts from working lights will be minimized off-site.

6.5.3.3 Significance of Impacts

Without mitigation measures, impacts from light emissions to sensitive receptors occurring from vehicles, drill rig, well site, campsite and flaring are expected to be local in extent, short-term in duration, reversible, of low magnitude. The impact disturbs an area currently used for agriculture with limited conservation value, and a reserved forest area also currently being used for agriculture with medium conservation value; the receptor sensitivity is rated medium. Given these impact criteria considerations the significance is determined to be Low.

The Significance Ranking of impacts to light emissions is rated as **Low** (**Table 6-43**).

Table 6-43: Significance Ranking of impacts from light emissions

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.5.3.4 Impact and Risk Mitigation Measures

Impacts from light can be mitigated through the use of the following measures:

Environment Impact Assessment –Drilling Phase			
3. Heat and Light	3.1. Functional lighting on vehicles and drill rig, camp site and well site during Drilling Wells.	3.1.1. Lighting on the site at night	3.1.1.1. Drilling Rig located in area distant to sensitive receptors.
			3.1.1.2. Keep night lighting to a minimum, consistent with safety and security.
			3.1.1.3. Direct lighting to the inside of the well sites.

6.5.3.5 Residual Impacts and Risks

With these management measures, the residual significance of impacts from heat and light is determined to be **Negligible**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.5.4 Assessment of Impacts to Surface Water Quality

6.5.4.1 Scope of Assessment

Resource/Receptor	Project Phase	Activity	Impact
Surface Water Quality	Drilling Phase	Site Runoff and Drainage Hazardous/non-hazardous waste management Handling of materials and chemicals	Potential contamination from spills or wastewater drainage to nearby water bodies

6.5.4.2 Assessment of Impacts from Site Runoff and Drainage

Activities during drilling that may affect surface water quality include chemical storage and handling, fuel storage and handling and the drilling operation itself. The sensitive receptors are the same as those identified for the construction phase.

The cuttings pit will be constructed at the drilling area and is lined with an impervious liner to keep all the water used/released within the drilling area. The cuttings pit has volume of 6,000 m^3.

The volume of runoff from the well site will be calculated from the volume of the heaviest rainfall within 30 minutes with a month's equivalent rainfall in one hour. The estimated typical amount of

runoff during a rainstorm varies according to the month of the year. Runoff from the rig pad enters the cuttings pit. The pit is sufficient in size to contain any runoff from storms. It is not expected that discharge of water will be required unless there is unusually prolonged storm activity. The cuttings pit has a maximum holding capacity of 6,000 m^3. The cuttings pit can therefore contain much more rainfall than the rainfall intensity of a ½-hr duration storm. The level of water in the cuttings pit will be monitored regularly.

If water level in the cuttings pit is high, it will be pumped into another container (such as a tanker truck) to make sure that the water will not overflow from the pit.

Calculation of surface water drainage from a well site is subdivided based on the various surfaces. Drainage calculated from each distinct area is outlined in **Table 6-44**.

Table 6-44: Runoff Distribution from Well Site and Capacity of Receiving Areas

Areas	Project Site Areas	Catchment Area (A)	Runoff Coefficient (C)	Runoff (Q) for extreme ½ hr storm	Receiving Area
Well Site					
Rig Pad	Rig Pad: Drilling Rig, Mud Tanks and Pumps, Cement Units, Generators, Solid Control Equipment (reinforced concrete pad)	20x20 m = 400 m^2	0.95	24.5 m^3	Cuttings pit Capacity 6,000 m^3/pit
	Cuttings Pit	40 m x 30 m = 1,200 m^2	1	77.5 m^3	
Well site and Camp site	Well site Pipe Storage, Work Shops, Offices	40,000 m^2 (well pad) –400 m^2 (rig pad) – 1200 m^2 (waste pit) = 38,400 m^2	0.35	1579.2 m^3	Cuttings pit Capacity 6,000 m^3/pit
	Accommodation camp (compacted fill)	80 m x 120 m = 9,600 m^2	0.35	144.6	Off site through drainage system with weir and oil trap

The uncontaminated runoff water from the camp site area will discharge to a drainage system surrounding the area with an offsite flow rate of 144.6 m^3 for the extreme ½ hr storm. Runoff after campsite construction is greater than runoff prior to construction; the compacted granular fill will inhibit infiltration compared to pre-construction conditions.

The contaminated runoff water from rig pad will drain only to designated cuttings pit (capacity 6,000 m^3). The runoff from the rig pad and well site combined with rain falling on the waste pit for a ½-hr duration storm totals 2010.1 m^3. The waste pit has an actual holding capacity of 6,000 m^3. The waste pit can therefore contain much more rainfall than the rainfall intensity of a ½-hr duration storm a month's equivalent rainfall in one hour. In the unlikely event that the waste pit should become full and overflow, tanker trucks are prepared to drain rainwater from the pit. This can be stored for later use as mix water, or if contaminated, will be disposed of at approved disposal site.

Runoff containing certain chemicals or drill fluid additives can cause water quality deterioration by increasing nutrient and/or organic matter loads (which can lead to eutrophication of water bodies from organic matter decomposition by micro-organisms), and by introducing toxic material into the water

bodies. The potential for impacts from silt in runoff from the well site is minimal once the construction is complete; the suspended solid load following construction is practically identical to the pre-construction load.

On site fuel will be stored in steel tanks that sit on an area lined with a tarpaulin and surrounded by a bund wall. The well site area of including the mud tanks and pumps, cement units, generators and solid control equipment is designed with an intermediate drainage system to drain all rainwater run-off into the waste pit.

These measures will create a zero-discharge well site and should ensure there is no release of contaminated water from the well sites. In the event of a spill, spill kits provided on site will be used to remove and contain the spill immediately. Any contaminated water will be collected in the waste pit through a drainage system around the project site and will be disposed of by the Waste Management company (DOWA).

6.5.4.3 Significance of Impacts

Without mitigation measures, impacts to surface water quality are expected to be local in extent, short-term in duration, reversible, and of medium magnitude. The impact disturbs an area currently used for agriculture with limited conservation value, and a reserved forest area also currently being used for agriculture with medium conservation value; the receptor sensitivity is rated medium. Given these impact criteria considerations the significance is determined to be medium.

The Significance Ranking of impacts to on surface water quality and aquatic biota from land and habitat disturbance is **Medium** (**Table 6-45**).

Table 6-45: Significance Ranking of impacts to Surface Water Quality and Aquatic Biota

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.5.4.4 Assessment of Impacts from Sewage and Sludge

Sewage and sludge (grey water generated from domestic processes such as dish washing, laundry and showers) will be generated at the campsite and well site.

A set of concrete septic tanks will be built into the work camp pad at the outer edges. They will have a combined capacity of 8000 litres (8 m^3). It is estimated that some 7.7 m^3 (7700 litres) of combined sewage and wastewater will be produced each day during maximum manned operations (110 people).

No pump out of septic sludge is required as the concrete septic tanks and any sewage sludge will be left in ground onsite at the end of the drilling campaign. Wastewater from the campsite, including both grey water and black water, will be treated separately. Grey water will be treated in a soak pit and Black water will be treated in septic tank and soak pit.

Without mitigation measures, impact from sewage and sludge on soil, surface and ground water resources will be local in extent, short term in duration, reversible and of medium magnitude. The impact disturbs an area currently used for agriculture with limited conservation value, and a reserved

forest area also currently being used for agriculture with medium conservation value; the receptor sensitivity is rated medium. Given these impact criteria considerations the significance ranking is determined to be Medium.

The Significance Ranking of impacts from sewage and sludge on soil, surface and ground water is ranked as **Medium**. (**Table 6-46**)

Table 6-46: Sigificance Ranking of impacts from sewage and sludge on soil, surface and ground water

	Level and Type of Impact				
	1	2	3	4	5
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.5.4.5 *Impact and Risk Mitigation Measures*

Impacts to water quality and aquatic biota can be mitigated through the use of the following measures:

Environment Impact Assessment –Drilling Phase			
4. Surface Water Quality	4.1. Site Runoff and Drainage	4.1.1. Contamination of surface water from runoff and drainage	4.1.1.1. Implement construction and installation phase mitigation measures in 5.1. (Ref 6.4.5.5 above)
			4.1.1.2. Provide drainage, buffer zone and earth bund surrounding well site area.
			4.1.1.3. The fuel storage will be surrounded by a bund wall in case of spill.
	4.2. Hazardous/non-hazardous waste management	4.2.1. Degradation of surface water quality from disposal of domestic sewage and grey water	4.2.1.1. Install concrete lined septic tank and soak away pit at the well site for holding & treating sewage.

6.5.4.6 *Residual Impacts and Risks*

With these management measures, the magnitude of impacts to *surface water quality and aquatic biota from land and habitat disturbance* will be reduced which will result in a residual significance ranking that is **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.5.5 Assessment of Impacts to Soil Quality

6.5.5.1 Scope of Assessment

Resource/Receptor	Project Phase	Activity	Impact
Soil	Drilling Phase:	Site Runoff and Drainage Hazardous/non-hazardous waste management, Handling of Materials and chemicals	Soil contamination from accidental releases

6.5.5.2 Assessment of Impacts from Site Runoff and Drainage

Wastewater drainage, Hazardous/non-hazardous waste management, handling of materials and chemicals spills of fuel and chemicals may cause contamination and/or the fertility of the soil to be reduced. Spills of fuel can occur during the transport of vehicles or fuel tanks on the project area. The project will clean chemical materials or oil spills immediately by using cleaning equipment on the drill site that consisted of shovels, absorbents, and steel containers. The impact from spills is detailed in **Section 6.16.4**.

The well site and camp site have drainage which is derived from rainwater and wash down water that may contain minor quantities of oil, grease and detergents if present on the site. Runoff within the drilling area will be drained via drainage gutter into the cuttings pit, which will accumulate all of the runoff and contaminated water generated within the drilling area. Therefore, contaminated water from this area will go through an oil trap and end up in the concrete lined cuttings pit and won't escape to contaminate surrounding areas. The impact from run-off and drainage are detailed in **Section 6.5.4**.

The volume of the cuttings pit (6,000 m^3) and concrete lined cutting pit is much more than the volume of the extremely heavy runoff. Therefore, the cuttings pit has the capacity to retain all the runoff within the drilling area even under heavy rainfall. The level of water in the cuttings pit will be monitored regularly. If water level in the cuttings pit is high, it will be pumped into another container (such as a tanker truck) to make sure that the water will not overflow from the pit. Around the well site area, the buffer zone and earth bun will be provided and served as a secondary containment.

The cuttings and fluids contain potassium chloride, which are saline and residual hydrocarbons. The entry of saline and hydrocarbon contaminated fluids into the ground water may affect the growth of agricultural crops and be potentially toxic to terrestrial and aquatic flora and fauna. The cuttings and fluids may also contain heavy metals, which may contaminate soils and affect the growth of agricultural crops.

The volumes of cuttings produced during this project are unlikely to cause major local environmental impacts, particularly as cuttings will be sent to the designated waste management facility.

Salinity levels are not predicted to be high, and the short duration of the drilling activity will not allow for the excessive evaporation levels required to concentrate and produce highly saline liquids.

6.5.5.3 Significance of Impacts

Without mitigation measures, impact from drill site drainage on soil, surface and ground water resources will be local in extent, short-term in duration, reversible and of medium magnitude. The impact disturbs an area currently used for agriculture with limited conservation value, and a reserved forest area also currently being used for agriculture with medium conservation value; the receptor sensitivity is rated medium. Given these impact criteria considerations the significance ranking is determined to be Medium.

The Significance Ranking of impacts from soil disturbance and erosion during the drilling phase is ranked as **Medium** (**Table 6-46**).

Table 6-47: Sigificance Ranking of impacts from site runoff and drainage

	Level and Type of Impact				
	1	2	3	4	5
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.5.5.4 Impact and Risk Mitigation Measures

Impacts to soils can be mitigated through the use of the following measures:

Environment Impact Assessment – Drilling Phase			
5. Soil Quality	5.1. Drill site ite Runoff and Drainage	5.1.1. Contamination of soil from runoff	5.1.1.1. Implement drilling phase mitigation measures in 4.1 (refer 6.5.4.5 above).

6.5.5.5 Residual Impacts and Risks

With these management measures, the magnitude of impacts from drill site run off and drainage to soil quality , resulting in a residual significance ranking that is **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.5.6 Assessment of Impacts to Ground Water Quality

Resource/Receptor	Project Phase	Activity	Impact
Groundwater Quality	Drilling Phase	Drilling wells Site Runoff and Drainage Handling of materials and chemicals Hazardous/non-hazardous waste management	Degradation of groundwater quality from spills or leaks leaching into water table

Groundwater can be affected by liquid wastes generated during the drilling campaign in varying quantities and contain both hazardous and non-hazardous materials. Liquid wastes discussed in this section are:

- Lost Circulation Mud
- Infiltration from the Drill Cuttings and fluids waste pit and sub-irrigation field
- Naturally Occurring Radioactive Materials

The nearest water receptors are the community water ponds, intermittent streams and water storage reservoirs. The sensitive receptors near the well site are shown in **Section 6.3**. The closest sensitive receptor is the Canal (0.2 km) from Naweng-1 wellsite.

6.5.6.1 Assessment of Impacts from Lost Circulation of Drill Cuttings and Fluids

Once the well is spudded, the mud circulates in an essentially closed system. The practice of casing sections of the well with steel tubing, cemented in place as it is drilled, will prevent significant losses of mud to the formation and prevent groundwater contamination.

In the event of lost circulation, mud may be released into the surrounding formations via fractures. As lost circulation normally occurs in the reservoir section, which is much deeper than the surface aquifers, mud is not likely to impact aquifers.

If mud loss should occur, a series of steps will be taken to seal the well bore as follows:

- Pump in Lost Circulation Material (LCM) such as mica;
- If this does not work, try to drill through it with water and LCM;
- If this does not work, the well will be plugged with cement and re-drilled.

The drilling fluids that are used for the well will be returned to the surface from the annulus of the drill with rock cuttings, and may also contain small quantities of other fluids, such as hydrocarbons and produced water. Shakers will separate the fluids from the cuttings. For this exploration drilling program, The Drilling Program for this project will use Water Based Mud and Low Toxic Synthetic Oil Based Mud (LTSOBM) depending on results of subsurface and seismic interpretation. The majority of the components of the drilling mud systems are classified as low toxic with the exception of a few key chemicals. The toxicology for Caustic Soda (sodium hydroxide), Sodium Bicarbonate, Calcium Hydroxide, Polymeric Blend are shown in **Table 6-113.**

At the end of the first well location, the leftover drilling mud will be transferred and used at the next well location. At the end of drilling campaign, the leftover mud will be sent back to mud contractor for reuse or use for other drilling campaign. If the well is actually abandoned rather than completed as a producer, some of this mud will be used to make the kill weight spacer between the cement plugs. Estimated mud volume is about 1,900 m^3 per well and estimated cutting volume is about 1500 m^3 per well. Discharged cuttings will contain some residual water-based mud, and residual hydrocarbons and any other contaminants such as heavy metals. Both the drill cuttings WBM and SOBM will be given to the waste management company for treatment and disposal at The second option is to send all cuttings to the designated waste management facility.

6.5.6.2 Significance of Impacts

Without mitigation measures, impact from drill cuttings and fluids on soil, water, and flora and fauna will be local in extent and transient, reversible, medium term duration and of medium magnitude. The impact disturbs an area currently used for agriculture with limited conservation value, and a reserved forest area also currently being used for agriculture with medium conservation value; the receptor sensitivity is rated medium. Given these impact criteria considerations the significance is determined to be Medium.

The Risk Ranking of impacts from drill cuttings and fluids on soil, water, and flora and fauna disposal is rated as **Medium** (**Table 6-48**).

Table 6-48: Sigificance Ranking of impacts from drill cuttings and fluids on soil, water, and flora and fauna

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km

Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.5.6.3 *Assessment of Impacts from Infiltration*

Infiltration is the process by which water on the ground surface enters the soil. The septic tanks will use a sub-irrigation infiltration field to treat the grey water from the project site. This field will be installed in areas of stable soils that are nearly level, well drained, and permeable, with enough separation between the drain field and the groundwater table or other receiving waters. Infiltration is also possible from the waste pit.

The volume of the cuttings pit (6,000 m^3) and concrete lined cutting pit is much more than the volume of the extremely heavy runoff. Therefore, the cuttings pit has the capacity to retain all the runoff within the drilling area even under heavy rainfall. The level of water in the cuttings pit will be monitored regularly. If water level in the cuttings pit is high, it will be pumped into another container (such as a tanker truck) to make sure that the water will not overflow from the pit. Around the well site area, the buffer zone and earth bun will be provided and served as a secondary containment. The earth bun will contain the runoff from the well site.

6.5.6.4 *Significance of Impacts*

Without mitigation measures the impacts to groundwater quality from site runoff and drainage are expected to be local in extent, medium-term in duration, reversible and of medium magnitude. The impact disturbs an area currently used for agriculture with limited conservation value, and a reserved forest area also currently being used for agriculture with medium conservation value; the receptor sensitivity is rated medium.

The Significance Ranking of impacts from site runoff and drainage of the cuttings and dirty water waste pit to groundwater quality is rated as **Medium** (**Table 6-49**).

Table 6-49: Sigificance Ranking of impacts from site runoff and drainage of the cuttings and dirty water waste pit to groundwater quality

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.5.6.5 *Impacts from Naturally Occurring Radioactive Materials*

No produced formation water is expected for the exploration drilling campaign. Produced water can contain small quantities of naturally occurring radioactive materials (NORMS). Under certain conditions (high salinity, together with the presence of sulphates and/or carbonates, calcium, barium and strontium) NORMS can become bound to scale deposits in production wells, pipelines and process equipment. Maintenance of wells, pipelines and process pipework or equipment may require the disposal of scale if it has built up as a solid. However, since no produced formation water is expected

and the exploration wells will be drilled over a short time frame (60 days) the potential for scale deposition containing NORMS to build up has been assessed as **Negligible**.

6.5.6.6 Impact and Risk Mitigation Measures

Impacts to groundwater from loss of circulation, site runoff and drainage from cuttings and dirty water waste pit can be mitigated through the use of the following measures:

Environment Impact Assessment – Drilling Phase			
6. Groundwater Quality	6.1. Loss of circulation mud during Drilling wells	6.1.1. Groundwater degradation from drilling	6.1.1.1. Install steel casing and cement in place to prevent chemical leak or contaminate into rock formation.
			6.1.1.2. Strict steel casing to well wall by cementing to prevent chemical contaminate to groundwater level.
	6.2. Infiltration from the waste pit and sub-irrigation field	6.2.1. Deterioration of shallow Groundwater	6.2.1.1. Install HDPE liner in the cuttings and dirty water waste pit. Monitor liner for tears or leaks during installation and operations.

6.5.6.7 Residual Impacts and Risks

With these management measures, the duration and magnitude of impacts will be reduced resulting in a residual significance to possible impacts to groundwater from site runoff and drainage from the cuttings and dirty water waste pit to be ranked as **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

With these management measures, the impact magnitude will be reduced resulting in a residual significance of impacts to groundwater quality from loss of circulation mud that is ranked as **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.5.7 Assessment of Impacts to Flora & Fauna

6.5.7.1 Scope of Assessment

Resource/Receptor	Project Phase	Activity	Impact
Flora & Fauna	Drilling Phase	Rig Move Drilling wells Vehicle and Equipment Use Site Runoff and Drainage Hazardous/non-hazardous waste management Handling of materials and chemicals Labour and Accommodation	Harvesting of plants and animals by human activity Disturbance Caused by Vehicle and Equipment Use Accidental Release

Sources of potential impact on aquatic biota in the drilling phase include contamination from wastewater and waste, spills and physical disturbance by workers and vehicle and equipment use. Impacts on soil, surface water quality, vegetation and aquatic biota from accidental spills are discussed **Section 6.16.4**.

6.5.7.2 Impacts from physical disturbance by workers and vehicle and equipment use

The activities in the project area that may cause impacts to wildlife include disturbing animal habitat, and transportation causing increased noise levels and disturbance. The impacts can be classified into 3 levels: high, medium, and low which are related to the possible adaptation of animals in that area. Types of possible wildlife impacts include:

1) **Disadvantages for wild animals**: there will be the negative effect from the activities of the project, both direct and indirect. The habitat, food resources, breeding places may be disturbed due to activities such as operation of heavy equipment, which will cause an increase in the noise levels and increase disturbance, and site clearance may destroy habitat and food sources of animals. This group of wildlife will move away from existing habitat. They may move too close to other colony/habitat that may cause competition for food and habitat
2) **Advantages for wild animals:** if animals are able to adapt in the new environment (human resident, noise, open area) there will be the migration into the project area to find food, for breeding, and nesting result in an increase in the animal population.
3) **Adaptable animals:** are animals that can adapt to a change in habitat conditions. However, they can adapt to the new environment and residential living area. Most wildlife in this group are small, fast moving and have low space requirements such as birds.

The activities of the project site such as the transportation of equipment, which will cause an increase in the noise levels have not been studied area as the area is currently used for agriculture and communities. Most of animals are highly adaptive and capable of adapting to the new environment, but there some animals that will still be impacted. The project will also construct drainage around the well pad to prevent any chemical spillage outside the working areas; therefore, the receptor sensitivity is rated as low.

Vehicles moving from the central campsite to each well site could disturb flora / fauna. The potential impacts from the movement of vehicles associated with the exploration drilling campaign are:

- Disturbance leading to behavioral changes or displacement of fauna
- Increased likelihood of incidents

The occurrence and intensity of disturbance is highly variable and depends on a range of factors relating to the animal and situation. Some behavioral disturbance may occur for short periods if fauna are present or near access roads and project site.

Human activity will be confined to the access road and well sites and will not constitute a new impact on the area, which is already regularly visited by people. Contractors and personnel will not be allowed off site where they could cause unnecessary disturbance to wildlife. In addition, hunting and trapping will be prohibited, and violations are grounds for termination of contract and dismissal.

The well site area is an existing agricultural area and open forest areas with limited natural terrestrial flora. As standard practice, OVL will ensure that its staff and contractors will not cut trees or forage in the area surrounding the well sites during any phase of the project. The Inn Ma Swamp is located within 5 km of Naweng-1 well site and Payama-1 is within the Shabyin Reserved Forest.

6.5.7.3 Significance of Impacts

The impact to flora and fauna from drilling activities, movement of vehicles, equipment and the rig, site runoff and drainage, handling materials and chemicals, hazardous/non-hazardous waste, flaring and labor and accommodation will be local in extent, short-term in duration, reversible and of medium magnitude. The impact disturbs an area currently used for agriculture with limited conservation value, and a reserved forest area also currently being used for agriculture with medium conservation value; the receptor sensitivity is rated medium. Given these impact criteria considerations the significance ranking is determined to be Medium.

The Significance Ranking of impacts to terrestrial flora and fauna from clearance of site, installation of rig and drilling equipment, constructing new access roads and physical disturbance is rated as **Medium** (**Table 6-50**).

Table 6-50: Significance Ranking of impacts to terrestrial flora and fauna from access road and site construction, movement of vehicles, equipment and the rig, site runoff and drainage, handling materials and chemicals, hazardous/non-hazardous waste and labor and accommodation.

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.5.7.4 Impact and Risk Mitigation Measures

Impacts to terrestrial flora can be mitigated through the use of the following measures:

Ecological Environment Impact Assessment – Drilling Phase			
7. Terrestrial Flora and Fauna	7.1. Drilling Activities and Labor and Accommodation	7.1.1. Flora and Fauna, and habitat disturbed from workers' activities	7.1.1.1. Fishing or Hunting will be prohibited to workers.
			7.1.1.2. Clearly mark signs showing the boundary of the project area.
			7.1.1.3. Prohibit workers from cleaning machines/ equipment in a public water source.
			7.1.1.4. Prohibit workers and contractors discharging or discarding project waste, chemicals, oil into public water sources.

6.5.7.5 Residual Impacts and Risks

With these management measures, the residual significance of impacts to flora and fauna from access road and site construction, movement of vehicles, equipment and the rig, site runoff and drainage, handling materials and chemicals, hazardous/non-hazardous waste and labor and accommodation is determined to be **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.6 Environmental Impact Assessment during Well Testing Phase

From the screening matrix the impacts in the well testing phase must be assessed in detail includes:

- Air quality
  - Dust
  - Air Pollution
  - Hydrogen Sulfide
  - Greenhouse Gas
- Noise
- Heat and Light
- Surface Water Quality
- Groundwater Quality
- Soil Quality
- Flora and Fauna

6.6.1 Assessment of Impacts to Air Quality

6.6.1.1 Scope of Assessment

Resource/Receptor	Project Phase	Activity	Impact
Air Quality/ Climate	Well Testing Phase	Flaring of excess gas Vehicle and Equipment Use	Deterioration of air quality from fuel combustion and flaring emissions

6.6.1.2 Assessment of Dust Impacts from Well Testing

During the testing phase, dust can occur from transportation of employees, equipment and waste. The dust emission from the transportation of employee, equipment and machine during the testing phase can be calculated from the equation of dust emission from unpaved road United state Environmental Protection Agency (US.EPA) AP-42 Compilation of Air Pollutant Emission Factor, 1995 and dust emission from paved road. Thus, the impacts from dust emission during the well testing phase is similar to the drilling phase impacts in **Section 6.5.1.2**.

6.6.1.3 Assessment of Air Emissions from Well Testing

Diesel generators will be used as a source of power supply for testing. The generators will operate 24 hr/day throughout a testing period of 15 days. If it is decided to test the well (DST) a significant quantity of gas could be flared from the well. The actual flow rate of the reservoir at this location is a parameter which the drilling of the well is intended to determine. The rate of gas production will range between 60 mmscfgd (60 mmscfgd being the maximum handling of the testing processing equipment). A worst case scenario for GHG calculations is a sustained flare of 10 mmscfgd for 15 days.

Based on compilation of air pollution emission factors established by the U.S. Environmental Protection Agency (EPA), air pollutants generated from diesel oil combustion will consist of carbon monoxide, nitrogen dioxide, sulphur dioxide, and methane at estimated concentrations shown in **Table 6-51**. Estimated carbon dioxide emissions are discussed under Greenhouse Gases below.

Table 6-51: Estimated Total Air Pollutant Emissions for Well Testing Phase

Air Pollutants – Fuel Use	Emission Factor (kg/TJ)	Emission of Air Pollutant (tonne/day/well)	Total Emission (tonnes)
350-KVA Camp Site Generator (1.5 m^3/day/well) – 15 days per well			
Nitrogen Oxides (NO_x)	1,896	0.103	1.6**
Sulphur Oxides (SO_x)	126	0.007	0.1**
Carbon Monoxide (CO)	410	0.022	0.3**
Air Pollutants – Flaring	**Emission Factor (lb/10^6 Btu)**	**Emission of Air Pollutant (lb/day)**	**Total Emission (tonnes)***
Flaring max 10 mmscfgd or 10 x 10^9 BTU/day/well – 15 d/well per well			
Carbon Monoxide (CO)	0.37	3700	25.2
Total Hydrocarbons**	0.14	1400	9.5
Nitrogen Oxides (NO_x)	0.068	680	4.6

Sources: US.EPA, "Compilation of Air Pollution Emission Factors, Volume 1, Stationary Point and Area Sources", Fifth Edition, January1995; http://www.epa.gov/ttn/chief/ap42/ch03/bgdocs/b03s03.pdf; http://www.eppo.go.th/ref/UNIT-OIL.html.
Note: Density of diesel oil is 0.8397 kg/L for calculation, IEA (2004), Densities of Oil Product, Energy Statics Working Group Meeting; Net Calorific Values is 43.33 TJ/Gg for calculation, IEA (2009), CO_2 Emission From Fuel Combustion, Documentation For Beyond 2020 Files

6.6.1.4 Significance of Impacts

Without mitigation measures, the impact from air pollutants will be local in extent, short-term in duration, reversible and of medium magnitude. The impact disturbs an area currently used for agriculture with limited conservation value, and a reserved forest area also currently being used for agriculture with medium conservation value; the receptor sensitivity is rated medium. Given these impact criteria considerations the significance is determined to be Medium.

The Significance Ranking of impacts from air pollutants is ranked **Medium** (**Table 6-52**).

Table 6-52: Sigificance Ranking of impacts from Air Pollutants

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.6.1.5 Assessment of Impacts from Hydrogen Sulphide

Hydrogen sulfide is a colorless, flammable, highly toxic gas. High concentration of H2S are immediately dangerous to life and health. Employees who work in the area may be affected by hydrogen sulfide (H2S) during testing.

Gas produced from the wells is constantly analysed for its composition and for the presence of hydrogen sulphide (H_2S). Hydrogen sulfide is a colorless, flammable, highly toxic gas. US Occupational Safety and Health Administration's (OSHA) occupational standard in the workplace is 10 ppm (8hr. TWA (time weighted average) and 15ppm (15min. STEL (short term exposure limit)); NIOSH IDLH (immediately dangerous to life or health) = 100 ppm. The potential for H_2S is a possibility but unlikely.

H_2S detection and safety equipment is standard issue (see **Section 4.5.8.4**). OVL in association with drilling contractor shall develop emergency response plan (ERP) to support any emergency cases.

6.6.1.6 Significance of Impacts

Without mitigation measures, hydrogen sulphide impacts during well testing will be local in extent, short-term in duration, reversible and of medium magnitude. The impact disturbs an area currently used for agriculture with limited conservation value, and a reserved forest area also currently being used for agriculture with medium conservation value; the receptor sensitivity is rated medium. Given these impact criteria considerations the significance is determined to be Medium.

The Significance Ranking of impacts from hydrogen sulphide release is rated as **Medium** (**Table 6-53**).

Table 6-53: Sigificance Ranking of impacts from Hydrogen Sulphide

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.6.1.7 Impacts from GHG Emissions

Fuel combustion of machinery during testing, transportation activities and fugitive emissions during testing and flaring. The sensitive receptors for greenhouse gas emissions are the same as those listed for dust emissions.

GHG emissions from diesel generators are estimated following the Tier 1 approach of IPCC (2006) for stationary combustion. GHG emissions are estimated using emission factors and global warming potentials for the three main greenhouse gases (CO2, CH4 and N2O) according to:

$$CH_4\ Emission\,(kg) = Gas\ Flared\ (TJ)\ x\ Fuel\ Emission\ Factor\ (kgCH_4/TJ)$$

$$N_2O\ Emission\,(kg) = Gas\ Flared\ (TJ)\ x\ Fuel\ Emission\ Factor\ (kgN_2O/TJ)$$

$$CO_2\ Emission\,(kg) = Gas\ Flared\ (TJ)\ x\ Fuel\ Emission\ Factor\ (kgCO_2/TJ)$$

$$CO_2\ eq\ Emission\,(kg) = Gas\ Flared\ (TJ)\ x\ Fuel\ Emission\ Factor\ (kgCO_2\ eq/TJ)$$

where

Gas flared = gas (10^6 scf) x 0.0283168 (m^3/scf) x 0.9 kg/m^3 x 10^{-6} Gg/kg x 48 (TJ/Gg) x 10^{-3} (tonne/kg)

Default Fuel Emission Factors are 5 kg CH_4/TJ, 0.1 kg N_2O/TJ and 56,100 kg CO_2/TJ (**Table 6-54**)

To calculate the total CO_2 equivalent GHG emissions, global warming potentials need to be used as some gases have a much greater greenhouse gas effect. The total CO_2 equivalent GHG emissions from fuel use by generators are obtained using an emission factor of 56,244.6 kg CO_2 eq/TJ resulting in

$$CH_4\ Emission\ (tonnes\ CH_4) = Gas\ Flared\ (10^6\ scf)\ x\ 0.00612\ (tonne CH_4/10^6\ scf)$$

$$N_2O\ Emission\ (tonnes\ N_2O) = Gas\ Flared\ (10^6\ scf)\ x\ 0.000122\ (tonne N_2O/10^6\ scf)$$

$$CO_2\ Emission\ (tonnes\ CO_2) = Gas\ Flared\ (10^6 scf)\ x\ 68.626\ (tonne CO_2/10^6\ scf)$$

$$CO_2\ Emission\ (tonnes\ CO_2) = Gas\ Flared\ (10^6 scf)\ x\ 68.8032\ (tonne CO_2\ eq/10^6 scf) \quad \textbf{Eq. 3}$$

Emissions are calculated based on volume of gas flared per day and the number of flaring days.

Table 6-54: Emission Factor for Flaring Natural Gas (Stationary Combustion)

Types	Unit	CH_4	N_2O	CO_2	Total
Natural Gas	kg/TJ	5	0.1	56,100	
	kg CO2 eq*/TJ	115	29.6	56,100	56,244.6

Source: IPCC (2006)
* Global warming potentials (100 year time horizon): CO_2 = 1; CH_4 = 23; N_2O = 296

GHG emissions from flaring during well testing are estimated by the amount of gas production (max 10 million scf/d/well) for a maximum 15 days to be tested, for a total of 150 x 10^6 scf. Using the gas flare equations (***Eq. 3***):

Total CH_4 released = 150 x 10^6 scf x 0.00612 t $CH_4/10^6$ scf = 0.92 t CH_4

Total N_2O released = 150 x 10^6 scf x 0.000122 t $N_2O/10^6$ scf = 0.02 t N_2O

Total CO_2 released = 150 x 10^6 scf x 68.626 t $CO_2/10^6$ scf = 10293.9 t CO_2

Total CO_2 eq released = 150 x 10^6 scf x 68.8032 t CO_2 eq/10^6 scf = 10320.48 ton eq CO_2

The total release of CO_2 during the flaring phase is estimated to be as a worst case maximum of 10320.5 ton of CO2 eq. A worst case maximum gas is quite likely that the amount of gas flared is less, which would reduce the amount of CO_2 emissions.

Total greenhouse gas emissions during for the project (2 exploration wells) amounts to 20,641 ton eq CO_2. When compared with available data on Myanmar's national CO_2 equivalent GHG emissions of 219,530,000 tonnes in 2016, including land use change (World Resources Institute, Climate Analysis Indicators Tool (CAIT)), the GHG emissions arising from the proposed activities are insignificant (approximately 0.0094%), and therefore will not significantly impact the environment.

6.6.1.8 Significance of Impacts

Without mitigation measures, the impact from greenhouse gas emissions during well testing considered to be a global issue and of low magnitude. The impact disturbs an area currently used for agriculture with limited conservation value, and a reserved forest area also currently being used for agriculture with medium conservation value; the receptor sensitivity is rated medium. Given these impact criteria considerations the significance is determined to be Low.

The Significance Ranking of impacts from GHG emissions is **Low** (**Table 6-55**).

Table 6-55: Sigificance Ranking of impacts from GHG Emissions

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr

Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.6.1.9 Impact and Risk Mitigation Measures

Potential impacts from dust dispersion can be mitigated by application of the following measures:

Environment Impact Assessment –Well Testing Phase				
1 Air Quality	1.1 Vehicle and Equipment Use	1.1.1 Deterioration of air quality due to dust.	1.1.1.1	Implement construction and installation phase mitigation measures in 2.1. (Refer 6.4.2.8 above)
		1.1.2 Deterioration of air quality due to combustion of diesel fuel and flaring.	1.1.2.1	Implement construction and installation phase mitigation measures in 2.2. (Refer 6.4.2.8 above)
			1.1.2.2	Process control to minimize flaring.
			1.1.2.3	Maintain pilot flame at the flare tip to ensure that flame is not extinguished by strong wind.
			1.1.2.4	Verify the operation's flaring system to highest efficiency.
	1.2 Well testing releasing hydrogen sulphide	1.2.1 Deterioration of air quality due to hydrogen sulphide	1.2.1.1	Install Gas Detectors to response during emergency situation.
			1.2.1.2	If H2S levels exceed 10 ppm in the gas stream, appropriate safety zone to be established (8 hr TWA).
			1.2.1.3	All crew are instructed and rehearsed in H2S procedures. Provide training, drill and exercise for H2S awareness.
			1.2.1.4	Limit well testing period where possible.
	1.3 Flare Emissions	1.3.1 Climate Change due GHG	1.3.1.1	To maximize energy efficiency and design facilities to minimize energy use
			1.3.1.2	Operating flare to control odor and visible smoke emissions.
			1.3.1.3	Locate flare at a safe distance from local communities (and the workforce including workforce accommodation units
			1.3.1.4	Implementation of burner maintenance and replacement, programs to ensure continuous maximum flare efficiency.
			1.3.1.5	Keep installation and functioning of flare gas system safe according to the good engineering practice.
			1.3.1.6	Ensure flare system has efficient combustion.

Environment Impact Assessment –Well Testing Phase				
			1.3.1.7	Maintain pilot flame at the flare tip to ensure that flame is not extinguished by strong wind.
			1.3.1.8	Verify the operation's flaring system.
			1.3.1.9	Minimize the duration of flaring when possible

6.6.1.10 Residual Impacts and Risks

With these management measures, the magnitude of impacts to air quality from nuisance dust, hydrogen sulphide, air pollutants and GHG emissions will be reduced resulting in a residual significance that is **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.6.2 Assessment of Impacts to Noise

6.6.2.1 Scope of Assessment

Resource/Receptor	Project Phase	Activity	Impact
Noise	Well Testing Phase	Flaring Vehicle and Equipment Use	Increased noise from flaring stack

The noise impacts from Vehicle and Equipment Use and equipment transportation are the same as in the construction phase in **Section 6.4.3**.

6.6.2.2 Assessment of Noise Impacts from Well Testing (Flaring)

During well testing (15 days/well), Noise will be generated from equipment and flaring. The noise during testing is not expected to be a significant source beyond about 500 m. The flare system will be a vertical flare stack of appropriate height conforming to national/international standard. The nearest community will be located over 300 m away (for all the proposed well sites); thus, impact from light and sound from the flare stack is designed to be minimal. A safety zone will be established around the flare with security fencing.

The well testing phase has lower power consumption than the construction phase. Maximum noise levels generated by the various pieces of equipment during well testing are listed in **Table 6-56**.

Table 6-56: Noise Level of Machine During Well Testing Phase

Source	Noise level at source (dB (A))	Number of Sources at one time
Diesel Generator	81	1
Gas flaring system	87[6]-83	1

Source: [1]US Federal Highway Administration, US Department of Transportation, 2008;
Reference distance 15.24 meter (50 feet); (http://ops.fhwa.dot.gov/wz/workshops/accessible/Schexnayder_paper.htm)
[2]Abdulkareem, A.S. and J. O. Odigure, 2006 Reference distance 20 meter

[6] Noise level of gas combustion is 87-83 dB(A) at distant 20 m, the selected level is 87dB(A) to calculate the noise level at distance 15.24 m by using **Equation 5-7**; the noise level at distance 15.24m. will be 89.95 dB(A) and substitute in **Equation 5-8**

6.6.2.3 Significance of Impacts

Without mitigation measures, impacts from noise from well testing to sensitive receptors are expected to be local in extent, short-term in duration, reversible, of medium magnitude. The impact disturbs an area currently used for agriculture with limited conservation value, and a reserved forest area also currently being used for agriculture with medium conservation value; the receptor sensitivity is rated medium. Given these impact criteria considerations the significance ranking is determined to be Medium.

The Significance Ranking of impacts from Noise to sensitive receptors is rated as **Medium** (**Table 6-57**).

Table 6-57: Sigificance Ranking of impacts from Noise to Sensitive Receptors

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.6.2.4 Impact and Risk Mitigation Measures

Impacts from noise can be mitigated through the use of the following mitigation measures:

Environment Impact Assessment –Well Testing Phase			
2 Noise	2.1 Flaring during Well Testing	2.1.1 Increase in noise levels during well testing.	2.1.1.1 Implement construction and installation phase mitigation measures in 3.1. (Refer 6.4.3.5 above)
			2.1.1.2 Verify the operation's flaring system.
			2.1.1.3 Minimize the duration of flaring when possible.

6.6.2.5 Residual Impacts and Risks

With these management measures, the residual significance from the impact of noise to sensitive receptors is **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.6.3 Assessment of Impacts to Heat and Light

6.6.3.1 Scope of Assessment

Resource/Receptor	Project Phase	Activity	Impact
Heat and Light	Testing Phase	Flaring of excess gas	Increased light and heat emitted from gas flaring

6.6.3.2 Assessment of Light Impacts from Flaring

Gas flaring during well testing is a source of light. If drilling results indicate the presence of sufficient petroleum hydrocarbons, well testing will be performed.

The flare system will be a vertical flare stack of appropriate height conforming to national/international standard. The nearest community will be located over 300 m away (for all the proposed well sites); thus, impact from light and sound from the flare stack is designed to be minimal. A safety zone will be established around the flare with security fencing.

The reservoir fluids will be burned. The produced water will be separated and directed into the wastewater pit.

Any impacts from light on wildlife will be limited to the immediate vicinity of the well sites. Animals that are disturbed will avoid the area during the period of occupation. Insects will be attracted to the lights, which is likely to provide an easy food source for birds and other wildlife species.

Functional lighting is required on vehicles, drill rigs, campsite and well site at levels that provide a safe working environment for personnel. Lighting typically consists of bright white lights, used in accordance with safety requirements. Working lights will be directed into the site so that impacts from working lights will be minimized off-site.

6.6.3.3 Significance of Impacts

Without mitigation measures, impacts from light emissions to sensitive receptors occurring from vehicles, drill rig, well site, campsite and flaring are expected to be local in extent, short-term in duration, reversible, of low magnitude. The impact disturbs an area currently used for agriculture with limited conservation value, and a reserved forest area also currently being used for agriculture with medium conservation value; the receptor sensitivity is rated medium. Given these impact criteria considerations the significance is determined to be Low.

The Significance Ranking of impacts to light emissions is rated as **Low** (**Table 6-58**).

Table 6-58: Sigificance Ranking of impacts from light emissions

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.6.3.4 Assessment of Impacts from Heat

Heat can disrupt terrestrial fauna within the project area. This section discusses the impacts of heat on terrestrial fauna within or adjacent to the project area.

The volume of gas to be flared from the wells in an LTP test is expected to be a maximum of 60 mm scfgd per well. However, this is an unlikely amount to be flared for a continuous time during well testing, therefore the flare heat calculations have been completed for continuous flaring of 10 mm scfgd. The safety distances and requirements are calculated below:

Minimum Distance

The minimum distance from the center of the flare to the point of exposure is estimated as follows

$$D = (\tau * F * Q / 4\pi * K)^{0.5}$$

$\tau = 1.00$
F = 0.25
Q = 163,255.45 kW
K = 1.58
D = 45.34 m, 148.75 ft

Where:

D = minimum distance from flame center, m
τ = fraction of heat intensity transmitted (for a conservative analysis, the value of τ is assumed as 1.)
F = fraction of heat radiated
Q = heat release, kW
K = allowable radiation, kW/m2

Fraction of heat radiated, F

This depends on the composition of gas and the burner diameter. An approx-imate value of F can be applied based on Table 2. The values presentedin Table 2 are applicable to radiation from a gas. If liquid droplets of the hydrocarbon larger than 150 μm in size are present in the flame, the values should be increased.

Heat release, Q

For gases with known compositions, the heat release is estimated as follows:

$$Q = (W / 3.6) * \sum w_i q_i$$

W = 10583.82
$w_i = 1$
$q_i = 55.53$
Q = **163,255.45**

Where:

Q = heat release, kW
W = gas flow rate, kg/hr
wi = mass fraction of component i
qi = heating value of component i, MJ/kg (Table 3)

If the gas composition is not known, the heating value of the gas can be assumed as 50 MJ/kg. Heating values of commonly used gases are presented in Table 3.

Mass flow rate in lb. per hour

$$W = V * D$$

V = 416666.6667
D = 0.056
W = **23333.33** lb. per hour,
10,583.82 kg per hour,

Where:

W = mass flow rate in lb. per hour,
V = flow rate in scf/hr,
D = gas specific density (Table 4)
SG = Specific Gravity (Table 4)

Sizing of a flare stack: simple approach

Calculation of stack diameter

Flare stack diameter depends on the Mach number and is estimated by using the following equation:

$$Mach = 3.23 * 10^{-5} (W / (P * d^2)) * (z * T /(k * MW))^{0.5}$$

Mach = 0.2
W = 10583.82
P = 101.325
z = 1
T = 293.15
k = 1.27
MW = 19.5 Mach #
d = **0.241** Calculated **0.20**
d = **0.254** Provided **0.18**

Where:

Mach = design Mach number
W = flow rate, kg/h
P = pressure at flare tip, kPaA
d = flare stack diameter, m
z = compressibility of the flowing gas
T = temperature of the flowing gas, K
k = ratio of specific heat

Calculation of flame length

The flame length is calculated by using the following equation:

L = exp(0.4562 * ln(Q) - 5.3603)

Q = 163255453.84
L = **26.23** m

Where:

L = flame length, m
Q = heat release, watt

Flame distortion caused by wind velocity:

This depends on the actual flow rate of the gas and the wind velocity.

Actual Volumetric Fow

$$F = (22.4 * W * T) / (3600 * 273 * MW)$$

W = 10583.82
MW = 19.5
T = 293.15
F = **3.63** m3/sec

Where:

F = actual volumetric flow, m3/sec
W = mass flow rate, kg/h (Table 4)
MW = molecular weight of the flowing gas (Table 4)
T = temperature of the flowing gas, K

The flare tip exit velocity is calculated as follows:

$$U_j = (4 * F) / (Pi * d^2)$$

d = 0.241 Calculated*
d = 0.254 Provided*
U_j = **56.25** m/sec Calculated*
U_j = **50.61** m/sec Provided*

*Values adjusted to consider the max deflection assumed by EPA of 45 degrees or cos(45) or Sin(45)=0.7071068

Where:

Uj = flare tip exit velocity, m/sec
d = flare stack diameter, m

Flame distortion caused by wind velocity is calculated as follows

$U = U_x / U_j$

$U_x = 8.9$
$U_j = 56.25$ m/sec Calculated*
$U_j = 50.61$ m/sec Provided*
$U =$ **0.158** m/sec Calculated*
$U =$ **0.176** m/sec Provided*

Where:

U = velocity factor
U_x = wind velocity, m/sec

Flame vertical length, Δy, is estimated by using the following equation

$$\Delta_y = L * [-0.0392 + (0.1267 / U^{0.5}) + (0.0178 / U) - (0.003 / U^{1.5})]$$

L = 26.23
U = 0.158 m/sec Calculated*
U = 0.176 m/sec Provided*
$\Delta_y =$ **9.03** m Calculated*
$\Delta_y =$ **8.48** m Provided*

Where:

Δ_y = Flame vertical length
L = flame length, m
U = velocity factor

Fame horizontal length, Δx, is estimated by using the following equation

$$\Delta_x = L * [0.9402 + (0.1067 / U^{0.5}) - (0.0165 / U) + (0.0038 / U^{1.5})]^{-1.0}$$

L = 26.23
U = 0.158 m/sec Calculated*
U = 0.176 m/sec Provided*
$\Delta_x =$ **22.52** m Calculated*
$\Delta_x =$ **22.76** m Provided*

Where:

Δx = Flame horizontal length
L = flame length, m
U = velocity factor

Flame Center

The center of the flame from the top of the flare stack can be calculated as follows:

$$y_c = 1/2 * \Delta_y$$

y_c = **4.51** Calculated*
y_c = **4.24** Provided*

$$x_c = 1/2 * \Delta_x$$

x_c = **11.26** Calculated*
x_c = **11.38** Provided*

Where:

y_c = vertical distance of flame center from the top of flare stack, m
x_c = horizontal distance of flame center from the top of flare stack, m

The flare heat model and outputs are summarized in **Figure 6-6**.

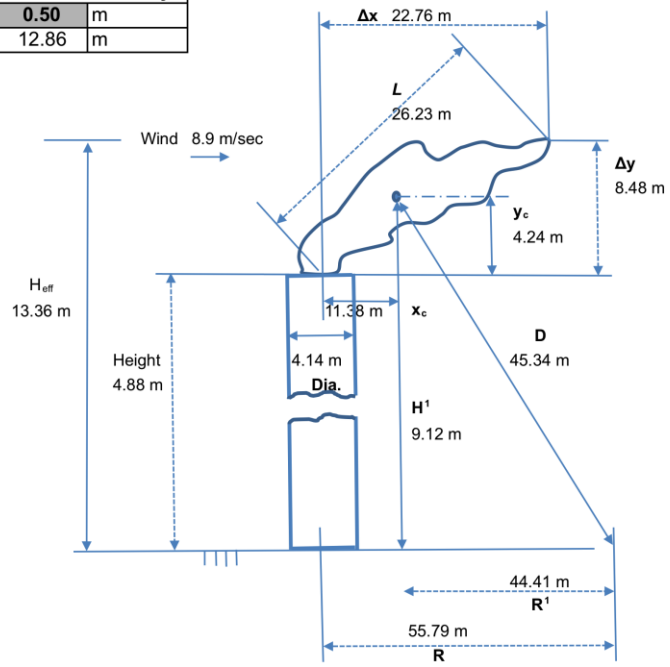
Flare Modeling Parameter Estimator

Facility ID: **Block EP-2** Flare Gas **NG**

Provided by Applicant		
Rating	416667	scf/hr
Diameter	0.254	Meters
Height	4.877	m
Temperature	1832	F

Modeling Parameters		
Eff. Stack Height	13.36	m
Eff. Velocity	50.61	m/sec
Eff. Diameter	4.14	m
Temperature	1273.15	K
For Partially Enclosed Flares Only		
Offset Height	0.50	m
True Eff. Stk. Ht.	12.86	m

Default Parameters	
1.58	Allowable radiation, kW/m2 (Table 1)
0.25	Fraction of heat radiated (Table 2)
55.53	Heating value of component i, MJ/kg (Table 3)
0.056	Gas specific density (Table 4)
19.5	Molecular weight of the flowing gas (Table 4)
293.15	Flowing Gas Temp. K
8.9	Wind Speed m/sec (~99th Percentile)
0.2	Mach #
101.325	Pressure at flare tip, kPaA
1.27	Ratio of Specific Heats (Table 5)



Note: The estimated flare parameters were generated using the calculation methodology provided in ANSI/API Standard 521. A publically available reference to these calculations can be found in a book by Arun Datta "Process engineering and design using Visual Basic" starting on page 330. A snippet can be found at http://www.scribd.com/doc/86470056/372/Lower-explosive-limit-of-mixtures.

Figure 6-6: Flare Model Summary

The flare stack will be located a reasonable distance from site facilities and the area will be cleared of vegetation. Furthermore, a constant fire watch will be posted during flaring and testing operations to specifically watch this area and ensure that in the event of any fire the operation is immediately shut down and the ground fire extinguished before it can spread. This follows the standard operational procedure when testing a well. Wildlife within this radius will be displaced due to a loss of habitat (including insects and birds feeding on the insects), but wildlife will avoid any adverse heat effects. Heat is therefore not expected to affect wildlife off site.

6.6.3.5 Significance of Impacts

Without mitigation measures, impacts from heat to sensitive receptors are expected to be local in extent, short-term in duration, reversible, of low magnitude. The impact disturbs an area currently used for agriculture with limited conservation value, and a reserved forest area also currently being used for

agriculture with medium conservation value; the receptor sensitivity is rated medium. Given these impact criteria considerations the significance is determined to be Low.

The Significance Ranking of impacts to heat are rated as **Low** (**Table 6-59**).

Table 6-59: Sigificance Ranking of the impacts of heat on terrestrial flora and fauna

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.6.3.6 Impact and Risk Mitigation Measures

Impacts from heat and light can be mitigated through the use of the following measures:

Environment Impact Assessment –Well Testing Phase			
3 Heat and Light	3.1 Flaring during Well testing	3.1.1 Increase in light at night from flaring	**3.1.1.1** Position flare away from sensitive receptors.
			3.1.1.2 Direction the light into wellpad as much as possible.
			3.1.1.3 Minimize the duration of flaring process when possible
		3.1.2 Increase heat from flaring	3.1.2.1 Clear vegetation around the flare stack.
			3.1.2.2 Minimize flare duration when possible.
			3.1.2.3 Maintain safety distance between flare stack and well site facilities and adjacent crops.
			3.1.2.4 Follow flare management procedures to ensure optimum management of fare system

6.6.3.7 Residual Impacts and Risks

With these management measures, the residual significance of impacts from heat and light is determined to be **Negligible**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.6.4 Assessment of Impacts to Surface Water Quality

6.6.4.1 Source of Impact

Resource/Receptor	Project Phase	Activity	Impact
Surface Water Quality	Testing Phase	Site Runoff and Drainage Handling of materials and chemicals Hazardous/non-hazardous waste management	Potential contamination from spills or wastewater drainage to nearby water bodies

6.6.4.2 Assessment of Impacts from Site Drainage, Hazardous/Non-hazardous Waste Management and Chemical Management

Activities during testing that may affect surface water quality include fuel spillage, produced water from well testing. Contamination of surface water from drained domestic waste and grey water that are the same as during the construction & installation phase and drilling phase as described in **Sections 6.4.5** and **6.5.4**.

During well testing, the separated emulsion-condensate will be stored in separate tanks and send to disposal at a permitted waste disposal facility. Chemicals used for well exploration will be placed on the waterproof concrete cement base, with roof and overflow curve to contain any spills. Any spills will be immediately cleaned up using the spill kits provided on site.

6.6.4.3 Significance of Impacts

Without mitigation measures, impacts to surface water quality are therefore expected to be local in extent, short-term in duration, reversible, and of medium magnitude. The impact disturbs an area currently used for agriculture with limited conservation value, and a reserved forest area also currently being used for agriculture with medium conservation value; the receptor sensitivity is rated medium. Given these impact criteria considerations the significance is determined to be medium.

The Significance Ranking of impacts to on surface water quality from site drainage, hazardous/non/hazardous waste management and chemical management is **Medium** (**Table 6-60**).

Table 6-60: Sigificance Ranking of impacts to Surface Water Quality and Aquatic Biota

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.6.4.4 Impact and Risk Mitigation Measures

Impacts to water quality and aquatic biota can be mitigated through the use of the following measures:

Environment Impact Assessment –Well Testing Phase			
4 Surface Water Quality	4.1 Non-Hazardous waste management	4.1.1 Contamination of surface water from drained domestic	4.1.1.1 Prohibit workers from cleaning machines/

		waste and grey water		equipment in a public water source.
			4.1.1.2	Prohibit workers and contractors discharging or discarding project waste, chemicals, oil into public water sources.
			4.1.1.3	Install septic tank and soak away pit on each well site for holding sewage.

6.6.4.5 Residual Impacts and Risks

With these management measures, the magnitude of impacts to *surface water* from site drainage, hazardous/non/hazardous waste management and chemical management will be reduced which will result in a residual significance ranking that is **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.6.5 Assessment of Impacts to Soil Quality

6.6.5.1 Source of Impact

Resource/Receptor	Project Phase	Activity	Impact
Soil Quality	Testing Phase	Site Runoff and Drainage Handling of Materials and chemicals Hazardous/non-hazardous waste management	Potential contamination from spills or wastewater drainage

6.6.5.2 Assessment of Impacts from Site Drainage, Hazardous/Non-hazardous Waste Management and Chemical Management

Activities during testing that may affect soil quality include fuel spillage, produced water and condensate from well testing. Contamination of soil from drained domestic waste and grey water which are the same as during the construction and installation phase described in **Sections 6.4.5.**

During well testing, the separated emulsion-condensate will be stored in separate tanks and sent for disposal at a permitted waste disposal facility. Chemicals used for well exploration will be placed on the waterproof concrete cement base, with roof and overflow curve to contain any spills. Any spills will be immediately cleaned up using the spill kits provided on site.

6.6.5.3 Significance of Impacts

Without mitigation measures, impacts to soil quality are therefore expected to be local in extent, short-term in duration, reversible, and of medium magnitude. The impact disturbs an area currently used for agriculture with limited conservation value, and a reserved forest area also currently being used for agriculture with medium conservation value; the receptor sensitivity is rated medium. Given these impact criteria considerations the significance is determined to be medium.

The Significance Ranking of impacts to soil quality from site drainage, hazardous/non/hazardous waste management and chemical management is **Medium** (**Table 6-61**).

Table 6-61: Sigificance Ranking of impacts to Surface Water Quality and Aquatic Biota

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.6.5.4 Impact and Risk Mitigation Measures

Impacts to water quality and aquatic biota can be mitigated through the use of the following measures:

Environment Impact Assessment –Well Testing Phase			
5 Soil Quality	5.1 Non-Hazardous waste management	5.1.1 Contamination of soil from drained domestic waste and grey water	5.1.1.1 Allow workers to clean machines/ equipment in designated areas only.
			5.1.1.2 Allow workers and contractors to discharge or discard project waste, chemicals, and oil in designated areas only.
			5.1.1.3 Install septic tank and soak away pit on each well site for holding sewage.

6.6.5.5 Residual Impacts and Risks

With these management measures, the magnitude of impacts to *surface water quality* from site drainage, hazardous/non-hazardous waste management and chemical management will be reduced which will result in a residual significance ranking that is **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.6.6 Assessment of Impacts to Ground Water Quality

Resource/Recepto	Project Phase	Activity	Impact
Groundwater Quality	Testing Phase	Handling of materials and chemicals Hazardous/non-hazardous waste management	Degradation of groundwater quality from spills or leaks leaching into water table

6.6.6.1 Assessment of Impacts from Site Drainage, Hazardous/Non-hazardous Waste Management and Chemical Management

Activities during well testing that may affect groundwater quality include fuel spillage, hazardous/non-hazardous wastes and chemical spills. Contamination of groundwater from domestic waste and grey water that may leach into the water table.

During abandonment fuel will be stored in a bunded area and wastes will be separated and stored in a secure location in appropriate containers. Wastes will ultimately be sent for disposal at a permitted waste disposal facility. Chemicals will be placed on the waterproof concrete cement base, with roof and overflow curve to contain any spills. Any spills will be immediately cleaned up using the spill kits provided on site.

A set of concrete septic tanks will be built into the work camp pad at the outer edges. They will have a combined capacity of 8000 litres (8 m^3). No pump out of septic sludge is required as the concrete septic tanks and any sewage sludge will be left in ground onsite at the end of the drilling campaign.
Wastewater from the campsite, including both grey water and black water, will be treated separately. Grey water will be treated in a soak pit and Black water will be treated in septic tank and soak pit.

A waste management plan will be prepared that defines waste types, disposal methods and locations consistent with waste management laws and regulations.

6.6.6.2 Significance of Impacts

Without mitigation measures, impacts to groundwater quality are expected to be local in extent, short-term in duration and of medium magnitude. The impact disturbs an area currently used for agriculture with limited conservation value, and a reserved forest area also currently being used for agriculture with medium conservation value; the receptor sensitivity is rated medium. Given these impact criteria considerations the significance is determined to be medium.

The Significance Ranking of impacts to on groundwater from site drainage, hazardous/non-hazardous waste management and chemical management is **Medium** (**Table 6-62**).

Table 6-62: Sigificance Ranking of impacts to Groundwater Quality

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.6.6.3 Impact and Risk Mitigation Measures

Impacts to groundwater quality can be mitigated through the use of the following measures:

Resource/Receptor	Project Phase	Activity	Impact
8 Groundwater Quality	8.1 Hazardous/Non-Hazardous waste management and chemical handling	8.1.1 Contamination of groundwater from waste, chemicals and wastewater	8.1.1.1 Prohibit workers from cleaning machines/ equipment in unauthorized locations.
			8.1.1.2 Prohibit workers and contractors discharging or discarding project waste, chemicals, or oil in unauthorized locations.

Resource/Receptor	Project Phase	Activity	Impact
			8.1.1.3 Install septic tank on each well site for holding sewage and grey water.
			8.1.1.4 Store wastes and chemicals in a secure area that has a hard surface and closed drains.

6.6.6.4 Residual Impacts and Risks

With these management measures, the magnitude of impacts to groundwater from site drainage, hazardous/non-hazardous waste management and chemical management will be reduced which will result in a residual significance ranking that is **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.6.7 Assessment of Impacts to Flora & Fauna

6.6.7.1 Scope of Assessment

Resource/Receptor	Project Phase	Activity	Impact
Flora & Fauna	Testing Phase	Flaring of Gas Vehicle and Equipment Use Site Runoff and Drainage Handling of materials and chemicals Hazardous/non-hazardous waste management Hazardous/non-hazardous waste management Labour and Accommodation	Harvesting of plants and animals by human activity

6.6.7.2 Assessment of Impacts from Vehicle & Equipment Use, Chemical and Waste Management and Site-Run-Off, Labour and Accommodation

Sources of impacts on fauna during the well testing phase include fuel and chemical spillage, waste management and habitat degradation from workers' activities, noise from vehicle and equipment use and flaring.

Water that may be contaminated with a chemical / fuel spills will be collected into a dirty water pit by using gutters around the concrete drilling pad area. In practice, contaminated water should not be generated. The pit at the drilling pad is required for cuttings. After drilling is finished the cuttings will be taken out and the pit will be cleaned and used to contain the contaminated water, if required.

The contaminated water will be transported for treatment and disposal by service companies who have permission from the government. The fuel, chemicals and mud used will be stored properly, which makes the chance of spillage leading to contamination of ground and surface water unlikely. The toxicity of stored chemical is low and biodegradable, limiting both the severity and the duration of any impact.

The potential impacts from the movement of vehicles associated with the exploration drilling campaign are:

- Disturbance leading to behavioral changes or displacement of fauna
- Increased likelihood of incidents

The occurrence and intensity of disturbance is highly variable and depends on a range of factors relating to the animal and situation. Some behavioral disturbance may occur for short periods if fauna are present or near access roads or project site.

Human activity will be confined to the access road and well sites and will not constitute a new impact on the area, which is already regularly visited by people. Contractors and personnel will not be allowed off site where they could cause unnecessary disturbance to wildlife. In addition, hunting and trapping will be not be allowed and violations are grounds for termination of contract and dismissal.

The well site area is an existing agricultural area with some open forest areas. The undisturbed areas of the Reserved Forest in the area have impacted terrestrial flora. As standard practice, OVL will ensure that its staff and contractors will not cut trees or forage in the area surrounding the well sites during any phase of the project. The Naweng-1 wellsite is within 5 km of the Inn Ma Swamp and the Payama-1 wellsite is within the Shabyin Reserved Forest.

6.6.7.3 Assessment of Impacts from Flaring

Flaring during well testing will cause light. The light may have an impact on crop productivity around the well sites. Vegetation within this radius may be displaced but this safety zone will prevent fire spreading to nearby fields. For one well site the value as habitat is significantly affected by its current use as an agriculture area and continued human activity. The other well site is in a forest reserve area that too is being used for agriculture.

Lighting on the site at night will be kept to a minimum and directed so that as little as possible falls outside the confines of the pad, consistent with safety and security.

Any impacts from light on wildlife will be limited to the immediate vicinity of the well sites. Animals that are disturbed will avoid the area during the period of occupation. Insects will be attracted to the lights, which is likely to provide an easy food source for birds and other wildlife species.

The flare stack will be located at a reasonable distance from site facilities and the area will be cleared of vegetation. A constant fire watch will be posted during flaring and testing operations to specifically watch this area and ensure that in the event of any fire the operation is immediately shut down and the ground fire extinguished before it can spread. This follows the standard operational procedure when testing a well. Wildlife within this radius will be displaced due to a loss of habitat (including insects and birds feeding on the insects), but wildlife will avoid any adverse heat effects. Heat is therefore not expected to affect wildlife off site.

6.6.7.4 Significance of Impacts

The impact to flora and fauna during well testing due to site runoff and drainage, handling materials and chemicals, hazardous/non-hazardous waste, flaring and labor and accommodation will be local in extent, short-term in duration, reversible and of medium magnitude. The impact disturbs an area currently used for agriculture with limited conservation value, and a reserved forest area also currently being used for agriculture with medium conservation value; the receptor sensitivity is rated medium. Given these impact criteria considerations the significance ranking is determined to be medium.

The Significance Ranking of impacts to terrestrial flora and fauna from well testing is rated as **Medium** (**Table 6-63**).

Table 6-63: Significance Ranking of impacts to terrestrial flora and fauna during well testing from movement of vehicles, equipment and the rig, site runoff and drainage, handling materials and chemicals, hazardous/non-hazardous waste, flaring and labor and accommodation.

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.6.7.5 Impact and Risk Mitigation Measures

Impacts to terrestrial flora can be mitigated through the use of the following measures:

Ecological Environment Impact Assessment – Well Testing Phase			
5 Terrestrial Flora and Fauna	5.1 Labour and Accommodations	5.1.1 Habitat degradation from workers' activities	5.1.1.1 Mark well site clearly and prohibit vehicles from moving off site onto surrounding land.
			5.1.1.2 Forest incursions will be specifically prohibited.
			5.1.1.3 Contractors and personnel will not be allowed off site where they could cause unnecessary disturbance to vegetation.
	5.2 Flaring during Well Testing	5.2.1 Habitat degradation from light and heat	5.2.1.1 Implement well testing phase mitigation measures 3.1. (Refer 6.6.3.6 above)

6.6.7.6 Residual Impacts and Risks

With these management measures, the residual significance of impacts to flora and fauna from well testing is determined to be **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.7 Environmental Impact Assessment during Abandonment Phase

Environmental Aspects that need to be assessed during Well abandonment phase include:

- Topography
- Air Quality
- Noise
- Surface Water Quality
- Surface Water Hydrology

- Groundwater quality
- Soil
- Flora and Fauna

6.7.1 Assessment of Impacts to Topography

6.7.1.1 Scope of Assessment

Resource/Receptor	Project Phase	Activity	Impact
Topography	Abandonment Phase	Access road and Site abandonment and restoration	Disturbance to local topography

6.7.1.2 Assessment of Impacts from Site Abandonment

Potential impacts to topography from well abandonment phase include the removal of the camp and well site, well site de-mobilization, transportation of machine and equipment, restoration of the site to original condition. However normally the community requests to keep the access road for local use.

The well abandonment will follow normal industry practices and procedures, conforming to all internal OVL regulations and MOGE requirements. The well site will be cleared of all equipment and cleaned up. A section of the 7" casing will be filled with heavy kill weight mud and a cement plug will be put in position, 30m below top of liner lap and 30m above as one 60m long plug. (Minimum length) After curing/thickening time, the position of the plug will be confirmed physically by tagging with the cementing string. It will then be pressure tested. Then a 30m (Minimum length) cement plug will be spotted at surface. Wellhead will then be removed and casing will be cut off at bottom of cellar. A steel plate will be welded on the top of the cut off casing. The cellar will then be removed and the cellar back filled with clean soil.

The well site will then be cleared of all equipment and cleaned up. The rig cellar will be removed and a steel plate welded on top of stump, a minimum 3 m below ground level. The concrete rig pad, other foundations and the water pit will be broken up and all material removed off site for disposal as normal building rubble. The Civil Work Contractor will have stripped and stockpiled the top 500 mm topsoil layer while constructing the well site area.

Once campaign finished, the surface of the well pad, consisting of compacted fill will be broken up and the contours of the site restored to their original levels then the civil work contractor will remove all borrowed soil from well site and put back the topsoil to the well site area to restore to original condition.

6.7.1.3 Significance of Impacts

Without mitigation measures, the impact on topography from abandonment and site restoration activity will be medium in extent, short-term in duration, reversible and of medium magnitude. The impact disturbs an area currently used for agriculture with limited conservation value, and a reserved forest area also currently being used for agriculture with medium conservation value; the receptor sensitivity is rated medium. Given these impact criteria considerations the impact significance to Topography is determined to be a medium.

The Significance Ranking of impacts to topography from abandonment and site restoration activity is rated as **Medium** (**Table 6-64**).

Table 6-64: Sigificance Ranking of impacts to topography

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.7.1.4 Impact and Risk Mitigation Measures

Impacts from abandonment and site restoration activities on topography can be mitigated through the use of the following measure:

Environment Impact Assessment –Well Abandonment Phase				
1 Topography	1.1 Site and Road abandonment and restoration	1.1.1 Disturbance to local topography	1.1.1.1	Limit site-clearing activities to well sites and access roads only.
			1.1.1.2	If no commercial find, restore the site and hand back to MOGE as per MOGE procedure.

6.7.1.5 Residual Impacts and Risks

With these management measures, the extent and magnitude of impacts from a change to topography from site abandonment will be reduced resulting in a residual significance ranked that is **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.7.2 Assessment of Impacts to Air Quality

6.7.2.1 Scope of Assessment

Resource/Receptor	Project Phase	Activity	Impact
Air Quality	Abandonment Phase	Vehicle and Equipment Use, Site Restoration	Deterioration of air quality from dust, vehicle emissions and Greenhouse Gas

6.7.2.2 Assessment of Dust Impacts from during Abandonment

Site restoration activities may cause dust and vehicles and machine transportation may cause of air pollution.

Potential impacts to air quality during the well abandonment phase will be caused by removing all equipment and cleaning up the site (soil excavation, soil levelling, and soil transportation). These activities may cause the dispersion of dust which may decrease temporary the air quality such as Total Suspended Particle (TSP) and Paticulate Matter (PM-10).

The impact significance to air quality from dust due to abandonment and site restoration activities will be the same as the construction and installation phase in **Section 6.4.2.2**.

6.7.2.3 Deterioration of air quality due to combustion of diesel fuel and flaring

Fuel combustion from site clearance, transportation and site restoration. During the well abandonment phase, combustion products will be released from vehicles transporting personnel, equipment and machinery. The clearance and site restoration will use dump trucks, loader, tractor/bulldozers, and levelling truck. Combustion products from these vehicles will be similar to those already experienced in the area.

6.7.2.4 Significance of Impacts

Without mitigation measures, air emission impacts during well abandonment will be local in extent, short-term in duration, reversible and of medium magnitude. The impact disturbs an area currently used for agriculture with limited conservation value, and a reserved forest area also currently being used for agriculture with medium conservation value; the receptor sensitivity is rated medium. Given these impact criteria considerations the significance is determined to be medium.

The Significance Ranking of impacts from dust and fuel combustion is rated as **Medium** (**Table 6-65**).

Table 6-65: Sigificance Ranking of impacts from Dust & Fuel Combustion

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.7.2.5 Impacts from GHG Emissions

The potential sources of deterioration of air quality are fuel combustion from:

- Vehicle Emissions
- Diesel Generators

The sensitive receptors for greenhouse gas emissions are the same as those listed for dust emissions.

The GHG emissions are estimated following the Tier 1 approach of IPCC (2006). GHG emissions are estimated using emission factors and global warming potentials for the three main greenhouse gases (CO_2, CH_4 and N_2O). The estimated GHG emissions for the project are shown in **Table 6-66**.

Total greenhouse gas emissions for the project (2 exploration wells) amounts to 757.4 ton eq CO_2. When compared with available data on Myanmar's national CO_2 equivalent GHG emissions of 219,530,000 tonnes in 2016, including land use change (World Resources Institute, Climate Analysis Indicators Tool (CAIT)), the GHG emissions arising from the proposed activities are insignificant (approximately 0.00003%), and therefore will not significantly impact the environment.

Table 6-66: Estimated Total GHG Emissions per Well

Project Phase	Activity	One Time CO_2 Release (ton CO_2)
Abandonment and Restoration	Heavy Equipment and transportation.	378.7
Total per well		378.7

6.7.2.6 Significance of Impacts

Without mitigation measures, the impact from greenhouse gas emissions during abandonment are considered to be a global issue and of low magnitude. The impact disturbs an area currently used for agriculture with limited conservation value, and a reserved forest area also currently being used for agriculture with medium conservation value; the receptor sensitivity is rated medium. Given these impact criteria considerations the significance is determined to be Low.

The Significance Ranking of impacts from GHG emissions is **Low**. (**Table 6-67**)

Table 6-67: Sigificance Ranking of impacts from GHG Emissions

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.7.2.7 Impact and Risk Mitigation Measures

Potential impacts from dust dispersion can be mitigated by application of the following measures:

Environment Impact Assessment –Well Abandonment Phase			
2 Air Quality	2.1 Vehicle and Equipment Use	2.1.1 Deterioration of air quality due to dust.	2.1.1.1 Implement construction and installation phase mitigation measures in 2.1. (Refer 6.4.2.8 above)
		2.1.2 Deterioration of air quality due to combustion of diesel fuel.	2.1.2.1 Implement construction and installation phase mitigation measures in 2.2. (Refer 6.4.2.8 above)
		2.1.3 Climate Change due to GHG	2.1.3.1 Implement construction and installation phase mitigation measures in 2.3. (Refer 6.4.2.8 above)

6.7.2.8 Residual Impacts and Risks

With these management measures, the magnitude of impacts to air quality from nuisance dust, air pollutants and GHG emissions will be reduced resulting in a residual significance that is **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.7.3 Assessment of Impacts to Noise

6.7.3.1 Scope of Assessment

Resource/Receptor	Project Phase	Activity	Impact
Noise	Abandonment Phase	Vehicle and Equipment Use Site Restoration	Increased noise and vibration from machines and equipment

6.7.3.2 Assessment of Noise Impacts from Vehicle and Equipment Use

For permanent well abandonment and site restoration, machinery will be used for clearance activities. The machinery will be used to clean up and restore the site to its original condition. Transportation of equipment and machines will cause noise during well abandonment. The maximum noise level generated during this phase are presented in **Table 6-68**.

Table 6-68: Noise Level from Equipment, Engine and Tools for Well Abandonment and Site Restoration

Source	Noise at source (dB (A))	Number
Dump Truck	84	1
Excavator	83	1
Bulldozer	75	1
Grader	75	1
Jack-Hammer	75 - 80	1

Source: British Columbia Ministry of Transportation and Infrastructure, 2012, reference distance = 15 m (49.21 ft): (http://www.th.gov.bc.ca/BCHighways/contracts/Reference_Material_Tenders/03901-0001/AW_CEMP_10%20Feb_2012.pdf)

The estimated noise levels for an absolute worst-case condition includes simultaneous operation of three pieces of equipment: dump truck, excavator and jack-hammer. Not all equipment will operate at the same time.

6.7.3.3 Significance of Impacts

Without mitigation measures, impacts from noise from site abandonment to sensitive receptors are expected to be local in extent, short-term in duration, reversible, of medium magnitude. The impact disturbs an area currently used for agriculture with limited conservation value, and a reserved forest area also currently being used for agriculture with medium conservation value; the receptor sensitivity is rated medium. Given these impact criteria considerations the significance ranking is determined to be Medium.

The Significance Ranking of impacts from **noise** to sensitive receptors is rated as **Medium**. (**Table 6-69**)

Table 6-69: Sigificance Ranking of impacts from Noise to Sensitive Receptors

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.7.3.4 Impact and Risk Mitigation Measures

Impacts from noise can be mitigated through the use of the following mitigation measures:

Environment Impact Assessment –Well Abandonment Phase			
3 Noise	3.1 Vehicle and Equipment Use	3.1.1 Increase in noise levels from machines/engines during site demolition & restoration and transportation.	3.1.1.1 Implement construction and installation phase mitigation measures in 3.1. (Refer 6.4.3.5 above)

6.7.3.5 Residual Impacts and Risks

With these management measures, the residual significance from the impact of noise to sensitive receptors is **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.7.4 Assessment of Impacts to Surface Water Hydrology

6.7.4.1 Source of Impact

Resource/Receptor	Project Phase	Activity	Impact
Surface Water Hydrology	Abandonment Phase	Site Restoration	Return to pre-construction condition

6.7.4.2 Assessment of Impacts from Site Restoration, Drainage, Hazardous/Non-hazardous Waste and Chemical Management

The well site will be cleared of all equipment and cleaned up. The cement walls of the rig cellar will be broken down below the surface and the hole backfilled with soil. The concrete rig pad, other foundations and the water pit will be broken up and all material removed off site for disposal as normal building rubble. The soil surface will be levelled to the previous level (before the project) which may cause change to surface water hydrology.

The activities of well abandonment and site restoration which may affect surface water hydrology include: site clearance, levelling of soil surface to previous level (before the project), and re-vegetation.

6.7.4.3 Significance of Impacts

Without mitigation measures, impacts to surface water hydrology are expected to be local in extent, short-term in duration, reversible, and of medium magnitude. The impact disturbs an area currently used for agriculture with limited conservation value, and a reserved forest area also currently being used for agriculture with medium conservation value; the receptor sensitivity is rated medium. Given these impact criteria considerations the significance is determined to be medium.

The Significance Ranking of impacts on surface water hydrology and soil quality is **Medium** (**Table 6-70**).

Table 6-70: Sigificance Ranking of impacts to Surface Water Hydrology

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.7.4.4 Impact and Risk Mitigation Measures

Impacts to surface water hydrology can be mitigated through the use of the following measures:

Environment Impact Assessment – Well abandonment Phase				
4 Surface water Hydrology	4.1 Soil excavation for site restoration	4.1.1 Area compaction or erosion during site demolition & restoration.	4.1.1.1	During restoration, avoid causing obstacles to water drainage
			4.1.1.2	Construct water drainage lines (culverts/causeway) to maintain natural drainage. The required permission will be obtained from MOGE, Forestry Department and Township GAD office.
			4.1.1.3	Vegetate site with native species

6.7.4.5 Residual Impacts and Risks

With these management measures, the residual significance from the impact of surface water hydrology to sensitive receptors is **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.7.5 Assessment of Impacts to Surface Water Quality

6.7.5.1 Source of Impact

Resource/Receptor	Project Phase	Activity	Impact
Surface Water Quality	Abandonment Phase	Site Runoff and Drainage Handling of materials and chemicals Hazardous/non-hazardous waste management	Potential contamination from spills or wastewater drainage to nearby water bodies

6.7.5.2 Assessment of Impacts from Site Restoration, Drainage, Hazardous/Non-hazardous Waste and Chemical Management

The well site will be cleared of all equipment and cleaned up. The cement walls of the rig cellar will be broken down below the surface and the hole backfilled with soil. The concrete rig pad, other foundations

and the water pit will be broken up and all material removed off site for disposal as normal building rubble. The soil surface will be levelled to the previous level (before the project) which may cause change to surface water quality.

The activities of well abandonment and site restoration which may affect surface water quality include; clearance of all equipment, structures and foundation, removal of contaminated runoff storage, removal of laterite well pad area and soil surface levelling to previous level and condition (before the project).

6.7.5.3 Significance of Impacts

Without mitigation measures, impacts to surface water quality are expected to be local in extent, short-term in duration, reversible, and of medium magnitude. The impact disturbs an area currently used for agriculture with limited conservation value, and a reserved forest area also currently being used for agriculture with medium conservation value; the receptor sensitivity is rated medium. Given these impact criteria considerations the significance is determined to be medium.

The Significance Ranking of impacts on surface water quality is **Medium**. (**Table 6-71**)

Table 6-71: Sigificance Ranking of impacts to Surface Water Quality

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.7.5.4 Impact and Risk Mitigation Measures

Impacts to surface water quality can be mitigated through the use of the following measures:

Environment Impact Assessment –Well abandonment Phase				
5 Surface Water Quality	5.1 Hazardous/non-hazardous waste management	5.1.1 Potential contamination from spills or wastewater drainage to nearby water bodies during site restoration	5.1.1.1	Implement construction and installation phase mitigation measures in 5.1. (Refer 6.4.5.5 above)
			5.1.1.2	Restore the site and hand back to MOGE as per MOGE procedure.

6.7.5.5 Residual Impacts and Risks

With these management measures, the residual significance from the impact of surface water quality to sensitive receptors is **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.7.6 Assessment of Impacts to Soil Quality

6.7.6.1 *Source of Impact*

Resource/Receptor	Project Phase	Activity	Impact
Soil Quality	Abandonment Phase	Site Runoff and Drainage Handling of Materials and chemicals Hazardous/non-hazardous waste management, Site Restoration	Return to pre-construction condition Potential contamination from spills or wastewater drainage

6.7.6.2 *Assessment of Impacts from Site Restoration, Drainage, Hazardous/Non-hazardous Waste and Chemical Management*

The well site will be cleared of all equipment and cleaned up. The cement walls of the rig cellar will be broken down below the surface and the hole backfilled with soil. The concrete rig pad, other foundations and the water pit will be broken up and all material removed off site for disposal as normal building rubble. The soil surface will be levelled to the previous level (before the project) which may cause change to surface water hydrology, soil, and groundwater.

The activities of well abandonment and site restoration which may affect soil include; clearance of all equipment, structures and foundation, removal of contaminated runoff storage, removal of laterite well pad area and soil surface levelling to previous level and condition (before the project).

The land contamination encountered during the site decommissioning due to known or unknown historical releases of hazardous materials or oil, or due to the waste pit infrastructure used to store or handle these materials requires appropriate measures to remediate after site closure.

6.7.6.3 *Significance of Impacts*

Without mitigation measures, impacts to surface soil quality are expected to be local in extent, short-term in duration, reversible, and of medium magnitude. The impact disturbs an area currently used for agriculture with limited conservation value, and a reserved forest area also currently being used for agriculture with medium conservation value; the receptor sensitivity is rated medium. Given these impact criteria considerations the significance is determined to be medium.

The Significance Ranking of impacts on soil quality is **Medium**. (**Table 6-72**)

Table 6-72: Sigificance Ranking of impacts to Soil Quality

	Level and Type of Impact				
	1	2	3	4	5
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.7.6.4 *Impact and Risk Mitigation Measures*

Impacts to soil quality can be mitigated through the use of the following measures:

Environment Impact Assessment – Well abandonment Phase					
6	Soil Quality	6.1	Soil excavation for site restoration	6.1.1 Degradation of soil quality through compaction or erosion during site demolition & restoration.	6.1.1.1 Limit site demolition & restoration only to well sites and access roads.
					6.1.1.2 Restore the site and hand back to MOGE as per MOGE procedure.
					6.1.1.3 Test and Managing potentially contaminated areas with the objective of protecting the safety and health of occupants of the site, the surrounding community, and the environment post decommissioning.
					6.1.1.4 Preparation of a management plan to manage obsolete, abandoned, hazardous materials or oil consistent with international hazardous waste management guidelines.

6.7.6.5 Residual Impacts and Risks

With these management measures, the residual significance from the impact of soil quality to sensitive receptors is **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.7.7 Assessment of Impacts to Ground Water Quality

Resource/Receptor	Project Phase	Activity	Impact
Groundwater Quality	Abandonment Phase	Handling of materials and chemicals Hazardous/non-hazardous waste management	Degradation of groundwater quality from spills or leaks leaching into water table

6.7.7.1 Assessment of Impacts from Site Drainage, Hazardous/Non-hazardous Waste Management and Chemical Management

Activities during abandonment that may affect groundwater quality include fuel spillage, hazardous/non-hazardous wastes and chemical spills. Contamination of groundwater from drained domestic waste and grey water may also leach into the water table.

During abandonment fuel will be stored in a bunded area and wastes will be separated and stored in a secure location in appropriate containers. Wastes will ultimately be sent for disposal at a permitted waste disposal facility. Chemicals will be placed on the waterproof concrete cement base, with roof and overflow curve to contain any spills. Any spills will be immediately cleaned up using the spill kits provided on site.

A set of concrete septic tanks will be built into the work camp pad at the outer edges. They will have a combined capacity of 8000 litres (8 m^3). It is estimated that some 7 m^3 (7000 litres) of combined sewage and wastewater will be produced each day during maximum manned operations (100 people). Wastewater from the campsite, including both grey water and black water, will be treated separately. Grey water will be treated in a soak pit and Black water will be treated in septic tank and soak pit. No pump out of septic sludge is required as the concrete septic tanks and any sewage sludge will be left in ground onsite at the end of the drilling campaign.

6.7.7.2 Significance of Impacts

Without mitigation measures, impacts to groundwater quality are expected to be local in extent, short-term in duration and of medium magnitude. The impact disturbs an area currently used for agriculture with limited conservation value, and a reserved forest area also currently being used for agriculture with medium conservation value; the receptor sensitivity is rated medium. Given these impact criteria considerations the significance is determined to be medium.

The Significance Ranking of impacts to on groundwater from site drainage, hazardous/non/hazardous waste management and chemical management is **Medium** (**Table 6-73**).

Table 6-73: Sigificance Ranking of impacts to Groundwater Quality

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.7.7.3 Impact and Risk Mitigation Measures

Impacts to groundwater quality can be mitigated through the use of the following measures:

Resource/Receptor	Project Phase	Activity	Impact
9 Groundwater Quality	9.1 Hazardous/Non - Hazardous waste management and chemical handling	9.1.1 Contamination of groundwater from waste, chemicals and wastewater	9.1.1.1 Prohibit workers from cleaning machines/ equipment in unauthorized locations.
			9.1.1.2 Prohibit workers and contractors discharging or discarding project waste, chemicals, or oil in unauthorized locations.
			9.1.1.3 Install septic tank on each well site for holding sewage and grey water.
			9.1.1.4 Store wastes and chemicals in a secure area that has a hard surface and closed drains.

6.7.7.4 Residual Impacts and Risks

With these management measures, the magnitude of impacts to groundwater from site drainage, hazardous/non-hazardous waste management and chemical management will be reduced which will result in a residual significance ranking that is **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.7.8 Assessment of Impacts to Flora & Fauna

6.7.8.1 Scope of Assessment

Resource/Receptor	Project Phase	Activity	Impact
Flora & Fauna	Abandonment Phase	Vehicle and Equipment Use Site Runoff and Drainage Hazardous/non-hazardous waste management Handling of materials and chemicals Hazardous/non-hazardous waste management Site Restoration Labour and Accommodation	Degradation or destruction of natural habitat Harvesting of plants and animals by human activity

6.7.8.2 Assessment of Impacts from Abandonment and Site Restoration

Sources of potential impact on flora during the well abandonment and site restoration phase include clearance of site, the removal of concrete rig pad, other foundations and the water pit.

The well abandonment will follow normal industry practices and procedures, conforming to all internal OVL regulations and MOGE requirements. The well site will be cleared of all equipment and cleaned up. The cement walls of the rig cellar will be broken down below the surface and the hole backfilled with soil. The concrete rig pad, other foundations and the water pit will be broken up and all material removed off site for disposal as normal building rubble. The soil surface will be levelled to the previous level (before the project), which will cause physical changes that could cause deterioration in terrestrial aquatic flora and fauna.

Soil compaction can reduce the permeability of water, which leads to increased runoff. A high volume of runoff may limit the growth of plants. The project will mark the area to be demolished to prevent soil compaction. The removal of vegetation in the well site area may cause sedimentation in water resource which will affect the aquatic biota. Runoff water from the project area may affect the surface water quality which may cause effects to aquatic biota in the area. The sedimentation could cause elevated turbidity levels from runoff which can reduce transmission of sunlight, thus limiting photosynthesis. In turn, this can reduce the level of oxygen in the water. Organic matter introduced into a watercourse can lead to further deoxygenation as the organic matter is decomposed by micro-organisms and result in eutrophication. If oxygen levels fall below the natural DO variability in a system, aquatic biota diversity and abundance could decline as described in **Section 6.4.5.3**.

6.7.8.3 Significance of Impacts

The impact to flora and fauna from abandonment and site restoration, movement of vehicles, equipment and the rig, site runoff and drainage, handling materials and chemicals, hazardous/non-hazardous waste and labor and accommodation will be local in extent, short-term in duration, reversible and of medium magnitude.

The impact disturbs an area currently used for agriculture with limited conservation value, and a reserved forest area also currently being used for agriculture with medium conservation value; the receptor sensitivity is rated medium. Given these impact criteria considerations the significance ranking is determined to be medium.

The Significance Ranking of impacts to terrestrial flora and fauna from clearance of site, installation of physical disturbance due to site abandonment is rated as **Medium**.

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.7.8.4 Impact and Risk Mitigation Measures

Impacts to terrestrial flora can be mitigated through the use of the following measures:

Ecological Environment Impact Assessment – Well Abandonment Phase			
Resource/Receptor	**Project Phase**	**Activity**	**Impact**
8 Terrestrial Flora and Fauna	8.1 Labour and Accommodations	8.1.1 Degradation or destruction of natural habitat and harvesting wild plants / animals	8.1.1.1 Limit abandonment to daytime hours only.
			8.1.1.2 Contractors and personnel will not be allowed off site where they could cause unnecessary disturbance to flora and fauna. In addition, fishing and hunting will be specifically prohibited.
	8.2 Site-Run off and drainage	8.2.1 Potential degradation or destruction of aquatic biota	8.2.1.1 Implement construction and installation phase mitigation measures in 7.3. (Refer 6.4.8.5 above)

6.7.8.5 Residual Impacts and Risks

With these management measures, the residual significance of impacts to flora and fauna from abandonment and site restoration is determined to be **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.8 Social Impact Assessment during Construction Phase

From the screening process the following must be assessed to determine their impacts during the preparation phase:

- Land Use
- Transportation
- Public Utility
- Drainage and Flooding
- Waste Management
- Socio-Economy
- Cultural and Archaeological Resources
- Tourism
- Visual Aesthetics

6.8.1 Assessment of Impacts to Land Use

6.8.1.1 Scope of Assessment

Resource/Receptor	Project Phase	Activity	Impact
Land Use	Construction Phase	Access road and Site Construction (Change from agricultural to industrial area)	Change in land use (Loss of agricultural activity)

6.8.1.2 Assessment of Impacts from Land Acquisition

The impact disturbs both an area currently used for agriculture with limited conservation value; and a forest reserve area also used for agriculture with a medium conservation value.

The main project activity that affects land use is the well site, campsite and access road construction as well as the topsoil storage area. All land needed for the project will be acquired or rented by OVL.

The well pad size for Naweng-1 is 200 m x 200 m (40,000 m^2) and the well pad size for Payama-1 is 130 m x 130 m (16,900 m^2). The well pad includes a rig area, campsite (accommodation), campsite office space and storage area. The field Office will be at the well sites. Drilling Contractor will provide all require containers. Permanent construction will be limited.

The distances from the existing road to the proposed well locations are provided in **Table 6-74**.

Table 6-74: The Distance from Exiting Road to the Proposed Well Location

Well site	Length of Road Upgrading
Naweng-1	• 1.215 km upgrading of existing 125 m of new road construction
Payama-1	• Existing rural earthen road – upgrade for about 15.25 km • Existing sugar cane extraction road – upgrade for 4.5 km • Newly constructed access road – 350 m

The well site and adjacent accommodation campsite areas will be cleared of topsoil and then levelled and elevated by cut and fill methods and compacted using bulldozers, dump trucks, water trucks and graders. The compacted granular pad will be 500 mm thick.

The purchase or rental of the land will provide a significant financial benefit to landowners. This land will be temporarily lost from agriculture production. Project operations too may degrade the nearby land and reduce agriculture productivity in those areas (i.e. dust, flares, drainage previously discussed). The impacts from changes in land use to human use values and quality of life values will be local in extent, short term in duration, of medium magnitude. The impact disturbs an area currently used for agriculture and a reserved forest area also currently being used for agriculture; income levels are low and infrastructure is not well developed; the receptor sensitivity is rated medium for potential social impacts as there is many communities nearby and some within less than 500 m away.

6.8.1.3 Significance of Impacts

Given the short-term impacts and its return to its original state, it is determined to be a positive benefit as a result of the financial benefit to landowners and the community.

The significance of impacts from changes in land use to human use values and quality of life values is ranked as **Positive**. (**Table 6-75**)

Table 6-75: Sigificance Ranking of impacts from changes in land use to human use values and quality of life values

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.8.1.4 Impact and Risk Mitigation Measures

Impacts from construction activities on land use can be mitigated through the use of the following measures:

Social Impact Assessment – Construction and Installation Phase			
9. Land Use	9.1 Purchase of land access road/well pad and camp site	9.1.1 Change of traditional use.	9.1.1.1 Transparent and fair compensation to landowners and users according to land acquisition committee decision.
			9.1.1.2 Ensure all permissions are obtained from landowners and MOGE, Forestry Department and Township GAD office.
			9.1.1.3 Notify surrounding landowners before on location and time of project activities.
			9.1.1.4 Hand back the land to MOGE with agreed condition after project completion.

6.8.1.5 Residual Impacts and Risks

With these management measures, the residual significance of impacts from changes in land use to human use values and quality of life values will result in a **Positive** financial benefit.

Residual Significance	Positive	Negligible	Low	Medium	High

6.8.2 Assessment of Impacts to Transportation

6.8.2.1 Scope of Assessment

Resource/Receptor	Project Phase	Activity	Impact
Transportation	Construction Phase	Access Road Construction and Site Construction Vehicle and Equipment Use Hazardous/Non-Hazardous waste management Labour and Accommodation	Increased traffic

6.8.2.2 Assessment of Impacts from Equipment and Vehicle Use

Transportation of equipment, people and services will increase traffic volume in the local area of the planned project and may disrupt community traffic. Transportation during construction and installation phase consists of transport of workers, construction equipment and supplies.

The impact of project transportation requirements affects the people that use the same route used for the project and around the project area. The transportation of personnel and equipment and materials from well site to well sites will be from Yangon to well site. There will be no restrictions on movement of the local population along the Highway during construction.

6.8.2.3 Significance of Impacts

The impacts from increased traffic and traffic disruption to human use and quality of life values will be medium in extent, short-term in duration, reversible and of medium magnitude. The impact disturbs an area currently used for agriculture and a reserved forest area also currently being used for agriculture; income levels are low and infrastructure is not well developed; the receptor sensitivity is rated High for potential social impacts as there is many communities nearby and some within 500 m away. This was noted during public meetings as they are concerned about possible conflicts during sugar cane harvesting period. As a result of these impact criteria considerations, significance is ranked as medium.

The Significance of increased traffic and traffic disruption on human use and quality of life values is ranked as **Medium**. (**Table 6-76**)

Table 6-76: Significance Ranking of impacts from traffic to human use values and quality of life values

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.8.2.4 Impact and Risk Mitigation Measures

Impacts from construction activities on traffic can be mitigated through the use of the following measures:

Social Impact Assessment – Construction and Installation Phase			
10. Transport	10.1 Construction Activities	10.1.1 Damage to roads	10.1.1.1 Weight of the trucks shall not exceed the limit set by the Myanmar regulations to reduce damage to road surfaces or structures
			10.1.1.2 Repair the road if found the damage is caused by project transportation
		10.1.2 Possibility of road accident	10.1.2.1 Follow traffic rules
			10.1.2.2 Drivers shall possess valid driving license

6.8.2.5 Residual Impacts and Risks

With these management measures, the magnitude of impacts will be reduced resulting in a residual significance of impacts from increased traffic and traffic disruption on human use and quality of life values; however due to the high receptor sensitivity the residual risk remains as **Medium**.

Residual Risk	Positive	Negligible	Low	Medium	High

6.8.3 Assessment of Impacts to Water Supply

6.8.3.1 Scope of Assessment

Resource/Receptor	Project Phase	Activity	Impact
Water Supply	Construction Phase	Public Utility	Increased water consumption

6.8.3.2 Assessment of Impacts from Water Supply on Public Utility

During the construction phase, water use will consist of water for dust suppression and cleaning and potable water for workers. The civil works campsite will be built near the well site construction zone. There is no suitable existing accommodation, such as hotels or guesthouses, within a reasonable distance of the proposed well sites, so a temporary campsite will be established near to the well sites. The two exploration wells in Block EP-3 will be drilled in two different locations. The well site coordinates are detailed in **Table 6-77**.

Table 6-77: Well Site Coordinates

Well	Lat	Long	Target Depth
Naweng-1	18° 31' 22.3437"N	95° 24'21.6247"E	5225 m
Payama-1	18° 45' 1.7997" N	95° 27' 45.1252" E	2230 m

The basecamp will be designed and built to international standard and comply with IFC Workers' accommodation Guidelines.

It is estimated that a total of 50 m^3/day of industrial grade fresh (non-potable) water will be required during the drilling operation (to be used as makeup water for the drilling mud, cement mixing and losses). For Naweng-1 well site, either water will be supplied by a deep tube well drilled onsite / a nearby deep tube well available or transported by tanker / by pumping through water pipeline to drilling well site from the nearest local reservoir with the consultation/direction of Thegon Township GAD.

For Payama-1 wellsite, water will be supplied by either a deep tube well drilled onsite with the consultation of Paukkhuang Township GAD or transported by tanker / by pumping through water pipeline to drilling wellsite from the old Shwe Lay dam under the direction & approval of the Ministry of Agriculture, Livestock and irrigation, or transported by tanker / by pumping through water pipeline to drilling well site from the nearest local reservoir with the consultation of Paukkhaung Township GAD.

The industrial water will be stored on the well site in a ground storage pit 30 m x 20 m x 3.5 m deep for a maximum capacity of 2,000 m^3 or as an alternative to store industrial water in steel tanks.

During the civil work phase, there will be a temporary base camp built to place all the workers with basic requirement as per IFC minimum remote site accommodation requirements such as beds, food, clean water and hygienic washroom facilities.

All drinking water will be sourced from local retail suppliers. The maximum demand from the operation, estimated to be 200 litres per day, will have a beneficial impact on the local sales of bottled drinking water.

6.8.3.3 Significance of Impacts

The impacts from water use to human use and quality of life values will be medium in extent, medium-term in duration, reversible and of medium magnitude. The impact disturbs an area currently used for agriculture and a reserved forest area also currently being used for agriculture; income levels are low and infrastructure is not well developed; the receptor sensitivity is rated medium for potential social impacts as there is many communities nearby and some within 500 m away. As a result of these impact criteria considerations, significance is ranked as medium.

The Significance of water use on human use and quality of life values is ranked as **Medium** (**Table 6-78**).

Table 6-78: Sigificance Ranking of impacts from water use to human use and quality of life values

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.8.3.4 Impact and Risk Mitigation Measures

Impacts from construction activities on water use will be mitigated through the use of the following measures:

Social Impact Assessment – Construction and Installation Phase			
11. Water Use	11.1 Use of water public utility for construction and domestic use	11.1.1 Compete for water use of communities	11.1.1.1 Obtain approval from Thegon Township or Paukkhung Township GAD before hauling water. (if water hauling is required)
			11.1.1.2 Potable water and industrial water, if taken by tanker from nearby unnamed irrigation canal (8.11 km), should not affect the availability of water to locals.

It is estimated that a total of 50 m^3/day of industrial grade fresh (non-potable) water will be required during the drilling operation (to be used as makeup water for the drilling mud, cement mixing and losses). For Naweng-1 well site, either water will be supplied by a deep tube well drilled onsite / a nearby deep tube well available or transported by tanker / by pumping through water pipeline to drilling well site from the nearest local reservoir with the consultation/direction of Thegon Township GAD.

For Payama-1 wellsite, water will be supplied by either a deep tube well drilled onsite with the consultation of Paukkhuang Township GAD or transported by tanker / by pumping through water pipeline to drilling wellsite from the old Shwe Lay dam under the direction & approval of the Ministry

of Agriculture, Livestock and irrigation, or transported by tanker / by pumping through water pipeline to drilling well site from the nearest local reservoir with the consultation of Paukkhaung Township GAD.

