	DELPHI MANAGEMENT C Delphi Risk Manage	ement Consult	ing	ſ
	ESSO AUSTRA	LIA PTY LTD		
	LPG250/LFD350 & Traralgon Deve	LFD700 Pipel lopment, Vic	ine	
A	S 2885.6 - Safety M Rend	lanagement	Study	
D	ocument Number: 20-02	-2024-PL-REP-(001 SMS	
Current Revision	1			
Revision:	Reason for Revision:	Revision Dat	e:	
Rev 0	Issue for Use	8/4/2024		
Prepared By:		Signature:		
Reviewed By:		Signature:	April	21, 202
Reviewed By:		Signature:	pril	21, 202
Approved By:		Signature:		
			April	19, 202

Revision History

Rev	Revision Date	Reason for Revision	Prepared By	Reviewed By	Reviewed By	Approved By
Α	11/3/2024	Issue For Review				
0	8/4/2024	Issued for Use				

Contents

1.	Executive Summary	5
-	 1.1 Background 1.2 Key Findings 1.3 Actions Raised 1.4 Outcomes 	5 5 6 7
2. 3.	Abbreviations Introduction	9 11
	 3.1 Overview	. 11 . 11 . 12 . 13 . 14 . 14 . 14 . 14
4.	Approach and methodology	15
	 4.1 Approach	. 15 . 15 . 17 . 17 . 17 . 18 . 18
5. 6.	Pipeline Technical Details Workshop Results	19 22
	 5.1 Location Class Changes 5.2 Risk Assessment Findings 5.3 Intermediate Risk Findings 	. 22 . 22 . 23
7.	Discussion	24
	 7.1 Excavator Hole Consequence Review 7.2 Light Pole Placement 7.3 Valve Site Operations 7.4 Power Pole Management 	. 24 . 24 . 24 . 24 . 24
8. 9. AP AP AP	Actions Conclusion PENDIX A: Document References PENDIX B: Classification of Locations PENDIX C Threats & Controls PENDIX D AS2885 Part6 Risk Assessment	25 28 29 30 32 35 28

List of Tables

Table 1, Pipeline Risk Summar	у	5
-------------------------------	---	---



Table 2, Actions Raised.	6
Table 3, Pipeline Parameters	12
Table 4, Pipeline Parameters	12
Table 5, Pipeline Parameters	
Table 6, Pipeline Procedural Controls	
Table 7, Attendance Record	
Table 8, Pipeline Technical Details PL27/34	
Table 9, Excavator Risk PL27/34	
Table 10, Pipeline Technical Details PL282	
Table 11, Excavator Risk PL282	
Table 12, Pipeline Technical Details PL35/126	
Table 13, Excavator Risk PL35/126	
Table 14. Pipeline Risk Summary	
Table 15, Intermediate Risk Assessment Summary	
Table 16, Action List	
Table 17. Document References	29

List of Figures

Figure 1 – LPG250 Pipeline Location	
Figure 2 – LFD350 Pipeline Location	
Figure 3 – LFD700 Pipeline Location	
Figure 4 - AS2885.6 Risk Assessment Process	

1. EXECUTIVE SUMMARY

1.1 Background

Developer Millar Merrigan (MM) has engaged **Exercise** from Delphi Risk Management Consulting (DRMC) to undertake a Safety Management Study (SMS) in accordance with AS2885.6 (Section 1.5.1(b)(ii)) for the Traralgon North Development (the Development) within the Measurement Length (ML) of the following pipelines

- DN250 Longford to Long Island Point LPG pipeline (LPG250), which operates under Pipeline Licence 27 & 34 (PL27 & 34).
- LFD350 Longford to Long Island Point Crude Oil pipeline, Pipeline Licence PL282.
- LFD700 Longford to Long Island Point pipeline, Pipeline Licences PL35 & PL126 .

The Development proposed was identified as a standard residential development with no plans for any sensitive uses, as a result there are no changes to the current Primary Location Class (LC) and Secondary LC already identified for each pipeline impacted.

Full results of the safety management study review are presented in Appendix E.

This SMS Report captures the findings of the Traralgon Development SMS Workshop.

1.2 Key Findings

A range of actions were identified associated with relevance of existing ALARP assessments, design of road crossings, lighting pole locations and impact of existing operational and maintenance activities associated with the existing Valve Station.

As the LPG250 represents the worst-case consequence to the Development, the existing LPG250 5 yearly risk assessment was used as the template for review of the Development at the SMS Workshop.

Table below presents an overview of the threats identified during the SMS workshop applicable to the pipelines.

Threat Type	No. Threats	Non-CredibleThreatsCrediblerequiring r	No.Non-CredibleThreatsThreatsCrediblerequiring risk	Credible Threats requiring risk	Risk Assessment		
	Considered Assessment	Negligible	Low	Intermediate			
Non-Location Specific	74	11	63	9	1	5	3
Location Specific	6	-	6	-	-	-	-
Facility	1	-	1	1	-	-	1
TOTAL	81	11	70	10	1	5	4

Table 1, Pipeline Risk Summary

The Intermediate Risks are summarised in Section 6.3 of this SMS Report.

1.3 Actions Raised

The following 19 Actions were raised at the SMS Workshop.

Table 2, Actions Raised.

Miscellaneous Actions

ID	Issue	Action	RESPONSIBLE PERSON	DUE DATE
A1	Construction of the Development could damage the pipeline	Principal Contractor(s)to prepare a Construction Management Plan, for review and acceptance by EAPL (pipeline licensee) prior to any third party works.	Constructor	Prior to construction
A2	Risk that what is agreed at the SMS Workshop is not passed onto the Development Plan and the future Constructor	SMS Report and Findings to be referenced and included in the Development Plan	ММ	Prior to completion of the Development Plan
A3	Future responsibility for vegetation control of the easement through the development unclear	Confirm who will be maintaining the pipeline easement (vegetation control) during and post completion of the Development?	ММ	31/3/2024
A4	Road to north of pipeline easement is within the 15m set back distance previously advised by EAPL	Confirm whether 15m property set back distance does allow for road reserves to be included within the 15m Set Back?	EAPL	31/3/2024
A5	Insufficient depth of cover (DOC) at proposed road crossing leading to overstress of pipeline.	Undertake potholing to confirm DOC of all pipelines at proposed road crossings to ensure the road design meets EAPL requirements. Potholing to following EAPL Potholing procedure, permitting and supervision.	ММ	Prior to completion of detailed design
A6	Development Drawings don't include names of roads crossing the pipeline easement	Provide new Road names to EAPL when available	EAPL	Prior to construction
A7	Potential for suspended LFD700 pipelines to collapse under new road crossings potentially leading to a car accident due to uneven road surface	Review integrity of LFD700 pipeline wall thicknesses and coatings to determine if recoating is necessary. Concrete slabbing over pipeline to prevent subsidence of road surface	MM/EAPL	Prior to completion of detailed design

Threat Specific Actions

ID	Issue	Action	RESPONSIBLE PERSON	DUE DATE
NLS2	Existing risk of an excavator causing a hole in the pipeline is now a higher consequence due to the presence of new residential development (thus more people at risk of seriously injured or fatality)	Esso to Review if an ALARP assessment needs to be done or whether an existing ALARP assessment for T1 is applicable and acceptable. Assessment needs to consider population density and thus lot sizes. EAPL to provide clear direction to Developer on requirements to ensure risk is ALARP	EAPL	31/3/2024
NLS3	Excavator 10T+ with Pen or tiger teeth leading to a Rupture resulting in loss of supply to make a repair. Ignited rupture could lead to an ML up to 860m possibly resulting in multiple fatalities. Supply could be out for 2-4 weeks due to the major third-party investigation.	Esso to Review if an ALARP assessment needs to be done or whether an existing ALARP assessment for T1 is applicable and acceptable. Assessment needs to consider population density and thus lot sizes. EAPL to provide clear direction to Developer on requirements to ensure risk is ALARP	EAPL	31/3/2024



ID	Issue	Action	RESPONSIBLE PERSON	DUE DATE
NLS12	There is a need to provide temporary crossing points of the easement to support construction of the Development.	MM to demonstrate that the Temporary Road Crossings being provided are suitable to protect the pipelines.	MM	31/3/2024
NLS12	Road crossings not designed to properly protect the pipeline(s) they cross can cause overstress to the pipeline and damage to the coating ultimately leading to a pipeline leak or failure	Demonstrate that the Permanent Road crossing designs are compliant with applicable standard and EAPL requirements (Refer to NLS25).	ММ	Prior to completion of detailed design
NLS15 & M9	Vehicle impact of Traralgon Valve Site causing rupture will result in major fire and multiple fatalities	Review proposed road and bollard design immediately north of Traralgon Valve Site and consider whether risk is mitigated or whether other controls/designs are required. (Refer to Action A4)	MM/EAPL	31/3/2024
NLS21	Vibration over pipeline easement could damage the pipeline coating resulting in long term corrosion and potential leak	Compaction of roadways over pipeline easement to be completed using static rollers. Peak Particle Velocity (PPV) for vibration near pipelines not to exceed 10mm/s unless otherwise assessed and approved by EAPL. Requirements to be included in Development Plan	MM/EAPL	Prior to construction
NLS22	Existing pipeline coatings may be compromised or fail due to stress from new road crossing leading to a corrosion leak and Loss Of Containment	Inspect coating of pipelines directly impacted by road crossings and confirm if recoating is required prior to construction of the road. Contractor to engage EAPL approved subcontractor for the works	ММ	Prior to completion of detailed design
NLS25	Utility crossings not properly designed could result in the pipeline being damaged when third parties seek to excavate and or repair their utility	EAPL to provide design guidelines for both road and utility crossings of EAPL pipelines. Guidelines to be included in Development Plan	EAPL	10/4/2024
NLS36	Stray current corrosion compromises Cathodic Protection System leading to pipeline leak	Transformer(s) location and high voltage cabling to consider Low Frequency Induction (LFI) or Earth Potential Rise (EPR) to ensure local pipeline Cathodic Protection Systems are not compromised. EAPL to review and accept design calculations	MM/EAPL	Prior to completion of detailed design
NLS38	Landscaping and road design will change the natural watercourse in the area potentially putting the pipeline easement at risk of water pooling or soil erosion	Stormwater Design to be provided to EAPL for review and acceptance	MM/EAPL	Prior to completion of detailed design
NLS45	Malicious damage due to the increased population in the area	EAPL to review security of the Valve Station due to the location of the new development	EAPL	31/3/2024
NLS73	EAPL requires space around their Valve Station Compound to under various periodic operational and maintenance activities	EAPL to review all operational and maintenance activities associated with the Valve Site and determine if any procedures require additional controls to prevent or mitigate any incidents with respect to the new development (e.g. vehicle movements near valve site during operations, venting plumes impacting third parties etc)	EAPL	31/3/2024

1.4 Outcomes

The SMS undertaken is considered to be a Change in Land Use SMS as required under AS2885. All actions raised at the SMS will need to be closed out in a timely manner as agreed at the SMS Workshop.



Upon satisfactory close out of the actions raised from this SMS Workshop, it can be confirmed that the requirements of AS2885.6-2018 are met and that the pipelines impacted by this Development will continue to be in compliance with the SMS requirements of AS2885.



2. ABBREVIATIONS

ALARP	As Low As Reasonably Practicable
ANSI	American National Standards Institute
API	American Petroleum Institute
AS	Australian Standard
С	Crowd (Secondary location class)
CDF	Computation Fluid Dynamics
CDL	Critical Defect Length
CIC	Common Infrastructure Corridor (Secondary location class)
CMP	Construction Management Plan
CP	Cathodic Protection
CTE	Coal Tar Enamel (nineline coating)
CWC	Concrete Weight Coating
	Dial Before You Dig
	Diameter nominal
	Diameter normal
	Depth of Cover Environment (Cocondens location aloce)
E	Environment (Secondary location class)
EAPL	Esso Australia Pty Ltd (Pipeline Licensee)
EIP	External Interference Protection
ERP	Emergency Response Plan
ESV	Energy Safe Victoria
FCP	Fracture Control Plan
GIS	Geographical Information System
GJ/s	Gigajoules per Second (energy release rate)
HDPE	High Density Polyethylene
HW	Heavy Wall (pipe wall thickness)
HI	Heavy Industrial (Secondary location class)
I	Industrial (Secondary location class)
ILI	In-Line Inspection
ISO	International Organization for Standardization
km	Kilometre(s)
KP	Kilometre Point
kW/m2	Kilowatts per metre squared (heat radiation flux)
LFD	Longford Gas Plant
LFL	Lower Flammability Limit
LIP	Long Island Point Fractionation Plant
LOPA	Lavers of Protection Analysis
LPG	Liquified Petroleum Gas
m	Metre(s)
MAOP	Maximum Allowable Operating Pressure
ML	Measurement Length
	$(4.7 \text{ kW/m}^2 \text{ radiation contour in the event of a full-bore rupture of the pipeline})$
MLV	Main Line Valve
MM	Millar Merrigan (Developer)
OIMS	Operations Integrity Management System
PIMP	Pipeline Integrity Management Plan
PRA	Periodic Risk Assessment
P&ID	Process & Instrumentation Drawing
PPV	Peak Particle Velocity, related to degree of ground movement or vibration
PSMP	Pipeline Safety Management Plan



R1 R2	Rural (Primary Location Classification) Rural Residential (Primary Location Classification)
ROW	Right of Way
RTP	Resistance to Penetration
S	Sensitive Use (Secondary location class)
SAOP	Safety and Operating Plan
SMS	Safety Management Study
SMYS	Specified Minimum Yield Stress
Std	Standard
T1	Residential (Primary Location Classification)
Т2	High Density (Primary Location Classification)
ТР	Transmission Pipeline
TOR	Terms of Reference
VS	Valve Site
WT	Wall Thickness

3. INTRODUCTION

3.1 Overview

Developer Millar Merrigan (MM) has engaged **Exercise** from Delphi Risk Management Consulting (DRMC) to undertake a Safety Management Study (SMS) in accordance with AS2885.6 (Section 1.5.1(b)(ii)) for the Traralgon North Development (the Development) within the Measurement Length (ML) of the following pipelines

- DN250 Longford to Long Island Point LPG pipeline (LPG250), which operates under Pipeline Licence 27 & 34 (PL27 & 34).
- LFD350 Longford to Long Island Point Crude Oil pipeline, Pipeline Licence PL282.
- LFD700 Longford to Long Island Point pipeline, Pipeline Licences PL35 & PL126.

The Development proposed was identified as a standard residential development with no plans for any sensitive uses, as a result there are no changes to the current Location Class (LC) and Secondary LC already identified for each pipeline impacted.

