Victorian Transmission System

December 1, 2021

Asset Performance & Lifecycle Plan

1. Introduction

1.1. Purpose

This Asset Performance & Lifecycle Plan presents a summary of the key aspects of management activities with respect to the Victorian Transmission System (VTS).

The Plan presents a summary of the key technical aspects of the management activities for VTS and provides an overview of the condition of the VTS and the proposed programs and projects to maintain and improve safety, integrity and reliability.

The Plan is a collaborative document where operational excellence process owners provide assessments of the performance of the asset and detail any necessary actions required to meet or maintain the assets key objectives.

1.2. Scope

This document is specific to the group of APA assets that collectively form the Victorian Transmission System. The Asset Performance and Lifecycle Plan includes the capital programs necessary to maintain the reliability, safety and integrity of the VTS to ensure the capability to meet customer requirements.

Expansion projects and routine operations (operating expenditure) are not reported in this Plan.

1.2.1. Asset Overview

The VTS comprises of approximately 2,267 km of high-pressure gas transmission pipelines throughout Victoria, made up of 51 pipelines under 46 individual licences. The list of pipelines is provided in **Error! Reference source not found.**.

Almost all the natural gas consumed in Victoria is transported through the VTS. The VTS serves a total consumption base of approximately two million residential consumers and approximately 60,000 industrial and commercial users throughout Victoria.

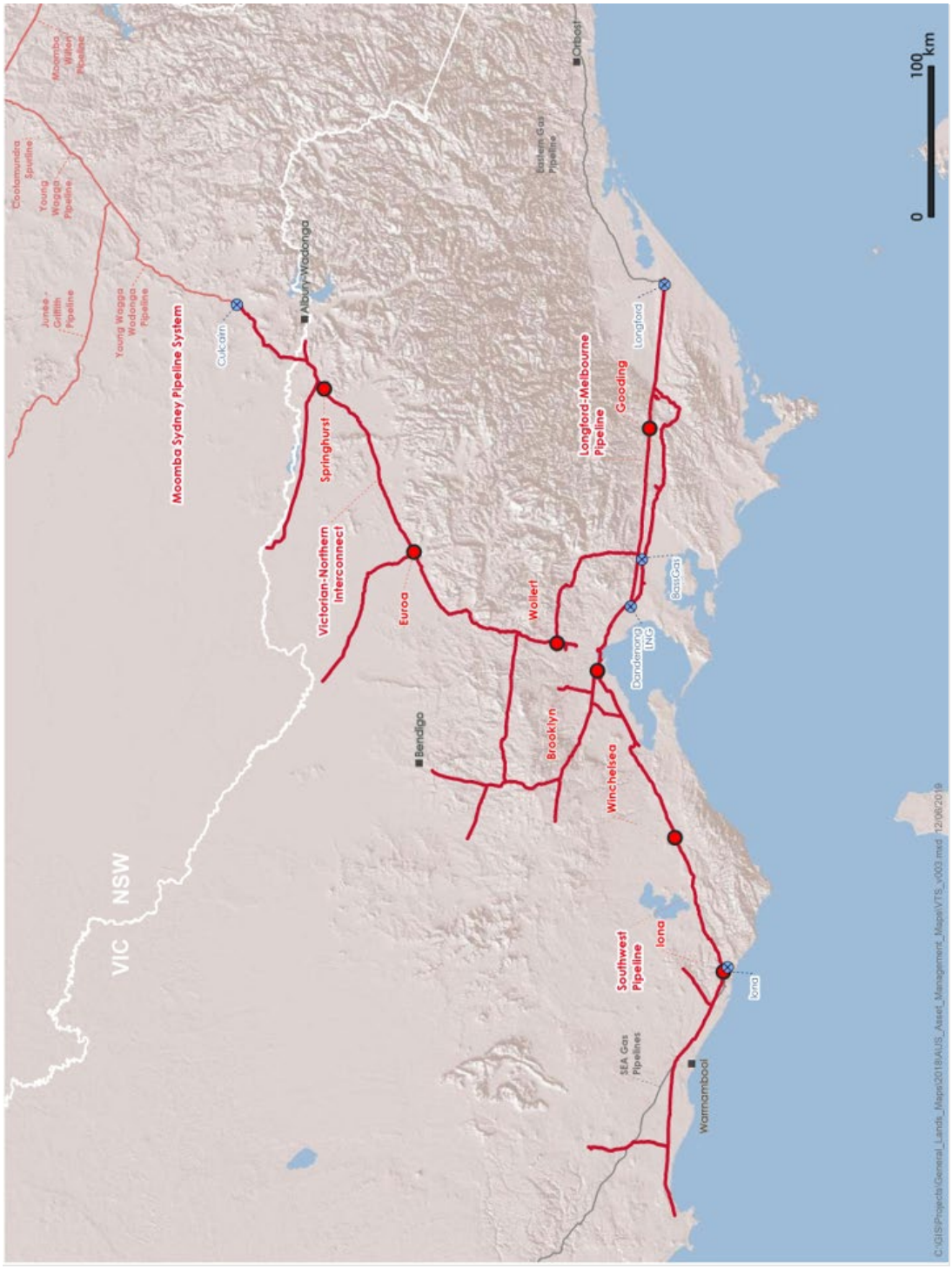
The VTS supplies gas to the Melbourne metropolitan area and to a number of regional centres including Corio (near Geelong), Ballarat, Bendigo, Wodonga, Koonoomoo and Echuca. The Laverton North, Somerton, Valley Power (Loy Yang B), Jeeralang and Newport gas-fired power stations are all supplied from the VTS.

The main VTS pipelines and compression facilities include:

- Longford to Melbourne Pipeline (Longford-Dandenong-Wollert) with compression at Gooding.
- South West Pipeline (SWP) (Port Campbell-Geelong-Brooklyn) with compression at Winchelsea and Brooklyn.
- Northern Lateral and NSW Interconnect (Wollert-Wodonga-Culcairn) with compression at Wollert, Euroa and Springhurst.
- Western Transmission System (WTS) (Iona-Portland) with compression at Iona.

Further detail about VTS is presented in Appendix A, a VTS overview is also provided in Figure 1 - VTS Asset Overview.

Figure 1 - VTS Asset Overview



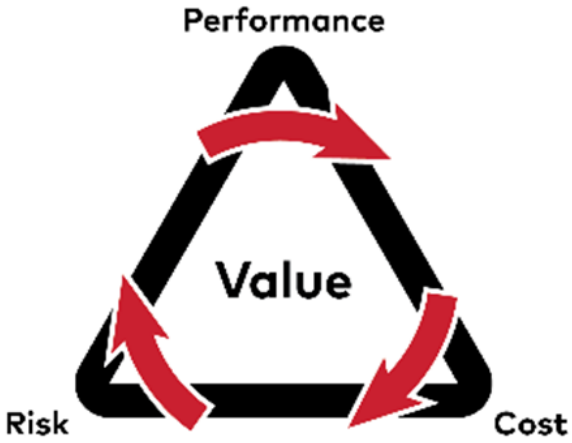
2. APA Asset Management

2.1. Policy and Framework

In 2018, APA introduced a new approach to asset management across the organisation. The Asset Management Policy and associated Framework guides effective asset management across APA supporting the efficient and effective management of assets.

The Asset Management Policy is critical to ensuring APA balances risk, cost and performance of its assets to meet the services required by our customers. This Policy applies to all assets that are under direct APA asset management control.

Asset Management is systematic and coordinated activities and practices through which APA optimally and sustainably manages its assets and asset systems, their associated performance, revenues, risks, and expenditures over the asset life cycles for the purpose of achieving its organisational strategic plan.



Under the Asset Management Policy, APA's Asset Management (AM) Department is the custodian for all of APA's owned assets nationally, including the Victorian Transmission System. The Department works in close association with VTS leadership and operational teams.

2.2. Asset Management Responsibilities

The Asset Management Department is responsible for the following:

- Accountable to design, govern and maintain:
  - Framework to deliver a consistent and integrated approach to asset management;
  - Operational excellence framework for Power, Transmission, and Midstream operations
- Accountable to execute:
  - Management of operational and non-operational contract obligations of third party operated/ maintained assets and Long- Term Service Agreements (LTSAs)
  - Asset Business planning and budgeting (including integration with Finance APA Business planning process)
  - Asset lifecycle planning

- Budget management for Stay-In-Business (SIB) Projects, Major Cyclical Maintenance (MCM) and major shutdowns
- Individual and integrated Asset Management planning and performance reporting
- Review and improvement processes for Asset Management performance - improvement opportunity identification and delivery.

The VTS Plan is written specifically for the VTS Access Arrangement and reflects the outcomes from the ongoing management of the assets under the normal lifecycle planning processes carried out across APA.

2.3. Operational Excellence

Operational excellence embraces principles and tools to create sustainable improvement within an organisation. It is a continuous improvement methodology on removing waste, focussing on value, and enhancing capability of Operations that translates to customer value.

Operational Excellence ensures APA executes its business strategy more effectively, efficiently, and consistently than its competitors, delivering maximum benefit from APA's assets for its customers and shareholders. Realising competitive advantage, best practice operations and supporting growth through the following operational excellence pillars:

- Exceeding Customer Expectations through reliable service to market and leading product offerings
- Strategic Alignment of business priorities realising long term business value whilst balancing risk, cost, and performance
- Performance monitoring and management against SMART metrics
- Innovation and Continuous Improvement aligned with value-ease and benefits realisation framework
- High Performing Teams where APA have access to the right people at the right time, working in a positive culture and a positive employee experience.

Figure 2 Operational Excellence Framework

As shown above, the Operational Excellence Framework includes effective application of business processes across the six operational excellence pillars.

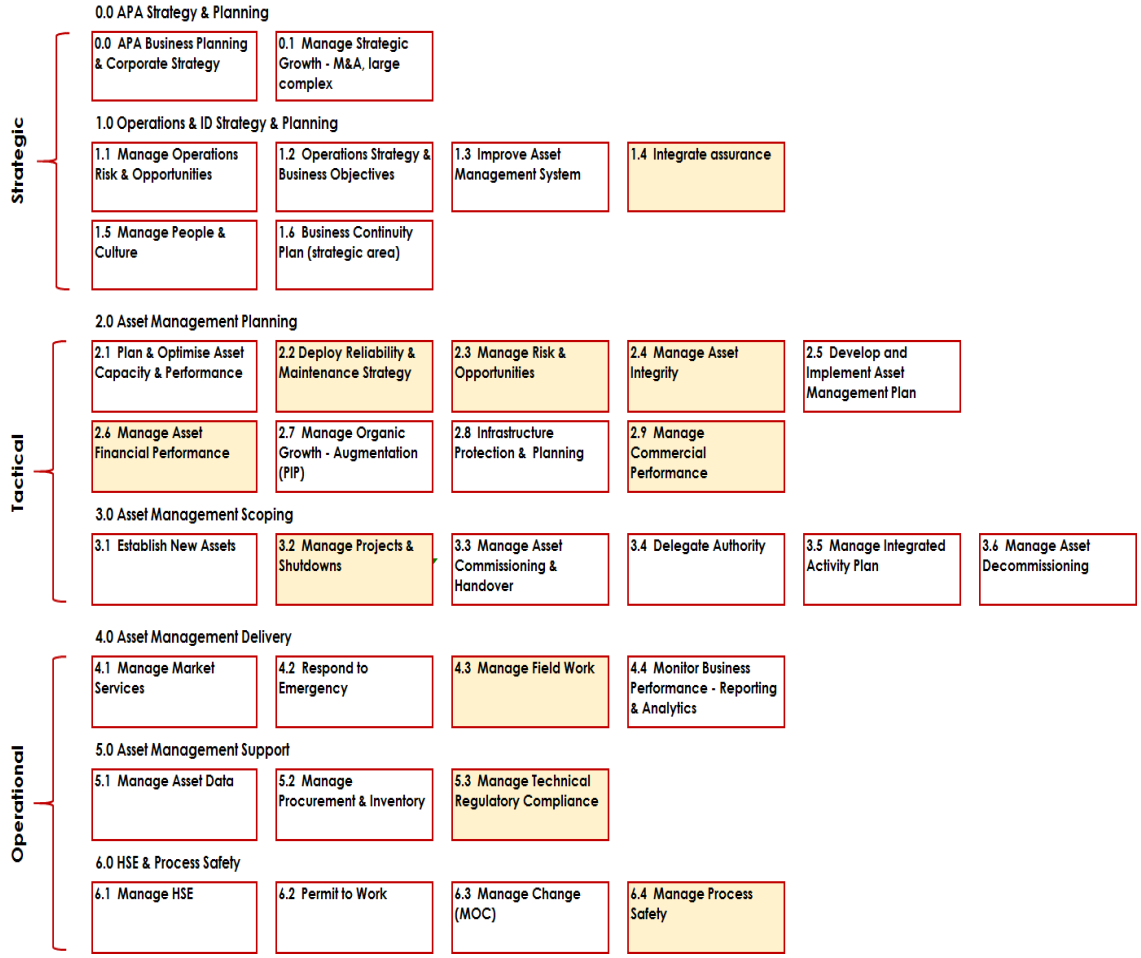
2.4. Operational Excellence Processes

APA's operational excellence processes cover three broad categories: strategy and planning; asset management planning; and operational asset management delivery. Thirty-four key processes have been defined that integrate to ensure the assets are operated, maintained, and improved to maximise value in a safe, compliant, and effective manner. The purpose of defining these processes is to ensure:

- Clear alignment of purpose
- Clear ownership of key processes
- Integration of activities across teams to minimise risk and waste
- Prioritisation of improvement initiatives (roadmaps and governance).