The industrial water will be stored on the well site in a ground storage pit 30 m x 20 m x 3.5 m deep for a maximum capacity of 2,000 m^3 or as an alternative to store industrial water in steel tanks.

6.8.3.5 *Residual Impacts and Risks*

With these management measures, the impact magnitude and duration will be reduced resulting in a residual significance of impacts from water us to human use values and quality of life values is ranked as **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.8.4 Assessment of Impacts to Drainage and Flooding

6.8.4.1 *Scope of Assessment*

Resource/Receptor	Project Phase	Activity	Impact
Drainage and Flooding	Construction Phase	Access road and Site Construction Site Runoff and Drainage	Potential increase in surface flow

6.8.4.2 *Assessment of Impacts from Surface runoff from roads, site and camp site*

Surface runoff from roads and campsite will result in increased drainage potentially affecting roads and infrastructure. Vegetation removal, construction of well sites and access roads can alter surface water hydrology by reducing interception, evaporation/ transpiration and infiltration, which in turn can increases runoff and change in local drainage patterns. Heavy rains can intensify changes in surface water hydrology and cause changes in drainage.

Agriculture and water sources around project well sites could be affected from water drainage during construction of the well sites. However, a civil engineering contractor will be hired to survey and upgrade the road. The contracted civil engineer will determine and recommend if culverts or additional ditches are necessary to manage surface water runoff. Local authorities and local landowners will also be consulted to address their requirements for any culverts or ditching to be installed at any point along the road. If culverts are required or requested, the size of culvert to install will depend on the civil engineer's recommendation and/or local authority's recommendation. Generally, culverts in this area are 60 cm in diameter, made of reinforced concrete and purchased prefabricated.

6.8.4.3 *Significance of Impacts*

The impacts from surface hydrology and drainage caused by construction of well sites and access roads to human use and quality of life will be local in extent, transient, reversible, short term in duration and of medium magnitude. The impact disturbs an area currently used for agriculture and a reserved forest area also currently being used for agriculture; income levels are low and infrastructure is not well developed; the receptor sensitivity is rated medium for potential social impacts as there is many communities nearby and some within 500 m away. As a result of these impact criteria considerations, significance is ranked as Medium.

The Significance Ranking of impacts from surface hydrology and drainage caused by construction of well sites and access roads to human use and quality of life is ranked as **Medium**. (**Table 6-79**)

Table 6-79: Significance Ranking of impacts from surface hydrology and drainage caused by construction of well sites and access roads to human use and quality of life

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.8.4.4 Impact and Risk Mitigation Measures

Impacts from drainage can be mitigated through the use of the following measures:

Social Impact Assessment – Construction and Installation Phase			
12. Drainage and Flooding	12.1 Surface runoff from roads, site and camp site	12.1.1 Increase runoff and change local drainage patterns	12.1.1.1 Obtain approval from MOGE and appropriate government offices before constructing, upgrading or reroute access roads.
			12.1.1.2 Follow civil engineer's recommendation on well site and access road construction design.
			12.1.1.3 Avoid construction of well sites in areas that may cause obstacles to water drainage.
			12.1.1.4 Water drainage lines (culverts/causeway) will be constructed to maintain natural drainage. The required permission will be obtained from obtained from MOGE, Forestry Department and Township GAD office.

6.8.4.5 Residual Impacts and Risks

With these management measures, the residual significance of impacts from surface hydrology and drainage caused by construction of well sites and access roads to human use and quality of life is ranked as **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.8.5 Assessment of Impact to Waste Management

6.8.5.1 Scope of Assessment

Resource/Receptor	Project Phase	Activity	Impact
Waste Management	Construction Phase	Site Runoff and Drainage Hazardous/non-hazardous waste management	Increased stress on local infrastructure

6.8.5.2 Assessment of Waste Management and Disposal

General non-hazardous waste will be generated from the drill site, campsite and vehicles during the construction stage. General non-hazardous wastes may include scrap metal, packaging, wood, cardboard, paper and empty containers. Improper handling and disposal of non-hazardous materials may cause adverse effects by materials spills or (as in the case of domestic wastes) being carried away by wind, vectors, etc. Burning some types of innocuous-looking waste types (especially plastics) may create toxic tar or even extremely toxic dioxin. Depending on their pathway, the end result would be air, soil, groundwater, freshwater life contamination. General non-hazardous solid wastes will be segregated at source into recyclable and non-recyclable wastes and stored in marked containers. Recyclable materials will be given to local recycling facilities for a net economic benefit and the remaining materials will be sent to approved landfill facilities.
Food and kitchen wastes will be produced from the campsite and well site during all phases of the project. Organic refuse, if not stored properly, attracts vectors (rats, mosquitoes, flies, cockroaches, etc.) causing health threats and unsightliness. Food scraps will be segregated and transferred to local government waste disposal facilities.

It is estimated that the well site will generate between 1 and 4 tonnes of "domestic" waste and "industrial" waste per month. **Recycle and General Non-Hazardous waste** shall be transferred to local government waste disposal facilities (like YCDC in Yangon) or disposed at a site approved by Pyay GAD.

The well site and accommodation campsite combined will generate a low volume of hazardous waste, estimated to be between 0.5 tonnes per month. **Medical or clinical waste** shall be transferred to Yangon for disposal at approved location by YCDC or authorized medical provider. **General Hazardous Waste** will be Transported to Yangon for disposal at approved location by an authorized Waste Management Company facility (DOWA).

All materials brought onto the well site and accommodation campsite will be logged and the relevant supplier or contractor will identify all sources of potential toxic waste. Equipment or materials containing heavy metals, such as batteries, will be identified and a special container designated for their disposal as waste. All used chemical and lubricant containers will be collected in separate containers.

6.8.5.3 Significance of Impacts

The impacts from waste management and disposal and its effect on human use and quality of life will be local in extent, medium term in duration, reversible and of medium magnitude. The impact disturbs an area currently used for agriculture and a reserved forest area also currently being used for agriculture; income levels are low, and infrastructure is not well developed; the receptor sensitivity is rated medium for potential social impacts as there is many communities nearby and some within 500 m away. As a result of these impact criteria considerations, significance is ranked as Medium.

The Significance Ranking of impacts from waste management and disposal and its effect on human use and quality of life is ranked as **Medium** (**Table 6-80**).

Table 6-80: Significance Ranking of impacts from waste management and disposal and its affect on human use and quality of life

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.8.5.4 Impact and Risk Mitigation Measures

Impacts from activities required for waste management can be mitigated through the use of the following measures:

Social Impact Assessment – Construction and Installation Phase			
13. Waste Management	13.1 Non - Hazardous waste management	13.1.1 Domestic waste result in windblown litter, attract vermin and be a vector for disease	13.1.1.1 OVL in association with drilling contractor shall develop Waste Management Plan for this drilling campaign
			13.1.1.2 Store hazardous waste in appropriately designed areas and safe containers that are suitable for transporting/transferring.
			13.1.1.3 Ensure treatment and disposal according to accepted international standard.
			13.1.1.4 Enforce “Good Housekeeping” practices.
			13.1.1.5 Domestic and general waste to be segregated and stored using suitability labeled.
			13.1.1.6 Disposal of waste in labelled containers for possible recycling
			13.1.1.7 Implement requirements for waste management and related laws
			13.1.1.8 Install septic tanks and soak away pit for holding sewage.
			13.1.1.9 Non-hazardous wastes will be taken to an approved waste site
			13.1.1.10 Hazardous waste will be taken to DOWA waste management facility

6.8.5.5 *Residual Impacts and Risks*

With these management measures, the magnitude and duration of impacts will be reduced resulting in a residual significance of impacts from waste management and disposal and its effect on human use and quality of life being reduced and ranked as **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.8.6 Assessment of Impacts to Socio Economy

6.8.6.1 *Scope of Assessment*

Resource/Receptor	Project Phase	Activity	Impact
Socio-Economic	Construction Phase	Access road and Site Construction Handling materials and Chemicals Use of Public Utility Hazardous/non-hazardous waste management Labour and accommodation	Increased employment/income and procurement opportunities for people, business and services in surrounding area Labour in-migration causing conflict with local communities

6.8.6.2 *Assessment of Impacts from Employment and Income*

Impact Assessment

Project employment and business opportunities will increase jobs and related income for local communities.

During construction, 60 – 80 workers will be employed and supplies (such as laterite, selected fill material, fuel, water) and services (accommodation, waste management) will be required. The composition of the crew will depend on actual contracting companies, most of which will be Myanmar subsidiaries of international companies. An onsite camp will be developed for workers.

IEM has surveyed households in this region for past project. Past Results indicated 40% of respondents earned between 500,001-1,000,000 Kyats; 36% earned between 1000,001-2,000,000 kyats, 11% earned between 2,000,001 – 3,000,000 kyats, 6% earned below 500,000 kyats, 5% earned between 3,000,001-5,000,000 kyats and earned above 5,000,000 kyats:

Of those interviewed, 79% considered oil and gas drilling to be important to the community. When asked what positive impacts from the project did they anticipate, the Villagers anticipated increased employment (35%), improved transport/ infrastructure (26%), and increase annual income (15%).

OVL shall encourage the hiring of local staff and contractors as per the required skill and availability. Advance meetings with local authorities on approaches to hiring will help OVL design hiring to maximise the positive effects and limit the loss of labour availability to local businesses at critical times (i.e. harvest).

6.8.6.3 *Significance of Impacts*

The impacts from employment and income from the project and its effect on human use and quality of life will be local in extent, short term in duration, reversible and of low magnitude but positive. The impact disturbs an area currently used for agriculture and a reserved forest area also currently being used for agriculture; income levels are low, and infrastructure is not well developed; the receptor sensitivity is rated medium for potential social impacts as there is many communities nearby and some within 500 m away. All land use will be compensated appropriately as determined by the Land

Compensation Committee that has representatives from all stakeholders. As a result of these impact criteria considerations, significance is ranked as Positive.

The Significance Ranking of impacts from employment and income from the project and its effect on human use and quality of life is ranked as **Positive**. (**Table 6-81**)

Table 6-81: Sigificance Ranking of impacts to employment and income from the project and its affect on human use and quality of life

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.8.6.4 Assessment of Impacts from Labour In-Migration

In-migration of labour and social interaction may result in conflict between workers from other regions and local communities.

During construction, 60 – 80 workers will be employed and supplies (such as granular fill, fuel, water) and services (accommodation, waste management) will be required. The composition of the crew will depend on actual contracting companies, most of which will be Myanmar subsidiaries of international companies. An onsite camp will be developed for workers.

The receptors of impact from the project are:

- businesses that trade and provide services near the project area and people who live in the surrounding area. The project would provide opportunities for additional work and business.
- businesses and trade who lose access to employees and contractors during the construction phase.
- vulnerable social and ethnic groups who are exposed to migrant project employees and contractors. The groups of possible concern are children, women affected from the project and landless farmers.

Pre-project awareness programs with migrant workers on local community, social and ethnic group sensitivities will help create increased understanding and, where advisable, limit interactions during project construction.

6.8.6.5 Significance of Impacts

The impacts from labour in-migration and its effect on human use and quality of life will be medium in extent, short term in duration, reversible and of medium magnitude. The impact disturbs an area currently used for agriculture and a reserved forest area also currently being used for agriculture; income levels are low, and infrastructure is not well developed; the receptor sensitivity is rated medium for potential social impacts as there are many communities nearby and some within 500 m away. As a result of these impact criteria considerations, significance is ranked as Medium.

The Significance Ranking of impacts from labour in-migration and its effect on human use and quality of life is ranked as **Medium**. (**Table 6-82**)

Table 6-82: Sigificance Ranking of impacts from labour in-migration and its affect on human use and quality of life

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.8.6.6 Impact and Risk Mitigation Measures

Impacts from project activities on the socio-economy are positive and can be further enhanced by the following measures:

Social Impact Assessment – Construction and Installation Phase			
14. Socio-Economy	14.1 Services Supply for Construction Activities	14.1.1 Employment/income and procurement opportunities for people, business and services in surrounding area	14.1.1.1 Employ qualified local workers preferably wherever possible.
			14.1.1.2 Purchase local supplies and services of the required quality, whenever possible.
			14.1.1.3 Terms of contract for recruitment of manpower in these project needs to include emphasis on hiring locals, especially for unskilled and semi-skilled workforce.
	14.2 In-migration of labour and social interaction	14.2.1 Potential conflict between workers from other regions and local communities	14.2.1.1 Restrict workers to within project boundaries and do not allow local interaction within the communities.

6.8.6.7 Residual Impacts and Risks

With these management measures, the residual significance of impacts from impacts to employment and income from the project and its effect on human use and quality of life will be a **Positive**.

Residual Significance	Positive	Negligible	Low	Medium	High

With these management measures, the residual significance of impacts from labour in-migration and its effect on human use and quality of life will be ranked as **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.8.7 Assessment of Impacts to Cultural and Archaeological Resources

6.8.7.1 Scope of Assessment

Resource/Receptor	Project Phase	Activity	Impact
Historical/Archaeological Sites	Construction Phase	Access road and Site Construction	Archaeological/ fossil finds within project area.

6.8.7.2 Assessment of Impacts

Potential impacts to the local historical, archaeological and cultural resources during the construction phase include possible damage or demolition of historical buildings or archaeological sites during construction of the access roads, campsite and well sites. During the archaeological and historic site assessment for the project area, the Township Administrator from Thegon and Paukhaung GAD confirmed that there are no archaeological or historic sites are present in the Township. The well site is located on agricultural and reserved forest land being used for agriculture, and no historic or archaeological sites are located near the planned project.

During the field program for the present project local residents were canvassed in regard to their cultural activities and cultural sites. The well site is located on agricultural and reserved forest land being used for agriculture. No cultural or historic site was identified in the site assessment. Therefore, construction activities will not disrupt any culturally important activities or cause any damage to the archaeological resources. However, there is a very small chance that unknown and prehistoric communities existed in the area and additional artefacts may be recovered during construction of the well sites, campsite and access roads. If any artefact is found, then work will be stopped and OVL will inform the Thegon and Paukhaung GAD for further action before proceeding with operations.

6.8.7.3 Significance of Impacts

The impacts on local historical, archaeological and cultural resources during the construction and its effect on human use and quality of life will be local in extent, medium term in duration, reversible and of low magnitude. The impact disturbs an area currently used for agriculture and a reserved forest area also currently being used for agriculture; income levels are low and infrastructure is not well developed; the receptor sensitivity is rated medium for potential social impacts as there is many communities nearby and some within 500 m away. As a result of these impact criteria considerations, significance is ranked as Low.

The Significance Ranking of impacts on local historical, archaeological and cultural resources during the construction and its effect on human use and quality of life is ranked as **Low**. (**Table 6-83**)

Table 6-83: Sigificance Ranking of impacts to local historical, archaeological and cultural resources during the construction and its affect on human use and quality of life

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.8.7.4 Impact and Risk Mitigation Measures

Impacts from construction activities on historical, archaeological and cultural resources can be mitigated through the use of the following measures:

Cultural Impact Assessment – Construction and Installation Phase			
15. Historical, Archaeological and Cultural Resources	15.1 Construction of access road/well pad and camp site	15.1.1 Archaeological/ fossil finds within project area.	15.1.1.1 Watch for artefacts during site construction and inform the Local Authorities before commencement of drilling.
			15.1.1.2 Report to the Pyay GAD if any archaeological evidence is discovered at the well sites or access roads. Through consultation, a plan to proceed will be developed
			15.1.1.3 If artefacts are found during the construction phase, OVL will inform the responsible local office immediately.
			15.1.1.4 Consult with local authorities to identify culturally important festivals and plan transportation, construction and drilling activities to avoid impact.

6.8.7.5 Residual Impacts and Risks

With these management measures, the duration of impacts will be reduced resulting in a residual significance of impacts on local historical, archaeological and cultural resources during the construction and its effect on human use and quality of life will be ranked as **Negligible**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.8.8 Assessment of Impacts to Tourism

6.8.8.1 Scope of Assessment

Resource/Receptor	Project Phase	Activity	Impact
Attractions/Recreational Areas	Construction Phase	Access road and Site Construction	Change in local environment

6.8.8.2 Assessment of Impacts

Project operation effects on tourism and recreation may reduce the tourism and recreational experience. As this area is a remote area outside of the township, little tourism and recreation currently exists. The project well sites will not directly affect tourism and recreation through land use and aesthetic changes. The main potential impacts would be increased traffic activity on major corridors that has been ranked as a Low Residual Risk.

6.8.8.3 Significance of Impacts

The impacts from project effects impact on tourism and recreation experience and its effect on human use and quality of life will be local in extent, short term in duration, reversible and of low magnitude. The impact disturbs an area currently used for agriculture and a reserved forest area also currently being used for agriculture; income levels are low, and infrastructure is not well developed; the receptor sensitivity is rated medium for potential social impacts as there is many communities nearby and some within 500 m away. As a result of these impact criteria considerations, significance is ranked as Low.

The Significance Ranking of impacts from project effects impact on tourism and recreation experience and its effect on human use and quality of life is ranked as **Low** (**Table 6-84**).

Table 6-84: Sigificance Ranking of impacts to from project effects impact on tourism and recreation experience and its affect on human use and quality of life

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.8.8.4 Impact and Risk Mitigation Measures

Impacts from project activities on tourism and recreation can be mitigated through the use of the transportation mitigation measures

Visual Impact Assessment – Construction and Installation Phase			
16. Tourism and Recreational experience	16.1 Well Site, Road and Camp Construction	16.1.1 Disturbance and reduction of tourism and recreational experience	16.1.1.1 Post and enforce speed limit.
			16.1.1.2 Consult with local authority before major movement.
			16.1.1.3 Notify the local authority on the oversized load and put an escort in front of this convoy with horn and hazard lights.
			16.1.1.4 Restrict/ avoid movement of heavy equipment during rush hours.
			16.1.1.5 Provide traffic signs or flags at junction of access roads and main roads.
			16.1.1.6 Investigate any complaints and handle appropriately. Keep records of complaints and follow-up.
			16.1.1.7 Obtain approval from MOGE and/or appropriate government offices before constructing, upgrading or reroute access roads.
			16.1.1.8 Strictly enforce training programs to reduce transport incident cases by its contractors.
			16.1.1.9 Restore any damage to roads if caused by contractor or company.
			16.1.1.10 Restrict local traffic on OVL private access road and wellsite area.
			16.1.1.11 When project complete, promptly (within 6 months), hand back the land to MOGE.

6.8.8.5 Residual Impacts and Risks

With these management measures, the residual significance of impacts from project effects impact on tourism and recreation experience and its effect on human use and quality of life values is ranked as **Negligible**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.9 Social Impact Assessment during Drilling Phase

Key issues identified by the screening process must be assessed to determine their impacts during the drilling phase, including:

- Transportation

- Water Supply
- Power Supply
- Waste Management
- Socio-Economy

6.9.1 Assessment of Impacts to Transportation

6.9.1.1 Scope of Assessment

Resource/Receptor	Project Phase	Activity	Impact
Transportation	Drilling Phase	Vehicle and Equipment Use Rig Move Hazardous/Non-Hazardous waste management Labour and Accommodation	Increased traffic

6.9.1.2 Assessment of Impacts from Rig Move, Equipment and Vehicle Use

Transportation of equipment, people and services will increase traffic volume in the local area of the planned project and may disrupt community traffic. Transportation during drilling consists of transport of rig move, workers and supplies, transport of industrial water supply and drilling support equipment (including casing, chemical etc.)

OVL plans to use a land rig for the drilling program. The exact transport route and duration of rig move is not available as the rig contract not yet awarded. The most likely route will be via the Yangon-Tharrawaddy-Pyay (Route 2). The rig mobilization will include around 130 truckloads to complete rig and support equipment. The maximum mobilization distance for the rig is estimated at about 400 km. The rig mobilization duration will be 2-3 weeks.

Drilling Materials will be transported from Yangon to the well sites. The estimated number of round trips for rig and support equipment is 100 truckloads during drilling activities. The rig personnel will transported to the well locations from Yangon.

The impact of transportation of the project affects the people that use the same route used for the project and around the project area. The transportation of personnel and equipment and materials from well site to well sites will be from Yangon to well site. There will be no restrictions on movement of the local population along the Highway during drilling.

6.9.1.3 Significance of Impacts

The impacts from increased traffic and traffic disruption to human use and quality of life values will be medium in extent, short-term in duration, reversible and of medium magnitude. The impact disturbs an area currently used for agriculture and a reserved forest area also currently being used for agriculture; income levels are low, and infrastructure is not well developed; the receptor sensitivity is rated High for potential social impacts as there are many communities nearby and some within 500 m away. This concern was raised during public meetings. As a result of these impact criteria considerations, significance is ranked as medium.

The Significance of increased traffic and traffic disruption on human use and quality of life values is ranked as **Medium**. (**Table 6-85**)

Table 6-85: Sigificance Ranking of impacts from traffic to human use values and quality of life values

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.9.1.4 Impact and Risk Mitigation Measures

Impacts from construction activities on traffic can be mitigated through the use of the following measures:

Social Impact Assessment – Construction and Installation Phase			
8. Transport	8.1 Rig Move and Equipment and Vehicle Use.	8.1.1 Disruption of traffic	8.1.1.1 Ensure all vehicles are in good operating condition and comply with project safety standards. Drivers must be healthy, have valid licenses, and by no means allowed to drink alcohol or take forms of medicine or illicit drugs that can affect performance.
			8.1.1.2 Strictly Follow Speed Limits
			8.1.1.3 Weight of the trucks shall not exceed the limit set by the Myanmar regulations to reduce damage to road surfaces or structures.
			8.1.1.4 Safety equipment and emergency equipment must be installed on vehicles such as tool box safety belts and portable fire extinguisher etc. as per company standards.
			8.1.1.5 Notify the local authority on the oversized load and put an escort in front of this convoy with horn and hazard lights.
			8.1.1.6 Consult with Thegon and Pauhkkhaung GAD and Village Headmen before major movement.
			8.1.1.7 Restrict/ avoid movement of heavy equipment during rush hours.
			8.1.1.8 Provide traffic signs or flags at junction of access roads and main roads.

Social Impact Assessment – Construction and Installation Phase			
			8.1.1.9 Investigate any complaints and handle appropriately. Keep records of complaints and follow-up.
			8.1.1.10 Obtain approval from MOGE and/or appropriate government offices before constructing, upgrading or reroute access roads.
			8.1.1.11 Strictly enforce training programs to reduce transport incident cases by its contractors.
			8.1.1.12 Restore any damage to roads that is caused by contractors or Company.
			8.1.1.13 Restrict local traffic in well site area
			8.1.1.14 Road Hazard Assessment will be conducted before transporting any large equipment by the civil contractor.
			8.1.1.15 Vehicles will take direct routes where possible and avoid significant habitat areas.
			8.1.1.16 Construction vehicles will follow speed limits.
		8.1.2 Damage to roads	8.1.2.1 Check and restore for any damage from project activities to local roads.

6.9.1.5 Residual Impacts and Risks

With these management measures, the magnitude of impacts will be reduced resulting in a residual significance of impacts from increased traffic and traffic disruption on human use and quality of life values; however due to the high receptor sensitivity the residual risk remains as **Medium**.

Residual Risk	Positive	Negligible	Low	Medium	High

6.9.2 Assessment of Impacts to Water Supply

6.9.2.1 Scope of Assessment

Resource/Receptor	Project Phase	Activity	Impact
Water Supply	Drilling Phase	Public Utility	Increased water consumption Increase or decrease of available power for local community

6.9.2.2 Assessment of Impacts

The planned wellsites are located in the Thegon Township for Naweng-1 well and Paukkhaung Township for Payama-1 well.

The well pad size for Naweng-1 is 200 m x 200 m (40,000 m^2) and the well pad size for Payama-1 is 130 m x 130 m (16,900 m^2). The well pad includes a rig area, campsite (accommodation), campsite office space and storage area. The basecamp will be designed and built to international standard and comply with IFC Workers' accommodation Guidelines.

The planned campsites will be inside each of the well site locations. The area of the camp site is about 80 m x 80 m per drill site. The campsite will be industry-standard, consisting of container-based sleeping and living quarters, messing and recreation facilities, with a capacity to accommodate up to 110 including ONGC personnel & its associates per drill site camp. Of these personnel, efforts shall be made to hire personnel locally to the maximum extent depending upon work requirement and available skill manpower. Duty pattern will be as per local applicable rules & regulations. The campsite will have its own cooking, freezer food storage, laundry and sanitation facilities.

Access to and availability of water is an important issue to all communities in the Regional Study Area. Community water wells are a critical piece of local infrastructure, and access to water to support domestic and farming requirement is critical.

It is estimated that a total of 50 m^3/day of industrial grade fresh (non-potable) water will be required during the drilling operation (to be used as makeup water for the drilling mud, cement mixing and losses). For Naweng-1 well site, either water will be supplied by a deep tube well drilled onsite / a nearby deep tube well available or transported by tanker / by pumping through water pipeline to drilling well site from the nearest local reservoir with the consultation/direction of Thegon Township GAD.

For Payama-1 wellsite, water will be supplied by either a deep tube well drilled onsite with the consultation of Paukkhuang Township GAD or transported by tanker / by pumping through water pipeline to drilling wellsite from the old Shwe Lay dam under the direction & approval of the Ministry of Agriculture, Livestock and irrigation, or transported by tanker / by pumping through water pipeline to drilling well site from the nearest local reservoir with the consultation of Paukkhaung Township GAD.

The industrial water will be stored on the well site in a ground storage pit 30 m x 20 m x 3.5 m deep for a maximum capacity of 2,000 m^3 or as an alternative to store industrial water in steel tanks.

All drinking water will be sourced from local retail suppliers. The maximum demand from the operation, estimated to be 200 litres per day, will have a beneficial impact on the local sales of bottled drinking water.

6.9.2.3 Significance of Impacts

The impacts from water use to human use and quality of life values will be medium in extent, short-term in duration, reversible and of medium magnitude. The impact disturbs an area currently used for agriculture and a reserved forest area also currently being used for agriculture; income levels are low and infrastructure is not well developed; the receptor sensitivity is rated medium for potential social impacts as there are many communities nearby and some within 500 m away. As a result of these impact criteria considerations, significance is ranked as medium.

The Significance of water use on human use and quality of life values is ranked as **Medium**. (**Table 6-86**)

Table 6-86: Sigificance Ranking of impacts from water use to human use and quality of life values

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.9.2.4 Impact and Risk Mitigation Measures

Impacts from construction activities on public utility will be mitigated through the use of the following measures:

Social Impact Assessment – Drilling Phase				
9. Water Use	9.1. Use of public utility for water resources	9.1.1. Water usage of project affects the community's water supply.	9.1.1.1.	Implement construction and installation phase mitigation measures in 10.1.
			9.1.1.2.	Investigate any complaints and handle appropriately. Keep records of complaints and follow-up.

6.9.2.5 Residual Impacts and Risks

With these management measures, the impact magnitude and duration will be reduced resulting in a residual significance of impacts from water use to human use values and quality of life values is ranked as **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.9.2.6 Assessment of Impact on Power Supply

All power for the campsite will be supplied by diesel powered generators. No public power utilities will be required at the campsite.

No power-use impacts will occur from power use by the project. The rig is powered by four diesel driven generator sets and each rated 1100 KVA for Naweng-1 and 750 KVA for Payama-1 to supply the rig site with power.

6.9.2.7 Significance of Impacts

The impacts (extent, duration and magnitude) from power use to human use and quality of life values will be negligible. Nearby communities are not affected. As a result of these impact criteria considerations, significance is ranked as negligible.

The Significance of power use on human use and quality of life values is ranked as Negligible (**Table 6-87**)

Table 6-87: Significance Ranking of impacts from power use on human use and quality of life values

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.9.2.8 Impact and Risk Mitigation Measures

Impacts will be mitigated through the use of the following measures:

Social Impact Assessment – Drilling Phase			
10. Power Use	10.1. Power for drilling operations and work camp	10.1.1. Increase or decrease of available power for local community	10.1.1.1. Install diesel-powered generators to supply all project power related needs.

6.9.2.9 Residual Impacts and Risks

As project will have their own power generators to supply electricity, the residual significance of impacts from power use to human use values and quality of life values is ranked as **Negligible**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.9.3 Assessment of Impacts to Waste Management

6.9.3.1 Scope of Assessment

Resource/Receptor	Project Phase	Activity	Impact
Waste Management	Drilling Phase	Site Runoff and Drainage Hazardous/non-hazardous waste management	Increased stress on local infrastructure

6.9.3.2 Assessment of Impacts from Wastewater

Project operation may affect water quality and has the potential to impact agriculture. Most households are engaged in agriculture. The existing condition of the well pad for Naweng-1 location is in a paddy field during the wet season only and the land acquisition will be completed as per MOGE requirements. The existing condition of the well pad for Payama-1 is located in an existing cleared area used for peanuts in the wet season only in the Sha Byin Reserved Forest Area. The reserved forest is highly disturbed with most of the area planted for crops and sugar cane plantations.

Accidental release of drill cuttings and drilling mud, spills, overflow of the cuttings and waste pit could affect soil quality and vegetation (agriculture), surface water quality and aquatic biota (aquaculture). Wastewater released from the sites could result in impacts on agriculture crops and river fishing. Impacts on soil, surface water quality, vegetation and aquatic biota from accidental spills are discussed **Section 6.16.4**.

6.9.3.3 Assessment of Non-Hazardous Waste Management

Solid wastes produced will consist of both hazardous and nonhazardous materials. For all solid wastes, a policy of reduce, reuse and recycle will be implemented, where possible, across all phases of the project.

Management of solid waste will be undertaken by OVL in association with drilling rig contractor in accordance with OVL standards. For each solid waste type generated the most appropriate method of management will be determined and documented in a Waste Management Plan. Solid non-hazardous wastes to be produced during exploration drilling campaign are summarised in **Table 6-88**.

Table 6-88: Types of Solid Waste and Potential Impacts

Waste Type	Potential Impacts
Food Waste	• Odour • Attraction of pests and disease vectors
Paper and plastic packaging, rags, plastic, glass	• Fire hazard • Wind-blown litter • Fouling of surface water
Metal and plastic drums, sacks and bags	• Fire hazard • Wind-blown litter • Fouling of surface water • Contamination of soil and water
Wooden packaging	• Fire hazard • Debris hazard
Scrap Metal	• Contamination of soil and water • Public Safety • Debris hazard

General non-hazardous waste will be generated from the drill site, campsite and vehicles during all phases of the project. General non-hazardous wastes may include scrap metal, packaging, wood, cardboard, paper and empty containers. Improper handling and disposal of non-hazardous materials may cause adverse effects by materials spills or (as in the case of domestic wastes) being carried away by wind, vectors, etc. Burning some types of innocuous-looking waste types (especially plastics) may create toxic tar or even extremely toxic dioxin. Depending on their pathway, the end result would be air, soil, groundwater, freshwater life contamination. General non-hazardous solid wastes will be segregated at source into recyclable and non-recyclable wastes and stored in marked containers. Recyclable materials will be given to local recycling facilities for a net economic benefit and the remaining materials will be sent to approved landfill facilities.

Food and kitchen wastes will be produced from the campsite and well site during all phases of the project. Organic refuse, if not stored properly, attracts vectors (rats, mosquitoes, flies, cockroaches, etc.) causing health threats and unsightliness. Food scraps will be segregated and transferred to local government waste disposal facilities or give to community for animal feeding if required. This waste will be stored in appropriate containers to be transported off site for recycling, reuse, treatment and/or disposal. It is estimated that the well site will generate between 1 and 4 tonnes of "domestic" waste and "industrial" waste per month. **Recycle and General Non-Hazardous waste** shall be transferred to local government waste disposal facilities (like YCDC in Yangon) or disposed at a site approved by Pyay GAD.

Significance of Impacts

The impacts from waste management and disposal and its effect on human use and quality of life will be local in extent, short term in duration, reversible and of medium magnitude. The impact disturbs an

area currently used for agriculture and a reserved forest area also currently being used for agriculture; income levels are low, and infrastructure is not well developed; the receptor sensitivity is rated medium for potential social impacts as there is many communities nearby and some within 500 m away. As a result of these impact criteria considerations, significance is ranked as Medium.

The Significance Ranking of impacts from waste management and disposal and its effect on human use and quality of life is ranked as **Medium**. (**Table 6-89**)

Table 6-89: Significance Ranking of impacts from waste management and disposal and its affect on human use and quality of life

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.9.3.4 Impacts from Hazardous Solid Waste

The well site will generate a low volume of hazardous waste throughout all project phases including:

- Excess or spent chemicals.
- Paints and paint cans.
- Biological waste from medical facilities.
- Oil contaminated materials (e.g. sorbents, filters and rags).
- Waste oils.
- **Drums and containers used for oil or chemical transportation and storage;**
- **Batteries.**
- **Fluorescent light tubes.**

General hazardous solid waste will be generated during all phases of the project. General hazardous solid wastes will be segregated at source into recyclable and non-recyclable wastes and stored in covered skips prior to transfer to an approved recycling contractor wherever practicable, or waste disposal site.

Hazardous wastes will be handled and stored in accordance with the material safety data sheets (MSDS) and tracked from source to its final destination. The estimated quantity of hazardous waste generated is approximately 0.5 tonnes per month of activities.

The well site and accommodation campsite combined will generate a low volume of hazardous waste, estimated to be between 0.5 tonnes per month. The drilling contractor is to ensure appropriate and safe storage until this waste is picked up by the waste transporter and taken to Yangon for disposal at approved waste management facility.

All materials brought onto the well site and accommodation campsite will be logged and the relevant supplier or contractor will identify all sources of potential toxic waste. Equipment or materials containing heavy metals, such as batteries, will be identified and a special container designated for their disposal as waste. All used chemical and lubricant containers will be collected in separate containers.

6.9.3.5 Significance of Impacts

Without mitigation measures, impact from hazardous waste on human use and quality of life will be local in extent and transient, reversible, medium term in duration and of medium magnitude. The impact disturbs an area currently used for agriculture and a reserved forest area also currently being used for agriculture; income levels are low, and infrastructure is not well developed; the receptor sensitivity is rated medium for potential social impacts as there is many communities nearby and some within 500 m away. As a result of these impact criteria considerations, significance is ranked as Medium.

The Significance Ranking of impacts from waste management and disposal and its effect on human use and quality of life is ranked as **Medium**. (**Table 6-90**)

Table 6-90: Sigificance Ranking of impacts from Hazardous Waste to Human Use and Quality of Life

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.9.3.6 Assessment of Impacts from Drill Cuttings and Fluids

The drilling fluids that are used for the well will be returned to the surface from the annulus of the drill with rock cuttings, and may also contain small quantities of other fluids, such as hydrocarbons and produced water. Shakers will separate the fluids from the cuttings. For this exploration drilling program, the drilling will use Water Based Mud (WBM) and Low Toxic Synthetic Oil Based Mud (LTSOBM) depending on results of subsurface and seismic interpretation. The majority of the components of the drilling mud systems are classified as non-hazardous with the exception of a few key chemicals. The toxicology for Caustic Soda (sodium hydroxide), Sodium Bicarbonate, Calcium Hydroxide, Polymeric Blend are shown in **Table 6-113**.

At the end of the first well location, the left-over drilling mud will be transferred and used at the next well location. At the end of drilling program the left over mud will be sent back to mud contractor for reuse or disposal or use for OVL other drilling campaign. If the well is actually abandoned rather than completed as a producer, some of this mud will be used to make the kill weight spacer between the cement plugs. Approximately 1500 -2500 m^3 per well of cuttings would be disposed during the drilling process. Discharged cuttings will contain some residual water-based mud, and residual hydrocarbons and any other contaminants. Waste cuttings disposal and management will be the responsibility of a licensed waste contractor and transported for disposal at DOWA waste management facility.

The cuttings and fluids contain potassium chloride, which are saline and residual hydrocarbons. The entry of saline and hydrocarbon contaminated fluids into the ground water may affect the growth of agricultural crops and be potentially toxic to terrestrial and aquatic flora and fauna. The cuttings and fluids may also contain heavy metals, which may contaminate soils and affect the growth of agricultural crops.

The volumes of cuttings produced during this project are unlikely to cause major local environmental impacts.

Salinity levels are not predicted to be high, and the short duration of the drilling activity will not allow for the excessive evaporation levels required to concentrate and produce highly saline liquids.

6.9.3.7 Significance of Impacts

Without mitigation measures, impact from hazardous waste on human use and quality of life will be local in extent and transient, reversible, medium term in duration and of medium magnitude. The impact disturbs an area currently used for agriculture and a reserved forest area also currently being used for agriculture; income levels are low, and infrastructure is not well developed; the receptor sensitivity is rated High for potential social impacts as there is many communities nearby and some within 500 m away. As a result of these impact criteria considerations, significance is ranked as Medium.

The Significance Ranking of impacts from waste management and disposal and its effect on human use and quality of life is ranked as **Medium**. (

Table 6-91)

Table 6-91: Sigificance Ranking of impacts from drill cuttings and fluids on human use and quality of life

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.9.3.8 Impact and Risk Mitigation Measures

Impacts from activities required for waste management can be mitigated through the use of the following measures:

Social Impact Assessment – Drilling Phase			
11. Waste Management	11.1. Non-Hazardous waste management	11.1.1. Domestic waste can be a fire hazard, constitute windblown litter, attract vermin, contaminated surface and groundwater and vector for disease	11.1.1.1. Implement construction and installation phase mitigation measures in 12.1. (Refer 6.8.5.4 above)
	11.2. Hazardous waste management	11.2.1. Hazard waste contaminate to environment.	11.2.1.1. Ensure treatment and disposal of hazardous waste by licensed contractor.
			11.2.1.2. Segregate and store hazardous waste in appropriate and safe containers that are suitable for transporting/transferring. Make sure all containers are clearly labeled.

Social Impact Assessment – Drilling Phase			
			11.2.1.3. Always check and record the type(s) and amount of hazardous waste generated.
			11.2.1.4. Dispose of waste in labeled containers for possible recycling or reuse.
			11.2.1.5. Prohibit open burning of any waste at project site.
			11.2.1.6. Enforce "Good Housekeeping" practices.
			11.2.1.7. All hazardous waste will be collected in skips ready for treatment and disposal. Hazardous wastes will be transported and disposed at approved waste management facility.
			11.2.1.8. Provide Manifest System for transportation of hazardous waste to treatment area or disposal area.
	11.3. Handling and Disposal of drill cuttings, sludge and chemicals.	11.3.1. Localized change in water quality and soil quality from chemical composition of drill fluids	11.3.1.1. Drill cuttings and adhered fluids will not be discharged to surrounding area.
			11.3.1.2. Volume of cuttings and fluids discharged will be reduced through use of solids control equipment.
			11.3.1.3. Store all chemicals in secured storage area.
			11.3.1.4. Hazardous wastes materials will be handled and stored in accordance with the corresponding MSDS.
			11.3.1.5. Implement awareness training on the hazards of the chemicals.
			11.3.1.6. Enforce use of PPE.
			11.3.1.7. Handle chemicals only in well-ventilated and controlled areas
			11.3.1.8. Fuel storage tanks to be surrounded by bund wall.
			11.3.1.9. Isolate any area(s) that might be contaminated from non-contaminated areas. Provide water drainage system around the contaminated area for collecting water into the concrete pit.
			11.3.1.10. Use oil catch pans under vehicles when performing maintenance. Conduct maintenance only on impervious surfaces (i.e. on tarpaulin sheet).

Social Impact Assessment – Drilling Phase			
			11.3.1.11. Provide spill cleanup kits and training for designated rapid response teams to clean up any spills. In the event of oil or chemical spill, implement spill response plan.
			11.3.1.12. Deposit treated cuttings into the cuttings pit, where they are to be temporarily held before disposal at approved waste management facility.
			11.3.1.13. Monitor level of cuttings and dirty water in waste pit.
			11.3.1.14. Implement land transportation procedure.

6.9.3.9 Residual Impacts and Risks

With these management measures, the magnitude and duration of impacts will be reduced resulting in a residual significance of impacts from hazardous and non-hazardous waste management and disposal and its effect on human use and quality of life being reduced and remaining a ranking of **Low**. However due to the high receptor sensitivity the residual risk of mud and cuttings remains at **Medium**.

Residual Significance	Positive	Negligible	Low	Medium	High

Residual Significance	Positive	Negligible	Low	Medium	High

6.9.4 Assessment of Impacts to Socio Economy

6.9.4.1 Scope of Assessment

Resource/Receptor	Project Phase	Activity	Impact
Socio-Economic	Drilling Phase	Rig Move Drilling wells Handling of Materials and chemicals Hazardous/non-hazardous waste management Use of Public Utility Labour and accommodation	Increased employment/income and procurement opportunities for people, business and services in surrounding area

6.9.4.2 Assessment of Impacts from Employment and Income

Project employment and business opportunities will increase jobs and related income for local communities.

During drilling, around 100 workers will be employed and supplies (such as fuel and water) and services (accommodation, waste management) will be required. Most of the workers are expected to be experienced drillers and rig crews, not locally available.

IEM has surveyed households in this region for past project. Past Results indicated 40% of respondents earned between 500,001-1,000,000 Kyats; 36% earned between 1000,001-2,000,000 kyats, 11% earned between 2,000,001 – 3,000,000 kyats, 6% earned below 500,000 kyats, 5% earned between 3,000,001-5,000,000 kyats and earned above 5,000,000 kyats:

Of those interviewed, 79% considered oil and gas drilling to be important to the community. When asked what positive impacts from the project did they anticipate, the Villagers anticipated increased employment (35%), improved transport/ infrastructure (26%), and increase annual income (15%).

6.9.4.3 Significance of Impacts

The impacts from employment and income from the project and its effect on human use and quality of life will be local in extent, short term in duration, reversible and of low magnitude but positive. The impact disturbs an area currently used for agriculture and a reserved forest area also currently being used for agriculture; income levels are low, and infrastructure is not well developed; the receptor sensitivity is rated medium for potential social impacts as there is many communities nearby and some within 500 m away. As a result of these impact criteria considerations, significance is ranked as Positive.

The Significance Ranking of impacts from employment and income from the project and its effect on human use and quality of life is ranked as **Positive**. (

Table 6-92)

Table 6-92: Sigificance Ranking of impacts to employment and income from the project and its affect on human use and quality of life

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.9.4.4 Impact and Risk Mitigation Measures

Impacts from project activities on the socio-economy are positive and can be further enhanced by the following measures:

Social Impact Assessment – Drilling Phase			
12. Socio-Economy	12.1. Employment opportunities and Use of local goods and services	12.1.1. Employment and income	12.1.1.1. Employ qualified local workers if possible.
			12.1.1.2. Purchase local supplies and services with required specifications, whenever possible.

6.9.4.5 Residual Impacts and Risks

With these management measures, the residual significance of impacts from impacts to employment and income from the project and its effect on human use and quality of life will be a **Positive**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.10 Social Impact Assessment during Well Testing Phase

From the screening process the following must be assessed to determine their impacts during the preparation phase:

- Transportation
- Waste Management
- Socio-Economy

6.10.1 Assessment of Impacts to Transportation

6.10.1.1 Scope of Assessment

Resource/Receptor	Project Phase	Activity	Impact
Transportation	Testing Phase	Vehicle and Equipment Use Hazardous/Non-Hazardous Waste management Labour and Accommodation	Increased traffic

6.10.1.2 Assessment of Impacts from Transportation

Transportation of equipment, people and services will increase traffic volume in the local area of the planned project and may disrupt of community traffic. Transportation during testing phase consists of transport of workers and supplies, transport of industrial water supply and equipment and will be similar to the impacts during construction in **Section 6.8.2**.

6.10.2 Assessment of Impact to Waste Management

6.10.2.1 Scope of Assessment

Resource/Receptor	Project Phase	Activity	Impact
Waste Management	Testing Phase	Hazardous/non-hazardous waste management	Increased stress on local infrastructure

6.10.2.2 Assessment of non-hazardous waste management

Non-hazardous waste from the well testing phase consists mostly of general non-hazardous waste from the well site and campsite. The General waste will be separated on-site to facilitate recycling. Domestic and general waste should be segregated and stored using suitability labeled containers to ensure safe collection segregation and handling of all waste streams generated. This waste will be stored in appropriate containers to be transported off site for recycling, reuse, treatment and/or disposal. It is estimated that the well site will generate between 1 and 4 tones of "domestic" waste and "industrial" waste per month. **Recycle and General Non-Hazardous waste** shall be transferred to local government waste disposal facilities (like YCDC in Yangon) or disposed at a site approved by Pyay GAD.

The impact significance is similar to the impacts in the Construction Phase in **Section 6.8.5**.

6.10.2.3 Assessment of hazardous waste management

General hazardous solid waste will be generated during all phases of the project. The well testing phase could generate a portion of condensate from the well testing procedure. This condensate will be separated and stored on site before being disposed as hazardous waste at the approved waste management facilities.

6.10.2.4 Significance of Impacts

The impacts from waste management and disposal and its effect on human use and quality of life will be local in extent, medium term in duration, reversible and of medium magnitude. The impact disturbs an area currently used for agriculture and a reserved forest area also currently being used for agriculture; income levels are low, and infrastructure is not well developed; the receptor sensitivity is rated High for potential social impacts as there is many communities nearby and some within 500 m away. This is issue was raised by the community during public meetings. As a result of these impact criteria considerations, significance is ranked as Medium.

The Significance Ranking of impacts from waste management and disposal and its effect on human use and quality of life is ranked as **Medium** (

Table 6-93).

Table 6-93: Significance Ranking of impacts from waste management and disposal and its affect on human use and quality of life

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.10.2.5 Impact and Risk Mitigation Measures

Impacts from activities required for waste management can be mitigated through the use of the following measures:

Social Impact Assessment – Well Testing Phase			
7 Waste Management	7.1 Hazardous/Non-Hazardous waste management	7.1.1 Domestic waste can be a fire hazard, constitute. windblown litter, attract vermin, contaminate surface and groundwater and be a vector for disease	7.1.1.1 Implement construction and installation phase mitigation measures in 12.1. (Refer 6.8.5.4 above)
		7.1.2 Hazard waste i.e. condensate	7.1.2.1 Implement from drilling phase in 13.4. (Refer 6.9.3.8 above)
			7.1.2.2 Transport produced water to dispose by licensed water treatment facility.

6.10.2.6 Residual Impacts and Risks

With these management measures, the magnitude and duration of impacts will be reduced resulting in a residual significance of impacts from waste management and disposal and its effect on human use and quality of life being reduced and remaining a ranking of **Medium**.

Residual Risk	Positive	Negligible	Low	Medium	High

6.10.3 Assessment of Impacts to Socio Economy

6.10.3.1 Scope of Assessment

Resource/Receptor	Project Phase	Activity	Impact
Socio-Economic	Well Testing Phase	Handling of Materials and chemicals Hazardous/non-hazardous waste management Use of Public Utility Labour and accommodation	Increased employment/income and procurement opportunities for people, business and services in surrounding area

6.10.3.2 Assessment of Impacts from Employment and Income

Impact Assessment

During well testing phase, around 30 workers will be employed and supplies (such as fuel and water) and services (accommodation, waste management) will be required. Most of the workers are expected to be experienced well testing crew and not locally available. The impacts will be similar the construction and installation phase described in **Section 6.8.6**.

6.11 Social Impact Assessment during Abandonment Phase

From the screening process the following must be assessed to determine their impacts during the preparation phase:

- Land Use
- Transportation
- Waste Management
- Socio-Economy

6.11.1 Assessment of Impacts to Land Use

6.11.1.1 Scope of Assessment

Resource/Receptor	Project Phase	Activity	Impact
Land Use	Well Abandonment	Site restoration	Restoration of land use

6.11.1.2 Assessment of Impacts from Land Acquisition

The impact disturbs both an area currently used for agriculture with limited conservation value; and forest reserve area also currently used for agriculture with a medium conservation value.

The main project activity that affects land use is the well site, campsite and access road construction as well as the topsoil storage area. All land needed for the project has been will be acquired or rented by OVL. ONGC Videsh plans to drill two (2) exploration drilling wells located in Thegon Township, Bago Region, Myanmar. The access road to Payama-1 crosses the Paukkhaung Township, Bago Region, Myanmar. The well pad size for Naweng-1 is 200 m x 200 m (40,000 m^2) and the well pad size for Payama-1 is 130 m x 130 m (16,900 m^2). The well sites are located in existing agricultural land or forest reserve land being used for agriculture; all new earth access roads will need upgraded to construct as required. The roads will be constructed with a 6 m wide top and 1.5 m side slope with a height of approximately 20 to 30 cm before compaction with granular fill.

The distances from the existing road to the proposed well locations are provided in

Table 6-94.

Table 6-94: The Distance from Exiting Road to the Proposed Well Location

Well site	Length of Road Upgrading
Naweng-1	• 1.215 km upgrading of existing 125 m of new road construction
Payama-1	• Existing rural earthen road – upgrade for about 15.25 km • Existing sugar cane extraction road – upgrade for 4.5 km • Newly constructed access road – 350 m

The well site and adjacent accommodation campsite areas will be cleared of topsoil and then levelled and elevated by cut and fill methods and compacted using bulldozers, dump trucks, water trucks and graders. The compacted granular pad will be 500 mm thick. In the event that the results of the well testing conclude that the wells are non-commercial, the well site, campsite and access roads will be restored to its original state.

The purchase or rental of the land provided a significant financial benefit to landowners. While this land will be temporarily lost from agriculture production. Project operations too may degrade the nearby land and reduce agriculture productivity in those areas (i.e. dust, flares, drainage previously discussed). If hydrocarbon resources are not found the land will be restored to its original state. The impacts from changes in land use to human use values and quality of life values will be local in extent, short term in duration, of medium magnitude. The impact disturbs an area currently used for agriculture and a reserved forest area also currently being used for agriculture; income levels are low and

infrastructure is not well developed; the receptor sensitivity is rated medium for potential social impacts as there is many communities nearby and some within 500 m away.

6.11.1.3 Significance of Impacts

Given the short-term impact of this aspect and its return to its original state, it is determined to be a positive benefit as a result of the financial benefit to landowners and the community.

The significance of impacts from changes in land use to human use values and quality of life values is ranked as **Positive** (

Table 6-95).

Table 6-95: Sigificance Ranking of impacts from changes in land use to human use values and quality of life values

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.11.1.4 Impact and Risk Mitigation Measures

Impacts from construction activities on land use can be mitigated through the use of the following measures:

Social Impact Assessment – Construction and Installation Phase			
9. Land Use	9.1 Return of Well site Land	9.1.1 Change of traditional use.	9.1.1.1 Restore the site and hand back to MOGE as per MOGE procedure.

6.11.1.5 Residual Impacts and Risks

With these management measures, the residual significance of impacts from changes in land use to human use values and quality of life values will result in a **Positive** financial benefit.

Residual Significance	Positive	Negligible	Low	Medium	High

6.11.2 Assessment of Impacts to Transportation

6.11.2.1 Scope of Assessment

Resource/Receptor	Project Phase	Activity	Impact
Transportation	Abandonment Phase	Vehicle and Equipment Use Hazardous/Non-Hazardous Waste management Site Restoration	Increased traffic

		Labour and Accommodation	

6.11.2.2 Assessment of Impacts from Vehicle and Equipment Use

Transportation of equipment, people and services will increase traffic volume in the local area of the planned project and may disrupt of community traffic. Transportation during drilling consists of transport of workers and supplies, transport of industrial water supply and drilling support equipment (Including casing, chemical and etc.) and will be similar to the impacts during construction in **Section 6.8.2**.

6.11.3 Assessment of Impact to Waste Management

6.11.3.1 Scope of Assessment

Resource/Receptor	Project Phase	Activity	Impact
Waste Management	Abandonment Phase	Site Runoff and Drainage Hazardous/non-hazardous waste management	Increased stress on local infrastructure

6.11.3.2 Assessment of Non-Hazardous Solid Waste

General non-hazardous waste will be generated from the drill site, campsite and vehicles during the abandonment phase.

This waste will be stored in appropriate containers to be transported off site for recycling, reuse, treatment and/or disposal. It is estimated that the well site will generate between 1 and 4 tonnes of "domestic" waste and "industrial" waste per month. **Recycle and General Non-Hazardous waste** shall be transferred to local government waste disposal facilities (like YCDC in Yangon) or disposed at a site approved by Pyay GAD.

The impact significance is similar to the construction and installation phase in **Section 6.8.5.2.**

6.11.4 Assessment of Impacts to Socio Economy

6.11.4.1 Scope of Assessment

Resource/Receptor	Project Phase	Activity	Impact
Socio-Economic	Abandonment Phase	Handling of Materials and chemicals Hazardous/non-hazardous waste management Use of Public Utility Labour and accommodation Site Restoration	Increased employment/income and procurement opportunities for people, business and services in surrounding area

6.11.4.2 Assessment of Impacts from Employment and Income

Project employment and business opportunities will increase jobs and related income for local communities. The impact significance will be similar to construction phase in **Section 6.8.6**.

6.12 Health Impact Assessment during Construction

From the screening process the following must be assessed to determine their impacts during the preparation phase:

- Dust
- Noise
- Traffic Accidents
- Non-hazardous waste

6.12.1 Assessment of Impacts on Public and Occupational Health

6.12.1.1 Scope of Assessment

Resource/Receptor	Project Phase	Activity	Impact
Public and Occupational Health	Construction Phase	Access road and Site Construction Vehicle and Equipment Use Site Runoff and Drainage Hazardous/non-hazardous waste management, Handling of Materials and Chemicals Labour and accommodation	Exposure to air pollutants, dust, or noise, exposure to water contaminated by accidental spills, accidents, concern and stress about accidents, spills, wastes, noise, contagious diseases from workers etc. Traffic Accidents

6.12.1.2 Assessment of Health Impacts from Dust

During the construction phase, new access roads and the well site will be constructed, while some sections of roads will be upgraded. Granular fill transport and construction activities may increase dust concentrations in air. The types of equipment used during construction include ten-wheel dump trucks, graders, rollers and water trucks. The construction time will be 120 days for the well site and access roads for both sites.

The potential health effects of dust are closely related to particle size. Particle sizes are normally measured in microns, and the size range of airborne particles is typically from less than 0.1 microns up to about 500 microns, or half a millimetre. Human health effects of airborne dust are mainly associated with particles less than about 10 microns in size (PM_{10}), which are small enough to be inhaled. Nuisance effects can be caused by particles of any size but are most commonly associated with those larger than 20 microns.

Many forms of dust are considered to be biologically inert, and hence the primary effects on people relate to our sense of aesthetics. There can also be minor health effects, such as eye irritation, when the dust is airborne. Indirect stress-related health effects could also arise, especially if dust problems are allowed to persist for an unreasonable length of time.

Some nuisance dust may have the potential to cause other types of health effects because of the presence of specific biologically active materials. For instance, some mineral dusts contain quantities of quartz, which can cause the lung disease known as silicosis when persistent at high concentrations. Other dusts may contain significant amounts of toxic metals such as mercury or lead.

There is also the potential for contamination of roof-collected water supplies. Dusty conditions can also affect people's ability to enjoy their outdoor environment. For most people, a major effect of a dust nuisance problem is annoyance at the increased requirement for cleaning.

Airborne dust can have effects on visibility, although dust is usually less regionally significant. Visibility effects from dust are usually only a concern in the immediate vicinity of a specific source. Visibility effects are largely a matter of aesthetics. However, it should also be recognised that visibility is one of the main ways by which people commonly judge air quality. Loss of visibility is also a safety

concern under extreme conditions, especially for road traffic.

Dust may result in respiratory irritation of construction workers and respiratory irritation and worsen asthma of people living nearby. *Dust levels during construction were evaluated in* **Section 6.4.2.2**. This area is dry and dusty, with fugitive dust emissions being high due to the wind action, agriculture activities, open burning, forest fires and usage of wood stoves contributing to high particulate daily levels in rural background area. The existing baseline levels of dust (respirable $PM_{2.5}$ and PM_{10}) in all regions can cause nuisance and respiratory tract infection. Dust calculations in **Section 6.4.2.2** show that construction of access roads and well sites could increase dust levels further beyond the ambient air standard. The ambient air standard is set to protect public health.

6.12.1.3 Significance of Impacts

The health impacts from dust will be local in extent, short term in duration, reversible and of medium magnitude as there are many nearby communities with some less than 500 m away from the project location.

The impact disturbs an area currently used for agriculture and a reserved forest area also currently being used for agriculture; income levels are low and health treatment infrastructure is not well developed; the receptor sensitivity is rated medium for potential health impacts as there is many communities nearby and some within 500 m away. As a result of these impact criteria considerations, significance is ranked as Medium.

The Significance Ranking of health impacts from dust is ranked as **Medium** (

Table 6-96).

Table 6-96: Sigificance Ranking of health impacts from dust

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.12.1.4 Assessment of Health Impacts from Noise

During the construction phase, noise will primarily be generated from project vehicles for transportation of granular fill, workers, construction equipment and generators.

Construction is expected to result in nuisance noise at some communities but is not expected to exceed the ambient noise standard (See **Section 6.4.3**).

Transport of road fill and the drilling rig will be on local roads. Heavy trucks are expected to emit noise levels of 88 dB (A) at 50 ft. from the source. Houses are located approximately 50 m away from the road. Using **Equation 6-3**, the noise calculated for these houses is approximately 77.7dB (A). The impact however takes place only during the time the truck passes the house. Ambient noise standards do not apply for this type of noise.

Noise levels from construction equipment do not exceed the 90 dB (A) noise standard in the workplace for an 8-hr exposure time. However, a combination of several construction machines could result in a compounded noise level 91 dB (A), exceeding the workplace standard.

The noise levels estimated at communities assumed a worst-case scenario of hemispherical spreading with no attenuation from the surrounding area. However, the presence of trees, vegetation, and the topography will attenuate the noise levels.

6.12.1.5 Significance of Impacts

The health impacts from noise will be local in extent, short term in duration, reversible and of medium magnitude. The impact disturbs an area currently used for agriculture and a reserved forest area also currently being used for agriculture; income levels are low and health treatment infrastructure is not well developed; the receptor sensitivity is rated High for potential health impacts as there is many communities nearby and some within 500 m away. This issue was raised by the community during public meetings. As a result of these impact criteria considerations, significance is ranked as Medium.

The Significance Ranking of health impacts from noise is ranked as **Medium**. (

Table 6-97)

Table 6-97: Sigificance Ranking of the Health Impacts from Noise

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.12.1.6 Assessment of Impacts from Traffic Accidents

Transportation of equipment during construction will increase traffic volume in the local area of the planned project resulting in a possible increase in traffic accidents. The transportation during construction and installation phase consists of transport of workers, construction equipment, fill materials and general supplies.

Construction activities may result in a significant increase in movement of heavy vehicles for the transport of construction materials and equipment increasing the risk of traffic-related accidents and injuries to workers and local communities. The incidence of road accidents involving project vehicles during construction should be minimized through a combination of education and awareness-raising, and the adoption of procedures. Measures will be in place to train all drivers in safe and defensive driving methods and the safe transportation of passengers. Speed limits for all vehicles will be implemented and enforced. Vehicles will be maintained in an appropriate road worthy condition and include all necessary safety equipment.

Vehicle traffic and use of lifting equipment in the movement of machinery and materials on a construction site may pose temporary hazards, such as physical contact, spills, dust, emissions, and noise. Heavy equipment operators have limited fields of view close to their equipment and may not see pedestrians close to the vehicle. Center-articulated vehicles create a significant impact or crush hazard zone on the outboard side of a turn while moving.

The road traffic accidents (RTA) data for Bago compared to Myanmar rates for the years of 2014-2016 are included below.

Year	Region	Road Traffic Accident[7]	
		(1)	(2)
2014	Bago	3.0	12.7
	Union	2.8	8.1
2015	Bago	2.7	12.7
	Union	3.0	8.4
2016	Bago	3.1	13.7
	Union	3.2	9.2

(1) Morbidity rate per 1000 Population
(2) Mortality rate per 100,000 Population

The Morbidity RTA rates are lower in Bago than the union average but the Mortality RTA rates are higher than the union average. The road traffic accident risk in Bago are moderate when compared with that of similar countries. The rate of fatalities per 100,000 people for 2016 in Bago is 13.7. This is not currently considered a high rate per 100,000 people on an international comparative basis. In 2010, the Philippines had a fatality rate of 8.3, Indonesia 17.7, Cambodia 17.6, and Thailand experienced a very high rate of 38.8.[8]

6.12.1.7 Significance of Impacts

The health impacts from traffic accidents will be medium in extent, short term in duration, reversible and of medium magnitude. The impact disturbs an area currently used for agriculture and a reserved forest area also currently being used for agriculture; income levels are low and health treatment infrastructure is not well developed; the receptor sensitivity is rated medium for potential health impacts as there are many communities nearby and some within 500 m away. As a result of these impact criteria considerations, significance is ranked as medium.

The Significance of traffic accidents on health is ranked as **Medium** (**Table 6-76**).

Table 6-98: Sigificance Ranking of Health Impacts from Traffic Accidents

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

[7] Ministry of Health and Sports Department of Public Health, Public Health Statistics (2014 - 2016), Nay Pyi Taw, September 2017

[8] Asian Development Bank, Myanmar transport sector policy note: Road safety. Mandaluyong City, Philippines: Asian Development Bank, 2016.

6.12.1.8 Impact and Risk Mitigation Measures

Impacts from construction activities on traffic accidents can be mitigated through the use of the following measures:

Health Impact Assessment – Construction and Installation Phase			
17. Public & Occupational Health	17.1 Construction Activities & Transportation	17.1.1 Traffic Accidents	17.1.1.1 Planning and segregating the location of vehicle traffic, machine operation, and walking areas, and controlling vehicle traffic through the use of one-way traffic routes, establishment of speed limits, and on-site trained flag-people wearing high-visibility vests or outer clothing covering to direct traffic
			17.1.1.2 Ensuring the visibility of personnel through their use of high visibility vests when working in or walking through heavy equipment operating areas, and training of workers to verify eye contact with equipment operators before approaching the operating vehicle
			17.1.1.3 Ensuring moving equipment is outfitted with audible back-up alarms
			17.1.1.4 Using inspected and well-maintained lifting devices that are appropriate for the load, such as cranes, and securing loads when lifting them to higher job-site elevations.
			17.1.1.5 Limit the speed of project vehicles, according to the road condition.
			17.1.1.6 Maintain construction equipment and vehicles.
			17.1.1.7 Notify the local authority on the oversized load and put an escort in front of this convoy with horn and hazard lights.
			17.1.1.8 Consult with community leaders on plan and transportation route before movement of large equipment.
			17.1.1.9 Investigate any complaints and handle appropriately. Keep records of complaints and follow-up.
			17.1.1.10 Strictly enforce training programs to reduce transport and drilling incidents by its contractors.
			17.1.1.11 Implement emergency response training, fire training and response drills.

6.12.1.9 Residual Impacts and Risks

With these management measures, the magnitude of impacts will be reduced resulting in a residual significance of impacts from Vehicle and Equipment Use on occupational and public health values due to the high receptor sensitivity the residual risk remains as **Medium** and reduced to **Low** for Traffic accidents.

Vehicle and Equipment Uses and Noise Concerns

Residual Risk	Positive	Negligible	Low	Medium	High

Traffic Accidents

Residual Significance	Positive	Negligible	Low	Medium	High

6.12.1.10 Assessment of Health Impacts from Non-Hazardous Waste

Non-hazardous wastes during construction and installation phase include food waste, paper, plastic and wooden packaging, rags, glass, metal and plastic drums, sacks, and scrap metal. General waste will be separated on-site to facilitate recycling. Domestic and general waste should be segregated and stored using suitability labelled containers to ensure safe collection segregation and handling of all waste streams generated. This waste will be stored in appropriate containers to be transported off site for recycling, reuse, treatment and/or disposal. It is estimated that the well site will generate between 1 and 4 tonnes of "domestic" waste and "industrial" waste per month.

All solid general waste will be sent for recycling or disposal to local government waste disposal facilities (like YCDC in Yangon) or disposed at a site approved by Local Authority.

Solid wastes may impact physical health, mental health, and quality of life: for example, food remains cause foul smell, unpleasant ambience, act as a fire hazard and provide habitat for disease carriers including bacteria, flies and rats. This increases the chance of bringing diseases to local people.

Myanmar is a tropical country prone to vector borne disease outbreaks, such as gastrointestinal diseases and dengue and malaria. In 2016, over 36,749 cases were reported as malaria by Basic Health Staff reporting.[9] Dengue and dengue haemorrhagic fever cases have seasonal epidemics; it is a leading cause of morbidity in Myanmar with 24,700 cases report in 2013.[10] Due to inadequate facilities, the number illnesses due to lack of water supply and sanitation in Myanmar for 2013 are as follows: 49,799 reported cases of diarrhea, 77,964 cases of Gastritis and Duodenitis. Statistics indicate that the situation of communicable vector-borne disease in the project districts is a public health concern.

6.12.1.11 Significance of Impacts

The health impacts from non-hazardous waste will be local in extent, medium term in duration, reversible and of medium magnitude. The impact disturbs an area currently used for agriculture and a reserved forest area also currently being used for agriculture; income levels are low and health treatment infrastructure is not well developed; the receptor sensitivity is rated medium for potential health impacts as there is many communities nearby and some within 500 m away. As a result of these impact criteria considerations, significance is ranked as Medium.

The Significance Ranking of health impacts from non-hazardous waste is ranked as **Medium**. (**Table 6-99**)

Table 6-99: Sigificance Ranking of Health Impacts from Non-Hazardous Waste

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr

[9] Public Health Statistics (2014 – 2016), Ministry of Health and Sport, 2017
[10] Annual Hospital Statistics Report 2013, Department of Public Health in collaboration with Department of Medical Services

Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.12.1.12 Impact and Risk Mitigation Measures

OVL will implement the following mitigation measures to reduce health impacts:

Health Impact Assessment – Construction and Installation Phase			
9. Public and Occupational Health	9.1 Well Site, Road and Camp Construction	9.1.1 Respiratory irritation and Exacerbation of asthma impact from dust	9.1.1.1 Implement construction and installation phase mitigation measures in 2.1. (Refer 6.4.2.8 above)
	9.2 Vehicle and Equipment Use during construction	9.2.1 Hearing impairment for workers and annoyance for public.	9.2.1.1 Implement construction and installation phase mitigation measures in 3.1. (Refer 6.4.3.5 above)
			9.2.1.2 Provide PPE to workers on site.
			9.2.1.3 Should complaints over noise be received, consideration will be given to the provision of noise barriers.
	9.3 Non-Hazardous Waste Management	9.3.1 Food safety, Increase in vector-borne diseases: malaria, typhus and dengue and others.	9.3.1.1 Implement construction and installation phase mitigation measures in 12.1.(Refer 6.4.6.3)

6.12.1.13 Residual Impacts and Risks

With the implementation of management measures, the magnitude of impacts from dust will be reduced resulting in a residual significance of the health impacts being ranked as **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

With the implementation of management measures, the residual significance ranking of the health impacts from Noise is **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

With the implementation of management measures, the magnitude of impacts from non-hazardous waste will be reduced resulting in a residual significance of health impacts being ranked **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.13 Health Impact Assessment during Drilling Phase

Key issues identified by the screening process must be assessed to determine their impacts during the drilling phase, including:

- Noise
- Traffic Accident
- Non-Hazardous Waste
- Hazardous Waste
- Chemical Management
- Labour and Accommodations

6.13.1 Assessment of Impacts to Public and Occupational Health

6.13.1.1 Scope of Assessment

Resource/Receptor	Project Phase	Activity	Impact
Public and Occupational Health	Drilling Phase	Rig Move Drilling Wells Vehicle and Equipment Use Site Runoff and Drainage Hazardous/non-hazardous waste management, Handling of Materials and Chemicals Labour and accommodation	Exposure to air pollutants, dust, or noise, exposure to water contaminated by accidental spills, accidents, concern and stress about accidents, spills, wastes, noise, contagious diseases from workers etc. Traffic Accident

6.13.1.2 Assessment of Health Impacts from Noise

Drilling is expected to result in nuisance noise at some communities which exceeds the ambient noise standard (See **Section 6.4.3**).

Noise levels from drilling equipment and generators do not exceed the 90 dB (A) noise standard in the workplace for an 8-hr exposure time. In addition, the compounded noise level of the drilling rig and two generators. (87.5 dB (A), does not exceed the workplace standard).

6.13.1.3 Significance of Impacts

The health impacts from noise will be local in extent, short term in duration, reversible and of medium magnitude. The impact disturbs an area currently used for agriculture and a reserved forest area also currently being used for agriculture; income levels are low and health treatment infrastructure is not well developed; the receptor sensitivity is rated High due to public concern for potential health impacts as there is many communities nearby and some within 500 m away. As a result of these impact criteria considerations, significance is ranked as Medium.

The Significance Ranking of health impacts from noise is ranked as **Medium** (**Table 6-100**).

Table 6-100: Sigificance Ranking of the Health Impacts from Noise

	Level and Type of Impact				
	1	2	3	4	5
Impact Criteria	Positive	Negligible	Low	Medium	High

Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.13.1.4 Assessment of Impacts from Traffic Accident

Traffic accidents are a significant cause of injuries and fatalities among members of the public worldwide. Therefore, during the drilling phase all project personnel must implement traffic safety during the rig mobilization and the personnel travelling from the well site to central campsite, and operation of project equipment on private or public roads. Prevention and control of traffic related injuries and fatalities should include the adoption of safety measures that are protective of project workers and the general public.

OVL plans to use a land rig for the drilling program. The exact transport route and duration of rig move is not available as the rig contract not yet awarded. The most likely route will be via the Yangon-Tharrawaddy-Pyay (Route 2). The rig mobilization will include around 130 truckloads to complete rig and support equipment. The maximum mobilization distance for the rig is estimated at about 400 km. The rig mobilization duration will be 2-3 weeks.

Drilling Materials will be transported from Yangon to the well sites. The estimated number of round trips for rig and support equipment is 100 truckloads during drilling activities. The rig personnel will transported to the well locations from Yangon.

6.13.1.5 Significance of Impacts

The health impacts from traffic accidents will be medium in extent, short term in duration, reversible and of medium magnitude. The impact disturbs an area currently used for agriculture and a reserved forest area also currently being used for agriculture; income levels are low and health treatment infrastructure is not well developed; the receptor sensitivity is rated medium for potential health impacts as there is many communities nearby and some within 500 m away. As a result of these impact criteria considerations, significance is ranked as medium.

The Significance of traffic accidents on health is ranked as **Medium** (**Table 6-76**).

Table 6-101: Sigificance Ranking of Health Impacts from Traffic Accidents

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.13.1.6 Impact and Risk Mitigation Measures

Impacts from drilling on traffic accidents can be mitigated through the use of the following measures:

Health Impact Assessment – Drilling Phase			
18. Public & Occupational Health	18.1 Drilling Support Activities & Transportation	18.1.1 Traffic Accidents	18.1.1.1 Adoption of best transport safety practices across all drilling operations with the goal of preventing traffic accidents and minimizing injuries suffered by project personnel and the public including: • Emphasizing safety aspects among drivers • Improving driving skills and requiring licensing of drivers • Adopting limits for trip duration and arranging driver rosters to avoid overtiredness • Avoiding dangerous routes and times of day to reduce the risk of accidents • Use of speed control devices (governors) on trucks, and remote monitoring of driver actions
			18.1.1.2 Regular maintenance of vehicles and use of manufacturer approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure.
			18.1.1.3 Collaboration with local communities and responsible authorities to improve signage, visibility and overall safety of roads, particularly along stretches located near schools or other locations where children may be present.
			18.1.1.4 Coordination with emergency responders to ensure that appropriate first aid is provided in the event of accidents
			18.1.1.5 Using locally sourced materials, whenever possible, to minimize transport distances. Locating associated facilities such as worker camps close to project sites and arranging worker transport to minimizing external traffic
			18.1.1.6 Employing safe traffic control measures, including road signs and flag persons to warn of dangerous conditions

6.13.1.7 Residual Impacts and Risks

With these management measures, the magnitude of impacts will be reduced resulting in a residual significance of impacts from Vehicle and Equipment Use on occupational and public health values due to the high receptor sensitivity the residual risk remains as **Medium** and reduced to **Low** for Traffic accidents.

Vehicle and Equipment Uses and Noise Concerns

Residual Risk	Positive	Negligible	Low	Medium	High

Traffic Accidents

Residual Significance	Positive	Negligible	Low	Medium	High

6.13.1.8 Assessment of Health Impacts from Non-Hazardous Waste

Non-hazardous wastes during drilling include food waste, paper, plastic and wooden packaging, rags, glass, metal and plastic drums, sacks, and scrap metal. General waste will be separated on-site to facilitate recycling. Domestic and general waste should be segregated and stored using suitability labelled containers to ensure safe collection segregation and handling of all waste streams generated. This waste will be stored in appropriate containers to be transported off site for recycling, reuse, treatment and/or disposal. It is estimated that the well site will generate between 1 and 4 tonnes of "domestic" waste and "industrial" waste per month.

All solid general waste will be sent for recycling or disposal to local government waste disposal facilities (like YCDC in Yangon) or disposed at a site approved by Local Authority.

Solid wastes may impact physical health, mental health, and quality of life: for example, food remains cause foul smell, unpleasant ambience, act as a fire hazard and provide habitat for disease carriers including bacteria, flies and rats. This increases the chance of bringing diseases to local people.

Myanmar is a tropical country prone to vector borne disease outbreaks, such as gastrointestinal diseases and dengue and malaria. In 2016, over 36,749 cases were reported as malaria by Basic Health Staff reporting.[11] Dengue and dengue haemorrhagic fever cases have seasonal epidemics; it is a leading cause of morbidity in Myanmar with 24,700 cases report in 2013.[12] Due to inadequate facilities, the number illnesses due to lack of water supply and sanitation in Myanmar for 2013 are as follows: 49,799 reported cases of diarrhea, 77,964 cases of Gastritis and Duodenitis. Statistics indicate that the situation of communicable vector-borne disease in the project districts is a public health concern.

6.13.1.9 Significance of Impacts

The health impacts from non-hazardous waste will be local in extent, medium term in duration, reversible and of medium magnitude. The impact disturbs an area currently used for agriculture and a reserved forest area also currently being used for agriculture; income levels are low and health treatment infrastructure is not well developed; the receptor sensitivity is rated medium for potential health impacts as there is many communities nearby and some within 500 m away. As a result of these impact criteria considerations, significance is ranked as Medium.

The Significance Ranking of health impacts from non-hazardous waste is ranked as **Medium** (**Table 6-102**).

[11] Public Health Statistics (2014 - 2016), Ministry of Health and Sport, 2017

[12] Annual Hospital Statistics Report 2013, Department of Public Health in collaboration with Department of Medical Services

Table 6-102: Sigificance Ranking of Health Impacts from Non-Hazardous Waste

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.13.1.10 Assessment of Health Impacts from Mud, Chemicals and Drilling Waste

Generally, the likelihood of workers in the drilling area to expose the chemicals is low. The workers may expose the chemicals by inhalation, irritation (skin and eye) and eating. However, spill accidents included during transportation may be caused to contaminate soil, surface water or groundwater.

Properties and toxicity of drilling chemicals to environment and health are shown in **Table 6-113**. Most of composition in drilling mud is not classified as hazardous. Some compositions are exceptional such as Caustic Soda (sodium hydroxide), Sodium Bicarbonate, Calcium chloride and Calcium Carbonate can have some health effects and require awareness of the Permissible Exposure Limits (PEL). Standard levels of the chemicals in the workplace are shown in **Table 6-103**.

The chemicals used for exploration drilling will be secured in designated storage area with impervious (cement or plastic sheet) floor and bund wall. If there is a chemical spill, they will be recovered/ cleaned with spill clean-up kits provided for the designated rapid response teams to clean up quickly and efficiently.

The Drilling Program for this project will use Water Based Mud and Low Toxic Synthetic Oil Based Mud (LTSOBM) depending on results of subsurface and seismic interpretation. The majority of the components of the drilling mud systems are classified as low-toxic with the exception of a few key chemicals.

Table 6-103: Permissible Exposure Limits (PEL) over 8-hour TWA

Chemicals	Permissible Exposure Limit (8-hr TWA)
Barium Sulphate (Barite)	Not applicable
Bentonite	Not applicable
Starch	Not applicable
Caustic Soda (sodium hydroxide),	2 mg/m^3 (WEL-TWA, respirable dust)
Sodium Bicarbonate	5 mg/m^3 (WEL-TWA, respirable dust)
Primary Emulsifier	Not applicable
Secondary Emulsifier	Not applicable
Organophilic Clay	Not applicable
Gilsonite	Not applicable
Calcium Hydroxide	Not applicable
Polymeric Blend	Not applicable

Calcium chloride	4 mg/m^3 (WEL-TWA, respirable dust)
Calcium Carbonate	4 mg/m^3 (WEL-TWA, Limestone-respirable dust)

Source: 1. SDS, Chemical Data Bank, Pollution Control Department of Thailand

2. Occupational Safety and Health Administration (OSHA), USA

Mud chemicals and drilling waste may impact community health should spillage contaminate soil, surface water or groundwater. Health may be impacted by accumulation of contaminants in the body if contaminated water is consumed and may cause irritation if used for bathing and washing. Local communities in the vicinity of the project site, particularly people who use and consume local water resources are potentially at risk. In addition, the public is concerned about chemicals and drilling waste.

Potential exposure to chemicals under normal conditions is limited to workers within the well site boundary. Workers can be exposed to the chemicals through the following exposure routes: inhalation, dermal or eye contact, and ingestion. However, accidental spills (including during transport) and leaks may release chemicals and drilling waste into the environment and impact nearby community health or contaminate their water and land resources.

Impacts from mud chemicals and drilling can have minor health effects, which are reversible e.g. skin irritation, food poisoning for occupational health; and for community health, extent of health effect limited to rare individual cases within worker and/or local community.

6.13.1.11 Significance of Impacts

The health impacts from mud chemicals and drilling waste will be local in extent, medium term in duration, reversible and of medium magnitude. The impact disturbs an area currently used for agriculture and a reserved forest area also currently being used for agriculture; income levels are low and health treatment infrastructure is not well developed; the receptor sensitivity is rated medium for potential health impacts as there is many communities nearby and some within 500 m away. As a result of these impact criteria considerations, significance is ranked as Medium.

The Significance Ranking of health impacts from mud chemicals and drilling waste is ranked as **Medium** (**Table 6-104**).

Table 6-104: Sigificance Ranking of health impacts from mud chemicals and drilling waste

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.13.1.12 Assessment of Health Impacts from Hazardous Chemicals and Waste

Drilling activities will generate a low volume of hazardous waste including lubricating and hydraulic oil, rags and other materials contaminated with chemicals, and drums and containers used for chemical transportation and storage. The well site and accommodation campsite combined will generate a low volume of hazardous waste, estimated to be between 0.5 tonnes per month. The drilling contractor is to ensure appropriate and safe storage until this waste is picked up by the waste transporter and taken to the approved waste management facility.

Generally, the likelihood of workers in the drilling area to expose the hazard wastes is low. However, spill accidents included during transportation may be impact to health of employees and people.

Community health may be impacted through spills and subsequent contamination of soil, surface and groundwater resources. Consumption of such water may result in bioaccumulation of contaminants and various health impairments. Bathing and washing in it may cause skin irritation. Indirect public health impacts could occur through soil contamination by oils, chemicals and the bioaccumulation of heavy metals impacting crop yields and food quality. Worker health is affected in similar ways. Because workers are closer to and handle hazardous waste, the likelihood of exposure is higher of workers than for the public.

Any spills on the drill pad would be directed into the waste pit. An oil trap will prevent oil from flowing into the waste pit. The site will have spill kits available to be used if any accidental spill happens during operations. The mud chemicals are all dry powder so spill or leakage is low, spill kits will be used for any oil or liquid spills.

6.13.1.13 Significance of Impacts

Impacts from hazardous chemicals and waste may affect both occupational health and community health, and are considered to be local in extent, of medium-term duration, reversible over time, and of medium magnitude. The impact disturbs an area currently used for agriculture and a reserved forest area also currently being used for agriculture; income levels are low and health treatment infrastructure is not well developed; the receptor sensitivity is rated medium for potential health impacts as there is many communities nearby and some within 500 m away. As a result of these impact criteria considerations, significance is ranked as Medium.

The Significance Ranking of health impacts from hazardous chemicals and waste is ranked as **Medium** (

Table 6-105).

Table 6-105: Sigificance Ranking of impacts from hazardous chemicals and waste

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.13.1.14 Assessment of Impacts from Health Impacts from Communicable Diseases

Drilling activities will require up to 100 temporary workers. Because these are specialized positions, most of these workers will temporarily move into the area. Experiences from other parts of the world have shown that oil and gas development activities introduced or increased incidence of communicable diseases, such as HIV/AIDS and malaria, in communities where these projects are located. Although the OVL project is not a large-scale development, the influx of outside workers could contribute to proliferation of communicable diseases in local communities.

The structures at the project well sites can conceivably contribute to vector-borne diseases such as malaria, dengue by providing breeding grounds for mosquitoes if they are not properly maintained.

These structures include a perimeter drainage trench and an intermediate drainage trench and the concrete lined cutting pit. Unhygienic practices in the workplace may also promote spread of gastrointestinal diseases amongst project employees.

The potential health impacts from an influx of workers could contribute to proliferation of communicable diseases in local communities and the work force.

National statistics on HIV/AIDS are provided in **Table 6-106**. Detailed information on HIV/AIDS is limited.

Table 6-106: National HIV/AIDS Statistics[13]

Number of people living with HIV	230 000 [200 000 - 260 000]
Adults aged 15 to 49 prevalence rate	0.8 [0.6 - 0.9]
Adults aged 15 and up living with HIV	220 000 [190 000 - 250 000]
Women aged 15 and up living with HIV	81 000 [71 000 - 91 000]

In 2016, over 36,749 cases were reported as malaria by Basic Health Staff reporting.[14] Dengue and dengue haemorrhagic fever cases have seasonal epidemics; it is a leading cause of morbidity in Myanmar with 24,700 cases report in 2013.[15] Due to inadequate facilities, the number illnesses due to lack of water supply and sanitation in Myanmar for 2013 are as follows: 49,799 reported cases of diarrhea, 77,964 cases of Gastritis and Duodenitis. Statistics indicate that the situation of communicable vector-borne disease in the project districts is a public health concern. Most surveyed respondents claimed to have slept under a mosquito net the previous night.

With the ongoing COVID19 Pandemic, this raises serious issues with the potential spread of this highly contagious and deadly virus. Strict quarantine and testing measures, in line with local government guidelines, will need to be put in place to ensure that this virus does not infect the workers during the drilling program.

6.13.1.15 Significance of Impacts

Impacts from communicable disease may affect both occupational health and community health, and are considered to be local in extent, medium term duration, reversible over time, and of High magnitude. The impact disturbs an area currently used for agriculture and a reserved forest area also currently being used for agriculture; income levels are low and health treatment infrastructure is not well developed; the receptor sensitivity is rated medium for potential health impacts as there is many communities nearby and some within 500 m away. As a result of these impact criteria considerations, significance is ranked as Medium.

The Significance Ranking of health Impacts from communicable disease is ranked as **Medium** (**Table 6-107**).

[13] UNAIDS Myanmar Statistics, 2016. Accessed on Feb 15th from http://www.unaids.org/en/regionscountries/countries/myanmar

[14] Public Health Statistics (2014 – 2016), Ministry of Health and Sport, 2017

[15] Annual Hospital Statistics Report 2013, Department of Public Health in collaboration with Department of Medical Services

Table 6-107: Significance Ranking of Impacts from Communicable Disease

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.13.1.16 Impact and Risk Mitigation Measures

OVL will implement the following mitigation measures to reduce health impacts:

Health Impact Assessment – Drilling Phase			
13. Occupational and Public Health	13.1. Rig, Generators and Equipment	13.1.1. Health impact from noise	13.1.1.1. Implement drilling phase mitigation measures in 2.1. (Refer 6.5.2.4 above)
			13.1.1.2. Provide PPE to workers on site
	13.2. Non-Hazardous waste management	13.2.1. Health impact from Non-Hazardous Waste	13.2.1.1. Implement construction and installation phase mitigation measures in 12.1. (Refer 6.4.6.3 above)
	13.3. Handling and Disposal of Hazardous Waste	13.3.1. Health impact from hazardous Waste	13.3.1.1. Implement drilling phase mitigation measures in 11.2. (Refer 6.5.5.5 above)
	13.4. Hazardous waste management and chemical handling	13.4.1. Health impact from Mud, Chemicals and Drilling Waste	13.4.1.1. Implement drilling phase mitigation measures in 11.3. (Refer 6.5.5.5 above)
	13.5. Labour and Accommodations	13.5.1. Health impact from Communicable Diseases	13.5.1.1. Implement construction and installation phase mitigation measures in 12.1.
			13.5.1.2. Deposit treated cuttings into the cuttings pit, where they are to be temporarily held before disposal at licenced waste management facility.
			13.5.1.3. Drainage and removal of waste from waste pit upon completion of drilling.
			13.5.1.4. Health screening of workers before employment.
			13.5.1.5. On-site health clinic (drilling operations) and referral system during all of project operations with external health agencies to ensure

Health Impact Assessment – Drilling Phase			
			timely diagnosis and treatment of workers' illness and injury.
			13.5.1.6. Considering on hiring of qualified local workers to reduce reliance on outside labour and increase local employment.
			13.5.1.7. Do not allow workers to enter communities near the drill site.
			13.5.1.8. Provide awareness to workers on preventive measures for the prevention of communicable and local diseases.

6.13.1.17 Residual Impacts and Risks

With the implementation of management measures, the residual significance ranking of the health impacts from Noise is **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

With the implementation of management measures, the magnitude and duration of impacts will be reduced resulting in a residual significance of the health impacts from non-hazardous waste being ranked as **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

With the implementation of management measures, the magnitude of impacts will be reduced resulting in a residual significance of the health impacts from hazardous waste being ranked as **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

With the implementation of management measures, the magnitude and duration of impacts will be reduced resulting in a residual significance of the health impacts from mud chemicals and drilling waste being ranked as **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

With the implementation of management measures, the magnitude and duration of impacts will be reduced resulting in a residual significance of the health Impacts from communicable disease, particularly COVID19, that is ranked as **Medium**.

Residual Risk	Positive	Negligible	Low	Medium	High

6.14 Health Impact Assessment during Well Testing Phase

From the screening process the following must be assessed to determine their impacts during the preparation phase:

- Dust
- Light and Heat from Flaring
- Air Emissions from Flaring
- Traffic Accidents
- Non-hazardous waste
- Hazardous Waste

6.14.1 Assessment of Impacts on Public and Occupational Health

6.14.1.1 Scope of Assessment

Resource/Receptor	Project Phase	Activity	Impact
Public and Occupational Health	Testing Phase	Flaring of Gas Vehicle and Equipment Use Site Runoff and Drainage Hazardous/non-hazardous waste management, Handling of Materials and Chemicals Labour and accommodation	Exposure to air pollutants, dust, or noise, exposure to water contaminated by accidental spills, accidents, concern and stress about accidents, spills, wastes, noise, contagious diseases from workers etc.

6.14.1.2 Assessment of Health Impacts from Dust

During the well testing phase Vehicle and Equipment Use could result in dust along the local roads in the area from transportation of workers and supplies. The impact will be similar to the drilling phase in **Section 6.12.1.2**.

6.14.1.3 Assessment of Impacts from Health Impacts from Light and Heat

Testing will be conducted for those exploration wells showing promising hydrocarbon presence. During the well testing process (15 days/well), flaring will create high temperatures near the flare. Flaring during well testing will constitute a potentially significant light source where gas will be burnt off via a flare stack. The flare stack will be a vertical flare designed to ensure the safety of workers at the well site and to reduce heat / light radiation. The nearest community is located less than 500m away (for all the proposed well sites); thus, impact from light and heat from the flare stack will be noticeable. A safety zone will be established around the flare with security fencing.

Residents close to the well testing sites will be affected from flaring, mainly through disturbance of psychological wellbeing and annoyance if the flare is visible. However, the flare will not be an issue if hydrocarbons are not found, as if found the flaring phase will last 15 days per well.

Workers could however be affected by heat from the flare. An assessment of heat impacts was done in **Section 6.6.3.4** and the safe distance for continuous exposure without protection is 60 m.

6.14.1.4 Significance of Impacts

Health impacts from light and heat are considered to be medium in extent, of short-term duration, reversible over time, and of medium magnitude. The impact disturbs an area currently used for agriculture and a reserved forest area also currently being used for agriculture; income levels are low

and health treatment infrastructure is not well developed; the receptor sensitivity is rated High for potential health impacts as there is many communities nearby and some within 500 m away. As a result of these impact criteria considerations, significance is ranked as Medium.

The Significance Ranking of health impacts from light and heat is ranked as **Medium**. (

Table 6-108)

Table 6-108: Sigificance Ranking of Health Impacts from Light and Heat

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.14.1.5 Assessment of Health Impacts from Flare Emissions

Pollutants emitted from the flare include Carbon dioxide, Hydrocarbons and Nitrogen oxides. These pollutants may affect the respiratory system, circulatory system and central nervous system, depending on the concentration of pollutants and period of contact. Evaluation of the rate of emission of air pollutants caused by flaring in the well testing phase found greenhouse gas emissions from the activities of well testing phase is 10,320.5 tons of carbon dioxide equivalent per year of primary greenhouse gases (GHGs) (e.g. carbon dioxide CO2 and methane CH4) and varying amounts of other pollutants such as carbon monoxide (CO), oxides of nitrogen (NO_x) and sulphur (SO_x), volatile organic compounds (VOCs), and particulate matter (PM) will be released to the atmosphere during the well testing program. This volume is considered low and not expected to have adverse health effect for the people who live around project site. The well testing process is short term (15 days/well).

6.14.1.6 Significance of Impacts

Health impacts from flare emissions are considered to be medium in extent, of short-term duration, reversible, and of medium magnitude. The impact disturbs an area currently used for agriculture and a reserved forest area also currently being used for agriculture; income levels are low and health treatment infrastructure is not well developed; the receptor sensitivity is rated High for potential health impacts as there is many communities nearby and some within 500 m away. As a result of these impact criteria considerations, significance is ranked as Medium.

The Significance Ranking of health impacts from flare emissions is ranked as **Medium**. (

Table 6-109)

Table 6-109: Sigificance Ranking of Health Impacts from Flare Emissions

	Level and Type of Impact				
	+1	0	-1	-2	-3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High

Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.14.1.7 Assessment of Impacts from Traffic Accidents

Traffic Accidents during well testing will consist of transport of workers and supplies, transport of industrial water supply and testing support equipment and will be similar to the impacts during Drilling Phase in **Section 6.13.1.4**.

6.14.1.8 Assessment of Health Impacts from Non-Hazardous Waste

Non-hazardous wastes during well testing phase are similar to the impacts from construction and installation phase in **Section 6.13.1.8**.

6.14.1.9 Assessment of Health Impacts from Hazardous Waste

Hazardous wastes during well testing phase are similar to the impacts from drilling phase in **Section 6.13.1.12.**

OVL will implement the following mitigation measures to reduce health impacts:

Health Impact Assessment – Well Testing Phase			
9 Occupational and Public Health	9.1 Flaring	9.1.1 Heat exposure and Nuisance light from Light and heat	9.1.1.1 Implement well testing phase mitigation measures 3.1. (Refer 6.6.3.6 above)
			9.1.1.2 Implement OVL's Emergency Response Plan including specific management procedures to mitigate the impacts if a fire occurs.
			9.1.1.3 Install fire extinguishers, alarms and windsocks (to be audible and visible from whole site).
			9.1.1.4 Heat impacts from the flare stack will be minimised by having a flare stack as per international standards.
			9.1.1.5 Maintain a safe distance from nearest sensitive receptor.
	9.2 Flaring	9.2.1 Increase in respiratory illnesses/diseases, asthma, Disturbance psychological wellbeing from flaring emissions	9.2.1.1 Ensure flare system has efficient combustion.
			9.2.1.2 Clear vegetation around the flare stack and build earth bermed flare pit.
			9.2.1.3 Maintain pilot flame at the flare tip to ensure that flame is not

Health Impact Assessment – Well Testing Phase				
				extinguished by strong wind.
			9.2.1.4	H2S detection and safety equipment is standard issue. OVL in association with drilling contractor shall develop emergency response plan (ERP) and H2S Contingency Plan.
			9.2.1.5	Monitor H2S during well testing.
			9.2.1.6	Staff trained in H2S procedures.
	9.3 Well Testing Support Activities & Transportation	9.3.1 Traffic Accidents	9.3.1.1	Implement drilling phase mitigation measures in 18.1.
	9.4 Non-hazardous waste management	9.4.1 Waste can contaminate surface and groundwater, and be a vector for disease.	9.4.1.1	Implement construction and installation phase mitigation measures in 12.1.
	9.5 Hazardous waste management	9.5.1 Health impacts from Hazardous Waste	9.5.1.1	Implement drilling phase mitigation measures in 11.2.

6.14.1.10 Residual Impacts and Risks

With the implementation of management measures, the magnitude of impacts will be reduced resulting in a residual significance of the health impacts from heat due to flare emission; however due to the high receptor sensitivity the residual risk remains as **Medium**.

Residual Risk	Positive	Negligible	Low	Medium	High

With the implementation of management measures, the magnitude and duration of impacts will be reduced resulting in a residual significance of the health impacts from air emissions due to flaring; however due to the high receptor sensitivity the residual risk remains as **Medium**.

Residual Risk	Positive	Negligible	Low	Medium	High

6.15 Health Impact Assessment during Abandonment Phase

From the screening process the following must be assessed to determine their impacts during the abandonment and site restoration phase:

- Traffic Accidents
- Non-hazardous waste

6.15.1 Assessment of Impacts on Public and Occupational Health

6.15.1.1 Scope of Assessment

Resource/Receptor	Project Phase	Activity	Impact
Public and Occupational Health	Abandonment Phase	Vehicle and Equipment Use Site Runoff and Drainage Hazardous/non-hazardous waste management, Handling of Materials and Chemicals Site Restoration Labour and accommodation	Exposure to air pollutants, dust, or noise, exposure to water contaminated by accidental spills, accidents, concern and stress about accidents, spills, wastes, noise, contagious diseases from workers etc. Traffic Accidents

6.15.1.2 Assessment of Impacts from Traffic Accidents

Traffic Accidents during well abandonment and site restoration will consist of transport of workers and supplies, construction equipment and removal of well infrastructure will be similar to the impacts during Construction Phase in **Section 6.12.1.6**.

6.15.1.3 Assessment of Health Impacts from Non-Hazardous Waste

Non-hazardous wastes during abandonment and site restoration phase are similar to the impacts from construction and installation phase in **Section 6.12.1.10**.

6.15.1.4 Impact and Risk Mitigation Measures

OVL will implement the following mitigation measures to reduce health impacts:

Health Impact Assessment – Well Abandonment Phase			
9 Public and Occupational Health	9.1 Well Abandonment Support Activities & Transportation	9.1.1 Traffic Accidents	9.1.1.1 Implement construction and installation phase mitigation measures in 17.1.
	9.2 Non-hazardous waste management	9.2.1 Exposure to contamination from non-hazardous wastes,	9.2.1.1 Implement construction and installation phase mitigation measures in 12.1.

6.16 Exploration Drilling Unplanned Events Impact Assessment

6.16.1 Criteria and Method for Unplanned Events Impact Assessment

The impacts associated with unplanned events during implementation of the OVL's Exploration Drilling Project are evaluated by determining the likelihood (or probability) of an event occurring, and the significance of the event on the environment, social, and health. Assessment of the level of significance impact requires consideration of the impact level (i.e. magnitude of the environmental effect, its geographical scale and duration) in relation to the sensitivity of the key receptors and

resources considered. The significance of possible impact and probability of the event occurring allows us to provide a Risk Ranking.

Unplanned Events Considered

For the OVL Exploration Drilling Project, the unplanned events considered were:

(1) Blowout (with subsequent fire and/or explosion);
(2) Fire or Explosion (not Associated with Blowout);
(3) Chemical or Hazardous Waste/Materials Spill
(4) Transportation Accidents;
(5) Thunderstorms; and
(6) Earthquakes.

These unplanned events will be assessed by determining possible causes, likely receptors affected, probability and Risk Rankings of the events. Residual risks will be evaluated after management measures are defined.

If the risk is determined to be "High", it is considered to be intolerable and must be reduced. If the risk is determined to be medium, risk reduction measures need to be implemented to reduce the frequency of occurrence or to mitigate any Risk Rankings to achieve a risk which is "As Low As Reasonably Possible" (ALARP). If the risk is determined to be "Low", the activity must be managed for continuous improvement.

The following table lists potential unplanned events affecting this exploration drilling program and identifies the aspects by project phase.

Table 6-110: Unplanned Event Aspects by Project Phase

Health Aspects	Site Construction	Exploration Drilling & Testing	Restoration and Abandonment
Blowout (with subsequent fire and/or explosion)		✓	
Fire or Explosion (not associated with Blowout)	✓	✓	✓
Chemical or Hazardous Waste/Material Spill	✓	✓	✓
Transportation Accidents	✓	✓	✓
Earthquakes	✓	✓	✓

The assessment of each aspect includes the following components:

- Description of the source and characteristic of the potential impacts.
- Identification of receptors sensitive to potential impacts.
- Description and evaluation of potential impacts.
- Identification of management measures to reduce potential impacts.
- A determination of the residual risk after management measures is included.
- An aspect summary assessment table.

6.16.2 Assessment of Impacts from Blowout (with subsequent Fire and/or Explosion)

Blowouts during exploration drilling and testing have an inherent risk of fire due to the flammability of hydrocarbon gas when mixed with air. The main risk is to the health and safety of the concessionaire's employees and contractors (People) working at the well site at the time of any incident and damage to equipment and structures (Assets).

A kick is an uncontrolled flow of formation fluids into the borehole and a blowout is the uncontrolled release at the surface. Not all kicks involve hydrocarbons; commonly they involve fresh or salty water. A kick can be controlled in the first instance by increasing the specific gravity of the drilling mud, which increases the effective pressure exerted by the mud on the formation, or by shutting in the well at the surface and increasing the mud weight. The ultimate response to a kick is to close the blow-out preventer (BOP) valve (pipe rams) to completely shut-in the well.