This report details the results of the SMS review for the following pipeline:

3.2 LPG250 Pipeline SMS Scope & Description

The scope of this SMS review covers the DN250 Longford to Long Island Point (LPG250) pipeline, which is an LPG pipeline which commences at Longford, and includes the pig launcher at the LFD Plants and terminates at Long Island Point and includes the pig receiver at the LIP Fractionation Plant. The licence length of the pipeline is approximately 185 km (refer to P&ID 304-12501) and is governed by pipeline licence 27 (PL/27) and pipeline licence 34 (PL/34).



Figure 1 – LPG250 Pipeline Location

Table 5, Fipeline Falanceers								
Pipeline	ne Segment		Nominal Diameter	Pipeline Licence	Pipeline Licence	Current MAOP (kPa)	Design Code	Year of Construction
	From	То	(mm)	Length (km)				
LPG250	LFD	LIP	250	185	PL27/34	8275	ANSI B31.8 1968	1969

Table 3, Pipeline Parameters

The pipeline was constructed in 1969. The 250 mm nominal diameter onshore pipeline is buried below ground, but rises above ground at the following valve site:

• Traralgon-Maffra Road valve site

3.3 LFD350 Pipeline SMS Scope & Description

The scope of this SMS review covers the DN350 Longford to Long Island Point (LFD350) pipeline, which is a Crude Oil pipeline which commences at Longford and includes the pig launcher at the LFD Plants and terminates at Long Island Point and includes the pig receiver at the LIP Fractionation Plant. The licence length of the pipeline is approximately 185 km and is governed by pipeline licence 282.





Table 4, Pipeline Parameters

Pipeline	Segment		Nominal Diameter	Pipeline Licence	Pipeline Licence	Current MAOP (kPa)	Design Code	Year of Construction
	From	То	(mm)	Length (km)				
LFD350	LFD	LIP	350	185	PL282	9530	AS 2885.1– 2012	2017

The pipeline was constructed in 2017 as a replacement pipeline for the LFD700. This DN350 pipeline transports crude oil from the LFD CSP to the LIP Tank Farm. The onshore pipeline is buried below ground, but rises above ground at the following valve site:

• Traralgon-Maffra Road mainline valve site.

Spec

X52

X52

X52

3.4 LFD700 Pipeline SMS Scope & Description

The scope of this SMS review covers the DN700 Longford to Long Island Point (LFD700) pipeline which is suspended and filled with either inhibited water or nitrogen. The pipeline commences at Longford and includes the pig launcher at the LFD Plants and terminates at Long Island Point and includes the pig receiver at the LIP Fractionation Plant. The licence length of the pipeline is approximately 185 km (refer to P&ID 305-12501) and is governed by pipeline licence 126 (PL126) and pipeline licence 35 (PL35).



Figure 3 – LFD700 Pipeline Location

Pipeline	From	То	DN mm	Length km	License	Contents	MAOP kPag	Design Code	Design Factor	Max Op temp degC	Coating	WT
LFD700- LIP	LFD	WBY	700	87.7	PL126	Nitrogen	Not Operating	AS2018 1977	0.72	85	HBE	9.52/ 12.7
	LFD	WBY	700	87.7	PL35	Inhibited Water	Not Operating	USAS B31.4	0.72	68	CTE	9.52/ 11.53
	WBY	LIP	700	98		Nitrogen	Not Operating	1900			CTE/ HBE	

Table 5, Pipeline Parameters

The pipeline was constructed in 1969. An original section of pipeline from LFD to Westbury (WBY) was replaced in 1980. This original section, and the remainder of the pipeline from WBY to LIP, are governed by pipeline licence 35 (PL35). The replacement looped pipeline from LFD to WBY is governed by pipeline licence (PL126).

The 700 mm nominal diameter pipeline is buried below ground, but rises above ground at each of the following valve sites:

• Traralgon-Maffra Road valve site

3.5 Procedural Controls

The pipelines are procedurally controlled with the following equipment and activities.

Control	Details			
Signage spacing	100m T1 -250m R2 - 500m R1			
Ground Patrolling	Weekdays			
Aerial Patrolling	Twice weekly			
Marker Tape	No			
Pipeline Awareness Programs	Council liaison & annual ERP drills			
DBYD	Yes			
Landholder Liaison	Yes -Annual diary drop			
Above Ground Facilities	Fenced sites			

Table 6, Pipeline Procedural Controls

3.6 External Coating & corrosion protection:

Primary external corrosion protection for the LFD700 and LPG250 pipelines is provided by CTE coating with glass fibre reinforcement and coal tar saturated asbestos felt at the field joints. The LFD350 is coated with FBE coating.

Further corrosion protection is achieved by the ICCP system.

3.7 External Interference Management

Approaches and procedures adopted by EAPL to prevent, detect, and control external interference threats are detailed in the PIMP.

3.8 Attendance

The Safety Management Study Workshop was held from the 20th of February 2024 online.

The workshop was attended by a range of qualified people, a list of the attendees is shown in the Table below. The group included sufficient disciplines, knowledge, and experience to provide confidence that the output of the workshop is soundly based.

Name	Position	Organisation	Attendance
		DRMC	Yes
		EAPL	Yes
		EAPL	Yes
		EAPL	Yes
		Millar Merrigan	Yes

Table 7, Attendance Record

4. APPROACH AND METHODOLOGY

4.1 Approach

The Australian Standard AS 2885.1–2018 & AS2885.6-2018 describes the requirements for pipeline SMS including:

- Threat identification.
- Application of physical, procedural and design controls for each credible threat.
- Review of threat control; and
- Assessment of residual risk from failure threats.

The SMS process focuses on eliminating threats to pipeline integrity from location specific and nonlocation specific activities, present and future, and conditions foreseeable, including likely land use, during the pipeline operational phase. Where failures are assessed as possible after the application of control measures, risk assessment is undertaken for the relevant threat, and it must be demonstrated that the risks are 'as low as reasonably practicable' (ALARP).

4.2 Methodology

Prior to the SMS workshop being convened, MM, EAPL & DRMC have prepared a range of relevant information to be presented to the workshop. The information available includes the results from previous SMS workshops held for the existing pipeline(s).

All threats developed prior to the SMS workshop were documented in a spreadsheet and projected on a screen for reference during the workshop. Changes or additions to the threats and risk mitigations were recorded directly into the spreadsheet. Additional actions not related to particular threats will also be recorded.

The GIS Database for the pipeline was presented to the workshop.

The SMS study is based on the risk assessment process defined in AS 2885.6–2018 and in particular the Flowchart presented in the Standard and referenced below.





through the flowchart which have been omitted for simplicity.

4.2.1 Location Classification

The AS 2885.6 – 2018 definition of Location Class is "The classification of an area according to its general geographic and demographic characteristics, reflecting both the threats to the pipeline from the land usage and the consequences for the population, should the pipeline suffer a loss of containment". For the selection of location class, the area along the pipeline route and the surrounding land uses are considered. There was also guidance from the Victorian Planning Schemes to consider upcoming developments and growth areas.

Classification of locations is defined in AS 2885.6-2018, Section 2.2.

The primary location class reflects the population density of the area. It is defined based on an analysis of the predominant land use in the broad area traversed by the pipeline/s. There are four primary location classes to select from, as described in, Appendix B. One or more secondary location classes, reflecting special uses, may also apply to an area, as described in, Appendix B. Changes in location class occur when there are changes in land use planning along the route of existing pipelines.

Where this occurs a safety assessment shall be undertaken, and additional control measures implemented until it is demonstrated that the risk from loss of containment involving a rupture is As Low As Reasonably Practical "ALARP".

The assessment shall include analysis of at least the alternatives of the following:

- a) MAOP reduction.
- b) Pipe replacement (with no rupture pipe).
- c) Pipeline relocation.
- d) Modification of land use; and
- e) Implementing physical and procedural protection measures that are effective in controlling threats capable of causing rupture of the pipeline.

4.2.2 Threat Identification

The threat identification process seeks to list all location specific and non-location specific threats with the potential to:

- Damage any of the pipelines.
- Cause interruption to service for any of the pipelines.
- Cause release of fluid from any of the pipelines; or
- Cause harm to pipeline operators, the public or the environment.

Prompts are used to aid the team, drawn from the Standard, and include the most commonly identified threats for gas and liquid petroleum pipelines. The threat prompts are provided in Appendix C. Threats determined to be non-credible are documented, along with the reasoning.

4.2.3 Threat Control

For each credible threat identified in the previous step, effective controls are listed. Controls are considered effective when failure as a result of that threat has been removed for all practical purposes.

For external interference threats, physical and procedural controls are required, a summary of the typical controls is shown in, Appendix C. The categories of physical and procedural are also displayed in Appendix C.

For all other threats, design and/or procedures are required.

To assist in the analysis and in determining if controls are effective (e.g., pipeline wall thickness), pipeline calculations are completed. The pipeline calculations establish:

- The maximum excavator size and teeth that can be used during construction to ensure the pipelines are not compromised; and
- Radiation contours (distances) of interest for full bore rupture incidents

A radiation of 4.7 kW/m2 will cause injury (at least second-degree burns) after 30 seconds exposure. Therefore, for example, it is preferred that there are no sensitive groups located within range of a pipeline's 4.7 kW/m2 measurement length as these population groups may be unable to be evacuated or to seek shelter.

4.2.4 Residual Threats Risk Assessment

For threats where failure is still possible despite the control measures, and no further threat controls can be applied, an assessment of the residual risk is undertaken. This is completed by:

- Assessment of the severity of the consequence of a failure event
- Analysis of the frequency of occurrence of the failure event and
- Risk ranking

The results of the risk ranking determine the required treatment action for the threat. Refer to the Risk Matrix in Appendix D.

If the risk of a particular threat cannot be considered to be low or negligible according to recognised industry risk matrix then further investigation of the threat will take place to confirm that the risk is "As Low As Reasonably Practical" (ALARP).

An SMS Report (this report) is produced following the workshop to capture proceedings of the workshop and highlight key decisions or issues. It will also contain all the threats and their associated mitigations and/or agreed actions.

4.3 Specific Approach for this Study

The focus of this study is on potential new threats or changes to existing threats as a result of the new Development.

The Development is encroaching on and changing the land use both north and south of the pipeline easement in the Traralgon North area including surrounding the existing Traralgon-Maffra Road Valve Station. The Development is not introducing any "Sensitive" use activities, but it does have the possibility of significantly influencing the normal operating and maintenance activities of the Valve Station and these activities will need to be considered when closing out the actions from the SMS Workshop.

5. PIPELINE TECHNICAL DETAILS

The pipeline's technical details and resistance to penetration data can be summarised as follows:

Table 8, Pipeline Technical Details PL27/34	
Substance conveyed	Natural Gas
Pipeline License No.	PL27/34
Measurement Length (ML) (ignited rupture)	860m (4.7 kW/m2 Heat Radiation Zone)
(ignited rupture)	530m (12.6 kW/m2 Heat Radiation Zone)
Length of pipeline	185.4 km
Pipeline Under Review within PSP	KP 0 to KP 185.4
Nominal diameter	250 mm
Wall thickness	5.56 mm (Std), N/A (Heavy Wall)
Depth Of Cover	0.6-0.9m
Pipe specification	X52 DSAW (with CTE coating)
Max. Allowable Operating Pressure (MAOP)	8275 kPag
CDL	73mm
Hole size & ML based on 10GJ/s release rate	59mm & 210m
Hole size & ML based on 1GJ/s release rate	19mm & 66m

The pipeline excavator risk can be summarised as follows:

Table 9, Excavator Risk PL27/34

Credible Excavator Size in area of PL27/34	25T
Max equipment sizes without risk of a leak: -	
Excavator with std bucket	No leak up to 55T
Excavator with Single Tiger Tooth or Penetration Tooth	>5T
Excavator with Twin Tiger Tooth	> 10T
Max equipment sizes without causing	
rupture: -	
Excavator with std bucket	No Rupture
Excavator with Single Tiger Tooth or Penetration Tooth	>5T
Excavator with Twin Tiger Tooth	>10T
Any unacceptable defects from DCVG	No known defects
report?	
Any unacceptable defects from Intelligent pigging report if available if pipe is piggable?	No significant defects in the area

Table 10, Pipeline Technical Details PL282

Substance conveyed	Natural Gas
Pipeline License No.	PL282
Measurement Length (ML) (ignited rupture)	476m (4.7 kW/m2 Heat Radiation Zone)
(ignited rupture)	280m (12.6 kW/m2 Heat Radiation Zone)
Length of pipeline	185.4 km
Pipeline Under Review within PSP	KP 0 to KP 185.4
Nominal diameter	350 mm
Wall thickness	9.53 mm (Std), 12.7 (Heavy Wall)

Depth Of Cover	0.9-2.0m
Pipe specification	API 5L X60 PSL2 (with 2-part FBE)
Max. Allowable Operating Pressure (MAOP)	9530 kPag
CDL	92mm
Hole size based on 10GJ/s release rate	64mm
Hole size based on 1GJ/s release rate	20mm

The pipeline excavator risk can be summarised as follows:

Table 11, Excavator Risk PL282

Credible Excavator Size in area of PL282	25T
Max equipment sizes without risk of a leak: -	
Excavator with std bucket	No leak up to 55T
Excavator with Single Tiger Tooth or	>5T
Penetration Tooth	
Excavator with Twin Tiger Tooth	> 20T
Max equipment sizes without causing	
rupture: -	
Excavator with std bucket	No Rupture
Excavator with Single Tiger Tooth or	>5T
Penetration Tooth	
Excavator with Twin Tiger Tooth	>20T
Any unacceptable defects from DCVG	No known defects
report?	
Any unacceptable defects from Intelligent	No significant defects in the area
pigging report if available if pipe is piggable?	

Table 12, Pipeline Technical Details PL35/126

Substance conveyed	Nitrogen at nominal pressure (PL126 LFD-WBY & PL35 WBY-LTP)
	Inhibited water (PL35 LFD-Westbury)
Pipeline License No.	PL35/126
Measurement Length (ML) (ignited rupture)	N/A
(ignited rupture)	N/A
Length of pipeline Under Review	PL35 185 km / PL126 87.7 km
Nominal diameter	700 mm
Wall thickness	9.52 mm (Std), 12.7 mm (Heavy Wall)
Depth Of Cover	0.9-1.2m
Pipe specification	X52 DSAW (with CTE/HBE coating)
Max. Allowable Operating Pressure (MAOP)	4800 kPag (MOP= nominal/atmos)
CDL	N/A
Hole size & ML based on 10GJ/s release rate	N/A
Hole size & ML based on 1GJ/s release rate	N/A

The pipeline excavator risk can be summarised as follows:

Table 13, Excavator Risk PL35/126

Credible Excavator Size in area	25T
Max equipment sizes without risk of a leak: -	
Excavator with std bucket	No leak up to 55T
Excavator with Single Tiger Tooth or Penetration Tooth	>10T
Excavator with Twin Tiger Tooth	>35T
Max equipment sizes without causing	
rupture: -	
Excavator with std bucket	No Rupture
Excavator with Single Tiger Tooth or	No Rupture
Penetration Tooth	
Excavator with Twin Tiger Tooth	No Rupture
Any unacceptable defects from DCVG	No known defects
report?	
Any unacceptable defects from Intelligent	No recent ILIs
pigging report if available if pipe is piggable?	