The below table links to the approved definition for each process. Definitions include the approved purposes and deliverables for each process as well as the agreed key performance metrics used to measure performance of each across APA Operations.

Figure 3 Operational excellence processes



The processes highlighted in yellow are the 10 key processes monitored monthly at the asset performance meetings. Key processes are described in section 2.

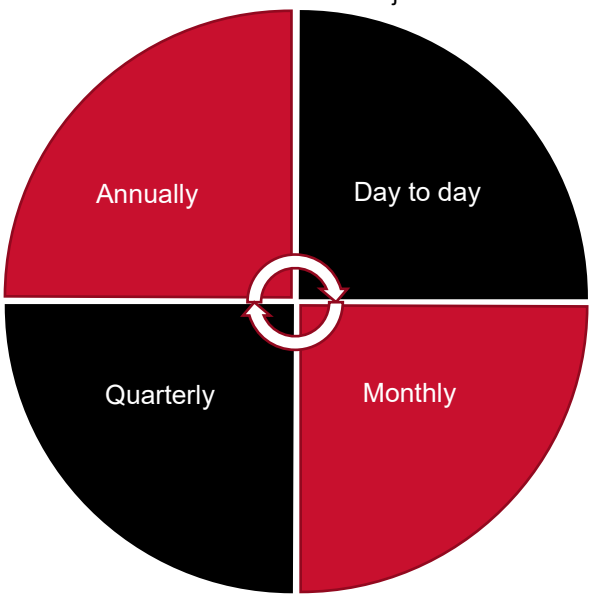
2.5. Asset Management Operating Rhythm

APA's approach to asset management for each asset follows an operating rhythm with key tasks and milestones at each stage. The operating rhythm covers day-to-day monthly, quarterly and annual activities. The asset management operating rhythm is presented in the figure below.

Figure 4 Asset Management operating rhythm

Asset Management Plan
- Scan the environment
- Review Business Objectives
- Review the asset
- Life cycle workshop
- Update business plan, risk register and forward budget cycle

Asset Champion
- Integrates stakeholder interests into decision-making
- Integrating knowledge base across functional experts
- Support integrated decision-making
- Drive function teams to Asset Mission
- Support activities that support mission and objectives



Asset Deep dive
- Integrated team – connect and team health check
- Refresh asset mission
- What's changed or likely to change
- Risk register refresh
- Large scale intervention required in any key areas

Asset Performance Review
- Integrated team – connect and team health check
- Refresh asset mission
- What's changed or likely to change
- Risk register refresh
- Large scale intervention required in any key areas

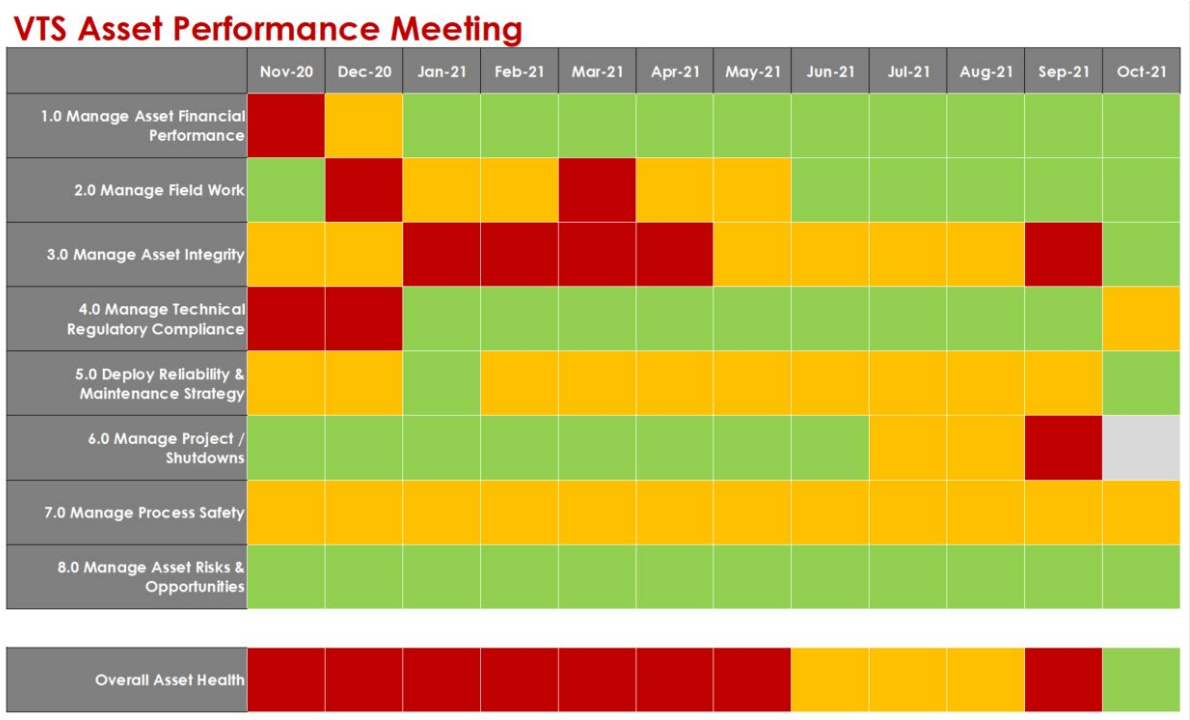
2.6. Asset Performance Monitoring

Performance monitoring is critical for driving strategic business decision making practices to achieve operational excellence.

Performance requirements:

- Key Performance Indicators for each asset applicable processes are monitored and reviewed at frequencies defined in the relevant process definition.

Each asset's management team consider corrective action where an asset's performance indicates it is not meeting its strategic objectives.



2.7. Asset Lifecycle Management

Lifecycle management involves the identification and treatment of risk/opportunities and the allocation of APA's Stay-in-business (SIB) capital budget over a 20-year window.

It is a tactical component of the Operational Excellence Framework supporting process 2.1 Develop & Implement Asset Management Plans. The processes are typically initiated under 2.3 Manage Asset Risks and Opportunities where physical and performance issues provide threats to the safe and reliable operation of the assets are identified.

2.7.1. Project Identification and Selection

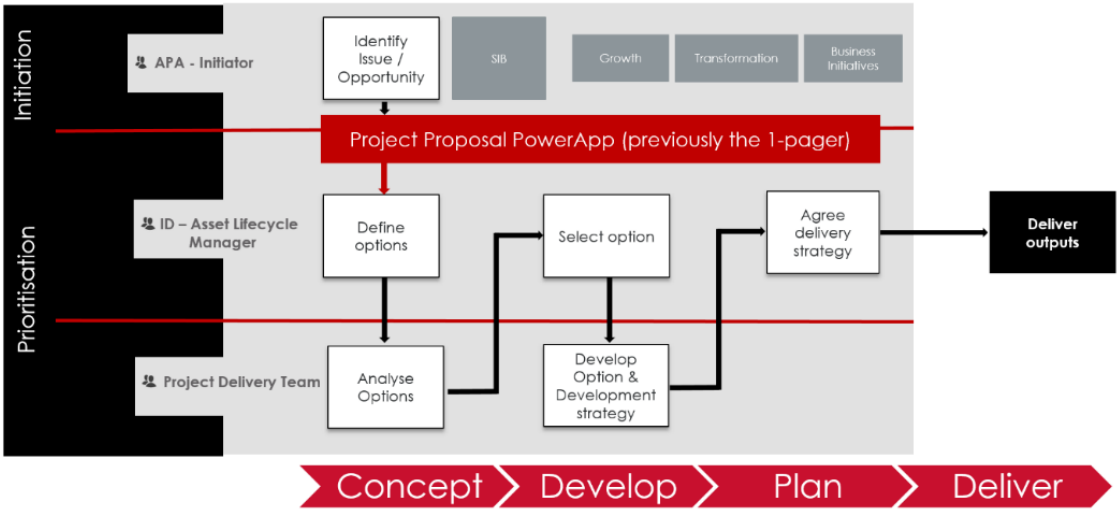
Operational data and integrity inspections provide much of the long-term planning, however, the process accepts additional proposals from the operating departments. These typically relate to short- and medium-term integrity-based activities, operating hours-based overhauls, asset condition rectification and risk management mitigation initiatives.

SharePoint databases manage this information, and the input is through a proposal form which has been specifically designed to collect the information to enable a thorough understanding of the scenario and its impact for processing.

Where the issue is complex additional information in the form of a business case may be attached. Additionally, opportunities to improve the assets may also be received. These are managed in parallel to the risk-based projects and utilise similar assessment criteria.

The following process map shows the high level approach that is applied to new proposed projects.

Figure 5 Project identification and selection process map



Project initiatives typically originate from three sources:

- Pipeline integrity driven work
- Field inspection driven replacement/upgrades
- Facility reliability improvement and upgrades.

The initiator provides as much information as possible to enable the projects to be understood and where a project has insufficient detail or there is concern that the budget proposed is inappropriate further investigation in a pre-FEED style process may be carried out, which might also include more detailed costing.

Most projects in the stay-in-business category have an obvious solution as they typically relate to strategic projects or direct replacement. Where there are multiple solutions (or options) these are assessed against cost and benefits (risk reduction) and a preferred solution is selected.

2.7.2. Project Ranking

All proposed projects undergo risk assessment during the identification stage 1.0, however this is re-validated and adjusted if necessary during the concept stage 2.0. The risk assessment is carried out against APA's corporate matrix (see Appendix B) which is broadly aligned with that used under

AS2885.6 Pipelines - Gas and liquid petroleum Pipeline safety management but incorporates additional criteria.

As an additional assessment criteria, each project is rated for their alignment to Asset Management Planning objectives, (see Appendix C) to ensure that APA's strategic objectives are brought into consideration during the prioritisation. This is a critical step to ensure that items such as obsolescence that are likely to have a relatively low risk actually have some strategic priority applied. This balances the risk approach with sound logic enabling a more comprehensive review of priority.

Ranking results are subject to review with the local Asset Manager and may be adjusted to optimise the approach for a specific year.

2.7.3. Risk Assessment

Proposed VTS replacement (stay-in-business) programs and projects have been subject to a risk assessment that supports the prioritisation of those programs identified as needing investment.

The risk assessment and management process is described in Section 4.2 and the individual risk assessments prepared for each of the proposed stay-in-business programs and projects are presented in the business cases.

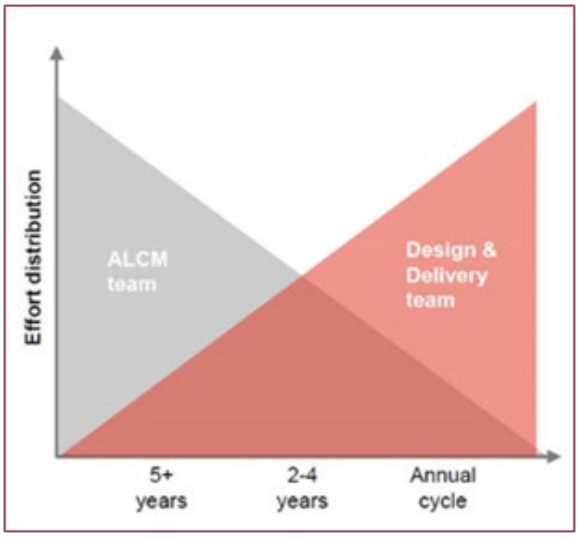
2.7.4. Delivery Management

Capital projects are typically delivered by APA's Project Design & Delivery team, within the Engineering and Planning business unit. Projects may also be delivered by the Infrastructure Construction group or by Operations & Maintenance depending on the nature of the project.

Throughout the year the delivery of projects is reviewed and the expenditure re-forecast monthly. The delivery teams operate independently, and separate governance meetings are held monthly to ensure scope, schedule and budget milestones are being met.

The Lifecycle team takes any variations into consideration and where required will add projects to or defer projects from the annual scope. Figure 6 describes the project lifecycle process.