A blowout only occurs if all of the measures taken to control a kick fail and the pressure cannot be contained by the BOPs or the well casing ruptures. The most common cause of a blowout is that the well encounters unexpectedly high formation pressures or there is a rapid loss of the drilling mud into fractures or caverns in the formation. In areas where previous wells have already been drilled, the maximum formation pressures and depths of any over-pressured zones or lost circulation zones have been determined. The well plan is designed based on this information and ensures that the BOPs are sized to contain the pressure and the casing is positioned to establish control. Thus, there are numerous control systems, plans and procedures that have to fail in order for a blowout to occur. Nevertheless, they do occur and are a constant hazard that may happen at any well. Consequently, all drilling operations are planned, taking into account the blowout risk and all personnel are trained and experienced in the procedures needed to control a kick and prevent a blowout.

Maximum expected surface pressure for the project prospect wells is expected to be not exceeding 11000psi. ONGC Videsh will use a 2000 psi rated 21-1/4" BOP and a 10,000 to 15,000 psi BOP with Annular BOP and double ram preventers in the 13-5/8" & 11" bores BOP.

The BOP is tested and certified as per API standards to 10,000 to 15,000 psi before installation. Once the BOP stack is installed it is pressure tested to API specification (API RP 53) to 10,000 to 15,000 psi. Once in service the BOP stack must be tested every 3 weeks as per API specification. Also, every time a connection is made (i.e. wellhead connection) the BOP must be pressure tested again to as per API specification. The BOP will have control unit to provide pressurised hydraulic fluid that will promptly operate the BOP. The charging unit consist of one Electrical driven pump and three Air operated pumps to charge the accumulator pressure to operate BOP.

If a blowout contains hydrocarbons, these have the potential to mix with the air, providing oxygen, and a spark can cause the mixture to ignite. As the fluids flowing from the well will be under significant pressure, the result will be a 'jet' of flame that will shoot out in the direction of any holes in the well head (usually this is directed vertically).

The impact of a blowout will depend on the volume of hydrocarbons flowing from the well and their pressure. Thermal radiation of 8.5 kW/m^2 can result in pain after about 8 seconds exposure and second-degree burns after about 20 seconds of exposure. A blowout could have the potential to create a significant hazard to anyone without protective clothing. Even if a fire does not ignite, the released gas can lead to suffocation or poisoning. Thus, the first response to any blowout is to evacuate personnel to a safe distance before planning commences for containment and well control. With the exception of the personnel on site, the nearest people to any of the sites must be greater than 350 feet (about 100 meters). Therefore, there is no immediate hazard to the local population in the unlikely event a blowout should occur, allowing time for evacuation in a severe situation.

Although standard precautions are taken on all wells drilled to prevent, control or contain a blowout, blowouts do occur, but rarely.

An escape of large quantities of gas could result in notable reduction in local air quality causing a temporary stress to those exposed. Natural gas can cause headaches, nausea and dizziness in a high concentration when inhaled.

Small leaks of gas will not be toxic, and any irritation would be minor to workers. In addition, a blowout is very likely to cause damage to equipment and injuries to drill rig workers.

Liquid hydrocarbon impacts in the event of Blowout, would lead to contamination of soil and groundwater, and also surface water.

6.16.2.1 Significance of Impacts

The frequency of a blowout is very low at 4.4×10^{-4} blowouts per well drilled worldwide (E&P, 2010), or 4.9 $x10^{-4}$ (SENES Consultants, 2016) and much lower for wells drilled into normal formations i.e. not known to have high-pressure gas. The likelihood of its occurrence is considered Unlikely (3) in our Risk Matrix.

The significance of a blowout considering its magnitude of the environmental effect, its geographical scale and duration in relation to the sensitivity of the key receptors and resources is considered to be very high (5). The significance of possible impact and probability of the event occurring allows us to provide a Risk Ranking of **Medium** (**Table 6-111**).

Table 6-111: Risk Assessment Matrix for Blowouts

Probability	Environmental, Social & Health	Consequence (Severity)				
		1	2	3	4	5
		Negligible	Slight	Moderate	High	Very High
1	Very Unlikely	Low Risk	Low Risk	Low Risk	Low Risk	Medium Risk
2	Unlikely	Low Risk	Low Risk	Low Risk	Medium Risk	**Medium Risk**
3	Possible	Low Risk	Low Risk	Medium Risk	Medium Risk	High Risk
4	Likely	Low Risk	Medium Risk	Medium Risk	High Risk	High Risk
5	Very Likely	Low Risk	Medium Risk	High Risk	High Risk	High Risk

6.16.2.2 Impact and Risk Mitigation Measures

OVL in association with drilling contractor will prepare ERP that will defines the procedures that are to be used in the event of a well control emergency occurring in their exploration drilling program.

A full set of preventative measures will be in place to reduce the risk significance of a blowout occurring, including:

- Examination of existing wells to identify shallow gas hazards.
- Drilling and Well Control Standard Operating Procedures and extensive HSE Management System procedures and operational controls in place.

- Internal hazardous operations reviews and "Table-Top Drilling" exercises to test procedures and individual personnel performances against the drilling plan.
- Select proper drill fluid formulation, provide well kill fluids/systems, loss control and weighting agents.
- Very careful monitoring of down hole conditions and mud returns.
- Use of appropriate, high quality materials in well construction (casing and cement grades).
- Provide a blowout preventer (BOP) stack that is sized appropriately in proportion to the maximum formation pressure; and test as per procedures.
- Follow OVL's Emergency Response Plan and Blow Out Contingency Plan in place. OVL in association with drilling contractor will further develop the emergency response plan (ERP) after the award of contract as a part of Bridging document.
- OVL's HSE Integrated Management System Procedures and operational controls will be in place to prevent a blowout/explosion.

6.16.2.3 *Residual Impacts and Risks*

With the implementation of management measures, the residual risk from a Blowout is ranked as **Medium**.

Residual Risk	Positive	Negligible	Low	Medium	High

6.16.3 Assessment of Impacts from Fire or Explosion (not Associated with Blowout)

Potential sources of fire other than from a release of hydrocarbons from the well include the burning of garbage, discarded cigarettes, the presence of diesel fuel on site and the flare during testing. Burning of garbage will be prohibited and smoking will be restricted to safe areas. Diesel is not easily ignited as flash point of diesel is in the range of 40 to 100 ^{0}C which is above the normal room temperature, so the likelihood of a fire occurring is unlikely. Furthermore, the lower explosive limit (LEL) of diesel fuel is 0.6 percent that equals of the concentration of approximately 6,000 ppm. It is unlikely that a fuel spill would cause this concentration to ignite and explode when it occurs in an open area, such as OVL's well site.

6.16.3.1 *Significance of Impacts*

Incident statistics for the onshore oil and gas sector are general and not specific for onshore oil wells, similar to OVL's proposed project. For instance, statistics for all oil and gas workers in the United States indicated that there were 120 fatalities in 2015 and 89 fatalities in 2016 for the entire Mining, quarrying, and oil and gas extraction industry. The rate of fatal injury is 10.1 per 100,000 full-time equivalent workers (FTEs)[16]. The probability of a fire or explosion is Possible (3).

A fire or explosion may result in multiple on-site fatalities. Therefore, the significance of a *fire or explosion not associated with a blowout* considering its magnitude of the environmental effect, its geographical scale and duration in relation to the sensitivity of the key receptors and resources is considered to be high (4). The significance of possible impact and probability of the event occurring allows us to provide a Risk Ranking of **Medium** (**Table 6-112**).

[16]US Labour Statistics. Accessed on Feb 15th from https://www.bls.gov/news.release/cfoi.t04.htm

Table 6-112: Risk Assessment Matrix for Fire or Explosion

Probability	Environmental, Social & Health	Consequence (Severity)				
		1	2	3	4	5
		Negligible	Slight	Moderate	High	Very High
1	Very Unlikely	Low Risk	Low Risk	Low Risk	Low Risk	Medium Risk
2	Unlikely	Low Risk	Low Risk	Low Risk	Medium Risk	Medium Risk
3	Possible	Low Risk	Low Risk	Medium Risk	**Medium Risk**	High Risk
4	Likely	Low Risk	Medium Risk	Medium Risk	High Risk	High Risk
5	Very Likely	Low Risk	Medium Risk	High Risk	High Risk	High Risk

Should a fire occur, there are numerous fire extinguishers on site, and staffs are trained in their use, so any fire from these sources would quickly be brought under control. In an event of a major fire, OVL would alert and cooperate with the local fire brigades.

6.16.3.2 Impact and Risk Mitigation Measures

Fires will be managed under existing emergency plans. The risk significance of fire will be reduced by using the following mitigation measures:

- OVL's HSE Integrated Management System Procedures and operational controls to prevent a fire/explosion. OVL in association with drilling contractor shall develop emergency response plan (ERP) after the award of contract as a part of Bridging document.
- OVL's Emergency Response Plan including specific management procedures to mitigate the impacts if a fire/explosion occurs.
- Install fire extinguishers, alarms and windsocks (to be audible and visible from whole site).
- Pre-arranged call out support from local fire brigades.

6.16.3.3 Residual Impacts and Risks

With the implementation of management measures, the residual risk from a Fire or Explosion not associated with a blowout is ranked as **Medium**.

Residual Risk	Positive	Negligible	Low	Medium	High

6.16.4 Hydrocarbon, Chemical or Hazardous Waste/Materials Spill

Hydrocarbon, chemicals and hazardous waste materials present potential risk of spills to the environment and spillage could affect air quality, soil quality, surface water, groundwater, biota and people. The quantity of the hazardous chemicals that will be used at well site is minimal; therefore, the impact on the environment in the case of a spill would be limited in area and likely to be transitory.

The potential impacts from spills of fuel or lubricant oils area:

- Decline in groundwater quality
- Temporary localized decline in surface water quality and aquatic biota
- Temporary localized decline in soil quality
- Temporary minor toxicity to flora and fauna

6.16.4.1 Impact from Hydrocarbon Spills Impacting Groundwater

The fuel tanks (approximate 80 m^3 capacity) will be set on the concrete rig pad within the rig pad. The fuel tanks will be completely surrounded with a bund to contain any spillage. The fuel storage area will have spill kits and absorbent material to contain any potential fuel spills during re-fuelling.

The areas of the well pad where oil, lubricants and drilling mud may spill are isolated by a drainage system designed to drain all run-off on the rig pad into the waste pit. The drilling well pad area is made of concrete, which prevents leakage of contaminated water to the surrounding area. Machines within the drilling pad area that could potentially release contaminated water include skip tank, cuttings pit, cement mixer, and drilling rig. Runoff within the drilling area will be drained via drainage gutter into the cuttings pit, which will accumulate all of the runoff and contaminated water generated within the drilling area. Therefore, contaminated water from this area will go through an oil trap and end up in the concrete lined cuttings pit and won't escape to contaminate surrounding areas.

The volume of runoff from the well site will be calculated from the volume of the heaviest rainfall within 30 minutes with a month's equivalent rainfall in one hour. The volume of the cuttings pit (6,000 m^3) and concrete lined cutting pit is much more than the volume of the extremely heavy runoff. Therefore, the cuttings pit has the capacity to retain all the runoff within the drilling area even under heavy rainfall. The level of water in the cuttings pit will be monitored regularly. If water level in the cuttings pit is high, it will be pumped into another container (such as a tanker truck) to make sure that the water will not overflow from the pit.

Around the well site area, the buffer zone and earth bun will be provided and served as a secondary containment. The earth bun will contain the runoff from the well site. The bun will be excavated 1.5 m high.

These measures should ensure that there is no accidental release of hydrocarbons into the groundwater. In the event of a spill, spill kits provided on site will be used to remove and contain the spill immediately. Any contaminated water will be collected in the waste pit through a drainage system around the project site.

6.16.4.2 Impact from Hydrocarbon Spills Impacting Surface Water Quality and Aquatic Biota

The areas of the well pad where oil, lubricants and drilling mud may spill are isolated by a drainage system designed to drain all run-off on the rig pad into the waste pit. The drilling well pad area is made of concrete, which prevents leakage of contaminated water to the surrounding area. Machines within the drilling pad area that could potentially release contaminated water include skip tank, cuttings pit, cement mixer, and drilling rig. Runoff within the drilling area will be drained via drainage gutter into the cuttings pit, which will accumulate all of the runoff and contaminated water generated within the drilling area. Therefore, contaminated water from this area will go through an oil trap and end up in the concrete lined cuttings pit and won't escape to contaminate surrounding areas. Around the well site area, the earth bun will be provided and served as a secondary containment. The earth bun will contain the runoff from the well site. The bun will be excavated 1.5 m high.

The fuel tanks (approximate 80 m^3 capacity) will be set on the concrete rig pad within the rig pad. The fuel tanks will be completely surrounded with a bund to contain any spillage. The fuel storage area will have spill kits and absorbent material to contain any potential fuel spills during re-fuelling. On site separated emulsion-condensate will be stored in separate tanks placed within the intermediate drainage system. These measures should ensure there is no release of contaminated water to the area outside the site. The site will have spill kits available to be used if any accidental fuel spill happens during operations. ONGC Videsh has an oil spill contingency plan if there is any accidental release.

These measures should ensure there is no release of contaminated water to the area outside the site. In the event of a spill, spill kits provided on site will be used to remove and contain the spill immediately. Any contaminated water will be collected in the waste pit through a drainage system around the project site. This will be disposed of as hazardous waste.

6.16.4.3 Impact from Hydrocarbon Spills Impacting Soils, Flora and Fauna

Fuel spills can increase soil toxicity and/or decrease soil fertility and impact flora and fauna. The site will have spill kits available to be used if any accidental fuel spill happens during operations. OVL in association with drilling contractor will develop an oil spill contingency plan to contain any accidental release.

Fuel spills may occur during fuelling of vehicles or tanks at the drilling site, or because of leaks from the fuel storage tank at the drilling site. All spills will be cleaned up immediately with the spill kits on site that include shovels, absorbents (sand) and steel containers. At the end of the project, all oily wastes classified as hazardous will be transported and disposed at approved waste management facility.

Fuelling during drilling operations will be conducted within the prepared site. The oil traps on each side of the location will ensure that any spills are contained within the site and do not contaminate any soil surrounding the location.

6.16.4.4 Mud and Chemical Spills

Mud and chemical spills from storage and handling could happen during all phases of the exploration campaign.

Impact Assessment

The potential impacts from mud and chemicals are:

- Decline in groundwater quality
- Temporary localized decline in surface water quality and aquatic biota
- Temporary localized decline in soil quality
- Temporary minor toxicity to flora and fauna

6.16.4.5 Impact from Mud and Chemical Spill Impacting Groundwater

Only a limited amount of hazardous material is to be held at the project site and only during drilling. The mud chemicals are all delivered and stored on site as dry powder. The majority of components of the drilling mud are classified as non-hazardous with the exception of a few key chemicals. The Concentrations of these chemicals used in the drilling mud are however of low toxicity.

Mud chemicals shall be stored in a covered and concreted warehouse before transportation to the drilling site. Mud chemicals will be stored with tarpaulin covers or roof to protect mud chemicals from rain. Hazardous chemicals will be segregated from the main chemicals and kept in appropriate containers. The area will have a berm to protect from accidental spills. However, the drilling chemicals are mostly dry powder materials, so the risk of spill is low. All Hazardous chemicals will be segregated from the main chemicals and kept in appropriate containers as per the manufacturer's recommendations. Other storage areas such as parts, equipment and repair shops will be contained in converted portable 40-foot containers or the steel baskets.

These measures should ensure that there is no accidental release into the groundwater. In the event of a spill, spill kits provided on site will be used to remove and contain the spill immediately. Any contaminated water will be collected in the waste pit through a drainage system around the project site.

6.16.4.6 Impact from Mud and Chemical Spill Impacting Surface Water and Aquatic Biota

For this exploration drilling program, the drilling will use Water Based Mud and Low Toxic Synthetic Oil Based Mud (LTSOBM) depending on results of subsurface and seismic interpretation. The majority of the components of the drilling mud systems are classified as non-hazardous with the exception of a few key chemicals. The toxicology for Caustic Soda (sodium hydroxide), Sodium Bicarbonate, Calcium Hydroxide, Polymeric Blend are shown in **Table 6-113**. At the end of the first well location, the leftover drilling mud will be transferred and used at the next well location. At the end of the drilling program, the leftover mud will be sent back to mud contractor for reuse or disposal or use for OVL other drilling campaign. If the well is actually abandoned rather than completed as a producer, some of this mud will be used to make the kill weight spacer between the cement plugs. There are alternatives for waste cuttings disposal and management at this moment. WMB will be transported by authorized Waste Management Company for disposal (DOWA).

The areas of the well pad where oil, lubricants and drilling mud may spill are isolated by a drainage system designed to drain all rainwater run-off on site into the cuttings pit. Mud chemicals will be stored with tarpaulin covers or roof to protect mud chemicals from rain. Hazardous chemicals will be segregated from the main chemicals and kept in appropriate containers. The area will have a berm to protect from accidental spills. However, the drilling chemicals are mostly dry powder materials, so the risk of spill is low. All Hazardous chemicals will be segregated from the main chemicals and kept in appropriate containers as per the manufacturer's recommendations.

Accidental spills may deteriorate surface water quality and aquatic biota. Some chemicals from drilling operation may be toxic to aquatic biota and cause eutrophication or dissolved oxygen depletion of water bodies. Containment measures are installed at the well sites to ensure that there is no release of spilt material off-site. These measures will include: drainage systems around the rig and areas of the well pad where oil, lubricants and drilling mud may spill, waste pit sufficient in size to contain any spills and storm rainfall event.

Table 6-113: Environmental Characteristics of Components in the Drilling Fluids

Chemical Compound	Biota Affected	Toxicity
Barium Sulphate (Barite)	N/A	No data
Bentonite	N/A	No data
Starch	N/A	No data
Caustic Soda (sodium hydroxide)	Fish	Fish $LC_{50\ (96h)}$: 43mg/l[2]
Sodium Bicarbonate	Fish	Fish $LC_{50\ (96h)}$: 8600 mg/l[2]
Primary Emulsifier	N/A	No data
Secondary Emulsifier	N/A	No data
Organophilic Clay	N/A	No data
Gilsonite	N/A	No data
Calcium Hydroxide	Fish	Fish $LC_{50\ (96h)}$: 160 mg/l[2]
PolymericBlend	Fish	Fish $LC_{50\ (96h)}$: fathead minnow 20 mg/l[2]
Calcium chloride	N/A	No data
Calcium Carbonate	N/A	No data

Source: [1]Ecotox: http://cfpub.epa.gov/ecotox/help.cfm?sub=about,
[2]SDS,
[3]http://www.pesticideinfo.org/List_ChemicalsAlpha.jsp

6.16.4.7 Impact from Mud and Chemical Spill Impacting Soil

With the necessary drainage isolation, capture systems, protected storage in place, together with good housekeeping, the risk of contaminants release into the soil around the site is minimal. The mud chemicals held on site are mostly non-toxic and biodegradable, limiting both the severity and the duration of any impact.

6.16.4.8 Impact from Mud and Chemical Spill Impacting Terrestrial Flora and Fauna

The containment systems chemicals and drilling mud are comprehensive and the likelihood of any of these substances reaching terrestrial flora and fauna off-site is unlikely. The mud chemicals held on site are mostly non-toxic and biodegradable, limiting both the severity and the duration of any impact from an on-site spill. Hazardous chemicals are segregated from the main chemicals and kept in appropriate containers during drilling. Spills during transportation however have the potential to affect soils and surface water quality and thus terrestrial flora and fauna.

6.16.4.9 Significance of Impacts Mud, Chemical and Hydrocarbon Spills

Without mitigation measures, the probability of a Hydrocarbon, chemicals and hazardous waste materials spill to the environment affecting air quality, soil quality, surface water, groundwater, biota and people impact occurring is determined to be Possible (3).

The value of the study area as habitat is significantly affected by its current use for agriculture. One wellsite (Payama-1) is located in Sha Byin Reserved Forest Area; this well site area will need special permission from the Forest Department of MONREC. The existing condition of the well pad for Naweng-1 well is located in a paddy field during the wet season only and the land acquisition will be completed as per MOGE requirements. The existing condition of the well pad for Payama-1 well is located in an existing cleared area used for peanuts in the wet season only in the Sha Byin Reserved Forest Area. The reserved forest is highly disturbed with most of the area planted for crops and sugar cane plantations.

The second well however is located in a reserved forest area and while also being used for agriculture is considered to have higher conservation values. The impact could be important on a local level, therefore the significance of a hydrocarbon, chemical or hazardous waste/materials spill considering its magnitude of the environmental effect, its geographical scale and duration in relation to the sensitivity of the key receptors and resources is considered to be very high (5). The significance of possible impact and probability of the event occurring allows us to provide a Risk Ranking of **Medium**. (**Table 6-114**)

Table 6-114: Hydrocarbon, Chemical or Hazardous Waste/Materials Spill

Probability	Environmental, Social &Health	Consequence (Severity)				
		1	2	3	4	5
		Negligible	Slight	Moderate	High	Very High
1	Very Unlikely	Low Risk	Low Risk	Low Risk	Low Risk	Medium Risk
2	Unlikely	Low Risk	Low Risk	Low Risk	Medium Risk	Medium Risk
3	Possible	Low Risk	Low Risk	Medium Risk	Medium Risk	High Risk
4	Likely	Low Risk	Medium Risk	Medium Risk	High Risk	High Risk
5	Very Likely	Low Risk	Medium Risk	High Risk	High Risk	High Risk

6.16.4.10 Impact and Risk Mitigation Measures

The impact of a hydrocarbon, chemical or hazardous waste/materials spill will be reduced by using the following mitigation measures:

- Chemicals, Hydrocarbons and hazardous materials or waste will be securely stored, and use governed by safe operating procedures.
- Spill containment and recovery equipment will be available near storage areas.
- Procedures for response to Chemicals, Hydrocarbons and hazardous materials or waste spills will be included in OVL's ERP. OVL in association with drilling contractor shall develop emergency response plan (ERP) after the award of contract as a part of Bridging document.
- MSDS Sheets will be posted in areas where Chemicals, Hydrocarbons and hazardous materials or waste is stored and with the HSE Officer.
- Construct drainage system around well sites and concrete rig pad which mud tanks, shakers, generators and fuel tanks sit on to divert any spills into the concrete pit.
- Use oil catch pans under vehicles when performing maintenance. Conduct maintenance only on impervious floor (e.g. tarpaulin sheet).
- Provide drip pans and absorbents to contain any spillage.
- Provide spill cleanup kits and training for designated rapid response teams to clean up any spills. In the event of oil or chemical spill, implement ERP.
- Prohibit workers from cleaning machines/equipment in/near a public water source.
- Prohibit workers and contractors discharging or discarding project waste, chemicals, and oil into public water sources.
- Maintain oil traps along perimeter drainage around concrete pad to prevent any spills from flowing off site.
- Isolate any area(s) that might be contaminated from non-contaminated areas.
- Store Chemicals and hazardous materials on concrete pad.
- Procedures for response to chemical spills will be included in OVL's ERP.
- Deposit treated cuttings into the cuttings pit, where they are to be temporarily held before bioremediation onsite after the rig move out from location or sent for disposal at approved waste management facility.
- Implement transportation plan.

OVL's in association with drilling contractor will develop an Emergency Response Plan, which will be put in place to mitigate the impact if a spill occurs.

6.16.4.11 Residual Impacts and Risks

With the implementation of management measures, the residual risk from a hydrocarbon, chemical or hazardous waste/materials spill is ranked as **Medium**.

Residual Risk	Positive	Negligible	Low	Medium	High

6.16.5 Assessment of Impacts from Transportation Accidents

Transportation accidents associated with OVL's project may occur during transportation of equipment, personnel, granular fill, mud and cuttings, and waste.

OVL plans to use a land rig for the drilling program. The exact transport route and duration of rig move is not available as the rig contract not yet awarded. The most likely route will be via the Yangon-Tharrawaddy-Pyay (Route 2). The rig mobilization will include around 130 truckloads to complete rig

and support equipment. The maximum mobilization distance for the rig is estimated at about 400 km. The rig mobilization duration will be 2-3 weeks.

Drilling Materials will be transported from Yangon to the well sites. The estimated number of round trips for rig and support equipment is 100 truckloads during drilling activities. The rig personnel will transported to the well locations from Yangon.

6.16.5.1 Significance of Impacts

No data on accidents is available for the area. However, this part of the county has a relatively small number of vehicles (including motorcycles) per capita. The probability of these impact occurring are ranked as Possible (3).

The significance of transportation accidents considering its magnitude of the environmental effect, its geographical scale and duration in relation to the sensitivity of the key receptors and resources is considered to be high (4). The significance of possible impact and probability of the event occurring allows us to provide a Risk Ranking of **Medium** (**Table 6-115**).

Table 6-115: Risk Assessment Matrix for Transportation Accidents

Probability	Environmental, Social &Health	Consequence (Severity)				
		1	2	3	4	5
		Negligible	Slight	Moderate	High	Very High
1	Very Unlikely	Low Risk	Low Risk	Low Risk	Low Risk	Medium Risk
2	Unlikely	Low Risk	Low Risk	Low Risk	Medium Risk	Medium Risk
3	Possible	Low Risk	Low Risk	Medium Risk	**Medium Risk**	High Risk
4	Likely	Low Risk	Medium Risk	Medium Risk	High Risk	High Risk
5	Very Likely	Low Risk	Medium Risk	High Risk	High Risk	High Risk

6.16.5.2 Impact and Risk Mitigation Measures

The risk significance of a transportation accident will be reduced by using the following management measures:

- Follow HSE Integrated Management System Procedures.
- Limit the speed of project vehicles, according to the road condition.
- Maintain construction equipment and vehicles.
- Notify the local authority on the oversized load and put an escort in front of this convoy with horn and hazard lights.
- Consult with community leaders on plan and transportation route before movement of large equipment.
- Restrict/ avoid movement of heavy equipment during rush hours. In case emergency, inform local government authorities.
- Provide traffic signs or flags at junction of access road and main road.

- Investigate any complaints and handle appropriately. Keep records of complaints and follow-up.
- Strictly enforce training programs to reduce transport and drilling incidents by its contractors.
- Restore any damage to roads caused by project vehicles.
- Implement emergency response training, fire training and response drills.
- Prohibit trespassers from entering the construction site.
- Referral system with external medical facilities for serious injuries or emergencies.

6.16.5.3 Residual Impacts and Risks

With the implementation of management measures, the residual risk from Transportation Accidents is ranked as **Medium**.

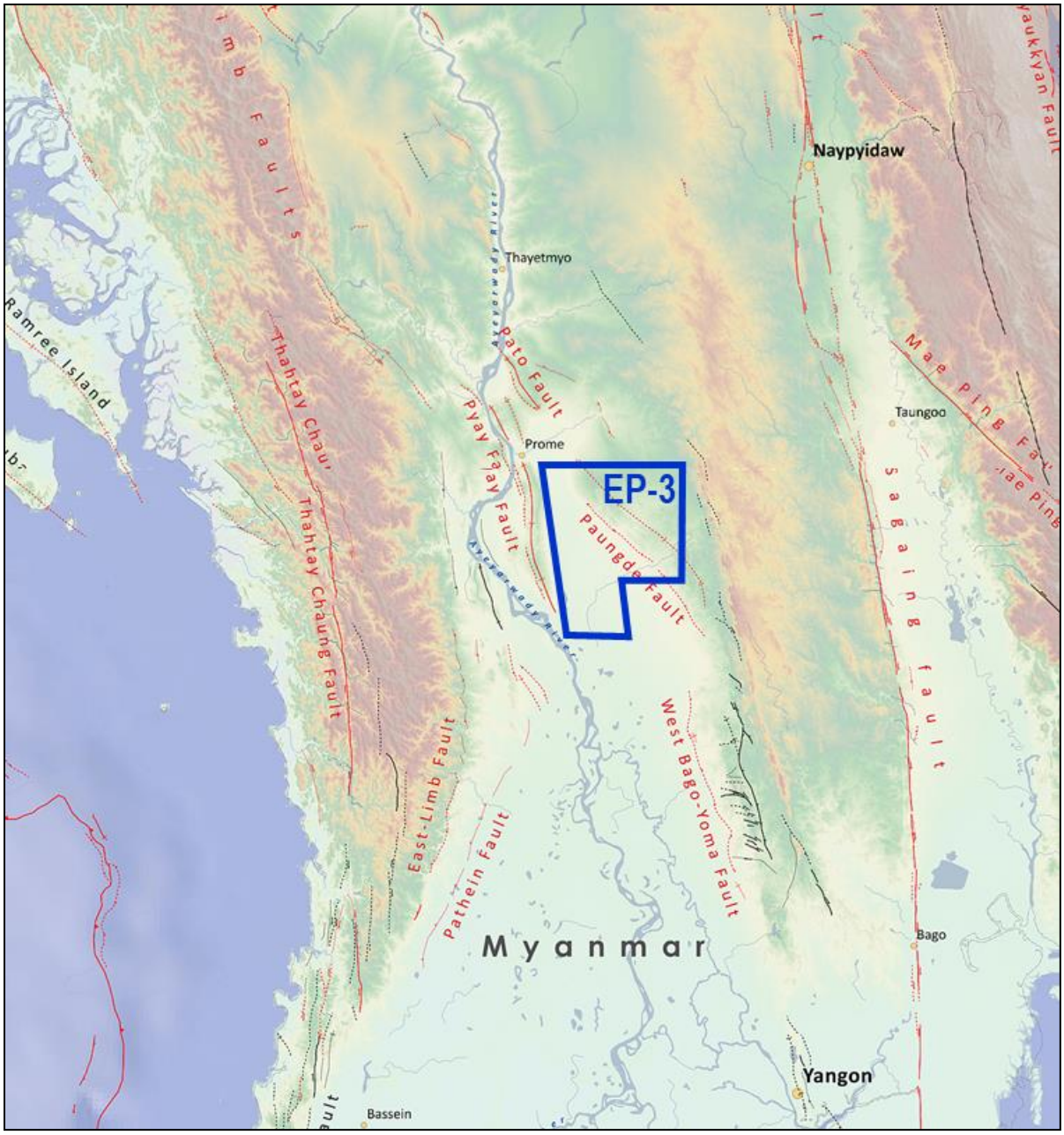
Residual Significance	Positive	Negligible	Low	Medium	High

6.16.6 Assessment of Impacts from Earthquakes

Present-day deformation and earthquakes in Myanmar and adjacent parts of Southeast Asia are driven by the northward movement of the Indian subcontinent as it collides with the Eurasian plate. Myanmar, on the eastern side of this collisional zone, lies east of the boundary between the Indian plate to the west, and the Sunda plate to the east (USGS, 2012). According to Wang *et al* (2014) geomorphologically evident active faults and folds of the Myanmar region comprise three major systems; (1) Indo-Burma Range, (2) Sagaing Fault, and (3) Shan domain. It can be seen that Pray Embayment falls at the east of Indo-Burman Range, between 18.3-18.8°N, on the margin of Sundra block where continues to Sagaing Fault.

Between Indo-Burman Range and Sagaing Fault, Bago Yoma exists from N to S, acts similarly as the central axe of Central Lowland. In Ayeyarwady valley which is on the west of Sagaing Fault, further from Bago Yoma, several active faults and folds were identified. In Block Ep-3, Paungde fault absences on the east from NNW to SSE. Nearby area, Pyay fault absence on the of side the western edge of block, West Bago-Yoma fault absences at the SW from block while at NW of block several active faults extended northward from Pyay fault (**Figure 6-7**).

Wang *et al* (2014) also noted that several active reverse faults between Thayet and Yangon could generate large earthquakes along the floodplain of the Ayeyarwady River. The West-Bago Fault possibly generate maximum magnitude Mw 7.2 to 7.3 for earthquakes near the Ayeyarwady flood plain north of Yangon. The Paduang Fault could produce a Mw 7.3 to 7.4 earthquake in the vicinity of Pyay. The latest earthquake in this area was M6.0 occurred on 12 January 2018. The epicenter is at 18.363°N, 96.080° E, 10 km depth, and 72 km E away from proposed exploration wells (**Figure 6-8**).



Source: Wang *et al*, 2014

Figure 6-7: Structural Map showing the faults ralative to Block EP-3

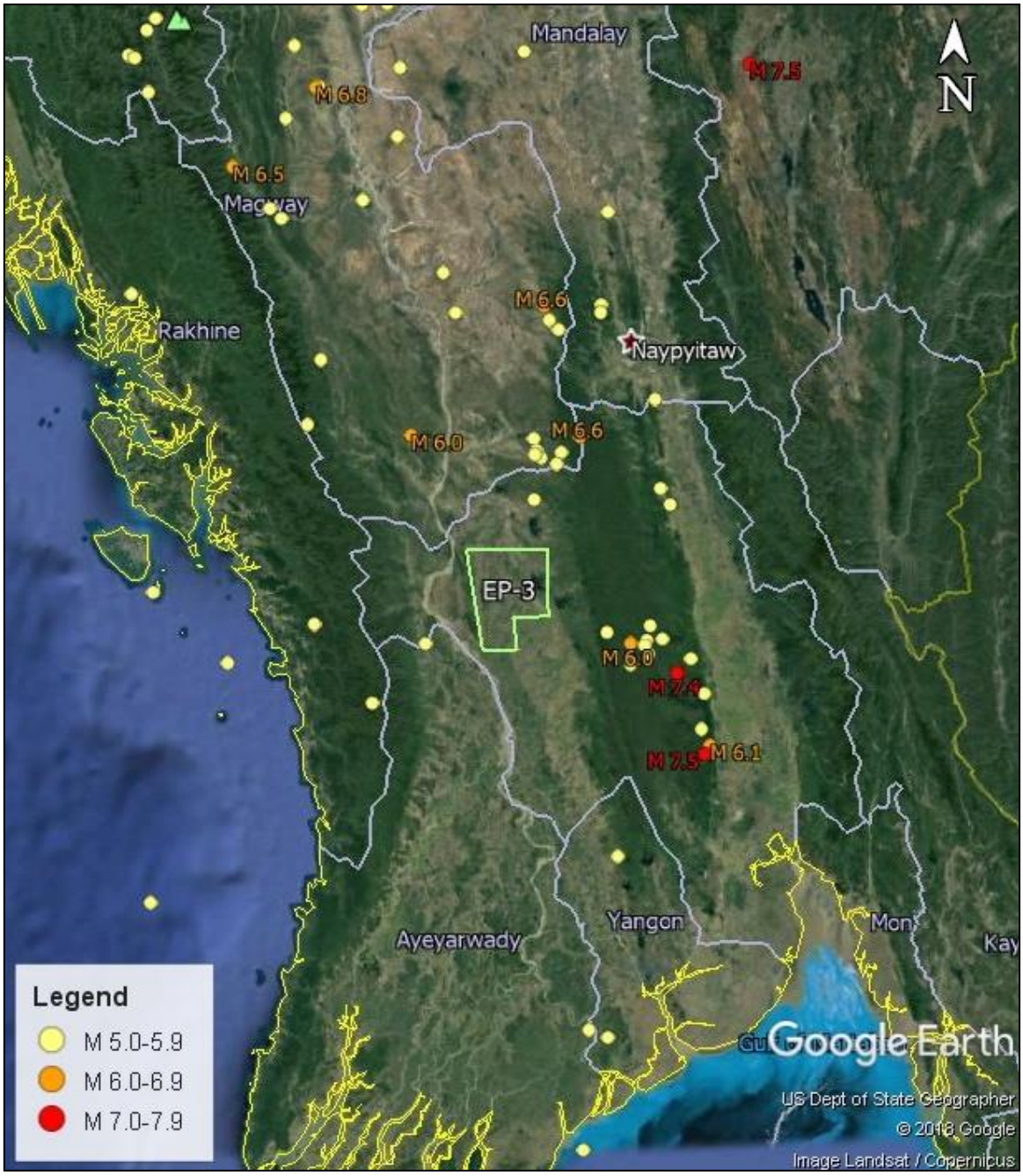


Figure 6-8: 100 years - Historical Earthquakes Greater Than M5 in Upper Myanmar

An earthquake could result in environmental, social and health impacts. The worst-case scenario would be similar to a blowout, fire or explosion.

6.16.6.1 Significance of Impacts

As earthquakes are possible in the region but rare, their frequency has been rated as "Unlikely" (2).

The significance of earthquake related accidents considering its magnitude of the environmental effect, its geographical scale and duration in relation to the sensitivity of the key receptors and resources is

considered to be high (4). The significance of possible impact and probability of the event occurring allows us to provide a Risk Ranking of **Medium** (**Table 6-116**).

Table 6-116: Risk Assessment Matrix for Earthquakes

Probability	Environmental, Social &Health	Consequence (Severity)				
		1	2	3	4	5
		Negligible	Slight	Moderate	High	Very High
1	Very Unlikely	Low Risk	Low Risk	Low Risk	Low Risk	Medium Risk
2	Unlikely	Low Risk	Low Risk	Low Risk	**Medium Risk**	Medium Risk
3	Possible	Low Risk	Low Risk	Medium Risk	Medium Risk	High Risk
4	Likely	Low Risk	Medium Risk	Medium Risk	High Risk	High Risk
5	Very Likely	Low Risk	Medium Risk	High Risk	High Risk	High Risk

6.16.6.2 *Impact and Risk Mitigation Measures*

Although earthquakes cannot be directly mitigated, the effects on operations can be managed through design and management measures as follows:

- Implement OVL's Emergency Response Plan.

6.16.6.3 *Residual Impacts and Risks*

With the implementation of management measures, the residual risk from earthquakes is ranked as **Medium**.

Residual Risk	Positive	Negligible	Low	Medium	High

6.17 Summary of Residual Significance/Risk Rankings from Exploration Drilling

The residual risk rankings of the impact assessment of the Exploration Drilling on environmental, social, health and unplanned aspects are summarized below in **Table 6-117** to **Table 6-121**.

Table 6-117: Construction and Installation Phase Significance Rankings

Environmental Factors/Events	Activity	Potential Impacts	Residual Risk
Physical Environmental Impact Assessment			
1. Topography	2.1 Well Site and Camp Construction	1.2.1 Disturbance to local topography	Low
2. Air Quality	2.4 Well Site and Camp Construction	2.4.1 Deterioration of air quality due to dust.	Low
	2.5 Equipment use during Site and Road Construction	2.5.1 Deterioration of air quality due to vehicle emissions.	Low

Environmental Factors/Events	Activity	Potential Impacts	Residual Risk
	2.6 Equipment use during Site and Road Construction	2.6.1 GHG Release contributing to climate change	Low
3. Noise	3.1 Use of machines/engines during construction and transportation	3.1.1 Increase in noise levels from machines/engines	Low
4. Surface Water Hydrology	4.1 Construction of roads and well / camp sites	4.1.1 Alteration of surface water hydrology	Low
5. Surface Water Quality	5.1 Construction of roads and well / camp sites and site runoff and drainage	5.1.1 Degradation of surface water quality from runoff/drainage	Low
6. Groundwater Quality	6.1 Hazardous/Non Hazardous waste management and chemical handling	6.1.1 Contamination of groundwater from waste, chemicals and wastewater	Low
7. Soil quality	7.1 Construction of roads and well / camp sites	7.1.1 Degradation of soil quality through compaction or erosion during construction.	Low
Ecological Environmental Impact Assessment			
8. Flora and Fauna	8.1 Site Clearing for Construction of roads and well / camp sites	8.1.1 Degradation or destruction of natural habitat	Low
	8.2 Construction of roads and well / camp sites	8.2.1 Habitat degradation from construction	Low
	8.3 Site Runoff and Drainage	8.3.1 Habitat degradation of aquatic biota	Low
Social Impact Assessment			
9. Land Use	9.1 Purchase o rental of land access road/well pad and camp site	9.1.1 Change of traditional use.	Positive
10. Transportation	10.1Rig Move and Equipment and Vehicle Use.	10.1.1 Disruption of traffic	Medium
		10.1.2 Damage to roads	
11. Water Supply	11.1Use of water public utility for construction and domestic use	11.1.1 Compete for water use of communities	Low
12. Drainage and Flooding	12.1Surface runoff from roads, site and camp site	12.1.1 Increase runoff and change local drainage patterns	Low
13. Waste Management	13.1Non-Hazardous waste management	13.1.1 Domestic waste result in windblown litter, attract vermin and be a vector for disease	Low
14. Socio-Economy	14.1 Services Supply for Construction Activities	14.1.1 Employment/income and procurement opportunities for people, business and services in surrounding area	Positive
	14.2 In-migration of labour and social interaction	14.2.1 Potential conflict between workers from other	Low

Environmental Factors/Events	Activity	Potential Impacts	Residual Risk
		regions and local communities	
Cultural Impact Assessment			
15. Historical, Archaeological and Cultural Resources	15.1 Construction of access road/well pad and camp site	15.1.1 Archaeological/ fossil finds within project area.	Negligible
Visual Impact Assessment			
16. Tourism and Recreational experience	16.1 Well Site, Road and Camp Construction	16.1.1 Disturbance and reduction of tourism and recreational experience	Negligible
Health Impact Assessment			
17. Public and Occupational Health	17.1 Well Site, Road and Camp Construction	17.1.1 Respiratory irritation and Exacerbation of asthma impact from dust	Low
	17.2 Vehicle and Equipment Use during construction	17.2.1 Hearing impairment for workers and annoyance for public.	Medium
	17.3 Construction Activities & Transportation	17.3.1 Traffic Accidents	Low
	17.4 Non-Hazardous Waste Management	17.4.1 Food safety, Increase in vector-borne diseases: malaria, typhus and dengue and others.	Low

Table 6-118: Drilling Phase Significance Rankings

Environmental Factors/Events	Activity	Potential Impacts	Residual Risk
Physical Environmental Impact Assessment			
1. Air Quality	1.1. Vehicle and Equipment Use	1.1.1. Deterioration of air quality due to dust.	Low
	1.2. Vehicle and Equipment Use	1.2.1. Deterioration of air quality due to vehicle emissions.	Low
	1.3. Well Drilling	1.3.1. Deterioration of air quality due to hydrogen sulphide	Low
	1.4. Vehicle and Equipment Use	*1.4.1.* Climate Change due to GHG	Low
2. Noise	2.1. Well Drilling and Vehicle and Equipment Use	2.1.1. Increase in noise levels during exploration drilling.	Low
3. Heat and Light	3.1. Functional lighting on vehicles and drill rig, camp site and well site during Drilling Wells.	3.1.1. Lighting on the site at night	Negligible
4. Surface Water Quality	4.1. Site Runoff and Drainage	4.1.1. Contamination of surface water from runoff and drainage	Low
	4.2. Hazardous/non-hazardous waste management	4.2.1. Degradation of surface water quality from disposal	Low

Environmental Factors/Events	Activity	Potential Impacts	Residual Risk
		of domestic sewage and grey water	
5. Soil Quality	5.1. Drill site Site Runoff and Drainage	5.1.1. Contamination of soil from runoff	Low
6. Groundwater Quality	6.1. Loss of circulation during Drilling wells	6.1.1. Groundwater degradation from drilling	Low
	6.2. Infiltration from the waste pit and sub-irrigation field	6.2.1. Deterioration of shallow Groundwater	Low
Ecological Environmental Impact Assessment			
7. Terrestrial Flora and Fauna	7.1. Drilling Activities and Labour and Accommodations	7.1.1. Aquatic biota and habitat disturbed from workers' activities	Low
Social Impact Assessment			
8. Transportation	8.1. Heavy Equipment on Road	8.1.1. Traffic disruption and damage to roads	Medium
9. Water Supply	9.1. Use of public utility for water resources	9.1.1. Water usage of project affects the community's water supply.	Low
10. Power Use	10.1. Power for drilling operations and work camp	10.1.1. Increase or decrease of available power for local community	Negligible
11. Waste Management	11.1. Non-Hazardous waste management	11.1.1. Domestic waste can be a fire hazard, constitute windblown litter, attract vermin, contaminated surface and groundwater and vector for disease	Low
	11.2. Hazardous waste management	11.2.1. Hazard waste contaminate to environment.	Low
	11.3. Handling and Disposal of drill cuttings, sludge and chemicals.	11.3.1. Localized change in water quality and soil quality from chemical composition of drill fluids	Medium
12. Socio-Economy	12.1. Employment opportunities and Use of local goods and services	12.1.1. Employment and income	Positive
Health Impact Assessment			
13. Occupational and Public Health	13.1. Rig, Generators and Equipment	13.1.1. Health impact from noise	Medium
	13.2. Well Drilling Support Activities & Transportation	13.2.1. Traffic Accidents	Low
	13.3. Non-Hazardous waste management	13.3.1. Health impact from Non-Hazardous Waste	Low
	13.4. Handling and Disposal of Hazardous Waste	13.4.1. Health impact from hazardous Waste	Low
	13.5. Hazardous waste management and chemical handling	13.5.1. Health impact from Mud, Chemicals and Drilling Waste	Low

Environmental Factors/Events	Activity	Potential Impacts	Residual Risk
	13.6. Labour and Accommodations	13.6.1. Health impact from Communicable Diseases	Medium

Table 6-119: Well Testing Phase Significance Rankings

Environmental Factors/Events	Activity	Potential Impacts	Residual Risk
Physical Environmental Impact Assessment			
1 Air Quality	1.1 Vehicle and Equipment Use	1.1.1 Deterioration of air quality due to dust.	Low
		1.1.2 Deterioration of air quality due to combustion of diesel fuel and flaring.	Low
	1.2 Well testing releasing hydrogen sulphide	1.2.1 Deterioration of air quality due to hydrogen sulphide	Low
	1.3 Flare Emissions	1.3.1 Climate Change due GHG	Low
2 Noise	2.1 Flaring during Well Testing	2.1.1 Increase in noise levels during well testing.	Low
3 Heat and Light	3.1 Flaring during Well testing	3.1.1 Increase in light at night from flaring	Low
4 Surface Water Quality	4.1 Non-Hazardous waste management	4.1.1 Contamination of surface water from drained domestic waste and grey water	Low
5 Soil Quality	5.1 Non-Hazardous waste management	5.1.1 Contamination of soil from drained domestic waste and grey water	Low
6 Ground Water Quality	6.1 Handling of Chemicals, Hazardous/non-hazardous waste	6.1.1 Degradation of groundwater quality from spills or leaks leaching into water table	Low
Ecological Environmental Impact Assessment			
7 Terrestrial Flora and Fauna	7.1 Labour and Accommodations	7.1.1 Habitat degradation from workers' activities	Low
	7.2 Flaring during Well Testing	7.2.1 Habitat degradation from light and heat	Low
Social Impact Assessment			
8 Transportation	8.1 Vehicle and Equipment Use	8.1.1 Disruption of traffic	Medium
		8.1.2 Damage to roads.	
9 Waste Management	9.1 Hazardous/Non -Hazardous waste management	9.1.1 Domestic waste can be a fire hazard, constitute. windblown litter, attract vermin, contaminate surface and groundwater and be a vector for disease	Low
		9.1.2 Hazard waste i.e. condensate	Low
10 Socio-Economy	10.1Labour and Accommodations	10.1.1 Employment and Income	Positive

Environmental Factors/Events	Activity	Potential Impacts	Residual Risk
Health Impact Assessment			
11 Occupational and Public Health	11.1Flaring	11.1.1 Heat exposure and Nuisance light from Light and heat	Medium
	11.2 Flaring	11.2.1 Increase in respiratory illnesses/diseases, asthma, Disturbance psychological wellbeing from flaring emissions	Medium
	11.3 Well Testing Support Activities & Transportation	11.3.1 Traffic Accidents	Low
	11.4 Non-hazardous waste management	11.4.1 Waste can be a contaminate surface and groundwater and be a vector for disease.	Low
	11.5 Hazardous waste management	11.5.1 Health impacts from Hazardous Waste	Low

Table 6-120: Well Abandonment Phase Significance Rankings

Environmental Factors/Events	Activity	Potential Impacts	Residual Risk
Physical Environment Impact Assessment			
18. Topography	*18.1*Site and Road abandonment and restoration	18.1.1 Disturbance to local topography	Low
19. Air Quality	*19.1*Vehicle and Equipment Use	19.1.1 Deterioration of air quality due to dust.	Low
		19.1.2 Deterioration of air quality due to combustion of diesel fuel.	
		19.1.3 Climate Change due to GHG	
20. Noise	*20.1*Vehicle and Equipment Use	20.1.1 Increase in noise levels from machines/engines during site demolition & restoration and transportation.	Low
21. Surface Water Hydrology	21.1Hazardous/non-hazardous waste management	21.1.1 Potential contamination from spills or wastewater drainage to nearby water bodies during site restoration	Low
22. Surface Water Quality	22.1Restore Site	22.1.1 Alteration of surface water hydrology	Low
23. Soil Quality	*23.1*Soil excavation for site restoration	23.1.1 Degradation of soil quality through compaction or erosion during site demolition & restoration.	Low
24. Groundwater Quality	24.1Hazardous/Non -Hazardous waste management and chemical handling	24.1.1 Contamination of groundwater from waste, chemicals and wastewater	Low

Environmental Factors/Events	Activity	Potential Impacts	Residual Risk
Ecological Environment Impact Assessment			
25. Terrestrial Flora and Fauna	*25.1* Labour and Accommodations	25.1.1 Degradation or destruction of natural habitat and harvesting wild plants / animals	Low
	25.2 Site-Run off and drainage	25.2.1 Potential degradation or destruction of aquatic biota	Low
Social Impact Assessment			
26. Land Use	26.1 Return of Land used for roads, well site and camp site	26.1.1 Change of traditional use.	Positive
27. Transportation	*27.1* Vehicle and Equipment Use	27.1.1 Disruption of traffic.	Medium
	27.2 Site restoration	27.2.1 Damage to roads.	
28. Waste Management	*28.1* Hazardous/non-hazardous waste management	28.1.1 Non-hazardous waste can be a contaminate surface and groundwater and be a vector for disease.	Low
29. Socio Economy	29.1 Handling of Materials, Hazardous/non-hazardous waste management, Labour and accommodation, site restoration	29.1.1 Increase employment/income, opportunities for business and services	Positive
Health Impact Assessment			
30. Public and Occupational Health	30.1 Well Abandonment Support Activities & Transportation	30.1.1 Traffic Accidents	Low
	30.2 Non-hazardous waste management	30.2.1 Exposure to contamination from non-hazardous wastes,	Low

Table 6-121: Unplanned Events Residual Risk Rankings

Environmental Factors/Events	Activity	Potential Impacts	Residual Risk
1. Blowout	1.1 Drilling	1.1.1 Release of uncontrolled volumes of hydrocarbons, Fire and Explosion	Medium
2. Fire or Explosion (not associated with Blowout)	2.1 Fuel Storage and Ignition Sources	2.1.1 Possible explosion or fire of drilling rig or at campsite, or fuel storage area	Medium
3. Fuel, Chemical or Hazardous Waste/Materials Spill	3.1 Storage of Fuel, chemicals, hazardous materials or waste	3.1.1 Potential risk of spills to the environment affecting air quality, soil quality, surface water, groundwater, biota and people	Medium
4. Transportation Accidents	4.1 Vehicle and Equipment Use	4.1.1 Possible injury or death to personnel; and localized contamination of environment	Medium
5. Earthquakes	5.1 Physical shifting of earth's surface	5.1.1 Potential physical disruption cause building collapse, blowouts, fires or spills	Medium

6.18 Conclusion

All environmental issues are ranked as low or negligible and can be managed to minimize potential impacts. Medium ranked Social issues include Transportation at all phases as during the public meetings communities expressed concern over potential impacts, particularly during sugar cane harvesting period as there are many communities along access roads and some within 500 m of the drill locations. These activities will need to be monitored closely as communities are quite near to a number of the potential drill sites.

Health issues including mud chemicals and drilling waste, communicable diseases, noise and flare emissions are ranked as medium. These will need to be monitored closely at those sites where communities are nearby. There are many communities nearby and some within 500 m of the drill locations. Health service infrastructure is not well developed in the communities and OVL will maintain its own clinic onsite during the entire exploration program. A specific waste management plan will be prepared to ensure that all wastes are managed to international standards. Hydrogen Sulphide is a potentially serious issue that requires monitoring equipment to be installed and tested, as well as having personnel trained on use of emergency response equipment.

Unplanned Events have all been ranked as having a medium residual risk. Key to ensuring that unplanned events do not happen is linked to ongoing training programs and a site-specific emergency response plan. Drug testing is recommended.

To mitigate the potential for a blowout, a BOP needs to be installed and tested. Drilling procedures need to be carefully implemented. The risk of fire and related explosions requires that regular monitoring and inspection measures are in place, as well as fire extinguishers strategically placed to minimize any damage should a fire occur.

This region has had earthquakes in the past and design considerations need to be taken to minimize the impact of an earthquake should it occur. Site-specific emergency response plans for all unplanned events need to be in place and training conducted for all staff as appropriate prior to the start of the exploration drilling program.

Positive impacts to locals will occur from the purchase or rental of land for access roads, well site and camp site; service supply for construction activities; employment opportunities and use of goods and services; labour income; return of land upon completion of drilling program; handling of materials, hazardous and non-hazardous waste management; and site restoration.

Recommendations:

The following recommendations are provided:

- Implement recommended stakeholder engagement program before site construction.
- Prepare a site-specific waste management plan.
- Apply OVL's Emergency Response Plan. OVL in association with drilling contractor shall further develop the emergency response plan (ERP) after the award of contract as a part of Bridging document.
- Conduct recommended training program prior to project initiation.
- Evaluate water resource potential to ensure it does not impact local community.
- Adopt and implement the EMP provided in **Chapter 8**.

7. CUMULATIVE IMPACTS ASSESSMENT

7.1. Methodology and Approach

The IFC notes that good practice requires that, at a minimum, project sponsors assess during the EIA process whether their development may contribute to cumulative impacts on Valued environmental and social components (VECs) and/or may be at risk from cumulative effects on VECs they depend on.

VECs are environmental and social attributes that are considered to be important in assessing risks; they may be:

- physical features, habitats, wildlife populations (e.g., biodiversity),
- ecosystem services,
- natural processes (e.g., water and nutrient cycles, microclimate),
- social conditions (e.g., health, economics), or
- cultural aspects (e.g., traditional spiritual ceremonies).

The IFC suggests a useful preliminary approach for developers in emerging markets to conduct of a rapid cumulative impact assessment (RCIA). It entails a desk review that, in consultation with the affected communities and other stakeholders, enables the developer to determine whether its activities are likely to significantly affect the viability or sustainability of selected VECs. The proposed approach recognizes that, especially in emerging markets, the many challenges associated with managing a good CIA process include lack of basic baseline data, uncertainty associated with anticipated developments, limited government capacity, and absence of strategic regional, sectoral, or integrated resource planning schemes.

The approach includes:

- follow a six-step RCIA process,
- engage stakeholders as early as possible and throughout the decision-making process, and
- clearly record the fundamental reasoning behind each important decision made, supporting it with as much technical evidence as possible.

The RCIA logical framework, which is an iterative six-step process including: scoping (Steps 1 and 2), VEC baseline determination (Step 3), assessment of the contribution of the development under evaluation to the predicted cumulative impacts (Step 4), evaluation of the significance of predicted cumulative impacts to the viability or sustainability of the affected VECs (Step 5), and design and implementation of mitigation measures to manage the development's contribution to the cumulative impacts and risks (Step 6). IFC defines cumulative impacts as those that result from the successive, incremental, and/or combined effects of developments when added to other existing, planned, and/or reasonably anticipated future ones.

The objective of the cumulative impact assessment is to identify those environmental, social or health aspects that may not on their own constitute a significant impact but when combined with impacts from past, present or reasonably foreseeable future activities associated with this and/or other projects, result in a larger and more significant impact(s).

Cumulative impact factors, include project resources and receptors, geographic and temporal boundaries, and other projects or developments near the planned project.

7.2. Cumulative Impact Assessment

7.2.1. Projects and Developments in Vicinity of Proposed Well Sites

ONGC Videsh is planning to conduct a drilling campaign in 2022 in order to explore petroleum potential in Block EP 3 and fulfill the PSC commitments. This drilling campaign will consist of two (2) exploration drilling wells located in Thegon Township, Bago Region, Myanmar. The access road for Naweng-1 is along an existing roadway directly off the Yangon-Pyay highway in Thegon Township. The access road to Payama-1 crosses the Paukkhaung Township. ONGC Videsh is planning to spud the first well in Novermber, 2022.

The two exploration wells in Block EP-3 will be drilled in two different locations. The well site coordinates are detailed in **Table 7-1**.

Table 7-1: Well Site Coordinates

Well	Lat	Long
Naweng-1	18° 31' 22.3437"N	95° 24'21.6247"E
Payama-1	18° 45' 1.7997" N	95° 27' 45.1252" E

The existing condition of the well pad for Naweng-1 (target depth of 5225m) is located in paddy field and the land acquisition will be completed as per MOGE requirements. The existing condition of the well pad for Payama-1 (target depth of 2230 m) well is located in the ShaByin Reserved Forest Area. The land for Payama-1 well will be rented as per agreement with MOGE and the Forest Department of MONREC. The exploration drilling projects are located on the southern portion of the Central Lowlands physiographic zone. The topography is a mixture of valleys and hilly/mountainous terrain.

Block EP-3 is located in Ayeyarwady valley, which is between the RakhineYoma at the west and BagoYoma at the east, on the left bank of Ayeyarwady River.

The land required for the access roads will follow land acquisition committee consideration and decision for compensation and access route. ONGC Videsh will consider the final access road route depending on the land compensation committee consideration and approval.

The distances from the Existing road to the proposed well locations are provided in **Table 7-2**.

Table 7-2: The Distance from Exiting Road to the Proposed Well Location

Well site	Length of Road Upgrading
Naweng-1	• 1.215 km upgrading of existing 125 m of new road construction
Payama-1	• Existing rural earthen road – upgrade for about 15.25 km • Existing sugar cane extraction road – upgrade for 4.5 km • Newly constructed access road – 350 m

The exploration drilling wells would be drilled during the dry season after the monsoon season. The overall detailed schedule of the drilling campaign for EP-3 is provided in **Table 7-3**.

Table 7-3: Schedule

Activity	Date	
	Naweng-1	Payama-1
Well site construction	April-July (2022)	April-Sept. (2022)
Spud Date	November (2022)	November (2022)
Drilling duration	120 Days	30 Days
Completion duration	15 Days	15 Days
Well testing duration	15 Days	15 Days

There are no officially established international protected areas in Block EP-3. A global/national area of biodiversity importance near the project area is the Ayeyarwady River corridor. This key biodiversity areas runs on the west of the Block and is located 20 km. away from the proposed well locations. In EP-3 block, reserved forests such as ShaByin, Dawle and Bwet exist. The Payama-1 well site is located in the ShaByin Reserved Forest Area.

According to the 2014 Myanmar Population and Housing Census the population of Pyay District has 251,643 people. Since the location of the study area is primarily in Thegon Township, the demographic characteristics will be discussed for Thegon Township.

Thegon Township has a total population of 130,957 in 2014, which is decreasing in 2017 as a result of the declining birth rate over the last 10 years. However in 2019, population has increased to 134,505 population in total. At the National level UN Population (2019) estimated the growth rate at 0.63%. The population density over the township was estimated to be 173.2 person/sq.km in 2019 which has increased from 168.6 persons/sq.km in 2014. There were 35,950 households in 2014, 23.7% of which was a female-headed household, and there were 36,433 households in 2017. Each household had 3.7 members as an average.

Land use in Block EP-3 study area is dominated by agricultural activities particularly with dry land cultivation along with irrigated cropland.

In 2018, ONGC Videsh successfully acquired about 563 full-fold LKM 2D seismic data in EP3 block in the areas of Thegon, Pyay, Paungde, Paukkhaungand Nattalin Township of Bago Region.
The Block has had the previous oil & gas exploration activities (**Figure 7-1**):

- 35 no. of New 2D lines (562 LKM).
- 12 Old 2D lines (260 LKM)
- 4 wells (Shwegu -1, 2, 3, 4)

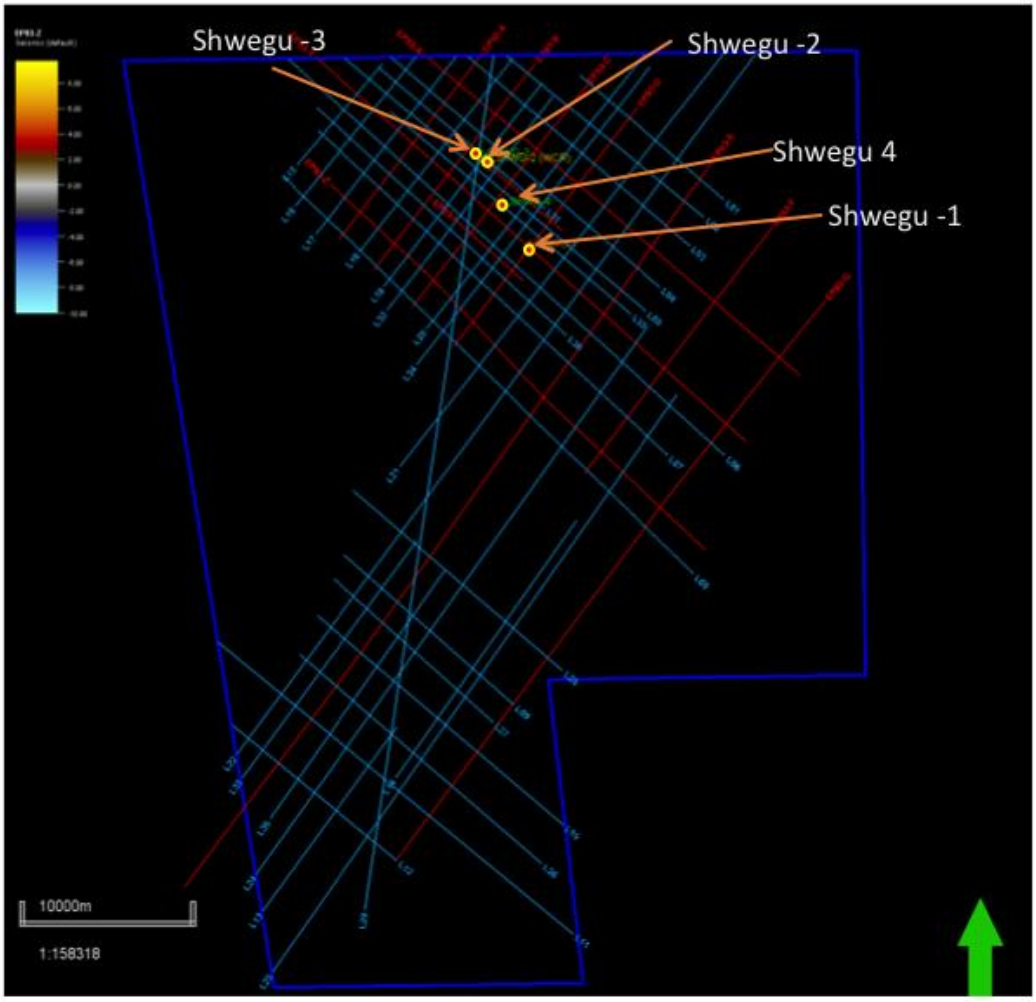


Figure 7-1: Previous Exploration Activities in Block EP-3

In Bago Region, many industrial zones have been established, (1) Pyay Industrial Zone including Nawaday Zone, (2) Bago Industrial Complex (foreign zone), (4) Bago Industrial Complex (Local Zone), (5) i-Land Park Myanmar Industrial Park, (6) Inntakaw Industrial Zone, and (7) Daik-U Industrial Area. The nearest to Block EP-3 is Pyay Industrial Zone (PIZ) and others located at Bago City. PIZ is located in Pyay District. In 2014 only 152 from 467 registered enterprises have operated in PIZ, both of old and new zone. Its main products are consumer goods, wooden products, machinery spare parts and food and agro-based products. And on the proposed access road to the Payama-1 Well, there is the In NgarGwa Sugar Mill and its worker residents.

Thegon Township is not a popular attraction or recreational area, most of them travel to Pyay which is principle town in this area. The natural recreation areas nearby the Block EP-3 are BagoYoma National Park and North Zarmayi Elephant Sanctuary.

Within a 5km-radius from proposed wells covers Thegon, Paungde and Paukkhaung Township.The communities located near the proposed well sites are detailed in **Table 7-4**. Those villages were considered to be potential affected according to the direct impacts from the proposed well sites such as nuisance noise, flow direction of waterway, access road, etc.

Table 7-4: Potentially Affected Villages

Proposed well	Village*	Village Tract	Distance (km) from well
Naweng-1 **Lat: 18°31'22.3437"N** **Long: 95°24'21.6247"E** **X: 754004.96** **Y: 2049730.75**	Tan Daw Gyi	YwaThit	1.40
	NyaungGon		1.02
	ZinByunGon		1.15
	PyinDaungGon		1.33
	Pwe Bye		1.90
	Sa Be Kan	YatTha	1.06
	Wa Le		1.10
	YatTha		1.58
	GyoGon		1.97
	Ka Yin Gon	Cha Ya Gone	0.42
	YwaThaGon		0.53
	Taw Chin		1.17
	Thit Cho		1.60
	Pan LanGon		0.71
	Kaung Bin Lu		1.20
	Cha Ya Gone		1.40
Payama-1 **Lat: 18°45'1.997"N,** **Long: 95°45.1252"E** **X: 759629.13** **Y: 2075021.51**	Sett Tone	ThaPhanKaing	>5 km but on the access road
	MinnLann		
	Kyo Pin	Kyoet Pin Waing	
	ThithYaungPaung		

7.2.2. Assessment of the Potential Cumulative Impacts

The IFC Rapid Cumulative Impact Assessment (RCIA) logical framework, includes:

1. Screening (Step 1),
2. Scoping (Step 2),
3. Valued environmental and social components (VECs)baseline determination (Step 3),
4. Assessment of the contribution of the development under evaluation to the predicted cumulative impacts (Step 4),
5. Evaluation of the significance of predicted cumulative impacts to the viability or sustainability of the affected VECs (Step 5), and
6. Design and implementation of mitigation measures to manage the development's contribution to the cumulative impacts and risks (Step 6).

The screening/scoping of planned and unplanned project related activities assisted to identify potential environmental, social, health aspects where cumulative impacts could possibly occur.

These areas include: Public and Occupational Health; Socioeconomic; Waste Management, Transportation; Flora and Fauna (including aquatic); Ground Water Quality; Surface Water Hydrology, Surface Water Quality, Soil, Noise and Air Quality. The key activities potentially causing these cumulative effects include: hazardous and non-hazardous waste; site runoff and drainage; handling of materials and chemicals; access roads and site construction; vehicles and equipment use, labour and accommodation and unplanned events (blowout, fire and explosion, chemical/hazardous materials spill).

From the scoping and impact analysis of the environmental, social, health and unplanned events of this short-term exploration drilling project and the determination of the residual risk, it is concluded that the management measures defined for each aspect will prevent cumulative effects from occurring for this exploration drilling project. The EIA Management Plan too outlines monitoring measures that will ensure that mitigation measures are effective and that any change or impact to the environment is detected.

Environmental Parameters		Physical Resources								Biological Resources		Social								Cultural		Health	
Project Activities/Events		Topography	Air Quality / GHG emissions	Noise	Heat and Light	Surface Water Hydrology	Surface Water Quality	Ground Water Quality	Soil Quality	Flora & Fauna	Aquatic Flora and Fauna	Land Use	Transportation	Water Supply	Power Supply	Drainage and Flooding	Waste Management	Tourism	Socio-economic	Cultural-Archaeological	Visual Aesthetics	Public Health	Occupational Health and Safety
	Projects/Activities																						
1	EP-3 Seismic Survey																						
2	EP-3 Exploration Drilling Project																						
3	Manufacturing Facilities																						
4	Agriculture																						
5	**Key Areas of Potential Cummulative Impacts**																						

	No Impact
	Potential Impact
	Positive Impact
	Potential Cummulative Impact

7.2.3. Possible Environmental and Social Cumulative Impact Aspects

Table 7-5: Environmental Aspects

Aspect	Activities	Potential Impacts	Impacts
Noise	Access road and Site Construction Vehicle and Equipment Use	Noise and vibration from machines and equipment	Potential for Cumulative Impact
Soil	Access road and Site Construction Site Runoff and Drainage Handling of Materials and chemicals Hazardous/non-hazardous waste management	Soil contamination Erosion, soil disturbance, soil compaction	Potential for Cumulative Impact
Surface Water Quality	Access road and Site Construction Site Runoff and Drainage Handling of materials and chemicals Hazardous/non-hazardous waste management	Increase in erosion and potential contamination from spills or wastewater drainage to nearby water bodies	Potential for Cumulative Impact
Surface Water Hydrology	Access road and Site Construction	Change in water surface flow direction Flow rate of run-off water	Potential for Cumulative Impact
Groundwater Quality	Handling of materials and chemicals Hazardous/non-hazardous waste management	Degradation of groundwater quality from spills or leaks leaching into water table during an unplanned event	Potential for Cumulative Impact
Flora & Fauna	Access road and Site Construction Vehicle and Equipment Use Site Runoff and Drainage Hazardous/non-hazardous waste management Handling of materials and chemicals Labour and Accommodation	Degradation or destruction of natural habitat Harvesting of plants and animals by Human activity	Potential for Cumulative Impact
Transportation	Access Road Construction and Site Construction Vehicle and Equipment Use Hazardous/Non-Hazardous waste management Labour and Accommodation	Increased traffic	Potential for Cumulative Impact
Waste Management	Site Runoff and Drainage Hazardous/non-hazardous waste management	Increased stress on local infrastructure	Potential for Cumulative Impact
Socio-Economic	Access road and Site Construction Handling materials and Chemicals Use of Public Utility Hazardous/non-hazardous waste management Labour and accommodation	Increased employment/income and procurement opportunities for people, business and services in surrounding area Labour in-migration causing conflict with local communities	Potential for Cumulative Impact (positive)
Public and Occupational Health	Access road and Site Construction Vehicle and Equipment Use Site Runoff and Drainage Hazardous/non-hazardous waste management, Handling of Materials and Chemicals Labour and accommodation	Exposure to air pollutants, dust, or noise, exposure to water contaminated by accidental spills, accidents, concern and stress about accidents, spills, wastes, noise, contagious diseases from workers etc.	Potential for Cumulative Impact

7.2.4. Influence of Exploration Drilling Project on Related Potential Cumulative Impacts

The planned 2 exploration wells have been assessed within a 1 km and up to a 5 km radius from the project site. These exploration wells will be drilled on 1st November, 2022.

Within Block EP-3 related seismic operations have been conducted over the past year. During two rounds of public involvement discussions, one issue raised was related to compensation. As a formal compensation process was implemented involving community representatives, it is considered that this issue has been adequately dealt with.

The other possible issue of concern is related to the increase in traffic that first resulted when seismic activities were initiated and now exploration drilling activities. OVL has addressed this with appropriate mitigation and monitoring measures.

From the screening of potential cumulative impacts, the location of the planned two (2) exploration wells, the location of other industrial and community locations, and timing of the planned project it is concluded that no cumulative impacts will occur.

7.2.5. Measures to Mitigate the Project's Contribution to Possible Cumulative Impacts

The cumulative impact assessment has determined that no cumulative impacts will occur. In addition it is determined that existing defined mitigation and monitoring measures for the planned two (2) well exploration drilling project will further prevent cumulative impacts from occurring.

8. ENVIRONMENTAL MANAGEMENT PLAN (EMP)

8.1 Introduction

This environmental management plan has been developed to prevent, minimize and monitor potential environmental, social and health impacts associated with OVL's planned exploration drilling program.
For each project activity, management measures have been defined to prevent and/or reduce the likelihood or magnitude of impacts and/or to limit the extent of an impact if one does occur. The proposed management measures will take into account applicable policies, guidelines, regulations, industry best practices, expert judgement, design techniques, and operational control. Monitoring measures too have been defined to determine if there are changes to the environment and to ensure that mitigation measures are effective.
The following hierarchy of control will be used to identify appropriate management measures:

- Eliminate the risk by removing the hazard.
- Substitute of a hazard with a less hazardous one.
- Prevention of potential events.
- Control the magnitude of an impact.
- Mitigation of the impact of an event on the environment e.g. (bunding for potential hydrocarbon spills).
- Monitoring environmental change and mitigation effectiveness.
- Emergency response and contingency planning to enable recovery from the impact of an event.
- Public consultation and disclosure.

8.2 Scope of This Document

The purpose of this EMP is to provide HSE management actions, monitoring requirements and roles and responsibilities for ensuring that this drilling program is implemented in a sustainable manner. In particular, the EMP will provide:

- Project Description by Project phase (construction phase, drilling phase, well testing phase, and abandonment phase);
- Project's Environmental, Socio-economic and, where relevant, Health Policies and Commitments, legal requirements and institutional arrangements;
- Summary of Impacts and Mitigation Measures;
- Overall budget for implementation of the EMP;
- Management and Monitoring Sub-Plans by Project phase (construction phase, drilling phase, well testing phase, and abandonment phase); the Management and Monitoring Sub-Plans will address relevant environmental and social management and monitoring issues including;
    - noise,
    - waste and hazardous waste,
    - wastewater and storm water,

- air quality,
- odor,
- chemicals,
- water quality,
- erosion, sedimentation and biodiversity,
- occupational, community health and safety,
- cultural heritage,
- employment and training, and
- emergency response.

8.3 Project Description by Project Phase

ONGC Videsh Limited (OVL), a 100% subsidiary company of Oil and Natural Gas Corporation Limited (ONGC), was awarded Block EP-3 to explore and produce hydrocarbon in the Myanmar Onshore Bidding Round 2013. Production Sharing Contract (PSC) for the onshore Block was signed between Myanmar Oil and Gas Enterprise (MOGE), ONGC Videsh Limited and Machinery & Solutions Company Limited (M&S) on 8th August, 2014. ONGC Videsh Limited will conduct an exploration drilling campaign in Block EP-3. As per PSC commitment, Minimum work program is Acquisition, Processing & Interpretation of 2D seismic data and drilling of 2 exploratory wells in 1st exploration phase, which commenced from 1st January 2016. ONGC Videsh has successfully completed the 2D seismic data acquisition work in the 1st week of February 2018 Also, 2D seismic data processing and Crop compensation have been completed and two wells were released by MOGE based on results of seismic data acquisition. ONGC Videsh will start the activities of drilling 2 exploratory wells in 2022 to fulfill the commitment of the initial exploration phase. ONGC Videsh is planning to spud the first well on 1st November, 2022.
This EIA will address OVL's plan to drill two (2) exploration drilling wells in Block EP-3 located in Thegon Township, Bago Region, Myanmar. The primary objectives of the onshore exploration drilling project in Block EP-3 are to:

1. Explore the hydrocarbon potential in Block EP-3;
2. Fulfill the PSC commitments.

The exploration drilling wells would be drilled during the dry season after the monsoon season. The EP-3 project timeline is shown in **Table 8-1**.

Table 8-1: EP-3 Project Schedule

Activity	Date	
	Naweng-1	**Payama-1**
Well site construction	April-July (2022)	April-Sept. (2022)
Spud Date	November (2022)	November (2022)
Drilling duration	120 Days	30 Days
Completion duration	15 Days	15 Days
Well testing duration	15 Days	15 Days

Source: ONGC Videsh, 2022

The wells will be drilled with a conventional hole size. A conventional hole size is required because of the depths being drilled, the type of formations being drilled, the kinds of pressures expected, and for hole stability.

The ONGC Videsh drilling program will use Water Based Mud (WBM) and LTSOBM (Low Toxic Synthetic Oil Based Mud) for the drilling campaign.

8.4 Project's Environmental and Social Policies, Legal Requirements and Institutional

The Project's Environmental and Social Policies, Legal Requirements and Institutional requirements have been detailed in **Chapter 3**.

8.5 Summary of Environmental Impacts, Mitigation & Monitoring Measures

During the environmental impact assessment, a number of potentially significant impacts were identified. In some cases, even though the impacts were of low significance, mitigation measures were provided as part of OVL's environmental management guidelines. This section outlines the mitigation measures that are to be employed to reduce the likelihood of impacts and/or to limit the extent of impact if one does occur. In addition, environmental monitoring measures will be undertaken to assess whether the mitigation measures are effective and if performance meets EIA commitments; these are outlined in the next section.

8.5.1 General Mitigation Measures for Project Operation

Table 8-2 shows the general mitigation measures for project operation.

Table 8-2: General Mitigation Measures for Project Operation

General Measures
1 Mitigation and monitoring measures set forth in this document must be incorporated into contractual agreements for all contractors, including: design, construction, and operation in order to obtain practical and effective execution of the project.
2. Report compliance with these mitigation and monitoring measures to MOGE in congruence with schedule.
3. Provide stakeholder relation plans to explain about the project when needed for communication of construction and drilling activities.
4. Operator must set up a contact point to receive any complaints from the stakeholder regarding its exploration activities. Further, the Operator must provide assistance and rectify the cause of such complaints as determined appropriate, as soon as possible.
5. If impacts and/or damages result from project activities, the Operator must implement all necessary measures to mitigate these impacts and/or damages as soon as possible.
6. MOGE will investigate complaints lodged by people living in the surrounding area concerning any disturbance by project activities, or any damage of public infrastructure resulting from project operations.
7. During the project period, if archaeological finds or fossils are encountered in the project area, the project team must immediately report the findings to the appropriate government office, e.g. District and Township Administrator, Local Archeological Department, Fossil Research Center and Geological Museum. In addition, the project team must cooperate with the government agencies in an effort to verify the findings in the project area. If it is proven that these findings are archaeological finds or fossils, the Operator must follow the regulations strictly.
8. The Operator will start operations only when the Operator has received the necessary approval, permit or agreement from the landowner or responsible agency. Moreover, the Operator will improve or construct access roads when approved by the authorized local government agencies and/or landowner. All activities will operate under the control of MOGE.

8.5.2 Environmental, Social, and Health Mitigation Measures

A summary of the mitigation measures and specific action commitments for Construction and Installation Phase, Drilling Phase, Well Testing Phase, Abandonment Phase, and Unplanned Events is presented in **Table 8-3** to **Table 8-7**.

Table 8-3: Mitigation Measures and Required Actions During Construction and Installation Phase

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures	Residual Risk	Specific Action	Responsible	Schedule	Records
Physical Environmental Impact Assessment								
1. Topography	1.1 Well Site and Camp Construction	1.1.1 Disturbance to local topography	1.1.1.1 Limit construction activities to well sites and access roads only.	Low	Limit construction activities to well sites and access roads only.	OVL	Throughout Construction Phase duration	OVL's Management System
2. Air Quality	2.1 Well Site and Camp Construction	2.1.1 Deterioration of air quality due to dust.	2.1.1.1 Minimize land clearance to a minimum especially during the dry season.	Low	Minimize land clearance during dry season.	OVL	Throughout Construction Phase duration	OVL's Management System
			2.1.1.2 Limit vehicle speed on access road and site.		Limit vehicle speed on access road and site.			
			2.1.1.3 Cover trucks transporting materials with tarpaulins or plastic to prevent any loose material from blowing away and also to prevent dust dispersion.		Cover all trucks transporting materials with tarpaulins or plastic.			
			2.1.1.4 Spray water on roads when needed to keep dust down.		Spray water on roads when needed to reduce dust.			
			2.1.1.5 Clean tires of the vehicles before leaving site if needed.		Clean tires of the vehicles before leaving site if needed.			
			2.1.1.6 Provide personal protective equipment to exposed field workers.		Provide all required personal protective equipment.			
			2.1.1.7 Use vehicles with dust flaps.		Provide dust flaps to vehicles.			

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures	Residual Risk	Specific Action	Responsible	Schedule	Records
	2.2 Equipment use during Site and Road Construction	2.2.1 Deterioration of air quality due to vehicle emissions.	2.2.1.1 Ensure all machinery and vehicles are properly checked and inspected.	Low	All machinery and vehicles will be properly checked and inspected.	OVL	Throughout Construction Phase duration	OVL's Management System
	2.3 Equipment use during Site and Road Construction	2.3.1 GHG Release contributing to climate change	2.3.1.1 Turn off all vehicles and equipment when not in use as well as prohibit vehicles from idling.		Drivers will be instructed to turn off all vehicles and equipment when not in use.	OVL	Throughout Construction Phase duration	OVL's Management System
3. Noise	3.1 Use of machines/engines during construction and transportation	3.1.1 Increase in noise levels from machines/ engines	3.1.1.1 Minimize vehicles and rig transportation from sensitive environmental areas.	Low	Minimize vehicles and rig transportation from sensitive environmental areas.	OVL	Throughout Construction Phase duration	OVL's Management System
			3.1.1.2 Minimize construction activities and vehicle/rig movements in nighttime.		Minimize construction activities and vehicle/rig movements in nighttime.			
			3.1.1.3 Limit vegetation removal to a minimum.		Limit vegetation removal to a minimum.			
			3.1.1.4 Turn equipment off when not in use.		Turn equipment off when not in use.			
			3.1.1.5 Use enclosures when possible to contain noise on site.		Enclosures installed when possible to contain noise on site.			
			3.1.1.6 Implement transportation plan to avoid traffic issue that make noise pollution.		Journey Management Plan to be implement before operation start.			
			3.1.1.7 Materials should be lowered when practical and not dropped while transferring		Supervise materials lowered and not dropped while transferring.			

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures	Residual Risk	Specific Action	Responsible	Schedule	Records
4. Surface Water Hydrology	4.1 Construction of roads and well / camp sites	4.1.1 Alteration of surface water hydrology	4.1.1.1 Avoid construction of well sites in areas that may cause obstacles to water drainage.	Low	Engineer to design well sites to ensure no obstacles to water drainage.	OVL	Throughout Construction Phase duration	OVL's Management System
			4.1.1.2 Construct water drainage lines (culverts/causeway) to maintain natural drainage. The required permission will be obtained from MOGE, Forestry Department and Township GAD office.		Engineer to design and construct water drainage lines (culverts/causeway) to maintain natural drainage.			
5. Surface Water Quality	5.1 Construction of roads and well / camp sites and site runoff and drainage	5.1.1 Degradation of surface water quality from runoff/drainage	5.1.1.1 The proposed drill site and campsite will be orientated and designed to minimize areas requiring soil stabilization.	Low	Engineer to design drill site and campsite to minimize areas requiring soil stabilization.	OVL	Throughout Construction Phase duration	OVL's Management System
			5.1.1.2 Provide drip pans and absorbents to contain any spillage from vehicle and machinery while transferring fuel or changing of engine oil.		Provide drip pans and absorbents to contain any spillage during fuel transferring and changing of engine oil.			
			5.1.1.3 Provide drainage and sediment traps around project area to reduce suspended particles in runoff from the well site and to contain minor oil spills.		Provide drainage and sediment traps around project area.			

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures	Residual Risk	Specific Action	Responsible	Schedule	Records
			5.1.1.4 Avoid construction of the well pad in areas where such construction obstructs water drainage.		Engineer to design well sites to ensure no obstacles to water drainage.			
			5.1.1.5 Prohibit workers from cleaning machines/equipment in/near a water source.		Prohibit workers from cleaning machines/ equipment in/near a water source.			
			5.1.1.6 Prohibit workers and contractors discharging or discarding project waste, chemicals, and oil into public water sources.		Prohibit workers and contractors discharging or discarding project waste, chemicals, and oil into public water sources.			
			5.1.1.7 Provide a suitable storage area for construction materials (such as soil, sand, and stone), chemicals (i.e., paint and thinner), and oil (i.e., fuel and lubricating oil).		Suitable Storage area for construction materials, chemicals and oil to be built on site with proper berm if needed.			
6. Soil quality	6.1 Construction of roads and well / camp sites	6.1.1 Degradation of soil quality through compaction or erosion during construction.	6.1.1.1 Limit soil compaction only to well sites and access roads.	Low	Ensure soil compaction only conduct to well sites and access roads.	OVL	Throughout Construction Phase duration	OVL's Management System
			6.1.1.2 Exposed site areas should be kept to a minimum during construction		Ensure exposed site areas should be kept to a minimum during construction			
			6.1.1.3 Provide effective construction site run-off control and design.		site run-off control and design must be installed			

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures	Residual Risk	Specific Action	Responsible	Schedule	Records
Ecological Environmental Impact Assessment								
7. Flora and Fauna	7.1 Site Clearing for Construction of roads and well / camp sites	7.1.1 Degradation or destruction of natural habitat	7.1.1.1 High valued habitat to be avoided where practicable in the design process.	Low	High valued habitat to be avoided.	OVL	Throughout Construction Phase duration	OVL's Management System
			7.1.1.2 Remove vegetation in project areas only (roads, camp site, well site).		Remove vegetation in project areas only			
			7.1.1.3 Mark well sites clearly and prohibit vehicles from moving off site onto surrounding land.		Mark well sites clearly and prohibit vehicles from moving off site onto surrounding land.			
	7.2 Construction of roads and well / camp sites	7.2.1 Habitat degradation from construction	7.2.1.1 Minimize noisy construction work preferably during daytime hours only.	Low	Minimize noisy construction work preferably during daytime hours only.	OVL	Throughout Construction Phase duration	OVL's Management System
			7.2.1.2 Limit vegetation removal to a minimum.		Limit vegetation removal to a minimum.			
			7.2.1.3 Limit to cut the tree only in well site and access road.		Limit to cut the tree only in well site and access road.			
			7.2.1.4 Contractors and personnel will not be allowed off site where they could cause unnecessary disturbance to vegetation or wildlife.		Contractors and personnel not allowed off site.			
			7.2.1.5 Hunting and trapping will be specifically prohibited.		Hunting and trapping will be specifically prohibited.			

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures	Residual Risk	Specific Action	Responsible	Schedule	Records
	7.3 Site Runoff and Drainage	7.3.1 Habitat degradation of aquatic biota	7.3.1.1 Avoid the construction of the well pads in areas where such construction obstructs a water route.	Low	Avoid the construction of the well pads in areas where such construction obstructs a water route.	OVL	Throughout Construction Phase duration	OVL's Management System
			7.3.1.2 Mark well sites clearly and prohibit vehicles from moving off site onto surrounding land.		Mark well sites clearly and prohibit vehicles from moving off site onto surrounding land.			
			7.3.1.3 Contractors and personnel will not be allowed off site where they could cause unnecessary disturbanc to aquatic biota. In addition, fishing will be specifically prohibited.		Contractors and personnel will not be allowed off site.			
			7.3.1.4 Provide a suitable storage area for construction materials (such as soil, sand, and stone), chemicals (i.e., paint and thinner), and oil (i.e., fuel and lubricating oil).		Suitable Storage area for construction materials, chemicals and oil to be built on site.			
			7.3.1.5 Provide drip pans and absorbents at fuel storage area to contain any spillage.		Provide drip pans and absorbents at fuel storage area to contain any spillage.			
			7.3.1.6 Strictly implement and follow mitigation measures to limit impacts to soil and surface water hydrology and quality.		Strictly implement mitigation measures on site to limit impacts to soil and surface water hydrology and quality.			

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures	Residual Risk	Specific Action	Responsible	Schedule	Records
Social Impact Assessment								
8. Land Use	8.1 Purchase of land access road/well pad and camp site	8.1.1 Change of traditional use.	8.1.1.1 Transparent and fair compensation to landowners and users according to land acquisition committee decision.	Positive	Ensure transparent and fair compensation to landowners and users.	OVL	Throughout Construction Phase duration	OVL's Management System
			8.1.1.2 Ensure all permissions are obtained from landowners and MOGE, Forestry Department and Township GAD office.		All permissions must be obtained from landowners and local authorities.			
			8.1.1.3 Notify surrounding landowners before on location and time of project activities.		Notify surrounding landowners before on location and time of project activities.			
			8.1.1.4 Hand back the land to MOGE with agreed condition after project completion.		Make sure to hand back the land to MOGE with agreed condition after project completion.			
9. Transport	9.1 Construction Activites	9.1.1 Damage to roads	9.1.1.1 Weight of the trucks shall not exceed the limit set by the Myanmar regulations to reduce damage to road surfaces or structures	Medium	Check and restore for any damage to local roads.			
			9.1.1.2 Repair the road if found the damage is caused by project transportation					
			9.1.2.1 Follow traffic rules					

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures	Residual Risk	Specific Action	Responsible	Schedule	Records
		9.1.2 Possibility of road accident	9.1.2.2 Drivers shall possess valid driving license					
10. Water Supply	10.1 Use of water public utility for construction and domestic use	10.1.1 Compete for water use of communities	10.1.1.1 Obtain approval from Thegon Township or Paukkhung Township GAD before hauling water. (if water hauling is required)	Low	Obtain approval from Thegon Township or Paukkhung Township GAD before hauling water.	OVL	Throughout Construction Phase duration	OVL's Management System
			10.1.1.2 Potable water and industrial water, if taken by tanker from nearby unnamed irrigation canal (8.11 km), should not affect the availability of water to locals.		Potable water and industrial water to site must not affect the availability of water to locals.			
11. Drainage and Flooding	11.1 Surface runoff from roads, site and camp site	11.1.1 Increase runoff and change local drainage patterns	11.1.1.1 Obtain approval from MOGE and appropriate government offices before constructing, upgrading or reroute access roads.	Negligible	Obtain approval from MOGE and appropriate government offices and implement Civil engineer's design for well site and access road construction.	OVL	Throughout Construction Phase duration	OVL's Management System
			11.1.1.2 Follow civil engineer's recommendation on well site and access road construction design.					
			11.1.1.3 Avoid construction of well sites in areas that may cause obstacles to water drainage.					
			11.1.1.4 Water drainage lines (culverts/causeway) will be constructed to maintain natural drainage. The					

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures	Residual Risk	Specific Action	Responsible	Schedule	Records
			required permission will be obtained from MOGE, Forestry Department and Township GAD office.					
12. Waste Management	12.1 Hazardous and Non Hazardous waste management	12.1.1 Domestic waste result in windblown litter, attract vermin and be a vector for disease	12.1.1.1 OVL in association with drilling contractor shall develop Waste Management Plan for this drilling campaign	Medium	OVL in association with contractor shall develop Waste Management Plan on site.	OVL	Throughout Construction Phase duration	OVL's Management System and Waste Management Plan
			12.1.1.2 Store hazardous waste in appropriately designed areas and safe containers that are suitable for transporting/transferring.					
			12.1.1.3 Ensure treatment and disposal according to accepted international standard.					
			12.1.1.4 Enforce "Good Housekeeping" practices.					
			12.1.1.5 Domestic and general waste to be segregated and stored using suitability labeled.					
			12.1.1.6 Disposal of waste in labelled containers for possible recycling					
			12.1.1.7 Implement requirements for waste management and related laws					

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures	Residual Risk	Specific Action	Responsible	Schedule	Records
			12.1.1.8 Install septic tanks and soak away pit for holding sewage.					
			12.1.1.9 Non-hazardous wastes will be taken to an approved waste site					
			12.1.1.10 Hazardous waste will be taken to DOWA waste management facility					
13. Socio-Economy	13.1 Services Supply for Construction Activities	13.1.1 Employment/ income and procurement opportunities for people, business and services in surrounding area	13.1.1.1 Employ qualified local workers preferably wherever possible.	Positive	Meet with local authorities to discuss and design local employment hiring and Employ qualified local workers.	OVL	Throughout Construction Phase duration	OVL's Management System
			13.1.1.2 Purchase local supplies and services of the required quality, whenever possible.					
			13.1.1.3 Terms of contract for recruitment of manpower in these project needs to include emphasis on hiring locals, especially for unskilled and semi-skilled workforce.					
	13.2 In-migration of labour and social interaction	13.2.1 Potential conflict between workers from other regions and local communities	13.2.1.1 Restrict workers to within project boundaries and do not allow local interaction within the communities.	Medium	Restrict workers to within project boundaries and do not allow local interaction within the communities.	OVL	Throughout Construction Phase duration	OVL's Management System

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures	Residual Risk	Specific Action	Responsible	Schedule	Records
Cultural Impact Assessment								
14. Historical, Archaeological and Cultural Resources	14.1 Construction of access road/well pad and camp site	14.1.1 Archaeological/ fossil finds within project area.	14.1.1.1 Watch for artefacts during site construction and inform the Local Authorities before commencement of drilling.	Negligible	Watch for artefacts during site construction and Report to the Pyay GAD if any archaeological evidence is discovered.	OVL	Throughout Construction Phase duration	OVL's Management System
			14.1.1.2 Report to the Pyay GAD if any archaeological evidence is discovered at the well sites or access roads. Through consultation, a plan to proceed will be developed					
			14.1.1.3 If artefacts are found during the construction phase, OVL will inform the responsible local office immediately.					
			14.1.1.4 Consult with local authorities to identify culturally important festivals and plan transportation, construction and drilling activities to avoid impact.					
Visual Impact Assessment								
	15.1 Well Site, Road and	15.1.1 Disturbance and reduction of tourism	15.1.1.1 Post and enforce speed limit.	Negligible	Road Hazard Assessment will be	OVL	Throughout Construction	

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures	Residual Risk	Specific Action	Responsible	Schedule	Records
15. Tourism and Recreational experience	Camp Construction	and recreational experience	15.1.1.2 Consult with local authority before major movement.		completed to reduce tourism and recreational impacts		Phase duration	OVL's Management System
			15.1.1.3 Notify the local authority on the oversized load and put an escort in front of this convoy with horn and hazard lights.					
			15.1.1.4 Restrict/ avoid movement of heavy equipment during rush hours.					
			15.1.1.5 Provide traffic signs or flags at junction of access roads and main roads.					
			15.1.1.6 Investigate any complaints and handle appropriately. Keep records of complaints and follow-up.					
			15.1.1.7 Obtain approval from MOGE and/or appropriate government offices before constructing, upgrading or reroute access roads.					
			15.1.1.8 Strictly enforce training programs to reduce transport incident cases by its contractors.					

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures	Residual Risk	Specific Action	Responsible	Schedule	Records
			15.1.1.9 Restore any damage to roads if caused by contractor or company.					
			15.1.1.10 Restrict local traffic on OVL private access road and wellsite area.					
			15.1.1.11 When project complete, promptly (within 6 months), hand back the land to MOGE.					
Health Impact Assessment								
16. Public and Occupational Health	16.1 Well Site, Road and Camp Construction	16.1.1 Respiratory irritation and Exacerbation of asthma impact from dust	16.1.1.1 Implement construction and installation phase mitigation measures in 2.1.	Medium	Implement construction and installation phase mitigation measures in 2.1 to reduce dust impacts.	OVL	Throughout Construction Phase duration	OVL's Management System
	16.2 Vehicle and Equipment Use during construction	16.2.1 Hearing impairment for workers and annoyance for public.	16.2.1.1 Implement construction and installation phase mitigation measures in 3.1.	Negligible	Implement construction and installation phase mitigation measures in 3.1 to reduce noise impacts.	OVL	Throughout Construction Phase duration	OVL's Management System
			16.2.1.2 Provide PPE to workers on site.		Provide all required PPE to workers on site.			
			16.2.1.3 Should complaints over noise be received, consideration will be given to the provision of noise barriers.		Install additional noise barriers if complaints over noise are received.			

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures	Residual Risk	Specific Action	Responsible	Schedule	Records
	16.3 Non-Hazardous Waste Management	16.3.1 Food safety, Increase in vector-borne diseases: malaria, typhus and dengue and others.	16.3.1.1 Implement construction and installation phase mitigation measures in 12.1.	Negligible	OVL in association with contractor shall develop Waste Management Plan on site.	OVL	Throughout Construction Phase duration	OVL's Management System and Waste Management Plan

Table 8-4: Mitigation Measures and Required Actions During Drilling Phase

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures	Residual Risk	Specific Action	Responsible	Schedule	Records
Physical Environmental Impact Assessment								
1. Air Quality	1.1. Vehicle and Equipment Use	1.1.1. Deterioration of air quality due to dust.	1.1.1.1. Implement construction and installation phase mitigation measures in 2.1.	Low	Implement construction and installation phase mitigation measures in 2.1 to reduce dust impacts	OVL	Throughout Drilling Phase duration	OVL's Management System
	1.2. Vehicle and Equipment Use	1.2.1. Deterioration of air quality due to vehicle emissions.	1.2.1.1. Implement construction and installation phase mitigation measures in 2.2.	Low	Implement construction and installation phase mitigation measures in 2.2 to reduce emission impacts.	OVL	Throughout Drilling Phase duration	OVL's Management System
	1.3. Well Drilling	1.3.1. Deterioration of air quality due to hydrogen sulfide	1.3.1.1. Install Gas Detectors	Low	H2S detection and safety equipment is standard issue. OVL in association with drilling contractor shall develop emergency response plan (ERP) and H2S Contingency Plan.	OVL	Throughout Drilling Phase duration	OVL's Management System
			1.3.1.2. If H2S levels exceed 10 ppm in the gas stream, implement appropriate safety zones.					
			1.3.1.3. All crew are instructed and rehearsed in H2S procedures.					
	1.4. Vehicle and Equipment Use	*1.4.1.* Climate Change due to GHG	1.4.1.1. Implement construction and installation phase mitigation measures in 2.3.	Low	Implement construction and installation phase mitigation measures in 2.3 to reduce GHG emissions.	OVL	Throughout Drilling Phase duration	OVL's Management System
2. Noise	2.1. Well Drilling and Vehicle and Equipment Use	2.1.1. Increase in noise levels during	2.1.1.1. Install noise barrier at the well site boundary toward nearest community. If required, Install noise barrier at	Low		OVL	Throughout Drilling Phase duration	OVL's Management System

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures	Residual Risk	Specific Action	Responsible	Schedule	Records
		exploration drilling.	the well site boundary toward nearest community					
			2.1.1.2. Ensure use of mufflers on diesel/gas driven machinery.					
			2.1.1.3. Ensure all machinery and vehicles are properly checked and inspected.					
			2.1.1.4. Equipment to be operated and maintained in accordance with manufacturer specifications.					
3. Heat and Light	3.1. Functional lighting on vehicles and drill rig, camp site and well site during Drilling Wells.	3.1.1. Lighting on the site at night	3.1.1.1. Drilling Rig located in area distant to sensitive receptors.	Negligible	Install well site in area distant to sensitive receptors and keep night lighting to a minimum.	OVL	Throughout Drilling Phase duration	OVL's Management System
			3.1.1.2. Keep night lighting to a minimum, consistent with safety and security.					
			3.1.1.3. Direct lighting to the inside of the well sites.					
4. Surface Water Quality	4.1. Site Runoff and Drainage	4.1.1. Contamination of surface water from runoff and drainage	4.1.1.1. Implement construction and installation phase mitigation measures in 5.1.	Low	Provide drainage, buffer zone and earth bund surrounding well site area. Monitor and transport waste to prevent any overflow from waste pit before being transported for treatment and/or disposal by a certified	OVL	Throughout Drilling Phase duration	OVL's Management System
			4.1.1.2. Provide drainage, buffer zone and earth bund surrounding well site area.					

