Delphi Risk Management Consulting

Victorian Planning Authority

Wallan East (Part 1) PSP, Mitchell Shire Council, Vic

AS 2885.1 Safety Management Study Workshop & Report

Document Number: 2020-0010-RPT-0003

Current Revision

Revision:	Reason for Revision:	Revision Date:	
Rev 1	Issue for Use	13/6/2021	
Prepared By:	Mark Harris SMS Facilitator	Signature:	
Reviewed By:	Glenn Ogilvie Mechanical Engineer APA Group	Signature:	
Approved By:	Scott Mitchell Risk & Engineering Services Team Leader - APA Group	Signature:	

Revision History

Rev	Revision Date	Reason for Revision	Prepared By	Reviewed By	Approved By
A	6/1/2021	DRAFT	MAH		
0	7/4/2021	Issued For Use	MAH	SR	SM
1	13/6/2021	Re-Issued For Use (VPA Additional Comments)	MAH	SR	SM

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1. EXECUTIVE SUMMARY

1.1 Background

The Victorian Planning Authority (VPA) is currently developing the Wallan East (Part 1) Precinct Structure Plan (PSP2012) located in the Mitchell Shire Council, approximately 60 kilometres north of Melbourne's Central Business District. The precinct is currently used for rural purposes and is 140 hectares in area.

There are two high pressure gas pipelines owned and operated by APA (pipeline numbers T74 and T119) which run north-south through the PSP. There is also the local Wallan City Gate and associated distribution trunk main to the town of Wallan on the south side of the PSP. The gate and trunk main are owned by Australian Gas Networks (Vic) Pty Ltd (AGN). APT O&M Services Pty Ltd, (APA Networks), operating as a subsidiary of APA Group, manages and operates these natural gas assets on behalf of AGN.

To comply with Australian Standard AS2885.1 -2018, subdivision works in the immediate vicinity (or Measurement Length) of a high-pressure gas pipeline must be subjected to a Safety Management Study (SMS) to review all possible threats to the safe operation and maintenance of the pipeline and ensure that any threats that cannot be mitigated by design or procedures are risk-assessed and confirmed to be As Low As Reasonably Practical (ALARP).

Mark Harris from Delphi Risk Management Consulting was engaged by the VPA to facilitate an SMS Workshop for this Development.

This SMS Report captures the findings of the SMS Workshop.

1.2 Key Findings

The workshop found that based on the known and anticipated threats considered, Pipeline T119 would be considered a "no rupture" pipeline and would not need any additional physical protection.

There was one risk assessed to be Intermediate requiring an ALARP assessment. Pipeline T74 is an older and thinner-walled pipeline and could be at risk of rupture based on the known and anticipated threats considered and so the workshop determined additional concrete slabbing and buried marker tape over the pipeline should be installed throughout the proposed development. Discussions at the SMS Workshop confirmed that providing slabbing over T74 pipeline was effective at reducing the risk of pipeline failure and that with the agreed mitigations the risk of failure was deemed to be ALARP. It was agreed that the slabbing can be in the form of a footpath over the pipeline as opposed to a buried slab (Note: - the pipeline coating does not need to be specifically assessed or upgraded in these areas).

At designated road crossings, both T119 and T74 will require buried slabbing and marker tape across the entire designated road crossing easement. Also, the T74 pipeline coating will need to be specifically assessed for defects and recoated as necessary before slabbing and roadworks can be undertaken.

1.3 Outcomes

The SMS undertaken is considered to be an Encroachment SMS. All actions raised at the SMS will need to be closed out to the satisfaction of APA and APA Networks prior to works commencing.

Continuing liaison between the VPA, VYW, MW, APA Networks, APA and future Developers should ensure that the design along with construction and post-construction activities pose no significant increase in the operational and maintenance risk to the transmission pipelines running past the Development.

Upon satisfactory close out of the actions raised from this SMS Workshop and completion of the relevant Project Lifecycle SMS studies required under AS2885.6-5.6, it can be confirmed that the requirements of AS2885.6-2018 are met and that the APA and APA Networks assets under review will continue to be in compliance with the SMS requirements of AS2885.6-2018 in the Wallan East (Part 1) PSP.

1.4 Actions

Twenty-Two (22) actions were developed during the SMS workshop including who carried what responsibility for closing out each action. The list of actions is referenced below in Section 7.

APA and/or APA Networks will require 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. All close out material provided by the Developer or a third party is to be provided to APA's and/or APA Networks representative for review and approval/acceptance at relevant stages of the development of the PSP.

2. INTRODUCTION

2.1 Overview

2.1.1 Wallan East (Part 1) PSP Project Description

The Victorian Planning Authority (VPA) is currently developing the Wallan East (Part 1) Precinct Structure Plan (PSP2012) located in the Mitchell Shire Council, approximately 60 kilometres north of Melbourne's Central Business District. The precinct is currently used for rural purposes and is 140 hectares in area.

The Wallan East (Part 1) PSP is generally bound by:

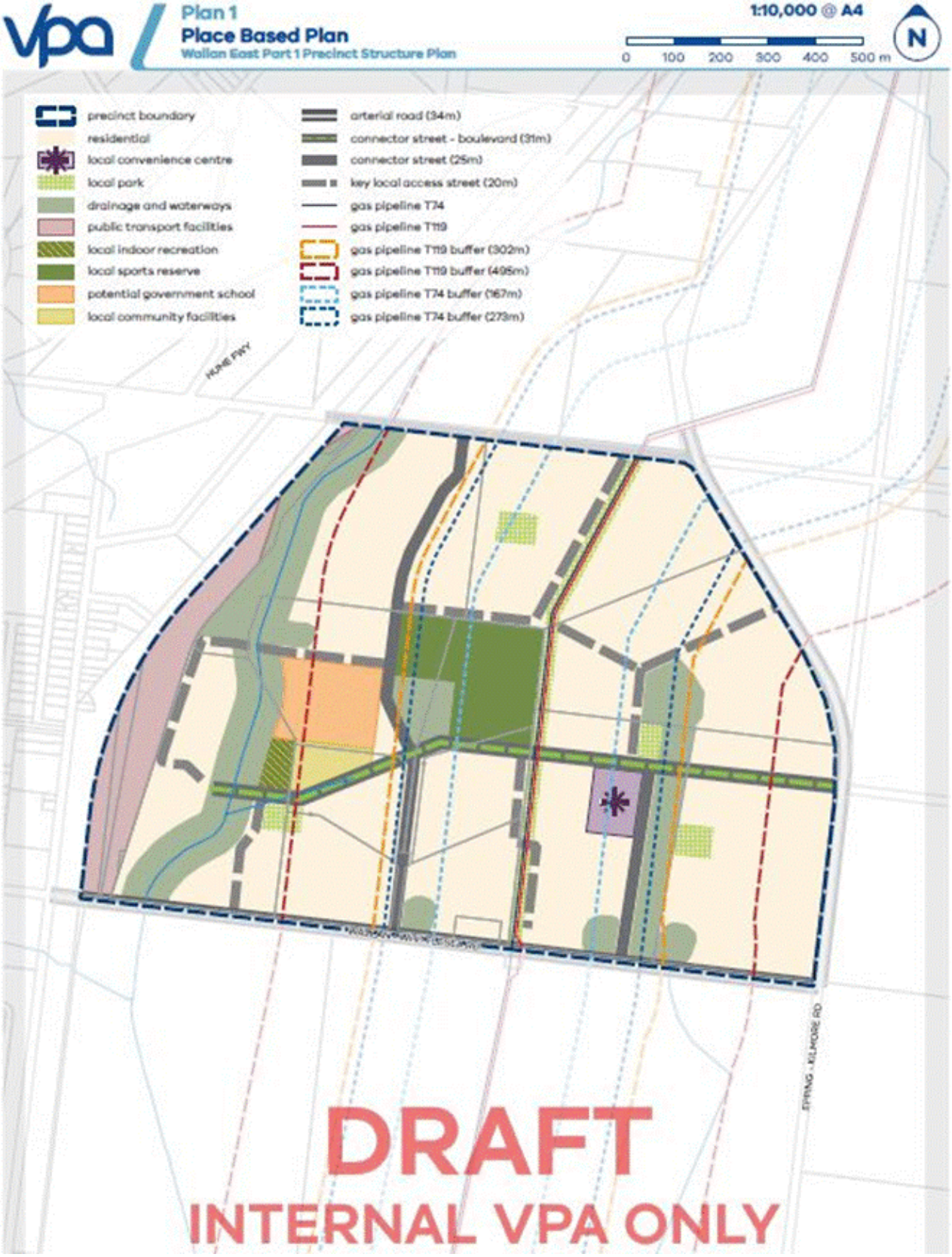
- Kelby Lane to the north.
- Epping–Kilmore Road to the east.
- Wallan-Whittlesea Road to the south; and
- The Sydney-Melbourne railway line to the west.

The precinct is located on Wallan-Whittlesea Road, east of Wallan township and the existing Wallan train station on the Sydney-Melbourne rail line.

This PSP proposes the following development of this area:
To be residential with associated community and commercial facilities.
The precinct will ultimately support a residential community comprising approximately 2250 dwellings and a population of around 7,000 new residents.

Figure 1 - Wallan East (Part 1) Current Land Use and location of APA Pipelines

Figure 2 - Wallan East (Part 1) Working Draft Future Urban Structure and location of APA Pipelines.



2.1.2 APA Gas transmission infrastructure

The APA Group has advised of the following assets are within the PSP area:

Table 1, Pipeline Summary

Pipeline	Pipeline Licence	Easement Width (m)	Easement Location (refer Fig 2 below)	Diameter (mm)	Measurement Length (m)
Keon Park – Wodonga West	T074	35	Westside	300	273
Victorian Northern Interconnect – Loop 1	T119	35	Eastside	400	495
	Note: Measurement Length is applied to either side of the pipeline				

In addition, APA have advised there is an existing "City Gate" gas facility owned by AGN and operated by APA Networks located to the south of Wallan-Whittlesea Road. These types of facilities may also impact upon the amenity of surrounding uses (noise, smell, safety etc.) and will be considered when undertaking the SMS for this PSP.

To comply with Australian Standard AS/NZS 2885.1:2018, any development works in the immediate vicinity of the gas main must be subjected to a Safety Management Study (SMS) to review all possible threats to the safe operation and maintenance of the pipeline and ensure that any threats that cannot be mitigated by design or procedures are risk-assessed and confirmed to be As Low As Reasonably Practical.

2.2 Objectives

The SMS objectives were:

- Review the Location Classification of the pipelines resulting from the proposed development
- Review AS 2885 requirements for the agreed Location Classification
- Identify and analyse the potential threats to the pipelines posed during and after construction of the residential development.
- Assess whether the risks posed by these threats have been reduced to As Low As Reasonably Practicable (ALARP).
- Involve the relevant stakeholders in the assessment.

2.3 Abbreviations

AEMO	Australian Energy Market Operator
AGN	Australian Gas Networks
ALARP	As Low As Reasonably Practicable
APA	APA Group
AS	Australian Standard
CDL	Critical Defect Length
CMP	Construction Management Plan
CIC	Common Infrastructure Corridor
DBYD	Dial Before You Dig
DN	Diameter nominal
DOC	Depth of Cover
EIP	External Interference Protection
ESV	Energy Safe Victoria
GIS	Geographical Information System
GJ/s	Gigajoules per Second (energy release rate)
HDD	Horizontal Direction Drilling
km	Kilometre(s)
KP	Kilometre Point
kW/m2	Kilowatts per metre squared (heat radiation flux)
LOPA	Layers of Protection Analysis
m	Metre(s)
MAOP	Maximum Allowable Operating Pressure
ML	Measurement Length (4.7 kW/m2 radiation contour in the event of an ignited full-bore rupture of the pipeline)
MLV	Main Line Valve
MW	Melbourne Water
PIMP	Pipeline Integrity Management Plan
PPV	Peak Particle Velocity, related to degree of ground movement or vibration.
R1	Rural location classification
R2	Rural Residential location classification
ROW	Right of Way
RTP	Resistance to Penetration
S	Sensitive Use location classification
SAOP	Safety and Operating Plan
SMS	Safety Management Study
T1	Residential location classification
T2	High Density location classification
TP	Transmission Pipeline
TOR	Terms of Reference
WT	Wall Thickness
VPA	Victorian Planning Authority
YVW	Yarra Valley Water

3. APPROACH AND METHODOLOGY

3.1 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 non-location 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).

3.2 Attendance

The Safety Management Assessment Workshop was held on the 9th of December 2020. The workshop was conducted over Microsoft Teams.

The workshop was attended by a range of qualified people, a list of the attendees can be found in Appendix A. Representatives from the pipeline operators, VPA, Yarra Valley Water, Melbourne Water and the Mitchell Shire Council participated in the session. The group included sufficient disciplines, knowledge, and experience to provide confidence that the output of the workshop is soundly based.