6. WORKSHOP RESULTS

6.1 Location Class Changes

The workshop team reviewed the current GIS Imagery and the Risk Assessment Spreadsheet prepared prior to the SMS Workshop and confirmed that the existing Primary Location Classes for the pipeline are appropriate.

LPG250 Location Class

- Current LC T1 / S / I. (Note I & S SLC currently more than 500m away)
- Future LC T1 / S / I. (Proposed Development intended to be Residential only, no Sensitive use proposed)
- Pipeline length impacted 1460m (KPs 53.457 to 55.06 + ML)

LFD350 Location Class

- Current LC T1
- Future LC T1 (Proposed Development intended to be Residential only, no Sensitive use proposed)
- Pipeline length impacted 1460m (KPs 53.457 to 55.06 + ML)

LFD700 Location Class

- Current LC T1
- Future LC T1 (Proposed Development intended to be Residential only, no Sensitive use proposed)
- Pipeline length impacted 1460m (KPs 53.457 to 55.06 + ML)

6.2 Risk Assessment Findings

The Threats listed in Appendix C were used as a guide when reviewing the Development. A total of 81 threats were considered during the SMS Workshop applicable to the pipelines.

Table 14, Pipeline Risk Summary

Threat Type	No. Threats	Non- Credible	Credible	Threats requiring risk Assessment	Risk Assessment		
	Considered				Negligible	Low	Intermediate
Non-Location Specific	74	11	63	9	1	5	3
Location Specific	6	-	6	-	-	-	-
Facility	1	-	1	1	-	-	1
TOTAL	81	11	70	10	1	5	4

Summary of findings – Workshop considered Low and Negligible risks were considered ALARP, provided controls are monitored as part of normal operations (Esso OIMS and WMS processes) The workshop results were recorded in the minutes, provided in Appendix F.

6.3 Intermediate Risk Findings

In accordance with AS2885, where a risk analysis is required, the risk from each threat is required to be reduced to 'negligible' or 'low', or where residual risk is 'intermediate' it should be demonstrated to be ALARP. Demonstration of ALARP was not covered in the SMS workshop and remains the responsibility of EAPL.

Threats which were identified as being credible and were risk assessed to be an 'intermediate' risk are summarised in the Table below.

Threat ID	Threat Description	Consequence Assessment	Likelihood	Severi	ty		Risk	Basis for Assessment
				Туре	Consequence	Severity		
NLS3	Excavator Impacts pipeline	Excavator 10T+ with Pen or tiger teeth leading to a Rupture resulting in loss of supply to make a repair. Ignited rupture could lead to an ML up to 860m possibly resulting in multiple fatalities. Supply could be out for 2-4 weeks due to the major third- party investigation.	Hypothetical	People	Multiple fatalities	Catastrophic	Intermediate	Esso to Review if an ALARP assessment needs to be done or whether an existing ALARP assessment for T1 is applicable.
NLS5	HDD Impacts pipeline	Leading to a hole >2/3CDL (50mm) resulting in Rupture and loss of supply to make a repair. Ignited rupture could lead to an ML up to 860m possibly resulting in multiple fatalities. Supply could be out for 2-4 weeks - major impact	Hypothetical	People	Multiple fatalities	Catastrophic	Intermediate	Risk is considered ALARP with existing controls. Workshop agreed that this risk is controlled during the construction of the development. Workshop noted that due to flood plain boundary to the north that there was no likelihood of any significant future expansion requiring HDD
NLS7	Auger or power pole equipment Impacts pipeline	Impacts pipeline leading to Rupture. Ignited rupture could lead to an ML up to ~860m possibly resulting in 1-2 fatalities. Supply could be out for a week or two - major impact	Hypothetical	People	Multiple fatalities	Catastrophic	Intermediate	Risk is considered ALARP with existing controls and proposed additional control
M9	Vehicle Impact	Roadway running north- south on the north side of the Valve Stn could result in impact to the above ground piping leading to Rupture. Ignited rupture could lead to an ML up to ~860m possibly resulting in multiple fatalities.	Hypothetical	People	Vehicle impact causing rupture will result in major fire and multiple fatalities	Catastrophic	Intermediate	Review proposed road and bollard design and consider whether risk is mitigated or whether other controls/designs are required

Table 15, Intermediate Risk Assessment Summary

7. DISCUSSION

7.1 Excavator Hole Consequence Review

The existing consequence of a hole in the LPG250 or LFD350 pipelines has previously been considered to result in 1-2 fatalities however given the increased population introduced in the Traralgon North area there is the possibility of the cause leading to multiple fatalities. As such the SMS Workshop agreed that EAPL will review the risk ranking and undertake an ALARP assessment with the new population around the pipeline. Assessment needs to consider population density and thus lot sizes. EAPL to provide clear direction to Developer on requirements to ensure risk is ALARP

7.2 Light Pole Placement

Lighting poles placed adjacent to or within the pipeline easement will need to be replaced in the future during the life of the pipeline. New poles will likely be place within 3m of the existing pole and potentially holing or rupturing the pipeline(s).

All proposed lighting poles are to be positioned more than 3m from the pipeline easement. Any poles that must be placed closer to the easement will require Ministerial and EAPL consent. An EAPL approved buried slabbing protection is required during construction of the Development where the easement is within 3m of the pole.

7.3 Valve Site Operations

EAPL requires space around their Valve Station compound to under various periodic operational and maintenance activities, EAPL shared images of one of their activities which does require land use outside of the fenced compound hence the 15m setback from the Valve Station compound fence line.

EAPL agreed to review all operational and maintenance activities associated with the Valve Site and determine if any procedures require additional controls to prevent or mitigate any incidents with respect to the new development (e.g. vehicle movements near valve site during operations, venting plumes impacting third parties etc...).

7.4 Power Pole Management

Lighting poles placed adjacent to, or within the pipeline easement will need to be replaced in the future during the life of the pipeline. New poles will likely be place within 3m of the existing pole and potentially holing or rupturing the pipeline(s).

All proposed lighting poles are to be positioned more than 3m from the pipeline easement. Any poles that must be placed closer to the easement will require Ministerial and EAPL consent. An EAPL approved buried slabbing protection is required during construction of the Development where the easement is within 3m of the pole.

8. ACTIONS

Nineteen (19) Actions were developed during the SMS workshop including who carried what responsibility for closing out the action. The list of Action is referenced below.

All actions to be documented as they are closed out with a description of what actions were taken and any documented supporting evidence being a Plan, Calculation Updated Drawing etc. Actions will be stewarded through EAPL's IMPACT system to track until completion.

Table 16, Action List

Miscellaneous Actions

ID	Issue	Action	RESPONSIBLE PERSON	DUE DATE
A1	Construction of the Development could damage the pipeline	Principal Contractor(s)to prepare a Construction Management Plan, for review and acceptance by EAPL (pipeline licensee) prior to any third party works.	Constructor	Prior to construction
A2	Risk that what is agreed at the SMS Workshop is not passed onto the Development Plan and the future Constructor	SMS Report and Findings to be referenced and included in the Development Plan	ММ	Prior to completion of the Development Plan
A3	Future responsibility for vegetation control of the easement through the development unclear	Confirm who will be maintaining the pipeline easement (vegetation control) during and post completion of the Development?	ММ	31/3/2024
A4	Road to north of pipeline easement is within the 15m set back distance previously advised by EAPL	Confirm whether 15m property set back distance does allow for road reserves to be included within the 15m Set Back?	EAPL	31/3/2024
A5	Insufficient depth of cover (DOC) at proposed road crossing leading to overstress of pipeline.	Undertake potholing to confirm DOC of all pipelines at proposed road crossings to ensure the road design meets EAPL requirements. Potholing to following EAPL Potholing procedure, permitting and supervision.	ММ	Prior to completion of detailed design
A6	Development Drawings don't include names of roads crossing the pipeline easement	Provide new Road names to EAPL when available	EAPL	Prior to construction
A7	Potential for suspended LFD700 pipelines to collapse under new road crossings potentially leading to a car accident due to uneven road surface	Review integrity of LFD700 pipeline wall thicknesses and coatings to determine if recoating is necessary. Concrete slabbing over pipeline to prevent subsidence of road surface	MM/EAPL	Prior to completion of detailed design

Threat Specific Actions

ID	Issue	Action	RESPONSIBLE PERSON	DUE DATE
NLS2	Existing risk of an excavator causing a hole in the pipeline is now a higher consequence due to the presence of new residential development (thus more people at risk of seriously injured or fatality)	Esso to Review if an ALARP assessment needs to be done or whether an existing ALARP assessment for T1 is applicable and acceptable. Assessment needs to consider population density and thus lot sizes. EAPL to provide clear direction to Developer on requirements to ensure risk is ALARP	EAPL	31/3/2024
NLS3	Excavator 10T+ with Pen or tiger teeth leading to a Rupture resulting in loss of supply to make a repair. Ignited rupture could lead to an ML up to 860m possibly resulting in multiple fatalities. Supply could be out for 2-4 weeks due to the major third-party investigation.	Esso to Review if an ALARP assessment needs to be done or whether an existing ALARP assessment for T1 is applicable and acceptable. Assessment needs to consider population density and thus lot sizes. EAPL to provide clear direction to Developer on requirements to ensure risk is ALARP	EAPL	31/3/2024
NLS12	There is a need to provide temporary crossing points of the easement to support construction of the Development.	MM to demonstrate that the Temporary Road Crossings being provided are suitable to protect the pipelines.	ММ	31/3/2024
NLS12	Road crossings not designed to properly protect the pipeline(s) they cross can cause overstress to the pipeline and damage to the coating ultimately leading to a pipeline leak or failure	Demonstrate that the Permanent Road crossing designs are compliant with applicable standard and EAPL requirements (Refer to NLS25).	ММ	Prior to completion of detailed design
NLS15 & M9	Vehicle impact of Traralgon Valve Site causing rupture will result in major fire and multiple fatalities	Review proposed road and bollard design immediately north of Traralgon Valve Site and consider whether risk is mitigated or whether other controls/designs are required. (Refer to Action A4)	MM/EAPL	31/3/2024
NLS21	Vibration over pipeline easement could damage the pipeline coating resulting in long term corrosion and potential leak	Compaction of roadways over pipeline easement to be completed using static rollers. Peak Particle Velocity (PPV) for vibration near pipelines not to exceed 10mm/s unless otherwise assessed and approved by EAPL. Requirements to be included in Development Plan	MM/EAPL	Prior to construction
NLS22	Existing pipeline coatings may be compromised or fail due to stress from new road crossing leading to a corrosion leak and Loss Of Containment	Inspect coating of pipelines directly impacted by road crossings and confirm if recoating is required prior to construction of the road. Contractor to engage EAPL approved subcontractor for the works	ММ	Prior to completion of detailed design
NLS25	Utility crossings not properly designed could result in the pipeline being damaged when third parties seek to excavate and or repair their utility	EAPL to provide design guidelines for both road and utility crossings of EAPL pipelines. Guidelines to be included in Development Plan	EAPL	10/4/2024
NLS36	Stray current corrosion compromises Cathodic Protection System leading to pipeline leak	Transformer(s) location and high voltage cabling to consider Low Frequency Induction (LFI) or Earth Potential Rise (EPR) to ensure local pipeline Cathodic Protection Systems are not compromised. EAPL to review and accept design calculations	MM/EAPL	Prior to completion of detailed design
NLS38	Landscaping and road design will change the natural watercourse in the area potentially putting the pipeline easement at risk of water pooling or soil erosion	Stormwater Design to be provided to EAPL for review and acceptance	MM/EAPL	Prior to completion of detailed design

Esso Australia Pty Ltd Esso Onshore Pipeline – Traralgon Development AS 2885.6 - SMS Report Rev 0



ID	Issue	Action	RESPONSIBLE PERSON	DUE DATE
NLS45	Malicious damage due to the increased population in the area	EAPL to review security of the Valve Station due to the location of the new development	EAPL	31/3/2024
NLS73	EAPL requires space around their Valve Station Compound to under various periodic operational and maintenance activities	EAPL to review all operational and maintenance activities associated with the Valve Site and determine if any procedures require additional controls to prevent or mitigate any incidents with respect to the new development (e.g. vehicle movements near valve site during operations, venting plumes impacting third parties etc)	EAPL	31/3/2024

9. CONCLUSION

The SMS undertaken is considered to be a Change in Land Use SMS as required under AS2885. All actions raised at the SMS will need to be closed out in a timely manner as agreed at the SMS Workshop.

The review was successfully carried out in accordance with the requirements of AS 2885.6 -2018. The workshop was attended by key operations, maintenance, and engineering personnel. The study team comprised a broad cross-section of responsibility, knowledge, and experience with the pipeline, and therefore possessed sufficient knowledge and experience to carry out an effective workshop review.

Upon satisfactory close out of the actions raised from this SMS Workshop, it can be confirmed that the requirements of AS2885.6-2018 are met and that the pipelines impacted by this Development will continue to be in compliance with the SMS requirements of AS2885.

APPENDIX A: Document References

Table 17, Document References

Document Name	Document Number
LPG250 SMS Report 2021	15-03-2021-PL-REP-001_SMS_LPG250_Rev1
LFD350 SMS Report 2021	15-03-2021-PL-REP-010 SMS LFD350 Rev1
LFD700 SMS Report 2021	15-03-2021-PL-REP-006_SMS_LFD700_Rev1
LFD700 – LPG250 Alignment Sheet	304-15104_2_800cb36e
LFD700 – LPG250 Alignment Sheet	304-15105_2_800cb36f
LFD700 – LPG250 Alignment Sheet	LFD 700 _ 250 To LIP 304-15106
LFD700 – LPG250 Alignment Sheet	LFD 700 _ 250 To LIP 304-15103
LFD350 Alignment Sheet	WP-DWG-355-PL831
LFD350 Alignment Sheet	WP-DWG-355-PL832
LFD350 Alignment Sheet	WP-DWG-355-PL833
Proposed Rezoning	25950Sk1 Concept_V5
Traralgon-Maffra Road, Traralgon	
Latrobe City Council	
LOT 1 ON PS329021J	21778P2_V9 PPOS A3P NBA PPOS
50 Glendale Road, Traralgon Victoria	
Latrobe City Council	
PROPOSED SUBDIVISION	18733T1_V9 PPOS-A3P PPOS MM NBA
110A Marshalls Road, Traralgon Victoria	
Latrobe City Council	
PROPOSED SUBDIVISION PLAN	27344P2_V4 PPOS-A1P PPOS
60 MARSHALLS ROAD, TRARALGON	
LATROBE CITY COUNCIL	
Previous SMS Report for Marshalls Rd Development 2016	1. 09-0028-01-PL-REP-001 SMS Report Marshalls Rd Property Development Rev 0

APPENDIX B: Classification of Locations

In order to determine the location class, the Standard requires that the population, activities, and environment be assessed within a distance described as the "measurement length (ML)" from the centre of the pipeline. For gas pipelines in particular, where the most serious outcome is either injury or fatality due to radiation from an ignited gas leak, the measurement length is deliberately and conservatively defined in AS 2885.1, Cls 4.3.2 as the radius of the 4.7 kW/m2 radiation contour for an ignited full-bore rupture calculated in accordance with Clause 4.10. Clause 4.10 states that the calculation is to assume that the pipeline is at Maximum Allowable Operating Pressure (MAOP) at the time of release. A full-bore rupture is a hole which is equivalent to the diameter of the pipeline.