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures	Residual Risk	Specific Action	Responsible	Schedule	Records
			4.1.1.3. The fuel storage will be surrounded by a bund wall in case of spill.		waste oil disposal contractor.			
	4.2. Hazardous/non-hazardous waste management	4.2.1. Degradation of surface water quality from disposal of domestic sewage and grey water	4.2.1.1. Install concrete lined septic tank and soak away pit at the well site for holding & treating sewage.	Low	OVL in association with drilling contractor shall develop and implement the Waste Management Plan on site.	OVL	Throughout Construction Phase duration	OVL's Management System and Waste Management Plan Waste Manifest
5. Soil Quality	5.1. Drill site Runoff and Drainage	5.1.1. Contamination of soil from runoff	5.1.1.1. Implement drilling phase mitigation measures in 4.1.	Low	Implement drilling phase mitigation measures in 4.1 to reduce soil impacts.	OVL	Throughout Drilling Phase duration	OVL's Management System
6. Groundwater Quality	6.1. Loss of circulation during Drilling wells	6.1.1. Groundwater degradation from drilling	6.1.1.1. Install steel casing and cement in place to prevent chemical leak or contaminate into rock formation.	Low	Install and design steel casing and cement to prevent chemical leak or contaminate into rock formation.	OVL	Throughout Drilling Phase duration	OVL's Management System
			6.1.1.2. Strict steel casing to well wall by cementing to prevent chemical contaminate to groundwater level.					
	6.2. Infiltration from the waste pit and sub-irrigation field	6.2.1. Deterioration of shallow Groundwater	6.2.1.1. Install HDPE liner in the cuttings and dirty water waste pit. Monitor liner for tears or leaks during installation and operations.	Low	Install HDPE liner in the cuttings and dirty water waste pit.	OVL	Throughout Drilling Phase duration	OVL's Management System
Ecological Environmental Impact Assessment								
7. Terrestrial Flora and Fauna	7.1. Drilling Activities and Labour and	7.1.1. Aquatic biota and habitat disturbed	7.1.1.1. Fishing or Hunting will be prohibited to workers.	Low	Prohibit workers and contractors discharging or discarding project waste,	OVL	Throughout Drilling Phase duration	OVL's Management System

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures	Residual Risk	Specific Action	Responsible	Schedule	Records
	Accommodations	from workers' activities	7.1.1.2. Clearly mark signs showing the boundary of the project area.		chemicals, oil into public water sources.			
			7.1.1.3. Prohibit workers from cleaning machines/ equipment in a public water source.					
			7.1.1.4. Prohibit workers and contractors discharging or discarding project waste, chemicals, oil into public water sources.					
Social Impact Assessment								
8. Transport	8.1. Rig Move and Equipment and Vehicle Use.	8.1.1. Disruption of traffic	8.1.1.1. Ensure all vehicles are in good operating condition and comply with project safety standards. Drivers must be healthy, have valid licenses, and by no means allowed to drink alcohol or take forms of medicine or illicit drugs that can affect performance.	Medium	Follow speed limits.	OVL	Throughout Construction Phase duration	OVL's Management System
			8.1.1.2. Strictly Follow Speed Limits		Maintain all vehicles and comply with project safety standards.			
			8.1.1.3. Weight of the trucks shall not exceed the limit set by the Myanmar regulations to reduce damage to road surfaces or structures.		Weight of the trucks checked to ensure they do not exceed the limit set by the Myanmar regulations.			
			8.1.1.4. Safety equipment and emergency equipment must be installed on		Safety equipment and emergency equipment			

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures	Residual Risk	Specific Action	Responsible	Schedule	Records
			vehicles such as tool box safety belts and portable fire extinguisher etc. as per company standards.		must be installed on all vehicles.			
			8.1.1.5. Notify the local authority on the oversized load and put an escort in front of this convoy with horn and hazard lights.		Notify the local authority on the oversized load and put an escort in front of this convoy with horn and hazard lights.			
			8.1.1.6. Consult with Thegon and Pauhkkhaung GAD and Village Headmen before major movement.		Consult with local authority before major movement.			
			8.1.1.7. Restrict/ avoid movement of heavy equipment during rush hours.		Restrict/ avoid movement of heavy equipment during rush hours.			
			8.1.1.8. Provide traffic signs or flags at junction of access roads and main roads.		Provide traffic signs or flags at junction of access roads and main roads.			
			8.1.1.9. Investigate any complaints and handle appropriately. Keep records of complaints and follow-up.		Investigate any complaints and handle appropriately to OVL & MOGE requirements.			
			8.1.1.10. Obtain approval from MOGE and/or appropriate government offices before constructing, upgrading or reroute access roads.		Obtain approval from MOGE and/or appropriate government offices before constructing, upgrading or reroute access roads.			
			8.1.1.11. Strictly enforce training programs to reduce transport incident cases by its contractors.		Implement training programs to reduce transport incident cases by its contractors.			
			8.1.1.12. Restore any damage to roads that is caused by		Restore any damage to roads.			

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures	Residual Risk	Specific Action	Responsible	Schedule	Records
			contractors or Company.					
			8.1.1.13. Restrict local traffic in well site area		Restrict local traffic in well site area			
			8.1.1.14. Road Hazard Assessment will be conducted before transporting any large equipment by the civil contractor.		Conduct the Road Hazard Assessment before transporting any large equipment.			
			8.1.1.15. Vehicles will take direct routes where possible and avoid significant habitat areas.		Vehicles will take direct routes where possible and avoid significant habitat areas.			
			8.1.1.16. Construction vehicles will follow speed limits.		Construction vehicles will follow speed limits.			
		8.1.2. Damage to roads	8.1.2.1. Check and restore for any damage from project activities to local roads.		Check and restore for any damage to local roads.			
9. Water Supply	9.1. Use of public utility for water resources	9.1.1. Water usage of project affects the community's water supply.	9.1.1.1. Implement construction and installation phase mitigation measures in 10.1.	Low	Investigate any complaints regarding water use and handle appropriately. Keep records of complaints and follow-up.	OVL	Throughout Drilling Phase duration	OVL's Management System
			9.1.1.2. Investigate any complaints and handle appropriately. Keep records of complaints and follow-up.					
10. Power Use	10.1. Power for drilling operations and work camp	10.1.1. Increase or decrease of available power for local community	10.1.1.1. Install diesel-powered generators to supply all project power related needs.	Negligible	Install diesel-powered generators.	OVL	Throughout Drilling Phase duration	OVL's Management System

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures	Residual Risk	Specific Action	Responsible	Schedule	Records
11. Waste Management	11.1. Non Hazardous waste management	11.1.1. Domestic waste can be a fire hazard, constitute windblown litter, attract vermin, contaminated surface and groundwater and vector for disease	11.1.1.1. Implement construction and installation phase mitigation measures in 12.1.	Medium	OVL in association with drilling contractor shall develop and implement Waste Management Plan on site.	OVL	Throughout Construction Phase duration	OVL's Management System and Waste Management Plan Waste Manifest
	11.2. Hazardous waste management	11.2.1. Hazard waste contaminate to environment	11.2.1.1. Ensure treatment and disposal of hazardous waste by licensed contractor.	Medium	OVL in association with drilling contractor shall develop and implement the Waste Management Plan on site. Ensure treatment and disposal of hazardous waste by licensed contractor All hazardous waste will be collected in skips ready for treatment and disposal. Hazardous wastes will be transported for disposal approved waste management facility.	OVL	Throughout Drilling Phase duration	OVL's Management System and Waste Management Plan Waste Manifest
			11.2.1.2. Segregate and store hazardous waste in appropriate and safe containers that are suitable for transporting/transferring . Make sure all containers are clearly labeled.					
			11.2.1.3. Always check and record the type(s) and					

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures	Residual Risk	Specific Action	Responsible	Schedule	Records
			amount of hazardous waste generated.					
			11.2.1.4. Dispose of waste in labeled containers for possible recycling or reuse.					
			11.2.1.5. Prohibit open burning of any waste at project site.					
			11.2.1.6. Enforce "Good Housekeeping" practices.					
			11.2.1.7. All hazardous waste will be collected in skips ready for treatment and disposal. Hazardous wastes will be transported and disposed at approved waste management facility.					
			11.2.1.8. Provide Manifest System for transportation of hazardous waste to treatment area or disposal area.					
	11.3. Handling and Disposal of drill cuttings, sludge and chemicals.	11.3.1. Localized change in water quality and soil quality from chemical composition of drill fluids	11.3.1.1. Drill cuttings and adhered fluids will not be discharged to surrounding area.	Medium	OVL in association with drilling rig contractor shall develop Waste Management Plan on site. Ensure treatment and disposal of hazardous waste by licensed contractor and taken to Yangon for disposal at approved waste management facility.	OVL	Throughout Drilling Phase duration	OVL's Management System and Waste Management Plan Waste Manifest
			11.3.1.2. Volume of cuttings and fluids discharged will be minimised through use of solids control equipment.					
			11.3.1.3. Store all chemicals in secured storage area.					
			11.3.1.4. Hazardous wastes materials will be					

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures	Residual Risk	Specific Action	Responsible	Schedule	Records
			handled and stored in accordance with the corresponding MSDS.					
			11.3.1.5. Implement awareness training on the hazards of the chemicals.					
			11.3.1.6. Enforce use of PPE.					
			11.3.1.7. Handle chemicals only in well-ventilated and controlled areas					
			11.3.1.8. Fuel storage tanks to be surrounded by bund wall.					
			11.3.1.9. Isolate any area(s) that might be contaminated from non-contaminated areas. Provide water drainage system around the contaminated area for collecting water into the concrete pit.					
			11.3.1.10. Use oil catch pans under vehicles when performing maintenance. Conduct maintenance only on impervious surfaces (i.e. on tarpaulin sheet).					
			11.3.1.11. Provide spill clean up kits and training for designated rapid response teams to clean up any spills. In the event of oil or chemical spill, implement spill response plan.					
			11.3.1.12. Deposit treated cuttings into the cuttings pit,					

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures	Residual Risk	Specific Action	Responsible	Schedule	Records
			where they are to be temporarily held before bioremediation onsite after the rig move out from location or sent for disposal at approved waste management facility.					
			11.3.1.13. Monitor level of cuttings and dirty water in waste pit.					
			11.3.1.14. Implement land transportation procedure.					
12. Socio-Economy	12.1. Employment opportunities and Use of local goods and services	12.1.1. Employment and income	12.1.1.1. Employ qualified local workers if possible.	Positive	Employ qualified local workers and purchase local supplies and services	OVL	Throughout Drilling Phase duration	OVL's Management System
			12.1.1.2. Purchase local supplies and services with required specifications, whenever possible.					
Health Impact Assessment								
13. Occupational and Public Health	13.1. Rig, Generators and Equipment	13.1.1. Health impact from noise	13.1.1.1. Implement drilling phase mitigation measures in 2.1.	Negligible	Provide all required PPE to workers on site.	OVL	Throughout Drilling Phase duration	OVL's Management System
			13.1.1.2. Provide PPE to workers on site					
	13.2. Non-Hazardous waste management	13.2.1. Health impact from Non-Hazardous Waste	13.2.1.1. Implement construction and installation phase mitigation measures in 12.1.	Medium	OVL in association with drilling rig contractor shall develop and implement Waste Management Plan on site.	OVL	Throughout Drilling Phase duration	OVL's Management System and Waste Management Plan and Waste Manifest
	13.3. Handling and Disposal of Hazardous Waste	13.3.1. Health impact from hazardous Waste	13.3.1.1. Implement drilling phase mitigation measures in 11.2.	Medium	Implement the OVL Waste Management Plan on site.	OVL	Throughout Drilling Phase duration	OVL's Management System and Waste

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures	Residual Risk	Specific Action	Responsible	Schedule	Records
								Management Plan and Waste Manifest
	13.4. Hazardous waste management and chemical handling	13.4.1. Health impact from Mud, Chemicals and Drilling Waste	13.4.1.1. Implement drilling phase mitigation measures in 11.3.	Medium	Implement the OVL Waste Management Plan on site.	OVL	Throughout Drilling Phase duration	OVL's Management System and Waste Management Plan and Waste Manifest
	13.5. Labour and Accommodation	13.5.1. Health impact from Communicable Diseases	13.5.1.1. Implement construction and installation phase mitigation measures in 12.1 13.5.1.2. The accommodation will be fitted with required utilities and facilities (sanitation, water, sewage, waste pit, electricity grounding and internet connection), as well as waste collection and segregation points as per international oil field practices	Medium	Install and Maintain an On-site health clinic and referral system during to ensure timely diagnosis and treatment of workers' illness and injury.	OVL	Throughout Drilling Phase duration	OVL's Management System
			13.5.1.3. Deposit treated cuttings into the cuttings pit, where they are to be temporarily held before bioremediation onsite after the rig move out from location or sent for disposal at approved waste management facility					
			13.5.1.4. Drainage and removal of waste from waste pit upon completion of drilling					

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures	Residual Risk	Specific Action	Responsible	Schedule	Records
			13.5.1.5. Health screening of workers before employment.					
			13.5.1.6. On-site health clinic (drilling operations) and referral system during all of project operations with external health agencies to ensure timely diagnosis and treatment of workers' illness and injury.					
			13.5.1.7. Considering on hiring of qualified local workers to reduce reliance on outside labour and increase local employment.					
			13.5.1.8. Do not allow workers to enter communities near the drill site.					
			13.5.1.9. Provide awareness to workers on preventive measures for the prevention of communicable and local diseases.					

Table 8-5: Mitigation Measures and Required Actions During Well Testing Phase

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures	Residual Risk	Specific Action	Responsible	Schedule	Records
Physical Environmental Impact Assessment								
1 Air Quality	1.1 Vehicle and Equipment Use	1.1.1 Deterioration of air quality due to dust.	1.1.1.1 Implement construction and installation phase mitigation measures in 2.1.	Low	Implement construction and installation phase mitigation measures in 2.1 to reduce dust impacts.	OVL	Throughout Well Testing Phase duration	OVL's Management System
		1.1.2 Deterioration of air quality due to combustion of diesel fuel and flaring.	1.1.2.1 Implement construction and installation phase mitigation measures in 2.2.		Implement construction and installation phase mitigation measures in 2.2 to reduce air emission impacts.			
			1.1.2.2 Process control to minimize flaring.		Process control to minimize flaring and Verify the operation's flaring system to highest efficiency.			
			1.1.2.3 Maintain pilot flame at the flare tip to ensure that flame is not extinguished by strong wind.					
			1.1.2.4 Verify the operation's flaring system to highest efficiency.					
	1.2 Well testing releasing hydrogen sulfide	1.2.1 Deterioration of air quality due to hydrogen sulfide	1.2.1.1 Install Gas Detectors.	Low	H2S detection and safety equipment is standard issue. OVL's emergency response plan (ERP) includes an H2S Contingency Plan. OVL in association with drilling contractor shall further develop the emergency response plan (ERP) and H2S Contingency Plan.	OVL	Throughout Well Testing Phase duration	OVL's Management System
			1.2.1.2 If H2S levels exceed 10 ppm in the gas stream, appropriate safety zone to be established (8 hr TWA).					
			1.2.1.3 All crew are instructed and rehearsed in H2S procedures.					
			1.2.1.4 Limit well testing period where possible.					
	1.3 Flare Emissions	1.3.1 Climate Change due GHG	1.3.1.1 To maximize energy efficiency and design facilities to minimize energy use	Low	Maximize energy efficiency and design facilities to minimize energy use. Locate flare at a safe distance from local communities and the	OVL	Throughout Well Testing Phase duration	OVL's Management System

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures	Residual Risk	Specific Action	Responsible	Schedule	Records
					workforce including workforce accommodation units.			
			1.3.1.2 Operating flare to control odor and visible smoke emissions.					
			1.3.1.3 Locate flare at a safe distance from local communities and the workforce including workforce accommodation units					
			1.3.1.4 Implementation of burner maintenance and replacement, programs to ensure continuous maximum flare efficiency.					
			1.3.1.5 Keep installation and functioning of flare gas system safe according to the good engineering practice.					
			1.3.1.6 Ensure flare system has efficient combustion.					
			1.3.1.7 Maintain pilot flame at the flare tip to ensure that flame is not extinguished by strong wind.					
			1.3.1.8 Verify the operation's flaring system.					
			1.3.1.9 Minimize the duration of flaring when possible					
2 Noise	2.1 Flaring during Well Testing	2.1.1 Increase in noise levels during well testing.	2.1.1.1 Implement construction and installation phase mitigation measures in3.1.	Low	Implement construction and installation phase mitigation measures in 3.1 to reduce noise impacts.	OVL	Throughout Well Testing Phase duration	OVL's Management System
			2.1.1.2 Verify the operation's flaring system.					

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures	Residual Risk	Specific Action	Responsible	Schedule	Records
			2.1.1.3 Minimize the duration of flaring when possible.					
3 Heat and Light	3.1 Flaring during Well testing	3.1.1 Increase in light at night from flaring	3.1.1.1 Position flare away from sensitive receptors	Negligible	Position flare away from sensitive receptors and Maintain safety distance between flare stack and well site facilities and adjacent crops	OVL	Throughout Well Testing Phase duration	OVL's Management System
			3.1.1.2 Direction the light into wellpad as much as possible.					
			3.1.1.3 Minimize the duration of flaring process when possible					
		3.1.2 Increase heat from flaring	3.1.2.1 Clear vegetation around the flare stack.					
			3.1.2.2 Minimize flare duration when possible.					
			3.1.2.3 Maintain safety distance between flare stack and well site facilities and adjacent crops)					
			3.1.2.4 Follow flare management procedures to ensure optimum management of fare system					
4 Surface Water Quality	4.1 Non - Hazardous waste management	4.1.1 Contamination of surface water from drained domestic waste and gray water	4.1.1.1 Prohibit workers from cleaning machines/ equipment in a public water source.	Low	OVL in association with drilling rig contractor shall develop Waste Management Plan on site.	OVL	Throughout Construction Phase duration	OVL's Management System and Waste Management Plan Waste Manifest
			4.1.1.2 Prohibit workers and contractors discharging or discarding project waste, chemicals, oil into public water sources.					

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures	Residual Risk	Specific Action	Responsible	Schedule	Records
			4.1.1.3 Install septic tank and soak away pit on each well site for holding sewage.					
5 Soil Quality	5.1 Non - Hazardous waste management	5.1.1 Contamination of soil from drained domestic waste and gray water	5.1.1.1 Prohibit workers from cleaning machines/ equipment in non designated areas.	Low	OVL in association with drilling rig contractor shall develop Waste Management Plan on site.	OVL	Throughout Construction Phase duration	OVL's Management System and Waste Management Plan Waste Manifest
			5.1.1.2 Prohibit workers and contractors discharging or discarding project waste, chemicals, oil in non designated areas.					
			5.1.1.3 Install septic tank and soak away pit on each well site for holding sewage.					
Ecological Environmental Impact Assessment								
6 Terrestrial Flora and Fauna	6.1 Labour and Accommodations	6.1.1 Habitat degradation from workers' activities	6.1.1.1 Mark well site clearly and prohibit vehicles from moving off site onto surrounding land.	Low	Contractors and personnel will not be allowed off site.	OVL	Throughout Well Testing Phase duration	OVL's Management System
			6.1.1.2 Forest incursions will be specifically prohibited.					
			6.1.1.3 Contractors and personnel will not be allowed off site where they could cause unnecessary disturbance to vegetation.					
	6.2 Flaring during Well Testing	6.2.1 Habitat degradation from light and heat	6.2.1.1 Implement well testing phase mitigation measures 3.1.	Low	Implement well testing phase mitigation measures 3.1 to reduce light and heat impacts.	OVL	Throughout Well Testing Phase duration	OVL's Management System

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures	Residual Risk	Specific Action	Responsible	Schedule	Records
Social Impact Assessment								
7 Transport	7.1 Vehicle and Equipment Use	7.1.1 Disruption of traffic	7.1.1.1 Implement construction and installation phase mitigation measures in 9.1.	Medium	Implement construction and installation phase mitigation measures in 9.1 to reduce disruption to traffic.	OVL	Throughout Well Testing Phase duration	OVL's Mnagement System
		7.1.2 Damage to roads.	7.1.2.1 Regularly restore any damaged roads from project activities to good condition.					
8 Waste Management	8.1 Hazardous/ Non - Hazardous waste management	8.1.1 Domestic waste can be a fire hazard, constitute. windblown litter, attract vermin, contaminate surface and groundwater and be a vector for disease	8.1.1.1 Implement construction and installation phase mitigation measures in 12.1.	Medium	OVL in association with drilling rig contractor shall develop Waste Management Plan on site.	OVL	Throughout Construction Phase duration	OVL's Management System and Waste Management Plan Waste Manifest
		8.1.2 Hazard waste	8.1.2.1 Implement from drilling phase in 13.4.					
			8.1.2.2 Transport produced water to dispose by licensed water treatment facility.					
9 Socio-Economy	9.1Labour and Accommodation	9.1.1 Employment and Income	9.1.1.1 Implement drilling phase mitigation measures in 12.1.	Positive	Implement drilling phase mitigation measures in 12.1 to increase socio-economic benefits.	OVL	Throughout Well Testing Phase duration	OVL's Management System
Health Impact Assessment								
10 Occupational and Public Health	10.1 Flaring	*10.1.1* Heat exposure and Nuisance from Light and heat	10.1.1.1 Implement well testing phase mitigation measures 3.1.	Medium	OVL in association with drilling contractor shall develop emergency response plan (ERP).	OVL	Throughout Well Testing Phase duration	OVL's Management System
			10.1.1.2 OVL in association with drilling contractor shall					

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures	Residual Risk	Specific Action	Responsible	Schedule	Records
			develop emergency response plan (ERP).					
			10.1.1.3 Install fire extinguishers, alarms and windsocks (to be audible and visible from whole site).					
			10.1.1.4 Heat impacts from the flare stack will be minimised by having a flare stack as per international standards.					
			10.1.1.5 Maintain a safe distance from nearest sensitive receptor					
	10.2 Flaring	10.2.1 Increase in respiratory illnesses/diseases, asthma, Disturbance psychological wellbeing from flaring emissions	10.2.1.1 Ensure flare system has efficient combustion.	Medium	H2S detection and safety equipment is standard issue. OVL's emergency response plan (ERP) includes an H2S Contingency Plan. OVL in association with drilling contractor shall develop emergency response plan (ERP).	OVL	Throughout Well Testing Phase duration	OVL's Management System
			10.2.1.2 Clear vegetation around the flare stack.					
			10.2.1.3 Maintain pilot flame at the flare tip to ensure that flame is not extinguished by strong wind.					
			10.2.1.4 H2S detection and safety equipment is standard issue. OVL in association with drilling contractor shall develop emergency response plan (ERP) and H2S Contingency Plan.					

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures	Residual Risk	Specific Action	Responsible	Schedule	Records
			10.2.1.5 Monitor H2S during well testing.					
			10.2.1.6 Staff trained in H2S procedures.					
	10.3 Non-hazardous waste management	10.3.1 Waste can be a contaminate surface and groundwater, and be a vector for disease.	10.3.1.1 Implement construction and installation phase mitigation measures in 12.1.	Medium	OVL in association with drilling rig contractor shall develop Waste Management Plan on site.	OVL	Throughout Well Testing Phase duration	OVL's Management System and Waste Management Plan Waste Manifest
	10.4 Hazardous waste management	10.4.1 Health impacts from Hazardous Waste	10.4.1.1 Implement drilling phase mitigation measures in 11.2.	Medium	OVL in association with drilling rig contractor shall develop Waste Management Plan on site.	OVL	Throughout Well Testing Phase duration	OVL's Management System and Waste Management Plan Waste Manifest

Table 8-6: Mitigation Measures and Required Actions During Well Abandonment Phase

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures	Residual Risk	Specific Action	Responsible	Schedule	Records
Physical Environment Impact Assessment								
1 Topography	1.1 Site and Road abandonment and restoration	1.1.1 Disturbance to local topography	1.1.1.1 Limit site-clearing activities to well sites and access roads only.	Low	Limit site-clearing activities to well sites and access roads and hand back to MOGE as per MOGE procedure.	OVL	Throughout Well Abandonment Phase duration	OVL's Management System
			1.1.1.2 Restore the site and hand back to MOGE as per MOGE procedure.					
2 Air Quality	2.1 Vehicle and Equipment Use	2.1.1 Deterioration of air quality due to dust.	2.1.1.1 Implement construction and installation phase mitigation measures in 2.1.	Low	Implement construction and installation phase mitigation measures in 2.1 to ensure reduction of dust, air pollution and GHG during abandonment phase	OVL	Throughout Well Abandonment Phase duration	OVL's Management System
		2.1.2 Deterioration of air quality due to combustion of diesel fuel.	2.1.2.1 Implement construction and installation phase mitigation measures in 2.2.					
		2.1.3 Climate Change due to GHG	2.1.3.1 Implement construction and installation phase mitigation measures in 2.3.					
3 Noise	3.1 Vehicle and Equipment Use	3.1.1 Increase in noise levels from machines / engines during site demolition & restoration and transportation	3.1.1.1 Implement construction and installation phase mitigation measures in 3.1.	Low	Implement construction and installation phase mitigation measures in 3.1 ensure reduction noise during abandonment phase	OVL	Throughout Well Abandonment Phase duration	OVL's Management System

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures	Residual Risk	Specific Action	Responsible	Schedule	Records
4 Surface Water Hydrology	4.1 Restore site	4.1.1 Alteration of surface water hydrology	4.1.1.1 During restoration, avoid causing obstacles to water drainage	Low	Implement construction and installation phase mitigation measures in 5.1 ensure protection of surface water hydrology during abandonment phase	OVL	Throughout Well Abandonment Phase duration	OVL's Management System
			4.1.1.2 Construct water drainage lines (culverts/causeway) to maintain natural drainage. The required permission will be obtained from MOGE and all relevant agencies.		Restore the site and hand back to MOGE as per MOGE procedure.			
5 Surface Water Quality	5.1 Hazardous/non-hazardous waste management	5.1.1 Potential contamination from spills or wastewater drainage to nearby water bodies during site restoration	5.1.1.1 Implement construction and installation phase mitigation measures in 5.1.	Low	Implement construction and installation phase mitigation measures in 5.1 ensure protection of surface water hydrology during abandonment phase	OVL	Throughout Well Abandonment Phase duration	OVL's Management System
			5.1.1.2 Restore the site and hand back to MOGE as per MOGE procedure.		Restore the site and hand back to MOGE as per MOGE procedure.			
6 Soil Quality	6.1 Soil excavation for site restoration	6.1.1 Degradation of soil quality through compaction or erosion during site demolition & restoration.	6.1.1.1 Limit site demolition & restoration only to well sites and access roads.	Low	Limit site demolition & restoration to well sites and access roads only.	OVL	Throughout Well Abandonment Phase duration	OVL's Management System
			6.1.1.2 Restore the site and hand back to MOGE as per MOGE procedure.		Restore the site and hand back to MOGE as per MOGE procedure.			

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures	Residual Risk	Specific Action	Responsible	Schedule	Records
7 Groundwater quality	7.1 Hazardous/Non - Hazardous waste management and chemical handling	7.1.1 Contamination of groundwater from waste, chemicals and wastewater	7.1.1.1 Prohibit workers from cleaning machines/ equipment in unauthorized locations. 7.1.1.2 Prohibit workers and contractors discharging or discarding project waste, chemicals, or oil in unauthorized locations. 7.1.1.3 Install septic tank on each well site for holding sewage and grey water. 7.1.1.4 Store wastes and chemicals in a secure area that has a hard surface and closed drains.	Low	Prohibit workers from cleaning machines/ equipment, discharging or discarding project waste, chemicals, or oil in unauthorized locations.	OVL	Throughout Well Abandonment Phase duration	OVL's Management System
Ecological Environment Impact Assessment								
8 Terrestrial Flora and Fauna	8.1 Labour and Accommodations	8.1.1 Degradation or destruction of natural habitat and harvesting wild plants / animals	8.1.1.1 Limit abandonment to daytime hours only. 8.1.1.2 Contractors and personnel will not be allowed off site where they could cause unnecessary disturbance to flora and fauna. In addition, fishing and hunting will be specifically prohibited.		Limit construction equipment to daytime hours only. Contractors and personnel will not be allowed off site.	OVL	Throughout Well Abandonment Phase duration	OVL's Management System

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures	Residual Risk	Specific Action	Responsible	Schedule	Records
	8.2 Site-Run off and drainage	8.2.1 Potential degradation or destruction of aquatic biota	8.2.1.1 Implement construction and installation phase mitigation measures in 7.3.	Low	Implement construction and installation phase mitigation measures in 7.3 to ensure no site-run off and drainage impacts.	OVL	Throughout Well Abandonment Phase duration	OVL's Management System
Social Impact Assessment								
9 Land Use	9.1 Return of Land used for roads, well site and camp site	9.2 Change of traditional use.	9.2.1.1 Restore the site and hand back to MOGE as per MOGE procedure.		Hand back wellsite to MOGE as per MOGE procedure.			
10 Transportation	10.1 Vehicle and Equipment Use	10.1.1 Disruption of traffic.	10.1.1.1 Implement construction and installation phase mitigation measures in 9.1.	Medium	Implement construction and installation phase mitigation measures in 9.1 to reduce distuption to traffic.	OVL	Throughout Well Abandonment Phase duration	OVL's Management System
	10.2 Site restoration	10.2.1 Damage to roads.	10.2.1.1 Restore any damage to roads.		Restore all damage to roads.			
11 Waste Management	11.1 Hazardous/non-hazardous waste management	11.1.1 Non-hazardous waste can contaminate surface and groundwater and be a vector for disease.	11.1.1.1 Implement construction and installation phase mitigation measures in 12.1.	Medium	OVL in association with drilling rig contractor shall develop Waste Management Plan on site.	OVL	Throughout Construction Phase duration	OVL's Management System and Waste Management Plan Waste Manifest
11 Socio-Economy	11.1 Labour and Accommodations	11.1.1 Employment and Income	11.1.1.1 Implement drilling phase mitigation measures in 12.1.	Positive	Implement construction phase mitigation measures to increase socio-economic benefits.	OVL	Throughout Abandonment Phase duration	OVL's Management System
Health Impact Assessment								
12 Public and Occupational Health	12.1 Non-hazardous waste management	12.1.1 Exposure to non-hazardous wastes,	12.1.1.1 Implement construction and installation phase mitigation measures in 12.1.	Negligible	OVL in association with drilling rig contractor shall develop Waste Management Plan on site.	OVL	Throughout Construction Phase duration	OVL's Management System and Waste Management Plan

Table 8-7: Mitigation Measures and Required Actions During Unplanned Event

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures	Residual Risk	Specific Action	Responsible	Schedule	Records
1. Blowout	1.1 Drilling	1.1.1 Release of uncontrolled volumes of hydrocarbons, Fire and Explosion	1.1.1.1 Examination of existing wells to identify shallow gas hazards.	Medium	Ensure OVL's HSE Integrated Management System Procedures and Emergency Response Plan operational controls are enfored to prevent a blowout/explosion As the Contingency Plan requires information about the equipment, facilities and organizational structure of the Drilling contractor, the detailed plans shall be prepared in association with drilling contractor, after the award of contract, as a part of a Bridging document.	OVL	Throughout project duration	OVL's Management System
			1.1.1.2 Drilling and Well Control Standard Operating Procedures and extensive HSE Management System procedures and operational controls in place.					
			1.1.1.3 Internal hazardous operations reviews and "Table Top Drilling" exercises to test procedures and individual personnel performances against the drilling plan.					
			1.1.1.4 Select proper drill fluid formulation, provide well kill fluids/systems, loss control and weighting agents.					
			1.1.1.5 Very careful monitoring of down hole conditions and mud returns.					
			1.1.1.6 Use of appropriate, high quality materials in well					

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures	Residual Risk	Specific Action	Responsible	Schedule	Records
			construction (casing and cement grades).					
			1.1.1.7 Provide a blowout preventer (BOP) stack that is sized appropriately in proportion to the maximum formation pressure; and test as per procedures.					
			1.1.1.8 Follow OVL's Emergency Response Plan and Blow Out Contingency Plan					
			1.1.1.9 OVL's HSE Integrated Management System Procedures and operational controls will be in place to prevent a blowout/explosion.					
2. Fire or Explosion (not associated with Blowout)	2.1 Fuel Storage and Ignition Sources	2.1.1 Possible explosion or fire of drilling rig or at campsite, or fuel storage area	2.1.1.1 OVL's HSE Integrated Management System Procedures and operational controls to prevent a fire/explosion.	Medium	Ensure OVL's HSE Integrated Management System Procedures and Emergency Response Plan operational controls are enfored to prevent a fire/explosion. As the Contingency Plan requires information about the equipment, facilities and organizational structure of the Drilling contractor, the detailed plans shall be prepared in association with drilling contractor, after the award of contract, as a part of a Bridging document.	OVL	Throughout project duration	OVL's Management System
			2.1.1.2 OVL's Emergency Response Plan including specific management procedures to mitigate the impacts if a fire/explosion occurs.					

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures	Residual Risk	Specific Action	Responsible	Schedule	Records
			2.1.1.3 Install fire extinguishers, alarms and windsocks (to be audible and visible from whole site).					
			2.1.1.4 Pre-arranged call out support from local fire brigades.					
3. Fuel, Chemical or Hazardous Waste/Materials Spill	3.1 Storage of Fuel, chemicals, hazardous materials or waste	3.1.1 Potential risk of spills to the environment affecting air quality, soil quality, surface water, groundwater, biota and people	3.1.1.1 Chemicals, Hydrocarbons and hazardous materials or waste will be securely stored and use governed by safe operating procedures.	Medium	Chemicals, Hydrocarbons and hazardous materials or waste will be securely stored and use governed by safe operating procedures with Procedures for response to Chemicals, Hydrocarbons and hazardous materials or waste spills will be included in OVL's ERP. As the Contingency Plan requires information about the equipment, facilities and organizational structure of the Drilling contractor, the detailed plans shall be prepared in association with drilling contractor, after the award of contract, as a part of a Bridging document.	OVL	Throughout project duration	OVL's Management System
			3.1.1.2 Spill containment and recovery equipment will be available near storage areas.					
			3.1.1.3 Procedures for response to Chemicals, Hydrocarbons and hazardous materials or waste spills will be included in OVL's ERP and Spill Contingency Plan.					
			3.1.1.4 MSDS Sheets will be posted in areas where Chemicals, Hydrocarbons and hazardous materials					

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures		Residual Risk	Specific Action	Responsible	Schedule	Records
				or waste is stored and with the HSE Officer.					
			3.1.1.5	Construct drainage system around well sites and concrete rig pad which mud tanks, shakers, generators and fuel tanks sit on to divert any spills into the concrete pit.					
			3.1.1.6	Use oil catch pans under vehicles when performing maintenance. Conduct maintenance only on impervious floor (e.g. tarpaulin sheet).					
			3.1.1.7	Provide drip pans and absorbents to contain any spillage.					
			3.1.1.8	Provide spill cleanup kits and training for designated rapid response teams to clean up any spills. In the event of oil or chemical spill, implement ERP.					
			3.1.1.9	Prohibit workers from cleaning machines/ equipment in/near a public water source.					
			3.1.1.10	Prohibit workers and contractors discharging or discarding project waste, chemicals, and oil into public water sources.					
			3.1.1.11	Maintain oil traps along perimeter drainage around concrete pad to					

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures	Residual Risk	Specific Action	Responsible	Schedule	Records
			prevent any spills from flowing off site.					
			3.1.1.12 Isolate any area(s) that might be contaminated from non-contaminated areas.					
			3.1.1.13 Store Chemicals and hazardous materials on concrete pad.					
			3.1.1.14 Procedures for response to chemical spills will be included in OVL's ERP.					
			3.1.1.15 Deposit treated cuttings into the cuttings pit, where they are to be temporarily held before bioremediation onsite after the rig move out from location or sent for disposal at approved waste management facility.					
4. Transportation Accidents	4.1 Vehicle and Equipment Use	4.1.1 Possible injury or death to personnel; and localized contamination of environmer	4.1.1.1 Follow HSE Integrated Management System Procedures.	Medium	Implement OVL's HSE Integrated Management System Procedures to prevent transportation accident.	OVL	Throughout project duration	OVL's Management System
			4.1.1.2 Limit the speed of project vehicles, according to the road condition.					
			4.1.1.3 Maintain construction equipment and vehicles.					
			4.1.1.4 Notify the local authority on the oversized load and put an escort in front of					

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures	Residual Risk	Specific Action	Responsible	Schedule	Records
			this convoy with horn and hazard lights.					
			4.1.1.5 Consult with community leaders on plan and transportation route before movement of large equipment.					
			4.1.1.6 Restrict/ avoid movement of heavy equipment during rush hours.					
			4.1.1.7 Provide traffic signs or flags at junction of access road and main road.					
			4.1.1.8 Investigate any complaints and handle appropriately. Keep records of complaints and follow-up.					
			4.1.1.9 Strictly enforce training programs to reduce transport and drilling incidents by its contractors.					
			4.1.1.10 Restore any damage to roads caused by project vehicles.					
			4.1.1.11 Implement emergency response training, fire training and response drills.					
			4.1.1.12 Prohibit trespassers from entering the construction site.					
			4.1.1.13 Referral system with external medical facilities for serious injuries or emergencies.					

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures	Residual Risk	Specific Action	Responsible	Schedule	Records
5. Earthquakes	5.1 Physical shifting of earths surface	5.1.1 Potential physical disruption cause building collapse, blowouts, fires or spills	5.1.1.1 Implement OVL's Emergency Response Plan.	Low	Implement OVL's Emergency Response Plan.	OVL	Throughout project duration	OVL's Management System

8.5.3 Environmental, Social, and Health Impacts and Monitoring Measures

A summary of EHS impact and monitoring measures for the onshore exploration drilling are shown **Table 8-8**.

Table 8-8: Environmental, Social, and Health Monitoring Measures for All Phases

Factors	Index/Parameter	Procedure	Proposed Duration and Frequency of Monitoring	Location	Reporting
Air Quality	• PM_{10} • $PM_{2.5}$ • NOx, • SOx, • Ozone • H_2S	Method • Myanmar National Environmental Quality (Emission) Guidelines, Effective since 2015 in accordance with The Environmental Conservation Law, 2012, and • WHO Air quality guideline (2006) and amendment.	**Duration:** 1 day continuously **Frequency:** • Once during construction, drilling and testing phases • In case of any complaint regarding air quality, an additional air quality measurement may be conducted in response to specific complaints (if necessary)	Nearest sensitive receptor or downwind of complaint area (if necessary)	• OVL to submit a Environmental Monitoring Report via ECD to MONREC every 6 months including air quality monitoring results.
Noise	• L_{eq} 24 hr • L_{max} • L_{dn}	Method • Measure background noise level, residual noise level, specific noise level and calculation of noise using a Type 1 or 2 sound level meters	**Duration:** 1 day continuously **Frequency:** • Once during construction, drilling and testing phases • In case of a complaint regarding noise from	100 meter from Drill Rig	• OVL to submit a Environmental Monitoring Report via ECD to MONREC every 6 months including noise monitoring results.

Factors	Index/Parameter	Procedure	Proposed Duration and Frequency of Monitoring	Location	Reporting
		meeting all appropriate IEC standards • Myanmar National Environmental Quality (Emission) Guidelines, Effective since 2015 in accordance with The Environmental Conservation Law, 2012, and • Following the Guidelines for Community Noise, World Health Organization (WHO), 1999	project site, an additional noise measurement may be conducted (if necessary)		
Cuttings from drilling (in case of further using cuttings)	• Chloride (for WBM) • Oil on Cuttings (for LTSOBM) • Mercury (in stock Barite) • Cadmium (in stock Barite)	Method • Myanmar National Environmental Quality (Emission) Guidelines, Effective since 2015 in accordance with The Environmental Conservation Law, 2012,	• Upon Completion of Drilling Phase before mixing / burial disposal in waste pit.	• Exploration drilling well	• Drilling Contractor to provide cuttings testing results to OVL • OVL to submit a Environmental Monitoring Report via ECD to MONREC every 6 months.
Chemical use for drilling	• Type of chemical • Volume of use	• Daily record type of chemicals and volume used.	• Daily and report after drilling is completed	• Project area	• Drilling Contractor to provide records of chemical use in drilling monthly to OVL. • OVL to submit a Environmental Monitoring Report via ECD to MONREC every 6 months.
Hazardous and Non-hazardous waste	• Manifest Disposal and Tracking Report	• Track waste volume by type and disposal location daily	• During Drilling Phase	• At all project locations	• Drilling Contractor to provide Monthly Environmental hazardous and non-hazardous waste disposal record to OVL. • OVL to submit a Environmental Monitoring Report via ECD to MONREC every 6 months.
Social	• Complaint • Monitoring and solving	• Record complaint • Monitor, investigate and implement suitable solutions	• Throughout all phases	• Project area, community around project area, and transportation route	• Drilling Contractor to Records of grievance in accordance with the community grievance mechanism and provide to OVL monthly.

Factors	Index/Parameter	Procedure	Proposed Duration and Frequency of Monitoring	Location	Reporting
					• OVL to submit a Environmental Monitoring Report via ECD to MONREC every 6 months.
Public and Occupational health and safety	• Accidental statistics • cause of accidents • Mitigation measures	• Record accidents or near misses generated during construction by identifying cause(s) and severity of impact(s), as well as operated mitigation measures • Conduct summary report for accident investigation	• Throughout all phases	• Project area, community around project area, and transportation route	• Drilling Contractor to provide Incident reports monthly to OVL. • OVL to submit a Environmental Monitoring Report via ECD to MONREC every 6 months.

1 = Extracted by using Waste Extraction Test Method and Leaching Test Method and also classify that analyzed cuttings is non-hazardous waste or hazardous waste by using analysis method and standard values

8.6 Overall Management and Monitoring Plan Budgets

Management actions are defined to prevent or mitigate potential issues from occurring and monitoring will provide:

(1) Data on waste-stream emissions to ensure an ongoing assessment of operating standards and to measure performance against established requirements (objectives, targets, and performance criteria).
(2) Data on the environment to measure changes from the original environmental conditions.

The baseline survey reported in this EIA provided information on the relevant chemical, biological and social environment before start-up of operations. Follow-up monitoring will be done to determine any possible changes as a result of the proposed OVL Exploration Drilling Project.
Discharges and emissions from the proposed project are monitored to determine compliance with regulations and/or company standards.

Monitoring therefore includes ambient monitoring of the environment and monitoring of discharges.
Monitoring measures for the construction, drilling, well testing and abandonment are outlined in the respective plans.

The following list presents the specific management plans foreseen for the Project, based on the outcomes of the impact assessment.

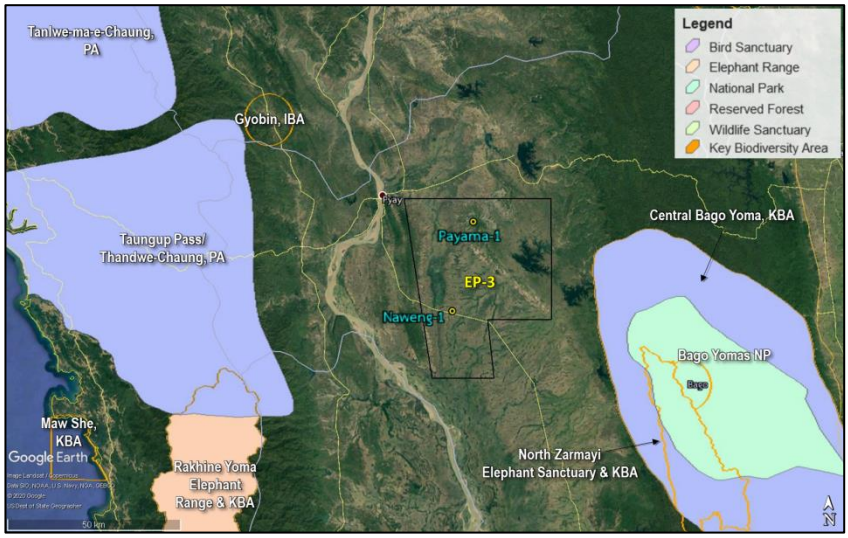
- Air Quality Management Plan
- Noise Management Plan
- Soil Management Plan
- Water Management Plan
- Waste Management Plan
- Emergency Response Plan
- Biodiversity Action Plan
- Public Consultation Plan & Grievance Mechanism
- Cultural Heritage Management Plan
- Occupational Health/Public Health Plan

The Fuel Management plan, Spill Contingency Plan, BOCP & H2S Contingency Plan require information about the equipment, facilities and organizational structure of the Drilling contractor, hence detailed plans shall be prepared in association with drilling contractor, after the award of contract, as part of a Bridging document. Note that for any monitoring in future, equivalent equipment and methods acceptable to the Myanmar Government and as per best international oil and gas industry best practices will be applied.

The overall budget required to implement the specific management plans based on the outcomes of the impact assessment and OVL's QHSE standards is **approximately** $**175,000 USD.** OVL will allocate it in the drilling budget. However, OVL will allocate additional budget if required to meet the applicable laws in Myanmar.

8.7 Overview Maps of Well Site Locations and Sensitive Receptors

When reviewing the management plan, please refer to the following maps of the sensitive receptors near each of the planned potential well sites.



Source: UNEP-WCMC (2019)

Figure 8-1: Protected Areas and Key Biodiversity Areas

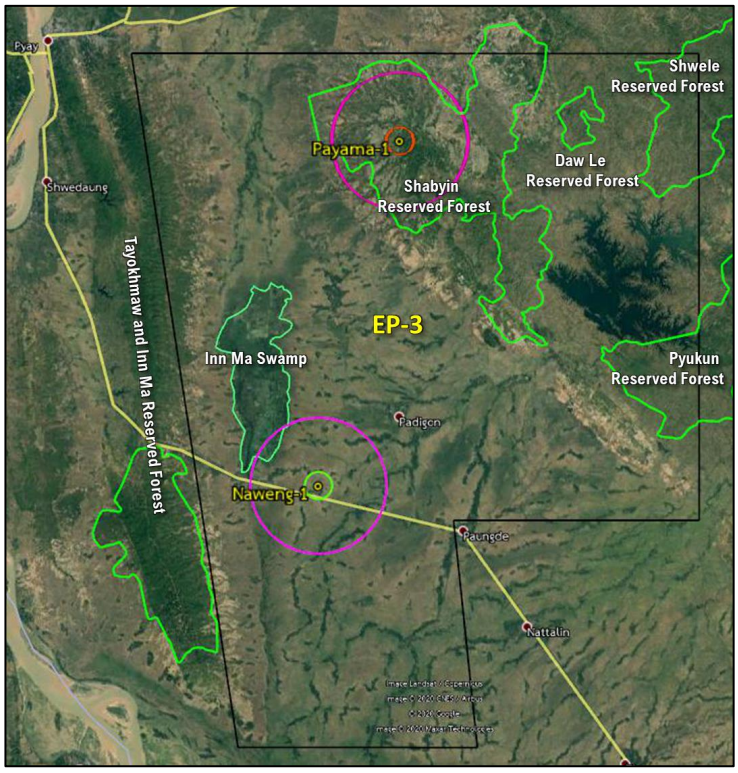


Figure 8-2: Reserved Forest Boundaries in Block EP-3

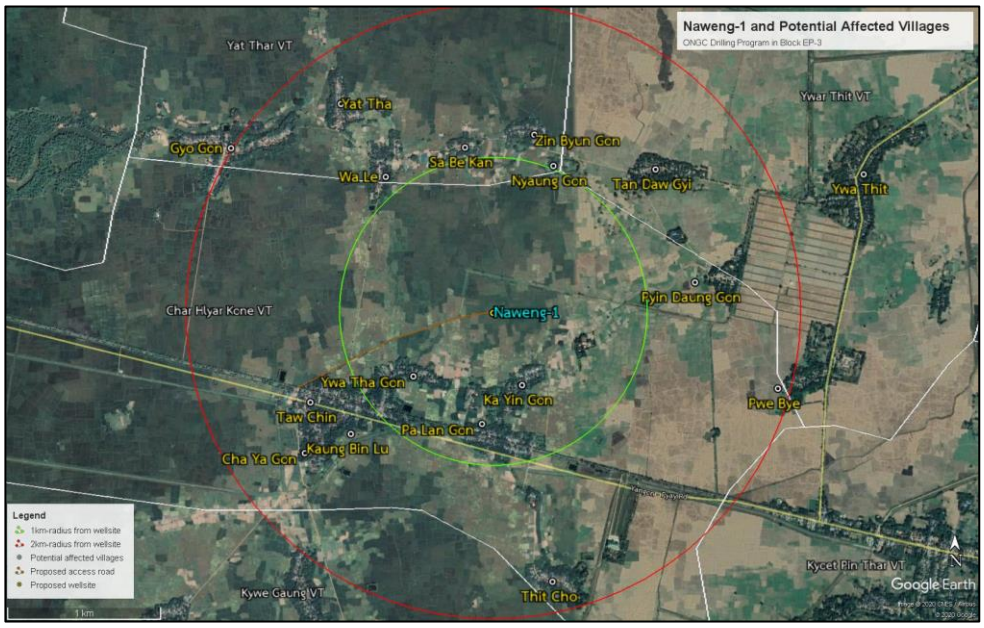


Figure 8-3: Potentially Affected Villages from Naweng-1 Well

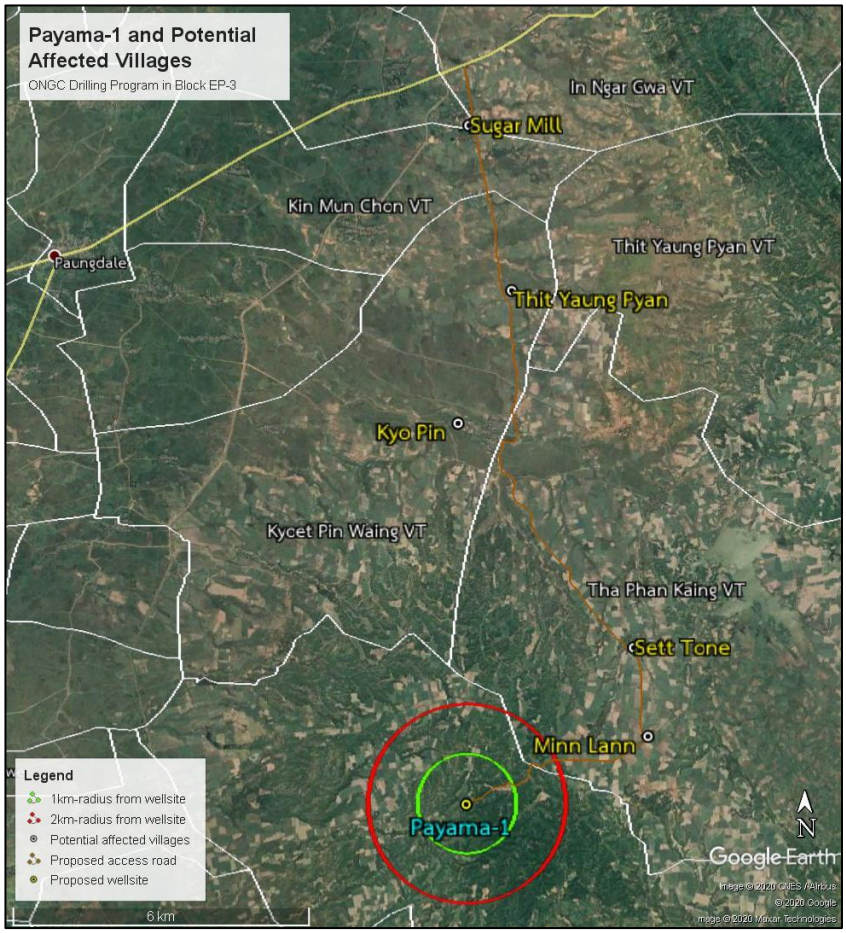


Figure 8-4: Potentially Affected Villages of Payama-1 Well

8.8 Air Quality Management Plan

8.8.1 Objectives

Monitor air quality to ensure compliance with national and international air quality standards.

8.8.2 Legal Requirements

Myanmar applicable legislation and regulation include:

- The Constitution of the Republic of the Union of Myanmar (2008);
- Myanmar Environmental Conservation Laws, (2012);
- Environmental Conservation Rules (2014);
- National Environmental Quality (Emission) Guideline (2015).

MONREC has established environmental quality standards, the National Environmental Quality Standard with Treatment as per General EHS Guidelines, Emission concentrations as per General EHS Guidelines, and specifically Hydrogen sulfide below 5 mg/Nm^3.
International air quality standards are set by the *IFC Environmental, Health, and Safety Guidelines for Air Emissions and Ambient Air Quality* published on 2007, which refers to the WHO Air Quality Guidelines[1].

Table 8-9: IFC/WHO Air Quality Standards

Parameter	Averaging Time	Concentration (µg/m^3)	Notes
Nitrogen dioxides (NO_2)	Annual	40	
	1-hour	200	
Photochemical Oxidants: Ozone (O_3)	8-hour daily maximum	100	
Particulate Matter (PM_{10})	Annual	20	
	24-hours	50	
Particulate Matter ($PM_{2.5}$)	Annual	10	
	24-hours	25	
Sulphur Dioxide (SO_2)	24-hours	20	
	10 minute	500	
Carbon Monoxide (CO)	1-hour	30 (mg/m^3)	Carbon monoxide was not included in the WHO Air Quality Guidelines 2005. As a result, the 2000 WHO guidelines per European Air Quality Guideline for CO remain in effect.
	8-hours	10 (mg/m^3)	
Benzene	Annual	5	European directive 2008/50/EC

[1] WHO Air Quality Guidelines are available at *http://www.who.int/en*

The WHO has established the following air quality criteria to be considered when selecting substances (or pollutant indicators) to be included in an air quality monitoring network:

- The selection of the substances shall be based on the current air pollution issues potentially affecting the area, and on those expected for the future.
- The substances shall be measured extensively, or the extent of monitoring shall be increased due to emerging concerns (for example: PM_{10} and $PM_{2.5}$).
- Only substances for which quality assurance and control procedures exist or are being developed shall be included.

8.8.3 Overview Maps and Site Layout

The sensitive receptors near the site for air quality are the local communities and agricultural area within 1 km of the well site as shown in **Maps below:**

Air and Noise

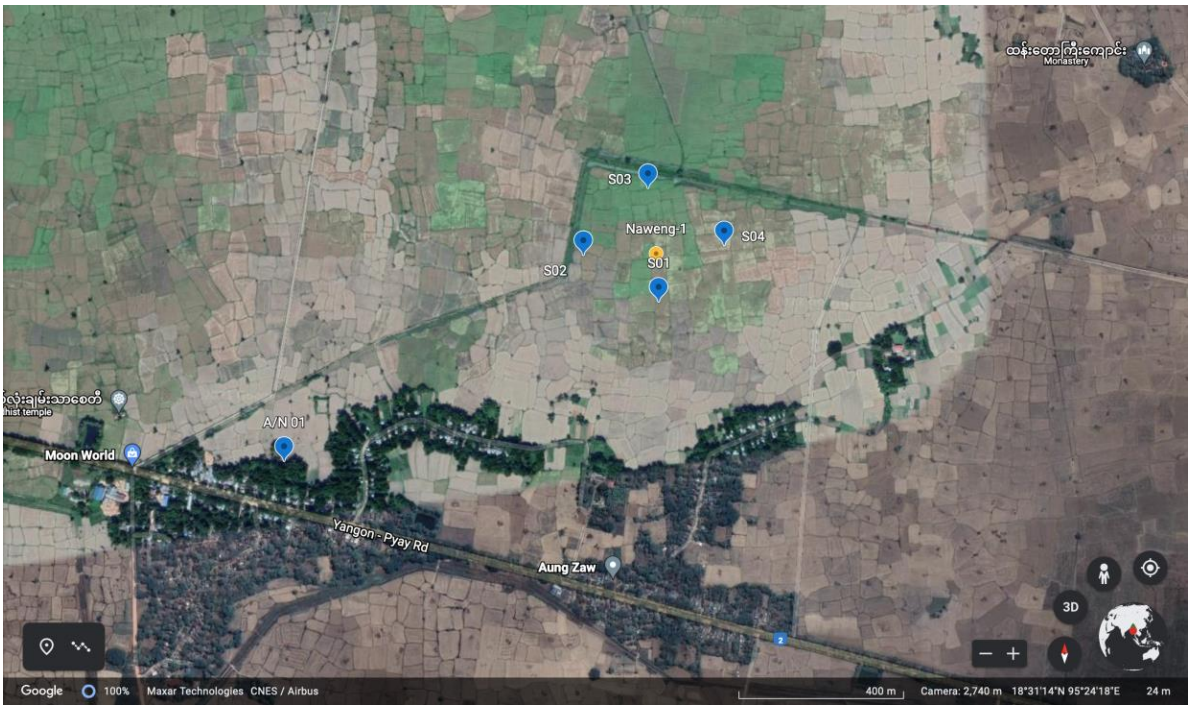


Figure 3: Ambient Air and Noise sampling station

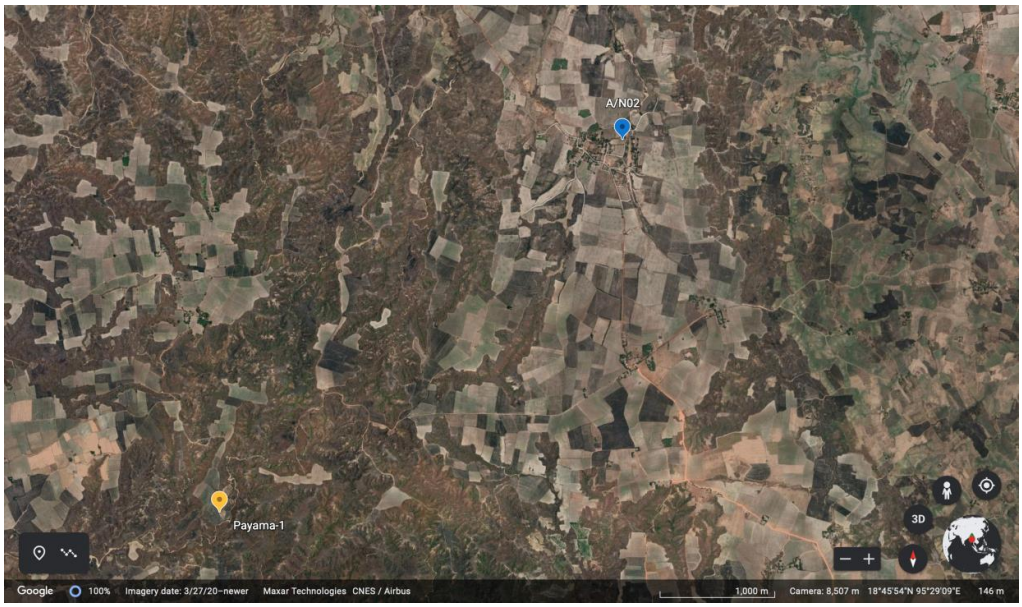


Figure 4: Ambient Air and Noise Sampling Station

Ambient Air and Noise Monitoring Coordinates for Naweng-1 and Payama-1

Soil SP	Lat	Long
S01	18.5238889	95.404978
S02	18.5253009	95.4088073
S03	18.5253009	95.4088073
S04	18.5241337	95.4038111
S05	18.7505285	95.4628655
S06	18.7505119	95.4627984
S07	18.7504921	95.4629282
S08	18.7505285	95.4628655
A/N 01	18.5199178	95.4003605
A/N 02	18.7792045	95.4935673

8.8.4 Management Actions

Environment Impact Assessment –Construction and Installation Phase			
2. Air Quality	2.1 Well Site and Camp Construction	2.1.1 Deterioration of air quality due to dust.	2.1.1.1 Minimize land clearance to a minimum especially during the dry season.
			2.1.1.2 Limit vehicle speed on access road and site.
			2.1.1.3 Cover trucks transporting materials with tarpaulins or plastic to prevent any loose material from blowing away and also to prevent dust dispersion.

			2.1.1.4 Spray water on roads when needed to keep dust down.
			2.1.1.5 Clean tires of the vehicles before leaving site if needed.
			2.1.1.6 Provide personal protective equipment to exposed field workers.
			2.1.1.7 Use vehicles with dust flaps.
	2.2 Equipment use during Site and Road Construction	2.2.1 Deterioration of air quality due to vehicle emissions.	2.2.1.1 Ensure all machinery and vehicles are properly checked and inspected.
	2.3 Equipment use during Site and Road Construction	2.3.1 GHG Release contributing to climate change	2.3.1.1 Turn off all vehicles and equipment when not in use as well as prohibit vehicles from idling.
Environment Impact Assessment –Drilling Phase			
1. Air Quality	1.1. Vehicle and Equipment Use	1.1.1. Deterioration of air quality due to dust.	1.1.1.1. Implement construction and installation phase mitigation measures in 2.1.
	1.2. Vehicle and Equipment Use	1.2.1. Deterioration of air quality due to vehicle emissions.	1.2.1.1. Implement construction and installation phase mitigation measures in 2.2.
	1.3. Well Drilling	1.3.1. Deterioration of air quality due to hydrogen sulfide	1.3.1.1. If H_2S levels exceed 10 ppm in the gas stream, implement appropriate safety zones.
			1.3.1.2. All crew are instructed and rehearsed in H_2S procedures.
			1.3.1.3. Implement construction and installation phase mitigation measures in 2.3.
	1.4. Vehicle and Equipment Use	*1.4.1.* Climate Change due to GHG	1.4.1.1. Implement construction and installation phase mitigation measures in 2.1.

Environment Impact Assessment –Well Testing Phase			
1 Air Quality	1.1 Vehicle and Equipment Use	1.1.1 Deterioration of air quality due to dust.	1.1.1.1 Implement construction and installation phase mitigation measures in 2.1.
		1.1.2 Deterioration of air quality due to combustion of diesel fuel and flaring.	1.1.2.1 Implement construction and installation phase mitigation measures in 2.2.
			1.1.2.2 Process control to minimize flaring.
			1.1.2.3 Maintain pilot flame at the flare tip to ensure that flame is not extinguished by strong wind.
			1.1.2.4 Verify the operation's flaring system to highest efficiency.

	1.2 Well testing releasing hydrogen sulfide	1.2.1 Deterioration of air quality due to hydrogen sulfide	1.2.1.1 Install Gas Detectors.
			1.2.1.2 If H2S levels exceed 10 ppm in the gas stream, appropriate safety zone to be established (8 hr TWA).
			1.2.1.3 All crew are instructed and rehearsed in H2S procedures.
			1.2.1.4 Limit well testing period where possible.
	1.3 Flare Emissions	1.3.1 Climate Change due to GHG	1.3.1.1 maximize energy efficiency and design facilities to minimize energy use
			1.3.1.2 Operating flare to control odor and visible smoke emissions.
			1.3.1.3 Locate flare at a safe distance from local communities (and the workforce including workforce accommodation units
			1.3.1.4 Implementation of burner maintenance and replacement, programs to ensure continuous maximum flare efficiency.
			1.3.1.5 Metering flare gas.
			1.3.1.6 Keep installation and functioning of flare gas system safe according to the good engineering practice.
			1.3.1.7 Ensure flare system has efficient combustion.
			1.3.1.8 Maintain pilot flame at the flare tip to ensure that flame is not extinguished by strong wind.
			1.3.1.9 Verify the operation's flaring system.
			1.3.1.10 Minimize the duration of flaring when possible

Environment Impact Assessment –Well Abandonment Phase			
2 Air Quality	2.1 Vehicle and Equipment Use	2.1.1 Deterioration of air quality due to dust.	2.1.1.1 Implement construction and installation phase mitigation measures in 2.1.
		2.1.2 Deterioration of air quality due to combustion of diesel fuel.	2.1.2.1 Implement construction and installation phase mitigation measures in 2.2.
		2.1.3 Climate Change due to GHG	2.1.3.1 Implement construction and installation phase mitigation measures in 2.3.

H_2S Management Guidelines

What is the acceptable safe work limit of H_2S?
OSHA: The legal airborne permissible exposure limit (PEL) is 20 ppm not to be exceeded at any time, and 50 ppm as a maximum peak, not to be exceeded during any 10-minute work period. NIOSH: The recommended airborne exposure limit (REL) is **10 ppm**, which should not be exceeded during any 10-minute work period.

What is the isolation distance for hydrogen sulfide?
Isolate spill or leak area for **at least 100 meters (330 feet)** in all directions.

What is the occupational exposure limit of H_2S for 8 hours?
OSHA has accordingly established an 8-hour TWA limit for hydrogen sulfide of **10 ppm** and a short-term limit of 15 ppm. These levels have been demonstrated to be effective in preventing irritation and conjunctivitis in the workplace (Poda and Aiken 1966/ Ex. 1-115)

What is a five-step approach to responding to an H_2S incident?
Initial Response strategy. Seven-step initial response strategy; Step 1: Evacuate; Step 2: Alarm; Step 3: Assess; Step 4: Protect; Step 5: **Rescue**; Step 6: First Aid; Step 7: Medical Aid.

Common effects of inhaling low concentrations of hydrogen sulfide (10 ppm or less) are **burning eyes, coughing and shortness of breath**. Repeated or prolonged exposure at low concentration levels can cause eye inflammation, headaches, fatigue, irritability, insomnia, and weight loss.

8.8.5 Monitoring Plans

Factors	Index/Parameter	Procedure	Proposed Duration and Frequency of Monitoring	Location
Air Quality	• PM-10 • PM-2.5 • NO_x, • SO_x, • Ozone • H_2S	Method • Myanmar National Environmental Quality (Emission) Guidelines, Effective since 2015 in accordance with The Environmental Conservation Law, 2012, and • WHO Air quality guideline (2006) and amendment. • For any monitoring in future, equivalent equipment and methods acceptable to the Myanmar Government and as per best international oil and gas industry best practices will be applied.	**Duration:** 1 day continuously **Frequency:** • Once during construction and installation, drilling and well testing phases • In case of any complaint regarding air quality, an additional air quality measurement may be conducted in response to specific complaints (if necessary)	Nearest sensitive receptor or downwind of complaint area (if necessary). See soil monitoring map locations

8.8.6 Implementation Schedule

Air quality monitoring will be conducted once during construction and drilling phase and well testing phase. If communities are located in close proximity to drilling sites, regular monitoring (instead of once) of air emissions may be necessary during drilling and construction. In addition, if complaints are received, an additional air quality monitoring may be conducted in response to specific complaints. Air quality monitoring will be conducted at the same location previously measured during the baseline survey and/or at the location of the complaint. The monitoring shall be conducted as defined by the Myanmar standards and or international guidelines. The parameters measured will be NO_x, SO_x, Ozone, PM_{10} and other parameters as specified and agreed by the COMPANY.

8.8.7 Responsibilities

Day to day supervision shall be done by the drilling Contractor and Over all supervision will be done by ONGC Videsh. Roles and responsibilities are as follows:

- ONGC VIDESH oversees the drilling of an exploratory well in EP-3 Block, Myanmar and provides coordination of well operations and planning, technical support and emergency support.
- The drilling contractor will provide a rig for drilling an exploratory well, including operators, accommodation facilities, medical personnel, ambulances and HSE supervisors, as well as emergency response plans.

Country Manager (ONGC Videsh):

Country Manager of ONGC Videsh Ltd. has ultimate responsibility for ensuring that effective measures are in place to fulfil the spirit and intent of all project activities including compliance to all legal & statutory requirements of host country.

i. Responsible and accountable for the effectiveness of the QHSE Management System
ii. Ensuring implementation of established policies and rules
iii. Ensuring compliance to applicable legal and other requirements including timely submission of monitoring reports, statements, returns etc. to the statutory authorities
iv. Promoting process approach and risk-based thinking
v. Ensuring arranging resources needed for the QHSE Management system
vi. Review and report the performance of QHSE Management System
vii. Ensure incidents and non-conformities are reported, investigated and corrective actions taken as per procedure
viii. Ensure effective communication with employees and relevant stakeholders
ix. Ensure emergency preparedness and response as per procedure
x. Ensuring competency in the Country Office and Operated projects
xi. Ensure establishing bridging documents with contractors
xii. Ensure procurement/ provisioning of the PPE as per PPE policy

Company Man (ONGC videsh)

The Company man, ONGC Videsh Ltd. has responsibility for the safe and effective execution of operations as per drilling programme.

i. The Company Man has the responsibility on site for all operations of drilling service in general.
ii. He will Prepare Daily Operations Reports for base and other likely requirements.
iii. Hel will assist Country office (CO) in ensuring that all regulatory and statutory notifications have been made
iv. In case of emergency Coordinate with Crisis Management Team (CMT) team on site.
v. Ensure SOPs are followed.

HSE Representative (ONGC Videsh)

HSE representative on site shall ensure effectiveness of all HSE Plans, procedures including Emergency Response & Disaster Management Plan (ERDMP) through regular mock drills and update and shall also assist Company man ONGC Videsh on site during emergencies.

i. Ensure to maintain all documents, forms and records related to HSE.
ii. Ensure availability of safety items, equipment, instruments (First aid box, gas detector etc.)
iii. Ensure PPE compliance in drill site by all persons working including contractual and visitors.
iv. Ensure regular safety talks/trainings/campaigns to promote safety awareness amongst persons working at rig.
v. Responsible for collection, compilation and analysis of information in respect of accidents and dangerous occurrences with a view to promote safe practices and improvement of working environment.
vi. Responsible for ensuring that required environmental monitoring is conducted and reported.
vii. To encourage every person (including contractual and visitors) to promote environment protection in drill site.

Rig Manager (RM) (Drilling Contractor's chief representative) on Site

i. Rig Manager is overall In-charge of daily operations and On-scene commander in case of any emergency situation.
ii. He is responsible for analysing and supervising all operations and regular inspections of the equipment. He will have the responsibility to ensure that all members of the team under their direction are trained in their respective roles, and that HSEQ procedures and safe work practices are met and implemented.
iii. Responsible for ensuring that environmental monitoring is conducted and reported.
iv. He shall ensure that this procedure is implemented and communicated to all rig personnel through trainings & drills
v. Ensure that he has contact numbers of all key personnel like Concerned Govt. officials, Ambulance, hospitals, fire department etc.
vi. He will be working in coordination with company man, HSE supervisor OVL, and contractor's project head at base office and if required, will ask for additional resources from offsite to handle any emergency situation.
vii. Rig Manager shall assign some suitable person to be the overall communication coordinator. Role of Communication coordinator/ translator being critical for all interactions / flow of information at drill site, he should be available from beginning of the operation & reasonably conversant in English as well as local language.

Tool Pusher (Drilling Contractor)

The Rig Tool Pusher will be responsible for execution of duties under direct supervision of Rig Manager. He will assist Rig Manager in his duties.

i. Tool Pusher is responsible for the direction and supervision of Rig crews for daily operations and execution of Drill plan.
ii. Tool Pusher is responsible for the direction and supervision of Rig crews mitigating any emergency or a situation which can lead to emergencies.
iii. They are responsible for analysing and supervising all operations and regular inspections of the equipment. They also have the responsibility to ensure that all members of the team under their direction are trained in their respective roles, and that HSEQ procedures and safe work practices are met and implemented.

HSE Officer (Drilling Contractor)

i. HSE Officer is responsible to ensure that all activities are carried out as per HSE requirements for the safety of all personnel involved in the operation.
ii. Responsible for conducting all required environmental monitoring and preparation of monitoring reports.
iii. He shall support the Rig Manager in coordinating day to day operations and in emergency handling activities.
iv. Prepare HSE Reports.
v. Record the incident/ accident in chronological order.
vi. The HSE Officer shall assist the Rig Manager in establishing communications with emergency services as and when required.

8.9 Noise Management Plan

8.9.1 Objectives

To minimize noise disturbance to fauna.

8.9.2 Legal Requirements

Myanmar applicable legislation and regulation include:

- The Constitution of the Republic of the Union of Myanmar (2008);
- Myanmar Environmental Conservation Laws, 2012
- Environmental Conservation Rules, 2014
- National Environmental Quality (Emission) Guideline (2015)

In the absence of relevant national laws, the Project will comply with international standards. The IFC General EHS Guidelines, Section 1.7 – Noise and Vibration Emissions as detailed in **Table 8-10**.

Table 8-10: Applicable IFC EHS Guidelines

Environmental topic	Applicable EHS Guidelines
Noise	Section 1.7 provides standards for daytime and night-time noise emissions (for residential and industrial environments, WHO 1999) and recommends that noise prevention and mitigation measures are implemented with regard to predicted noise levels at sensitive receptors. Noise monitoring may be carried out for the purpose of establishing the existing ambient noise levels in the area of the proposed project or for verifying emission noise levels during project execution. A key priority should be the implementation of noise control measures at source; the selected methods will depend on the source type and the proximity of sensitive receptors, and can include: equipment selection, acoustic enclosures, vibration isolation, traffic route selection, other.

Noise pollution will be regulated based on national and international guidelines (e.g., IFC) shall be applied to the Project. The noise limits established by the World Bank Group/International Finance Corporation (IFC) for residential areas are the following [2]:

- **55 dBA during daytime** (daytime hours 07:00 to 22:00).
- **45 dBA during night-time** (night-time hours 22:00 to 07:00).

Vibration impacts will be minimal as exploration drilling does not cause large vibration effects.

8.9.3 Overview Maps and Site Layout

The sensitive receptors for noise and vibration are the communities near the basecamp and well site areas. See **Maps below:**

[2] IFC doesn't discriminate between temporary and permanent Project operations. Conservatively, in consideration of the survey period and all associated activities, it is considered that the IFC threshold levels for the daytime and for the nighttime would be appropriate for the entire project phase.

Air and Noise

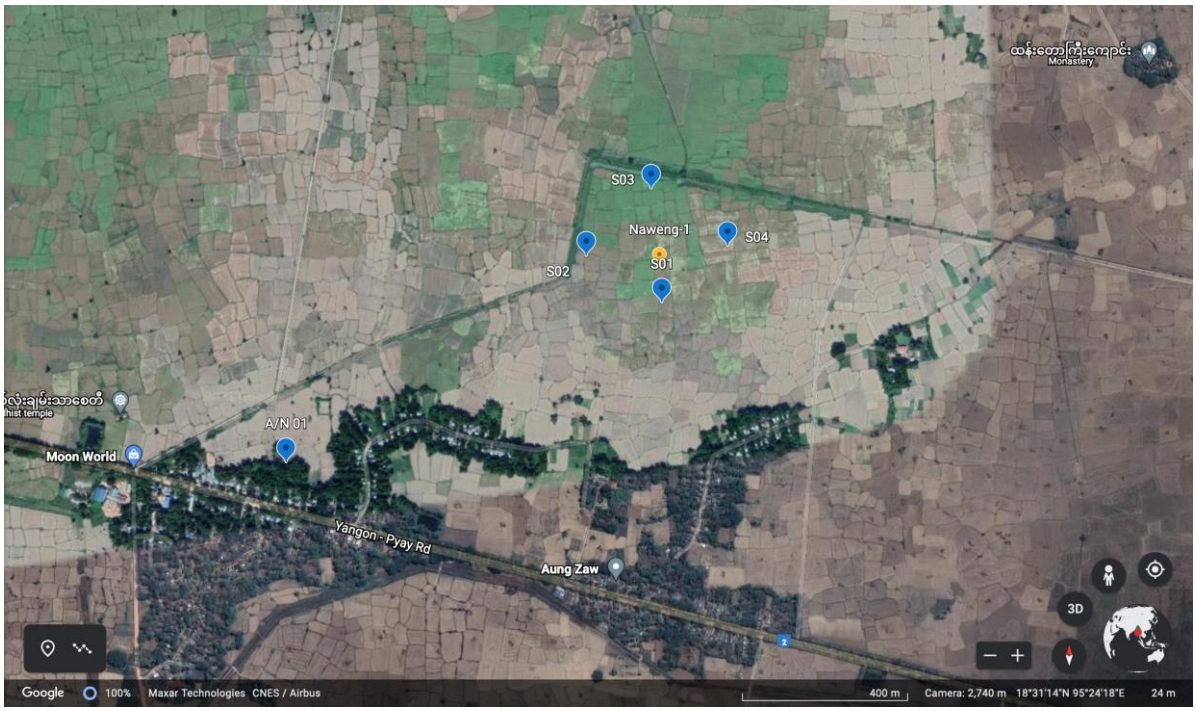


Figure 3: Ambient Air and Noise sampling station

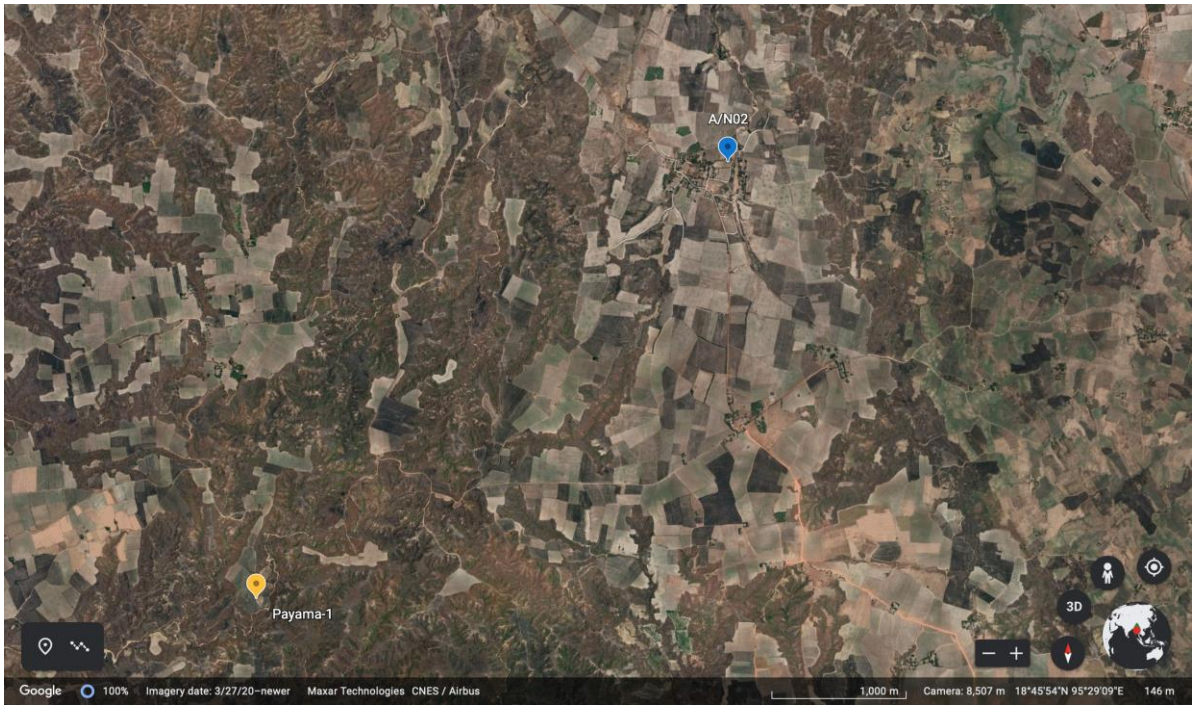


Figure 4: Ambient Air and Noise Sampling Station

Ambient Air and Noise Monitoring Coordinates for Naweng-1 and Payama-1

Soil SP	Lat	Long
S01	18.5238889	95.404978
S02	18.5253009	95.4088073
S03	18.5253009	95.4088073
S04	18.5241337	95.4038111
S05	18.7505285	95.4628655
S06	18.7505119	95.4627984
S07	18.7504921	95.4629282
S08	18.7505285	95.4628655
A/N 01	18.5199178	95.4003605
A/N 02	18.7792045	95.4935673

8.9.4 Management Actions

Environment Impact Assessment –Construction and Installation Phase			
3. Noise	3.1 Use of machines/engines during construction and transportation	3.1.1 Increase in noise levels from machines/engines	3.1.1.1 Minimize vehicles and rig transportation from sensitive environmental areas.
			3.1.1.2 Minimize construction activities and vehicle/rig movements in nighttime.
			3.1.1.3 Limit vegetation removal to a minimum.
			3.1.1.4 Turn equipment off when not in use.
			3.1.1.5 Use enclosures when possible to contain noise on site.
			3.1.1.6 Implement transportation plan to avoid traffic issue that make noise pollution.
			3.1.1.7 Materials should be lowered when practical and not dropped while transferring
Environment Impact Assessment –Drilling Phase			
2. Noise	2.1. Well Drilling and Vehicle and Equipment Use	2.1.1. Increase in noise levels during exploration drilling.	2.1.1.1. If required, Install noise barrier at the well site boundary toward nearest community 2.1.1.2. OVL in association with drilling contractor will follow guidelines on design of noise barriers that are acceptable to the Myanmar Government and that follow international

			oil and gas industry best practice.
			2.1.1.3. Ensure use of mufflers on diesel/gas driven machinery.
			2.1.1.4. Ensure all machinery and vehicles are properly checked and inspected.
Environment Impact Assessment –Well Testing Phase			
2 Noise	2.1 Flaring during Well Testing	2.1.1 Increase in noise levels during well testing.	2.1.1.1 Implement construction and installation phase mitigation measures in 3.1.
			2.1.1.2 Verify the operation's flaring system.
			2.1.1.3 Minimize the duration of flaring when possible.
Environment Impact Assessment –Well Abandonment Phase			
3 Noise	3.1 Vehicle and Equipment Use	3.1.1 Increase in noise levels from machines/engines during site demolition & restoration and transportation.	3.1.1.1 Implement construction and installation phase mitigation measures in 3.1.

8.9.5 Monitoring Plans

Noise will be measured once during drilling phase to monitor noise level generated from drilling activities. If communities are located in close proximity to drilling sites, regular monitoring (instead of once) of noise may be necessary during drilling and construction. In addition, if complaints are receive (24 hour Leq) will be monitored at the same location previously measured during the baseline survey and/or at the location of the complaint. If monitoring indicates noise levels over the WHO standards (70 dB (A)) at the receptor as a result of drilling, specific mitigation measures will be implemented. The noise levels will be measured as defined by Myanmar or international standards.

Factors	Index/Parameter	Procedure	Proposed Duration and Frequency of Monitoring	Location
Noise	• L_{eq}24 hr. • L_{max} • L_{dn}	Method • Measure background noise level, residual noise level, specific noise level and calculation of noise using a Type 1 or 2 sound level meters meeting all appropriate IEC standards • Myanmar National Environmental Quality (Emission) Guidelines, Effective since 2015 in accordance with The Environmental Conservation Law, 2012, and	**Duration:** 1 day continuously **Frequency:** • Once during construction and installation, drilling and well testing phases • If within 1 km of a community regular monitoring will be required • In case of a complaint regarding noise from project site, an additional noise measurement may	100 meters from Drill Rig and as per the noise sampling map locations

Factors	Index/Parameter	Procedure	Proposed Duration and Frequency of Monitoring	Location
		• Following the Guidelines for Community Noise, World Health Organization (WHO), 1999 Noise was monitored with a Sound Level Meter Model No: SL-4023SD. For any monitoring in future, equivalent equipment and methods acceptable to the Myanmar Government and as per best international oil and gas industry best practices will be applied.	be conducted (if necessary)	

8.9.6 Implementation Schedule

The monitoring activities will be performed as mentioned in the tables above.

The Plan shall be revised before project activities start, in order to guarantee the compliance with Myanmar laws.

8.9.7 Responsibilities

Day to day supervision shall be done by the drilling Contractor and Over all supervision will be done by ONGC Videsh. Roles and responsibilities are as follows:

- ONGC VIDESH oversees the drilling of an exploratory well in EP-3 Block, Myanmar and provides coordination of well operations and planning, technical support and emergency support.
- The drilling contractor will provide a rig for drilling an exploratory well, including operators, accommodation facilities, medical personnel, ambulances and HSE supervisors, as well as emergency response plans.

Country Manager (ONGC Videsh):

Country Manager of ONGC Videsh Ltd. has ultimate responsibility for ensuring that effective measures are in place to fulfil the spirit and intent of all project activities including compliance to all legal & statutory requirements of host country.

i. Responsible and accountable for the effectiveness of the QHSE Management System
ii. Ensuring implementation of established policies and rules
iii. Ensuring compliance to applicable legal and other requirements including timely submission of monitoring reports, statements, returns etc. to the statutory authorities
iv. Promoting process approach and risk-based thinking
v. Ensuring arranging resources needed for the QHSE Management system
vi. Review and report the performance of QHSE Management System
vii. Ensure incidents and non-conformities are reported, investigated and corrective actions taken as per procedure
viii. Ensure effective communication with employees and relevant stakeholders
ix. Ensure emergency preparedness and response as per procedure
x. Ensuring competency in the Country Office and Operated projects
xi. Ensure establishing bridging documents with contractors
xii. Ensure procurement/ provisioning of the PPE as per PPE policy

Company Man (ONGC videsh)

The Company man, ONGC Videsh Ltd. has responsibility for the safe and effective execution of operations as per drilling programme.

i. The Company Man has the responsibility on site of all operations of drilling service in general.
ii. He will Prepare Daily Operations Reports for base and other likely requirements.
iii. Hel will assist Country office (CO) in ensuring that all regulatory and statutory notifications have been made
iv. In case of emergency Coordinate with Crisis Management Team (CMT) team on site.
v. Ensure SOPs are followed.

HSE Representative (ONGC Videsh)

HSE representative on site shall ensure effectiveness of all HSE Plans, procedures including Emergency Response & Disaster Management Plan (ERDMP) through regular mock drills and update and shall also assist Company man ONGC Videsh on site during emergencies.

i. Ensure to maintain all documents, forms and records related to HSE.
ii. Ensure availability of safety items, equipment, instruments (First aid box, gas detector etc.)
iii. Ensure PPE compliance in drill site by all persons working including contractual and visitors.
iv. Ensure regular safety talks/trainings/campaigns to promote safety awareness amongst persons working at rig.
v. Responsible for collection, compilation and analysis of information in respect of accidents and dangerous occurrences with a view to promote safe practices and improvement of working environment.
vi. Responsible for ensuring that required environmental monitoring is conducted and reported.
vii. To encourage every person (including contractual and visitors) to promote environment protection in drill site.

Rig Manager (RM) (Drilling Contractor's chief representative) on Site

i. Rig Manager is overall In-charge of daily operations and On-scene commander in case of any emergency situation.
ii. He is responsible for analysing and supervising all operations and regular inspections of the equipment. He will have the responsibility to ensure that all members of the team under their direction are trained in their respective roles, and that HSEQ procedures and safe work practices are met and implemented.
iii. Responsible for ensuring that environmental monitoring is conducted and reported.
iv. He shall ensure that this procedure is implemented and communicated to all rig personnel through trainings & drills
v. Ensure that he has contact numbers of all key personnel like Concerned Govt. officials, Ambulance, hospitals, fire department etc.
vi. He will be working in coordination with company man, HSE supervisor OVL, and contractor's project head at base office and if required, will ask for additional resources from offsite to handle any emergency situation.
vii. Rig Manager shall assign some suitable person to be the overall communication coordinator. Role of Communication coordinator/ translator being critical for all interactions / flow of information at drill site, he should be available from beginning of the operation & reasonably conversant in English as well as local language.

Tool Pusher (Drilling Contractor)

The Rig Tool Pusher will be responsible for execution of duties under direct supervision of Rig Manager. He will assist Rig Manager in his duties.

i. Tool Pusher is responsible for the direction and supervision of Rig crews for daily operations and execution of Drill plan.
ii. Tool Pusher is responsible for the direction and supervision of Rig crews mitigating any emergency or a situation which can lead to emergencies.
iii. They are responsible for analysing and supervising all operations and regular inspections of the equipment. They also have the responsibility to ensure that all members of the team under their direction are trained in their respective roles, and that HSEQ procedures and safe work practices are met and implemented.

HSE Officer (Drilling Contractor)

i. HSE Officer is responsible to ensure that all activities are carried out as per HSE requirements for the safety of all personnel involved in the operation.
ii. Responsible for conducting all required environmental monitoring and preparation of monitoring reports.
iii. He shall support the Rig Manager in coordinating day to day operations and in emergency handling activities.
iv. Prepare HSE Reports.
v. Record the incident/ accident in chronological order.
vi. The HSE Officer shall assist the Rig Manager in establishing communications with emergency services as and when required.

8.10 Soil Management Plan

8.10.1 Objectives

Construction and operation activities will be managed to prevent soil contamination or erosion.

8.10.2 Legal Requirements

Myanmar applicable legislation and regulation include:

- The Constitution of the Republic of the Union of Myanmar (2008);
- Myanmar Environmental Conservation Laws (2012);
- Environmental Conservation Rules (2014);
- National Environmental Quality (Emission) Guideline (2015);
- The Farmland Law and Farmland Rules (2012 - Section 30).

The Environmental, Health, and Safety (EHS) Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP). They are designed to provide relevant industry background and technical information. This information supports actions aimed at avoiding, minimizing, and controlling EHS impacts during the construction, operation, and decommissioning phase of a project or facility. The IFC guidelines regarding waste management are applicable to protecting soil quality (Environmental Health and Social Guidelines, IFC 2007) as detailed in **Table 8-11**.

Table 8-11: Applicable IFC EHS Guidelines

Environmental topic	Applicable EHS Guidelines
Waste management	Section 1.6 provides guidelines for projects/facilities that generate, store, or handle any quantity of industrial hazardous or not hazardous waste. Section 1.6 provides appropriate guidelines for hazardous waste storage, transport, treatment and disposal, in order to prevent harm to health, safety and environment. These Guidelines include the following key recommendations: • waste management should be addressed through a Waste management system that addresses issues linked to waste minimization, generation, transport, disposal, and monitoring; • in addition to the implementation of waste prevention strategies, the total amount of waste may be significantly reduced through the implementation of recycling plans; • if waste materials are still generated after the implementation of feasible waste prevention, reduction, reuse, recovery and recycling measures, waste materials should be treated and disposed and all measures should be taken to avoid potential impacts to human health and the environment.

8.10.3 Overview Maps and Site Layout

The area is dominated by agricultural area and open forest land areas as shown in **Figures 8-1 to 8-4**.

8.10.4 Management Actions

Environment Impact Assessment –Construction and Installation Phase			
1. Topography	2.1 Well Site and Camp Construction	1.2.1 Disturbance to local topography	1.2.1.1 Limit construction activities to well sites and access roads only.
Environment Impact Assessment –Well Abandonment Phase			
1 Topography	1.1 Site and Road abandonment and restoration	1.1.1 Disturbance to local topography	1.1.1.1 Limit site clearing activities to well sites and access roads only.
			1.1.1.2 Restore the site and hand back to MOGE as per MOGE procedure.

Environment Impact Assessment –Construction and Installation Phase			
6. Soil quality	6.1 Construction of roads and well / camp sites	6.1.1 Degradation of soil quality through compaction or erosion during construction.	6.1.1.1 Limit soil compaction only to well sites and access roads.
			6.1.1.2 Exposed site areas should be kept to a minimum during construction
			6.1.1.3 Provide effective construction site run-off control and design.
Environment Impact Assessment – Drilling Phase			
5. Soil Quality	5.1. Drill site Site Runoff and Drainage	5.1.1. Contamination of soil from runoff	5.1.1.1. Implement drilling phase mitigation measures in 4.1.
Environment Impact Assessment –Well Testing Phase			
2 Soil Quality	5.2. Non-Hazardous waste management	5.2.1. Contamination of surface water from drained domestic waste and gray water	5.2.1.1. Prohibit workers from cleaning machines/ equipment in a public water source.
			5.2.1.2. Prohibit workers and contractors discharging or discarding project waste, chemicals, oil into public water sources.
			5.2.1.3. Install septic tank and soak away pit on each well site for holding sewage.
Environment Impact Assessment – Well abandonment Phase			
5 Soil Quality	5.1 Soil excavation for site restoration	5.1.1 Degradation of soil quality through compaction or erosion during site demolition & restoration.	5.1.1.1 Limit site demolition & restoration only to well sites and access roads.
			5.1.1.2 Restore the site and hand back to MOGE as per MOGE procedure.

8.10.5 Monitoring Plans

Under normal circumstances there is no pathway for contaminants to reach soils off-site. However, soils will be sampled once within one month after well shut-in or as determined appropriate. In addition, soils will be sampled in the event of spillage or leakage.

Factors	Index/Parameter	Procedure	Proposed Duration and Frequency of Monitoring	Location
Soil	Physical parameters: • pH • Soil texture • Salinity • Conductivity • Temperature • Cl- Chemical Parameters: • Petroleum Hydrocarbons • Total PAH, Total DDT, Total PCBS. • Heavy Metals: As, Cd and Cd-compound, Cr^{6+}, Pb, Hg, Ni, Cu, Zn, Vanadium, Total Nitrogen and Total Phosphorus,	Method* • Monitored with equipment and methods acceptable to Myanmar government as per best international oil and gas industry best practices	• Once after well abandoned and site restored within 3 months. • In an event of spillage and leakage	Project site At the spillage or leakage areas

* Equipment and methods acceptable to the Myanmar Government and as per best international oil and gas industry best practices will be applied.

8.10.6 Implementation Schedule and Location

Soils will be sampled once within one month after well shut-in or as determined appropriate. In addition,

soils will be sampled in the event of spillage or leakage. See monitoring sites in Maps below:

Figure 1: Soil Monitoring Stations for Naweng-1

Figure 2: Soil Monitoring Stations for Payama-1

Soil Monitoring Coordinates for Naweng-1 and Payama-1

Soil SP	Lat	Long
S01	18.5238889	95.404978
S02	18.5253009	95.4088073
S03	18.5253009	95.4088073
S04	18.5241337	95.4038111
S05	18.7505285	95.4628655
S06	18.7505119	95.4627984
S07	18.7504921	95.4629282
S08	18.7505285	95.4628655

8.10.7 Responsibilities

Day to day supervision shall be done by the drilling Contractor and Over all supervision will be done by ONGC Videsh. Roles and responsibilities are as follows:

- ONGC VIDESH oversees the drilling of an exploratory well in EP-3 Block, Myanmar and provides coordination of well operations and planning, technical support and emergency support.
- The drilling contractor will provide a rig for drilling an exploratory well, including operators, accommodation facilities, medical personnel, ambulances and HSE supervisors, as well as emergency response plans.

Country Manager (ONGC Videsh):

Country Manager of ONGC Videsh Ltd. has ultimate responsibility for ensuring that effective measures are in place to fulfil the spirit and intent of all project activities including compliance to all legal & statutory requirements of host country.

i. Responsible and accountable for the effectiveness of the QHSE Management System
ii. Ensuring implementation of established policies and rules
iii. Ensuring compliance to applicable legal and other requirements including timely submission of monitoring reports, statements, returns etc. to the statutory authorities
iv. Promoting process approach and risk-based thinking
v. Ensuring arranging resources needed for the QHSE Management system
vi. Review and report the performance of QHSE Management System
vii. Ensure incidents and non-conformities are reported, investigated and corrective actions taken as per procedure
viii. Ensure effective communication with employees and relevant stakeholders
ix. Ensure emergency preparedness and response as per procedure
x. Ensuring competency in the Country Office and Operated projects
xi. Ensure establishing bridging documents with contractors
xii. Ensure procurement/ provisioning of the PPE as per PPE policy

Company Man (ONGC videsh)

The Company man, ONGC Videsh Ltd. has responsibility for the safe and effective execution of operations as per drilling programme.

i. The Company Man has the responsibility on site of all operations of drilling service in general.
ii. He will Prepare Daily Operations Reports for base and other likely requirements.
iii. Hel will assist Country office (CO) in ensuring that all regulatory and statutory notifications have been made
iv. In case of emergency Coordinate with Crisis Management Team (CMT) team on site.
v. Ensure SOPs are followed.

HSE Representative (ONGC Videsh)

HSE representative on site shall ensure effectiveness of all HSE Plans, procedures including Emergency Response & Disaster Management Plan (ERDMP) through regular mock drills and update and shall also assist Company man ONGC Videsh on site during emergencies.

i. Ensure to maintain all documents, forms and records related to HSE.
ii. Ensure availability of safety items, equipment, instruments (First aid box, gas detector etc.)
iii. Ensure PPE compliance in drill site by all persons working including contractual and visitors.
iv. Ensure regular safety talks/trainings/campaigns to promote safety awareness amongst persons working at rig.
v. Responsible for collection, compilation and analysis of information in respect of accidents and dangerous occurrences with a view to promote safe practices and improvement of working environment.
vi. Responsible for ensuring that required environmental monitoring is conducted and reported.
vii. To encourage every person (including contractual and visitors) to promote environment protection in drill site.

Rig Manager (RM) (Drilling Contractor's chief representative) on Site

i. Rig Manager is overall In-charge of daily operations and On-scene commander in case of any emergency situation.
ii. He is responsible for analysing and supervising all operations and regular inspections of the equipment. He will have the responsibility to ensure that all members of the team under their direction are trained in their respective roles, and that HSEQ procedures and safe work practices are met and implemented.
iii. Responsible for ensuring that environmental monitoring is conducted and reported.
iv. He shall ensure that this procedure is implemented and communicated to all rig personnel through trainings & drills
v. Ensure that he has contact numbers of all key personnel like Concerned Govt. officials, Ambulance, hospitals, fire department etc.
vi. He will be working in coordination with company man, HSE supervisor OVL, and contractor's project head at base office and if required, will ask for additional resources from offsite to handle any emergency situation.
vii. Rig Manager shall assign some suitable person to be the overall communication coordinator. Role of Communication coordinator/ translator being critical for all interactions / flow of information at drill site, he should be available from beginning of the operation & reasonably conversant in English as well as local language.

Tool Pusher (Drilling Contractor)

The Rig Tool Pusher will be responsible for execution of duties under direct supervision of Rig Manager. He will assist Rig Manager in his duties.

i. Tool Pusher is responsible for the direction and supervision of Rig crews for daily operations and execution of Drill plan.
ii. Tool Pusher is responsible for the direction and supervision of Rig crews mitigating any emergency or a situation which can lead to emergencies.
iii. They are responsible for analysing and supervising all operations and regular inspections of the equipment. They also have the responsibility to ensure that all members of the team under their direction are trained in their respective roles, and that HSEQ procedures and safe work practices are met and implemented.

HSE Officer (Drilling Contractor)

i. HSE Officer is responsible to ensure that all activities are carried out as per HSE requirements for the safety of all personnel involved in the operation.
ii. Responsible for conducting all required environmental monitoring and preparation of monitoring reports.
iii. He shall support the Rig Manager in coordinating day to day operations and in emergency handling activities.
iv. Prepare HSE Reports.
v. Record the incident/ accident in chronological order.
vi. The HSE Officer shall assist the Rig Manager in establishing communications with emergency services as and when required.

