

ภาคผนวกที่ 24

Maintenance and Inspection Management



PTT Exploration and Production Public Company Limited

S1 Production Operations

Maintenance Guideline

Maintenance and Inspection Management

Document Code: 13245-GDL-1-S1M-ALL-MMS-002-R04

October 2022



Document Register	
Document Title:	Maintenance and Inspection Management
Document Code:	13245-GDL-1-S1M-ALL-MMS-002-R04
Document Author:	[REDACTED] EDP-ALG [REDACTED] [REDACTED]; PS1/M [REDACTED]
Department/Division:	
Effective Date:	October 2022

Document Custodian			
Name	Position	Signature	Date
Apisak Sri-Amorntham	Superintendent, Maintenance	[REDACTED]	12.10.22

Document Technical Review			
Name	Position	Signature	Date
Wattana Ratchatamongkolchol	Senior Engineer, Reliability and Integrity	[REDACTED]	12.10.22
Apisak Sri-Amorntham	Superintendent, Maintenance		

Digitally signed by WattanaR
DN: cn=WattanaR
Date: 2022.10.15 00:45:11
+0700

Document Approval			
Name		Signature	Date
Document Owner:	Apisak Sri-Amorntham	[REDACTED]	12.10.22
Approval Authority:	Nattapong Vattanajaroen		02/11/22

This document shall be reviewed every 5 years from the date of approval or revised earlier if necessary.

Document Change History		
Date	Revision	Description of Change
	0	New issue
26-Apr-04	1	Issued after company ownership change
26-Sep-06	1.1	2 Yearly review
30-Jul-09	1.2	Change document no. from A72 to SMNT
28-Mar-13	2	<ul style="list-style-type: none"> Reformatted document Aligned with new PTTEP SSHE MS, ISO14001:2022 and OHSAS18001:2007 requirement Updated organizational indicators from JGO to DSO
30-Sep-16	3	<ul style="list-style-type: none"> Reformatted to corporate template Updated organizational indicators
02-Oct-22	4	<ul style="list-style-type: none"> Renamed from “Maintain Wells and Facilities” to “Maintenance and Inspection Execution Management” Renumbering per new S1 document numbering Combine contents from SMNT-PN-01, 02, 03 and 04 into one document per 2021 OTR-RAI audit findings

Table of Contents

1.0	INTRODUCTION.....	1
2.0	SCOPE	1
3.0	KEY REQUIREMENTS	1
3.1	WOK FLOW DESCRIPTION	1
4.0	STRATEGY AND APPROACH.....	2
5.0	PLANNING AND SCHEDULING	5
5.1	RESPONSIBILITY FOR PLANING AND SCHEDULING	6
5.2	MAINTENANCE AND INSPECTION PLAN	7
5.3	PLAN AND SCHEDULE PROCESS	10
6.0	EXECUTION	13
6.1	SITE PREPARATION AND INTEGRITY ASSURANCE	13
6.2	TASK UNDERTAKING.....	15
6.3	HAND-OVER PREPARATION.....	16
6.4	WORK ORDER CLOSE-OUT.....	17
7.0	REVIEW AND IMPROVEMENT	18
8.0	ROLES AND RESPONSIBILITIES	20
9.0	DEFINITIONS	21
9.1	LANGUAGE.....	21
9.2	TERMINOLOGY.....	21
9.3	COMMON ACRONYMS.....	22
10.0	DOCUMENT REFERENCE LIST	23

1.0 INTRODUCTION

This document describes more what and how process of maintenance and inspection manage at Sirikit Oil Field (S1) asset. This document cascades down from Maintenance and inspection guideline 13245-GDL-1-S1M-ALL-MMS-001.

2.0 SCOPE

This guideline covers the followings:

- Several sources and formations of the maintenance and inspection strategy by selecting the most appropriate approach for the asset
- Concept of the maintenance and inspection approaches with appropriate options plans and definition of the resources required and the impact on production targets.
- Planning layer cascaded and rolled over to scheduling into execution step.
- Recommended key performance indicators for maintenance and inspections after execution.

3.0 KEY REQUIREMENTS

3.1 WOK FLOW DESCRIPTION

Maintenance and Inspection Management can be described in 4 major stages: Strategy and Approach, Planning & Scheduling, Execution, and Review & Improvement.

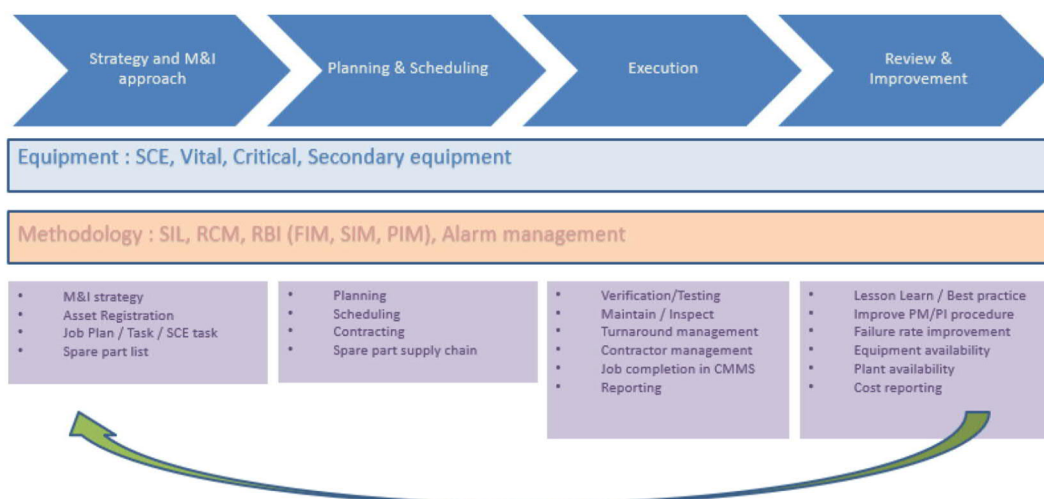


Figure 1 – Maintenance and Inspection Management

4.0 STRATEGY AND APPROACH

Maintenance Approach involves formulating maintenance and inspection strategies that conform to PTTEP objectives, reviewing, confirming, or updating requirements or assumptions.

Refer to high level maintenance and inspection direction well and facilities, the maintenance and inspection requirements are established the following approaches

4.1.1 The 5-Year Key-Activities roadmap

The 5-year key activities roadmap identifies key M&I activities that interrelated among other stakeholders to achieve mutual goals. MRP has been already incorporated.

Having been Integrated with RAI expectations, OMI co-KPI target, Production target, M&I cost, and manning strategy of S1 contributed by M&I, the 5-year key activities roadmap is purposefully used as reference to confirm whether approved budget is still adequate.

The 1st year is considered firm while the following years are changeable to suit business needs. However, maintenance and inspection activities that cause significant facility outage will require more detailed planning and integration into PTTEP Business Plans. The roadmap can be revised in yearly basis by default to ensure key M&I activities are addressed and well reconciled among stakeholders' needs.



Figure 2 – 5-Years key activities roadmap

4.1.2 Maintenance Reference Plan

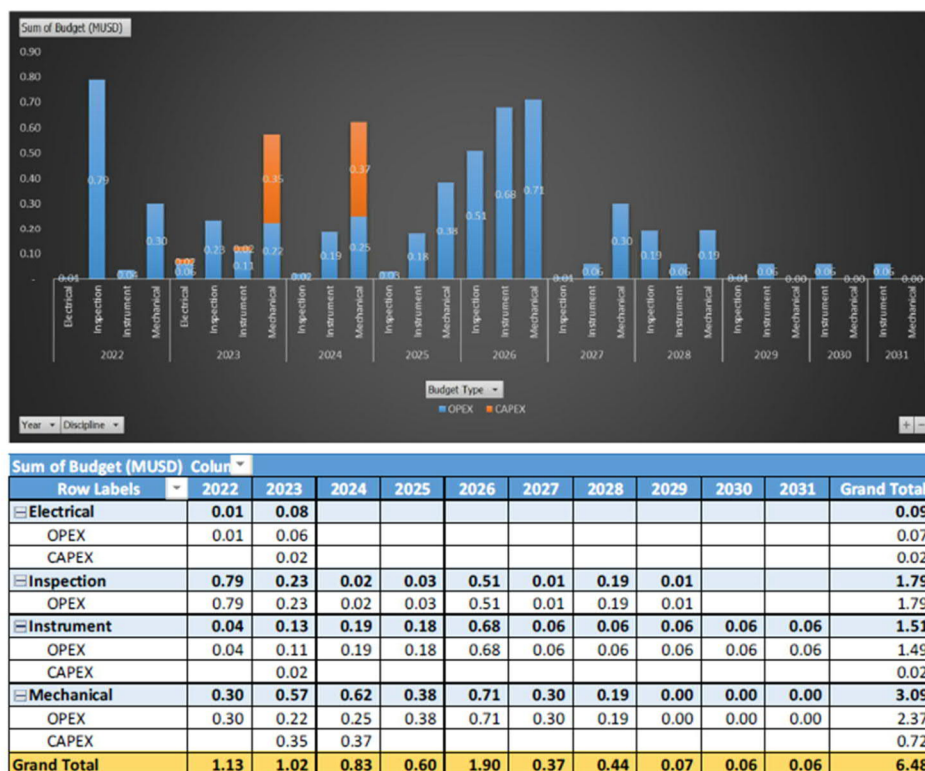
Maintenance Reference Plan (MRP) is another set of maintenance and inspection tasks look ahead in high level for 5-10 years magnitude of time scale, associated OPEX/CAPEX, implications for the plant and equipment. MRP incorporates all constraints and business requirements underlying with equipment current condition is another main portion of maintenance.

MRP often split apart from typical approach for non-routine M&I activities such as upgrade, obsolescence management, and MOC related with debottlenecking or plant major change.

MRP is based on "Operation Philosophy" and "Maintenance and Inspection Philosophy" and sets the way things will be done according to business direction (FDP), current equipment reliability, integrity, performance, and statutory requirements as key drivers underlying with OEMS framework. MRP provides information needed to implement of Cost, Time, and Resources requirement over a long-term period in budgetary scale; i.e. accuracy could be slipped in certain extent up to 20-30%; the closest to current year will be more precise.

MRP determines what needs to be achieved in the years ahead, typically 10-years ahead with a one-year firmed element, a four-year rolling element, and significant elements over the remaining life cycle. MRP can be updated either yearly, or any change based on field development and/or business plan catered for the original MRP.

S1 has recently reviewed its MRP in 2019 due to concession renewal via **12153-GDL-5-MMS-001**, and in 2022 LPG plant operating direction change via **13245-GDL-1-S1M-LKU-MMS-002**. **Figure 3** gives one example of MRP deliverables in cost perspective along the life of LPG plant.



Unit: Million USD

Figure 3 – MRP example: case of LPG review in 2022 till EOC.

4.1.3 Risk and Reliability Approach

Proactive approach drives via Criticality of Asset during Register. It is a list of the equipment on which maintenance and inspection activities are required and are maintained in CMMS. The high-level asset hierarchy is also represented in the Chart of Accounts (COA) structure. The asset register forms the common database for Maintenance Management Module, Inspection Management Module, Materials and Procurement Module, and is fully integrated with the Finance Package. Hierarchical structure of Asset is registered in compliance with ISO14224 and is in line with OEMS RAI requirements.

Refer to Reliability and Integrity Framework, a short summary of RAI guides how each group of equipment is managed based on its criticality ranking result.

Different criticality of equipment is treated and managed by different strategies and approaches. Therefore, assessment of asset criticality is the risk-based assessment and is the key process to determine how critical equipment is. The criticality will bring all what and how S1 manage its equipment.

For High criticality rank of asset register i.e. SCE 4 and some selective VITAL 3, Risk and Reliability Maintenance (RRM) tools are recommended approach. These tools are Reliability Centered Maintenance (RCM), Risk Based Inspection (RBI) and Safety Integrity Level Classification and Verification Review (SIL class, SIL ver; also called Instrumented Protective Function or IPF review).

- RCM: Typically well applied to rotating equipment
- RBI: Typically well applied to static equipment
- SIL: Typically well applied to instrumentation, control and safeguarding systems

The intermediate rank of criticality (remaining VITAL 3, and CRITICAL 2); unless otherwise specially required, the framework recommends to approach by Failure Modes and Effect Analysis (FMEA), OEM manual of M&I recommendations, experienced based maintenance strategy from similar kind of equipment specification/functionality.

The lowest rank of criticality; SECONDARY 1, run-to-fail approach is preferred as long as the consequence of failure is less than repair cost.

The selection of the maintenance and inspection strategies is also approached by Quantitative Risk Assessment (QRA) and any Statutory requirements e.g. Gas sale agreement, EIA, local authorities regulations, etc.

RRM which includes but not limited to RCM, RBI, IPF or SIL can be read its methodology in more detail: 10012-GDL-5-MMS-002 for RCM, 10015-PDR-4-PRS-056 RBI, and 10008-GDL-5-INS-005 SIL Verification Guideline

4.1.4 Strategy Implementation and Job Card Development

The right maintenance and inspection options are presented in Maintenance and Inspection Strategy documents. Include appropriate interval or frequency to carry out tasks, it will be M&I strategy: WHAT/WHEN; which could be run-hour or calendar basis.

Applicable options deployed into strategy and approaches:

Applicable M&I Options	Failure behavior	Common Examples
Time-Based Replacement	Wear & Tear with known lifetime or confident MTBF.	Rotating equipment: Gearbox, Belt, bearing, impeller, engine, compressor valves,
Condition-based Maintenance	Random	Complicated system, DCS, control system, Instrument,
Risk-Base Inspection	Wear or Corrosion rate dominated failure or LOPC	Stationary, Vessel, Flowlines, Pipelines
Failure Finding Function Test	Hidden failures	Safeguarding
Precision Based Maintenance	Infant failure Craftmanship and competency related failure	relocation, recommission, conversion, startup, major turnaround

Table 1 – Correlation between M&I Options, Failure Behavior, and common Equipment

From strategy, detailed procedures (Job Cards and/or Task Lists) are developed to provide steps or HOW to execute the maintenance and inspection task with respect to anticipated criteria (QA/QC) Specifications or standards (of pass or fail) required to be revised should be included. Total set of maintenance and inspection strategies and tasks are implemented in CMMS for further deployment and implementation.

5.0 PLANNING AND SCHEDULING

MRP consolidates with M&I strategy embedded in CMMS form the basis of the overall planned maintenance schedule and is used for making strategic decisions on Maintenance Management; and in most cases incorporated with impact of production and business direction.

Maintenance Reference Plan can give indirect view of downtime to project to production deferment which varies over period of time and the consumption of resources due to foreseen M&I activities. It determines what needs to be achieved in years ahead

With a one-year firmed element, a four-year rolling element, and significant elements over the remaining life cycle. MRP together with 52-week plan will be settled.

The medium-term plan contains a firm element of 3-months and a rolling element up to 1-year to proposed to 3-months IOP (integrated operation plan) look-ahead across stakeholders including drilling, well services, engineering etc. Normally when plan comes to the shorter and closer time in the period of 3-to-1 month usually confirmed upon IOP (integrated operation plan)

Scheduling will be rolling in magnitude of 1-month or 4-weeks lookahead with frontline production and maintenance team to simultaneously optimize and prioritize among various crew and resources to fit for actual daily production against situations at site.

Note that interval (5-yearly, 1-yearly, 3 monthly, 4-weekly, weekly, etc.) within hierarchical concept of planning could be timely adjusted based on dynamic of the asset production behavior.

The hierarchy of maintenance and inspection plans are conceptualized from upper level cascaded down to daily scheduling of work is depicted as below.

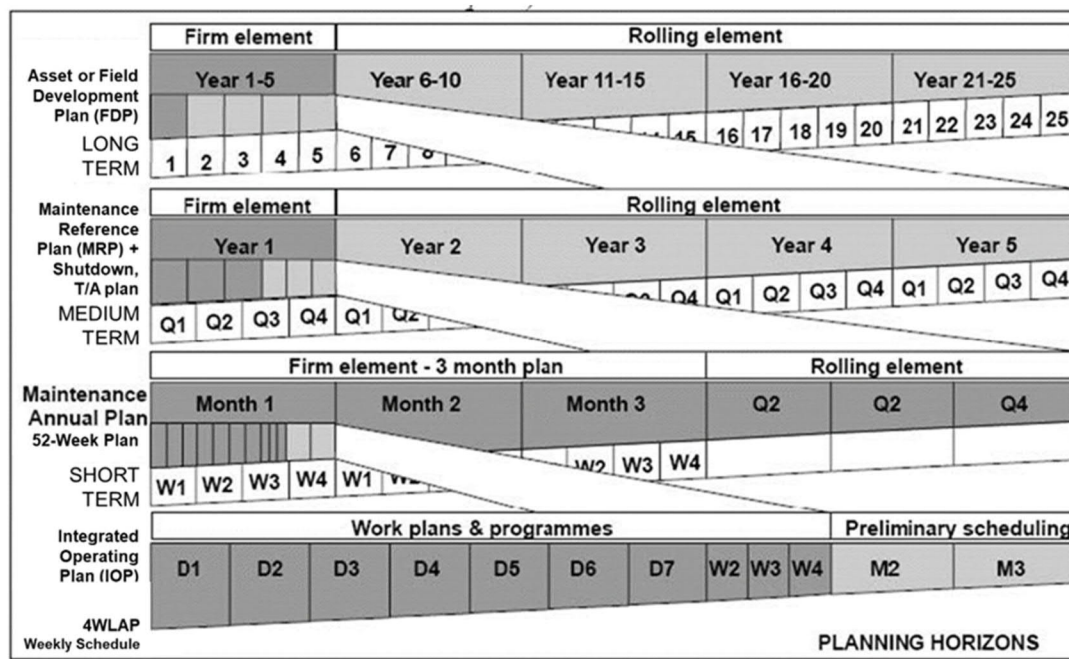


Figure 4 – Hierarchy of Maintenance and Inspection Plans

Scheduling is a time related process whereby the resources from pre-agreed plans are synchronized, sequenced, and converted into a detailed set of tasks to carry out within a discrete period. It essentially evolves around the development of the longer-term plans into weekly and daily work schedules.

The schedule should be continuously rolled forward with a time horizon of typically one-month firm and two-month rolling. **Figure 5** below illustrates correlation between maintenance and inspection planning types (refer to 10012-GDL-5-INT-008-R00, Maintenance and Inspection Planning Guideline).



Figure 5 – Correlation between Plan Types (from 10012-GDL-5-INT-008-R00)

5.1 RESPONSIBILITY FOR PLANING AND SCHEDULING

Responsibility of the preparation and approval of the various plans and schedules is shown in Table 2 below.

Plan and Schedule Type	Prepared by:	Approved by:	Notes
Field Development Plan	PTN/P	PTN	
Maintenance Reference Plan (MRP)	PS1/M and OMI	PS1	1
52-Week Look Ahead	PS1/M Supervisor PS1/M Scheduler	PS1/M and PS1/P	2, 3
3-Month Activity Plan (Integrated Operation Plan, IOP)	PS1/M Supervisor PS1/M Scheduler	PTN/P, PS1, PS1/T, PS1/P and PS1/M	4
2-Week Work Schedule	PS1/M Supervisor PS1/M Scheduler	PS1/P and PS1/M	5
Daily Work Schedule	PS1/M Team Leader PS1/M Scheduler	PS1/P and PS1/M	6

Notes:

1. PS1 approves MRP for further planning, deployment, and budget preparation.
2. To be per 52-week plan based on set strategy in CMMS. PS1/M Scheduler develops weekly look ahead, and PS1/M supervisor to review the plan.
3. Plan to incorporate maintenance, inspection and re-certification activities.
4. To be incorporated into IOP facilitated by PS1/T and presented in IOP monthly for review and approval.
5. PS1/M Supervisor and PS1/P to endorse 1-to-2 weekly work schedule.
6. PS1/P to endorse and revalidate via Permit-to-Work (PTW) to proceed M&I tasks.

Table 2 – Planning and Scheduling Responsibility Matrix

5.2 MAINTENANCE AND INSPECTION PLAN

5.2.1 52-Week Look-Ahead Plan

Regarding the 1st year of 5-Year Plan and MRP, they provides list of activities to be implemented within the year. It will be incorporated with routine 52-week maintenance and inspection plan. The 52-Week Look-Ahead Plan will form the high level plan. Performance will be judged against and form the basis for the more detailed 3-Month activity plans. The 52-Week Look-Ahead will also form the basis for the ordering of materials with long lead items, i.e., more than 3-Month Plan.

5.2.2 3-Month Activity Plan

This schedule is for the maintenance and inspection activities within 3-month period and are revised monthly on a rolling basis; they contain preventive and condition monitoring routines as well as approved corrective routines. Therefore, 1st month of the plan is considered firm, with the following 2 months tentatively agreed to enable the preliminary establishment and securing of manpower and materials. The 3-Month Activity Plan shall incorporate key equipment availability and resource utilization reports. The activities require partial or full facilities shutdown and/or having deferment potential included into the Integrated Operations Plan (IOP).

PS1/M IOP							
Departm	Period	Location	Activities	Start Date	Finish Date	Duration	
PS1/M	Aug-22	F/STN	PM ME (ENGINE + COMPRESSOR 1Y) K-3200 - Plan 08 - 11 August 2022 total 4 days.	8-Aug-22	11-Aug-22	4 Days	
PS1/M	Aug-22	F/STN	PM ME GAS COMP K-3550 2M	2-Aug-22	2-Aug-22	4 hrs.	
PS1/M	Aug-22	F/STN	PM ME GAS COMP K-3950 2M	28-Aug-22	28-Aug-22	4 hrs.	
PS1/M	Aug-22	F/STN	PM ME (ENGINE 6Y + COMPRESSOR 1Y) K-3750 - Plan 15-26 August 2022 total 12 days.	15-Aug-22	26-Aug-22	12 Days	
PS1/M	Aug-22	F/STN	PM ME (ENGINE + COMPRESSOR 1Y) K-3400 - Plan 29 August - 02 September 2022 total 5 days.	29-Aug-22	2-Sep-22	5 Days	
PS1/M	Aug-22	F/STN	P-2401-A, THREE MONTHLY, PREVENTIVE MAINTENANCE	3-Aug-22	3-Aug-22	4 hrs.	
PS1/M	Aug-22	F/STN	P-2402-A, THREE MONTHLY, PREVENTIVE MAINTENANCE	4-Aug-22	4-Aug-22	4 hrs.	
PS1/M	Aug-22	LKU-B	P-117A, THREE MONTHLY, PREVENTIVE MAINTENANCE (WS-B)	4-Aug-22	4-Aug-22	4 hrs.	
PS1/M	Aug-22	LKU-B	P-117B, THREE MONTHLY, PREVENTIVE MAINTENANCE (WS-B)	4-Aug-22	4-Aug-22	4 hrs.	
PS1/M	Aug-22	LKU-B	P-115A, THREE MONTHLY, PREVENTIVE MAINTENANCE (WS-B)	3-Aug-22	3-Aug-22	4 hrs.	
PS1/M	Aug-22	LKU-B	P-115B, THREE MONTHLY, PREVENTIVE MAINTENANCE (WS-B)	3-Aug-22	3-Aug-22	4 hrs.	
PS1/M	Aug-22	LKU-E	P-145-A, THREE MONTHLY, PM (WS-E)	4-Aug-22	4-Aug-22	4 hrs.	
PS1/M	Aug-22	LKU-E	P-145-B, THREE MONTHLY, PM (WS-E)	4-Aug-22	4-Aug-22	4 hrs.	
PS1/M	Aug-22	LKU-E	P-142-A, PREVENTIVE MAINTENANCE (WS-E)	4-Aug-22	4-Aug-22	4 hrs.	
PS1/M	Aug-22	LKU-E	P-143-A, PREVENTIVE MAINTENANCE (WS-E)	4-Aug-22	4-Aug-22	4 hrs.	
PS1/M	Aug-22	PTT-NGV	A-8000, YEARLY, PREVENTIVE MAINTENANCE	3-Aug-22	5-Aug-22	3 Days	
PS1/M	Aug-22	PTO-A	PTO-A GAS METERING 80-FPTR-652 YEARLY CALIBRATION	7-Aug-22	7-Aug-22	8 hrs.	
PS1/M	Aug-22	STN-A	STN-A GAS METERING 68-FPTR-657A/B and 68-FPTR-658A/B YEARLY CALIBRATION	8-Aug-22	8-Aug-22	8 hrs.	
PS1/M	Aug-22	NTM-A	NTM-A GAS METERING MONTHLY CALIBRATION	6-Aug-22	6-Aug-22	8 hrs.	
PS1/M	Aug-22	F/STN	CRUDE METERING MONTHLY PM	9-Aug-22	10-Aug-22	2 Days	
PS1/M	Aug-22	F/STN	T-306 CALIBRATION AND PREVENTIVE MAINTENANCE	11-Aug-22	11-Aug-22	8 hrs.	
PS1/M	Aug-22	NGV	OMA_NGV Online Moisture Analyser	3-Aug-22	3-Aug-22	8 hrs.	
PS1/M	Aug-22	BPR	BPR T-902 Tank calibration	12-Aug-22	12-Aug-22	8 hrs.	
PS1/M	Aug-22	NSG-A	PM IN NSG-A, ESD/OSD function test 1Y	4-Aug-22	4-Aug-22	2 hrs.	
PS1/M	Aug-22	NPG-A	PM IN NPG-A, ESD/OSD function test 1Y	11-Aug-22	11-Aug-22	2 hrs.	
PS1/M	Aug-22	NPG-E	PM IN NPG-E, ESD/OSD function test 1Y	18-Aug-22	18-Aug-22	2 hrs.	
PS1/M	Aug-22	LKU-M	PM IN LKU-M, ESD/OSD function test 1Y	25-Aug-22	25-Aug-22	2 hrs.	
PS1/M	Aug-22	F/STN	PM ME+EL+IN K-5801A 1YPM + Engine Change out + RGB	10-Aug-22	14-Aug-22	5 Days	
PS1/M	Aug-22	F/STN	PM ME+EL+IN K-5801B 1YPM	5-Aug-22	7-Aug-22	3 Days	
PS1/M	Aug-22	F/STN	PM EL K-5804C 2500 HRS PM	8-Aug-22	8-Aug-22	8 hrs.	

Figure 6 – 3-Month Activity Plan



5.2.3 2 Week Work Schedule

Derived from the firm plan for 1st month of 3-Month Activity Plan and updated on a weekly cycle. Concerns the maintenance and inspection activities for 14-days ahead, based on the activities on the monthly activity plan supplemented by work orders raised on an ad-hoc basis and required to be executed within 14-day timeframe. The 2-Week Work Schedule typically covers a period Monday-Sunday, with first 7 days firm and last 7 days tentative.

The following basic requirements applied to the 2-Week Work Schedule:

- Schedule is issued in MS Project or MS Excel
- Activities are grouped by location, i.e., Crude, LPG, well sites, outstations (essentially grouping by asset cost center)
- Activities are resourced in MS Project or MS Excel, including required trades, number of trade staffs and special resources (where required).
- Activities are assigned estimated duration, represented as grant chart.
- Activities are scheduled with due account given to operational constraints, i.e., LPG coolers to be starting in early morning, crude transfer pumps after morning production surge, etc.
- Planned resource usage is provided with schedule.

Maintenance Highlight Activity 15 - 28 August 2022

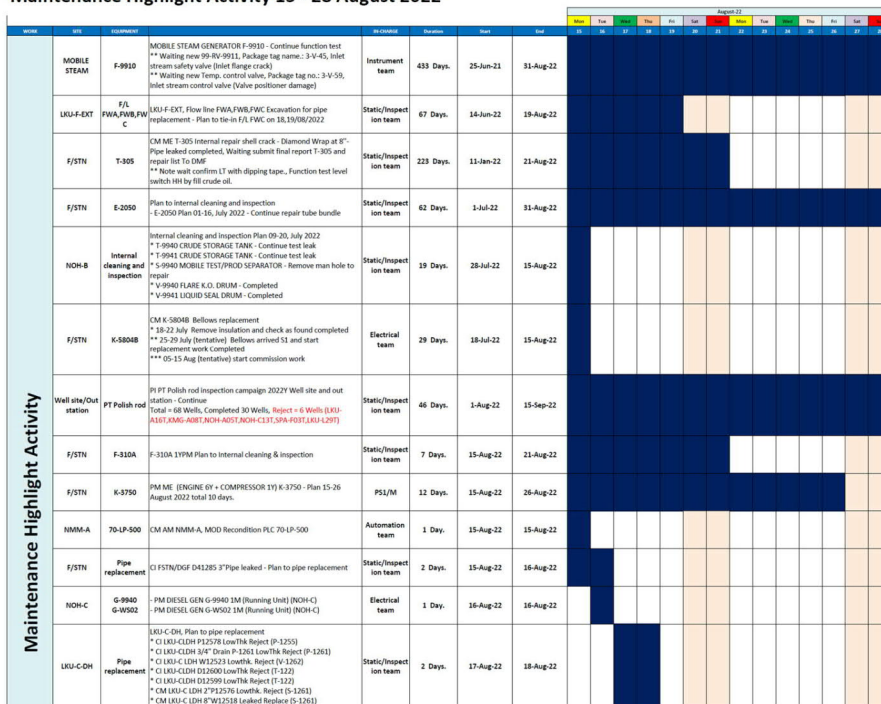


Figure 7 – 2-Week Work Schedule

5.2.4 DAILY-TO-WEEKLY WORK SCHEDULING

The Daily Work Schedule is a list of activities to be carried out the next day. It is not subjected to a separated approval; however, a review may be required at the morning of the workday itself for high priority work that may have been occurred overnight.



Item	Notification No.	Work Order No.	Location	Equipment	Job description	Type	Start date	Completed Date	Status	In-charge
1	100419325	500397412	Crude plant	SI-40-DC-01.ASY	PM EL 40-DC-01 Battery Room 2M	PM	4/Aug/22	4/Aug/22	Plan	Electrical team
2	100419315	500397402	Crude plant	SI-PWD-LSWG	PM EL 40-HV-02 & 40-LV-01 Cabin SWGR 2M	PM	4/Aug/22	4/Aug/22	Plan	Electrical team
3	100419317	500397404	Crude plant	SI-PWD-LSWG	PM EL 50-HV-01 Green Building SWGR 2M	PM	4/Aug/22	4/Aug/22	Plan	Electrical team
4	100419318	500397405	Crude plant	SI-PWD-LSWG	PM EL 50-HV-02 Green Building SWGR 2M	PM	4/Aug/22	4/Aug/22	Plan	Electrical team
5	100380412	500362162	Well site	SI-LKU-C067.PK	CL LKU-C M/F C067 / Elbow Drain Reject - Plan to M/F replacement	CI	4/Aug/22	4/Aug/22	Plan	Inspection team
6	100410502	500389375	Well site	Flow line	Flow line inspection at 8"-BL-XWA by TFM and take photo. (RTJ No.SI-RTJ-Maint-00021)	PI	4/Aug/22	6/Aug/22	Plan	Inspection team
7	100406084	500388687	Well site	Flow line	Flow line inspection at 3"-BL-GGA by TFM and take photo. (RTJ No.SI-RTJ-Maint-00021)	PI	4/Aug/22	6/Aug/22	Plan	Inspection team
8	100376469	500353384	Well site	Flow line	Flow line inspection at 3"-TRT-AGA by UTM / MFL and take photo. (RTJ No.SI-RTJ-Maint-00021)	PI	2/Aug/22	6/Aug/22	In progress	Inspection team
9	100376196	500358111	Well site	Flow line	Flow line inspection at 6"-BL-FXA by UTM / MFL and take photo. (RTJ No.SI-RTJ-Maint-00021)	PI	30/Jul/22	5/Aug/22	In progress	Inspection team
10	100377059	500358974	Well site	Flow line	Flow line inspection at 8"-BL-DWE by UTM / MFL and take photo. (RTJ No.SI-RTJ-Maint-00021)	PI	3/Aug/22	5/Aug/22	In progress	Inspection team
11	100366997	500491212	Well site	Flow arm & Manifold	Flow arm / Manifold 3 Month at NMM-F by VT,UTM and take photo. (RTJ No.SI-RTJ-Maint-00020)	PI	4/Aug/22	5/Aug/22	Plan	Inspection team
12	100365711	500348235	Well site	Flow arm & Manifold	Flow arm / Manifold 3 Month at TY-A by VT,UTM and take photo. (RTJ No.SI-RTJ-Maint-00020)	PI	4/Aug/22	5/Aug/22	Plan	Inspection team
13	100375726	500357641	Well site	Flow arm & Manifold	Flow arm / Manifold 3 Month at NMM-H by VT,UTM and take photo. (RTJ No.SI-RTJ-Maint-00020)	PI	2/Aug/22	5/Aug/22	In progress	Inspection team
14	100419272	500397359	Well site	NGV	PM IN GAS METERING A-8000 1M - Continue meter run#1	PM	3/Aug/22	5/Aug/22	In progress	Instrument team
15	100423061	500401058	Well site	NSG-A	PM IN NSG-A, ESD/OSD function test 1Y	PM	4/Aug/22	4/Aug/22	Plan	Instrument team
16	100419349	500397436	Well site	SI-LKU-M06.PK	P-4406, 4M, BEAM PUMP PM (WS-M06T)	PM	4/Aug/22	4/Aug/22	Plan	Artificial Lift team
17	100419510	500397597	Well site	SI-LKU-M09.PK	PM EL BEAM PUMP P-4409 (LKU-M09) 4M	PM	4/Aug/22	4/Aug/22	Plan	Artificial Lift team
18	100419511	500397598	Well site	SI-LKU-M12.PK	PM EL BEAM PUMP P-4412 (LKU-M12) 4M	PM	4/Aug/22	4/Aug/22	Plan	Artificial Lift team
19	100419512	500397599	Well site	SI-LKU-M14.PK	PM EL BEAM PUMP P-4414 (LKU-M14) 4M	PM	4/Aug/22	4/Aug/22	Plan	Artificial Lift team
20	100428871	500406272	Well site	SI-LKU-Z08.PK	PM EL ESP VSD PANEL LKU-Z08 6M	PM	4/Aug/22	4/Aug/22	Plan	Artificial Lift team
21	100428872	500406273	Well site	SI-LKU-Z18.PK	PM EL ESP VSD PANEL LKU-Z18 6M	PM	4/Aug/22	4/Aug/22	Plan	Artificial Lift team
22	100428873	500406274	Well site	SI-LKU-Z39.PK	PM EL ESP VSD PANEL LKU-Z39 6M	PM	4/Aug/22	4/Aug/22	Plan	Artificial Lift team
23	100423084	500401081	Well site	LKU-E	PM ME PCP P-145A 3M	PM	4/Aug/22	4/Aug/22	Plan	Mechanical team
24	100423027	500401024	Well site	LKU-E	PM ME+EL+IN HSP P-142 1Y	PM	4/Aug/22	4/Aug/22	Plan	Mechanical team
25	100423039	500401036	Well site	LKU-E	PM ME+EL+IN HSP P-143 1Y	PM	4/Aug/22	4/Aug/22	Plan	Mechanical team
26	100423086	500401083	Well site	LKU-E	PM ME+EL+IN PCP P-145B 1Y	PM	4/Aug/22	4/Aug/22	Plan	Mechanical team
27	100423070	500401067	Well site	SI-P-5501A.PK	PM ME+EL+IN Vertical Inline Pump P-5501A 1Y - Repair mechanical seal leak	PM	4/Aug/22	4/Aug/22	Plan	Mechanical team
28	100423064	500401061	Well site	SI-P-5501B.PK	PM ME+EL+IN Vertical Inline Pump P-5501B 1Y	PM	4/Aug/22	4/Aug/22	Plan	Mechanical team
29	100423022	500401019	Well site	LKU-B	PM ME PCP P-115A 3M	PM	4/Aug/22	4/Aug/22	Plan	Mechanical team
30	100423012	500401009	Well site	LKU-B	PM ME PCP P-115B 3M	PM	4/Aug/22	4/Aug/22	Plan	Mechanical team
31	100423013	500401010	Well site	LKU-B	PM ME PCP P-117A 3M	PM	4/Aug/22	4/Aug/22	Plan	Mechanical team
32	100423041	500401038	Well site	LKU-B	PM ME PCP P-117B 3M	PM	4/Aug/22	4/Aug/22	Plan	Mechanical team
33	100419332	500397419	Well site	SI-W-TRTC-AUT	PM TRT-C AUTOMATION - RTU AND LOCAL CONT	PM	3/Aug/22	4/Aug/22	In progress	Automation team
34	100415041	500393377	Well site	LKU-D-DH	PM EL WS-D Duty GROUND RESISTANCE 1Y	PM	4/Aug/22	4/Aug/22	Plan	Electrical team
35	100415038	500393374	Well site	LKU-D-DH	PM EL WS-D Duty TRANSFORMER 1Y	PM	4/Aug/22	4/Aug/22	Plan	Electrical team
36	100420799	500398860	Well site	LKU-D-DH	PM EL WS-D Duty OUTDOOR LIGHTING 12M	PM	4/Aug/22	4/Aug/22	Plan	Electrical team
37	100320424	500305619	Well site	LKU-D-DH	PM EL INSPECTION EX-PROOF EQ. LKU-D-DH 1Y	PM	3/Aug/22	4/Aug/22	In progress	Electrical team

Item	Notification No.	Work Order No.	Location	Equipment	Job description	Type	Start date	Completed Date	Status	In-Charge
1	100419330	500397417	Crude plant	SI-20-DC-01.ASY	PM EL 20-DC-01A/B Battery Room 2M	PM	3/Aug/22	3/Aug/22	Completed	Electrical team
2	100419333	500397410	Crude plant	SI-50-DCU-01.ASY	PM EL 50-DCU-01 Battery Room 2M	PM	3/Aug/22	3/Aug/22	Completed	Electrical team
3	100419324	500397411	Crude plant	SI-60-DCU-01.ASY	PM EL 60-DCU-01 Battery Room 2M	PM	3/Aug/22	3/Aug/22	Completed	Electrical team
4	100419329	500397416	Crude plant	SI-70-DCU-01.ASY	PM EL 70-DCU-01/02 Battery Room 2M	PM	3/Aug/22	3/Aug/22	Completed	Electrical team
5	100419331	500397418	Crude plant	SI-L-COM-UTL	PM EL 55-UPS-02 Battery Room 2M	PM	3/Aug/22	3/Aug/22	Completed	Electrical team
6	-	-	Crude plant	Glycol	CM IN New glycol 43-LT-4304 reading error - Flushing column level transmitter, Change parameter level offset from 8 cm. to 4 cm., Change parameter threshold from 40 to 60, Change parameter damping value from 10 s. to 2 s., Confirm reading 43-LT-4304 compare 43-LT-4303 normal	CM	3/Aug/22	3/Aug/22	Completed	Instrument team
7	-	-	Crude plant	A-2500	CM IN A-2500, 03-LT-2524 and 03-LT-2520 Reading different - Continue check and investigation	CM	3/Aug/22	3/Aug/22	Completed	Instrument team
8	100423075	500401072	Crude plant	SI-P-3801/2.PK	PM ME+EL+IN VS P-3801 1Y	PM	3/Aug/22	3/Aug/22	Completed	Mechanical team
9	100423078	500401075	Crude plant	SI-P-3801/2.PK	PM ME+EL+IN VS P-3802 1Y	PM	3/Aug/22	3/Aug/22	Completed	Mechanical team
10	100423081	500401078	Crude plant	SI-P-2401.PK	PM ME Twin Screw Pump P-2401 3M	PM	3/Aug/22	3/Aug/22	Completed	Mechanical team
11	100423082	500401079	Crude plant	SI-P-2402.PK	PM ME Twin Screw Pump P-2402 3M	PM	3/Aug/22	3/Aug/22	Completed	Mechanical team
12	100426030	500413669	Crude plant	SI-G-2350.PK	CM ME E-2350 Clean up sight glass - Clean up sight glass completed	CM	3/Aug/22	3/Aug/22	Completed	Mechanical team
13	-	-	Crude plant	DAF Unit	CM DAF Unit pipe PVC leaked - Remove PVC pipe for repair by welding at maintenance workshop and reinstall	CM	1/Aug/22	3/Aug/22	Completed	Mechanical team
14	-	-	Crude plant	Crude loading	CM ME Z-317 Handle valve seeping - Replace internal part and check leak completed	CM	3/Aug/22	3/Aug/22	Completed	Mechanical team
15	-	-	Crude plant	K-3600	CM ME K-3600 Cyl 1R/2R Abnormal noise - Replace hydraulic filter & valve rack adjustment.	CM	3/Aug/22	3/Aug/22	Completed	Mechanical team
16	100419480	500397567	Well site	SI-LKU-CB01.PK	PM EL BEAM PUMP P-3701 (LKU-CB01) 4M	PM	3/Aug/22	3/Aug/22	Completed	Artificial Lift team
17	100419481	500397568	Well site	SI-LKU-CB08.PK	PM EL BEAM PUMP P-3708 (LKU-CB08) 4M	PM	3/Aug/22	3/Aug/22	Completed	Artificial Lift team
18	100419479	500397566	Well site	SI-LKU-CB10.PK	PM EL BEAM PUMP P-3710 (LKU-CB10) 4M	PM	3/Aug/22	3/Aug/22	Completed	Artificial Lift team
19	100419373	500397460	Well site	SI-LKU-DD03.PK	P-6303, 4M, BEAM PUMP PM (WSSD-03T)	PM	3/Aug/22	3/Aug/22	Completed	Artificial Lift team
20	100419363	500397450	Well site	SI-LKU-DD06.PK	P-6306, 4M, BEAM PUMP PM (WSSD-06T)	PM	3/Aug/22	3/Aug/22	Completed	Artificial Lift team
21	100419383	500397470	Well site	SI-LKU-DD07.PK	P-6307, 4M, BEAM PUMP PM (WSSD-07T)	PM	3/Aug/22	3/Aug/22	Completed	Artificial Lift team
22	100428868	500406269	Well site	SI-LKU-Z03.PK	PM EL ESP VSD PANEL LKU-Z03 6M	PM	3/Aug/22	3/Aug/22	Completed	Artificial Lift team
23	100428869	500406270	Well site	SI-LKU-Z11.PK	PM EL ESP VSD PANEL LKU-Z11 6M	PM	3/Aug/22	3/Aug/22	Completed	Artificial Lift team
24	100428870	500406271	Well site	SI-LKU-Z15.PK	PM EL ESP VSD PANEL LKU-Z15 6M	PM	3/Aug/22	3/Aug/22	Completed	Artificial Lift team
25	-	-	Well site	NGP-A09T	CM EL NGP-A09T, BP Trip VSD Failure - Replace VSD 1 set, Under observation	CM	3/Aug/22	3/Aug/22	Completed	Artificial Lift team
26	100419439	500397526	Well site	SI-W-TRTC-AUT	PM IN TRC-2 AUTOMATION RTU & LOCAL CONTR	PM	3/Aug/22	3/Aug/22	Completed	Automation team
27	100419332	500397419	Well site	SI-W-TRTC-AUT	PM TRT-C AUTOMATION - RTU AND LOCAL CONTR	PM	3/Aug/22	3/Aug/22	In progress	Automation team
28	100415214	500393550	Well site	OHL	PM EL ALI OHL VISUAL INSPECTION 1M (Trim branches of tree and install snake guard OHL-1.6)	PM	1/Aug/22	31/Aug/22	In progress	Electrical team
29	100320424	500305619	Well site	LKU-D-DH	PM EL INSPECTION EX-PROOF EQ. LKU-D-DH 1Y	PM	3/Aug/22	3/Aug/22	In progress	Electrical team
30	100415042	500393378	Well site	LKU-D-DH	PM EL WSD Duty LIGHTNING PROTECT INSP 1Y	PM	3/Aug/22	3/Aug/22	Completed	Electrical team
31	-	-	Well site	LKU-L	* CL LKU-L P1922 Low Thk. Reject - Pipe replacement completed * CL LKU-L P1926 Low Thk. Reject - Pipe replacement completed	CI	3/Aug/22	3/Aug/22	Completed	Inspection team
32	100365729	500348253	Well site	Flow arm & Manifold	Flow arm / Manifold 3 Month at NMM-F by VT,UTM and take photo. (RTJ No.SI-RTJ-Maint-00020)	PI	2/Aug/22	3/Aug/22	Completed	Inspection team
33	100377111	500359027	Well site	Flow arm & Manifold	Flow arm / Manifold 3 Month at NMM-A by VT,UTM and take photo. (RTJ No.SI-RTJ-Maint-00020)	PI	2/Aug/22	3/Aug/22	Completed	Inspection team
34	100410553	500389420	Well site	Flow line	Flow line inspection at 8"-FSTN-WA by TFM and take photo. (RTJ No.SI-RTJ-Maint-00021)	PI	3/Aug/22	3/Aug/22	Completed	Inspection team
35	100419272	500397359	Well site	NGV	PM IN GAS METERING A-8000 1M - Meter run#2 completed	PM	3/Aug/22	5/Aug/22	In progress	Instrument team

Figure 8 – Daily Work Schedule

5.2.5 Shutdown Plan

Shutdown or Turnaround Plan is specifically developed for maintenance and inspection activities requiring partial or full plant shutdown. These activities are typically grouped to take place in the same concurrent period; e.g. vessel internal inspection, and relief valve recertification, that cannot be carried out during plant normal operation which may cause high production deferment, mainly on process safeguarding and/or major vital equipment. Plant Turnaround approaches like project non routine works. S1 manages its shutdown activities in alignment with L3 Shutdown management 10012-PDR-5-MMS-003.