3.3 Methodology

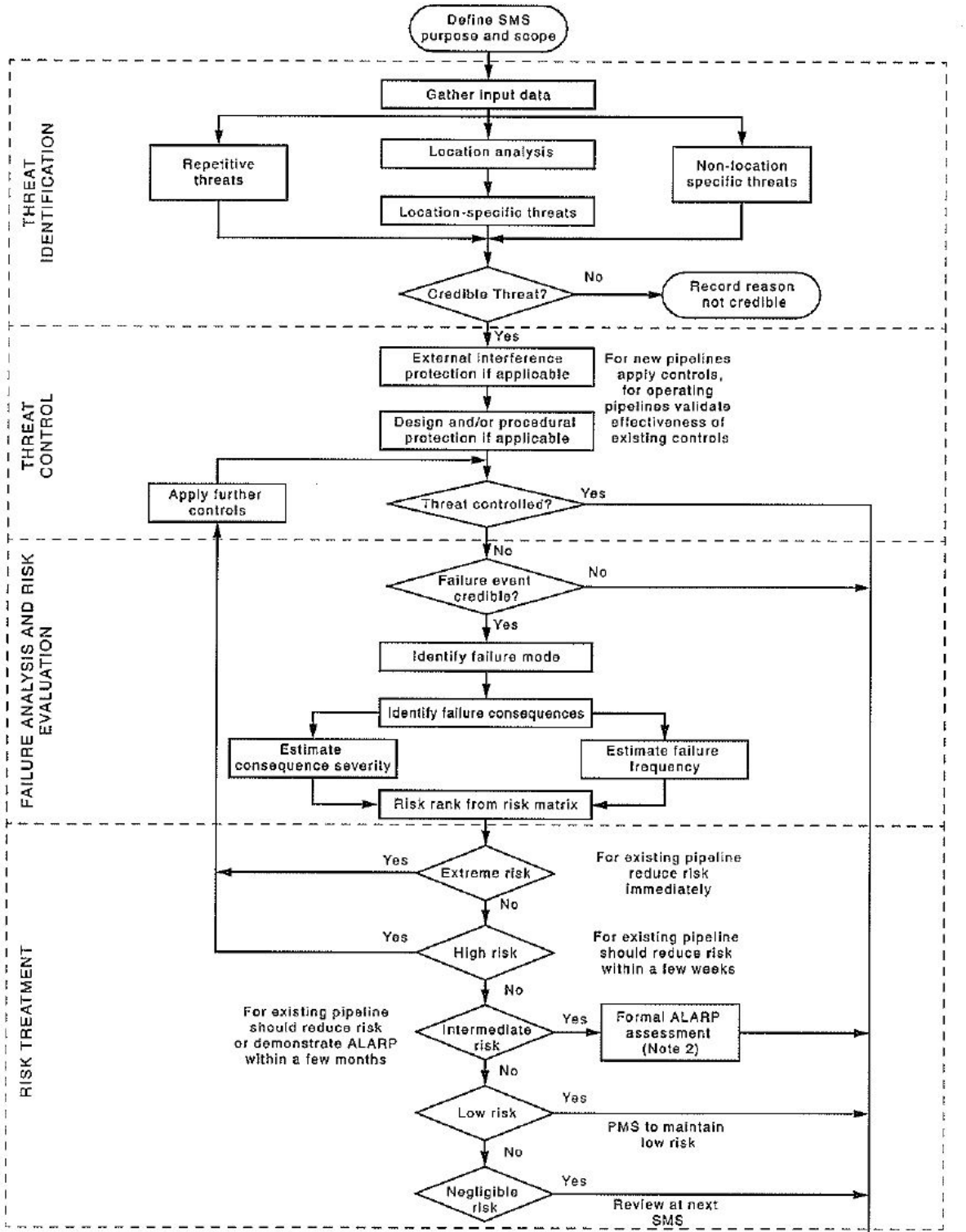
Prior to the SMS workshop being convened, APA and the VPA prepared a range of relevant information to be presented at the workshop. The information available included the results from previous SMS workshops held for the existing pipelines.

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 were also recorded.

A copy of the Development Plan was available in the Terms of Reference issued prior to the Workshop. All other documents referenced in the TOR and Pre-SMS Document Review Report were made available electronically at the SMS 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.

Figure 3 - AS2885.6 Risk Assessment Process



NOTES:

1. This flowchart is an informative aid to assist in interpretation of the safety management process. Safety management requirements are fully defined in the text and take precedence over this flowchart.
2. Formal ALARP assessment may require multiple further steps including design, revision to the PMS, risk evaluation, etc, possibly involving various loops through the flowchart which have been omitted for simplicity.

3.3.1 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.

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.

3.3.2 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.

3.3.3 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, and the minimum number of effective controls required for a threat depends on the location class, as 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 can be 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.

3.3.4 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).

At the end of the Workshop, participants are required to form an opinion on the quality of the SMS presented for review, and to reach a conclusion as to whether the SMS satisfies the requirements of AS 2885.1.

Actions minuted during the course of the SMS workshop will fall into two general categories, those requiring close out before the change in land use can proceed and those that will form part of the future Pipeline Integrity Management Plan (PIMP) or equivalent.

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

3.4 Specific Approach for this Study

The pipeline under consideration during this study has its own existing pipeline SMS (last updated in 2016), which covers the existing threats and controls for the pipeline based on the current land use for the development site. The focus of this study is on potential new threats or changes to existing threats as a result of the construction and long-term presence of the Wallan East (Part 1) PSP Development.

4. PIPELINE TECHNICAL DETAILS

The SMS focused on the sections of pipelines within the Wallan East Precinct Structure Plan area. The pipeline's technical details and resistance to penetration data in the area of the PSP can be summarised as follows:

Table 2, Pipeline Technical Details T119

Substance conveyed	Natural Gas
Pipeline License No.	Lic 101, T119
Measurement Length (ML)	495m (4.7 kW/m2 Heat Radiation Zone)
	302m (12.6 kW/m2 Heat Radiation Zone)
Length of pipeline	1767.3 m + 2 x 495m (Total 2757 approx.)
Pipeline Under Review within PSP	KP18.0 to KP 19.1
Outside diameter	406.4 mm
Wall thickness	12.7 mm
Depth Of Cover	1.2 – 1.6m
Pipe specification	API 5L Grade X70 (with Dual Layer FBE coating)
Max. Allowable Operating Pressure (MAOP)	15306 kPa (MAOP)
Location Class - Primary	T1
Location Class – Secondary	S (from KP 3.0 to KP 7.7)
CDL	176mm (@ 12.7mm WT)
Hole size & ML based on 10GJ/s release rate	121mm & 146m (12.7mm WT)
Hole size & ML based on 1GJ/s release rate	47mm & 58m (12.7mm WT)

Calculations for this information are included in the SMS Database Lic 101 VNIE Wollert to Barnawartha T119 2018 Rev 0.2 Spreadsheet and Heat Radiation Release Calculation T119 are included in Appendix E.

The pipeline excavator risk can be summarised as follows:

Table 3, Excavator Risk T119

Max equipment sizes without risk of a leak:	
Excavator with std bucket	No leak up to 55T
Excavator with Single Tiger Tooth	40T
Excavator with Twin Tiger Tooth	No leak up to 55T
Excavator with Penetration Tooth	40T
Max equipment sizes without causing rupture: -	
Excavator with std bucket	No Rupture
Excavator with Single Tiger Tooth	No Rupture
Excavator with Twin Tiger Tooth	No Rupture
Excavator with Penetration Tooth	No Rupture
Any unacceptable defects from DCVG report?	No known defects
Any unacceptable defects from Intelligent pigging report if available if pipe is piggable?	No known defects

Calculations for this information are included in the SMS Database Lic 101 VNIE Wollert to Barnawartha T119 2018 Rev 0.2 Spreadsheet and Penetration Resistance Calculation T119 are included in Appendix E.

Table 4, Pipeline Technical Details T74

Substance conveyed	Natural Gas
Pipeline License No.	Lic 101, T74
Measurement Length (ML)	273m (4.7 kW/m2 Heat Radiation Zone)
	167m (12.6 kW/m2 Heat Radiation Zone)
Length of pipeline	1767 m + 2 x 273m (Total 2313 approx.)
Pipeline Under Review within PSP	KP17.45 to KP 18.55
Outside diameter	323.9 mm
Wall thickness	7.55mm
Depth Of Cover	1.1 – 1.6m
Pipe specification	API 5L Grade X46 (with Heat Shrink Sleeves coating)
Max. Allowable Operating Pressure (MAOP)	8800 kPa (MAOP)
Location Class - Primary	T1
Location Class – Secondary	I (from KP 0.0 to KP 3.3)
CDL	110mm (@ 7.55 mm WT)
Hole size & ML based on 10GJ/s release rate	Rupture (187mm & 177m, 7.55mm WT)
Hole size & ML based on 1GJ/s release rate	61mm & 58m (7.55mm WT)

Calculations for this information are included in the SMS Database Lic 101 Melbourne Wodonga Shepparton T74 T59 2016 Rev 0.1Z Spreadsheet and Heat Radiation Release Calculation T74 are included in Appendix E.

The pipeline excavator risk can be summarised as follows:

Table 5, Excavator Risk T74

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

Calculations for this information are included in the SMS Database Lic 101 Melbourne Wodonga Shepparton T74 T59 2016 Rev 0.1Z Spreadsheet and Penetration Resistance Calculation T74 are included in Appendix E.

5. WORKSHOP RESULTS

The workshop team reviewed the proposed Development and confirmed that the existing T1 Location Class for the pipelines is appropriate. APA representatives did advise that at the most recent 5-yearly SMS review of the pipelines it was known that a development was likely in this location and that the Location Class had already been changed.

The Threats listed in Appendix C were used as a guide when reviewing the Development. Forty (40) Threats were specifically recorded for comments on the day of the Workshop. The other Threats listed in Appendix C were either unaffected by this Development or not relevant to this Development and not expected to change the frequency of these threats occurring.
The results of the 40 Threats specifically considered can be summarised as follows: -

Table 6, Risk Assessment Summary

Pipeline	Threats		Threats requiring Risk Assessment	Risk Assessment		
	Non-Credible	Credible		Negligible	Low	Intermediate
T119	13	27	6	-	6	-
T74	11	29	8	-	7	1

The workshop results were recorded in the minutes, provided in Appendix H.

5.1 Low Threats

There were 7 threats that were risk assessed as LOW for T74 (6 threats for T119) and did not require further ALARP or LOPA assessment.

The threats were based on the pipelines being struck by either an excavator, an HDD, or an Auger which each piece of equipment having the ability to gouge the pipe and damaging the coating or putting a hole up to 50mm in diameter in the pipeline.

The workshop considered both Safety and Supply considerations when making the assessment on the following basis for the two failure modes:

For coating damage or a gouge in the pipeline

- Loss of Supply consideration only: -
    - Consequence - Minor as supply can be made up from other sources.
    - Likelihood - Unlikely as pipelines can be impacted from time to time.

For putting a hole in the pipeline

- Safety consideration: -
    - Consequence - Major as potential work crew or an onlooker could be seriously injured or killed.
    - Likelihood - Hypothetical as never happened in a pipeline in Australia.
- Loss of Supply consideration: -
    - Consequence - Severe for loss of supply as outage was considered relatively short term but perhaps up to a week.
    - Likelihood - Hypothetical as never happened in a pipeline in Australia.

The act of setting up for these activities can be a major exercise and the weekday patrolling would almost certainly spot the activity and take control of the work to protect the pipeline.

The use of concrete footpaths over the pipelines also makes the likelihood of failure very low. The Workshop agreed that the Likelihood of failure for this Threat was in the Hypothetical range and required no further mitigation being deemed a LOW risk.

5.2 Intermediate Threats

There was only one threat (Threat ID 4) associated with T74 that was risk assessed as INTERMEDIATE and requiring further ALARP or LOPA assessment.

Threat ID 4 - The scenario considered an uncontrolled excavation over the pipeline using an excavator capable of rupturing the T74 DN300 pipeline. This in turn would put at significant risk the work crew and the residents within 275m (ML) distance of the pipeline.

The Workshop considered the implications of rupturing the pipeline as follows: -

- Safety consideration: -
    - Consequence - Catastrophic as it would be likely to kill more than 2 people in the ML due to population density.
    - Likelihood - Hypothetical as has never happened in a pipeline in Australia.
- Loss of Supply consideration: -
    - Consequence - Major, for loss of supply as outage is significant, however the societal risk is relatively low with gas supply being made up from other sources.
    - Likelihood - Hypothetical as has never happened in a pipeline in Australia.

There are other forms of mitigation for this type of threat referred to in AS2885.6 (Section 4.2) including: -

- relocating the pipeline,
- replacing the pipeline with stronger pipe
- lowering the pipeline pressure
- or not proceeding with the development within the ML

However, it is clear that these mitigations would be extremely expensive or not practical.

The SMS Workshop Team discussed the Intermediate Risk Assessment and confirmed that with the provision of a concrete path and buried marker tape over the T74 pipeline as part of the PSP development along with the other existing physical and procedural mitigations, the residual risk was considered ALARP.

6. DISCUSSION

6.1 Water Crossings

During the workshop attendees included staff from Yarra Valley Water and Melbourne Water to discuss current plans for various water crossings. The crossings planned are:

1. Potable water DN225 and DN150 installed above the gas pipelines typically at road crossings.
2. Recycled water DN150 installed above the gas pipelines typically at road crossings.
3. Reticulated Sewer DN225 installed at a depth below the gas pipelines.
4. Main Sewer DN300 installed at a depth below the gas pipelines.
5. Stormwater runoff and holding basins adjacent to the pipeline easement.

