
vector
2023—2033
gas distribution asset management plan

Contents

Foreword

The Asset Management Plan (AMP) is a document which aims to communicate how Vector intends to manage its gas network assets for the benefit of Auckland energy consumers, for the period 1 July 2023 to 30 June 2033.

The investments we plan to make, set out in this 2023 edition, are required to deliver a safe and reliable gas network for Aucklanders, and are aligned with Vector's Symphony strategy, which is how Vector is delivering its vision of creating a new energy future.

This 2023 AMP provides the context and details of our investments, and asset management strategies for our gas network. It explains how we will maintain our assets and ensure the network and the services to customers provided through it remain safe, reliable, nimble and responsive to potential future technological, environmental and consumer-behavioural changes. We note however that particularly given the uncertainty over future demand for natural gas, we are not bound to follow the investments described in this AMP as we update our views on how to best deliver for our customers.

The objectives of our AMP are to:

- Be transparent with our customers and stakeholders about our plans and investments for the network;
- Detail the projects and improvements underway for our network and how they will benefit our customers;
- Foster understanding of how our asset management approach works, by providing details about our assets, Vector's plans for them, and the company's objectives; and
- Explain how these plans align with our corporate Symphony strategy and vision to bring about a new energy future.

This AMP was certified and approved by our Board of Directors on 29 June 2023.

AMP Planning Period

This AMP covers a 10-year planning period, from 1 July 2023 to 30 June 2033, as prescribed by the Commerce Commission's Information Disclosure Determination to meet our obligations as a regulated gas distribution business.

Company Overview

Vector is an innovative New Zealand energy company which runs a portfolio of businesses delivering energy and communication services to more than one million homes and commercial customers across Australasia and the Pacific. Vector is leading the country in creating a new energy future through its Symphony strategy which puts customers at the heart of the energy system. Vector is listed on the New Zealand Stock Exchange with ticker symbol VCT. Our majority shareholder, with voting rights of 75.1%, is Entrust. For further information, visit https://www.vector.co.nz/

Vector's gas distribution network is described in Section 6.1.

AMP Structure

Vector's 2023 AMP has been developed in accordance with good asset management principles. There are ten primary sections with supporting details in the appendices that contribute to our asset management story. As described in the following table, the primary sections of the AMP include:

SECTION	OVERVIEW
1 – Introduction	• Provides the executive summary for AMP, considering the purpose, objectives and the operating environment that shapes the AMP.
2 – Customers and stakeholders	• Identifies Vector's primary customer and stakeholder's interest; and • Details how we engage with our customers.
3 – Our service levels	• Presents the service level metrics and sets our performance targets to meet their interests; and • Discusses the performance of our network against these service level metrics, along with the primary causes of performance deviation from the service level targets.
4 – Asset management at Vector	• Provides insight into Vector's asset management practices; • The asset management objectives, scope and governance are presented here; and • Discusses how Vector intends to improve its asset management practices over time.

SECTION	OVERVIEW
5 – Governance, risk management and information management	• Provides an overview of Vector's governance and organisational structure, accountable for delivering effective and fit for purpose asset management planning; • Includes an overview of our enterprise risk management framework, key risk practices and event management documentation; and • Discusses our data and privacy management practices.
6 – Our assets	• Presents an overview of our gas distribution assets and the lifecycle management strategies for them; • Provide insights into the types, volumes and functional role of assets we manage in the network; and • Summarises our primary asset management strategies that inform and/or drive our expenditure.
7 – Managing our asset's lifecycle	• Provides an overview by asset category, of the plans we have to manage our distribution network assets over the planning horizon.
8 – Delivering our plan	• Outlines how we deliver Capital Expenditure (CAPEX) and Operational Expenditure (OPEX) projects and programmes required to deliver our gas distribution network AMP.
9 – Expenditure forecast	• Presents a summary of the CAPEX and OPEX required to deliver our gas distribution network AMP.
10 – Appendices	• Contains supporting and supplementary information for Sections 1 to 9; • Lists the key standards that inform our asset management practices; and • Presents a compliance table showing how our AMP meets the Commerce Commission's Information Disclosure requirements.

SECTION 01

Introduction

1 – Introduction

This AMP sets out our view of the investments we believe will deliver the best outcomes, however we note that, particularly given the uncertainty over future demand for natural gas, we are not bound to follow the investments described here as we update our views on how to best deliver for our customers. Each investment we make goes through appropriate governance processes to ensure it is delivering against our Asset Management Objectives.

1.1 Executive Summary

There is significant uncertainty over the future operating environment for gas distribution businesses in New Zealand. This is driven primarily by government action to reduce carbon emissions from the energy sector, including the establishment of the Climate Change Commission, the Emissions Reduction Plan, and the forthcoming Gas Transition Plan and national energy strategy.

Our updated modelling for the gas network shows the number of connections to the network projected to grow at a slower rate, and a steady decrease in total gas volume, albeit while peak demand continues to increase. We've continued to adjust our investment plans to account for updated forecasts and modelling. And we're continuing to invest appropriately to ensure a safe, reliable and affordable network for our customers. Some of the changes we've made to account for the future uncertainty, and updated modelling projections, include:

- Maintaining the reduced system growth expenditure prescribed in last year's AMP;
- Utilising risk-based asset replacement strategies and additional maintenance activities to defer some asset replacements;
- Preserving our ability to facilitate the adoption of new technologies; and
- Continuing to investigate hydrogen blending with Firstgas and other gas businesses.

Overall, this AMP sets out slightly lower capital expenditure, and slightly higher operational expenditure, than the current Default Price-Quality Path (DPP3) allowance. This is consistent with the observed changes and future projections in network utilisation, and provides appropriate investment to ensure a safe, reliable, resilient network for our customers throughout this AMP period and beyond.

1.2 Climate change and the future of gas

The uncertainty of the future asset life utilisation (capacity and longevity) of gas networks has the potential to change the regulatory compact on which gas network owners invest and introduce a stranded asset risk (as also recognised in the government's Emission Reduction Plan[1]), whereby investment recovery is not achieved over the long term.

This has been further reinforced by the Climate Change Commission draft advice for Emission Reduction Plan 2[2], whereby *'continued fossil gas use and asset expansion will add additional cost to consumers as well as raise equity issues for future generations'*. As *'households are not best placed to manage the risks of economic stranding of gas pipeline businesses' assets or to support continued gas use by large industrial users'*. This has led to the Climate Change Commission's recommended a prohibition of *'new installation of fossil gas in buildings where there are affordable and technically viable low emission alternatives'*.

If the government were to accept these recommendations, then it is imperative that it is backed by regulated cost recovery. *'The Commerce Commission's regulated investment framework should provide clear strategic direction on the future of fossil gas and options for regulated cost recovery models for gas pipeline businesses which are equitable, give consumers time to transition, and support hard-to-abate industries'.*

We're pleased the Commerce Commission has enabled an accelerated cost recovery for gas distribution assets, as an acknowledgement that the transition is underway. The Government is currently developing its Gas Transition Plan, a key input into the forthcoming national energy strategy. Our view of this transition, and its implication for our gas distribution network, can be found in Vector's Taskforce for Climate-related Financial Disclosures (TCFD)[3] report.

1.2.1 CUSTOMER ENGAGEMENT

Through our engagement with customers, we have observed changing attitudes towards gas use, with significant investments being considered by industrial customers into reducing gas use to lower carbon emissions. These investments are driven by companies' internal science-based emission reduction targets, net-zero targets, and may be supported in part by the Government Investment in Decarbonising Industry (GIDI) fund. EECA has also launched its Equipment Replacement Scheme (ERS) as of April 2023 which targets small to medium businesses' transition from fossil fuels via a $330million fund. As customers disconnect from the gas network, the network's ongoing operational, maintenance, and capital recovery costs will be shared amongst the customers that remain.

[1] https://environment.govt.nz/publications/aotearoa-new-zealands-first-emissions-reduction-plan/

[2] https://www.climatecommission.govt.nz/our-work/advice-to-government-topic/advice-for-preparation-of-emissions-reduction-plans/2023-draft-advice-to-inform-the-strategic-direction-of-the-governments-second-emissions-reduction-plan-april-2023/#read-draft-advice

[3] https://blob-static.vector.co.nz/blob/vector/media/vector-2022/tcfd-report-2022-vector-limited.pdf

1.2.2 RENEWABLE GASES

There is interest from some commercial customers to utilise alternative renewable combustion sources, such as biomethane, hydrogen or biomass. Currently, there are limitations in renewable gases in terms of feedstock availability, price, and technical barriers to unlock the gases. Vector is working closely with some commercial customers to help overcome these barriers as renewable gases would be an optimum utilisation of existing gas pipeline infrastructure. However due to current uncertainty, such as the technological availability to unlock renewable gases, it is important that the Commerce Commission continues to prioritise financial capital maintenance such as accelerated depreciation, which would in turn still provide for future optionality for renewable gases as they become available.

1.2.3 GAS FUGITIVE EMISSIONS

Natural gas fugitive emissions (gas leaks) are responsible for 56.4% of Vector's total Scope 1 emissions in FY22. Vector continues to refine its capability to accurately quantify and reduce these emissions. It is important to note that gas fugitive emissions are a function of gas pressure and network length. So even as gas volumes decline, fugitive emissions may stay relatively constant. The results are highlighted in greater detail in Section 3.4.

1.2.4 CLIMATE CHANGE RESILIENCE

Vector's natural gas network demonstrated a high degree of reliability and resilience to the impacts of climate change, which was recently observed during the 27 January 2023 Auckland flooding event and Cyclone Gabrielle in February 2023. The gas network was able to maintain supply to most customers during the two events. Vector nevertheless will continue to advance its climate change modelling.

1.3 Regulatory update

Vector's Gas Distribution Business (GDB) is subject to both Price-Quality and Information Disclosure regulation under sub-part 10 of Part 4 of the Commerce Act.

Part 4 is intended to guarantee the long-term interests of customers by balancing the need for service providers to invest in their service and the interest of customers to have fair prices. Both Price-Quality and Information Disclosure Regulation are administered by the New Zealand Commerce Commission (the Commission). A key element to the Commission's approach to administering Price-Quality regulation is to set prices consistent with a commitment financial capital maintenance (FCM) also referred to as the Net Present Value = zero principle (NPV=0). The NPV=0 principle ensures an asset owner is able to recover its invested capital and earn a return on investment (consistent with alternative equivalent uses of capital) over the life of the investment.

Investments for both gas transmission and gas distribution pipelines are now occurring at a time of increased uncertainty as New Zealand transitions to Net Zero 2050. The Climate Change Commission (CCC) recommendations for natural gas networks are a significant departure from the historical environment these businesses have operated in. The Commission has recognised this uncertainty in its decision on the default price-quality path for GPBs from 1 October 2022 by introducing a mechanism to bring cashflows forward by accelerating depreciation in order to mitigate heightened asset stranding risk. Vector supports this approach. We also strongly recommend the Commission take further action to address uncertainty in the natural gas sector in its current review of input methodologies. While accelerated depreciation is a crucial first step, other mechanisms such as changing the form of price control and the approach to indexation of the regulatory asset base should also be considered. It is our view that these mechanisms are appropriate given the future uncertainty for gas pipeline businesses and the risk of asset stranding.