Year	2019	2020	2021	2022		2023	2024	2025	2026		2027	2028	2029	2030		2031
Plan				SD	OSD				SD	OSD				SD	OSD	
CUI	0	0	0	7	0	0	5	0	9	1	0	0	0	7	15	0
EXT	0	0	0	0	70	0	0	0	0	70	0	0	0	0	69	0
INT	0	0	0	5	0	0	0	0	63	0	0	0	0	5	0	0

Figure 9 – Shutdown Plan (driven by RBI)

5.3 PLAN AND SCHEDULE PROCESS

5.3.1 Plan and Review Cycles

Plans and schedules will have to be prepared and reviewed in a timely manner, consistent with PTTEP Sirikit Oil Field (S1) asset' other processes. The process is illustrated in Figure 10 below.

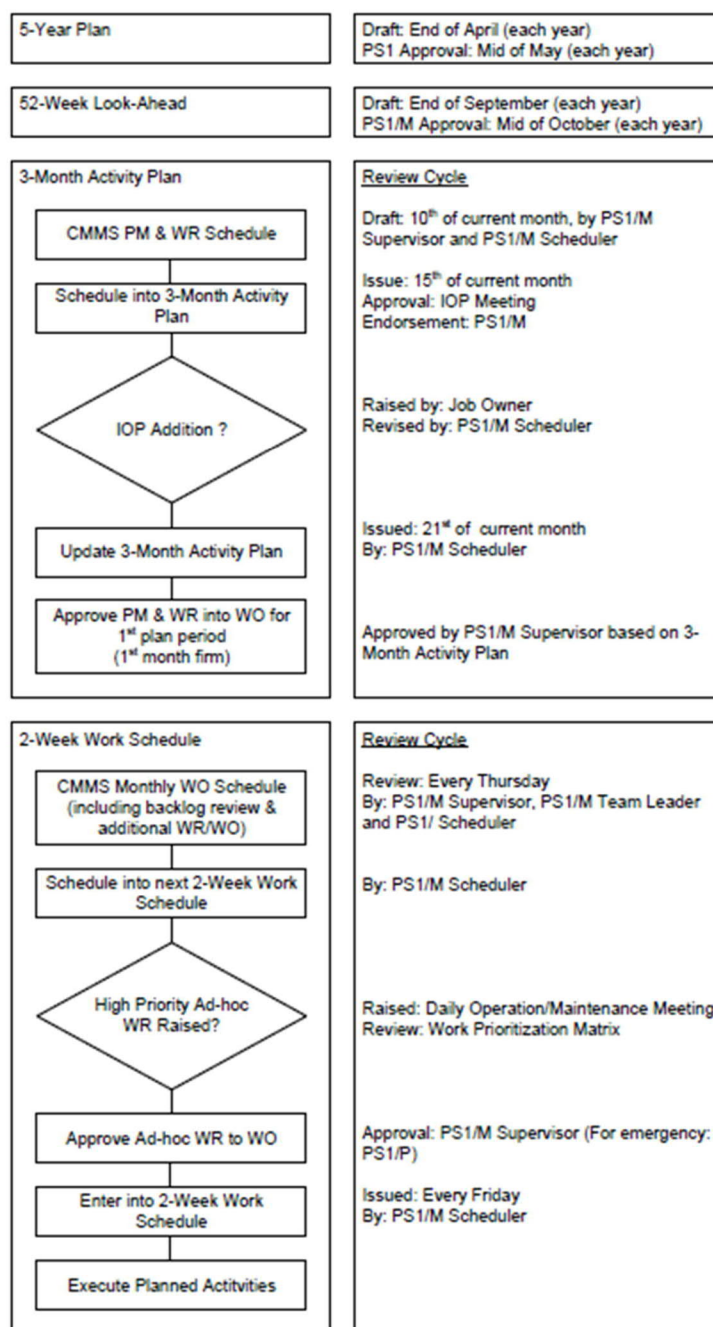


Figure 10 – Planning and Scheduling Process

5.3.2 Plan Review Meetings

Plans will be reviewed and updated on a regular basis to ensure plans reflect the latest work progress and changes to work scope.

- 1) **3-Month Activity Plan:** The 3-Month Activity Plan will be established in two (2) phases, to link the maintenance and inspection activities into S1 Integrated Operations Plan (IOP).

Phase 1 - Prior to IOP meeting, PS1/M, PS1/M Supervisor and PS1/M Scheduler will meet to:

- Obtain overview of maintenance activities in next 3-month period;
- Review priority setting of maintenance activities;
- Agree tentative plan (priorities, dates and resources) for next 3-month period;
- Prepare draft plan, clearly identifying deferment related activities and technical integrity related activities;
- Review work preparation plans and agree the list of actions.
- Proposed released date: Every 10th of the month

Phase 2 – The draft maintenance and inspection plan will be presented to IOP meeting for review and approval. The IOP meeting will be attended by delegates from Asset Planning, Reservoir, Production Planning, Maintenance and related sections. Proposed review date is Every 15th of the month.

- 2) **2-Week Work Schedule:** The 2-Week Work Schedule will be derived from the approved 3-Month Activity Plan, supplemented by approved work order's not featuring on the plan. The 2-Week Work Schedule will be reviewed on a weekly basis in order to:
- Review next week's planned activities against approved (monthly) plan;
 - Review progress against approved (monthly) plan;
 - Review maintenance backlog;
 - Review additional, non-planned activities;
 - Confirm maintenance activity prioritization;
 - Confirm next week's schedule.

The weekly review meeting will take place every Thursday afternoon and be attended by PS1/M, PS1/M Supervisors, PS1/M Team Leaders and PS1/M Scheduler with the final plan as established during the meeting issued on the same day. Although the 2-Week Work Schedule is considered firm, the opportunity exists for items to be added to the schedule later as requirements and/or opportunities arise. In order to ascertain the requirement for late changes to the agreed schedule, all requests for additional items to be added shall be reviewed as to its priority as further described in this document.

- 3) **Daily Work Schedule:** The Daily Work Schedule is for use by the maintenance executor in order to direct maintenance staffs. The Daily Work Schedule is produced in every afternoon before and issued to relevant persons; a copy of daily work list is provided. Daily Work Schedule is reviewed the operation/maintenance morning meeting, where further work requests may be identified. Depending on the priority of additional work requests, changes to the daily work list may be required.

5.3.3 Prioritization of Maintenance Activities

To ensure the timely execution of maintenance activities, it is essential that priorities are assigned to the various maintenance and inspection activities and these priorities are used to schedule the activities. The priorities are recognized by S1 which considered in CMMS. The general meaning of priority based on risk assessed is well applicable to CM or CI that recommends completion date of work order.

Unlike CM/CI WO, Recommended completion date defined for Priority will not be applicable to the other plannable WO types (PM/PI or GSM/GSI, or MD) because some are carried out as campaign whose the completion interval can be longer than 3 months e.g. flowline UT inspection campaign.

Due to this constraint, Priority definition in CMMS is however more effective work around via Planning because PM/PI or GSM/GSI is the prevention and validation approach; i.e., nature of the work is to prevent, validate, or assure rather than to recover or reinstate the functionality or integrity of equipment back to normal like CM/CI's working nature.

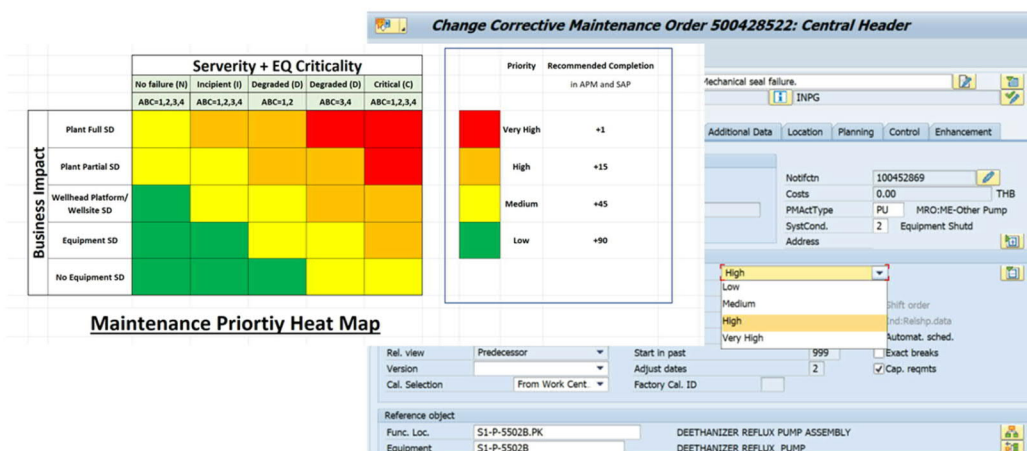


Figure 11 – Risk Based Priority corresponded to recommended completion date

6.0 EXECUTION

This is the only stage when field activities take place that is those directed at anything other than the acquisition and the processing of information. It is the part of the process which yields the return in the form of hydrocarbons and in which the physical implementation of planned activities takes place. Once the execution phase has been initiated, the activity management role changes from “Planning the work” to “Working the plan”. The ability to significantly influence the reduction of costs or schedule has passed and the focus shifts to keeping to the plan in order to avoid time and cost overruns. Work Order generated by CMMS at scheduling phase is how the on-site supervision gets its instructions and how it controls and feedbacks information to the schedulers.

Maintenance and Inspection Management of S1 Asset recognizes four (4) steps for the execution workflow in daily work which to be described in the following Clauses.

6.1 SITE PREPARATION AND INTEGRITY ASSURANCE

Upon identification of the activity to be executed, as detailed in the relevant Work Order), the activity is further detailed in separate steps inclusive of the preparation required before the actual work taking place. Typically, preparation of the site will be considered as part of the actual activity to be undertaken; however in some circumstances the site preparation scope will form a separate activity itself, then follow the general structure outlined in Figure 10. The below outline is controlled by PTTEP S1 Asset Permit-to-Work (PTW) system as described in 13247- PDR-SSHE-505/08, SSHE Rules and Requirement Procedure.

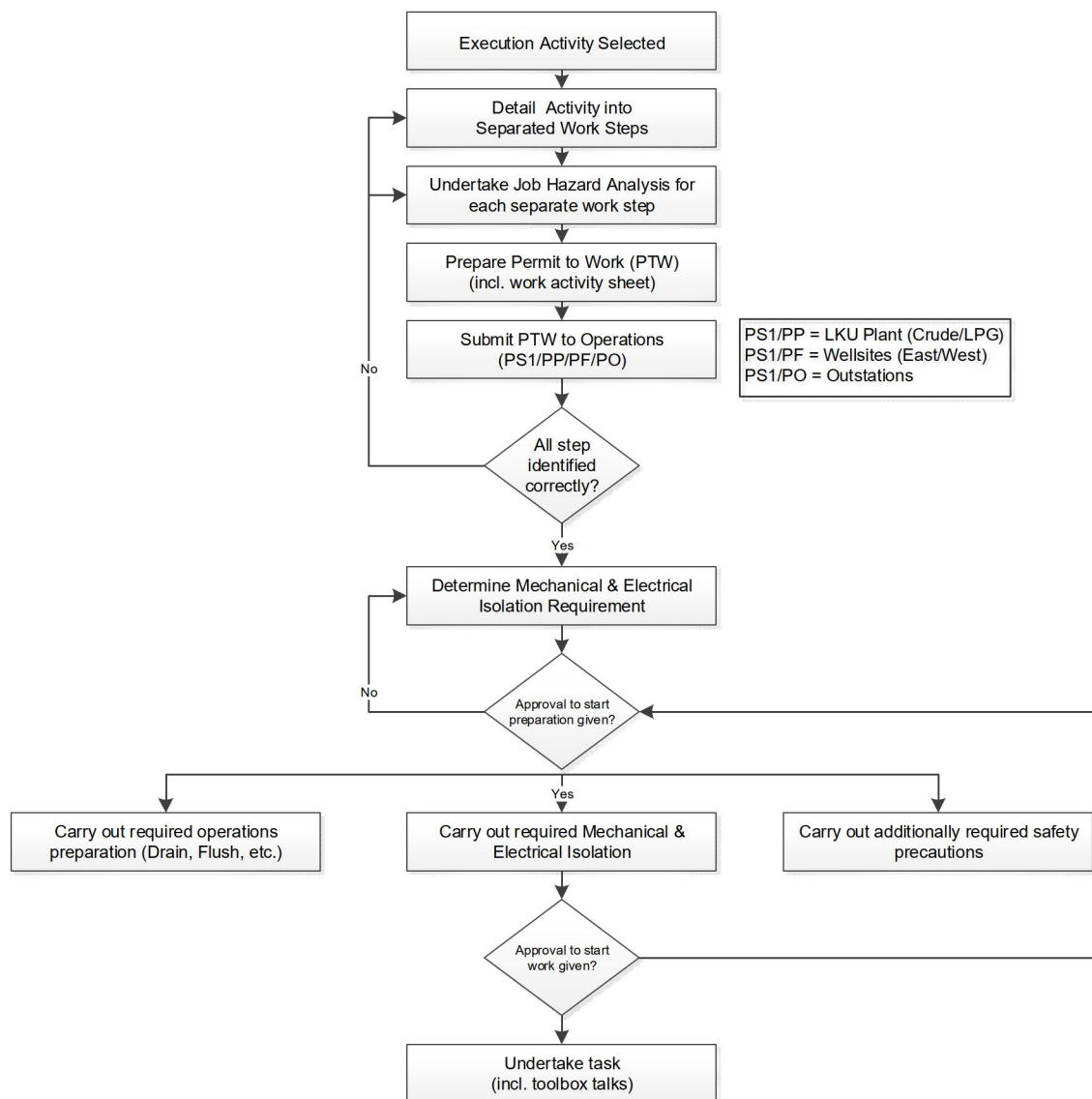


Figure 12 – Site Preparation and Integrity Assurance

Work Description	By	Notes
Detailed activity into separated work steps	Job executor, PS1/M Team Leader	1
Undertake job safety analysis for each separate work step	Job executor, PS1/M Team Leader (supported by Safety Officer)	1
Prepare permit to work (including work analysis sheet)	Job executor, PS1/M Team Leader	1
Submit permit to work to Production section for review	PS1/M Team Leader	
Determine mechanical and electrical isolation requirements	PS1/M Electrical, PS1/PP/PF/PO	2, 3
Carry out required operational preparation activities (drain, flush, etc.)	PS1/PP/PF/PO	
Carry out mechanical and electrical isolation	PS1/M Electrical, PS1/PP/PF/PO	3, 4
Carry out additionally required safety precautions	Job executor	
Undertake task (including toolbox talks)	Job executor	5
Notes: <ol style="list-style-type: none"> Maintenance jobs are normally executed by Maintenance/Inspection crews (under PS1/M Team Leader's supervision) who will be responsible for correctly identifying the separate work steps and permit requirements. For non-routine activities, the activity may be assisted by PS1/M Supervisor and/or Maintenance Discipline Engineers. Isolation requirements and additional safety precautions are established as per the requirements of PTW system and operation procedures. Electrical Isolation is carried out per Electrical Safety Rules procedures. Upon request, isolations may be brought in place by competent persons (typically PS1/M staffs) under the supervision of Production section. For electrical isolations, special requirement applied, as detailed in Electrical Safety Rules. Additionally required precautions (barriers, gas testers, etc.) are normally brought in place jointly by Maintenance/Inspection crews and Production section (PS1/PP/PF/PO), with ultimate approval of adequacy of these provided by Production section. Standard forms for toolbox talks to be used. 		

Table 3 – Responsibility for Site Preparation and Integrity Assurance

6.2 TASK UNDERTAKING

Once site preparation and integrity assurance are completed and approval to proceed work has been obtained as per the requirements of PTW system, actual task can be executed in accordance with the task description shown on the job cards and permit. A task is considered complete when all described tasks have been executed, the site has been re-instated, and the equipment worked on has been returned to a status in which it can safely resume operation.

For various maintenance and inspection activities, detailed procedures are available to provide further clarification to the activity described on the job card and to ensure the consistent execution of maintenance and inspection tasks. Relevant procedures are included in vendor manuals or separate PTTEP maintenance work procedures available from PTTEP's intranet.

Where a task involves the investigation of a failure, the conduct of this investigation and associated reporting shall follow the process outlined in the relevant S1 procedures including PTTEP maintenance work procedures.

6.3 HAND-OVER PREPARATION

This clause covers the process required to administer the resources used during the undertaking of the task, as well as the process to administer any relevant findings obtained during the undertaking of the task. This process exists of various separate steps as outlined in Figure 13.

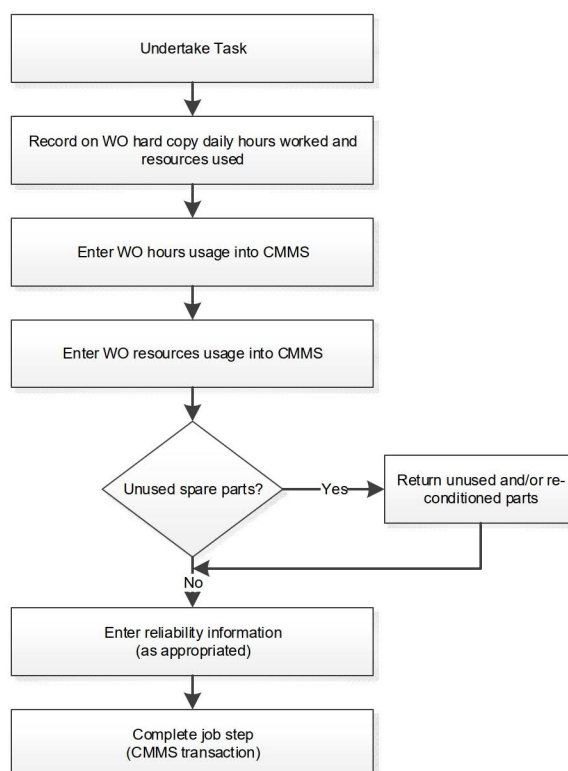


Figure 13 – Hand-over Preparation Process

6.3.1 Work Order Hardcopy Data Record

During the undertaking of tasks, usage of manpower resources (hour worked on WO per individually named person) and other resources are recorded on WO hardcopy on daily basis by the maintenance or inspection technicians. Upon completion of the work, the technicians return the WO hardcopy to their Foreman for entering the relevant data into CMMS.

6.3.2 WO Hours and Resource Usage Entering into CMMS

The information recorded on WO hardcopy is transferred to CMMS within two (2) working days of physical completion of the work, so called “posting of hours usage and resource usage”. It is important that timely entry of this data is strictly adhered to, as it forms the basis of an efficient and effective maintenance scheduling process. Furthermore, it provides the necessary input to the automatic accrual system and thus the link between work management and finance system.

6.3.3 Unused Part Return

All parts and/or consumables reserved or consumed during the undertaking of the task shall be properly balanced against the Work Order bill of materials.

Unused or excess material, spare parts, and/or consumables shall be returned to the material warehouse (5101 is warehouse designated for S1 Maintenance section).

Hint: Stuff replaced by new material but considered reusable if refurbished can also be returned to warehouse as long as they are stock registered and were drawn to use via the WO's bill of Material. Once they are refurbished/reconditioned, the process to return can be further proceeded to the same WO that has yet not technically completed (TECO) under "USED" code of stock – Seek advice from local warehouse personnel for returning "Used part" to Warehouse.

6.3.4 Reliability Information Recoding

In order to capture data on equipment failure modes and frequencies, performing activities and reliability data needs to be entered into CMMS for all corrective maintenance activities. The format adopted by PTTEP S1 asset complied with the requirement of ISO14224, standard for reporting of equipment reliability, and as such requires the following data to be entered:

- Symptom of problem (how did the problem manifest itself?)
- Equipment cause of failure
- Equipment downtime
- Equipment repair time
- Corrective action undertaken

Further details of the entry of reliability data is provided in the relevant PTTEP maintenance work procedure.

Signals completion of work and administrative effort as described in the earlier Clause of this guideline for the relevant job step, and as such a quality check to confirm work completion and correct entry of relevant manpower, resource and materials utilization data. With the approval of a job step to be complete, all transactions are deemed complete, and the WO is ready for close-out.

6.4 WORK ORDER CLOSE-OUT

This process covers the final process of execution process and serves to add deferment data and quality checking the job history data, including reliability data and close out the entire work order, i.e., confirms that all job steps on the subject work order have been completed. For all jobs related to deferment of production, the associated deferment shall be entered by Production Planning section (PS1/T). Deferment related jobs can be identified by the deferment code associated with the work order.

Notes:

1. Where the Work Order involves corrective maintenance, completion also signifies that reliability information has been entered into CMMS.
2. Where a certain job step has not been completed but cancelled, the job card can still be closed out. The relevant cancelled job step will; however, remain shown as cancelled instead of complete in CMMS.
3. WO final closure will be by relevant PS1/M supervisor, discipline engineer followed by PS1/M, dependent on WO scope of work, and its criticality.

7.0 REVIEW AND IMPROVEMENT

Review is the stage in which all the results obtained during execution are analyzed to determine asset status and its performance in various perspectives.

The main source of data for analysis stage is the completed fulfillment on Notifications and Work Orders (WO) via CMMS with relevant parameters and quality of data; both master data of asset and transaction data of execution in a single work order on such registered asset.

S1 adopts Corporate's framework of Maintenance and Inspection Management System underlying with OEMS RAI where every company within PTT Groups are mutually developed, revised, and agreed to conform to develop S1 asset master data structures while transactional fields are configured for user to input relevant parameters into CMMS.

S1 CMMS architecture is therefore built in common with other assets of PTTEP and using the same data catalogue in order that they can be benchmarkable when performing analysis.

Other sources of information including PDMS (Production Data Management System, PDMS), Process Indicator monitoring system (PI), etc.

The analysis results have 3 major categories of outputs. Asset performance, Asset integrity condition, and Work Performance and Effectiveness.

7.1.1 Asset Performance

This activity is concerned with the performance of the physical facilities including items of equipment of the asset. They all have purposes to deliver intended function in efficient and reliable performance within operating context.

Performance Indicators (PI's) used in this area are the equipment performance in term of

- Key equipment or plant availability
- Key equipment or plant efficiency
- Mean Time Between Failures (MTBF)
- Bad actor lists
- Trips of key equipment
- Plant unplanned shutdown
- Plant reliability Index (RI)

7.1.2 Asset Integrity Condition

This activity is concerned with the technical integrity and safety status. Most facilities usually have additional dedicated systems to safeguard, protect, prevent, terminate or retard escalation of undesired circumstances in case the facilities were failed or run out of safe operating envelop.

The dedicated systems: so called SCE or safety critical elements, which determine asset's technical integrity status:

- Structural integrity
- Process containment
- Ignition control
- Protection systems
- Detection systems
- Shutdown systems
- Emergency response systems
- Lifesaving systems

Asset technical integrity condition must also be analyzed in conjunction with performance and validity of the asset design intent under the current conditions. Technical Authorities and Performance standards substantially involves with this analysis.

Examples of asset integrity condition or status are exemplified below:

- Safety relief valve inspection and certification status
- Static equipment (vessel, heat exchanger, tanks, piping) inspection status
- Instrumented Protective Function testing (ESD test, F&G system test) status
- Known variations of Equipment (safeguards overrides, temporary repairs, run out of operating envelop)
- PM compliances
- SCE Backlogs
- Anomalies List
- Critical Alarm Rates
- Findings and corrective action management related to technical integrity
- Corrosion Rate and remaining useful life of process containment.

7.1.3 Work Performance and Effectiveness

This activity is concerned with execution efficiency and effectiveness of maintenance activities themselves. These will include cost, time, and resources consumption to achieve the various deliverables. This analysis of resource performance data is at the core of management information and will bear directly on all aspects of Maintenance and Inspection management.

The impact will range from plans, designs, practices, and procedures and the Cost Model in whole process of Maintenance and Inspection.

Typical Performance Indicators are exemplified below:

- Meantime to Repair (MTTR)
- Turnaround compliance
- PM:CM ratio
- Overdue or Ready Backlogs
- Manhour analysis (Actual and Planned Manhour)
- Cost Analysis (expenditure by asset, activity, WO type)
- Cost per asset replacement value

7.1.4 Feedback and Lesson Learned

Key performance indicators will highlight the improvements and gaps to be fulfilled for the planning, resources, execution tactic, crew competency.

The improvements can be started more upfront to M&I approach and strategy or even further to engineering and design. Enablers and Technologies should enrich to all stages of M&I work process. Life-Cycle-Cost and Risk-based Approach is always underlying of M&I work process as it is the heart and M&I continuous improvement process.

8.0 ROLES AND RESPONSIBILITIES

The following table outlines the roles and responsibilities associated with this document.

Roles	Responsibilities
Document Author	<p>The author of Maintenance and Inspection Execution Management is S1 Maintenance Superintendent or equivalent or person as assigned by Document Owner, with responsible for:</p> <ul style="list-style-type: none"> Investigate and plan of a document structure and its contents Create and/or update a document as planned Report to Document Owner on the progress of the work on a document Issue draft revision of a document for review, and embed all comments made by Document Reviewers to the document
Document Custodian	<p>The custodian of Maintenance and Inspection Execution Management is S1 Maintenance Superintendent or equivalent or higher level who assigned by Document Owner, with responsible for:</p> <ul style="list-style-type: none"> Identify deficiencies or potential improvements Initiate periodic revision Maintain revision history and document status register
Document Owner	<p>The owner of Maintenance and Inspection Execution Management is VP, S1 Production Operation Department, with responsible for:</p> <ul style="list-style-type: none"> Issue this document and its revisions
Document Reviewer	<p>The reviewer of Maintenance and Inspection Execution Management is Technical Authority in reliability and integrity engineering or equivalent or higher level, with responsible for:</p> <ul style="list-style-type: none"> Review the document contents to ensure adequate quality Provide comments and/or suggestions on document issued

9.0 DEFINITIONS

9.1 LANGUAGE

In this document, the following verbal forms are used.

May	Indicates a possible course of action or permission.
Must	Indicates a mandatory and regulatory course of action.
Shall	Indicates a mandatory course of action or requirement.
Should	Indicates a preferred/logical course of action or recommendation.

9.2 TERMINOLOGY

The following terms and definitions apply to this document.

Terminology	Description
Approval	The authority in writing given by COMPANY to Contractor on a procedure or to proceed with the performance of a specific part of the work without releasing in any way the Contractor from any of his obligations to conform with the technical specifications, requisitions, etc. The words "Approve", "Approved" and "Approval" shall be constructed accordingly.
Asset	Any physical facilities used in the exploration, production, processing or transportation of oil and gas, and any supporting facilities or equipment.
Asset Integrity (AI)	The ability of an asset to perform its required function efficiently and effectively whilst safeguarding life and the environment.
Availability	The ability of an item to performs its required function under given conditions at a given instant of time or during a given time interval. The availability of an item does no necessarily imply that it is performing, but it is a state to perform.
Barrier	Measure which reduces the probability of releasing a hazard's potential for harm or which reduces its consequences. The hierarchy of barriers is prevention, detection, control, mitigation and emergency response.
Company	PTT Exploration and Production Public Company Limited PTTEP Siam Limited
Contractor	Any company PTTEP has signed a contract with for the Engineering, Procurement, Construction, Installation, Maintenance and Inspection of a part of service work.
Major Accident Event (MAE)	Any incident that results in multiple fatalities or equivalent damage, production loss, environment impact as per the risk matrix.
Quantitative Risk Assessment (QRA)	QRA is the evaluation of the extend of risk arising, with incorporation of calculations based upon the frequency and magnitude of hazardous events.

Reliability	The ability of an item to perform a required function under give conditions for a given period of time. This is document it is used as "Reliability Performance" and refers to probability of failure.
S1 Asset	Sirikit Oil Field under PTTEP Siam Limited
Safety Critical Element (SCE)	Safety Critical Elements are any part of the installation, plant or computer programs whose failure will either cause or contribute to an MAE, or the purpose of which is to prevent or limit the effect of an MAE.
Technical Authority (TA)	PTTEP personnel responsible for technical standards, providing advice on issues relating to their discipline and Four Pillars of integrity as defined in CMS. There are two levels of TA as defined in CMS.
Technical Integrity	Technical soundness, within E&P context it is "The technical integrity of a facility is achieved when, under specified operating conditions, there is no foreseeable risk of failure endangering the safety of personnel, environment or asset value".

9.3 COMMON ACRONYMS

Set out below in alphabetical order are common acronyms as found within this document.

AI	Asset Integrity
CM	Corrective Maintenance
CMMS	Computerized Maintenance Management System
COA	Chart of Accounts
CPFT	Critical Proof Function Test
ESD	Emergency Shutdown
F&G	Fire and Gas System
FMEA	Fault Modes and Effect Analysis
IOP	Integrated Operations Plan
IPF	Instrument Protective Function
MRP	Maintenance Reference Plan
MS	Microsoft Software
MTBF	Mean Time Between Failure
OMI	Maintenance and Inspection Department
QRA	Quantitative Risk Assessment
PI	Performance Indicator
PM	Preventive Maintenance
PS1	S1 Production Operations Department
PS1/M	S1 Maintenance and Inspection Section

PS1/P	S1 Production Section
PS1/T	S1 Production Support Section
PTN/P	S1 Asset Planning Department
PTW	Permit to Work
RAM	Risk Assessment Matrix
RBI	Risk Based Inspection
RCM	Reliability Centered Maintenance
RRM	Risk and Reliability Maintenance
S1	Sirikit Oil Field
SCE	Safety Critical Element
SSHE	Safety, Security, Health and Environment
TA	Technical Authority
WO	Work Order
WR	Work Request

10.0 DOCUMENT REFERENCE LIST

PTTEP internal references, international codes and standards, provincial legislation, and other references pertinent to this document are indicated in the table below.

Document Code	Document Title
PTTEP internal references	
10012-GDL-5-INT-008-R00	Maintenance and Inspection Planning Guideline
10017-PDR-5-MMS-001-R00	Maintenance and Inspection Approach
13245-GDL-1-S1M-ALL-MMS-001-R04	S1 Maintenance and Inspection Guideline
10015-STD-4-PRS-006-R00	Reliability and Asset Integrity Management Standard
HQ.2020.01082.3	Reliability and Integrity MGT Framework
12153-GDL-5-MMS-001-R00	S1 MRP 2019-2031
13245-GDL05-MMS-002-R00	S1 MRP LPG 2022-2031
International codes and standards, provincial legislation, and other references	
ISO 14224	Petroleum, Petrochemical and Natural Gas Industries – Collection and Exchange of Reliability and Maintenance Data for Equipment



LAST PAGE – INTENTIONALLY BLANK

ภาคผนวกที่ 25

Flowline and Well Gas Lift Line



PTT Exploration and Production Public Company Limited

PTTEP Procedure

FLOWLINE AND WELL GAS LIFT LINE

Document No: SMNT-MS-M-05

Revision No: 05



PTT Exploration and Production Public Company Limited

APPROVAL REGISTER	
Document Title:	FLOWLINE AND WELL GAS LIFT LINE
Document Reference No:	SMNT-MS-M-05
Prepared By:	
Document Owner:	Sarayut Niamrit (PS1/M)
Division/Department:	PTN/PNO

Document Custodian			
Name	Title	Signature	Date
	TA1		07 Jul 2016

Technical Review			
Name	Title	Signature	Date
	PS1/M		13-07-2016
	PS1/F		30-07-16

Revision History			
Rev	Description of Revision	Authorised by	Date
1	New issue Issued after company ownership change		25/03/2008
2	Change document No. A72 to SMNT		28/08/2009
3	(1) Reformatted from SMNT-MS-M-05: FLOWLINES AND WELL GAS LIFT LINES (2) Aligned with new PTTEP SSHE MS, ISO14001:2004 and OHSAS18001:2007 requirement (3) Updated Organizational Indicators from JGO to DSO	DSO/M	18/10/2010
4	Updated Organizational Indicators from DSO/M to DSF/M	DSF/M	18/10/2013
5	(1) Change document to corporate format and revise section /Department Abbreviate (2) Update Strategy (3) Added Thickness Monitoring Location Guideline	PS1/M	01/07/2016



PTT Exploration and Production Public Company Limited

Document Approvals		
	Signature	Date
Author:		18 AUG 2016
Document Owner:		18-08-2016

THIS DOCUMENT WILL BE REVIEWED 5 YEARS FROM DATE OF APPROVAL
OR REVISED EARLIER IF NECESSARY



TABLE OF CONTENTS

1.0	PURPOSE	1
2.0	SCOPE	1
3.0	REFERENCES	1
4.0	DEFINITIONS	1
5.0	ROLES AND RESPONSIBILITIES	2
6.0	STRATEGY	2
7.0	APPENDIX	4



1.0 PURPOSE

The objectives of the maintenance strategy are:

- To demonstrate and maintain the technical integrity of (safety critical) assets
- To fulfil maintenance activities in the most business-efficient manner by effective and efficient deployment and use of resources
- To improve asset reliability, availability and performance and optimise maintenance efforts such that company targets in terms of product quantity, quality and unit maintenance cost can be met
- To have in place and operate an auditable system of asset performance and maintenance controls
- To comply with all applicable legislation and company SSHE policies

2.0 SCOPE

This generic maintenance strategy is written to cover well flowlines and well gas lift lines in perimeter of PTTEP Siam, S1 Asset. The term “flowline” is used to define line from wellhead to the first common manifold including the part of the manifold, which is directly connected to the well (i.e. the section after the choke valve).

3.0 REFERENCES

3.1 PTTEP CONTROLLING DOCUMENTS

Document Number	Document Title
S1.SMNT.PH.00	PTTEP S1 Maintenance Philosophy
EP 2000-5008	Carbon Steel Pipeline Corrosion Engineering Manual

3.2 OTHER REFERENCE DOCUMENTS

Document Number	Document Title
API 570	Piping Inspection Code
NACE Standard RP0274-98	High Voltage Electrical Inspection of Pipeline Coating
NACE Standard RP0169-96	Control of External Corrosion on Underground or Submerged Metallic Piping Systems
ASME B31.3	Process Piping
ASME B31.8	Gas Transmission and Distribution Piping System

4.0 DEFINITIONS

Terminology	Description
Flowline	B31.3 Process piping between wellhead to manifold



4.1 COMMON ACRONYMS

Set out below are common specific terms presented in alphabetical order:

SAP	PTTEP Computerized Maintenance Management System
PI	Planned Inspection (Work Order Type)
CI	Corrective Inspection (Work Order Type)

5.0 ROLES AND RESPONSIBILITIES

5.1 OWNERSHIP OF THE DOCUMENT: PS1/M

The owner of the document is Superintendent, Maintenance with responsibilities for:

- Issuing the FLOWLINE AND WELL GAS LIFT LINE INSPECTION Procedure and its revisions
- Ensuring effective implementation of the procedure

5.2 CUSTODIAN OF THE DOCUMENT: TA1

The custodian of the document is TA1, In-service Inspection and Corrosion with responsibilities for:

- Identifying deficiencies or potential improvements
- Initiating periodic revision
- Maintaining revision history and document status register

6.0 STRATEGY

The need for the regular inspection of flowlines on PTTEP facilities to assure integrity in service is identified in PTTEP Maintenance Philosophy and also in Statutory Regulations.

6.1 FLOWLINE

In PTTEP the wells are drilled from common well site locations and grouped in manifolds after a short distance from wellhead.

A. INTERNAL CORROSION

Currently the field operates with low carbon dioxide contents (approx. 1.5% mole) and minor amount of hydrogen sulphide. The water cut averages at 50% across the field with some wells producing up to 90% water. With the introduction of the water flooding of the reservoir the water cut will increase more rapidly than before.

B. SAND EROSION

Some wells are producing high volume of sand and sand erosion takes place at flow direction change location such as elbow, and tee junction.

C. EXTERNAL CORROSION

A large portion of the flowline is underground. That section is protected against external corrosion by protective wrapping. No cathodic protection is applied. In some well locations that section of the flowline is routed through open concrete trench and some have no protective coating, as such they are more vulnerable to external corrosion.



6.2 WELL GAS LIFT LINES

A. EXTERNAL CORROSION

Same as well flowlines

B. INTERNAL CORROSION

The lift gas is generally dry. However with the introduction of wet gas wells directly to the gas lift system there is an increasing risk of internal corrosion.