8.11 Water Management Plan

8.11.1 Objectives

The Water Management Plan will have the following objectives:

- Monitor water use: the Plan will set procedures for estimating water used by the project, identifying activities that use this resource, and following a reporting procedure for registering volumes of water used;
- Minimise water use: the Plan will provide a series of measures to be considered for minimising the use of water;
- Log water suppliers: the supply, the volume and the type of water provided will be identified and registered in the Plan.
- Monitor surface water quality
- Monitor ground water quality

8.11.2 Legal Requirements

Myanmar applicable legislation and regulation regarding the water resources include:

- The Constitution of the Republic of the Union of Myanmar (2008);
- Myanmar Environmental Conservation Laws (2012);
- Environmental Conservation Rules (2014);
- National Environmental Quality (Emission) Guideline (2015);
- Public Health Law (1972);
- The Prevention and Control of Communicable Disease Law (1995);
- Fresh Water Fisheries Law (1991 Section 40);
- The Underground Water Act (1930);
- Conservation of Rivers, Creeks and Water Resources Law, 2006 (Section 24 (b), 21(a)(b), 19, 11(a) (b));
- The Prevention of Danger of Hazardous Chemical and related Substances Law, 2013 (Section 16,17,23,27

MONREC has established environmental quality standards, the National Environmental Quality Standard [Legal Reference: ECL 2012 (Article 2c) and EQS 2016]. ECD / MONREC have indicated that the discharge standards shown in **Table 8-12** below would be applicable for Onshore Oil and Gas activities. These are in accordance with international standards.

Table 8-12: Myanmar Discharge Standards Applicable to Onshore Oil and Gas activities

Guideline	Standard
Drilling fluids and cuttings	Treatment and disposal in accordance with applicable standards provided in the General EHS Guidelines
Produced water	Treatment and disposal in accordance with applicable standards provided in the General EHS Guidelines[1]For discharge to surface waters or to land: – Total hydrocarbon content 10 mg/L – pH 6-9[1] – Biochemical oxygen demand 25 mg/L[1] – Chemical oxygen demand 125 mg/L[1] – Total suspended solids 35 mg/L[1] – Phenols 0.5 mg/L[1] – Sulfides 1 mg/L[1] – Heavy metals (total)a 5 mg/L[1]

Guideline	Standard
	– Chlorides 600 mg/L (average), 1,200 mg/L maximum
Completion and well work-over fluids	Treatment and disposal in accordance with applicable standards provided in the General EHS Guidelines For discharge to surface waters or to land: – Total hydrocarbon content 10 mg/L – pH 6-9
Storm water drainage	Storm water runoff should be treated through an oil / water separation system able to achieve oil and grease concentration of 10 mg/L
Cooling water	The effluent should result in a temperature increase of no more than 3°C at edge of the zone where initial mixing and dilution take place; where the zone is not defined, use 100 m from point of discharge
Sewage	Treatment as per General EHS Guidelines, including discharge requirements

a Heavy metals include: Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Silver, Vanadium and Zinc

The IFC General EHS Guidelines considered relevant to the project are General EHS Guidelines, Section 1.3 – Wastewater and Ambient Water Quality and Onshore Oil and Gas Development Guidelines as detailed in **Table 8-13**.

Table 8-13: Applicable IFC EHS Guidelines

Environmental topic	Applicable EHS Guidelines
Wastewater and Liquid effluent quality	Section 1.3 provides guidelines applied for projects that have either direct or indirect discharge of process wastewater or wastewater from utility operations. Section 1.3 provides guidelines for treatment approaches of process wastewater and wastewater from utility operations. These Guidelines include the following key recommendations: • points of discharge, rate of discharge, chemical use, dispersion and environmental risk should be considered in a disposal plan; • discharges should be planned away from environmentally sensitive areas, with specific attention to high water tables, vulnerable aquifers, wetlands, and community receptors, including water wells and intakes.
Onshore Oil and Gas Development	The EHS Guidelines for Onshore Oil and Gas Development include information relevant to exploration drilling These Guidelines include the following key recommendations regarding wastewater / effluent discharges: • Separate drainage systems for drainage water from process areas that could be contaminated with oil (closed drains) and drainage water from non-process areas (open drains) should be available; • Equipment and vehicle wash waters should be directed to the closed drainage system; • Oily water from drip trays and liquid slugs from process equipment should be routed to the closed drainage system

8.11.3 Overview Maps and Site Layout

The water resources in the area can be identified in **Figures 8-1 to 8-4** where groundwater and surface water samples were taken typically from small ponds and streams in the area.

8.11.4 Management Actions

Environment Impact Assessment –Construction and Installation Phase			
4. Surface Water Hydrology	4.1 Construction of roads and well / camp sites	4.1.1 Alteration of surface water hydrology	4.1.1.1 Avoid construction of well sites in areas that may cause obstacles to water drainage.
			4.1.1.2 Construct water drainage lines (culverts/causeway) to maintain natural drainage. The required permission will be obtained from MOGE and all relevant agencies.

Environment Impact Assessment –Construction and Installation Phase			
5. Surface Water Quality	5.1 Construction of roads and well / camp sites and site runoff and drainage	5.1.1 Degradation of surface water quality from runoff/drainage	5.1.1.1 The proposed drill site and campsite will be orientated and designed to minimize areas requiring soil stabilization.
			5.1.1.2 Provide drip pans and absorbents to contain any spillage from vehicle and machinery while transferring fuel or changing of engine oil.
			5.1.1.3 Provide drainage and sediment traps around project area to reduce suspended particles in runoff from the well site and to contain minor oil spills.
			5.1.1.4 Avoid construction of the well pad in areas where such construction obstructs water drainage.
			5.1.1.5 Prohibit workers from cleaning machines/equipment in/near a water source.
			5.1.1.6 Prohibit workers and contractors discharging or discarding project waste, chemicals, and oil into public water sources.
			5.1.1.7 Provide a suitable storage area for construction materials (such as soil, sand, and stone), chemicals (i.e., paint and thinner), and oil (i.e., fuel and lubricating oil).
Environment Impact Assessment –Drilling Phase			
4. Surface Water Quality	4.1. Site Runoff and Drainage	4.1.1. Contamination of surface water from runoff and drainage	4.1.1.1. Implement construction and installation phase mitigation measures in 5.1.
			4.1.1.2. Provide drainage, buffer zone and earth bund surrounding well site area.

			4.1.1.3. The fuel storage will be surrounded by a bund wall in case of spill.
	4.2. Hazardous/non-hazardous waste management	4.2.1. Degradation of surface water quality from disposal of domestic sewage and grey water	4.2.1.1. Install concrete lined septic tank and soak away pit at the well site for holding & treating sewage.
Environment Impact Assessment –Well Testing Phase			
4 Surface Water and Soil Quality	4.1 Non-Hazardous waste management	4.1.1 Contamination of surface water from drained domestic waste and gray water	4.1.1.1 Prohibit workers from cleaning machines/ equipment in a public water source.
			4.1.1.2 Prohibit workers and contractors discharging or discarding project waste, chemicals, oil into public water sources.
			4.1.1.3 Install septic tank and soak away pit on each well site for holding sewage.
Environment Impact Assessment –Well abandonment Phase			
4 Surface Water Quality and Surface Water Hydrology	4.1 Hazardous/non-hazardous waste management	4.1.1 Potential contamination from spills or wastewater drainage to nearby water bodies during site restoration	4.1.1.1 Implement construction and installation phase mitigation measures in 5.1.
			4.1.1.2 Restore the site and hand back to MOGE as per MOGE procedure.

Environment Impact Assessment – Drilling Phase			
6. Groundwater Quality	6.1. Loss of circulation during Drilling wells	6.1.1. Groundwater degradation from drilling	6.1.1.1. Install steel casing and cement in place to prevent chemical leak or contaminate into rock formation.
			6.1.1.2. Strict steel casing to well wall by cementing to prevent chemical contaminate to groundwater level.
	6.2. Infiltration from the waste pit and sub-irrigation field	6.2.1. Deterioration of shallow Groundwater	6.2.1.1. Install HDPE liner in the cuttings and dirty water waste pit. Monitor liner for tears or leaks during installation and operations.

Social Impact Assessment – Construction and Installation Phase			
11. Drainage and Flooding	11.1 Surface runoff from roads, site and camp site	11.1.1 Increase runoff and change local drainage patterns	11.1.1.1 Obtain approval from MOGE and appropriate government offices before constructing, upgrading or reroute access roads.
			11.1.1.2 Follow civil engineer's recommendation on well site and access road construction design.
			11.1.1.3 Avoid construction of well sites in areas that may cause obstacles to water drainage.
			11.1.1.4 Water drainage lines (culverts/ causeway) will be constructed to maintain natural drainage. The required permission will be obtained from all relevant agencies.

8.11.5 Monitoring Plans

Surface Water

Monitoring of surface water in the immediate vicinity of the drill site or campsite will be conducted at appropriate intervals (quarterly) during exploration drilling to monitor any adverse changes to surface water quality. This is particularly important if the well sites are located in close proximity to areas where there are beneficial uses of surface water. However, in the event of spillage or leakage, potentially affected watercourses will be sampled and analysed for the substance spilt.

Factors	Index/Parameter	Procedure	Proposed Duration and Frequency of Monitoring	Location
Surface water	Physical parameters: • pH • Conductivity • Temperature • SS • TDS • Salinity Chemical Parameters: • DO • BOD • TPH and Oil and Grease • Cl, SO_4 • Metals: As, Cd, Total Cr, Pb, Total Hg, Ni, Se, Ba, Cu, Zn, Fe, Mn Biological parameters: • TCB	Method* • Monitoring will be conducted based on the equipment and methods acceptable to the Myanmar Government and as per best international oil and gas industry best practices will be applied	• Once after well abandoned and site restored within 3 months. • In an event of spillage and leakage	• At the same surface water sampling station before having project (Baseline) • Water sources which are potentially affected (in case of spillage of leakage)

Monitoring will be conducted based on the equipment and methods acceptable to the Myanmar Government and as per best international oil and gas industry best practices will be applied.

Groundwater

Monitoring of groundwater in the immediate vicinity of the sites will be conducted at regular intervals as detailed in Monitoring plan during exploration drilling to monitor any adverse changes to groundwater quality. In addition, groundwater will be sampled in the event of spillage or leakage.

Factors	Index/Parameter	Procedure	Proposed Duration and Frequency of Monitoring	Location
Groundwater	Physical parameters: • pH • Conductivity • Temperature • TDS • Salinity Chemical Parameters: • TPH and Oil and Grease • Benzene • Toluene • Ethyl benzene • Total xylene • Cl, SO_4 • Metals : As, Cd, Total Cr, Pb, Hg, Ni,Se, Ba, Cu, Zn, Fe, Mn	Method* • Monitoring will be conducted based on the equipment and methods acceptable to the Myanmar Government and as per best international oil and gas industry best practices will be applied	• Once after well abandoned and site restored within 3 months. • In event of spillage and leakage	• Nearest groundwater well or just off well pad area • Area of possible spill

Monitoring will be conducted based on the equipment and methods acceptable to the Myanmar Government and as per best international oil and gas industry best practices will be applied.

Actual Analytical Methods Applied

Parameter	Proposed guidelines	Ref. Method used by ALSHK	Limit of Reporting (ALSHK)
Oil and grease	10 mg/L (EQEG)	ALS HK	5 mg/L
Total coliform bacteria	< 400 MPN/100 ml (EQEG)	DoE Section 7.8 & 7.9	1 cfu/100ml
Cyanide (free)	5 µg/l (CA)	APHA4500 CN: B &N	0.01 mg/L
Cyanide (total)	1 mg/L (EQEG)	APHA4500 CN:B & O	0.1 mg/L
Heavy metals (total)	5 mg/L (EQEG)		Total Metals is determined as the sum of all the tested metals as listed

Parameter	Proposed guidelines	Ref. Method used by ALSHK	Limit of Reporting (ALSHK)
Arsenic	5 µg/l (CA)	USEPA 6020	10 ug/L
Cadmium	5.1 µg/l (CA*)	USEPA 6020	0.2ug/L
Copper	700 µg/l (CA)	USEPA 6020	1 ug/L
Chromium (hexavalent)	1 µg/l (CA)	APHA3500Cr: B & USEPA 6020	20 ug/L
Chromium (total)	8.9 µg/l (CA)	USEPA 6020	1 ug/L
Iron	300 µg/l (CA)	USEPA 6010	0.05 mg/L
Lead	200 µg/l (CA*)	USEPA 6020	1 ug/L
Mercury	3 µg/l (CA*)	USEPA 6020	0.5 ug/L
Nickel	200 µg/l (CA*)	USEPA 6020	1 ug/L
Selenium	50 µg/l (CA*)	USEPA 6020	5 ug/L
Silver	0.5 mg/L (EQEG)	USEPA 6020	1 ug/L
Zinc	30 µg/l (CA)	USEPA 6020	10 ug/L
Barium	--	USEPA 6020	1 ug/L

8.11.6 Implementation Schedule

The monitoring activities will be performed as mentioned in the tables above.

Monitoring of surface and groundwater in the immediate vicinity of the sites will be conducted at regular intervals (monthly or quarterly) during exploration drilling to monitor any adverse changes to surface or ground water quality. However, in the event of spillage or leakage, potentially affected groundwater or watercourses will be sampled and analysed for substance spilt. Monitoring locations are shown in Figures 1 & 2 below. Monitoring Coordinates are also provided.

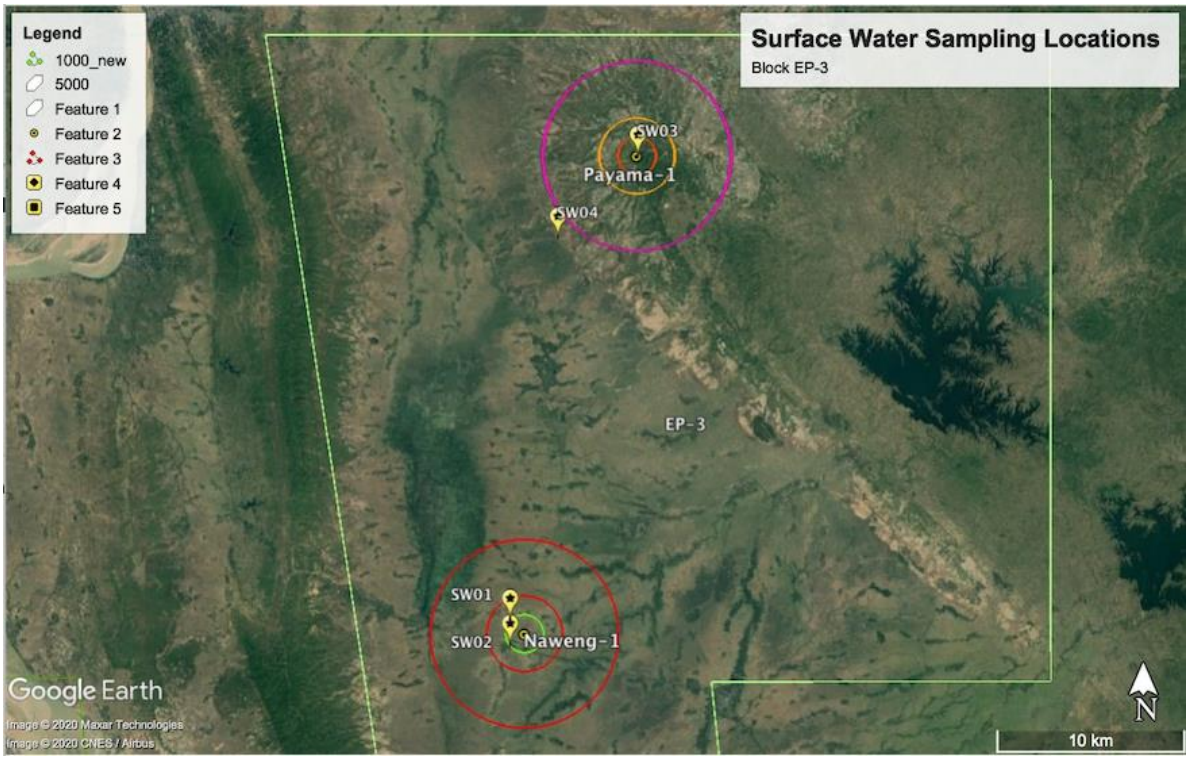


Figure 1: Surface Water Sampling Locations for Naweng-1 and Payama-1

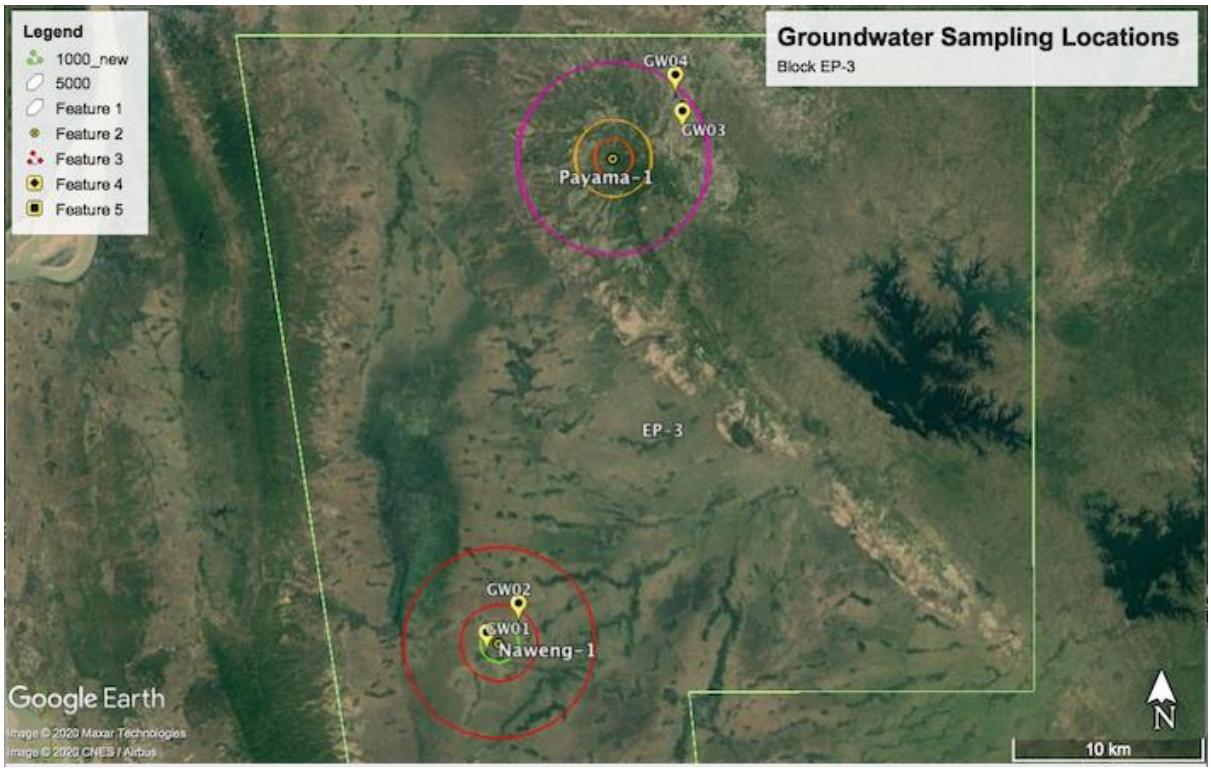


Figure 2: Groundwater Sampling Locations for Naweng-1 and Payama-

Monitoring Coordinates for Naweng-1 and Payama-1

Surface water Sampling Locations		
ID	**North**	**East**
SW-01	18°31’44.6”N	95°23’55.0”E
SW-02	18°31’01.4”N	95°23’55.0”E
SW-03	18°45’08.2”N	95°27’48.6”E
SW-04	18°42’39.8”N	95°25’21.4”E

Groundwater Sampling Locations		
ID	**North**	**East**
GW-01	18°31’01.6”N	95°23’58.7”E
GW-02	18°31’51.1”N	95°24’55.6”E
GW-03	18°45’43.0”N	95°29’48.0”E
GW-04	18°46’44.6”N	95°29’35.3”E

8.11.7 Responsibilities

Day to day supervision shall be done by the drilling Contractor and Over all supervision will be done by ONGC Videsh. Roles and responsibilities are as follows:

- ONGC VIDESH oversees the drilling of an exploratory well in EP-3 Block, Myanmar and provides coordination of well operations and planning, technical support and emergency support.
- The drilling contractor will provide a rig for drilling an exploratory well, including operators, accommodation facilities, medical personnel, ambulances and HSE supervisors, as well as emergency response plans.

Country Manager (ONGC Videsh):

Country Manager of ONGC Videsh Ltd. has ultimate responsibility for ensuring that effective measures are in place to fulfil the spirit and intent of all project activities including compliance to all legal & statutory requirements of host country.

i. Responsible and accountable for the effectiveness of the QHSE Management System
ii. Ensuring implementation of established policies and rules
iii. Ensuring compliance to applicable legal and other requirements including timely submission of monitoring reports, statements, returns etc. to the statutory authorities
iv. Promoting process approach and risk-based thinking
v. Ensuring arranging resources needed for the QHSE Management system
vi. Review and report the performance of QHSE Management System
vii. Ensure incidents and non-conformities are reported, investigated and corrective actions taken as per procedure
viii. Ensure effective communication with employees and relevant stakeholders
ix. Ensure emergency preparedness and response as per procedure
x. Ensuring competency in the Country Office and Operated projects
xi. Ensure establishing bridging documents with contractors
xii. Ensure procurement/ provisioning of the PPE as per PPE policy

Company Man (ONGC videsh)

The Company man, ONGC Videsh Ltd. has responsibility for the safe and effective execution of operations as per drilling programme.

i. The Company Man has the responsibility on site of all operations of drilling service in general.
ii. He will Prepare Daily Operations Reports for base and other likely requirements.
iii. Hel will assist Country office (CO) in ensuring that all regulatory and statutory notifications have been made
iv. In case of emergency Coordinate with Crisis Management Team (CMT) team on site.
v. Ensure SOPs are followed.

HSE Representative (ONGC Videsh)

HSE representative on site shall ensure effectiveness of all HSE Plans, procedures including Emergency Response & Disaster Management Plan (ERDMP) through regular mock drills and update and shall also assist Company man ONGC Videsh on site during emergencies.

i. Ensure to maintain all documents, forms and records related to HSE.
ii. Ensure availability of safety items, equipment, instruments (First aid box, gas detector etc.)
iii. Ensure PPE compliance in drill site by all persons working including contractual and visitors.
iv. Ensure regular safety talks/trainings/campaigns to promote safety awareness amongst persons working at rig.
v. Responsible for collection, compilation and analysis of information in respect of accidents and dangerous occurrences with a view to promote safe practices and improvement of working environment.
vi. Responsible for ensuring that required environmental monitoring is conducted and reported.
vii. To encourage every person (including contractual and visitors) to promote environment protection in drill site.

Rig Manager (RM) (Drilling Contractor's chief representative) on Site

Rig Manager is overall In-charge of daily operations and On-scene commander in case of any emergency situation.

i. He is responsible for analysing and supervising all operations and regular inspections of the equipment. He will have the responsibility to ensure that all members of the team under their direction are trained in their respective roles, and that HSEQ procedures and safe work practices are met and implemented.
ii. Responsible for ensuring that environmental monitoring is conducted and reported.
iii. He shall ensure that this procedure is implemented and communicated to all rig personnel through trainings & drills
iv. Ensure that he has contact numbers of all key personnel like Concerned Govt. officials, Ambulance, hospitals, fire department etc.
v. He will be working in coordination with company man, HSE supervisor OVL, and contractor's project head at base office and if required, will ask for additional resources from offsite to handle any emergency situation.
vi. Rig Manager shall assign some suitable person to be the overall communication coordinator. Role of Communication coordinator/ translator being critical for all interactions / flow of information at drill site, he should be available from beginning of the operation & reasonably conversant in English as well as local language.

Tool Pusher (Drilling Contractor)

The Rig Tool Pusher will be responsible for execution of duties under direct supervision of Rig Manager. He will assist Rig Manager in his duties.

i. Tool Pusher is responsible for the direction and supervision of Rig crews for daily operations and execution of Drill plan.
ii. Tool Pusher is responsible for the direction and supervision of Rig crews mitigating any emergency or a situation which can lead to emergencies.
iii. They are responsible for analysing and supervising all operations and regular inspections of the equipment. They also have the responsibility to ensure that all members of the team under their direction are trained in their respective roles, and that HSEQ procedures and safe work practices are met and implemented.

HSE Officer (Drilling Contractor)

i. HSE Officer is responsible to ensure that all activities are carried out as per HSE requirements for the safety of all personnel involved in the operation.
ii. Responsible for conducting all required environmental monitoring and preparation of monitoring reports.
iii. He shall support the Rig Manager in coordinating day to day operations and in emergency handling activities.
iv. Prepare HSE Reports.
v. Record the incident/ accident in chronological order.
vi. The HSE Officer shall assist the Rig Manager in establishing communications with emergency services as and when required.

8.12 Waste Management Plan

8.12.1 Objectives

The WMP is designed for use in all activities associated with this drilling project. The Waste Management Plan has been developed on the basis of EIA report provided by OVL. All Drilling Contractor, OVL, MOGE and sub-contractor staff must ensure that they become familiar with the requirements and strictly follow them contained in this procedure.

The purpose of the procedure is to describe the Waste Management Standards that must be implemented where **the Drilling Contractor** has operational control. The implementation of these Waste Management Standards is aimed to ensure:

- Full compliance with local environmental requirements
- To eliminate or minimize the number of serious environmental incidents

This Plan applies to all sectors and activities related to the drilling operations for EP-3, throughout all operations and includes:

- collection, handling and temporary storage of wastes; and
- management and transportation to treatment/disposal of the waste at authorized facilities.

8.12.2 Legal Requirements

The section provides a description of the legal framework relevant to the management of the wastes produced during drilling activities.

International Conventions and Agreements

Basel Convention: The Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal was adopted on 22nd March 1989 by the Conference of Plenipotentiaries in Basel, Switzerland. The overarching objective of the Basel Convention is to protect human health and the environment against the adverse effects of hazardous wastes. The provisions of the Convention center around the following principal aims:

- the reduction of hazardous waste generation and the promotion of environmentally sound management of hazardous wastes, wherever the place of disposal;
- the restriction of transboundary movements of hazardous wastes except where it is perceived to be in accordance with the principles of environmentally sound management;
- a regulatory system applying to cases where transboundary movements are permissible.

Myanmar Laws and Regulations

The Ministry of Natural Resources and Environmental Conservation is the main institutional body responsible for setting a framework for waste management at the national level. Similarly, all major cities across Myanmar are administrated by City Development Committees that are responsible for providing municipal waste management services.

Existing Policy and Regulations

Existing Laws and Regulations are as follows:

National Level

- The Constitution of the Republic of the Union of Myanmar (2008);
- National Government Policy (1994);
- Environmental Conversation Law (March, 2012);
- Environmental Conservation Rules (June 2014);
- Environmental Impact Assessment procedures (Dec, 2015);
- National Environmental Quality (Emission) Guideline (2015);
- Factories Act (1951) ;
- Public Health Law (1972);

Yangon

- The Yangon Civil Development Law (2013);
- The City of Yangon Development Law (1990);
- The Underground Water Act (1930);
- The Water Power Act (1927);
- The City of Yangon Municipal Act (1922);
- The Yangon Water-work Act (1885).

In addition, City and Township Development Committees promulgated the solid waste disposal and collection by-law providing the legal basis at the local level. For the Ayeyarwady Region Regional Level, there is the "Ayeyarwady Region Municipal Act" which is concerned with the whole region. For each township, there are local by-laws specific to town. These by-laws are based on the township level situation. Thus the by-laws are different between each township.

MONREC has established environmental quality standards, the National Environmental Quality Standard [Legal Reference: ECL 2012 (Article 2c) and EQS 2016]. ECD / MONREC have indicated that the discharge standards shown in **Table 8-14** below would be applicable for Onshore Oil and Gas activities. These are in accordance with international standards.

Table 8-14: Myanmar Discharge Standards Applicable to Onshore Oil and Gas activities

Guideline	Standard
Drilling fluids and cuttings	Treatment and disposal in accordance with applicable standards provided in the General EHS Guidelines
Produced sand	Treatment and disposal in accordance with applicable standards provided in the General EHS Guidelines
Produced water	Treatment and disposal in accordance with applicable standards provided in the General EHS Guidelines For discharge to surface waters or to land: – Total hydrocarbon content 10 mg/L – pH 6-9 – Biochemical oxygen demand 25 mg/L – Chemical oxygen demand 125 mg/L – Total suspended solids 35 mg/L – Phenols 0.5 mg/L – Sulfides 1 mg/L – Heavy metals (total)a 5 mg/L – Chlorides 600 mg/L (average), 1,200 mg/L maximum
Completion and well work- over fluids	Treatment and disposal in accordance with applicable standards provided in the General EHS Guidelines

Guideline	Standard
	For discharge to surface waters or to land: – Total hydrocarbon content 10 mg/L − pH 6-9
Storm water drainage	Storm water runoff should be treated through an oil / water separation system able to achieve oil and grease concentration of 10 mg/L
Cooling water	The effluent should result in a temperature increase of no more than 3°C at edge of the zone where initial mixing and dilution take place; where the zone is not defined, use 100 m from point of discharge
Sewage	Treatment as per General EHS Guidelines, including discharge requirements
Air emissions	Treatment as per General EHS Guidelines Emission concentrations as per General EHS Guidelines, and: – Hydrogen sulfide 5 mg/Nm^3

a Heavy metals include: Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Silver, Vanadium and Zinc

Standards And Guidelines

The following Standards and Guidelines are to be considered:

- ISO 14001:2015, Environmental Management Systems - Requirements with Guidance for use;
- International Finance Corporation (IFC), General Environmental, Health, and Safety General Guidelines, 2007;
- International Finance Corporation (IFC) Environmental, Health, And Safety Guidelines for Onshore Oil And Gas Development, 2017;

The Environmental, Health, and Safety (EHS) Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP) are detailed in **Table 8-15**.

Table 8-15: Applicable IFC EHS Guidelines

Environmental topic	Applicable EHS Guidelines
Wastewater and Liquid effluent quality	Section 1.3 provides guidelines applied for projects that have either direct or indirect discharge of process wastewater or wastewater from utility operations. Section 1.3 provides guidelines for treatment approaches of process wastewater and wastewater from utility operations. These Guidelines include the following key recommendations: • points of discharge, rate of discharge, chemical use, dispersion and environmental risk should be considered in a disposal plan; • discharges should be planned away from environmentally sensitive areas, with specific attention to high water tables, vulnerable aquifers, wetlands, and community receptors, including water wells and intakes.

Environmental topic	Applicable EHS Guidelines
Waste management	Section 1.6 provides guidelines for projects/facilities that generate, store, or handle any quantity of industrial hazardous or not hazardous waste. Section 1.6 provides appropriate guidelines for hazardous waste storage, transport, treatment and disposal, in order to prevent harm to health, safety and environment. These Guidelines include the following key recommendations: • waste management should be addressed through a Waste management system that addresses issues linked to waste minimization, generation, transport, disposal, and monitoring; • in addition to the implementation of waste prevention strategies, the total amount of waste may be significantly reduced through the implementation of recycling plans; • if waste materials are still generated after the implementation of feasible waste prevention, reduction, reuse, recovery and recycling measures, waste materials should be treated and disposed and all measures should be taken to avoid potential impacts to human health and the environment.

8.12.3 Waste Management Principles

The Drilling Contractor will be responsible for waste management during the drilling program and will be required to be in compliance with the local legislation and Environmental Management and Monitoring Plan (EMP). OVL will regularly conduct inspections during operations to ensure compliance to contract requirements. .

General Waste Management Principles

The following guidance applies to the management of non-hazardous and hazardous waste. Waste management should be addressed through a Waste management system that addresses issues linked to waste minimization, generation, transport, disposal, and monitoring.

IFC (2007) notes that Facilities that generate and store wastes should practice the following:

- Establishing waste management priorities at the outset of activities based on an understanding of potential Environmental, Health, and Safety (EHS) risks and impacts and considering waste generation and its consequences.
- Establishing a waste management hierarchy that considers prevention, reduction, reuse, recovery, recycling, removal and finally disposal of wastes.
- Avoiding or minimizing the generation of waste materials, as far as practicable.
- Where waste generation cannot be avoided but has been minimized, recovering and reusing waste.
- Where waste cannot be recovered or reused, treating, destroying, and disposing of it in an environ-mentally sound manner.

The waste management hierarchy below considers prevention, reduction, reuse, recovery, recycling, removal and finally disposal of wastes:

- prevention (don’t generate waste);
- reduction (generate less waste by better management and by material substitution);
- reuse (reuse in its original form);
- recovery (extract material or energy from a waste);
- recycle (recycle and reprocess the waste to incorporate it into a new product or new use);
- disposal (mitigate the hazard through treatment, relocate the waste to another location).

Efforts should be made to eliminate, reduce or recycle wastes at all times, in line with the waste hierarchy. At a minimum, the waste materials should be segregated into non-hazardous and hazardous wastes for consideration for reuse, recycling, or disposal.

Waste management planning should establish a clear strategy for wastes that will be generated including options for waste elimination, reduction or recycling or treatment and disposal, before any wastes are generated.

Waste Management and Minimisation Plan

Waste minimization practices are to be applied to all types of waste. In addition, the conservation of re-sources (energy, water, gas, and fuel) will be addressed. The waste minimization plan is one part in the overall programme of responsible waste management.

Training

All contractor personnel will be trained on the Waste Management Plan, so they can become familiar with the reporting procedures and the entities involved in the management of the wastes derived by the drilling activities. Due Diligence

Steps toward the establishment of due diligence includes:

- Regular performance of environmental inspections
- The establishment of periodic exercising of contingency plans
- Knowledge and compliance with applicable legislation
- Employee/contractor training
- Establishing and maintaining codes and operating procedures, and
- Maintaining detailed records and inventories

WASTE CLASSIFICATION

The classification of waste generated shall be categorized in 2 main groups according to criteria of danger as non-hazardous waste and hazardous waste **Classification**. However, laboratory analysis waste will sometime be required.

Non-Hazardous Waste
Non-Hazardous waste presents a lower level of risk to human health and the environment. There are 2 types of non-hazardous waste as follows:

1) General non-hazardous wastes from office, catering services, laundry, household and similar ones 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)
- Biodegradable waste (e.g. food waste, sewage)

2) Waste containing or contaminated with hazardous substance in concentration before or after treatment to meet the specified international or regulatory discharge criteria which do not

exceed the standard limit of country, e.g.

- Produced water
- Produced sand
- Drilled cutting

Hazardous Waste
Hazardous waste defines as any waste which cause danger or 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. Form of hazardous waste comprises solids, sludge, liquid and containerized gas and hydrocarbon waste.
Hazardous waste shall be categorized into 2 main types as follows:

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

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

Gas canisters have to be thoroughly bled off prior to being disposed of.

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

2) Waste containing or contaminated with hazardous substance in concentration which exceeds 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.

8.12.4 Color Coding and Labelling

The following waste segregation system will be implemented:

Table 8-16: Waste Segregation System

Color	Waste description
Red	Hazardous waste
Blue	General Non-hazardous waste
Yellow	Recyclable waste
Green	Food Waste
Black	Spent oils waste

8.12.5 Containers

All containers should be as follows;

- Made from durable materials compatible with the waste to be collected, leakage proof, sturdy, stable and easily handled,
- Design to prevent the ingress of animals, escaping odor and place under cover if necessary to avoid leachate
- Dedicated containers (bins, skips, etc.) should be labeled clearly by type of waste for example by homogeneous color-coding and illustrated by pictographs, and the potential need for multiple language labeling (English and Myanmar)
- Install adequately in the vicinity of working area, accommodation and office area,

Containers used for medical or clinical waste shall be marked prominently with universal warning signs and/or the word "**Medical Waste**". Used needles and syringes represent a particular threat as failure to dispose of them safely may lead to recycling and repacking which in turn lead to unsafe re-use. Where possible, management of medical/clinical wastes should be integrated into existing healthcare waste management system. Infectious waste must be collected and shipped in suitable containers. Each on duty of site doctor should handle the medical/clinical wastes shipment for further final disposal at the end of his/her rotation.

8.12.6 Management Actions

The waste inventory (per well site) has been provided for reference is section 8.12.7. The waste management actions are provided below.

Social Impact Assessment – Construction and Installation Phase			
12. Waste Management	12.1 Hazardous and Non-Hazardous waste management	12.1.1 Domestic waste result in windblown litter, attract vermin and be a vector for disease	12.1.1.1 OVL in association with drilling contractor shall develop Waste Management Plan for this drilling campaign
			12.1.1.2 Store hazardous waste in appropriately designed areas and safe containers that are suitable for transporting/transferring.
			12.1.1.3 Ensure treatment and disposal according to accepted international standard.
			12.1.1.4 Enforce "Good Housekeeping" practices.
			12.1.1.5 Domestic and general waste to be segregated and stored using suitability labeled.
			12.1.1.6 Dispose of waste in labelled containers for possible recycling
			12.1.1.7 Implement requirements for waste management and related laws
			12.1.1.8 Install septic tanks and soak away pit for holding sewage.

			12.1.1.9 Non-hazardous wastes will be taken to an approved waste site
			12.1.1.10 Hazardous waste will be taken to DOWA waste management facility
Social Impact Assessment – Drilling Phase			
11. Waste Management	11.1. Non-Hazardous waste management	11.1.1. Domestic waste can be a fire hazard, constitute windblown litter, attract vermin, contaminate surface and groundwater and vector for disease	11.1.1.1. Implement construction and installation phase mitigation measures in 12.1.
	11.2. Hazardous waste management	11.2.1. Hazardous waste that may contaminate the environment.	11.2.1.1. Ensure treatment and disposal of hazardous waste by licensed contractor.
			11.2.1.2. Segregate and store hazardous waste in appropriate and safe containers that are suitable for transporting/transferring. Make sure all containers are clearly labeled.
			11.2.1.3. Always check and record the type(s) and amount of hazardous waste generated.
			11.2.1.4. Dispose of waste in labeled containers for possible recycling or reuse.
			11.2.1.5. Prohibit open burning of any waste at project site.
			11.2.1.6. Enforce “Good Housekeeping” practices.
			11.2.1.7. All hazardous waste will be collected in skips ready for treatment and disposal. Hazardous wastes will be transported and disposed at approved waste management facility.
			11.2.1.8. Provide Manifest System for transportation of hazardous waste to treatment area or disposal area.
	11.3. Handling and Disposal of drill cuttings, sludge and chemicals.	11.3.1. Localized change in water quality and soil quality from chemical	11.3.1.1. Drill cuttings and adhered fluids will not be discharged to surrounding area.

		composition of drill fluids	11.3.1.2. Volume of cuttings and fluids discharged will be minimised through use of solids control equipment.
			11.3.1.3. Store all chemicals in secured storage area.
			11.3.1.4. Hazardous wastes materials will be handled and stored in accordance with the corresponding MSDS.
			11.3.1.5. Implement awareness training on the hazards of the chemicals.
			11.3.1.6. Enforce use of PPE.
			11.3.1.7. Handle chemicals only in well-ventilated and controlled areas
			11.3.1.8. Fuel storage tanks to be surrounded by bund wall.
			11.3.1.9. Isolate any area(s) that might be contaminated from non-contaminated areas. Provide water drainage system around the contaminated area for collecting water into the concrete pit.
			11.3.1.10. Use oil catch pans under vehicles when performing maintenance. Conduct maintenance only on impervious surfaces (i.e. on tarpaulin sheet).
			11.3.1.11. Provide spill clean up kits and training for designated rapid response teams to clean up any spills. In the event of oil or chemical spill, implement spill response plan.
			11.3.1.12. Deposit treated cuttings into the cuttings pit, where they are to be temporarily held before bioremediation onsite after the rig move out from location or sent for disposal at approved waste management facility.
			11.3.1.13. Monitor level of cuttings and dirty water in waste pit.
			11.3.1.14. Implement land transportation procedure.
Social Impact Assessment – Well Testing Phase			
7 Waste Management	7.1 Hazardous/Non-Hazardous waste management	7.1.1 Domestic waste can be a fire hazard, constitute. windblown litter, attract vermin,	7.1.1.1 Implement construction and installation phase mitigation measures in 12.1.

		contaminate surface and groundwater and be a vector for disease	
		7.1.2 Hazard waste i.e. condensate	7.1.2.1 Implement from drilling phase in 13.4
			7.1.2.2 Transport produced water to dispose by licensed water treatment facility.
Social Impact Assessment – Well Abandonment Phase			
8 Waste Management	8.1 Hazardous/non-hazardous waste management	8.1.1 Non-hazardous waste can contaminate surface and groundwater and be a vector for disease.	8.1.1.1 Implement construction and installation phase mitigation measures in 12.1.

8.12.7 Disposal Methods and Facilities

The waste disposal methods and facilities available for OVL wastes are as follows:

- Recycling or reusing whenever beneficial for local villagers and/or local recycling industry.
- Yangon City Development Committee (YCDC) surface disposal yards and incinerators.
- Soak away pits (e.g. sewage from onshore sites)
- Qualified third party hazardous waste landfill location at Thilawa Industrial Estate.

8.12.8 Summary of Waste Inventory and Disposal Plan

OVL in consultation with their subcontractors is expecting the following type and volumes of waste:

Waste Type	Estimated Quantity	Disposal Plan
1) Drill cuttings	1500 – 2500 m^3 per well	Cuttings of WBM & LTSOBM will be dried onsite using drier. The dilution of WBM will be treated through TFM (Total Fluid Management System). The dried cuttings and any drilling fluid waste will be transported by authorised Waste Management Company to DOWA waste management facility for disposal.
2) Drilling Mud (WBM and LTSOBM)	1900 m^3 per well	Drilling Mud will be re-used at next well site and at the end of drilling campaign any waste mud will be returned to Mud Contactor for re-use or disposal.
3) Unused chemicals	N/A	Returned to supplier or kept for future drilling campaigns.

Waste Type	Estimated Quantity	Disposal Plan
4) Domestic waste	Construction: 50 kg/day Drilling: 130 kg/day Well abandonment: 30 kg/day Site restoration: 25 kg/day	**Biodegradable waste** (food waste) will be segregated and transferred to local government waste disposal facilities (like YCDC in Yangon). **Recycle and General Non-Hazardous waste except recycle and biodegradable waste** shall be transferred to local government waste disposal facilities (like YCDC in Yangon) or disposed at a site approved by Local Authority.
5) Industrial waste (scrap metal, plastic, paper, wood, glass etc.)	N/A	Recyclable or reusable waste to be sold or donated. Other non-recyclable or reusable waste will be transferred to local government waste disposal facilities (like YCDC in Yangon).
6) Hazardous waste	Drilling: 500 kg/month	**Medical or clinical waste** shall be transferred to Yangon for disposal at approved location by YCDC or authorized medical provider. **General Hazardous Waste** - Transported to Yangon for disposal at approved location by an authorized Waste Management Company facility
7) Sanitary wastewater	Construction: ~3 m^3/day Drilling: ~7.8 m3/day Well abandonment: ~1.8 m^3/day Site Restoration: ~1.5 m^3/day	**Grey water** will be treated in soak pit. **Black water** will be treated in septic tank and soak pit.

8.12.9 Monitoring Plans

Factors	Index/Parameter	Procedure	Proposed Duration and Frequency of Monitoring	Location
Cuttings from drilling (in case of further using cuttings)	• Chloride (for WBM) • Oil on Cuttings (for LTSOBM) • Mercury (in stock Barite) • Cadmium (in stock Barite)	Method • Myanmar National Environmental Quality (Emission) Guidelines, Effective since 2015 in accordance with The Environmental Conservation Law, 2012,	• Upon Completion of Drilling Phase before mixing / burial disposal in waste pit.	• Exploration drilling well
Chemical use for drilling	• Type of chemical • Volume of use	• Daily record type of chemicals and volume used.	• Daily and report after drilling is completed	• Project area
Hazardous and Non-hazardous waste	• Manifest Disposal and Tracking Report	• Track waste volume by type and disposal location daily	• During Drilling Phase	• At all project locations

8.12.10 Implementation Schedule

WASTE RECORD AND REPORTING

Tracking of waste types, quantities and methods and location of final disposal of these wastes shall be conducted as part of an overall waste management system to document the intended management of the waste.

Solid

Waste is to be weighted on the weighing scales provides, where possible. Where it is not possible to weigh the waste directly on the scales, the following steps shall be adopted in estimating the weight of the waste materials.

The collected drums of the wastes are multiple to the standard weight per drum of specific waste type

Some wastes are difficult to collect in the drum such as bulbs, fluorescent, aerosol cans, production filters etc. In such case, the counted numbers of items are to be multiplied with the estimated standard weight per number of items in 10 units.

Weight evaluation can only be accurate if the wastes have been correctly segregated. It is thus essential that waste streams should be segregated with the appropriate monitoring to ensure that personnel comply with such requirements.

Liquid

Liquid discharges shall be calculated as daily measurement on the metering or monthly average based on daily production report. Specific note shall be made of any non-routine liquid discharges.

Gas

Any pressure relief or blow-downs shall also be reported by the site representative on the monthly waste and/or environmental report to allow involved parties to estimate the GHG emission.

Waste Tracking Documents and Report Preparation

Waste tracking documents or waste manifests shall give the exact description of the content of the skips/drums/containers.

The waste manifests shall be filled in and filed by both sender and receiving parties. Site HSE representative and/or waste management operational personnel are in charge of the waste manifests. He/she shall calculate or weight the quantity of each waste stream transferred from their particular site. This shall be totaled on a monthly basis.

Site HSE representative and/or waste management operational personnel shall prepare monthly

waste management report to OVL HSE Manager for further waste reporting and disposal purposes which shall be included, as a minimum:

- Type of waste
- Location of waste generated
- Quantity or volume of waste including generating, storing and disposal.
- Method used for transferring waste.
- Method used at disposal facility.
- Final disposal location.
- Waste manifest

8.12.11 Responsibilities

OVL HSE MANAGER/Contractor

- Ensure that waste is managed and implemented to comply with this procedure.
- Develop site specific waste management instruction/procedure to align with the procedure.
- Provide onsite training for the contractor personnel who will work on site location
- Routine site audit to ensure onsite waste generation is properly segregated and handling
- In charge of the waste manifests record system and monthly waste reporting

8.13 Emergency Response Plan

8.13.1 Objectives

The objective of Emergency Response Plan is to evaluate the consequences and to muster prompt, planned, collective and well-coordinated remedial actions during emergency situations, identified through hazard identification and Risk analysis in the least possible time with minimum loss to human life, environment and property. The specific objectives are:

- Action to be taken in the event of any emergency, including when and how the said action is to be taken.
- Action to be taken by those involved in and outside ONGC Videsh, to mobilize their resources in an orderly way and react in time and effectively to handle emergency.
- Duties and responsibility of each key personnel including measures to be adopted to avert or minimize the consequences of the emergency.
- Alarm and communication system including the system of notifying the concerned authorities.
- Plan for competence of personnel and for mock drills.

The plan, therefore, aims at immediate response to an emergency event to prevent escalation to a disaster and also the response in the event of such escalation.

8.13.2 Scope

The plan covers the emergencies arising out of acts such as:

- Well Blowout, Fire or Explosion Emergency at Well Site
- Oil or Chemical Spill
- H2S Emissions
- Toxic Gas Leak
- Medical Evacuation
- General Evacuation
- Flooding in the Field
- Security Breach

8.13.3 Legal Requirements

Myanmar applicable legislation and regulation include:

- The Constitution of the Republic of the Union of Myanmar (2008);
- The Myanmar Investment Law (2016);
- Myanmar Environmental Conservation Laws (2012);
- Environmental Conservation Rules (2014);
- National Environmental Quality (Emission) Guideline (2015);
- Public Health Law (1972);
- The Prevention and Control of Communicable Disease Law (1995);
- The Control of Smoking and Consumption of Tobacco Product Law, 2006 (Section 9);
- The Petroleum and Petroleum Products Law, 2017, Section 8 (m), Section 9 (a, c, d), Section 19(a,b,e), Section 10 (a,c,d,f)
- The Myanmar Fire Force Law, 2015 (Section 25);
- The Explosive Act (1887)
- The Explosive Substances Act (1908)
- The Factories Act (1951)
- The Oilfields Act (1918)
- The Welfare of Labors of Oilfield Act, 1951(After notification);
- The Motor Vehicles Law (2015) and Rule (1987);
- Myanmar Insurance Law (1993 - Section 16);
- The Prevention of Danger of Hazardous Chemical and related Substances Law, 2013 (Section 16,17,23,27);
- Import and Export Law, 2012 (Section 7).

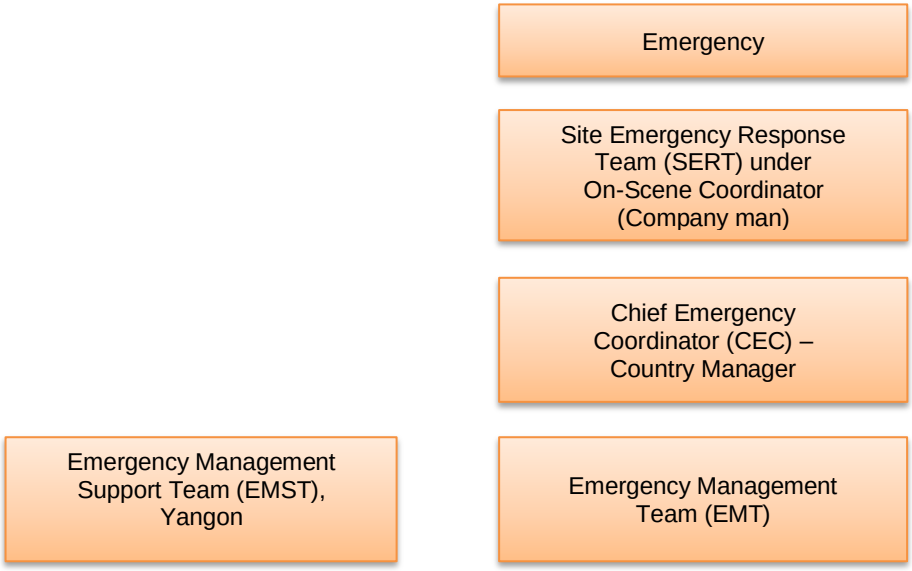
8.13.4 Overview Maps and Site Layout

The sensitive receptors for the Emergency response plan are the well site areas and basecamp area in regard to the nearby communities (see **Figures 8-1 to 8-4**).

8.13.5 Organization, Roles and Responsibilities

The responsibilities of each person may vary depending of the group or department he belongs. However, it is the responsibility of each member of OVL and contractors, to follow and comply with this Emergency Response Plan in performance of their activities.

The Country Manager of OVL has ultimate responsibility for ensuring that effective measures are in place to fulfil the spirit and intent of Emergency Response Plan and OVL HSE policy. The drilling Manager has the line responsibility for the safe and effective execution of operations as per drilling programme. As part of these responsibilities he will monitor the development and implementation of the Emergency Response System and ensure that it is fit for the purpose.



8.13.6 Site emergency Response Team (SERT)

Roles, Responsibilities and Functions of SERT

- SERT is the first responder in case of any emergency at site
- Team will be responsible for:
  o Search & rescue operation
  o First aid & fire fighting
  o Rig shut down, if required
  o Evacuation in case of emergency beyond control
  o Response as enumerated in procedures of different emergency scenarios
- Work out requirement of material, equipment & services for emergency control
- Coordinate with external emergency teams like firefighting, oil spill control, blow out control teams
- Take active part in mock drills
- Suggest revision of ERP based on threat vs vulnerability analysis, hazards, mock drills, actual incidents & emergencies

Composition of SERT

- Company Man - The Company Man on the rig will be On-scene coordinator & Head of SERT. He shall supervise and monitor onsite emergency response and will also co-

ordinate communications with OVL's base support resources / teams. He will be assisted by Site Emergency Response Team (SERT).

- HSE Manager - He shall be assisting Company man in on-site emergency response and assist in co-ordinating with Contractor's supervisor as well as OVL's base support resources/ teams.
- Tool Pusher - The Contractor's Tool pusher will be the nodal coordinator for coordination with Company man on emergency response of the Work over Rig including supervision of the emergency teams made up of rig personnel. He will also be responsible for communications with the Contractor's base office and other contractual agencies involved. He will be assisted by the defined rig team including HSE and operational personnel to deal with the emergencies.
- Contractor's Personnel - To complete formation of SERT, rig crew (including services) shall be selected based on position & competency and will be directly responsible for execution of the emergency plan.
- List of SERT, shift wise will be formulated & displayed.

Training and Competence of SERT Members

SERT team members will be formed from experienced rig crew knowledgeable about hazard identification, risk analysis and emergency management. All SERT team members shall have basic knowledge of first aid firefighting. At least two members of SERT each shift shall be trained first aider.

Mock Drills and Training

The best training for emergency response is practice in the form of mock drills. This will help in study the promptness of response and effectiveness tactics and in turn improve them. Prior to any exercises being run all prospective members of the various emergency response teams will receive a briefing outlining the Emergency Response System in general and the roles of teams and the responsibilities of individuals in the teams in the event of an emergency.

The mock drill should be followed by briefing and training. The report should be generated for each mock drill bringing out "lessons learned". The feedback of mock drills shall be used for subsequent updating of Emergency Response Plan.

8.13.7 Planning Operation

At emergency control room (ECR), actions to be taken in the next 24, 48 and 72 hours will be prepared on the basis of situation reports received from site control room (SCR) for mobilization of additional resources and manpower to deal with the emergency.

8.13.8 Emergency Service Contacts

The following emergency contacts for nearby emergency services are included for the SERT to access for additional support during an emergency. (**Table 8-17**)

Table 8-17: Local Emergency Service Contacts

Sr	Organization	Address	Contact number
Paukkaung Township			
1	Municipal office	Phan Khar Pin street, No (5) ward	053-45052
2	Hospital	Pyay-Taungoo Road, No (1) ward	053-45022
3	Police station	Pyay-Taungoo Road, No (5) ward	053-45006
4	Fire Bridge	Pyay-Taungoo Road, No (3) ward	053-45500
Thegon Township			
1	Municipal office	Sa Yin Sit Yone street, Arr Ga Sar new ward	053-62030
2	Hospital	Hospital road	053-62025
3	Police station	Yone street	053-62099
4	Fire Bridge	Shwe Bone Shane street	053-62180

8.13.9 Daily Incident Log and Management Reports

At ECR, a daily incident log will be maintained and management reports will be prepared for the situation at every 12 hours interval.

8.13.10 Termination of Emergency Operation

Once the disaster/ emergency has been brought under control, an assessment of the situation will be made by the Emergency Response Team for safe operation and the measure needed for safety of personnel& Environment protection.

CEC after having satisfied himself about the safety of the installation and personnel and measures for Environment protection, will issue instruction to Drill Site Coordinator regarding termination of the emergency operation (All clear) and the precaution to be observed. On receipt of such instruction, the Drill Site Coordinator will take necessary actions for resumption of normal operations.

8.13.11 Report on Management of Disaster

The emergency response team mobilized at ECR will prepare a detailed report on the management of the disaster and submit the same to CEC. A copy of the report should be maintained in the HSE group.

8.13.12 Monitoring Plans

Factors	Index/Parameter	Procedure	Proposed Duration and Frequency of Monitoring	Location
Public and Occupational health and safety	• Accident statistics • cause of accidents • Mitigation measures	• Record accidents or near misses generated during construction by identifying cause(s) and severity of impact(s), as well as operated mitigation measures • Conduct summary report for accident investigation	• Throughout all project phase	• Project area, community around project area, and transportation route

8.13.13 Implementation Schedule

The emergency response plan must be customized for the location one month prior to project initiation to ensure that personnel are trained as required.

8.13.14 Specific Response Actions for Blow Out, Chemical Spill, Toxic Gas Leak and H2S Emissions

Blow Out:

Considering that a blowout is occurring or has occurred, the courses of action will be as follows:

Step No.	ACTION	OFFICIAL
1.	The rig to be evacuated as an immediate action for safety of personnel.	Company Man
2.	In serious blowout situations natural survival instincts over rule all else and an orderly evacuation is not possible, still if circumstances permit the rig to be evacuated in an orderly manner.	All personnel
3.	A head count to be carried out once the personnel have reached a safe distance.	HSE officer contractor
4.	First aid to be given to the injured without delay at assembly point area.	Medical officer
5.	All electrical installations within the danger zone to be de energised; approved safety lamps or torches only to be used within the danger zone; no naked lights or vehicular traffic to be permitted within the danger zone.	Tool Pusher
6.	Circumstances permitting a search party to cover the area surrounding the rig, but under no circumstances should their safety be put at risk. It is to be ensured that no one returns to rig unless permitted by the company man.	Company Man
7.	The RM to work with the company man to re-organize rig crew and delegate tasks as per his instructions.	Rig Manager
8.	If the well is on fire, the H_2S danger is eliminated the presence of wind will reduce the possibility of H_2S build up in low lying areas. However personnel on the downwind side of the rig are still at risk. If the presence of H_2S is uncertain testing to be carried out only if safe to do so and tester shall wear a breathing apparatus set.	HSE officer Contractor
9.	RM to ascertain the condition of ventilation and presence of gases with an approved instrument.	Rig Manager
10.	RM to ensure that the communication coordinator contacts all the nearby installation communities & villages and made them aware of the possible risks from the products that may have landed at their location inform them.	Rig Manager

11.	The spill control team to be activated by the RM/HSE Officer in case of such calls to collect the blowout product.	Oil Spill control team
12.	The emergency situation to be ended by the client's well control task force when: a. Primary or secondary control of the well has been re-engineered and situation is confirmed as stable. b. The blowing well has been sealed and no longer giving cause for concern.	

Flammable or toxic gas leak:

Step No.	ACTION	OFFICIAL
1.	The person discovering the gas leak to inform driller.	Incident Reporter
2.	Driller to ensure that Rig Manager is informed immediately.	Driller
3.	Rig Manager to nominate trained person to identify the location of the leakage, type of gas and the concentration of leakage using explosive meter.	On Scene commander
4.	The nominated person to wear breathing apparatus / respiratory mask to carry out the activity.	Nominated Person
5.	If the concentration level goes beyond danger level, Rig Manager to raise the gas leak alarm as identified, and ensure that all activities that may ignite the gas are stopped	On scene Commander
6.	On identification of leakage, the trained person to try to isolate the leak by shutting the relevant valve.	Nominated Person
7.	On hearing the gas leak alarm all persons except drill crew to immediately evacuate the area and move towards the upwind assembly point.	All persons
8.	The firefighting team to be ready for any potential fire.	Firefighting team
9.	Rig Manager to inform the Base Manager regarding the emergency situation.	On Scene commander
10.	Rig Manager in consultation with company man to try to stop the leakage if safe to do so.	RM/Company Man
11.	Company man also to inform the country manager regarding incident and any offsite help required.	Company Man
12.	Secure the rig d by closing all entrances using hazard tape.	Security Officer

13.	Guard Main entrance and restrict entry to essential personnel only.	Security Officer
14.	Make Medical officer available at rig site in a safe area.	On scene commander
15.	Rig Manager along with crew to assess situation and develop plan to vent gas from the area.	On scene commander
16.	Rig Manager/Company Man to instruct the communication coordinator to contact the local authorities and police in case of evacuation of persons residing in nearby areas is required for venting the gas.	Communication coordinator
17.	Once the venting has been carried out safely, Rig Manager along with HSE officer to ensure that the gas concentration level is within limit. Subsequently All clear signal will be given.	On scene commander

Course of action in Oil or Chemical Spill:

Pollution as a result of an oil or chemical spill can have a significant impact on the environment. The OVL Oil/ Chemical Spill Contingency Plan contains strategies and procedures to be followed, plus useful background information, for dealing with an oil or chemical spill has been deliberated in Environmental Impact Study.

Drill Site Co-ordinator will notify immediately to Chief Emergency Coordinator on occurrence of any oil or chemical spill. All spills will be handled as per steps given in the table below:

Step No.	ACTION	OFFICIAL
1.	The person reporting oil spill, if aware of location of leakage and finds it controllable, to shut the relevant valves.	Incident Reporter
2.	Inform the RM of the oil spill.	On scene commander
3.	The RM/HSE to ensure that all hot work in the nearby area is stopped and power cut off and the area is marked off by hazard tape, drum etc.	On scene commander
4.	If RM/HSE observes that the oil spill can pose hazard to personnel or equipment, RM to inform the company man , Tool Pusher to instruct the driller to secure the well as per standard operating practice and to inform spill control team.	On scene commander
5.	The team to ensure that upstream and downstream valves of the leakage are closed and the system is depressurized.	Spill control team
6.	If the oil spill can pose hazards to personnel from poisonous or combustible gases, the area to be evacuated by moving all personnel to the upwind assembly point.	Spill control team
7.	Depute spill control team to construct temporary bund around the oil and use the available absorbent or equivalent quick clean up material to collect the spilled oil in the containers / if the quantity is less.	Spill control team
8.	In case the quantity of oil is large; pump to be used to collect the spilled oil and available absorbent used to collect the remaining spillage.	Spill control team
9.	In case the oil has spilled into land, spill control team to remove the contaminated soil and collect the same in drums for disposal.	Spill control team

10.	Follow the spill control procedure for disposal of the absorbent / water if any generated during the process.	Spill control team
11.	HSE Officer to record the incident in incident report.	HSE officer Contractor
12.	Company man to send the initial incident notification format duly filled to Country office.	Company Man

Road Tanker Oil Spill:

Step No.	ACTION	OFFICIAL
1.	The tanker driver/ helper to notify the RM/HSE about the incident informing: a. Location of tanker b. Nature of emergency c. If there is any injury	Incident Reporter
2.	To find means to barricade the area with stones, tree trunks etc. to stop the vehicular traffic and inform the nearby inhabitant's roadside/ villagers to move away from the tanker.	Incident Reporter
3.	On receipt of the information, RM to instruct the spill control team to barricade the area and stop all vehicular movement near that area. The RM also to inform the company man. HSE Officer in consultation with RM to inform the nearest police station to ensure that the area is secured from external personnel, to carry out the spill control.	RM
4.	Aware Personnel in the vicinity that there may be hazardous situation. Possible dangers may include toxic gases, explosive or combustible gases, unstable structures, mechanical damage, threat to adjacent facilities and installations.	Spill control team
5.	On the basis of information, RM/HSE officer to arrange to provide the necessary equipment such as pumps, vacuum truck, crude tankers/ barrel, transporters, dump trucks piping barrier etc, to carry out spill control.	RM
6.	Pump the residual oil accumulated and collect in the crude tanks, absorbent or equivalent quick clean up material shall be used to absorb the surface oil spill and is collected in drums.	Spill control team

Chemical Spill:

Step No.	ACTION	OFFICIAL
1.	In the event of chemical spill that can be hazardous to personnel or equipment, the first person at site to inform the same to RM, who in turn to inform the company man.	RM
2.	The RM to assemble the spill control team.	RM
3.	Ascertain the identification of the source of the chemical spill, type of chemical and quantity (volume).	Spill control team
4.	Separate the spill area and mark off by hazard tape or drums etc. Mark off Chemical spillage onto roads and vehicle access ways similarly at a good distance and suitable position to allow for vehicles to slow down and stop	Spill control team
5.	In case the chemical spill poses any hazard i.e. poisonous or combustible gases, Use self- contained breathing apparatus, personal protective equipment to handle the chemical.	Spill control team
6.	Follow the procedure for chemical spill control to mitigate the situation.	Spill control team
7.	If any of the crew personnel is injured, communication coordinator to inform the medical officer so that injured are given immediate first aid.	Medical officer
8.	Spill team to make concentrated effort on means of isolation of the source, basic containment of the chemical spill and removal of ignition sources.	Spill control team
9.	RM to declare end of the emergency in consultation with the company man once: a. The chemical spill has been removed from the site. b. There is no immediate possibility of further chemical spillage	RM
10.	HSE Officer to make an incident report and send to Project Head and Country Office.	HSE officer contractor

H_2S CONTINGENCY PLAN

I. INTRODUCTION

H_2S is a toxic, poisonous gas that can cause death or injury. The objective of this contingency plan is to provide an organized plan of action for alerting and protecting the public from H_2S exposure in the event a potentially hazardous volume is accidentally released to the atmosphere. This plan should be activated immediately if any such release occurs. The Rig Manager is responsible for initiating and carrying out the plan.

H_2S is generally recognized by a characteristic foul, rotten egg odor. Prolonged exposure to low concentrations will dull the sense of smell. This can be fatal to those who think they can detect dangerous concentrations by the offensive odor. It acts on the eyes and respiratory system, resulting in irritation. Irritation to the eyes often causes severe pain and may incapacitate the worker. When high concentrations are present, death, due to lung paralysis, may occur before the odor is detected.

Toxicity Table of H_2S

Concentration of H_2S		Effects and Required Response
ppm	Mg/m^3	
1	1.5	A strong smell of rotten egg.
10	15	Safe for 8 hours exposure.
20	30	Protective equipment will be necessary.
100	150	Kill sense of smell in 3 to 15 minutes and burn eyes and throat. 3~15min
200	300	Kill sense of smell quickly and burn eyes and throat.
500	750	Individual loses sense of reasoning and balance. Respiratory paralysis occurs in several minutes. Requires prompt artificial resuscitation.
700	1050	Breathing will cease and death if not rescued promptly and immediate artificial resuscitation applied.
1000	1500	Individual is unconscious immediately; permanent brain damage may result if not rescued immediately

II. ROLES & RESPONSIBILITIES:

It is the responsibility of all personnel on the location to familiarize themselves with the procedures outlined in this contingency plan.

A. All Personnel:

1. Responsible for his assigned safety equipment.
2. Responsible for familiarizing himself with the location of all safety equipment.
3. Responsible for reporting any indications of H_2S to those in the area and to a supervisor.

B. Rig Manager:

1. Responsible for thoroughly understanding and seeing that all aspects of this contingency plan are enforced.
2. Responsible for implementing all phases of this contingency plan.
3. Responsible for keeping a minimum of personnel on the location during expected hazardous operations.
4. Responsible for coordinating all well site operations and communications in the event that an emergency condition develops.
5. Responsible for ensuring that all visitors receive an H_2S Safety Orientation. A visitor's log will be maintained as well as a list of all personnel on the location after drilling has progressed to the suspected H_2S formation.

III. LOCATION LAYOUT

A. The location of at least two pre-determined safe areas to assemble at in the event of an emergency. These locations should be located 180 degrees to one another, and in the direction of the prevailing winds.

B. H_2S sensors are to be placed at least at three places for continuous monitoring. One located at the Well head, one located at the shale shaker, and a third one on the rig floor. These sensors need to be set at 10 PPM H_2S concentration and must generate an audible alarm and can as well provide a blinking light bar. Once the alarm goes off, the driller is to pull off bottom and lock the brake handle, and one crew member to stay with driller and mask up, and the remainder of the crew go to the Muster Station. Only when

the alarm condition is removed and clearance to return to work can be given by the Rig Manager or Sr. Drilling Supervisor.

C. Air masks & Self-contained breathing apparatus (SCBA) for use by rig personnel is to be maintained as per OEM instructions.

IV. OPERATING PROCEDURES:

The following operating procedures will be utilized for drilling in areas with H_2S.

A. Plan of operating for handling gas kicks and other drilling problems: Any gas kick will be controlled by using approved well control techniques. Upon evidence that ambient H_2S concentrations have reached 10 PPM, all non-essential personnel will be evacuated to pre-determined safe areas. Personnel remaining on the rig floor will continue to control the well until the situation indicates the area is safe to re-enter.

B. Special Operations

1. Drill Stem Tests: All drill stem tests must be closed chamber and conducted during daylight hours.
2. Coring: After a core has been cut, circulate bottoms up and monitor for H2S. If hole Conditions (and/or detectors) indicate potentially hazardous conditions, put breathing equipment on 10 stands before core barrel reaches the surface. Breathing equipment will be worn by all personnel while core barrel is pulled, broken out and opened up, and until a safe atmosphere is indicated.

V. OPERATING CONDITIONS: Operating conditions are defined in three categories. A description of each of these conditions and the required action to take are given below.

A. CONDITION I - Normal Operating Conditions, Potential Danger, Operations Under Control

Characterized by: Normal drilling operations and test operations in zones which contain or may contain H_2S.
Warning Flag: Yellow
Alarm: None

Probable Occurrence: No detectable gas present at surface. General Action:
(1) Know location of safety equipment.
(2) Check safety equipment for proper function. Keep it available.
(3) Be alert for a condition change.
(4) Follow instructions of the supervisor.

B. **CONDITION II - Potential to Moderate Danger to Life**

Characterized by: H_2S gas present. Concentration less than 10 PPM.
Warning Flag: Orange
Alarm: Flashing light at 10 PPM H_2S.Intermittent blasts on horn at 10 PPM H_2S.

Probable Occurrence: (1) As drill gas.
(2) As trip gas when circulating bottoms up.
(3) When a core barrel is pulled.
(4) When a well kick is circulated out.
(5) Surface pressure, well flow or lost operations.
(6) Equipment failure during testing operations.

General Action: (1) Follow instructions of supervisor.

(2) Put on breathing equipment if directed, or conditions warrant it.
(3) Stay in "SAFE BRIEFING AREA" if instructed and not working to correct the problem.
(4) The Rig Manager will initiate action to mitigatethe H_2S concentration.

C. CONDITION III – Moderate to Extreme Danger to Life

Characterized by: H_2S present in concentrations at or above 10 PPM. Critical well operations or well control problems. In the extreme, loss of well control.

Warning Flag: Red

Alarm: Flashing light and continuous blast on horn at 10 PPM H_2S. Probable

Occurrence:
(1) As drill gas.
(2) As trip gas when circulating bottoms up.
(3) When a core barrel is pulled.
(4) When a well kick is circulated out.
(5) Surface pressure, well flow or lost returns problems.
(6) Equipment failure during testing operations.

General Action:
(1) Put on breathing equipment. Move to "SAFE BRIEFING AREA" and remain there if not working to correct the problem.
(2) Follow instructions of Rig Manager or other supervisor.

(3) The Rig Manager will initiate emergency action as provided in the contingency plan and as appropriate to the actual conditions. If testing operations are in progress the well will be shut in.
(4) The Rig Manager will conduct any necessary operations with an absolute minimum of personnel. All persons in the immediate area will wear a breathing apparatus. All other personnel will restrict their movements to those directed by the Rig Manager.

VI. EMERGENCY PROCEDURES: The procedures listed below apply to drilling and testing operations.

A. If at any time during Condition I, the Mud Logger, Mud Engineer, or any other person detects H_2S, he will notify the Rig Manager. All personnel should keep alert to the Rig Manager's orders.
He will:
1. Immediately begin to ascertain the cause or the source of the H_2S and take steps to reduce the H_2S concentration to zero. This should include having the mud engineer run a sulfide and Ph determination on the flowline mud if water-base mud is in use. If an oil-base mud is in use, the Mud Engineer should check the lime content of the mud.
2. Order non-essential personnel out of the potential danger area.
3. Order all personnel to check their safety equipment to see that it is working properly and in the proper location. Persons without breathing equipment will not be allowed to work in a hazard area.
4. Notify the contract Supervisor of the condition and action taken.
5. Increase gas monitoring activities with portable H2S detectors and continue operations with caution.
6. Display the orange warning flag.

B. If the H_2S concentration exceeds 10 PPM the following steps **will** be taken:
1. Put on breathing equipment.
2. Display red flag.

3. Driller – prepare to shut the well in.
   a. Pick up pipe and get Kelly out of BOP's
   b. Close BOP's if necessary.
4. If testing operations are in progress, the well will be shut-in.
5. Help anyone who may be affected by gas.
6. Evacuate quickly to the "SAFE BRIEFING AREA" if instructed or conditions warrant.

C. In the event a potentially hazardous volume of H_2S is released into the atmosphere, the following steps must be taken to alert the public:
   1. Remove all rig personnel from the danger area and assemble at a pre-determined safe area, preferably upwind from the well site.
   2. Alert the drilling office, public safety personnel, regulatory agencies, and the general public of the existence and location of an H_2S release.
   3. Assign personnel to block any public road (and access road to location) at the boundary of the area of exposure. Any unauthorized people within the area should be informed that an emergency exists and be ordered to leave immediately.
   4. Request assistance from public safety personnel to control traffic and/or evacuate people from the threatened area.

VII. TRAINING PROGRAM: All personnel associated with the drilling operations shall have training to insure efficient and correct action in all situations. This training will be in the general areas of: (1) personnel safety, (2) rig operations, and (3) well control procedures.

A. Personnel Safety Training – All personnel shall have received H_2S training in the following areas:
   1. Hazards and characteristics of H_2S.
   2. Effect on metal components of the system.
   3. Safety precautions.
   4. Operation of safety equipment and life support systems.
   5. Corrective action and shutdown procedures.

B. Rig Operations – All rig personnel shall have received training in the following areas:
   1. Well control procedures.
   2. Layout and operations of the well control equipment.
      NOTE: Proficiency will be developed through BOP drills which will be documented by the Rig Manager.

C. Service Company Personnel – All service personnel shall have been trained by their employers in the hazards and characteristics of H_2S and the operation of safety equipment and life support systems.

D. Visitors – All first-time visitors to the location will be required to attend a safety orientation. The Rig Manager shall be responsible for this orientation and he shall see that every visitor is logged in correctly.

8.14 Biodiversity Management Plan

8.14.1 Objectives

The objective is to protect and conserve biodiversity, maintain ecosystem services, and sustainably managing living natural resources that are fundamental to sustainable development within the project area.

The main consequences of impacts on biodiversity during drilling phase are.

1. Clearing of existing vegetation for drill site, camp site or roads may lead to the loss of habitat. Loss of habitat may lead to the loss of fauna species and/or temporary or permanent displacement of fauna species. It may also lead to food scarcity for fauna species.
2. The Biodiversity Action Plan establishes specific measures to ensure the prevention or destruction of ecology or forest during the Drilling Program.

8.14.2 Legal Requirements

Myanmar applicable legislation and regulation include:

- The Constitution of the Republic of the Union of Myanmar (2008);
- National Environmental Quality (Emission) Guideline (2015);
- Fresh Water Fisheries Law, 1991 (Section 40);
- Forest Law (2018);
- Conservation of Biodiversity and Protected Areas Law (2018);
- The Farmland Law (2012 - Section 30).

The IFC General EHS Guidelines for air quality, noise, waste management and wastewater are relevant for biodiversity protection.

The International Finance Corporation (IFC) has developed a series of Performance Standards that aim at protecting the environment. Performance Standard 6 “recognizes that protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources are fundamental to sustainable development”. The requirements set out in this Performance Standard have been guided by the Convention on Biological Diversity, which defines biodiversity as “the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species, and of ecosystems” (IFC, October 2012).

The guidance notes accompanying Performance Standard 6 indicate that in situations where there is the potential of significant negative impacts to biodiversity the project proponent should develop a Biodiversity Action Plan (BAP), to guide its activities so as to protect the natural environment.

8.14.3 Overview Maps and Site Layout

A global/national area of biodiversity importance near the project area is the Ayeyarwady River corridor. This key biodiversity areas runs on the west of the Block and is located far away from the proposed well locations for at least 20km. In EP-3 block, reserved forest such as Sha Byin, Dawle and Bwet exist. The Payama-1 well is located Sha Byin Reserved Forest Area as shown in **Figure 8-5**. The In Ma Swamp is also located in Block EP-3 to the northwest of wellsite A. However, the In Ma Swamp is around 5 km away from the Naweng-1 wellsite.

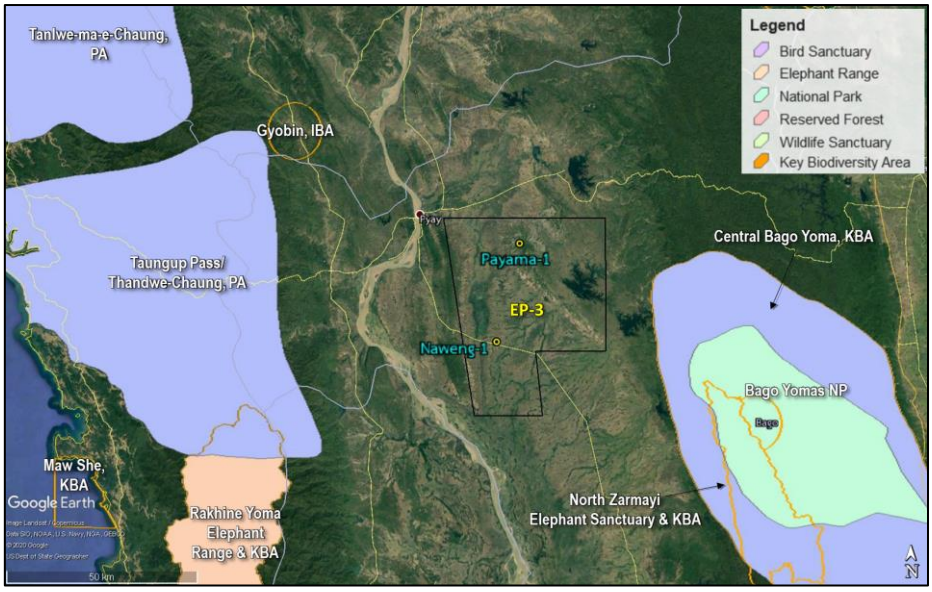


Figure 8-5: Protected Area and Key Biodiversity Areas in Central Myanmar

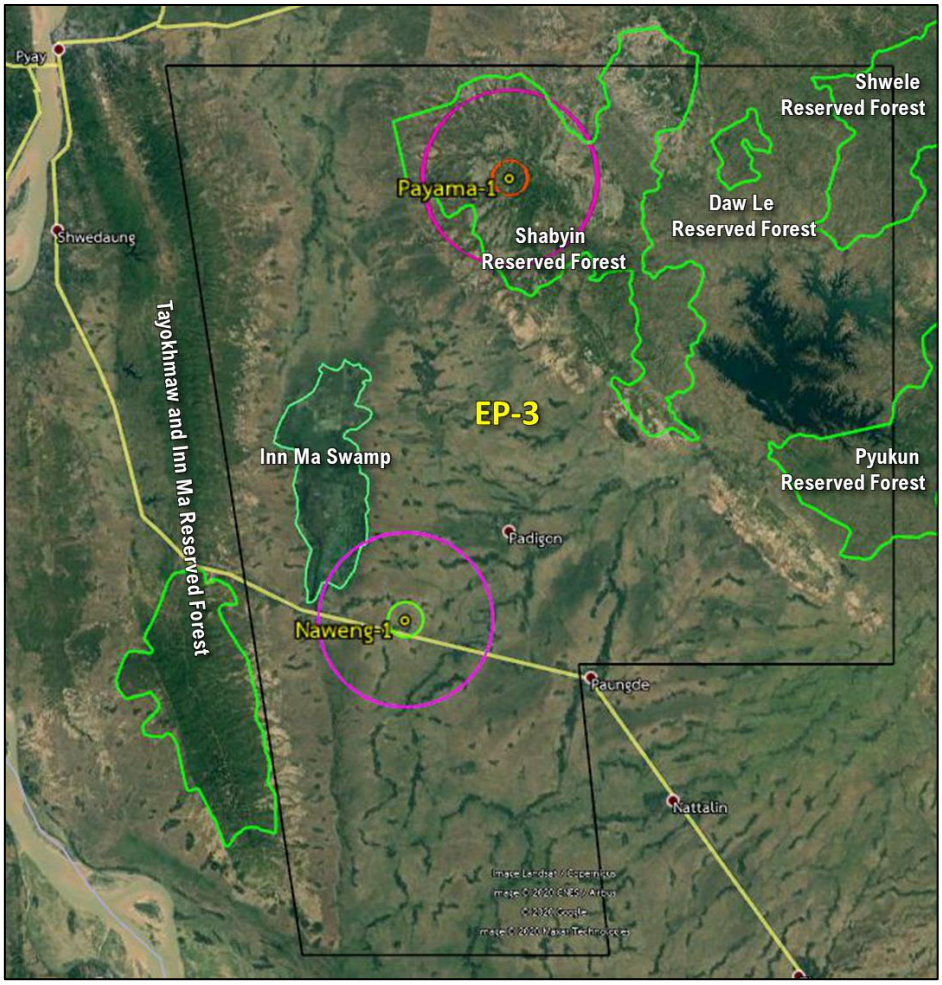


Figure 8-6: Reserved Forest Boundaries in Block EP-3

The biodiversity field survey was carried out starting from 13th August to 16th August 2020. The baseline studies were conducted in order to identify biodiversity as well as ecosystem services. A total of 42 plant species were observed during the survey. The main iconic floras in the exploration block are the more mature ***Dipterocarpus spp***. According to both field surveys and community interviews, 14 species of mammals, 15 species of fish, 28 species of birds and 25 species of reptiles and amphibians were identified.

The threatened species that were identified in the biodiversity site assessment and interviews included:

- **Mammals** - the Kway-aa (*Cuon alpinus* – EN), Shwe Thamin (*Axis porcinus*– EN) Kyar-kyaung (*Prionailurus viverrinus* –EN), Sin *(Elephas maximus*– EN), Myauk-hlwal-kyaw (*Hylobates lar* –EN), Phyan *(Cynogale bennettii* – EN), Pa-shu-thin-khway-chat (*Manis javanica* – CR), Ta-yoke-thin-khway-chat (*Manis pentadactyla* – CR).
- **Fish** - One species of Near Threatened (NT) species (*Channa harcourtbutleri*).
- **Birds** - And also four Endanger species (*Pavo muticus, Sittavictoriae, Asarcornis scutulata, Tringa guttifer*)
- **Amphibian and Reptiles** - 3 Endangered Species (*Indotestudo elongate, Manouria emys and Batagur trivittata)* and 1 Critically Endangered species (*Geochelone platynota)*

The rest of the species identified were either not classified, or classified as least concern vulnerable or near threated only. The full details are included in **Appendix 4**.

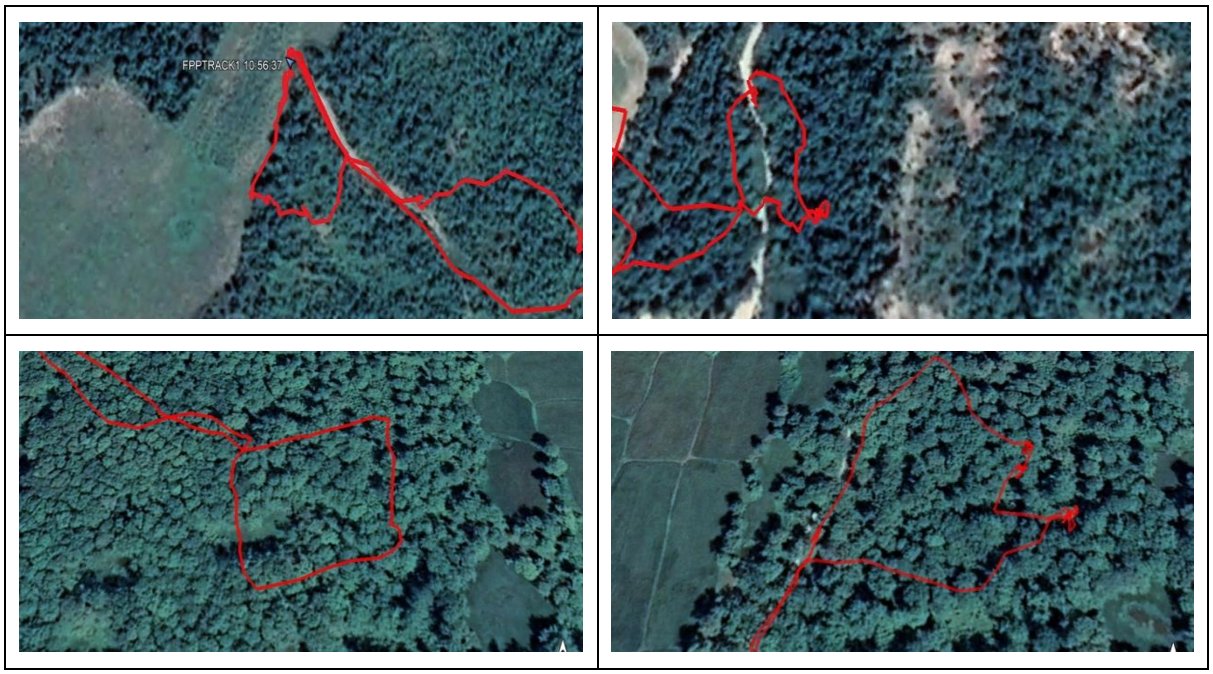


Figure 8-7: Flora Survey Map

8.14.4 Management Actions

Overall

- The forest department officials will be informed prior to working at forest areas and necessary regulatory approvals obtained for working in forest areas within or outside the drilling block.
- Necessary guidance as provided in the regulatory clearance issued by Forest Department will be adhered to.
- Uprooting of vegetation, cutting of trees, collection of any forest produce is prohibited. Hunting of animal, damaging of nest will be prohibited.
- Burning practice will not be adopted for ground cover clearance, which may lead to forest fire. Every possible care would be taken to prevent flames or lights when operating in forest areas to avoid forest fires.
- It will be ensured that no member of the drilling team collect firewood from the forest area.
- Each member of the drilling team would be briefed on the Do's and Do not's for operation in Forest Areas during Induction Training. A booklet detailing these Do's and Do not's for drilling survey in forest will be provided to all workers**.** During induction training behavior which would be adopted during the drilling survey would be detailed. If any member of the drilling team is found to be in violation of the above the same would be reported to OVL and necessary actions taken.
- Site inspections will be undertaken prior to line clearance activities and establishment of drill pad and camps to ensure minimal impact on sensitive ecological communities.
- If any large animal or nesting site is spotted the location would be documented and the same will be intimated to the local forest official and OVL by the drilling team. The team will operate as per the guidance provided by the official. OVL will also make an official communication to the Forest Department intimating the sighting.
- Nighttime activity in forest areas will be restricted.
- A Site Restoration Plan will be prepared and implemented to restore the location once the drilling program is finished.
- The procedure for Terrestrial Habit Restoration is to remove and store the surface soil layer during site clearing for restoration. OVL will upon completion of the project remove all equipment and restore the surface area with the stored topsoil over the site and plant native grass and vegetation.

The management actions for biodiversity are as follows:

- Drill Rig located in area distant to sensitive receptors.
- Keep night lighting to a minimum, consistent with safety and security.
- Direct lighting to the inside of the well sites.
- Clear vegetation around the flare stack.
- High valued habitat to be avoided where practicable in the design process.
- Remove vegetation in project areas only (roads, camp site, well site). Avoid cutting Riparian trees.
- Mark well sites clearly and prohibit vehicles from moving off site onto surrounding land.
- Mark trees to be cut prior to constructing well pads to prevent the cutting of other trees.
- Contractors and personnel will not be allowed off site where they could cause unnecessary disturbance to vegetation or wildlife.
- Hunting and trapping is not allowed and any violations will be grounds for termination of contract and dismissal.

In cases where Critical Habitats are present IFC specifies that:

1. In areas of critical habitat, the client will not implement any project activities unless all of the following are demonstrated:
    a. No other viable alternatives within the region exist for development of the project on modified or natural habitats that are not critical;
    b. The project does not lead to measurable adverse impacts on those biodiversity values for which the critical habitat was designated, and on the ecological processes supporting those biodiversity values;
    c. The project does not lead to a net reduction in the global and/or national/ regional population of any Critically endangered or endangered species over a reasonable period of time; and
    d. A robust, appropriately designed, and long-term biodiversity monitoring and evaluation program is integrated into the client's management program.

IFC further specifies that in such cases where a client is able to meet these requirements the project's mitigation strategy will be described in a biodiversity action Plan and will be designed to achieve net gains of those biodiversity values for which the critical habitat was designated.

The following measures are proposed to avoid, minimize or offset impacts to biodiversity in the project area.

Environment Impact Assessment –Drilling Phase			
3. Light	3.1. Functional lighting on vehicles and drill rig, camp site and well site during Drilling Wells.	3.1.1. Lighting on the site at night	3.1.1.1. Drilling Rig located in area distant to sensitive receptors.
			3.1.1.2. Keep night lighting to a minimum, consistent with safety and security.
			3.1.1.3. Direct lighting to the inside of the well sites.
Environment Impact Assessment –Well Testing Phase			
3 Heat and Light	3.1 Flaring during Well testing	3.1.1 Increase in light at night from flaring	3.1.1.1 Position flare away from sensitive receptors.
			3.1.1.2 Direction of the light into wellpad as much as possible.
			3.1.1.3 Minimize the duration of flaring process when possible
		3.1.2 Increase heat from flaring	3.1.2.1 Clear vegetation around the flare stack.
			3.1.2.2 Minimize flare duration when possible.
			3.1.2.3 Post constant fire watch during flaring operations
			3.1.2.4 Maintain safety distance between flare stack and well site facilities and adjacent crops (

Ecological Environment Impact Assessment – Construction and Installation Phase			
7. Flora and Fauna	7.1 Site Clearing for Construction of roads and well / camp sites	7.1.1 Degradation or destruction of natural habitat	7.1.1.1 High valued habitat to be avoided where practicable in the design process.
			7.1.1.2 Remove vegetation in project areas only (roads, camp site, well site).
			7.1.1.3 Mark well sites clearly and prohibit vehicles from moving off site onto surrounding land.
	7.2 Construction of roads and well / camp sites	7.2.1 Habitat degradation from construction	7.2.1.1 Minimize noisy construction work during daytime hours only.
			7.2.1.2 Limit vegetation removal to a minimum.
			7.2.1.3 Limit to cut the tree only in well site and access road.
			7.2.1.4 Contractors and personnel will not be allowed off site where they could cause unnecessary disturbance to vegetation or wildlife.
			7.2.1.5 Hunting and trapping will be specifically prohibited.
	7.3 Site Runoff and Drainage	7.3.1 Habitat degradation of aquatic biota	7.3.1.1 Avoid the construction of the well pads in areas where such construction obstructs a water route.
			7.3.1.2 Mark well sites clearly and prohibit vehicles from moving off site onto surrounding land.
			7.3.1.3 Contractors and personnel will not be allowed off site where they could cause unnecessary disturbance to aquatic biota. In addition, fishing will be specifically prohibited.
			7.3.1.4 Provide a suitable storage area for construction materials (such as soil, sand, and stone), chemicals (i.e., paint and thinner), and oil (i.e., fuel and lubricating oil).
			7.3.1.5 Provide drip pans and absorbents at fuel storage area to contain any spillage.
			7.3.1.6 Strictly implement and follow mitigation measures for impacts to soil and surface water hydrology and quality.
Ecological Environment Impact Assessment – Drilling Phase			
7. Terrestrial Flora and Fauna	7.1. Drilling Activities and Labour and Accommodations	7.1.1. Aquatic biota and habitat disturbed from	7.1.1.1. Fishing is not allowed.

		workers' activities	
			7.1.1.2. Clearly mark signs showing the boundary of the project area.
			7.1.1.3. Prohibit workers from cleaning machines/ equipment in a public water source.
			7.1.1.4. Prohibit workers and contractors discharging or discarding project waste, chemicals, oil into public water sources.
Ecological Environment Impact Assessment – Well Testing Phase			
5 Terrestrial Flora and Fauna	5.1 Labour and Accommodations	5.1.1 Habitat degradation from workers' activities	5.1.1.1 Mark well site clearly and prohibit vehicles from moving off site onto surrounding land.
			5.1.1.2 Forest incursions will be specifically prohibited.
			5.1.1.3 Contractors and personnel will not be allowed off site where they could cause unnecessary disturbance to vegetation.
	5.2 Flaring during Well Testing	5.2.1 Habitat degradation from light and heat	5.2.1.1 Implement well testing phase mitigation measures 3.1.
Ecological Environment Impact Assessment – Well Abandonment Phase			
6 Terrestrial Flora and Fauna	6.1 Labour and Accommodation	6.1.1 Degradation or destruction of natural habitat and harvesting wild plants / animals	6.1.1.1 Limit abandonment to daytime hours only.
			6.1.1.2 Contractors and personnel will not be allowed off site where they could cause unnecessary disturbance to flora and fauna. In addition, fishing will be specifically prohibited.
			6.1.1.3 Restore and revegetate the site to its original condition. ONGC Videsh has an agreement with the Department of Forestry to build an ecological park as compensation for any tree loss.
	6.2 Site-Run off and drainage	6.2.1 Potential degradation or destruction of aquatic biota	6.2.1.1 Implement construction and installation phase mitigation measures in 7.3.

8.14.5 Well Closure, Restoration and Re-vegetation

If commercial hydrocarbons are found, the area will be maintained as is for future development to be determined in accordance with the production sharing contract (PSC) agreement.
If commercial hydrocarbons are not found all facilities will be removed, including material used for construction, pipe, tanks, etc. unless otherwise requested by community or government.
After the Test Well is closed, all equipment including Concrete rig pad and water pit will be cleared unless otherwise requested by the community or government. Under the construction of well site area, the 500 mm topsoil layer will be stockpiled and then will be placed back at the well site area. Restoration will be carried out to return the site to its original conditions. ONGC Videsh has an agreement with the Department of Forestry to build an ecological park as compensation for any tree loss (see Appendix 6 – Provisions to Forest Department for Use of Payama-1 Site).

8.14.6 Responsibilities

- The HSE Officer (Drilling Contractor) along with Forest official will conduct site inspection.
- The regulatory compliance relating to working inside the forest area will be the responsibility of Project Manager (Drilling Contractor) / Country Manager (OVL). Drilling Supervisor (OVL) would ensure that the drilling contractor adopts the practices specified in the plan.

8.15 Cultural Heritage Management Plan

8.15.1 Objectives

The Cultural Heritage Management and Monitoring Plan will have the objective of avoiding potential damage to cultural resources within 5 km of the project area.

8.15.2 Legal Requirements

Myanmar applicable legislation and regulation include:

- The Constitution of the Republic of the Union of Myanmar (2008);
- The Myanmar Investment Law (2016);
- Myanmar Environmental Conservation Laws (2012);
- Environmental Conservation Rules (2014);
- National Environmental Quality (Emission) Guideline (2015);
- The Protection and Prevention of Antique Objective Law, 2015 (Section 12);
- The Protection and Prevention of Ancient Monument Law, 2015 (Section 12, 20(f) (c), 15(c));
- The Protection and Prevention of Cultural Heritage Area, 2015 (Section 20, 23, 29(b)).

The cultural heritage plan will be implemented based on the requirements from IFC Performance Standard 8. IFC Performance Standard 8 requires that projects:

- protect cultural heritage by ensuring that internationally recognized practices for the protection, field-based study, and documentation of cultural heritage are implemented. Where relevant this includes the retention of a competent professional to assist in the identification and protection of cultural heritage;
- develop provisions for managing chance finds, requiring any chance find to be undisturbed until an assessment by competent professional is complete and management actions are identified;

- consult with affected communities to identify cultural heritage of importance and to incorporate their views into the decision-making process. This shall involve national and local regulatory agencies;
- allow continued access to cultural heritage sites by affected communities within living memory for long-standing cultural purposes;
- avoid impacts to or where not feasible minimize (negative impacts) or restore in situ the functionality of replicable cultural heritage;
- do not remove any non-replicable cultural heritage unless the following criteria are met namely, that – there are no technically or financially feasible alternatives; the overall benefit of the project outweigh the anticipated cultural heritage loss from removal; and the removal of cultural heritage is conducted using the best available techniques;
- shall not remove, significantly alter, or damage critical cultural heritage. In exceptional circumstances where impacts are unavoidable, the Project will use a process of Informed Consultation and Participation (ICP);

8.15.3 Overview Maps and Site Layout

During the archaeological and historic site assessment for the project area, the Township Administrator from Thegon and Paukhaung GAD confirmed that there are no archaeological or historic sites present in the Township. The well site is located on agricultural and reserved forest land being used for agriculture, and no historic or archaeological sites are located near the planned project.

During the field program for the present project local residents were canvassed in regard to their cultural activities and cultural sites. The well site is located on agricultural and reserved forest land being used for agriculture. No cultural or historic site was identified in the site assessment. Therefore, construction activities will not disrupt any culturally important activities or cause any damage to the archaeological resources. However, there is a very small chance that unknown and prehistoric communities existed in the area and additional artefacts may be recovered during construction of the well sites, campsite and access roads. If any artefact is found, then work will be stopped and OVL will inform the Thegon and Paukhaung GAD for further action before proceeding with operations. The cultural heritage areas are located near the villages sensitive receptors (see **Figures 8-1 to 8-4**).

Thegon Township

The list of religious buildings and religious person in Thegon Township are as follow.

(A) Religious buildings

No	Township/Town	Status	Pagoda	Temple	Monastery	Nun Monastery	Religious Hall
1	Thegon	4	67	-	117	-	-
2	Pa Ti Kone	2	4	-	58	-	-
3	Inn Ma	2	5	-	73	-	-
Total (Township)		**7**	**76**	**-**	**248**	**-**	**-**

(B) Monks and Nuns

No	Township/ Town	Monk	Younger Monk	Nun
1	Thegon	362	172	75
2	Pa Ti Kone	134	59	5
3	Inn Ma	156	112	14
Total (Township)		**651**	**343**	**94**

(C) Well Known Pagodas

No	Township/ Town	Name of Pagodas	Location
1	Thegon	Kan Thar Yar Yae Lae Kun Pagoda	Ward (2)
		Moe Kaung Kyauk Taw Gyi Pagoda	Ywa Ma Village Tract
		Phaung Taw Oo Pagoda	Ward (4)
		Mya Thein Tan Pagoda	Ward (4)
		Shwe Phone Shein Pagoda	Ward (4)
2	Pa Ti Kone	Shwe Kyaung Saung Pagoda	Zee Oak Village Tract
3	Inn Ma	Shwe Kyaung Gyi Pagoda	Thiriyadanar Ward
Total (Township)		**7 Pagodas**	

(D) Well Known Monasteries

No	Township/Town	Monastery Name	Head of Monk (Name)	Location
1	Thegon	Thi Ta Gu	U Nandar Mar La	Ward (4)
		Taung Lay Su Taw Ya	A Shin Zar Nay Ya	Thit Ni Taw
Total (Township)		**2 Monasteries**		

(E) Other Religious Buildings

No	Township/Town	Christian		Muslim		Hindu		Chinese Temple	
		Urban	Village	Urban	Village	Urban	Village	Urban	Village
1	Thegon	-	-	1	-	-	-	-	-
2	Pa Ti Kone	1	-	1	-	1	-	-	
3	Inn Ma	-	-	1	-	-	-	-	-
Total (Township)		**1**	**-**	**3**	**-**	**1**	**-**	**-**	**-**

(F) Historical Buildings and Places

There are no historical buildings and places in Thegon Township.

Paukkhaung Township

The list of religious buildings and religious person in Paukkhaung Township are as follow.