As New Zealand transitions to a net carbon zero economy, it is essential that the move from fossil fuels to cleaner fuels is an orderly one. We encourage the Commission to make sure regulatory frameworks are adapted for the continued support of FCM. We are prepared, willing and have offered to work with the sector including the Commission to develop what is required for this orderly transition. This will in turn ensure the continued investment by pipeline owners in gas infrastructure enabling an orderly transition away from natural gas. An orderly transition is clearly in the long-term interests of consumers.

SECTION 02

Customers and stakeholders

2 – Customers and stakeholders

2.1 Knowing and delivering for our customers

While Vector is responsible for connecting new consumers to the network, maintaining supply to consumers and in particular, restoring supply after interruptions, we do not contract directly with end users. The only exception is a handful of commercial and industrial consumers that have dedicated capacity or non-standard supplies. Despite this, Vector treats all consumers as 'customers' and has a range of programmes and initiatives in place to understand their behaviours and needs. This customer understanding is becoming more important as we move through into energy transition. In this AMP the term 'customer' is used in this broader context.

Vector's gas network delivers gas to Aucklanders, from Wellsford to Tuakau. More than 6,800kms of underground pipelines deliver gas to more than 116,000 Installation Control Points (ICP). Our customers at each of those ICPs are hugely diverse with varying needs.

We value our relationship with our customers and stakeholders, dedicating time and resources into building those relationships, making sure we listen, and prioritise outcomes that will meet their needs when making our investment decisions.

For 2023, our focus is on ensuring robust processes are in place to support and encourage active engagement with key stakeholders and customer groups so we can understand their evolving needs and expectations as the energy transition unfolds. We know that the energy transition will occur at different paces for different parts of the network and for different customer groups. Understanding these different elements will be extremely important for guiding many of the decisions that will need to be made over the next one to two decades.

An illustrative summary of some of the key customer and stakeholder groups we engage with are shown in Table 2-1.

GROUP	INTEREST AND PRIORITIES	HOW WE ENGAGE
Residential (112,000 ICPs) customers	• Safe, reliable and affordable network	• Contact Centre manages phone calls for gas leaks, social media interactions and emails for outages and general enquiries • Regular customer surveys
Corporate and commercial (more than 4,000 businesses from Wellsford to Hunua)	• Larger commercial entities make individual decisions around network resilience and configuration to manage their unique requirements	• Key account team manage the large gas conveyance contracts with large customers on our network
Developers of large commercial projects	• New commercial connections often require bespoke connection plans • Increasing interest in products to displace traditional natural gas such as renewable gases	• Dedicated team providing individual management of their engagement with Vector quote, design and contract
Developers of residential sub-divisions	• Ease, process and cost of new connections to the network • Coordination with other utilities • Transparency and availability of job progress	• Two streams for engagement, including (for projects larger than ten lots) a dedicated team arranges the gas design, commercial terms and pricing for residential subdivisions and developments
Retailers	• Maintain strong relationships and ensure ease of doing business • Promote customer service • Industry development & coordination	• Range of senior managers work with retailers directly as well as participating in engagement with the fora and industry groups associated with retail-orientated and consumer-orientated work and industry development programmes (resource is dependent on issues and expertise required) • Commercial activities managed through dedicated senior manager
Infrastructure providers (e.g. road, rail, water)	• Ensuring large infrastructure projects have the greatest possible synergies and cause the least possible disruption for the public (e.g., City Rail Link)	• Key account team and stakeholder engagement lead have direct account management relationships with all major infrastructure operators in the region

GROUP	INTEREST AND PRIORITIES	HOW WE ENGAGE
Community groups and business associations	• Public safety and fault response activities • Community resilience planning, and investment and affordability	• Dedicated Community Engagement Manager
Iwi	• Create and maintain strong working relationships with iwi across Auckland	• Dedicated Community Engagement Manager, Resource management and planning lead
Auckland Council and CCOs	• Creating enabling infrastructure, coordination of operational and investment activities • Civil defence and emergency management • Sharing of asset location information • Climate adaptation	• Dedicated Key Account managers; range of senior managers across specific areas such as risk/emergency management, operations, forecasting etc
First Gas Limited	• Ensure transmission network interface is well maintained • Technical performance and compliance • Network planning (gate stations)	• Dedicated Key Account managers; range of senior managers across specific areas such as risk/emergency management, operations, forecasting etc
Regulatory Bodies	• Foster open and trusting relationships with policy makers and regulatory decision makers, engaging in targeted decision-making processes where required, to advocate for robust and sustainable policy and regulation in the long-term interests of consumers	• Senior managers engage across specific functions including Policy and Regulatory; Pricing; Future Networks; as well as a range of senior subject matter experts as required

TABLE 2-1: GROUPS AND ENGAGEMENT METHODS

2.2 Accommodating stakeholder interests and managing conflicting interests

Vector accommodates our stakeholders' interests in our asset management practices by, amongst other things:

- Due consideration of the health, safety and environmental impact of Vector's operations;
- Looking after the health, safety and wellbeing of our employees, their families, and our communities;
- Providing a safe, reliable and resilient distribution network;
- Due consideration for the affordability of our services;
- Quality of supply performance meeting consumers' needs and expectations, subject to trade-off of capital and operational expenditures (CAPEX and OPEX);
- Maintaining a sustainable business that caters for consumer growth requirements; comprehensive risk management strategies and contingency planning;
- Complying with regulatory and legal obligations;
- Looking ahead and planning for future innovation and disruption;
- Removing barriers to innovation.

With numerous stakeholders with diverse interests, it may happen that not all stakeholder interests can be accommodated, or conflicting interests exist. From an asset management perspective, these are managed by:

- Clearly identifying and analysing stakeholder conflicts (existing or potential);
- Seeking an acceptable alternative or commercial solution based on a set of fundamental, consistent and transparent principles;
- Effective communication with affected stakeholders to assist them to understand Vector's position, as well as that of other stakeholders that may have different requirements;

In developing solutions where conflicting interests exist, Vector strives to achieve consistency, transparency and fairness.

SECTION 03

Our service levels

3 – Our service levels

The service levels that Vector uses to assess performance of the network against the asset management objectives are described in this section. The service levels include those that are required for regulatory purposes through the Information Disclosure requirements[4]. Further service levels are also measured that inform Vector's asset management practices.

The following sections detail each service level, the methodology of measurement, target level and performance. In addition, Vector also uses a wide range of asset management metrics (refer Section 10.3) that inform our asset experts about the detailed behaviour and performance of various types of network equipment.

3.1 Customer and stakeholder experience

3.1.1 UNPLANNED INTERRUPTIONS

DEFINITION

The unplanned interruption rate is an indicator of network reliability and measures the number of times the network supply is interrupted, resulting in an unplanned customer outage, including third party events. This measure does not count the number of customers affected by each event (see System Average Interruption Frequency Index (SAIFI) below).

MEASUREMENT

The unplanned interruption rate is calculated by dividing the total unplanned interruptions on the network and third party damage events in the relevant year by the total customers and dividing by 1,000.

TARGET

Vector's overall target level performance is less than 1.8 interruptions per 1,000 customers per annum. This target is based on the historical average for reference period RY18-RY21.

PERFORMANCE

The following table shows the comparison of unplanned interruptions per 1,000 customers for the previous five years against Vector's target.

SERVICE LEVEL	RY18	RY19	RY20	RY21	RY22	TARGET	PERFORMANCE AGAINST TARGET
Unplanned interruptions per 1,000 customers	2.1	1.9	1.6	1.5	1.6	< 1.8	●

For the period ending 30 June 2022, Vector's unplanned interruption rate of 1.6 was below (favourable) compared to our target of 1.8 interruptions per 1,000 customers. As mentioned in Section 3.2.3, TPD events have increased in RY22 resulting in more unplanned interruptions from third parties and our new proactive communications strategy is focused on reducing TPD damage events, which will also result in a lower number of unplanned interruptions.

Equipment failures remain fairly flat across the previous four years. This trend demonstrates that Vector's current asset management practices are appropriate to achieve ongoing network performance improvements.

3.1.2 NUMBER OF POOR PRESSURE EVENTS

DEFINITION

Poor pressure events are a count of the number of unplanned incidents where delivery pressure drops below contracted delivery requirements. Vector uses this measure as an indicator of network capacity to meet customer demand.

MEASUREMENT

Poor pressure events are recorded where the cause of the poor pressure is related to Vector's assets upstream of, and including, the customer isolation valve (CIV). Vector's Quality of Supply (QoS) criteria for system pressure is described in Section 4.6.8.

4 Gas Distribution Information Disclosure Determination 2012.

TARGET

Vector's overall target level performance is four poor pressure events or less per annum. This target is based on the industry average for reference period RY22.

PERFORMANCE

The following table shows the comparison of poor pressure events due to network causes for the previous five years against Vector's target.

SERVICE LEVEL	RY18	RY19	RY20	RY21	RY22	TARGET	PERFORMANCE AGAINST TARGET
Poor pressure due to network causes	1	1	2	3	4	4	

For the period ending 30 June 2022, there have been four poor pressure events compared to our target of four events or less per annum. All four events were related to either a service pipe fault or a damage on a service pipe due to third parties. None of the events related to poor supply pressure on the mains network.

The absence of poor supply pressure events on the mains network can be attributed to the level of permanent telemetry monitoring currently installed on the network, and the annual pressure monitoring and network analysis programmes that Vector undertakes to identify constraints on the network.

3.1.3 CUSTOMER SATISFACTION SCORE (CSAT) – FAULTS

DEFINITION

Customer Satisfaction (CSAT) is a key performance indicator used to track how satisfied customer are with Vector's products and/or services.

MEASUREMENT

A typical CSAT question is usually asked on a scale of 0-10 where 0 means very dissatisfied and 10 means very satisfied. For the gas faults monthly monitor we ask, "Thinking about your overall experience in dealing with Vector with regards to your recent gas fault, how satisfied are you overall?"

TARGET

Vector's target level CSAT performance is 8.7. The target is based on the historical average for reference period RY18-RY21.

PERFORMANCE

The following table shows the comparison of CSAT for the previous five years

SERVICE LEVEL	RY18	RY19	RY20	RY21	RY22	TARGET	PERFORMANCE AGAINST TARGET
Customer Satisfaction Score (CSAT)	8.7	8.3	8.9	8.9	9.2	> 8.7	

3.2 Safety

3.2.1 RESPONSE TIME TO EMERGENCIES

DEFINITION

Response time to emergencies (RTE) is a measure of the time elapsed from when an emergency is reported to Vector to the time Vector's personnel arrives at the location of the emergency.

MEASUREMENT

The RTE is calculated by adding the number of emergencies responded to within one hour or three hours and dividing this number into the total number of emergencies.

TARGET

The RTE target is set by the Commerce Commission's regulatory determination. The process for setting this target is specified in the DPP[5]. For the Regulatory Period (1 October 2022 to 30 September 2026) Vector's RTE targets have been set at the following limits:

- 80% of RTE are responded to within one hour; and
- 100% of RTE are responded to within three hours.

PERFORMANCE

The following table shows the comparison of RTE for the previous five years against the DPP target.