Figure 7 – Project lifecycle process overview



The lifecycle team receive projects as proposals which are then assessed and prioritised into a 5 year schedule.
The lifecycle team also maintain a 20 year view of longer term project budgets but the 5 year view is more relevant to the access arrangement rhythm.
One of the key objectives of the lifecycle team is to ensure that projects being funded are important and will address the objective. As such the lifecycle team maintains line of site of each project to ensure cost and scope remain relevant and would be considered prudent expenditure.

Design and delivery team assigns resources to design and develop solutions which are then scheduled for delivery. As the projects are delivered or paused (e.g. awaiting maintenance windows) the team then get tasked with the next project.

3. Asset Summary

3.1. Description of VTS and services provided

The VTS as at 30 June 2021 comprises of approximately 2,267 km of high pressure gas transmission pipelines throughout Victoria, made up of 51 pipelines under 46 individual licences.

Almost all the natural gas consumed in Victoria is transported through the VTS. The VTS serves a total consumption base of approximately 2 million residential consumers and approximately 60,000 industrial and commercial users throughout Victoria.

The VTS supplies gas to the Melbourne metropolitan area and to a number of regional centres including Corio (near Geelong), Ballarat, Bendigo, Wodonga, Koonoomoo and Echuca. The Laverton North, Somerton, Valley Power (Loy Yang B), Jeeralang and Newport gas-fired power stations are all supplied from the VTS.

The main VTS pipelines and compression facilities include:

- Longford to Melbourne Pipeline (Longford-Dandenong-Wollert) with compression at Gooding.
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- Western Transmission System (WTS) (Iona-Portland) with compression at Iona.

Gas transmitted through the VTS is supplied primarily by Esso/ BHP and injected into the VTS at the Longford injection point. Other gas supplies are sourced from the BassGas injection point at Pakenham and from the Iona injection points at Port Campbell. A small portion of gas can enter the VTS through the Interconnect pipeline from NSW, the Eastern Gas Pipeline (VicHub) and the Tasmanian Gas Pipeline (TasHub).

From the Longford and BassGas injection points, gas is transported to the Dandenong and Wollert city gate regulating stations on the outskirts of Melbourne via a partially duplicated 750 mm diameter trunk line. The Gooding compressor station, located along the trunk line between Longford and Dandenong, has four compressor units.

The Wollert city gate regulating station supplies the VTS 600mm diameter pipeline feeding into the distribution networks in metropolitan Melbourne. The Dandenong city gate directly feeds the distribution networks owned by Multinet Gas and Australian Gas Networks and also feeds the APA VTS gas transmission system 750mm diameter trunk pipeline to Brooklyn.

Gas from Iona can also enter the trunk pipelines from Brooklyn. The Dandenong to Brooklyn pipeline supplies gas to the AusNet Services distribution network and to a number of Multinet Gas and Australian Gas Networks (AGN) delivery points. Approximately two thirds of Melbourne's gas demand is met through the Dandenong city gate and one third through the Wollert and Brooklyn city gates.

The VTS extends north from the Wollert city gate to Bendigo, Echuca, Koonoomoo and Wodonga through an extensive network of pipelines with diameters ranging from 150 to 400 mm including

looped sections of the Melbourne to Wodonga Pipeline (PL101) known as Victorian Northern Interconnect Expansion (VNIE).

APA VTS owns compressor stations located at Gooding, Iona, Wollert, Euroa, Springhurst, Brooklyn and Winchelsea. The network extends from Brooklyn Compressor Station to Corio (near Geelong) in the south and to Ballarat/Bendigo in the north.

VTS supplies a number of gas powered generators (GPG) at Laverton North, Somerton, Valley Power, Jeeralang and Newport.

3.2. Asset Mission

The VTS Asset Mission is to carefully manage operational complexities and regulatory outcomes to safeguard our ability to provide cost effective and reliable gas to new and existing customers throughout Victoria.

3.3. Asset condition

Age

- VTS pipelines have an average service life of 33.5 years but range in age from 6 years to 65 years.

Condition of assets

- Several of our ageing assets in high consequence areas require increases in inspection resolution and frequency.

- Managing asset integrity is a key focus of the proposed program

Urbanisation and encroachment.

- APA VTS is facing increasing expectations from government, customers and internally (with our recent shifts to national discipline based policies) to mitigate risks of urban encroachment.

- Continued urban growth is expected to present ongoing encroachment challenges that require focused planning, pipeline safety management, corridor protection and recoverable works effort.

What are the reasons for the increase in forecasts?

APA are responding to increased risk factors;

- VTS is an ageing asset and more integrity management is required to maintain integrity

- Increasing encroachment by urban development of our assets.

APA is now using high resolution inline inspection tools to assess asset integrity.

- Although it initially costs more to perform inline inspections it has the following benefits;
    - Inline inspections are the industry preferred method for confirming pipeline integrity (as they are a more comprehensive and accurate assessment of pipeline condition).
    - As inline inspections provide a superior assessment of asset condition the cost of direct assessments is reduced, this is due to inline inspection-targeted physical inspections

rather than quantitative physical inspections required for similar confidence from direct assessments.

- Inline inspection also identifies more defects so the repair campaign may appear to cost more but completing will improve remaining life confidence for the next remaining life period and there will be fewer defect to contend with next time.

APA policy changes;

- Inline inspection frequency has been adjusted from 15 to 10 yearly which is as per national asset integrity strategy.
- Legacy practices that no longer meet modern day expectations are being addressed.
- We are applying the process safety principles of "As low as reasonably practicable".

4. Asset Management Planning

Key aspects of asset management planning applied to each asset including VTS are discussed below.

4.1. Reliability & Maintenance Strategy (Engineering & Planning)

The purpose of the Reliability and Maintenance Strategy process definition is to ensure equipment is available when needed while minimising business risk of equipment failure through the effective and efficient implementation of reliability and maintenance strategies.

Applying Reliability Centred Maintenance (RCM) principles to maintenance strategy development will allow us to generate fit for purpose strategies that align with asset/business criticality. Doing the right tasks at the right time, on the right equipment will increase reliability reducing preventable reactive maintenance, as well as improving availability.

The program to implement RCM is the subject of stay-in-business Business Case 307 Reliability Centred Maintenance.

4.2. Asset Risk (Asset Management)

APA's risk management framework has been developed to comply with *AS2885.3 Pipelines - Gas and liquid petroleum, Part 3: Operation and maintenance* for the operation of the assets and utilises a standard risk assessment matrix which is consistent with *AS2885.6 Pipelines - Gas and liquid petroleum Pipeline safety management*. The framework aligns with international standard ISO 31000 (2018) Risk Management and has been developed in accordance with industry best practice.

The risk management framework is designed to support the management of our assets to:

- Identify, assess and manage risks
- Create clear ownership and accountability for risks and opportunities
- Ensure adequate knowledge and capability is applied to risk assessment activity
- Escalate and create visibility of risks, controls and control performance, and

Integrate risk into decision making through risk appetite and acceptance criteria. The risk management approach assesses the impact of risk using the following impact categories.

Impact category	Description
Health & Safety	Injuries, illness or death of employees, contractors or members of the public
Environment (including heritage)	Environmental harm or adverse effect on ecosystem i.e. the surroundings in which APA operates, including natural, built and Aboriginal cultural heritage, soil, water, vegetation, fauna, air and their interrelationships.
Operational Capability	Disruption in our operations (supply or services)
People	Impact size, engagement, capability of our Staff.

Compliance	Non-compliance with operating licences, legal, regulatory, contractual obligations, debt financing covenants or reporting / disclosure requirements
Reputation & Customer	The view of APA from its stakeholders, customers, investors, regulators, governments and the community.
Financial	APA Group Balance sheet, P&L impact (cumulative or one off) Asset Revenue, Cost impact (cumulative or one off).

4.3. Asset Integrity (Engineering & Planning)

The purpose of Manage Asset Integrity is to maintain the physical life of our assets to ensure the safety of our employees, contractors and the public and security of supply. Many transmission assets are exposed to corrosion, cracking, fatigue, stress related failure, vibration, wear and tear, third party damage and other degradation.

Managing asset integrity is an important focus in the proposed programs for the VTS.

Integrity related programs include stay-in-business Business Case 258 Pipeline Integrity and Business Case 259 VTS Unpiggables.

4.4. Integrated Activity Plan (Engineering & Planning)

The purpose of the Integrated Activity Plan process definition is to facilitate the efficient and safe management of a program of works that have a material impact on transmission capacity, grid operability and resource availability.

The Integrated Operations Centre (IOC) manages the maintenance schedule using the Maximo maintenance scheduling system. The Maximo maintenance schedule is used to plan the work program (up to 90 days ahead) and issue work permits before work commences. If it is a critical asset, IOC liaises with AEMO to minimise operational disruptions.

Integrated Activity Planning is linked to another planning function - Projects / Shutdowns (Engineering & Planning / Infrastructure Construction). The purpose of Manage Projects and Shutdowns is to deliver project work enabling asset reliability improvements efficiently and safely, revenue growth and major maintenance, in alignment with all stakeholder expectations, customer requirements and asset strategies.

4.5. Procurement & Inventory (Procurement Transmission & Power)

The purpose of the Procurement and Inventory processes to provide strategic and operational supply chain (inventory management, purchasing and logistics) services and strategic procurement services where they are needed, to maximise asset performance and enable assets to meet their objectives.

4.6. Regulatory Compliance (Asset Management)

The purpose of Regulatory Compliance is to ensure all assets are being managed and operated in accordance with legislative obligations.

APA VTS Annual (Safety) Report is submitted in accordance with the requirements of Section 11(c) Pipelines Regulations 2017 (Vic). This Report has been attached in 2020/21 VTS Annual Pipeline Report for the Victorian Transmission System

4.7. Process Safety (Engineering & Planning)

The purpose of Process Safety is to assure the safety of our people and the public from any major accident event as a result of an unplanned/uncontrolled harmful substance or energy release.

Process safety relates to controls at compressor stations and making them 'fail-safe'. This reduces opportunity for a process to result in loss of containment (release of methane). This includes improvements underway on control systems and station vents at compressor stations –.

The compressor station upgrade program (SIB Business Case 205 Compressor Station Vent Upgrade) seeks to upgrade the vents at Longford, Springhurst, Brooklyn, Wollert B and Gooding Compressor Stations to mitigate risk of vent ignition.

5. VTS Replacement (Stay-in-Business) programs and projects

5.1. Overview

The majority of proposed replacement/ stay-in-business programs are ongoing and continue over several access arrangement periods.

Capital expenditure in the current period saw increased focus on asset integrity and the deferral of other projects

The key areas of investment for the 2023-2027 access arrangement period addressing increased risk from an ageing asset in tandem with continuing urban encroachment adjacent to APA assets. These factors together have increased the risks and consequences

APA national approach / greater focus on integrity has identified the need to address asset integrity of unpiggable pipelines on the VTS.

5.2. Drivers for Investment

APA VTS manages assets to ensure compliance with National Gas Rules, Victorian Government legislation and regulations and relevant Australian and international standards.

The primary drivers for replacement/ SIB capital expenditure

- Safety
- Reliability
- Integrity
- Regulatory obligations

These drivers are subject requirements set out in:

- Victorian Government legislation
- Australian Standards
- International Standards
- AEMO Service Envelope Agreement.

5.2.1. Victorian Government Legislation

Victorian Government legislation includes:

- Pipelines Act 2005
- Pipelines Regulations 2017 (Vic).
- Pipeline licences for [46/47] pipelines on the VTS
- Gas Safety Act 1997
- Gas Safety (Safety Case) Regulations 2018
- Victorian OH&S Act 2004
- OH&S Regulations 2018
- Electrical Safety Act 1998

- Electrical Safety (Installation) Regulations 2009
- Electrical Safety (General) Regulations 2019

The pipeline operates under a safety case regime in accordance with the Gas Safety (Safety Case) Regulations 2017 and has a safety management system in place in accordance with the regulations.

APA operates and maintains the VTS and its associated facilities in accordance with AS2885.3 and other relevant standards.

5.2.2. Industry Standards

Australia Standard (AS) 2885 Pipelines—Gas and liquid petroleum is a series of standards that provide important principles, practices and practical guidelines for use by competent persons and organisations involved in the operation and maintenance of high-pressure petroleum pipelines.

AS 2885 has evolved and expanded in order to meet the requirements of the Australian industry to reduce the cost of construction pipeline as well as maintain the existing high standards of safety and reliability.

The Standard has seven parts:

- AS 2885.0: General requirements
- AS 2885.1 Design and construction
- AS 2885.2: Welding
- AS 2885.3: Operation and maintenance
- AS 2885.4: Submarine pipeline systems
- AS 2885.5: Field pressure testing
- AS 2885.6: Pipeline safety management.