(A) Religious buildings

No	Township/Town	Status	Pagoda	Temple	Monastery	Nun Monastery	Religious Hall
1	Paukkhaung	-	34	-	252	2	1
Total (Township)		-	34	-	252	2	1

(B) Monks and Nuns

No	Township/ Town	Monk	Younger Monk	Nun
1	Paukkhaung	420	130	30
Total (Township)		420	130	30

(C) Well Known Pagodas

No	Township/ Town	Name of Pagodas	Location
1	Paukkhaung	Lay Myat Na Pagoda	No (3) Ward
		Shwe Ta Lune Pagoda	Myo Kone Village
Total (Township)		**2 Pagodas**	

(D) Well Known Monasteries

There is no well-known monastery in this township.

(E) Other Religious Buildings

No	Township/Town	Christian		Muslim		Hindu		Chinese Temple	
		Urban	Village	Urban	Village	Urban	Village	Urban	Village
1	Kaukkhaung	2	32	1	-	-	-	-	-
Total (Township)		2	32	1	-	-	-	-	-

(F) Historical Buildings and Places

There is no historical buildings and places in Paukkhaung Township.

8.15.4 Management Actions

Cultural Impact Assessment – Construction and Installation Phase			
14. Historical, Archaeological and Cultural Resources	14.1 Construction of access road/well pad and camp site	14.1.1 Archaeological/ fossil finds within project area.	14.1.1.1 Watch for artefacts during site construction and inform the Local Authorities before commencement of drilling.
			14.1.1.2 Report to the Pyay GAD if any archaeological evidence is discovered at the well sites or access roads. Through consultation, a plan to proceed will be developed
			14.1.1.3 If artefacts are found during the construction phase, OVL will inform the responsible local office immediately.
			14.1.1.4 Consult with local authorities to identify culturally important festivals and plan transportation, construction and drilling activities to avoid impact.

8.15.5 Monitoring Plans

In conclusion, an outline of the monitoring programmes proposed for the Project, is presented below in **Table 8-18**.

Table 8-18: Environmental monitoring

Receptor	*Monitoring Task*	*Monitoring locations*	*Monitoring Parameter*	*Timing*
CH sites	Monitor appearance of CH resources: survey and recording of the condition and structural integrity of sites with above-ground components.	Area of direct interference (camp site, drill site, access roads)	Presence of CH resources	Continuous
CH sites	Review and audit of mitigation activities to ensure satisfactory implementation of mitigation measures	Area of direct interference (camp site, drill site, access roads)	Completion of required reporting, including: • reporting of ground disturbing activities • Reporting on findings • Completion of induction training • Implementation of all additional measures, such as signage, fencing, structural bracing & conservation • 100% of cultural heritage related grievances and cultural heritage issues raised through community consultation addressed	Weekly

8.15.6 Implementation Schedule

The monitoring activities will be performed as mentioned in the table above. The Plan will be designed to guarantee compliance with Myanmar laws.

8.15.7 Responsibilities

- Drilling Contractor;
- Drilling Contractor HSE Manager;
- OVL HSE Manager

8.16 Occupational Health/Public Health Plan

8.16.1 Objectives

OVL will require the drilling contractor to prepare a detailed QHSE Drilling Operations Plan. The Operations Plan is designed to address the Drilling Project Specific Risk Assessment to prevent and eliminate the risk of personal injury, occupational illnesses and damage to properties.

8.16.2 Legal Requirements

Myanmar applicable legislation and regulation include:

- The Constitution of the Republic of the Union of Myanmar (2008);
- The Myanmar Investment Law (2016);
- Myanmar Environmental Conservation Laws, 2012 (Section 7(o), 14,15,29):
- National Environmental Quality (Emission) Guideline (2015):
- Public Health Law (1972);
- The Prevention and Control of Communicable Disease Law (1995);
- The Control of Smoking and Consumption of Tobacco Product Law, 2006 (Section 9);
- The Petroleum and Petroleum Products Law, 2017, Section 8 (m), Section 9 (a, c, d), Section 19(a,b,e), Section 10 (a,c,d,f)
- The Myanmar Fire Force Law, 2015 (Section 25);
- Employment and Skill Development Law, 2013 (Section 5, 14, 30);
- The Factories Act, 1951;
- The Oilfields Act, 1918;
- The Welfare of Labors of Oilfield Act, 1951(After notification);
- The Workmen Compensation Act, (1951);
- Labor Organization Law (2012);
- Settlement of Labor Dispute Law (2012)
- Minimums Wages Law (2013)
- Payment of Wages Law, 2016 (3,4,8,7(ii),9,10(a) to e);
- Social Security Law, 2012 - 11, 16(a), 48(a), 51(a) (b), 54;
- Leaves and Holidays Act (1951);
- The Explosive Act (1887)
- The Explosive Substances Act (1908)
- The Motor Vehicles Law (2015) and Rule (1987);
- Myanmar Insurance Law, 1993 (Section 16);
- The Prevention of Danger of Hazardous Chemical and related Substances Law, 2013 (Section 16,17,23,27);
- Import and Export Law, 2012 (Section 7).

The management and mitigation measures of the Plan are aligned with the IFC guidelines detailed here below:

- IFC Environmental, Health, and Safety (EHS) Guidelines - GENERAL EHS GUIDELINES: OCCUPATIONAL HEALTH AND SAFETY
- IFC Environmental, Health, 188and Safety (EHS) Guidelines - GENERAL EHS GUIDELINES: COMMUNITY HEALTH AND SAFETY
- IFC Performance Standard 4 Community Health, Safety, and Security

Standards and Document Control

Applicable HSE Procedures, standards, guidelines and documents shall be used for the entire scope of work during the drilling operation in different locations. All the documents shall be revised as and when required. HSE Officer shall maintain these documents for reference and use.
OVL Myanmar Asset is committed to safe Exploration and Production (E&P) Operations in Myanmar with an ultimate goal of "Target Zero – Nobody Gets Hurt 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).

8.16.3 Overview Maps and Site Layout

The area includes local communities within a 5-km radius of the well site and the basecamp / well site area (for all phases of the project). Please see **Figures 8-1 to 8-4**.

8.16.4 Management Actions

Health Impact Assessment – Construction and Installation Phase			
16. Public and Occupational Health	16.1 Well Site, Road and Camp Construction	16.1.1 Respiratory irritation and Exacerbation of asthma impact from dust	16.1.1.1 Implement construction and installation phase mitigation measures in 2.1. 16.1.1.2 The accommodation will be fitted with required utilities and facilities (sanitation, water, sewage, waste pit, electricity grounding and internet connection), as well as waste collection and segregation points as per international oil field practices
	16.2 Vehicle and Equipment Use during construction	16.2.1 Hearing impairment for workers and annoyance for public.	16.2.1.1 Implement construction and installation phase mitigation measures in 3.1.
			16.2.1.2 Provide PPE to workers on site.
			16.2.1.3 Should complaints over noise be received, consideration will be given to the provision of noise barriers.
	16.3 Non-Hazardous Waste Management	16.3.1 Food safety, Increase in vector-borne diseases: malaria, typhus and dengue and others.	16.3.1.1 Implement construction and installation phase mitigation measures in 12.1.
Health Impact Assessment – Drilling Phase			
13. Occupational and Public Health	13.1. Rig, Generators and Equipment	13.1.1. Health impact from noise	13.1.1.1. Implement drilling phase mitigation measures in 2.1.
			13.1.1.2. Provide PPE to workers on site
	13.2. Non-Hazardous waste management	13.2.1. Health impact from Non-Hazardous Waste	13.2.1.1. Implement construction and installation phase mitigation measures in 12.1.
	13.3. Handling and Disposal of	13.3.1. Health impact from hazardous Waste	13.3.1.1. Implement drilling phase mitigation measures in 11.2.

	Hazardous Waste		
	13.4. Hazardous waste management and chemical handling	13.4.1. Health impact from Mud, Chemicals and Drilling Waste	13.4.1.1. Implement drilling phase mitigation measures in 11.3.
	13.5. Labour and Accomodations	13.5.1. Health impact from Communicable Diseases	13.5.1.1. Implement construction and installation phase mitigation measures in 12.1.
			13.5.1.2. Deposit treated cuttings into the cuttings pit, where they are to be temporarily held before to be sent for disposal at approved waste management facility.
			13.5.1.3. Drainage and removal of waste from waste pit upon completion of drilling.
			13.5.1.4. Health screening of workers before employment.
			13.5.1.5. On-site health clinic (drilling operations) and referral system during all of project operations with external health agencies to ensure timely diagnosis and treatment of workers' illness and injury.
			13.5.1.6. Considering on hiring of qualified local workers to reduce reliance on outside labour and increase local employment.
			13.5.1.7. Do not allow workers to enter communities near the drill site.
			13.5.1.8. Provide awareness to workers on preventive measures for the prevention of communicable and local diseases.
Health Impact Assessment – Well Testing Phase			
9 Occupational and Public Health	9.1 Flaring	9.1.1 Heat exposure and Nuisance light from Light and heat	9.1.1.1 Implement well testing phase mitigation measures 3.1.
			9.1.1.2 Implement OVL's Emergency Response

			Plan including specific management procedures to mitigate the impacts if a fire occurs.
			9.1.1.3 Install fire extinguishers, alarms and windsocks (to be audible and visible from whole site).
			9.1.1.4 Heat impacts from the flare stack will be minimized by having a vertical flare stack to international standards.
			9.1.1.5 Maintain a safe distance from nearest sensitive receptor.
	9.2 Flaring	9.2.1 Increase in respiratory illnesses/diseases, asthma, Disturbance psychological wellbeing from flaring emissions	9.2.1.1 Ensure flare system has efficient combustion.
			9.2.1.2 Clear vegetation around the flare stack.
			9.2.1.3 Maintain pilot flame at the flare tip to ensure that flame is not extinguished by strong wind.
			9.2.1.4 H2S detection and safety equipment is standard issue. OVL's develop emergency response plan (ERP) and H2S Contingency Plan.
			9.2.1.5 Monitor H2S during well testing.
			9.2.1.6 Staff trained in H2S procedures.
	9.3 Non-hazardous waste management	9.3.1 Waste can contaminate surface and groundwater, and be a vector for disease.	9.3.1.1 Implement construction and installation phase mitigation measures in 12.1.
	9.4 Hazardous waste management	9.4.1 Health impacts from Hazardous Waste	9.4.1.1 Implement drilling phase mitigation measures in 11.2.
Health Impact Assessment – Well Abandonment Phase			
9 Public and Occupational Health	9.1 Non-hazardous waste management	9.1.1 Exposure to contamination from non-hazardous wastes,	9.1.1.1 Implement construction and installation phase mitigation measures in 12.1.

8.16.5 Fuel Storage

The fuel tanks (2 tanks approximate 40 m^3 capacity each) will be stored above the ground and set on concrete foundations within the rig pad. The fuel tank area will be surrounded with an impervious dike

made of brick wall and cement plaster to contain any spillage, in accordance with good international industry practice including the Environmental, Health and Safety general Guidelines of IFC. The volume of the dike area surrounding the fuel tanks shall be equal to the cumulative volume of the fuel storage tanks with provision for a 15 cm freeboard.

8.16.6 Layout and Facilities in Basecamp, Campsite and Accommodation Areas

Accommodation for workers may consist of rental houses in nearby village, local hotels, or be provided in a temporary onsite camp.

The on-site accommodation will be fitted with required utilities and facilities (sanitation, water, sewage, waste pit, electricity grounding and internet connection), as well as waste collection and segregation points as per international oil field practices.

The campsite will be industry-standard, consisting of container-based sleeping and living quarters, messing and recreation facilities, with a capacity to accommodate up to 110 including ONGC personnel & its associates per drill site camp.

8.16.7 Flaring System

The Flaring System requirements have been added to Chapter 8: Management Plan, Section 8.16.7, page 8-133. The Flaring System will be designed to comply with API 521. Oil Industry Safety Directorate (OISD), India, STD-106 states that the flare stack is to be located at a minimum distance of 90 meters from public roads and property.
The Maximum flare height as per API 521 shall be 45 feet.

8.16.8 Monitoring Plans

Factors	Index	Procedure	Proposed Duration and Frequency of Monitoring	Location
Occupational health and safety	• Accident statistics • cause of accidents • Mitigation measures	• Record accidents or near misses generated during construction by identifying cause(s) and severity of impact(s), as well as operated mitigation measures • Conduct summary report for accident investigation	• All phases	• Project area, community around project area, and transportation route

Methods and Procedures for Hazards and Effects Management

Hazards will be identified and assessed for all activities including sub-contractor's activities in the contract and documented on the **Project Risk Assessment Register**.

The Company man and Rig manager will ensure that control measures mentioned on the **Project Risk Assessment Register** are implemented. The HSE Officer will carry out periodic check on awareness among site personnel of the hazards and report any non-compliance for corrective action. The **Project Risk Assessment Register** will be reviewed for the changes required and will be updated accordingly.

8.16.9 Monitoring Plans

Audits: Organised and led by HSE Team

Audit	Responsible Person (Leader)	Schedule
1. Carry out HSE Compliance audit in the locations.	HSE Officer/ Country Manager	Once during Drilling Phase
2. Conduct Health and Hygiene audit	HSE Officer/Crew Doctor	Once during Drilling Phase
3. Conduct Medical Facilities audit	HSE Officer/Crew Doctor	Once during Drilling Phase
4. Conduct audit on journey management system.	Vehicle Controller/HSE Officer	Once during Drilling Phase

Inspections

No	Action	Action Party	Schedule
1	Carry out inspection in location during site visit.	Country Manager /HSE Officer	Monthly
2	Conduct inspection in sub-contractors worksite, maintenance workshop, sludge farm, waste yard, STOP and call of work.	Country Manager /HSE Officer	Monthly
3	Conduct inspections on Field Survey Team	Country Manager /OVL Site Representative	Monthly
4	Conduct Health and Hygiene inspections	HSE Officer/Crew Doctor	Monthly
5	Conduct Medical Facilities inspections	HSE Officer/Crew Doctor	Monthly

8.16.10 Implementation Schedule

The Occupational Health/Community Health Plan will be conducted during all phases of the project's operations. The personnel and infrastructure necessary for implementing the occupational health/community health plan will be established 2 weeks prior to project initiation and will be maintained until one month after project completion.

8.16.11 Responsibilities

Responsibilities for Audits and Actions is provided above.

8.17 Public Consultation Plan & Grievance Mechanism

8.17.1 Objectives

Prior to the initiation of drilling activities, as part of the ongoing stakeholder consultation and engagement plan and in response to suggestions voiced at the stakeholder meetings, OVL will undertake the following objectives prior to and during the proposed operations:

- Appoint a community liaison officer;
- Engagement with communities
- Dissemination of Information;
- Monitor Feedback and Community Attitudes, and
- Implement a Grievance Mechanism

8.17.2 Legal Requirements

Myanmar applicable legislation and regulation include:

- The Constitution of the Republic of the Union of Myanmar (2008);
- The Myanmar Investment Law (2016);
- Myanmar Environmental Conservation Laws (2012);
- Environmental Conservation Rules (2014);
- National Environmental Quality (Emission) Guideline (2015);
- Public Health Law (1972);
- The Prevention and Control of Communicable Disease Law (1995);
- The Control of Smoking and Consumption of Tobacco Product Law, 2006 (Section 9);
- The Farmland Law and Farmland Rules, 2012 (Section 30);
- The Prevention of Danger of Hazardous Chemical and related Substances Law, 2013 (Section 16,17,23,27).

The management and mitigation measures of the Plan are aligned with the IFC guidelines detailed here below.

IFC Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts.

Performance Standard 1 underscores the importance of managing environmental and social performance throughout the life of a project. An effective Environmental and Social Management System (ESMS) is a dynamic and continuous process initiated and supported by management, and involves engagement between the client, its workers, local communities directly affected by the project (the Affected Communities) and, where appropriate, other stakeholders.

8.17.3 Overview Maps and Site Layout

The study area includes local communities near the basecamp and well sites (for all phases of the project). Please see **Figures 8-1 to 8-4**.

8.17.4 Management Actions

Engagement with Communities

Engagement with local communities that may be impacted by OVL business activities shall be conducted to create awareness on Company's operations, including the associated HSE controls and recovery measures. Where there are legislative requirements to conduct such engagements, these requirements shall be fully complied with. To facilitate information exchange a community liaison officer will be appointed. The local village leader could possibly fulfill this role. Villages near project activities must be advised 2 weeks in advance of project initiation.

Dissemination of Information

The objective of these activities is to distribute information to affected stakeholders and communities within the project area. A combination of communication methods will be used to ensure the target groups within the project area are reminded and aware of the proposed plans. OVL will periodically inform the local authorities the project plans throughout all phases of the project.

Before project commencement, the Local Authority will be formally notified of the upcoming project. A meeting with the village heads will be conducted at least 2 weeks before project launch. This meeting will be used to inform the community leaders of transportation routes, drilling operations and potential disturbances from these activities. The meeting will also introduce key staff members and ensure contact details are exchanged. The community leaders will be asked to relay the information to their communities.

Feedback and Community Attitudes

OVL understands the importance of listening to stakeholder concerns and addressing any valid issues to maintain good relations and demonstrate respect for the neighbouring communities in which it operates.

The following techniques and mechanisms will be utilized to ensure effective feedback:

Handling a Stakeholder Complaint

All HSE Complaint shall be processed immediately and according to Stakeholder Complaint Procedure. Access to complaint-handling process shall be free-of-charge to the complainant. All Complainants shall be treated courteously and be kept informed of the progress of their complaint, being addressed in an equitable, objective and unbiased manner through the complaint-handling process.

OVL will used the corporate ONGC policy for grievance redress. ONGC has adopted best industry practices in Corporate Governance as well, to ensure trust-worthy relations between the organization and all its stakeholders. Stakeholder communities are an extended part of the ONGC family. Apart from the mandatory measures required to be implemented as a part of Corporate Governance. This web-based Grievance Redressal protal ONGC reinforces was developed to maintain the Citizen-Government Interface with the highest integrity. Through this portal, OVL are committed to empower each stakeholder viz. citizen/vendor/employee/former-employee to register their grievances relating to any operational wing of ONGC, through a single window on our corporate web portal.

The corporate ONGC grievance mechanism portal can be accessed publicly at: **https://grievance.ongc.co.in.**

The steps For Lodging Online Grievance are as follows:

1. The user who wants to submit a Grievance shall register him/herself as a user giving the required details before lodging his/her complaint.
2. User will be sent a One Time Password (OTP) to the mobile number of the user provided by the user during registration process.
3. After receipt of OTP, the user shall enter the OTP to complete the registration process.
4. After successful registration, the User shall login with his login credentials to lodge a Grievance. After lodging of every Grievance, the User will be sent an OTP (One Time Password) again to the registered mobile no of the user. The complaint will only be registered if the OTP sent by the website is entered and verified by the system.
5. The user when logins to system next time he will be able to see the list complaints registered by the user and the status of the Grievances lodged. If there are some issues regarding OTP then it will be shown in the remark asking the user to send SMS for requesting OTP again.

Mitigation Measures

Social Impact Assessment – Construction and Installation Phase			
8. Land Use	8.1 Purchase of land access road/well pad and camp site	8.1.1 Change of traditional use.	8.1.1.1 Transparent and fair compensation to landowners and users
			8.1.1.2 Ensure all permissions are obtained from landowners and local authorities.
			8.1.1.3 Notify surrounding landowners before on location and time of project activities.
			8.1.1.4 Hand back the land with agreed condition after project completion.
Social Impact Assessment – Construction and Installation Phase			
9. Transport	9.1 Construction Activiti's	9.1.1 Damage to roads	9.1.1.1 Check and restore for any damage from project activities to local roads.
Social Impact Assessment – Drilling Phase			
14. Transport	14.1. Vehicle and Equipment Use	14.1.1. Disruption of traffic	14.1.1.1. Ensure all vehicles are in good operating condition and comply with project safety standards. Drivers must be healthy, have valid licenses, and by no means allowed to drink alcohol or take forms of medicine or illicit drugs that can affect performance.
			14.1.1.2. Strictly Follow Speed Limits
			14.1.1.3. Weight of the trucks shall not exceed the limit set by the Myanmar regulations to reduce damage to road surfaces or structures.
			14.1.1.4. Safety equipment and emergency equipment must be installed on vehicles such as toolbox safety belts and portable fire extinguisher etc. as per company standards.
			14.1.1.5. Provide left hand drive car as priority.
			14.1.1.6. Notify the local authority on the oversized load and put an escort in front of this convoy with horn and hazard lights.
			14.1.1.7. Consult with local authority before major movement.
			14.1.1.8. Restrict/ avoid movement of heavy equipment during rush hours.
			14.1.1.9. Provide traffic signs or flags at junction of access roads and main roads.

			14.1.1.10. Investigate any complaints and handle appropriately. Keep records of complaints and follow-up.
			14.1.1.11. Obtain approval from MOGE and/or appropriate government offices before constructing, upgrading or reroute access roads.
			14.1.1.12. Strictly enforce training programs to reduce transport incident cases by its contractors.
			14.1.1.13. Restore any damage to roads that is caused by contractors or Company.
			14.1.1.14. Restrict local traffic in well site area
			14.1.1.15. Vehicles will take direct routes where possible and avoid significant habitat areas.
			14.1.1.16. Construction vehicles will follow speed limits.
	14.2. Damage to roads	14.2.1. Check and restore for any damage from project activities to local roads.	14.2.1.1. Check and restore for any damage from project activities to local roads.
Social Impact Assessment – Well Testing Phase			
6 Transport	6.1 Vehicle and Equipment Use	6.1.1 Disruption of traffic	6.1.1.1 Implement construction and installation phase mitigation measures in 9.1.
		6.1.2 Damage to roads.	6.1.2.1 Regularly restore any damaged roads from project activities to good condition.
Social Impact Assessment – Well Abandonment Phase			
7 Transportation	7.1 Vehicle and Equipment Use	7.1.1 Disruption of traffic.	7.1.1.1 Implement construction and installation phase mitigation measures in 9.1.
	7.2 Site restoration	7.2.1 Damage to roads.	7.2.1.1 Restore any damage to roads.

Social Impact Assessment – Construction and Installation Phase			
10. Water Use	10.1Use of water public utility for construction and domestic use	10.1.1 Compete for water use of communities	10.1.1.1 Inform authority for drilling a ground water well.
			10.1.1.2 OVL to drill their own ground water wells on site.

			10.1.1.3 Potable water and industrial water, if taken by tube wells or tanker from nearby reservoirs/rivers, should not affect the availability of water to locals.
Social Impact Assessment – Drilling Phase			
9. Water Use	9.1. Use of public utility for water resources	9.1.1. Water usage of project affects the community's water supply.	9.1.1.1. Implement construction and installation phase mitigation measures in 10.1.
			9.1.1.2. Investigate any complaints and handle appropriately. Keep records of complaints and follow-up.

Social Impact Assessment – Drilling Phase			
10. Power Use	10.1. Power for drilling operations and work camp	10.1.1. Increase or decrease of available power for local community	10.1.1.1. Install diesel-powered generators to supply all project power related needs.

Social Impact Assessment – Construction and Installation Phase			
13. Socio-Economy	13.1 Services Supply for Construction Activities	13.1.1 Employment/ income and procurement opportunities for people, business and services in surrounding area	13.1.1.1 Employ qualified local workers.
			13.1.1.2 Purchase local supplies and services, whenever possible.
			13.1.1.3 Terms of contract for recruitment of manpower in these project needs to include emphasis on hiring locals, especially for unskilled and semi-skilled workforce.
	13.2 In-migration of labour and social interaction	13.2.1 Potential conflict between workers from other regions and local communities	13.2.1.1 Restrict workers to within project boundaries and do not allow local interaction within the communities.
Social Impact Assessment – Drilling Phase			
12. Socio-Economy	12.1. Employment opportunities and Use of local goods and services	12.1.1. Employment and income	12.1.1.1. Employ qualified local workers if possible.
			12.1.1.2. Purchase local supplies and services, whenever possible.
Social Impact Assessment – Well Abandonment Phase			
8 Socio-Economy	8.1 Labour and Accomidations	8.1.1 Employment and Income	8.1.1.1 Implement drilling phase mitigation measures in 12.1.

Visual Impact Assessment – Construction and Installation Phase			
15. Tourism and Recreational experience	15.1 Well Site, Road and Camp Construction	15.1.1 Disturbance and reduction of tourism and recreational experience	15.1.1.1 Post and enforce speed limit.
			15.1.1.2 Consult with local authority before major movement.
			15.1.1.3 Notify the local authority on the oversized load and put an escort in front of this convoy with horn and hazard lights.
			15.1.1.4 Restrict/ avoid movement of heavy equipment during rush hours.
			15.1.1.5 Provide traffic signs or flags at junction of access roads and main roads.
			15.1.1.6 Investigate any complaints and handle appropriately. Keep records of complaints and follow-up.
			15.1.1.7 Obtain approval from MOGE and/or appropriate government offices before constructing, upgrading or reroute access roads.
			15.1.1.8 Strictly enforce training programs to reduce transport incident cases by its contractors.
			15.1.1.9 Restore any damage to roads if caused by contractor or company.
			15.1.1.10 Restrict local traffic in well site area
			15.1.1.11 When project complete hand back the land with agreed conditions.

Study Area, Duration and Responsible Agencies

Study Area

The study area includes local communities within a 5-km radius of the well site (for all phases of the project).

Duration

The Stakeholder Engagements will be conducted during all phases of the project's operations. Four weeks prior to site operations, the stakeholder (village headman, household representatives and community leaders) will be informed about project activities. OVL will attend monthly meetings at the district office with village headman, household representatives to address any issues regarding OVL's project if required.

8.17.5 Monitoring Plans

Factors	Index	Procedure	Proposed Duration and Frequency of Monitoring	Location
Social	• Complaint • Monitoring and solving	• Record complaint • Monitor, investigate and implement suitable solutions	• All phases • Once after well abandoned and site restored within 3 months.	• Project area, community around project area, and transportation route

8.17.6 Implementation Schedule

The Community Consultation Plan and Grievance Mechanism will be conducted during all phases of the project's operations. Four weeks prior to site operations, the stakeholder (village headman, household representatives and community leaders) will be informed about project activities and Grievance Mechanism. OVL will attend monthly meetings at the district office with village headman, household representatives to address any issues regarding OVL's project as required.

8.17.7 Projected Budgets and Responsibilities

Budget

USD $ 25,000

Key Roles and Responsibilities

OVL Asset Manager

- Serve as a chairperson for both internal and external meetings for grievance resolution.
- Ensure his/her asset/department apply the Grievance handling Guideline throughout the lifecycle of the project.
- Ensure staff and reporting personnel report all grievances, excluding requests from communities and/or authorities, and grievances raised by staff regarding their employment conditions
- Review and approve corrective actions
- Monitor effectiveness of corrective actions. Introduce additional actions if required.
- Review the implementation of corrective actions for proper close out

External Community Relations Officer

- Perform initial review of grievance and determine the relevance of the grievance.
- Assist plaintiff to fill in the initial grievance record form.
- Serve as the grievance investigation facilitator in the investigation team.
- Investigate and record the complaint in a given form, keep a physical record and answer the plaintiff by acknowledging receipt of the grievance.
- Propose a solution, in case the grievance can be solved by an immediate action.
- Inform supervisor of the ongoing action until the resolution of the issue.
- Participate as an investigation member and act as the secretary to assist the investigation team.

- Act as the secretary for internal and external meetings for grievance resolution.
- External Relations Officer/External Relations Site Officer
- Keep a yearly record on the number of grievances and analyze trends, to compare with previous years, if any.
- Conduct knowledge sharing about the Grievance Handling Guideline with all concerned stakeholders both internal and external.

Site HSE Officer

- Serve as an investigation team member.
- Participate as a member at internal and external meetings for grievance resolution.
- Provide comment and review necessary information in HSE aspects and point of view.
- Record all grievances, actions in response to grievances and close outs in the Incident Management System Workflow.

9. PUBLIC CONSULTATION AND DISCLOSURE

9.1 Methodology and Approach

9.1.1 Purpose and Objectives

The primary objective of public consultation and disclosure is to maximize public understanding of the project through information distribution and exchange between the project proponent and the communities that might be affected directly or indirectly by the proposed project activities.

Stakeholder consultation is a process, which involves the two-way sharing of information and knowledge, seeking to understand the concerns of others and building relationships based on collaboration. It allows stakeholders to understand the potential risks, impacts and opportunities of the project in order to achieve positive outcomes.

The main objectives of stakeholder consultation are:

- to ensure that adequate information is provided to those affected by a project;
- to provide these groups with sufficient opportunity to voice their opinions and concerns;
- to ensure that comments are received in a timely manner so that they can be taken into account in project decisions.

9.1.2 Approach

The main steps in a successful stakeholder consultation are the following:

- stakeholder identification and analysis, which consists of identification of the various individuals or groups who (i) are affected or likely to be affected (directly or indirectly) by the project, or (ii) may have a relevant interest in the project;
- stakeholder consultation plan, which defines how communication with the identified stakeholders will be handled throughout project preparation and implementation, including the type of grievance procedure envisaged;
- information disclosure, provides awareness and helps stakeholders understand the planned project and possible risks, impacts and opportunities of the project.

The comments and concerns of the stakeholders consulted during this EIA will be considered and incorporated into the project design and mitigation measures. This chapter presents the key findings from public consultation and disclosure. It also provides recommendations for future consultation to be implemented throughout the execution of the project.

Within the project area, 21 villages were identified for participation in the public involvement meetings in the potentially affected exploration drilling area located in Thegon Township, Bago Region, Myanmar. The access road for Naweng-1 is along an existing roadway directly off the Yangon-Pyay highway in Thegon Township. The access road to Payama-1 crosses the Paukkhaung Township. ONGC Videsh is planning to spud the first well in November 2022.

9.1.3 Determining the Sample Sizes

The sample size for the socio-economic and opinion questionnaire survey was collected as follows:

(1) Nearby Villages – nearby potentially affected villages determined according to Yamane (1973) with the confidence level at 95% as following formula;

$$n = \frac{N}{\left(1 + Ne^2\right)}$$

where n = Sample size
N= Number of population – households in this study
e = Level of precision at 0.1 in this study

Equation 1

From the above instructions the sample size was calculated as follows:

The project area consists of 21 villages with an estimated 5000 households (HH) total. Using **Equation 1** the minimum sample size in the area is:

$$n = \frac{5000}{1 + 5000\ (0.05)^2} = 370 \text{ samples}$$

The total number of 370 samples will be taken once the socio-economic survey is completed along with the 2nd Public Consultation meetings for a minimum for 95% confidence level.

9.1.4 Stakeholder Identification and Analysis

Stakeholder is 'any individual or group who may be directly or indirectly affected by the Project, as well as those who may have an interest in or influence over the project'. The objective of stakeholder identification is therefore to establish which organisations and individuals may be directly or indirectly affected (positively and negatively) by the Project ("affected parties") and those that may have an interest in the project ("other interested parties").

When identified, stakeholders are classified according to their importance to the success of the Project and their influence or potential impact over its implementation and outcome. Different issues are likely to concern different stakeholders, therefore stakeholders are grouped based on their connections to the project; having an understanding of the connections of a stakeholder group to the project helps identify the key objectives of consultation. The process of stakeholder mapping also aims to identify which stakeholder may have a positive or negative impact or influence on the project.

Mapping of stakeholders in the OVL Block EP-3 project area include:

Stakeholders	Likely interest/ Responsibilities
Farmers/Local Business	• Possible impact/benefit
Sugar Cane Factory & Suppliers	• Possible impact/benefit
Vulnerable Groups including landless farm labourers	• Possible impact/benefit
Government (Local - State and Regional)	
Chief Minister of Bago Region	• Administration
Member Ministers of Bago Region	
Ministry of Home Affairs	
General Administration Department	
District Commissioner/Administrator	

Stakeholders	Likely interest/ Responsibilities
Township Commissioner/Administrator	
Village Head	
Regional Police Force	
Township and District Police Officer	• Security and Civil jurisdictions
Government (Departments under concerned Ministry)	
Representative of Forestry Department under Ministry of Natural Resources and Environmental Conservation	• Protection, and conservation of the wildlife and sustainable management of the forest resources
Representative of Environmental Conservation Department under Ministry of Natural Resources and Environmental Conservation	• Responsible for implementing National Environmental Policy, strategy, framework, planning in the national sustainable development process. • Manage natural resources conservation and sustainable utilisation, and pollution control • Co-operate with other government organisations, civil society, private sectors and international organisations with environmental management.
Representative of Water Resources Utilization Department, Ministry Of Agriculture and Irrigation	• Provision of irrigation water by pumping water from rivers and streams and also utilization of groundwater to boosting crop production.
Representative of Township Agriculture Land Management and Statistics Department, Ministry of Agriculture and Irrigation	• The only government agency with the mandate to collect and disseminate agricultural statistics. SLRD's statistical activities include; • Monitoring the progress of land preparation and cropping; condition of weather and crops and crop forecasts, • Carrying out periodic crop surveys to compile data on farmers and farm size distribution • Taking annual inventory of agricultural machinery and equipment. • Compiling the annual Season and Crop Report which provides statistics on rainfall; land use; irrigation and flood protection; crop acreage, yield per acre and production; multiple cropping; inventory of agricultural machinery and implements.
Township Medical officer (TMO) Township Health Department or Township Hospital, Ministry of Health	• Provision of all health care services. • Collaboration with organizations such as WHO, UN and NGO etc.
Departmental Head of Labour Relations /Ministry of Labour	• Maintains peaceful workplace between the employer or employer organizations and the worker or the labour organizations
Fire Services Department, Ministry Of Social Welfare, Relief And Resettlement	• Protection and prevention of fire disaster and natural disaster
NGO / CSOs from Township	• Regional development and public services

9.2 Summary of Consultations and Activities Undertaken

9.2.1 Overview

Based on stakeholder mapping and information collected during EHS baseline discussions, this EIA has engaged the following stakeholder groups:

1. Directly affected Stakeholders including Village heads and villagers;
2. Sugar Cane Factory and Workers
3. Non-Government Organizations; and
4. Authorities at the Pyay District and Township Level.

Public consultation allows for scoping of issues that are of significance to the communities. Their concerns can assist in identification of potential project impacts that are unique and specific to the communities where the project is situated. Similarly, recommendations from the affected communities on how to manage the potential impacts are essential in developing mitigation measures and management practices for eliminating/reducing negative impacts and enhancing positive impacts.

Consultations also maximize stakeholder understanding of the proposed project through information exchange between the project proponent and the communities that might be affected directly or indirectly by the proposed project activities.

9.2.2 Scoping Stage Public Consultation

ONGC Videsh, M&S and MOGE along with IEM and EQM conducted a Courtesy Visit with Bago Regional Chief Minister on 3rd January 2020 to ensure higher level awareness of the proposed project and to get approval of project activities, EIA study and Public Consultation plan.

ONGC Videsh together with IEM and EQM completed public consultation meetings to ensure that key stakeholders are aware of the planned project activities and any comments and concerns that have made will be considered as part of the EIA and Environmental Management Plan.

IEM conducted focus group meetings in Block EP-3 covering Thegon and Paukkhaung Townships, Pyay District, Bago Region Myanmar. The stakeholder consultation recommendations will be incorporated into the EIA TOR of EP-3 Petroleum Exploration Drilling project operated by ONGC Videsh.

Prior to initiating the fieldwork, a preliminary meeting was held between the field team and the Pyay District & Thegon / Paukkhaung Township Authorities prior to stakeholder meetings being conducted to obtain support and approval.

The first public consultation and stakeholder meetings were conducted in February 2020 as per the schedule in **Table 9-1**.

Table 9-1: 1st Public Consultation Schedule and Stakeholders

Date	Time	Meeting Venue	Stakeholders Covered/Villages	Number of Attendees
Feb 10th	15:30 – 16:30	Pyay District Administrative Office	• District & Township Level Authorities • Forestry & ECD • NGOs • CSOs • Media	12
Feb 11th	9:30 – 12.00	Paukkhaung Township Administrative Office	• Township Level Authorities • Forestry & ECD • NGOs • CSOs • Media	19
Feb 11th	13:00 – 16:30	Kyo Pin Village	• Sett Tone, • Minn Lann • Thith Yaung Paung	93
Feb 12th	10:30 – 12:00	Thegon Township Administrative Office	• Township Level Authorities • Forestry & ECD • NGOs • CSOs • Media	29
Feb 12th	13:00 – 16:00	Cha Ya GoneVillage	• Ywa Tha Gon • Taw Chin, • Thit Cho, • Pan Lan Gon, K • Kaung Bin Lu • Ka Yin Gon	21
Feb 13th	9:30 – 11:00	Ywa Thit Village	• Tan Daw Gyi • Nyaung Gon • Zin Byun Gon • Pyin Daung Gon • Pwe Bye • Sa Be Kan • Wa Le • Yat Tha • Gyo Gon	18

9.2.3 EIA Stage Public Consultation

MOGE, ECD along with ONGC Videsh and IEM/EQM conducted the 2nd stakeholder consultation meetings with local officials for Pyay Township and District, and conducted focus group meetings with 21 villages within the Thegon and Paukkhaung Townships from December 19 to 25, 2021.

The second public consultation meetings purpose was to present the draft preliminary EIA report to the stakeholders. The stakeholder consultations included:

- Stakeholders Meeting/Focus Group Discussions with communities, non-governmental organizations (NGOs), international NGOs, and community interest groups in urban and rural areas.

The second public consultation meetings were arranged in the same Township and Villages locations as the first Public Consultation. MOGE and IEM/EQM engaged with relevant Township Administrative Officers to discuss the public consultation plan and support needs. The public consultation schedule was agreed with by Township Administrative Officers, IEM/EQM completed the Public Consultation Meetings to present the draft preliminary EIA Report, gather the suggestions/concerns from stakeholders for developing the appropriate Environmental Management Plan. Results of Public Consultations from the Scoping Stage (1st Public Meetings) and EIA Review Stage (2nd Public Meetings) are presented below.

9.3 Results of Consultations

9.3.1 Scoping Stage Public Consultation

The 21 villages selected were the closest sensitive receptors to the potentially affected well site area. IEM's Socio-Economic survey team consisted of the Senior Socio-Economic Expert, two supervisors, and Myanmar local technicians who were trained by IEM.

At the meetings prior to conducting the meetings and surveys, the villagers were informed that ONGC Videsh was planning to conduct exploratory drilling for two wells in the area. The low villager rep turn out was due to the meetings being conducted during the mung bean harvest. Villagers informed us they were busy in the field. So we had predominantly the village reps and household heads who attended. The villagers informed us they would invite more people during the second meetings.

The meetings included the following agenda:

1. Opening of Public Consultation meeting
2. Introduction to ONGC Videsh personnel
3. Introductory speech by MOGE representative U Myint Kyaw Oo,
4. Presentation about company and drilling operation by U Kyaw Zaw Han, rep of ONGC Videsh
5. Presentation about Environmental Impact Assessment (EIA) by Dr. Twae Mu Mu Myint, (EQM) and Mr. Dylan Jenkins (IEM)
6. Question and Answer

The stakeholders at the township meeting and at the villages raised two main concerns and questions as detailed in Table 9-2. Photos from the meetings are included in **Figure 9-1**. The meeting minutes are detailed in **Appendix 5**.

Table 9-2: Key Points from 1st Public Consultation Meetings

Question / Comment	Response	Mitigation Measures
What are the benefits for local people?	Government will get profit sharing from the project at economic production phase. From this project, government will get energy support and local people will get job opportunities. CSR are usually conducted in economic production phase of Oil and Gas. Project benefits for local community include job opportunities and at production phase, implementation of CSR programs. CSR program to schools are already given in Pauk-Khaung and Kyo-Pin-Wine villages. Bridges are also provided in some villages. CSR is conducted in the villages where seismic surveys were conducted.	• Implement ONGC Videsh's complaint handling process. • Liaise with MOGE for energy and electricity issue from stakeholders.
Project Compensation	A land acquisition / compensation committee will be organized including MOGE, Land Settlement and Records Department and Township GAD. Then, the committee will discuss with land owners for compensation. Compensation rate will be specified considering both government and local people.	• The land acquisition process shall be led by MOGE • Transparent and fair compensation to land owners and users • Ensure all permissions are obtained from landowners and local authorities. Provide summary to MOGE. • Notify surrounding landowners 2 weeks before on location and time of project activities. • Restoration of land to its original state within 6 months of project completion. • Follow speed limits of 80 km/hour on highways (unless otherwise posted), 60 km/hour on lateritic roads, 20 km/hour in villages or communities, and 80 km/hour on paved roads outside Yangon within the project site and on main roads. • Potable water and industrial water, if taken by tube wells or tanker from nearby reservoirs/rivers, should not affect the availability of water to locals. • ONGC Videsh in association with drilling contractor shall develop a Waste Management Plan for this drilling campaign.
How about the local job opportunities?	Villagers will be hired for suitable positions during the construction wherever possible. However the drilling requires many skilled engineers and skilled positions.	• Efforts to Ensure construction and drilling contractors hire local labor based on the skill and availability from the nearby area. • Ensure OVL's HSE Integrated Management System Procedures and Emergency Response Plan operational controls are enforced to prevent a fire/explosion. As Contingency Plan require information about the equipment, facilities and organizational structure of the Drilling contractor, hence detailed plans shall be prepared in association with

Question / Comment	Response	Mitigation Measures
		drilling contractor, after the award of contract, as a part of a Bridging document. • ONGC Videsh and employed contractors to coordinate with local Township firefighting facilities.
What is the risk of fire from the project?	Drilling will be according to international standard to reduce fire risk.	• Implement ONGC Videsh's Emergency Response Plan including specific management procedures to mitigate the impacts if a fire occurs. • ONGC Videsh and employed contractors to coordinate with local Township firefighting facilities.
Access Road	Construction will start November, 2022 The construction is for the road and well pad both. The road to Payama-1 is owned by the sugar cane production. So need to meet and get agreement with sugar mill. The construction is same time as the sugar extraction so many trucks will be used during the construction time. So need to ensure we manage for sugar cane operations. In case of excessive cost or difficulty is getting permissions ONGC Videsh may look for alternate access route The contractor will bring all soil / fill from other areas and construction of the road and pad will be without taking soil from nearby paddy field.	• Obtain approval from MOGE and appropriate government offices before constructing, upgrading or reroute access roads. • Upgrade local road to support overload trucks and restore any damage to roads regularly. • Restore any damage to roads that is caused by contractors or Company
Alternative Access route to Payama-1 - Villagers suggest an alternative route to the sugar cane road (Baw Di Gone- I Hnauk -Tha Phan Kine- Kyo Pin Wine) which is suitable for farmers.	Ministry suggested choosing the pathway that will have least negative impacts. As you suggested, we will consider and evaluate feasibility of alternate access road route it is beneficial to all stakeholders We will encourage the contracted company to employ local people for construction new roads.	• ONGC Videsh to consider alternative route if applicable depending on the approval from relevant Ministries.
Traffic -There will be traffic on roads during harvesting season of farmers. The sugar cane extraction starts from the last week of November to December. The road construction may be one month and cause obstruction. The construction is September and October. If road construction is longer than may impact the sugar cane structure.	As the drilling will start early November 2022, all construction must be completed in advance of this date. We will not close the road. It will be built in sections and lanes and allow existing stakeholders to use the road. Need a diversion road if road is not completed before sugar extraction period. If road is blocked during sugar extraction will be a big problem as only one sugar mill for all villagers in the region. Because there is a sugar factory in this area will be negatively impacted if there is traffic-jam.	• ONGC Videsh to make all possible efforts for access road construction to avoid the sugar cane harvest season and to include diversions if required to not block local traffic. • The road shall be strengthened in lanes and sections for minimum inconvenience to all road users. • Notify the local authority on the oversized load and put an escort in front of this convoy with horn and hazard lights. • Consult with local authority before major movement.

Question / Comment	Response	Mitigation Measures
There are two irrigation dams in Pauk-Khaung. Will vibration by the drilling of the deep well impact on the dams?	The deeper the well, the narrower the diameter of the well. Smallest diameter of the well is 7 inches. So, this vibration will not negatively impact to surrounding area.	• The wells will be designed to international standards to limit vibrations to the surrounding areas.
What are the impacts to water wells from the drilling?	The vibration of drilling will not impact to the existing water wells. The wells are sealed with steel and cemented in place. The well hole is only seven inches and complete sealed and stabilized by the concrete. There will be no impact to any thing nearby or the dams which are far away. According to our experience, there were no sand and landslide in the tube wells of every village due to the drilling process. If there are any issues with the wells, please inform us immediately.	• Select drill site locations at safe distances from nearest community. • Investigate any complaints and handle appropriately. Keep records of complaints and follow-up.

Meeting at Phaukkhaung Township Meeting

Questions during the Kyo Pin Village Meeting

Member of Parliament Question at Thegon Township Meeting

ONGC Videsh Rep Informing the proposed location of the access road to Naweng-1.

Meeting at Pha-Lan-Gone Village

Questions at Htan Taw Gyi Meeting

Figure 9-1: Photos from 1st PC Meetings

9.3.2 EIA Phase Public Consultation (2nd Public Meetings)

MOGE, ECD along with ONGC Videsh and IEM/EQM conducted the 2nd stakeholder consultation meetings with local officials for Pyay Township and District, and conducted focus group meetings with 21 villages within the Thegon and Paukkhaung Townships following ECD advised protocol.

The 2nd Public Meetings were held from 19th December to 25th December , 2022. This period includes meeting arrangement and approval with government authorities.

MOGE, ECD along with ONGC Videsh and IEM/EQM completed the 2nd round of public consultation meetings to ensure that key stakeholders are aware of the planned project activities and any comments and concerns that have made will be considered as part of the EIA and Environmental Management Plan.

IEM/EQM conducted focus group meetings in Block EP-3 covering Thegon and Paukkhaung Townships, Pyay District, Bago Region Myanmar. The stakeholder consultation recommendations have been incorporated into the EIA TOR of EP-3 Petroleum Exploration Drilling project operated by ONGC Videsh.

Prior to initiating the fieldwork, a preliminary meeting was held between the field team and the Pyay District & Thegon / Paukkhaung Township Authorities prior to stakeholder meetings being conducted to obtain support and approval.

The 2nd public consultation and stakeholder meetings were conducted as per the following schedule.

DAY 1 (21.12.2021) -Yangon to Pyay

9:30- 3:30 Team mobilizes from Yangon to Pyay. 3:30-4:30 Pyay District Administrative Office Meeting

---END of DAY 1---

Day 2 (22.12.2021) - Paukkhaung Township (For Payama-1)
9:30 - 12:00 Paukkhaung Township Administrative Office Meeting
1:00 - 4:00 Meeting at **Kyo Pin Village** and (invite representatives from Kyo-pin-wine villager, Sett-tone, Minn Lann and Thit-yaung-pyan Villages)

---END of DAY 2---

Day 3 (23.12.2021) - The'gone Township
9:30 - 12:00 Thegon Township Administrative Office Meeting (for both Payama-1 and Naweng-1 wells)
1:00 - 4:00 Meeting at **Char-yar-gone Village** (invite representatives from Kan-taw-gyi, Nyaung-gone , Ywa-tha- gone , Zin-pyun-gone , Pyin-daung-gone , Ywa-thit, Pwe-taing , Sabel-kan , Wa-le , Yet-tha , Gyo-gone, Taw-chin, Thit Cho, Pha-lan-gone, Kaung-bin-lu, Kayin-gone Villages)

The following Table 9-3 identifies the meeting participants.

Table 9-3: Meeting Participants

Date	Time	Meeting	Stakeholders Covered/Villages	Number of Attendees
21 Dec, 2021	15:30 – 17:30	Pyay District Administrative Office Meeting	• Pyay District Administration • Forestry Dept, Pyay District • Planning Dept, Pyay District • ECD • Agriculture Dept. • Myanmar Police • Health Dept. • Education Dept. • Rural Development Dept. • Fire Services Dept • Settlement and Land Records Dept. • City Development Committee • MOGE • ONGC • IEM/EQM	22
22 Dec, 2021	9:30 – 11:30	Paukkhaung Township Administrative Office Meeting	• Head of Pauk khaung Township Admin • Agricultural Land Management and Statistics Dept. • Immigration Dept • Agriculture Dept. • Township Development Committee • TEO • Planning Dept. • Livestock Breeding and Veterinary Dept. • Rural Development Dept. • Myanmar Police • Fire Services Dept. • Health Dept. • Forestry Dept. • Rural Road Development Dept. • MOGE • ONGC • IEM/EQM	23
22 Dec, 2021	15:30 – 17:30	Meeting at **Kyo Pin Village** and (invite representatives from Kyo-pin-wine villager, Sett-tone, Minn Lann and Thit-yaung-pyan Villages)	• MOGE • ONGC • IEM/EQM Villages (1) Kyot Pin Waing (2) Min Lann (3) Thit Yaung Pyan (4) Sat Tone	56 Villagers
23 Dec, 2021	9:30 – 11:00	Thegon Township Administrative Office Meeting (for both Payama-1 and Naweng-1 wells)	• General Administration Dept., Thaegone • Settlement and Land Records Dept • Planning Dept • Agriculture Dept • Agriculture Land Management and Statistics Dept.	15

Date	Time	Meeting	Stakeholders Covered/Villages	Number of Attendees
			• Information and Communications Dept • MOGE • ONGC • IEM/EQM	
23 Dec, 2021	15:30 – 17:30	Meeting at **Char-yar-gone Village** (invite representatives from Kan-taw-gyi, Nyaung-gone , Ywa-tha- gone , Zin-pyun-gone , Pyin-daung-gone , Ywa-thit, Pwe-taing , Sabel-kan , Wa-le , Yet-tha , Gyo-gone, Taw-chin, Thit Cho, Pha-lan-gone, Kaung-bin-lu, Kayin-gone Villages)	• MOGE • ONGC • IEM/EQM Villages (1) Char Yar Kone (2) Htan Daw Gyi (3) Nyaung Gon (4) Zin Byun Gon (5) Pyin Daung Gon (6) Ywa Thit (7) Pwe Bye (8) Sa Be Kan (9) Wa Le (10) Yat Tha (11) Gyo Gon (12) Ka Yin Gon (13) Ywa Tha Gon (14) Taw Chin (15) Thit Cho (16) Pan Lan Gon (17) Kaung Bin Lu	51 people from 17 Villages

An example of Photos taken during the 2nd Public meetings with villagers are found below in Figure 9-2.

Figure 9-2: Photos of Villagers Participating in 2nd Public Meeting

The meetings included the following agenda:

1. Opening of Public Consultation meeting
2. Introductory by MOGE representative U Win Naing Swe,
3. Introduction of Personnel by ONGC, U Kyaw Zaw han
4. Presentation about company and drilling operation by U Kyaw Zaw Han, ONGC Videsh
5. Presentation about Environmental Impact Assessment (EIA) by Dr, Ohnmar May Tin Hlaing, (EQM)
6. Question and Answer

The stakeholders at the township meeting and at the villages raised the following concerns and questions during the 2nd Public Meetings as detailed in Table 9-4. The meeting minutes are included in **Appendix 5**.

Table 9-4: Key Points from 2nd Public Consultation Meetings

Key Questions / Comment	Response	Mitigation Measures
How will this project benefit local people?	This EP-3 project has 75 million USD investment and we believe that the locals will have work opportunities through our contractors during road construction and site work and improved roads around the vicinity of the project. If the two wells from EP-3 project find oil and gas production, we hope to increase our CSR projects and there will be additional opportunities for the locals. There will be jobs and OVL will be hiring people from nearby villages. We have also planned to fix up roads and start some construction activities around the wells, so we believe these operations can provide some jobs for the locals even before the project commences.	• Project planning will give preference to the use of local services and supplies. • A CSR Program will be discussed with MOGE and the local communities
Are there any plans for CSR related activities	OVL is planning to enlarge and rebuild the sugarcane factory road (Takyarsat road). The total distance of the road that will be improved for approximately 13 miles. Approximate width of this road is 18 feet. We believe that this improved road will be very beneficial to sugar cane farmers. This road will be improved to withstand 60 tonnes of weight.	• Access roads will be designed to benefit local communities and the sugarcane factory.
	OVL is only required to start its CSR projects when production starts, but we have already started some CSR projects during seismic operation even before we have started commercial production and profiting from the budget	• OVL will discuss with MOGE for more CSR activities.
	The total cost of building roads is approximately 20,000 Lakhs (MMK).	• The access roads being repair for all weather and will be designed for the long-term benefit of local communities

When the project will start and when it will end	The project is in operation and drilling of wells will begin after the monsoon finishes and will last for approximately 6 to 8 months.	
After drilling the test wells, will you be returning these wells and facilities back to the government? What are your plans?	If oil production is achieved from these test wells, then field with be developed after government approval. MOGE is also likely to take a stake in the project and reimburse the investments made during exploration stage, as per their participation as per signed PSC and laws of the Union of Myanmar Royalties and taxes shall be payable as per PSC terms.	• Compensation will be provided for use of farm and forest land. • OVL will plant 1 acre in support of the ecological conservation plan
	The test wells will be drilled on farmland and forests and therefore, the company will be required to reimburse the farmers on the cancelled production of crops from these farmlands. Township administrative body of farmland, district administrative body of farmland and MOGE have negotiated with the existing land and crop owners and the final proposal has been sent to region administrative body of farmland for approval. When final approval is granted by the central administrative body of farmland, ONGC Videsh will pay compensation to the affected farmers as per government approval.	
	For this project, we will be leasing the forest lands and we will be paying rental fees as dictated by the Ministry of Forestry. OVL too has agreed to replant 1 acre of plants as a part of the ecological conservation plan.	
What proportion of the new 350 m road that will be construction will be in Pauk Khaung Township?	All 350 m of the new road will be in Th~~a~~e ~~K~~Gone township. We are also renovating the 6 m Myanma Economic Holdings Public Company Limited (EH) 's Sugar Cane production road so that it is more durable. We will not be widening the existing old 4 m road of forest area, but we will be renovating it so that it is more durable. As we have previously discussed, we will be compensating the sugar cane farmers. We will start building the new 350 m road from the point, where the existing ~~old~~ road ends until it gets to the location of the wells. This new road will be 6m wide.	• The access road will be constructed for 350 m that is 6m wide and can carry a load of 60 tons
How will Waste Management be arranged?	OVL will contract an international company, approved by Myanmar government to be responsible for waste management. Wastes will be taken to Thilawa, Yangon. OVL will also remove all equipment and	• Follow waste management plan

	rehabilitate the land after drilling is finished.	
Are the current EIA reports only valid for 1 year? Will there be more EIA reports if the test drilling is successful?	This current EIA report is for the test drilling period. OVL will need a new EIA report once the production phase starts because the environmental impacts of the test drilling phase and the production phase are not the same.	• The EIA Report will be approved prior to the Test Well Exploration Drilling Project
What have you planned for the CSR projects?	For now, we will be building the roads that will cost 20,000 Lakhs (MMK) and the future CSR projects will be discussed with MOGE in upcoming meetings. We will be planning additional CSR projects if MOGE requests for more.	• The initial CSR activity will be to construct and improve roads that will also benefit the local communities
	MOGE had also previously planned CSR programs with 2% of the profit we get from production. The total cost of building roads is approximately 20,000 Lakhs (MMK)	• OVL will discuss CSR activities with MOGE once production is started. • The access roads will be designed for the long-term benefit of local communities
	If hydrocarbons are not found during this project, all lands may be released back to the farmers and the Forestry department as per terms of MOGE.	• All lands will be returned upon project completion as per terms of MOGE
How many people will be involved in this project?	We anticipate that there will be around 200 people on site for this project.	• Efforts will be made to ensure construction and drilling contractors hire local labor based on the skill and availability from the nearby area.
Do you have plans to keep a fire safety manager?	We have plans to keep HSE managers from both the company and subcontractors. We also have protocols to follow if an accident occurs. ECD too will require emergency response capabilities on site. The EIA report will also include the contact of local fire service and we will also be advising the company HSE team to talk to the local fire service to arrange support as required.	• Ensure OVL's HSE Integrated Management System Procedures and Emergency Response Plan operational controls are enforced to prevent a fire/explosion. As Contingency Plan require information about the equipment, facilities and organizational structure of the Drilling contractor, hence detailed plans shall be prepared in association with drilling contractor, after the award of contract, as a part of a Bridging document. • ONGC Videsh and employed contractors to coordinate with local Township firefighting facilities.
There are about 100 vehicles from the village that will travel on this road to carry sugar cane on a daily basis. This will make the road and houses next to it dusty. How will this issue be managed	We will be advising the project team to reduce the number of vehicles they use as much as possible. Water trucks will occasionally spray the road to reduce dust as much as possible	• Obtain approval from MOGE and appropriate government offices before constructing, upgrading or reroute access roads. • Upgrade local road to support truck movement and restore any damage to roads regularly.

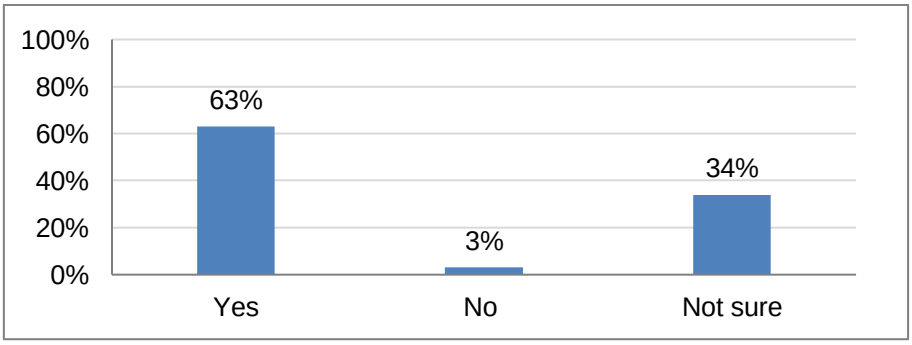
		• Restore any damage to roads that is caused by contractors or Company
Are any water drainage projects planned around the project site?	We have planned to provide drainage system between dikes and the plots in fields. As there are ditches between the plots and the dikes, these ditches may get filled with water during monsoon season. Ditches also get clogged up easily and this leads to flood in the plots. With the drainage system we provide, there will be reduced flooding in the plots. The drilling of wells will not be operating during monsoon season and once we are done with the drilling works, we will be removing all the equipment from the sites.	• Design roads to ensure proper drainage and flood protection. • Obtain approval from MOGE and appropriate government offices before constructing, upgrading or reroute access roads. • Restore any damage to roads that is caused by contractors or Company during exploratory drilling period. Restoration at site will be conducted.

9.4 Local Community Support for the Project

As part of the public consultation process a survey was undertaken in 21 villages around the project which interviewed a total of 400 households. One important question asked was whether they agreed with the proposed project.

The following **Figure 9-3** indicates the 63% of the local community households that were surveyed support the project, while 3% do not support the project and 34% were still not sure.

Figure 9-3: Percentage of Local People Supporting the Proposed Project



9.5 Further Ongoing Consultation

Before operations begin, additional public consultations and disclosure prior to project implementation are required. This will be initiated in advance before the exploration drilling program is started. Once the project is initiated and throughout project execution a communication process and schedule must be defined. Consultations conducted early on prior to project commencement will assist to ensure that the concerns of the stakeholders are considered, and that mitigation measures are developed to address them.

Stakeholder engagement is a continuous process to be undertaken throughout the life of the Project and, as such, OVL will implement and manage this ongoing consultation, address stakeholder concerns if they emerge, and regularly monitor stakeholder feedback.

9.6 Disclosure

The project disclosure will be conducted in compliance with EIA Procedure. ONGC Videsh will disclose the planned project at the Scoping Phase via the ONGC Videsh website (https://www.ongcvidesh.com) and with a public notice through a Myanmar Government Newspaper. (**Figure 9-4**)

The 1st PC Disclosure at the EIA Phase will be completed via website and with a public notice of Myanmar Languages through a Local Newspaper (Mirror Daily) on 24-9-2020. (**Figure 9-5**) The disclosure can be accessed online at the following link:
https://www.burmalibrary.org/sites/burmalibrary.org/files/obl/KM_24.9.2020.pdf.

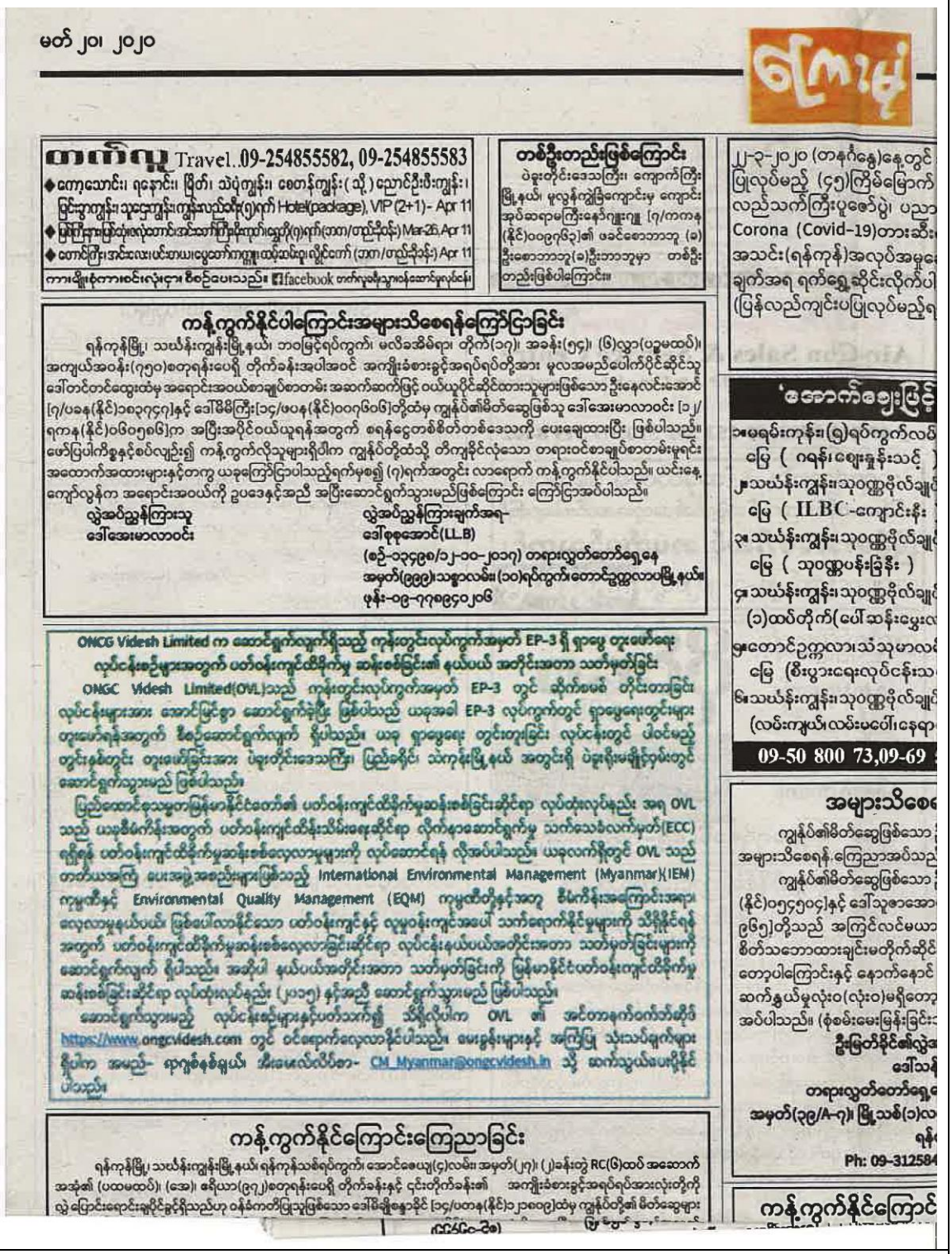
The program for distribution of the project information including project Start-up time, Project Activities Timeline, Project Duration to the local community has been conducted during the second public meetings which were conducted from 19th – 25th December, 2021.

The drilling spud date is 1st November, 2022. Once all actions are completed the stakeholders shall be given further notice in advance and information disclosed in the newspaper and https//www.burmalibrary.org.

During the Final EIA Phase; ONGC Videsh will also disclose the planned project via the ONGC Videsh website and with a public notice through a Myanmar Government Newspaper.

In addition copies of the submitted EIA will be provided for public viewing at the following locations:

- ONGC Videsh office in Yangon
- Environmental Conservation Department, Bago Region
- Pyay District General Administrative Department Office, Bago Region
- On ONGC Videsh website (https://www.ongcvidesh.com)



မတ် ၂၀၊ ၂၀၂၀

ကြေးမုံ

ကန့်ကွက်နိုင်ပါကြောင်းအများသိစေရန်ကြော်ငြာခြင်း

ရန်ကုန်မြို့၊ သဃ်ိန်းကျွန်းမြို့နယ်၊ ဘဝမြင့်ရပ်ကွက်၊ မလိခအိမ်ရာ၊ တိုက်(၁၇)၊ အခန်း(၅၄)၊ (၆)လွှာ(ပဥမထပ်)၊ အကျယ်အဝန်း(၇၅၀)စတုရန်းပေရှိ တိုက်ခန်းအပါအဝင် အကျိုးခံစားခွင့်အရပ်ရပ်တို့အား မူလအမည်ပေါက်ပိုင်ဆိုင်သူ ဒေါ်တင်တင်ထွေးထံမှ အရောင်းအဝယ်စာချုပ်စာတမ်း အဆက်ဆက်ဖြင့် ဝယ်ယူပိုင်ဆိုင်ထားသူများဖြစ်သော ဦးနေလင်းအောင် [၇/ပခန(နိုင်)၁၈၃၇၄၇]နှင့် ဒေါ်မိမိကြီး[၁၄/ဖပန(နိုင်)၀၀၇၆၀၆]တို့ထံမှ ကျွန်ုပ်၏မိတ်ဆွေဖြစ်သူ ဒေါ်အေးမာလာဝင်း [၁၂/ရကန(နိုင်)၀၆၀၅၈၆]က အပြီးအပိုင်ဝယ်ယူရန်အတွက် စရန်ငွေတစ်စိတ်တစ်ဒေသကို ပေးချေထားပြီး ဖြစ်ပါသည်။ ဖော်ပြပါကိစ္စနှင့်စပ်လျဉ်း၍ ကန့်ကွက်လိုသူများရှိပါက ကျွန်ုပ်တို့ထံသို့ တိကျနိုင်လုံသော တရားဝင်စာချုပ်စာတမ်းမူရင်း အထောက်အထားများနှင့်တကွ ယခုကြော်ငြာပါသည့်ရက်မှစ၍ (၇)ရက်အတွင်း လာရောက် ကန့်ကွက်နိုင်ပါသည်။ ယင်းနေ့ကျော်လွန်က အရောင်းအဝယ်ကို ဥပဒေနှင့်အညီ အပြီးဆောင်ရွက်သွားမည်ဖြစ်ကြောင်း ကြော်ငြာအပ်ပါသည်။

လွှဲအပ်ညွှန်ကြားသူ
ဒေါ်အေးမာလာဝင်း

လွှဲအပ်ညွှန်ကြားချက်အရ-
ဒေါ်စုစုအောင်(LL.B)
(စဉ်-၁၃၄၉၈/၁၂-၁၀-၂၀၁၇) တရားလွှတ်တော်ရှေ့နေ
အမှတ်(၉၉၉)သစ္စာလမ်း။ (၁၀)ရပ်ကွက်၊ တောင်ဥက္ကလာပမြို့နယ်။
ဖုန်း-၀၉-၇၇၈၉၄၀၂၀၆

ONGC Videsh Limited က ဆောင်ရွက်လျက်ရှိသည့် ကုန်းတွင်းလုပ်ကွက်အမှတ် EP-3 ရှိ ရှာဖွေ တူးဖော်ရေး လုပ်ငန်းစဉ်များအတွက် ပတ်ဝန်းကျင်ထိခိုက်မှု ဆန်းစစ်ခြင်း၏ နယ်ပယ် အတိုင်းအတာ သတ်မှတ်ခြင်း

ONGC Videsh Limited(OVL)သည် ကုန်းတွင်းလုပ်ကွက်အမှတ် EP-3 တွင် ဆိုက်စမစ် တိုင်းတာခြင်း လုပ်ငန်းများအား ဆောင်ရွက်နိုင်ပြီး ဖြစ်ပါသည်။ ယခုအခါ EP-3 လုပ်ကွက်တွင် ရှာဖွေရေးတွင်းများ တူးဖော်ရန်အတွက် ဒီဇဉ်ဆောင်ရွက်လျက် ရှိပါသည်။ ယခု ရှာဖွေရေး တွင်းတူးခြင်း လုပ်ငန်းတွင် ပါဝင်မည့် တွင်းနှစ်တွင်း တူးဖော်ခြင်းအား ပဲများတိုင်းဒေသကြီး၊ ပြည်စရိုင်း၊ သဲကုန်းမြို့နယ် အတွင်းရှိ ပဲများဂိုးမချိုနှိုက်ပတ်လည် ဆောင်ရွက်သွားမည် ဖြစ်ပါသည်။

ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံတော်၏ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်း အရ OVL သည် ယခုစီမံကိန်းအတွက် ပတ်ဝန်းကျင်ထိခိုက်သိမ်းဆေးဆိုင်ရာ လိုက်နာဆောင်ရွက်မှု သက်သေခံလက်မှတ်(ECC) ရရှိရန် ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်လေ့လာမှုများကို လုပ်ဆောင်ရန် လိုအပ်ပါသည်။ ယခုလက်ရှိတွင် OVL သည် တတိယအကြိ ပေးအပ်အရည်းများဖြစ်သည့် International Environmental Management (Myanmar)(IEM) ကုမ္ပဏီနှင့် Environmental Quality Management (EQM) ကုမ္ပဏီတို့နှင့်အတူ စီမံကိန်းအကြောင်းအရာ လေ့လာမှုနယ်ပယ် ဖြစ်ပေါ်လာနိုင်သော ပတ်ဝန်းကျင်နှင့် လူမှုဝန်းကျင်အပေါ် သက်ရောက်နိုင်မှုများကို သိရှိနိုင်ရန် အတွက် ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်လေ့လာခြင်းဆိုင်ရာ လုပ်ငန်းနယ်ပယ်အတိုင်းအတာ သတ်မှတ်ခြင်းများကို ဆောင်ရွက်လျက် ရှိပါသည်။ အဆိုပါ နယ်ပယ်အတိုင်းအတာ သတ်မှတ်ခြင်းကို မြန်မာနိုင်ငံပတ်ဝန်းကျင်ထိခိုက်မှု ဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်း (၂၀၁၅) နှင့်အညီ ဆောင်ရွက်သွားမည် ဖြစ်ပါသည်။

ဆောင်ရွက်သွားမည့် လုပ်ငန်းဆောင်မှုများနှင့်ပတ်သက်၍ သိရှိလိုပါက OVL ၏ အင်တာနက်ဝက်ဘ်ဆိုဒ် https://www.ongcvidesh.com တွင် ဝင်ရောက်လေ့လာနိုင်ပါသည်။ မေးခွန်းများနှင့် အကြံပြု သုံးသပ်ချက်များ ရှိပါက အမည်- ဒေါက်တာစံစံရွှမ်း၊ အီးမေးလ်လိပ်စာ- CM_Myanmar@ongcvidesh.in သို့ ဆက်သွယ်ပေးပို့နိုင် ပါသည်။

ကန့်ကွက်နိုင်ကြောင်းကြေညာခြင်း

ရန်ကုန်မြို့၊ သဃ်ိန်းကျွန်းမြို့နယ်၊ ရန်ကုန်သစ်ရပ်ကွက်၊ အောင်စေယျ(၄)လမ်း၊ အမှတ်(၂၇)၊ (၂)ခန်းတွဲ RC(၆)ထပ် အဆောက်အအုံ၏ (ပထမထပ်)၊ (အေ)၊ ဧရိယာ(၉၇၂)စတုရန်းပေရှိ တိုက်ခန်းနှင့် ၎င်းတိုက်ခန်း၏ အကျိုးခံစားခွင့်အရပ်ရပ်အားလုံးတို့ကို လွှဲပြောင်းရောင်းချပိုင်ခွင့်ရှိသည်ဟု ဝန်ခံကတိပြုသူဖြစ်သော ဒေါ်မိမိချိစန္ဒာခိုင် [၁၄/ပတန(နိုင်)၁၂၁၈၀၉]ထံမှ ကျွန်ုပ်တို့၏ မိတ်ဆွေများ

Myanmar Language Disclosure Statement at Scoping Phase

Figure 9-4: Scoping Phase Disclosure Statements

ONGC Videsh Limited ကုမ္ပဏီမှ ဆောင်ရွက်လျက်ရှိသည့် ကုန်းတွင်းလုပ်ကွက်အမှတ် EP - 3 ရှိ တူးဖော်ရေးလုပ်ငန်းစဉ်များအတွက် ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း

ONGC Videsh Limited သည်ကုန်းတွင်းလုပ်ကွက်အမှတ် EP - 3 တွင်ဆိုက်စမ်းတိုင်းတာခြင်းလုပ်ငန်းများအားအောင်မြင်စွာဆောင် ရွက်ခဲ့ပြီးဖြစ်ပါသည်။ ယခုအခါ EP - 3 လုပ်ကွက်တွင်ရှာဖွေရေးတွင်းများ တူးဖော်ရန် အတွက်စီစဉ်ဆောင်ရွက်လျက်ရှိပါသည်။ အဆိုပြုထားသော တွင်းနေရာတွင်းကို ပဲခူးတိုင်းဒေသကြီး ပြည်မြို့နယ်၊ ပဲခူးရိုးမချိုင့်ဝှမ်းတွင် တူးဖော်သွားရန်ရည်ရွယ် ထားရှိပါသည်။

ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာန (ECD) သို့တင်ပြထားသော နယ်ပယ်အတိုင်းအတာသတ်မှတ်ခြင်းအစီရင်ခံစာတွင် ဖော်ပြခဲ့သည့်အတိုင်း OVL သည် တတိယအကြံပေးအဖွဲ့အစည်းများဖြစ်သည့် International Environmental Management (Myanmar) (IEM) ကုမ္ပဏီ နှင့် Environmental Quality Management (EQM) ကုမ္ပဏီတို့နှင့်အတူ စီမံကိန်းနှင့်သက်ဆိုင်သူများအားတွေ့ဆုံဆွေးနွေးခြင်းအပါအဝင်ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာလေ့လာမှုများကိုဆောင်ရွက်လျက်ရှိပါသည်။

အဆိုပါပတ်ဝန်းကျင် ထိခိုက်မှုဆန်းစစ်ခြင်းလုပ်ငန်းကိုမြန်မာနိုင်ငံ၏ ပတ်ဝန်းကျင် ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်း (၂၀၁၅)နှင့်အညီဆောင်ရွက်သွားမည်ဖြစ်ပါသည်။

ဆောင်ရွက်သွားမည့်လုပ်ငန်းစဉ်များနှင့်ပတ်သက်၍ သိရှိလိုပါက OVL ၏အင်တာနက်ဝက်ဘ်ဆိုဒ် https://www.ongcvidesh.com တွင်ဝင်ရောက်လေ့လာကြည့်ရှုနိုင်ပါသည်။

မေးခွန်းများနှင့် အကြံပြုသုံးသပ်ချက်များရှိပါက အမည်-Rajiv Nischal ၏အီးမေးလ်လိပ်စာ - CM_Myanmar@ongcvidesh.in သို့ဆက်သွယ်မေးမြန်းနိုင်ပါသည်။

တရားလို
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မသိ) သိစေရမ
သင်တို့
လိုမှ လျှောက်
အရေးကြီးသည့်
ရှေ့နေနှင့်ဖြစ်
ကျွတ်လဆန်း
အဆိုလွှာကို ထ
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ထုတ်ပေးလိမ့်မ
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Myanmar Language Disclosure Statement at EIA Phase

Figure 9-5: EIA Phase Disclosure Statements

10. CONCLUSION & RECOMMENDATIONS

All environmental issues are ranked as low or negligible and can be managed to minimize potential impacts. Medium ranked Social issues include Transportation at all phases as during the public meetings communities expressed concern over potential impacts, particularly during sugar cane harvesting period as there are many communities along access roads and some within 500 m of the drill locations. These activities will need to be monitored closely as communities are quite near to a number of the potential drill sites.

Health issues including mud chemicals and drilling waste, communicable diseases, noise and flare emissions are ranked as medium. These will need to be monitored closely at those sites where communities are nearby. There are many communities nearby and some within 500 m of the drill locations. Health service infrastructure is not well developed in the communities and OVL will maintain its own clinic onsite during the entire exploration program. A specific waste management plan will be prepared to ensure that all wastes are managed to international standards. Hydrogen Sulphide is a potentially serious issue that requires monitoring equipment to be installed and tested, as well as having personnel trained on use of emergency response equipment.

Unplanned Events have all been ranked as having a medium residual risk. Key to ensuring that unplanned events do not happen is linked to ongoing training programs and a site-specific emergency response plan.

To mitigate the potential for a blowout, a BOP needs to be installed and tested. Drilling procedures need to be carefully implemented. The risk of fire and related explosions requires that regular monitoring and inspection measures are in place, as well as fire extinguishers strategically placed to minimize any damage should a fire occur.

This region has had earthquakes in the past and design considerations need to be taken to minimize the impact of an earthquake should it occur. Site-specific emergency response plans for all unplanned events need to be in place and training conducted for all staff as appropriate prior to the start of the exploration drilling program.

Positive impacts to locals will occur from the purchase or rental of land for access roads, well site and camp site; service supply for construction activities; employment opportunities and use of goods and services; labour income; return of land upon completion of drilling program; handling of materials, hazardous and non-hazardous waste management; and site restoration.

The overall budget required to implement the specific management plans based on the outcomes of the impact assessment and OVL's QHSE standards is estimated at **175,000 USD.** OVL will allocate it in the drilling budget. However, OVL will allocate additional budget if required to meet the applicable laws in Myanmar.

Recommendations:

The following recommendations are provided:

- Implement recommended stakeholder engagement program before site construction.
- Prepare a site-specific waste management plan.
- Apply OVL's Emergency Response Plan.
- Conduct recommended training program prior to project initiation.
- Evaluate water resource potential to ensure it does not impact local community.
- Adopt and implement the EMP and Recommended Monitoring Measures.

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Appendix 1

IEM consultant registration

REPUBLIC OF THE UNION OF MYANMAR

Ministry of Natural Resources and Environmental Conservation

CERTIFICATE FOR TRANSITIONAL CONSULTANT REGISTRATION

(ကြားကာလအကြံပေးလုပ်ကိုင်သူမှတ်ပုံတင်ခြင်းအထောက်အထားလက်မှတ်)

No. 0011 Date 07 JUL 2017

The Ministry of Natural Resources and Environmental Conservation, hereby, issues this certificate to the organization under Environmental Impact Assessment Procedure, Notification No. 616/2015.

(ပတ်ဝန်းကျင် ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်း၊ အမိန့်ကြော်ငြာစာအမှတ်၊ ၆၁၆/၂၀၁၅ အရ သယံဇာတနှင့် သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာနသည် ဤအထောက်အထားလက်မှတ်ကို အဖွဲ့အစည်းအား ထုတ်ပေးလိုက်သည်။)

(a)	Name of Organization (အဖွဲ့အစည်းအမည်)	International Environmental Management Co. Ltd.
(b)	Name of the representative in the organization (အဖွဲ့အစည်းကိုယ်စားလှယ်၏ အမည်)	Mr. Ronald David Livingstone
(c)	Citizenship of the representative in the organization (အဖွဲ့အစည်းကိုယ်စားလှယ်၏ နိုင်ငံသား)	Canadian
(d)	Identity Card /Passport Numberof the representative person in the organization (အဖွဲ့အစည်းကိုယ်စားလှယ်၏ မှတ်ပုံတင်/ နိုင်ငံကူးလက်မှတ်အမှတ်)	HG068880
(e)	Address of organization (ဆက်သွယ်ရန်လိပ်စာ)	No. 148/B, Dhamma Zedi Road, Bahan Township, Yangon ron@iem-global.com , www.iem-global.com
(f)	Type of Consultancy (အကြံပေးလုပ်ကိုင်မှုအမျိုးအစား)	Organization
(g)	Duration of validity (သက်တမ်းကုန်ဆုံးရက်)	31 March 2018

EXTENSION
သက်တမ်းတိုးမြှင့်ခြင်း
The VALIDITY of this certificate is extended for one year from (1.4.2018) to (31.3.2019)
ဤလက်မှတ်အား (၁-၄-၂၀၁၈) ရက်နေ့မှ (၃၁-၃-၂၀၁၉) ရက်နေ့အထိ တစ်နှစ်သက်တမ်း တိုးမြှင့်သည်။
1.4.2018
For Director General
(Soe Naing, Director)
Environmental Conservation Department

Director General
Environmental Conservation Department
Ministry of Natural Resources and Environmental Conservation

Areas of Expertise Permitted
(ခွင့်ပြုသည့် ကျွမ်းကျင်မှုနယ်ပယ်များ)

1. Ecology and Biodiversity
2. Socio-Economy
3. Biology and Environmental management, Risk Assessment
4. Geotechnical and Environmental Engineering
5. GIS
6. Marine Science

EXTENSION
သက်တမ်းတိုးမြှင့်ခြင်း
The VALIDITY of this certificate is extended for nine months from (1.4.2019) to (31.12.2019)
ဤလက်မှတ်အား (၁-၄-၂၀၁၉) ရက်နေ့မှ (၃၁.၁၂.၂၀၁၉) ရက်နေ့အထိ (၉)လသက်တမ်း တိုးမြှင့်သည်။
25.6.2019
For Director General
(Soe Naing, Director)
Environmental Conservation Department

EQM consultant registration

REPUBLIC OF THE UNION OF MYANMAR

Ministry of Natural Resources and Environmental Conservation

CERTIFICATE FOR TRANSITIONAL CONSULTANT REGISTRATION

(ကြားကာလအကြံပေးလုပ်ကိုင်သူမှတ်ပုံတင်ခြင်းအထောက်အထားလက်မှတ်)

No. 0009 Date 07 JUL 2017

The Ministry of Natural Resources and Environmental 'Conservation, hereby, issues this certificate to the organization under Environmental Impact Assessment Procedure, Notification No. 616/2015.

(ပတ်ဝန်းကျင် ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်း၊ အမိန့်ကြော်ငြာစာအမှတ်၊ ၅၁၆/၂၀၁၅ အရ သယံဇာတနှင့် သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာနသည် ဤအထောက်အထားလက်မှတ်ကို အဖွဲ့အစည်းအား ထုတ်ပေးလိုက်သည်။)

(a)	Name of Organization (အဖွဲ့အစည်းအမည်)	Environmental Quality Management Co., Ltd. (EQM)
(b)	Name of the representative in the organization (အဖွဲ့အစည်းကိုယ်စားလှယ်၏ အမည်)	Dr. Ohnmar May Tin Hlaing
(c)	Citizenship of the representative in the organization (အဖွဲ့အစည်းကိုယ်စားလှယ်၏ နိုင်ငံသား)	Myanmar
(d)	Identity Card /Passport Numberof the representative person in the organization (အဖွဲ့အစည်းကိုယ်စားလှယ်၏ မှတ်ပုံတင်/ နိုင်ငံကူးလက်မှတ် အမှတ်)	12/Da Ga Ta (N) 024452
(e)	Address of organization (ဆက်သွယ်ရန်လိပ်စာ)	No 233, Block 23, Sayeepin Lane, Thuwunna, Thingungyun Township, Yangon contact@eqmmyanmar.com , 012330291
(f)	Type of Consultancy (အကြံပေးလုပ်ကိုင်မှုအမျိုးအစား)	Organization
(g)	Duration of validity (သက်တမ်းကုန်ဆုံးရက်)	31 March 2018

EXTENSION
သက်တမ်းတိုးချဲ့ခြင်း
The VALIDITY of this certificate is extended for one year from (1.4.2018) to (31.3.2019)
ဤလက်မှတ်အား (၀၁-၀၄-၂၀၁၈) ရက်စွဲမှ (၃၁-၀၃-၂၀၁၉) ရက်စွဲအထိ တစ်နှစ်သက်တမ်းတိုးချဲ့သည်။
1.11.2018
For Director General
(Soe Naing, Director)
Environmental Conservation Department

Director General
Environmental Conservation Department
Ministry of Natural Resources and Environmental Conservation

Areas of Expertise Permitted
(ခွင့်ပြုသည့် ကျွမ်းကျင်မှုနယ်ပယ်များ)

1. Ecology and Biodiversity
2. Socio-Economy
3. Biology and Environmental management, Risk Assessment
4. Geotechnical and Environmental Engineering
5. GIS
6. Marine Science

EXTENSION
သက်တမ်းတိုးမြှင့်ခြင်း
The VALIDITY of this certificate is extended for nine months from (1.4.2019) to (31.12.2019)
ဤလက်မှတ်အား (၁-၄-၂၀၁၉) ရက်နေ့မှ (၃၁.၁၂.၂၀၁၉) ရက်နေ့အထိ (၉)လသက်တမ်း တိုးမြှင့်သည်။
25.6.2019
For Director General
(Soe Naing, Director)
Environmental Conservation Department

Appendix 2

Environmental
Quality
Management

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Background Ambient Air Monitoring Report

On

The proposed ONGC Videsh EP-3 Exploration Drilling project located at Paukkhaung Township and Inn Ma Township, Bago Region

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Executive Summary

In order to determine the ambient air quality status around the ONGC Videsh EP-3 exploration drilling project located at the Paukkhaung Township and Inn Ma Township, Bago Region, the levels of ambient air parameters monitored throughout the survey period were compared with National Environmental Quality (Emission) Guidelines) stated by Environmental Conservation Department (ECD).

Regarding the findings of average ambient air concentrations monitored around the ONGC Videsh EP-3 exploration drilling Environmental Survey project, the existing particulates level PM10 and PM 2.5 met the guideline.

In terms of gases level, based on comparison of 24 hr average level of SO2 met the **g**uidelines, one-hour average level of NO_2, one-hour average of CO, and 8 hr average of O_3 met the guidelines, thus, it can be assumed as the good air quality for these gases.

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1. Introduction

The ambient air monitoring was conducted in the vicinity within 2km around the proposed project located at Paukkhaung Township and Inn Ma Township, Bago Region, where people are spending several hours working both weekdays and weekends.

2. Objective

It was aimed to reveal the existing baseline ambient air quality at and around the project site.

3 Ambient air monitoring locations

Locations of air sampling stations are listed in **Table 3-1.** The air quality sampling methodology used for this project is described in the annex.

- Sett Tone village
- Cha Ya Gone village

Table 3.1 Air sampling locations for baseline survey, August 2020

Points	Locations	Coordinates		Start Date	End Date
		N	E		
1	Sett Tone village	18°46'39.65"N	95°29'45.38"E	13.8.2020	14.8.2020
2	Cha Ya Gone village	18°31'3.90"N	95°24'16.20"E	14.8.2020	15.8.2020

3.1 . Point (1) The existing baseline ambient air monitoring location (1), Sett Tone village

Figure 3.1: Map of ambient air monitoring at A&N-02, Sett Tone village

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Figure 3.2: Air monitoring at A&N-02, Sett Tone village (Day time)

Figure 3.3: Air monitoring at A&N-02, Sett Tone village (Night time)

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The point A&N-02 is located at the Sett Tone village. Regarding particulates, Table 3.2 presents both the 24hr average levels of PM10 (6 µg/m^3) and PM2.5 (4 µg/m^3) met the Guideline (ECD). In terms of gases level, 24hr average levels of SO2 (3 µg/m3), one-hour average level of NO2 (103 µg/m3), one-hour average of CO (175 µg/m^3), 8-hour average CO (61 µg/m3) and 8-hour average of O_3 (2 µg/m^3) met the guidelines.

The meteorology findings (Temperature, Relative Humidity, Wind Speed and Wind Direction) during the monitoring were presented below. (Table 3.2)

Table 3.2: Ambient air monitoring at point (1), A&N-02 at Sett Tone village

Parameters	Concentration (24hr average) except some Gases (NO2, CO and O3)*	National Environmental Air Quality Guideline (ECD)/WHO Guideline (24hr average)
PM_{10}	$6^a(2^b\text{-}59^c)$ µg/m^3	50 µg/m^3
$PM_{2.5}$ (µg/m^3)	$4^a(1^b\text{-}59^c)$ µg/ m^3	25 µg/m^3
NO_2*	$58^a(16^b\text{-}119^c)$ µg/m^3(24 hr) 103µg/m^3 (one hr)	40 µg/m^3 (annual) /200 µg/m^3 (one hour)
SO_2	$3^a(0^b\text{-}5^c)$ µg/m^3	20 µg/m^3
CO*	$0.047^a(0^b\text{-}0.2^c)$ ppm / 54µg/m^3 (24hr) 0.153 ppm/ 175µg/m^3 (one hr) 0.053 ppm/ 61 µg/m^3 (8 hr)	30,000 µg/m^3 (one hr) 10,000 µg/m^3 (8 hr)
O_3*	$2^a(1^b\text{-}30^c)$ µg/m^3 (24hr) 2 µg/m^3 (8 hr)	100 µg/m^3 (8hr)
CO_2	$375^a(329^b\text{-}490^c)$ ppm	NA
VOC	$0^a(0^b\text{-}0^c)$ ppb	NA
NH_3	$16^a(0^b\text{-}35^c)$ ppm	NA
CH_4	$111^a(0^b\text{-}148^c)$ ppm	NA
H_2S	$12^a(0^b\text{-}411^c)$ ppb	NA
Meteorology		
T (Degree C)		$26^a(24^b\text{-}30^c)$
RH		$100^a(100^b\text{-}100^c)$
Wind Speed (kph)		$0.2^a(0^b\text{-}1.8^c)$
Wind Direction (Degree from North)		193(SSW)
Remark		
There were 4 times of car and 8 times of motor cycle passing around the monitoring area. It was slight raining between 7:15 pm to 9:40 pm.		

[a] Average [b] Min [c] Max

Referring to National Environmental Air Quality Guideline (ECD), the color codes are categorized in order to reveal the general air quality status around the project area.

Green – meets the standards
Yellow (slightly over)
Orange (exceeding)

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Website:www.eqm- myanmar.com

3.2. Point (2) The existing baseline ambient air monitoring at Location (2), Cha Ya Gone village

Figure 3.4: Map of ambient air monitoring at A&N-01, Cha Ya Gone village

Figure 3.5: Air monitoring at A&N-01, Cha Ya Gone village (Day time)

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Website:www.eqm- myanmar.com

Figure 3.6: Air monitoring at A&N-01, Cha Ya Gone village (Night time)

The point A&N-01 is located at the Cha Ya Gone village. Regarding particulates, Table 3.3 presents both the 24hr average levels of PM10 (10 µg/m^3) and PM2.5 (7 µg/m^3) met the Guideline (ECD). In terms of gases level, 8hr average levels of SO2 (7 µg/m^3), one-hour average level of NO2 (73 µg/m^3), one-hour average of CO (424 µg/m3), 8-hour average CO (104 µg/m^3) and 8-hour average of O_3 (2 µg/m^3) met the guidelines.

The meteorology findings (Temperature, Relative Humidity, Wind Speed, Wind Direction) during the monitoring were presented below. (Table 3.3)

Table 3.3: Ambient air monitoring at point (2), A&N-01 at Cha Ya Gone village

Parameters	Concentration (24hr average) except some Gases (NO2, CO and O3)*	National Environmental Air Quality Guideline (ECD)/WHO Guideline (24hr average)
PM10	$10^a(2^b\text{-}83^c)$ µg/m^3	50 µg/m^3
PM 2.5(µg/m^3)	$7^a(1^b\text{-}41^c)$ µg/m3	25 µg/m^3
NO_2*	$60^a(2^b\text{-}75^c)$ µg/m^3(24 hr) 73 µg/m^3 (one hr)	40 µg/m^3 (annual) /200 µg/m^3 (one hour)
SO_2	$7^a(3^b\text{-}9^c)$ µg/m^3	20 µg/m^3
CO *	$0.066^a(0^b\text{-}1.11^c)$ ppm / 76µg/m^3 (24hr) 0.37 ppm/ 424 µg/m^3 (one hr) 0.091 ppm/ 104 µg/m^3 (8 hr)	30,000 µg/m^3 (one hr) 30,000 µg/m^3 (one hr) 10,000 µg/m^3 (8 hr)

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Parameters	Concentration (24hr average) except some Gases (NO2, CO and O3)*	National Environmental Air Quality Guideline (ECD)/WHO Guideline (24hr average)
O_3*	$1^a(1^b\text{-}4^c)$ µg/m^3 (24hr) 2 µg/m^3 (8 hr)	100 µg/m^3 (8hr)
CO_2	$374^a(340^b\text{-}1008^c)$ ppm	NA
VOC	$1^a(0^b\text{-}17^c)$ ppb	NA
NH_3	$13^a(0^b\text{-}26^c)$ ppm	NA
CH_4	$131^a(105^b\text{-}154^c)$ ppm	NA
H_2S	$15^a(0^b\text{-}133^c)$ ppb	NA
Meteorology		
T (Degree C)		$25^a(24^b\text{-}28^c)$
RH		$100^a(100^b\text{-}100^c)$
Wind Speed (kph)		$0.7^a(0^b\text{-}5.5^c)$
Wind Direction (Degree from North)		109(ESE)
Remark		
There were 14 times of car and 24 times of motor cycle passing around the monitoring area. It was slight raining between 2:30 pm to 4:00 pm and moderately raining between 6:30 pm to 11:00 pm. The monitoring station was located parallelly with the wind direction of the Yangon-Pyay highway road.		

[a] Average [b] Min [c]Max

Referring to National Environmental Air Quality Guideline (ECD), the color codes are categorized in order to reveal the general air quality status around the project area.

Green – meets the standards

Yellow (slightly over)

Orange (exceeding)

Appendix 3

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Ambient Noise Level Monitoring Report

On

The proposed ONGC Videsh EP-3 Exploration Drilling project located at Paukkhaung Township and Inn Ma Township, Bago Region

No.233,Block 23,Sayee Pin Lane,Thuwanna,Thingungyun Township,Yangon.
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Executive summary

In order to determine the existing background noise levels around the proposed project, ambient 24hr average noise levels were monitored at each selected location as well as compared with the national ambient noise level guideline for residential stated by the Environmental Conservation Department (ECD).

Regarding the ***existing baseline noise levels, Sett Tone village and Cha Ya Gone village met the EQEG guideline.***

Looking at the source of noise emission, the ***vehicles, and noise of the raindrops and people activities.***

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1 Introduction

The ambient noise level monitoring was carried out for 24hr continuously at the project located at the Sett Tone village and the Cha Ya Gone village where people are spending several hours working in weekdays.

2. Objective

It was aimed to reveal the existing baseline ambient noise level.

3 Ambient noise monitoring locations

Locations of noise sampling stations are listed in **Table 3.1.**

- Sett Tone village
- Cha Ya Gone village

Table 3.1 Noise sampling locations for baseline survey, August, 2020

Points	Locations	Coordinates		Start Date	End Date
		N	E		
1	Sett Tone village	18°46'39.65"N	95°29'45.38"E	13.8.2020	14.8.2020
2	Cha Ya Gone village	18°31'3.90"N	95°24'16.20"E	14.8.2020	15.8.2020

The following tables (3.2 to 3.3) show the noise level measured around the proposed project area. Being situated around the residential area, the findings were compared with the applicable noise level guideline for residential by National Environmental Quality Guideline by Environmental Conservation Department (ECD).

3.1 . Point (1): The existing baseline ambient noise monitoring at Sett Tone village

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Website:www.eqm- myanmar.com

Figure 3.1: Map of ambient noise monitoring at Sett Tone village

Figure 3.4 Noise monitoring station at Sett Tone village

Table 3.2: The 24hr average noise level of A&N-02, Sett Tone village

Area	Whole Day Average Noise Level (dB)	Day Time Noise Level (dB)	Noise standard value of EQG for Residential (Day Time)
Sett Tone village	49[a]±0.3[b] 43[c](22[d]-60[e])	51[a]±0.2[b] 50[c](31[d]-60[e])	55
		Night Time Noise Level (dB)	**Noise standard value of EQG for Residential (Night tome)**
		36[a]±0.3[b] 32[c](22[d]-49[e])	45

[a]Average[b] Standard Error [c]Median [d]Min [e]Max

Based on the findings, the average noise levels (both day and night time) at the Sett Tone village met the EQEG. Generally, these levels were mainly captured from vehicles (Cars and Motorcycle) and noise of the raindrops.

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3.2 . Point (2): The existing baseline ambient noise monitoring at Cha Ya Gone village

Figure 3.1: Map of ambient noise monitoring at the Cha Ya Gone village

Figure 3.4 Noise monitoring station at the Cha Ya Gone village

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Website:www.eqm- myanmar.com

Table 3.3: The 24hr average noise level of A&N-01, Cha Ya Gone village

Area	Whole Day Average Noise Level (dB)	Day Time Noise Level (dB)	Noise standard value of EQG for Residential (Day Time)
Cha Ya Gone village	$39^{a}\pm0.2^{b}$ $26^{c}(21^{d}\text{-}66^{e})$	$41^{a}\pm0.04^{b}$ $28^{c}(21^{d}\text{-}66^{e})$	55
		Night Time Noise Level (dB)	**Noise standard value of EQG for Residential (Night tome)**
		$26^{a}\pm0.3^{b}$ $26^{c}(22^{d}\text{-}37^{e})$	45

[a]Average[b] Standard Error [c]Median [d]Min [e]Max

Based on the findings, the average noise levels at the Cha Ya Gone village (both day time and night time) met the EQEG. Generally, these levels were mainly captured from people activities, vehicles (Cars and Motorcycle) and noise of the raindrops.

Appendix 4

Environmental Baseline Monitoring at Payama-1 well site and Naweng-1 well site

Biodiversity Report

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Table

Figure

1. Executive summary

The project area is situated in the Pauk Khaung Township and Thae Kone Township, Bago Region which is in the central part of Myanmar. The biodiversity field survey was carried out starting from 13th August to 16th August 2020. The baseline studies were conducted in order to identify biodiversity as well as ecosystem services.

The flora survey was carried out by the forest inventory method to identify the species composition, density and distribution. A total of 42 plant species were observed during the survey.

Regarding fauna survey sample-plotting methods, random transect methods and traditional biodiversity survey method were carried out to identify the vegetation types and endangered species in the proposed project area.

According to both field surveys and community interviews, 14 species of mammals, 15 species of fish, 28 species of birds and 25 species of reptiles and amphibians were identified.