SERVICE LEVEL	RY18	RY19	RY20	RY21	RY22	TARGET	PERFORMANCE AGAINST TARGET
Proportion of RTE within one hour	98.1%	97.8%	95.1%	100%	96.2%	>80%	●
Proportion of RTE within three hours	100%	100%	100%	100%	100%	100%	●

For the period ending 30 June 2022, Vector's RTE targets were met or exceeded. This demonstrates that Vector's current reactive response strategies are effective at ensuring that response times to faults and emergencies are appropriate.

3.2.2 PUBLIC REPORTED ESCAPES

DEFINITION

Vector uses public reported escapes (PRE) as its primary technical network service quality measure for operational purposes. It is a critical safety measure and a reliable indicator of the condition of the network. This measure is impacted by a number of factors, including the effectiveness of renewal strategies, the condition and composition of assets, the level of odorant added (which increases the likelihood of PREs), and the extent and effectiveness of leakage surveys.

MEASUREMENT

PRE is calculated by dividing the total number of confirmed PRE on the network (including mains, service pipes, valves, and pressure stations) in the relevant year by the total length of network (mains and services) and further dividing by 1,000. The measurement of PRE excludes third party damage events, leaks detected by routine survey and no trace events, and is limited to Vector's assets upstream of, and including, the CIV.

TARGET

Vector's overall target level performance is 20 PRE or less per 1,000km of distribution network. The target is based on the historical average for reference period RY18-RY21.

PERFORMANCE

The following table shows the comparison of PRE for the previous five years against Vector's target.

SERVICE LEVEL	RY18	RY19	RY20	RY21	RY22	TARGET	PERFORMANCE AGAINST TARGET
PRE per 1000km	24	21	19	17	19	<20	●

For the period ending 30 June 2022, Vector's PRE performance was 19 (favourable) compared to our target of less than 20 PRE per 1000km. Approximately 61% of all PRE related to service riser faults (i.e. riser valve, pipe or crimp joint); a further 19% of PRE related to service pipe faults (i.e. service pipe or fitting) and the balance related to mains pipes and fittings, DRS and service regulators etc.

Over the last three years, the PRE results for each year have been below the current target. This trend demonstrates that Vector's current planned and corrective maintenance programmes (e.g. increased proactive leakage surveys), and asset renewal programmes (e.g., pre-1985 Polyethylene (PE) pipeline replacement, riser valve replacements etc.) are appropriate strategies to achieve ongoing network performance improvements.

5 Gas Distribution Services Default Price-Quality Path Determination 2022 dated 31 May 2022.

3.2.3 THIRD PARTY DAMAGES

DEFINITION

Third Party Damage (TPD) events to networks are a significant cause of gas escapes and customer supply interruptions. The levels of third party interference damage provide some indication of the network operator's level of success in communicating awareness to those who control and / or are directly engaged in any activities that put gas networks at risk.

MEASUREMENT

TPD events are calculated by dividing the total number of TPD events on the network in the relevant year by the total length of network (mains and services) and further dividing by 1,000.

TARGET

Vector's overall target level performance is 45 TPD or less per 1,000km of distribution network. The target is based on the historical average for reference period RY18-RY21.

PERFORMANCE

The following table shows the comparison of TPD for the previous five years against Vector's target.

SERVICE LEVEL	RY18	RY19	RY20	RY21	RY22	TARGET	PERFORMANCE AGAINST TARGET
TPD per 1000km	49	46	41	45	47	<45	

For the period ending 30 June 2022, Vector's TPD event performance was 47 which is above (unfavourable) compared to our target of less than 45 events per 1000km. TPD events exceeded our target. Approximately 73% of damages were on service pipes and recent analysis shows that the majority of damages occur within customer's properties. Accordingly, to achieve our TPD target, Vector has implemented a proactive communications strategy to reduce third party damages in collaboration with the wider GDBs.

3.3 Asset management maturity

The Asset Management Maturity Assessment Tool (AMMAT) set out in Schedule 13 of the Commerce Commission's Information Disclosure Determination is a series of questions against which a business has to assess its asset management maturity level. For full details on the AMMAT self-assessment framework and definitions of maturity levels refer to Schedule 13 of the Commerce Commission's gas distribution information disclosure requirements[6].

The full assessment criteria for the individual questions and how Vector has self-scored against each criteria are included in Section in 10.15.

At an overall level, our asset management maturity compares well with generally accepted New Zealand gas asset management practices to ensure the ongoing safe and efficient operation of the gas network. Our approach has matured progressively with our self-assessment improving year-on-year from an overall AMMAT score of 2.6 in RY16 to 2.8 in RY22.

Vector's overall goal is to progressively achieve a minimum of "3" rating on each criteria. The following table shows Vector's self-assessment score and progress towards its target.

SERVICE LEVEL	RY16	RY18	RY20	RY22	TARGET	PERFORMANCE AGAINST TARGET
AMMAT score	2.6	2.7	2.7	2.8	3	

3.4 Natural gas fugitive emissions (scope 1)

In support of the national efforts to reduce greenhouse gas (GHG) emissions, and more specifically methane (CH4) emissions, it is critical for the gas industry to accurately define and quantify their methane emissions, which can then be used to develop emission reduction initiatives.

In 2020 Vector developed a comprehensive emission reporting methodology, based on a bottom-up approach, to identify and to quantify all types of methane emissions from Vector's gas network. Vector has implemented the guidelines of the Technical Association for the European Gas Industry (Marcogaz)[7], which was found to be the most comprehensive and applicable to Vector's gas network. Marcogaz is currently in the process of integrating these guidelines into the CEN/TC 234

[6] refer to https://comcom.govt.nz/regulated-industries/gas-pipelines/information-disclosure-requirements-for-gas-pipelines

[7] refer to Marcogas WG_ME-485

European Technical Standard for Gas Infrastructure. Vector's reporting methodology has been audited with reasonable assurance by our external auditors.

Adopting this approach allows Vector to identify and calculate emission reduction opportunities and set practical targets to reduce its total emissions. Vector is currently supporting the wider gas industry to implement a similar methodology, for consistent emission reporting across the other GDBs.

Vector has set a science-aligned emissions reduction target of reducing Scope 1 and 2 emissions (excluding electricity line losses) by 53.5% by RY2030, using an RY20 baseline. The emissions reduction target is aligned with the methodology by the Science Based Target initiative (SBTi). As Vector's natural gas fugitive emissions account for the largest share of these group wide emissions (66% of emissions in the baseline year RY2020), significant attention is given to fugitive emission reduction.

The following table and Figure 3-1 show Vector's Scope 1 fugitive emissions on the gas distribution network were 14,493[8] tonnes of CO_2 equivalent.

SERVICE LEVEL	ACTUAL				FORECAST				PERFORMANCE AGAINST TARGET
	RY17	RY18	RY19	RY20	RY21	RY22	RY23	RY27	RY30	
Scope 1 emissions in tonnes of carbon dioxide equivalent (tCO_2e)	15,851	25,328	12,607	16,368	12,074	14,493	9,549	7,352	7,022	●

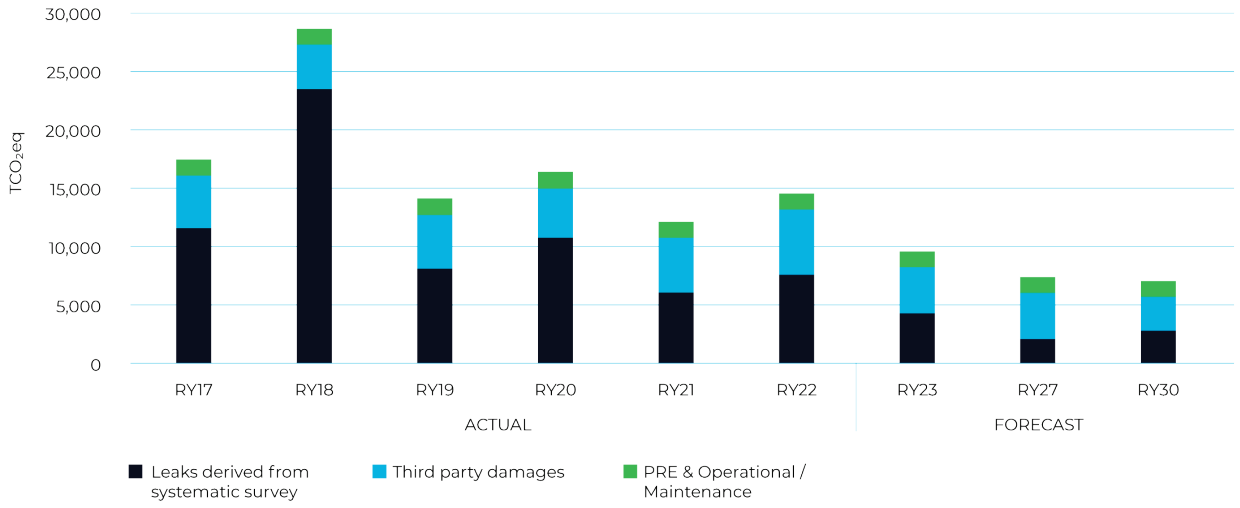


FIGURE 3-1 ESTIMATED FUGITIVE EMISSIONS – ACTUAL AND FORECAST

Note: Operational / Maintenance category includes all associated fugitive emissions from operating and maintaining all assets, e.g., tightness failure factors, pipeline permeation, all planned maintenance activities, commissioning and decommissioning of assets, etc.

Using the comprehensive reporting methodology, Vector has identified that approximately 70% of its fugitive emissions (in FY20 baseline year) resulted from leakage detected by systematic survey. Applying the principal fluid mechanics equations and the Gaussian distribution for the leakage period, the leakage survey frequency was found to be a critical factor to quantify the amount of fugitive emissions detected by the survey, since any reported leakage is assumed to be ongoing since the previous survey, which significantly increases the accumulated gas emissions.

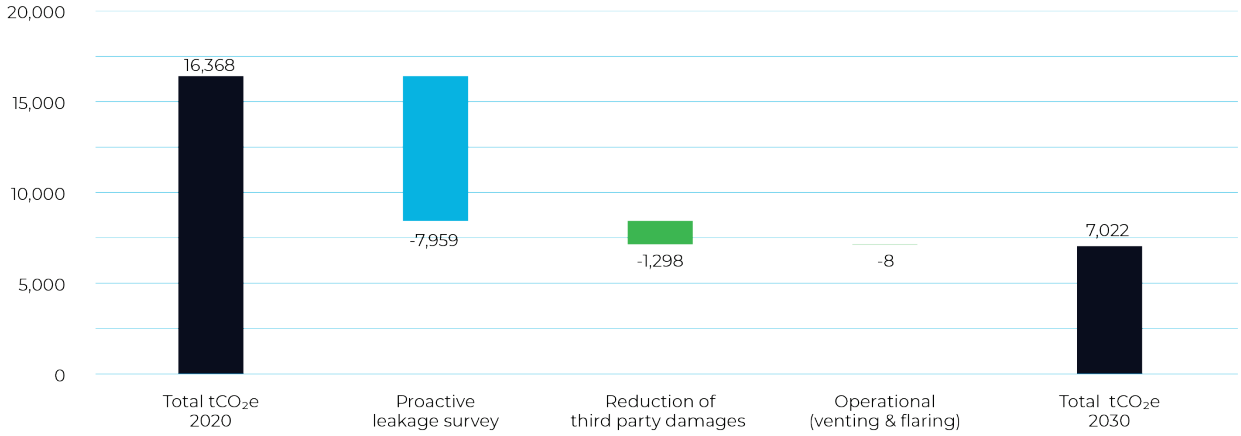
Accordingly, to achieve our emission reduction targets, Vector has identified several initiatives including: increased leakage surveying, reduction of third party damages, improving response time and reduction of operational venting. Increasing the leakage surveying frequency across the gas network was found to be the most effective (refer to Figure 3-2). The new leakage surveying initiative includes the deployment of a new surveying system (with wider detection range) and doubling the frequency of leakage survey of the gas network in FY24 (from yearly to 6 monthly), and in FY27 from (6 monthly to 3 monthly). These initiatives come at a carbon abatement price that is cheaper than the existing NZ-ETS market price and therefore make sense to initiate even from a cost perspective. Note that the carbon price is expected to increase to $140/tCO2e by around 2030 as per recommendations from the Climate Change Commission.