It is important to understand that the measurement length is used to define the corridor around the pipeline that must be considered to determine location classification, regardless of whether a full-bore rupture at MAOP is credible or not.

As is required by the Standard, consideration has been given to future development along the pipeline route both within and outside the pipeline measurement length when assessing the pipeline classification.

For any given location classification, AS 2885 defines minimum compliance requirements. As the consequence of a pipeline failure increases and location classification changes, the requirements of AS 2885 become more stringent. The various Location Classes under the Standard are outlined below

AS2885.1-2012 gives four primary location classes:

- **R1 Rural** Land that is unused, undeveloped or is used for rural activities such as grazing, agriculture and horticulture.
- **R2 Rural Residential -** Land that is occupied by single residence blocks typically in the range 1 to 5 ha.
- **T1 Residential -** Residential applied where multiple dwellings exist in proximity of other dwellings and are surveyed by common public utilities.
- **T2 High Density -** multi storey dwellings where a large number of people congregate.

In addition, AS2885.1-2018 gives five secondary location classes:

- S Sensitive Use: where consequences of a failure may be increased due to use by a community unable to protect themselves from consequences of pipeline failure. Schools, hospitals, aged care facilities and prisons within the pipeline measured length are examples of this classification. The requirements are as for T2.
- E Environmental: The Environmental LOCATION CLASS identifies locations of high environmental sensitivity to pipeline failure, including particularly areas where pipeline failure may impact on threatened ecological communities or species or where rectification of environmental damage may be difficult. Areas of high environmental sensitivity may be identified by analysis of government environmental mapping within the pipeline MEASUREMENT LENGTH and, where required, may be validated by field surveys conducted by COMPETENT persons. A consequence assessment shall be undertaken and depending on the.
- I Industrial: Manufacturing, processing, maintenance, storage, or similar activities. These are assigned to any portion of land immediately adjoining the pipeline. The requirements are for T1.

- HI Heavy Industrial: Heavy industry or toxic industrial use. Require assessment of any threats to the pipeline or may cause pipeline failure to escalate. Depending on assessment R2, T1 or T2 may apply.
- **CIC Common Infrastructure Corridor:** Multiple infrastructure development within a common easement or reserve or in easements which are in close proximity. A CIC secondary classification places the following requirements on the pipeline owner/operator To control the activities that take place in the CIC easement some form of agreement should be in place.
- C Crowd: The crowd LOCATION CLASS shall be applied to locations where there may be crowds or congestion leading to concentrations of population that are both intermittent and much higher than typical for the prevailing primary LOCATION CLASS. Examples include sports fields, roads subject to serious traffic congestion, and rural community halls. Where C LOCATION CLASS is assigned, the SMS shall examine risk to the concentration of people with consideration of the number of people, the frequency and duration of assembly, the time of day or week that people are present, and the likelihood that THREATS and the population concentration will occur at the same time. Controls appropriate to the level of risk shall be applied.

NOTE: In crowd areas, the societal risk associated with loss of containment is a dominant consideration. The risk level may vary considerably. For example, the SMS may conclude that a country playing field, which is only used on occasional Sundays, presents a much lower risk than a motorway that becomes highly congested twice every weekday, because of both the frequency of congestion and the likelihood (or otherwise) of concurrent THREATS.

APPENDIX C Threats & Controls

CATEGORY	THREAT
External Interference	Excavation - related to construction
	Excavation - without consent
	Excavation - private landowners post construction (e.g., ploughing, ripping, or trenching)
	Power augers and drilling
	Cable installation ripping & ploughing
	Pipeline access for maintenance activities
	Installation of posts or poles
	Land use development - pavement works, road surfacing &/or grading
	Land use development - landscaping
	Deep ploughing or drilling around pipeline (horizontal)
	Vehicle or vessel impact - during construction
	Vehicle or vessel impact - during ongoing use of the road
	Vehicle or vessel impact - rail
	Vehicle or vessel impact - aircraft crash
	Damage from bogged vehicles or plant
	External loads from backfill or traffic
	Blasting
	Blasting - seismic survey for mining using explosives
	Anchor dropping & dragging
	Other - soil testing with penetrometer
	Other - methane from contaminated land ignited by site works (e.g., welding)
	Other - creeping movement of slope (geotechnical risk)
	Other - loading from the buildings
	Other - Vibration due to piling
Corrosion	External corrosion or erosion due to environmental factors
	Internal corrosion due to contaminants
	Internal erosion
	Environmentally assisted cracking / stress corrosion cracking
	Bacterial corrosion
	Other - stray current corrosion
	Other - CP testing performed incorrectly and potential for corrosion.
	Other - low frequency induction from parallel HV power lines or earthing bed
Natural Events	Earthquake
	Ground movement - land subsidence, soil expansion / contraction
	Ground movement - land subsidence causing breakage of water
	pipelines in region of gas pipe
	Wind and cyclone
	Bushfires
	Lightning
	Flooding or inundation

	Erosion of cover or support
	Other – tsunami or volcanic eruption
CATEGORY	THREAT
Operations &	Exceeding MAOP of pipeline
Maintenance	Incorrect operation of pigging
	Incorrect valve operating sequence
	Incorrect operation of control & protective equipment
	Bypass of logic, control or protection equipment followed by incorrect
	manual operation
	Fatigue from pressure cycling
	Inadequate or incomplete maintenance procedures
	Maintenance actions contrary to procedures
	Incident due to inadequate, incorrect, or out of date operating or
	maintenance procedures
	Inadequate servicing of equipment
	Other - inaccurate test equipment, leading to incorrect settings
	Other - overpressure control system failure
	Other - pipe vibration (e.g., underground due to road works)
	Other - failure to adequately manage and implement changes to assets
	Other - incident caused due to project records, as built records and
	installed material records being lost, ignored, or not maintained
	Other - inaccurate measurement equipment or equipment not calibrated
	Other - inadequate emergency management
	Other - live welding
Design Defects	Incorrect material, component, and equipment characteristics
	Incorrect design or engineering analysis
	Failure to define correct range of operating conditions
	Failure of design configuration and equipment features to allow for safe
	operations & maintenance
	Other - design for corrosion
	Other - stresses in places that are not earth anchored areas
Material Defects	Incorrectly identified components
	Incorrect specification, supply, handling, storage, installation, or testing
	Under-strength pipe
	Manufacturing defect
	Lack of adequate inspection & test procedures
Construction Defects	Undetected of unreported damage to the pipe, coating, or equipment
	Undetected or unreported critical weld defects
	Failure to install the specified materials or equipment
	Failure to install equipment using the correct procedures or materials
	Failure to install equipment in accordance with the design
	Failure to install the pipeline in the specified location or manner
	Inadequate testing of materials for defects prior to handover
Intentional Damage	Sabotage / Terrorism / Malicious Damage / Vandalism
Other - environmental	Soil excavation



Ground water and soil contamination from fuel and other chemicals	used
on site during construction	
Escape of liquid fuel to ground water and soil contamination	

CONTROL	METHODS	EXAMPLES
SEPARATION	BURIAL	
	EXCLUSION	FENCING
	BARRIER	BRIDGE CRASH BARRIERS
RESISTANCE TO	WALL THICKNESS -	
PENETRATION	BARRIER TO	CONCRETE SLABS
	PENETRATION	CONCRETE ENCASEMENT
		CONCRETE COATING

CONTROL	METHODS	EXAMPLES
PIPELINE	LANDOWNER	
AWARENESS -	THIRD PARTY	LIAISON PROGRAM
	LIAISON	INCLUDING ALL RELEVANT
		PARTIES
	COMMUNITY	
	AWARENESS	
	PROGRAM	
	ONE-CALL SERVICE	
	MARKING	SIGNAGE
		BURIED MARKER TAPE
	ACTIVITY	
	AGREEMENTS WITH	
	OTHER ENTITIES	
EXTERNAL	PLANNING	PLANNING NOTIFICATION
INTERFERENCE	NOTIFICATION	REQUIRE BY LAW
DETECTION	ZONES	
	PATROLLING	SYSTEMATIC PATROLLING
		OF THE PIPELINE
	REMOTE INTRUSION	DETECTION AND ALARM
	MONITORING	BEFORE THE PIPELINE IS
		DAMAGED



APPENDIX D AS2885 Part6 Risk Assessment

The AS2885 Risk Assessment we used to undertake any risk assessments is provided below

TABLE 3.1 SEVERITY CLASSES

	Severity class						
Dimension	Catastrophic	Major	Severe	Minor	Trivial		
		Mea	sures of severity				
People	Multiple fatalities result	One or two fatalities; or several people with life- threatening injuries	Injury or illness requiring hospital treatment	Injuries requiring first aid treatment	Minimal impact on health and safety		
Supply (see Note)	Widespread or significant societal impact, such as complete loss of supply to a major city for an extended time (more than a few days)	Widespread societal impact such as loss of supply to a major city for a short time (hours to days) or to a localized area for a longer time	Localized societal impact or short-term supply interruption (hours)	Interruption or restriction of supply but shortfall met from other sources	No loss or restriction of pipeline supply		
Environment	Impact widespread; viability of ecosystems or species affected; or permanent major changes	Major impact well outside PIPELINE CORRIDOR or site; or long-term severe effects; or rectification difficult	Localized impact, substantially rectified within a year or so	Impact very localized and very short-term (weeks), minimal rectification	No effect; or minor impact rectified rapidly (days) with negligible residual effect		

NOTE: Appendix G provides guidance on assessment of consequence severities.

3.5.3 Frequency analysis

A frequency class shall be assigned to each FAILURE SCENARIO. The frequency class shall be selected from Table 3.2.

The contribution of existing controls to the prevention of failure shall be considered in assigning the frequency class.

NOTE: Appendix F provides guidance on estimating frequencies.

TABLE 3.2

Frequency class	Frequency description
Frequent	Expected to occur once per year or more
Occasional	May occur occasionally in the life of the pipeline
Unlikely	Unlikely to occur within the life of the pipeline but possible
Remote	Not anticipated for this pipeline at this location
Hypothetical	Theoretically possible but would only occur under extraordinary circumstances

3.5.4 Risk ranking

Table 3.3 shall be used to combine the results of the consequence analysis and the frequency analysis to determine the risk rank.

Use of the risk matrix in Table 3.3 is mandatory for SAFETY MANAGEMENT STUDIES in accordance with this Standard. Other methods such as a corporate risk matrix may be used only in parallel with Table 3.3 or as part of a separate corporate RISK ASSESSMENT.

TAE	LE	3.3
RISK	MA	TRIX

	Trans to belies	899 100 m			
	Catastrophic	Major	Severe	Minor	Trivial
Frequent	Extreme	Extreme	High	Intermediate	Low
Occasional	Extreme	High	Intermediate	Low	Low
Unlikely	High	High	Intermediate	Low	Negligible
Remote	High	Intermediate	Low	Negligible	Negligible
Hypothetical	Intermediate	Low	Negligible	Negligible	Negligible

NOTE: Comparative studies sponsored by the Energy Pipelines Cooperative Research Centre have shown that for risks ranked as Intermediate, Table 3.3 produces results consistent with both reliability-based analysis (in accordance with Annex 0 of CSA 2662-07) and quantitative risk assessment. Use of a different risk matrix or method that has not been similarly calibrated may produce invalid results.

3.6 RISK TREATMENT

3.6.1 General

Action to reduce risk shall be taken in accordance with Table 3.4, based on the risk rank determined from Table 3.3.

The action(s) taken and the planned effect on risk shall be documented.

3.6.2 Risk treatment during design

Risk treatment actions at design stage may include the following:

- (a) Relocation of the pipeline route.
- (b) Modification of the design for any one or more of the following:
 - (i) **PIPELINE SYSTEM isolation**.
 - (ii) PHYSICAL CONTROLS for prevention of external interference.
 - (iii) PROCEDURAL CONTROLS for prevention of external interference.
 - (iv) Corrosion prevention.
 - (v) Operational controls.

TABLE 3.4

RISK TREATMENT ACTIONS

Risk rank	Required action
Extreme	Modify the THREAT, the frequency or the consequences so that the risk rank is reduced to Intermediate or lower.
	For an in-service pipeline, the risk shall be reduced immediately.
High	Modify the THREAT, the frequency or the consequences so that the risk rank is reduced to Intermediate or lower.
	For an in-service pipeline, the risk shall be reduced as soon as possible. Risk reduction should be completed within a timescale of not more than a few weeks.
Intermediate	Repeat THREAT identification and risk evaluation processes to verify the risk estimation; determine the accuracy and uncertainty of the estimation. Where the risk rank is confirmed to be "intermediate", where reasonably practicable modify the THREAT, the frequency or the consequence to reduce the risk rank to "low" or "negligible".
	Where it is not reasonably practicable to reduce the risk rank to "low" or "negligible", action shall be taken to—
	 (a) remove THREATS, reduce frequencies and/or reduce severity of consequences to the extent practicable; and
	(b) formally demonstrate ALARP (see Section 4).
	For an in-service pipeline, the reduction to "low" or "negligible" or demonstration of ALARP shall be completed as soon as possible. Risk reduction or demonstration of ALARP should be completed within a few months.
Low	Determine the management plan for the THREAT to prevent occurrence and to monitor changes that could affect the classification.
Negligible	Review at the next relevant SMS (for periodic operational review, LAND USE CHANGE, ENCROACHMENT, or change of operating conditions).

3.6.3 Risk treatment during operation and maintenance

Risk treatment actions at operating pipeline stage may include one or more of the following:

- (a) Installation of additional or modified PHYSICAL CONTROLS.
- (b) Additional or modified PROCEDURAL CONTROLS.
- (c) Specific actions in relation to identified activities (e.g. presence of operating personnel during activities on the easement).
- (d) Modification to pipeline marking.
- (e) Changes to the isolation plan.
- (f) Changes to the PIPELINE SYSTEM design or operation to satisfy the requirements of this Standard when there is a change to the LOCATION CLASS of the pipeline.
- (g) Specific operational or maintenance procedures.
- (h) Repair, remediation or removal of a condition or DEFECT that presents a THREAT.