The water crossings will be installed based on APA's standard utility crossing designs under APA's permit system and under the supervision of APA staff.
Indicative/Concept sewer and water reticulation layouts were provided by YVW at the workshop, sections of which are included below.

Figure 4 - Wallan East (Part 1) Working Draft Sewer & Water Reticulation Layout provided by YVW.

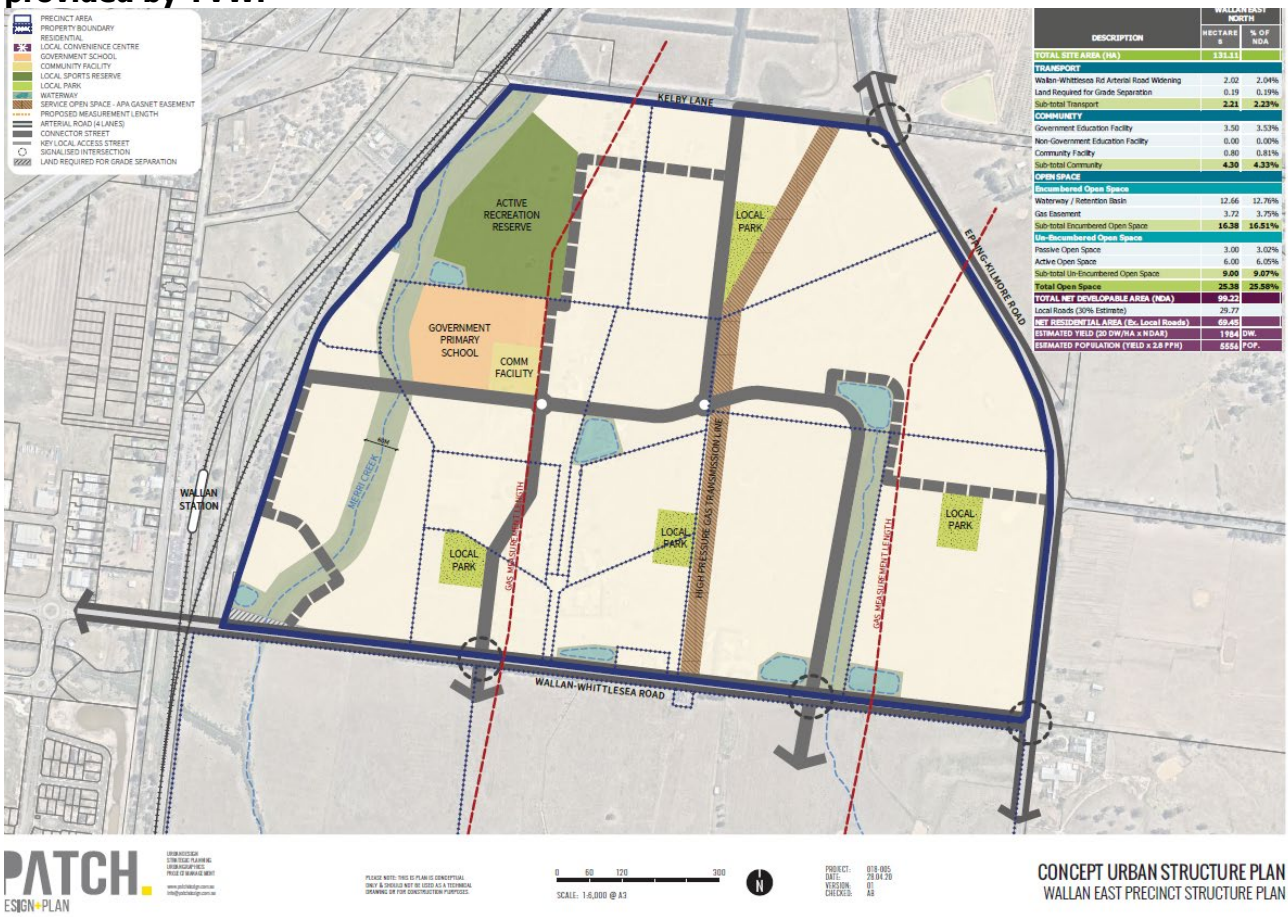


Figure 5 - Wallan East (Part 1) Working Draft of Sewer Staged Layout presented at the SMS Workshop.

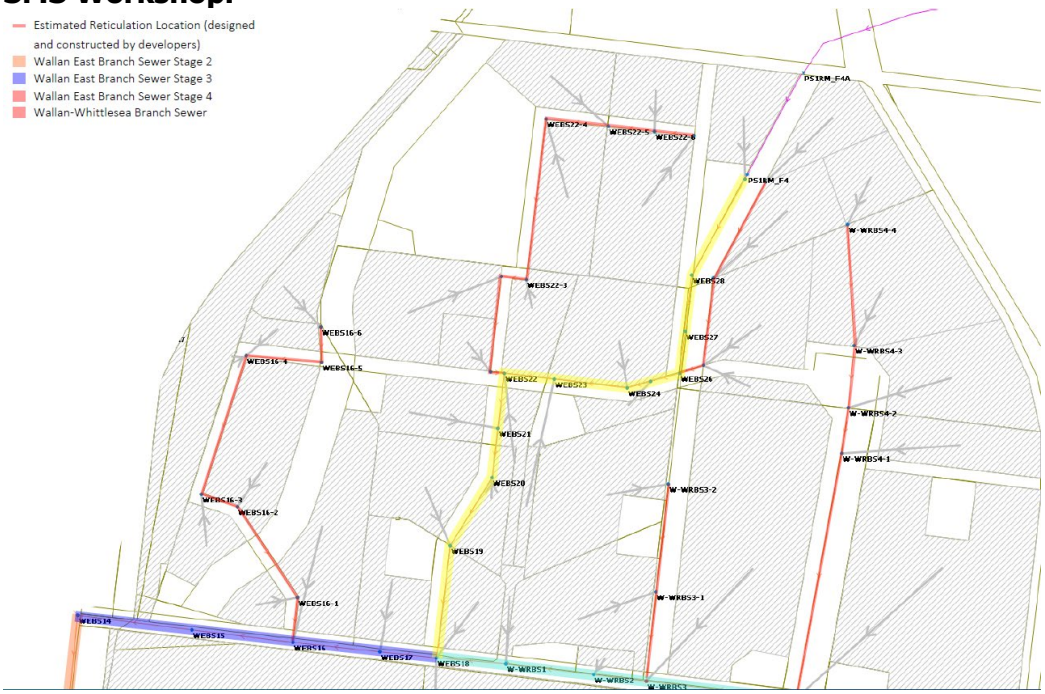
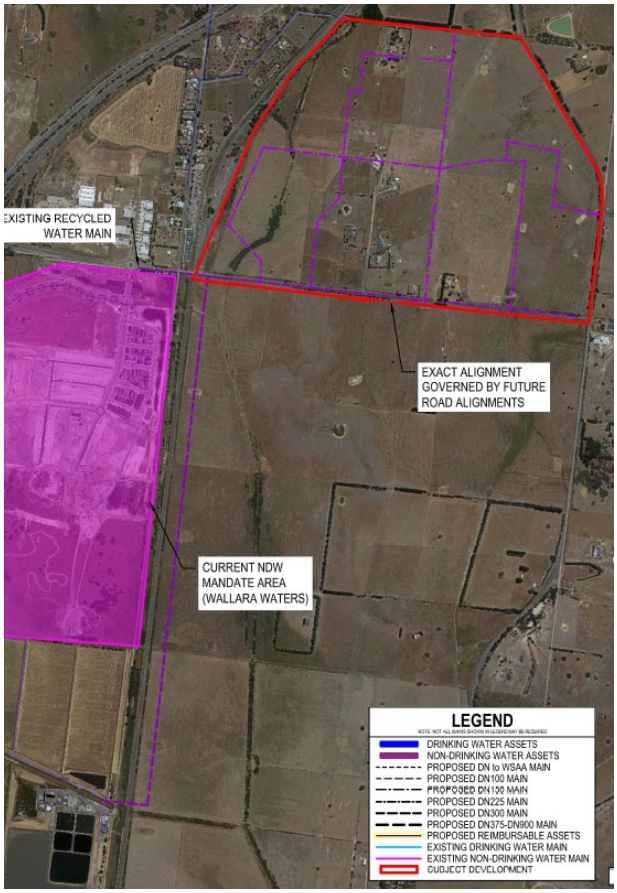


Figure 6 - Wallan East (Part 1) Working Draft of Water Mains presented at the SMS Workshop.



6.2 City Gate Input

The Wallan City Gate is located at the crossing of the pipeline easement and Wallan-Whittlesea Rd on the southern side of the PSP area. APA Networks advised that a noise survey should be undertaken to determine if any noise mitigation treatments should be implemented to meet EPA requirements once the PSP is populated.

The City Gate supplies gas to the town of Wallan via a buried gas pipeline running along the southern side of the Wallan-Whittlesea Road. Whilst this pipeline is not a Transmission Pipeline under AS2885, this is a critical main and the source of supply into Wallan, and care must be taken when widening the road as part of the development. APA Networks should be engaged to ensure the pipeline is protected during the road upgrade.

6.3 Marker Tape

APA provided the following photo to show what marker tape would typically look like.

Figure 7 - Typical Marker Tape.

7. ACTIONS

Twenty-Two (22) actions were developed during the SMS workshop including who carried what responsibility for closing out each action. The list of actions is referenced below.

APA and/or APA Networks will require 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. All close out material provided by the Developer or a third party is to be provided to APA's and/or APA Networks representative for review and approval/acceptance at relevant stages of the development of the PSP.

Table 7, Action List

Miscellaneous Actions

No.	Issue	Action	Responsibility	Due Date
A1	**Development of Construction Management Plan (CMP) does not include required pipeline protection mitigations raised at SMS leading to pipeline failure during development works**	APA approval of the Construction Management Plan	APA/APA Networks/ Council	Include requirement in Planning Permit
A2	**Road widening works and future spoon drain maintenance may impact the integrity of the existing APA Networks pipelines running on the south side of Wallan-Whittlesea Rd into Wallan township**	Road design to be reviewed and accepted by APA Networks	VPA/Council/ APA NETWORKS/ DoT/VicRoads	Include requirement in Planning Permit
A3	**Expansion of Wallan-Whittlesea Rd may impact safe access to the city gate**	Road design to consider appropriate access lanes into and out of the City Gate Compound. (Changes will be designed as part of the detailed design stage of the upgrade of the road)	Council/ APA NETWORKS/ DoT	Prior to finalisation of design of road project
A4	**Piling not currently anticipated for this PSP development. Could result in pipeline rupture if used in an uncontrolled manner.**	Piling as part of the PSP development is specifically excluded from the works unless specific piling is requested, and the activity risk assessed and approved by APA prior to any works taking place. Advice to be included in future developer tender documents	VPA/Council/ APA	Include requirement in Planning Permit
A5	**Third party uncontrolled access to the pipeline easement may affect depth of cover over pipeline or lead to malicious damage to pipeline.**	Consider the requirement for protective removable bollarding or similar assets that will prevent uncontrolled vehicle access to the proposed linear park where it sits over the pipeline easement.	VPA/Council/ APA	At the Planning Permit stage
A6	**Inappropriate road crossing design over stresses the pipeline having a long-term impact on pipeline integrity leading to damage**	Road crossing design to be approved by APA	VPA/Council/ APA	At the Planning Permit stage
A7	**Stormwater design impacts pipeline easement leading to loss of cover and or pipeline damage**	MW to produce stormwater management plans and any proposed crossing designs for PSP and review them with APA.	MW/APA	Prior to finalisation of detailed PSP design
A8	**Sewer and reticulated water crossing design impacts pipeline easement leading to pipeline damage or rupture**	Developer to liaise with YVW to produce proposed crossing designs for PSP and review them with APA. (Note: - as the Developer is not in attendance at the SMS it is expected YVW will have some interaction with the Developer in reviewing & agreeing the final design)	YVW/Developer/ APA	At the Planning Permit stage
A9	**APA has specific requirements for road and utility crossing drawings**	APA to provide standard road and utility crossing design drawings to VPA and Council	APA	At the Planning Permit stage
A10	**Soil types will affect MW stormwater design**	APA to provide feedback to MW with respect to soil types in the area of the pipeline easement	APA	At the Planning Permit stage