6.3 INSPECTION FREQUENCIES

Since well fluid condition of each well is changed with hardly to notice and re-evaluate inspection frequencies on time. Therefore, thickness monitoring frequency of each flowline is 3 monthly as campaign basis on February, May, August and November.

SAP shall regularly generated PI Work Order of each well site accordingly. Thickness monitoring location for each flowline and manifold shall be followed Appendix II using Ultrasonic Thickness Measurement to find minimum thickness of each location.

In case possibility of high wall thickness loss due to well fluid condition changing such as high sand alert from lab sampling, CI Work Order shall be manually created in SAP for the concerned well to monitor thickness ASAP.



7.0 APPENDIX

7.1 APPENDIX I: CALCULATION OF MINIMUM ALLOWABLE PIPING WALL THICKNESS

A. The Final retirement thickness for piping is based on the higher of two thicknesses:

- Pressure design thickness under internal pressure - Wall thickness required for pressure competency can be calculated with the following formula (as per ANSI B31.3)

$$t = P * D / [2(SE+PY)]$$

Where

D= Nominal outside diameter of pipe, mm

P= Operating pressure, barg

S= Stress value at design temperature, MPa

E= Quality factor

Y= Coefficient

t= Pressure Design thickness, mm

- Wall thickness required to cover other loading on the pipe, besides internal pressure, e.g. support loading, third party damage, vibration etc., which are very difficult to quantify, often called the "Structural retirement thickness"

NPS (in)	Recommended retirement Thickness (mm)
0.5 - 3	2.50
4	3.00
6	3.75
8	4.50
10	4.75
12	4.75

B. Line standards

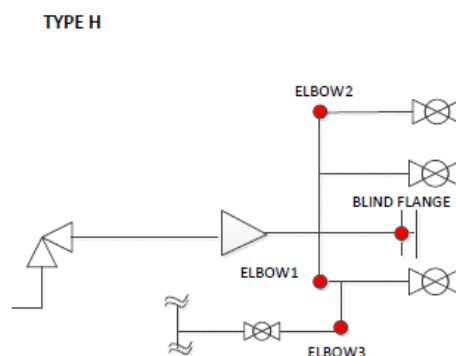
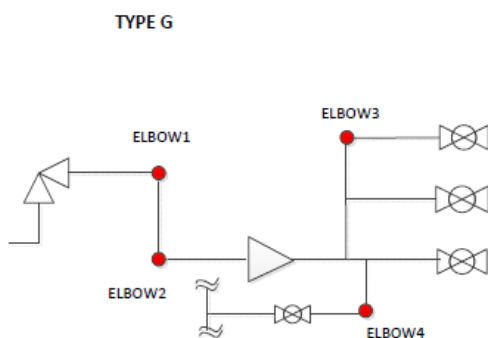
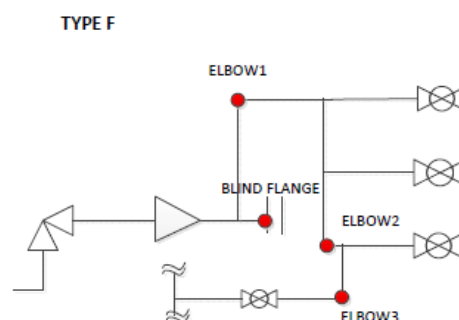
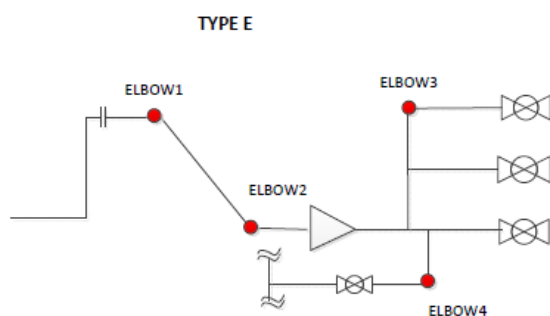
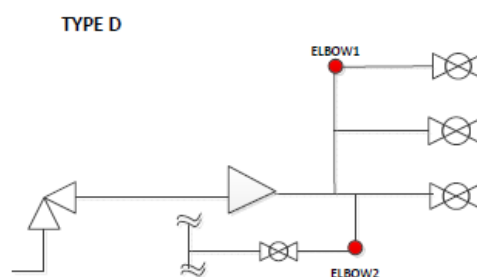
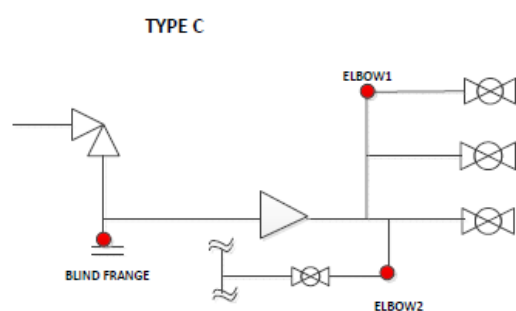
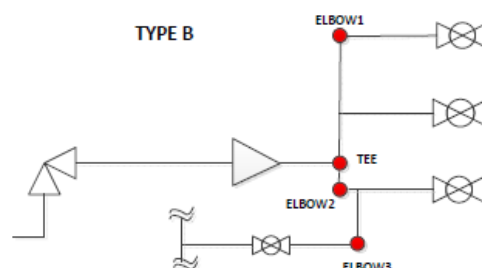
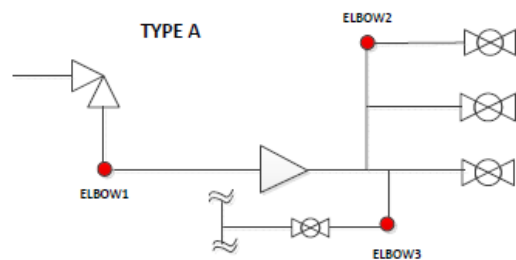
A standard well flowline consist of the following sections:

- 3"- SCH 160 line pipe and elbows, material API 5L Grade B (Yield Strength 241 MPa), from X-mas tree until the choke valve
- 3"- SCH 80 line pipe and elbows, material API 5L Grade B, from choke valve to the manifold
- 1"- SCH 80 line pipe and elbows, material API 5L Grade B, drain line after choke valve
- Gas lift lines are 2" SCH 80 line pipe, material API 5L Grade B

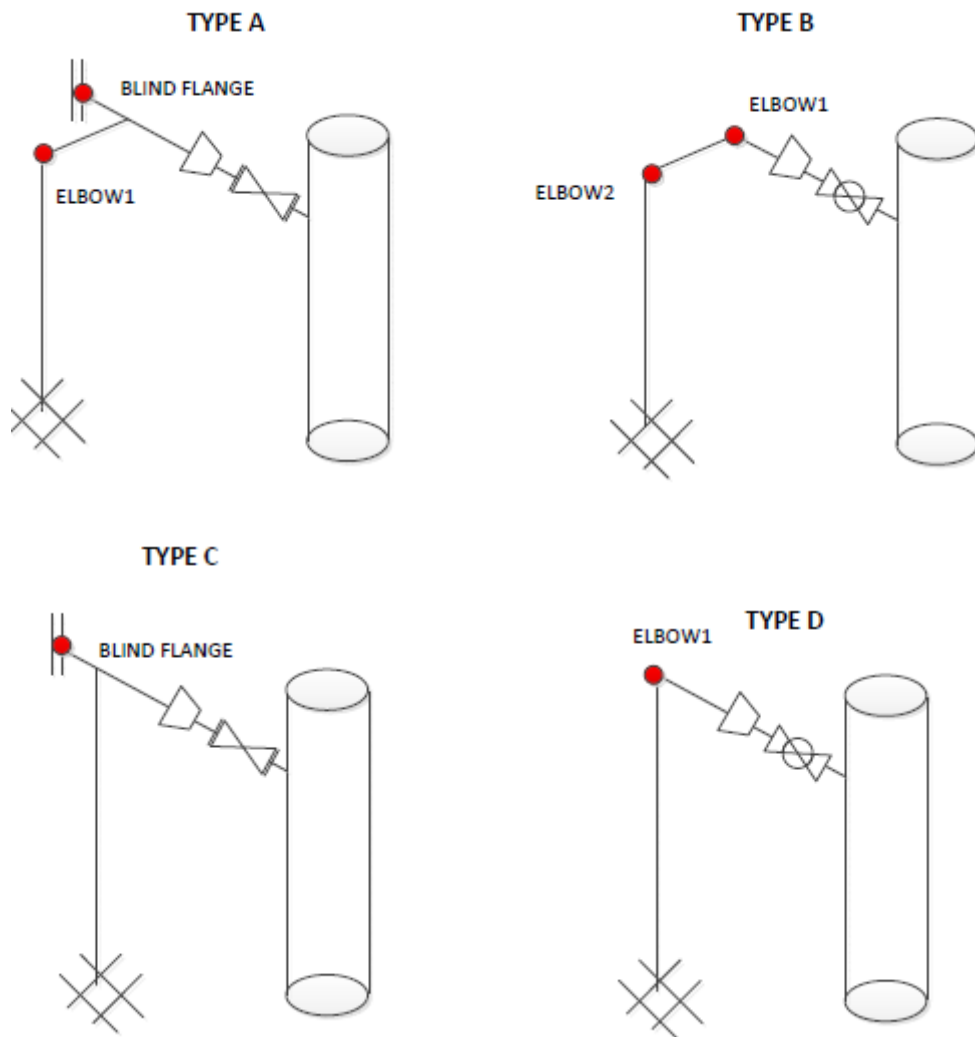
NPS (in)	SCH	OD (mm)	WT (mm)
1	80	33.4	4.55
2	80	60.3	5.54
3	80	88.9	7.62
3	160	88.9	11.13



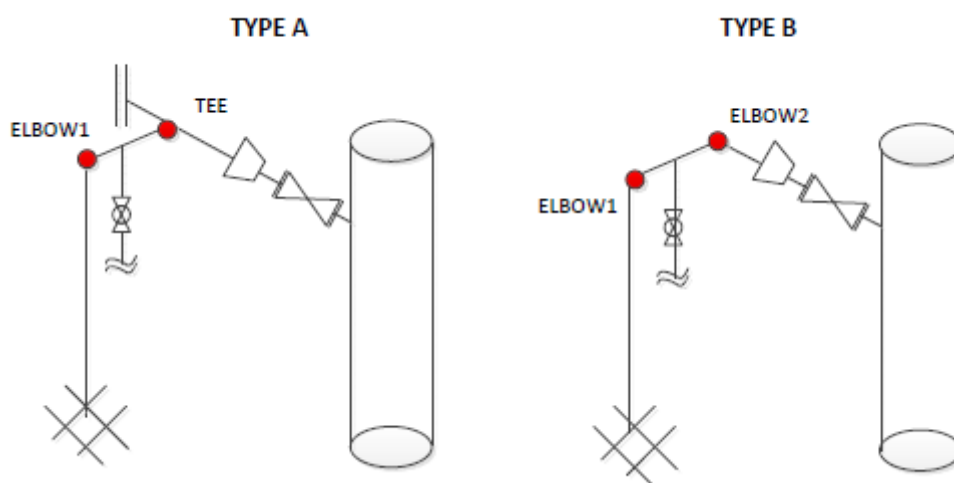
7.2 APPENDIX I: THICKNESS MONITORING LOCATION GUIDELINE

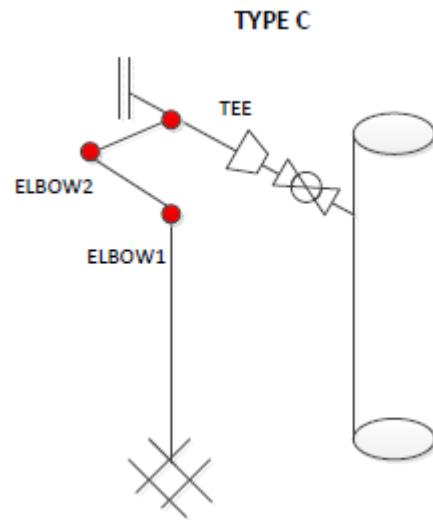


Manifold Thickness Monitoring Location



Crude Flowline Monitoring Location







Water Flowline Monitoring Location

ภาคผนวกที่ 26

เอกสารแสดงการตรวจสอบผิวท่อด้วยวิธี

Ultrasonic Wall Thickness Measurement

<div><div>PTTEP</div></div>	FLOWLINE SUMMARY REPORT				PS1/M INSPECTION TEAM		
FLOWLINE INFORMATION					NORMAL		
Tag number:		S1-NTMA-NTMH-3-NTMHGA-P-GL		Report number:		FL-3-NTM-HGA-GL-2023-02	
Line number:		NTM-HGA		Inspection date:		Nov 08, 2023	
Location: From-To		NTM-A	NTM-H	Inservice date:		Mar 09, 2023	
P&ID number:		NTMH-1-8-002C NTMA-1-08-016C		API Classification:		2.00	
Piping group:		Process		API MII (yrs):		5.00	
Service description:		Gaslift		WO number:		500451544	
THICKNESS SUMMARY					NORMAL		
CML-TP Number:		A-A1-S11-W11-W		Nominal thickness (mm):		11.13	
Distance Description:		110m 110000mm From W11 0mm		Lowest actual thickness (mm):		10.21	
Location Description:		4500 After S-NTM - A31		Retirement thickness (mm):		3.20	
NPS (inch):		3.00		Selected corrosion rate (mm/yr):		1.38	
Material:		API 5L X42		Remaining life (yrs):		5.09	
CML MII, RL/2 (yrs):				Next inspection date (NID):		Nov 08, 2023	
MAWP							
Piping inspection interval (months):					Derate Pressure rec (psig):		
t:ta-2(CRxInterval) (mm):					retired after derate pressure (mm):		
MAWP (psig):					Remaining Life after Pressure (months):		
EXTERNAL VISUAL INSPECTION SUMMARY						GOOD	
Damage mechanism check list							
Leak or Seepage		Good					
General corrosion		Good					
Vibration		Good					
Soil-to-Air Interface		N/A					
Corrosion under insulation (CUI)		N/A					
Corrosion under support (CUS)		Good					
Other		N/A					
Piping component check list							
Weld seam		Good					
Painting		N/A					
Insulation		N/A					
Pipe Support		Good					
Flange/Bolt/Nut/Gasket		N/A					
Instrument Component		N/A					
Deck Penetration		N/A					
Other		N/A					
INSPECTION SUMMARY				RECOMMENDATION DESCRIPTION			
<p>- BL-NTM-HGA 3" During a gaslift flowline examination, it was discovered that the low reading thickness indicated considerable internal corrosion, which generally occurred at the root weld and nearby base material, as detected by TFM Technique with a high corrosion rate & remaining thickness at CML no.A-A1-S11-W11-W is 10.21 mm. with SCR 1.38 mm./yr. & RL is 5.09 yrs.</p> <p>- The overall of this flowline results still in normal thickness with no any significant to low reading thickness or high corrosion rate.</p> <p>The minimum remaining thickness at CML no.A-A1-S18-W19-U is 10.20 mm. with SCR 0.00 mm./yr. & RL is 16.94 yrs.(Determined by UTM)</p> <p>Note; As previous inspection on Aug 10'2023.</p> <p>1.) Baseline inspection will be use mill tolerance ±12.5% to consideration.</p> <p>2.) This line route form NTM-A to NTM-H was install completed on Mar 9'2023.</p> <p>3.) TFM Technique was used to confirm internal condition at 20.0% of weld joints in a selected area (total of 12 welds) and confirmed to be in good condition.</p>				<p>- Continue normal flowline 100% inspection of entire flowline length for plan in next year 2024.(Aug-24)</p> <p>- Plan to extent inspection 20% or Min.10 of welding joint by PAUT/TFM Technique for detect internal weld metal loss within 12 months.(Nov-24)</p> <p>- The design pressure and typical maximum operating pressure for gaslift transfer flowlines shall not be more than 2,000 PSI.</p>			
REQUIRED ACTION							
Temporary repair				Repaint			
Permanent repair				Rerating			
				Derating			
Inspected by:					Date:	Nov 16, 2023	
API Inspector reviewed by:					Date:	Nov 16, 2023	
PTTEP Leader reviewed:					Date:	Feb 02, 2024	

				FLOWLINE THICKNESS REPORT														PS1/M INSPECTION TEAM			
Tag No.:				S1-NTMA-NTMH-3-NTMHGA-P-GL				Total length (m):				700		Installation date:		Mar 09, 2023		Service life (yrs):		0.90	
Pipe size (in):				3				% Inspection:				100		1st Inspection date:		Aug 10, 2023		6th Inspection date:			
Flowline No.:				NTM-HGA				No. of section (sections):				1		2nd Inspection date:		Nov 08, 2023		7th Inspection date:			
From-To:				NTM-A		NTM-H		Length of section (m):				700		3rd Inspection date:				8th Inspection date:			
Process:				P		Process		Length of subsection (m):				700		4th Inspection date:				9th Inspection date:			
Service:				GL		Gaslift		Total spool (spools):				62		5th Inspection date:				10th Inspection			
THICKNESS MEASUREMENT RESULT																					
Section	Subsection	Weld Joint	Distance (m)	CML Name	Location Desc	Nominal Thickness (mm)	Retired Thickness (mm)	Up/Down/Weld	MFL	Previous Inspection Date	Previous Thickness (mm)		Last Inspection Date	Last Thickness (mm)		SCR (mm/yr)	RL (yrs)	Temporary Repair			
											Top (0)	Bottom (180)		Top (0)	Bottom (180)						
A	A1	1	0	A-A1-S0-W1-U	100 After Flang 1	11.13	3.20	U													
		1	0	A-A1-S1-W1-D	100 After Flang 1	11.13	3.20	D					Aug 10, 2023	11.26	11.67	0.00	26.51				
		1	0	A-A1-S1-W1-W	100 After Flang 1	11.13	3.20	W TFM													
		2	11	A-A1-S1-W2-U	600 After W.1	11.13	3.20	U					Aug 10, 2023	11.94	11.45	0.00	27.14				
		2	11	A-A1-S2-W2-D	600 After W.1	11.13	3.20	D					Aug 10, 2023	11.47	11.79	0.00	27.20				
		2	11	A-A1-S2-W2-W	600 After W.1	11.13	3.20	W TFM													
		3	22	A-A1-S2-W3-U	3800 After W.2	11.13	3.20	U					Aug 10, 2023	11.21	11.07	0.00	25.89				
		3	22	A-A1-S3-W3-D	3800 After W.2	11.13	3.20	D					Aug 10, 2023	15.50	15.22	0.00	39.54				
		3	22	A-A1-S3-W3-W	3800 After W.2	11.13	3.20	W TFM													
		4	33	A-A1-S3-W4-U	1200 After W.3	11.13	3.20	U					Aug 10, 2023	14.98	14.59	0.00	37.47				
		4	33	A-A1-S4-W4-D	1200 After W.3	11.13	3.20	D					Aug 10, 2023	10.97	11.15	0.00	25.56				
		4	33	A-A1-S4-W4-W	1200 After W.3	11.13	3.20	W TFM													
		5	44	A-A1-S4-W5-U	1000 After W.4	11.13	3.20	U					Aug 10, 2023	11.06	10.61	0.00	24.38				
		5	44	A-A1-S5-W5-D	1000 After W.4	11.13	3.20	D					Aug 10, 2023	10.92	11.21	0.00	25.39				
		5	44	A-A1-S5-W5-W	1000 After W.4	11.13	3.20	W TFM													
		6	55	A-A1-S5-W6-U	500 After S-NTM - A40	11.13	3.20	U					Aug 10, 2023	10.73	11.32	0.00	24.77				
		6	55	A-A1-S6-W6-D	500 After S-NTM - A40	11.13	3.20	D					Aug 10, 2023	11.07	10.64	0.00	24.47				
		6	55	A-A1-S6-W6-W	500 After S-NTM - A40	11.13	3.20	W TFM													
		7	66	A-A1-S6-W7-U	600 After S-NTM - A38	11.13	3.20	U					Aug 10, 2023	11.06	11.40	0.00	25.86				
		7	66	A-A1-S7-W7-D	600 After S-NTM - A38	11.13	3.20	D					Aug 10, 2023	11.10	11.59	0.00	25.99				
		7	66	A-A1-S7-W7-W	600 After S-NTM - A38	11.13	3.20	W TFM					Nov 08, 2023		10.46	1.00	7.24				



	<h1>FLOWLINE THICKNESS REPORT</h1>	PS1/M INSPECTION TEAM
---	------------------------------------	-----------------------------

Tag No.:	S1-NTMA-NTMH-3-NTMHGA-P-GL		Total length (m):	700	Installation date:	Mar 09, 2023	Service life (yrs):	0.90
Pipe size (in):	3		% Inspection:	100	1st Inspection date:	Aug 10, 2023	6th Inspection date:	
Flowline No.:	NTM-HGA		No. of section (sections):	1	2nd Inspection date:	Nov 08, 2023	7th Inspection date:	
From-To:	NTM-A	NTM-H	Length of section (m):	700	3rd Inspection date:		8th Inspection date:	
Process:	P	Process	Length of subsection (m):	700	4th Inspection date:		9th Inspection date:	
Service:	GL	Gaslift	Total spool (spools):	62	5th Inspection date:		10th Inspection	

THICKNESS MEASUREMENT RESULT

[illegible]



	<h1>FLOWLINE THICKNESS REPORT</h1>	PS1/M INSPECTION TEAM
---	------------------------------------	-----------------------------

Tag No.:	S1-NTMA-NTMH-3-NTMHGA-P-GL		Total length (m):	700	Installation date:	Mar 09, 2023	Service life (yrs):	0.90
Pipe size (in):	3		% Inspection:	100	1st Inspection date:	Aug 10, 2023	6th Inspection date:	
Flowline No.:	NTM-HGA		No. of section (sections):	1	2nd Inspection date:	Nov 08, 2023	7th Inspection date:	
From-To:	NTM-A	NTM-H	Length of section (m):	700	3rd Inspection date:		8th Inspection date:	
Process:	P	Process	Length of subsection (m):	700	4th Inspection date:		9th Inspection date:	
Service:	GL	Gaslift	Total spool (spools):	62	5th Inspection date:		10th Inspection	

THICKNESS MEASUREMENT RESULT

[illegible]



	<h1>FLOWLINE THICKNESS REPORT</h1>	PS1/M INSPECTION TEAM
---	------------------------------------	-----------------------------

Tag No.:	S1-NTMA-NTMH-3-NTMHGA-P-GL		Total length (m):	700	Installation date:	Mar 09, 2023	Service life (yrs):	0.90
Pipe size (in):	3		% Inspection:	100	1st Inspection date:	Aug 10, 2023	6th Inspection date:	
Flowline No.:	NTM-HGA		No. of section (sections):	1	2nd Inspection date:	Nov 08, 2023	7th Inspection date:	
From-To:	NTM-A	NTM-H	Length of section (m):	700	3rd Inspection date:		8th Inspection date:	
Process:	P	Process	Length of subsection (m):	700	4th Inspection date:		9th Inspection date:	
Service:	GL	Gaslift	Total spool (spools):	62	5th Inspection date:		10th Inspection	

THICKNESS MEASUREMENT RESULT									
------------------------------	--	--	--	--	--	--	--	--	--

[illegible]



	<h1>FLOWLINE THICKNESS REPORT</h1>	PS1/M INSPECTION TEAM
---	------------------------------------	-----------------------------

Tag No.:	S1-NTMA-NTMH-3-NTMHGA-P-GL		Total length (m):	700	Installation date:	Mar 09, 2023	Service life (yrs):	0.90
Pipe size (in):	3		% Inspection:	100	1st Inspection date:	Aug 10, 2023	6th Inspection date:	
Flowline No.:	NTM-HGA		No. of section (sections):	1	2nd Inspection date:	Nov 08, 2023	7th Inspection date:	
From-To:	NTM-A	NTM-H	Length of section (m):	700	3rd Inspection date:		8th Inspection date:	
Process:	P	Process	Length of subsection (m):	700	4th Inspection date:		9th Inspection date:	
Service:	GL	Gaslift	Total spool (spools):	62	5th Inspection date:		10th Inspection	

THICKNESS MEASUREMENT RESULT

[illegible]



	<h1>FLOWLINE THICKNESS REPORT</h1>	PS1/M INSPECTION TEAM
---	------------------------------------	-----------------------------

Tag No.:	S1-NTMA-NTMH-3-NTMHGA-P-GL		Total length (m):	700	Installation date:	Mar 09, 2023	Service life (yrs):	0.90
Pipe size (in):	3		% Inspection:	100	1st Inspection date:	Aug 10, 2023	6th Inspection date:	
Flowline No.:	NTM-HGA		No. of section (sections):	1	2nd Inspection date:	Nov 08, 2023	7th Inspection date:	
From-To:	NTM-A	NTM-H	Length of section (m):	700	3rd Inspection date:		8th Inspection date:	
Process:	P	Process	Length of subsection (m):	700	4th Inspection date:		9th Inspection date:	
Service:	GL	Gaslift	Total spool (spools):	62	5th Inspection date:		10th Inspection	

THICKNESS MEASUREMENT RESULT									
------------------------------	--	--	--	--	--	--	--	--	--

[illegible]




	<h1>FLOWLINE THICKNESS REPORT</h1>	PS1/M INSPECTION TEAM
---	------------------------------------	-----------------------------

Tag No.:	S1-NTMA-NTMH-3-NTMHGA-P-GL		Total length (m):	700	Installation date:	Mar 09, 2023	Service life (yrs):	0.90
Pipe size (in):	3		% Inspection:	100	1st Inspection date:	Aug 10, 2023	6th Inspection date:	
Flowline No.:	NTM-HGA		No. of section (sections):	1	2nd Inspection date:	Nov 08, 2023	7th Inspection date:	
From-To:	NTM-A	NTM-H	Length of section (m):	700	3rd Inspection date:		8th Inspection date:	
Process:	P	Process	Length of subsection (m):	700	4th Inspection date:		9th Inspection date:	
Service:	GL	Gaslift	Total spool (spools):	62	5th Inspection date:		10th Inspection	

THICKNESS MEASUREMENT RESULT									
------------------------------	--	--	--	--	--	--	--	--	--

[illegible]

 PTTEP				FLOWLINE THICKNESS REPORT													PS1/M INSPECTION TEAM				
Tag No.:				S1-NTMA-NTMH-3-NTMHGA-P-GL				Total length (m):				700		Installation date:		Mar 09, 2023		Service life (yrs):		0.90	
Pipe size (in):				3				% Inspection:				100		1st Inspection date:		Aug 10, 2023		6th Inspection date:			
Flowline No.:				NTM-HGA				No. of section (sections):				1		2nd Inspection date:		Nov 08, 2023		7th Inspection date:			
From-To:				NTM-A		NTM-H		Length of section (m):				700		3rd Inspection date:				8th Inspection date:			
Process:				P		Process		Length of subsection (m):				700		4th Inspection date:				9th Inspection date:			
Service:				GL		Gaslift		Total spool (spools):				62		5th Inspection date:				10th Inspection			
THICKNESS MEASUREMENT RESULT																					
Section	Subsection	Weld Joint	Distance (m)	CML Name	Location Desc	Nominal Thickness (mm)	Retired Thickness (mm)	Up/Down/Weld	MFL	Previous Inspection Date	Previous Thickness (mm)		Last Inspection Date	Last Thickness (mm)		SCR (mm/yr)	RL (yrs)	Temporary Repair			
											Top (0)	Bottom (180)		Top (0)	Bottom (180)						
		50	539	A-A1-S49-W50-U	400 After Under ground	11.13	3.20	U					Aug 10, 2023	11.14	10.93	0.00	25.43				
		50	539	A-A1-S50-W50-D	400 After Under ground	11.13	3.20	D					Aug 10, 2023	14.82	15.11	0.00	38.22				
		50	539	A-A1-S50-W50-W	400 After Under ground	11.13	3.20	W TFM													
		51	550	A-A1-S50-W51-U	1500 After Under ground	11.13	3.20	U					Aug 10, 2023	10.87	15.13	0.00	25.23				
		51	550	A-A1-S51-W51-D	1500 After Under ground	11.13	3.20	D					Aug 10, 2023	11.34	11.26	0.00	26.51				
		51	550	A-A1-S51-W51-W	1500 After Under ground	11.13	3.20	W TFM													
		52	561	A-A1-S51-W52-U	1200 After S-NTM - H14	11.13	3.20	U					Aug 10, 2023	11.10	11.13	0.00	25.99				
		52	561	A-A1-S52-W52-D	1200 After S-NTM - H14	11.13	3.20	D					Aug 10, 2023	11.32	11.42	0.00	26.71				
		52	561	A-A1-S52-W52-W	1200 After S-NTM - H14	11.13	3.20	W TFM													
		53	572	A-A1-S52-W53-U	1200 Before S-NTM - H12	11.13	3.20	U					Aug 10, 2023	11.16	11.35	0.00	26.18				
		53	572	A-A1-S53-W53-D	1200 Before S-NTM - H12	11.13	3.20	D					Aug 10, 2023	11.14	11.07	0.00	25.89				
		53	572	A-A1-S53-W53-W	1200 Before S-NTM - H12	11.13	3.20	W TFM													
		54	583	A-A1-S53-W54-U	3000 After S-NTM - H11	11.13	3.20	U					Aug 10, 2023	11.16	11.12	0.00	26.05				
		54	583	A-A1-S54-W54-D	3000 After S-NTM - H11	11.13	3.20	D					Aug 10, 2023	10.78	11.34	0.00	24.93				
		54	583	A-A1-S54-W54-W	3000 After S-NTM - H11	11.13	3.20	W TFM													
		55	594	A-A1-S54-W55-U	2900 After S-NTM - H10	11.13	3.20	U					Aug 10, 2023	10.91	11.14	0.00	25.36				
		55	594	A-A1-S55-W55-D	2900 After S-NTM - H10	11.13	3.20	D					Aug 10, 2023	10.89	11.11	0.00	25.30				
		55	594	A-A1-S55-W55-W	2900 After S-NTM - H10	11.13	3.20	W TFM													
		56	605	A-A1-S55-W56-U	2900 After S-NTM - H08	11.13	3.20	U					Aug 10, 2023	10.96	11.19	0.00	25.53				
		56	605	A-A1-S56-W56-D	2900 After S-NTM - H08	11.13	3.20	D					Aug 10, 2023	11.68	10.92	0.00	25.39				
		56	605	A-A1-S56-W56-W	2900 After S-NTM - H08	11.13	3.20	W TFM					Nov 08, 2023		10.47	0.99	7.36				





	<h1 style="text-align: center;">FLOWLINE THICKNESS REPORT</h1>	<p style="text-align: center;">PS1/M INSPECTION TEAM</p>
---	--	--

Tag No.:	S1-NTMA-NTMH-3-NTMHGA-P-GL		Total length (m):	700	Installation date:	Mar 09, 2023	Service life (yrs):	0.90
Pipe size (in):	3		% Inspection:	100	1st Inspection date:	Aug 10, 2023	6th Inspection date:	
Flowline No.:	NTM-HGA		No. of section (sections):	1	2nd Inspection date:	Nov 08, 2023	7th Inspection date:	
From-To:	NTM-A	NTM-H	Length of section (m):	700	3rd Inspection date:		8th Inspection date:	
Process:	P	Process	Length of subsection (m):	700	4th Inspection date:		9th Inspection date:	
Service:	GL	Gaslift	Total spool (spools):	62	5th Inspection date:		10th Inspection	

THICKNESS MEASUREMENT RESULT

[illegible]

 PTTEP		MINIMUM REMAINING THICKNESS						PS1/M INSPECTION TEAM
Inspection date	Section	CML Name	Previous Min thickness (mm)	Min thickness (mm)	ST_CR (mm/yr)	LT_CR (mm/yr)	RL (yrs)	Retirement date
Aug 10, 2023	A1	A-A1-S17-W18-U		10.20	0.00	0.00	23.03	Aug 13, 2046

		MINIMUM REMAINING LIFE						PS1/M INSPECTION TEAM
Inspection date	Section	CML Name	Previous Min thickness (mm)	Min thickness (mm)	ST_CR (mm/yr)	LT_CR (mm/yr)	RL (yrs)	Retirement date
Nov 08, 2023	A1	A-A1-S11-W11-W		10.21	1.38	1.38	5.09	Dec 10, 2028



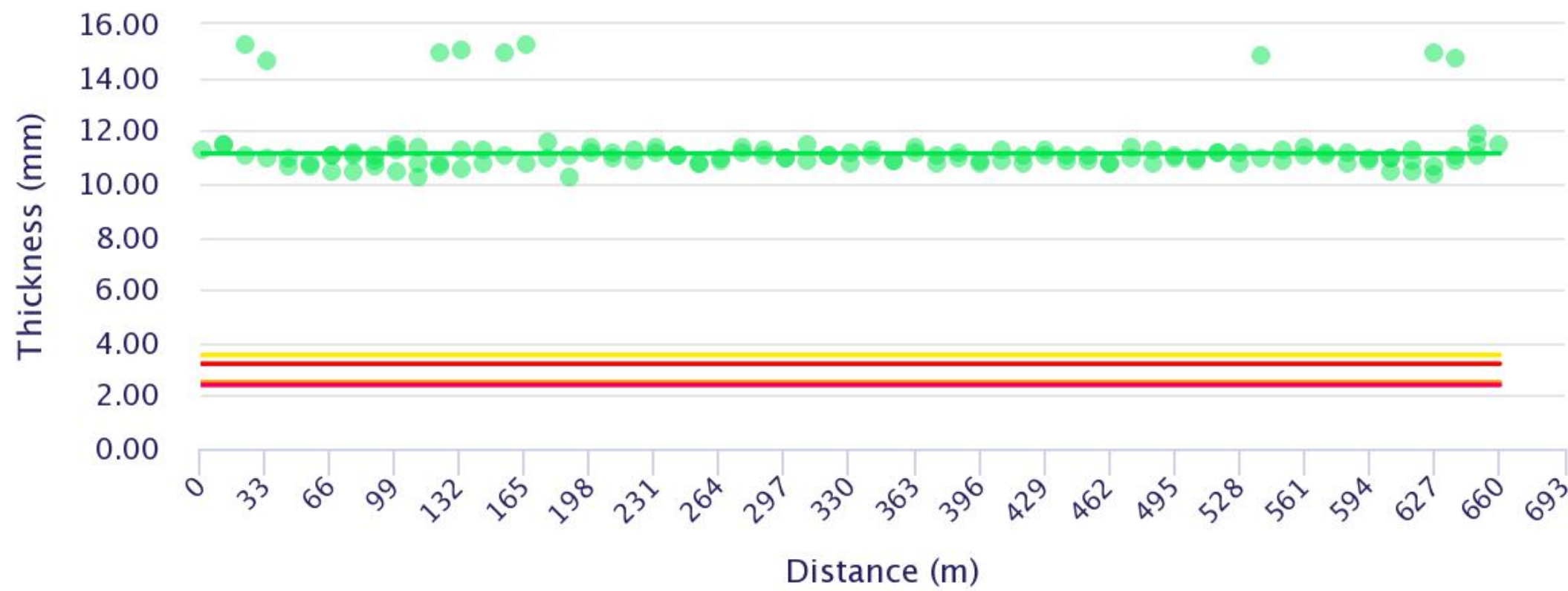
FLOWLINE THICKNESS REPORT

PS1/M
INSPECTION
TEAM


Tag No.:	S1-NTMA-NTMH-3-NTMHGA-P-		Total length (m):	700	Installation date:	Mar 09, 2023
Pipe size (in):	3		% Inspection:	100	1st Inspection date:	Aug 10, 2023
Flowline No.:	NTM-HGA		No. of section (sections):	1	2nd Inspection date:	Nov 08, 2023
From-To:	NTM-A	NTM-H	Length of section (m):	700	3rd Inspection date:	
Process:	P	Process	Length of subsection (m):	700	4th Inspection date:	
Service:	GL	Gaslift	Total spool (spools):	62	5th Inspection date::	

THICKNESS MEASUREMENT RESULT

Distribution of Thickness along NTM-HGA



tnom tdesign tretired_S1 topert 0.75topert
Normal Medium High Extreme

	FLOWLINE VISUAL INSPECTION REPORT				PS1/M INSPECTION TEAM
Inspection date:	Nov 08, 2023	Damage mechanism:	Int-No anomaly found	Severity:	GOOD
Line No:	NTM-HGA	Main component :		Reporting by :	
Anomaly point:	CML no.A-A1-S11-W11-W	WO number :	500451544	Reporting date :	11/16/2023 10:16:05 AM
Finding			Recommendation		
<p>-BL-NTM-HGA 3" During a gas lift flowline examination, it was discovered that the low reading thickness indicated considerable internal corrosion, which generally occurred at the root weld and nearby base material, as detected by TFM Technique with a high corrosion rate & remaining thickness at CML no.A-A1-S11-W11-W is 10.21 mm. with SCR 1.38 mm./yr. & RL is 5.09 yrs.</p>			<p>- Plan to extent inspection 20% or Min.10 of welding joint by PAUT/TFM Technique for detect internal weld metal loss within 12 months.(Nov-24)</p>		

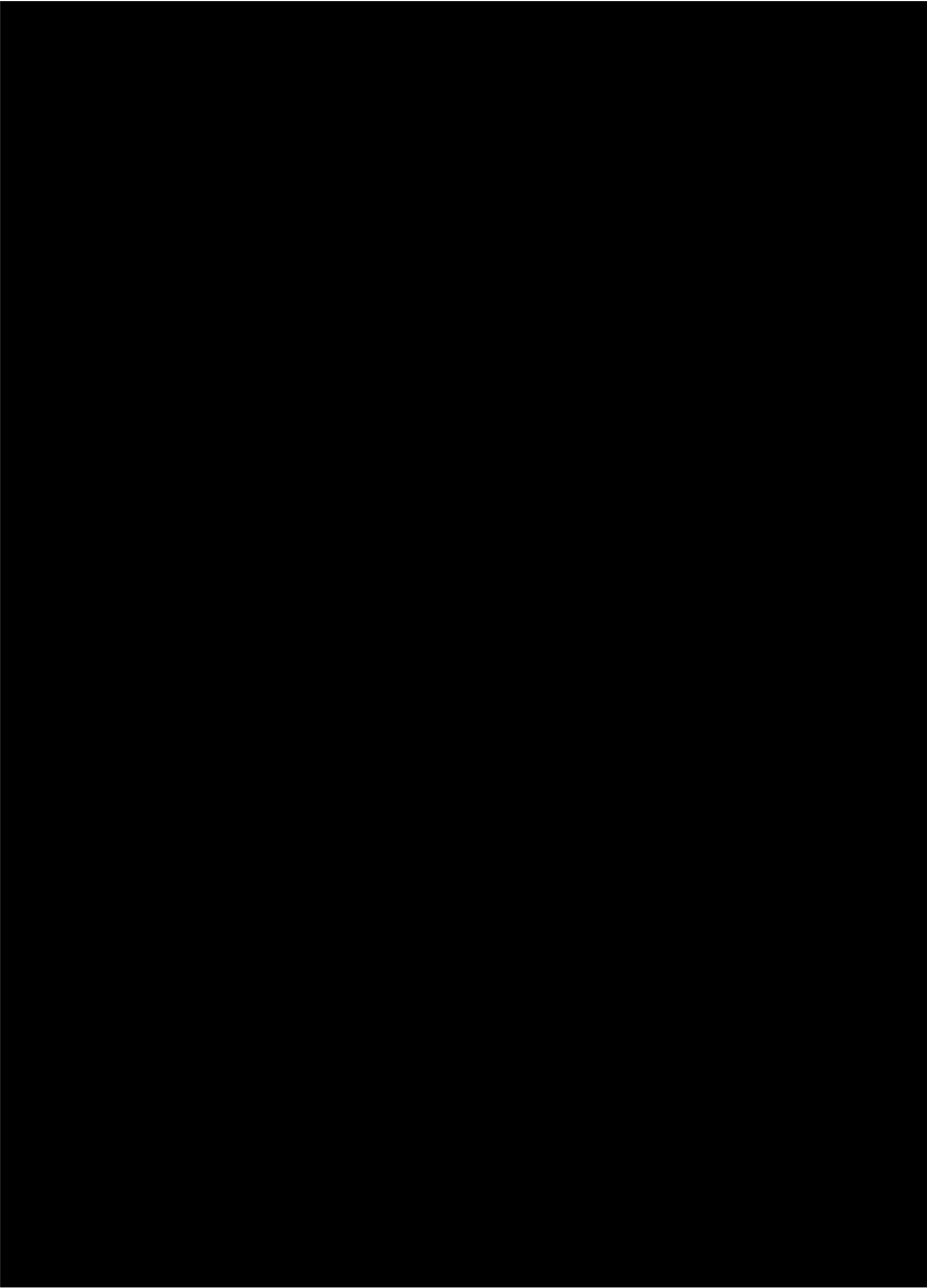
Inspected by:		Date:	
API Inspector reviewed by:		Date:	Nov 16, 2023
PTTEP Leader reviewed:		Date:	Feb 02, 2024