THREAT treatment for operating PIPELINE SYSTEMS should consider interim control measures (e.g. reduction in operating pressure, access restrictions) to allow time for the implementation of permanent control measures (e.g. repair).



APPENDIX E: SMS Workshop Minutes

Traralgon Development SMS

SMS Workshop Date: SMS Workshop Location: Attendees List Name Comp DRMC	pany IC	20-Feb-24 TEAMS Position Title		Esso			D E L Managi	PHI RISK IMENT CONSULTING										
EAPL EAPL Millar EAPL	L L r Merrigan L			Pipeline: Pipeline License:		LI Pi	FD250		Pipeline: Pipeline License	:	LFD350 PL282			Pipeline: Pipeline License:	:	LFD700 PL35 & 126		
				Current LCT1 / S / I. (No Euture LCT1 / S / I. (Pro	ote I & S SLC currently	more than 50	00m away) e Residential only, no	Sensitive use proposed)	Current LCT1 (Note I	I & S SLC currently ed Development in	more than 500m away) ial only, i	no Sensitive use pronoseri)	Current LCT1 (Note I	& S SLC currently more	than 500m away) In to be Residently	l only, no Sei	nsitive use proposed)
				Pipeline length impacte	d 1460m (KPs 53.457	to 55.06 + MI	4		Pipeline length impac	cted 1460m (KPs 5	3.457 to 55.06 + ML)			Pipeline length impac	ted 1460m (KPs 53.457	to 55.06 + ML)		
Procedural Mitigations in Place?	2																	
Signage spacing		100m T1 -250m F	R2 - 500m R1	Installation year		1969			Installation year		2017			Installation year	PL35	1969		
Ground Patrolling	-	Weekdays		Length		185.4 kr	m		Length	LFD to LIP	186.1	km		Length	LFD to LIP	185	km	
Aerial Patrolling Marker Tape		Twice weekly		Nominal Diameter		DN250								Fluid description	Nitrogen at nomina	I pressure Wes	tbury - LIP.	Inhibited water LFD-Westbury
Pipeline Awareness Programs		Yes	Council liaison &	Material		X52			Nominal Diameter		DN350			Length	LFD to Westbury	87.7	km	
DBYD		Yes	Composition of the second s	Wall thickness	Std	5.56 m	n		Original Design Fa	actor	0.72					Nitrogen at ne	ominal pres	surə
Landholder Liaison Above Ground Facilities		Yes Yes	Annually Fenced valve sites	Wall thickness Design corresion all	Heavy Wi	NA m	רחו		Material Onshore Wall thick	mass	API 5L X60 PSL2 9 53	mm						
				Design pressure	Shanoo	8.275 M	Pa		Heavy Wall		12.7	mm		Nominal Diameter		DN700		
				MAOP		8,275 kF	Pag			-				Original Design Fa	ictor	0.72		
				Current operating pr Maximum design fer	ressure	38 %	1Pa		Design corrosion a	allowance	2 9.530	mm kPag		Material Onshore Wall thick	mess	x52 DSAW 9 52	mm	
Potential Threats				Minimum design terr	perature	0 %	5 D		MAOP		9,530	kPag		Heavy Wall LFD to	Westbury	12.7	mm	
Excavators		25T		Typical operating ter	mperature	Ambient °C	C		MOP		9,530	kPag		Heavy Wall Westb	ury to LIP	11.53	mm	
Water/Sewer Crossing Design		Yes		Depth of Cover		600-900 m	m							Design corrosion a	allowance	NA	mm	
Bored Crossing		Yes		Easement Width	-	??? m	n (minimum each s	ide)	Maximum design t	temperature	85	°C		Design pressure		4,800	kPag kDag	
Blade Ploughing		Tes Road Conssion Co	onstruction	Costing type	7.	Coal Tar En	amel		Typical operation	temperature	Ambient	°C		MADE		4,000 N/A	kPag kPag	
Heavy Vehicles		Yes		Cathodic protection	type	Silicon Iron	Anode Beds		Depth of Cover	temperature	1200	mm	T1 - S/HI/I/CIC/E/C	Current operating	pressure	N/A	KPag	
Bulkozers (Ripping)	1	Yes		Fluid description		LPG no	on toxic		Depth of Cover		900	mm	R1/R2	Maximum design t	emperature	N/A	°C	
Auger (Fence or Power Pole Instal	lation)	Yes				fle	ammable (jet fire, j	pool fire and explosion)	Depth of Cover		1200	mm	Cultivation Areas/Road Crossings	Minimum design te	imperature	N/A	°C	
HDD		Yes				00	dourless (mainly p	ropane and butane)	Depth of Cover		1500	mm	Bored Crossings	Typical operating 1	temperature	Ambient	°C	
							25 present (appro	x. o.o ppm)	Depth of Cover		2000	mm	Reli under bellest/ 1200mm meerve	Essement Width		24.5	mm m (minimu	m each eide)
				Resistance to Pene	stration				Depth of Cover		1500	mm	minor/moderate/major water crossing:	CDL		N/A		in outer energy
				Max equipment size	es without risk of	a leak(B Fa	actor 1.3)		Depth of Cover		1200	mm	water washes	Coating type	To Westbury	Raychem Hot	Clad (PL/1	26)
				1 5	xcavator with Gen xcavator with Tige	Teeth (Sind	e ⊧eetn gie Point Penetrat	>55 ion) 5T	CDI		24.5	mm	(minimum either side)		From Westbury Above around	Coal Tar Enal	mei (PL/35)	
				Ē	xcavator with Twin	Tiger Teeth	(both Points Per	etratior 10T	Coating type		2FBE			Cathodic protectio	n type	NA		
				E Max aguinment ala	xcavator with Pene	tration Teel	th untrus (P) Existen 1	5T	Credible hole size	(2/3 CDL)	60	mm		Perintenen te Don	atmilian			
				E	xcavator with Gen	aral Purpose	e Teeth	-3) >55T	Cathodic protectio	on type	Impressed Current	Catho	dic Protection (ICCP)	Resistance to Pe	netration			
				E	xcavator with Tiger	Teeth (Sing	gle Point Penetrat	ion) 5T	Fluid description		Crude Oil		and antenative state of a	Max equipment s	izes without risk of	a leak(B Facto	r 1.3)	
					xcavator with Twin	I ger Teeth	the the termination of termination	etratior 10T 5T	Resistance to Per	netration				Excavat	or with General Purp or with Tiger Teeth (*	ose Teeth Single Point Pe	netration)	>551 10T
				Credible Excavator	Size	100	25T (ver	y rare to see TT)	Resistance to Pe	netration				Excavat	or with Twin Tiger Te	eth (both Point	s Penetrati	35T
				Credible Hole Size			85 mm	(based on SP/T	Max equipment s	izes without ris	sk of a leak(B Fact	or 1.3)	CT	Excavat	or with Penetration T	eeth	m (D Fact	10T
				1 GU/S HOLE SIZE			is mm		Excavat	tor with Twin Tia	er Teeth (both Point Pi	ts Pene	20T	Excevat	or with Tiger Teeth (Single Point Pe	netration)	N/A
				Measurement length	n				Excavat	tor with Penetral	tion Teeth	_	5T	Excavat	or with Twin Tiger Te	eth (both Point	s Penetrati	N/A
					Rupture	4.7kW/m2 R 12 6kW/m2	Rad Contour Rad Contour	860 m 530 m	Max equipment s	tor with General	using risk of Rupt Pumose Teeth	ure(B F	actor 1.3)	Excavat	or with Penetration T	eeth		N/A
				c	redible Hole Size	4.7kW/m2 R	Rad Contour	297 m	Excavat	tor with Tiger Te	eth (Single Point Po	enetrati	ST	Credible Excavato	r Size	25T	(very rare	to see TT)
				1	0GJ/s Hole Size	4.7kW/m2 R	Rad Contour	210 m	Excavat	tor with Twin Tig	er Teeth (both Poin	ts Pene	20T	Credible Hole Size		100	mm	(based on SP/TT)
				1	GJ/S HOIE SIZE	4.7 KW/m2 H AT 50 mm h	kad Contour	66 M	Excavat	tor with Penetral	tion leeth		51	10GJ/s Hole Size		N/A	mm	
						R4.7 =182 r	m		Credible Excavato	or Size	25T	(very r	are to see Pg19 SMS Report					1966 - 1079 - 14 - 1079
						R12.6 =108	3.25		Credible Hole Size	Ð	100	mm	(based on SP/TT)	Measurement leng	t Rupture Leak of	inhibited Water	nulmannent	Ref to RA
									1GJ/s Hole Size		20	mm	m3		Rupture Leak of	Nitrogen	in a lonnant	Ref to RA
															Rupture 4.7kW/m	2 Rad Contour	N/A	m
				Current LCT1 / S / I. (No	ote I & S SLC currently	more than 50	00m away) Basidontial an'i	Constitution and an and an	Measurement leng	gt Rupture Lea	ik to lowest point in	the en	vironment		Rupture 12.6kW/	m2 Rad Contou	II N/A	m
				Pipeline length impacte	d 1300m (KPs 53.457	to 54.757 + M	e nesidendal only, no AL)	sensitive use proposed)		Rupture 12.	6kW/m2 Rad Conto	280	m 180	10G.J/s	Hole Size 4.7kW/m	2 Red Contour	N/A	m
									Credible	Hole Size 4.7	kW/m2 Rad Contou	N/A	m	1GJ/s H	ole Size 4.7kW/m	2 Rad Contour	N/A	m
									10GJ/s	Hole Size 4.7	kW/m2 Rad Contou	N/A	m					
									103/8 H	NE OLE 4./	NTIMIZ INCU CONTOU	i nin						
									1									

Esso

AS2885 SAFETY MANAGEMENT STUDY

Proiec								Esso Onshore Pip	eline Regualificati	ion					Document Title			AS288	5 Safety Management Study	
Applica	ble Pipeline(s):						PL 27 & PL 34 LF	PG250 / LFD350 F	PL282 / LFD700 PL3	5 & PL126				Workshop Date	(s) / L	ocation:	20/2/2	024 / ZOOM	
		_																		
THREAT ID	LOCATION DESCRIPTION	KP FROM	KP TO	PRIMARY LOCATION CLASS SECONDARY LOCATION CLASS	THREAT TYPE	THREAT DESCRIPTION	CONSEQUENCE ASSESSMENT	CREDIBLE	Physical	IG CONTROLS Procedural	THREAT FULLY MITIGATED WITH EXISTING CONTROLS?	Additional Controls	Does threat require a risk assessment	FAILURE MODE		AS2885 WORST CONSEQUENCE	CONSEQUENCE	AS2885 SEVERITY CLASS	AISK KANKING ASSUMPTIONS / COMMENTS	PROPOSED RISK MANAGEMENT PLAN ACTIONS
NLS1	All Areas	52.6	55.6	T1 S/I	External interference	Excavator, Ripper, Auger, HDD Impacts pipeline	Dent or Gouge or coating damage leading to reduced MOP.	Yes	WT, DOC	Direct liaison, patrolling, DBYD, signage	No		Yes	Damage reduced MAOP		Supply	Dent to pipeline. Repair work	Minor	Risk is considered ALARP with existing controls	
NLS2	All Areas	52.6	55.6	T1 S/I	External interference	Excavator Impacts pipeline	Excavator 10T+ with Pen or tiger teeth leading to a hole less than the 2/3CDL (50mm hole) resulting in loss of supply to make a repair. Ignited leak could lead to an ML up to 290m possibly resulting in 1-2 fatalities. Supply could be out for a week or two.	Yes	WT, DOC	Direct liaison, patrolling, DBYD, signage	No		Yes	Leak	Hypothetical	People	Potential for 1-2 fatalities	Major	Existing risk of an excavator causing a hole in the pipeline is now a higher consequence due to the presence of new residential development (thus more people at risk of seriously injured or fatality - potentially catastrophic consequence)	Esso to Review if an ALARP assessment needs to be done or whether an existing ALARP assessment for T1 is applicable.
NLS3	All Areas	52.6	55.6	T1 S/I	External interference	Excavator Impacts pipeline	Excavator 10T+ with Pen or tiger teeth leading to a Rupture resulting in loss of supply to make a repair. Ignited rupture could lead to an ML up to 860m possibly resulting in multiple fatalities. Supply could be out for 2-4 weeks due to the major third party investigation.	Yes	WT, DOC	Direct liaison, patrolling, DBYD, signage	No		Yes	Rupture	Hypothetical	People	Multiple fatalities	Catastrophic	Discussion at workshop noting that surveillance is weekdays in T1 areas.	Esso to Review if an ALARP assessment needs to be done or whether an existing ALARP assessment for T1 is applicable.
NLS4	All Areas	52.6	55.6	T1 S/I	External interference	HDD Impacts pipeline	HDD impacts pipeline leading to a hole less than the 2/3CDL (50mm) resulting in loss of supply to make a repair. Ignited leak could lead to an ML up to 290m possibly resulting in 1-2 fatalities. Supply could be out for a week or two major impact	Yes	WT	Direct liaison, patrolling, DBYD, signage	No		Yes	Leak	Hypothetical	People	Potential for 1-2 fatalities	Major	Risk is considered ALARP with existing controls. Workshop agreed that this risk is controlled during the construction of the development. Workshop noted that due to flood plane boundary to the north that there was no likelihood of any significant future expansion requiring HDD	
NLS5	All Areas	52.6	55.6	T1 S/I	External interference	HDD Impacts pipeline	Leading to a hole >2/3CDL (50mm) resulting in Rupture and loss of supply to make a repair. Ignited rupture could lead to an ML up to 860m possibly resulting in multiple fatalities. Supply could be out for 2-4 weeks - major impact	Yes	WT	Direct liaison, patrolling, DBYD, signage	No		Yes	Rupture	Hypothetical	People	Multiple fatalities	Catastrophic	Risk is considered ALARP with existing controls. Workshop agreed that this risk is controlled during the construction of the development. Workshop noted that due to flood plain boundary to the north that there was no likelihood of any significant future expansion requiring HDD	