2. Introduction

2.1 Bago region

According to the World Database Protected Area (WDPA, February 2018), there are 11 National designations and 2 International designations are being observed in Myanmar. The name and number of National designations are Nature Reserve (2), National Park (6), Protected Area (4), National Park and ASEAN Heritage Park (4), Wildlife Sanctuary (27), Bird Sanctuary (3), Wildlife Park (1), Mountain Park (1), Wildlife Sanctuary and ASEAN Heritage Park (2), Elephant Range (1) and Wildlife Sanctuary (1).

Bago is located in the southern central part of the Myanmar. It is bordered by Magway region and Mandalay region. According to legend, two Mon princes from Thaton founded the city of Bago in 573 AD. They saw a female goose standing on the back of a male goose on an island in a huge lake. Believing this was an auspicious omen, the princes built a city called Hanthawady on the edge of the lake. From 1369–1539, Hanthawady was the capital of the Hanthawaddy Kingdom, which covered all of what is now lower Burma.

The area came under Burman control again in 1539, when it was annexed by King Tabinshwehti of Kingdom of Taungoo. The kings of Taungoo made Bago their royal capital from 1539–1599, and used it as a base for their repeated invasions of Siam. As a major seaport, the city was frequently visited by Europeans, who commented on its magnificence. Burmese King Bodawpaya (1782–1819) rebuilt Bago, but by then the river had shifted course, cutting the city off from the sea. It never regained its previous importance. After the Second Anglo-Burmese War, the British annexed Bago in 1852. In 1862, with the formation of the province of British Burma, the capital was moved to Yangon.

Also King Bodawpayar (most king of Myanmar) has a great reputation for the protection forest and he believe in environmentalism. As a consequences, forest along with the Shan Yoma are deep Tropical mixed deciduous forest and also rich in biodiversity once in there. Extensive logging has caused the present deforeststion and increased erosion in the area. Due

to illegal logging and overexploitation of natural resources, however, the landscape is now remaining just as secondary forest. Even as a secondary forests, the resources serves as a source of fishing, hunting animals, fruits from pants to the local people in the area. In the Bago Region, there are Moeyungyi wetland wildlife sanctuaries and Sein Ye forest park.

2.2 Pauk Khaung and Thae Kone township

Pauk Khaung Township is located in the lower part of Bago Region. The township has an area of 751.49 square miles. The elevation is 241.06 ft. The climate is tropical and the total rainfall in the sample year was about 48.30 inches and the highest temperature was about 42°C and the lowest temperature was about 31°C. The population of the township was estimated at 124,344 (Gender: Male 60,334 / Female 64,010 and Urbanization: Rural 110,074 / Urban 14,270) according to the 2014 Myanmar Population and Housing Census. It borders with Oak Twin, Taung Ngu, Phyu and Nat Talin Townships in the East, Paung Tae and Thae Kone townships in the South, Pyay Township in the West and Magway District and Aung Lan Township in the north. It is located at 19° 1'2.81"N,95°30'16.10"E.

The total forest area of the Pauk Kaung Township which includes the Reserved Forest which is about 11.42 percent and there is no protected public forest. The geomorphology of the area comprises of reserved forests between mountains. Some of the high hills now become destroyed due to gold mining and shifting cultivation. Pauk Kaung township conserves 156,215 Ac of Reserved Forest for natural resource conservation. There are two private commercial plantations in this township.

Thae Kone Township is also located in the lower part of Bago Region. The township has an area of 299.87 square miles. The elevation above sea level is 103.06 ft. There is tropical climate and three seasons are summer, rainy and spring. The highest temperature was about 38°C and the lowest temperature was about 20°C. The population of the township was approximately 131,073 (Gender: Male 61,804 / Female 69,269 and Urbanization: Rural 98,659 / Urban 32,414) according to the 2014 Myanmar Population and Housing Census. It borders with Paung Tae and Pauk Khaung Townships in the East, Shwe Taung Township in the West, Paung Tae and Natalin townships in the South, Pyay Township in the North. It is located at 18° 38'3.61"N, 95°26'18.10"E.

The total forest of the Thae Kone Township is about 34.21% which includes the Reserved Forest which is about 19.03% and there is no Protected Public Forest. The geomorphology of the area comprises of reserved forests between mountains. Some of the high hills now become destroyed due to gold mining and shifting cultivation.

The Bago Sub-basin lays in the southern central part of Myanmar. It includes the Bage River which come from the catchment of Bago yoma. The area of the Reserved Forests in Thae Kone township are 36502.38 Ac.

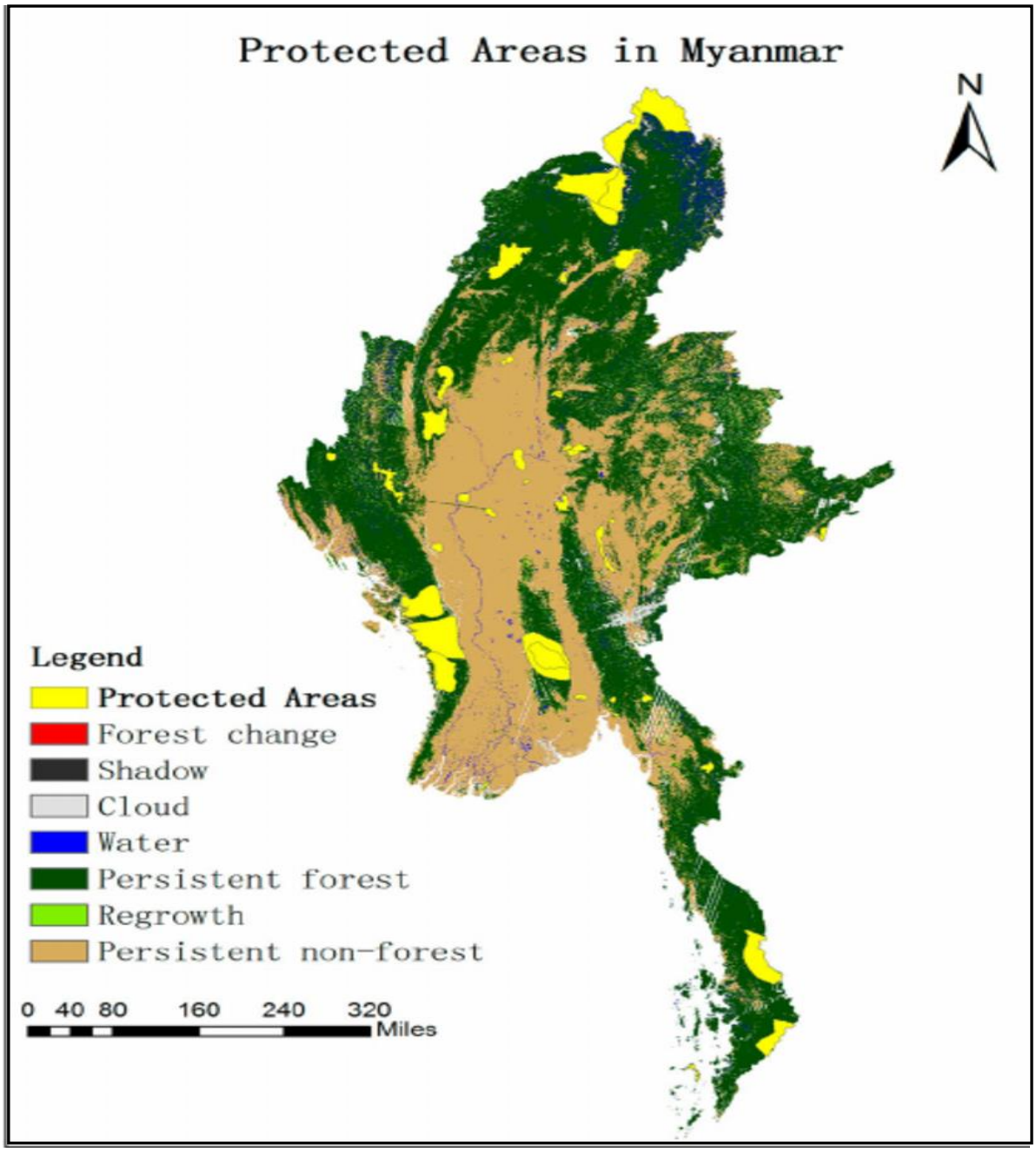


Figure 2.1: Protected Area in Myanmar

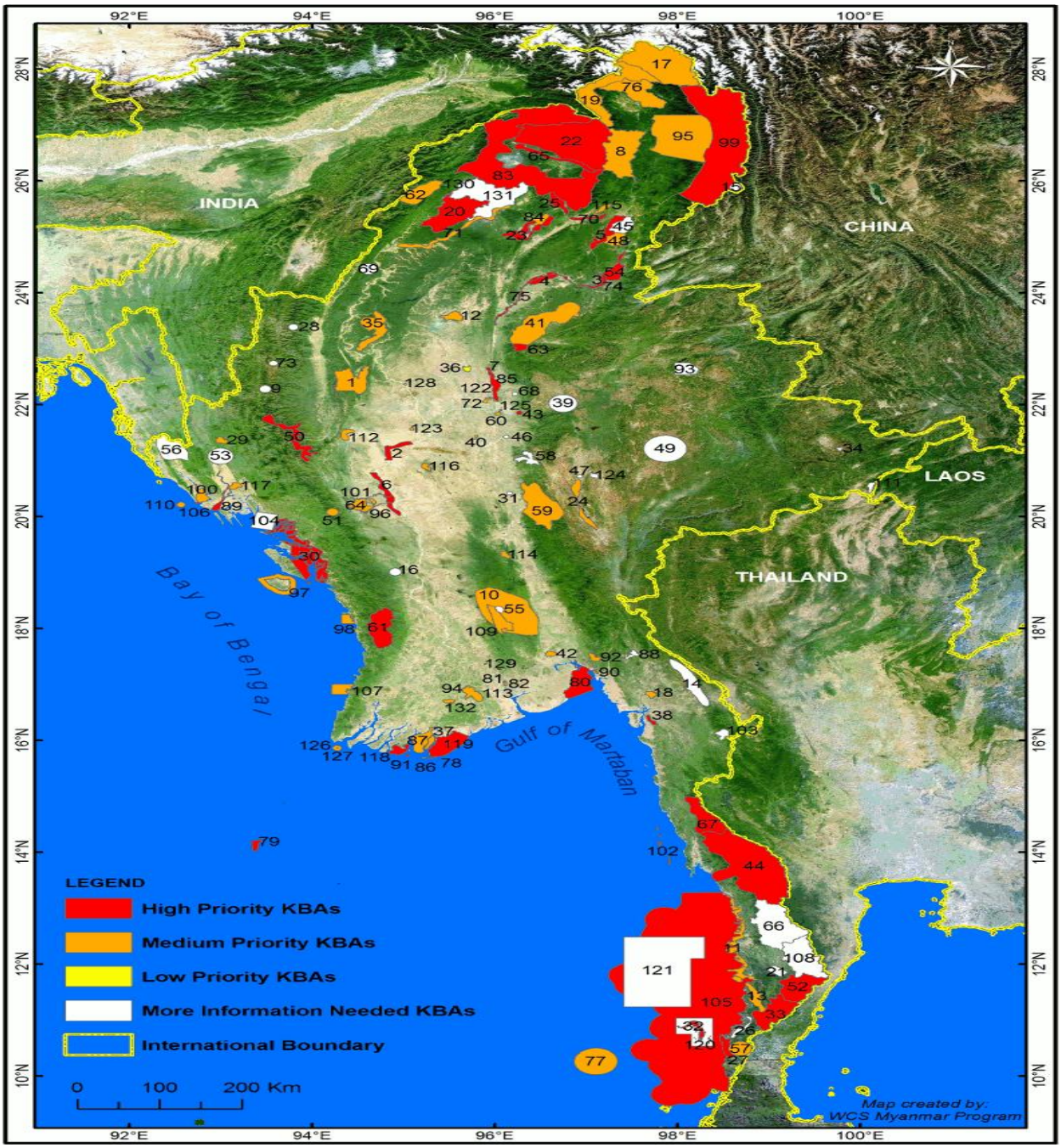


Figure 2.2: Protected Areas and Key Biodiversity Areas (KBAs) in Myanmar

2.3 The project area

The project area is located in the Pauk Khaung Township and Thae Kone Township, the lower part of the Bago region.

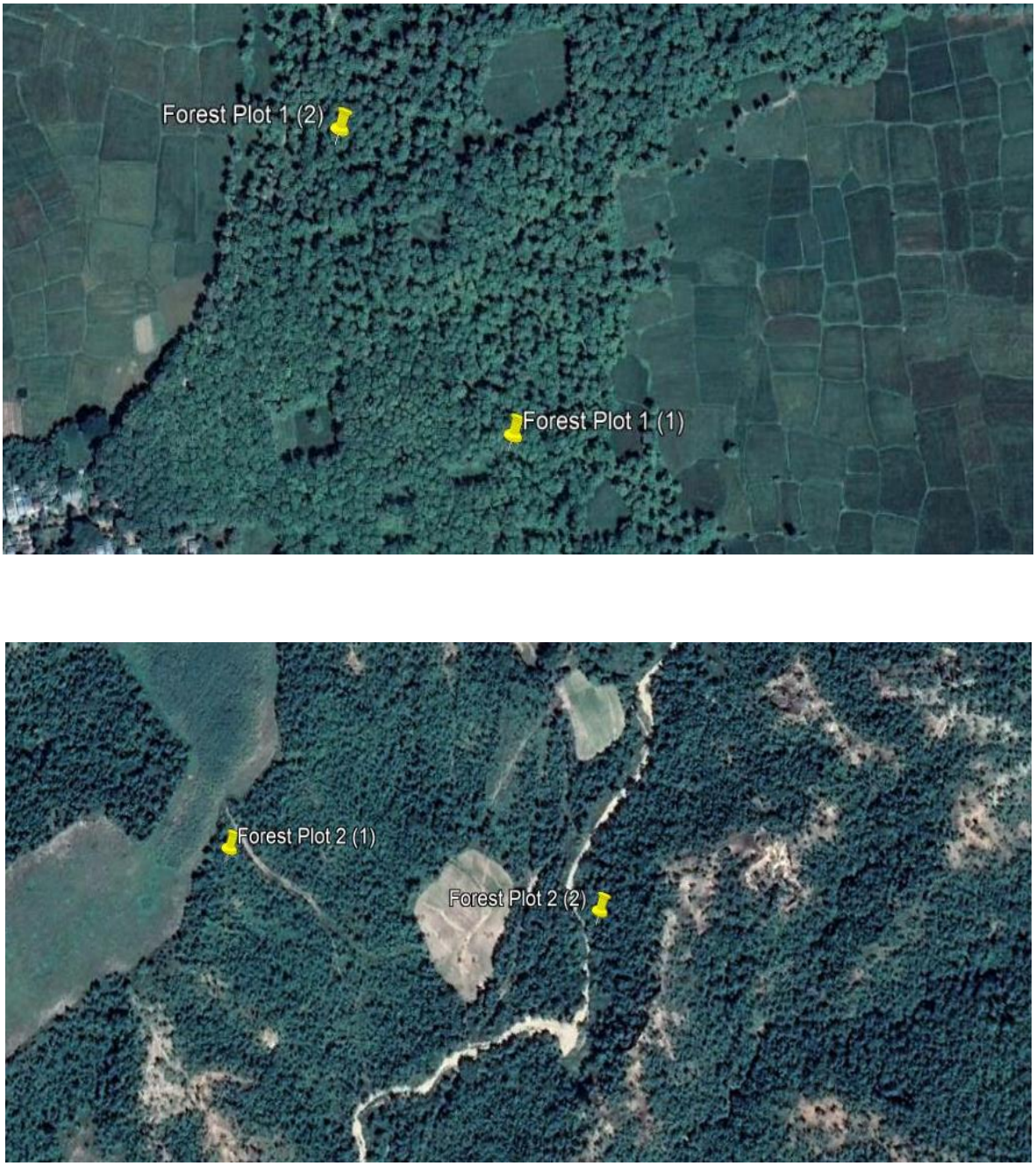


Figure 2.3: The project area location map

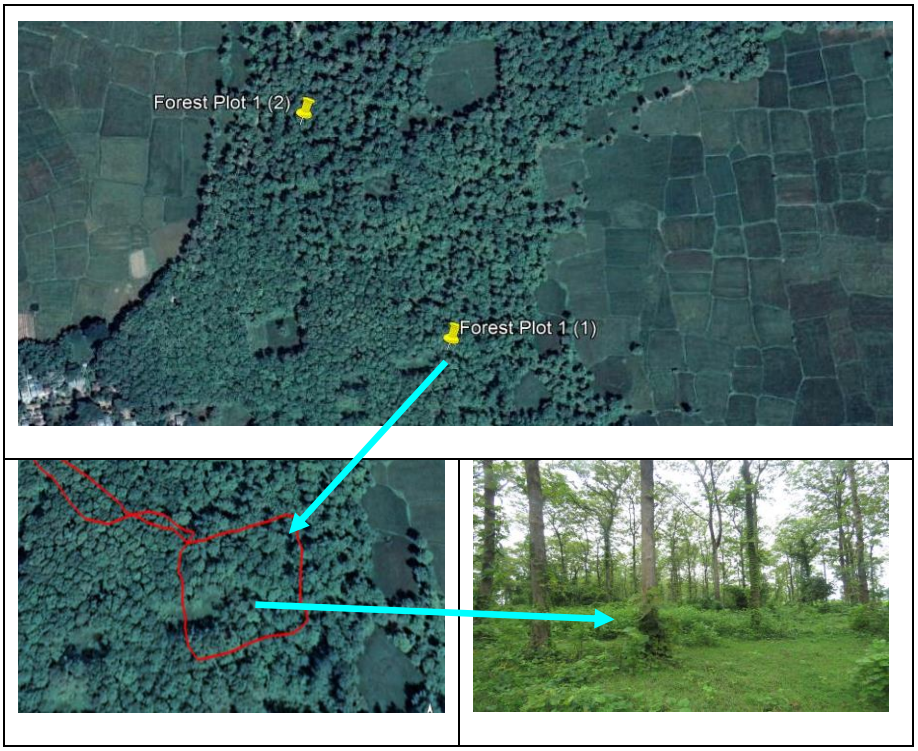


Figure 2.4: Forest Plot 1 (1) flora and fauna survey (147 acres Teak Plantation)

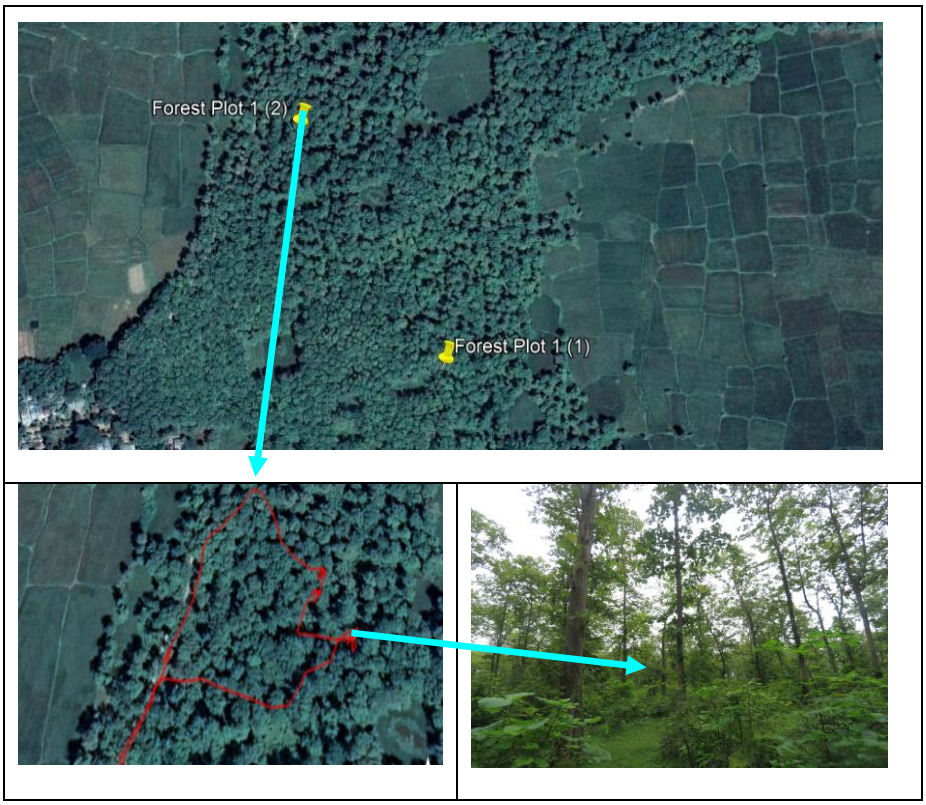


Figure 2.5: Forest Plot 1 (2) flora and fauna survey (147 acres Teak Plantation)

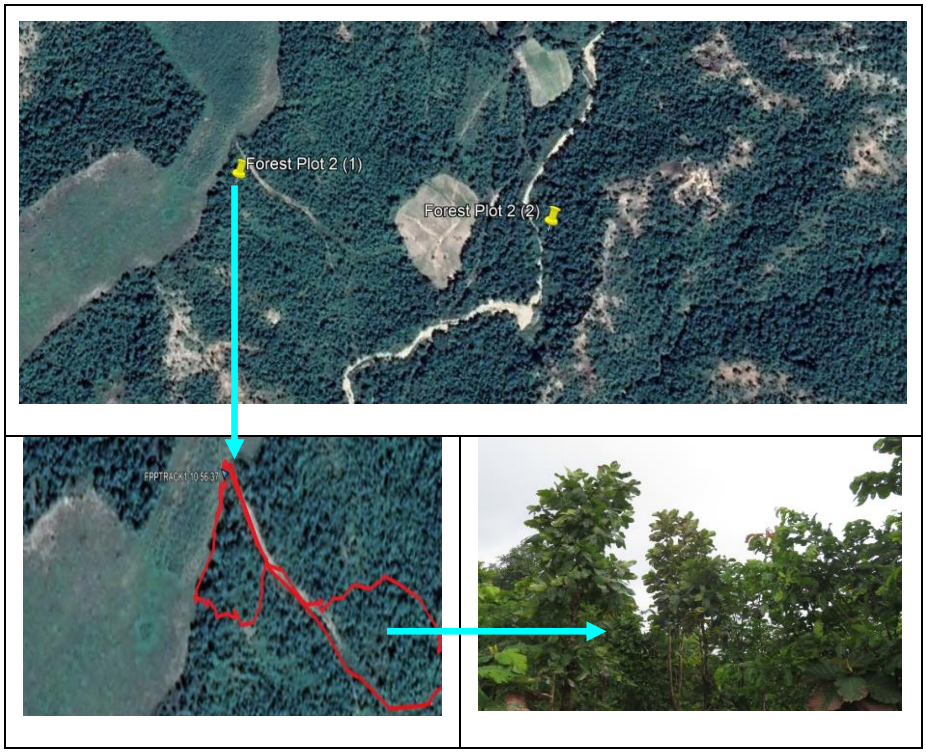


Figure 2.6: Forest Plot 2 (1) flora and fauna survey

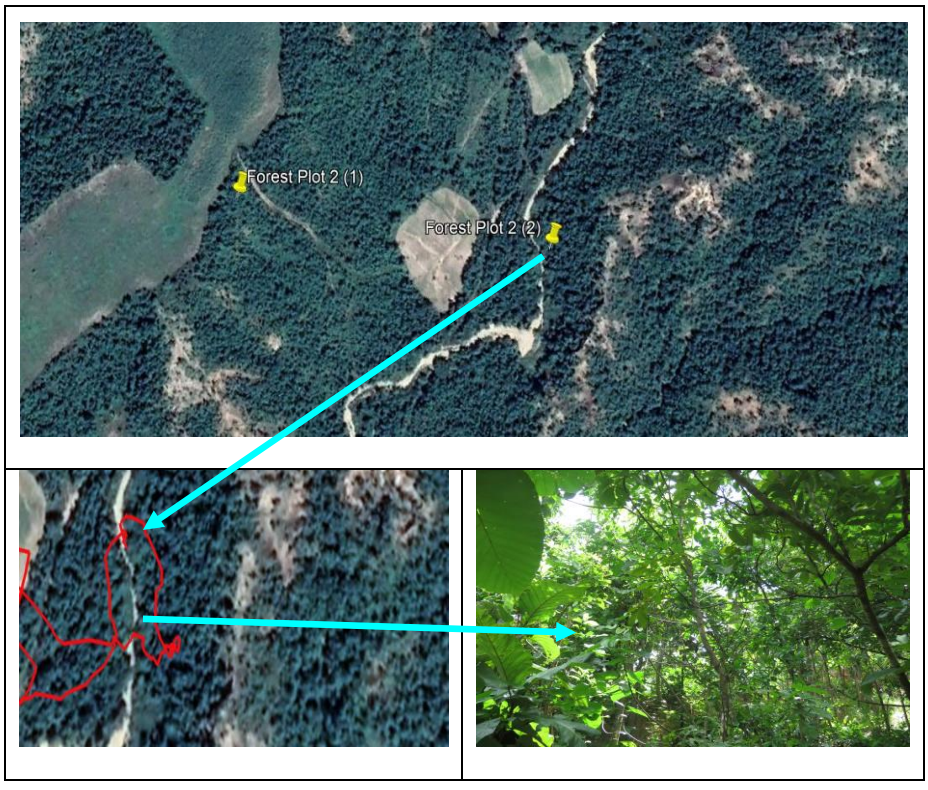


Figure 2.7: Forest Plot 2 (2) flora and fauna survey

2.4 The Vegetation

The Phayama well site is located in the Shar Pyin reserved forest and the Naweng well site is near the Shwe Kyun Taw reserved forest where teak plantation 147 acres are being grown. The unique features of the forests are the ***In, Htauk Kyant, Bamboo, Kyun Pho and Htauk Kyant*** which are the dominant species in the project area. The regeneration of In trees are found everywhere in the forests.

The dominant tree species in this area are ***Dipterocarpus tuberculatus (In)*** followed by ***Terminalia chebula (Phan Khar), Haplophragma adenophyllum (Phat than) and Xylia xylocarpa (Pyin Ka Doe).***

3 Aim and Objective

1. To collect, identify and list the plants and animals (Biodiversity data) in the area.
2. To record the dominant tree species and evaluate the vegetation types (forest type).
3. To record the animal species and determine the habitat type.
4. To collect the ecological data and evaluate the existing ecosystems in the project area.
5. To identify and records the endanger species according to IUCN Red List.
6. To record and list the Myanmar protected species in the area.

4 Material and method

4.1 Flora

4.1.1 Method

The floristic data and ecological data collection were conducted by the following methods in the study area.

4.1.1.1 Sample plotting

The Global Positioning System was used to navigate and mark the coordinates of the sample plots. In order to obtain the essential data for predicting tree species composition in the forest and vegetation types, 20x30 meter quadrants were set up. And then, tree species in the plot were collected as well as population of each species were also counted.

For the Bamboo survey, 20x30 meter quadrants were set up and bamboo species were collected and number of clump of each species were also counted. The species identification was carried out by using key to families of flowering plants and appropriate literature and confirmed by matching with herbarium specimens of Department of Botany, University of Yangon.

4.1.1.2 Random transecting

To achieve the representative checklists of the tree species and bamboo species, plant collection was also carried out by random transect lines along the road side and between one plot and another wherever possible. Specimen collection was done within 10 meter on each side of the transect line.

4.1.2 Materials

Materials used for recording are strings for sample plotting and transecting, digital camera for recording, GPS, maps and field note books.

4.1.3 Data analysis

After field survey, data entry was carried out in the excel work sheet. Analysis of population per hectare percentage was conducted using excel work 2010.

4.1.3.1 How to calculate for the population of individual species (per hectare)

The population of species will show not only the composition of species but also the richness of the species in the study area. The population of individual species (per hectare) is determined by following formula. (Ref: R.He'dl, M Sva'tek, M. Dancak, Rodzay A.W., M. Salleh A.B., Kamariah A.S.(2009).

$$\text{Population of Individual Species} = \frac{\text{Total Individual Species}}{\text{Total Plot Area } (m^2)} \times 1{,}000\ m^2\ (1\text{ha})$$

4.1.3.2 How to calculate for the relative density of tree species

The density of a species refers to the numerical representation of its individual and the availability of space in a unit area. The density index shows not only the richness of the texa but also the relative distribution of the individuals. According to Curtis (1959), the density index is determined by the following formula.

$$\text{Relative Density of Tree species} = \frac{\text{No. of Individual species}}{\text{Total No. of all Individual species}} \times 100$$

4.1.3.3 How to calculate for the relative frequency of tree species

The relative frequency of a species refers to the percentage occurrence of its individuals and shows the frequency of different species growing in the study area. The species which fall in high frequency class can be considered as the most common species in the study area. According to Curtis (1959), the relative frequency is determined by the following formula.

$$\text{Relative Frequency of tree species} = \frac{\text{No. of sample plot occurs}}{\text{Total No. of all species occurs}} \times 100$$

4.1.3.4 How to calculate for the species distribution by frequency class

According to Raunkiaer's Law of frequency (1934), each species was grouped into one of five frequency class (FC); Frequency range (1-20%) represents rare species, (20 - 40%) represents seldom species, (40 - 60%) represents often species, (60 - 80%) represents mostly species, and (80 - 100%) represents constantly present species. This frequency class will also clarify the homogeneity or heterogeneity of the floristic distribution in the study area.

4.1.3.5 How to calculate for the tree species in DBH class interval

Tree species in DBH class interval is calculated by

$$\text{Population of DBH class interval} = \frac{\text{No. of species}}{\text{Total no. of all species}} \times 100$$

Low DBH class interval shows the degraded and secondary forest height DBH class interval shows the primary forest.

4.1.3.6 How to calculate for the tree species in height class interval

Tree species in Height class interval is calculated by

$$\text{Population of Height class interval} = \frac{\text{No. of species}}{\text{Total no. of all species}} \times 100$$

Low height class interval shows the degraded and secondary forest and high height class interval shows the primary forest.

5 Field findings

5.1 Observation of flora

A forest inventory of 20 m x 20 m flora plots was completed by the survey team at four locations, around the well sites. One well site is located within the Shar Pyin reserved forest and the other is located near the Shwe Kyun Taw reserved forest. According to the survey, only Teak tree was planted in the Shwe Kyun Taw reserved forest. In order to cover up the whole area, secondary data was examined in light of habitat conditions present in the project site.

In Myanmar, there are an estimated 50 threatened plant species, out of which, 18 critically endangered, 16 Endangered and 16 Vulnerable based on the classification from IUCN Red List. Native vegetation cover within the exploration block has been subject to a prolonged period of alteration and human activity. Timber harvesting, clearing for agriculture and plantations and livestock grazing have occurred near the project area. A list of tree species noted during the reconnaissance of each sample areas is provided in table 5.1.

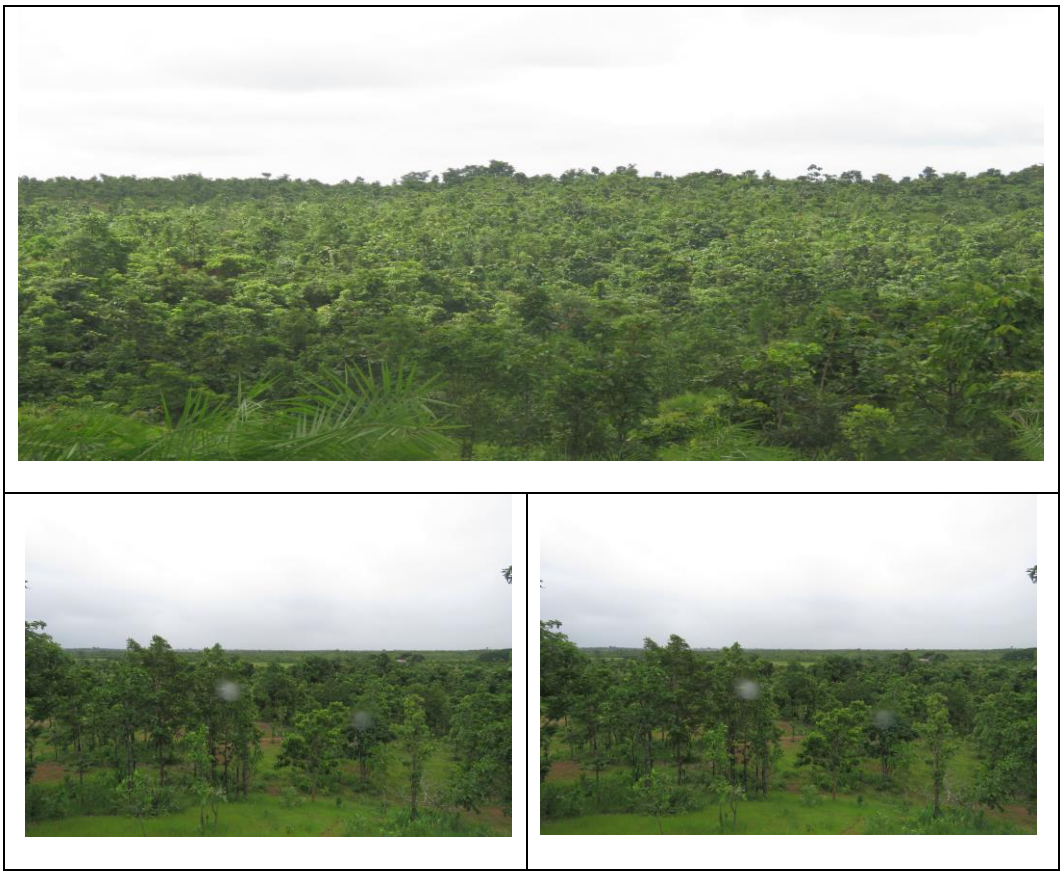


Figure 5.1: Mixed Deciduous Forest

5.1.1 Endemic Species

Myanmar is reportedly home to over 1,071 endemic species of flora. The project area was dense forest in the past. During the field reconnaissance, the endemic ***Dipterocarpus tuberculatus*** was noted. Confirmation of the presence of uncommon local endemics would require intensive potentially multi-season surveys.

5.1.2 Iconic Species

The main iconic floras in the exploration block are the more mature ***Dipterocarpus spp***.

5.1.3 Alien Invasive Species

During the biodiversity reconnaissance, local community representatives were asked whether they had any unusual weed problems and found out any new species of plant or animal in their area. In all cases, the community representatives reported that they did not have any major weed problems, nor had they noticed any new species in their areas.

Significant invasive plant species previously reported for Myanmar include ***Prosopis spp., Acacia auriculiformis, Ageratum conyzoides, Leucaena leucocephala, Eucalyptus spp, Casurina equisetifolia, Chromolaena odorata, Hyptis suaveolens, Lantana camara, Mimosa diplotricha, Mikania micrantha, Sorghum halepense, Paspalum conjugatum, Imperata cylindrica, Echinochloa crus-galli, Eleusine indica*** and ***Pennisetum polystachion*.**

Globally threatened status of Flora species was categorized using The IUCN Red List of Threatened Species as shown in below:

Status	Code
Critically Endangered	(CR)
Endangered	(EN)
Vulnerable	(VU)
Near Threatened	(NT)
and Least Concern	(LC)

Source: IUCN Red List of Threatened species, Version 3.1. Accessed from www.iucnredlist.org on 01 November 2016

Table 5.1: List of tree species noted during the biodiversity survey

No	Local Name	Scientific Name	Habitat	IUCN Status
1	Kyun	***Tectona grandis***	T	NE
2	Ingyin	***Pterocarpus siamensis***	T	NE
3	Taw Ye Yo	***Morinda citrifolia***	ST	NE
4	Kok-Ko	***Albizzia lebbek***	T	NE
5	Kyet Yoe	***Premna latifolia***	T	NE
6	Pyin Ka Doe	***Xylia xylocarpa***	T	NE
7	Ount Chin Sar	***Diospyros ehretioides***	T	NE
8	Tha Yin Gyi	***Croton oblangifolius***	Medicinal Plant	NE
9	Didu	***Bombax insigne***	T	NE
10	Tae	***Diospyros kaki***	T	NE
11	Kyoe	***Schneichera oneosa***	T	NE
12	Yin Daik	***Dalbergia cultrata***	T	NT
13	Thit Yar	***Shorea obtusa***	T	NT
14	Lun Pho	***Buchanania lanzan***	T	NE
15	Thit Sae	***Liquidambar styraciflua***	T	NE
16	In	***Dipterocarpus tuberculatus***	T	NT
17	Ka-nyin	***Dipterocarpus turbinatus***	T	VU
18	Pyin-ma	***Lagerstroemia cpeciosa***	T	NE
19	Tha-di	***Protium serrate***	T	NE
20	Hti Ka Yone	***Mimosa pudica***	S	NE
21	Gone Cho	***Leptadenia reticulata***	CL	NE
22	Letpan	***Salmalia malabarica***	T	NE
23	Kyun-pho	***Walsura robusta***	T	NE
24	Kha-paung	***Strychnos mux-bianda***	ST	NE
25	Eucalypt	***Eucalyptus***	T	NE
26	Ban Bwe	***Careya arborea***	T	NE
27	Thit Ni	***Amoora rohituka***	T	NE
28	Thit Ba Gan	***Millttia brandisiana***	T	NE
29	Chin Byit	***Bauxinia malabarica***	T	NE
30	Nabe	***Lennea grandis***	T	NE
31	Nyaung	***Ficus benghalensis***	T	NE
32	Pauk	***Butea monosperman***	T	NE
33	Phat-than	***Haplophragma adenophyllum***	T	NE
34	Htauk-kyant	***Terminalia tomentosa***	T	NE
35	Ta-yaw	***Grewia tiliaefolia***	H	NE
36	Tha-phan	***Ficus glomerata***	T	NE
37	Tha-yet	***Mangifeta indica***	T	NE
38	Yin-mar	***Chukrasia velutina***	T	LC
39	Zee-phyu	***Emblica officinalis***	Medicinal Plant	NE
40	Beat Hsat	***Eupatorium cannabium***	Medicinal Plant	NE
41	Nwe cho	***Glycyrrhiza glabra L.***	Medicinal Plant	NE
42	Phan Khar	***Terminalia chebula***	T	NE

Note: [1]Aq F=Aquatic Fern, Aq H= Aquatic Herb, B= Bamboo, CL= Climber, E=Epiphyte, F=Fern, G= Grass, H=Herbs, Mo=Moss, Mu=Mushroom, S=Shrubs, ST=Small Tree, T=Tree, LC = Least Concern, NE = Not Evaluated, EN = Endangered Species, VU = Vulnerable, NT = Near Threatened, DD = Data Deficient, CR = Critically Endangered

5.2 Floristic composition

The total number of tree species collected in the flora sample plots in this area is 21 species. The dominant tree species in this area are ***Dipterocarpus tuberculatus*** followed by ***Terminalia chebula, Haplophragma adenophyllum, Lennea grandis, Premna latifolia and Terminalia tomentosa.***

Table 5.2: Tree species population

No.	Scientific Name	No. of individual	Total no. of individual per ha	Total no. of population per ha (%)
1	***Dipterocarpus tuberculatus***	42	525	25
2	***Terminalia tomentosa***	11	137	6.6
3	***Lennea grandis***	12	150	7.2
4	***Premna latifolia***	12	150	7.2
5	***Xylia xylocarpa***	11	137	6.6
6	***Emblica officinalis***	2	25	1.2
7	***Diospyros ehretioides***	2	25	1.2
8	***Albizzia lebbek***	7	88	4.2
9	***Bombax insigne***	5	63	3
10	***Pterocarpus siamensis***	5	63	3
11	***Terminalia chebula***	19	238	11.4
12	***Bauxinia malabarica***	2	25	1.2
13	***Haplophragma adenophyllum***	13	163	7.8
14	***Diospyros kaki***	3	38	1.8
15	***Schneichera oneosa***	3	38	1.8
16	***Dipterocarpus turbinatus***	3	38	1.8
17	***Salmalia malabarica***	2	25	1.2
18	***Walsura robusta***	4	50	2.4
19	***Buchanania lanzan***	4	50	2.4
20	***Careya arborea***	3	38	1.8
21	***Millttia brandisiana***	1	13	0.6
Total		**166**	**2079**	**100**

5.3 Relative Density

Among the sample plots, species density per hectare is varied and the highest density was observed the ***Tectona grandis***, ***Haplophragma adenophyllum***, ***Pterocarpus siamensis*** and followed by ***Terminalia tomentosa***, ***Chukrasia velutina***, ***Mangifeta indica*** and ***Grewia tiliaefolia***. This shows that these seven species are abundant in this area.

Table 5.3: Relative Density

No.	Scientific Name	Density	Relative Density (R.D%)
1	***Dipterocarpus tuberculatus***	21	25
2	***Terminalia tomentosa***	5.5	6.6
3	***Lennea grandis***	6	7.2
4	***Premna latifolia***	6	7.2
5	***Xylia xylocarpa***	5.5	6.6
6	***Emblica officinalis***	1	1.2
7	***Diospyros ehretioides***	1	1.2
8	***Albizzia lebbek***	3.5	4.2
9	***Bombax insigne***	2.5	3
10	***Pterocarpus siamensis***	2.5	3
11	***Terminalia chebula***	9.5	11.4
12	***Bauxinia malabarica***	1	1.2
13	***Haplophragma adenophyllum***	6.5	7.8
14	***Diospyros kaki***	1.5	1.8
15	***Schneichera oneosa***	1.5	1.8
16	***Dipterocarpus turbinatus***	1.5	1.8
17	***Salmalia malabarica***	1	1.2
18	***Walsura robusta***	2	2.4
19	***Buchanania lanzan***	2	2.4
20	***Careya arborea***	1.5	1.8
21	***Millttia brandisiana***	0.5	0.6

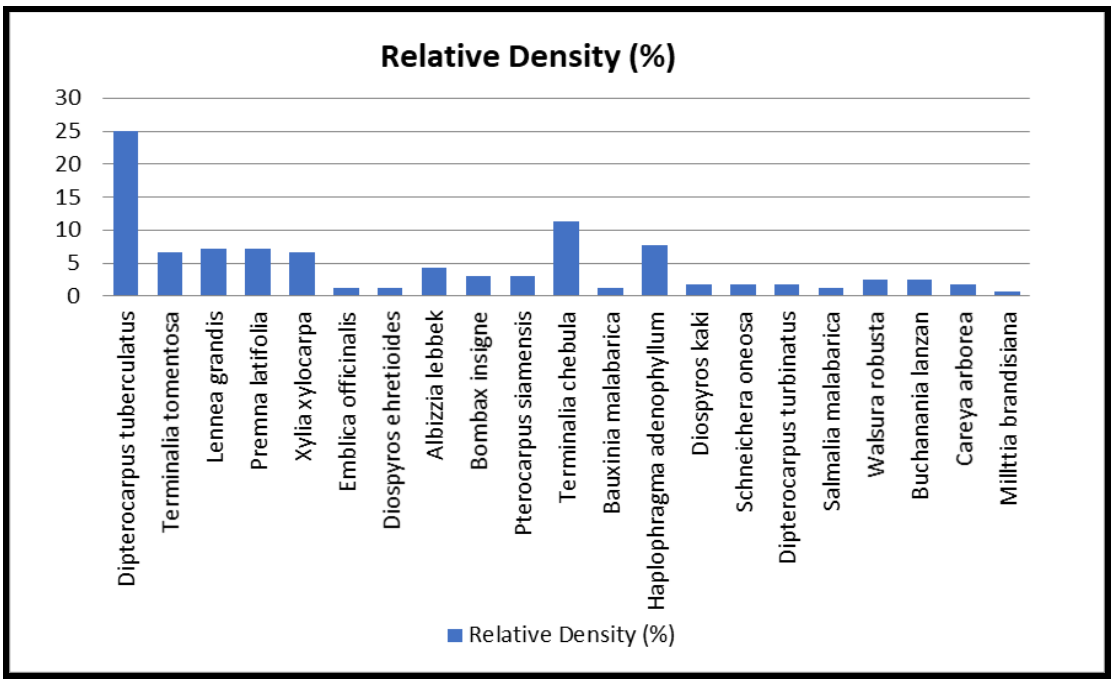


Figure 5.2 Relative Density of tree species

5.4 Relative frequency of Tree species

Relative frequency is the frequency of one species compared to the total frequency of all the species. According to the results**,** ***Dipterocarpus tuberculatus*** *(6.06%),* ***Terminalia chebula*** *(6.06%) and* ***Terminalia tomentosa*** *(6.06%)* are high relative frequency class, followed by ***Emblica officinalis***, ***Pterocarpus siamensis***, *and* ***Millttia brandisiana*** *(3.04%)* are equally same. Therefore, the highest frequency species and the lowest frequency species are nearly the same in the project area.

Table 5.4: Relative frequency of tree species

No	Scientific Name	Frequency (No of sample plot occur)	Relative Frequency (RF %)
1	***Dipterocarpus tuberculatus***	2	6.06
2	***Terminalia tomentosa***	2	6.06
3	***Lennea grandis***	2	6.06
4	***Premna latifolia***	2	6.06
5	***Xylia xylocarpa***	2	6.06
6	***Emblica officinalis***	1	3.04
7	***Diospyros ehretioides***	2	6.06
8	***Albizzia lebbek***	2	6.06
9	***Bombax insigne***	2	6.06
10	***Pterocarpus siamensis***	1	3.04

No	Scientific Name	Frequency (No of sample plot occur)	Relative Frequency (RF %)
11	***Terminalia chebula***	2	6.06
12	***Bauxinia malabarica***	2	6.06
13	***Dipterocarpus tuberculatus***	2	6.06
14	***Diospyros kaki***	2	3.04
15	***Schneichera oneosa***	1	3.04
16	***Dipterocarpus turbinatus***	1	3.04
17	***Salmalia malabarica***	1	3.04
18	***Walsura robusta***	1	3.04
19	***Buchanania lanzan***	1	3.04
20	***Careya arborea***	1	3.04
21	***Millttia brandisiana***	1	3.04

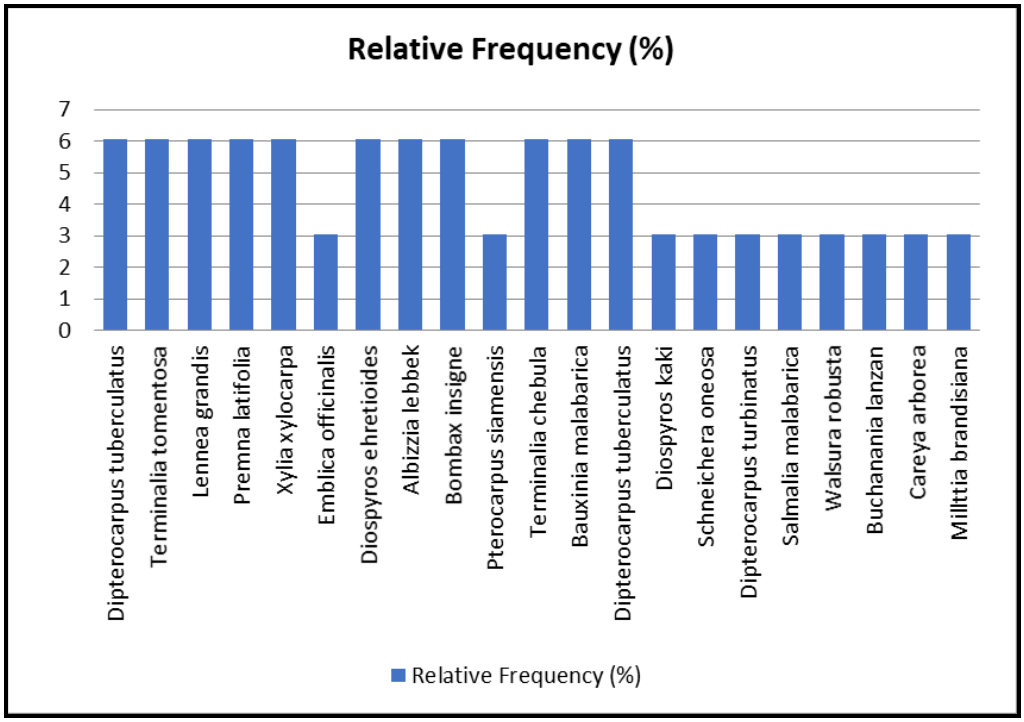


Figure 5.3: Relative Frequency of Tree Species

5.5 Species distribution by frequency class

In order to clarify the homogeneity and heterogeneity of the floristic distribution in the area, the species distribution by frequency class was examined. According to the outcome of the frequency classes, 12 species is in high frequency class and 9 species are in low frequency class. This shows that this area is floristically high degree of homogeneity.

Table 5.5: Species distribution by frequency class

Frequency Class	No. of species
1-20%	2
20-40%	4
40-60%	4
60-80%	5
80-100%	6

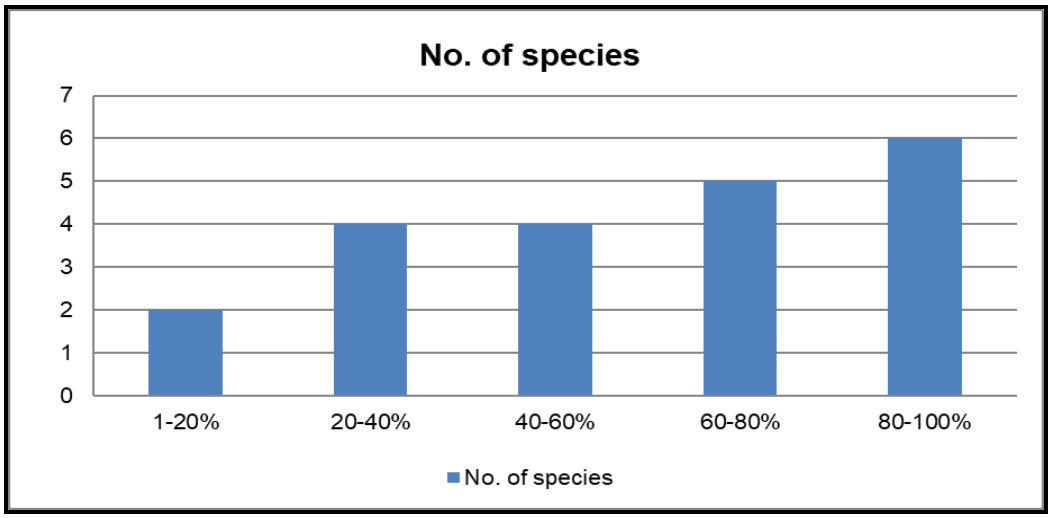


Figure 5.4: Frequency Class of Tree Species

5.6 Tree species in DBH class interval

The distribution of DBH interval class reveals that the dominant of small stem individuals in the area is 37% of the tree (166 trees) which are less than 40cm DBH. Large stem individuals with DBH more than 40cm are of 60 %. Majority of the trees are more than 40cm in girth which indicates that the forests primary types.

Table (5.6) Tree species and DBH interval class

DBH Class	No of species	Total number of individuals	% of total population
<40cm	63	787.5	37.9
41-60cm	43	537.5	25.9
61-80cm	32	400	19.2
81-100cm	18	225	10.8
>101cm	10	125	6
Total	166	2075	100

Figure 5.5: Biodiversity survey (DBH measuring)

5.7 Tree species in height class interval

The distribution of Height shows that 160 individuals are less than 15 meter, comprising 95% and of the total population and 6 individuals are more than 15meter, comprising the 10%. Since most canopy height classes are less than 10m, the forests in the area could be classified as secondary forests.

Table 5.7 Tree species in height class interval

Height Class	No. of species	Total number of individuals	% of total population
<5m	51	637	30.7
6-10m	83	1037	50
11-15m	28	350	16.9
>16m	4	50	2.4
Total	**166**	**2074**	**100.00**

Table 5.8 Vegetation in the study area

No	Sample Quadrant	Vegetation type	Latitude/ Longitude	Altitude	Dominant species
1	PQ I	Mixed Deciduous Forest	18.750760°N 95.461416°E	464 ft	***Dipterocarpus tuberculatus, Terminila chebula, Haplophragma adenophyllun, Lennea grandis, Premna latifolia, Terminalia tomentosa, Xylia xylocarpa***
2	PQ II	Mixed Deciduous Forest	18.750473°N 95.463527°E	436 ft	
4	BQ I	Bamboo Forest	18.749891°N 95.463288°E	432 ft	***Bambusa tulda***

6 Bamboo Forest

The dominant bamboo specie is ***Bambusa tulda.***

Figure 6.1 : Bamboo forests

7.Field findings and observation of fauna

The August 13-16, 2020 biodiversity focused on the community interviews identified potentially 14 species of mammals, 15 species of fish, 28 species of birds and 25 species of reptiles and amphibians were identified.

Suitable habitat for a number of these species was noted in the area; however, confirmation of the actual occurrence of these species would require extensive, multi-season investigation.

Figure 7.1a: Biodiversity survey (Community Interviews)

Figure 7.1b: Biodiversity survey (Camera Trapping – Plot 1)

Figure 7.1c: Biodiversity survey (Camera Trapping – Plot 2)

7.1 Mammals

The threatened mammal species that were identified in the biodiversity site assessment and interviews included the Kway-aa (***Cuon alpinus*** – **EN**), Shwe Thamin (***Axis porcinus***– **EN*)*** Kyar-kyaung (***Prionailurus viverrinus* –EN*),*** Sin ***(Elephas maximus***– **EN*)***, Myauk-hlwal-kyaw (***Hylobates lar* –EN*),*** Phyan ***(Cynogale bennettii*** – **EN**), Pa-shu-thin-khway-chat (***Manis javanica* – CR),** Ta-yoke-thin-khway-chat (***Manis pentadactyla* – CR),** Kyaung-nga-cheik (***Viverricula indica* – LC*),*** Taw Kyaung (***Felis chaus* – LC*),*** Kyaung Ka Doe (***Viverricula indica* – LC*).*** One species of Vulnerable (VU) species **(*Cervus unicolor)*** and One species of Near Threatened (NT) species (***Pteropus vampyrus)*** were identified during the site visit and interviews.

Protection of mammals from impacts potentially affected by the development relies on avoidance of critical habitats and implementation of designs and practices which reduce the potential project specific hazards which may impact wildlife species.

Table (7.1) Field findings/Interviewing mammal species list during biodiversity survey

No	Local name	Scientific name	Common name	IUCN list
1	Pa-shu-thin-khway-chat	***Manis javanica***	The sunda pangolin	CR
2	Ta-yoke-thin-khway-chat	***Manis pentadactyla***	Chinese pangolin	CR
3	Da Yel	***Cervus unicolor***	Sambar Deer	VU
4	Kway-aa	***Cuon alpinus***	Dhole	EN
5	Shwe Thamin	***Axis porcinus***	Indian Hog Deer	EN
6	Gyi	***Muntiacus feae***	Fea's muntjac	DD
7	Kyar-kyaung	***Prionailurus viverrinus***	Fishing cat	EN
8	Taw Kyaung	***Felis chaus***	Jungle cat	LC
9	Sin	***Elephas maximus***	Asian Elephant	EN
10	Myauk Hlwal Kyaw	***Hylobates hoolock***	Hoolock Gibbon	EN
11	Kyaung Ka Doe	***Viverricula indica***	The small Indian Civet	LC
12	Lin-sawe	***Pteropus vampyrus***	Common flying fox	NT
13	Kyaung-nga-cheik	***Viverricula indica***	The small Indian civet	LC
14	Phyan	***Cynogale bennettii***	Otter Civet	EN
Note: LC = Least Concern, NE = Not Evaluated, EN = Endangered Species, VU = Vulnerable, NT = Near Threatened, DD = Data Deficient, CR = Critically Endangered				

7.2 Fish

No specific references were identified for Central Myanmar and the project area; however, given the patterns of human exploitation, any species of fish present in these areas would be very vulnerable. Fish is important food source of the local people. One species of Near Threatened (NT) species (***Channa harcourtbutleri***), twelve species of Least Concern species (***Notopterus notopterus*** , ***Cirrhinus mrigala*** , ***Cirrhinus rubirostris. Puntius sophore***, ***Lepidocephalichthys berdmorei***, ***Mystus bleekeri, Clarias gariepinus, Heteropneustes kemratensis, Monopterus albus, Mastacembelus alboguttatus, Oreochromis niloticus, Channa gachua*** and Not Evaluated (NE) two species (***Macrognathus auresu and Oreochromis sp.***) were identified in the project area.

Table (7.2) Field findings/Interviewing fish species list during biodiversity survey

No	Local name	Scientific name	Common name	IUCN list
1	Nga-phae	***Notopterus notopterus***	Bronze Feather back	LC
2	Nga chin phyu	***Cirrhinus mrigala***	Carp	LC
3	Nga chin ni	***Cirrhinus rubirostris***	NA	LC
4	Nga-khone-ma	***Puntius sophore***	Pool Barb	LC
5	Nga-thalae-doe	***Lepidocephalichthys berdmorei***	Pepper loach	LC
6	Nga-zin-yaing-kywe	***Mystus bleekeri***	Day's mystus	LC
7	Nga Khu	***Clarias gariepinus***	North African Catfish	LC
8	Nga-gyi	***Heteropneustes kemratensis***	Airsac Catfish	LC
9	Nga-shint	***Monopterus albus***	Asian swamp Eel	LC
10	Nga-mway-htoe	***Macrognathus auresu***	N/A	NE
11	N/A	***Channa harcourtbutleri***	Burmese snakehead	NT
12	Nga La Mway	***Mastacembelus alboguttatus***	Boulenger's spiny eel	LC
13	Shwe ni	***Oreochromis sp.***	Red Tilapia	NE
14	Tilapia	***Oreochromis niloticus***	Nile tilapia	LC
15	Nga Yant Gaung Toe	***Channa gachua***	Dwarf Snakehead	LC
Note: LC = Least Concern, NE = Not Evaluated, EN = Endangered Species, VU = Vulnerable, NT = Near Threatened				

7.3 Birds

The threatened bird species that were identified in the biodiversity site assessment and interviews included 10 Least Concern bird species (***Polyplectron bicalcaratum, Grus Grus, Accipiter trivirgatus, Passer domesticus, Gallicrex cinerea, Upupa epops, Tyto alba, Pandion haliaetus, Gracula breligiosa and Gallus gallus)*** and 7 Vulnerable bird species (***Grus Antigone, Rhyticeros subruficollis, Aquila clanga, Mulleripicus pulverulentus, Otus sagittatus, Leptoptilos javanicus, Gallinago nemoricola)***. And also four Endanger species (***Pavo muticus, Sittavictoriae, Asarcornis scutulata, Tringa guttifer*****)** and three near threatened species (***Harpactes duvaucelii, Chrysophlegma mentale and Falco jugger*** **)** were noted during the interviews.

Protection of bird species from unnecessary development impacts relies on avoidance of important habitats and creation of hazards that attract or otherwise place birds at risk (e.g., contaminated waste water pits, spills, unshielded or higher risk lighting, garbage etc.)

Table (7.3) Field finding/ interviewing bird species during the biodiversity survey

No	Local name	Scientific name	Common name	IUCN list
1	Yit	***Polyplectron bicalcaratum***	Grey peacock-pheasant	LC
2	Daung	***Pavo muticus***	Green Peafowl	EN
3	Joe Jar	***Grus antigone***	Sarus Crane	VU
4	Joe Jar	***Grus Grus***	Common Crane	LC
5	Aukchin	***Rhyticeros subruficollis***	Plain-pouched hornbill	VU
6	Thein	***Accipiter trivirgatus***	Cresred goshawk	LC
7	Thein-nget	***Aquila clanga***	Greater spotted eagle	VU
8	Sar-kalay	***Passer domesticus***	House sparrow	LC
9	Joe	***Streptopelia chinensis***	Spotted dove	NE
10	Nget-pyar-chauk	***Sittavictoriae***	White Browed	EN
11	Baung Tote	***Gallicrex cinerea***	Water Cock	LC
12	Htat Ta Yu	***Harpactes duvaucelii***	scarlet-rumped trogon	NT
13	Bee-taung-po	***Upupa epops***	Hoopoe	LC
14	Thit-tauk-nget	***Mulleripicus pulverulentus***	Great slaty woodpecker	VU
15	Thit-tauk	***Chrysophlegma mentale***	Javan yellownape	NT
16	Thein-phyu	***Tyto alba***	Barn owl	LC
17	Zee-gwet	***Otus sagittatus***	White fronted scops owl	VU
18	Won-let	***Pandion haliaetus***	Osprey	LC
19	Thein-nget	***Falco jugger***	Laggar falcon	NT
20	Thar-li-kar	***Gracula breligiosa***	Common hill myna	LC
21	Done Hmee Kwat	***Leptoptilos javanicus***	Lesser Adjutant Stork	VU
22	Pandali	***Asarcornis scutulata***	White-winged Wood duck	EN

No	Local name	Scientific name	Common name	IUCN list
23	Pandali	***Aythya baeri***	Baer's pochard	CR
24	Chay Sein Yay Nyaunt	***Tringa guttifer***	Nordmann's Green Shank	EN
25	Snike	***Gallinago nemoricola***	Wood snipe	VU
26	Taw-kyet	***Gallus gallus***	Red gunglefowl	LC
27	Zayat	***Acridotheres tristis***	N/A	NE
28	Yay-kyet	***Accipiter badicus***	N/A	NE
Note: LC = Least Concern, NE = Not Evaluated, EN = Endangered Species, VU = Vulnerable, NT = Near Threatened				

Figure 7.2 ***Streptopelia chinensis***

Figure 7.3 ***Acridotheres tristis***

Figure 7.4 ***Hemicircus canente***

Figure 7.5 ***Mulleripicus pulverulentus***

Figure 7.6 ***Otus sagittatus***

Figure 7.7 ***Gallus gallus***

7.4 Amphibians and reptiles

The threatened amphibian and reptile species that were identified in the biodiversity site assessment and interviews included 3 Endangered Species (***Indotestudo elongate, Manouria emys and Batagur trivittata)*** and 1 Critically Endangered species (***Geochelone platynota)*** and 2 Nearly Threatened ***species (Limnonectes (Rana) blythii and Lygosoma bowringii)*** 2 Vulnerable species ***(Ophiophagus hannah and Python bivittatus)*** and 11 Not Evaluated species (***Clinotarsus alticola, Varanus salvator, Clinotarsus alticola, Python reticulates, Calotes versicolor, Dendrelaphis pictus, Daboia russelii, Lycodon capucinus, Xenochrophis piscator, Ptyas korros and Sphenomorphus maculatus).***

Most of the tortoises are being threatened to some extent by a combination of subsistence and commercial harvesting, over-collection for the pet trade, and to a lesser extent, habitat destruction. Conversion of natural vegetation to agricultural land is primarily a threat to tortoises.

Table (7.4) Field finding/ interviewing amphibian and reptile species during the biodiversity survey

No	Local name	Scientific name	Common name	IUCN list
1	Kyauk-lake	***Indotestudo elongata***	Elongate tortoise	EN
2	Lake Pint ku	***Geochelone platynota***	Spider tortoise	CR
3	Yae Lake	***Manouria emys***	Asian Forest Tortoise	EN
4	Kyae Lake	***Batagur trivittata***	Burmese roofed turtle	EN
5	Phar Thin	***Amolops indoburmanensis***	Indoburman Torrent Frog	LC
6	Phar Ni Tak	***Clinotarsus alticola***	Assam Hill frog	NE
7	Sar-far	***Limnonectes (Rana) blythii***	Giant river frog	NT
8	Phar Pyote	***Bufo melanostictus***	Asian Common Toad	LC
9	Thit Phar	***Kaloula pulchra***	Asian Painted Frog	LC
10	Zaw-ti-ka	***Varanus salvator***	Clouded monitor	NE
11	Far-pyout	***Kaloula pulchra***	Asian painted forg	LC
12	Sue-htaung-far	***Bufo melanostictus***	Asian common toad	LC
13	Far-pyan	***Clinotarsus alticola***	Assan hill frog	NE
14	Sa-ba-gyi	***Python reticulates***	Reticulated python	NE
15	Tatu	***Calotes versicolor***	Garden lizard	NE
16	Ngan-taw-gyar	***Ophiophagus hannah***	Kind cobra	VU
17	Mway-hauk	***Naja kaouthia***	Monocled cobra	LC
18	Myet-shaw	***Dendrelaphis pictus***	Painted bronzeback	NE
19	Ma-bway	***Daboia russelii***	Russels viper	NE
20	Sa-ba-own	***Lycodon capucinus***	Island wolf snake	NE
21	Burmese Sa Ba Own	***Python bivittatus***	Burmese Python	VU

No	Local name	Scientific name	Common name	IUCN list
22	Yay-mway	***Xenochrophis piscator***	Checkered keelback	NE
23	Lin-mway	***Ptyas korros***	Javan rat snake	NE
24	Kin-lake	***Lygosoma bowringii***	Bowring's supple skink	NT
25	Kin-lake-kyar	***Sphenomorphus maculatus***	Spotted forest skink	NE
Note: LC = Least Concern, NE = Not Evaluated, EN = Endangered Species, VU = Vulnerable, NT = Near Threatened				

Figure 7.8 ***Varanus salvator***

Figure 7.9 ***Kaloula pulchra***

Figure 7.10 ***Limnonectes (Rana) blythii***

Figure 7.11 ***Sphenomorphus maculatus***

Figure 7.12 ***Indotestudo elongata***

Figure 7.13 ***Batagur trivittata***

7.5 Cultural heritage

Phaya Taung Hill

On the way from Pauk Khaung to forest plot 2, there is ancient religious building called as Phaya Taung Hill.

Figure 7.14 Images of Phaya Taung Hill ancient religious building

Appendix 5

MOM of meeting town and village administrators, other government officials and 1st time public consultation for EIA campaign in EP3 block

February 10, 2020

Combined team of Mr. Myint Kyaw Oo-Public consultation representative from MOGE, Mr. Rajiv Nischal-CM, Mr. NA Jamir-Drilling Engineer, Mr. Kyaw Zaww Han-Manager from ONGC VIDESH, Mr. Tun Tun Win- Senior Geologist from M&S, Mr. Dylan Patrick Jenkins from IEM, Ms. Twae Mu Mu Myint, Mr. Thiha Htut, Ms. No No from EQM left for Pyay and made the presentation about drilling campaign and EIA study to officials of Pyay district at 15:30 Pm.

Discussion took place during presentation at Pyay district administration office as under;

Discussion	Questions, Concerns and Recommendation
Daw Sein Hla Myint, Deputy Director, Department of Agriculture	The profit from this project is good for government but the opinions of local people are important.
U Ye Tun Lin, Staff Officer, Pyay District GAD (General Administration Deptt.)	The project sites are in The Gone and Pauk-Khaung which are far from Pyay GAD office. I would like more people from that area to attend this meeting and listen to their views.
ONGC VIDESH response	The meetings are planned to be held in The` Gone and Pauk-Khaung townships.
U Wai Phyo Kyaw, The' Gone Township GAD	What are the benefits for local people?
U Myint Kyaw Oo, MOGE	Current situation is for exploration phase. CSR are usually conducted in economic production phase of Oil and Gas.
ONGC VIDESH response	During this exploration phase, ONGC VIDESH is spending without any returns and also Govt. does not get anything Government will get profit sharing from the project at economic production phase. From this project, government will get energy support when it is commercially discovered and local people will get job opportunities. Various CSR items are already given to Pyay, Pauk-Khaung, The' gone, Paung de' and Nattalin townships after completion of Seismic Acquisition.
U Wai Phyo Kyaw, Pyay Township GAD	Local people will not agree the land compensation rate specified by the government. It should be considered.
U Myint Kyaw Oo, MOGE	Compensation rate will be specified considering both government and local people.
ONGC VIDESH response	Regarding with LAQ, ONGC VIDESH will submit its letter about LAQ to related department such as MOGE.
U Myint Thein Oo, District Forest Department	Team from each concerned township forest department are ready to scouting the forest area for access road and well site. There is debt of shot holes drilling fees of seismic acquisition in 2017 to be paid to Forest Department. If this debt is not meant to be given to our Department, but clarification from G to G on this issue is needed.
ONGC VIDESH response	ONGC is government company of India, we maintain dignity and we have good reputation. We will not do things that are not good for both government and local people. We follow Health, Safety & Environmental rules & regulations of Government.
U Myint Kyaw Oo, MOGE	This issue should be clarified by submitting official letter between related Ministries.

February 11, 2020

Team has made presentation about drilling and EIA study to Pauk khaung township administrator and representatives' at 09:30 AM at township administrative office. Key discussions are as below under;

Discussion	Questions, Concerns and Recommendation
Pauk Khaung Township Administrator	Which activities will be done in Pauk-Khaung? How can we help?
ONGC VIDESH response	Well locations are fallen in The' gone township. Only mobilization of machineries, heavy equipment and crew will be done in Pauk khaung township. Draft access road to the location B (Payama-1) by planning of strengthening & widening the existing road is selected from Pauk khaung tar road to well location through existing road of Inn nga khwa sugarcane mill. Some parts of sugarcane area will touch to reach well location. Township administrative office support for using this road is requested.
Pauk Khaung Township Administrator	There are fire hazards in Oil and gas production areas. So, please consider safety measures for local community.
Pauk Khaung Township Administrator	There will be the traffic by sugarcane transport trucks from Nov. to Feb. during harvesting. Diversion especially at the box culvert (concrete pass) shall be considered during the construction period to avoid disruption in transportation. Company may have to compensate for the sugarcanes if construction is not completed and blocking the sugarcane trucks in the season.
U Soe Aung Win, Assistant Staff Officer, Livestock Breeding and Veterinary Department	There are two irrigation dams in Pauk-Khaung. Will vibration by the drilling of the deep well impact on the dams?
U Myint Kyaw Oo, MOGE	Safety will be conducted as international company's practices. Nothing affected to the dam by drilling. This project will be reviewed by the team at ECD including Ministry of Agriculture, Livestock and Irrigation. Various matters will be checked and considered to approve this project proposal.
Pauk Khaung Township Administrator	Why the access road is selected from Pauk khaung tsp. to well location of The' gone tsp. This question may be asked by the villagers.
ONGC VIDESH response	Considering the minimum impact to the public and four canals, the proposed road is selected after studying all other alternative access roads to access the location.

It was understood during discussion with government officials that the road we propose for well B is developed by sugarcane factory after obtaining permission from Forest department. If ONGC VIDESH needs to use this road permission will be needed from sugar mill owners for strengthening and use of the road. Accordingly in the afternoon, ONGC VIDESH & M&S team has visited and met the head of sugarcane mill. According to the discussion with the head of the sugarcane mill, he said he does not have authority to decide for allowing of using the existing road to be used as access road for ONGC Videsh Limited drill site because most of the part of the road is fallen in the factory own area. Proper application for using the existing road in the factory own area shall be sent to higher authorities through MOGE. ONGC Videsh will approach the factory owners through MOGE for necessary permissions

Then, combined team has made separate presentation about drilling and EIA study to the villagers from Kyo bin wine, Settone, Minlann, Thit young byan at Kyo bin win monastery at 13:30. Following were discussed at presentation as under;

Discussed by	Questions, Concerns and Recommendation
U Thet Naing Win, Tha Phan Kine Village	What are the benefits by this project because I have 8 seismic holes in my farmland?
U Myint Kyaw Oo, MOGE	Project benefits for local community include job opportunities and at production phase, CSR plan for health and education will be provided. If there was seismic holes in your farmland, it does not mean oil and gas will be drilled in your land.
U Htay Win, Tha Phan Kine Village	We would like to know about the new road. There are three alternatives access roads to reach this village, sometimes sugarcane mill does not want the farmers to pass through the road if the sugarcane is not loaded to their factory, so the alternative access road shall be considered. I would like you to choose the access route (Baw Di Gone- I Hnauk -Tha Phan Kine- Kyo Pin Wine) which is suitable for farmers. ONGC VIDESH informed
ONGC VIDESH response	ONGC VIDESH has surveyed the area through survey team. ONGC VIDESH may consider for the suggested access road.
U Myint Maung, Kyo Pin Wine Village	We have experience in road construction. I would like you to employ local people to construct new road.
ONGC VIDESH response	We will encourage the tender company to employ local people for construction for new roads.

February 12, 2020

Team has made presentation about drilling and EIA study to The' gone township administrative office at 10:30 AM at township administrative office. Key discussions are as under:

Discussed by	Questions, Concerns and Recommendation
Member of Parliament	Appreciated ONGC VIDESH for successful completion of seismic acquisition. Is third party hired by company or government? If it is hired by ONGC VIDESH, is there any influence by the ONGC VIDESH company? How about the compensation plan for farmlands in Cha-Yar-Gone village?
MOGE	Third party is selected by tender system. And MOGE review the selected third party and then approve.
ONGC VIDESH response	This presentation is only intended for drilling and EIA study Compensation plans (LAQ) will be submitted to MOGE. Access road near Cha-Yar-Gone village will be upgraded to 6 meter width. LAQ team will come later to discuss with farmers.
Daw Tin Zar Win, Site Assistant Engineer, Rural Department	Is new road included in the list of Rural Development Department? If it is included in the list, I will inform to Rural Development Department and ONGC VIDESH also have to submit letter to Rural Development Department. Company has to negotiate with land owners for widening of the road as Rural Development Department has no authority to expand the road without permission of land owners.
Member of Parliament	That would be better if there is no dispute about land compensation?
ONGC VIDESH response	It was presented to H.E Chief minister, to buy the lands for 200 meter x 200 meter area for drill sites construction. The land price will be negotiated through

Discussed by	Questions, Concerns and Recommendation
	the land compensation committee to buy the land with local price. MP is requested to get involve and negotiate when LAQ team comes.
MOGE	MOGE will buy the land with ONGC VIDESH budget.
Member of Parliament	Road should be left in good situation after project.
The` Gone CDC	Who will take care of roads after project? Please make the roads perfect for 20 years time period.
ONGC VIDESH response	Proper restoration will be made after completion of the project. The new road built will have a capacity for 60 tons. We may hand over the roads to Township Administration Department and/or Rural Development Department
Member of Parliament	System for third party is great. But I am concerned that, in some projects, there are some problems (negative impacts) left after the project is over.
ONGC VIDESH response	ONGC VIDESH informed that ONGC VIDESH is a government of India Company and follows all rules and behaves like a good corporate citizen
Daw Nwe New Oo, Staff Officer, Customs Department	For buying lands in project area, tax (3% Income Tax + 4% Stamp Duty = Total 7%) have to be given to The' Gone Customs Department rather than Yangon Customs Department. And, for foreign workers, withholding tax (2.5%) also have to be given to The' Gone Customs Department rather than Yangon Customs Department.
ONGC VIDESH response	It was informed that ONGC VIDESH shall pay all taxes per government rules as applicable and will comply with relevant laws and regulations
U Wai Phyo Kyaw, Staff Officer, The` Gone Township GAD	It is suggested that about 1300 ft part near to the village on the drafted access road shall be constructed as concrete road.
ONGC VIDESH response	ONGC VIDESH informed that it will look into the demand and will decide at latter stage about its feasibility and relevance or can be part of CSR project. To be decided latter

In the afternoon, team has met the villagers from various areas at 14:00 Pm nearby Naweng-1 drill site. Discussions are as under;

Discussed by	Questions, Concerns and Recommendation
U Khin Soe, Thit Cho Village	What are the plans and benefits for farmland owners in the project site?
MOGE	A land acquisition / compensation committee will be organized including MOGE, Land Settlement and Records Department and Township GAD. Then, the committee will discuss with land owners for compensation. There will not be any loss from farmers.
U Nay Min Tun, Village Administrator, Cha-Yar-Gone village	Thank you for the project. How about the local job opportunities and how about CSR program?
MOGE	The project will employ the local people in the project except expertise because it needs professional skills. When oil production becomes economic, CSR will be done for health and education sectors of local community.
U Nay Min Tun, Village Administrator, Cha-Yar-Gone village	Our transportation is already good. We need more buildings in our middle-school. Please consider that for CSR program.

Discussed by	Questions, Concerns and Recommendation
Mr. Kyaw Zaw Han discussed with villagers to clarify the road whether it is included in the list of Rural Development Department or not.	
U Nay Min Tun, Village Administrator, Cha-Yar-Gone village	When will second Public Consultation meeting be conducted?
Mr. Dylan Jenkins, IEM	It is planned to be in March or April.
U Nay Min Tun, Village Administrator, Cha-Yar-Gone village	In April, we do seeding in paddy fields. So, it will be better if Land Acquisition team comes earlier before seeding (April).
ONGC VIDESH response	A letter will be submitted soon to MOGE for organizing Land Acquisition Committee. Villagers shall proceed as its own plan without waiting for our team.
U Kyaw San Win, Ka-Yin-Gone village, Ywar-Thit village tract	There is water flow like drainage on the access road to the well site especially in raining season. Proper box culvert shall be put under the access road.
ONGC VIDESH response	We will see the well site after this meeting. Will suggest to Survey company to design this box culvert in his report.

After the presentation to the villagers, team visited Naweng-1 to see access road and new well location.

February 13, 2020

Team has made the presentation about drilling and EIA study to Htan taw gyi village in The' gone township at 10:30 AM at monastery. Key discussions are as under;

Discussed by	Questions, Concerns and Recommendation
U Than Zaw Win, Htan Taw Gyi Village	There are many tube wells in my village outside of the project area of 9-10 acres. What kind of impacts can be affected to those wells by drilling process?
MOGE	The deeper the exploration well, the smaller the diameter of this well. Therefore, there will be no impacts on those tube wells. According to our experience, there were no sand and land slide in the tube wells of every villages due to the drilling process. If there are any issues with the wells, please inform us immediately.
U Tin San, Htan Taw Gyi Village	Do we have to move our village to another place if the project area (10 Acres) is included in our village area? What will be the positive and negative impacts to local community by this project? What are the profits and losses to us if the project is over?
MOGE	The drilling site will be far from the village, so you don't need to move the village. Even if the project doesn't succeed, the economy of the village will not be affected negatively.
U Tin San, Htan Taw Gyi Village	Last 40 years, the irrigation dam was constructed. Farmer had loss of their farmland and no benefit due to this dam project. How many benefits can we receive from this oil and gas project if the project is over?
MOGE	This project is not like the dam project, this oil and gas project will be implemented under the new procedure of the government. If this oil and gas project causes environmental damages, the government will not approve this project. So, don't worry about loss of your farmlands. Land acquisition committee including MOGE and the relevant government departments will discuss with farmers before project implementation.

Discussed by	Questions, Concerns and Recommendation
ONGC VIDESH response	This presentation is only intended for EIA study. The land acquisition committee will be arranged and come to your villages later on during the project. But, farm lands from this village might not be fallen to our well site.

2nd Public Involvement Meeting Minutes

2nd Public Consultation Schedule and Stakeholders

DAY 1 (21.12.2021) -Yangon to Pyay

9:30- 3:30 Team mobilizes from Yangon to Pyay. 3:30-4:30 Pyay District Administrative Office Meeting

---END of DAY 1---

Day 2 (22.12.2021) - Paukkhaung Township (For Payama-1)
9:30 - 12:00 Paukkhaung Township Administrative Office Meeting
1:00 - 4:00 Meeting at **Kyo Pin Village** and (invite representatives from Kyo-pin-wine villager, Sett-tone, Minn Lann and Thit-yaung-pyan Villages)

---END of DAY 2---

Day 3 (23.12.2021) - The'gone Township
9:30 - 12:00 Thegon Township Administrative Office Meeting (for both Payama-1 and Naweng-1 wells)
1:00 - 4:00 Meeting at **Char-yar-gone Village** (invite representatives from Kan-taw-gyi, Nyaung-gone , Ywa-tha- gone , Zin-pyun-gone , Pyin-daung-gone , Ywa-thit, Pwe-taing , Sabel-kan , Wa-le , Yet-tha , Gyo-gone, Taw-chin, Thit Cho, Pha-lan-gone, Kaung-bin-lu, Kayin-gone Villages)

Date	Time	Meeting	Stakeholders Covered/Villages	Number of Attendees
21 Dec, 2021	15:30 – 17:30	Pyay District Administrative Office Meeting	• Pyay District Administration • Forestry Dept, Pyay District • Planning Dept, Pyay District • ECD • Agriculture Dept. • Myanmar Police • Health Dept. • Education Dept. • Rural Development Dept. • Fire Services Dept • Settlement and Land Records Dept. • City Development Committee • MOGE • ONGC • IEM/EQM	22
22 Dec, 2021	9:30 – 11:30	Paukkhaung Township Administrative Office Meeting	• Head of Pauk khaung Township Admin • Agricultural Land Management and Statistics Dept.	23

Date	Time	Meeting	Stakeholders Covered/Villages	Number of Attendees
			• Immigration Dept • Agriculture Dept. • Township Development Committee • TEO • Planning Dept. • Livestock Breeding and Veterinary Dept. • Rural Development Dept. • Myanmar Police • Fire Services Dept. • Health Dept. • Forestry Dept. • Rural Road Development Dept. • MOGE • ONGC • IEM/EQM	
22 Dec, 2021	15:30 – 17:30	Meeting at **Kyo Pin Village** and (invite representatives from Kyo-pin-wine villager, Sett-tone, Minn Lann and Thit-yaung-pyan Villages)	• MOGE • ONGC • IEM/EQM Villages (1) Kyot Pin Waing (2) Min Lann (3) Thit Yaung Pyan (4) Sat Tone	56 Villagers
23 Dec, 2021	9:30 – 11:00	Thegon Township Administrative Office Meeting (for both Payama-1 and Naweng-1 wells)	• General Administration Dept., Thaegone • Settlement and Land Records Dept • Planning Dept • Agriculture Dept • Agriculture Land Management and Statistics Dept. • Information and Communications Dept • MOGE • ONGC • IEM/EQM	15
23 Dec, 2021	15:30 – 17:30	Meeting at **Char-yar-gone Village** (invite representatives from Kan-taw-gyi, Nyaung-gone , Ywa-tha- gone , Zin-pyun-gone , Pyin-daung-gone , Ywa-thit, Pwe-taing , Sabel-kan , Wa-le , Yet-tha , Gyo-gone, Taw-chin, Thit Cho, Pha-lan-gone, Kaung-bin-lu, Kayin-gone Villages)	• MOGE • ONGC • IEM/EQM Villages (1) Char Yar Kone (2) Htan Daw Gyi (3) Nyaung Gon (4) Zin Byun Gon (5) Pyin Daung Gon (6) Ywa Thit (7) Pwe Bye (8) Sa Be Kan (9) Wa Le (10) Yat Tha	51 people from 17 Villages

Date	Time	Meeting	Stakeholders Covered/Villages	Number of Attendees
			(11) Gyo Gon (12) Ka Yin Gon (13) Ywa Tha Gon (14) Taw Chin (15) Thit Cho (16) Pan Lan Gon (17) Kaung Bin Lu	

Meeting minutes

The second Public Consultation and Socioeco Surveys to be conducted in the Environmental and Social Impact Assessment (ESIA): Q&A with the communities likely affected by onshore block EP-3

Detail

Project	ONGC Videsh Block EP3	**Region / State**	Bago
District	Pyay	**Township**	Pyay
Objective	To explain the project operation and ESIA's process		
Date	(3:30 pm-5;30pm) 21.12.2021		

U Kyaw Zaw Han (KZH) (ONGC Manager)

- Introduced team members to all local attendees.
- Briefed about the previous meetings held in 2020
- Further explained the operations of the project in 3 parts – 1) briefed about the ONGC company and its work, 2) explained more on the operations of the project, 3) introduced the ESIA team, who will be presenting more on environmental and social impact of the project

Dr. Ohnmar May Tin Hlaing (OMM) (EQM Managing Director)

- Explained the objectives of environmental and social impact assessment of the project
- Briefed about the IEM and EQM company
- Briefed about the process of environmental impact studies
- Informed that the ESIA team has been studying about the environmental and social conditions in the vicinity of the project
- Informed that the team will be holding public consultation meetings with the locals and related personals to the project will be further briefed about the impact conducted and questionnaire surveys to be carried out in the local communities in accordance with the covid 19 measures by Ministry of Health.
- Informed that public opinion about the project will be mentioned in the ESIA report
- Informed that the locals will be apprised with updated progress reports and future plans/agendas of the project, contents of the ESIA report, socio-eco studies and related questionnaires, results of the previous ESIA reports.

Question 1 from U Than Zaw Htwe (Assistant Director, ECD) – Where was the 2020 meeting held? Was it held online or in person?

Answered by KZH – A meeting was held on the 3rd of January at a state government office. Another meeting on the 10th of February was held at a district government office and subsequent meetings were held on the morning of 11th of February at Pouk Khaung Township government management office and at Kyo Pin Wine village in the afternoon. On the 12th of February, another meeting was held at Tae Gone township government office. A further visit to 2 drilling wells at the vicinity of Khyar Yar Gone village was made and a meeting with local farmers was held on the same day.

U Than Zaw Htwe (ECD) mentioned that it is necessary and imperative to hold meetings with the locals. He further mentioned that it would be very hard for the project to progress through without the agreement of the locals.

Q 2 from U Than Zaw Htwe (ECD) – He asked EQM that how will this project benefit the locals?

Answered by OMM – As illustrated by the ESIA guidelines, the third party is responsible for accounting and presenting socio-eco related improvements that the locals require to the designated company. Afterwards, the designated company will discuss with the locals to accommodate the improvements/changes that is required. The report written by the third-party team will only include the improvements that the locals need and not what the designated company will provide.

Q 3 from U Than Zaw Htwe (ECD) – Are there any plans for CSR related activities?

Answered by KZH – During the seismic measuring period in 2017 at Pauk Khaung, Tae Kone, Pyae, Paung Te and Nat Ta Lin, multiple CSR projects that focused on building schools, roads and water supply chains were accomplished and these projects added up to a total of 1,000 lakhs in Burmese Kyats. We have also further discussed with MOGE regarding CSR operations and have decided to add them to annual work program plans. We are also planning to enlarge and rebuild the sugarcane factory road (Takyarsat road) and enlarge another road in Na Win-1 from 10-12 feet to 18 feet width. The budget allocated for these projects will only be exactly confirmed after the tendering process. The total distance of the road that will be improved is approximately around 13 miles and we believe that this road will be very beneficial to sugar cane farmers. This road will be improved to withstand 60 tonnes of weight and the total cost of these projects will be discussed again in budget and work program meetings between MOGE and ONGC in January 2022.

Mr. Rajiv Nischal (Country Manager, ONGC country director) – This EP-3 project has 75 million USD investment and we believe that the locals will have work opportunities through our contractors during road construction and site work and improved roads around the vicinity of the project. If the two wells from EP-3 project is found to have oil and gas production, we hope to increase our CSR projects and therefore, there will be additional opportunities for the locals.

Q 4 from U Than Zaw Htwe (ECD) – It is mentioned that there will not be a tremendous impact on biodiversity regarding forestry and ecology, I was wondering why would that be the case?

Answered by OMM – This is impact assessment estimated base on step by step procedures and standard methodology looking into the magnitude, duration, extent and characteristic of impact etc. The current results that we have received are only for pre-drilling stage circumstances. These results will be submitted to the review team and they will decide whether these results of environmental impact are acceptable. We also would like to request secondary data of Shar Pyin forest (Shar Pyin Kyo Wine) from the respective forest department.

U Tin Mg Win (Assistant Director), Forest Dept- Yes, we will be supplying you with the data. It's just that we currently don't have the data for Pauk Khoung and Tae Kone at Pye at the moment. You can request the data of Shar Pyin forest (Shar Pyin Kyo Wine) from the respective township forest department and, I will make sure I will contact them ahead so that you can ask for the data when you go there.

Q5 from U Win Ko from Department of Planning Pyay District– *I was wondering when the project will* start and when it will end. With the previous 5 drilling sites you have mentioned, all of them are located in Pye district other than Nat Ta Lin village (drilling site). Since you will now be drilling in Pauk Khoung and Tae Kone, what will you be doing in Pye and Poung Te? I would also like to know a rough outline of the project in Tae Kone and Pouk Khoung. The management office also needs to know the details of the project. I was also wondering if the allocated 75 million USD budget has been used since 2017. I have also noticed that the budgeting periods have also changed, for instance, the 6 months mini

budget for this year was allocated for October to March, but it has since changed to April to March for next year. Also, what is the mini budget allocated for October 2021 to March 2022 and what parts of the project is the company planning to accomplish with this allocated mini budget. What is the company also planning to accomplish with allocated budget for budgeting years of 2022 and 2023. We would also like to know how the allocated budget is going to be used on a monthly basis or at least on a 3-month basis, if it is inconvenient for the company to give us monthly data. You will not be required to submit a detailed report on how this $75 million USD allocated budget will be paid to third party companies and how this will be used for logistics of the project. However, you will need to submit a detailed report on budget allocation of planning and preparation works done before the project, works done during the project, CSR projects. I am just presenting these issues at this *meeting because I believe it is going to be harder for us to try to contact the company later.*

Answered by KZH – The contract was drawn on the 8th of August between MOGE and ONGC and according to the contract, the preparation work, such as setting up offices and other miscellaneous activities was given 6 months to complete. After those 6 months, we carried on working other operations of the project. The original operation period was supposed to be 6 and a half years and as this 6 and a half years has passed, we got an extension for 3 more years from MIC. According to the contract, the operation date officially began on the 1/1/2016 and as ONGC Videsh company, we are not allowed to disclose any information on the budgeting allocations of the project. I also believe that MOGE had already reported to your office on the budgeting of the project form 1/1/2022 to 31/12/2022 and they had also discussed in detail with the company regarding this matter. The auditors from MOGE, along with the auditors from the general accounting department had also completed auditing the company. Currently, we are following MOGE annual budgeting timeline instead of the one drawn up by the government. $75 million USD is only allocated for the pilot study drilling period as we are supposed to drill 2 wells for the test drills as per PSC with MOGE. If we are tsuccessful in finding oil or gas we shall be developing the field to drill actual wells for production after approval from MOGE/other government agencies. , wWe are required to request for 1 year extension period from the government. It also took as 2 years to receive the ESIA report as we requested for the report in 2015 and was only supplied with one in 2017. Therefore, it really wasn't our fault for this unexpected extension on the project and for that reason, the government had granted us 1 year extension period. We have planned tcommitted to spend only use $18.5 million USD as per signed PSC with MOGE on this project uptoup to exploratory drilling of 2 wells, However we have increased the budget out ofto $75 million USD on the project. during the preparation period on the seismic measuring activities, drilling works and iIt is estimated that we have currently used $10 million USD till December 2021. The $75 million USD is estimatedmeant to be used until we finish drilling two wells and if we are to drill more production wells in case of wellsdiscovery and approval of development plan. , we may are required to ask for additional budget. MIC has already allowed us to use $32 million USD and according to FDI law, we are only required to start our CSR projects when production and profits startstarts, but we have already commenced these CSR projects by using 2% of the total allocated budget even before we have started profiting from the budget. The total cost of building roads around the vicinity of the project will be costing $2 million USD and that is more than 2% of the allocated budget. We have already done CSR activities during the seismic activities. We will need to have more discussion with MOGE to be able to come up with an absolute budget that will be used for CSR projects. Our company will be responsible for all operational related matters of the project, while MOGE will be taking care of rules and regulations of the project.

Q 6 from U Win Ko from District level planning dept – We would also like to know all the budget usage every 3 months on the project by the company. It is hard for us to get this information from MOGE, which is why I am asking the company here instead. You do not necessarily need to report on the budget used on operation part of the project. We just would like to know the budget that will be used for CSR and related construction activities.

Answered by KZH – The budgeting reports that you requested will also be reported to our headquarters. It is just that we have not really figured out the tender prices and therefore, we do not know the exact budget allocations. We will let you know once the road construction costs they are release.

Q 7 from U Win Ko from District level planning dept – We would also like to know what the main aim of the company is.

Answered by KZH – We focus in exploration and production of oil and natural gas.

Q 8 from U Win Ko from District level planning dept – After drilling all these test wells, will you be returning these wells and facilities back to the government? What are your plans?

Answered by KZH – The two test wells are located in in The Kone tsp. and it will also cross and overlap to Pauk Kaung tsp area. These are all a part of government led projects. EP-3 project will span across 6 townships and these will be the 5 townships that I have previously mentioned, along with Shwe Taung township. Seismic measurements will not include Shwe Taung township. As this is a government led project, we are required to report back on all that's happening in the projects. All ground operations are always accompanied by MOGE representatives and MOGE reps will also be present at the drilling period. When determining the location of the wells, the company has to work together with the government, and it is only decided after multiple discussions between the two parties. We are also required to make daily reports on the results of drill tests and if no oil production is detected in these test wells, the company will be responsible for taking all the loses. However, if oil production is expected from these test wells, then field with be developed after government approval the government. MOGE is also likely to take stake in the project as per PSC and all we shall be paying all taxed, royalties etc as per signed PSC and laws of the Union of Myanmar.

U Win Ko from District level planning dept – Thank you for that information and like I have mentioned before, you will not be required to submit all operational related budgeting, we would only like to know the budget allocations related to CSR activities.

Answered by KZH – Yes, we will ask the MOGE rep to provide you with the information once it has become available.

Q 9 from U Khin Mg Myint (District staff officer, settlement and Land records Department– I would like to make some comments on behalf of farmland usage. The test wells will be drilled on farmland and forests and therefore, the company will be required to reimburse the farmers on the cancelled production of crops from these farmlands. We are still calculating on the amount the company would need to refund respective farmers for taking over their farmlands. As you are using farmlands and forests for the project, you will need to report and need permission from relevant government offices for your usage.

Answered by KZH – For this project, we will be leasing the forest lands and we will be paying lease fees as dictated by the Ministry of Forestry. In terms of farmland usage, the Bago district government had instructed U Win Naing Swe (MOGE Rep) to work through this together with MOGE and the company. We would also like to request you for your help, as if we work together on issues like these, we can streamline and fasten the duration and process of being granted with approvals from the government. This will help us stay on track with the contracts drawn, tendering and construction periods.

Comment from U Thein Aung (Deputy Director , District Administration office) – These government approval related operations will be dealt with right after this meeting and the district farmland department will work on it as fast as they can as they need to further submit to state level farmland department for further approvals.

Comment from U Khin Maung Myint (Staff Officer, Department of Settlement and Land Records Department) – If you would like to speed up this process, we do not need to wait for the approval to be granted under MOGE name. We can use other means to get approval. We can give Form-7 (form filled up by the farmers to report that they have released their ownership on their farmlands) to the company so that the company can reimburse the farmers as soon as possible. Afterwards, farmers can write up a letter that they are satisfied with the reimbursement provided by the company. MOGE can use these

letters and submit it to the state government to speed up the process of renaming the ownership of these farmlands to MOGE.

Attendance List for Pyay District

No	Contact Person	Organization	Contact Details
1	U Thein Aung (Deputy Director	Pyay District Administration Office	
2	U Tin Mg Win (Assistant Director)	Department of Forestry, Pyay District	
3	U Win Ko (Deputy Director)	Planning Department, Pyay District	
4	U Than Zaw Htwe (Assistant Director)	Environmental Conservation Department	
5	Daw Myint Myint Thein (Staff Officer)	Department of Agriculture	
6	U Mg Mg Myint (Police Officer, Deputy District Officer)	Myanmar Police Force	
7	Dr Chanthar Zaw (Staff Officer)	Department of Health	
8	U Saw Oo (Assistant Director, Pyay District)	Department of Education	
9	Daw Kyawt Kyawt Khaing (Executive Engineer, Pyay District)	Department of Rural Development	
10	U Kyaw Linn Soe (Staff Officer)	Department of Fire Services	
11	U Khin Mg Myint (Staff Officer, Pyay District)	Department of Settlement and land Records Department	09428144544
12	U Htin Kyaw Oo	City Development Committee	
13	U Win Naing Swe (Manager)	MOGE	09767615074
14	Mr. Rajiv Nischal (Country Manager)	ONGC Videsh Limited	017536573
15	U Kyaw Zaw Han (Manager)	ONGC Videsh Limited	09974748400
16	U San Aung (Assistant Manager)	ONGC Videsh Limited	
17	Mr. Rajiv Nischal (Country Manager)	ONGC Videsh Limited	
18	Dr Ohnmar May Tin Hlaing	Environmental Quality Management Co., Ltd (EQM)	095016606
19	Daw New New Win	(EQM)	09793267856
20	Daw Zu Zu Aung	(EQM)	09797945932
21	U Thet Paing Phyo	(EQM)	09256215545
22	U Ye Phyo Han	(EQM)	09968820001

Photos Section for Pyay District Office

Deputy Director, Pyay District, Bago Regional Development Committee

Presented by U Kyaw Zaw Han, OVL

Presented by Dr. Ohnmar May Tin Hlaing, EQM

Comment from U Than Zaw Htwe , ECD

Comment from U Win Ko, Planning Department

Comment from U Thein Aung, District Administrator

Meeting minutes

The second Public Consultation and Socioeco Surveys to be conducted in the Environmental and Social Impact Assessment (ESIA): Q&A with the communities likely affected by onshore block EP-3

Detail

Project	ONGC Videsh Block EP3	**Region / State**	Bago
District	Pyay	**Township**	Pauk Khaung
Objective	To explain the project operation and ESIA's process and collect the socieco surveys		
Date	(3:00pm-5;30pm)22.12.2021		
Village	Kyot Pin Waing Village, Min Lann Village, Thit Yaung Pyan Village, Sat Tone		
Village Tract	Kyot Pin Waing Village Tract		
Number of Household	(1) Kyot Pin Waing Village (620) (2) Min Lann Village (64) (3) Thit Yaung Pyan Village (500) (4) Sat Tone (93)		
Number of House	(1) Kyot Pin Waing Village (620) (2) Min Lann Village (64) (3) Thit Yaung Pyan Village (500) (4) Sat Tone (93)		
Population	(1) Kyot Pin Waing Village (2409) (2) Min Lann Village (256) (3) Thit Yaung Pyan Village (1860) (4) Sat Tone (382)		

1. U Win Naing Swe (MOGE representative) gave introduction
2. U Kyaw Zaw Han (KZH) ONGC Manager explained information related to the operations of the project.
3. Dr. Ohnmar May Tin Hlaing (OMM) Managing Director from EQM explained the objectives of environmental impact assessment of the project

Notes : (56) people from (10) villages attended the meeting.
The villagers showed great interest in the matters of the project and answered related questions with enthusiasm. They are happy with the upcoming project to be conducted in the vicinity of their residence. Additionally, they took provided questionnaires papers back to their residences in order to ensure people who couldn't attend the meeting can answer the questions provided on the questionnaires.