This initiative would also improve network performance and reduce the risk of potential incidents, by earlier detection of any minor leaks. This approach also aligns with Vector's asset management policy, in particular our commitment to prevent harm to the public through the management of our assets over their entire lifecycle. In addition, historical data (from 2017

[8] This has been updated since Vector's release of its FY22 GHG emissions inventory report to reflect emissions from 2 additional leaks that occurred in June 2022 but had not yet been recorded at the time the report was published.

to 2018) has confirmed that increasing the network leakage survey frequency has reduced our PRE by more than 30%, which will contribute in achieving the network performance targets described in Section 3.4.

Vector has also re-initiated a proactive communications strategy to reduce third party damages in collaboration with the wider GDBs.



PATHWAY TO OUR EMISSIONS TARGET (TONNES OF CO_2 EQUIVALENT)

FIGURE 3-2 ESTIMATED EMISSION REDUCTION BY CATEGORY

The following table shows the survey frequency initiatives proposed to reduce fugitive methane emissions. All these initiatives come at a price cheaper than the market price and therefore should be initiated.

INITIATIVE	TOTAL CO_2 ABATED	COST PER TONNE CO_2 AGAINST BASELINE OF 2-YEARLY SURVEYING	NOTES
Annual Surveying	5660	$9.89	Already initiated in FY22
6-monthly Surveying	7959	$30.94	Planned for FY24
3-monthly Surveying	9330	$57.45	Planned for FY27

3.5 Process for recording reactive fault information

Vector's Field Service Provider (FSP) undertakes data capture activities within the gas distribution network. The FSP manages data in accordance with Vector's requirements as defined in the Vector Gas Network Standard (GNS) GSD004 (standard for Gas Distribution Network Reliability, Integrity and Consumer Service).

Gas distribution network performance and consumer service data is captured using two methods:

- Electronically via hand-held tablets in the field. Data from the hand-held tablets is automatically uploaded into Vector's Customer Management System (CMS); and
- Remotely entered (external to Vector) directly into Vector's CMS, with hard copy paper records scanned and entered as an attachment. This approach is used only if the electronic data capture systems are not available.

Data entered in Vector's CMS by one of the above methods is then quality checked by the FSP for accuracy, prior to undergoing additional quality assurance checks by Vector personnel. Data is then extracted from Vector's CMS and the required information is generated for reporting purposes.

The following system integrity and reliability metrics are extracted from the CMS database for disclosure reporting:

- RTEs
- SAIDI Unplanned
- SAIDI Planned
- SAIFI Unplanned
- SAIFI Planned
- Customer Average Interruption Duration Index (CAIDI) Unplanned
- CAIDI Planned
- Interruptions by Class
- Outage Events
- Outage Events Caused by Third Party Damage

- PREs
- Third Party Damage Events
- Leakage Survey
- Poor Pressure Due to Network Causes
- Emergency Telephone Calls answered within 30 Seconds
- Product Control – Non Compliance Odour Tests
- Number of Complaints

Figure 3-3 shows how the reactive fault information is recorded and checked for completeness.

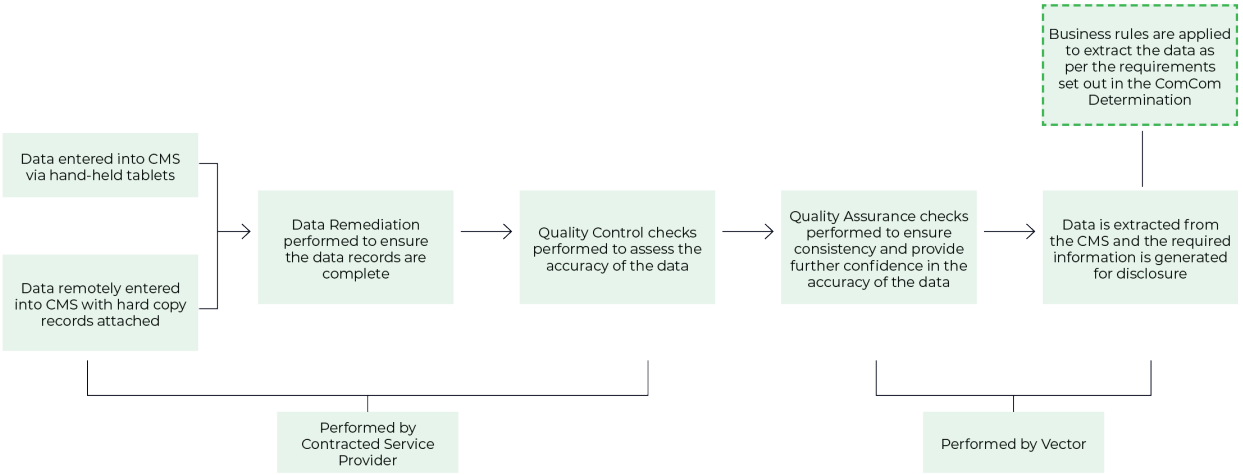


FIGURE 3-3: VECTOR'S REACTIVE FAULT INFORMATION FRAMEWORK

SECTION 04

Asset management at Vector

4 – Asset management at Vector

This section describes the framework that supports and enables Vector's asset management practice.

Vector's asset management practice is a multi-utility practice that includes electricity, gas and fibre communications assets. Much of the enabling framework applies equally to each of those utility networks, however where a practice at Vector relates specifically to its gas distribution network it is called out in this section.

4.1 Asset management policy and principles

Vector's corporate vision is to create a new energy future and innovation is at the core of our culture of continuous improvement.

Our Asset Management Policy supports our vision of creating a new energy future by setting clear principles (detailed below) to guide the development of Vector's asset management objectives and plans. Our policy principles represent Vector's values, commitments and strategic pillars which apply to all employees and partners (field services providers, contractors and suppliers), involved in the management of Vector's gas network assets.

ASSET MANAGEMENT PRINCIPLES

1. Safety is our highest priority, and we strive to achieve zero harm to employees, contractors, and the public through the management of our assets over their entire lifecycle.
2. We strive to optimise the total lifecycle costs of our assets in ensuring the safe, reliable, resilient, efficient, and affordable provision of energy related services.
3. We comply with internal policies, processes, and established frameworks as well as applicable statutory and regulatory obligations.
4. We use risk models, data, analytics, and market driven insights to make decisions that are in the long-term interests of our customers.
5. We use innovation to accelerate the convergence of traditional and digital assets to manage and meet our customers' evolving expectations.
6. We manage the impact of our assets on the environment while supporting both Vector and our customers' decarbonisation objectives.
7. We engage commercially but collaboratively with our partners by encouraging open and clear communication to leverage diversity of thinking and experience.
8. We align our Asset Management System with industry recognised asset management practices including ISO 55001.
9. We manage risk effectively, and continuously adjust our approaches to manage new and emerging risks such as cybersecurity, privacy, and climate change.
10. We measure the effectiveness of our efforts to ensure we continuously improve our asset management capabilities in delivering our vision.

4.2 Asset management objectives

Our asset management objectives have been developed in alignment with the principles set out in our Asset Management Policy. The objectives further consider our operating environment and represent specific stakeholder requirements. These are considered at a more detailed and defined level, enabling appropriate asset management plans and activities to be developed and set (refer to Table 4-1).

FOCUS AREA	OBJECTIVES	AM POLICY ITEM
Safety, Environment and Network Security	• Preventing harm to workers, contractors and the public through our work practices and assets. • Ensuring health and 'safety always' is at the forefront of decision making for the business. • Complying with relevant safety and environmental legislation, regulation and planning requirements. • All staff are competent and trained in their applicable roles with the right equipment available to work safely and effectively. • Asset management activities align with environmentally responsible and sustainable behaviours, in line with industry best practice, enabling wider emissions reductions.	1, 6

FOCUS AREA	OBJECTIVES	AM POLICY ITEM
	• Minimise the impact on the environment with regards to our assets and work practices. • Proactively manage network security, which includes adequacy, reliability and resilience (including managing the growing impact of climate change).	
Customers and Stakeholders	• Enable customers' future energy and technology choices. • Provide a high-quality customer service experience across all interactions. • Listen to and learn from our customers to ensure our service offering aligns with customer expectations. • Consider the impact of our operational decisions on customers and minimise the disruption of planned outages and unplanned outage response times. • Ensure the long-term interest of our customers by providing an affordable and equitable network.	2, 4, 5, 6, 7, 9
Network Performance & Operations	• Comply with regulatory quality standards set out in the DPP3 Determination. • Maintain accurate and comprehensive information management systems to drive continuous improvement of our asset health database and information records and meet regulatory reporting obligations. • Continual improvement of our asset management system and alignment to ISO 55001. • Strive to optimise asset lifecycle performance through increased asset standardisation, clear maintenance regimes and the development of fact based investment profiling. • Utilise clear business cases processes, integrate risk management and complete post investment reviews to inform our decision making and analysis. • Maintain compliance with Security of Supply Standards through risk identification and mitigation. • Expand our asset strategies to both incorporate new technologies and optimise the use of existing technologies to enable future resilience and customer choice. • Collaborate with teams throughout Vector to leverage different thinking, skillsets and asset management capabilities. • Ensure continuous improvement by reviewing and investigating performance and embedding learnings. • Manage performance of field service providers through effective commercial arrangements and regular review.	2, 3, 4, 5, 7, 8, 9, 10
Future Energy Network	• Prepare the network for future changes that will be driven by climate change including decarbonisation of the economy. • Prioritise network flexibility to meet changing customer needs and facilitate and affordable transition to a decarbonised economy. • Facilitate customer adoption of new technology while ensuring a resilient and efficient network. • Treat data as an asset, protect it appropriately and manage its use in accordance with its criticality to customers and the network. • Collaborate with industry, partners, thought leaders and subject matter experts to ensure Vector remains at the leading edge of future energy solutions.	2, 4, 5, 6, 7, 9, 10

TABLE 4-1: ASSET MANAGEMENT OBJECTIVES

4.3 Asset management standard

Vector's Asset Management Standard links the organisational asset management objectives to the tactical asset management practice. The Asset Management Standard creates a clear link between Vector's vision, strategic objectives and asset management plans. The framework for our asset management standard is shown in Figure 4-1.