FLOWLINE P&ID

PS1/M
INSPECTION
TEAM

P&ID DRAWING



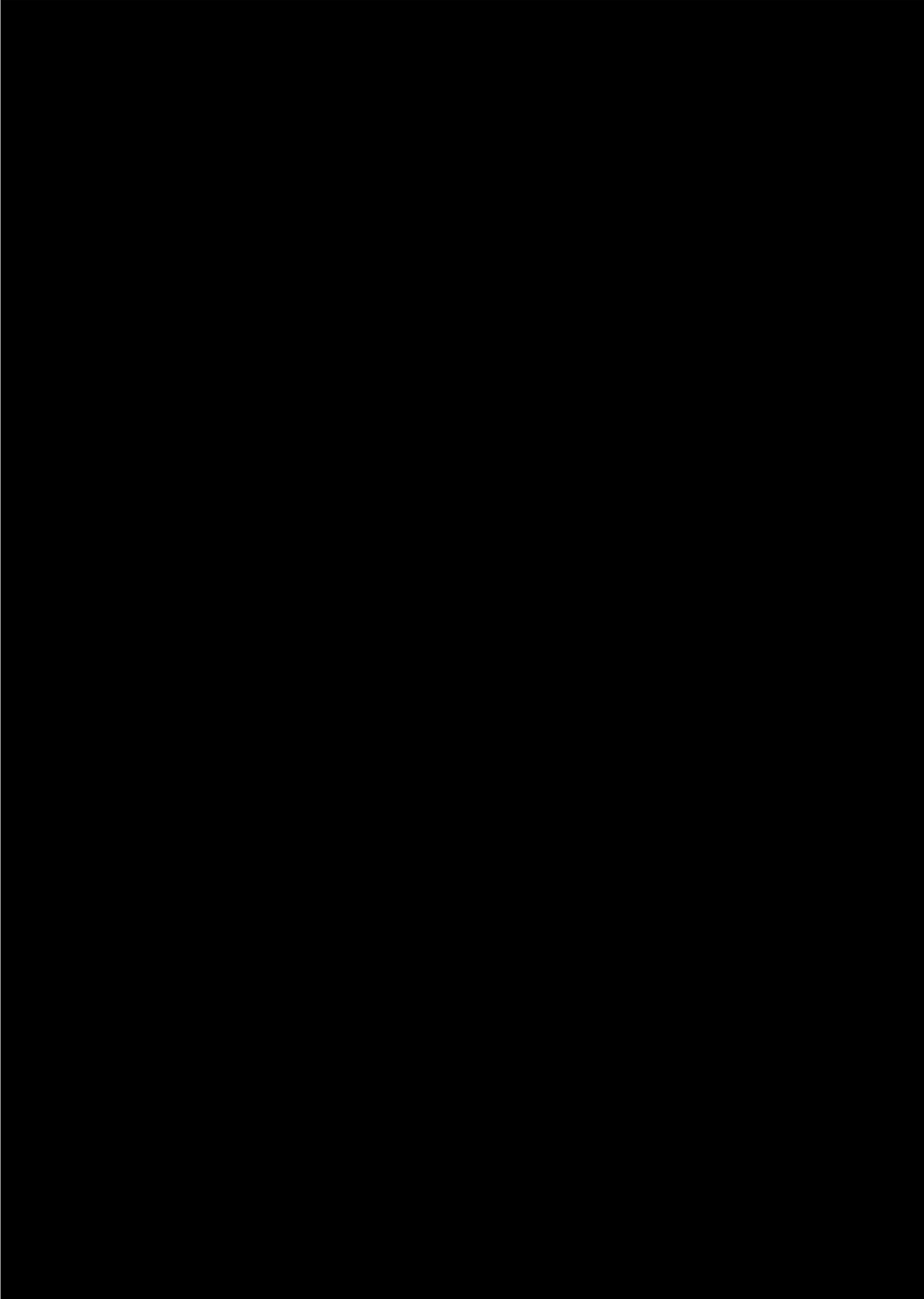
Inspected by:	<div></div>		Date:	Aug 19, 2023
API Inspector reviewed by:			Date:	Nov 16, 2023
PTTEP Leader reviewed:			Date:	Feb 02, 2024




FLOWLINE P&ID

PS1/M
INSPECTION
TEAM

P&ID DRAWING



Inspected by:	<div></div>		Date:	Aug 19, 2023
API Inspector reviewed by:			Date:	Nov 16, 2023
PTTEP Leader reviewed:			Date:	Feb 02, 2024

<div><div>PTTEP</div></div>	FLOWLINE SUMMARY REPORT				PS1/M INSPECTION TEAM			
FLOWLINE INFORMATION					NORMAL			
Tag number:		S1-NTMH-NTMA-6-NTMHA-P-CO		Report number:		FL-6-NTM-HA-CO-2023-02		
Line number:		NTM-HA		Inspection date:		Nov 08, 2023		
Location: From-To		NTM-HNTM-A		Inservice date:		Mar 09, 2023		
P&ID number:		NTMH-1-08-001C & NTMA-1-08-043C		API Classification:		2.00		
Piping group:		Process		API MII (yrs):		5.00		
Service description:		Crude oil		WO number:		500451538		
THICKNESS SUMMARY					NORMAL			
CML-TP Number:		A-A1-S12-W12-W		Nominal thickness (mm):		14.27		
Distance Description:		121m 121000mm From W12 0mm		Lowest actual thickness (mm):		13.09		
Location Description:		2900 Before S-NTM-H-05		Retirement thickness (mm):		2.00		
NPS (inch):		6.00		Selected corrosion rate (mm/yr):		1.77		
Material:		API 5L X42		Remaining life (yrs):		6.28		
CML MII, RL/2 (yrs):				Next inspection date (NID):		Nov 08, 2023		
MAWP								
Piping inspection interval (months):					Derate Pressure rec (psig):			
t:ta-2(CRxInterval) (mm):					tretired after derate pressure (mm):			
MAWP (psig):					Remaining Life after Pressure (months):			
EXTERNAL VISUAL INSPECTION SUMMARY							GOOD	
Damage mechanism check list								
Leak or Seepage		Good						
General corrosion		Good						
Vibration		Good						
Soil-to-Air Interface		N/A						
Corrosion under insulation (CUI)		N/A						
Corrosion under support (CUS)		Good						
Other		N/A						
Piping component check list								
Weld seam		Good						
Painting		N/A						
Insulation		N/A						
Pipe Support		Good						
Flange/Bolt/Nut/Gasket		N/A						
Instrument Component		N/A						
Deck Penetration		N/A						
Other		N/A						
INSPECTION SUMMARY				RECOMMENDATION DESCRIPTION				
<p>-BL-NTM-HA 6" During a crude flowline examination, it was discovered that the low reading thickness indicated considerable internal corrosion, which generally occurred at the root weld and nearby base material, as detected by TFM Technique with a high corrosion rate on this inspection time.</p> <p>The minimum remaining thickness at CML no.A-A1-S12-W12-W is 13.09 mm. with SCR 1.77 mm./yr. & RL is 6.28 yrs.</p> <p>Note; As previous inspection on Aug 10'2023.</p> <p>1.) Baseline inspection will be use mill tolerance ±12.5% to consideration.</p> <p>2.) This line route form NTM-H to NTM-A was install completed on Mar 9'2023.</p> <p>3.) TFM Technique was used to confirm internal condition at 20.0% of weld joints in a selected area (total of 16 welds) and confirmed to be in good condition.</p>				<p>- Continue normal flowline 100% inspection of entire flowline length for plan in next year 2024.(Aug-24)</p> <p>- Plan to extent inspection 20% or Min.10 of welding joint by PAUT/TFM Technique for detect internal weld metal loss within 12 months.(Nov-24)</p> <p>- For crude transfer flowlines, the normal maximum operating pressure shall not exceed 500 PSI.</p>				
REQUIRED ACTION								
Temporary repair				Repaint				
Permanent repair				Rerating				
				Derating				
Inspected by:					Date:		Nov 16, 2023	
API Inspector reviewed by:					Date:		Nov 16, 2023	
PTTEP Leader reviewed:					Date:		Feb 02, 2024	



	<h1>FLOWLINE THICKNESS REPORT</h1>	PS1/M INSPECTION TEAM
---	------------------------------------	-----------------------------

Tag No.:	S1-NTMH-NTMA-6-NTMHA-P-CO		Total length (m):	700	Installation date:	Mar 09, 2023	Service life (yrs):	0.90
Pipe size (in):	6		% Inspection:	100	1st Inspection date:	Aug 10, 2023	6th Inspection date:	
Flowline No.:	NTM-HA		No. of section (sections):	1	2nd Inspection date:	Nov 08, 2023	7th Inspection date:	
From-To:	NTM-H	NTM-A	Length of section (m):	700	3rd Inspection date:		8th Inspection date:	
Process:	P	Process	Length of subsection (m):	700	4th Inspection date:		9th Inspection date:	
Service:	CO	Crude oil	Total spool (spools):	81	5th Inspection date:		10th Inspection	

THICKNESS MEASUREMENT RESULT									
------------------------------	--	--	--	--	--	--	--	--	--

[illegible]



	<h1>FLOWLINE THICKNESS REPORT</h1>	PS1/M INSPECTION TEAM
---	------------------------------------	-----------------------------

Tag No.:	S1-NTMH-NTMA-6-NTMHA-P-CO		Total length (m):	700	Installation date:	Mar 09, 2023	Service life (yrs):	0.90
Pipe size (in):	6		% Inspection:	100	1st Inspection date:	Aug 10, 2023	6th Inspection date:	
Flowline No.:	NTM-HA		No. of section (sections):	1	2nd Inspection date:	Nov 08, 2023	7th Inspection date:	
From-To:	NTM-H	NTM-A	Length of section (m):	700	3rd Inspection date:		8th Inspection date:	
Process:	P	Process	Length of subsection (m):	700	4th Inspection date:		9th Inspection date:	
Service:	CO	Crude oil	Total spool (spools):	81	5th Inspection date:		10th Inspection	

THICKNESS MEASUREMENT RESULT

[illegible]



	<h1>FLOWLINE THICKNESS REPORT</h1>	PS1/M INSPECTION TEAM
---	------------------------------------	-----------------------------

Tag No.:	S1-NTMH-NTMA-6-NTMHA-P-CO		Total length (m):	700	Installation date:	Mar 09, 2023	Service life (yrs):	0.90
Pipe size (in):	6		% Inspection:	100	1st Inspection date:	Aug 10, 2023	6th Inspection date:	
Flowline No.:	NTM-HA		No. of section (sections):	1	2nd Inspection date:	Nov 08, 2023	7th Inspection date:	
From-To:	NTM-H	NTM-A	Length of section (m):	700	3rd Inspection date:		8th Inspection date:	
Process:	P	Process	Length of subsection (m):	700	4th Inspection date:		9th Inspection date:	
Service:	CO	Crude oil	Total spool (spools):	81	5th Inspection date:		10th Inspection	

THICKNESS MEASUREMENT RESULT

[illegible]



Tag No.:	S1-NTMH-NTMA-6-NTMHA-P-CO		Total length (m):	700	Installation date:	Mar 09, 2023	Service life (yrs):	0.90
Pipe size (in):	6		% Inspection:	100	1st Inspection date:	Aug 10, 2023	6th Inspection date:	
Flowline No.:	NTM-HA		No. of section (sections):	1	2nd Inspection date:	Nov 08, 2023	7th Inspection date:	
From-To:	NTM-H	NTM-A	Length of section (m):	700	3rd Inspection date:		8th Inspection date:	
Process:	P	Process	Length of subsection (m):	700	4th Inspection date:		9th Inspection date:	
Service:	CO	Crude oil	Total spool (spools):	81	5th Inspection date:		10th Inspection	

THICKNESS MEASUREMENT RESULT

[illegible]



Tag No.:	S1-NTMH-NTMA-6-NTMHA-P-CO		Total length (m):	700	Installation date:	Mar 09, 2023	Service life (yrs):	0.90
Pipe size (in):	6		% Inspection:	100	1st Inspection date:	Aug 10, 2023	6th Inspection date:	
Flowline No.:	NTM-HA		No. of section (sections):	1	2nd Inspection date:	Nov 08, 2023	7th Inspection date:	
From-To:	NTM-H	NTM-A	Length of section (m):	700	3rd Inspection date:		8th Inspection date:	
Process:	P	Process	Length of subsection (m):	700	4th Inspection date:		9th Inspection date:	
Service:	CO	Crude oil	Total spool (spools):	81	5th Inspection date:		10th Inspection	

[illegible]



	<h1>FLOWLINE THICKNESS REPORT</h1>	PS1/M INSPECTION TEAM
---	------------------------------------	-----------------------------

Tag No.:	S1-NTMH-NTMA-6-NTMHA-P-CO		Total length (m):	700	Installation date:	Mar 09, 2023	Service life (yrs):	0.90
Pipe size (in):	6		% Inspection:	100	1st Inspection date:	Aug 10, 2023	6th Inspection date:	
Flowline No.:	NTM-HA		No. of section (sections):	1	2nd Inspection date:	Nov 08, 2023	7th Inspection date:	
From-To:	NTM-H	NTM-A	Length of section (m):	700	3rd Inspection date:		8th Inspection date:	
Process:	P	Process	Length of subsection (m):	700	4th Inspection date:		9th Inspection date:	
Service:	CO	Crude oil	Total spool (spools):	81	5th Inspection date:		10th Inspection	

THICKNESS MEASUREMENT RESULT

[illegible]



	<h1>FLOWLINE THICKNESS REPORT</h1>	PS1/M INSPECTION TEAM
---	------------------------------------	-----------------------------

Tag No.:	S1-NTMH-NTMA-6-NTMHA-P-CO		Total length (m):	700	Installation date:	Mar 09, 2023	Service life (yrs):	0.90
Pipe size (in):	6		% Inspection:	100	1st Inspection date:	Aug 10, 2023	6th Inspection date:	
Flowline No.:	NTM-HA		No. of section (sections):	1	2nd Inspection date:	Nov 08, 2023	7th Inspection date:	
From-To:	NTM-H	NTM-A	Length of section (m):	700	3rd Inspection date:		8th Inspection date:	
Process:	P	Process	Length of subsection (m):	700	4th Inspection date:		9th Inspection date:	
Service:	CO	Crude oil	Total spool (spools):	81	5th Inspection date:		10th Inspection	

THICKNESS MEASUREMENT RESULT									
------------------------------	--	--	--	--	--	--	--	--	--

[illegible]




	<h1>FLOWLINE THICKNESS REPORT</h1>	PS1/M INSPECTION TEAM
---	------------------------------------	-----------------------------

Tag No.:	S1-NTMH-NTMA-6-NTMHA-P-CO		Total length (m):	700	Installation date:	Mar 09, 2023	Service life (yrs):	0.90
Pipe size (in):	6		% Inspection:	100	1st Inspection date:	Aug 10, 2023	6th Inspection date:	
Flowline No.:	NTM-HA		No. of section (sections):	1	2nd Inspection date:	Nov 08, 2023	7th Inspection date:	
From-To:	NTM-H	NTM-A	Length of section (m):	700	3rd Inspection date:		8th Inspection date:	
Process:	P	Process	Length of subsection (m):	700	4th Inspection date:		9th Inspection date:	
Service:	CO	Crude oil	Total spool (spools):	81	5th Inspection date:		10th Inspection	

THICKNESS MEASUREMENT RESULT									
------------------------------	--	--	--	--	--	--	--	--	--

[illegible]

 PTTEP				FLOWLINE THICKNESS REPORT													PS1/M INSPECTION TEAM				
Tag No.:				S1-NTMH-NTMA-6-NTMHA-P-CO				Total length (m):				700		Installation date:		Mar 09, 2023		Service life (yrs):		0.90	
Pipe size (in):				6				% Inspection:				100		1st Inspection date:		Aug 10, 2023		6th Inspection date:			
Flowline No.:				NTM-HA				No. of section (sections):				1		2nd Inspection date:		Nov 08, 2023		7th Inspection date:			
From-To:				NTM-H		NTM-A		Length of section (m):				700		3rd Inspection date:				8th Inspection date:			
Process:				P		Process		Length of subsection (m):				700		4th Inspection date:				9th Inspection date:			
Service:				CO		Crude oil		Total spool (spools):				81		5th Inspection date:				10th Inspection			
THICKNESS MEASUREMENT RESULT																					
Section	Subsection	Weld Joint	Distance (m)	CML Name	Location Desc	Nominal Thickness (mm)	Retired Thickness (mm)	Up/Down/Weld	MFL	Previous Inspection Date	Previous Thickness (mm)		Last Inspection Date	Last Thickness (mm)		SCR (mm/yr)	RL (yrs)	Temporary Repair			
											Top (0)	Bottom (180)		Top (0)	Bottom (180)						
		57	616	A-A1-S56-W57-U	700 After S-NTM-A-30	14.27	2.00	U					Aug 10, 2023	14.33	14.84	0.00	20.10				
		57	616	A-A1-S57-W57-D	700 After S-NTM-A-30	14.27	2.00	D					Aug 10, 2023	14.60	15.80	0.00	20.54				
		57	616	A-A1-S57-W57-W	700 After S-NTM-A-30	14.27	2.00	W TFM													
		58	627	A-A1-S57-W58-U	2000 After S-NTM-A-30	14.27	2.00	U					Aug 10, 2023	14.63	14.56	0.00	20.47				
		58	627	A-A1-S58-W58-D	2000 After S-NTM-A-30	14.27	2.00	D					Aug 10, 2023	14.04	14.80	0.00	19.63				
		58	627	A-A1-S58-W58-W	2000 After S-NTM-A-30	14.27	2.00	W TFM													
		59	638	A-A1-S58-W59-U	2500 After S-NTM-A-30	14.27	2.00	U					Aug 10, 2023	13.86	14.36	0.00	19.33				
		59	638	A-A1-S59-W59-D	2500 After S-NTM-A-30	14.27	2.00	D					Aug 10, 2023	15.28	14.71	0.00	20.72				
		59	638	A-A1-S59-W59-W	2500 After S-NTM-A-30	14.27	2.00	W TFM													
		60	649	A-A1-S59-W60-U	3000 After S-NTM-A-30	14.27	2.00	U					Aug 10, 2023	15.25	14.92	0.00	21.06				
		60	649	A-A1-S60-W60-D	3000 After S-NTM-A-30	14.27	2.00	D					Aug 10, 2023	14.72	14.21	0.00	19.90				
		60	649	A-A1-S60-W60-W	3000 After S-NTM-A-30	14.27	2.00	W TFM													
		61	660	A-A1-S60-W61-U	4500 Before S-NTM-A-31	14.27	2.00	U					Aug 10, 2023	14.91	14.67	0.00	20.65				
		61	660	A-A1-S61-W61-D	4500 Before S-NTM-A-31	14.27	2.00	D					Aug 10, 2023	14.87	13.17	0.00	18.21				
		61	660	A-A1-S61-W61-W	4500 Before S-NTM-A-31	14.27	2.00	W TFM					Nov 08, 2023		13.19	1.62	6.93				
		62	671	A-A1-S61-W62-U	1600 After S-NTM-A-32	14.27	2.00	U					Aug 10, 2023	14.14	15.00	0.00	19.79				
		62	671	A-A1-S62-W62-D	1600 After S-NTM-A-32	14.27	2.00	D					Aug 10, 2023	15.19	14.72	0.00	20.73				
		62	671	A-A1-S62-W62-W	1600 After S-NTM-A-32	14.27	2.00	W TFM					Nov 08, 2023		14.42	-0.22	20.24				
		63	682	A-A1-S62-W63-U	2200 Before S-NTM-A-34	14.27	2.00	U					Aug 10, 2023	14.66	14.80	0.00	20.64				
		63	682	A-A1-S63-W63-D	2200 Before S-NTM-A-34	14.27	2.00	D					Aug 10, 2023	14.93	14.32	0.00	20.08				
		63	682	A-A1-S63-W63-W	2200 Before S-NTM-A-34	14.27	2.00	W TFM					Nov 08, 2023		14.75	-0.72	20.78				



	<h1>FLOWLINE THICKNESS REPORT</h1>	PS1/M INSPECTION TEAM
---	------------------------------------	-----------------------------

Tag No.:	S1-NTMH-NTMA-6-NTMHA-P-CO		Total length (m):	700	Installation date:	Mar 09, 2023	Service life (yrs):	0.90
Pipe size (in):	6		% Inspection:	100	1st Inspection date:	Aug 10, 2023	6th Inspection date:	
Flowline No.:	NTM-HA		No. of section (sections):	1	2nd Inspection date:	Nov 08, 2023	7th Inspection date:	
From-To:	NTM-H	NTM-A	Length of section (m):	700	3rd Inspection date:		8th Inspection date:	
Process:	P	Process	Length of subsection (m):	700	4th Inspection date:		9th Inspection date:	
Service:	CO	Crude oil	Total spool (spools):	81	5th Inspection date:		10th Inspection	

THICKNESS MEASUREMENT RESULT

[illegible]



	<h1>FLOWLINE THICKNESS REPORT</h1>	PS1/M INSPECTION TEAM
---	------------------------------------	-----------------------------

Tag No.:	S1-NTMH-NTMA-6-NTMHA-P-CO		Total length (m):	700	Installation date:	Mar 09, 2023	Service life (yrs):	0.90
Pipe size (in):	6		% Inspection:	100	1st Inspection date:	Aug 10, 2023	6th Inspection date:	
Flowline No.:	NTM-HA		No. of section (sections):	1	2nd Inspection date:	Nov 08, 2023	7th Inspection date:	
From-To:	NTM-H	NTM-A	Length of section (m):	700	3rd Inspection date:		8th Inspection date:	
Process:	P	Process	Length of subsection (m):	700	4th Inspection date:		9th Inspection date:	
Service:	CO	Crude oil	Total spool (spools):	81	5th Inspection date:		10th Inspection	

THICKNESS MEASUREMENT RESULT									
------------------------------	--	--	--	--	--	--	--	--	--


[illegible]





Tag No.:	S1-NTMH-NTMA-6-NTMHA-P-CO		Total length (m):	700	Installation date:	Mar 09, 2023	Service life (yrs):	0.90
Pipe size (in):	6		% Inspection:	100	1st Inspection date:	Aug 10, 2023	6th Inspection date:	
Flowline No.:	NTM-HA		No. of section (sections):	1	2nd Inspection date:	Nov 08, 2023	7th Inspection date:	
From-To:	NTM-H	NTM-A	Length of section (m):	700	3rd Inspection date:		8th Inspection date:	
Process:	P	Process	Length of subsection (m):	700	4th Inspection date:		9th Inspection date:	
Service:	CO	Crude oil	Total spool (spools):	81	5th Inspection date:		10th Inspection	

THICKNESS MEASUREMENT RESULT

[illegible]

 PTTEP		MINIMUM REMAINING THICKNESS						PS1/M INSPECTION TEAM
Inspection date	Section	CML Name	Previous Min thickness (mm)	Min thickness (mm)	ST_CR (mm/yr)	LT_CR (mm/yr)	RL (yrs)	Retirement date
Nov 08, 2023	A1	A-A1-S12-W12-W		13.09	1.77	1.77	6.28	Feb 17, 2030

		MINIMUM REMAINING LIFE						PS1/M INSPECTION TEAM
Inspection date	Section	CML Name	Previous Min thickness (mm)	Min thickness (mm)	ST_CR (mm/yr)	LT_CR (mm/yr)	RL (yrs)	Retirement date
Nov 08, 2023	A1	A-A1-S12-W12-W		13.09	1.77	1.77	6.28	Feb 17, 2030

		FLOWLINE THICKNESS REPORT				PS1/M INSPECTION TEAM
Tag No.:	S1-NTMH-NTMA-6-NTMHA-P-CO		Total length (m):	700	Installation date:	Mar 09, 2023
Pipe size (in):	6		% Inspection:	100	1st Inspection date:	Aug 10, 2023
Flowline No.:	NTM-HA		No. of section (sections):	1	2nd Inspection date:	Nov 08, 2023
From-To:	NTM-H	NTM-A	Length of section (m):	700	3rd Inspection date:	
Process:	P	Process	Length of subsection (m):	700	4th Inspection date:	
Service:	CO	Crude oil	Total spool (spools):	81	5th Inspection date::	

THICKNESS MEASUREMENT RESULT


Distribution of Thickness along NTM-HA





Inspection date:	Nov 08, 2023	Damage mechanism:	Int-No anomaly found	Severity:	GOOD
Line No:	NTM-HA	Main component :	Weld joint	Reporting by :	Manop N.
Anomaly point:	CML no.A-A1-S12-W12-W	WO number :	500451538	Reporting date :	11/16/2023 9:52:52 AM

[illegible]


สหกิจ การบริการ ตรวจสอบ และ ควบคุม คุณภาพ จำกัด
SQA TESTING INSPECTION & CONSULTING CO., LTD.

TFM Scan plan

Report No.	RP-BPK-212629-009	Rev. 00
Exam Date	November 8, 2023	
	Page 1 of 1	

Section AA

Revision No.: Draw-SI-110020

The project inspection has been carried out to the best of our knowledge and belief. By signing this inspection report, neither the inspector nor the company accept any responsibility and shall be in no way answer for any personal injury, properties damage or loss of any kind arising from or connected with this inspection.

Srinag Bhoonak 862 Thani Tra-Rattana Road, Bangnaheang, Bangkok-Mongkolkeang, Thailand
 21060, Thailand Tel: +66(0)81 388 1774 Fax: +66(0)24 246 2020 / 7
 E-mail: reports@stceng.com Website: www.stcenging.com

Document No.: FIM-TBM-FIT737

Bangkok Office : 105 Soi Pathumwan 65, Pathumwan Road, Bangkok, Thailand 10330, Thailand
 Tel: +66(0)88 3607 5719 Fax: +66(0)24 246 2020 / 7 Email: info@stceng.com
 Website: www.stcenging.com

TFM Examination record	Report No. : RP-BPK-23Z629-009	Rev. 00
	Exam Date : November 8, 2023	Page 6 of 11
<div> <div>Identification Joint no. W12</div> <div>Down stream</div> </div>		

Finding	Recommendation
-BL-NTM-HA 6" During a crude flowline examination, it was discovered that the low reading thickness indicated considerable internal corrosion, which generally occurred at the root weld and nearby base material, as detected by TFM Technique with a high corrosion rate & remaining thickness at CML no.A-A1-S12-W12-W is 13.09 mm. with SCR 1.77 mm./yr. & RL is 6.28 yrs.	-None

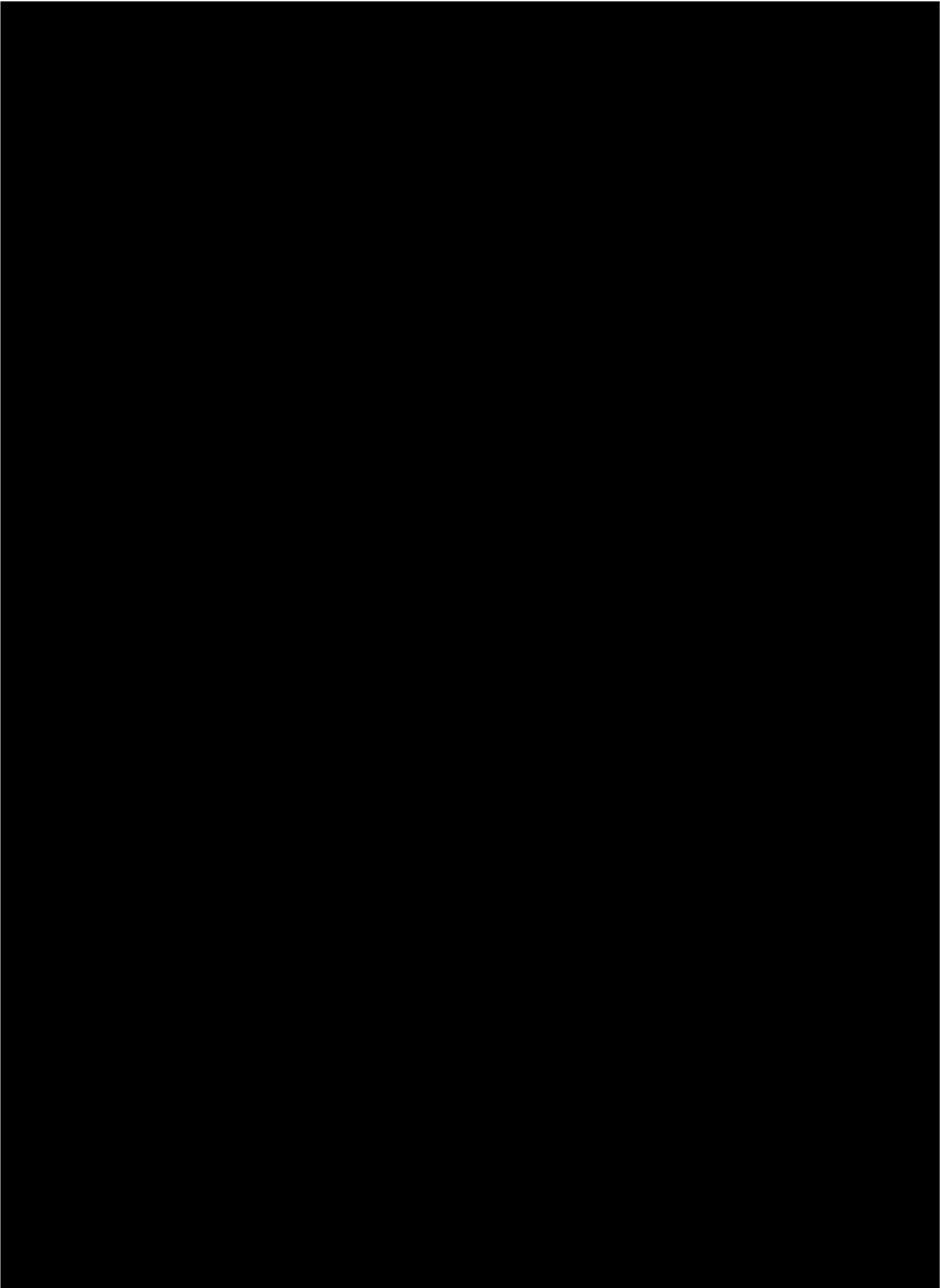
Inspected by:		Date:	
API Inspector reviewed by:		Date:	Nov 16, 2023
PTTEP Leader reviewed:		Date:	Feb 02, 2024



FLOWLINE P&ID

PS1/M
INSPECTION
TEAM

P&ID DRAWING



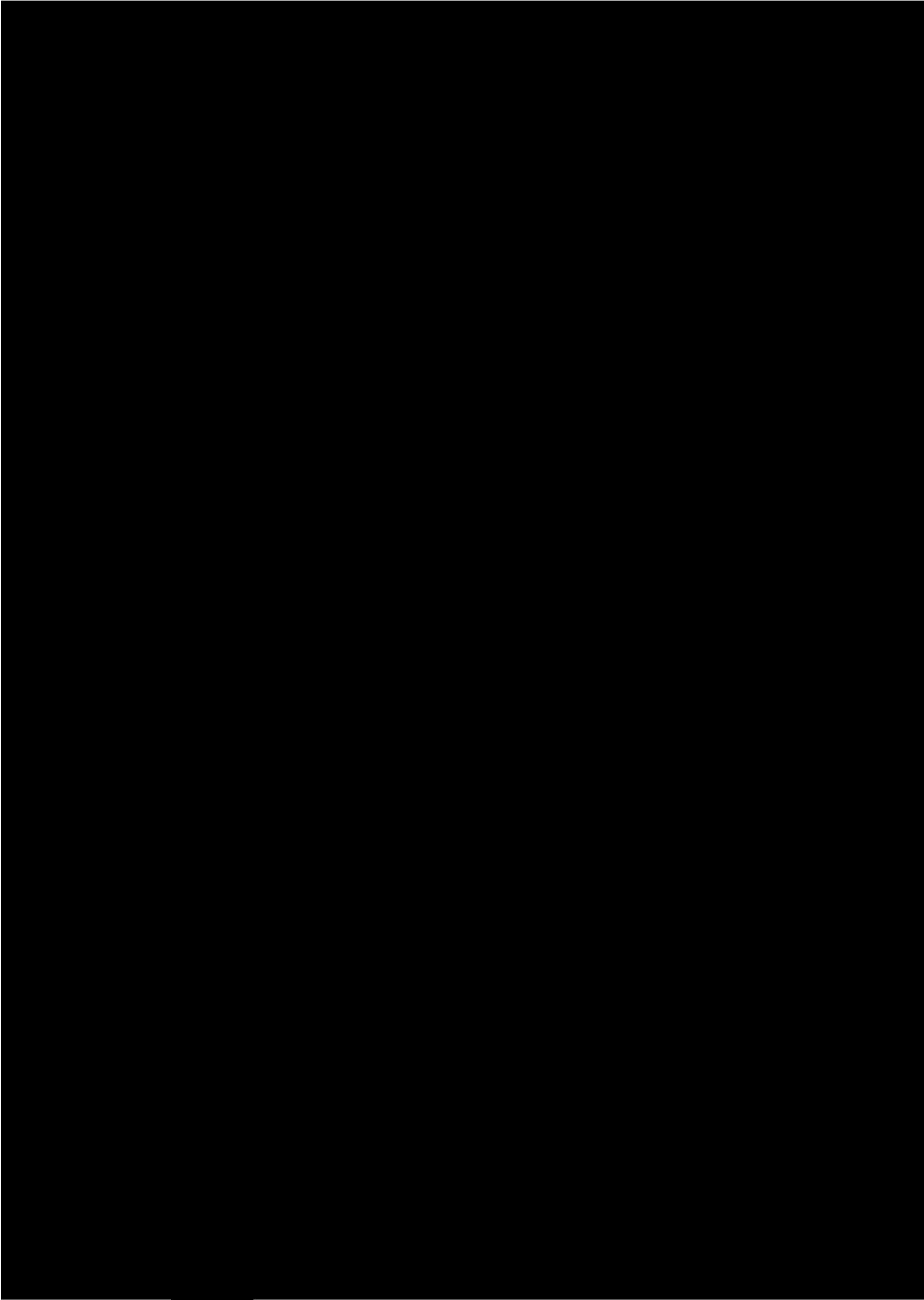
Inspected by:	<div></div>		Date:	Aug 21, 2023
API Inspector reviewed by:			Date:	Nov 16, 2023
PTTEP Leader reviewed:			Date:	Feb 02, 2024




FLOWLINE P&ID


PS1/M
INSPECTION
TEAM


P&ID DRAWING





Inspected by:		Date:	Aug 21, 2023
API Inspector reviewed by:		Date:	Nov 16, 2023
PTTEP Leader reviewed:		Date:	Feb 02, 2024


<div><div>PTTEP</div></div>	FLOWLINE ANOMALY REPORT							PS1/M INSPECTION TEAM	
Line number:		NTM-HWA				Report number:		FL-6-NTM-HWA-W-2023-01	
Tag number:		S1-NTMA-NTMH-6-NTMHWA-P-W				Inspection date:		Dec 11, 2023	
From-to:		NTM-A-NTM-H				Code:		ASME B31.4	
THICKNESS SUMMARY									
CML name:	A-A1-S16-W16-W	A-A1-S17-W17-W	A-A1-S18-W18-W	A-A1-S19-W19-W	A-A1-S22-W22-W	A-A1-S32-W32-W	A-A1-S33-W33-W	A-A1-S34-W34-W	A-A1-S40-W40-W
Location description:	2100 Before S-NTM-A26	1700 After S-NTM-A26	600 After S-NTM-A24	900 Before S-NTM-A22	700 After S-NTM-A16	2200 Before S-200-06	2400 Before S-200-08	2500 Before S-200-10	2900 Before S-200-21
Pipe size (NPS):	6	6	6	6	6	6	6	6	6
Original thk (mm):	14.27	14.27	14.27	14.27	14.27	14.27	14.27	14.27	14.27
Previous thk (mm):	0	0	0	0	0	0	0	0	0
Pipe wall loss thk (mm):	3.29	3.69	3.61	4.72	3.61	3.38	4.95	4.40	3.77
Remaining thk (mm):	10.98	10.58	10.66	9.55	10.66	10.89	9.32	9.87	10.50
Min. required thk:	5.56	5.56	5.56	5.56	5.56	5.56	5.56	5.56	5.56
Result:	Alert	Alert	Alert	Extreme	Alert	Alert	Extreme	Extreme	Extreme
Recommendation:	Monitoring	Monitoring	Monitoring	Monitoring	Monitoring	Monitoring	Monitoring	Monitoring	Monitoring
CML name:	A-A1-S43-W43-W								
Location description:	2700 After S-200-26								
Pipe size (NPS):	6								
Original thk (mm):	14.27								
Previous thk (mm):	0								
Pipe wall loss thk (mm):	3.30								
Remaining thk (mm):	10.97								
Min. required thk:	5.56								
Result:	Alert								
Recommendation:	Monitoring								
CML name:									
Location description:									
Pipe size (NPS):									
Original thk (mm):									
Previous thk (mm):									
Pipe wall loss thk (mm):									
Remaining thk (mm):									
Min. required thk:									
Result:									
Recommendation:									
CML name:									
Location description:									
Pipe size (NPS):									
Original thk (mm):									
Previous thk (mm):									
Pipe wall loss thk (mm):									
Remaining thk (mm):									
Min. required thk:									
Result:									
Recommendation:									
PS1/M Team Lead		PS1/M Supervisor		Inspection Technical Authority 1		Anomaly Priority		SAP Work Order	
						CMS-13425-PDR-5-INT		500517898(CI)	


		<h1>FLOWLINE ANOMALY REPORT</h1>		PS1/M INSPECTION TEAM			
Line number:		NTM-HWA		Report number:		FL-6-NTM-HWA-W-2023-01	
Tag number:		S1-NTMA-NTMH-6-NTMHWA-P-W		Inspection date:		Dec 11, 2023	
From-to:		NTM-A-NTM-H		Code:		ASME B31.4	
INSPECTION SUMMARY				RECOMMENDATION DESCRIPTION			
<p>- NTM-HWA 6" During a water flowline inspection as follow S1 Flowline water disposal integrity campaign, it was discovered that the low reading thickness indicated significant severe internal corrosion,which PWC was detected by TFM Technique with high corrosion rate at weld metal loss on root weld on this inspection time.</p> <p>The minimum remaining thickness at CML no.A-A1-S33-W33-W is 9.32 mm. with SCR 6.52 mm./yr. & RL is 0.58 yr.(Susceptible to PWC corrosion at weld joint by TFM Technique)</p> <p>Note; As previous inspection data on Aug 10'2023.</p> <p>1.) Baseline inspection will be use mill tolerance ±12.5% to consideration.</p> <p>2.) This line route form NTM-A to NTM-H was install completed on Mar 9'2023.</p> <p>3.) TFM Technique can complete this water flowline in 100% of the period.</p>				<p>- Plan for 1st/CI monitoring. Within 3 months to verify next corrosion rate, monitoring thickness on entire flowline at low reading thickness as show significant internal corrosion at weld is lower than 11.00 mm.(Mar-24)</p> <p>Gathering inspection data</p> <p>- Plan to extent inspection 100% of welding joint by TFM Technique for detect internal weld metal loss within 6 months.(Jun-24)</p> <p>- Continue normal flowline 100% inspection of entire flowline length for plan in next year 2024.(Aug-24)</p> <p>- The design pressure and typical maximum operating pressure for water transfer flowlines shall not be more than 2,000 PSI.</p> <p>Note: As follow S1 Flowline water disposal integrity campaign.</p>			
RECOMMENDATION BY API INSPECTOR							
<p>- Plan for 1st/CI monitoring. Within 3 months to verify next corrosion rate, monitoring thickness on entire flowline at low reading thickness as show significant internal corrosion at weld is lower than 11.00 mm.(Mar-24)</p> <p>Gathering inspection data</p> <p>- The design pressure and typical maximum operating pressure for water transfer flowlines shall not be more than 2,000 PSI.</p> <p>Note: As follow S1 Flowline water disposal integrity campaign.</p>							
RECOMMENDATION BY PTTEP LEADER							
REQUIRED ACTION							
Temporary repair							
Permanent repair							
Repaint							
Rerating							
Derating							
ACTION / AS FOUND							
<input type="checkbox"/> Radiographic Test		<input type="checkbox"/> Magnetic Particle Test		By: <div></div>			
<input checked="" type="checkbox"/> Ultrasonic Test		<input type="checkbox"/> Liquid Penetrant Test		Date: Dec 25, 2023			
<input type="checkbox"/> Hydro Test At psig		<input checked="" type="checkbox"/> Other: Visual inspection & TFM		Result: <input checked="" type="checkbox"/> Accepted <input type="checkbox"/> Rejected			
COMPLETION RESPONSIBILITY							
<input type="checkbox"/> Mechanical		<input type="checkbox"/> Instrument		<input type="checkbox"/> Static type			
		<input checked="" type="checkbox"/> Inspection team		<input type="checkbox"/> Contractor team			
				<input type="checkbox"/> Outsource			
PS1/M Team Lead		PS1/M Supervisor		Inspection Technical Authority 1			
				Anomaly Priority			
				CMS-13425-PDR-5-INT			
				<div></div>			
				SAP Work Order			
				500517898(CI)			