	z								EXISTIN	G CONTROLS	ED -S?		×							ATS	
THREAT ID	LOCATION DESCRIPTIO	KP FROM	KP TO	PRIMARY LUCATION CLA SECONDARY LOCATION CLASS	THREAT TYPE	THREAT DESCRIPTION		CREDIBLE	Physical	Procedural	THREAT FULLY MITIGAT	Additional Controls	Does threat require a ris assessment	FAILURE MODE	AS2885 FREQUENCY CLASS	AS2885 WORST CONSEQUENCE	CONSEQUENCE	AS2885 SEVERITY CLASS	RISK RANKING	ASSUMPTIONS / COMMEN	PROPOSED RISK MANAGEMENT PLAN ACTIONS
NLS6	All Areas	52.6	55.6	5/1 S/1	External	Auger or power /light pole equipment Impacts pipeline	Impacts pipeline leading to a 50mm hole resulting in loss of supply to make a repair. Ignited leak could lead to an ML up to ~190m possibly resulting in 1-2 fatalities. Supply could be out for a week or two - major impact	Yes	WT	Direct liaison, patrolling, DBYD, signage	No	All proposed lighting poles are to be positioned more than 3m from the pipeline easement. Any poles that must be placed closer to the easement will require Ministerial Consent and EAPL approved buried slabbing protection of the easement where easement is within 3m of the pole.	Yes	Leak	Hypothetical	People	Potential for 1-2 fatalities	Major	Low	Risk is considered ALARP with existing controls and proposed additional control	
NLS7	All Areas	52.6	55.6	T1 S/I	Extemal interference	Auger or power /light pole equipment Impacts pipeline	Impacts pipeline leading to Rupture. Ignited rupture could lead to an ML up to ~860m possibly resulting in 1- 2 fatalities. Supply could be out for a week or two - major impact	Yes	WT	Direct liaison, patrolling, DBYD, signage	No		Yes	Rupture	Hypothetical	People	Multiple fatalities	Catastrophic	Intermediate	Risk is considered ALARP with existing controls and proposed additional control	
NLS8	All Areas	52.6	55.6	T1 S/I	External interference	Deep ripping for farming. Market gardens		No requirement for ripping in the area during or post development. E.g. NBN Installation in a built up area would not use ripping													
NLS9	All Areas	52.6	55.6	T1 S/I	External interference	Deep ripping for farming. Market gardens	Impacts pipeline leading to Rupture. Ignited rupture could lead to an ML up to ~860m possibly resulting in 1- 2 fatalities. Supply could be out for a week or two - major impact	No requirement for ripping in the area during or post development. E.g. NBN Installation in a built up area would not use ripping													
NLS10	All Areas	52.6	55.6	T1 S/I	External interference	Deep ripping for farming. Market gardens. Supply - 1- 2 weeks repair time		No requirement for ripping in the area during or post development. E.g. NBN Installation in a built up area would not use ripping													
NLS11	All	52.6	55.6	S/I	External interference	Drainage ditch maintenance equipment damages pipeline		Yes	WT, DOC	Direct liaison, patrolling, DBYD, signage	Yes		N/A						 	Note that new road crossings will have proper guttering, no requirement for drainage ditches adjacent to the road	
NLS12	All	52.6	55.6	T1 S/I	External interference	External loading such as construction equipment crossing over non- engineered crossings, bogged vehicles/plant on easement.	Ovality of pipeline causing stuck pig and repair works, damaged coating leading to localised corrosion	Yes	WT, DOC, engineered temporary crossing points during construction (already in place	Direct liaison, patrolling, DBYD, signage, ILIs	Yes		N/A							Note Workshop was advised that the easement is largely fenced off on the south side of the easement foring vehicles to cross at the dedicated temporary crossing points.	MM to demonstrate that Temporary Road Crossings are suitable to protect the pipelines. Demonstrate that the Permanaent Road crossing designs are compliant with applicable standard.
NLS13	All	52.6	55.6	S/I	External interference	Construction of new or replacement fencing - penetration of pipeline	Refer to auger threat ID	Yes	WT, DOC	Direct liaison, patrolling, DBYD, signage, WMS	Yes		N/A							Adequate cover exists. Max depth of fenceposts 600mm	

	z			SS	z				EXISTIN	G CONTROLS	ED _S?		×							VTS	
THREAT ID	LOCATION DESCRIPTIC	KP FROM	KP TO	PRIMARY LOCATION CLA	THREAT TYPE	THREAT DESCRIPTION		CREDIBLE	Physical	Procedural	THREAT FULLY MITIGAT WITH EXISTING CONTRO	Additional Controls	Does threat require a ris assessment	FAILURE MODE	AS2885 FREQUENCY CLASS	AS2885 WORST CONSEQUENCE	CONSEQUENCE	AS2885 SEVERITY CLASS	RISK RANKING	ASSUMPTIONS / COMME	PROPOSED RISK MANAGEMENT PLAN ACTIONS
NLS14	All	52.6	55.6	Т1	External interference	HV transmission tower/Power pole installation - penetration of pipeline	Refer to auger threat ID	Yes	WT, DOC	Direct liaison, patrolling, DBYD, signage	No		Yes	Leak	Hypothetical	People	Leak, potential ignition from spark	Major	Low	Very few poles within current easement. Easement clearly marked. High level of compliance with DBYD by installers. Risk is considered ALARP with existing controls	
NLS15	Above ground sites	52.6	55.6	Т1	External interference	Direct impact from vehicles/equipment - damage to pipeline		Yes	Pipeline is buried. Bunds, barriers and fencing around all valve sites.	Patrolling, BYDA	Yes	Security risk assessment completed in 2019, which reviewed third party impact. No additional controls were recommended to manage known risks	N/A								Review proposed road and bollard design immediately north of Traralgon Valve Site and consider whether risk is mitigated or whether other controls/designs are required
NLS16	All	52.6	55.6	11	External interference	Mining activities - penetration of pipeline		No		Mining licences do not allow activity near the easement. As a last line of defence, patrols would see preparations for mining activity. Not considered credible threat to pipeline.											
NLS17	All	52.6	55.6	Т1	External interference	New pipeline construction or maintenance of existing pipeline in easement - penetration of pipeline	See excavator, HDD and boring	Yes	WT, DOC	Direct liaison, patrolling, DBYD, signage, interface agreement for WMS, project specific SMS	Yes		N/A							Fully mitigated by liaison with other operators and local councils	
NLS18	All	53	56	Ħ	kiterference	Standard rail crossing		Not for Development													
NLS19	All	52.6	55.6	11	External interference	New railway lines or upgrade of existing - penetration of pipeline or increased loading		Not for Development													
NLS20	All	52.6	55.6	Т1	External interference	Failure of another pipeline in the same easement, leading to LOC from LPG250	History of similar incidents overseas does not indicate LOC as credible failure mode. Potential for coating damage and pipeline repair on case by case basis	Yes	WT, DOC	Direct liaison, patrolling, DBYD, signage	Yes		N/A							LPG pipeline shares easement with low pressure oil pipelines. Threat of damage due to failure of crude oil pipeline is very low (crude pipeline failure likely to be a leak only). Also shares easement with oil pipeline under construction - work management controls in place	
NLS21	All	52.6	55.6	T1	External interference	Road - maintenance / upgrade / widening - penetration of pipeline or increased loading		Yes	WT, DOC	Direct liaison, patrolling, DBYD, signage, WMS	Yes		N/A								Compaction of roadways to be completed using static rollers. Peak Partical Velocity (PPV) for vibration near pipelines not to exceed 10mm/s unless otherwise assessed and approved by EAPL

	z			ss					EXISTIN	G CONTROLS	ED S?		*		LIKELIHOOD				IS	
THREAT ID	LOCATION DESCRIPTIO	KP FROM	KP TO	PRIMARY LOCATION CLA SECONDARY LOCATION CLASS	THREAT TYPE	THREAT DESCRIPTION	CONSEQUENCE ASSESSMENT	CREDIBLE	Physical	Procedural	THREAT FULLY MITIGATE WITH EXISTING CONTROL	Additional Controls	Does threat require a ris assessment	FAILURE MODE	AS2885 FREQUENCY CLASS	AS2885 WORST CONSEQUENCE	CONSEQUENCE	AS2885 SEVERITY CLASS RISK RANKING	ASSUMPTIONS / COMMEN	PROPOSED RISK MANAGEMENT PLAN ACTIONS
NLS22	All	52.6	55.6	T1 S/I	External interference	Road - new construction - penetration of pipeline or increased loading	Ovality of pipeline causing stuck pig and repair works, damaged coating leading to localised corrosion. Fatigue	Yes	WT, DOC	Project specific SMS Direct liaison, patrolling, DBYD, signage, WMS, integrity management program - inspect & recoat, concrete slabbing assessment, pipeline	, Yes		N/A							Inspect coating of pipelines directly impacted by road crossings and confirm if recoating is required prior to construction of the road. Contractor to engage EAPL approved subcontractor for the works
NLS23	All	52.6	55.6	T1 S/I	External interference	Track / unsealed road standard crossing	Ovality of pipeline causing stuck pig and repair works, damaged coating leading to localised corrosion	Yes	WT, DOC	Direct liaison, patrolling, DBYD, signage, ILIs	Yes		N/A							
NLS24	All	52.6	55.6	T1 S/I	External interference	Track maintenance	Ovality of pipeline causing stuck pig and repair works, damaged coating leading to localised corrosion	Yes	WT, DOC	Direct liaison, patrolling, DBYD, signage, ILIs	Yes		N/A						Surface maintenance only.	
NLS25	All	52.6	55.6	T1 S/I	External interference	Utility installation - above	As per excavator	Yes	WT, DOC	Direct liaison, patrolling, DBYD, signage, WMS	Yes		N/A						Existing controls have been upgraded based upon lessons learnt from 2000 Telstra incident. High level of liaison and compliance with utility companies.	EAPL to provide design guidelines for both road and utility crossings of EAPL pipelines
NLS26	All	52.6	55.6	T1 S/I	Extemal interference	Utility installation - below open cut	As per excavator	Yes	WT, DOC	Direct liaison, patrolling, DBYD, signage, WMS	Yes		N/A						Existing controls have been upgraded based upon lessons leamt from 2000 Telstra incident. High level of liaison and compliance with utility companies.	
NLS27	All	52.6	55.6	T1 S/I	Extemal interference	Utility installation - below bored	As per excavator	Yes	WT, DOC, slip trenching	Direct liaison, patrolling, DBYD, signage, WMS, project specific SMS	Yes		N/A						Existing controls have been upgraded based upon lessons learnt from 2000 Telstra incident. High level of liaison and compliance with utility companies.	
NLS28	All	53	56	T1 S/I	External interference	Blasting - rupture of pipelin	e No known mining activities that would require blasting	No												
NLS29	All	52.6	55.6	S/I	External interference	Aircraft crash onto easement (helicopter or aeroplane)		No, not credible in Traralgon North												
NLS30	All	52.6	55.6	T1 S/I	External interference	Tree roots damaging coating		Yes	WT, DOC	IILIS, WMS	Yes		N/A						Depth of cover protects pipeline even in the event of a large tree falling. No trees growing on top of pipeline. Patrol officers work with landowners to minimise large trees near easement	
NLS31		52.6	55.6	T1 S/I	External interference	Falling tree impacting above ground asset	e Ovality - inability to pig or stuck pig. Coating damage	Yes	WT	WMS, Vegetation management	Yes		N/A							
NLS32	All	52.6	55.6	T1 S/I	Corrosion - internal	General corrosion		Yes		ILI, WMS, Clean, dry product.	Yes	<u> </u>	N/A						ILI results show very little internal corrosion. LPG is dry (minimal water)	

		z		SS	-				EXISTIN	G CONTROLS	S?		×		LIKELIHOOD				TS	
THREAT ID		LOCATION DESCRIPTIO	KP FROM KP TO	PRIMARY LOCATION CLA	SECONDARY LOCATION CLASS	THREAT	THREAT DESCRIPTION	CREDIBLE	Physical	Procedural	THREAT FULLY MITIGATE WITH EXISTING CONTROL	Additional Controls	Does threat require a ris assessment	FAILURE MODE	AS2885 FREQUENCY CLASS	AS2885 WORST CONSEQUENCE	CONSEQUENCE	AS2885 SEVERITY CLASS	ASSUMPTIONS / COMMEN	PROPOSED RISK MANAGEMENT PLAN ACTIONS
NLS	533	All	52.6	71 T1	S/I	Corrosion - external	External corrosion due to coating damage and inadequate cathodic protection	Yes		Coating, CP, ILI, DVCG survey, verification digs, Higher consequence scenario monitoring	Yes		N/A							
NLS	534	All	52.6	T1	S/I	Corrosion - stress corrosion cracking	Stress Corrosion Cracking (SCC) or other environmentally assisted cracking leading to leak of LPG	No		Conditions do not support potential for SCC. Material grade not prone to SCC due to alloy content. Good coating condition. SCC not observed in any inspection over last 45 years with no evidence from digs and physical inspections.										
NLS	535	All	52.6	T1	S/I	Corrosion	Hydrogen Induced Cracking leading to leak of LPG	No		CP results show pipeline operates at a potential not prone to HIC. Steel composition not prone to HIC									Cathodic protection potentials maintained more negative that -850mV and less negative than - 1300mV. Steel composition in accordance with API standard	
NLS	536	All	52.6	T1	S/I	Corrosion	Stray current corrosion leading to LPG leak	Yes		ILI, sources of stray current are removed when identified, CP monitoring. Pipelines cross bonded in easement. No evidence observed in repair digs.	Yes		N/A							Transformers location and high voltage cabling to consider Low Frequency Induction (LFI) or Earth Potential Rise (EPR) to ensure local pipeline Cathodic Protection Systems are not compromised.
NLS	537	All	52.6	T1	S/I	Corrosion - internal	Sulphate Reducing Bacteria (SRB) corrosion	No		Internal corrosion not seen in ILI. Clean, dry product with no solids to shelter SRB. Product specification; water and H2S monitoring	t								Not seen in operating history of pipeline.	
NLS	538	All	52.6 55.6	T1	S/I	Natural events - erosion	Reduced cover / protection	Yes	WT, DOC	Patrols, depth checks, WMS	Yes		N/A						Properly considered Stormwater design will be prepared.	Stormwater Design to be provided to EAPL for review and acceptance
NLS	539	All	52.6 EE.e	11	S/I	Natural events - lan subsidence	Poor trench backfill, d sinkholes, ground movement, slippage, leading to stress on pipeline and leak	Yes	WT, DOC	Patrols, depth checks, work management procedures, depth or cover	Yes		N/A						No significant ground movement anticipated from this development	
NLS	540	All	52.6 55.6	T1	S/I	Natural events - flooding	Reduced cover / protection in wet areas, on slopes, valleys, etc. leading to stress on pipeline and leak	Yes	WT, DOC	Patrols, depth checks, depth of cover	Yes		N/A						No significant reduced cover anticipated from this development	