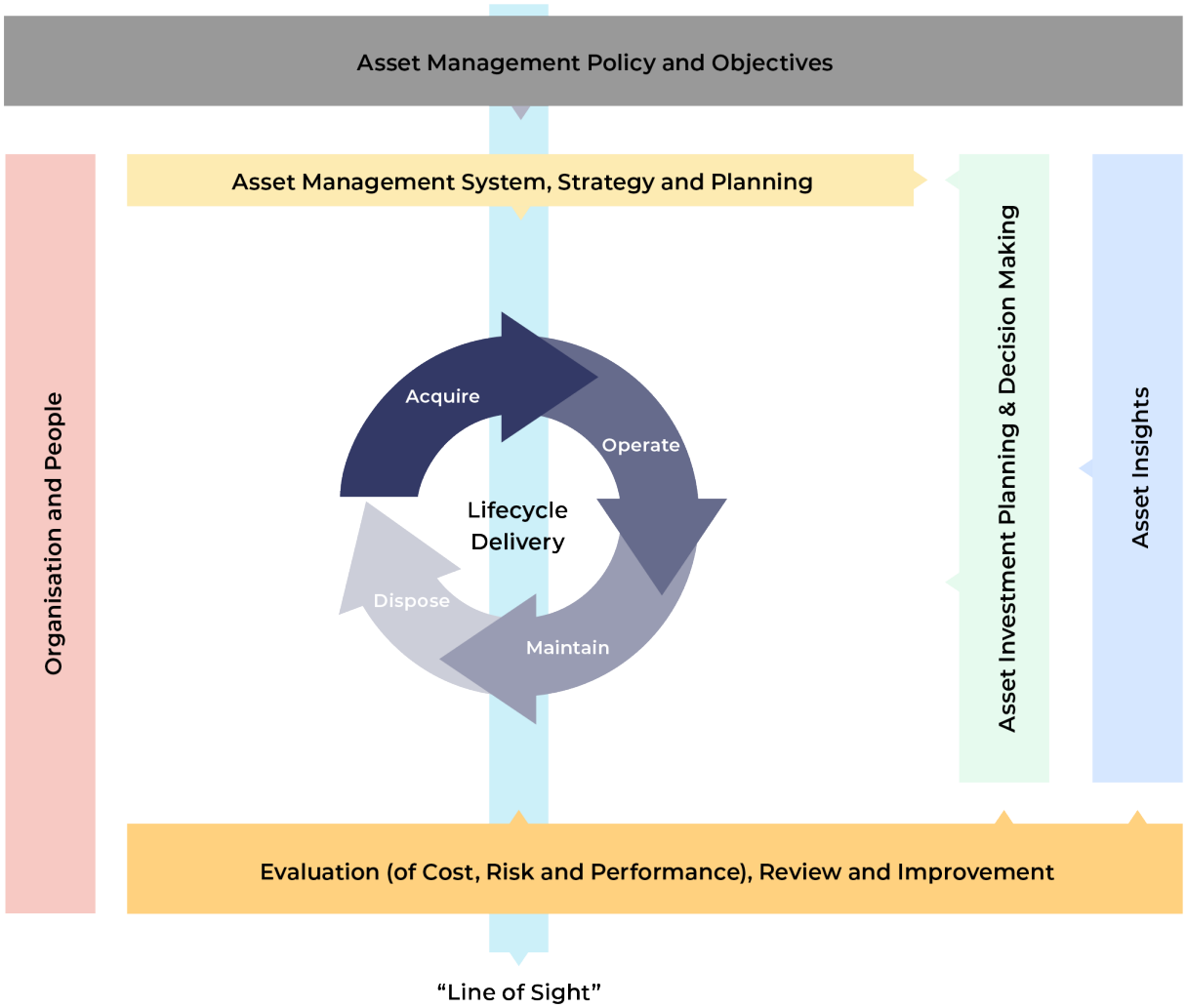


FIGURE 4-1: VECTOR'S ASSET MANAGEMENT STANDARD FRAMEWORK

Continuous improvements in our practices, with supporting cost, risk and performance monitoring, as well as data driven reporting, ensure a full "Line of Sight" throughout the asset management governance structure, from asset management objectives to individual asset level performance. We continuously measure and review progress against asset management objectives to provide assurance and to respond quickly to changes in our operating environment.

Vector is continually advancing its asset management practices (refer Section 3.3) to best position ourselves to achieve its objectives and ultimately its vision of a new energy future. This journey includes aligning our asset management systems with ISO 55001. TABLE 4-2 describes Vector's Asset Management standards and key elements.

ASSET MANAGEMENT STANDARD	DESCRIPTION	ELEMENTS
AMS 01: Asset Management System, Strategy and Planning	Provides the Asset Management System framework and foundational documents.	• Asset Management Framework • Asset Management Policy • Strategic Asset Management Plan
AMS 02: Asset Investment Planning & Decision Making	Documents how asset investment decisions (prioritisation and optimisation) are made to compile the final asset management plans.	• Asset Strategy Management • Network Development Planning • Asset Replacement and Refurbishment Planning • Asset Relocation Planning • Customer Planning • Project Planning • Development of the AMP
AMS 03: Lifecycle Delivery	Documents how asset management plans are translated into more detailed work plans, namely project scopes, programme scopes or routine maintenance plans.	• Technical Standards and Legislation • Asset Creation and Acquisition • Asset Performance and Reliability Management

ASSET MANAGEMENT STANDARD	DESCRIPTION	ELEMENTS
		• Maintenance Delivery • Capital Programme Delivery • Fault and Incident Response • Asset Decommissioning
AMS 04: Asset Insights	Documents how asset data standards and systems are defined and implemented in line with the Asset Insights Strategy in order to collect, store and utilise meaningful data to drive effective decisions around asset management activities.	• Data and Information Management • Asset Data Standards
AMS 05: Organisation and People	Documents the processes used to develop and maintain competent resources as well as how outsourced activities are aligned to asset management objectives.	• Competence and Behaviour • Supply Chain Management
AMS 06: Evaluation (of Cost, Risk and Performance), Review and Improvement	Documents how continuous evaluation of asset performance takes place to ensure alignment with asset management objectives.	• Asset Management Control, Review, Audit and Assurance • Asset Performance and Health Monitoring • Post Investment Reviews • Stakeholder Engagement • Sustainable Development

TABLE 4-2: VECTOR'S ASSET MANAGEMENT STANDARDS

4.4 Asset management key documents

Vector uses a range of document types to stipulate and control requirements. Each document type is represented in a hierarchy structure to ensure all information is aligned. This approach creates a "system of control" in relation to technical and business risks. Figure 4-2 represents Vector's document hierarchy.

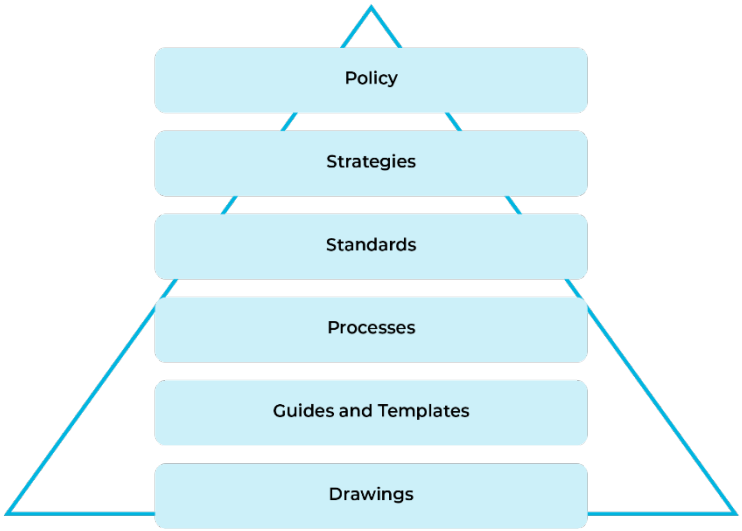


FIGURE 4-2: VECTOR DOCUMENT HIERARCHY

4.4.1 LEGISLATIVE REQUIREMENTS

Vector's gas distribution assets are designed, constructed and operated in accordance with the following principal Acts, Regulations and industry codes:

- Gas Act 1992 and Gas Amendment Act;
- Health and Safety in Employment Act;
- Gas (Safety and Measurement) Regulations;
- Civil Defence and Emergency Management Act;
- Hazardous Substances and New Organisms Act;

- New Zealand Standard (NZS) 7901 Electricity and Gas Industries – Safety Management Systems for Public Safety;
- AS/NZS 4645.1 Gas Network Management;
- AS/NZS 2885 Pipelines – Gas and liquid petroleum; and
- NZS 5263 Gas detection and odorisation.

These Acts, Regulations and industry codes include both prescriptive and performance-based requirements which have been embedded into Vector's suite of asset management documentation. Vector uses ComplyWith to assist in documenting our risk assessments, monitoring and reporting on our legal compliance obligations. Any changes or impacts on our asset management processes are recorded through our change control process.

4.4.2 STRATEGIC DOCUMENTS

Table 4-3 sets out the key strategic documents relating to Vector's asset management framework. Our strategic documents are subject to change control. The change control process obtains feedback and approval of the controlled document and related change impacts prior to publication.

DOCUMENT	ROLE IN ASSET MANAGEMENT PRACTICE
Asset management policy	This policy is Vector's formative asset management document. It defines the principles that guide all aspects of our asset management practice including the development of objectives and plans.
Strategic asset management plan	As part of our working towards alignment with ISO 55001, we are developing and defining the SAMP which documents our asset management objectives in line with our policy and operating context. The SAMP will link the organisational asset management objectives to the tactical asset management practice. The SAMP is still a work in progress.
Delegated Authority (DA) framework	The DA framework applies to all business activities that have financial or non-financial consequences including contracts and expenses. The DA framework sets out specific approvals for particular transactions and governs the level of financial commitment that individuals can make on behalf of Vector. All decisions within our asset management practice that require expenditure or involve significant risk will be made under this policy and in accordance with Vector's project approval process.
Risk management policy	This policy provides the overarching risk management intent that Vector strives for. Its purpose is to: a) outline our key management objectives and the principles underpinning them, b) provide a framework for optimising opportunities and minimising risks, c) demonstrate Vector's understanding and commitment to promoting a culture of risk awareness throughout the organisation, and d) define key risk management roles, responsibilities, accountabilities and reporting requirements.
Health and safety policy	This policy sets out Vector's commitments and requirements for health and safety. Vector will conduct its business activities in such a way as to protect the health and safety of all workers, the public and visitors in its work environment.
Environmental policy	This policy sets out Vector's commitment to managing the environmental aspects of its businesses and sets out the standards expected of all workers.
Sustainability policy	This policy provides Vector's framework for managing environmental, social and governance risks and opportunities. It includes commitments to recognised international agreements and sets out the key principles by which sustainability will be adopted within the business.
Supply chain and procurement policy	This policy provides Vector's framework for building supplier capacity and capability enabling more effective management of network and supply chain risk, realisation of value and assist in achieving Vector's strategy to reduce its carbon footprint.
Safety and operating plan	This safety and operating plan has been developed for Vector's gas network to detail the controls in place to mitigate the risks that have been identified under the hazard and risk assessment processes for minimisation of harm to persons, property, the public and the environment, including emergency response.
Group data and information policy	The purpose of this policy is to govern and guide Vector's key data and information principles and includes everyone's responsibilities regarding data. Data and information refer collectively to all records and documents (both physical and electronic) used to describe and document Vector's business.
Asset class strategies	These strategy documents facilitate the annual development of the AMP through formally recording asset strategies at the asset header class level for our different asset classes.