<div><div>PTTEP</div></div>	FLOWLINE SUMMARY REPORT				PS1/M INSPECTION TEAM		
FLOWLINE INFORMATION					EXTREME		
Tag number:		S1-NTMA-NTMH-6-NTMHWA-P-W		Report number:		FL-6-NTM-HWA-W-2023-02	
Line number:		NTM-HWA		Inspection date:		Dec 11, 2023	
Location: From-To		NTM-A NTM-H		Inservice date:		Mar 09, 2023	
P&ID number:		NTM-H-1-08-003C & NTM-A-1-08-045C		API Classification:		2.00	
Piping group:		Process		API MII (yrs):		5.00	
Service description:		Waterflood		WO number:		500451579	
THICKNESS SUMMARY					EXTREME		
CML-TP Number:		A-A1-S33-W33-W		Nominal thickness (mm):		14.27	
Distance Description:		352m 352000mm From W33 0mm		Lowest actual thickness (mm):		9.32	
Location Description:		2400 Before S-200-08		Retirement thickness (mm):		5.56	
NPS (inch):		6.00		Selected corrosion rate (mm/yr):		6.52	
Material:		API 5L X42		Remaining life (yrs):		0.58	
CML MII, RL/2 (yrs):		1.00		Next inspection date (NID):		Dec 10, 2024	
MAWP							
Piping inspection interval (months):		3		Derate Pressure rec (psig):			
t:ta-2(CRxInterval) (mm):		6.06		tretired after derate pressure (mm):			
MAWP (psig):		2177.57		Remaining Life after Pressure (months):			
EXTERNAL VISUAL INSPECTION SUMMARY					GOOD		
Damage mechanism check list							
Leak or Seepage		Good					
General corrosion		Good					
Vibration		Good					
Soil-to-Air Interface		Good					
Corrosion under insulation (CUI)		N/A					
Corrosion under support (CUS)		Good					
Other		N/A					
Piping component check list							
Weld seam		Good					
Painting		N/A					
Insulation		N/A					
Pipe Support		Good					
Flange/Bolt/Nut/Gasket		N/A					
Instrument Component		N/A					
Deck Penetration		N/A					
Other		N/A					
INSPECTION SUMMARY				RECOMMENDATION DESCRIPTION			
<p>- NTM-HWA 6" During a water flowline inspection as follow S1 Flowline water disposal integrity campaign, it was discovered that the low reading thickness indicated significant severe internal corrosion,which PWC was detected by TFM Technique with high corrosion rate at weld metal loss on root weld on this inspection time.</p> <p>The minimum remaining thickness at CML no.A-A1-S33-W33-W is 9.32 mm. with SCR 6.52 mm./yr. & RL is 0.58 yr.(Susceptible to PWC corrosion at weld joint by TFM Technique)</p> <p>Note; As previous inspection data on Aug 10'2023.</p> <p>1.) Baseline inspection will be use mill tolerance ±12.5% to consideration.</p> <p>2.) This line route form NTM-A to NTM-H was install completed on Mar 9'2023.</p> <p>3.) TFM Technique can complete this water flowline in 100% of the period.</p>				<p>- Plan for 1st/CI monitoring. Within 3 months to verify next corrosion rate, monitoring thickness on entire flowline at low reading thickness as show significant internal corrosion at weld is lower than 11.00 mm.(Mar-24)Gathering inspection data</p> <p>- Plan to extent inspection 100% of welding joint by TFM Technique for detect internal weld metal loss within 6 months.(Jun-24)</p> <p>- Continue normal flowline 100% inspection of entire flowline length for plan in next year 2024.(Aug-24)</p> <p>- The design pressure and typical maximum operating pressure for water transfer flowlines shall not be more than 2,000 PSI.</p> <p>Note: As follow S1 Flowline water disposal integrity campaign.</p>			
REQUIRED ACTION							
Temporary repair				Repaint			
Permanent repair				Rerating			
				Derating			
Inspected by:				Date:		Dec 23, 2023	
API Inspector reviewed by:				Date:		Dec 25, 2023	
PTTEP Leader reviewed:				Date:		Feb 02, 2024	


				FLOWLINE THICKNESS REPORT													PS1/M INSPECTION TEAM				
Tag No.:				S1-NTMA-NTMH-6-NTMHWA-P-W				Total length (m):				700		Installation date:		Mar 09, 2023		Service life (yrs):		0.90	
Pipe size (in):				6				% Inspection:				100		1st Inspection date:		Aug 10, 2023		6th Inspection date:			
Flowline No.:				NTM-HWA				No. of section (sections):				1		2nd Inspection date:		Dec 11, 2023		7th Inspection date:			
From-To:				NTM-A		NTM-H		Length of section (m):				700		3rd Inspection date:				8th Inspection date:			
Process:				P		Process		Length of subsection (m):				700		4th Inspection date:				9th Inspection date:			
Service:				W		Waterflood		Total spool (spools):				75		5th Inspection date:				10th Inspection			
THICKNESS MEASUREMENT RESULT																					
Section	Subsection	Weld Joint	Distance (m)	CML Name	Location Desc	Nominal Thickness (mm)	Retired Thickness (mm)	Up/Down/Weld	MFL	Previous Inspection Date	Previous Thickness (mm)		Last Inspection Date	Last Thickness (mm)		SCR (mm/yr)	RL (yrs)	Temporary Repair			
											Top (0)	Bottom (180)		Top (0)	Bottom (180)						
A	A1	.1	-9.9	A-A1-S0-W.1-U	100 After Flange	14.27	5.56	U													
		.1	-9.9	A-A1-S.1-W.1-D	100 After Flange	14.27	5.56	D													
		.1	-9.9	A-A1-S.1-W.1-W	100 After Flange	14.27	5.56	W TFM					Dec 11, 2023		13.97	0.40	21.26				
		.2	-8.8	A-A1-S.1-W.2-U	300 Before W0.3	14.27	5.56	U													
		.2	-8.8	A-A1-S.2-W.2-D	300 Before W0.3	14.27	5.56	D													
		.2	-8.8	A-A1-S.2-W.2-W	300 Before W0.3	14.27	5.56	W TFM					Dec 11, 2023		13.91	0.47	17.59				
		.3	-7.7	A-A1-S.2-W.3-U	300 Before W0.4	14.27	5.56	U													
		.3	-7.7	A-A1-S.3-W.3-D	300 Before W0.4	14.27	5.56	D													
		.3	-7.7	A-A1-S.3-W.3-W	300 Before W0.4	14.27	5.56	W TFM					Dec 11, 2023		13.05	1.61	4.66				
		.4	-6.6	A-A1-S.3-W.4-U	300 Before W0.5	14.27	5.56	U													
		.4	-6.6	A-A1-S.4-W.4-D	300 Before W0.5	14.27	5.56	D													
		.4	-6.6	A-A1-S.4-W.4-W	300 Before W0.5	14.27	5.56	W TFM					Dec 11, 2023		12.96	1.73	4.28				
		.5	-5.5	A-A1-S.4-W.5-U	300 Before W1	14.27	5.56	U													
		.5	-5.5	A-A1-S.5-W.5-D	300 Before W1	14.27	5.56	D													
		.5	-5.5	A-A1-S.5-W.5-W	300 Before W1	14.27	5.56	W TFM					Dec 11, 2023		15.37	-1.45	22.53				
		1	0	A-A1-S1-W1-D	100 After Flange	14.27	5.56	D					Aug 10, 2023	21.45	21.69	0.00	36.50				
		1	0	A-A1-S1-W1-W	100 After Flange	14.27	5.56	W TFM					Dec 11, 2023		16.91	-3.48	26.07				
		1	0	A-A1-S.5-W1-U	100 After Flange	14.27	5.56	U													
		2	11	A-A1-S1-W2-U	300 After Flange	14.27	5.56	U					Aug 10, 2023	21.35	22.26	0.00	36.27				
		2	11	A-A1-S2-W2-D	300 After Flange	14.27	5.56	D					Aug 10, 2023	14.39	15.20	0.00	20.28				
		2	11	A-A1-S2-W2-W	300 After Flange	14.27	5.56	W TFM					Dec 11, 2023		13.05	1.61	4.66				


				FLOWLINE THICKNESS REPORT													PS1/M INSPECTION TEAM				
Tag No.:				S1-NTMA-NTMH-6-NTMHW-P-W				Total length (m):				700		Installation date:		Mar 09, 2023		Service life (yrs):		0.90	
Pipe size (in):				6				% Inspection:				100		1st Inspection date:		Aug 10, 2023		6th Inspection date:			
Flowline No.:				NTM-HWA				No. of section (sections):				1		2nd Inspection date:		Dec 11, 2023		7th Inspection date:			
From-To:				NTM-A		NTM-H		Length of section (m):				700		3rd Inspection date:				8th Inspection date:			
Process:				P		Process		Length of subsection (m):				700		4th Inspection date:				9th Inspection date:			
Service:				W		Waterflood		Total spool (spools):				75		5th Inspection date:				10th Inspection			
THICKNESS MEASUREMENT RESULT																					
Section	Subsection	Weld Joint	Distance (m)	CML Name	Location Desc	Nominal Thickness (mm)	Retired Thickness (mm)	Up/Down/Weld	MFL	Previous Inspection Date	Previous Thickness (mm)		Last Inspection Date	Last Thickness (mm)		SCR (mm/yr)	RL (yrs)	Temporary Repair			
											Top (0)	Bottom (180)		Top (0)	Bottom (180)						
		3	22	A-A1-S2-W3-U	2900 After W.2	14.27	5.56	U					Aug 10, 2023	16.03	14.78	0.00	21.17				
		3	22	A-A1-S3-W3-D	2900 After W.2	14.27	5.56	D													
		3	22	A-A1-S3-W3-W	2900 After W.2	14.27	5.56	W TFM					Dec 11, 2023		11.59	3.53	1.71				
		4	33	A-A1-S3-W4-U	300 After W.3	14.27	5.56	U													
		4	33	A-A1-S4-W4-D	300 After W.3	14.27	5.56	D					Aug 10, 2023	14.87	13.70	0.00	18.69				
		4	33	A-A1-S4-W4-W	300 After W.3	14.27	5.56	W TFM					Dec 11, 2023		12.02	2.96	2.18				
		5	44	A-A1-S4-W5-U	2500 Before S-NTM-A37	14.27	5.56	U					Aug 10, 2023	15.33	14.58	0.00	20.71				
		5	44	A-A1-S5-W5-D	2500 Before S-NTM-A37	14.27	5.56	D					Aug 10, 2023	15.43	14.60	0.00	20.76				
		5	44	A-A1-S5-W5-W	2500 Before S-NTM-A37	14.27	5.56	W TFM					Dec 11, 2023		12.19	2.74	2.42				
		6	55	A-A1-S5-W6-U	1000 Before S-NTM-A37	14.27	5.56	U					Aug 10, 2023	14.56	14.13	0.00	19.68				
		6	55	A-A1-S6-W6-D	1000 Before S-NTM-A37	14.27	5.56	D					Aug 10, 2023	14.50	14.65	0.00	20.53				
		6	55	A-A1-S6-W6-W	1000 Before S-NTM-A37	14.27	5.56	W TFM					Dec 11, 2023		13.05	1.61	4.66				
		7	66	A-A1-S6-W7-U	900 After S-NTM-A37	14.27	5.56	U					Aug 10, 2023	14.86	14.35	0.00	20.18				
		7	66	A-A1-S7-W7-D	900 After S-NTM-A37	14.27	5.56	D					Aug 10, 2023	14.38	14.21	0.00	19.86				
		7	66	A-A1-S7-W7-W	900 After S-NTM-A37	14.27	5.56	W TFM					Dec 11, 2023		11.41	3.77	1.55				
		8	77	A-A1-S7-W8-U	2800 Before S-NTM-A35	14.27	5.56	U					Aug 10, 2023	14.20	13.70	0.00	18.69				
		8	77	A-A1-S8-W8-D	2800 Before S-NTM-A35	14.27	5.56	D					Aug 10, 2023	15.17	14.52	0.00	20.57				
		8	77	A-A1-S8-W8-W	2800 Before S-NTM-A35	14.27	5.56	W TFM					Dec 11, 2023		11.24	3.99	1.42				
		9	88	A-A1-S8-W9-U	2900 After S-NTM-A34	14.27	5.56	U					Aug 10, 2023	14.66	14.73	0.00	20.90				
		9	88	A-A1-S9-W9-D	2900 After S-NTM-A34	14.27	5.56	D					Aug 10, 2023	14.29	14.32	0.00	20.05				
		9	88	A-A1-S9-W9-W	2900 After S-NTM-A34	14.27	5.56	W TFM					Dec 11, 2023		11.33	3.87	1.49				


				FLOWLINE THICKNESS REPORT													PS1/M INSPECTION TEAM				
Tag No.:				S1-NTMA-NTMH-6-NTMHWA-P-W				Total length (m):				700		Installation date:		Mar 09, 2023		Service life (yrs):		0.90	
Pipe size (in):				6				% Inspection:				100		1st Inspection date:		Aug 10, 2023		6th Inspection date:			
Flowline No.:				NTM-HWA				No. of section (sections):				1		2nd Inspection date:		Dec 11, 2023		7th Inspection date:			
From-To:				NTM-A		NTM-H		Length of section (m):				700		3rd Inspection date:				8th Inspection date:			
Process:				P		Process		Length of subsection (m):				700		4th Inspection date:				9th Inspection date:			
Service:				W		Waterflood		Total spool (spools):				75		5th Inspection date:				10th Inspection			
THICKNESS MEASUREMENT RESULT																					
Section	Subsection	Weld Joint	Distance (m)	CML Name	Location Desc	Nominal Thickness (mm)	Retired Thickness (mm)	Up/Down/Weld	MFL	Previous Inspection Date	Previous Thickness (mm)		Last Inspection Date	Last Thickness (mm)		SCR (mm/yr)	RL (yrs)	Temporary Repair			
											Top (0)	Bottom (180)		Top (0)	Bottom (180)						
		10	99	A-A1-S9-W10-U	2900 After S-NTM-A32	14.27	5.56	U					Aug 10, 2023	15.09	14.16	0.00	19.75				
		10	99	A-A1-S10-W10-D	2900 After S-NTM-A32	14.27	5.56	D					Aug 10, 2023	14.80	14.02	0.00	19.43				
		10	99	A-A1-S10-W10-W	2900 After S-NTM-A32	14.27	5.56	W TFM					Dec 11, 2023		12.36	2.52	2.70				
		11	110	A-A1-S10-W11-U	3200 After S-NTM-A31	14.27	5.56	U					Aug 10, 2023	14.60	14.16	0.00	19.75				
		11	110	A-A1-S11-W11-D	3200 After S-NTM-A31	14.27	5.56	D					Aug 10, 2023	14.44	14.42	0.00	20.34				
		11	110	A-A1-S11-W11-W	3200 After S-NTM-A31	14.27	5.56	W TFM					Dec 11, 2023		12.27	2.64	2.54				
		12	121	A-A1-S11-W12-U	5500 Before S-NTM-A30	14.27	5.56	U					Aug 10, 2023	14.61	13.90	0.00	19.15				
		12	121	A-A1-S12-W12-D	5500 Before S-NTM-A30	14.27	5.56	D					Aug 10, 2023	14.21	14.46	0.00	19.86				
		12	121	A-A1-S12-W12-W	5500 Before S-NTM-A30	14.27	5.56	W TFM					Dec 11, 2023		12.79	1.95	3.70				
		13	132	A-A1-S12-W13-U	3700 Before S-NTM-A30	14.27	5.56	U					Aug 10, 2023	14.60	14.64	0.00	20.76				
		13	132	A-A1-S13-W13-D	3700 Before S-NTM-A30	14.27	5.56	D					Aug 10, 2023	14.93	14.05	0.00	19.49				
		13	132	A-A1-S13-W13-W	3700 Before S-NTM-A30	14.27	5.56	W TFM					Dec 11, 2023		11.76	3.31	1.87				
		14	143	A-A1-S13-W14-U	2200 After S-NTM-A29	14.27	5.56	U					Aug 10, 2023	13.92	14.42	0.00	19.20				
		14	143	A-A1-S14-W14-D	2200 After S-NTM-A29	14.27	5.56	D					Aug 10, 2023	14.29	13.93	0.00	19.22				
		14	143	A-A1-S14-W14-W	2200 After S-NTM-A29	14.27	5.56	W TFM					Dec 11, 2023		11.24	3.99	1.42				
		15	154	A-A1-S14-W15-U	700 After S-NTM-A27	14.27	5.56	U					Aug 10, 2023	14.09	13.95	0.00	19.26				
		15	154	A-A1-S15-W15-D	700 After S-NTM-A27	14.27	5.56	D					Aug 10, 2023	14.35	14.91	0.00	20.18				
		15	154	A-A1-S15-W15-W	700 After S-NTM-A27	14.27	5.56	W TFM					Dec 11, 2023		11.41	3.77	1.55				
		16	165	A-A1-S15-W16-U	2100 Before S-NTM-A26	14.27	5.56	U					Aug 10, 2023	14.47	14.39	0.00	20.28				
		16	165	A-A1-S16-W16-D	2100 Before S-NTM-A26	14.27	5.56	D					Aug 10, 2023	13.91	14.04	0.00	19.17				
		16	165	A-A1-S16-W16-W	2100 Before S-NTM-A26	14.27	5.56	W TFM					Dec 11, 2023		10.98	4.34	1.25				


				FLOWLINE THICKNESS REPORT													PS1/M INSPECTION TEAM				
Tag No.:				S1-NTMA-NTMH-6-NTMHW-P-W			Total length (m):			700			Installation date:		Mar 09, 2023		Service life (yrs):		0.90		
Pipe size (in):				6			% Inspection:			100			1st Inspection date:		Aug 10, 2023		6th Inspection date:				
Flowline No.:				NTM-HWA			No. of section (sections):			1			2nd Inspection date:		Dec 11, 2023		7th Inspection date:				
From-To:				NTM-A		NTM-H		Length of section (m):			700			3rd Inspection date:				8th Inspection date:			
Process:				P		Process		Length of subsection (m):			700			4th Inspection date:				9th Inspection date:			
Service:				W		Waterflood		Total spool (spools):			75			5th Inspection date:				10th Inspection			
THICKNESS MEASUREMENT RESULT																					
Section	Subsection	Weld Joint	Distance (m)	CML Name	Location Desc	Nominal Thickness (mm)	Retired Thickness (mm)	Up/Down/Weld	MFL	Previous Inspection Date	Previous Thickness (mm)		Last Inspection Date	Last Thickness (mm)		SCR (mm/yr)	RL (yrs)	Temporary Repair			
											Top (0)	Bottom (180)		Top (0)	Bottom (180)						
		17	176	A-A1-S16-W17-U	1700 After S-NTM-A26	14.27	5.56	U					Aug 10, 2023	14.28	13.78	0.00	18.87				
		17	176	A-A1-S17-W17-D	1700 After S-NTM-A26	14.27	5.56	D					Aug 10, 2023	14.44	14.59	0.00	20.39				
		17	176	A-A1-S17-W17-W	1700 After S-NTM-A26	14.27	5.56	W TFM					Dec 11, 2023		10.58	4.86	1.03				
		18	187	A-A1-S17-W18-U	600 After S-NTM-A24	14.27	5.56	U					Aug 10, 2023	14.68	13.97	0.00	19.31				
		18	187	A-A1-S18-W18-D	600 After S-NTM-A24	14.27	5.56	D					Aug 10, 2023	13.95	12.85	0.00	16.74				
		18	187	A-A1-S18-W18-W	600 After S-NTM-A24	14.27	5.56	W TFM					Dec 11, 2023		10.66	4.76	1.07				
		19	198	A-A1-S18-W19-U	900 Before S-NTM-A22	14.27	5.56	U					Aug 10, 2023	14.65	14.06	0.00	19.52				
		19	198	A-A1-S19-W19-D	900 Before S-NTM-A22	14.27	5.56	D					Aug 10, 2023	14.59	13.75	0.00	18.81				
		19	198	A-A1-S19-W19-W	900 Before S-NTM-A22	14.27	5.56	W TFM					Dec 11, 2023		9.55	6.22	0.64				
		20	209	A-A1-S19-W20-U	1400 Before S-NTM-A20	14.27	5.56	U					Aug 10, 2023	13.70	13.50	0.00	18.23				
		20	209	A-A1-S20-W20-D	1400 Before S-NTM-A20	14.27	5.56	D					Aug 10, 2023	13.83	14.47	0.00	18.99				
		20	209	A-A1-S20-W20-W	1400 Before S-NTM-A20	14.27	5.56	W TFM					Dec 11, 2023		12.32	2.57	2.63				
		21	220	A-A1-S20-W21-U	2400 Before S-NTM-A18	14.27	5.56	U					Aug 10, 2023	14.31	13.58	0.00	18.41				
		21	220	A-A1-S21-W21-D	2400 Before S-NTM-A18	14.27	5.56	D					Aug 10, 2023	14.80	13.86	0.00	19.06				
		21	220	A-A1-S21-W21-W	2400 Before S-NTM-A18	14.27	5.56	W TFM					Dec 11, 2023		12.71	2.06	3.48				
		22	231	A-A1-S21-W22-U	700 After S-NTM-A16	14.27	5.56	U					Aug 10, 2023	13.92	14.74	0.00	19.20				
		22	231	A-A1-S22-W22-D	700 After S-NTM-A16	14.27	5.56	D					Aug 10, 2023	13.81	14.36	0.00	18.94				
		22	231	A-A1-S22-W22-W	700 After S-NTM-A16	14.27	5.56	W TFM					Dec 11, 2023		10.66	4.76	1.07				
		23	242	A-A1-S22-W23-U	1600 Before S-NTM-A13	14.27	5.56	U					Aug 10, 2023	13.70	13.58	0.00	18.41				
		23	242	A-A1-S23-W23-D	1600 Before S-NTM-A13	14.27	5.56	D					Aug 10, 2023	14.28	13.62	0.00	18.51				
		23	242	A-A1-S23-W23-W	1600 Before S-NTM-A13	14.27	5.56	W TFM					Dec 11, 2023		11.92	3.10	2.05				


 PTTEP				FLOWLINE THICKNESS REPORT													PS1/M INSPECTION TEAM				
Tag No.:				S1-NTMA-NTMH-6-NTMHW A-P-W				Total length (m):				700		Installation date:		Mar 09, 2023		Service life (yrs):		0.90	
Pipe size (in):				6				% Inspection:				100		1st Inspection date:		Aug 10, 2023		6th Inspection date:			
Flowline No.:				NTM-HWA				No. of section (sections):				1		2nd Inspection date:		Dec 11, 2023		7th Inspection date:			
From-To:				NTM-A		NTM-H		Length of section (m):				700		3rd Inspection date:				8th Inspection date:			
Process:				P		Process		Length of subsection (m):				700		4th Inspection date:				9th Inspection date:			
Service:				W		Waterflood		Total spool (spools):				75		5th Inspection date:				10th Inspection			
THICKNESS MEASUREMENT RESULT																					
Section	Subsection	Weld Joint	Distance (m)	CML Name	Location Desc	Nominal Thickness (mm)	Retired Thickness (mm)	Up/Down/Weld	MFL	Previous Inspection Date	Previous Thickness (mm)		Last Inspection Date	Last Thickness (mm)		SCR (mm/yr)	RL (yrs)	Temporary Repair			
											Top (0)	Bottom (180)		Top (0)	Bottom (180)						
		24	253	A-A1-S23-W24-U	900 Before S-NTM-A11	14.27	5.56	U					Aug 10, 2023	13.76	14.31	0.00	18.83				
		24	253	A-A1-S24-W24-D	900 Before S-NTM-A11	14.27	5.56	D					Aug 10, 2023	14.43	13.93	0.00	19.22				
		24	253	A-A1-S24-W24-W	900 Before S-NTM-A11	14.27	5.56	W TFM					Dec 11, 2023		11.13	4.14	1.35				
		25	264	A-A1-S24-W25-U	1100 Before S-NTM-A09	14.27	5.56	U					Aug 10, 2023	11.50	14.20	6.57	0.90				
		25	264	A-A1-S25-W25-D	1100 Before S-NTM-A09	14.27	5.56	D					Aug 10, 2023	13.66	14.24	0.00	18.60				
		25	264	A-A1-S25-W25-W	1100 Before S-NTM-A09	14.27	5.56	W TFM					Dec 11, 2023		11.68	3.41	1.79				
		26	275	A-A1-S25-W26-U	1200 Before S-NTM-A07	14.27	5.56	U					Aug 10, 2023	14.07	13.67	0.00	18.62				
		26	275	A-A1-S26-W26-D	1200 Before S-NTM-A07	14.27	5.56	D					Aug 10, 2023	14.02	14.05	0.00	19.43				
		26	275	A-A1-S26-W26-W	1200 Before S-NTM-A07	14.27	5.56	W TFM					Dec 11, 2023		12.71	2.06	3.48				
		27	286	A-A1-S26-W27-U	1350 Before S-NTM-A05	14.27	5.56	U					Aug 10, 2023	14.38	14.13	0.00	19.68				
		27	286	A-A1-S27-W27-D	1350 Before S-NTM-A05	14.27	5.56	D					Aug 10, 2023	13.74	14.10	0.00	18.78				
		27	286	A-A1-S27-W27-W	1350 Before S-NTM-A05	14.27	5.56	W TFM					Dec 11, 2023		12.00	2.99	2.15				
		28	297	A-A1-S27-W28-U	1500 Before S-NTM-A03	14.27	5.56	U					Aug 10, 2023	13.37	14.19	0.00	17.93				
		28	297	A-A1-S28-W28-D	1500 Before S-NTM-A03	14.27	5.56	D					Aug 10, 2023	13.98	13.64	0.00	18.55				
		28	297	A-A1-S28-W28-W	1500 Before S-NTM-A03	14.27	5.56	W TFM					Dec 11, 2023		11.21	4.03	1.40				
		29	308	A-A1-S28-W29-U	1700 Before S-NTM-A01	14.27	5.56	U					Aug 10, 2023	14.73	13.73	0.00	18.76				
		29	308	A-A1-S29-W29-D	1700 Before S-NTM-A01	14.27	5.56	D					Aug 10, 2023	13.74	14.75	0.00	18.78				
		29	308	A-A1-S29-W29-W	1700 Before S-NTM-A01	14.27	5.56	W TFM					Dec 11, 2023		11.53	3.61	1.65				
		30	319	A-A1-S29-W30-U	1850 Before S-200-02	14.27	5.56	U					Aug 10, 2023	14.33	13.65	0.00	18.58				
		30	319	A-A1-S30-W30-D	1850 Before S-200-02	14.27	5.56	D					Aug 10, 2023	14.07	14.31	0.00	19.54				
		30	319	A-A1-S30-W30-W	1850 Before S-200-02	14.27	5.56	W TFM					Dec 11, 2023		12.39	2.48	2.76				


 PTTEP				FLOWLINE THICKNESS REPORT													PS1/M INSPECTION TEAM				
Tag No.:				S1-NTMA-NTMH-6-NTMHWa-P-W				Total length (m):				700		Installation date:		Mar 09, 2023		Service life (yrs):		0.90	
Pipe size (in):				6				% Inspection:				100		1st Inspection date:		Aug 10, 2023		6th Inspection date:			
Flowline No.:				NTM-HWA				No. of section (sections):				1		2nd Inspection date:		Dec 11, 2023		7th Inspection date:			
From-To:				NTM-A		NTM-H		Length of section (m):				700		3rd Inspection date:				8th Inspection date:			
Process:				P		Process		Length of subsection (m):				700		4th Inspection date:				9th Inspection date:			
Service:				W		Waterflood		Total spool (spools):				75		5th Inspection date:				10th Inspection			
THICKNESS MEASUREMENT RESULT																					
Section	Subsection	Weld Joint	Distance (m)	CML Name	Location Desc	Nominal Thickness (mm)	Retired Thickness (mm)	Up/Down/Weld	MFL	Previous Inspection Date	Previous Thickness (mm)		Last Inspection Date	Last Thickness (mm)		SCR (mm/yr)	RL (yrs)	Temporary Repair			
											Top (0)	Bottom (180)		Top (0)	Bottom (180)						
		31	330	A-A1-S30-W31-U	200 Before S-200-04	14.27	5.56	U					Aug 10, 2023	14.40	13.69	0.00	18.67				
		31	330	A-A1-S31-W31-D	200 Before S-200-04	14.27	5.56	D					Aug 10, 2023	13.77	13.78	0.00	18.85				
		31	330	A-A1-S31-W31-W	200 Before S-200-04	14.27	5.56	W TFM					Dec 11, 2023		11.84	3.20	1.96				
		32	341	A-A1-S31-W32-U	2200 Before S-200-06	14.27	5.56	U					Aug 10, 2023	14.20	14.22	0.00	19.84				
		32	341	A-A1-S32-W32-D	2200 Before S-200-06	14.27	5.56	D					Aug 10, 2023	14.24	13.76	0.00	18.83				
		32	341	A-A1-S32-W32-W	2200 Before S-200-06	14.27	5.56	W TFM					Dec 11, 2023		10.89	4.45	1.20				
		33	352	A-A1-S32-W33-U	2400 Before S-200-08	14.27	5.56	U					Aug 10, 2023	13.61	14.32	0.00	18.48				
		33	352	A-A1-S33-W33-D	2400 Before S-200-08	14.27	5.56	D					Aug 10, 2023	13.85	13.80	0.00	18.92				
		33	352	A-A1-S33-W33-W	2400 Before S-200-08	14.27	5.56	W TFM					Dec 11, 2023		9.32	6.52	0.58				
		34	363	A-A1-S33-W34-U	2500 Before S-200-10	14.27	5.56	U					Aug 10, 2023	13.91	14.85	0.00	19.17				
		34	363	A-A1-S34-W34-D	2500 Before S-200-10	14.27	5.56	D					Aug 10, 2023	14.03	13.87	0.00	19.08				
		34	363	A-A1-S34-W34-W	2500 Before S-200-10	14.27	5.56	W TFM					Dec 11, 2023		9.87	5.80	0.74				
		35	374	A-A1-S34-W35-U	2600 Before S-200-12	14.27	5.56	U					Aug 10, 2023	13.84	14.76	0.00	19.01				
		35	374	A-A1-S35-W35-D	2600 Before S-200-12	14.27	5.56	D					Aug 10, 2023	14.34	13.51	0.00	18.25				
		35	374	A-A1-S35-W35-W	2600 Before S-200-12	14.27	5.56	W TFM					Dec 11, 2023		13.03	1.63	4.57				
		36	385	A-A1-S35-W36-U	3150 After S-200-13	14.27	5.56	U					Aug 10, 2023	13.58	14.04	0.00	18.41				
		36	385	A-A1-S36-W36-D	3150 After S-200-13	14.27	5.56	D					Aug 10, 2023	13.59	13.90	0.00	18.44				
		36	385	A-A1-S36-W36-W	3150 After S-200-13	14.27	5.56	W TFM					Dec 11, 2023		11.21	4.03	1.40				
		37	396	A-A1-S36-W37-U	1450 Before S-200-15	14.27	5.56	U					Aug 10, 2023	14.20	13.94	0.00	19.24				
		37	396	A-A1-S37-W37-D	1450 Before S-200-15	14.27	5.56	D					Aug 10, 2023	14.86	13.37	0.00	17.93				
		37	396	A-A1-S37-W37-W	1450 Before S-200-15	14.27	5.56	W TFM					Dec 11, 2023		13.89	0.50	16.63				


				FLOWLINE THICKNESS REPORT													PS1/M INSPECTION TEAM				
Tag No.:				S1-NTMA-NTMH-6-NTMHW-P-W			Total length (m):			700			Installation date:		Mar 09, 2023		Service life (yrs):		0.90		
Pipe size (in):				6			% Inspection:			100			1st Inspection date:		Aug 10, 2023		6th Inspection date:				
Flowline No.:				NTM-HWA			No. of section (sections):			1			2nd Inspection date:		Dec 11, 2023		7th Inspection date:				
From-To:				NTM-A		NTM-H		Length of section (m):			700			3rd Inspection date:				8th Inspection date:			
Process:				P		Process		Length of subsection (m):			700			4th Inspection date:				9th Inspection date:			
Service:				W		Waterflood		Total spool (spools):			75			5th Inspection date:				10th Inspection			
THICKNESS MEASUREMENT RESULT																					
Section	Subsection	Weld Joint	Distance (m)	CML Name	Location Desc	Nominal Thickness (mm)	Retired Thickness (mm)	Up/Down/Weld	MFL	Previous Inspection Date	Previous Thickness (mm)		Last Inspection Date	Last Thickness (mm)		SCR (mm/yr)	RL (yrs)	Temporary Repair			
											Top (0)	Bottom (180)		Top (0)	Bottom (180)						
		38	407	A-A1-S37-W38-U	1200 After S-200-17	14.27	5.56	U					Aug 10, 2023	14.40	14.57	0.00	20.30				
		38	407	A-A1-S38-W38-D	1200 After S-200-17	14.27	5.56	D					Aug 10, 2023	14.16	14.13	0.00	19.68				
		38	407	A-A1-S38-W38-W	1200 After S-200-17	14.27	5.56	W TFM					Dec 11, 2023		11.45	3.72	1.58				
		39	418	A-A1-S38-W39-U	2800 Before S-200-19	14.27	5.56	U					Aug 10, 2023	14.50	14.26	0.00	19.98				
		39	418	A-A1-S39-W39-D	2800 Before S-200-19	14.27	5.56	D					Aug 10, 2023	13.54	14.18	0.00	18.32				
		39	418	A-A1-S39-W39-W	2800 Before S-200-19	14.27	5.56	W TFM					Dec 11, 2023		11.13	4.14	1.35				
		40	429	A-A1-S39-W40-U	2900 Before S-200-21	14.27	5.56	U					Aug 10, 2023	13.32	14.46	0.00	17.82				
		40	429	A-A1-S40-W40-D	2900 Before S-200-21	14.27	5.56	D					Aug 10, 2023	14.28	14.70	0.00	20.02				
		40	429	A-A1-S40-W40-W	2900 Before S-200-21	14.27	5.56	W TFM					Dec 11, 2023		10.50	4.97	0.99				
		41	440	A-A1-S40-W41-U	3000 Before S-200-23	14.27	5.56	U					Aug 10, 2023	13.96	13.43	0.00	18.07				
		41	440	A-A1-S41-W41-D	3000 Before S-200-23	14.27	5.56	D					Aug 10, 2023	14.39	13.40	0.00	18.00				
		41	440	A-A1-S41-W41-W	3000 Before S-200-23	14.27	5.56	W TFM					Dec 11, 2023		12.16	2.78	2.37				
		42	451	A-A1-S41-W42-U	2800 After S-200-24	14.27	5.56	U					Aug 10, 2023	13.78	13.75	0.00	18.81				
		42	451	A-A1-S42-W42-D	2800 After S-200-24	14.27	5.56	D					Aug 10, 2023	14.49	14.69	0.00	20.51				
		42	451	A-A1-S42-W42-W	2800 After S-200-24	14.27	5.56	W TFM					Dec 11, 2023		12.61	2.19	3.22				
		43	462	A-A1-S42-W43-U	2700 After S-200-26	14.27	5.56	U					Aug 10, 2023	13.79	13.60	0.00	18.46				
		43	462	A-A1-S43-W43-D	2700 After S-200-26	14.27	5.56	D					Aug 10, 2023	13.68	13.77	0.00	18.64				
		43	462	A-A1-S43-W43-W	2700 After S-200-26	14.27	5.56	W TFM					Dec 11, 2023		10.97	4.35	1.24				
		44	473	A-A1-S43-W44-U	2900 After S-200-28	14.27	5.56	U					Aug 10, 2023	13.36	14.92	0.00	17.91				
		44	473	A-A1-S44-W44-D	2900 After S-200-28	14.27	5.56	D					Aug 10, 2023	13.99	14.01	0.00	19.36				
		44	473	A-A1-S44-W44-W	2900 After S-200-28	14.27	5.56	W TFM					Dec 11, 2023		12.71	2.06	3.48				


				FLOWLINE THICKNESS REPORT													PS1/M INSPECTION TEAM	
Tag No.: S1-NTMA-NTMH-6-NTMHW-A-P-W					Total length (m): 700			Installation date: Mar 09, 2023		Service life (yrs): 0.90								
Pipe size (in): 6					% Inspection: 100			1st Inspection date: Aug 10, 2023		6th Inspection date:								
Flowline No.: NTM-HWA					No. of section (sections): 1			2nd Inspection date: Dec 11, 2023		7th Inspection date:								
From-To: NTM-A			NTM-H		Length of section (m): 700			3rd Inspection date:		8th Inspection date:								
Process: P			Process		Length of subsection (m): 700			4th Inspection date:		9th Inspection date:								
Service: W			Waterflood		Total spool (spools): 75			5th Inspection date:		10th Inspection								
THICKNESS MEASUREMENT RESULT																		
Section	Subsection	Weld Joint	Distance (m)	CML Name	Location Desc	Nominal Thickness (mm)	Retired Thickness (mm)	Up/Down/Weld	MFL	Previous Inspection Date	Previous Thickness (mm)		Last Inspection Date	Last Thickness (mm)		SCR (mm/yr)	RL (yrs)	Temporary Repair
											Top (0)	Bottom (180)		Top (0)	Bottom (180)			
		45	484	A-A1-S44-W45-U	2700 After S-200-30	14.27	5.56	U					Aug 10, 2023	14.82	13.56	0.00	18.37	
		45	484	A-A1-S45-W45-D	2700 After S-200-30	14.27	5.56	D					Aug 10, 2023	13.88	13.66	0.00	18.60	
		45	484	A-A1-S45-W45-W	2700 After S-200-30	14.27	5.56	W TFM					Dec 11, 2023		12.71	2.06	3.48	
		46	495	A-A1-S45-W46-U	2500 After S-200-32	14.27	5.56	U					Aug 10, 2023	14.21	14.11	0.00	19.63	
		46	495	A-A1-S46-W46-D	2500 After S-200-32	14.27	5.56	D					Aug 10, 2023	13.79	14.44	0.00	18.90	
		46	495	A-A1-S46-W46-W	2500 After S-200-32	14.27	5.56	W TFM					Dec 11, 2023		12.87	1.84	3.96	
		47	506	A-A1-S46-W47-U	500 After S-200-34	14.27	5.56	U					Aug 10, 2023	13.92	14.39	0.00	19.20	
		47	506	A-A1-S47-W47-D	500 After S-200-34	14.27	5.56	D					Aug 10, 2023	14.21	14.44	0.00	19.86	
		47	506	A-A1-S47-W47-W	500 After S-200-34	14.27	5.56	W TFM					Dec 11, 2023		12.24	2.67	2.50	
		48	517	A-A1-S47-W48-U	2600 After S-200-35	14.27	5.56	U					Aug 10, 2023	13.94	15.29	0.00	19.24	
		48	517	A-A1-S48-W48-D	2600 After S-200-35	14.27	5.56	D					Aug 10, 2023	14.58	14.44	0.00	20.39	
		48	517	A-A1-S48-W48-W	2600 After S-200-35	14.27	5.56	W TFM					Dec 11, 2023		12.79	1.95	3.70	
		49	528	A-A1-S48-W49-U	1500 After C-200-01	14.27	5.56	U					Aug 10, 2023	14.38	14.39	0.00	20.25	
		49	528	A-A1-S49-W49-D	1500 After C-200-01	14.27	5.56	D					Aug 10, 2023	14.11	14.28	0.00	19.63	
		49	528	A-A1-S49-W49-W	1500 After C-200-01	14.27	5.56	W TFM					Dec 11, 2023		12.87	1.84	3.96	
		50	539	A-A1-S49-W50-U	500 After Under Ground	14.27	5.56	U					Aug 10, 2023	14.60	13.57	0.00	18.39	
		50	539	A-A1-S50-W50-D	500 After Under Ground	14.27	5.56	D					Aug 10, 2023	14.96	14.86	0.00	21.36	
		50	539	A-A1-S50-W50-W	500 After Under Ground	14.27	5.56	W TFM					Dec 12, 2023		13.10	1.54	4.91	
		51	550	A-A1-S50-W51-U	1500 After Under Ground	14.27	5.56	U					Aug 10, 2023	15.13	14.82	0.00	21.26	
		51	550	A-A1-S51-W51-D	1500 After Under Ground	14.27	5.56	D					Aug 10, 2023	14.18	13.89	0.00	19.13	
		51	550	A-A1-S51-W51-W	1500 After Under Ground	14.27	5.56	W TFM					Dec 12, 2023		13.65	0.81	9.93	