Alignment of operations with AS 2885 reflects good industry practice.

5.2.3. Service Agreement Envelope with AEMO

APA VTS has a Service Envelope Agreement with AEMO. AEMO operates the VTS - both the Declared Wholesale Gas Market (“DWGM”) and the physical asset. AEMO schedules all gas flows

APA VTS owned and maintained the VTS assets that are operated by AEMO.

Under the Service Envelope Agreement with AEMO we guarantee “all-year-round” ability to deliver the required demand/ capacity.

5.3. Justification of stay-in-business programs and projects

The VTS stay-in-business programs and projects are justified under NGR, rule 79. The stay-in-business capital expenditure is necessary to

- to maintain and improve the safety of services; or
- to maintain the integrity of services; or
- to comply with a regulatory obligation or requirement; or
- maintain capacity to meet levels of demand for services existing at the time the capital expenditure is incurred (as distinct from an expansion of pipeline capacity).

The business cases for the stay-in-business programs and projects justify the need for undertaking replacement, upgrades or overhauls of VTS assets. The proposed APA VTS stay-in-business programs and projects are driven by safety, integrity and reliability and regulatory obligations and reflect good industry practice.

The replacement business cases are structured as follow:

- Provide background for the program and project
- Identify the program and project need/ driver including
    - Relevant legislation and alignment with regulatory obligations
    - Meeting Australian (and international) standards
    - Meeting good industry practice
- Risk assessment
    - Aligns with APA's Risk policy
- Identification of options
    - All options are compared to a "Do Nothing" option.
    - Do nothing can be 'run-to-failure' of the assets
    - For replacement expenditure, do nothing is often not a credible option as it risks breaching regulatory obligations and standards regarding safety, integrity and reliability
- Assessment of options
    - Assessment is based on comparing the outcomes if the identified risks are not addressed compared to undertaking options to mitigate the risks
    - Assessment of options uses ALARP as a benchmark
- Identify the preferred option following assessment of options
    - Forecast the cost of the option and breakdown into cost components
- Justification of preferred option against Rule 79.
- Discussion of benefits to customers and consumers of the preferred option.

5.4. Summary of programs and projects

APA risk assessed the VTS assets and collated the required expenditure into 32 business cases which have also been grouped by access arrangement class. A summary of the access arrangement class estimates is provided below in the table below.

Table 1 VTS proposed replacement (stay-in-business) capital expenditure ($2022)

AA Class	Sum(23:27)	23	24	25	26	27
Other	$67,700,097	$12,332,993	$16,487,320	$15,534,824	$13,207,320	$10,137,642
Pipelines	$30,448,788	$9,690,884	$14,724,264	$4,033,640	$1,000,000	$1,000,000
Compressor Stations	$22,410,719	$4,400,000	$4,475,000	$5,800,000	$3,300,000	$4,435,719
Gas Quality	$1,979,240	$250,000	$0	$850,000	$500,000	$379,240
Receipt & Delivery Points	$507,475	$100,000	$100,000	$100,000	$100,000	$107,475
Buildings	$230,000	$130,000	$100,000	$0	$0	$0
Total	**$123,276,319**	**$26,903,877**	**$35,886,584**	**$26,318,464**	**$18,107,320**	**$16,060,076**

Program	AA Class	BC No.	Sum(23:27)	23	24	25	26	27
BC203 AA23-27 WCS A Process Safety	Compressor Stations	203	$1,300,000	$0	$0	$1,300,000	$0	$0
BC204 AA23-27 BCS 8,9,10,11 Upgrade	Compressor Stations	204	$10,300,000	$2,500,000	$2,500,000	$2,500,000	$2,800,000	$0
BC205 AA23-27 Compressor Station Vent Upgrade	Compressor Stations	205	$1,975,000	$0	$475,000	$500,000	$500,000	$500,000
BC211 AA23-27 Iona CS Aftercooler upgrade	Compressor Stations	211	$3,200,000	$200,000	$1,500,000	$1,500,000	$0	$0
BC212 AA23-27 Battery Chargers	Other	212	$1,000,000	$200,000	$200,000	$200,000	$200,000	$200,000
BC216 AA23-27 Wollert CG, T74 & T119 PRS Instrument Air	Other	216	$1,596,000	$500,000	$500,000	$596,000	$0	$0
BC220 AA23-27 T33 LV03 Pit Installation	Other	220	$330,860	$330,860	$0	$0	$0	$0
BC224 AA23-27 DCG Gas Quality	Gas Quality	224	$1,379,240	$0	$0	$500,000	$500,000	$379,240
BC225 AA23-27 Control Valve Positioner Replacement	Receipt & Delivery Points	225	$507,475	$100,000	$100,000	$100,000	$100,000	$107,475
BC227 AA23-27 SMS Aerial Photography	Other	227	$200,000	$0	$0	$200,000	$0	$0
BC230 AA23-27 Encroachment-High Consequence Areas	Other	230	$2,200,000	$440,000	$440,000	$440,000	$440,000	$440,000
BC235 AA23-27 Turbine Overhaul	Compressor Stations	235	$5,000,000	$1,700,000	$0	$0	$0	$3,300,000
BC239 AA23-27 Emergency Response	Other	239	$7,620,000	$0	$2,500,000	$2,000,000	$2,000,000	$1,120,000
BC242 AA23-27 BCS Unregulated Bypass	Other	242	$341,504	$0	$0	$341,504	$0	$0
BC244 AA23-27 CP Replacement	Other	244	$1,162,322	$232,400	$232,400	$232,400	$232,400	$232,722
BC249 AA23-27 Hazardous Area Rectification	Other	249	$890,000	$200,000	$200,000	$200,000	$290,000	$0
BC258 AA23-27 Pipeline Integrity	Other	258	$27,641,733	$6,991,733	$6,450,000	$6,900,000	$5,200,000	$2,100,000
BC259 AA23-27 VTS Unpiggables	Pipelines	259	$26,798,788	$9,690,884	$14,074,264	$3,033,640	$0	$0
BC260 AA23-27 Liquids Management	Gas Quality	260	$600,000	$250,000	$0	$350,000	$0	$0
BC263 AA23-27 Pipe Support Replacement	Other	263	$850,000	$0	$0	$250,000	$250,000	$350,000
BC264 AA23-27 HMI Upgrade	Other	264	$720,000	$180,000	$360,000	$180,000	$0	$0
BC267 AA23-27 BCS Unit 12 Inlet Filter Upgrade	Compressor Stations	267	$635,719	$0	$0	$0	$0	$635,719
BC271 AA23-27 Type B	Other	271	$1,960,000	$0	$460,000	$500,000	$500,000	$500,000
BC275 AA23-27 Mainline Isolation Valve Upgrade	Pipelines	275	$3,650,000	$0	$650,000	$1,000,000	$1,000,000	$1,000,000
BC307 AA23-27 Reliability Centred Maintenance	Other	307	$2,250,000	$500,000	$1,750,000	$0	$0	$0
BC309 AA23-27 Arc Flash	Other	309	$1,250,000	$250,000	$250,000	$250,000	$250,000	$250,000
BC314 AA23-27 Critical Spares	Other	314	$2,100,000	$0	$0	$0	$0	$2,100,000
BC317 AA23-27 Station Control Logic Review & Rectification	Other	317	$2,027,678	$80,000	$486,920	$486,920	$486,920	$486,920
BC328 AA23-27 Waterbath Heater Integrity	Other	328	$2,000,000	$200,000	$400,000	$400,000	$1,000,000	$0
BC329 AA23-27 Facility Pipework Integrity	Other	329	$9,290,000	$1,858,000	$1,858,000	$1,858,000	$1,858,000	$1,858,000
BC330 AA23-27 Low Value Preventative & Reactive Maintenance	Buildings	330	$2,500,000	$500,000	$500,000	$500,000	$500,000	$500,000
Total	**Buildings**	**203**	**$123,276,319**	**$26,903,877**	**$35,886,584**	**$26,318,464**	**$18,107,320**	**$16,060,076**

The remainder of Section 5.4 provides business case scope overviews.

5.4.1. WCS A Process Safety (BC203)

The aim of this project is to improve the safety and reliability of the Wollert Compressor Station A (WCS A) by implementing upgrades to achieve the following objectives: · Convert unit isolation valves from fail-last to fail-safe configuration · Retrofit check valves to prevent reverse flow and compressor reversal related failures · Conversion from instrument gas to instrument air (hazardous area and Type B improvement) The successful solution will provide a more dependable and safer station that addresses identified process safety vulnerabilities. The project is an ongoing project that had been partially deferred in the current access arrangement period. The project was deferred to address other priorities that emerged during the access arrangement period.

The following options have been considered:

Option 1: Do Nothing Option

Option 2: Replace compressor packages and associated balance of plant

Option 3: Replace and upgrade necessary equipment for process safety concerns. (recommended option).

5.4.2. Brooklyn CS Upgrade (BC204)

The asset management strategy applying to Brooklyn Compressor Station is to replace each component of the station as necessary to ensure the life of the units and station past the year 2022.

This project is consistent with the asset management strategy and the following aspects of the Brooklyn Compressor Station have been identified as needed upgrading:

- Safety and Process Control systems
- Unit 8, 9, 10, 11 controls
- Unit 8, 9, 10, 11 enclosure fans
- Unit 8, 9, 10, 11 fuel gas
- Unit 8, 9, 10, 11 exhaust stack replacement.

The project forms an ongoing program to maintain proper functioning of the Brooklyn Compressor Station.

The following options have been considered:

Option 1: Do Nothing

Option 2: Total Replacement

Option 3: Station upgrade to ensure life past 2031. (recommended option).

5.4.3. Compressor Station Vent Upgrade (BC205)

The current station vents and five compressor stations are not acceptable in the event of ignition and personnel or the public are within the heat flux zone · Each station needs to be assessed and vent modifications installed · The result is the risk reduction to ALARP.

The following options have been considered:

Option 1: Do Nothing Option

Option 2: Upgrade to Vent Stacks at Compressor Stations (recommended option)

5.4.4. Iona CS Aftercooler Upgrade (BC211)

The Iona Compressor Station has a power output constraint due to insufficient cooling of process gas during the summer months. This project is for the installation of a larger, more capable gas aftercooler to ensure the full capacity of the station can be realised.

The following options have been considered:

Option 1: Do Nothing Option

Option 2: Augmentation of existing cooling

Option 3: Replacement of existing cooler with larger model (recommended option)

5.4.5. Battery Charger Upgrades (BC212)

Battery Charger replacement for backup power control for the following stations:

- Springhurst CS
- Euroa CS
- Winchelsea CS
- Wandong PRS
- Newport

The following options have been considered:

Option 1: Do Nothing Option

Option 2: No alternative identified

Option 3: Replace battery charging systems (recommended option)

5.4.6. Wollert CG & T74/T119 PRS Instrument Air (BC216)

The Wollert City Gate & T74/T119 PRS uses Instrument Gas which vents to atmosphere causing a safety hazard and unnecessary greenhouse gas emissions. The project is to convert the Wollert CG & T74/T119 PRS to instrument Air.

The following options have been considered:

Option 1: Do Nothing Option

Option 2: Convert the Wollert City Gate and T74/T119 PRS to Instrument Air (recommended option)

5.4.7. T33 LV03 Pit (BC220)

It is standard APA practice to have all bypass valves installed above ground; however both bypass valves for LV03 on T33 pipeline are currently buried and cannot be accessed for maintenance and/or inspection (per T33-22 and T33-08-05).

A small pit currently exists around LV03 for limited access. A new larger pit will be constructed to current standards to allow safe and unrestricted access for LV03 and both bypass valves, which will reduce workplace hazards related to confined space entry and exit.

These bypass valves permit effective isolation of T33 pipeline as well as protecting LV03 from being re-opened from a high pressure differential event. Without the bypass valves being in a functional and accessible state, the capacity to protect LV03 and isolate T33 pipeline is compromised.

Option 1: Do nothing

Option 2: Replace 3 valve pits with one large valve pit (recommended option)

5.4.8. Dandenong City Gate Gas Quality (BC224)

Problem: Inadequate gas temperature requirements of NGR rule 288 injecting into the T16 pipeline due to no gas heating equipment installed at the Dandenong City Gate.

Affects: Inability for AEMO to ensure the quality of the gas entering the T16 pipeline complies with the gas quality Standards as set out in the AEMO procedures, enforced by law.

Impact: gas that does not meet the AEMO gas quality standards requires notifications and potentially curtailment, it may be damaging to the T16 pipeline and/or pose a public risk if for example condensate reaches consumer assets.

Successful solution will: Install suitable gas heating in line with the requirements of the NGR, rule 288.