	z		SS					EXISTIN	G CONTROLS	ED -S?		¥						4TS	
THREAT ID	LOCATION DESCRIPTIO	KP FROM KP TO	PRIMARY LOCATION CLA SECONDARY LOCATIO	THREAT TYPE	THREAT DESCRIPTION		CREDIBLE	Physical	Procedural	THREAT FULLY MITIGATI WITH EXISTING CONTROI	Additional Controls	Does threat require a ris assessment	FAILURE MODE	AS2885 FREQUENCY CLASS	AS2885 WORST CONSEQUENCE	CONSEQUENCE	AS2885 SEVERITY CLASS RISK RANKING	ASSUMPTIONS / COMMEN	PROPOSED RISK MANAGEMENT PLAN ACTIONS
NLS41	All	52.6 55.6	T1 S/I	Natural events - earthquake	Tremors/earthquakes causing damage to pipeline due to land movement.	Minor tremors around the Latrobe valley & Tralagon area.	Yes	WT, DOC	Pipeline design, patrols, ILI	Yes		N/A						Minor tremors are infrequent in Victoria. Potential seismic activity was addressed in the initial design. A minor earth tremor occurred in southern Victoria 2009 but it was not considered to be of sufficient intensity to adversely affect the pipeline. No further actions identified.	
NLS42	All	52.6 55.6	T1 S/I	Natural events - lightning	Lightning strike	Possible for lightning to strike valve sites or in easement but likelihood is hypothetical. At valve sites, radio towers would be more attractive target than pipeline	Yes	WT, DOC	Patrolling,	Yes		N/A						No work occurs on pipeline during electrical storm, to prevent personnel injury.	
NLS43	All	52.6 55.6	T1 S/I	Natural events - fire	Fire above pipeline, high temperatures leading to coating damage and overpressure		Yes	WT, DOC (for Pipeline)	Clearing around valve sites & easements. Maintenance PMs Continued flow in pipeline provides cooling	Yes		N/A						Depth of cover provides thermal protection. Continued flow and cover depth keeps pipeline cool	
NLS44	All	52.6 55.6	S/I	Natural events - high wind	Cyclone or strong wind		Yes	WT, DOC (for Pipeline)		Yes		N/A						Depth of cover protects pipeline from damaging wind	
NLS45	All	52.6 55.6	T1 S/I	Intentional damage	Malicious damage		Yes	WT, DOC	Patrols. Direct liaisor with landowners.	Yes	Security risk assessment completed in 2019, which reviewed third party impact. No additional controls were recommended to manage known risks	N/A							EAPL to review security of the Valve Station due to the location of the new development
NLS46	All	52.6 55.6 55.6	T1 S/I	Intentional damage	Sabotage		Yes	WT, DOC	Patrols. Direct liaisor with landowners.	Yes	Security risk assessment completed in 2019, which reviewed third party impact. No additional controls were recommended to manage known risks	N/A							
NLS47	All	52.6 55.6	T1 S/I	Intentional damage	Vandalism		Yes	WT, DOC	Patrols. Direct liaisor with landowners.	Yes	Security risk assessment completed in 2019, which reviewed third party impact. No additional controls were recommended to manage known risks	N/A							

	z		SS	z					EXISTI	NG CONTROLS	ED -S?		×							VTS	
THREAT ID	LOCATION DESCRIPTIO	KP FROM KP TO	PRIMARY LOCATION CLA	SECONDARY LOCATIO	S THRE	AT E THREAT DESCRIPT	ION CONSEQUENCE ASSESSMENT	CREDIBLE	Physical	Procedural	THREAT FULLY MITIGAT	Additional Controls	Does threat require a ris assessment	FAILURE MODE	AS2885 FREQUENCY CLASS	AS2885 WORST CONSEQUENCE	CONSEQUENCE	AS2885 SEVERITY CLASS	RISK RANKING	ASSUMPTIONS / COMMEN	PROPOSED RISK MANAGEMENT PLAN ACTIONS
NLS48	All	52.6	0.00 T1		Intentio damage	al Terrorism		Yes	WT, DOC	Patrols. Direct liaisor with landowners.	1 Yes	Security risk assessment completed in 2019, which reviewed third party impact. No additional controls were recommended to manage known risks	N/A								
NLS49	All	52.6	0.00 11	S.I	Operati activitie	nal Pressure exceeds MA transient pressure sce - causes leak at undet pinhole.	DP - narios ected	Yes		Pressure control systems. Review of operating history shows no pressure above MAOP has occurred. Corrosion control programs including coating, CP, ILI, digs	Yes		N/A							No pressure above design MAOP has occurred. Adequate controls in place to prevent.	
NLS50	All	52.6	0.00 1 T		Operati activitie	nal Temperature beyond design conditions		Yes		Temperature control systems. No source of temperature above design conditions. High pressure differential across valves managed by start-up and shutdown procedures and operator training	Yes		N/A							No temperature above design temperature has occurred. Adequate controls in place to mitigate. Operation below MDMT managed by start up procedures	
NLS51	All	52.6	0.00		Operati activities	nal Fatigue		Yes		Pipeline design, Remaining life review, WMS	Yes		N/A							Review of operating history shows little pressure cycling has occurred. Fatigue due to booster pump operation was assessed as part of the LPG250 Remaining Life Review. Booster pump operation not expected to increase beyond the conservative estimates in the fatigue assessment; hence it is expected that the LPG250 pipeline has adequate remaining fatigue life for ~78 years.	
NLS52	All	52.6	0.00 11		Operati activitie	nal Incorrect operation of pigging		Yes		Pigging procedures, pig design, management of change procedures, stuck pig contingency plan, pull test	Yes		N/A							Stuck pigs have occurred from time to time in Gippsland operations. ILI run in this pipeline on risk based frequency	
NLS53	All	52.6	0.00 T		Operati activitie	Incorrect valve operati	ng	Yes		Operating procedures. Operating logic is straight-forward and simple, WMS	Yes		N/A								
NLS54	All	52.6	0.00 1T		Operati activitie	nal Bypass of logic, contro protection equipment, followed by incorrect fu partial manual operatio	il or ill or on	Yes		Operating procedures. Operating logic is straight-forward and simple, WMS, Managed by LFD Ops	Yes		N/A								

		z		SS	z				EXISTIN	G CONTROLS	ED -S?		×						ATS	
THREAT ID		LOCATION DESCRIPTIO	KP FROM	PRIMARY LOCATION CLA	SECONDARY LOCATIO	THREAT	THREAT DESCRIPTION	CREDIBLE	Physical	Procedural	THREAT FULLY MITIGAT WITH EXISTING CONTROI	Additional Controls	Does threat require a ris assessment	FAILURE MODE	AS2885 FREQUENCY CLASS	AS2885 WORST CONSEQUENCE	CONSEQUENCE	AS2885 SEVERITY CLASS RISK RANKING	ASSUMPTIONS / COMMEN	PROPOSED RISK MANAGEMENT PLAN ACTIONS
NLS	55	All	52.6	55.6 T1	S/I	Operational conditions	Product contamination	Yes		Process system controls, product quality controls.	Yes		N/A							
NLSS	56	All	52.6	55.6 T1	S/I	Operational conditions	Product contamination: mercury	Yes		No risk to pipeline integrity. Potential personnel exposure for maintenance at valve sites. Procedures in place to manage personnel exposure to mercury (SWP 50.138)	Yes		N/A						Procedures in place for maintenance on pipeline and valves (SWP 50.138). Car seals at valve sites to prevent cross-over from one pipeline to another	
NLSS	57	All	52.6	55.6 T1	S/I	Operational conditions	Maintenance work not following procedures	Yes		EAPL procedures and work practices in place. Training for WMS, permit auditing, safety observation cards	Yes		N/A							
NLS	58	All	52.6	55.6 T1	S/I	Operational conditions	Inadequate / incomplete maintenance or servicing procedures	Yes		EAPL procedures and work practices in place. Training for WMS, permit auditing, safety observation cards	Yes		N/A							
NLSS	59	All	52.6	55.6 T1	S/I	Operational conditions	Inaccurate maintenance test equipment, leading to incorrect control and safety equipment settings	Yes		Maintenance procedures, work management expectations, employee and contractor competency assurance	Yes	Overdue PMs reported up the line	N/A							
NLS6	60	All	52.6	55.6 T1	S/I	Operational conditions	Inadequate servicing of maintenance test equipment	Yes		Maintenance procedures, work management expectations, employee and contractor competency assurance	Yes		N/A							
NLSE	61	All	52.6	55.6 T1	S/I	Operational conditions	Incorrect equipment, valves, instruments used in replacements	Yes		EAPL procedures and work practices in place. Management of change process used for replacements that are not "like for like"	Yes		N/A							
NLS6	62	All	52.6	55.6 T1	S/I	Design and construction	Inadequate QA / QC procedures to confirm acceptability of materials	Yes		No evidence of non acceptable materials in original construction. EAPL procedures for new work mitigates threat.	Yes		N/A							
NLS	63	All	52.6	55.6 T1	s/I	Design and construction	Inadequate fracture control	Yes		Fracture Control Plan completed for this pipeline	Yes		N/A							

	z		SS	_					EXISTIN	IG CONTROLS	S?		*		LIKELIHOOD				TS	
THREAT ID	LOCATION DESCRIPTIO	KP FROM	KP TO PRIMARY LOCATION CLA	SECONDARY LOCATION CLASS	THREAT TYPE	THREAT DESCRIPTION	CONSEQUENCE ASSESSMENT	CREDIBLE	Physical	Procedural	THREAT FULLY MITIGATE WITH EXISTING CONTROL	Additional Controls	Does threat require a ris assessment	FAILURE MODE	AS2885 FREQUENCY CLASS	AS2885 WORST CONSEQUENCE	CONSEQUENCE	AS2885 SEVERITY CLASS	ASSUMPTIONS / COMMEN	PROPOSED RISK MANAGEMENT PLAN ACTIONS
NLS64	All	52.6	55.6 T1	S/I	Design and construction	Incorrect design or engineering analysis of the pipeline		Yes		ILI inspections and physical visual inspections have occurred for this pipeline and others with no evidence of incorrect design. Remaining Life Review thoroughly reviewed design characteristics	Yes		N/A							
NLS65	All	52.6	55.6 T1	S/I	Design and construction	Failure to define correct range of operating conditions leading to incorrect settings on control or protective devices or unacceptable pressures, temperatures and loads		Yes		ILI inspections and physical visual inspections have occurred for this pipeline and others with no evidence of incorrect design. Remaining Life Review thoroughly reviewed design characteristics	Yes		N/A							
NLS66	All	52.6	55.6 T1	S/I	Design and construction	Manufacturing defect in the line pipe		Yes		No manufacturing defects detected however some installation dents/gouges/toolin g mark. ILI inspections and physical visual inspections have occurred for this pipeline. 11 direct inspections in 2020 of possible dents from ILI - none concerning.	Yes		N/A							
NLS67	All	52.6	55.6 T1	S/I	Design and construction	Inadequate testing of materials to ensure defects have been detected		Yes		No materials defects detected however some installation dents/gouges/toolin g mark. ILI inspections and physical visual inspections have occurred for this pipeline. 11 direct inspections in 2020 of possible dents from ILI - none concerning.	Yes		N/A							
NLS68	All	52.6	55.6 T1	S/I	Design and construction	Inadequate or incompetent NDT of pipeline girth welds		Yes		ILI inspections and physical visual inspections have occurred for this pipeline and others with no evidence of defects. Direct inspection program	Yes		N/A							

		z			SS						EXISTIN	G CONTROLS	ED S?		¥		LIKELIHOOD					IIS	
THREAT ID		LOCATION DESCRIPTIO	KP FROM	KP TO	PRIMARY LOCATION CLA SECONDARY LOCATION	CLASS	THREAT TYPE	THREAT DESCRIPTION	CONSEQUENCE ASSESSMENT	CREDIBLE	Physical	Procedural	THREAT FULLY MITIGATE WITH EXISTING CONTROL	Additional Controls	Does threat require a ris assessment	FAILURE MODE	AS2885 FREQUENCY CLASS	AS2885 WORST CONSEQUENCE	CONSEQUENCE	AS2885 SEVERITY CLASS	RISK RANKING	ASSUMPTIONS / COMMEN	PROPOSED RISK MANAGEMENT PLAN ACTIONS
NLS6	9	All	52.6	55.6	11	S/I 2 D	esign and onstruction	External coating / pipe damage during installation		Yes		Some installation dents/gouges/toolin g marks. ILI inspections and physical visual inspections have occurred for this pipeline. 11 direct inspections in 2020 of possible dents from ILI - none concerning.	No		Yes	Leak	Remote	Supply	Leak leading to LOC with ignition source. Repair time 1- 2 weeks	Minor	Negligible A 1 8 a 11 U	Continue dig program and ILI program. Existing mitigations adequate given nspection technology. eMOC NFDG-20-97 assessed risk as Cat 3. Risk is considered ALARP with existing controls	
NLS7	0	All	52.6	55.6	Т1	s/ا م ص	esign and onstruction	Signposting not as per code		Yes		Signposting according to code, aerial and ground patrols,	Yes		N/A						A b c A	All Pipeline signs have been upgraded to reflect correct wording as per AS2885.	
NLS7	1	All	52.6	55.6	11	S/I O	ther	Fault voltages from nearby transmission towers		Yes		High voltage lines cross, but do not parallel the line. Esso would be involved in installation of new transmission towers. Patrols	Yes		N/A						л Р	No transmission towers as part of the development	
NLS7	2	All	52.6	55.6	11	s/I O	ther	Induced voltages		Yes		No parallel transmission lines or HV lines to induce voltages. Esso would be involved in installation of new transmission towers. Patrols	Yes		N/A								Refer above
NLS7	3 All f	acilities	52.6	55.6	Т1	S/I		Flange or other seal loss of integrity causing a leak / Valve stem leak		Yes		Inspection, maintenance procedures, installation of clamps, MLV maintenance program,	Yes	In 2020 EAPL added controls following MLV stem leak - additional inspection & maintenance	N/A			-					EAPL to review all operational and maintenance activities associated with the Valve Site and determine if any procedures require additional controls to prevent or mitigate any incidents with respect to the new development (e.g. vehicle movements near valve site during operations, venting plumes impaction third parties)
NLS7	4 All f	acilities	52.6	55.6	Т1	S/I		Corrosion of pipeline casing	Leading to failure of the casing to protect the pipeline from stress leading to ovality or localised corrosion of the pipeline (casing not connected to pipeline CP)	Yes		ILI, physical inspection. Assessed requirement of grouting	Yes		N/A								