Threat Specific Actions

No.	Issue	Action	Responsibility	Due Date
4	T74 is susceptible to rupture by known excavator threats in the area.	The T74 pipeline requires additional physical protection from excavator impact. An appropriate use of concrete slabbing (e.g. as a footpath) directly over the pipeline and marker tape installed under the slabbing would be an appropriate mitigation as part of the PSP development of a linear park design for the easement. Easement design cross section to be developed by VPA	APA/VPA/ Council	Include requirement in Planning Permit
15	Deep excavation over the pipeline is a credible threat not mitigated by current controls	Avoid putting street lighting within the pipeline easement. Pedestrian lighting within linear park should consider pad type footings. Refer to APA landscape guidelines for more detailed guidance for works within pipeline easement.	VPA/Council	At the Planning Permit stage
17	Road Crossing (road legal vehicles).	APA to provide Std Road Crossing Design to VPA for reference.	APA/VPA	Prior to finalisation of design
18	During construction, the pipeline may be put at risk due to random and or repeated crossing of the easement by road legal and non-road legal vehicles	PSP to require CMP (including proposed temporary crossing design and traffic management plan) for any works within 50m of the pipeline easement. APA to review any proposed vehicle crossing locations and proposed vehicle using the crossing. Crossing to be constructed per APA standard temporary vehicle crossing or as directed by APA	VPA, Council, APA	At the Planning Permit stage
23	Damage to Cathodic Protection equipment during works could lead to pipeline failure in the long term	APA & APA Networks to confirm to VPA & Council locations of CP test point and anode beds and agree a method of protecting assets from damage during road Wallan/W Road upgrade and PSP	APA/APA Networks/ VPA/Council	Before any construction works commences
26	Damage to pipe if exposed during works. Vehicle impact/malicious damage.	Review individual excavation plans and mitigations including consideration for steel plates or temporary bollards. PSP Permit to reflect requirements	VPA/Council/ APA	Before any construction works commences
31	New road crossings or easement furniture/infrastructure make accessing the pipeline very difficult into the future post the PSP. New easement furniture/infrastructure make accessing the pipeline very difficult into the future post the PSP	New road crossings trigger requirement for coating inspection and possible rectification within the road reserve. Undertake coating assessment to determine whether recoating needs to be undertaken in locations within road reserve. New furniture/infrastructure in easement must comply with APA Easement Landscape guidelines	APA / APA Networks/ VPA / Council	As part of Planning Permit stage and then approved by APA/APA Networks at detailed design
32	Threat - New building footings located on edge of easement	VPA and Council to agree with APA on an appropriate set back distance in PSP Permit requirements	VPA / Council/ APA	As part of Planning Permit stage
34	Deep ripping could rupture T74 and potentially T119 if ripper is large enough	Deep Ripping is to be excluded from use in the PSP. To be included in the PSP Permit requirements	VPA/Council/ APA	As part of Planning Permit stage
35	Noise levels from city gate may exceed EPA requirement near suburban dwellings potentially impacting the operation of the city gate in the future.	VPA/Council to arrange for a future Developer to conduct a noise survey of City Gate to confirm what the existing noise contour is and whether any additional noise mitigations are required to comply with EPA levels at nearest dwelling. Any proposed modification to the city gate must be reviewed and approved by APA and APA Networks	VPA / Council/ APA/ APA Networks	As part of Planning Permit advice and then approved by APA/APA Networks at detailed design.
38	Need to use augering within easement to install light poles could damage pipelines if not properly controlled	Consider use of concrete slab footings for light poles within the easement to mitigate need for Augering within easement. APA to approve proposed lighting construction method within easement. (use of slab footings also allows for easier removal of light if pipeline works are required)	APA / APA Networks/ VPA / Council	As part of Planning Permit advice and then approved by APA/APA Networks at detailed design
39	Landscaping of easement as part of PSP may change pipeline depth of cover or introduce inappropriate vegetation to the easement	APA to provide Easement Landscaping Guidelines to Developer for incorporation into the final Design. APA to review any proposed landscape plans.	APA/ VPA	Prior to completion of Detailed Design of the PSP

8. CONCLUSION

A Safety Management Study (SMS) was undertaken to review whether or not additional protection measures are required to mitigate the risks associated with the construction of and future use of the new Wallan East (Part 1) PSP Development in accordance with the requirements of the Australian Standard AS2885 for High Pressure Gas Pipelines.

This report summarises the following aspects considered at the SMS workshop:

- The nature of the pipelines in question
- The key aspects of the Development presented that reside near the pipelines.
- Review the Location Classification of the pipeline and facility resulting from the proposed Development.
- Review of AS2885 requirements for the agreed Location Classification
- The threats considered.
- The threats requiring Risks Assessment and the findings of those assessments.
- The actions required to ensure the ongoing safe operation and maintenance of the pipelines in compliance with AS2885.
- Identify planning options which account for the presence of the pipeline.

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 proposed Development and the Pipelines, and therefore possessed sufficient knowledge and experience to carry out an effective workshop review.

The SMS undertaken is considered to be a Front-End Engineering Design (FEED) SMS as many of the proposed crossings are yet to be designed or located. Reference to AS2885 Part 6 Section 5.6 confirms that a Detailed Design SMS will need to be completed with the engaged Developer at a minimum, once the detailed design of the PSP and associated crossings have been prepared by the Developer and before any works are approved to start on site.

Continuing liaison between the VPA, MW, YVW, APA Networks and APA should ensure that construction activities and post construction activities pose no significant increase in the operational and maintenance risk to the transmission pipelines running past the Development.

Upon satisfactory close out of the actions raised from this SMS Workshop and completion of the relevant Project Lifecycle SMS studies required under AS2885.6-5.6, it can be confirmed that the requirements of AS2885.6-2018 are met and that the APA and APA Networks assets under review will continue to be in compliance with the SMS requirements of AS2885.6-2018 in the Wallan East (Part 1) Development area.

APPENDIX A: Attendance List

Table 8, Attendees List

Name	Position	Organisation	Attendance
Mark Harris	Facilitator	DRMC	Yes
Conrad Mazurkiewicz	Strategic Planner	VPA	Yes
Ammar Habasch	Strategic Planning Manager	VPA	Yes
Crystal Tang	Strategic Planner	VPA	Yes
Melanie Ringersma	Senior Planner	VPA	Part-time
James Kirby	Senior Strategic Planner	Mitchell Shire Council	Morning Only
Rosario Guastalegname	Coordinator Urban Design	Mitchell Shire Council	Afternoon Only
Sajna Ramachandran	Project Development Engineer	APA Group	Yes
Glenn Ogilvie	Senior Risk Engineer	APA Group	Yes
Michael Mielczarek	Senior Urban Planner	APA Group	Yes
Keith Lenghaus	Integrity Manager	APA Networks	Yes (1pm-2pm)
Jen Sweatman	Planning Engineer	Yarra Valley Water	Yes (11am-12pm)
Melissa Sartori	Water Growth Planning	Yarra Valley Water	Yes (11am-12pm)
Maryanne Tully	Development Planning Manager	Yarra Valley Water	Yes (11am-12pm)
Felicity Gould	Manager Water Growth	Yarra Valley Water	Yes (11am-12pm)
James Hodgens	Project Manager	Melbourne Water	Yes (11am-12pm)
Laurence Newcome	Precinct Structure Planning Coordinator	Melbourne Water	Yes (11am-12pm)

APPENDIX B: Classification of Locations

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**.**

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.

APPENDIX C Threats & Controls

Table 9, Threat Identification Prompts

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 & Maintenance	Exceeding MAOP of pipeline
	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

Table 10, External Interference Protection – Physical Controls

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

Table 11, External Interference Protection – Procedural Controls

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

Dimension	Severity class				
	Catastrophic	Major	Severe	Minor	Trivial
	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 (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 CLASSES

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.

TABLE 3.3

RISK MATRIX

	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 O of CSA Z662-07) 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: Documents and References for Workshop

The documents referenced at the SMS workshop are listed below.

Table 12, Documents & References for Workshop

Document Name	Document Number
Proposed Development	201021_Wallan East (Part 1) PSP_Draft Emerging Place Based Concept_Op1
Jacobs – Wallan East Utility Services Assessment	D/19/5148 3/7/2020
Jacobs – Wallan East PSP – Existing Utility Services Plan	IS311600-0000-SKT-0001/2/3/4/5/6/7/8/9 RevA
YVW - Wallan Planned Sewer Assets	N/A
Pipeline Penetration Calc	Penetration Resistance Calculation T74 Penetration Resistance Calculation T119
Pipeline Radiation Contour Calc	Heat Radiation Release Calculation T74 Heat Radiation Release Calculation T119
SMS Databases	SMS Database Lic 101 Melbourne Wodonga Shepparton T74 T59 2016 Rev 0.1Z SMS Database Lic 101 VNIE Wollert to Barnawartha T119 2018 Rev 0.2
Pipeline Route Plan & Longitudinal Section	T74-19_1_AB T74-19-1 T74-19-2 T74-20-1 T74-20-1_1_AB T74-20-2 T119-16 T119-16-1_1_AB T119-16-2_1_AB T119-17 T119-17-1_1_AB T119-17-2_1_AB T119-18-1_1_AB

The legislative references for this Workshop are listed below: -
Victoria

- Pipelines Act 2005
- Pipelines Regulations 2017

The Industry Standards referenced for this Workshop are listed below: -

- AS2885.0 – 2008 General
- AS2885.1 – 2012 Design & Construction
- AS2885.3 – 2012 Operations and Maintenance

APA Pipeline Management System - Volume 1 Introduction – dated 3/11/16 Section 2 Coverage states that when conflict exists between the various applicable documents, the following order shall apply, in decreasing order of precedence. Where APA requirements are more stringent, they shall take precedence.

- Acts of law or other legislation
- Government licenses and permits
- APA Engineering Standards. This will be covered by documented practices and any specific inputs from APA risk assessments.
- Local engineering standards

Note the following advice from the APA SMS Technical Guide for Localised Urban Developments: -

- There is no requirement to redo-calculations if the calculations provided by APA have already been completed.
- If there are threats that are new i.e., not captured by the existing Pipeline SMS and it needs supporting calculations, then the Facilitator can raise this with APA where it can leave it to APA to perform the calculations or have an external provider produce the calculations that will be issued to APA for review and approval.
- The facilitator can identify any aspects of the calculations that need to be updated but it is not their responsibility to perform any peer reviews on the existing APA calculations.
- The facilitator is to conduct a threat assessment pertaining to the development in question before the commencement of the SMS Workshop (unlike a HAZOP which requires the risk assessment to be done during the workshop). That is revisit the existing threat controls even if they have already been captured in the existing SMS Database.
- The workshop is to validate the location class and all the threats have been captured and the necessary control measures are documented covering construction activities and future threats.

APPENDIX F: SMS Terms Of Reference

Victorian Planning Authority

Wallan East (Part1) PSP, Mitchell Shire Council, Vic

SMS Workshop Terms of Reference

DRMC Ref Number: 2020-0010-REP-002

Current Revision

Revision:	Reason for Revision:	Revision Date:3 Dec 2020	
Rev No.0	Issued for SMS workshop		
Prepared By:	Mark Harris	Signature:	
Reviewed By:	Conrad Mazurkiewicz – VPA	Signature:	

Revision History

Rev	Revision Date	Reason for Revision	Prepared By	Reviewed By	Reviewed By	Approved By
A	26/11/20	Issued For Review				
0	3/12/2020	Issued for Use	MAH	CM (VPA)		MAH

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1 ABBREVIATIONS

ALARP	As Low As Reasonably Practicable
APA	APA Group (Pipeline Licensee)
APT	APT Services (City Gate Operator)
AS	Australian Standard
CIC	Common Infrastructure Corridor
CDL	Critical Defect Length (mm) is a hole size where a pipeline is likely to rupture
DRMC	Delphi Risk Management Consulting – SMS Facilitator
DN	Diameter nominal
EPC	Engineering Procurement Construction
FEED	Front end engineering design
FJC	Field Joint Coating
GIS	Geographical Information System
HDD	Horizontal Directional Drill (used for installation of utilities under existing assets)
km	Kilometre(s)
KP	Kilometre Point
LC	Location Class
LOPA	Layers of Protection Analysis
m	Metre(s)
MAOP	Maximum Allowable Operating Pressure
ML	Measurement Length (4.7 kW/m2 radiation contour in the event of a full bore rupture of the pipeline)
MLV	Main Line Valve
MSC	Mitchell Shire Council
MW	Melbourne Water
OPP	Overpressure Protection
PIMP	Pipeline Integrity Management Plan
PL	Pipeline License
PPC	Primary Pressure Control
ROW	Right of Way
SMS	Safety Management Study
SMYS	Specified Minimum Yield Stress
SPC	Secondary pressure Control
TOR	Terms of Reference
VPA	Victorian Planning Authority
YVW	Yarra Valley Water

2 INTRODUCTION

2.1 Wallan East (Part1) PSP Project Description

The Victorian Planning Authority (VPA) is currently developing the Wallan East (Part1) Precinct Structure Plan (PSP2012) located in the Mitchell Shire Council, approximately 60 kilometres north of Melbourne's Central Business District. The precinct is currently used for rural purposes and is 140 hectares in area.

The Wallan East (Part1) PSP is generally bound by:

- Kelby Lane to the north;
- Epping – Kilmore Road to the east;
- Wallan-Whittlesea Road to the south; and
- The Sydney-Melbourne railway line to the west.

The precinct is located on Wallan-Whittlesea Road, east of Wallan township and the existing Wallan train station on the Sydney-Melbourne rail line.

This PSP proposes the following development of this area:

- A residential, community and commercial precincts is nominated for development.
- The precinct will ultimately support a residential community comprising approximately 2250 dwellings and a population of around 7,000 new residents.