The following options have been considered:

Option 1: Do Nothing Option

Option 2: Install a gas heater compliant with the requirements of NGR rule 288 (recommended option)

5.4.9. Control Valve Positioner Replacement (BC225)

Ageing electro/pneumatic equipment with increasing likelihood of failure. The positioners are used to control the positioning of flow control valves, failure of the device will impact gas flow which can lead to a failure to supply. The impact varies per site with some sites having redundancies to reduce the impact of individual failures although those redundancies will involve equipment of the same vintage

Successful solution will maintain the life and maintainability of the equipment and reduce likelihood of failures resulting in loss of supply or ability to efficiently manage system linepack.

The following options have been considered:

Option 1: Do Nothing Option

Option 2: Replace all the older DVC5000 series positioners as a single project.

Option 3: Staged replacement of positioners over 5 year period. (recommended option)

5.4.10. SMS Aerial Photography (BC227)

The Australian Standard for transmission pipelines AS2885.1 (sec 2) requires that a Safety Management Study (SMS) is to be conducted as a minimum every five years to identify location specific and non-location risks along the entire length of the pipeline. The identification of land use changes and population density is a fundamental input to the SMS and is best performed by aerial photography with feature identification.

The following options have been considered:

Option 1: Do nothing. Use existing outdated photography (5 years old)

Option 2: Compile new Aerial photography (recommended option)

5.4.11. Encroachment High Consequence (BC230)

The project is to ensure the safety of the public and the pipeline by reducing the risks associated with third party interference causing damage to high pressure pipelines. Some of the VTS pipelines need physical or operating changes to ensure risk levels are acceptable due to urban encroachment. These pipelines involve those with the high consequence surroundings associated with fully developed urban areas, proposed urban development areas and areas with specific sensitivity.

The following options have been considered:

Option 1: Do Nothing Option

Option 2: Protective slabbing

Option 3: Lower the pressure of the pipeline to reduce the consequences and modes of failure

Option 4: Combination of option 2 & 3 (recommended option)

Option 5: Replace the pipeline

5.4.12. Turbine Overhaul and Minor Upgrades (BC235)

Turbine Overhaul of:

The T4002 gas turbine engines in Gooding Unit 3 and Unit 2 are expected to reach overhaul runtime during the period 2023-2027.

The T6102 gas turbine engine at Springhurst may reach overhaul runtime during the end of the 2023-2027 period if flows south increase.

It is expected that the WORM project completion will result in lower utilisation of the Brooklyn CS Unit 11 and 12 (Centaur T4002) engines meaning they will not require overhaul in this time period. If utilisation continues at current levels the engine will reach run time towards the end of the 2023-2027 period.

The overhaul of the engine is a relatively simple process and will permit another 30,000 hours of engine life.

During the event of an overhaul often small upgrades to incorporate service bulletins to improve reliability or address a safety concern.

The following options have been considered:

Option 1: Do Nothing

Option 2: Complete Overhaul at Recommended Life

Option 3: Overhaul Based on Inspection (recommended option)

5.4.13. Emergency Response Equipment (BC239)

The VTS is required to maintain emergency response and recovery equipment and material in order to deliver timely management and recovery from pipeline events. The inability to efficiently and effectively respond and repair pipeline damages could result in prolonged loss of supply to customers and greater risks of Health & Safety and Environmental impacts from emergency scenarios to workforce and neighbouring communities.

The following options have been considered:

Option 1: Do Nothing Option

Option 2: Third Party Emergency Response (Hot Tap Equipment only)

Option 3: Purchase Emergency Pipe and Equipment (recommended option)

5.4.14. BCS Unregulated Bypass Upgrade (BC242)

The BCS Station bypass is currently setup to be manually regulated by throttling across either of the 2 x plug valves (6237 and 6234 drawing reference – 1200-PA-005). This has the potential of over-pressuring the 2800Kpa pipeline from the T56 or T24 which operates at a Maximum Allowable Operating Pressure (MAOP) 7,400 kPa pipelines. It is not standard APA practice to manually throttle valves over such a large pressure differential due to the reliance on the technician skill in such an approach significantly increases the risk of error and over pressurisation. Over-pressurisation can lead to pipe rupture. This procedural means is not an acceptable method for pressure regulation.

The aim of this project is to totally remove any possibility of a safety breach associated with manual regulation of the BCS station bypass pipeline. To achieve this aim, the station bypass pipeline upstream of Valve 6234 will be disconnected and blinded.

The AER has approved similar works on other assets in the Access Arrangement.

The following options have been considered:

Option 1: Do Nothing

Option 2: Cut and shut station bypass (recommended option)

5.4.15. Security Physical (BC243) (now part of SOCI Program Scope)

Physical security upgrades at key sites along the Critical Infrastructure assets In the Victorian Transmission System. APA has identified 49 VTS sites that require upgrades to physical security to comply with Australian Government Security of Infrastructure (SOCI).

The following options have been considered:

Option 1: Do Nothing Option

Option 2: Upgrade of physical security measures – deter, detect, delay and response. (recommended option)

5.4.16. CP Replacement (BC244)

The cathodic protection system comprises of many components. Over time these components fail, deplete or require augmentation. This business case is the supporting evidence for the capex investment required to maintain the integrity of the 2,200km of buried transmission pipeline.

The following options have been considered:

Option 1: Do Nothing Option

Option 2: No alternative identified

Option 3: Replace and upgrade the cathodic protection system (recommended option)

5.4.17. Hazardous Area Rectification (BC249)

APA has responsibility to ensure all the electrical equipment installed in APA hazardous areas is in safe working condition and meets the legal requirement and that compliance is being met or maintained with all relevant Standards.

To meet the requirement of AS/NZS 60079, a Hazardous Area Verification Dossier HAVD is a fundamental requirement which details the compliance and safety of the electrical equipment installed within hazardous area at all APA sites. The majority the APA VTS sites now have an HAVD that complies with the preliminary requirements of AS/NZS 60079.

Audit and inspections of APA VTS sites has been completed and equipment not installed/conforming to the Australian Standards, and therefore requiring rectification, have been identified. Rectification of these non-conformances will reduce the identified risks to APA personnel and the business as it is a statutory requirement that the sites should be compliant to the mentioned standard.

The following options have been considered:

Option 1: Do Nothing Option

Option 2: Complete the identified rectification of electrical equipment not conforming to the requirements of the Australian Standards. (recommended option)

5.4.18. Pipeline Integrity (BC258)

The aim of the Integrity Management Program is to ensure that Victorian Transmission System buried gas pipelines remain fit for safe and reliable service. The integrity management program for buried transmission pipelines includes:

- Inline inspections
- Direct assessments
- Verification and remediation excavations.

Execution of the integrity management program allows APA to:

- Periodically review the condition of each pipeline
- Use the inspection data to recalibrate remaining life modelling
- Apply efficient targeted remedial action campaigns.

The following options have been considered:

Option 1: Do Nothing Option

Option 2: Integrity Management Program (recommended option)

5.4.19. VTS Unpiggables (BC259)

The aim of the unpiggables program is to convert unpiggable pipelines on the Victorian Transmission System to be suitable for pigging (inline inspection by intelligent pig).

The objective is to improve certainty for calculating remaining life for unpiggable pipelines that do not meet APA acceptable risk tolerance.

Pipeline remaining life is initially calculated using conservative corrosion rate modelling. However, when numerical remaining life thresholds are reached, periodic physical inspection and assessment is required to meet APA integrity policy and ensure continued safe reliable operation.

Inline inspection (pigging) is considered the most efficient method to identify pipeline defects and enable a targeted repair campaign. However (older) pipelines were sometimes constructed without launchers or receivers (i.e. unable to be pigged).

Several of these pipelines have either reached or exceeded a typical inline-inspection interval (typically 10-15 years). Inspection is now required to ensure asset integrity is adequate for continued safe operation.

The objective of this project is to conform with APA pipeline integrity policy and ensure safe reliable operation of the Victorian Transmission System unpiggable pipelines using one of the following actions:

- Modify unpiggable pipelines that do not meet APA acceptable risk tolerances to enable inline inspection
- Pressure reduce or decommission pipelines that are no longer viable to leave in service.

The following options have been considered:

Option 1: Do nothing – ALARP assessment required (continued direct assessment of unpiggable pipelines)

Option 2: Address remaining life uncertainty using APA unpiggable strategy. (recommended option)

5.4.20. Liquids Management (BC260)

The aim of this business case is to ensure liquids removed from pipeline systems in accordance with Gas Safety Regulations.

The objective of this business case is to upgrade existing liquids management systems to the APA standard design. Scope for the 2023-2027 period is as follows;

- Brooklyn liquids management system upgrade
- Wollert liquid level indicator upgrade

The implemented solution will be as per completed upgrades to date and consist of a low risk, low cost asset without the need of pressure vessels and other high maintenance equipment.

The following options have been considered:

Option 1: Do Nothing Option

Option 2: Upgrade of existing liquids management systems (recommended option)

5.4.21. Pipe Support Replacement (BC263)

Replacement of inferior pipe supports with modern design to prevent corrosion at locations:

- Dandenong City Gate (100% complete)
- Various compressor and city gate stations (Brooklyn complete)
- Pig traps (75% complete)

The following options have been considered:

Option 1: Do Nothing Option

Option 2: Replace Pipe Supports (recommended option)

5.4.22. HMI ClearSCADA Upgrade (BC264)

Human Machine Interface (HMI) software on existing sites is not compatible with APA standard, the software is installed in standard computers and due for replacement. Maintenance technicians and engineers, used for diagnostics and plant re-instatement after shutdown. Failure of HMI computer results in inability to fault find or re-instate the plant after shutdown, resulting on extended duration of the outage. The successful solution will provide standardised HMI equipment and increased reliability of the HMI.

The following options have been considered:

Option 1: Do Nothing Option

Option 2: Upgrade to Local HMI's to Clear SCADA by schedule (recommended option)

5.4.23. BCS Unit 12 Inlet Filter Upgrade (BC267)

The Brooklyn Compressor Station Unit 12 (BCS12) has a single process gas inlet filter. This filter was procured from another APA VTS compressor station (Bulla Park) to reduce cost of BCS12 installation in 2007.

The filter has consumable elements that require cleaning/replacement when they become fouled. In order to perform this maintenance activity, the vessel must be isolated from gas, depressurised, purged of hydrocarbons and then the confined space must be entered by a technician.

There are 5 main problems with the existing BCS 12 inlet filter:

Availability of BC12 is lost whenever this filter requires cleaning as there is only one filter for the unit

Maintainability of the filter is restricted by the performance of the isolation valves, should they pass gas the confined space atmosphere fit for human occupation cannot be maintained and thus the maintenance cannot be performed.

Maintainability of the filter. The filter housing is difficult to clean due to the associated safety concerns. The means of confined space rescue is severely inhibited by design of entry and elevated platform.

Performance of the filter is limited to 10µm whereas the standard APA design for inlet filters for process gas for Solar Turbine packages are 3µm and 99% efficiency for all solid and liquid particles greater than 1µm. This is the specification set by Solar Turbines International.

Reliability of the compressor seal is influenced by the cleanliness of the process gas. A 10µm filter on the inlet side will result in larger particles being compressed with the process gas. 'Dirty gas' has contributed to dry seal failures for gas compressors nationally. The result is an immediate shutdown with a loss of plant up to least six weeks.

The following options have been considered:

Option 1: Do Nothing Option

Option 2: Replacement of the BCS12 Filter (recommended option)

5.4.24. Type B Compliance (BC271)

APA has received instruction from the Safety Case regulator (ESV) that gas fired appliances are required to comply with AS3814 (See Appendix for email from ESV).

APA operates about 34 Type B appliances (compressors, heaters and generators) constructed from 1977 onwards and have identified the following issues;

Most Type B Appliances over 7 years old would not currently comply with AS3814

Compliance with AS3814 can impact safety and integrity of gas fired appliances

If a noncompliant Type B appliance component fails, an (unplanned) full upgrade of the affected appliance to Type B compliance is required.

Successful solution will: Upgrade the appliances to comply with AS3814 and ESV requirements

The following options have been considered:

Option 1: Do Nothing Option

Option 2: Replace all old Heaters, Gas Generators and Compressors with new, compliant equipment

Option 3: Complete the AS3814 audits on the affected appliances and rectify non-compliances. (recommended option)

5.4.25. VTS Mainline Isolation Valve Upgrade (BC275)

The aim of this project ensure that Victorian Transmission System pipeline mainline isolation valves are able to operate safely and reliably when required. The objective of this project is to target with remedial actions all mainline isolation valves in a high consequence areas with any of the following issues:

- The mainline valve has internal leaks or internal friction which prevent the valve from isolating gas flow as per AS2885 requirements.
- The mainline valve has external leaks
- The mainline valve is located in residential property

The following options have been considered:

Option 1: Do Nothing Option

Option 2: Overhaul the existing isolation valve

Option 3a: Replace the existing isolation valve (recommended option)

Option 3b: Install new mainline valve in a safer location and decommission existing isolation valve (recommended option)

5.4.26. Reliability Centred Maintenance (BC307)

Existing maintenance tasks have never been rationalised in accordance with equipment criticality or reliability. They are mostly defined from rudimentary OEM manuals or replicated from seemingly similar assets without consideration of asset criticality or application. Detail is discretionary depending on the project team and handover quality. Subsequently many tasks are not fit for purpose. Currently we have tasks that are either not required or simply do not proactively prevent trips / downtime and or increase MTBF. We are not currently utilising our operations and maintenance resources in the most efficient manner nor are they aligned to safety, reputational and commercial goals.