TABLE 4-3: VECTOR ASSET MANAGEMENT STRATEGIC DOCUMENTS

4.4.3 STANDARDS

Standards and specifications are an integral part of our asset management framework. These state the levels of service, performance targets, define intervention levels and minimum performance criteria. Table 4-4 lists the major standards that support the procurement, supply, commissioning, operation and maintenance of existing, new or replacement assets. Our technical specifications and engineering and maintenance standards are listed in detail in Section 10.2. These documents are improved under a defined management of change process and document revision control process as described in Vector standard USD001 Controlled document management. Management of change is the flow of documentation and change-related collateral between the document author, our FSPs and all end users in Vector's management of change process obtains internal and if our FSPs are involved, external feedback and approval of the controlled document and related change impacts prior to publication.

ASSET STANDARD	ROLE IN ASSET MANAGEMENT PRACTICE
Planning and design standards	These standards guide the planning and development of Vector's overall distribution network architecture. They work in conjunction with the Security of Supply (SoS) standards service level metric to ensure that the network has sufficient capacity and capability to provide the required service levels, enable customer connections and accommodate growth. These standards also set requirements that enable the appropriate operation of the network in accordance with the Network Operating Standards.
Maintenance standards	Vector has developed a set of maintenance standards for each major class of asset that detail the required inspections, failure modes, condition monitoring, maintenance and data capture requirements. Where a cyclic maintenance strategy is applied these standards also set out the maximum maintenance cycle frequency.
Operating standards	These standards define protocols and procedures for operating and controlling Vector's gas network, including contingency plans. They also inform the minimum requirements for network planning and design practices.
Construction standards	These standards and their accompanying standard design drawings cover the detailed design and installation of Vector's network equipment. They also include the data capture requirements for our asset management systems and plant in Vector's network.
Equipment specifications	Equipment specifications specify the materials and equipment to be used on the gas network and the quality and performance requirements with which the materials and equipment must comply.
AS/NZ standards	Australian and New Zealand standards are referenced extensively in our standards and scopes of work.

TABLE 4-4: VECTOR STANDARDS

4.5 Asset management and asset management maturity

Developing our asset management maturity is a key focus of continuous improvement for Vector. We review our asset management practices using the Commerce Commission's AMMAT. We use these reviews to inform our plans to improve our asset management practice.

As described in Section 3.3, our approach has matured progressively with our self-assessment improving year-on-year from an overall AMMAT score of 2.6 in RY16 to 2.8 in RY22.

Our latest AMMAT review (refer to Section 10.15) highlighted the good progress we are making in terms of formalising our asset management practices and improving our asset management practices. We recognise the importance of continuous improvement and that this process is ongoing, in our aim of achieving a target score of 3 on each AMMAT rating criteria. We will continue to improve our Condition Based Asset Risk Management (CBARM) models, formalise our data and information systems to support these models and continue developing our suite of asset management standards.

Set out below is an overview of the primary areas where ongoing improvements in our asset management practise are being implemented.

4.5.1 ASSET MANAGEMENT, ASSET MANAGEMENT STRATEGY AND ASSET MANAGEMENT POLICY

Our asset management policy broadly outlines the principles and requirements for undertaking asset management across the organisation (see Section 4.1 for the broad outline of our policy). These strategies and goals then translate the strategic intentions into an asset investment strategy. These are documented in the Asset Management Plan. Technical standards, work practices and equipment specifications support the asset management policies, guiding the capital and operational works programmes.

4.5.2 COST, RISK AND SYSTEM PERFORMANCE

Asset management encompasses all practices associated with considering management strategies as part of the asset lifecycle. The objective is to look at the lowest long-term cost rather than short-term savings only. To achieve optimal asset management requires a balance between cost, level of risk and performance of the asset. We utilise a risk-based approach that considers the different failure modes of an asset, its condition, criticality scores, probability of failure, likelihood of consequences and a final risk score (our condition-based asset risk models are described in detail elsewhere).

A combined list of proposed projects and initiatives are then prioritised based on a set of agreed business objectives and values with the constraints of resources taken into consideration. The combined list contains our proposed projects and initiatives, high level cost estimates and estimated risks together with investment prioritisation.

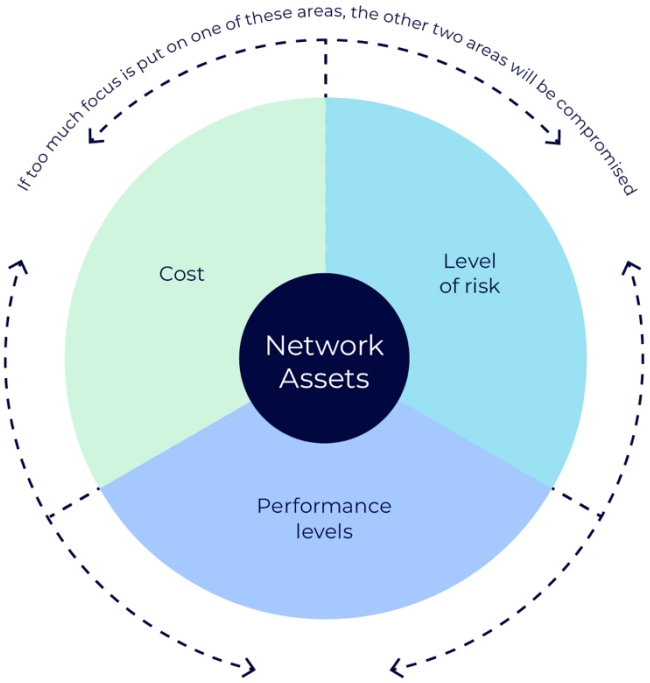


FIGURE 4-3: RELATIONSHIP, COST, RISK AND PERFORMANCE

COST

Improvements have been made to our process for creating business cases and justifications for capital projects to arrange capital budgets. A clear business process with stage gates has been compiled that describes the actions that need to be completed prior to moving past a stage-gate to the next stage in the budget and funding process. Our business cases state the risk and need that drives the requirement for a project, alternative options that were considered and the cost for each option. Our works cost estimates are detailed providing an overview of the total estimated cost of the works, the portion that is required to develop the design of the works, funding required for early procurement of long lead items and the portion required to move to full project funding. Business cases and cost estimates undergo a rigorous peer review process and then a controlled approval process via our SAP business software workflow procedure.

LEVEL OF RISK

Our risks are registered in our Active Risk Manager (ARM) together with controls, actions, assignment of responsibilities and target dates for assessment, review and completion. We use a risk matrix that considers consequences and likelihood to assess and score risks. The risk scores are assigned in our ARM software application. Initiatives to address a risk could also present itself as an opportunity for new solutions and innovations. In certain instances, risks are accepted within the business and such decisions are recorded in ARM as well as in the corporate risk register.

PERFORMANCE LEVELS

Our performance levels for our network are stated in the AMP. Our measures and the data are retained for reporting and analysis and reported annually to the Commerce Commission in our compliance statement. Our average network customer base is calculated using our Gentrack billing and revenue system application.

4.5.3 ASSET HEALTH, MODELLING AND INVESTMENT SCHEDULE

For our asset fleet we have developed an asset strategy for each asset class. These strategy documents clearly describe the asset class equipment, their status and condition, challenges, future management, and maintenance and replacement strategies. These strategy documents thus informs and facilitates the annual creation of the capital investment programs and capital budget. They are updated annually to coincide with the development of the annual asset management plan.

CBARM models have been developed for all distribution assets. These models that use condition data, risk data, as well as environmental conditions and location, provide a data driven basis for the planning of projects and programmes rather than a pure focus on annual planning within a defined financial budget. Asset data supports and underpins these CBARM models, which in turn inform our asset health knowledge and support the development of our asset class strategies, renewal and replacement programme and, capital budgeting. FIGURE 4-4 is a flow diagram for our CBARM models.

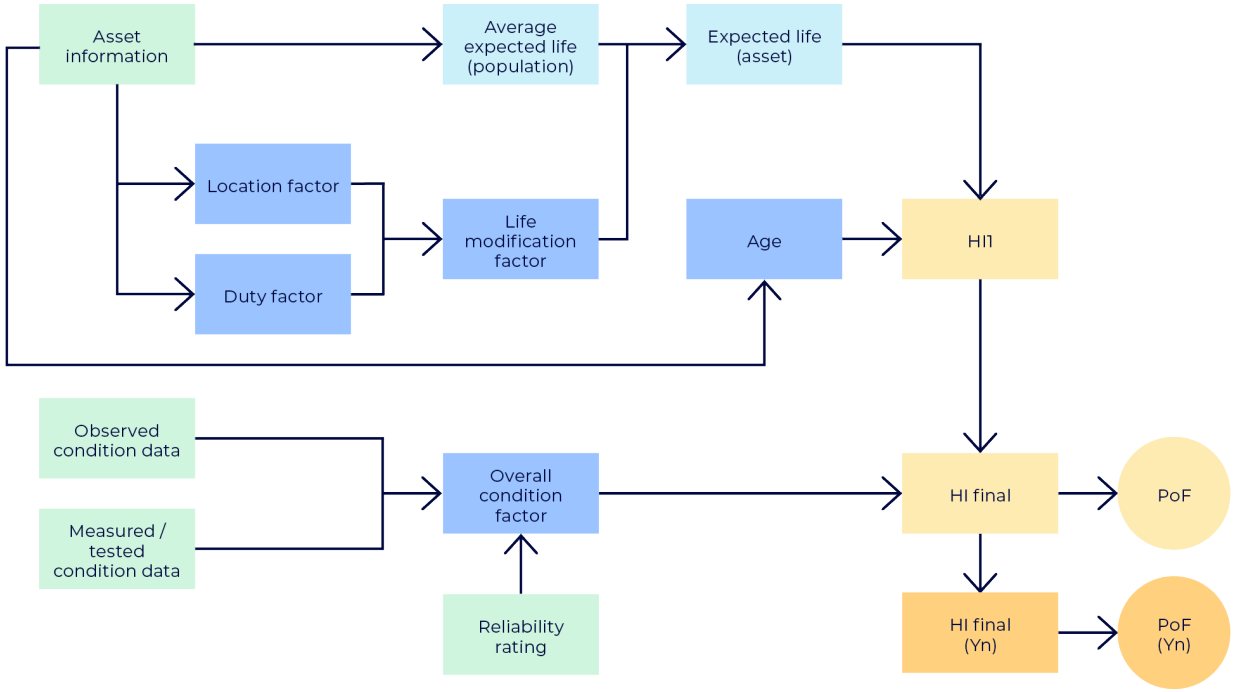


FIGURE 4-4: CBARM MODEL FLOW CHART

4.5.4 ASSET MANAGEMENT DOCUMENTATION, CONTROLS AND REVIEW

Document control is stipulated and governed by our standard GNS-0085 Management of change. Policies, strategies, and standards are circulated for reviews and updates via our SharePoint application including our external partners such as field service providers. A standards register that includes document owners, document review dates and if applicable, any auditing requirements. It enables a high level of control of the documentation process and a historic record of reviews. Updates of asset management documents, standards and standard drawings are issued via SharePoint. Each asset management document has a revision number, current date, and a date at which it needs to be reviewed.