 PTTEP				FLOWLINE THICKNESS REPORT													PS1/M INSPECTION TEAM				
Tag No.:				S1-NTMA-NTMH-6-NTMHWA-P-W				Total length (m):				700		Installation date:		Mar 09, 2023		Service life (yrs):		0.90	
Pipe size (in):				6				% Inspection:				100		1st Inspection date:		Aug 10, 2023		6th Inspection date:			
Flowline No.:				NTM-HWA				No. of section (sections):				1		2nd Inspection date:		Dec 11, 2023		7th Inspection date:			
From-To:				NTM-A		NTM-H		Length of section (m):				700		3rd Inspection date:				8th Inspection date:			
Process:				P		Process		Length of subsection (m):				700		4th Inspection date:				9th Inspection date:			
Service:				W		Waterflood		Total spool (spools):				75		5th Inspection date:				10th Inspection			
THICKNESS MEASUREMENT RESULT																					
Section	Subsection	Weld Joint	Distance (m)	CML Name	Location Desc	Nominal Thickness (mm)	Retired Thickness (mm)	Up/Down/Weld	MFL	Previous Inspection Date	Previous Thickness (mm)		Last Inspection Date	Last Thickness (mm)		SCR (mm/yr)	RL (yrs)	Temporary Repair			
											Top (0)	Bottom (180)		Top (0)	Bottom (180)						
		52	561	A-A1-S51-W52-U	1200 After S-NTM-H14	14.27	5.56	U					Aug 10, 2023	14.94	14.12	0.00	19.66				
		52	561	A-A1-S52-W52-D	1200 After S-NTM-H14	14.27	5.56	D					Aug 10, 2023	14.27	15.56	0.00	20.00				
		52	561	A-A1-S52-W52-W	1200 After S-NTM-H14	14.27	5.56	W TFM					Dec 12, 2023		13.65	0.81	9.93				
		53	572	A-A1-S52-W53-U	1200 Before S-NTM-H12	14.27	5.56	U					Aug 10, 2023	13.84	14.39	0.00	19.01				
		53	572	A-A1-S53-W53-D	1200 Before S-NTM-H12	14.27	5.56	D					Aug 10, 2023	14.39	14.43	0.00	20.28				
		53	572	A-A1-S53-W53-W	1200 Before S-NTM-H12	14.27	5.56	W TFM					Dec 12, 2023		12.55	2.26	3.09				
		54	583	A-A1-S53-W54-U	2150 Before S-NTM-H11	14.27	5.56	U					Aug 10, 2023	14.54	14.06	0.00	19.52				
		54	583	A-A1-S54-W54-D	2150 Before S-NTM-H11	14.27	5.56	D					Aug 10, 2023	13.70	13.59	0.00	18.44				
		54	583	A-A1-S54-W54-W	2150 Before S-NTM-H11	14.27	5.56	W TFM					Dec 12, 2023		13.19	1.42	5.38				
		55	594	A-A1-S54-W55-U	2200 Before S-NTM-H09	14.27	5.56	U					Aug 10, 2023	14.93	13.50	0.00	18.23				
		55	594	A-A1-S55-W55-D	2200 Before S-NTM-H09	14.27	5.56	D					Aug 10, 2023	13.70	14.24	0.00	18.69				
		55	594	A-A1-S55-W55-W	2200 Before S-NTM-H09	14.27	5.56	W TFM					Dec 12, 2023		12.64	2.14	3.31				
		56	605	A-A1-S55-W56-U	2450 Before S-NTM-H07	14.27	5.56	U					Aug 10, 2023	14.86	14.68	0.00	20.94				
		56	605	A-A1-S56-W56-D	2450 Before S-NTM-H07	14.27	5.56	D					Aug 10, 2023	14.76	13.79	0.00	18.90				
		56	605	A-A1-S56-W56-W	2450 Before S-NTM-H07	14.27	5.56	W TFM					Dec 12, 2023		12.47	2.36	2.92				
		57	616	A-A1-S56-W57-U	2600 After S-NTM-H06	14.27	5.56	U					Aug 10, 2023	14.78	14.18	0.00	19.79				
		57	616	A-A1-S57-W57-D	2600 After S-NTM-H06	14.27	5.56	D					Aug 10, 2023	14.56	14.41	0.00	20.32				
		57	616	A-A1-S57-W57-W	2600 After S-NTM-H06	14.27	5.56	W TFM					Dec 12, 2023		12.18	2.74	2.41				
		58	627	A-A1-S57-W58-U	5400 After S-NTM-H06	14.27	5.56	U					Aug 10, 2023	14.79	14.32	0.00	20.11				
		58	627	A-A1-S58-W58-D	5400 After S-NTM-H06	14.27	5.56	D					Aug 10, 2023	13.88	14.22	0.00	19.10				
		58	627	A-A1-S58-W58-W	5400 After S-NTM-H06	14.27	5.56	W TFM					Dec 12, 2023		13.19	1.42	5.38				

 PTTEP				FLOWLINE THICKNESS REPORT													PS1/M INSPECTION TEAM		
Tag No.:			S1-NTMA-NTMH-6-NTMHWA-P-W			Total length (m):			700			Installation date:		Mar 09, 2023		Service life (yrs):		0.90	
Pipe size (in):			6			% Inspection:			100			1st Inspection date:		Aug 10, 2023		6th Inspection date:			
Flowline No.:			NTM-HWA			No. of section (sections):			1			2nd Inspection date:		Dec 11, 2023		7th Inspection date:			
From-To:			NTM-A		NTM-H	Length of section (m):			700			3rd Inspection date:				8th Inspection date:			
Process:			P		Process	Length of subsection (m):			700			4th Inspection date:				9th Inspection date:			
Service:			W		Waterflood	Total spool (spools):			75			5th Inspection date:				10th Inspection			
THICKNESS MEASUREMENT RESULT																			
Section	Subsection	Weld Joint	Distance (m)	CML Name	Location Desc	Nominal Thickness (mm)	Retired Thickness (mm)	Up/Down/Weld	MFL	Previous Inspection Date	Previous Thickness (mm)		Last Inspection Date	Last Thickness (mm)		SCR (mm/yr)	RL (yrs)	Temporary Repair	
											Top (0)	Bottom (180)		Top (0)	Bottom (180)				
		59	638	A-A1-S58-W59-U	2800 Before W.60	14.27	5.56	U					Aug 10, 2023	14.21	14.55	0.00	19.86		
		59	638	A-A1-S59-W59-D	2800 Before W.60	14.27	5.56	D					Aug 10, 2023	15.00	14.85	0.00	21.33		
		59	638	A-A1-S59-W59-W	2800 Before W.60	14.27	5.56	W TFM					Dec 12, 2023		13.01	1.65	4.50		
		60	649	A-A1-S59-W60-U	100 Before Flange	14.27	5.56	U					Aug 10, 2023	14.42	13.96	0.00	19.29		
		60	649	A-A1-S60-W60-D	100 Before Flange	14.27	5.56	D					Aug 10, 2023	15.73	16.04	0.00	23.35		
		60	649	A-A1-S60-W60-W	100 Before Flange	14.27	5.56	W TFM					Dec 12, 2023		12.82	1.90	3.81		
		61	660	A-A1-S60-W61-U	100 After Flange	14.27	5.56	U											
		61	660	A-A1-S61-W61-D	100 After Flange	14.27	5.56	D					Aug 10, 2023	15.01	15.12	0.00	21.70		
		61	660	A-A1-S61-W61-W	100 After Flange	14.27	5.56	W TFM					Dec 12, 2023		13.65	0.81	9.93		
		62	671	A-A1-S61-W62-U	300 Before Flange	14.27	5.56	U					Aug 10, 2023	14.20	14.97	0.00	19.84		
		62	671	A-A1-S62-W62-D	300 Before Flange	14.27	5.56	D					Aug 10, 2023	21.11	23.33	0.00	35.71		
		62	671	A-A1-S62-W62-W	300 Before Flange	14.27	5.56	W TFM					Dec 12, 2023		12.92	1.77	4.15		
		63	682	A-A1-S62-W63-U	100 Before Flange	14.27	5.56	U					Aug 10, 2023	20.41	23.72	0.00	34.11		
		63	682	A-A1-S63-W63-D	100 Before Flange	14.27	5.56	D											
		63	682	A-A1-S63-W63-W	100 Before Flange	14.27	5.56	W TFM					Dec 12, 2023		14.77	-0.66	21.15		
		64	693	A-A1-S63-W64-U	300 After W63	14.27	5.56	U											
		64	693	A-A1-S64-W64-D	300 After W63	14.27	5.56	D											
		64	693	A-A1-S64-W64-W	300 After W63	14.27	5.56	W TFM					Dec 12, 2023		14.66	-0.51	20.90		
		65	704	A-A1-S64-W65-U	300 After W64	14.27	5.56	U											
		65	704	A-A1-S65-W65-D	300 After W64	14.27	5.56	D											
		65	704	A-A1-S65-W65-W	300 After W64	14.27	5.56	W TFM					Dec 12, 2023		14.29	-0.03	20.05		

				FLOWLINE THICKNESS REPORT													PS1/M INSPECTION TEAM		
Tag No.:			S1-NTMA-NTMH-6-NTMHWA-P-W			Total length (m):			700			Installation date:		Mar 09, 2023		Service life (yrs):		0.90	
Pipe size (in):			6			% Inspection:			100			1st Inspection date:		Aug 10, 2023		6th Inspection date:			
Flowline No.:			NTM-HWA			No. of section (sections):			1			2nd Inspection date:		Dec 11, 2023		7th Inspection date:			
From-To:			NTM-A		NTM-H	Length of section (m):			700			3rd Inspection date:				8th Inspection date:			
Process:			P		Process	Length of subsection (m):			700			4th Inspection date:				9th Inspection date:			
Service:			W		Waterflood	Total spool (spools):			75			5th Inspection date:				10th Inspection			
THICKNESS MEASUREMENT RESULT																			
Section	Subsection	Weld Joint	Distance (m)	CML Name	Location Desc	Nominal Thickness (mm)	Retired Thickness (mm)	Up/Down/Weld	MFL	Previous Inspection Date	Previous Thickness (mm)		Last Inspection Date	Last Thickness (mm)		SCR (mm/yr)	RL (yrs)	Temporary Repair	
											Top (0)	Bottom (180)		Top (0)	Bottom (180)				
		66	715	A-A1-S65-W66-U	200 After W65	14.27	5.56	U											
		66	715	A-A1-S66-W66-D	200 After W65	14.27	5.56	D											
		66	715	A-A1-S66-W66-W	200 After W65	14.27	5.56	W TFM					Dec 12, 2023		12.92	1.77	4.15		
		67	726	A-A1-S66-W67-U	300 After W66	14.27	5.56	U											
		67	726	A-A1-S67-W67-D	300 After W66	14.27	5.56	D											
		67	726	A-A1-S67-W67-W	300 After W66	14.27	5.56	W TFM					Dec 12, 2023		13.47	1.05	7.53		
		68	737	A-A1-S67-W68-U	300 After W67	14.27	5.56	U											
		68	737	A-A1-S68-W68-D	300 After W67	14.27	5.56	D											
		68	737	A-A1-S68-W68-W	300 After W67	14.27	5.56	W TFM					Dec 12, 2023		13.93	0.45	18.74		
		69	748	A-A1-S68-W69-U	100 Before Flange	14.27	5.56	U											
		69	748	A-A1-S69-W69-D	100 Before Flange	14.27	5.56	D											
		69	748	A-A1-S69-W69-W	100 Before Flange	14.27	5.56	W TFM					Dec 12, 2023		14.20	0.09	93.96		

 PTTEP		MINIMUM REMAINING THICKNESS						PS1/M INSPECTION TEAM
Inspection date	Section	CML Name	Previous Min thickness (mm)	Min thickness (mm)	ST_CR (mm/yr)	LT_CR (mm/yr)	RL (yrs)	Retirement date
Dec 11, 2023	A1	A-A1-S33-W33-W		9.32	6.52	6.52	0.58	Jul 08, 2024

 PTTEP		MINIMUM REMAINING LIFE						PS1/M INSPECTION TEAM
Inspection date	Section	CML Name	Previous Min thickness (mm)	Min thickness (mm)	ST_CR (mm/yr)	LT_CR (mm/yr)	RL (yrs)	Retirement date
Dec 11, 2023	A1	A-A1-S33-W33-W		9.32	6.52	6.52	0.58	Jul 08, 2024



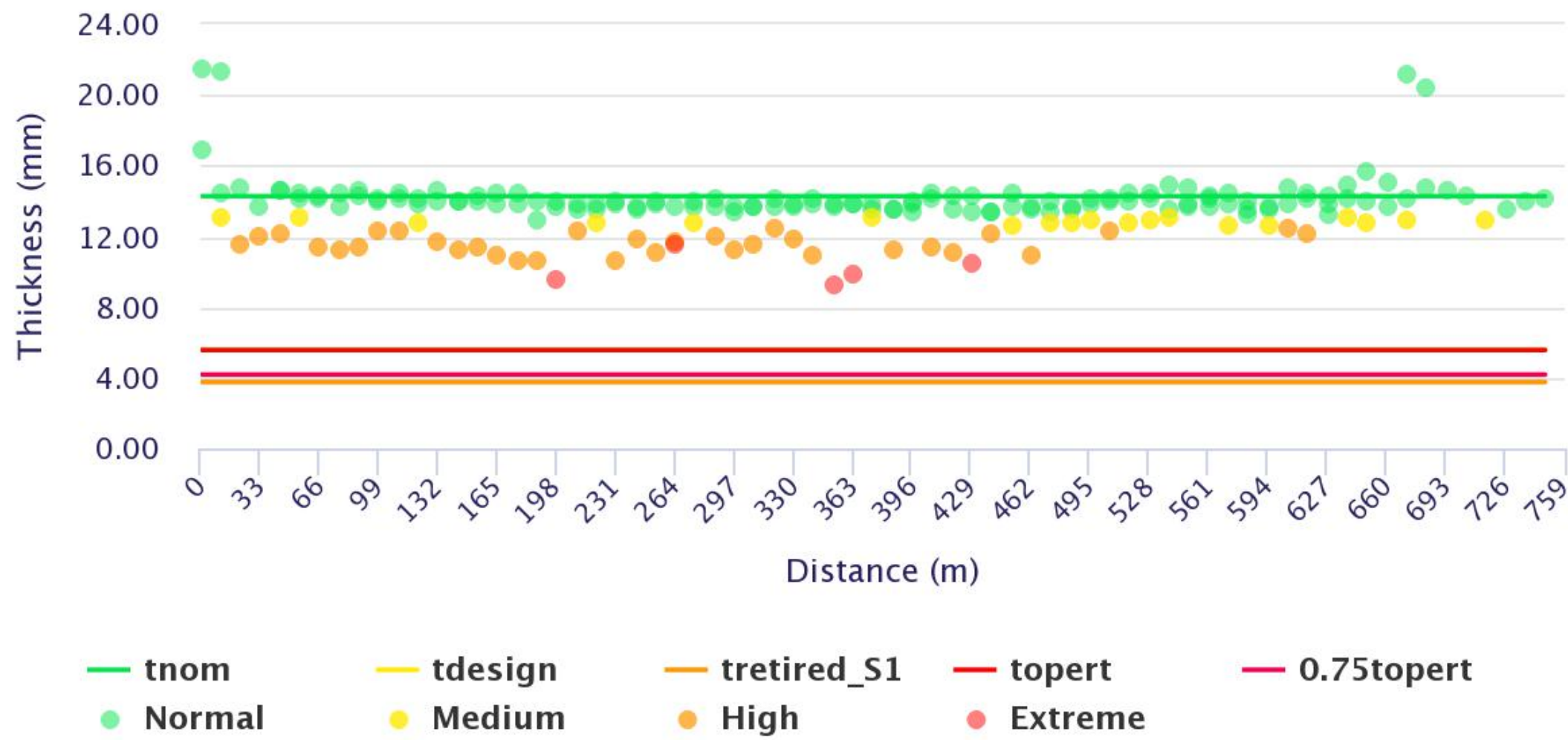
FLOWLINE THICKNESS REPORT


PS1/M
INSPECTION
TEAM

Tag No.:	S1-NTMA-NTMH-6-NTMHWA-P-W		Total length (m):	700	Installation date:	Mar 09, 2023
Pipe size (in):	6		% Inspection:	100	1st Inspection date:	Aug 10, 2023
Flowline No.:	NTM-HWA		No. of section (sections):	1	2nd Inspection date:	Dec 11, 2023
From-To:	NTM-A	NTM-H	Length of section (m):	700	3rd Inspection date:	
Process:	P	Process	Length of subsection (m):	700	4th Inspection date:	
Service:	W	Waterflood	Total spool (spools):	75	5th Inspection date::	

THICKNESS MEASUREMENT RESULT

Distribution of Thickness along NTM-HWA



	FLOWLINE VISUAL INSPECTION REPORT				PS1/M INSPECTION TEAM	
Inspection date:	Dec 11, 2023	Damage mechanism:	Int-Corrosion	Severity:	SEVERE	
Line No:	NTM-HWA	Main component :		Reporting by :		
Anomaly point:	CML no.A-A1-S33-W33-W	WO number :	500451579	Reporting date :	12/23/2023 8:37:59 AM	
<div></div>						
Finding			Recommendation			
<p>- At weld no.W33 of NTM-HWA 6" During a water flowline inspection, it was discovered that the low reading thickness indicated significant slightly internal corrosion,which PWC was detected by TFM Technique with high corrosion rate at weld metal loss on root weld on this period. The minimum remaining thickness at CML no.A-A1-S33-W33-W is 9.32 mm. with SCR 6.52 mm./yr. & RL is 0.58 yr.(Susceptible to PWC corrosion at weld joint by TFM Technique)</p>			<p>- Plan for 1st/CI monitoring. Within 3 months to verify next corrosion rate, monitoring thickness on entire flowline at low reading thickness as show significant internal corrosion at weld is lower than 11.00 mm.(Mar-24)Gathering inspection data - The design pressure and typical maximum operating pressure for water transfer flowlines shall not be more than 2,000 PSI.</p>			

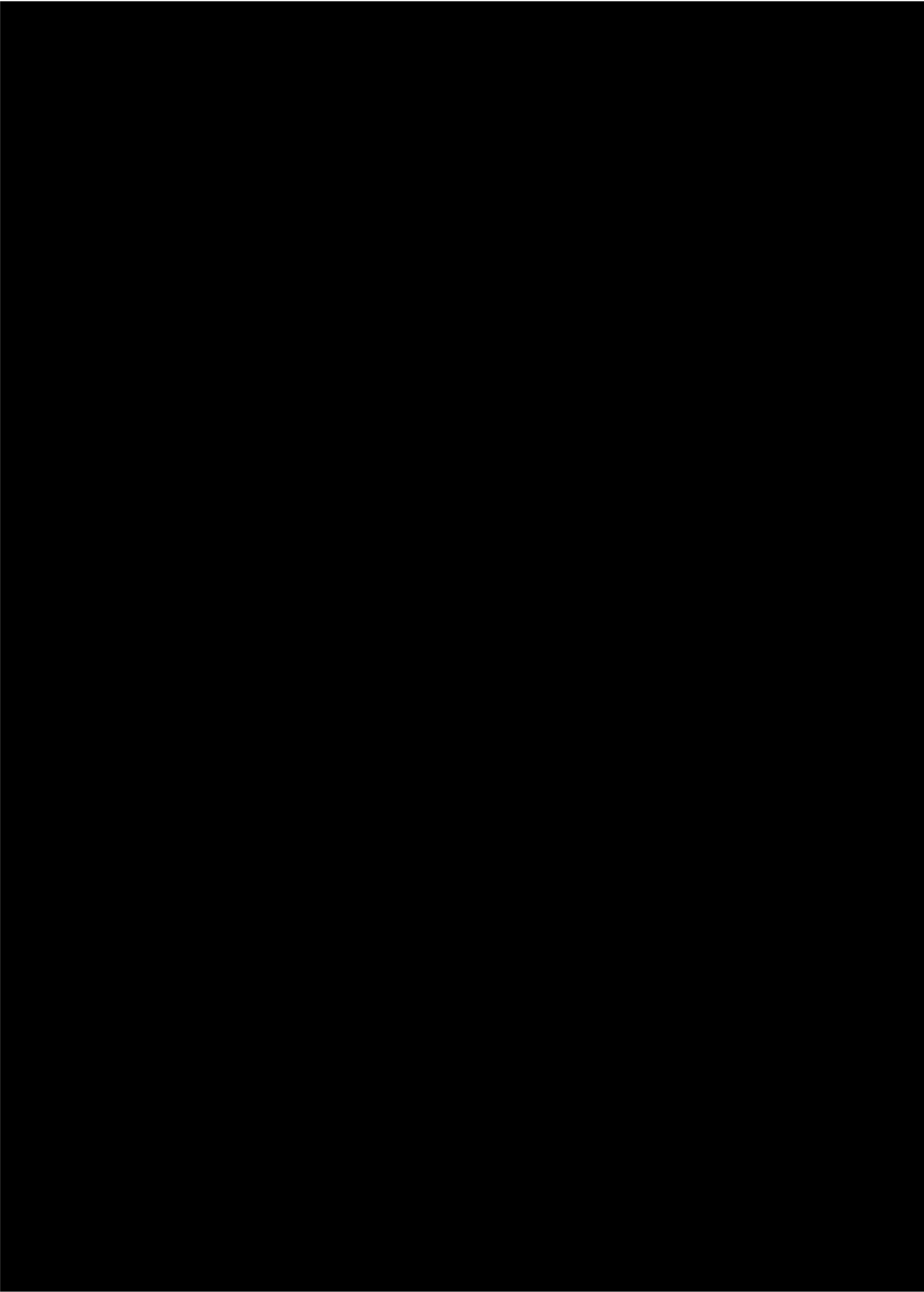
Inspected by:		Date:	
API Inspector reviewed by:		Date:	Dec 25, 2023
PTTEP Leader reviewed:		Date:	Feb 02, 2024



FLOWLINE P&ID

PS1/M
INSPECTION
TEAM

P&ID DRAWING



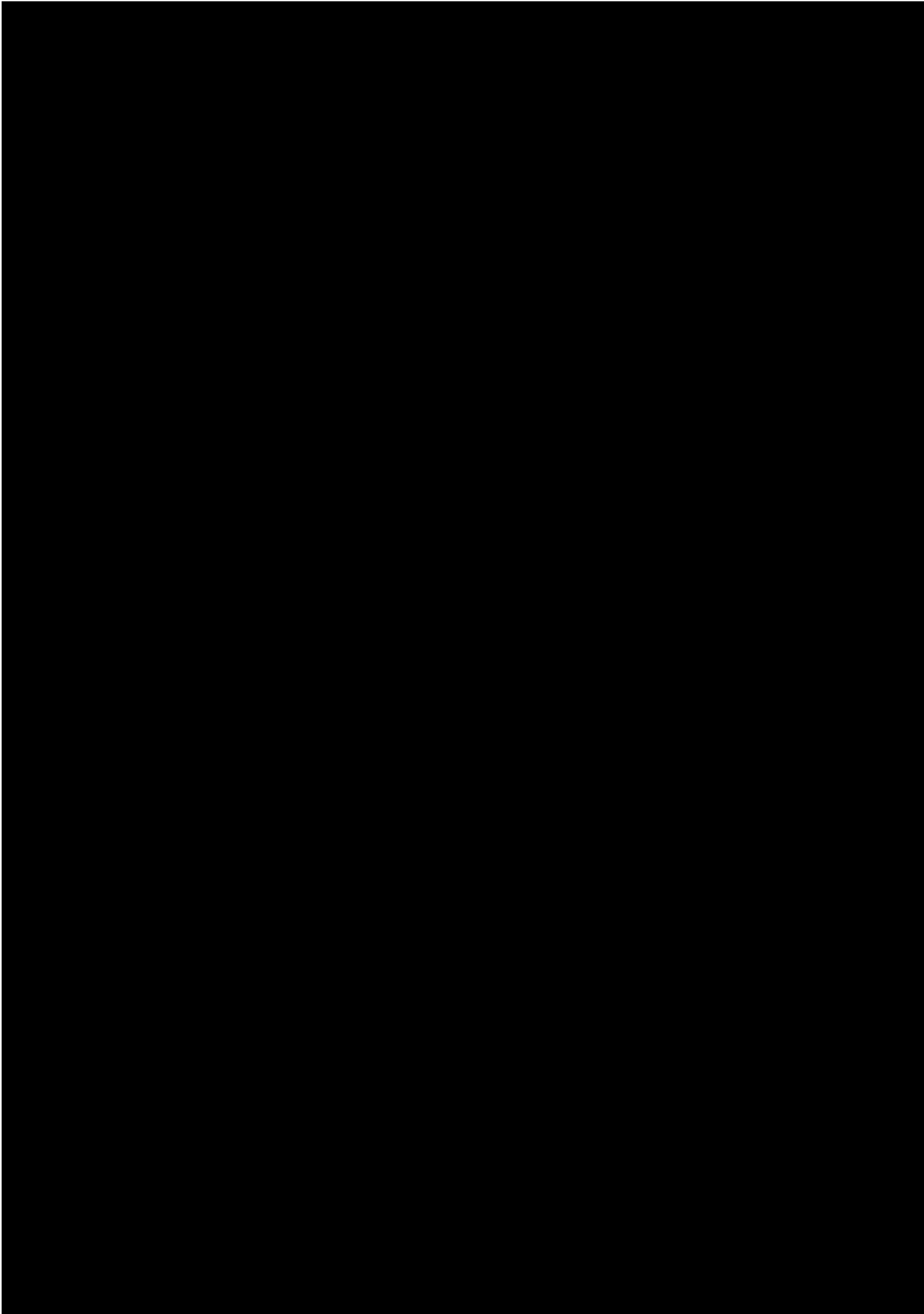
Inspected by:	<div></div>		Date:	Aug 19, 2023
API Inspector reviewed by:			Date:	Dec 25, 2023
PTTEP Leader reviewed:			Date:	Feb 02, 2024




FLOWLINE P&ID

PS1/M
INSPECTION
TEAM

P&ID DRAWING



Inspected by:		Date:	Aug 19, 2023
API Inspector reviewed by:		Date:	Dec 25, 2023
PTTEP Leader reviewed:		Date:	Feb 02, 2024

	FLOWLINE MAWP REPORT			PS1/M INSPECTION TEAM				
FLOWLINE MAWP								
Tag number:		S1-NTMA-NTMH-6-NTMHWA-P-W		Report number:		FL-6-NTM-HWA-W-2023-01		
Line number:		NTM-HWA		Inspection date:		Aug 10, 2023		
Location: From-To		NTM-A NTM-H		Inservice date:		Mar 09, 2023		
P&ID number:		NTM-H-1-08-003C & NTM-A-1-08-045C		API Classification:		2		
Piping group:		Process		API MII (yrs):				
Service description:		Waterflood		WO number:		500491952		
<div><div><div>CML name:</div><div>A-A1-S33-W33-W</div></div><div><div>Sub distance:</div><div>0</div></div><div><div>Inspection date:</div><div>Dec 11, 2023</div></div></div> <div><div><div>MAWP = $\frac{2tFE Sy}{D}$</div></div></div>								
ta: Minimum Actual Thickness		9.32 mm		0.37 inch				
D: Outside Diameter		168.28 mm		6.63 inch				
F: Design Factor		0.72		0.72				
Sy: Specific Minimum Yield Stress (SMYS)		2895.80 barg		42000.00 psig				
E: Longitudinal Weld Joint Efficiency		1.00		1.00				
CR: Maximum corrosion rate		6.52 mm/yr		0.26 in/yr				
Piping inspection interval		0.25 years		3.00 months				
t: ta-2(CR x Interval)		6.06 mm		0.24 inch				
MAWP: Maximum allowable working pressure on next inspection interval requirement.		150.14 barg		2177.57 psig				
Derating pressure recommended								
retired after pressure derating								
RL after pressure derating								
Conclusion								
<div><div>- NTM-HWA 6" During a water flowline inspection as follow S1 Flowline water disposal integrity campaign, it was discovered that the low reading thickness indicated significant severe internal corrosion,which PWC was detected by TFM Technique with high corrosion rate at weld metal loss on root weld on this inspection time. The minimum remaining thickness at CML no.A-A1-S33-W33-W is 9.32 mm. with SCR 6.52 mm./yr & RL is 0.58 yr.(Susceptible to PWC corrosion at weld joint by TFM Technique)</div></div>								
Recommendation								
<div><div>- Plan for 1st/CI monitoring. Within 3 months to verify next corrosion rate, monitoring thickness on entire flowline at low reading thickness as show significant internal corrosion at weld is lower than 11.00 mm.(Mar-24)Gathering inspection data - The design pressure and typical maximum operating pressure for water transfer flowlines shall not be more than 2,000 PSI. Note: As follow S1 Flowline water disposal integrity campaign.</div></div>								
Inspected by:					Date:		Dec 11, 2023	
API Inspector reviewed by:					Date:		Dec 25, 2023	
PTTEP Leader reviewed:					Date:		Feb 02, 2024	

ภาคผนวกที่ 27
Spill Management Plan



PTTEP

PTT Exploration and Production Public Company Limited

Spill Management Plan

Document Number: 12146-PDR-SSHE-501/03-R03

March 2023

Approval Register	
Document Subject	Spill Management Plan
Document Number	12146-PDR-SSHE-501/03-R03
Document Owner	Environment Management Department (CEN)
Prepared by	[REDACTED] (Engineer, Environment)
Effective Date	March 2023

Review			
	Name	Signature	Date
Document Custodian	[REDACTED] Manager, Operational Environment Section	[REDACTED]	16-Mar-2023
Document Reviewer	[REDACTED] VP, Safety Management Department		17-Mar-2023
	[REDACTED] VP, Process Safety and Assurance Department		17-Mar-2023
	[REDACTED] Team Leader, SSHE		18-Mar-2023

Approval			
	Name	Signature	Date
Document Owner	[REDACTED] VP, Environment Management Department	[REDACTED]	17-Mar-2023
Document Approval	[REDACTED] SVP, Safety, Security, Health and Environment Division		21-Mar-2023

This document shall be reviewed every 5 years from the date of approval or revised earlier if necessary.

Revision History			
Rev.	Description of Revision	Authorized by	Effective Date
0	New	CSH	December 2011
1	<ul style="list-style-type: none"> Add list of approved dispersants in Thailand Add request form of dispersant application for approval in Thailand Add Tier2 Equipment Stockpile Update Role & Responsibility of Corporate and asset during exploration drilling phase Update Role & Responsibility of Corporate and asset during production drilling phase Update Role & Responsibility of Corporate and asset for Tier 2 & 3 Equipment Request Update Tier 2 and Tier 3 Communication Flow and appendices 	TSH	December 2016
2	<ul style="list-style-type: none"> Add summary of spill management team leader Add minimum requirements of Asset Spill Response Plan preparation, response techniques, consequence analysis, training, and exercise Add list of Spill Response Equipment under PTTEP and the alliances Update document title and contents reorganization. Update contact number of Thailand and International Authority and Organization 	CSH	March 2018
3	<ul style="list-style-type: none"> Added additional information about spill management for newly acquired asset, tool for self-assessment of spill capability, and example of Thai Offshore Oil Spill Crisis Response Plan in Appendix A. Clarified spill response responsibility for all E&P phases. Updated content reorganization, SIMA tool, IESG response resources and request form, tier 3 resources mobilization, and spill exercise to align with international guideline. 	CSH	March 2023

TABLE OF CONTENTS

INTRODUCTION	1
1.0 PURPOSE.....	1
2.0 SCOPE.....	1
3.0 DEFINITIONS AND ACRONYMS	1
3.1 TERMS AND DEFINITIONS	1
3.2 ACRONYMS	1
REQUIREMENTS.....	2
4.0 SPILL MANAGEMENT	2
ROLES AND RESPONSIBILITIES.....	16
REFERENCES	17
APPENDICES	18
APPENDIX A: EXAMPLE OF THAILAND OFFSHORE OIL SPILL CRISIS RESPONSE PLAN	18
APPENDIX B: EXTERNAL NOTIFICATION OF SPILL INCIDENT IN THAILAND.....	19
APPENDIX C: NATIONAL AND INTERNATIONAL AUTHORITIES AND ORGANIZATION CONTACT LIST.....	20
APPENDIX D: RECOMMENDED STRUCTURE OF ASSET SPILL RESPONSE PLAN	21
APPENDIX E: LIST OF RESPONSE TECHNIQUES	27
APPENDIX F: REQUEST FORM FOR APPROVAL OF DISPERSANT APPLICATION IN THAILAND.....	33
APPENDIX G: LIST OF APPROVED DISPERSANTS FOR THAILAND ASSETS	34
APPENDIX H: IESG OIL SPILL RESPONSE RESOURCES REQUEST FORM	37
APPENDIX I: LIST OF IESG RESOURCES	39
APPENDIX J: ESTIMATED MOBILIZATION TIME TO THAILAND OFFSHORE ASSET FOR NATIONAL ASSISTANCE FROM THE NEAREST IESG SITE	41
APPENDIX K: LIST OF PTTEP AUTHORIZED PERSONNEL FOR OSRL ACTIVATION (AS OF JANUARY 2023).....	42
APPENDIX L: IESG OIL SPILL RESPONSE RESOURCES REQUEST FORM.....	44
APPENDIX M: PTT GROUP MOBILIZATION AUTHORIZATION FORM	46
APPENDIX N: OSRL NOTIFICATION AND MOBILIZATION PROCEDURE	47
APPENDIX O: OSRL NOTIFICATION FORM	48



Table of Contents (continue)

APPENDIX P: OSRL MOBILIZATION AUTHORIZATION FORM	50
APPENDIX Q: ESTIMATED MOBILIZATION AND FLIGHT TIME FOR OSRL'S AERIAL DISPERSANT CAPABILITY	51
APPENDIX R: SPILL CAPABILITY ASSESSMENT CHECKLIST	52

INTRODUCTION

1.0 PURPOSE

The Spill Management Plan is developed to outline the preparation of response actions and resources needed for an spill incident. The necessary response actions include the following as a minimum; the requirements of the Asset Spill Response Plan preparation, the response organization and protocol, the notification and interface between PTTEP Headquarters and assets and/or the external agencies including government agencies and other related organizations, resources preparation, including capability assessment and document review and update. This plan guides PTTEP assets for preparation and implementation of an effective spill response.

The Asset Spill Response Plan discussed in this document is intended to include not only the operating asset spill response plan, but also the support functions, i.e. seismic, drilling exploration and drilling production response plan. In some cases, bridging documents from contractors who provide the main activities to PTTEP (i.e. seismic and drilling) are required in order to establish the interface between these organizations as well as ensuring the alignment and prompt response.

2.0 SCOPE

This plan applies to all PTTEP assets and support functions in preparation and implementation of the effective spill response in all activities of Exploration and Production (E&P) Phases, i.e. seismic exploration, exploration and production drilling, production and decommissioning activities, including the storage, offloading and logistics support.

Compliance with the requirements described in this plan is mandated for all PTTEP assets and their subsidiaries. In the countries where local regulations exist, this plan shall be read and implemented in conjunction with all relevant regulations or adopted as a minimum requirement if this plan is more stringent than the regulatory requirements. Where PTTEP is a joint venture partner or joint operator under PTTEP operational or financial control, compliance with this document is also mandated where PTTEP has legal obligations on the spill response and management, unless otherwise specified in the operational agreement.

3.0 DEFINITIONS AND ACRONYMS

3.1 TERMS AND DEFINITIONS

All terms and definitions in this document can be reached at [SSHE Intranet > SSHE MS > SSHE Terms and Definitions](#).

3.2 ACRONYMS

All acronyms in this document are available at [SSHE Intranet > SSHE MS > SSHE Acronym](#).

REQUIREMENTS

4.0 SPILL MANAGEMENT

Generally, spill management in the oil and gas exploration and production business is classified based on the 3-tiered response system in accordance with the IPIECA-IOGP good practice guide related to oil spill preparedness and response.

Activation of each tier response and management team is based on the capability of response resources as defined below:

- Tier 1: Asset capability necessary to handle local spill and/or initial response
- Tier 2: Local and National capability to supplement a tier 1 response
- Tier 3: Global and International capability required due to scale, complexities, and/or global potential impact

Classification of tier responses shall follow the SSHE Risk Management Standard (11038-STD-SSHE-401), Emergency and Crisis Management Standard (11038-STD-SSHE-501), and PTTEP Incident Management Standard (11038-STD-SSHE-601) for more details and definition of severity or impact to people, environment, asset, and reputation as well as incident management and reporting protocol.

4.1 SPILL MANAGEMENT ORGANIZATION

4.1.1 PTTEP 3-Tier Response

Figure 1 shows the 3-tier spill response organization as well as necessary internal and external resources. Tier 1 response requires internal resources whereas tier 2 and 3 responses require national and international resources, respectively. Members of each tier response team shall refer to the Emergency and Crisis Management Standard (11038-STD-SSHE-501).

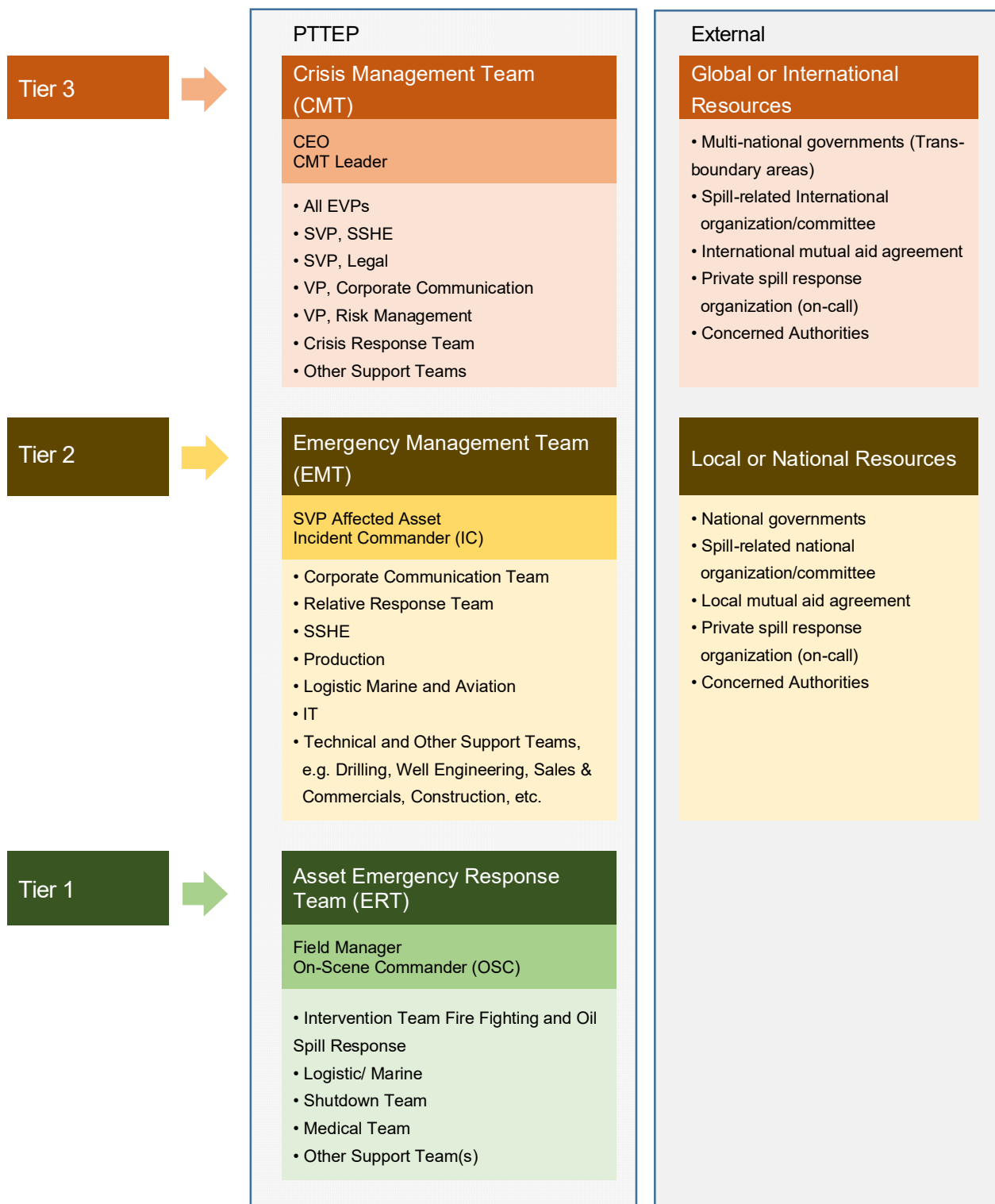


Figure 1: Tier Response Organization and Resources

In case that Thailand offshore oil spill response is escalated to tier 3, the Crisis Management Team (CMT) shall be activated. The example of Oil Spill Crisis Response Plan (CRP) as presented in Appendix A can be referred to as guidance. For production assets under a Production Sharing Contract (PSC) scheme, linkage of emergency and crisis management organization between PTTEP and government agencies shall be defined and established.