Applying RCM principles to maintenance strategy development will allow us to generate fit for purpose strategies that align with asset/business criticality. Doing the right tasks at the right time, on the right equipment will increase reliability reducing preventable reactive maintenance, as well as improving availability.

The following options have been considered:

Option 1: Do Nothing Option

Option 2: Complete RCM strategy development on VTS transmission assets (recommended option)

5.4.27. Arc Flash Risk Mitigation (BC309)

Interim results of an Arc Flash Study highlighted an existing risk at a high portion of reviewed APA sites in line with the 2018 standard. This is when an arc fault develops while personnel are operating or working on high energy electrical equipment. This has been risk assessed as High risk (approved July 2021). To reduce risk to within the APA risk apatite short medium and long term work items have been identified.

The following options have been considered:

Option 1: Do Nothing Option

Option 2: Complete Arc Flash studies and implement recommendations (recommended option)

5.4.28. Critical Spares (BC314)

APA endeavours to maintain adequate critical spares inventory to enable prompt recovery from critical compressor station equipment failures and avoid prolonged Victorian Gas Transmission System capacity impacts. However, due to recent reductions in critical spare availability (i.e. increased procurement lead-times), the availability of critical spares has dramatically reduced.

The aim of this business case is to ensure to the extent practicable that Victorian Transmission System compressor stations remain able to recover in a timely manner after critical equipment failures.

The objective of this business case is address long lead critical sparing vulnerabilities to reduce the consequence of compressor station equipment failures.

The following options have been considered:

Option 1: Do Nothing Option

Option 2: Engage Third Parties (OEMs/Suppliers) to hold spares for the VTS

Option 3: Increase In-House Inventory of Critical Spares (recommended option)

5.4.29. Station Control Logic Review and Rectification (BC317)

Throughout their years in service the older compressor stations on the Victorian Transmission System have received numerous functionality and capacity upgrades, generally equipment or function changes also require station control system logic review and amendment. Historically the functional safety review of the control logic was focused on the impact of the changes, however a more thorough (holistic) logic review has recently been mandated by the APA process optimisation team to ensure the functional logic is failsafe and compliant. In addition, the existing control system hardware is obsolete and requires replacement to address control system hardware failure risks.

The aim of this project is to ensure that Victorian Transmission System compressor station control systems are failsafe and compliant. The objective of this project to replace the station control system hardware and also conduct HAZOP and LOPA assessments to ensure the installed logic is complaint and failsafe at the following locations;

CY18-CY22	CY23-CY27
Brooklyn CS	Gooding CS
Wollert CS	

The following options have been considered:

Option 1: Do Nothing Option

Option 2: Replace station control system with modern equivalent and perform holistic logic review (recommended option)

5.4.30. VTS Waterbath Integrity (BC328)

The aim of this project is to ensure compliance with APA integrity policy and maintain the waterbath heater equipment to a safe and dependable standard.

Waterbath heaters require periodic internal inspection to meet Type B requirements and ensure safe reliable operation.

The objective of this project is to schedule waterbath heater internal inspections that verify condition and identify risks and manage accordingly, which in turn improves certainty of remaining life and related supply confidence.

Note: Previously these inspections were treated as operational expenditure but recent reviews identified that they should be capitalised.

The following options have been considered:

Option 1: Do nothing – ALARP assessment required

Option 2: Assess waterbath heaters to fixed schedule

Option 3: Assess waterbath heaters to RBI schedule (recommended option)

5.4.31. VTS Facility Pipework Integrity (BC329)

Facility pipework remaining life is confirmed with periodic physical assessment to meet APA integrity policy and ensure continued safe reliable operation. The integrity of unpiggable buried piping and above ground insulted piping cannot be easily determined. For such buried and insulated facility pipework where no simple assessment methods exist, excavation (digs) and insulation removal, combined with visual inspection and non-destructive testing (NDT) are generally considered the most efficient method to identify facility pipework faults and enable a targeted repair campaign.

The aim of this project is to ensure compliance with APA integrity policy and maintain the facility pipework to a safe and dependable standard.

The objective of this project is to schedule physical condition verification assessments which will identify risks and allow the actual condition to be known and managed accordingly. This will in turn improve certainty of remaining life and related supply confidence.

The following options have been considered:

Option 1: Do nothing – ALARP assessment required

Option 2: Assess facility pipework to fixed schedule

Option 3: Assess facility pipework to RBI schedule (recommended option)

5.4.32. Low Value Preventative & Reactive Maintenance (BC330)

A recent review of Victorian transmission system operational expenditure identified maintenance activities and urgent procurement items that should be capitalised. These tasks are mission critical to reduce risk of non-compliance, equipment failure or enable transmission operations field personnel to respond quickly, safely and efficiently to ensure VTS assets remain safe and reliable. The aim of this business case is to move to capitalise this expenditure.

Successful solution will:

Ensure the ongoing timely and efficient execution of low value maintenance and upgrades by allocating funds to the following;

Reactive upgrades (urgent replacement of obsolete components)

Procurement of tools and equipment for transmission operations field staff

Minor facility upgrades (e.g. renovation or asbestos removal managed by operations)

The following options have been considered:

Option 1: Do Nothing Option

Option 2: Allocate funding for preventative maintenance & reactive upgrades/tooling (recommended option)

5.5. VTS stakeholder feedback

Replacement capital expenditure proposal doubling was questioned

- Taking on board AER staff concerns about a big capex forecasts with accelerating depreciation, some stakeholders questioned what we were doing about the doubling in the repex program forecast. There were calls for us to review for only "must haves" in light of falling flows and lower usage
- Some stakeholders questioned the scope of the unpiggables program

The APA VTS response has been to take on board comments from AER staff, that we'll we review the business cases with the asset managers to ensure that they are needed.

6. Appendix

Appendix A 2020/21 VTS Annual Pipeline Report for the Victorian Transmission System

This document is submitted to Energy Safe Victoria annually, it provides a good overview of VTS assets, the risks identified and how APA is addressing them.

2020/21VTS Annual Pipeline Report for the Victorian Transmission System

Version:	1.0
Released:	29 September 2021

VTS – Annual Pipeline Report 2020/21

Annual Report

Table of Contents

1 INTRODUCTION

This Annual Report is submitted in accordance with the requirements of *Section 11(c) Pipelines Regulations 2017* (Vic).

The Victorian Transmission System (VTS) Natural Gas Transmission Pipeline is owned and operated by APT VTS Australia (Operations) Pty. Ltd. (herein referred to as APA Group).

2 FACILITY DESCRIPTION VTS

The VTS as at 30 June 2021 comprises of approximately 2,267 km of high pressure gas transmission pipelines throughout Victoria, made up of 51 pipelines under 46 individual licences (including 1 in NSW). Almost all the natural gas consumed in Victoria is transported through the VTS. The VTS serves a total consumption base of approximately 2.0 million residential consumers and approximately 60,000 industrial and commercial users throughout Victoria.

The VTS supplies gas to the Melbourne metropolitan area and to a number of regional centres including Corio (near Geelong), Ballarat, Bendigo, Wodonga, Koonoomoo and Echuca. The Laverton North, Somerton, Valley Power (Loy Yang B), Jeeralang and Newport gas-fired power stations are all supplied from the VTS.

The main VTS pipelines and compression facilities include:

- Longford to Melbourne Pipeline (Longford-Dandenong-Wollert) with compression at Gooding.
- South West Pipeline (SWP) (Port Campbell-Geelong-Brooklyn) with compression at Winchelsea and Brooklyn.
- Northern Lateral and NSW Interconnect (Wollert-Wodonga-Culcairn) with compression at Wollert, Euroa and Springhurst.
- Western Transmission System (WTS) (Iona-Portland) with compression at Iona.

Gas transmitted through the VTS is supplied primarily by Esso/BHP and injected into the VTS at the Longford injection point. Other gas supplies are sourced from the BassGas injection point at Pakenham and from the Iona injection points at Port Campbell. A small portion of gas can enter the VTS through the Interconnect pipeline from NSW, the Eastern Gas Pipeline (VicHub) and the Tasmanian Gas Pipeline (TasHub).

From the Longford and BassGas injection points, gas is transported to the Dandenong and Wollert city gate regulating stations on the outskirts of Melbourne via a partially duplicated 750 mm diameter trunk line. The Gooding compressor station, located along the trunk line between Longford and Dandenong, has four compressor units.

The Wollert city gate regulating station supplies the VTS 600mm diameter pipeline feeding into the distribution networks in metropolitan Melbourne. The Dandenong city gate directly feeds the distribution networks owned by Multinet Gas and Australian Gas Networks and also feeds the APA VTS gas transmission system 750mm diameter trunk pipeline to Brooklyn. Gas from Iona can also enter the trunk pipelines from Brooklyn. The Dandenong to Brooklyn pipeline supplies gas to the AusNet Services distribution network and to a number of Multinet Gas and Australian Gas Networks (AGN) delivery points. Approximately two thirds of Melbourne's gas demand is met through the Dandenong city gate and one third through the Wollert and Brooklyn city gates.

The VTS extends north from the Wollert city gate to Bendigo, Echuca, Koonoomoo and Wodonga through an extensive network of pipelines with diameters ranging from 150 to 400 mm including looped sections of the Melbourne to Wodonga Pipeline (PL101) known as Victorian Northern Interconnect Expansion (VNIE).

APA VTS owns compressor stations located at Gooding, Iona, Wollert, Euroa, Springhurst, Brooklyn & Winchelsea. The network extends from Brooklyn Compressor Station to Corio (near Geelong) in the south and to Ballarat/Bendigo in the north.

APA VTS also owns an LNG storage facility located at Dandenong which provides security of supply/demand balancing and winter peak shaving for the VTS.

Table 1 lists the licenced pipelines that make up the VTS, while Table 2 lists the compression facilities within the VTS.

Table 1: APA VTS Licenced Pipelines

Pipeline Name	VTS Licence	T Number	MAOP [kPa]	Length [km]	Diameter [mm]	Coating Type	Wall Thickness min, max[mm]	Grade[API 5L]	Design Temp. max[°C]
Dandenong to West Melbourne	36	T16	2760	36.2	750	C.T.E.	9.52, 9.52	X42	60
Princes Hwy to Regent St	36	T15	2760	0.8	200	C.T.E.	6.35, 6.35	A	60
Morwell to Dandenong	50	T1	2760	127	450	Bitumen	7.94, 7.94	SAA A.33 Class D	60
Supply to Jeeralang	50	T1	2760	0.4	300	P.E.	6.35, 6.35	B	60
Maryvale	67	T37	6890	5.4	150	C.T.E.	6.35, 6.35	B	60
Pakenham (Koo Wee Rup Rd)	68	T38	2760	0.7	80	C.T.E	5.49, 5.49	B	60
			2760	0.5	150	P.E.	7.11, 7.11	X42	60
Pakenham (Longford to Dandenong)	68	T116	2760	0.5	150	D.L. FBE	8.18, 8.18	X42	60
Longford to Dandenong	75	T60	6890	174.2	750	C.T.E.	10.31, 12.7	X60	60
Brooklyn to Ballan	78	T56	7390	66.6	200	C.T.E.	6.35, 7.04	B	60
Ballan to Ballarat	78	T57	7390	22.7	150	C.T.E.	4.78, 6.35	B	60
Ballan to Bendigo	78	T70	7390	90.8	150	C.T.E.	4.78, 6.35	B	60
Brooklyn to Corio	81	T24	7390	50.7	350	C.T.E.	5.56, 6.35	X60	60
Supply to Anderson St., Warragul	91	T44	2760	4.8	100	C.T.E.	6.02, 6.02	B	60
Keon Park to Wodonga and Shepparton (Keon Park – Wollert)	101	T74	2760	14.1	600	P.E.	7.92, 7.92	X42	60
Keon Park to Wodonga and Shepparton (Wollert – Wodonga)	101	T74	8800	124.2	300	P.E.	6.35, 7.55	X46	60
Keon Park to Wodonga and Shepparton (Euroa PRS – Wodonga)	101	T74	7400	145.2	300	P.E.	6.35, 7.55	X46	60
Keon Park to Wodonga and Shepparton (Euroa – Shepparton)	101	T59	7400	34.5	200	P.E.	5.59, 5.59	X42	60