This document control process also applies to outsourced works. The issuing, changes and return of changed documents are controlled via our SharePoint software application with a revision recording and history of changes system in place as part of the application.

4.5.5 COMMUNICATION OF THE ASSET MANAGEMENT PLAN

Our website portal (www.vector.co.nz), provides a wide range of asset management information to external parties. It provides information with regard to new connections, faults information, work in close proximity to our networks and our AMP amongst others. Our AMP, for both OPEX and CAPEX are formally communicated with our field service providers via formal meetings and programme of works schedules.

4.5.6 AUDIT OF THE ASSET MANAGEMENT PLAN

Vector undergoes annual safety audits of its network and asset management practices in terms of NZS7901, Public Safety. These audits are completed by external independent auditors and we use these reviews to address gaps and inform our plans to improve our asset management practice.

4.6 Asset management strategies

4.6.1 OVERVIEW

Management of Vector's network is undertaken in accordance with Vector's asset strategies. These strategies are focused on meeting service level targets. To this end, Vector's assets are managed over their full lifecycle to avoid failures that pose a hazard to workers, public safety or harm to the environment and minimise interruptions of supply to our customers. Strategies are also aligned with statutory and regulatory requirements and design and maintenance standards. A list of key asset strategy documents, design and maintenance standards are provided in Section 10.2.

This section describes the asset management strategies that are in place at Vector that span across all asset classes. These include planning, operation and maintenance strategies as well as specific strategies relating to service level performance i.e. safety, reliability, gas quality and environment. Specific asset class strategies are described in Vector's asset class strategy documents which have been summarised in Section 4.7.

4.6.2 NETWORK PLANNING STRATEGY

The planning strategy ensures that both Vector's QoS and SoS are maintained across the network. Broadly speaking QoS addresses network pressure issues, both current and forecast, while SoS addresses the level of redundancy or the degree of meshing across the network.

Demand for new customer connections outside existing network boundaries is typically supplied through the development of new distribution pipelines and pressure stations. Where forecast demand within an existing network supply area is expected to exceed the nominal capacity of an asset, causing a QoS breach, then solutions are identified to address the constraints. The timing of the solution is scheduled to ensure that the QoS is not compromised. Forecast QoS constraints are reviewed annually or if a significant load is added to the network, to ensure the scheduling of the solution remains valid. Where target forecasts are not achieved, the solution may be deferred.

The SoS criteria determines the level of redundancy required on the network to ensure the risk profile remains within acceptable limits set by Vector's Risk Framework (refer Section 5.3). Key factors include scenario modelling examining the consequences of non-supply through equipment failure or damage on customers and Vector.

4.6.3 STANDARDISED ASSET DESIGN STRATEGY

Vector uses standardised design and equipment on its network. This has the advantage of lowering project costs through competitive bulk materials supply agreements, standardised installation drawings and practices, lower stockholding and emergency spares, standardised maintenance practices, and engaging in a rigorous equipment selection process to ensure fit-for-purpose whilst ensuring appropriate equipment performance over the life of the equipment.

Standardisation has been applied to pipelines, DRS equipment and installation practices. Vector may apply differing architectural treatments to its DRS to better align with local architecture, but construction techniques, materials and fit outs align with well-established standards.

Standard designs are introduced to avoid producing customised solutions for identical network installations. The standard designs ensure rigour and consistency in evaluation, design and application, cost savings over bespoke designs, simplified procurement and reduced stockholding, less rework during construction, safer outcomes and improved mechanism for capturing incremental improvements.

The approach that has been adopted within Vector is that when designs are repeatedly used on the network, standard designs are developed. As design improvements are identified either by Vector's own staff or as feedback from our FSPs, standard designs are amended and updated.

4.6.4 REFURBISHMENT AND REPLACEMENT STRATEGY

Assets that are no longer able to deliver the level of service that customers require in a safe, efficient and economical way, will be replaced or refurbished. In dealing with distribution assets, where Vector has large populations of low cost assets and associated components, the optimal investment options to repair, replace or refurbish are relatively limited and are readily evaluated.

For DRS assets where replacement costs are typically high, the optimal investment options to repair, replace or refurbish will require more complex multi-criteria evaluation and business case justification. Factors that may be considered include:

- Maintenance costs over the remaining life of the asset will exceed that of replacement;
- The asset has become obsolete, component fabrication is expensive, the asset may be the last of its kind and difficult to maintain;
- Low cost retrofit replacements are available with enhanced ratings and safety features; and
- Associated risk and asset performance history.

Economic asset refurbishment is generally restricted to DRS and special crossings. This is an efficient way of extending the asset life where appropriate.

The choice to refurbish assets is based on the condition of the asset, accessibility, its age, history of faults, known issues and criticality of the asset. The availability of assets and the safety of assets also play an important part to elect whether refurbishment is an option.

Asset replacement is generally condition based, rather than age based. Vector has developed CBARM models for its assets, which support a more risk based approach to replacement. This approach would be similarly applied to maintenance prioritisation.

4.6.5 MAINTENANCE STRATEGY

Vector's assets are maintained over their whole lifecycle to avoid failures that pose a hazard to workers or public safety. The core that underpins the maintenance strategy is scheduled inspections for equipment in accordance with maintenance standards for each asset class. Maintenance inspections are used to perform maintenance tasks, repairs and identify and record any non-compliances with the maintenance standards.

Vector has a comprehensive suite of in-house developed maintenance standards that define asset inspections, condition testing and associated maintenance tasks by asset class. In general, Vector's philosophy is to keep its assets in use for as long as they can be operated safely, technically and economically. The maintenance standards support this goal to ensure optimal performance. Corrective maintenance for non-compliances will then be undertaken within specified time frames, as stipulated in the maintenance standards.

Each maintenance standard addresses the purpose, content, frequency, record requirements and associated treatment criteria. The treatment criteria and resulting actions generally direct field workers, to repair defects identified.

In addition to the foregoing, Vector has taken a pro-active approach to the management of its gas distribution network and assets. This involves improving overall asset management capability and the ability to monitor the condition of the network as well as the implementation of programmed replacements in circumstances where these are deemed appropriate.

Some capability and monitoring improvements include the use of criticality information developed for CBARM to move to a risk based prioritisation of maintenance and increased "drive-by" leakage detection surveys.

4.6.6 RELIABILITY AND RESILIENCE STRATEGY

The operation of the gas network is focused on safety, reliability and resilience. Where network failures occur either through equipment malfunction or third party damage, it must be possible to manage these situations safely. The impact these abnormal situations have on other gas users is dependent on the reliability and resilience of the network.

Through scenario modelling, it is possible to remove critical assets from the model to simulate an asset failure and test the impact the absence these assets have on the performance of the network. Where the resultant network pressure model signals unsafe operating pressures, mitigation measures may be identified and enacted before a real situation arises. The determination of acceptable mitigation measures can be identified through a risk-based approach (consequences x likelihood).

Vector has introduced a number of QoS and SoS projects to improve the reliability of the network. The intention is to extend this scenario-based approach and look more closely at the reliability of the various pressure networks.

Reliability and resilience can also be impacted by cyber-attacks that target the core control systems with downstream impacts on the physical infrastructure. While the majority of controls will be implemented at a group level, we will continue to investigate and deploy specific tools designed to detect and prevent attacks on the core control systems of the gas network. These will integrate into the broader security monitoring capabilities of the group.

4.6.7 NETWORK LOAD FORECASTING PROCESS

A time-series moving average model has been developed for gas demand forecasting. The model delivers steady-state winter peak loads, at gate-station level, forecasted for the ten-year planning period, effective from the date of the published AMP. The model is based on hourly readings from each gate station, from which monthly flows are summarised into quarterly peak values, allowing seasonal trends to be observed. As the gate station meters provide data for upstream network reconciliation and billing, a high degree of accuracy is inherent in the forecasting model. The time-series was taken as the maximum flow of each quarter (Jan-Mar as Q1, Apr-Jun as Q2, etc).

Various gate stations are comprised of multiple supply streams and therefore are fitted with multiple meters, resulting in multiple simultaneous meter readings. At these sites, hourly flows are summed to account for either parallel supply or switching of supply streams.

The time-series quarterly values are analysed for several factors: long-term trend, business cycle effects, seasonality, and unexplained, random variation. The forecasting method assumes the trend component has both long-term average and cyclical effects, due to the difficulty to isolate the business cycle effects. This approach ensures the adequacy of the long term (10 years) forecast, and the capability of the network to supply any future demands. For instance, the recent pandemic and consequential lockdown have caused significant energy consumption changes. Using both long-term average and cyclical effects in forecasting will mitigate / reduce any anomalies in long term forecast.

The multiplicative model calculates the value using the formula:

Value = Trend x Seasonal x Random

The process of analysing time-series comprises two stages. The first stage is called 'decomposition' by applying moving averages to eliminate the irregular and seasonal variation in the data and identifying the long-term growth trend within the time-series. Secondly, historical flow data is seasonally adjusted, and the trend of the adjusted quarterly flow values is extrapolated and multiplied by an appropriate seasonal index to obtain the forecasted long-term gas demand at each gate station. Using actual gate station flow data and providing the results of the updated time series analysis allows the demand forecasts to be developed using maximum values for year "zero", and derived values for successive years during the ten-year planning period.

Where a gas network is supplied from two (or more) gate stations, the timing of the network peak gas flow may not coincide with any individual gate station peak flow. In such cases, a co-incidence factor is calculated and applied to the growth trend. It is expressed as the maximum peak flow into the network divided by the sum of the individual peak flows of the two gate stations.

Graphical presentation of the trends allows easy identification of zero, anomalous or incomplete data, which can then be omitted or corrected.

Vectors load forecasts can be found in Section 10.5.

4.6.8 QUALITY OF SUPPLY CRITERIA

Growth in network peak demand (organic growth) and Vector's QoS criteria (GNS-0074) is discussed in Section 7.1. The QoS criteria captures a cost-quality trade-off that reflects the ability of our assets to accommodate gas demand without breaching QoS requirements, and to provide restoration capacity that supports planned and unplanned supply interruption events. Performance against QoS is managed through an annual network planning cycle that involves:

- Development of Vector's annual network load forecast in accordance with the Gas Distribution Forecast Utilisation (GNS-0086). An overview of Vector's load forecasting process is provided Section 4.6.7.

- Updating of Vector's network model with asset changes and the latest load forecast in accordance with GNS-0089 Gas distribution model building. To support this practice, data on customer connections is extracted from Gentrack and Smallworld;
- Modelling of the network to identify future capacity or security constraints that breach the QoS service level requirements. Modelling is undertaken using Synergi Gas, our network modelling software, and in accordance with the Gas Distribution Model Building standard (GNS-0089). This model includes the capability of modelling all pressure systems to ensure adequate capacity under contingency conditions or other nominated scenarios including future loads increases, the impact of investment in additional network capacity and effect of seasonal load and asset ratings to meet QoS; and
- Undertaking a risk assessment where a breach of the QoS service level is identified and developing options. Any proposal to respond to an expected breach will be developed to address the breach on a just-in-time basis and are developed in accordance with Vector's corporate and asset strategies and with the Piping System Design standard (GNS-0002).