Attendance List for Kyot Pin Waing Village

No	Contact Person	Organization/ Village	Contact Details
1	U Htwe Mg (farmer)	Kyot Pin Waing Village	
2	U Zaw Min Aung (Village Head)	Kyot Pin Waing Village	09783735735
3	U Aung Cho Myint (clerk)	Kyot Pin Waing Village	09983079934
4	U Aye Hlaing	Kyot Pin Waing Village	09794113415
5	U Htay Win (Village Head)	Thaphan Gaing Village	09789642523
6	U Myint Oo (Village Head)	Thit Yaung Pyan Village	
7	U Mg Swe (farmer)	Kyot Pin Waing Village	
8	U Myo Win (farmer)	Kyot Pin Waing Village	
9	U Nyunt Thaung (farmer)	Kyot Pin Waing Village	
10	U Win Naing (farmer)	Kyot Pin Waing Village	
11	U Than Tun (farmer)	Kyot Pin Waing Village	
12	U Myint Aung (farmer)	Sat Tone Village	
13	U Tin Thein (farmer)	Shwe Ku Village	09669064114

No	Contact Person	Organization/ Village	Contact Details
14	U Yan Min (farmer)	Kyot Pin Waing Village	
15	U Mg Nyunt (farmer)	Sat Tone Village	09756869263
16	U Aung Kyan (farmer)	Kyot Pin Waing Village	
17	U Tint Lwin (farmer)	Sat Tone Village	
18	U Zaw Naing Min (farmer)	Shwe Ku Village	09429625478
19	U Kyaing (farmer)	Shwe Ku Village	
20	U Myint Naing (farmer)	Shwe Ku Village	
21	U Hla Min Htike (farmer)	Shwe Ku Village	
22	U Aung Htike (farmer)	Shwe Ku Village	
23	U Tin Tun (farmer)	Shwe Ku Village	
24	U Zaw Win (farmer)	Kyot Pin Waing Village	
25	U Myint Mg (farmer)	Sat Tone Village	
26	U Win Than (farmer)	Ngat Pyaw Taw Village	
27	U Tin Soe (farmer)	Ngat Pyaw Taw Village	09696405871
28	U Myint Ngwe (farmer)	Kyaunggone Village	09266468783
29	U Soe Than (farmer)	Ngat Pyaw Taw Village	09787356683
30	U Than Shwe (farmer)	Ngat Pyaw Taw Village	09696855198
31	U Kyaw Soe (farmer)	Kyot Pin Waing Village	09423716110
32	U Mya Soe (farmer)	Ngat Pyaw Taw Village	
33	U Nyunt Soe (farmer)	Kyot Pin Waing Village	09689668643
34	U Aung Soe (farmer)	Kyot Pin Waing Village	
35	U Tin Swe (farmer)	Min Lann Village	09253441534
36	U Min Naing (farmer)	Min Lann Village	09254236899
37	U Win Aung (farmer)	Min Lann Village	09694695911
38	U Win Naing (farmer)	Min Lann Village	09423693415
39	U Kyaw Min (farmer)	Min Lann Village	09447525731
40	U Khin Mg Win (farmer)	Shwe Ku Village	
41	U Htay Win (farmer)	Kyot Pin Waing Village	
42	U Soe Naing (farmer)	Shwe Ku Village	
43	Daw San San Win (farmer)	Shwe Ku Village	
44	Daw San Htay (farmer)	Shwe Ku Village	
45	Daw Htay (farmer)	Kyot Pin Waing Village	
46	U Thein Soe (farmer)	Ngat Pyaw Taw Village	
47	U Chit Shwe (farmer)	Ngat Pyaw Taw Village	
48	U Than Tun Lay (farmer)	Hlwa Sin Gone Village	
49	U Than Lwin (farmer)	Kyaunggone Village	
50	U Zaw Myint Swe (farmer)	Kyot Pin Waing Village	
51	U Thet Khaing (farmer)	Kyot Pin Waing Village	
52	U Khin Soe (farmer)	Kyot Pin Waing Village	
53	U Tin Hlaing (farmer)	Sat Tone Village	09445700164
54	U Myint Tin (farmer)	Thit Yaung Pyan Village	
55	U Myint Mg (farmer)	Thit Yaung Pyan Village	
56	U Myint Hlaing (farmer)	Kyot Pin, Ywa Ma Village	

Photos Section for Kyot Pin Wine Village

Kyot Pin Wine Village

Meeting with local community with MOGE, ONGC and EQM

Presented by U Kyaw Zaw Han (OVL)

Presented by Dr Ohnmar May Tin Hlaing (EQM)

Socioeco surveys

Meeting minutes
The second Public Consultation and Socioeco Surveys to be conducted in the Environmental and Social Impact Assessment (ESIA): Q&A with the communities likely affected by onshore block EP-3

Detail

Project	ONGC Videsh Limited (OVL) Onshore Block EP3	**Region / State**	Bago
District	Pyay	**Township**	Pauk Khaung
Objective	To explain the project operation and ESIA's process		
Date	(9:30 am-11:30 am) 22.12.2021		

U Kyaw Zaw Han (KZH) (ONGC Manager)

- Introduced team members to all local attendees.
- Briefed about the previous meetings held in 2020
- Further explained the operations of the project in 3 parts – 1) briefed about the ONGC company and its work, 2) explained more on the operations of the project, 3) introduced the ESIA team, who will be presenting more on environmental and social impact of the project

Dr. Ohnmar May Tin Hlaing (OMM) (EQM Managing Director)

- Explained the objectives of environmental impact assessment of the project
- Re-informed the attendees that the ESIA team will be studying the impacts the project has on the environment
- Briefed about the IEM and EQM company
- Briefed about the process and purpose of environmental impact studies
- Informed that the team will be holding public consultation meetings with the locals and related personals to the project will be further briefed about the operations in these meetings
- Informed that public opinion about the project will be mentioned in the ESIA report
- Informed that the ESIA team will be studying about the environmental and social conditions in the vicinity of the project
- Informed that the locals will be apprised with updated progress reports and future plans/agendas of the project, contents of the ESIA report, socio-eco studies and related questionnaires, results of the previous ESIA reports.

Q1, U Nay Myo Win (Staff Officer) Forestry Department – How long of the new 350 m road that you are building will be in or be a part of Pauk Khaung Township?
Ans, KZH – All 350 m of the new road will be in Tae Kone township. We are also renovating the 6 m Myanma Economic Holdings Public Company Limited (EH) 's Sugar Cane production road so that it is more durable. We will not be widening the old 4 m road, but we will be renovating it so that it is more durable. As we have previously discussed, we will be compensating the sugar cane manufacturers. We will start building the new 350 m road from the point, where the old road ends until it gets to the location of the wells. This new road will be 4/6 m wide.

Q2, Forest Department – Does the old production road extend to the border of Pauk Khaung Township?

Ans, KZH – Yes, it does

Q3, Forestry Department – In that case, if there isn't any necessary renovating works to widen the road, I don't think there should be an issue. However, if the township management team is not informed of any renovations that you would be working on, they wouldn't be too happy. It is good that your operation had planned to replant 1 acre of plants as a part of your ecological conservation plan, but 1 acre might be too little. Therefore, I really would like you guys to make sure this 1 acre is fruitful. Where would you be planting this 1 acre of plantation?

Ans, KZH – It will be in the vicinity of the well in Tae Kone Township. We have already determined the location as per discussions with Myanmar government authorities.

Forestry Department – If that's the case, this plan doesn't have much to do with Pauk Khaung Township, but it will still be under the jurisdiction of the department of Forestry. I would really like to reinforce the importance of this 1 acre plantation to make sure it's successful.

KZH – We will be working to our best abilities on this plantation as discussed. We will also be starting our plantation works this coming monsoon season.
Forestry Department – Thank you we will also be regularly auditing the condition of the plantation so I would persuade the team to work on the plantation to be successful rather than just working on it out of obligation.

Q4, Dr Myo Min Zaw Health Department – We also hope to see air, water and soil conditions for environmental health on the report that you will be submitting. Waste management is important too and if it wasn't done properly, it can affect the locals severely. Please do let the management team know, if you need any help. Once again, I would like to urge you to carefully handle and work on waste management.

Ans, OMM – Yes, we will be including all that you have mentioned into the EIA report.

KZH – We have asked an international company to work on waste management. We will be wrapping all the waste into tarpaulin so that the waste wouldn't seep through, and we will be discarding the waste in Thilawa, Yangon through Myanmar government approved waste management company and procedures. We will also be restoring the land after all the drilling works.

Q5, U Phyo Thu Maung Township Administrator – Are the current EIA reports that we have only valid for 1 year? Will there be more EIA reports if the test drilling is successful?

Ans, KZH – The current EIA report is just for these testing of drilling works.

Ans, Mr. Rajiv Nischal country manager – The current EIA report is just for testing two drilling wells as per PSC. In case we are successful in finding oil/gas we shall take approval from relevant authorities for development plan including new EIA report as per government regulations

Ans, OMM – The first EIA report that we will be writing is for the test drilling period. We will need a new EIA report once the production phase starts because the environmental impacts of this project between the test drilling phase and the production phase are not the same.

Q6, Township Administrator – Will ECD handle all the monitoring work?

Ans, KZH – To our understanding ECD is currently only able to form a monitoring group at a state level. I don't think they have form a monitoring group for each township. WE shall be following all instructions and approvals of ECD

Ans, OMM – ECD will not be monitoring all the time around the clock. The company would just have to follow the guidelines as mentioned in the contract and out of obligation. The company will also be responsible for making sure the subcontractors are following the guidelines.

Ans, KZH – The company and its subcontractors will be obliged to follow the guidelines according to the contract and ECD will ensure whether the two aforementioned parties are following the guidelines.

Q7, Township Administrator – What have you planned for the CSR projects?

Ans, KZH – For now, we will be building the roads that will cost 20,000 Lakhs (MMK) and the future CSR projects will be discussed with MOGE in the upcoming meetings in January 2022. We will be planning additional CSR projects if MOGE requests for more.

Township Administrator – We understand that this project is developed for the benefit if the country and therefore, the federal government will also be investing in this project alongside the company.

Ans, KZH – As this is a government project, we are obliged to carry out CSR projects and as I have mentioned, if MOGE instructs us to plan more CSR projects in the upcoming meetings, we will be doing so as instructed.

Q8, Township Administrator – Will you determine if the current wells can move onto the production phase according to the results you receive from these wells?

Ans, KZH – We will not be able to receive a decisive answer right on the 15th test day as the results will be discussed between the technical experts from India and MOGE. Therefore, we will know if these wells can move onto the production phase after testing.

MOGE representative – MOGE had also previously planned CSR programs with 2% of the profit we get from production. We will also be discussing about CSR programs for this project in upcoming meetings. Although we were able to produce a lot of gas from previous projects, we didn't end up

yielding a lot due to relatively lower demands for gas. However, we are currently observing and studying increased demands for gas. We are also supplying electricity in different time periods and intervals for the same reason. As mentioned in the contract, if these test wells give favourable results, we will be planning additional CSR programs.

Q9, Township Administrator – Is there anything new with Inn Nar Khwa Sugar cane production road? How is it going?

Ans, KZH – MOGE has already sent a letter to Economic Holding to inform them about the construction of the new road. However, Economic Holding hasn't gotten back to MOGE. The approvals granted have been significantly delayed and this has in turn lengthen the project timeline. Economic Holding has verbally given us the approval since November, but the official approval hasn't been sent over yet.

Township Administrator – The factories in the vicinity are also starting classes for the locals regarding sugar cane production. The roads will also be better if they let the locals take over.

Q 10, U Myint Htay, Township Administrative Member - Will the road be built with concrete to withstand 60 tonnes of weight?

Ans, KZH – The roads will be built with smoothened hard stones because the expenses would be too high if they were concrete roads. Roads will be built as per standard procedure for such activities by oil companies in Myanmar.

Q11, Forestry Department – Is the Ministry of Natural Resources and Environmental Conservation aware that we will be building such roads on lands owned by Economic Holding?

Ans, KZH – Our Nodal Agency as per PSC is MOGE and accordingly we interact with MOGE and follow as per their instructions. If any other agency approval is needed it is taken by MOGE

Ans, MOGE representative – MOGE will then in turn inform additional relevant ministries about the projects we are working on.

Forest Department – Within the 10,000 acres of land we rented to Economic Holding, this township contains 5000 acres of land and within 5000 acre of land that they have to return, this township contains 2500 acres of land. Once these lands have been given back, they will be returned to Forestry department.

Ans, KZH – Some parts of the current existing road from Pauk Khaung to Min Lan is located within the forestry area. The production road that the farmers use is also located within the forestry area. We will not be widening these aforementioned roads; we will only be renovating them to make them more durable. These roads will also be extended by the new 350 m road. We have also submitted our plans for the road works to MOGE and we have also additionally requested MOGE to help us get approvals from relevant ministries.

Forest Department – If we use Economic Holding road without informing the forestry department, I am worried that we won't be informed when Economic Holding returns forest lands to department of Forestry.

MOGE representative – Yes, we will be making an enquiry to the department with this issue.

Ans, KZH – I believe the forestry department is already aware of the 3 roadworks that we have planned. We have obtained the lease approvals ofor the forest land to be used and have already paid the lease fee. Then, Economic Holding part of the road is mainly located outside of forest area.

Q12, U Aye Kyaw Zin Tun (Deputy Staff, officer, Department of Fire Services) – How many people and what kind and the number of machineries will be involved in this project?

Ans, KZH – Machinery to be used shall be as per requirement of the drilling which depends on drilling depths etc I believe there will be around 100 people involved on site during drilling of wells.

Q13, Fire Services – Do you have plans to keep a fire safety manager?

Ans, KZH – We have plans to keep HSE managers from both the company and subcontractors. We also have protocols to follow if an accident occurs. ECD had also inquired us regarding this issue and the final report will include all the protocols to follow and the responsibilities of everyone on site.

Fire brigade – The HSE manager should be aware and be used to all the fire safety regulations regarding this project.

MOGE representative – I believe the HSE manager has received an HSE certificate as per Myanmar rules and therefore, I am sure he is aware of fire safety regulations. The project site will be run by HSE manager in a shift-to-shift basis and each shift will include appropriate man power. The total project site will have 100 people and as we are drilling a well that is 16000 feet, we will only be using big machines.

Q14, Fire brigade – Will the HSE manager be a foreigner?

Ans, KZH – He shall have the desired qualification and could be a local or foreigner .

Fire service – We have had experiences of foreigners returning to their countries in times of an emergency without taking any responsibilities. We need to make sure such an incident never happens again because this will be detrimental to the company. The company needs to hire someone who's responsible and meticulous.

Ans, KZH – MOGE representatives will be assigned on site to ensure such a thing never happens and there will also be other Myanmar employees to support our HSE manager. Fire services department will be communicated before starting the operation.

Q15, U Myint Htay, Township Administrative Member - Will the road between Min Lan and Sat tone be widened? If you are widening the road by 18 feet, will the houses and lands on the side be affected? If they are affected, are there any plans laid out for these properties? I believe that these houses will be likely be affected by widening of the roads and I think there are plants as well. We need to discuss between the two villages on this issue.

Ans, KZH – Our current discussion on this issue with the locals are going really well so far and we have also planned to discuss further. The locals are really excited about the widening of the roads. We have learned that the widening of the roads can affect some of the fences along the road, but I don't think it will be affecting the houses. We have also talked to U Win Naing from the village management team and will also be compensating for the affected houses until the owners are satisfied. We will also be cutting down some of the trees along the route. The company that will build the road also collected roadwork related survey since 2020. If the locals object about the road widening project, then we will resort to just renovating the road instead of widening it. We will also only be using a maximum 60 tonnes vehicles and these vehicles will only be passing on this road twice (once to enter the well site and once to exit) throughout the project period. We will be using smaller vehicles most of the time during operations on this road.

Q16, U Myint Htay, Township Administrative Member-There are about 100 vehicles from the village that will travel on this road to carry sugar cane on a daily basis. This will make the road and houses next to it dusty. Although people living in these properties will not complain about sugar cane cars, they can still complain about project related cars travelling on the road for polluting the air. We should discuss the two villages ahead of time to resolve the issue.

OMM- We will be advising the project team to reduce the number of vehicles they use as much as possible. The EIA report will also include the contact of local fire service and we will also be advising the company HSE team to talk to the local fire service to contact with each other.

Q17, U Ko Ko Naing (Township Police Officer), Police department – The police department will also be assisting in different operations of the project if we have been instructed to do so by the federal police department.

MOGE representative – Yes we can contact the federal police department of assistance if necessary.

Q18, U Myint Soe (Staff Officer) Department of Imigration and Population – Once the foreigners start arriving, they will be required to send a copy of their passports and visa. They are rounding up foreigners who are entering the country illegally in some places. If Myanmar citizens from other states arrive to the project site, they will also be required to notify our department with their names so that we can take care of their safety and security.

MOGE representative – MOGE will also get an employee to help with all the immigration works once the project commences.

Q19, Township Administrator - Will you be building tents to facilitate with the accommodation of the people on site once the project commences?
MOGE representative – The technicians will be living on site.

Q20, U Myint Htay, Township Administrative Member - How far is the drilling site from the village?

Ans, KZH – Approximately 4 miles. There are no villages around the drilling sites. There are only a handful of people, who grows sugar cane living in the vicinity. The two wells will be located within the boundary of Tae Kone village. We came here today to inform you about the work processes of this operation, and we will be including all your suggestions into the EIA report.

MOGE representative – The operations requires vehicles to transport men and material to the site and efforts shall be made to minimize the vehicles needed. I am sure they will be meticulous and systematic with everything.

Q21, Township Administrator- When will you start building the road?

Ans, KZH – The road construction will probably commence after we have dealt with the land issues. We are also waiting for EIA approval so it will most likely start after May 2022. The final EIA report will also be submitted to ECD and ECD will call us for a meeting after reviewing the report. This meeting will be attended by around 22 ministries, and they will be asking the company with all the questions that they will have about the project. We will have completed more discussions with MOGE by that time so we hope to be able to answer more questions you might have by then.

Attendance List for Pauk Khaung Township

No	Contact Person	Organization	Contact Details
1	U Phyo Thu Maung	Head of Pauk Khaung Township Administration	
2	U Ye Tun Oo	Department of Agricultural Land Management and Statistics	09785181251
3	U Myint Htay	Township Administrative Member	09793443800
4	U Myint Soe (Staff Officer)	Department of immigration and Population	0943126676

5	Daw Ye Ye Mya	Department of Agriculture	09250114487
6	U Min Aung (Executive Officer)	Township Development Committee	09423676709
7	U Tun Lwin	TEO	09260568899
8	U Win Naing Swe (Manager)	MOGE	09767615074
9	Daw Khin NI Ni Htwe(Assistant Director)	Department of Planning	09423671421
10	U Myo Zaw Tun (Assistant Supervisor)	Livestock Breeding and Veterinary Department	09423696175
11	U Khin Mg Win (Deputy Staff Officer)	Department of Rural Development	09254092261
12	U Ko Ko Naing (Township Police Officer)	Myanmar Police Force	09457842613
13	U Aye Kyaw Zin Tun (Deputy Staff Officer)	Department of Fire Services	09256303935
14	Dr Myo Min Zaw	Department of Health	09789397575
15	U Nay Myo Win (Staff Officer)	Department of Forestry	09402786124
16	U Zaw Win Tun (SAE)	Department of Rural Road Development	09421726871
17	Mr. Rajiv Nischal (Country Manager)	ONGC Videsh Limited	017536573
18	U Kyaw Zaw Han (Manager)	ONGC Videsh Limited	09974748400
19	Dr Ohnmar May Tin Hlaing	Environmental Quality Management Co., Ltd (EQM)	095016606
20	Daw New New Win	(EQM)	09793267856
21	Daw Zu Zu Aung	(EQM)	09797945932
22	U Thet Paing Phyo	(EQM)	09256215545
23	U Ye Phyo Han	(EQM)	09968820001

Photos Section for Meeting held in Pauk Khaung Township

Meeting at the Pauk Khaung Township

Presented by U Kyaw Zaw Han, OVL

 **Presented by Dr. Ohnmar May Tin Hlaing, EQM**	 **Comment from U Phyo Thu Mg, Township Administrator**
 **Comment from Dr. Myo Min Zaw, Department of Health**	 **Comment from U Nay Myo Win, Forest Department**
 **Comment from U Myint Soe, Department of Immigration**	 **Comment from U Aye Kyaw Zin Tun, Fire Services Department**

 **Comment from U Ko Ko Naing, Police Officer**	 **Comment from U Myint Htay, Administrative member**

Meeting minutes

<u>The second Public Consultation and Socioeco Surveys to be conducted in the Environmental and Social Impact Assessment (ESIA): Q&A with the communities likely affected by onshore block EP-3</u>

Detail

Project	ONGC Videsh Block EP3	**Region / State**	Bago
District	Pyay	**Township**	Tae Gone
Objective	To explain the project operation and ESIA's process		
Date	(3:30 pm-5:30pm), 23.12.2021		
Village	Char Yar Kone Village		
Village Tract	Char Yar Kone Village Tract		
Number of Household	(1) Char Yar Kone Village (83) (2) Htan Daw Gyi (69) (3) Nyaung Gon (11) (4) Zin Byun Gon(57) (5) Pyin Daung Gon (46) (6) Ywa Thit (142) (7) Pwe Bye (56) (8) Sa Be Kan (27) (9) Wa Le (43) (10) Yat Tha (64) (11) Gyo Gon (121) (12) Ka Yin Gon (28) (13) Ywa Tha Gon (123) (14) Taw Chin (63) (15) Thit Cho (70) (16) Pan Lan Gon (151) (17) Kaung Bin Lu (45)		
Number of House	(1) Char Yar Kone Village (98) (2) Htan Daw Gyi (75) (3) Nyaung Gon (14) (4) Zin Byun Gon (57)		

	(5) Pyin Daung Gon (50) (6) Ywa Thit (154) (7) Pwe Bye (61) (8) Sa Be Kan (33) (9) Wa Le (48) (10) Yat Tha (71) (11) Gyo Gon (142) (12) Ka Yin Gon (28) (13) Ywa Tha Gon (123) (14) Taw Chin (63) (15) Thit Cho (71) (16) Pan Lan Gon (162) (17) Kaung Bin Lu (45)
Population	(1) Char Yar Kone Village (303) (2) Htan Daw Gyi (208) (3) Nyaung Gon (26) (4) Zin Byun Gon (158) (5) Pyin Daung Gon (78) (6) Ywa Thit (306) (7) Pwe Bye (162) (8) Sa Be Kan (91) (9) Wa Le (128) (10) Yat Tha (223) (11) Gyo Gon (426) (12) Ka Yin Gon (138) (13) Ywa Tha Gon (226) (14) Taw Chin (216) (15) Thit Cho (247) (16) Pan Lan Gon (507) (17) Kaung Bin Lu (142)

Notes : (51) people from (17) villages attended the meeting. The villagers showed great interest in the matters of the project and answered related questions with enthusiasm. Additionally, they took provided questionnaires papers back to their residences in order to ensure people who couldn't attend the meeting can answer the questions provided on the questionnaires.

1) U Win Naing Swe (MOGE representative) gave introduction
2) U Kyaw Zaw Han (KZH) ONGC Manager explained information related to the operations of the project.
3) Dr. Ohnmar May Tin Hlaing (OMM) Managing Director from EQM explained the objectives of environmental impact assessment of the project
4) Q and A session

U Khin Soe, Thit Cho Villager – We would like you to let us, the villagers, know if there is any job opportunities for us in the project.

MOGE representative - As part of the project road will be repaired and new road will be Buit. Also there will be construction at well site and drilling of 2 wells. All these projects will require manpower, unskilled manpower is likely to be hired by our contractors from the local area. So we believe these operations can provide some jobs for the locals through our contractors as per need basis and availability.

OMM – As brought out above by MOGE representative job opportunities for locals are anticipated through our contractors. This is also brought out in ESIA report.

U Kyaw San Win, Kayin Gone Villager – I was wondering if there will be any water or drainage works around the project site.

KZH - The roads to be strengthened and new roads are planned to be constructed as all weather roads. We have planned to provide drainage system between dikes and the plots in fields. As there are ditches between the plots and the dikes, these ditches get filled with water during monsoon season. Ditches also get clogged up easily and this leads to flood in the plots. With the drainage system we provide, as par recommendation from one of the villagers, there will be reduced flooding in the plots. Once we are done with the drilling works, we will be removing all the equipment from the sites in case of no find and in case of find the field will be developed after approval of relevant government authorities.

OMM – We will be collecting questionnaires that we have provided next week Wednesday from Ko Ye Phyo Han.

Photos Section for Phalan Gone Village

Presented by U Win Naing Swe (MOGE representative)

Presented by U Kyaw Zaw Han (KZH) ONGC Manager

Dr. Ohnmar May Tin Hlaing (OMM) Managing Director (EQM)

Comment from U Khin Soe, Thit Cho village

Comment from U Kyaw San Win, Kayin Gone village

Socioeco surveys

Attendance List for Phalan Gone Village

No	Contact Person	Organization/ Village	Contact Details
1	U Nyan Thein (Farmer)	Taunggone Village	0975813034
2	U Myo Zaw Oo (Farmer)	Khaung Pin Luu Village	09762597650
3	U Khin Soe (Farmer)	Thit Cho Village	09250217492
4	U Nyunt Win (Farmer)	Thit Cho Village	0931450963
5	U Myint Naing (Farmer)	Phalan Gone Village	09694142447
6	U Myiny Lwin (Farmer)	Phalan Gone Village	09778920978
7	U Myint Shein (1) (Farmer)	Phalan Gone Village	09796832933
8	U Myint Shein (2) (Farmer)	Phalan Gone Village	0945321370

No	Contact Person	Organization/ Village	Contact Details
9	U Min Naing (Farmer)	Thit Cho Village	09457825322
10	U Aye Naing (Farmer)	Taunggone Village	09774261107
11	U Win Naing (Farmer)	Taw Chin Village	09795226221
12	U Soe Tint (Farmer)	Taw Chin Village	
13	U Hlit (Village Head)	Khaung Pin Luu Village	09264703787
14	U Aung San Oo (Village Head)	Ywa Thit Village	09250815591
15	U Win Zaw (Hundred Households Head)	Ywa Thit Village	
16	U Moe Zaw (Village Head)	Kyot Gone Village	09257028991
17	U Soe Naing (Farmer)	Wa Le Village	09444572950
18	U Thein Htay (Farmer)	Ywa Tha Gone Village	09252012721
19	U Khaing Oo (Farmer)	Ywa Tha Gone Village	09421750553
20	U Thein Zaw (Farmer)	Ywa Tha Gone Village	09792623574
21	U Win Lwin Htay (Farmer)	Chayar Gone Village	09792257673
22	U Mg Win (Farmer)	Chayar Gone Village	
23	U Win Ngwe (Farmer)	Kayin Gone Village	09458012468
24	U San Win (Farmer)	Pyin Taung Gone Village	09778432232
25	U Win Hlaing (Farmer)	Pwe Pyae Village	09457828163
26	U Aye Ngwe (Farmer)	Sabae Kan Village	09794108654
27	U Win Aung (Farmer)	Yutthar Village	09251586907
28	U Win Mg (Farmer)	Zin Myun Gone Village	09960942985
29	U Kyaw Zin Oo (Farmer)	Chayar Gone Village	
30	U Myint Thein (Farmer)	Chayar Gone Village	
31	U Htay Myint (Farmer)	Chayar Gone Village	
32	U Kyi Soe (Farmer)	Chayar Gone Village	
33	U Kyi Win (Farmer)	Chayar Gone Village	
34	U Win Than (Farmer)	Chayar Gone Village	
35	U Soe Lwin (Farmer)	Chayar Gone Village	
36	U Thein Lwin (Farmer)	Chayar Gone Village	
37	U Than Hlaing (Farmer)	Chayar Gone Village	
38	U Tin Myo Hlaing (Farmer)	Chayar Gone Village	
39	U Myint Thein (Farmer)	Chayar Gone Village	
40	U Kyaw San (Farmer)	Chayar Gone Village	
41	U Thein Shwe (Farmer)	Chayar Gone Village	
42	U Thet Naing Oo (Farmer)	Chayar Gone Village	
43	U Myint Oo (Farmer)	Chayar Gone Village	
44	U Win Oo (Farmer)	Chayar Gone Village	
45	U Ye Lwin (Farmer)	Chayar Gone Village	

No	Contact Person	Organization/ Village	Contact Details
46	U Moe Aung (Farmer)	Chayar Gone Village	
47	U Htay Win (Farmer)	Chayar Gone Village	
48	U Myint Naing (Farmer)	Chayar Gone Village	
49	U Myo Naing (Farmer)	Chayar Gone Village	
50	U Soe Win (Farmer)	Chayar Gone Village	
51	U Khin Zaw (Farmer)	Chayar Gone Village	

Meeting minutes of Tae Gone Township
The second Public Consultation and Socioeco Surveys to be conducted in the Environmental and Social Impact Assessment (ESIA): Q&A with the communities likely affected by onshore block EP-3

Detail

Project	ONGC Videsh Block EP3	**Region / State**	Bago
District	Pyay	**Township**	Tae Gone
Objective	To explain the project operation and ESIA's process		
Date	(9:30am -11;:0am) 23.1.2022		

- **U Kyaw Zaw Han (KZH) (ONGC Manager) –**
  - Introduced team members to all local attendees.
  - Briefed about the previous meetings held in 2020
  - Further explained the operations of the project in 3 parts – 1) briefed about the ONGC company and its work, 2) explained more on the operations of the project, 3) introduced the ESIA team, who will be presenting more on environmental and social impact of the project

- **Dr. Ohnmar May Tin Hlaing (OMM) (EQM Managing Director)** –
  - Explained the objectives of environmental impact assessment of the project
  - Re-informed the attendees that the ESIA team will be studying the impacts the project has on the environment
  - Briefed about the IEM and EQM company
  - Briefed about the process of environmental impact studies
  - Informed that the team will be holding public consultation meetings as well as socioeco surveys using the prepared questionnaires with the locals and related personals to the project will be further briefed about the operations in these meetings
  - Informed that public opinion about the project will be mentioned in the ESIA report
  - Informed that the ESIA team will be studying about the environmental and social conditions in the vicinity of the project
  - Informed that the locals will be apprised with updated progress reports and future plans/agendas of the project, contents of the ESIA report, socio-eco studies and related questionnaires, results of the previous ESIA reports.

U Yin Htwe, Township Administrator – You all have given an incredible explanation of the operations of the project. You should also keep using laymen terms to ensure that the villagers understand the information you are trying to communicate. You must specifically take your time to explain what this project will bring for the locals, how you will be dealing if there are dissatisfaction among the locals and how the logistics of the project will be dealt with. You also must explain them that they will be fully reimbursed for their loss of farmland and that the logistics regarding carrying of chemical products to the project site will be done meticulously to avoid any spillage.

The ESIA team led by Dr. Ohnmar May Tin Hlaing will have to be patient when explaining these matters to the locals as they are not familiar with the technicalities of the operation. You will also have to mention that the ESIA team has also studied all the potential risks that can come from this project and that any activity that can be harmful to the villagers will not be permitted to carry out by the company. This will help to reduce the worry and stress of the villagers.

As a representative of the management body, I understand the operations involved in the project and I am also aware that the team members will finish the work to the best of their capabilities to ensure that there won't be much risk posed to the locals.

Attendance List for Thae Gone Township

No	Contact person	Organization	Contact Details
1	U Yin Htwe (Township Administrator)	General Administration Department, Thaegone	09256146644
2	U Han Aye	Settlement and Land Records Department	09251101202
3	U Thein Zaw (Assistant Director)	Department of Planning	09456400962
4	U Win Naing Swe (Manager)	MOGE	09767615074
5	Mr. Rajiv Nischal (Country Manager)	ONGC Videsh Limited	017536573
6	U Kyaw Zaw Han (Manager)	ONGC Videsh Limited	09974748400
7	U Aung Win (Staff Officer)	Department of Agriculture	0943134916
8	U Win Ko	Department of Agricultural Land Management and Statistics	09250561225
9	U Nay Linn Oo	General Administration Department, Thaegone	09250408500
10	Daw Chit Win Thone	Department of Information and Communications	09255826472
11	Dr Ohnmar May Tin Hlaing	Environmental Quality Management Co., Ltd (EQM)	095016606
12	Daw New New Win	(EQM)	09793267856
13	Daw Zu Zu Aung	(EQM)	09797945932
14	U Thet Paing Phyo	(EQM)	09256215545
15	U Ye Phyo Han	(EQM)	09968820001

Photos Section for the meeting held in Thae Gone Township

Meeting at the Tae Gone Township

Presented by U Kyaw Zaw Han, OVL

Presented by Dr. Ohnmar May Tin Hlaing, EQM

Comment from U Yin Htwe, Township Administrator

Appendix 6

Attachment 1: MOGE Approval Letters for Well Locations and Names

MOGE Approval of Well Locations

ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံတော်အစိုးရ
လျှပ်စစ်နှင့်စွမ်းအင်ဝန်ကြီးဌာန
မြန်မာ့ရေနံနှင့်သဘာဝဓာတ်ငွေ့လုပ်ငန်း
MYANMA OIL AND GAS ENTERPRISE

076889

FAX : 067-411125
TEL : 067-411055, 411056

M.O.G.E

P.O BOX NO. 1049
BUILDING NO.44
NAY PYI TAW, THE REPUBLIC OF THE UNION OF MYANMAR.

Letter No: MD (20) 3/6 (585) 2019
Date : 5 September, 2019

Mr. Rajiv Nischal
Country Manager
ONGC Videsh Ltd.

Subject: **Release of 2 Wells Drilling Location in EP3 Block**

Reference: ONGC's Letter No: OVL/ MYANMAR/MOGE/284 dated September 2, 2019

Dear Mr. Rajiv Nischal,

First of all, we would like to express our appreciation to ONGC Videsh Ltd. for the proposal two well locations in EP3 block on the basis of G&G study in EP-3 block.

Regarding the above reference letter, our MOGE G&G team reviewed and we technically accepts to approve the two following locations you proposed:

1) Location: "B" (Lat: 18° 45' 1.997" N; Long: 95° 27' 45.1252") of which primary target in Kyaukkok Formation at 1300 meters and secondary target in Pyawbwe Formation at 1850 meters
2) Location: "A" (Lat: 18° 32' 3.3408" N; Long: 95° 24' 54.8260") to explore the hydrocarbon potential in Obogon Fromation at 3420 meters and Kyaukkok Formation at 5050 meters

Although we approve the Location "A" for necessary preparation in time, you understand that more G&G studies and technical support from PSM is required to reduce the risk of exploration on such a clinoform structure. We urge you to to revisit on study of Location "A" and perform more investigations from all aspects available.

Furthermore, MOGE would like to advise you to propose atleast three alternative well names for each location instead of Thida-1 and Lapia-1. For your consideration, our practice of naming well is based on geographic places especially and we are looking forward to hearing your reply.

Your cooperation is highly appreciated.

Sincerely yours,

For Managing Director
Nyan Tun (Director- Exploration and Development)
Myanma Oil and Gas Enterprise

CC: Directors (Planning) (Admin) (Finance) (Drilling)
Dy. Director (E&D) (TSC) / CG/ CGP

MOGE Approval of Well Names Naweng-1 and Payama-1

ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံတော်အစိုးရ
လျှပ်စစ်နှင့်စွမ်းအင်ဝန်ကြီးဌာန
မြန်မာ့ရေနံနှင့်သဘာဝဓာတ်ငွေ့လုပ်ငန်း
MYANMA OIL AND GAS ENTERPRISE

075721

FAX : 067-411125
TEL : 067-411055, 411056

M.O.G.E

P.O BOX NO. 1049
BUILDING NO.44
NAY PYI TAW, THE REPUBLIC OF THE UNION OF MYANMAR.

Letter No: MD (20)3/6(740) 2019
Date: November 20, 2019

Mr. Rajiv Nischal
Country Manager
ONGC Videsh Ltd., Myanmar Branch

Subject: **Giving Well Names as *Naweng-1* for Location-A and *Payama-1* for Location B in Onshore Block EP-3**

Reference: ONGC Videsh Ltd., Myanmar Branch Letter No: OVL/MYANMAR/MOGE/292 dated 5th November 2019

Dear Mr. Rajiv Nischal,

Regarding the above subject and reference letter, ONGC Videsh Ltd. requested MOGE to give the official well names for two exploration well locations A and B, block EP-3.

Please be informed that the official well name is given as Naweng-1 (နဝင်း-၁) for Location-A and Payama-1 (ဘုရားမ-၁) for Location B.

Sincerely yours,

For Managing Director
Thet Tun (Director-Exploration & Development)
Myanma Oil and Gas Enterprise

CC: Director (Planning)/ (Drilling)/ (Engineering)/ (Administration)
CG
File

Attachment 2: Forest Department Approval Letter for Payama-1 Well Access Road

Off 05327067, 05327069
Fax 05327068
Hotline 09454803155 / AD-09778902268
pyaydistrictfd@gmail.com
FD Pyay District
PYAY District AD

လက် ထောက် ညွှန် ကြား ရေး မှူး ရုံး
သစ် တော ဦး စီး ဌာ နံ
ပြည် ခ ရိုင် - ပြည် မြို့
စာအမှတ်။၁၂၂၆-၂၈/၈(က)၂/ရေနံအစမ်းတွင်း။
ရက် စွဲ ။၂၀၂၀ပြည့်နှစ်၊ ဒီဇင်ဘာလ ၂၄ ရက်။

သို့
Country Manager
ONGC Videsh Ltd 346/354
Room no (4003)4th Floor Pyay
Garden Office Tower, Pyay Road
Sanchaung
Yangon

အကြောင်းအရာ။ ။ ရေနံလုပ်ကွက်အမှတ် Block EP-3 အစမ်းတွင်း Payama-1 တူးဖော်ဆောင်ရွက်ခွင့်ရရှိရေးကိစ္စ။

ရည်ညွှန်းချက်။ (၁) ညွှန်ကြားရေးမှူးရုံး၊ သစ်တောဦးစီးဌာန၊ ပဲခူးတိုင်းဒေသကြီး၊ ပဲခူးမြို့ ၏ ၁၁-၁၂-၂၀၂၀ရက်စွဲပါစာအမှတ်၊ ၅၂၂၀-၂၁/စီမံကိန်း/ ရေနံအစမ်း တွင်း။
(၂) လက်ထောက်ညွှန်ကြားရေးမှူးရုံး၊ သစ်တောဦးစီးဌာန၊ ပြည်ခရိုင် ၏ ၁၅-၁၂-၂၀၂၀ရက်စွဲပါစာအမှတ်၊၁၁၇၆၃-၆၄/စ(က)၂/ရေနံအစမ်းတွင်း။

၁။ အကြောင်းအရာပါကိစ္စနှင့် ပတ်သက်၍ ပဲခူးတိုင်းဒေသကြီး၊ ပြည်ခရိုင်အတွင်း ONGC VIDESH Co.,Ltd က လျှောက်ထားသည့် ရေနံလုပ်ကွက် Block EP-3 တွင် အစမ်းတွင်းတူးဖော်ခြင်း၊ တွင်းတူးဝန်ထမ်းများနေထိုင်ခြင်း၊ လုပ်ငန်းသုံးပစ္စည်းနှင့်ယာဉ်ယန္တရားများ ထားရှိအသုံးပြုမည့် ဧရိယာ (၁၃၀ မီတာ x ၁၃၀ မီတာ)(၄.၁၇)ကေနှင့် ယခင်လမ်းဖောက်လုပ်သုံးစွဲခဲ့သည့် လမ်းဟောင်းနှင့် ကျေးရွာကြံထုတ်လမ်းကိုအခြေပြု၍ (၆ မီတာ x ၃၅၀ မီတာ) (၀.၅၂) ကေတို့နှင့် ပတ်သက်၍ အပင်ကြီးများပေါက်ရောက်မှု နည်းပါးခြင်း၊လျှပ်စစ်နှင့်စွမ်းအင်ဝန်ကြီးဌာနမှ ထပ်မံညှိနှိုင်းလာခြင်း ဖြစ်ပြီးယခင်လျှောက်ထားသည့်ဧရိယာအောက်လျော့နည်းခြင်းတို့ကြောင့် မလွတ်ကင်းသည့်သစ်မျိုးစုံ စုစုပေါင်း(၁၈၀)ပင်အတွက် ဌာနကသတ်မှတ်ထားသည့် အပင်လျော်ကြေးငွေ ပေးဆောင်စေပြီး ကျွဲကျော်ယာမြေ(၃)ကေအား ကုမ္ပဏီမှ သက်ဆိုင်သူယာသမားများနှင့် ညှိနှိုင်းဆောင်ရွက်မည်ဖြစ်ကြောင်း၊ ဂေဟစနစ်ဖြည့်တင်းရေး စိုက်ခင်း (၁) ကေအား ရာနှုန်းပြည့်ရှင်သန်အောင်မြင်အောင် စိုက်ပျိုးမည်ဖြစ်ကြောင်းနှင့် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဥပဒေ၊ နည်းဥပဒေ၊ အမိန့်ညွှန်ကြားချက်များကို လိုက်နာမည်ဖြစ်ကြောင်း စသည့်ဝန်ခံကတိများဖြင့် မြေ (၄.၁၇) ကေနှင့် (၀.၅၂) ကေတို့အား တစ်နှစ်လျှင် မြေငှားရမ်းခ(၁)ကေ (၁၀၀,၀၀၀/-)ကျပ်နှုန်းဖြင့် မြေငှားရမ်းခပေးသွင်းစေပြီး နှစ်စဉ် မြေငှားရမ်းစနစ်ဖြင့် ခွင့်ပြုကြောင်း ပြည်ထောင်စုဝန်ကြီးရုံးမှ အကြောင်းကြားလာပါသည်။

၂။ ထိုသို့ အကြောင်းကြားမှုအပေါ် ကုမ္ပဏီအား ပဲခူးတိုင်းဒေသကြီး၊ ပြည်ခရိုင်အတွင်း အစမ်းတွင်းတူးဖော်ခြင်း၊ တွင်းတူးဝန်ထမ်းများနေထိုင်ခြင်း၊ လုပ်ငန်းသုံးပစ္စည်းနှင့် ယာဉ်ယန္တရားများထားရှိအသုံးပြုမည့် ရေနံလုပ်ကွက်အမှတ် Block EP-3 အစမ်းတွင်း Payama-1 အတွက် မြေ(၄.၁၇) ကေနှင့်(၀.၅၂)ကေတို့အား ခွင့်ပြုကြောင်းနှင့် သစ်တောဦးစီးဌာန၊ ရုံးအမှတ်(၃၉)၊ နေပြည်တော်တွင် ကုမ္ပဏီမှသွားရောက်စာချုပ် ချုပ်ဆိုနိုင်ရေးအတွက် အောက်ပါအတိုင်း ဆောင်ရွက်ပြုစုပေးပို့ရန် သစ်တောဦးစီးရုံးချုပ် စာမိတ္တူ ပူးတွဲ၍ ရည်ညွှန်း (၁) ပါစာဖြင့် အကြောင်းကြားခြင်းအပေါ် ရည်ညွှန်း (၂)ပါစာဖြင့် မိတ္တူပေးပို့ အကြောင်းကြားထားပြီးဖြစ်ပါသည်-

(က) ခွင့်ပြုမြေဧရိယာ (၁)ကေလျှင်လုပ်ငန်းအာမခံငွေကျပ်(၁၀၀,၀၀၀/-)နှုန်းဖြင့် ပေးသွင်း၍ မြန်မာ့စီးပွားရေးဘဏ် (သို့မဟုတ်) မြန်မာနိုင်ငံတော်ဗဟိုဘဏ်က အသိ အမှတ်ပြုထားသော ပုဂ္ဂလိကဘဏ်တစ်ခုခုတွင် Performance Guarantee ထားရှိ တင်ပြရန်၊

(ခ) မြေငှားရမ်းခ အခွန်ငွေ(၁)ကေလျှင် (၁၀၀,၀၀၀/-) (ကျပ်တစ်သိန်းတိတိ) နှုန်းဖြင့် (၄.၆၉)ကေအတွက် မြေငှားခပေးသွင်းရန်နှင့် ဘဏ်ချေလန်မိတ္တူ တင်ပြရန်၊

(ဂ) မြေငှားရမ်းခကောက်ခံရရှိမှုအပေါ် ကုန်သွယ်ခွန်ပေးသွင်းစေပြီး ချေလန်မိတ္တူပြန်လည် တင်ပြရန်၊

(ဃ) ဂေဟစနစ်ဖြည့်တင်းရေး စိုက်ခင်း(၁)ကေအား ရာနှုန်းပြည့် ရှင်သန်အောင်မြင်အောင် စိုက်ပျိုးမည်ဖြစ်ကြောင်း၊ နယ်နိမိတ်အမှတ်အသားများ ထင်ရှားစွာ စိုက်ထူမည်ဖြစ်ကြောင်း၊ ကျူးကျော်ယာမြေ (၃) ကေအား ကုမ္ပဏီမှ သက်ဆိုင်သူ ယာသမားများနှင့် ညှိနှိုင်း ဆောင်ရွက်မည် ဖြစ်ကြောင်းနှင့် ပတ်ဝန်းကျင် ထိန်းသိမ်းရေး ဥပဒေ၊ နည်းဥပဒေ၊ အမိန့်ညွှန်ကြားချက်များကို လိုက်နာမည်ဖြစ်ကြောင်း ဝန်ခံကတိရယူ တင်ပြရန်၊

(င) မလွတ်ကင်းသည့် သစ်မျိုးစုံ စုစုပေါင်း (၁၈၀) ပင်အတွက် ဌာနက သတ်မှတ်ထားသည့် အပင်လျော်ကြေးငွေ ပေးဆောင်စေပြီးကြောင်း ပြန်လည်တင်ပြရန်၊

(စ) စာချုပ်ချုပ်ဆိုမည့်ပုဂ္ဂိုလ် (အုပ်ချုပ်မှုဒါရိုက်တာ) နှင့် အသိသက်သေ၏ ကိုယ်ရေးအချက်အလက်များ-
(၁) အမည်၊
(၂) မှတ်ပုံတင်အမှတ်၊
(၃) နေရပ်လိပ်စာ၊
(၄) တယ်လီဖုန်းအမှတ်၊

၃။ သို့ဖြစ်ပါ၍သစ်တောဦးစီးဌာန၊ရုံးအမှတ်(၃၉)၊ နေပြည်တော်တွင်ကုမ္ပဏီမှသွားရောက်စာချုပ်ချုပ်ဆိုနိုင်ရေး အထက်အပိုဒ် (၂) (က) အရ ONGC ကုမ္ပဏီမှ တာဝန်ရှိ ပုဂ္ဂိုလ်၏ အမည်၊ မှတ်ပုံတင်အမှတ်၊နေရပ်လိပ်စာ၊(ဃ)အရ ဝန်ခံကတိပြုမည့်သူနှင့် အသိသက်သေ(၁)ဦး၏ အမည်၊ မှတ်ပုံတင်အမှတ်၊ နေရပ်လိပ်စာ၊ (စ)အရ စာချုပ် ချုပ်ဆိုမည့် (အုပ်ချုပ်မှုဒါရိုက်တာ)နှင့် အသိသက်သေ၏ကိုယ်ရေးအချက်အလက်များ၊အမည်၊ မှတ်ပုံတင်အမှတ်၊နေရပ်လိပ်စာ၊ တယ်လီဖုန်းအမှတ်များပေးပို့ပါရန်မေတ္တာရပ်ခံ ညှိနှိုင်းအကြောင်းကြားပါသည်။

(မြင့်သိန်းဦး)
လက်ထောက်ညွှန်ကြားရေးမှူး
သစ်တောဦးစီးဌာန
ပြည်ခရိုင်

မိတ္တူကို-
- မြန်မာ့ရေနံနှင့်သဘာဝဓါတ်ငွေ့လုပ်ငန်း၊ နေပြည်တော်ထံသိသာနိုင်ပါရန်နှင့်လိုအပ်သည်များကို လမ်းညွှန်မှုပြုပေးနိုင်ပါရန် တင်ပြချက်ဖြင့် မိတ္တူပေးပို့ပါသည်။
- မြို့နယ်ဦးစီးဌာနမှူး၊ သစ်တောဦးစီးဌာန၊ သဲကုန်းမြို့နယ်။
- ရုံးလက်ခံ။ - မျောစာတွဲ။

Attachment 3: Provisions to Forest Department for Use of Payama-1 Site

Establishment Plan for Ecological Park

လျပ်စစ်နှင့်စွမ်းအင်ဝန်ကြီးဌာန

မြန်မာ့ရေနံနှင့်သဘာဝဓါတ်ငွေ့လုပ်ငန်း၊ ၄င်းနှင့်အကျိုးတူပူးပေါင်းဆောင်ရွက်လျက်ရှိသည့်

ONGC Videsh Limited

ओएनजीसी विदेश
ONGC VIDESH

၂၀၂၁ - ၂၀၂၂ ခုနှစ်

ပဲခူးတိုင်းဒေသကြီး၊ ပြည်ခရိုင်၊ သဲကုန်းမြို့နယ်၊ ရှားပြင်ကြီးဝိုင်း၊

EP-3 လုပ်ကွက်အတွင်း ရှာဖွေရေးတွင်းအမှတ် ဘုရားမ- ၁
ရေနံစမ်းသတ်တူးဖော်ရာတွင် ဂေဟစနစ်ဖြည့်တင်းရေးစိုက်ခင်း

(၁)ဧကအား ရာနှုန်းပြည့်ရှင်သန်အောင်မြင်အောင်စိုက်ပျိုးမည့်စီမံချက်

ရက်စွဲ၊ ၂၀၂၁ခုနှစ်၊ နိုဝင်ဘာလ ၁၁ ရက်

မြန်မာ့ရေနံနှင့်သဘာဝဓါတ်ငွေ့လုပ်ငန်း၊ ၄င်းနှင့် အကျိုးတူပူးပေါင်းဆောင်ရွက်လျက်ရှိသည့် ONGC Videsh Limited က ပဲခူးတိုင်းဒေသကြီး၊ ပြည်ခရိုင်၊ သဲကုန်းမြို့နယ်၊ ရှားပြင်ကြီးဝိုင်း၊ EP-3 လုပ်ကွက်အတွင်း ရှာဖွေရေးတွင်းအမှတ် ဘုရားမ- ၁ ရေနံစမ်းသတ်တူးဖော်ရာတွင် ဂေဟစနစ်ဖြည့်တင်းရေးစိုက်ခင်း (၁)ဧက အား ရာနှုန်းပြည့်ရှင်သန်အောင်မြင်အောင်စိုက်ပျိုးမည့်စီမံချက်

နိဒါန်း

၁။ မြန်မာ့ရေနံနှင့်သဘာဝဓါတ်ငွေ့လုပ်ငန်း၊ ၄င်းနှင့်အကျိုးတူပူးပေါင်းဆောင်ရွက်လျက်ရှိသည့် ONGC Videsh Limited က ပဲခူးတိုင်းဒေသကြီး၊ ပြည်ခရိုင်၊ သဲကုန်းမြို့နယ်၊ ရှားပြင်ကြီးဝိုင်း၊ EP-3 လုပ်ကွက်အတွင်း ရှာဖွေရေးတွင်း အမှတ် ဘုရားမ- ၁ ရေနံစမ်းသတ်တူးဖော်ရန်အတွက် သယံဇာတနှင့်သဘာပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာန၊ သစ်တောဦးစီးဌာနက ခွင့်ပြုပေးခဲ့ပြီးဖြစ်ပါသည်။

ရည်ရွယ်ချက်

၂။ ရှာဖွေရေးတွင်းအမှတ် နဝင်း-၁အားရေနံစမ်းသတ်ရှာဖွေတူးဖော်ရာတွင် လူနေစခန်း၊လုပ်ငန်းသုံးပစ္စည်းများနှင့် ယာဉ်ယဉ်ကျေးများထားရှိအသုံးပြုမည့် ရှားပြင်ကြီးဝိုင်းမြေနေရာ (၄.၆၉) ဧကအတွက် သစ်တောပြုန်းတီးမှုကိုကာကွယ်ရန်၊ သယံဇာတနှင့်သဘာပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာန၊သစ်တောဦးစီးဌာန၏လိုလားချက်နှင့်အညီ ထိခိုက်ပျက်စီးသွားမည့်သစ်ပင်များအစား ဂေဟစနစ်ဖြည့်တင်းရေးစိုက်ခင်း (၁)ဧကအား ရာနှုန်းပြည့်ရှင်သန်အောင်မြင်အောင် ပြန်လည်စိုက်ပျိုးပေးသွားရန်ဖြစ်ပါသည်။

စီမံချက်ကာလ

၃။ ဂေဟစနစ်ဖြည့်တင်းရေးစိုက်ခင်း(၁)ဧကအား ၂၀၂၂-၂၀၂၃ ဘဏ္ဍာရေးနှစ်အတွင်း ရာနှုန်းပြည့်ရှင်သန်အောင် စိုက်ပျိုးသွားမည့်ဖြစ်ပါသည်။

စိုက်ပျိုးမည့်တည်နေရာ

၄။ ဂေဟစနစ်ဖြည့်တင်းရေးစိုက်ခင်း(၁)ဧကအား သယံဇာတနှင့်သဘာပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာန၊ သစ်တောဦးစီးဌာနက စီမံပိုင်ခွင့်ရှိသော ပဲခူးတိုင်းဒေသကြီး၊ ပြည်ခရိုင်၊ သဲကုန်းမြို့နယ်၊ ရှားပြင်ကြီးဝိုင်းအတွင်း အကွက်အမှတ် (၂၈)တွင် စိုက်ပျိုးသွားမည်ဖြစ်ပါသည်။

စိုက်ခင်းအမျိုးအစားနှင့် သစ်မျိုး

၅။ သစ်တောကြီးဝိုင်း၏ ဂေဟမြေအနေအထားအရ ယူကလစ်ပင်များသာ စိုက်ပျိုးပါမည်။

စာချုပ်ချုပ်ဆိုခြင်း

၆။ စာချုပ်လက်မှတ်ရေးထိုးမည့်ပုဂ္ဂိုလ်နှင့် အသိသက်သေများ၏ ကိုယ်ရေးအချက်အလက်များမှာ ပူးတွဲပါအတိုင်းဖြစ်ပါသည်။

လုပ်ငန်းဆောင်ရွက်မည့်နည်းစနစ်များ

၇။ အောက်ပါအတိုင်းဖြစ်ပါသည်-

(က) မြေနေရာရွေးချယ်ခြင်း။ ပဲခူးတိုင်းဒေသကြီး၊ ပြည်ခရိုင်၊ သဲကုန်းမြို့နယ်၊ ရှားပြင်ကြီးဝိုင်းအတွင်း အကွက်အမှတ် (၂၈) အတွင်းတွင်ဖြစ်ပါသည်။ ပူးတွဲမြေပုံပါနေရာအတိုင်းဖြစ်ပါသည်။

(ခ) **စိုက်ပျိုးမြေပြင်ပြုပြင်ခြင်း။** စိုက်ပျိုးရန်မြေနေရာပြုပြင်ခြင်းလုပ်ငန်းကို ၂၀၂၂ခုနှစ်၊ ဇွန်လ အတွင်းပြီးစီးအောင်ဆောင်ရွက်သွားမည်ဖြစ်ပါသည်။

(ဂ) **ပျိုးပင်စုဆောင်းခြင်း။** ယူကလစ်ပျိုးပင်များအား နီစပ်ရာပတ်ဝန်းကျင်ဒေသများမှ (၁) ဧက အတွက် ပျိုးပင် (၁၂၁၀)ပင်အား ဝယ်ယူပျိုးထောင်သွားမည်ဖြစ်ပါသည်။

(ဃ) **ပန္နက်ရိုက်ခြင်း။** (၆မေ x ၆မေ) အကွာအဝေးဖြင့် (၁)ဧကအတွက် ပန္နက်ပေါင်း ၁၂၁၀ အား ၂၀၂၂ခုနှစ်၊ ဇူလိုင်လကုန်အတွင်းတွင် အပြီးဆောင်ရွက်သွားမည်ဖြစ်ပါသည်။

(င) **ကျင်းတူးခြင်း။** ပန္နက်ရိုက်ခြင်းလုပ်ငန်းပြီးစီးပါက ကျင်းတူးခြင်းလုပ်ငန်းအား သဘာဝမြေဩဇာများထည့်သွင်းခြင်းနှင့်အတူ ဆက်လက်ဆောင်ရွက်သွားပါမည်။

(စ) **စိုက်ပျိုးခြင်း။** လုံလောက်သောမိုးရေရှိရန်နှင့် ပျိုးပင်များရှင်သန်ဖြစ်ထွန်းစေရန်အတွက် စိုက်ပျိုးခြင်းလုပ်ငန်းကို ၂၀၂၂ခုနှစ်၊ ဩဂုတ်လ ပထမပတ်အတွင်းတွင်ပြီးစီးအောင်စိုက်ပျိုးသွားမည်။

ပြုစုထိန်းသိမ်းစောင့်ရှောက်ခြင်း

၈။ အောက်ပါအတိုင်းအဆင့်ဆင့်ဆောင်ရွက်သွားပါမည်-

(က) **ပေါင်းမြက်ရှင်းလင်းခြင်း။** ပေါင်းမြက်ရှင်းလင်းခြင်းကို စိုက်ခင်းတည်ထောင်ပြီးသည့်နောက် ပထမနှစ် (၃) ကြိမ်၊ ဒုတိယနှစ် (၂) ကြိမ်ဆောင်ရွက်သွားပါမည်။

(ခ) **သေပင်ဖါထေးခြင်း။** စိုက်ပျိုးပြီး အကြောင်းအမျိုးမျိုးကြောင့်သေကြေပျက်စီးသည့် စိုက်ပင်များအား ဖါထေးခြင်းလုပ်ငန်းကို ၂၀၂၂ခုနှစ်၊ ဩဂုတ်လကုန်ပိုင်းတွင် အပြီးဆောင်ရွက်ပါမည်။

(ဂ) **မြေတောင်မြှောက်ခါးဆွခြင်း။** စိုက်ပင်ကိုဗဟိုပြု၍ (၃)ပေအကျယ်အပြောင်ရှင်းလင်းက မြေတောင်မြှောက်ခါးဆွခြင်းလုပ်ငန်းကိုဆောင်ရွက်ပါမည်။

(ဃ) **ခါတ်မြေဩဇာကျွေးခြင်း။** အပင်များရှင်သန်နိုင်ရန်အတွက် လုံလောက်သောအာဟာရရရှိရေးအတွက် လိုအပ်သလိုခါတ်မြေဩဇာကျွေးခြင်းလုပ်ငန်းများအားဆောင်ရွက်သွားပါမည်။

(င) **မီးဘေးကာကွယ်ခြင်း။** မီးဘေးကာကွယ်ခြင်းလုပ်ငန်းကို ၂၀၂၃ခုနှစ်၊ ဇန်နဝါရီလမှ စတင်ကာ အတွင်း/ အပြင်မီးတားလမ်းများဖေါက်လုပ်မည်ဖြစ်ပြီး (၃)နှစ်သားအထိဆောင်ရွက်သွားမည်ဖြစ်ပါသည်။

ကြီးကြပ်မည့်ဝန်ထမ်းအင်အား

၉။ လုပ်ငန်းကျွမ်းကျင်သော ဒေသခံတောင်သူများအားငှားရမ်း၍ ONGC Videsh Limitedမှ တာဝန်ရှိဝန်ထမ်းများက၊ သက်ဆိုင်ရာမြို့နယ်သစ်တောဦးစီးဌာနရှိ အရာရှိ/ ဝန်ထမ်းများထံက အကြံဉာဏ်များရယူကာ ကြီးကြပ်ဆောင်ရွက်သွားမည်ဖြစ်ပါသည်။

နိဂုံး

၁၀။ ဂေဟစနစ်ဖြည့်တင်းရေးစိုက်ခင်း (၁)ဧကအတွက်စိုက်ပျိုးခြင်းအား ရာနှုန်းပြည့်ရှင်သန်အောင်မြင်အောင် ထိန်းသိမ်းစောင့်ရှောက်သွားမည်ဖြစ်ပြီး အဆိုပါစိုက်ခင်း၏အောင်မြင်ဖြစ်ထွန်းမှုအခြေအနေကိုလည်း မှတ်တမ်းခါတ်ပုံများနှင့်အတူပြန်လည်တင်ပြပေးသွားမည်ဖြစ်ပါသည်။

(For)
Country Manager
ONGC VIDESH. LTD
Kyaw Zaw Htun

မြန်မာ့ရေနံနှင့်သဘာဝဓါတ်ငွေ့လုပ်ငန်း၊ ၄င်းနှင့် အကျိုးတူပူးပေါင်းဆောင်ရွက်လျက်ရှိသည့်
ONGC Videsh Limited

ကတိဝန်ခံချက်

ပဲခူးတိုင်းဒေသကြီး၊ ပြည်ခရိုင်၊ သဲကုန်းမြို့နယ်၊ ရှားပြင်ကြီးဝိုင်းအတွင်း၊အကွက်အမှတ်(၂၈)တွင် ဂေဟစနစ်ဖြည့်တင်းရေးစိုက်ခင်း (၁)ဧကအား ရာနှုန်းပြည့်ရှင်သန်အောင်မြင်အောင် စိုက်ပျိုးတည်ထောင်မည်ဖြစ်ပါကြောင်း ဝန်ခံကတိပြုပါသည်။

(For) Country Manager
ONGC VIDESH. LTD.
Kyaw Zaww Han

မြန်မာ့ရေနံနှင့်သဘာဝဓါတ်ငွေ့လုပ်ငန်း၊ ၄င်းနှင့် အကျိုးတူပူးပေါင်းဆောင်ရွက်လျက်ရှိသည့်
ONGC Videsh Limited

ကတိဝန်ခံချက်

မြန်မာ့ရေနံနှင့်သဘာဝဓါတ်ငွေ့လုပ်ငန်း၊ ၄င်းနှင့်အကျိုးတူပူးပေါင်းဆောင်ရွက်လျက်ရှိသည့် ONGC Videsh Limited တို့က ပဲခူးတိုင်းဒေသကြီး၊ ပြည်ခရိုင်၊ သဲကုန်းမြို့နယ်၊ ရှားပြင်ကြီးဝိုင်း၊ EP-3 လုပ်ကွက်အတွင်း ရှာဖွေရေးတွင်းအမှတ် ဘုရားမ-၁ ရေနံစမ်းသတ်တူးဖော်ရာတွင် လူနေစခန်း၊လုပ်ငန်းသုံးပစ္စည်းများနှင့် ယာဉ်ယန္တရားများထားရှိအသုံးပြုမည့် ရှားပြင်ကြီးဝိုင်းမြေနေရာ (၄.၆၉)ဧကအတွင်းရှိ ကျူးကျော်ယာမြေ(၃)ဧကနှင့်ပတ်သက်၍ သက်ဆိုင်သူယာသမားများနှင့်ညှိနှိုင်းဆောင်ရွက်သွားမည်ဖြစ်ကြောင်း ဝန်ခံကတိပြုပါသည်။

(For) Country Manager
ONGC VIDESH. LTD.
Kyaw Zaww Han

ယခုကာလစိုက်ခင်း (၁)ဧကအတွက် စိုက်ခင်းတည်ထောင်ခြင်းလုပ်ငန်းအချိန်ပြဇယား

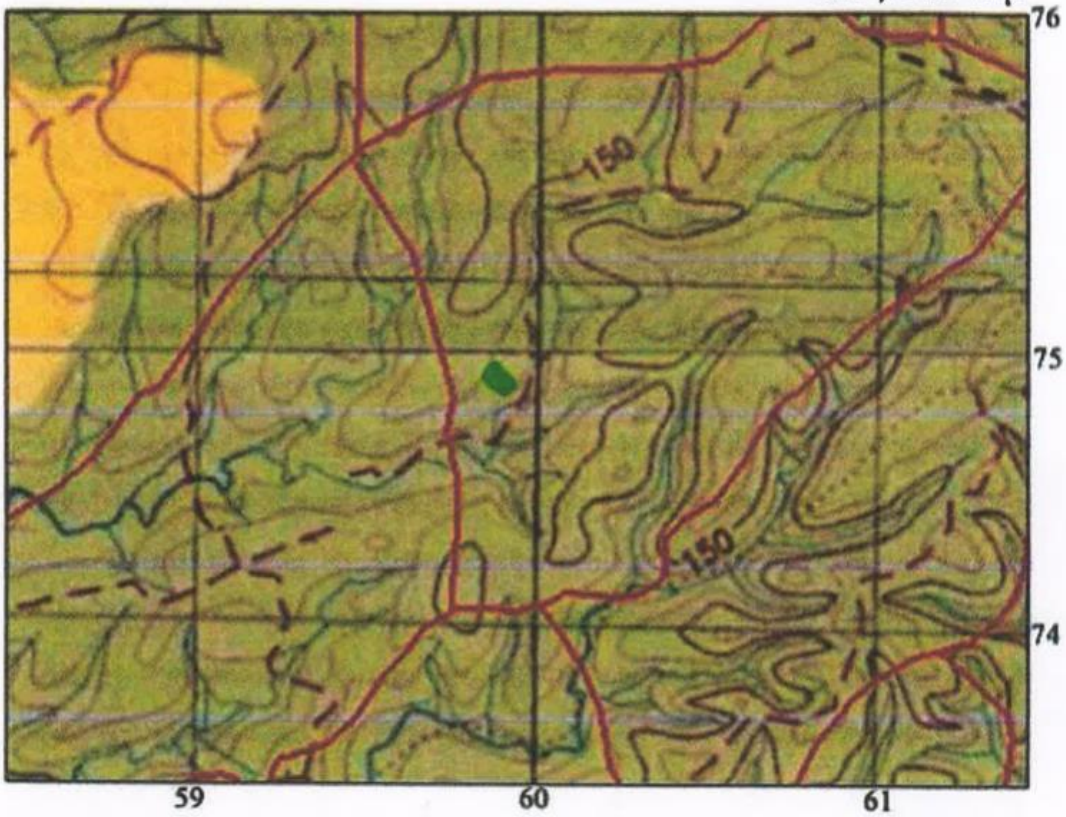
လုပ်ငန်းအမျိုးအစား	ဇန်	ဖေ	မတ်	ဧပြီ	မေ	ဇွန်	ဇူလိုင်	ဩ	စက်	အောက်	နို	ဒီ
စိုက်ခင်းမြေနေရာ												
ရွေးချယ်တိုင်းတာခြင်း၊ စိုက်ခင်းမြေပြုပြင်ခြင်း												
မျိုးပင်ဝယ်ယူ စုဆောင်းခြင်း												
ပန္နက်ရိုက်ခြင်း/ မြေကျင်းတူးခြင်း												
စိုက်ပျိုးခြင်း												
ပေါင်းရှင်းခြင်း												
အပင်ဖါထေးခြင်း												
မီးဘေးကာကွယ်ခြင်း (၂၀၂၃ ဖေဖော်ဝါရီ)												

(For) Country Manager
ONGC VIDESH. LTD.
Kyaw Zaww Han

မြည်ခရိုင် ၊ သဲကုန်းမြို့နယ် ၊ ရွာပြင်ကြီးဝိုင်း၊ အကွက်အမှတ်(၂၈)အတွင်း
ONGC VIDESH ကုမ္ပဏီမှ ကွင်းဆင်းတူးဖော်မည့် မြေနေရာအတွက်
ဂေဟစနစ်ဖြည့်တင်းရေးစိုက်ခင်း(၁)ဧက၏ ဧရိယာပြမြေပုံ

N
W E
S

စကေး ၄ လက်မ - ၁ မိုင်



ရည်ညွှန်းချက်

- မြို့နယ်နယ်နိမိတ်
- ကြိုးဝိုင်းနယ်နိမိတ်
- အကွက်နယ်နိမိတ်
- ချောင်း/မြောင်း
- လူသွားလမ်း
- စိုက်ခင်းတည်နေရာ

မြေပုံချပ်အမှတ် ၊ **1895-05,06**

ခန့်မှန်းမြေပုံအညွှန်း ၊ **46Q-GR-747598**

(ပြဲ) Country Manager
ONGC VIDESH. LTD.

ဝင်းနိုင်ဆွေ (ဝ၃ဝ၈၂)
မန်နေဂျာ(လုံခြုံရေး)
မြည်ရေနံမြေ

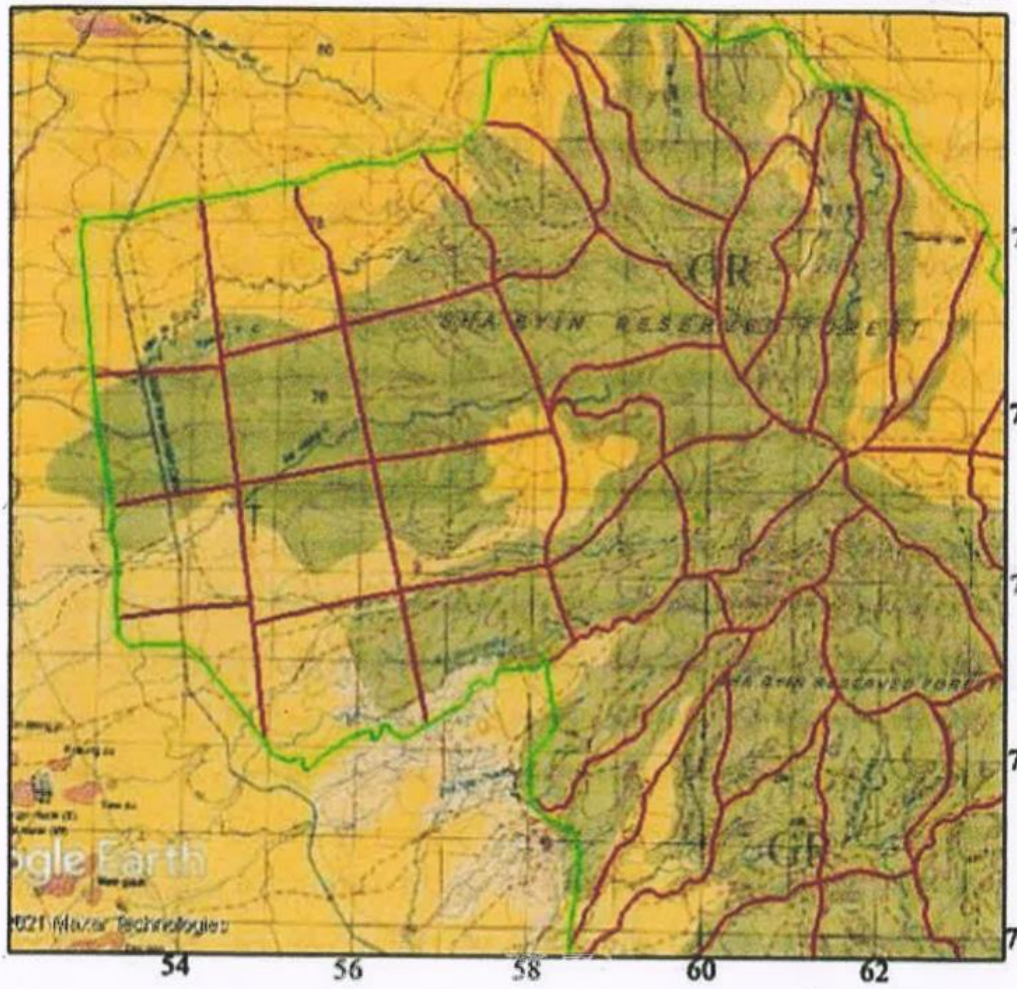
(သန်းဇော်ဌေး)
တောအုပ်
သစ်တောဦးစီးဌာန
သဲကုန်းမြို့

(မျိုးမြင့်ကို)
မြို့နယ်ဦးစီးဌာနမှူး
သစ်တောဦးစီးဌာန
သဲကုန်းမြို့

မြည်ခရိုင် ၊ သဲကုန်းမြို့နယ် ၊ ရွာမြင်ကြီးဝိုင်း အကွက်အမှတ်(၂၈)အတွင်း
ONGC VIDESH ကုမ္ပဏီမှ ကွင်းဆင်းတူးဖော်မည့် မြေနေရာအတွက်
ဂေဟစနစ်ဖြည့်တင်းရေးဝိုက်ခင်း(၁)ကေ၏ တည်နေရာပြမြေပုံ

N
W E
S

စကေး ၁ လက်မ - ၁ မိုင်



ညွှန်းချက်
မြို့နယ်နယ်နိမိတ်
ကြီးဝိုင်းနယ်နိမိတ်
အကွက်နယ်နိမိတ်
ချောင်း/မြောင်း
လူသွားလမ်း
နိုက်ခင်းတည်နေရာ

မြေပုံချမ်းအနှစ် ၊ 1895-05,06
ခန့်မှန်းမြေပုံအညွှန်း ၊ 46Q-GR-747598

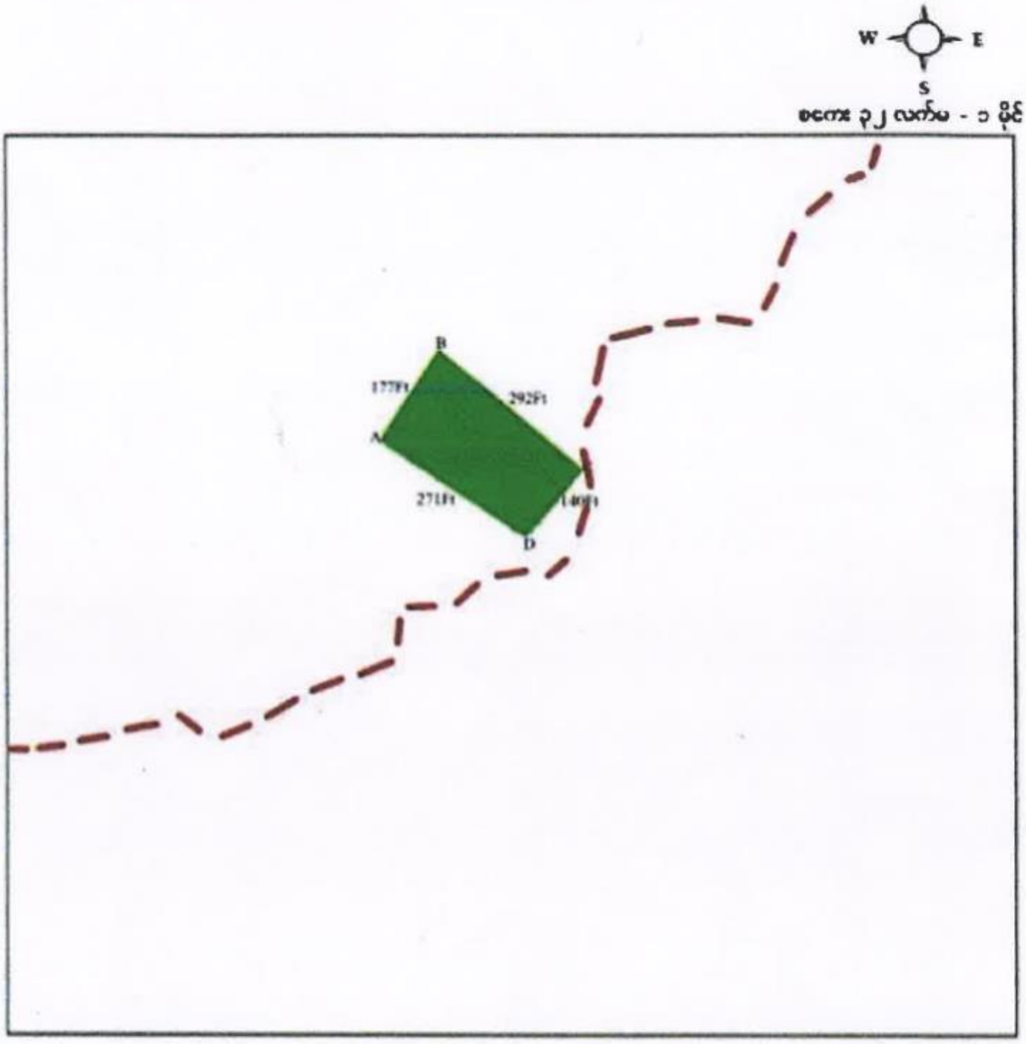
Country Manager
ONGC VIDESH LTD.

ဝင်းနိုင်ဆွေ (၀၃၀၅၂)
မန်နေဂျာ(ရောင်းရေး)
မြည်ခရိုင်

(သန်းဇော်ပြေး)
တောအုပ်
သစ်တောဦးစီးဌာန
သဲကုန်းမြို့။

(ရဲစိုကို)
မြို့နယ်ဦးစီးဌာနမှူး
သစ်တောဦးစီးဌာန
သဲကုန်းမြို့။

ပြည်ခရိုင် ၊ သဲကုန်းမြို့နယ် ၊ ရွာပြင်ကြီးဝိုင်း၊ အကွက်အမှတ်(၂၈)အတွင်း
ONGC VIDESH ကုမ္ပဏီမှ ကွင်းဆင်းတူးဖော်မည့် မြေနေရာအတွက်
ဂေဟာစနစ်ဖြည့်တင်းရေးစိုက်ခင်း(၁)ကောင်၏ မြေတိုင်းတာခြင်းပြမြေပုံ



ရည်ညွှန်းချက်

လူသွားလမ်း
စိုက်ခင်းတည်နေရာ

(A) Latitude-18°45'1.62"N Longitude- 95°27'42.41"E

(B) Latitude- 18°45'3.11"N Longitude- 95°27'43.34"E

(C) Latitude- 18°45'1.18"N Longitude- 95°27'45.61"E

(D) Latitude- 18°45'0.08"N Longitude- 95°27'44.69"E

(For) Country Manager
ONGC VIDESH. LTD.

ဝင်းနိုင်ဆွေ (၀၃၀၈၂)
မန်နေဂျာ(လုံခြုံရေး)
ပြည်ရေနံမြေ၊

(သန်းဇော်ဆွေ)
တောအုပ်
သစ်တောဦးစီးဌာန
သဲကုန်းမြို့၊

(ချစ်ကိုကို)
မြို့နယ်ဦးစီးဌာနမှူး
သစ်တောဦးစီးဌာန
သဲကုန်းမြို့၊

Damaged Trees in Payama-1

T.F. No.1 NOTE - To be prepared by the payer in duplicate. Art. 5. C.A.C.

Chalan No. 48 Credit. MD 020510

To

THE TREASURY OFFICER

PLEASE receive the sum of Kyat *(in words)* ________

________ K *(in figures)* ________

being the amount payable by ________

on account of * ________

Authority under which payment is made is ________

STATION ________

Dated, ________ 20 ________ Signatures of the payer.

Examined and entered

Treasurer

Head Accountant K-380500/-

Received the sum of kyat *(in words)* ________

K *(in figures)* ________ on the above account

STATION ________

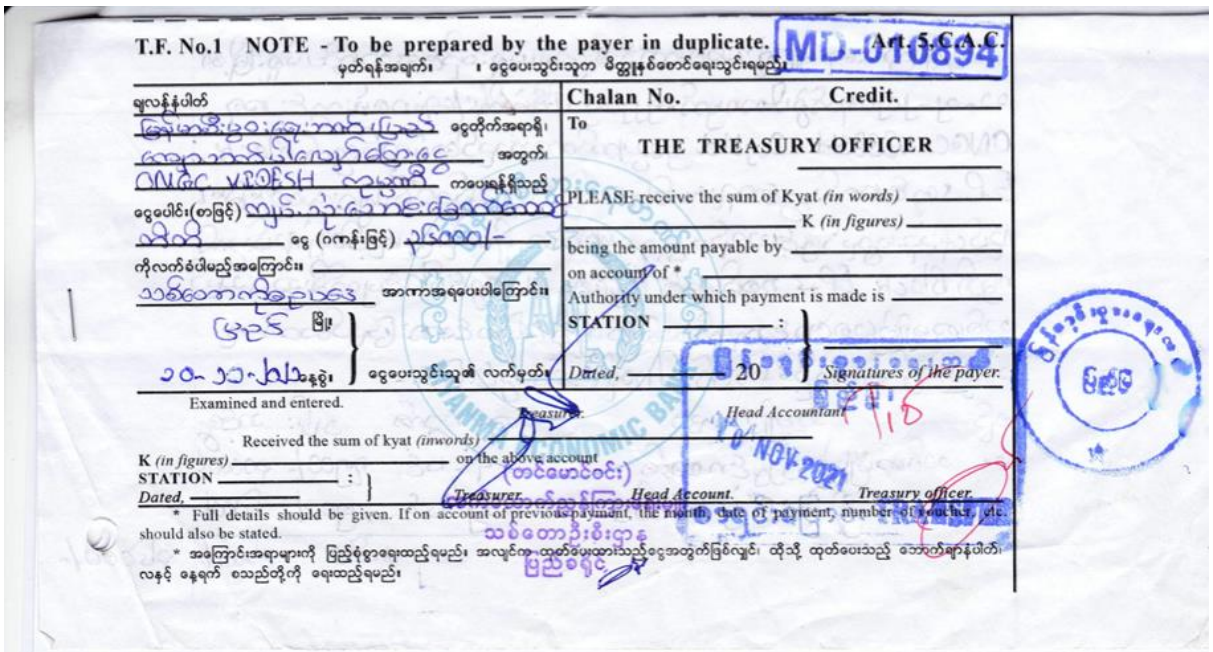
Dated ________

26 OCT 2021

Treasurer Head Accountant Treasury Officer

* Full details should be given. If on account of previous payment, the month, date of payment, number of voucher, etc should also be stated

Payama-1 – Forest Leasing and Damaged Trees



T.F. No.1 NOTE - To be prepared by the payer in duplicate. Art. 5.C.A.C.
မှတ်ရန်အချက်၊ ။ ငွေပေးသွင်းသူက မိတ္တူနှစ်စောင်ရေးသွင်းရမည်။

MD-010894

ချုပ်လန်နံပါတ် Chalan No. Credit.

ငွေတိုက်အရာရှိ၊ အတွက်၊ ကပေးရန်ရှိသည့် ငွေပေါင်း(စကြွင်း) ငွေ (ဂဏန်းဖြင့်) ကိုလက်ခံပါမည်အကြောင်း။ အကောအခရပေးပါကြောင်း။

To
THE TREASURY OFFICER

PLEASE receive the sum of Kyat *(in words)* _____
K *(in figures)* _____
being the amount payable by _____
on account of * _____
Authority under which payment is made is _____
STATION _____ : Dated, _____ 20 Signatures of the payer.

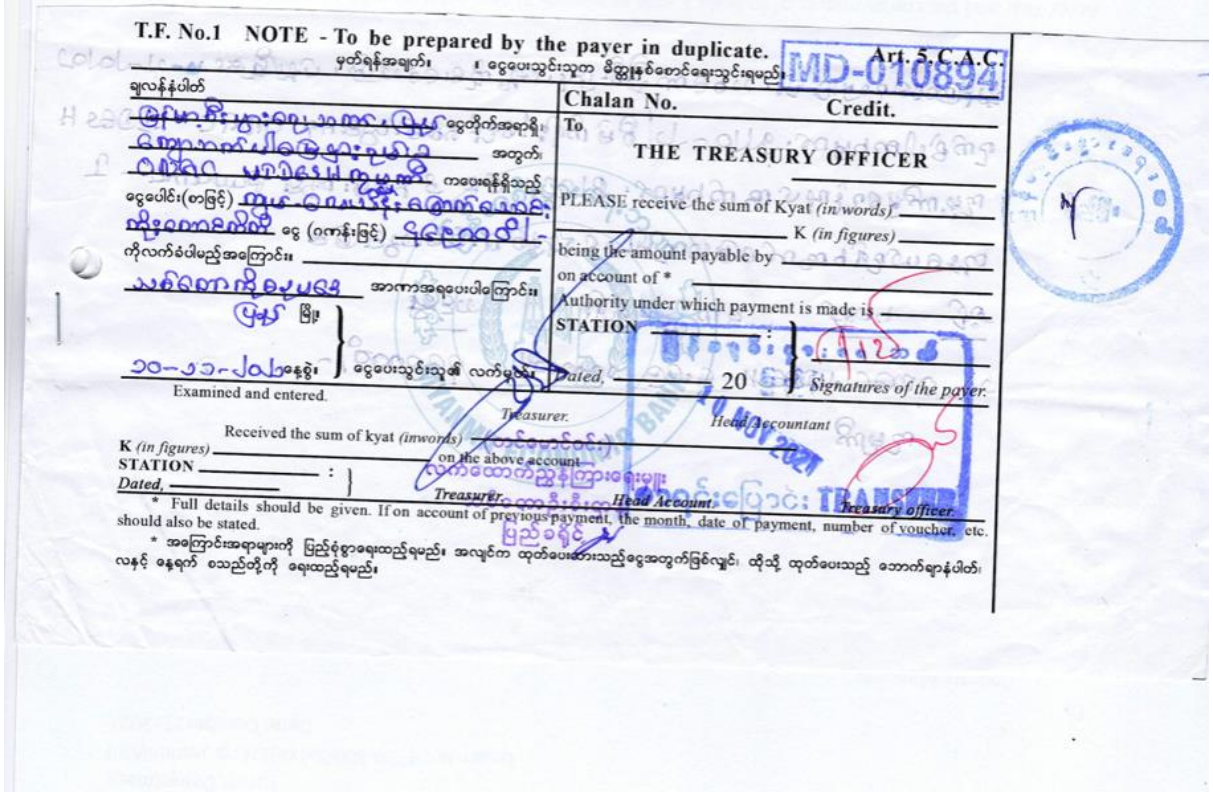
ငွေပေးသွင်းသူ၏ လက်မှတ်၊

Examined and entered.
Treasurer. Head Accountant

Received the sum of kyat *(inwords)* _____
K *(in figures)* _____ on the above account
STATION _____ : Dated, _____
Treasurer. Head Account. Treasury officer.

* Full details should be given. If on account of previous payment, the month, date of payment, number of voucher, etc. should also be stated.

* အကြောင်းအရာများကို ပြည့်စုံစွာရေးထည့်ရမည်၊ အလွှာက ထုတ်ပေးထားသည့်ငွေအတွက်ဖြစ်လျှင်၊ ထိုသို့ ထုတ်ပေးသည့် ဘောက်ချာနံပါတ်၊ လနှင့် နေ့ရက် စသည်တို့ကို ရေးထည့်ရမည်၊



T.F. No.1 NOTE - To be prepared by the payer in duplicate. Art. 5.C.A.C.
မှတ်ရန်အချက်၊ ။ ငွေပေးသွင်းသူက မိတ္တူနှစ်စောင်ရေးသွင်းရမည်။

MD-010894

ချုပ်လန်နံပါတ် Chalan No. Credit.

ငွေတိုက်အရာရှိ၊ အတွက်၊ ကပေးရန်ရှိသည့် ငွေပေါင်း(စကြွင်း) ငွေ (ဂဏန်းဖြင့်) ကိုလက်ခံပါမည်အကြောင်း။ အကောအခရပေးပါကြောင်း။

To
THE TREASURY OFFICER

PLEASE receive the sum of Kyat *(in words)* _____
K *(in figures)* _____
being the amount payable by _____
on account of * _____
Authority under which payment is made is _____
STATION _____ : Dated, _____ 20 Signatures of the payer.

ငွေပေးသွင်းသူ၏ လက်မှတ်၊

Examined and entered.
Treasurer. Head Accountant

Received the sum of kyat *(inwords)* _____
K *(in figures)* _____ on the above account
STATION _____ : Dated, _____
Treasurer. Head Account. Treasury officer.

* Full details should be given. If on account of previous payment, the month, date of payment, number of voucher, etc. should also be stated.

* အကြောင်းအရာများကို ပြည့်စုံစွာရေးထည့်ရမည်၊ အလွှာက ထုတ်ပေးထားသည့်ငွေအတွက်ဖြစ်လျှင်၊ ထိုသို့ ထုတ်ပေးသည့် ဘောက်ချာနံပါတ်၊ လနှင့် နေ့ရက် စသည်တို့ကို ရေးထည့်ရမည်၊

[illegible] ၁၁-၀၂-၂၀၂၀ ရက်စွဲပါစာအမှတ် - ၅၂၂၀-၂၁/ [illegible] အရ ONGC VIDESH Co;Ltd [illegible] Block E.P.3 [illegible] Block EP-3 [illegible] Payama-1 [illegible]

စဉ်	အမျိုးအမည်	အရေအတွက်	နှုန်း	သင့်ငွေ
၁။	[illegible]	၄-၁၄	၇၅၀၀/-	၃၀၀၀၀/-
၂။	[illegible]	၁၂-၁၄	၅၀၀/-	၆၀၀၀/-
		ပေါင်း	၃၆၀၀၀/-	၃၆၀၀၀

[illegible] ONGC VIDESH [illegible] ၅၂၂၀-၂၁/ [illegible] BLOCK EP-3 [illegible] Payama-1 [illegible]

စဉ်	[illegible]	[illegible]	နှုန်း	သင့်ငွေ
၁.	ONGC VIDESH	၄.၆၉	၁၀၀၀၀/-	၄၆၉၀၀/-

[illegible]

Letter of Guarantee (Performance Guarantee) to PBG EP-3 Pyay District Forest Department

uab
Connect. Create. Change.

To
Assistant Director
Pyay District Forest Department
Department of Forestty
Office of the Assistant Director
The Republic of the Union of Myanmar

Sr. No: 017723

Date:

Ref : Letter of Guarantee (Performance Guarantee) No: UAB016-PFB212852

WHEREAS **ONGC VIDESH Co.,Ltd(Branch Office) Address: RegNo13005624(Former-66FC/2014-15)No,(346/354),Pyay Road,Room No,(4003), Pyay Garden Office Tower, sanchaung, Yangon Region, Myanmar (hereinafter called "the Applicant"**) has undertaken, in pursuant to **Contract Dated 5048-50 / Sa(Ka) 2/ Oil Test well Dated 29 May 2021 for the Oil Block No, Block EP-3 Test Well(Payama-1) For Excavation.**

AND WHEREAS, it has been stipulated by you in the said Contract that the Applicant shall furnish you with a bank guarantee by a reputable bank for the sum specified therein as security for compliance with the Applicant's performance obligations in accordance with the Contract.

AND WHEREAS, we **uab bank Limited**, having our office address at No. W-1/2/3/4, Padonmar Stadium, Bagayar Road, Shinsawpu Ward, Sanchaung Township, Yangon, Myanmar have agreed to give the applicant such a Bank Guarantee.

NOW THEREFORE, we hereby affirm that we are Guarantor and responsible to you, on behalf of the Applicant, up to a total amount of **MMK 469,000(Myanmar Kyats Four Hundred Sixty Nine Thousand Only** and we undertake to pay you, upon your first written demand declaring the Applicant to be in default under the Contract and without cavil or argument, any sum or sums within the limits **of MMK 469,000 (Myanmar Kyats Four Hundred Sixty Nine Thousand Only**), as aforesaid without your needing to prove or to show grounds or reasons for your demand or the sum specified therein.

We further agree that no change or addition to or other modification of the terms of the Contract of any of the Contract documents which may be made between you and the Applicant shall in any way release us from liability under this Guarantee, and we hereby waive notice of any such change, addition or modification.

This guarantee will be in effect from **10 August 2021** and shall remain in force up **09 August 2022** and any demand in respect thereof should reach the Bank not later than the above expiry date **09 August 2022** along with the Guarantee original.

This guarantee will become null and void upon expiry whether the original guarantee is returned to us or not.

This guarantee is not transferable or assignable.

This guarantee shall be governed by and construed in accordance with the laws of the Republic of the Union of Myanmar.

Authorized Signatory

Authorized Signatory

Commercial Tax Payam-1 Forest

November 11, 2021

ပတန(ကသခ)-၇။

MED-010270

ငွေသွင်းချလန်

(ငွေပေးသွင်းသူ ... ပုံစံ)

အခွန်ပေးဆောင်မှုအတွက် အထူးပင်ကျေးဇူးတင်ရှိပါသည်။

၂၀၀၈ခုနှစ် ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံတော်ဖွဲ့စည်းပုံ အခြေခံဥပဒေ ပုဒ်မ၃၈၉ အရ နိုင်ငံသားတိုင်းသည် ဥပဒေအရ ပေးဆောင်ရမည့် အခွန်အကောက်များကို ပေးဆောင်ရန် တာဝန်ရှိသည်။

ဒေါ်သက်သက်နွယ်

အခွန်ထမ်းလုပ်ငန်းမှတ်ပုံတင်အမှတ် ကသ/797/အခြားရုံး

အခွန်ထမ်းအမည်နှင့် လိပ်စာ ONGC Co.Ltd (မြေငှားရမ်းခ)

၃၄၆/၃၅၄၊ ပြည်လမ်း၊စမ်းချောင်းမြို့နယ်၊ရန်ကုန်

ကုန်သွယ်လုပ်ငန်းခွန်ဥပဒေပုဒ်မ ၁၂ အရ ၂၀၂၂-၂၀၂၃ ခုနှစ် နိုဝင်ဘာ လ၊

အတွက်ပေးသွင်းငွေ(ဂဏန်းဖြင့်) ၂၃၄၅၀

(စာဖြင့်) နှစ်သောင်းသုံးထောင့်လေးရာ့ငါးဆယ် ကျပ်

ပေးသွင်းသဖြင့် လက်ခံရရှိပါသည်။

ရက်စွဲ 11/Nov/2021

(19)

မြန်မာ့စီးပွားရေးဘဏ်

ဘဏ်မန်နေဂျာ

လက်ခံရရှိငွေ 23450/-

ငွေကိုင်

11 NOV 2021

ဘဏ်တံဆိပ်

အခွန်ဆောင်ထားနိုင်ငံသား

လေးစားသမှုတို့ဂုဏ်ပြု

Attachment 4: LAQ Team Organized by Bago Regional Government

ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံတော်
ပဲခူးတိုင်းဒေသကြီးအစိုးရအဖွဲ့
ပဲခူးမြို့
ရုံးအမိန့်အမှတ်(၁၀၉/၂၀၁၃)
၁၃၇၅ ခုနှစ်၊ တော်သလင်းလပြည့်ကျော် ၈ ရက်
၂၀၁၃ခုနှစ်၊ စက်တင်ဘာလ ၂၈ ရက်

"မြေယာနှင့်သီးနှံလျော်ကြေးပေးရေးအဖွဲ့ ဖွဲ့စည်းတာဝန်ပေးအပ်ခြင်း"

၁။ မြန်မာ့ရေနံနှင့်သဘာဝဓာတ်ငွေ့လုပ်ငန်းနှင့်အကျိုးတူ ပူးပေါင်းဆောင်ရွက်နေသည့် ONGC VIDESH ကုမ္ပဏီသည် Block EP-3 ဧရိယာအတွင်း ပါဝင်နေသည့် သဲကုန်းမြို့နယ်၊ ရွာဝင်ကျေးရွာအနီး(နဝင်း-၁)ရေနံအစမ်းတွင်းနှင့် (ဘုရားမ-၁)ရေနံအစမ်းတွင်းအား တူးဖော်ရန် စီစဉ်ဆောင်ရွက်လျက်ရှိရာ ရေနံတူးဖော်ရေးလုပ်ငန်းအသုံးပြုရန် လိုအပ်သည့် မြေနေရာများအတွက် မြေယာနှင့်သီးနှံလျော်ကြေးပေးရေးအဖွဲ့အား အောက်ပါအတိုင်းဖွဲ့စည်းတာဝန်ပေးအပ်လိုက်သည်-

(က)	မြို့နယ်အုပ်ချုပ်ရေးမှူး	သဲကုန်းမြို့နယ်အထွေထွေအုပ်ချုပ်ရေးဦးစီးဌာန	ဥက္ကဋ္ဌ
(ခ)	မြို့နယ်ဦးစီးမှူး	လယ်ယာမြေစီမံခန့်ခွဲရေးနှင့်စာရင်းအင်းဦးစီးဌာန	အဖွဲ့ဝင်
(ဂ)	မြို့နယ်ဦးစီးမှူး	မြို့နယ်စိုက်ပျိုးရေးဦးစီးဌာန	အဖွဲ့ဝင်
(ဃ)	မြို့နယ်ဦးစီးမှူး	မြို့နယ်သစ်တောဦးစီးဌာန	အဖွဲ့ဝင်
(င)	အုပ်ချုပ်ရေးမှူး	သက်ဆိုင်ရာရပ်ကွက်/ကျေးရွာအုပ်ချုပ်ရေးမှူးရုံး	အဖွဲ့ဝင်
(စ)	ကိုယ်စားလှယ်(၁)ဦး	သက်ဆိုင်ရာရပ်ကွက်/ကျေးရွာရပ်မိရပ်ဖ	အဖွဲ့ဝင်
(ဆ)	ဦးကျော်အောင်ဟန်	မန်နေဂျာ၊ ONGC VIDESH ကုမ္ပဏီ	အဖွဲ့ဝင်
(ဇ)	ဦးစန်းအောင်	လက်ထောက်မန်နေဂျာ၊ ONGC VIDESH ကုမ္ပဏီ	အဖွဲ့ဝင်
(ဈ)	ဦးနေဦး	ဌာနခွဲစာရေး၊ မြန်မာ့ရေနံနှင့်သဘာဝဓာတ်ငွေ့လုပ်ငန်း	အဖွဲ့ဝင်
(ည)	ဦးဝင်းနိုင်မြ	မန်နေဂျာ၊ မြန်မာ့ရေနံနှင့်သဘာဝဓာတ်ငွေ့လုပ်ငန်း	အတွင်းရေးမှူး

၂။ ဖော်ပြပါအဖွဲ့သည် ပြည်ခရိုင်၊ သဲကုန်းမြို့နယ်အတွင်း ONGC VIDESH ကုမ္ပဏီမှ မြေယာနှင့်သီးနှံလျော်ကြေးပေးရေးကိစ္စနှင့်ပတ်သက်၍ ပေါင်းစပ်ညှိနှိုင်းဆောင်ရွက်သွားရန်နှင့် ဆောင်ရွက်ပြီးစီးမှု အခြေအနေအား ပြန်လည်တင်ပြရန်ဖြစ်ပါသည်။

၃။ ဤရုံး၏(၁၀.၈.၂၀၁၃)ရက်စွဲပါအမိန့်အမှတ်(၁၀၃/၂၀၁၃)အား ဤအမိန့်စာဖြင့် လွှမ်းမိုးပယ်ဖျက်လိုက်သည်။

(ပုံ) မျိုးဆွေဝင်း
ဝန်ကြီးချုပ်

စာအမှတ်၊ ၇ / ၃ - ၂၀/ ဦး ၆ (၂၀၁၇)
ရက်စွဲ၊ ၂၀၁၃ခုနှစ်၊ စက်တင်ဘာလ ၂၈ ရက်

ဖြန့်ဝေခြင်း
အဖွဲ့ဝင်များအားလုံး

အမိန့်အရ

စိုးသိန်း
အတွင်းရေးမှူး

မိတ္တူကို
လက်ခံစာတွဲ/မျှောစာတွဲ