Pipeline Name	VTS Licence	T Number	MAOP [kPa]	Length [km]	Diameter [mm]	Coating Type	Wall Thickness min, max[mm]	Grade[API 5L]	Design Temp. max[°C]
Keon Park to Wodonga and Shepparton–VNIE Loop	101	T119	15300	258	400	Dual layer F.B.E.	8.00, 12.70	X70	60
Clyde North	107	T32	2760	2	100	P.E.	6.02, 6.02	B	60
South Melbourne to Brooklyn	108	T33	2760	12.8	750	C.T.E.	9.52, 9.52	X42	60
Brooklyn to Altona	112	T112	2760	4.62	250	P.E.	6.35, 6.35	B	60
Rosedale to Tyers	117	T60	7070	34.3	750	C.T.E.	10.9, 13.1	X60	60
Longford to Rosedale	120	T60	7070	30.5	750	C.T.E.	10.9, 13.1	X60	60
Longford to Rosedale (TasHub)	120	T121	6890	0.7	300	Canusa HBE 95	9.50	X52	60
Tyers to Morwell	121	T63	7070	15.7	500	C.T.E.	8.72, 10.59	X60	60
Derrimut to Sunbury	122	T62	7390	24	150	P.E.	6.35, 6.35	B	60
Truganina to Plumpton	122	T118	10200	8.4	500	D.L FBE	7.9, 11.40	X70	60
Newport (supply to Newport Power Station)	124	T64	2760	1	450	C.T.E	7.92, 7.92	B, A	60
Maryborough (Guildford to Maryborough)	125	T67	7390	31.4	150	P.E.	6.35, 6.35	B	60
Mt Franklin to Kyneton	128	T66	7390	24.5	300	P.E.	6.35, 7.55	X46	60
Dandenong to Princes Hwy	129	T65	2760	5	750	C.T.E.	9.52, 9.52	X42	60
Princes Hwy. to Henty St.	129	T65	2760	0.2	500	P.E.	7.92, 7.92	B	60
Mt Franklin to Bendigo	131	T70	7390	50.8	300	P.E.	6.35, 7.55	X46	60
Tatura	132	T71	7390	16.2	200	P.E.	6.35, 6.35	B	60
Ballan to Ballarat	134	T57	7390	22.8	300	P.E.	6.4, 7.6	X46	60
Bunyip to Pakenham	135	T60	7070	18.7	750	C.T.E.	10.9, 13.1	X60	60
Tatura to Kyabram	136	T71	7390	21.3	200	P.E.	6.35, 7.07	B	60
Pakenham to Wollert	141	T61	6890	93.1	750	C.T.E.	10.6, 12.7	X60	60
Wandong to Kyneton	143	T75	7390	59.5	300	P.E.	6.35, 7.6	X46	60

Pipeline Name	VTS Licence	T Number	MAOP [kPa]	Length [km]	Diameter [mm]	Coating Type	Wall Thickness min, max[mm]	Grade[API 5L]	Design Temp. max[°C]
Paaratte to Allansford	145	T81	9890	33.3	150	P.E.	6.35, 6.35	B	60
Kyabram to Echuca	152	T85	7390	30.7	150	P.E.	4.8, 6.35	B	60
Allansford to Portland	155	T86	9890	100.4	150	P.E.	4.8, 6.35	X42	60
Laverton to Coogee	162	T88	2760	1.6	150	P.E.	6.4, 6.4	X42	60
Bay St to Unichema	164	T89	2760	0.4	150	P.E.	6.4, 6.4	X42	60
Cobden (Curdievale to Cobden)	168	T91	9890	27.7	150	P.E.	4.8, 6.4	X42	60
Hamilton (Codrington to Hamilton)	171	T93	9890	54.6	150	P.E.	4.8, 6.4	X42	60
Chiltern Valley to Rutherglen	176	T96	7400	14.7	200	P.E.	4, 4.8	X60	60
Barnawartha to Murray River	178	T99	10200	5.5	450	P.E.	6.8, 9.7	X70	60
Murray River to Culcairn	NSW:24	T99	10200	57.0	450	P.E.	6.8, 9.7	X70	60
Rutherglen to Koonoomoo	182	T98	7400	88.8	200	P.E.	4.32, 5.20 4.32, 8.20	X52 X42	60
Dandenong to West Melbourne (Keon Park East – Keon Park West)	202	T18	2760	0.6	450	C.T.E.	7.92, 7.92	A	60
			2760	0.6	450	C.T.E	7.92, 7.92	X42	60
Iona Paaratte	227	T100	2760	7.8	150	P.E.	7.1, 7.1	X52	60
Iona to Lara	231	T92	10200	143.9	500	FBE	9, 12.7 9, 12.7	X60 X70	45
Somerton Pipeline	238	T102	9890	3.4	250	P.E.	6.4, 6.4	X42	60
Supply to Iluka Resources, Hamilton	252	T109	9890	1.1	100	P.E.	6, 8.6	B	45
Supply to Snowy Hydro Power Plant, Laverton North	253	T110	10200	1.6	350	Tri-laminate	9.5, 9.5	X56	45
Brooklyn to Lara	266	T112	10200	58	500	D.L. FBE	7.9, 12.7	X70	60

Table 2: Specification of the VTS Compressor Stations

Compressor Station	Min Inlet Press. (kPa)	Max Outlet Press. (kPa)	Min Inlet Temp. (°C)	Max Outlet Temp (°C)	Seal System	Number of 'Standby' Units	Number of 'duty' Unit(s)
Gooding	4200	6850	-10	45	Dry	1 X Centaur 40	3 X Centaur 40
Brooklyn	1800	7390	-10	45	Wet/Dry	1 x Centaur 40	2 X Centaur 40 2 X Saturn 10
Wollert	3000	7400/8800/10200	-10	45	Dry	1 x Saturn 10	2 X Centaur 50S 2 x Saturn 10
Euroa	3200	7400/8800/10200	-10	45	Dry	Nil	1 X Centaur 50S
Springhurst	4500	7400/10200	-10	45	Dry	Nil	1 X Centaur 50S
Iona	3800	7400	-10	45	Wet	1X Caterpillar reciprocating engine	1XCaterpillar reciprocating engine
Winchelsea	4500	10200	-10	50	Dry	Nil	1 x Taurus 60S

3 ASSET INTEGRITY

Pipeline integrity activities for the VTS pipeline are included in the Victorian Transmission Pipeline Integrity Management Plan, document 320-PL-AM-0006, supported by the Pipelines Database, which details the activities undertaken to achieve compliance with the requirements specified in section 5 of AS2885.3.

3.1 Pipeline Coating

Most pipelines within the VTS has an internal factory applied factory coating layer for the purpose of gas flow improvement and to reduce the amount of dust in gas flow.

There are six different types of external coating systems used within the VTS which include the following:

- Bitumen;
- Coal Tar Enamel;
- Dual Layer Fusion Bonded Epoxy;
- Fusion Bonded Epoxy;
- Extruded Polyethylene; and
- Tri-laminate.

Most pipeline coating is factory applied, therefore there are minimal integrity issues associated with over the trench applied coating.

Bitumen and C.T.E coatings were predominately used on pipelines constructed before 1980 and in some cases have deteriorated due to age and soil stress. Deterioration of C.T.E. coating system has in some cases completely disbonded from the pipe surface, but thus far significant corrosion metal loss has not been detected from ILI inspections as cathodic protection provides an additional layer of protection against corrosion.

The historic data for the coating condition and link to external corrosion is considered during the 5 yearly SMS review workshop and this is reflected in the ILI inspection frequency.

Failure of field applied heat shrink polyethylene sleeves has been identified on some pipelines, particularly those installed during coating refurbishment work. These sleeves tend to shield cathodic protection current enabling corrosion to occur under the sleeve.

On pipelines known to be susceptible to corrosion under shielded coating, corrosion monitoring is carried out via ILI and pipeline Direct Assessment methods. As per the APA Victorian PIMP, document 320-PL-AM-0006, routine coating surveys are not undertaken on pipelines that are in-line inspected.

Where third party works may impact the pipeline, APA will take the opportunity to undertake an assessment and recoating of the pipeline in the case where new infrastructure will make access to the pipeline more difficult in future. This regularly happens in relation to third party works and new infrastructure built by other authorities such as road expansions, new precinct subdivisions, water drainage works, etc.

3.2 In-Line Inspection

The VTS utilises ILI to determine the integrity of each piggable pipeline, primarily to assess the pipeline wall thickness metal loss resulting from external corrosion and mechanical damage. ILI is contracted to a specialist third party operator who provides the ILI tool and highly sophisticated software data analysis to determine the type and dimensions of any pipeline anomalies The ILI's of the VTS is typically scheduled between 10 to 15 years.

APA has been running a program where it is converting pipelines that were previously un-piggable, due to size (diameter, length or both), into piggable pipelines and is gradually working its way through this program.

In-line Inspection performed during the year includes;

- PL108 South Melbourne to Brooklyn (unpiggable section)
- PL202 Dandenong to West Melbourne
- PL141Pakenham to Wollert
-

No immediate issues have been identified and a number of sites will be prioritised for verification digs in accordance with the intervention level determined for anomalies.

Criteria		**Number of Defects Recorded**	**Number of Defects Repaired**	**Comments**
Estimated Repair Factor (ERF)[1]	>1	0	0	PL108 South Melbourne to Brooklyn Pipeline
		0	0	PL202 Dandenong to West Melbourne (Keon Park E
		3	3	PL141Pakenham to Wollert Pipeline
	0.9<ERF<1	0	0	PL108 South Melbourne to Brooklyn Pipeline
		0	0	PL202 Dandenong to West Melbourne (Keon Park E
		2	1	PL141Pakenham to Wollert Pipeline (remaining loca
Non-corrosion related	Dents	0	0	PL108 South Melbourne to Brooklyn Pipeline
		0	0	PL202 Dandenong to West Melbourne (Keon Park E
		5	0	PL141Pakenham to Wollert Pipeline – 4 dents will be
	Gouges	0	0	All pipelines

	Cracks	0	0	All pipelines
	Dents and gouge combinations	0	0	All pipelines

3.3 Gas Leak Detection

As part of monthly ROW aerial road patrols and station inspections, all sections of the pipeline are inspected for signs of possible leaks.

Odorising of natural gas within the Victorian Transmission ensures that a gas leak can be detected by smelling it. Alternatively, APA may be notified by the general public if there is a gas odour and this is captured through the incident database.

3.4 Pipeline Patrols

A frequency of pipeline easement patrols varies across the VTS according to the location class of each pipeline section and varies from daily in metropolitan areas through to monthly in rural areas. Pipeline patrols are a combination of ground and aerial patrols and the frequency is determined on a risk assessed basis confirmed by the 5 yearly Safety Management Study.

The patrols are used to check the condition of the easement for line of sight, signage, gas leaks, check for weeds & erosion and detect unauthorised encroachment.

Sightings from patrols are recorded via a formal "sighting report" and actioned as corrective maintenance via the computerised maintenance management system.

Ground patrols are performed daily during week days on all metropolitan and T1 classification pipelines in 26 locations, quarterly at 30 locations and six monthly at 13 locations across the VTS.

Aerial patrols are conducted monthly on the following pipelines;

Pipeline
PL135 (Bunyip-Pakenham (Sth Line))
PL75 (Longford-Dandenong (Nth Line))
PL117 & 120 (Longford-Rosedale-Tyers (Sth Line)
PL68 Pakenham (Koo-Wee-Rup Rd) Pipeline 80mm + 150mm pipelines
PL50 Morwell to Dandenong Pipeline
PL81 Brooklyn to Corio Pipeline (Includes Brooklyn Compressor Station)
PL107 Cranbourne (Pound Rd - Tuckers Rd) Pipeline
PL67 Maryville (A.P.M.) Pipeline
PL91 Warragul Pipeline
PL78 Brooklyn to Ballan Pipeline
PL134 (300 Ballan-Ballarat)
PL78 (150 Ballan-Ballarat)
PL101 Euroa to Shepparton Pipeline
PL141 Pakenham to Wollert Pipeline

PL122 Deer Park to Sunbury Pipeline
PL121 Tyers to Morwell Pipeline
PL128 Mount Franklin to Kyneton Pipeline
PL125 Guildford to Maryborough Pipeline
PL131 (300 Mt Franklin-Bendigo)
PL78 (150 Ballan-Bendigo)
PL132 Shepparton to Kyabram Pipeline
PL101 (300 Wollert-Wodonga)
PL143 Wandong to Kyneton Pipeline
PL145 Paaratte to Allansford Pipeline
PL152 Kyabram to Echuca Pipeline
PL155 Allansford to Portland Pipeline
PL168 Curdievale - Cobden Pipeline
PL231 Lara to Iona (SWP) Pipeline (Includes WICS & ICS)
PL171 Codrington to Hamilton Pipeline
PL176 Chiltern to Rutherglen Pipeline
PL182 Rutherglen to Koonoomoo Pipeline
PL178 Barnawartha to Murray River Pipeline
PL227 Iona to Paaratte Pipeline (Includes ICS)
PL252 Iluka Pipeline
PL266 Brooklyn to Lara Pipeline
PL122 Truganina to Plumpton Pipeline

All scheduled ground and aerial patrols were completed during the reporting year, some aerial patrols may have been delayed from the original scheduled time on occasion due to weather conditions, but where delayed have been completed shortly afterwards.