2.2 Gas Transmission Infrastructure

The APA Group has advised of the following assets are within the PSP area:

Pipeline	**Pipeline Licence**	**Easement Width (m)**	**Easement Location** **(refer Fig 2 below)**	**Diameter (mm)**	**Measurement Length (m)**
Keon Park – Wodonga West	T074	35	Westside	300	273
Victorian Northern Interconnect – Loop 1	T119	35	Eastside	400	495
	Note: Measurement Length is applied to either side of the pipeline				

In addition, APA have advised there is an existing "City Gate" gas facility operated by APT located to the south of Wallan-Whittlesea Road. These types of facilities may also impact upon the amenity of surrounding uses (noise, smell, safety etc.) and will be considered when undertaking the SMS for this PSP.

To comply with Australian Standard AS/NZS 2885.1:2018, any Development works in the immediate vicinity of the gas main must be subjected to a Safety Management Study (SMS) to review all possible threats to the safe operation and maintenance of the pipeline and ensure that any threats that cannot be mitigated by design or procedures are risk assessed and confirmed to be As Low As Reasonably Practical.

This document outlines the Terms of Reference for the SMS Workshop

Figure 1 – Wallan East (Part1) Draft Future Urban Structure and location of APA Pipelines

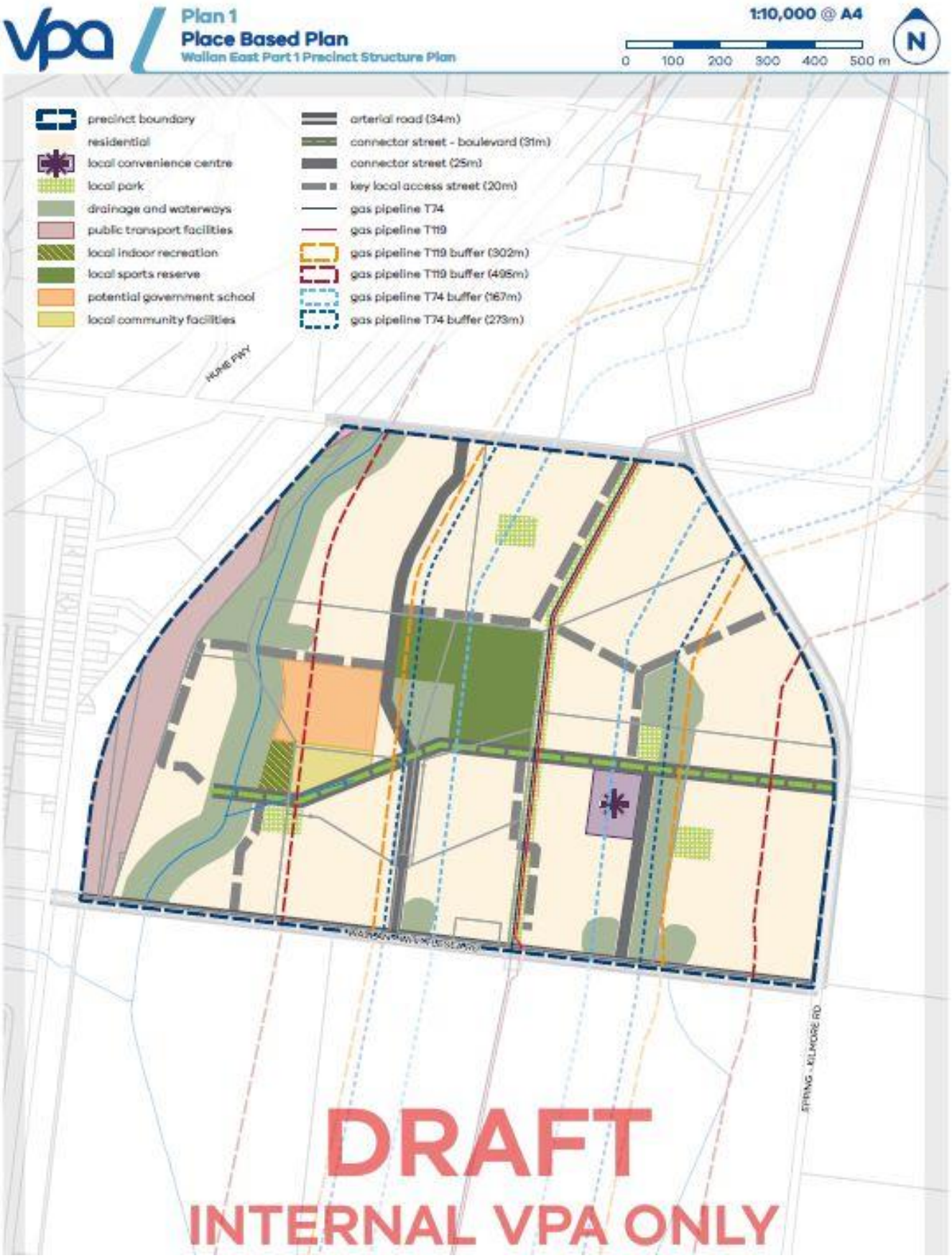
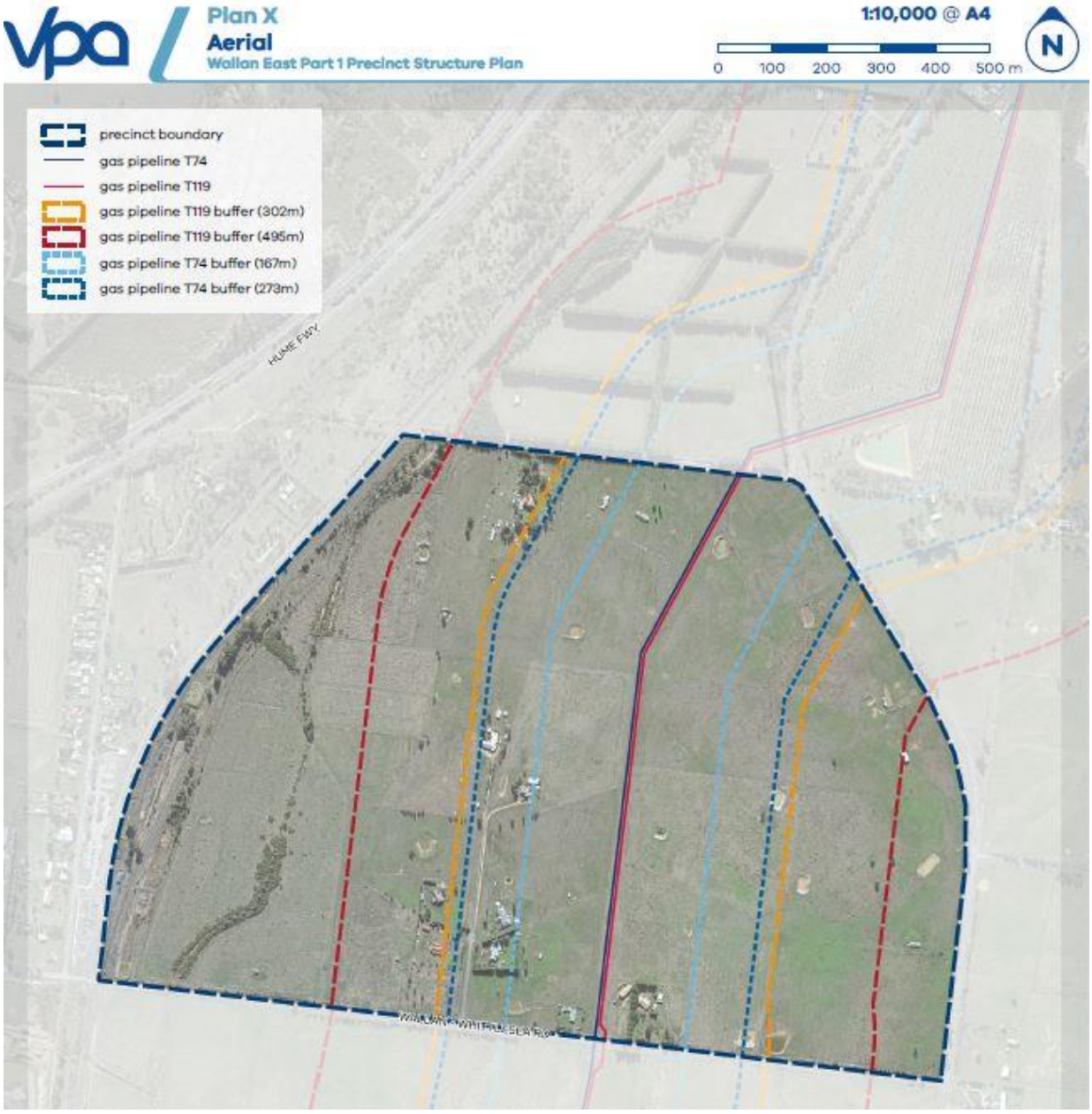


Figure 2 – Wallan East (Part1) Current Land Use and location of APA Pipelines



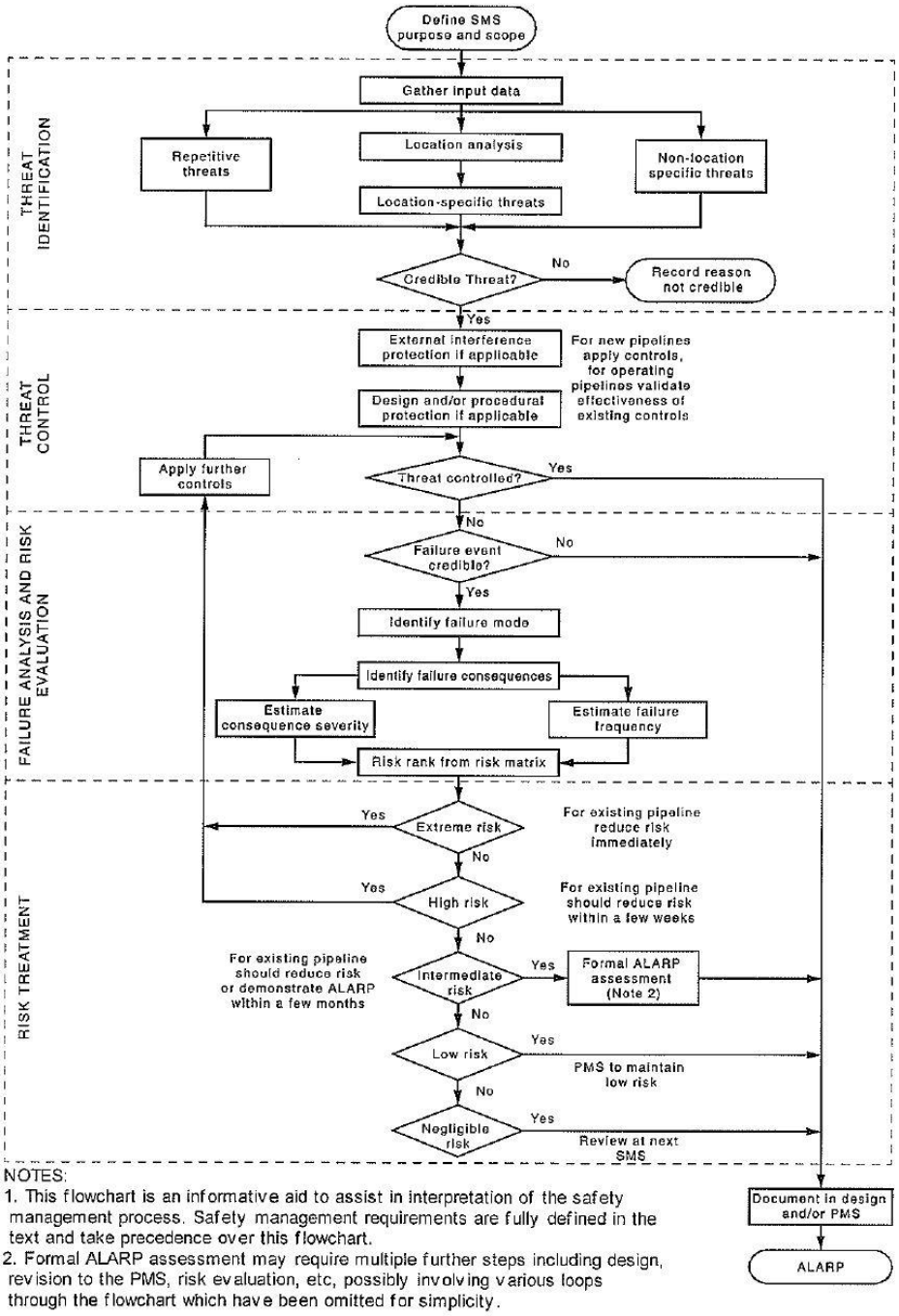
3 OBJECTIVE AND METHODOLOGY

Prior to the SMS workshop being convened APA and VPA teams have prepared a range of relevant information to be presented to the workshop (refer to Section 4 below for the list of Documents). The information available includes the results from previous SMS workshops held for the existing pipelines.

The SMS workshop objective is to re-validate the APA pipeline design under AS/NZS 2885.1:2018 against the proposed new land use plans.

The risk assessment process is broadly described in Figure 2 below.