"	AS2885 SAFETY MANAGEMENT STUDY																							
Proj App	Project: Esso Onshore Pipeline Requalification Document Title: Applicable Pipeline(s): PL 27 & PL 34 LPG250 / LFD350 PL282 / LFD700 PL35 & PL126 Workshop Date(s) / Lo														ent Title: nop Date(s) / Loc	AS2885 Safety Management Study Location: 20/2/2024 / ZOOM								
	NO			ASS	z	9						EXISTING	CONTROLS	red NLS?		risk		LIKELIHOOD				INTS		
THREAT ID	LOCATION DESCRIPTI		KP TO	PRIMARY LOCATION CL	SECONDARY LOCATIC CLASS	Standard Feature typ	Reference dwgs	THREAT TYPE	THREAT DESCRIPTION	CONSEQUENCE ASSESSMENT	CREDIBLE	Physical	Procedural	THREAT FULLY MITIGA WITH EXISTING CONTRC	Additional Controls	Does threat require a assessment	FAILURE MODE	AS2885 FREQUENCY CLASS	AS2885 WORST CONSEQUENCE	CONSEQUENCE	AS2885 SEVERITY CLASS	ASSUMPTIONS / COMME	PROPOSED RISK MANAGEMENT PLAN ACTIONS	
LS8	Giffard	٦d	5.255	R2	- Standard	Crossing - Uncased	NA A	External interference	Road Maintenance		Yes	2m+DOC at roads	signposting, patrolling	Yes								Cover depth was based on as built drawings and anecdotal evidence. Confirmed to provide adequate threat	5	
LS9	Giffard	٦d	5.255 -	R2	- Standard	Crossing - Uncased	NA	External interference	Road upgrade/widening		Yes	2m+DOC at roads	signposting, patrolling	Yes								Casings are as wide as road easements. Road widening beyond existing road easement would trigger		
LS10	Giffard	٦d	5.255 -	R2		Standard Crossing - Uncased Road	NA	Extemal interference	Drainage ditch maintenance		Yes	2m+DOC at roads	signposting, patrolling	Yes								Cover depth was based on as built drawings and anecdotal evidence. Confirmed to provide adequate threat control by regular patrolling and depth checks	>	
LS11	Giffard	٦d	5.255	R2		Standard Crossing - 1 Uncased Road	NA	External interference	Motor vehicle / truck crash		Yes	2m+DOC at roads	signposting, patrolling	Yes								Cover depth was based on as built drawings and anecdotal evidence. Confirmed to provide adequate threat control by regular patrolling and depth checks	>	
LS31	Rail Cro	ssing	03.8 (03.4) -	т1		Cased	304-15332 304-50024	External interference	Railway maintenance works		Yes		No longer active. Now a rail trail. Refe as built drawings casing details	Yes r								Train crash not credible since not an active railway line		
LS30	Traral Maffra	gon <mark>f</mark>		т1	S/I	Standard Uncased	NA		As per standard uncased crossing. Refer to Threat ID LS8-LS11		Yes													
LS30 a	Futur (No.1) Utility	Rd And King		Τ1	S/I	Standard Uncased	NA		As per standard uncased crossing. Refer to Threat ID LS8-LS11		Yes													
LS30 b	Future (No.2) Utility 2	Rd And King	00.40	T1	S/I	Standard Uncased	NA		As per standard uncased crossing. Refer to Threat ID LS8-LS11		Yes													
LS30	Futur (No.3) Utility 2	Rd And King		T1	S/I	Standard Uncased	NA		As per standard uncased crossing. Refer to Threat ID LS8-LS11		Yes													
LS30 d	Futur (No.4) Utility 2	Rd And King	-	T1	S/I	Standard Uncased	NA		As per standard uncased crossing. Refer to Threat ID LS8-LS11		Yes													

(Esso										AS2885 SAF	ETY MANAGEME	NT STUDY	<i>,</i>											
Pro	ject:						Esso Onshore Pipe	eline Requalification		-			Document Title: AS2885 Safe							Aanagement Study					
Ар	plicable Pi	peline	e(s):				PL 27 & PL 34 LPC	250 / LFD350 PL282 /	LFD700 PL35 & PL12	6			Workshop	Date(s) / Locatio	n:			20/2/2024 / ZOOM							
	IPTION				Type						EXISTIN	G CONTROLS	IGATED IG 1)		e arisk t	щ	LIKELIHOOD ASSESSMENT			0	1 9				
THREAT ID	LOCATION DESCR	KP FROM	KP TO	PRIMARY LOCA CLASS SECONDARY LOC	CLASS Standard Feature	Feature Drawing	THREAT TYPE	THREAT DESCRIPTION	CONSEQUENCE ASSESSMENT	CREDIBLE	Physical	Procedural	THREAT FULLY MIT WITH EXISTIN CONTROLS' (Refer to Note	Additional Controls	Does threat requir assessmen	FAILURE MOD	AS2885 FREQUENCY CLASS	AS 2885 WORST CONSE QUENCE	CONSEQUENCE	AS2885 SEVERITY CLASS RISK RANKIN	ASSUMPTION	PROPOSED RISK MANAGEMENT PLAN ACTIONS			
M1	Longford Tower Valv Site	4.		11	- Yes	304- 50041 304-	External interference	Vehicle hitting the valve or above ground piping		Yes	Fencing, 30m distance from track, locked gates		Yes												
M2	Longford Tower Valv Site	4.1		T1	- Yes	304-50041	Natural events - fire	Heat damage to pipeline and equipment		Yes		No vegetation in fenced valve site area. Area around valve site kept mown	Yes								Radiant heat from grass fire outside the fence has potential to cause superficial damage to instruments, controls and coatings but would not cause LOC or pipeline integrity issue				
МЗ	Longford Tower Valv Site	4.1		T1	- Yes	304-50041	Natural events - high wind	High wind or cyclone causes tower to fall and impact pipeline at valve site		Yes		Radio tower design, radio tower integrity inspection by LFD	Yes												
M4	Longford Tower Valv Site	4 F		T1	- Yes	304-50041	Intentional damage	Vandalism		Yes		Patrols. Direct liaison with landowners.	Yes	Security risk assessment completed in 2019, which reviewed third party impact. No additional controls were recommended to											
M5	Longford Tower Valv Site	4. F		11	- Yes	304-50041	Intentional damage	Sabotage / terrorism		Yes	Fences around all valve sites.	Intrusion detection system at Westbury with UPS, CCTV at Westbury, remote activated lighting. Security signage and danger warning signs. Patrols. Direct liaison	Yes	Security risk assessment completed in 2019, which reviewed third party impact. No additional controls were recommended to											
M6	Longford Tower Valv Site	, t		11	- Yes	304-50041	Corrosion - external	Corrosion of aboveground and ground interface		Yes		Coatings and wraps at AGIs, AGI inspection program, patrols, CP, Above ground thickness L-PIP	Yes												
M7	Longford Tower Valv Site	1.4		11	- Yes	304-50041	Other	Damage to pipeline from fauna - vermin	Damage to communications, loss of control. Damage to LDS pipeline shut down	Yes		Inspection of MLVs, vermin baiting, patrols, 12 monthly building inspections	Yes												
M9	Traralgon Maffra Roa Valve Site (remote shutdowr	(_ p . 53.46		11	s of	304-62066 304-50041 304-40022	N 000	Additional physical impact barriers at this location since near road. As per standard MLV. Refer to M1-7			Concrete barriers either side of valve site, guard rail,	Motion alarmed gate, intrusion alarms. Signage	No			Rupture	Hypothetical	V cau res	/ehicle impact ising rupture will sult in major fire and multiple fatalities	Catastrophic Intermediate		Review proposed road and bollard design and consider whether risk is mitigated or whether other crontrls/designs are required			

Traralgon Development SMS SMS Workshop Date: SMS Workshop Location:

Tuesday 20 February 2024 TEAMS

	•					
No.	Issue	Action	Responsibility	Due Date	Close Out Comments (references/calcs etc)	Close Out Date
A1	Construction of the Development could damage the pipeline	Principal Contractor(s)to prepare a Construction Management Plan, for review and acceptance by EAPL (pipeline licensee) prior to any third party works.	Constructor	Prior to construction		
A2	Risk that what is agreed at the SMS Workshop is not passed onto the Development Plan and the future Constructor	SMS Report and Findings to be referenced and included in the Development Plan	MM	Prior to completion of the Development Plan		
A3	Future responsibility for vegetation control of the easement through the development unclear	Confirm who will be maintaining the pipeline easement (vegetation control) during and post completion of the Development?	MM	31/3/2024		
A4	Road to north of pipeline easement is within the 15m set back distance previously advised by EAPL	Confirm whether 15m property set back distance does allow for road reserves to be included within the 15m Set Back?	EAPL	31/3/2024		
A5	Insufficient depth of cover (DOC) at proposed road crossing leading to overstress of pipeline.	Undertake potholing to confirm DOC of all pipelines at proposed road crossings to ensure the road design meets EAPL requirements. Potholing to following EAPL Potholing procedure, permitting and supervision.	MM	Prior to completion of detailed design		
A6	Development Drawings don't include names of roads crossing the pipeline easement	Provide new Road names to EAPL when available	MM/EAPL	Prior to construction		
A7	Potential for suspended LFD700 pipelines to collapse under new road crossings potentially leading to a car accident due to uneven road surface	Review integrity of LFD700 pipeline wall thicknesses and coatings to determine if recoating is necessary. Concrete slabbing over pipeline to prevent subsidence of road surface	MM	Prior to completion of detailed design		
Threat S NLS2	pecific Actions Existing risk of an excavator causing a hole in the pipeline is now a higher consequence due to the presence of new residential development (thus more people at risk of seriously injured or fatality - potentially catastrophic consequence)	Esso to Review if an ALARP assessment needs to be done or whether an existing ALARP assessment for T1 is applicable and acceptable. Assessment needs to consider population density and thus tot sizes. EAPL to provide clear direction to Developer on requirements to ensure risk is ALARP	EAPL	31/3/2024		
NLS3	Excavator 10T+ with Pen or tiger teeth leading to a Rupture resulting in loss of supply to make a repair. Ignited rupture could lead to an ML up to 850m possibly resulting in multiple fatalities. Supply could be out for 2-4 weeks due to the major third party investigation.	Esso to Review if an ALARP assessment needs to be done or whether an existing ALARP assessment for T1 is applicable and acceptable. Assessment needs to consider population density and thus lot sizes. EAPL to provide clear direction to Developer on requirements to ensure risk is ALARP	EAPL	31/3/2024		
NLS12	There is a need to provide temporary crossing points of the easement to support construction of the Development.	MM to demonstrate that the Temporary Road Crossings being provided are suitable to protect the pipelines.	ММ	31/3/2024		
NLS12	Road crossings not designed to properly protect the pipeline(s) they cross can cause overstress to the pipeline and damage to the coating ultimately leading to a pipeline leak or failure	Demonstrate that the Permanent Road crossing designs are compliant with applicable standard and EAPL requirements (Refer to NLS25).	MM	Prior to completion of detailed design		
NSL15 & M9	Vehicle impact of Traralgon Valve Site causing rupture will result in major fire and multiple fatalities	Review proposed road and bollard design immediately north of Traralgon Valve Site and consider whether risk is mitigated or whether other controls/designs are required. (Refer to Action A4)	MM/EAPL	31/3/2024		
NSL21	Vibration over pipeline easement could damage the pipeline coating resulting in long term corrosion and potential leak	Compaction of roadways over pipeline easement to be completed using static rollers. Peak Particle Velocity (PPV) for vibration near pipelines not to exceed 10mm/s unless otherwise assessed and approved by EAPL. Requirements to be included in Development Plan	MM/EAPL	Prior to construction		
NLS22	Existing pipeline coatings may be compromised or fail due to stress from new road crossing leading to a corrosion leak and Loss Of Containment	Inspect coating of pipelines directly impacted by road crossings and confirm if recoating is required prior to construction of the road. Contractor to engage EAPL approved subcontractor for the works	MM	Prior to completion of detailed design		
NSL25	Utility crossings not properly designed could result in the pipeline being damaged when third parties seek to excavate and or repair their utility	EAPL to provide design guidelines for both road and utility crossings of EAPL pipelines. Guidelines to be included in Development Plan	EAPL	10/4/2024		
NSL36	Stray current corrosion compromises Cathodic Protection System leading to pipeline leak	Transformer(s) location and high voltage cabling to consider Low Frequency Induction (LFI) or Earth Potential Rise (EPR) to ensure local pipeline Cathodic Protection Systems are not compromised. EAPL to review and accept design calculations	MM/EAPL	Prior to completion of detailed design		
NSL38	Landscaping and road design will change the natural watercourse in the area potentially putting the pipeline easement at risk of water pooling or soil erosion	Stormwater Design to be provided to EAPL for review and acceptance	MM/EAPL	Prior to completion of detailed design		
NSL45	Malicious damage due to the increased population in the area	EAPL to review security of the Valve Station due to the location of the new development	EAPL	31/3/2024		
NSL73	EAPL requires space around their Valve Station Compound to under various periodic operational and maintenance activities	EAPL to review all operational and maintenance activities associated with the Valve Site and determine if any procedures require additional controls to prevent or mitigate any incidents with respect to the new development (e.g. vehicle movements near valve site during operations, venting plumes impacting third parties etc)	EAPL	31/3/2024		
				+		<u> </u>
	1	1		1	1	1

AS2885.6 Risk Matrix

			Severity Class		
	Catastrophic	Major	Severe	Minor	Trivial
Dimension			Measures of Severity		
People	Multiple fatalities result	One or two fatalities or several people with life- threatening injuries	Injury or illness requiring hospital treatment	Injuries requiring first aid treatment	Minimal impact on health and safety
Supply	Widespread or significant societal impact, such as complete loss of supply to a major city for an extended time (more than a few days)	Widespread societal impact such as loss of supply to a major city for a short time (hours to days) or to a localized area for a longer time	Localised societal impact or short- termsupply interruption (hours)	Interruption or restriction of supply but shortfall met from other sources	No impact or restriction of pipeline supply
Environment	Impact widespread; viability of ecosystems or species affected or permanent major changes	Major impact well outside PIPELINE CORRIDOR or site; or long-term severe effects; or rectification difficult	localised impact substantially rectified within a year or so	Impact very localized and very short-term (weeks), minimal rectification	No effect; minor impact rectified rapidly (days) with negligible residual effect
	Catastrophic	Major	Severe	Minor	Trivial
Frequent Expected to occur typically once per year or more. Event > 1 year	Extreme	Extreme	High	Intermediate	Low
Occasional May occur occasionally in the life of the pipeline. 1 Year > Event> 1/10 Years	Extreme	High	Intermediate	Low	Low
Unlikely Unlikely to occur within the life of the pipeline, but possible. 1/10 years > Event > 1/1000 years	High	High	Intermediate	Low	Neglegible
Remote Not anticipated for this pipeline at this location. 1/1000 years > Event > 1/100,000 years	High	Intermediate	Low	Neglegible	Neglegible
Hypothetical Theoretically possible, but would only occur under extraordinary circumstances 1/100,000 year > Event	Intermediate	Low	Neglegible	Neglegible	Neglegible