4.1.2 Spill Response and Management Team Duty

The authorized persons of E&P activities in each phase are different which results in different designated persons of spill response and management team leaders of each tier response as summarized in Table 1. Although the team leader is different, the team member of each Tier at each phase is commonly the same, except for the technical support, as listed in 3.1.1 in which their specific duties shall be described in the Asset Spill Response Plan. The technical support can be requested from each relevant discipline subject to the incident description.

Table 1: Summary of Team Leaders

Team Leader	Spill Management Team Leader of each E&P Phases			
	Seismic Exploration	Drilling Exploration	Drilling Production	Production
Tier 1: On-scene Commander	VP under Geosciences, Subsurface, and Exploration Division	<Spill on rig> Drilling Supervisor (DSV)		Field Manager
		<Spill to sea>		
		Drilling Supervisor (DSV)	Field Manager	
Tier 2: Incident Commander	SVP of affected asset (Thailand) Asset Country Manager (Overseas)			
Tier 3: CMT Leader	CEO or Designated Top Management			
Technical Support	VP/ Field manager of affected asset	Field manager of affected asset/ Drilling Contractor	VP of affected asset	
	Depends on incident situation and shall be requested from the affected asset			

4.2 SPILL NOTIFICATION PROCESS

Initial internal and external notification of spill incidents shall follow the protocol and reporting requirements as determined in the Incident Management Standard (11038-STD-SSHE-601-R07) which covers the reporting channel, period, and organization to be notified within PTTEP and externally to the government agencies both for Thailand and International assets. External notification of spill incidents which have occurred within Thailand jurisdiction is summarized in Appendix B. Contact numbers of Thailand and International authorities and organization are provided in Appendix C.

For Thailand assets, the need of a National Oil Spill Response Plan activation shall be discussed during the initial notification to government agencies. Certain information shall be provided to the government agencies, e.g. estimated spill volume, sensitive environmental resources and facilities, other potential risks, etc.

It is the responsibility of the International assets to determine the in-country notification process of all internal and external communications for all tiers of spill incidents, including communication with PTTEP headquarters. The communication protocol shall be documented in the asset Spill Response Plan. The protocol shall include the communication channel to the authorities, notification timelines to the authorities, and the responsible person who is authorized to initiate the communication. The contact numbers of authorities in each operating country shall be provided and kept up to date in the asset Spill Response Plan.

For any updated situation to external media and relatives, refer to the Crisis Communication Guideline (12145-GDL-004) under Branding Communications and Knowledge Intelligence Division (CBK).

4.3 SPILL RESPONSE RESOURCES

Spill response resources in this plan, are defined as spill response and management plan and other supporting documentation, trained personnel, and sufficient equipment and supplies which may come from local, regional, or international sources in accordance with 3-tier classification. These resources shall be identified in the Asset Spill Response Plan based on their operational risk assessment results, e.g. by conducting spill capability assessment, etc., regulatory requirements, international convention, e.g. MARPOL, etc., hydrocarbon amount and characteristic, nearby sensitive areas and supporting facilities, and planning scenarios.

The agreement or spill response organization for spill response resources at each asset and tier response is recommended to be prepared in advance to ensure the availability of the resources when spill incident has occurred.

4.3.1 Asset Spill Response Plan Preparation

PTTEP assets shall prepare and implement asset Spill Response Plans and supporting documentation. The Asset Spill Response Plan shall be scoped and scaled according to the type of operation undertaken, the level of risk associated with the operations, and assurance of compliance with applicable local and national regulations. Asset Spill Response Plan shall include the necessary information which assist assets to identify and specify the key processes and resources that are crucial to respond to the spill incidents, both for the initial and subsequent stages. PTTEP assets can develop their own plan, either integration with Asset Emergency Response Plan or separately, by following the requirements stated below. A recommended structure of the Asset Spill Response Plan is listed in Appendix D.

The Asset Spill Response Plan shall comply with the National Oil Spill Response Plan of the country of operation as well as relevant PTTEP standards and procedures. Each of asset's Spill Response Plans shall be reviewed by Corporate SSHE Division for advice and alignment with this plan and other compulsory documents.

4.3.2 Spill Scenario Consequence Analysis

Based upon the risk assessment results, the asset shall identify potential spill scenarios and documents in the asset Spill Response Plan, then the detailed consequence analysis shall be conducted to confirm consequences from the spill and identify resources at risk which include environmental and socio-economic resources that could be affected, and assess the degree of sensitivity of those resources, as well as impact mitigation and minimization measures, specifically for:

- Worst credible case of spill scenario(s) for oil type(s) that potentially have a significant contribution to the risk (high likelihood, high potential discharge volume or low likelihood but high severity)
- Any additional potential spill scenarios that generate essential planning factors.

Criteria for justification are referred to in the SSHE Risk Management Standard (11038-STD-SSHE-401).

4.3.2.1 Spill Trajectory Model

The objective of numerical simulation of spill fate and trajectory is to estimate the physical changes which spilled oil undergoes especially offshore or on open waters (i.e. the weathering processes which include evaporation, spreading, natural dispersion, emulsification, and shoreline stranding) and its potential pathways, travel times, surface distribution and associated volumes under the prevailing climate.

The spill trajectory model shall be developed based on the risk assessment results to provide the area of impact or consequence for consideration in the environmental and socio-economic severity and to guide decisions for a suitable response strategy.

Examples of 2 types of spill trajectory modelling output are shown in Figure 2:

- Stochastic models primarily are used for contingency planning purposes which apply historical wind and current conditions to simulate multiple spill trajectories that together give a statistical output
- Deterministic models typically are used in both response and contingency planning scenarios, which utilize a single set of wind and current conditions (for example the most probable) to simulate a single spill trajectory

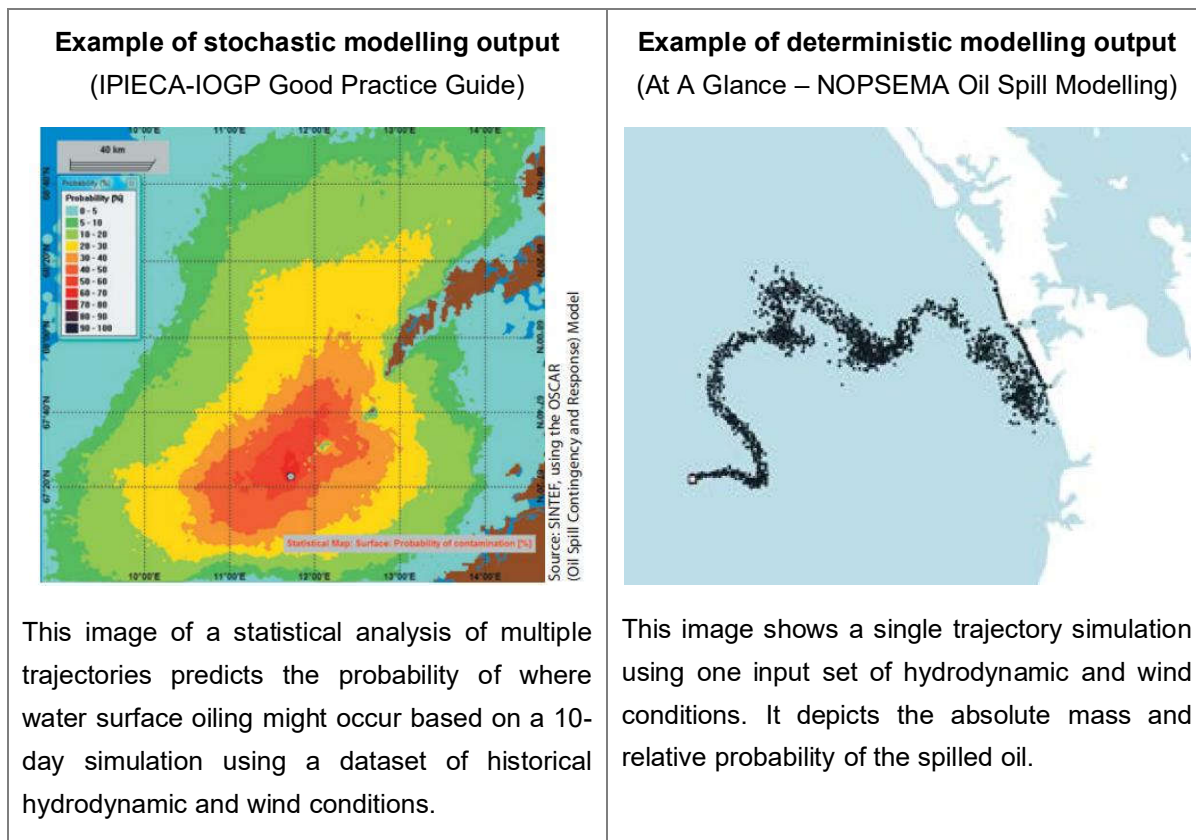


Figure 2: Example of Spill Modelling Output

4.3.2.2 Sensitivity Mapping

Once asset has identified the spill scenario, the trajectory of the oil, and how it behaves in the environment, it is necessary to identify and characterize relevant sensitive resources and receptors within the influence area.

Mapping of ecological and socio-economic resources allows the identification of those which may lie in the trajectory of spill. Mapping shall be performed within the influence area of the potential spill. The IPIECA/IMO/IOGP Good Practice Guidance on Sensitivity Mapping for Oil Spill Response (Revision 2016) provides examples of mapping both ecological and socio-economic resources. Environmental impact assessments and monitoring data can provide valuable input to the mapping of resources and sensitive receptors. With confidential agreement, operators within the same area are encouraged to share information on ecological and socio-economic resources to secure efficient mapping and consistent input.

The assessment of potential consequences is recommended to be made for time periods (i.e. monthly, seasonal or yearly) as relevant for the activity or operation that is posing the risk. It is also recommended that a full year field activity at least should have a seasonal resolution in the consequence assessment as this can provide important information and input to risk management and advice on risk reducing measures for time-limited operations.

The available information such as the Environmental Sensitivity Index (ESI), Environmental Sensitivity Maps (ESM), etc. can be accessed from published sources or national database or equivalent. The sensitivity map from the environmental impact assessment report can be partially applied.

4.3.3 Response Strategy Development

Following the identification of sensitive resources and priority protection sites, PTTEP assets shall identify the appropriate response strategies, which are comprised of viable response techniques which can adequately mitigate the impact and consequences of each oil spill scenario.

A response strategy can consist of a single response technique or a combination of techniques. A list of the response techniques and its requirements are listed in Appendix E. The response strategy should be established in consultation with the relevant authorities and stakeholders, with consideration given to Spill Impact Mitigation Assessment (SIMA).

4.3.3.1 Spill Impact Mitigation Assessment (SIMA)

When considering the suitable response technique, the SIMA shall be considered to determine the best response options that are the most effective, feasible and will minimize the impact from the selected planning scenario on the environment and the community including ecological, socio-economic, and cultural aspects. As such, the Asset Spill Response Plan shall document the following information as shown in Figure 3 when selecting the response option.

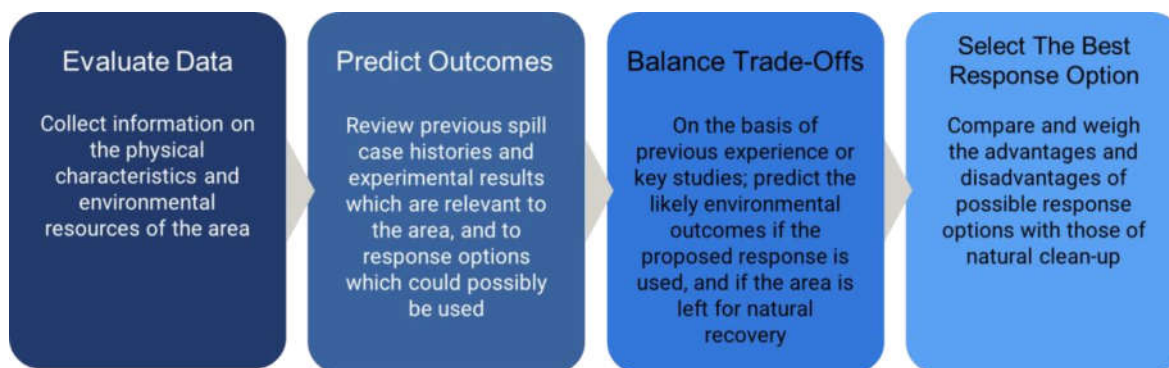


Figure 3: Steps of Net Environmental Benefit Analysis (NEBA)

Assets shall ensure that the response priorities selected are aligned with the national or regional register of priority areas. Where different protection priority ranking is assigned to a specific resource compared to these national or regional register, justifications for the difference is to be specified.

It is important to note that the SIMA process is generally applicable to larger or higher consequence oil spill scenarios where multiple spill response options are being considered. It is not value-added to conduct SIMA for smaller, lower consequence spills where only one or two response options are contemplated or feasible.

4.3.4 Spill Response Resources

4.3.4.1 Tier 1 - Asset Resources

PTTEP Assets shall provide and ensure the availability of spill response resources on each location as identified in their planning scenario. The identification of necessary spill response resources shall be documented in the asset Spill Response Plan. Asset representative shall ensure the readiness of the Asset Spill Response Plan and the sufficient equipment and resources for combating spill up to a Tier 1. A preventive maintenance plan of spill response equipment shall be established and followed for prompt spill response. Asset ERT members shall be trained to promptly respond and become familiar with all available spill response equipment.

For seismic exploration, the spill response equipment and services from reliable local contractors is recommended to prepare by Geosciences, Subsurface, and Exploration Division under the advisory guidance of the Corporate SSHE Division.

For drilling exploration and production, the drilling contractor shall provide on-site spill response equipment and personnel as per their contract agreement to ensure that tier 1 can be handled. Drilling contractor is responsible for any spills occurring within the boundary of the rig itself, while Corporate SSHE and assets are responsible for the spills reaching the environment for drilling exploration and production respectively.

In case dispersant application is required for Thailand assets, it is the asset's responsibility to request the approval from the Pollution Control Department (PCD) before use when the water depth is less than 10 meters referred from Nation Oil Spill Plan. The request form for approval of dispersant application in Thailand and list of approved dispersants for Thailand assets is provided in Appendix F and G, respectively. To expedite the approval period, the completeness of information and appropriate volume of dispersant application filled in the form shall be provided. In general, the consideration result would be sent to the requestor within 5 hours after submitting the request to PCD. For the International assets, this process could be different which may require the different approval process to comply with local regulations as well as any prohibition of using some dispersant in some country.

In case the incident reaches tier 2 and 3, the Corporate SSHE Division will be responsible for dispersant application approval process.

4.3.4.2 Tier 2 – Local and National Resources

Thailand Asset

Corporate SSHE Division shall provide and seek other available equipment and resources to support asset spill response including all E&P phases. These resources, i.e. equipment, personnel, and logistic support, specified in the following documents, but not limited to, shall be included in asset Spill Response Plan.

- Onshore Operating Asset: Local contract availability, National level regulators or agencies and National Oil Spill Response Organizations (OSROs)

- Offshore Operating Asset: Nearby operators, regional operators, national level regulators or agencies and National Oil Spill Response Organizations (OSROs)

Pre-arrangement or exercises to test the mobilization is highly recommended to conduct by asset to ensure the availability and validity of Tier 2 resources and secure spill response support.

PTT Group is a member of the Oil Industry Environmental Safety Group Association (IESG) in Thailand. All PTTEP assets in Thailand are able to request additional resources and the trained personnel from outsource under IESG's contract via corporate by using Oil Spill Response Resources Request Form as provided in Appendix H. PTTEP authorized personnel for IESG including tier 2 resources support activation, which is recommended to be asset SVP, SSHE Manager or Corporate SSHE SVP/VP, shall be included asset Spill Response Plan. The list of IESG available resources is shown in Appendix I and the estimated mobilization time to Thailand offshore asset for national assistance from the nearest IESG site is shown in Appendix J.

Further, assets in Thailand may also request resources from the Marine Department through activation of the National Oil Spill Response Plan. This allows the asset to have access to the national resources, which include equipment, vessels, and technical specialists. PTTEP assets shall identify tier 2 resources in Asset Spill Response Plan for the purpose of pre-assessment whether the available resources are sufficient to handle with tier 2 spills or otherwise refer to this plan. When resources from in-country mutual aid agreement is required to respond to the spill, the National Oil Spill Response Plan will be incorporated with the company plan. The role and responsibility of the emergency response team and support team will be in accordance with both plans.

International Asset

It is recognized that some International assets may also be legally bounded to attain membership for their local tier 2 organizations or Contractors as specified by laws and regulations of the country where PTTEP operates in all E&P phases (e.g. PIMMAG, OSCT, etc.). All assets shall adhere to the in-country legislative requirements and ensure the familiarity of the call-out procedure for the respective tier 2 organizations or contractors.

Similar to Thailand assets, the international assets should ascertain similar processes to access to the national resources of their country. PTTEP authorized personnel for tier 2 resources provider activation, which is recommended to be Country Manager or SSHE Manager, shall be included in the asset Spill Response Plan.

4.3.4.3 Tier 3 – Global and International Resources

Currently, the international service provider for PTTEP is the Oil Spill Response Limited (OSRL) Group for which PTTEP has access to their resources via PTT Group membership. The OSRL activation can be done through PTT Group as per the following steps, in which is a list of PTTEP authorized personnel is provided, Appendix K.

- PTTEP Authorized Personnel shall fill out the PTT Group Notification form and Mobilization Authorization Form submit to PTT for their information as provided in Appendix L and M, respectively

- Then, the OSRL Notification and Mobilization Procedure shall be followed as described in Appendix N. PTTEP Authorized Personnel shall fill out the OSRL Notification Form and Mobilization Authorization Form, and submit it to OSRL for requesting their services as provided in Appendix O and P, respectively

Corporate SSHE is responsible for assisting the asset in securing OSRL resources for their prompt response. OSRL resources available for membership can be found in the OSRL website.

For planning purposes, the assets shall take into account the lead time required for mobilization of OSRL resources in their asset Spill Response Plan. However, the global alliance from PTTEP and OSRL requires lead time for internal preparation and logistic arrangement.

Equipment Mobilization

PTTEP is responsible for the logistics of any resources from OSRL from the point of handover whilst OSRL handles the equipment transfer up to the point of handover (i.e. at OSRL base or departure airport/port) where there is a transfer of responsibility. Mobilization time for air and sea transport is dependent on availability and location of the chartered aircraft or supply vessel. Table 2 summarizes the various mobilization methods of OSRL's equipment.

Table 2: OSRL's Equipment Mobilization Method

Mobilization by	Remarks
Land	This refers to the use of truck/lorries for transportation of equipment from OSRL's nearest base before subsequent transfer to vessels.
Sea	Depending on location of spill, the supply vessel can also be chartered in-country where the nearest OSRL base is located. Equipment is loaded at the OSRL base and sails directly to the spill site.
Air	Equipment is loaded into chartered cargo aircraft which will then fly into the identified airport of entry upon the clearance of permits and customs etc.

Aerial Dispersant Aircraft Mobilization

Two types of aerial dispersant aircraft provided by OSRL can be mobilized in a spill: C130 departing from Senai, Malaysia and B727 departing from Doncaster, UK. OSRL's nearest support site to PTTEP's country of operations, the nearest airport to PTTEP asset's location, estimated mobilization time and flight time from OSRL's base to these airports are summarized in Appendix Q. However, contingency time, e.g. custom clearance and immigration, are not included.

4.3.5 Spill Training and Exercise

Asset shall develop spill training and exercise programs with consultation from Corporate SSHE Division based on the applicable national and local regulations as well as the requirements stated in this plan and SSHE Training and Competency Standard (11038-STD-SSHE-305). The training and exercise program shall include the personnel with their role and responsibility to manage and respond to the spill incident.

It is recommended to consider determining the frequency and number of personnel to be trained in each role and involved in exercises and factors such as staff turnover rate, staff rotation to prepare for a prolonged response, and stand-by requirements for on duty responders as well as backup staff to support an ongoing response.

Asset shall organize the spill exercise to be in accordance with the applicable national and local regulation. Exercise activities may be undertaken using a variety of types as shown in Table . The estimated duration and frequency provided as guidance excludes the time of planning and preparation, which may be significant. An exercise can contain a mix of these types.

- Oil field asset: it is mandatory to conduct the spill exercises to cover all types of exercise as shown in Table 3.
- Gas field asset: the spill exercise arrangement is depended on asset's spill risk profile and scenario. However, it is recommended to conduct any types of spill exercise at least once a year, e.g. following to asset emergency exercise, pre-fire plan, etc.

These exercises may be conducted separately or in conjunction with other exercises as long as they are well documented. The training and exercise programs and records shall be documented for further tracking and reference. Opportunities for improvement and actions arising from these activities shall be documented and recorded in close-out exercise or audit report to ensure that the actions are being implemented in a timely manner.

Asset shall also ensure that the monitoring for training with expiration date and requires refresher periodically is being done and documented properly to ensure the sustainability of personnel knowledge and competence.

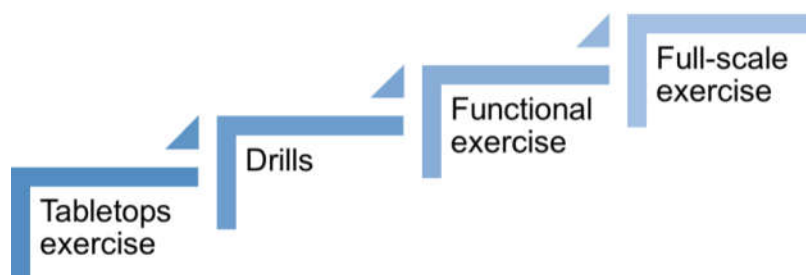


Figure 4: The progressive of the development of exercise program

Table 3: Types of Spill Exercise (IPIECA-IOGP, 2016)

Type	Detail Exercise	Frequency	Responsible party
Tabletop Exercises (Duration: 2 to 4 hrs.)	<ul style="list-style-type: none"> • Discussion of simulated scenario in the asset spill response plan/contingency plan • Build competency and confidence in the implementation of the asset spill response and contingency plan • Predetermine set of specific objectives • Be part of functional exercise preparation 	At least once per asset/year	Site SSHE/ Asset SSHE
Drills (Duration: 2 to 4 hrs.)	<ul style="list-style-type: none"> • Validate a specific function or capability in a single organization • Be commonly used to provide training on new equipment, validate procedures to practice and maintain current skills, e.g. • For example, test the notification and alert procedures in an oil spill response plan, test a tactical booming plan, dispersant spraying practice, etc. 	At least once per asset/year	Site SSHE/ Asset SSHE
Functional Exercises (Duration: 4 to 8 hrs.)	<ul style="list-style-type: none"> • Validate and evaluate capacities, multiple functions, or interdependent groups of functions • Be conducted in a realistic or real-time environment movement of personnel and equipment is usually simulated. • Can be integrated with Annual Emergency/ Crisis Management Exercise 	At least once per asset/year	Asset SSHE
Full scale exercise (Duration: 8 to 72 hrs.)	<ul style="list-style-type: none"> • May involve multiple authorities, relevant organizations, and jurisdictions, and can validate many elements of preparedness. • Test plans and procedures across the span of asset's crisis management and emergency response arrangements • Can involve national capability (Tier 2) and regional or international support (Tier 3), i.e., trans-boundary response issues • Include personnel and resources mobilization and deployment 	Once every five years, however, it is subject to resource's availability	Asset SSHE/ Corporate SSHE

4.3.6 Spill Capability Assessment

An asset shall plan to conduct the capability assessment with the consultation of the Corporate SSHE Division. The spill capability assessment shall be carried out for newly acquired assets to assess and ensure that the asset spill response meets the operation's risk level. The frequency of the capability assessment depends on the results of the risk assessment and consideration of the following:

- When there is any significant change in oil spill risk profile, e.g. new assets are introduced
- Upon any significant oil spill incident occurrence
- When new information on spill management is known

It is recommended that the capability review process is in line with the IPIECA-IOGP industry good practice guidelines for tiered response and includes the following assessments as a minimum:

- Review of oil Spill Response Plans and relevant tactical plans including SIMA
- Availability and suitability of oil spill response tier 1 (onsite) resources
- Availability of tier 2 and tier 3 resources
- Review of logistical arrangements
- Review of training and exercise program

For an effective tier 2 and tier 3 capability assessment, PTTEP shall utilize a third party to conduct the activities. The assessment results shall identify the gaps and recommendations for improving of the asset and Company spill response capability. The gaps and recommendations shall be followed up following to Audit and Review Standard (1038-STD-SSHE-701).

Spill capability assessment checklists are available to assist PTTEP assets to self-assess their level of preparedness to respond to an oil spill incident, including notification and mobilization of tier 2 and 3 resources and identification of infrastructure required to support the response. The spill capability assessment checklist is provided in Appendix R or can be found in OSRL's website (<https://www.oilspillresponse.com/tools/ready-check/>).

4.3.7 Asset Spill Response Plan Review and Update

Where the national or local regulation dictates a system of review and evaluation for approved plans, it shall take precedence. In the absence of regulatory guidance, asset shall develop and implement a program for review to ensure sustained readiness and competency to align at least with document review period or significant deviation following to SSHE Documentation Management Procedure (11038-PDR-SSHE-304/01).

The review and update to Asset Spill Response Plan shall be undertaken when there are any updates from, but not limited to:

- Oil spill risk profile e.g. new assets are introduced, or additional oil types are identified

- Response arrangements, including any changes to external notification and response contractors
- Location of operation (e.g. drilling campaigns) and sensitive resources
- Legislation or regulations in the country of operation
- International standards and industry good practices
- Relevant PTTEP corporate standards and procedures

Where applicable, if major changes occurred that could potentially affect the validity or effectiveness of the plan, resubmission to the approving authority in the country of operations shall be undertaken as required per local regulations and PTTEP corporate.

ROLES AND RESPONSIBILITIES

Roles and Responsibilities of relevant personnel shall follow the Emergency and Crisis Management Standard (11038-STD-SSHE-501), Emergency Management Plan (12148-PDR-SSHE-501/02), and Crisis Management Plan (12148-PDR-SSHE-501/01).

REFERENCES

Document Number	Document Title
PTTEP Controlling Documents	
11038-STD-SSHE-305	SSHE Training and Competency Standard
11038-STD-SSHE-401	SSHE Risk Management Standard
11038-STD-SSHE-501	Emergency and Crisis Management Standard
11038-STD-SSHE-601	Incident Management Standard
12148-PDR-SSHE-501/01	Crisis Management Plan
12146-PDR-SSHE-503/01	Waste Management Procedure
12148-PDR-SSHE-501/02	Emergency Management Plan
Other Reference Documents	
-	Guidelines on implementing spill impact mitigation assessment (SIMA); International Petroleum Industry Environmental Conservation Association (IPIECA); 2017
-	National Plan for Oil Spill Protection (TH only); Ministry of Transport; 2002
-	Oil Spill Exercises Good Practice Guidelines for the Development of an Effective Exercise Programme; International Petroleum Industry Environmental Conservation Association (IPIECA); 2016
-	Oil Spill Response Field Guides; Oil Spill Response Limited (OSRL); 2013

APPENDICES

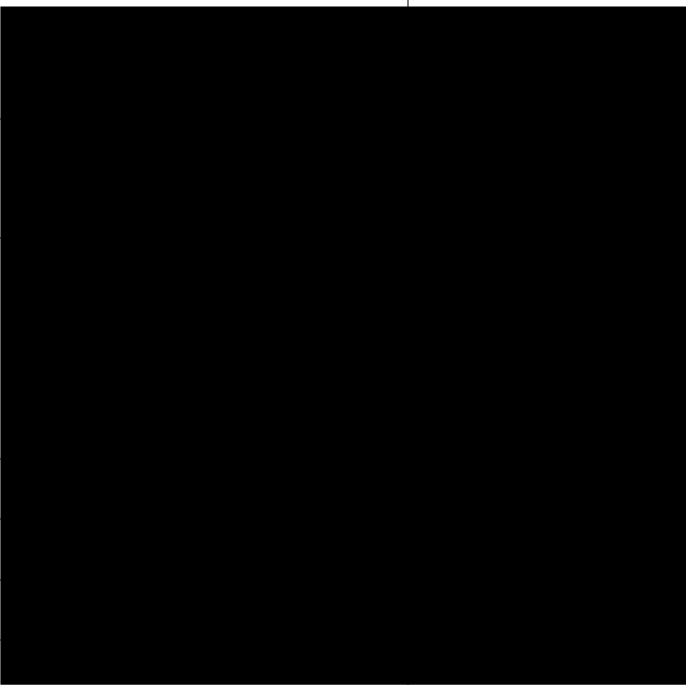
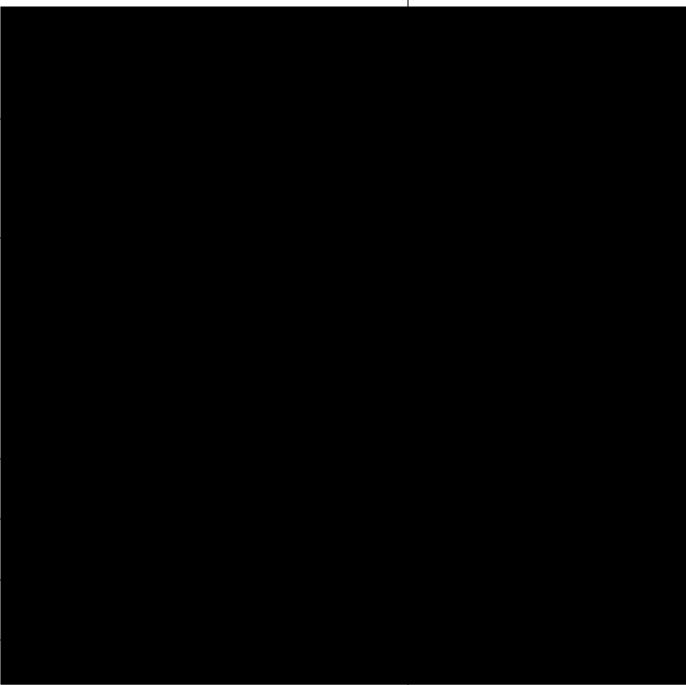
APPENDIX A: EXAMPLE OF THAILAND OFFSHORE OIL SPILL CRISIS RESPONSE PLAN

An example of Thailand Offshore Oil Spill Crisis Response Plan is available on [SSHE Intranet > SSHE MS > SSHE MS Documents > Corporate Tools > Appendix–Spill Management Plan](#).

APPENDIX B: EXTERNAL NOTIFICATION OF SPILL INCIDENT IN THAILAND

Spill Incident Volume	Notify	Reporting timescale	Reported by
>1 bbl	<ul style="list-style-type: none"> Department of Mineral Fuels (DMF) Marine Department (MD) for spill to water 	Initial report by phone or e-mail within 24 hrs. and followed by a written report within 72 hrs.	Asset SSHE
> Approx. 149.75 bbls (20 tonnes) or Local and National capability to supplement a Tier 1 response	<ul style="list-style-type: none"> Department of Disaster Prevention and Mitigation (DDPM) for spill on land PTT Group IESG OSRL for Tier 3 	Initial report by phone or e-mail within 24 hrs.	EMT for Tier 2 and CMT for Tier 3/ Corporate SSHE Division by Operational Safety Section

APPENDIX C: NATIONAL AND INTERNATIONAL AUTHORITIES AND ORGANIZATION CONTACT LIST

Organization	Tel	Fax
Department of Mineral Fuels (DMF)		
Department of Disaster Prevention and Mitigation		
Marine Department (MD)		
Pollution Control Department (PCD)		
IESG		
PTT Command Centre		
OSRL Singapore base		

APPENDIX D: RECOMMENDED STRUCTURE OF ASSET SPILL RESPONSE PLAN

Note: ✓ = Required
 + = Recommended (may depend on the planning scenario)
 X = Not required

Section	Description	Offshore	Onshore
1. Introduction			
1.1 Objective	<ul style="list-style-type: none"> Describe the overall purpose of the Spill Response Plan Include statement of PTTEP's guiding principles of protecting people, environment, asset, and reputation 	✓	✓
1.2 Scope	A summary description of operations and facilities covered by the Spill Response Plan	✓	✓
1.3 Interface with Other Plan	<ul style="list-style-type: none"> Identify other plans the Spill Response Plan interfaces with Demonstrate how it integrates with other plans. These plans include, but not limited to: <ul style="list-style-type: none"> Crisis management plan Emergency management plan Environmental Impact Assessment Report Bridging documents / Well control plans 	✓	✓
1.4 Document Control	<ul style="list-style-type: none"> Specify approval dates and sign-offs by internal management, plan custodian, distribution list, review and update records Include approvals obtained from authority, if applicable 	✓	✓
2. Notifications and Reporting			
2.1 Internal Notification	<ul style="list-style-type: none"> Develop a clear written procedure to immediately notify and report to internal stakeholders and initiate a response showing appropriate response levels, as well as response escalation procedure Include contact details, notification method (e.g. phone, fax, email, etc.) and team/person responsible for performing the notification. This may be reflected in the form of a flowchart <p><i>Refer to Emergency and Crisis Management Standard (1038-STD-SSHE-501-R05) for emergency notification standard</i></p>	✓	✓

Section	Description	Offshore	Onshore
2.2 External Notification	<ul style="list-style-type: none"> Develop a clear written procedure to notify and report to external stakeholder which needs to be done at the early stage of the incident i.e. authorities, shareholders, OSROs and other contractors Include contact details, notification method (e.g. phone, fax, email, etc.) and team/person responsible for performing the notification 	✓	✓
3. Assessments			
3.1 Site Assessment	Provide a checklist/guideline to conduct initial site safety and spill assessment	✓	✓
	Provide key facility information	✓	✓
	Identify environmental and socio-economic sensitivities	✓	✓
	Determine current and forecasted meteorological and hydrodynamic conditions	✓	✗
3.2 Volume and Trajectory Assessment	A summary or checklist of: <ul style="list-style-type: none"> Spill surveillance methods (aerial surveillance, tracking buoys, etc.) Spill observation and assessment guidance Spill trajectory and modelling including required input data 	✓	+
3.3 Tier Assessment	Evaluate the scale, Tier level, and impact of the incident (following the National Oil Spill Contingency Plan, if any or as described in this Guideline) as well as the escalation potential	✓	✓
4. Response Management			
4.1 Response Organization	<ul style="list-style-type: none"> Include organization of the response teams (ERT, EMT, CMT) and their relationship with each other Include overall responsibility of the team and management of processes and procedures within each team Include the response management facility location and activation procedure <i>Refer to Emergency Management Plan (12148-PDR-SSHE-501/02-R04) and Incident Management Standard (11038-STD-SSHE-601-R07)</i>	✓	✓

Section	Description	Offshore	Onshore
4.2 Roles and Responsibilities	Main role and responsibility of the key personnel in the response team, including action checklist described for each stage of response. <i>Refer to Emergency Management Plan (12148-PDR-SSHE-501/02-R04) and Incident Management Standard (11038-STD-SSHE-601-R07)</i>	✓	✓
5. Action Checklist			
Establish initial action checklists for key personnel in the EMT as follows, as a minimum:			
<ul style="list-style-type: none"> Initial response priorities and objectives Initial actions and strategy decision guide Activation of response management team Activation and deployment of resources 		✓	✓
6. Response Strategy			
6.1 Response Strategies	<ul style="list-style-type: none"> Develop strategy decision guidance (flow charts, scenario matrix, and NEBA/SIMA decision guidance) Include scenario-specific response strategy summaries and regulatory pre-approvals and/or approval application procedures if any 	✓	✓
6.2 On Water Response	Offshore and near-shore response capabilities and general tactical plans	✓	✗
6.3 Shoreline Response	Shoreline response capabilities and general tactical plans.	+	✗
6.4 Inland Response	Inland waterway and onshore response capabilities and general tactical plans.	✗	✓
7. Sensitive Areas			
Provide summary of sensitivities identified in the area and the protection priorities. Maps may be included for ease of reference. This information should be supported with the Baseline Environmental Settings information in the Reference Material.		✓	✓
8. Response Resources			
8.1 Tier 1 Capability	Include a summary and reference to Tier 1 resources inventories including required logistics support, internal contact information and mobilization timescale	✓	✓

Section	Description	Offshore	Onshore
8.2 Tier 2 Arrangement	Provide a summary and reference to Tier 2 Arrangement including, but not limited to: <ul style="list-style-type: none"> Contracted resources inventories and services list Mobilization procedure and timeframes Contact information including authorized personnel for resources activation Required logistics support Additional non-contracted resources and services list including government resources, vessels of opportunity, local labor sources and volunteers, and subject matter experts or specialty expertise Resourcing procedures for non-contracted services 	✓	✓
8.3 Tier 3 Arrangement	Include a summary and reference to Tier 3 arrangements, including accessing international mutual aid, contact information, contracted OSRO mobilization procedures, resources, and response timeframes. Procedures for immigration and customs, and any emergency dispensation information for cross-border movement of personnel, equipment and material	✓	✓
9. Supporting Response Element			
9.1 Waste Management Procedure	Provide guidance for handling oily waste.	✓	✓
9.2 Oiled Wildlife Response	Provide guidance for handling wildlife impacted by oil spill.	+	+
9.3 Stakeholder Engagement and Communications	Provide guidance for engaging and communicating with Stakeholders.	+	+
9.4 Economic Assessment and Compensation	Provide guidance for conducting economic assessment and compensation.	+	+
9.5 Environmental Impact Assessment (Including Sampling)	Provide guidance for conducting environmental impact assessment.	+	+

Section	Description	Offshore	Onshore
10. Decontamination			
10.1 Requirement	Summarize health, safety, and environmental requirement for decontamination.	✓	✓
10.2 Decontamination Procedure	<ul style="list-style-type: none"> • Provide guidance for developing a spill-specific decontamination plan including standard procedures of setting up decontamination area, zoning, etc. and list of approved cleaning agents • Provide information on pre-designated decontamination sites, if any 	✓	✓
11. Termination of Response			
11.1 Demobilization Procedure	<ul style="list-style-type: none"> • Provide guidance for developing a spill-specific demobilization plan • Provide standard procedures for demobilizing resources e.g. final equipment and vessel inspections, personnel checkout, resupply of consumables, claims for repairs, return of hired gear, etc. 	✓	✓
11.2 Response Termination	<ul style="list-style-type: none"> • Provide guidance on establishing treatment end points and response termination criteria • Include information regarding the roles with authority to sign off on completed areas and approve termination of the response 	✓	✓
11.3 Response Debrief	<ul style="list-style-type: none"> • Include responsibilities and guidelines for conducting post-response debrief, conducting post-spill analysis and develop report, etc. • Include documentation requirements. <p><i>Refer to Incident Management Standard (11038-STD-SSHE-601-R07)</i></p>	✓	✓
Supporting Documentation or Appendices			
Site- Specific Tactical Response Plan	Provide operational maps identifying the sensitivity the site-specific tactical plans that cover the area to be protected, worksite configuration, and other considerations and useful information necessary to facilitate rapid and effective response	+	+

Section	Description	Offshore	Onshore
Reference Material	<p>Consist of the Spill Response Plan justification and other preparedness material including but not limited to:</p> <ul style="list-style-type: none"> • Oil spill risk assessment result and scenario planning • Applicable requirement from international convention, national and local regulations on oil spill response • Operational overview which describes the facility and/or operations (including facility information, oil types and volumes handled, oil properties and weathering data, etc.) • Oil spill modelling result • Baseline environmental settings including meteorological and hydrodynamic information and socio-economic information • Training and exercise program • Plan and equipment review and audit schedule 	✓	✓
Directories	<p>Provide directories of resources and contact that are potentially needed during response including, external contractors, response organization, vessel of opportunity, logistics contractors, etc. This may be updated frequently.</p>	✓	✓

APPENDIX E: LIST OF RESPONSE TECHNIQUES

Response Technique Options	Requirements
Source Control	<p>Source control techniques are usually linked with other emergency response plans/documents which provide specific actions to stop or minimize the release of oil from the source. Details in the Spill Response Plan or supporting documents shall include a description of the interface between the Spill Response Plan and other specific internal/external emergency response documents. For the incident management, the Spill Response Plan should describe how the source control team interface with the spill response team. Where specialized resources are required, the Spill Response Plan shall inform EMT/CMT in advance for the availability of these resources.</p> <p>Source control technique shall be considered for the following scenarios:</p> <p>For spills originating from the well, source control techniques are linked to Well Blowout/Source Control Contingency Plan which should have already detailed the emergency response procedures in the event of an incident involving the well. Specialized resources include vessels and technical specialists who are trained in conducting well control management are often required for such spills. Confirm availability or provide contact of the specialized resources e.g. support vessels equipped with dynamic positioning and cranes with appropriate lifting capacity.</p> <p>For spills originating from vessels (e.g. oil tankers, FPSOs, etc.), source control techniques onboard are linked with SOPEP which shall be executed by the vessel captain and vessel emergency response team, while on-water spills shall include containment by booming around the source and on-water recovery. Deployment techniques will be the same as At Sea Containment and Recovery. Communication linkage and mobilization period between spill site and support site is recommended to exercise to ensure the readiness and effectiveness.</p> <p>For spills from stationary offshore storage tanks or pipelines, the source control measures shall consider loss of primary containment. The response techniques are linked with the site Emergency Response procedures to shut down, contain and recover the spill. Migration of oil from the source is managed with the same techniques as At Sea Containment and Recovery. Communication linkage and mobilization period between spill site and support site is recommended to exercise to ensure the readiness and effectiveness.</p>

Response Technique Options	Requirements
Source Control (continue)	<p>For spills from onshore storage tanks, pipelines or land transports, the source control measures shall consider the loss of primary containment. The response techniques are linked with the site Emergency Response procedures to shut down, contain and recover the spill. Migration of oil from the source is managed with the same techniques as Inland Response.</p>
Surveillance, Modelling and Visualization	<p>Description of the surveillance platform (e.g. aircraft, vessels, installations, on-foot, vehicles, subsea) and trained observers to support the implementation of the response technique. If specialist monitoring and/or remote sensing techniques (e.g. satellite imagery, oil detecting radar) are available to supplement surveillance methods, these shall be described in the Spill Response Plan or supporting documentation. However, safety shall be considered as the first priority when monitoring at spill site. Remote sensing observation is recommended for safety issue found while entering the spill area.</p> <p>When spill modelling is intended to be used together with the surveillance capability, the model shall be capable of being recalibrated regularly as new field data is generated. Communication methods to relay information between response teams (strategic (EMT) and tactical/field (ERT) shall be described in a plan or supporting documentation.</p>
Offshore Dispersant Application Surface and Subsea	<p>Pre-approval from applicable regulators/authorities for the use of surface and/or subsea-applied dispersant, or where no formal pre-approval mechanism exists, seek approval on the basis that such approval may be granted by or at the time of a spill incident response. Authorized person who asking for approval will indicated in Corporate Spill Contingency Plan.</p> <p>Confirm that the capability includes dispersant(s) for surface and/or subsea application that are effective for the oil type(s) included in the selected spill planning scenarios and are identified in the applicable country-approved list of dispersants (if available). Confirm that any applicable country-specific legal and regulatory restrictions on applying dispersant (e.g. water depth, distance from shore) are known, are described in the Spill Response Plan, and that the intended dispersant use complies with those restrictions.</p> <p>Confirm local availability of on-site stocks of dispersant to support an initial response to the selected spill planning scenarios and identify supplementary dispersant stocks and supply chains needed to maintain on-going dispersant operations. Exercise the mobilization period for additional dispersant from support site to spill area. Confirm the means to monitor the effectiveness of the oil-dispersant mix.</p>

Response Technique Options	Requirements
Offshore Dispersant Application Surface and Subsea (continue)	Confirm the availability of suitable subsea dispersant injection devices and related ancillaries, and the platforms for transport and deployment.
In Situ Burning	<p>Pre-approval from applicable regulators/authorities for the use of in situ burning, or where no formal pre-approval mechanism exists, seek approval on the basis that such approval may be granted by or at the time of a spill incident response.</p> <p>Consider the weather conditions and limitations prior to burn.</p> <p>Confirm the availability of resources such as vessels and boom designed for burning operations, ignition sources and related ancillaries.</p> <p>Confirm the means to monitor the effectiveness of the burning operations and atmospheric dispersion.</p>
At Sea (Offshore and Nearshore) Containment and Recovery	<p>Describe in the Spill Response Plan or supporting documentation, the availability of specialist and non-specialist resources, including:</p> <ol style="list-style-type: none"> Vessels, booms, and skimmers suitable for the prevailing operating conditions and oil characteristics Offshore temporary storage available for recovered oil and water Methods to transfer recovered oil and water and pre-separation Onshore reception and temporary storage facilities for recovered oil and water Surveillance aircraft to locate oil, direct the vessels and monitor effectiveness
Protection of Sensitive Resources (Offshore, Shoreline and Inland)	Identify environmental and socioeconomic sensitivities and agree on priorities for protection with applicable stakeholders and in accordance with regulatory requirements. Information regarding environmental and socio-economic sensitivity can be found in the environmental impact assessment report. A summary of this and initial response actions shall be presented in the Spill Response Plan or supporting documentation as site-specific tactical response plans.
Shoreline and Inland Assessment	If planning scenarios show there is potential for shoreline oiling, describe them in the Spill Response Plan or supporting documentation, the capability for carrying out a Shoreline Clean-up Assessment Technique (SCAT).
Shoreline Clean-up	If planning scenarios show there is potential for shoreline oiling, describe them in the Spill Response Plan or supporting documentation the roles and responsibilities for shoreline clean-up operations with national and provincial agencies/authorities. Clean-up resources shall be identified, including potential contractors and sources of plant/labour etc.