Figure 3 – AS/NZS 2885.6:2018 Risk Assessment Process



The focus of the SMS workshop is on the safe operation and maintenance of the pipeline including consideration of the risks of the construction of the mixed use development and on the safe operation and maintenance of the pipeline into the future.
Where the SMS workshop considers that a design proposed is inadequate to reduce a particular identified threat to a level of accepted risk, it will identify additional controls which if implemented, would achieve that objective.

If further controls cannot fully mitigate the threat then the SMS workshop will risk assess the residual threat against a recognised industry risk matrix to determine the residual level of risk. 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).

At the end of the Workshop, participants will be required to form an opinion on the quality of the SMS presented for review, and to reach a conclusion as to whether the SMS satisfies the requirements of Section 5.2.2 of AS/NZS 2885.6:2018.

Actions minuted during the course of the SMS workshop will fall into two general categories, those requiring close out before the change in land use can proceed and those that will form part of the future Pipeline Integrity Management Plan (PIMP).

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

A copy of the Development Plan will be available on a wall of the workshop with additional smaller copies for reference on the table. All other relevant documents will be made available in either electronic or hard copy at the SMS Workshop.

An SMS Report will be 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 DOCUMENTS AND REFERENCES FOR WORKSHOP

The documents required for the SMS workshop are referenced below.

Table 1, Documents

Document Name	Document Number
Proposed Development	201021_Wallan East (Part1) PSP_Draft Emerging Place Based Concept_Op1
Jacobs – Wallan East Utility Services Assessment	D/19/5148 3/7/2020
Jacobs – Wallan East PSP – Existing Utility Services Plan	IS311600-0000-SKT-0001/2/3/4/5/6/7/8/9 RevA
YVW - Wallan Planned Sewer Assets	N/A
Pipeline Penetration Calc	Penetration Resistance Calculation T74 Penetration Resistance Calculation T119
Pipeline Radiation Contour Calc	Heat Radiation Release Calculation T74 Heat Radiation Release Calculation T119
SMS Databases	SMS Database Lic 101 Melbourne Wodonga Shepparton T74 T59 2016 Rev 0.1Z SMS Database Lic 101 VNIE Wollert to Barnawartha T119 2018 Rev 0.2
Pipeline Route Plan & Longitudinal Section	T74-19_1_AB T74-19-1 T74-19-2 T74-20-1 T74-20-1_1_AB T74-20-2 T119-16 T119-16-1_1_AB T119-16-2_1_AB T119-17 T119-17-1_1_AB T119-17-2_1_AB T119-18-1_1_AB

The legislative references for this Workshop are listed below:-
Victoria

- Pipelines Act 2005
- Pipelines Regulations 2017

The Industry Standards referenced for this Workshop are listed below:-

- AS 2885.0 :2018 Gas and liquid petroleum General requirements
- AS/NZS 2885.1:2018 Gas and liquid petroleum Design & Construction
- AS2885.3 :2012 Gas and liquid petroleum Operations and Maintenance
- AS/NZS 2885.6:2018 Pipelines - Gas and liquid petroleum - Pipeline safety management

APA Pipeline Management System - Volume 1 Introduction – dated 3/11/16 Section 2 Coverage states that when conflict exists between the various applicable documents, the following order shall apply, in decreasing order of precedence. Where APA requirements are more stringent, they shall take precedence.

- Acts of law or other legislation
- Government licenses and permits
- APA Engineering Standards. This will be covered by documented practices and any specific inputs from APA risk assessments
- Local engineering standards

Note the following advice from the APA SMS Technical Guide for Localised Urban Developments:-

- There is no requirement to redo-calculations if the calculations provided by APA have already been completed.
- If there are threats that are new (i.e. not captured by the existing Pipeline SMS) and it needs supporting calculations, then the Facilitator can raise this with APA where it can leave it to APA to perform the calculations or have an external provider produce the calculations that will be issued to APA for review and approval.
- The facilitator can identify any aspects of the calculations that need to be updated but it is not their responsibility to perform any peer reviews on the existing APA calculations.
- The facilitator is to conduct a threat assessment pertaining to the development in question before the commencement of the SMS Workshop (unlike a HAZOP which requires the risk assessment to be done during the workshop). That is revisit the existing threat controls even if they have already been captured in the existing SMS Database.
- The workshop is to validate the location class and all the threats have been captured and the necessary control measures are documented covering construction activities and future threats.

5 WORKSHOP PARTICIPANTS

The Workshop will comprise representatives from the Licensee (APA Group), APT Services (APT), Mitchell Shire Council (Council)and the Victoria Planning Commission (VPA).

Workshop participants will have appropriate experience and authority to present the opinion of the segment that he/she represents.

The integrity of the SMS Workshop is based not only on a detailed assessment of all the relevant data but also the continuous attendance of the various experts during the Workshop.

The SMS Workshop will require fulltime attendance or nomination of an appropriately experienced replacement. The nominated attendees for the workshop are listed below.

Table 2, Participants

Name	Position	Organisation
Mark Harris	Facilitator	DRMC
Conrad Mazurkiewicz	Project Manager	VPA
Ammar Habasch	Strategic Planning Manager	VPA
Crystal Tang	Strategic Planner	VPA
Melanie Ringersma	Senior Planner	VPA
James Kirby	Senior Strategic Planner	Mitchell Shire Council
Rosario Guastalegname	Coordinator Urban Design	Mitchell Shire Council
Travis Conway	Manager Strategic Planner	Mitchell Shire Council
James Hodgens	TBC	Melbourne Water
Laurence Newcome	Precinct Structure Planning Coordinator	Melbourne Water
Maryanne Tully	Development Planning Manager	Yarra Valley Water
Keith Lenghaus	Integrity Manager	APA Group (Networks)
Sajna Ramachandran	Project Development Engineer	APA Group
Glenn Ogilvie	Senior Risk Engineer	APA Group
Michael Mielczarek	Senior Urban Planner	APA Group

6 WORKSHOP RULES

The workshop will be governed by the following rules as a minimum:

- The Owner of the pipeline (APA) along with the City Gate Operator (APT) and the Developer (VPA) will, to the extent practicable, present the pipeline design and Development Plan respectively in a manner that provides participants with sufficient understanding for them to reach an informed opinion as to whether the threats are properly identified, whether the controls applied adequately control the threats, and where risk assessment is required, to reach a conclusion on the risk.
- The opinion of each participant is equally important and relevant, and must be heard and assessed.
- Each participant will conduct themselves in a manner that contributes to the best outcome from the workshop and active participation is compulsory.
- The facilitator will manage the workshop to allow all relevant opinions to be presented, discussed and that each discussion reaches a conclusion.
- Please be prompt at the start of each day and when returning from breaks.
- Mobile phones are to be switched off or on silent, any important calls may be taken outside the workshop room.
- As this is a "TEAMS" Workshop please use your video where possible so all participants can see you and allow the facilitator to better engage with all participants.

7 SMS WORKSHOP LOGISTICS

The Safety Management Assessment Workshop will be held on the 9th of Dec 2020
Location for the workshop will be on TEAMS, the VPA will issue the meeting request.

The SMS agenda proposed in Section 9 is indicative only. It should be noted that the integrity of the SMS process will take priority over meeting particular time commitments.

The workshop will commence at 9:00am sharp and will end between 3:00pm and 4:00pm. ***(Note:- it is far more important to properly consider all the risks rather than try and rush to meet a deadline and so I ask all participants to be flexible with their time as the workshop will finish when we are done!).***

Breaks during the day will typically be taken at the following times:

- Morning tea will be taken at ~10:30am for 10 minutes.
- Lunch will be taken at ~12:30pm for 20 minutes.
- Afternoon tea break will be around 3pm depending on how we are progressing.

Electronic copies of the documents will be shared at the Workshop.

8 SCOPE OF SMS

The SMS will focus on the section of pipeline within the Development. The pipeline has been divided into the following sections:

Table 3, Pipeline sections

Pipeline	Pipeline Licence	Previous Location Class	Proposed Primary Location Class	Proposed Secondary Location Class	KP point (km)	Allowable Heat Release Rate from a leak (GJ/s)
Keon Park – Wodonga West	T074	R1/I	T1	-	17.1-18.8	10
Keon Park – Wodonga West	T074	R1/I	T1	S	17.75-18.4	1
Victorian Northern Interconnect – Loop 1	T119	T1	T1 (no change)	-	17.5-19.6	10
Victorian Northern Interconnect – Loop 1	T119	T1	T1 (no change)	S	17.85-19.12	1

In addition to the sections identified in the table above, the SMS will focus on the following aspects of the design:

- Non-Location Specific Threats (e.g. corrosion, coating damage);
- Standard Crossing Designs (e.g. minor roads);
- Location Specific Crossing Designs will be considered as they appear during the meter by meter pipeline risk assessment;
- Slabbing requirements to mitigate risks to the development from third party strikes
- Review of the design calculations or reports which form the basis of the design presented (e.g. wall thickness calculation, fracture control plan etc.).
- There are no above ground pipeline facilities within the area being considered during this SMS.

9 PROPOSED AGENDA

Table 4, SMS agenda

	Agenda Items	Presenter
1	**Welcome**	
2	**Safety Briefing**	**Facilitator**
3	**Pipeline Design Review/ Operating Approach** · Wall Thicknesses · Rupture and puncture · Radiation contours · Location Classes · Fracture Control Plan · Pipeline Isolation Plan · Interface agreements with corridor users · Other relevant items	**Facilitator/APA**
4	**PSP Development Review**	**VPA**
5	**Non-Location Specific Threats Review** · Review identified non-location specific threats – confirm or add as required · Review external interference controls applied and assess adequacy · Review design controls applied and assess adequacy	**All**
6	**Location Specific Threats and Standard Designs Review** · Review location specific threats · **Yarra Valley Water – Sewer/Water Crossing at 11am** · Review Standard designs	**All**
7	**Pipeline Threat Risk Assessment** · Review the threats found not to be mitigated during the threat review process and undertake a risk assessment to determine the level of residual risk. Proposed Risk Matrix is included in Appendix A.	**All**
8	**Pipeline "All Controls Fail" Risk Assessment** · If no Threats have required a risk assessment then select threat(s) for assessment of risk with respect to "all controls fail" – undertake the risk assessment and determine the level of residual risk.	**All**
9	**"ALARP" Assessment** · Any ALARP Assessments will be undertaken outside of the SMS Workshop for separate review and acceptance.	**TBC**
10	**Workshop Close**	

APPENDIX A - AS2885 Risk Matrix

The AS2885.6.2108 Risk Matrix we will use to undertake any risk assessments.
Please refer to Tables 3.1/3.2/3.3 in the Standard. Excerpt of the Risk Matrix from the Standard is attached.

APPENDIX B – SMS Technical Presentation

APPENDIX G: SMS Technical Presentation

AS 2885.1 SMS Workshop
Wallan East PSP

Technical Information

Dec 2020

Facilitator:- Mark Harris
Delphi Risk Management Consulting
Ph 0438890968
ma_harris@me.com

APA Pipeline Licence No. T119 - Design Information

Substance conveyed	Natural Gas
Measurement Length (ML)	495m (4.7 kW/m^2 Heat Radiation Zone) 302m (12.6 kW/m^2 Heat Radiation Zone)
Length of pipeline affected	1100 m + 2 x 495m (Total 2090 approx)
Pipeline section under review within PSP	KP18.0 to KP 19.1
Outside diameter	406.4 mm
Depth Of Cover	1.2 – 1.6m
Pipe specification	API 5L Grade X70 (with Dual Layer FBE coating)
Max. Allowable Operating Pressure	15306 kPa (MAOP)
Location Class - Primary	T1 (KP 17.5 to 19.6 Incl ML)
Location Class – Secondary	None
CDL	176mm (@ 12.7mm WT)
Hole size & ML based on 10GJ/s release rate	121mm & 146m (12.7mm WT)
Hole size & ML based on 1GJ/s release rate	47mm & 58m (12.7mm WT)
Max equipment sizes without risk of a leak(B Factor 1.3, 12.7mm WT)	
• Excavator with General Purpose Teeth	N/A (>55T)
• Excavator with Tiger Teeth (Single Point Penetration)	40T
• Excavator with Twin Tiger Teeth (both Points Penetration)	N/A (>55T)
• Excavator with Penetration Teeth	40T
Max equipment sizes without causing risk of Rupture(B Factor 1.3, 12.7mm WT)	
• Excavator with General Purpose Teeth	N/A (>55T)
• Excavator with Tiger Teeth (Single Point Penetration)	N/A (>55T)
• Excavator with Twin Tiger Teeth (both Points Penetration)	N/A (>55T)
• Excavator with Penetration Teeth	N/A (>55T)

APA Pipeline Licence No. T74 - Design Information

Substance conveyed	Natural Gas
Measurement Length (ML)	273m (4.7 kW/m^2 Heat Radiation Zone) 167m (12.6 kW/m^2 Heat Radiation Zone)
Length of pipeline affected	1100 m + 2 x 273m (Total 1650 approx)
Pipeline section under review within PSP	KP17.45 to KP 18.55
Outside diameter	323.9 mm
Depth Of Cover	1.2 – 1.6m
Pipe specification	API 5L Grade X46 (coated with Yellow Jacket/Heat Shrink Sleeves @ joints)
Max. Allowable Operating Pressure	8800 kPa (MAOP)
Location Class - Primary	T1 (KP 17.1 to 18.8)
Location Class – Secondary	S (TBC - only where sensitive use falls within ML of pipeline)
CDL	110mm (@ 7.55 mm WT)
Hole size & ML based on 10GJ/s release rate	Rupture (187mm & 177m, 7.55mm WT)
Hole size & ML based on 1GJ/s release rate	61mm & 58m (7.55mm WT)
Max equipment sizes without risk of a leak(B Factor 1.3, 12.7mm WT)	
• Excavator with General Purpose Teeth	N/A (>55T)
• Excavator with Tiger Teeth (Single Point Penetration)	10T
• Excavator with Twin Tiger Teeth (both Points Penetration)	N/A (>55T)
• Excavator with Penetration Teeth	10T
Max equipment sizes without causing risk of Rupture(B Factor 1.3, 12.7mm WT)	
• Excavator with General Purpose Teeth	N/A (>55T)
• Excavator with Tiger Teeth (Single Point Penetration)	25T
• Excavator with Twin Tiger Teeth (both Points Penetration)	N/A (>55T)
• Excavator with Penetration Teeth	25T

APT City Gate - Design Information

Noise Contour	Noise contour assessment to be undertaken to determine if additional noise mitigation is required.
Flammable Plume Contour	N/A
Odour Contour	N/A

Generic Protections – By APA/APT

Patrolling :
Ground patrol – Week days (not weekends)
Aerial patrol – Monthly

Liaison with land users – annually

Marker signs, max. spacing
T1 100m, T1,S 50m, T2 50m

Buried Marker Tape (300mm above pipe) – T74-No, T119-Yes

Pipeline Awareness Programs, D.B.Y.D, Landholder Liaison

Depth Of Cover :
1.2 to 4m at roads, railways & creeks etc

Bollards and Fencing for above ground facilities

Land Use (both during Construction & Existing land use?)