3.5 Maintenance Activities

All preventative, corrective and reactive maintenance is managed through APAs Computerised Maintenance Management System with work orders issued by maintenance schedulers for technicians to complete.

Routine preventative maintenance on the pipelines and their facilities has been carried out in accordance with the maintenance schedule. During the reporting period typical maintenance activities included (but not limited to);

Pipelines;

- Easement corridor Inspections
- Easement ground patrols
- Cathodic protection surveys- 6 monthly
- Earthing system service

Main Line Valve, Offtake & Scraper Sites;

- Gas chromatograph sites
- Main Line Valve Oil Reservoir annual level check & external Condition Inspection
- Valve inspection
- Filter, Strainer Servicing
- Sample probe 6 monthly Inspection
- Routine inspection & operational checks

Compressor Stations;

- Mechanical maintenance fuel gas
- Emission testing
- Fire protection systems and equipment
- Gas / diesel engine alternator checks & yearly servicing
- ESD system annual functional check
- Vessels external inspection / internal inspection
- Solar gas turbine / compressor monthly checks
- Compressor engine condition assessments
- Gas chromatograph testing
- Pressure regulator yearly maintenance
- Pressure transmitter annual calibration
- Instrumentation – yearly functional tests
- Pressure safety valve yearly inspection / 4 yearly test
- Ball valve inspections
- Filter/Separator/Coalescer Vessels External Inspection (Statutory)
- Hazardous area inspections

Meter Stations;

- Mechanical maintenance annual
- Station analysers 3 monthly & annual service
- Gas chromatograph testing
- 6 monthly RCD verification & annual function test
- Electrical & instrumentation annual maintenance
- Sample probe 6 monthly inspection
- Site routine inspection and operational checks quarterly
- Hazardous area equipment close inspections

Odorant Stations;

- Odorant station quarterly, annual & 2 yearly service
- Instrumentation temperature calibration
- Pressure safety valve maintenance
- Annual mechanical & electrical checks
- Vessels external inspection

Regulating Stations;

- Water bath heater mechanical maintenance
- Station facilities 6 monthly checks
- Water bath heater service
- Above ground tanks inspections
- Filter/Separator/Coalescer Vessels Element Replacement
- Filter/Separator/Coalescer Vessels Internal Inspection (Statutory)
- Pressure safety valve maintenance.

APA completed 7,480 work orders on the VTS during the year, including 5,168 preventative maintenance items.

Corrective maintenance was completed on varying issues during the year along the pipeline easement, during the year there were 1590 corrective maintenance works orders issued.

APA permit issuing officers attended site to locate the pipeline or supervise third party works in proximity of the pipeline on approximately 300 occasions during the reporting year.

3.6 Direct Assessment

Direct assessment has been undertaken at a number of locations following interpretation of in-line inspection results as per the following table;

License No.	Location	Inspections completed	Comments and inspection outcomes
PL50	Morwell to Dandenong	16	All within expected results, recoating work for 15 defects, steel sleeve required for 1 defect
PL141	Pakenham to Wollert	6	All within expected results, recoating work only

3.7 Cathodic Protection

Cathodic protection is used as a secondary protection layer to prevent corrosion on the VTS, the first protection layer being the pipeline coating.

Potential surveys were completed on each of the pipelines that make up the VTS on a 6 monthly basis.

License No.	Location	Scheduled	Completed	Number of non-compliant CP test points
All	APA – VTS	79	77	• Overall protection level to AS 2832.1 – 99% – Under protection on PL141 & PL75 continues due to traction issues associated with the Pakenham rail depot

Reduction in protection levels mainly in Pakenham location (PL141, PL75, PL50, PL135). APA is working with ESV to perform further testing and bonding on L141 (Pakenham to Wollert) to improve protection levels.

4 PIPELINE MANAGEMENT SYSTEM

APA operates and maintains the VTS and its associated facilities in accordance with AS2885.3 and other relevant standards. The pipeline operates under a safety case regime in accordance with the Gas Safety (Safety Case) Regulations 2017 and has a safety management system in place in accordance with the regulations.

4.1 Audit Reports

Audits completed on the VTS pipeline assets and on aspects of the safety management system consisted of a combination of internal audits and regulatory audits. The entirety of the safety management system is completed over a 3 year period.

Internal audits of the Victorian safety management system this year included the following topics;

- Incident Management
- Communication & Consultation
- Emergency Response

Observations from the audits are placed into an action tracking system for completion.

In addition, ESV completed regulator audits in relation to Pipeline Patrolling and Training & Competency.

WorkSafe Victoria completed an audit on Contractor Management.

4.2 Stakeholder Engagement

Various forms of stakeholder engagement took place during the year through the pipeline awareness program. APA attempts to contact key stakeholders living and working around the pipeline as well as local government authorities and other infrastructure owners. The table below provides a summary of the type of contact made;

Landowner & Occupier Communications	Landowner Face to Face	Third Party Communications
1,490	542	933
Third Party Face to Face	Council Communications	Council face to face
195	203	40

Land owner and occupier communications on the VTS was performed via telephone, email, letters and face-to-face, including 18 complaint communications from eighteen landholders.

Third party stakeholders include State Government Authorities, civil contractors, utility owners, indigenous groups, mining & exploration companies, emergency services, developers, local businesses, infrastructure owners, excavation & drilling companies and other companies active around the pipeline easements. Communications were made via presentations, meetings and conferences/forums, letters, provision of materials and text messages.

Issues covered included encroachment, limiting the number of building and structures around the easement, controlling activity on the easement and obtaining third party works approval.

The Landowner Contact Program (LCP) aims to contact people living in close proximity to the pipelines and provide details of the pipeline, its safety features and the need to control activity within the easement.

In addition, APA deals with numerous planning issues as development around pipeline easements is very active and protection of the pipeline from development is an ongoing challenge and one of the biggest risks to safe operation. APA has its own planners employed within the Infrastructure Planning & Protection unit who deal with developers, Council planners, other infrastructure owners and Government departments on a daily basis.

APA provides a Dial Before You Dig (DBYD) service which enables people to call and receive free advice for any works around the pipeline easement that may potentially affect the pipeline. Advice, drawing, works approvals and direct supervision of site works can then be generated as necessary. APA dealt with 40,636 Dial Before You Dig Enquiries on the VTS which included 12,595 pipeline "affected" enquiries and 28,041 pipeline "non-affected" enquiries.

4.3 Incident Database

Operational incidents are maintained via the SafeGuard + database, which categorises incidents in accordance with four levels of severity and includes near miss events. The levels range from Level 1 – low impact, Level 2 - medium impact, Level 3 - high impact and Level 4 – extreme.

An operational incident is an unplanned event that causes, or has potential to cause, harm to pipeline integrity and functionality. As a result of an operational incident people and public could be injured due to loss of containment and asset could lose its functionality and lead to loss of supply to customers. Operational incidents may lead to safety, environment, reputation, financial and regulatory consequences.

Examples of operational incidents and near misses include various degree of;

- Easement issues
- Equipment faults; and
- Security issues

A near miss is a type of incident that does not actually cause harm to asset integrity or its functionality, but had circumstances been different, that event could have eventuated.

There were 125 incidents logged during the reporting year across the VTS. There were no level 4 incidents recorded therefore all incidents are relatively minor in nature with 82 categorised as Level 1, 37 at level 2, and 6 x level 3 incidents.

There was 1 environmental reportable issue to the EPA where a compressor oil leak inadvertently spilled into the stormwater drainage system and required remediation of the area. The area was able to be remediated without any residual pollution spilling into the main stormwater drainage system. A

certified soil removal company was able to remove a small amount of contaminated soil and reinstate the area to a suitable standard.

4.4 Emergency Exercises

An emergency response exercise for the VTS was held at the APA Dandenong office on the 26th November 2020.

The purpose of the Emergency Response (ER) exercise/simulation was to assess emergency response preparedness across the VTS. The exercise was conducted as a desktop exercise.

The objectives of the exercise were as follows:

- Provide training to the VIC teams on the APA Group Emergency Response system
- Practice the APA Transmission National ER Plan through a simulated pipeline rupture and leak followed with a cyber-attack of the APA system controls.
- Test the ability of engineering to access technical information and make decisions in an emergency situation.
- Ensure coordination of internal and external stakeholders operates as expected.
- Able to identify and rectify the multi-dimensional emergency incident.

The scenario was a flooding event on PL75 Longford to Dandenong Pipeline and Warragul meter station on Pipeline Licence 91 exposing the PL75 pipeline and loss of pressure at the Warragul meter station.

APA Emergency Management Team and responders were required to deal with assets under threat and the possibility of a loss of supply. Engineering teams were required to deal with safe operation of the pipeline and possible repair scenarios and the EMT in organising resources, communicating t stakeholders and ensuring the situation is managed effectively.

The exercise contained specific objectives and KPIs which were achieved in execution of the exercise response. Eight observations and improvements were identified and targeted for completion prior to the next exercise.

In addition to this, APA VTS Operations participated in the annual industry Gas Emergency Management Consultative Forum emergency exercise on the 6th October 2020, Exercise Surge which originated on an APA transmission line and involved a coordinated industry response.

4.5 Encroachment Management

Regular monthly road and aerial patrols were undertaken along the pipeline easement to identify any encroachments and monitor activity along the pipeline.

There were 2 unauthorised encroachments identified along the pipeline easements by patrols during the reporting period.

The most common unauthorised encroachments are fencing on the easement and other infrastructure owners working within the easement. The incidents are summarised in the following table;

Date	Pipeline	Issue
24/9/20	PL81 Brooklyn to Corio	Excavation for highway signage
26/11/20	PL145 Paaratte to Allansford	Fence installation across easement

The number of unauthorised encroachments is extremely low in comparison to the kilometres of pipeline, though a large number of patrols undertaken. The type of equipment used would not be capable of penetrating the pipeline, in each instance, work was stopped and the encroachment was investigated until the third party had gone through the correct channels of pipeline identification and supervision of work, or a direction given for the structure to be removed from the easement.

APA commits significant resources into identifying the pipeline for DBYD requests, and providing permit issuing officers where larger excavation and building works taking place within the easement have the potential to impact the pipeline.

4.6 Training

APA is committed to developing the skills of all employees and contractors to meet the operational and technical needs of its business. Training requirements and competencies are specific to each role, a computerised Learning Management System (LMS) is used to manage all training information, competencies, trade licences and course enrolment. The LMS generates reminders to staff for update of training competencies electronically prior to expiration and staff are able to enrol into a course via the LMS.

During 2019-20 staff training was conducted through a combination of in-house and external training providers.

The range of training staff attended during the reporting period included;

Enter & work in confined spaces refresher	Fire prevention & control
Identify, locate and protect underground services	ICAM – Incident causation analysis method training
Operate fire extinguisher	Navigating your way through change
Operate vehicles in the field 4WD refresher	Gas detection
Provide CPR	Incident reporting
Chain of responsibility	Manual handling
Permit to Work – PIO B,C,E training	Environmental awareness
Fair treatment at APA	Security awareness
Emergency Response	Work safely at heights
Excavation & the protection of assets	Workzone traffic management
First aid	Enter and work in confined spaces

4.7 Signage

All signage on the VTS Pipeline is installed in accordance with AS2885 and maintains "Line of Sight". The pipeline signage is monitored and replaced as part of the corrective maintenance activities along the pipeline. All activities are recorded within the computerised maintenance management system. 1,384 damaged or non-conforming pipeline warning signs were upgraded or replaced during the reporting period.

Compound signage providing contact details, emergency "Toll Free" numbers, site location and "HAZCHEM" details are installed at all facilities on the VTS Pipeline. The signage is maintained in conjunction with routine maintenance activities.

5 CONCLUSION

The maintenance and inspection programs carried out on the VTS Pipeline during the 2019/20 reporting period have indicated the pipeline is in sound condition and is capable of operating at set parameters with no restrictions.

The pipeline and facilities are considered to be in good working condition and the easements are well maintained.