Response Technique Options	Requirements
Shoreline Clean-up (continue)	Reception and temporary storage facilities for recovered oil and materials shall be described in the Spill Response Plan or supporting documentation. Describe the processes to locate oil, direct the clean-up operations and monitor effectiveness.
Inland Response	<p>If planning scenarios show there is potential for an inland response, whether they are on land or on inland waterway, describe them in the Spill Response Plan or supporting documentation, the range of logistical issues that could influence the response implementation (e.g. access, remoteness of operations, special precautions for designated, private and/or sensitive areas) and the availability of resources for the response. The communication system shall be available 24/7 and exercise as scheduled, especially mobile carriers.</p> <p>For spill scenarios at a fixed location (drilling well pad, storage tank, product pipeline, pump house or other fixed structures): Confirm the availability of specialist and non-specialist resources, including, vehicles, heavy machinery, equipment and tools for the environment, terrain, and hydrological and geological conditions, above and below ground. Reception and temporary storage facilities for recovered oil and materials shall be described in the Spill Response Plan or supporting documentation.</p> <p>Describe the processes to locate oil, direct the clean-up operations and monitor effectiveness. Specialist and non-specialist equipment to monitor on/below ground and groundwater contamination as determined by the selected spill planning scenarios shall be described, along with the means to measure the quantities of recovered oil and other materials.</p> <p>For spill scenarios on mobile carriers on land (e.g. road / rail tankers) : Map out the available resources and critical sensitive area/receptor within the known transportation route. Provide estimated response times of nearest specialist and non-specialist resources, including vehicles, heavy machinery, equipment and tools to respond to different types of environments, terrain, and hydrological and geological conditions. The processes to locate oil, direct clean-up operations and conduct monitoring program shall be similar with the processes described for fixed structures.</p>

Response Technique Options	Requirements
Oiled Wildlife Response	<p>If planning scenarios identify the potential for oiled wildlife or the presence of endangered or legally protected species, then identify the available oiled wildlife specialists (whether locally available or internationally available) to respond to the incident. This may be sourced from the relevant government authorities, response organizations or non-governmental organizations. Critical information to be included in the Spill Response Plan or supporting oiled wildlife response plan are the notification procedures to engage these specialists, arrangements for wildlife protection and the response methodology for oiled wildlife.</p>
Waste Management	<p>Identify any country-specific or local legal and regulatory requirements pertaining to hazardous and non-hazardous waste management (including notification requirements, and how to set up temporary storage areas). Local availability of sufficient waste storage equipment and approved waste contractors for transportation of hazardous wastes shall be identified with contractual agreements for these services in place. Further, the final waste disposal location for each type of waste stream shall be identified with verification that the facility has the capability to accept the estimated volume of waste as identified in the planning scenario.</p> <p>Refer to the PTTEP's Waste Management Procedure for further guidance in waste management procedure (2146-PDR-SSHE-503/01).</p> <p>A summary of this information shall be presented in the Spill Response Plan or supporting documentation as the site-specific tactical response plans.</p>
Stakeholder Engagement and Communications	<p>Identify stakeholders who share the risk and maintain a database of these stakeholders and their contact information. A program shall be drawn to conduct regular communication with the stakeholders based on country-specific or local legal requirements and the duration of the operation. The frequency and need of stakeholder's engagement should be specified in the Spill Response Plan or supporting documents for engagement during the planning process or in a response stage.</p>

Response Technique Options	Requirements
Economic Assessment and Compensation	<p>Identify environmental and socioeconomic sensitivities that may be potentially impacted by spill from the operations. The Spill Response Plan or supporting documents should include a process for mobilizing resources to assess the impacts, to evaluate and to process claims and compensation to impacted communities. This shall include documentation preservation processes and any associated legal requirements of records and data. General information of socio-economic can be found in environmental impact assessment report related organization in operating country.</p>
Environmental Sampling, Monitoring and Assessment	<p>A monitoring program shall be implemented before, in between and after accidents to aid in decision making, to monitor technique effectiveness or to determine the extent of spill impact to the environment.</p> <p>Confirm the capability of subject matter experts, qualified sampling organizations and laboratories, and the equipment and logistics required to execute the monitoring program. This shall include the local compliance requirements for environmental monitoring.</p> <p>The sampling and monitoring procedures and the resources to support this assessment shall be included in the Spill Response Plan or supporting documents.</p>

APPENDIX F: REQUEST FORM FOR APPROVAL OF DISPERSANT APPLICATION IN THAILAND

กรมควบคุมมลพิษ คำขออนุญาตใช้สารเคมีจัดการน้ำมัน

เขียนที่.....
วันที่.....เดือน.....พ.ศ.....

เรียน อธิบดีกรมควบคุมมลพิษ

หน่วยงาน.....
ขออนุญาตใช้สารเคมีจัดการน้ำมันชนิด.....
เพื่อจัดการน้ำมันที่รั่วไหลจากสาเหตุ.....
สถานที่เกิดเหตุ.....
พิกัด.....
วันที่เกิดเหตุ.....เดือน.....พ.ศ.....เวลา.....
ชนิดน้ำมันที่รั่วไหล.....ปริมาตร.....ลิตร
น้ำมันรั่วไหลมาแล้ว.....วัน โดยทางหน่วยงานมีความประสงค์ในการใช้สารเคมีจัดการ
น้ำมันชนิดดังกล่าวข้างต้นเพื่อจัดการน้ำมันบริเวณ.....
จำนวน.....ลิตร โดยวิธี.....

ลงชื่อ.....ผู้ยื่นคำขอ
(.....)

ตำแหน่ง.....

สถานที่ติดต่อของผู้ยื่นคำขอ.....

โทรศัพท์.....โทรสาร.....

Pager.....e-mail

สถานที่ติดต่อกรมควบคุมมลพิษ

ในเวลาราชการ

นอกเวลาราชการ

กรมควบคุมมลพิษ 92 ซอยพหลโยธิน 7 ถนนพหลโยธิน แขวงสามเสนใน เขตพญาไท กรุงเทพฯ 10400	อธิบดีกรมควบคุมมลพิษ	0 2521 8682 / 0 1896 3594
	รองอธิบดีกรมควบคุมมลพิษ	0 2235 6536 / 0 1938 8018
	รองอธิบดีกรมควบคุมมลพิษ	0 2465 8938 / 0 1442 2661
	ผอ. สำนักจัดการคุณภาพน้ำ	0 2411 1341 / 0 1622 4124
	ผอ. ส่วนแหล่งน้ำทะเล	0 2973 4088 / 0-1816-4280

APPENDIX G: LIST OF APPROVED DISPERSANTS FOR THAILAND ASSETS

รายชื่อสารเคมีขจัดคราบน้ำมันที่อนุญาตให้ใช้ในประเทศไทย
กรณีแก้ไขปัญหาน้ำมันรั่วไหล

ลำดับที่	ชื่อสารเคมี	บริเวณที่ อนุญาตให้ ใช้ได้ ¹	วันหมดอายุ	วันจดทะเบียน/ วันที่ปรับปรุง	หน่วยงานที่ อนุญาต ²
1	Accell Clean® DWD	*		18 กรกฎาคม 2554	U.S. EPA.
2	Agma DR 379	S B RS	20 มิถุนายน 2559		MMO
3	Agma OSD 569	S B RS	20 มิถุนายน 2559		MMO
4	BIODISPERS (FROMERLY PETROBIODISPERS)	*		28 มิถุนายน 2545	U.S. EPA.
5	Caflon OSD	S B RS	20 ธันวาคม 2561		MMO
6	CHEMAX 307 oil spill dispersant	*	-	-	TISI
7	COREXIT® EC9500A	S	12 ธันวาคม 2561	13 เมษายน 2537/ 18 ธันวาคม 2538	MMO U.S. EPA.
8	COREXIT® EC9500B	*		1 สิงหาคม 2556	U.S. EPA.
9	COREXIT EC9527A (Formerly Corexit 9527)	*		10 มีนาคม 2521/ 18 ธันวาคม 2538	U.S. EPA.
10	DASIC SLICKGONE NS/ Slickgone NS	S B RS	20 กุมภาพันธ์ 2562		AMSA / MMO
11	DASIC SLICKGONE EW/ Slickgone EW	S B RS	25 เมษายน 2561		AMSA / MMO
12	DISPERSIT SPC 1000TM	*		22 เมษายน 2542	U.S. EPA.
13	FFT-Solution®	*		1 พฤศจิกายน 2554	U.S. EPA.
14	Finasol OSR 51	S B RS	27 มิถุนายน 2560		AMSA MMO
15	Finasol OSR 52	S B RS	18 มีนาคม 2563	30 มกราคม 2546	MMO U.S. EPA.
16	JD-109	*		20 กันยายน 2543	U.S. EPA.

ลำดับที่	ชื่อสารเคมี	บริเวณที่ อนุญาตให้ ใช้ได้ ¹	วันหมดอายุ	วันจดทะเบียน/ วันที่ปรับปรุง	หน่วยงานที่ อนุญาต ²
17	JD-2000™	*		6 สิงหาคม 2544	U.S. EPA
18	MARE CLEAN 200	*		23 กุมภาพันธ์ 2531/ 26 มกราคม 2539	U.S. EPA
19	MARINE D-BLUE CLEAN™	*		23 เมษายน 2555	U.S. EPA
20	NEOS AB3000	*		22 เมษายน 2528/ 26 มกราคม 2539	U.S. EPA
21	NOKOMIS 3-AA	*		31 กรกฎาคม 2551	U.S. EPA
22	NOKOMIS 3-F4	*		4 มีนาคม 2545	U.S. EPA
23	OSD/LT Oil Spill Dispersant	S B RS	20 มิถุนายน 2559		MMO
24	OSR 4000	S B RS	7 สิงหาคม 2561		MMO
25	Radiagreen OSD	S	19 กุมภาพันธ์ 2563		MMO
26	SAF-ROD GOLD (a/k/a SF-GOLD DISPERSANT	*		3 มกราคม 2548	U.S. EPA
27	SEA BRAT #4	*		26 พฤศจิกายน 2545	U.S. EPA
28	SEACARE ECOSPERSE	S B RS	20 มีนาคม 2560		MMO
29	SEACARE ECOSPERSE 52 (see FINASOL OSR 52)	S B RS	25 เมษายน 2561	30 มกราคม 2546	MMO U.S.EPA
30	Seacare Ecosperse LT23	S B RS	28 ตุลาคม 2561		MMO
31	SEACARE E.P.A. (see Dispersit SPC 1000™)	*		22 เมษายน 2542	U.S. EPA
32	Seacare OSD	S B RS	10 พฤษภาคม 2561		MMO
33	Seacare OSD2	S B RS	28 ตุลาคม 2561		MMO

ลำดับที่	ชื่อสารเคมี	บริเวณที่อนุญาตให้ใช้ได้ ¹	วันหมดอายุ	วันจดทะเบียน/วันที่ปรับปรุง	หน่วยงานที่อนุญาต ²
34	SF-GOLD DISPERSANT (see SAF-ROD GOLD)	*		3 มกราคม 2548	U.S.EPA
35	Super-dispersant 25	S B RS	17 มีนาคม 2563		MMO
36	SUPERPERSE TM WAO2500	*		23 มีนาคม 2554	U.S.EPA
37	ZI-400	*		16 มิถุนายน 2548	U.S.EPA
38	ZI - 400 OIL SPILL DISPERSANT (see ZI-400)	*		16 มิถุนายน 2548	U.S.EPA

ปรับปรุงข้อมูลล่าสุด 19 พฤษภาคม 2558

หมายเหตุ

¹ อนุญาตให้ใช้ในพื้นที่

- S ■ Sea ทะเล
- B ■ Beach ชายหาดทราย
- RS ■ Rocky shore ชายหาดหิน
- * ■ ไม่ได้ระบุ

² หน่วยงานที่อนุญาต

- Marine Management Organisation : MMO สหราชอาณาจักร
- U.S. Environmental Protection Agency : U.S. EPA สหรัฐอเมริกา
- Australian Maritime Safety Authority : AMSA ประเทศออสเตรเลีย
- Thai Industrial Standards Institute : TISI ประเทศไทย

APPENDIX H: IESG OIL SPILL RESPONSE RESOURCES REQUEST FORM



Oil Spill Response Assistance and Interface Procedure

Appendix F: OSR Resources Request Form

แบบฟอร์มการขอรับการสนับสนุนในการขจัดคราบน้ำมันสำหรับสมาชิก

ส่วนที่ 1 Contact Details

ชื่อผู้ขอการสนับสนุน.....

ตำแหน่ง.....บริษัท/หน่วยงาน.....

หมายเลขโทรศัพท์.....หมายเลขโทรสาร.....

อีเมล.....

ที่อยู่ Command Center

รายการอุปกรณ์ที่ขอการสนับสนุน.....

รายการอื่นๆ ที่ขอการสนับสนุน.....

สถานที่จัดส่ง

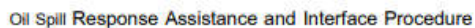
☐ รับเอง

☐ จัดส่งให้ (โปรดระบุสถานที่จัดส่ง).....

ลายเซ็น.....

ลงชื่อผู้ร้องขอ(ตัวบรรจง).....

วันที่.....เวลา.....



รายการอุปกรณ์ที่ให้การสนับสนุน.

รายการอื่นๆ ที่ให้การสนับสนุน

หมายเหตุ ให้บันทึกการรายการอุปกรณ์ให้ครบถ้วนหรือใช้แบบฟอร์มที่สะดวกกว่า

ลงชื่อ.....ผู้ยืนยันให้นำของออก/ให้การสนับสนุน

ตำแหน่ง _____ วันที่ _____ เวลา _____

โทรศัพท์

Page 16 of 33

APPENDIX I: LIST OF IESG RESOURCES

Type of Equipment	Size or Capacity	Total Quantity	Sattahip	Songkhla	Insurance Value	Daily rate		Daily rate	
						Government		Non-member	
						In Use	Stand-by Baht	In Use	Stand-by Baht
OIL CONTAINMENT BOOMS									
Complete set and ready to deploy									
1. Offshore Boom Air inflatable Auto Boom Lamor LAN 1500 in set composed with Hydraulic reel, power pack and air blower	200 m.	8	6	2	3,954,000	39,875	19,940	79,750	39,875
2. Offshore Boom Air inflatable Auto Boom Lamor LAN 1800 in set composed with Hydraulic reel, power pack and air blower	200 m.	1	1		4,032,000	42,085	21,045	84,170	42,085
3. Nearshore boom Air inflatable LAMOR ILB 1100 in set composed with Hydraulic reel, power pack and air blower	200 m.	10	8	2	2,565,650	65,225	32,615	130,450	65,225
4. Sea Sentinel Boom Vikoma Sentinel 900 in set composed with Hydraulic reel, power pack and air blower	200 m.	4	2	2	2,589,000	63,025	31,515	126,050	63,025
5. Beach Boom Desmi Ro Beach 800 in set composed with water pump and air blower	100 m.	3	2	1	1,064,000	33,150	16,575	66,300	33,150
6. Shore Guardian 400 in set composed with water pump, air blower (diesel engine)	100 m.	2	1	1	1,303,500	28,080	14,040	56,160	28,080

Type of Equipment	Size or Capacity	Total Quantity	Sattahip	Songkhla	Insurance Value	Daily rate		Daily rate	
						Government		Non-member	
						In Use	Stand-by Baht	In Use	Stand-by Baht
7. Solid Boom SK-Boom model SK-C105U	200 m.	2		2	759,000	25,300	12,650	50,600	25,300
8. Solid Boom SK-Boom model SK-C90U	200 m.	2		2	706,200	23,550	11,775	47,100	23,550
9. Solid Boom SK-Boom model SK-C75U (Bangkok)	200 m.	1			663,400	22,120	11,060	44,240	22,120
10. Solid Boom Supermax	150 m.	1	1		783,860	26,130	13,065	52,260	26,130
11. Solid Boom Flexi 900	200 m.	2		2	660,000	22,000	11,000	44,000	22,000
Booms									
Offshore Boom Air inflatable Auto Boom Lamor LAN 1800 w/ winder and build -in power pack	200 m.	1	1		3,544,000	39,375	19,690	78,750	39,375
Offshore Boom Air inflatable Auto Boom Lamor LAN 1500 w/ winder	200 m.	7	5	2	3,223,900	35,825	17,915	71,650	35,825
Nearshore boom Air inflatable LAMOR ILB 1100 w/ winder	200 m.	10	8	2	1,835,000	61,175	30,590	122,350	61,175
Sea Sentinel Boom Vikoma Sentinel 900 w/ winder	200 m.	4	2	2	1,751,000	58,365	29,185	116,730	58,365
Beach Boom Desmi Ro Beach 800	100 m.	3	2	1	884,000	29,475	14,750	58,950	29,475
Shore Guardian 400	100 m.	2	1	1	749,500	25,000	12,500	50,000	25,000

Type of Equipment	Size or Capacity	Total Quantity	Sattahip	Songkhla	Insurance Value	Daily rate		Daily rate	
						Government		Non-member	
						In Use	Stand-by Baht	In Use	Stand-by Baht
Boom components									
Air Blower ; "LAMOR", DAB70Y - 3 KW Diesel Engine, Capacity 400 m3/hr		8	6	2	441,700	2,450	1,225	4,900	2,450
Air Blower ; Elastec, 7 HP Diesel Engine, capacity 3000 CFM		4	2	2	488,000	2,710	1,355	5,420	2,710
Air inflator LBP 350				1	350,000	1,950	975	3,900	1,950
Back pack air blower Gasoline Engine, Capacity 1200 m3/hr		3	3		120,000	675	350	1,350	675
Power pack with build-in air blower (Auto boom LAN 1500)		2	2		556,000	3,100	1,550	6,200	3,100
Hydraulic Power Pack LPP7 - 7 KW Diesel Engine, Hi press 170 bar		5	4	1	288,900	1,600	800	3,200	1,600
Hydraulic power pack (for Sea Sentinel Boom)		4	2	2	350,000	1,950	975	3,900	1,950
Power pack SN P750-3222 (for offshore boom Auto LAN 1500)			1		122,500	700	350	1,400	700
Pacer water pump for beach boom		5	4	1	66,000	370	185	740	370

Type of Equipment	Size or Capacity	Total Quantity	Sattahip	Songkhla	Insurance Value	Daily rate		Daily rate	
						Government		Non-member	
						In Use	Stand-by Baht	In Use	Stand-by Baht
OIL RECOVERY SKIMMERS									
Complete set and ready to deploy									
12. Lamor Brush - Weir Skimmer LWS 500 W/P in set composed with Oil Transfer pump GTA70 and Hydraulic power pack LPP35K 35KW, Diesel engine	70 m3/hr.	1	1		3,519,000	19,550	9,775	39,100	19,550
13. Multi skimmer, LAMOR LMS/P in set composed with oil transfer pump GT A30 and Hydraulic power pack LPP250	30 m3/hr.	3	1	1 - BKK 1 - SKL	3,416,938	19,000	9,500	38,000	19,000
14. Weir Skimmer Desmi 250 in set composed with oil transfer pump and power pack			1		3,505,000	19,475	9,740	38,950	19,475
15. Brush Disc Skimmer Lamor Minimax 12 in set composed with Power pack with pump Spate C75	12 m3/hr.	4	3	1	822,400	4,570	2,285	9,140	4,570
16. Disc Skimmer T12 in set composed with Power pack with pump Spate C75	12 m3/hr.	4	3	1	616,800	3,425	1,713	6,850	3,425
17. Rope Mob Skimmer		3	2	1	680,000	3,350	1,675	6,700	3,350
18. Power Vac Skimmer		6	4	2	453,900	2,525	1,265	5,050	2,525
19. Weir Skimmer, Desmi Mini-Max in set composed with spate pump 75C	12 m3/hr.	1		1	580,000	3,225	1,613	6,450	3,225
20. Floating Suction Head, Vikoma Delta Head in set composed with spate pump 75C	12 m3/hr.	1		1	427,395	2,375	1,188	4,750	2,375

Type of Equipment	Size or Capacity	Total Quantity	Sattahip	Songkhla	Insurance Value	Daily rate		Daily rate		
						Government		Non-member		
						In Use	Stand-by Baht	In Use	Stand-by Baht	
OIL DISPERSANT SPRAYERS										
Complete set and ready to deploy										
21. Dispersant Spray Set; Lamor Boat Spray 100 Dual AFEDO nozzles in set composed with pump unit and 2 AFEDO nozzles	100 L/min.	8	6	2	800,500	4,445	2,223	8,890	4,445	
22. Portable Dispersant Sprayer		4	3	1	120,000	675	340	1,350	675	
OIL STORAGE TANKS										
Complete set and ready to deploy										
23. Oil storage tank Lamor LCT TSC11.4	10 m3	4	2	2	318,900	5,315	2,660	10,630	5,315	
24. Fast Tank 2000	10 m3	6	4	2	358,950	5,980	2,990	11,960	5,980	
ANCILLARIES - OTHERS										
25. Spate pump C75					377,400	2,100	1,050	4,200	2,100	
26. 10 ft. 2 doors Storage containers for offshore					334,000	1,850	925	3,700	1,850	
27. Cargo Basket (70"x70"x50")					184,000	1,025	513	2,050	1,025	

APPENDIX J: ESTIMATED MOBILIZATION TIME TO THAILAND OFFSHORE ASSET FOR NATIONAL ASSISTANCE FROM THE NEAREST IESG SITE

Asset	IESG Nearest Site	Nearest Airport to PTTEP Assets	In-land Preparation & Mobilization time (hrs.)	Vessel Mobilization time (hrs.)	Total time (hrs.)
ART	Songkhla	Hat Yai (HDY)	6	16	22
G2/61	Songkhla	Hat Yai (HDY)	6	18	24
G1/61	Songkhla	Hat Yai (HDY)	6	18	24

APPENDIX K: LIST OF PTTEP AUTHORIZED PERSONNEL FOR OSRL ACTIVATION (AS OF JANUARY 2023)

No.	Name	Position/Job Title	Telephone	Mobile	Email Address
1		SVP, Thai Offshore 1 Asset			
2		SVP, Thai Offshore 2 Asset			
3		SVP, Thai Offshore 3 Asset			
4		Acting SVP, Thai Onshore Asset			
5		SVP, Safety, Security, Health & Environment Division			
6		SVP, Exploration Project Division			
7		SVP, Development Project Division			
8		Acting SVP, Myanmar Asset			
9		VP, Algeria Development Project			
10		Country Manager, Malaysia Asset			
11		VP, Safety Management Department			
12		VP, Environment Management Department			
13		SSHE Manager, Myanmar Asset			
14		SSHE Manager, Myanmar Asset (Yadana)			



No.	Name	Position/Job Title	Telephone	Mobile	Email Address
15		SSHE Manager, Algeria Hassi Bir Rekaiz Project			
16		Co-HSE Manager, Algeria Groupement BIR-SEBA (GBRS)			
17		Head of SSHE Section, Malaysia Asset			
18		Head of SSHE Operations and Project Support, Malaysia Asset			

**APPENDIX L: IESG OIL SPILL RESPONSE RESOURCES REQUEST FORM**

PTT Public Company Limited (PTT)

Communication Centre:

Oil Spill Response and East Asia Response Limited (OSRL)

Singapore Base:**Southampton Base:****Notification Form – Page 1 of 2**

To: PTT Communication Center	Date:
Cc: OSRL	Warning! Ensure telephone contact has been established with the Duty Manager before using Email communication.
From:	Position:
Company:	Contact Number:
Subject: For Your Information	Incident name:
OBLIGATORY INFORMATION REQUIRED – COMPLETE ALL DETAILS	
Name of person in charge	
Position	
Company	
Contact telephone number	
Contact fax number	
Email address	
Spill Details	
Location of spill	
Description of slick (size/direction appearance)	
Latitude / Longitude	
Situation (cross box)	
Date & Time of spill	
Source of spill	
Quantity (if know)	
Spill status (cross box)	
Action taken so far	
Oil type & characteristics	
Name	
Viscosity	
API/SG	
Pour point	
Asphaltene	
Weather	
Wind speed and direction	
Sea state	
Sea temperature	
Tides	
Forecast	



PTT Public Company Limited (PTT)

Communication Centre:

Oil Spill Response and East Asia Response Limited (OSRL)

Singapore Base:**Southampton Base:**

Notification Form – Page 2 of 2

ADDITIONAL INFORMATION REQUIRED – COMPLETE DETAILS IF KNOW	
Resources at risk	
Clean up resources	
On site / Ordered	
Nearest airport (if know)	
Runway length	
Handling facilities	
Customs	
Handling agent	
Vessel availability	
Equipment deployment	
Recovered oil storage	
Equipment logistics	
Transport	
Secure storage	
Port of embarkation	
Location of command centre	
Other designated contacts	
Special requirements of country	
Security	
Visa	
Medical advise	
Vaccinations	
Others (specify)	
Climate information	

**APPENDIX M: PTT GROUP MOBILIZATION AUTHORIZATION FORM****Mobilisation Authorisation**

To: PTT Communication Center	Date:
Tel: [REDACTED]	
From:	Position:
Company:	Contact Number:
Subject: Mobilisation of OSRL	Incident name:

I, _____ (Name in Block Capitals)
hereby authorise to request PTT for the activation of OSRL and its resources in connection
with the oil spill incident of _____ (Name of Ship/Oil Rig or Terminal)
as of _____ (Time) on _____ (Date)

OSRL shall work under the direction of:

Name: _____
Position: _____
Company: _____

Signature _____ Position _____
Company name _____

To: OSRL	Date:
[REDACTED]	[REDACTED]
From: PTT Public Company Limited	Contact Number: [REDACTED]
Subject: Mobilisation of OSRL	Incident name:

I, _____ (Name in Block Capitals)
hereby authorize the activation of OSRL and its resources in connection with the oil spill
incident of _____ (Name of Ship/Oil Rig or Terminal)
as of _____ (Time) on _____ (Date)

Signature _____ Position _____
PTT Public Company Limited

APPENDIX N: OSRL NOTIFICATION AND MOBILIZATION PROCEDURE

OSRL Request Step

PTTEP is a participant member with OSRL, and therefore has immediate access to Tier 3 technical advice, resources and expertise 365 days a year on a 24-hour basis. The following steps should be followed to request OSRL's support:

- In the event of an incident, a call should be placed to one of the following numbers. The Duty Manager (DM) will call Client back within 10 minutes of receiving notification of the call.

Emergency Contact (TELEPHONE)

[REDACTED]

[REDACTED]

Emergency Contact (FAX)

[REDACTED]

[REDACTED]

- Complete the Notification (Appendix L) and Mobilization Authorization forms (Appendix M) as necessary, which can be sent to OSRL by fax or email.
- Under the Participant Member Agreement which governs the mobilization of resources from OSRL, OSRL must receive official notification to mobilize from one of PTTEP's Nominated Call-out Authorities, summarized in Appendix H. These are individuals within PTTEP who have been appointed to approve the expenditure of mobilizing Tier 3 equipment.

APPENDIX O: OSRL NOTIFICATION FORM



OSRL Notification Form

(Initial Incident Information)

Warning! Please telephone the Duty Manager before e-mailing or faxing this form

To	Duty Manager		
OSRL Base	Southampton, UK	Loyang, Singapore	Fort Lauderdale, USA
Telephone			
Emergency Fax			
Email			

Guidance: This information will be used to develop and recommend the most appropriate response strategy. If new information should become available, or the situation changes, please inform the Duty Manager as soon as possible.

Section 1 – Contact Details					
Member Company					
Name of Person Notifying OSRL					
Job Title (Designation)					
Direct Phone Number	Country code		Number		
Mobile Number	Country code		Number		
Fax Number					
Email Address					
Command Centre Address					
Date and Time of Notification	Date and Time		Time Zone		
Section 2 – Location					
Country / Region of Spill					
Latitude of spill (north/south)					
Longitude of Spill (east/west)					
Area Affected	<input type="checkbox"/> Offshore	<input type="checkbox"/> Subsea	<input type="checkbox"/> Shoreline	<input type="checkbox"/> Estuary	<input type="checkbox"/> Other
	<input type="checkbox"/> Port	<input type="checkbox"/> Harbour	<input type="checkbox"/> Inland	<input type="checkbox"/> River	
Water Depth (if applicable)					
Section 3 – Spill Details					
Date and Time of Spill				Time Zone	
Source of Spill					
Cause of Spill					
Status of Spill	<input type="checkbox"/> Secured		<input type="checkbox"/> Uncontrolled		<input type="checkbox"/> Unknown
Product Properties	Product Name / Type				State Units Provide an assay sheet if available. <input type="checkbox"/> Assay sheet provided
	Specific Gravity	API			
	Pour Point				
	Wax Content				
	Asphaltene				
	Sulphur Content				
	Viscosity	Reference Temperature °C			
Type of Release	Instantaneous Release	<input type="checkbox"/>	Volume		
	OR				
	Continuous Release	<input type="checkbox"/>	Release Rate		
State Units					

Section 3 – Spill Details continued				
Description of Observed Spill	Estimated Quantity			State Units
	Size			
	Appearance			
	Direction of Travel			
Section 4 – Weather and Modelling				
Weather forecast provided? e.g. Excel/Word	<input type="checkbox"/> Yes	<input type="checkbox"/> No, OSRL to source a weather forecast		
Sea Temperature			State Units	
Sea State				
Visibility				
Cloud Base				
Do you require Oil Spill Trajectory Modelling?	<input type="checkbox"/> Surface 2D	<input type="checkbox"/> Sub-surface 3D Additional time and costs apply	<input type="checkbox"/> Not at this time	
Sub-surface 3D Modelling Information if requested	Gas to Oil Ratio	Sm ³ /m ³	Release Hole Diameter	m
Section 5 – Safety and Security				
Highlight any known safety or security risks e.g. high levels of H ₂ S, high risk country				<input type="checkbox"/> Not Applicable
Describe security arrangements for OSRL staff				<input type="checkbox"/> Not Applicable
Section 6 – Resources at Risk (if available)				
Environmental or socio-economic sensitivities that may be impacted. Provide the relevant oil spill contingency plan and sensitivity maps if available.				<input type="checkbox"/> Contingency plan included <input type="checkbox"/> Sensitivity maps included
Section 7 – Equipment (if available)				
Equipment already deployed or being mobilised (other than OSRL resources)				
Section 8 – Further Information				

OSRL 027 - Issue 9, 4-Aug-16

APPENDIX P: OSRL MOBILIZATION AUTHORIZATION FORM



Mobilisation Authorisation Form

Please do not hesitate in contacting the duty manager at the earliest opportunity in the event of an incident or potential incident. Please ensure you telephone the Duty Manager before e-mailing or faxing this completed form

Safety and Security

Oil Spill Response Limited's safety policy requires us to work closely with the mobilising party to ensure all aspects of safety and security are addressed for our personnel.

To	Duty Manager		
OSRL Base	Southampton, UK	Loyang, Singapore	Fort Lauderdale, USA
Telephone			
Emergency Fax			
Email			

Details of Authorised Contact			
Incident Name			
Mobilising Company			
Name of Person Authorising OSRL			
Position of Authorising Representative			
Direct Phone Number	Country Code	Number	
Mobile Number			
Fax Number			
Email Address			

Invoice Address if available	
Purchase Order Number	

I, the above named Authorising Representative for the Mobilising Company, approve activation of Oil Spill Response Limited and its resources in connection with the above incident under the terms of the Agreement in place between the above stated Company and Oil Spill Response Limited.

Signature:		Date / Time:		
------------	--	--------------	--	--

If Oil Spill Response Limited personnel are to work under another party's direction please complete details below:

Directing Party's Details	
Company	
Contact Name	
Position in Incident	
Direct Phone Number	
Mobile Number	
Fax Number	
Email Address	

APPENDIX Q: ESTIMATED MOBILIZATION AND FLIGHT TIME FOR OSRL'S AERIAL DISPERSANT CAPABILITY

Country	OSRL Nearest Site	Nearest Airport to PTTEP Assets	Mobilization time (hrs)	Flight time (hrs)	Total time (hrs)
Algeria	United Kingdom	Houari Boumediene (DAAG)	6	9	15
Australia	Singapore	Darwin	6	8	14
Canada	United Kingdom	1st day to St John's (YYT) 2nd day to Calgary International (YCC)	6	15.5	>25
Mozambique	United Kingdom	Maputo	6	20.5	25.5
Myanmar	Singapore	Yangon	6	4	10
Thailand	Singapore	Suvarnabhumi Airport	6	3	9
		Hat Yai Airport	6	2.25	8.25
Malaysia	Singapore	Senai Airport	6	0.4	6.4

APPENDIX R: SPILL CAPABILITY ASSESSMENT CHECKLIST

Section 1 Management Organization & Training

It is essential that there is a robust management structure to lead the response to any incident. The members of the response team should be aware of their individual roles and responsibilities and trained in oil spill response. The team should be aware of how IESG and its members interface with their response organization. The organization should be regularly exercised.

Management Organization & Training		1	2	3
Reference document – OSCP				
M1	Is there a management structure for dealing with an oil spill incident?			
M2	Are all members of the team aware of their individual Roles and Responsibilities?			
M3	Is there a Response management System in place?			
M4	Have all of the team members been trained in oil spill response?			
M5	Have members of the management team been briefed in how IESG and its member operate and their respective responsibilities?			
M6	When was the management team last exercise?			

Section 2 Planning

There should be a contingency plan in place to co-ordinate the response to an oil spill which will bring together various elements of the response, including cleanup equipment. It should be kept up to date and tested on a regular basis. The plan should interface with other adjacent plans. And, should have an appropriate and relevant risk assessment and identify where resources to support tier 1, 2 and 3 response can be accessed.

Planning		1	2	3
Reference document – OSCP				
P1	Is there a contingency plan in place?			
P2	When was it last review/update?			
P3	When was the plan last exercise?			
P4	Does the plan integrate with IESG response?			
P5	Does the plan interface with national and other adjacent local plans?			
P6	Does the plan risk assessment reflect the scope of the operation and anticipate credible level of IESG and its members' involvement?			
P7	Does the credible Tier 1 spill scenario identified?			
P8	Does the cleanup equipment appropriate with the Tier 1 spill scenario?			
P9	Does the equipment maintenance and test program in place?			
P10	Does the equipment mobilization & deployment logistics been planned and tested?			

Section 3 Notification and Mobilization

An effective response is dependent upon an effective notification and mobilization system to alert the responders. This section deals with the alerting system, and ensures that all parties are aware of the required information and authorities to mobilize the support response from IESG and its members.

Notification and Mobilization		1	2	3
Reference document – OSCP				
N1	Is there a procedure in place to notify IESG of an incident?			
N2	When was it last review/update? (<i>notification procedure</i>)			
N3	When was the procedure last exercise?			
N4	Is there a procedure in place to mobilize IESG support in the event of an incident?			
N5	When was it last review/update? (<i>mobilization procedure</i>)			
N6	When was the system last exercise?			
N7	Are you aware of the information needed by IESG & members to mobilize a response?			
N8	Are you aware of the advice and information support that can be accessed from IESG?			
N9	Are you aware of the response time likely to be achieved in the event of a call?			

Section 4 Response

In order for IESG and its members to be able to respond effectively with the member (spill owner) there is a need for infrastructure items to support the response. This section deals with these elements.

Response		1	2	3
Reference document – OSCP				
R1	Is there a safety management plan in place for response operations?			
R2	Have response personnel been trained in the safety aspects of oil spill response?			
R3	Is there a communications system to enable effective co-ordination of the response?			
R4	Have secure equipment stockpile areas been identified?			
R5	Have the logistical arrangements been identified to import and deploy additional equipment delivered by IESG and its members?			
R6	Has a waste management plan been developed for the response operation?			
R7	When was the system last exercise?			

Answers to the questions are recorded on a numerical matrix indicating whether the issue is considered to be adequately addressed. Certain aspects are considered critical success factors, and failure in these areas would be

material to the ability of IESG and its members to assist the member (spill owner), or more importantly, for the member to be able to respond effectively. The answers should be dependent upon the question context.

Answers	Status
Yes / Satisfactory / this year	1
In need of action / Review / last year	2
No / Unsatisfactory/ Before last year	3