Nominate in general the types of activities expected from land users over the length of the pipeline. (e.g. Farmers, Council, Constructors etc.)

Existing Use:
Rural

Excavators	Size typically 30T in the area according to APA Operators (general purpose teeth only)

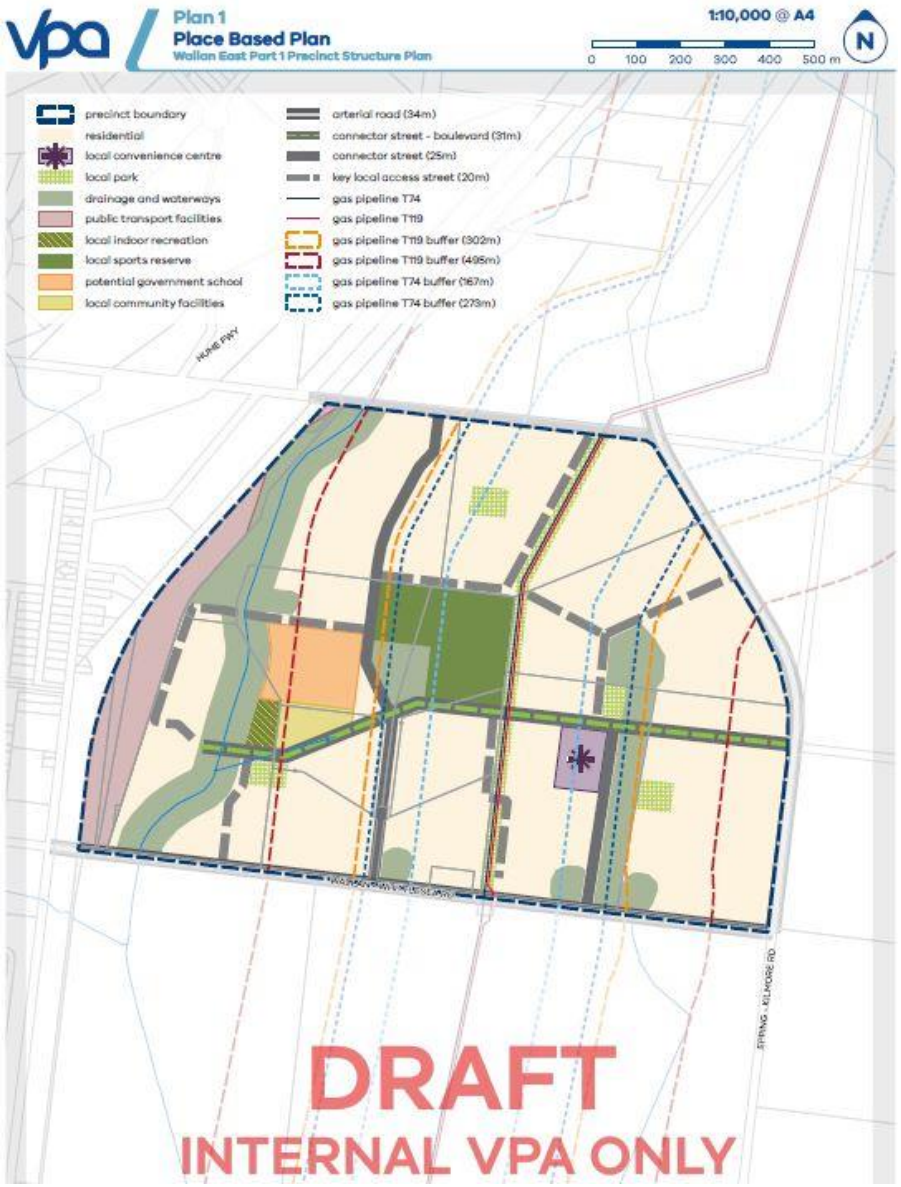
Future Use:
Residential

Excavators	Size typically 30T in the area according to APA Operators (general purpose teeth only)

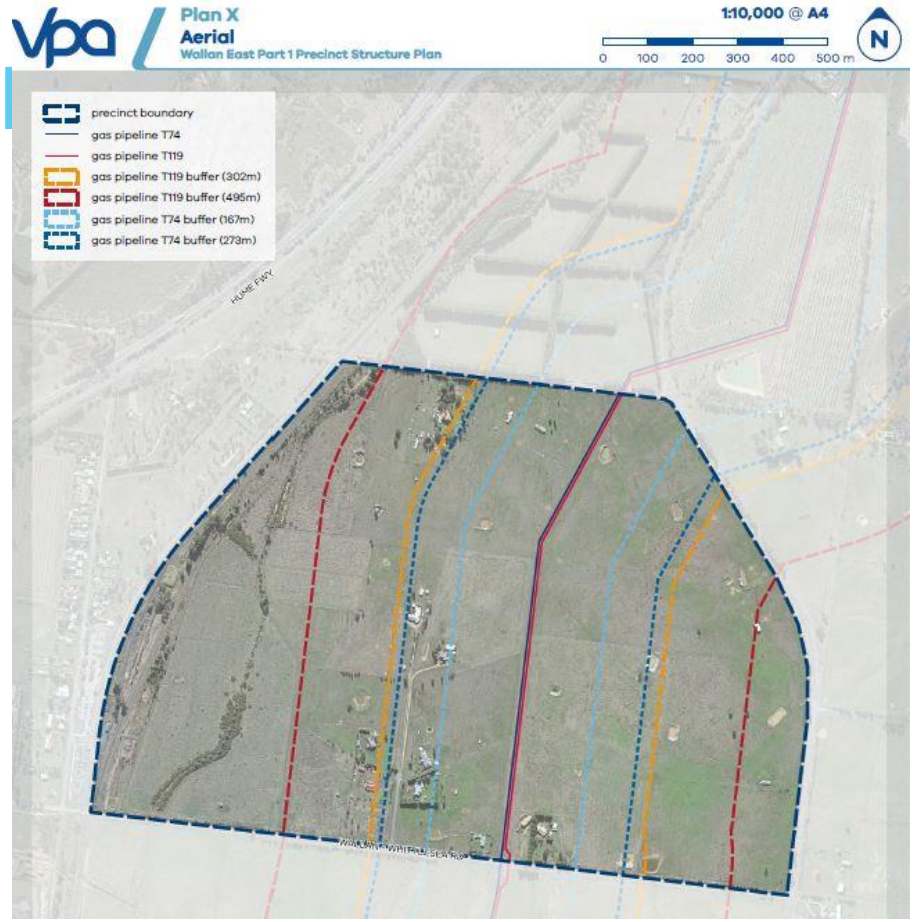
During Construction:

Yarra Valley Water Crossing Design	Yes
Boring and Open Cut	Yes
Blade Ploughing	Yes - Road/Rail Crossing Construction
Ripping	Possible
Excavators	Size 30T
Bulldozers (use of Rippers)	Yes
Boring rigs (pole augers/piling or HDD)	Possible
Heavy Vehicles	Yes - Non road legal

Wallan Ea


Plan 1
Place Based Plan
Wallan East Part 1 Precinct Structure Plan
1:10,000 @ A4
0 100 200 300 400 500 m
N
precinct boundary
residential
local convenience centre
local park
drainage and waterways
public transport facilities
local indoor recreation
local sports reserve
potential government school
local community facilities
arterial road (34m)
connector street - boulevard (31m)
connector street (25m)
key local access street (20m)
gas pipeline T74
gas pipeline T119
gas pipeline T119 buffer (302m)
gas pipeline T119 buffer (495m)
gas pipeline T74 buffer (167m)
gas pipeline T74 buffer (273m)
HUME FWY
SPRING - KILMORE RD
DRAFT
INTERNAL VPA ONLY

Wallan East – Pi



APPENDIX H: SMS Workshop Minutes

Wallan East Part 1 - Safety Management Study

APA Lic 101 VNIE Wollert to Barnawartha T119
KP18.0 to KP 19.1 : - 1100 m + 2 x 495m (Total 2090 approx.)
APA Lic 101 Melbourne Wodonga Shepparton T74
KP17.45 to KP 18.55 : 1100 m + 2 x 273m (Total 1650 approx.)

Wednesday, 9 December 2020

	Physical Mitigations	Procedural Mitigations
T119	1st Physical measure. - 12.7mm wall thickness' using 30T Excavator and Penetration teeth cannot penetrate the pipeline. The pipeline cannot rupture in this area with this equipment.	DBYD Marker Posts Pipeline Patrols
	2nd Physical measure of protection. - Depth of 1200mm in T1 & S	Liaison Activities
T74	1st Physical measure. - 12.7mm wall thickness' using 30T Excavator and Tiger teeth can penetrate the pipeline with both points (95mm hole) or with penetration teeth. The pipeline cannot rupture in this area with this equipment.	DBYD Marker Posts Pipeline Patrols Liaison Activities
	2nd Physical measure of protection. - Depth of 1100mm in T1 & S	

Threat ID	Threats	Consequence	Credible Risk T119 (Y/N)	Credible Risk T74 (Y/N)	Reasons this threat is not a credible risk?	Physical Protection Measures	Procedural Protection Measures	Is Risk Mitigated as per AS2566?	Comments	Frequency (AS2566)	Consequence (AS2566)	Pipeline Risk	Considerations which lead to assessment of Risk	Issue Arising	Actions	Responsibility	Due Date	Is Risk Mitigated as per AS2566? (If No,
1	**Excavator use over easement**	Damage to coating & or gouge to pipe requiring dig up and repair and temporary loss of supply.	Y	Y	N/A	As above	As above	**No**		**Unlikely**	**Minor**	**Low**	Consequence - Minor as supply can be made up from other sources; Likelihood - Unlikely as pipelines can be impacted from time to time.					
2	**Excavator use over easement**	Pipe Damage resulting in a hole causing loss of containment. Hole is less than critical defect length or max credible hole size (whichever is the smaller)	Y	Y	N/A	As above	As above	**No**		**Hypothetical**	**Major**	**Low**	Consequence - Major as potential work crew or an onlooker could be seriously injured or killed (Supply consequence considered Severe not Major); Likelihood - Hypothetical as never killed or seriously injured happen in a pipeline in Australia					
3	**Excavator use over easement - During Construction Works**	Pipe Damage resulting in a hole causing loss of containment. Hole is greater than critical defect length leading to rupture	N	Y	N/A	As above	As above	**No**		**Hypothetical**	**Major**	**Low**	Consequence - Major as potential work crew or an onlooker could be seriously injured or killed (Supply consequence considered Major not Catastrophic); Likelihood - Hypothetical as never happened in a pipeline in Australia					
4	**Excavator use over easement - Post Construction of PSP**	Pipe Damage resulting in a hole causing loss of containment. Hole is greater than critical defect length leading to rupture. Leading to endangerment of	N	Y	N/A	As above	As above	**No**		**Hypothetical**	**Catastrophic**	**Intermediate**	Consequence - Catastrophic as we are likely to kill more than 2 people in the ML due to population density (Supply consequence considered Major not Catastrophic); Likelihood - Hypothetical as never happened in a pipeline in Australia	T74 is susceptible to rupture by known excavator threats in the area.	The T74 pipeline requires additional physical protection from excavator impact. An appropriate use of concrete slabbing (e.g. as a footpath) directly over the pipeline and marker tape installed under the slabbing would be an appropriate mitigation as part of the PSP development of a linear park design for the easement. Easement design cross section to be developed by VPA	APA/VPA/ Council	Include requirement in Planning Permit	**Yes**
5	**Boring of Piles.**	Damage to coating & or gouge to pipe requiring dig up and repair and temporary loss of supply.	N	N	No Piles are required to be bored as part of the PSP Development													
6	**Boring of Piles.**	Pipe Damage resulting in a hole causing loss of containment. Hole is less than critical defect length or max credible hole size (whichever is the smaller)	N	N	No Piles are required to be bored as part of the PSP Development													
7	**Boring of Piles.**	Pipe Damage resulting in a hole causing loss of containment. Hole is greater than critical defect length leading to rupture	N	N	No Piles are required to be bored as part of the PSP Development													
8	**Use of HDD to install Utilities across pipeline easement**	Damage to coating & or gouge to pipe requiring dig up and repair and temporary loss of supply.	Y	Y		As above	As above + APA procedure for monitoring of HDD crossing including use of slit trenches to positively identify the HDD	**No**		**Unlikely**	**Minor**	**Low**	Consequence - Minor as supply can be made up from other sources; Likelihood - Unlikely as pipelines can be impacted from time to time.					
9	**Use of HDD to install Utilities across pipeline easement**	Pipe Damage resulting in a hole causing loss of containment. Hole is less than critical defect length or max credible hole size (whichever is the smaller)	Y	Y		As above	As above + APA procedure for monitoring of HDD crossing including use of slit trenches to positively identify horizontal trenching	**No**		**Hypothetical**	**Major**	**Low**	Consequence - Major as potential work crew or an onlooker could be seriously injured or killed (Supply consequence considered Severe not Major); Likelihood - Hypothetical as never happened in a pipeline in Australia					
10	**Use of HDD to install Utilities across pipeline easement**	Pipe Damage resulting in a hole causing loss of containment. Hole is greater than critical defect length leading to rupture	N	N	HDD pilot drill will hole the pipe but will not create a hole to cause the pipe to rupture.	As above	As above + APA procedure for monitoring of HDD crossing including use of slit trenches to positively identify horizontal trenching	**Yes**										
11	**Use of Bored or Jack crossing to install Utilities across pipeline easement**	Damage to coating & or gouge to pipe requiring dig up and repair and temporary loss of supply.	Y	Y		As above	As above + APA procedure for monitoring of Bored or Jack crossing including use of slit trenches to positively identify horizontal trenching	**Yes**	Setup for a Bored Crossing takes days by a highly experience contractor who will engage with APA and Council so this threat is mitigated									
12	**Use of Bored or Jack crossing to install Utilities across pipeline easement**	Pipe Damage resulting in a hole causing loss of containment. Hole is less than critical defect length or max credible hole size (whichever is the smaller)	Y	Y		As above	As above + APA procedure for monitoring of Bored or Jack crossing including use of slit trenches to positively identify horizontal trenching	**Yes**	Setup for a Bored Crossing takes days by a highly experience contractor who will engage with APA and Council so this threat is mitigated									
13	**Use of Bored or Jack crossing to install Utilities across pipeline easement**	Pipe Damage resulting in a hole causing loss of containment. Hole is greater than critical defect length leading to rupture	Y	Y		As above	As above + APA procedure for monitoring of Bored or Jack crossing including use of slit trenches to positively identify horizontal trenching	**Yes**	Setup for a Bored Crossing takes days by a highly experience contractor who will engage with APA and Council so this threat is mitigated									
14	**Auger used to install Fence Post & Power Poles etc..**	Auger impacts pipeline damaging the coating and denting or gouging the pipeline which could require reducing the MAOP or replacement of a section. Potential loss of supply.	Y	Y		As above	As above	**No**		**Unlikely**	**Minor**	**Low**	Consequence - Minor as supply can be made up from other sources; Likelihood - Unlikely as pipelines can be impacted from time to time.					
15	**Auger used to install Fence Post etc..**	Auger impacts pipeline causing a hole in the pipe (~50mm) which would require replacement of a section. Potential loss of supply and serious injury to auger operator if gas ignited (2% chance for a gas leak)	Y	Y		As above	As above	**No**		**Hypothetical**	**Major**	**Low**	Consequence - Major as potential work crew or an onlooker could be seriously injured or killed (Supply consequence considered Severe not Major); Likelihood - Hypothetical as never happened in a pipeline in Australia	Deep excavation over the pipeline is a credible threat not mitigated by current controls	Avoid putting street lighting within the pipeline easement. Pedestrian lighting within linear park should consider pad type footings. Refer to APA landscape guidelines for more detailed guidance for works within pipeline easement.	VPA/Council	At the Planning Permit stage	**Yes**
16	**Auger used to install Fence Post etc.. - Post Construction of PSP**	Auger impacts pipeline causing a rupture. Potential loss of supply and serious injury to auger operator if gas ignited (10-30% chance for a gas leak)	N	N	Auger pilot drill will hole the pipe but will not create a hole to cause the pipe to rupture.	As above	As above	**Yes**										
17	**Road Crossing (road legal vehicles).**	Over stressing the pipe resulting in pipe deformation (out of round), which could require reducing the MAOP or replacement of a section to allow for future integrity works. Potential loss of supply.	Y	Y		As above + concrete	Properly considered road design	**Yes**						Road Crossing (road legal vehicles).	APA to provide Std Road Crossing Design to VPA for reference.	APA/VPA	Prior to finalisation of PSP design	**Yes**
18	**Heavy vehicle access track to works (non road legal vehicles).**	Over stressing the pipe resulting in pipe deformation (out of round), which could require reducing the MAOP or replacement of a section to allow for future integrity works. Potential loss of supply.	Y	Y		As above + implementation of an approved temporary crossing design	As above + bunting off of the easement to be included as part of traffic management plan	**Yes**						During construction the pipeline may be put at risk due to random and or repeated crossing of the easement by road legal and non-road legal vehicles	PSP to require CMP (including proposed temporary crossing design and traffic management plan) for any works within 50m of the pipeline easement. APA to review any proposed vehicle crossing locations and proposed vehicle using the crossing. Crossing to be constructed per APA standard temporary vehicle crossing or as directed by APA	VPA, Council, APA	At the Planning Permit stage	**Yes**
19	**Increased DOC due to landscaping or pavement build-up or placement of Spoil?**	Over stressing the pipe resulting in pipe deformation (out of round), which could require reducing the MAOP or replacement of a section to allow for future integrity works. Potential loss of supply.	Y	Y		As above	As above + APA approval of the Construction Management Plan	**Yes**										
20	**Heavy lift cranes straddling pipeline.**	Over stressing the pipe resulting in pipe deformation (out of round), which could require replacement of a section to allow for future integrity works. Potential loss of supply for perhaps up to a month.	N	N	Current design does not require any crane activities over the easement													
21	**Crane heavy lift over easement**	Heavy components falls on the easement resulting in localised overstressing or damage of coating	N	N	Current design does not require any crane activities over the easement													
22	**CP interference from adjacent, parallel infrastructure or construction works.**	CP is damaged or compromised during works resulting in long term corrosion potential	N	N	No high voltage assets being installed parallel or perpendicular to the easement.													
23	**CP interference from adjacent, parallel high voltage infrastructure.**	CP design is compromised by new infrastructure resulting in long term corrosion potential	Y	Y		None	As Above	**Yes**	Note that there are APA CP Test Points in the area and likely along Wallan/W rd. where the APA Networks gas pipeline runs to Wallan					Damage to CP equipment during works could lead to pipeline failure in the long term	APA & APA Networks to confirm to VPA & Council locations of CP test point and anode beds and agree a method of protecting assets from damage during road Wallan/W Road upgrade and PSP	APA/ APA Networks / VPA/Council	Before any construction works commences	**Yes**
24	**Scouring of pipe trench, change in watercourse conditions during works.**	Buried equipment potentially being inundated with stormwater compromising its operation	Y	Y		As above	As above + agreed designs for water crossing with MW	**Yes**										
25	**Vibration during construction (heavy vehicle movement/pile boring) causes stress on buried pipeline and possible damage to coating**	Potential localised corrosion resulting in reduced MAOP due to loss of wall thickness.	Y	Y		As above	As above + road crossing design to be approved by the APA	**Yes**										
26	**Damage to pipe if exposed during works. Vehicle impact/malicious damage.**		Y	Y		As above	As above	**Yes**						Damage to pipe if exposed during works. Vehicle impact/malicious damage	Review individual excavation plans and mitigations including consideration for steel plates or temporary bollards. PSP Permit to reflect requirements	VPA/Council/ APA	Before any construction works commences	**Yes**

27	**Blasting.**		N	N	No blasting required as part of the PSP development													
28	**Potholing to locate pipe.**	Damage to pipe coating in process of locating pipe resulting in coating failure and possible corrosion to pipe	Y	Y		Wall thickness	As above + APA's approved potholing procedure.	Yes										
29	**Tree removal adjacent to the pipeline.**	Ripping of trees where roots are in contact with pipe could damage coating, requiring repair	N	N	No substantial trees exist on easement.													
30	**Natural Events - Floods (Erosion, impact damage)**	Rain event during or post construction washes away cover exposing pipeline to impact damaging coating	Y	Y		As above	As above + bespoke approved drawings	Yes										
31	**Maintenance - Inadequate servicing of equipment**	APA cannot access easement due to new development	Y	Y		As above	As Above + Refer APA Easement Landscape guidelines	Yes					New road crossings or easement furniture/infrastructure make accessing the pipeline very difficult into the future post the PSP. New easement furniture/infrastructure make accessing the pipeline very difficult into the future post the PSP	New road crossings trigger requirement for coating inspection and possible rectification within the road reserve. Undertake coating assessment to determine whether recoating needs to be undertaken in locations within road reserve. New furniture/infrastructure in easement must comply with APA Easement Landscape guidelines	APA / APA Networks / VPA / Council	As part of Planning Permit stage and then approved by APA/ APA Networks at detailed design	Yes
32	**Threat - New building footings located on edge of easement**	may present an additional stress to the pipeline, resulting in coating damage and eventual corrosion, leading to a leak.	Y	Y		As above	Building guidelines will require a building set back from the easement	Yes					Threat - New building footings located on edge of easement	VPA and Council to agree with APA on an appropriate set back distance in PSP Permit requirements	VPA / Council/ APA	As part of Planning Permit stage	Yes
33	**Intentional Damage - Sabotage, Terrorism or Malicious Damage**		Y	Y		As above	As above + additional population provides passive surveillance	Yes										
34	**Threat - Deep ripping to >1.2m deep activities impacts the pipe and causes a loss of containment**		N	N									Deep ripping could rupture T74 and potentially T119 if ripper is large enough	Deep Ripping is to be excluded from use in the PSP. To be included in the PSP Permit requirements	VPA/Council/ APA	As part of Planning Permit stage	Yes
35	**Noise from the City Gate causes complains to APA Networks and potential impact to normal operation**	Cannot operate the facility	Y	Y		Separation distance		Yes					Noise levels from city gate may exceed EPA requirement near suburban dwellings potentially impacting the operation of the city gate in the future.	VPA/Council to arrange for a future Developer to conduct a noise survey of City Gate to confirm what the existing noise contour is and whether any additional noise mitigations are required to comply with EPA levels at nearest dwelling. Any proposed modification to the city gate must be reviewed and approved by APA and APA Networks	VPA / Council/ APA/ APA Networks	As part of Planning Permit advice and then approved by APA/ APA Networks at detailed design	Yes
36	**Odour from City Gate causes complaints to APA Networks and potential impact to normal operation**	Cannot operate the facility	Y	Y		Separation distance		Yes	Gas release from city gate is minor and intermittent and not expected to have any impact on the PSP									
37	**Flammable gas plume from City Gate impinges nearest residents or nearest ignition source**	Prevents normal venting operations from the City gate	Y	Y		Separation distance		Yes	No significant venting from City Gate									
38	**Installation of light poles within easement to light proposed footpaths.**	Up to 1m Augering over pipeline leading to a hole in the pipe	Y	Y		As above	As above	Yes					Need to use augering within easement to install light poles could damage pipelines if not properly controlled	Consider use of concrete slab footings for light poles within the easement to mitigate need for Augering within easement. APA to approve proposed lighting construction method within easement. (use of slab footings also allows for easier removal of light if pipeline works are required)	APA / APA Networks / VPA / Council	As part of Planning Permit advice and then approved by APA/ APA Networks at detailed design	Yes
39	**Inappropriate choice of vegetation within easement**	Blocking line of site between marker signs or roots damaging pipeline coating.	Y	Y		As above	As above	Yes					Landscaping of easement as part of PSP may change pipeline depth of cover or introduce inappropriate vegetation to the easement	APA to provide Easement Landscaping Guidelines to Developer for incorporation into the final Design. APA to review any proposed landscape plans.	APA/ VPA	Prior to completion of Detailed Design of the PSP	Yes
40	**Sodic Soils may impact the pipeline integrity**	Accelerated erosion of sodic soil used in backfilling crossing excavation may lead to localised pipeline exposure	Y	Y		As above	As above	Yes										
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