The QoS criteria is also taken into consideration when reviewing asset replacement options, and any synergies with network development works are investigated.

The key objective of the QoS is to ensure that the Minimum Operating Pressure (MinOp) is at greater than 50% of the Nominal Operating Pressure (NOP) and no more than 110% of its Maximum Allowable Operating Pressure (MAOP).

Where network modelling forecasts potential QoS issues, closer field monitoring of the pressure at the extremities of the network is carried out to confirm the accuracy of the model. Where forecast QoS breaches are confirmed, solutions are investigated and implemented in a timely manner to ensure the breach does not occur in practice.

In some cases, non-standard minimum network pressures are used as a result of network configuration, cost efficiency or special agreements with customers. Vector's QoS standard provides the MinOp that apply at the critical locations where non-standard conditions apply.

Under contingency situations, networks are isolated to maintain safety to customers and the public. During contingency conditions, network pressures may drop below those experienced during standard and non-standard operating conditions. In these situations, maintaining network pressure depends on the type of fault and the network configuration. Contingency provisions such as customer load shedding are used to maintain network pressure to the end users. Upon loss of a critical element in the supply chain, the following minimum network pressures shall be maintained using contingency provisions:

- Intermediate Pressure (IP) networks shall be operating at no less than 40% of NOP;
- Medium Pressure (MP) networks shall be operating at no less than 30% of NOP; and
- Low Pressure (LP) networks shall be operating at no less than 1.2kPa.

4.6.9 SECURITY OF SUPPLY STRATEGY

The QoS strategy ensures the gas networks operate within safe pressure limits but lacks the wider perspective of managing the network against High Impact, Low Probability (HILP) risks such as ensuring the safe delivery of gas upon the loss of critical components. The widespread application of meshed networks not only ensures efficient use of the network assets but allows a level of redundancy as a precaution against asset failure. For example, a single IP20 pipeline supplying a network has no redundancy, whereas the downstream MP4 network may have multiple DRS's and interconnected pipelines offering additional levels of redundancy.

The SoS criteria is a risk-based assessment based on the numbers of customers affected by an event, network pressure modelling following a simulated contingent event, and the costs and benefits of mitigation measures. The assessment criteria for a project to be implemented under the SoS category is on a case-by-case basis determined by evaluating the risk-mitigation cost trade-off.

4.6.10 ENVIRONMENTAL STRATEGY

Sustainability lies at the heart of creating a new energy future and Vector strives to be an industry leader in Health, Safety and Environmental performance. The Environmental Strategy is to provide sufficient competent resources and effective systems at all levels of the organisation to fulfil this objective. Vector has ISO14001 Environmental Management System certification and will strive to maintain this.

To achieve the above, Vector is committed to:

- Ensuring environmental aspects and impacts are considered as part of all business decisions;
- Meeting and where possible, exceeding the requirements of all relevant environmental compliance obligations;
- Providing environmental leadership through participation in business networks and working with government to create pragmatic laws, regulations, standards and codes of practice to protect the environment;
- Operating in a manner that prevents pollution, minimises environmental impacts and promotes beneficial environmental performance;
- Monitoring and continually improving our environmental footprint;
- Consulting with Vector People, customers and other relevant stakeholders on our environmental performance; and
- Using our knowledge, resources and technology to influence positive environmental outcomes throughout the industries and geographic areas we interact with.

To deliver this strategy Vector will:

- Increase environmental awareness across the business;
- Focus on responsible energy management within our assets;

- Establish environmental goals through our business health, safety and environmental plans and continually monitor, review and improve the effectiveness of our Health, Safety and Environmental Management System;
- Improve environmental capability of all Vector People;
- Set environmental criteria through our purchasing processes; and
- Deliver services and technology to our customers that displace carbon emissions and other forms of pollution.

4.6.11 SAFETY IN DESIGN STRATEGY

The distribution of natural gas involves managing significant hazards, and the Health and Safety at Work Act 2015 places greater accountability on designers to achieve safe outcomes for works. Safety in Design means the integration of control measures early in the design process to eliminate or, if this is not reasonably practicable, minimise the risks to health and safety throughout the life of the asset being designed. Safety in design applies to any plant, substance or structure that is constructed whether fixed or movable.

It is the fundamental of getting asset management practices right and forces us to take a collaborative, well considered, risk based multidisciplinary approach across the lifecycle of the asset.

4.6.12 DIGITAL STRATEGY

The Vector digital strategy has evolved to reflect the changing nature of our business, the wider energy landscape, and new digital technologies. Vector leverages smart digital platforms, optimised across five key value streams: Customer Operations, Records & Asset Management, Network Operations, Maintenance & Construction, and Network Innovation & Planning.

As part of the continuous improvement path for asset management we continue to invest in key systems that will enhance our core capabilities around asset replacement, planning, and maintenance and use network level data analytics and customer behavioural insights to ensure that our physical network investments are targeted.

Accordingly, we will continue to target investments as efficiently as we can by supporting traditional network assets with digital and new energy solutions for the long-term benefit of energy consumers.

4.7 Asset class strategies

The assets owned by Vector is divided into seven asset classes. For each asset class, a strategy document records the asset strategy down to sub-asset class level.

- Pipelines;
- Pressure stations;
- Below ground valves;
- Special crossings;
- Corrosion protection;
- Telemetry; and
- Riser assembly.

Vector's asset strategies for each of its asset classes describe in detail Vector's long-term actions and plans required to deliver specific objectives and network outcomes based on stakeholder requirements and long-term service level performance criteria.

Each asset strategy provides an overview of the class of asset, its purpose and information about its population, asset class replacement considerations, its maintenance requirements, failure modes, specific known issues, risks and asset health indicators and refurbishment requirements. A high-level summary of these strategies is given below.

4.7.1 PIPELINES

Our asset strategy for distribution pipelines is described in GAA002 Distribution Pipelines. The strategies cover distribution mains and services pipelines.

Vector has developed CBARM models for its assets, which would support a more risk-based approach to replacement and to asset maintenance prioritisation. The current CBARM model for our assets has been developed based on two methodologies adopted by the wider industry overseas, i.e. DNO Common network asset indices methodology, UK and Network Output Measures Health & Risk Reporting Methodology & Framework, GB. The two methodologies have been combined and tailored to Vector's available data.

In general, the model utilises all available data, i.e. operational, condition assessment and geographical, to plot a matrix of two key outputs (Health Index and Criticality) that drive the required intervention. The model also identifies the probability of failure and the monetised consequence of failure, which can be normalised across different asset types to identify the expenditure strategy across all asset types.

The Health Index (HI) score of each pipeline has been calculated based on the Location and Material data and then forecasted over the next ten years, based on asset specific aging rate. In this assessment, the HI of a new asset is considered (0.5), and for an asset at its end of life is considered (10).

The Criticality Index (CI) of assets are band in four groups based on their relative Consequence of Failure (CoF). Each asset is placed in a CI Band, based on the relative magnitude of the overall CoF of the entire asset population, and compared to the average overall CoF for all assets in the same HI asset category.

There are four CI bands:

i. C1 - 'Low' criticality

ii. C2 - 'Average' criticality

iii. C3 - 'High' criticality

iv. C4 - 'Very High' criticality

The current risk distribution associated with the pipeline (mains) asset are as the below matrix.

RISK MATRIX YEAR 0 - TOTAL (KM)						
	C1		C2	C3	C4	Total
(0-2)	736	2,380	1,087	170	4,373	
(2-4)	5	42	38	34	119	
(4-5.5)	17	21	21	8	67	
(5.5-6.5)	8	14	10	2	33	
(6.5-7.5)	2	1	2	0	5	
(7.5-8)	-	-	-	-	-	
(8-10)	-	-	-	-	-	
(10+)	-	-	-	-	-	
Total	767		2,457	1,158	214	4,596

The embedded current risk for the majority of the pipeline length is considered very low, 63% of the associated risk is allocated to pipelines within health index of (0-2) category. This indicates that most of the consequential failure risk is associated for pipeline assets with good conditions. The remaining significant risk within HI (4-7.5) categories, is due to the pre-85 pipeline assets.

The forecast pipeline asset HI and CI, without any intervention, at the end of this planning period and based on the current condition and specific individual deterioration rate are shown in the table below.

FUTURE RISK - YEAR 10- TOTAL (KM)					
	C1	C2	C3	C4	Total
(0-2)	721	2,288	1,024	160	4,192
(2-4)	18	125	91	37	270
(4-5.5)	2	9	10	8	30
(5.5-6.5)	2	11	9	6	28
(6.5-7.5)	16	18	17	4	54
(7.5-8)	0.28	2	1	-	3
(8-10)	6.34	4	4	-	15
(10+)	2	1	2	0.01	4
Total	767	2,457	1,158	214	4,596

The future increase in the consequential risk for the HI (6.5 - 10+) categories is mainly due to the aging of the pre-85 pipeline population. However, this increase is a result of a relatively small shift in the pipeline health index. Vector currently has an ongoing pre-85 pipeline replacement programme and is investigating further options to replace the higher risk pre-85 sections and manage the remaining risk of smaller sections of the pre-85 pipelines. The planned interventions over the 10-year planning period that will reduce the future forecast risk, as shown in the following matrix.

FUTURE RISK – AFTER INTERVENSION - TOTAL (KM)					
	C1	C2	C3	C4	Total
(0-2)	721	2,288	1,024	160	4,192
(2-4)	18	125	91	41	274
(4-5.5)	2	9	16	8	36
(5.5-6.5)	2	11	9	6	28
(6.5-7.5)	16	18	17	-	54
(7.5-8)	0.28	2	1	-	3
(8-10)	6	4	-	-	10
(10+)	2	1	-	-	3
Total	767	2,457	1,158	214	4,596

Further details for Vector's pre-85 risk management approach are in Section 7.5.1.

PE PIPELINES

Vector's distribution pipelines are comprised of PE pipe (93.1%), steel pipe (6.8%) and nylon and cast-iron pipe (<0.1%).

The average age of Vector's mains and service PE pipelines is approximately 20 years; the standard life for pre-1985 PE is 40 years and the standard life for modern PE is 60 years.

PE pipelines have been in use on Vector's networks since the 1970s. PE pipe manufactured up to the mid-1980s is known to be susceptible to premature brittle-like failure issues due to the resin type that was in use at the time of manufacture. The issues occur as a result of stress intensification brought on by the PE pipe being exposed to excessive shear and/or bending forces while in service.

Analysis carried out over recent years has shown that that the PRE rate for pre-1985 PE systems is significantly higher than the average PRE rate for the whole of the Vector network, and that the PRE the rate for MP4 pre-1985 PE systems is significantly higher than that for MP1 and MP2 pre-1985 PE systems. The analysis also showed that for the 5-year period (FY17 – FY22), approximately 60% of pre-1985 PE PRE were caused by either a squeeze-off failure or a manual-fusion joint failure. To address the risks associated with pre-85 PE systems Vector has implemented an ongoing programme of targeted pipeline replacement initially targeting higher priority areas; priorities are based on risk factors which include PRE history, operating pressure, pipe diameter and pipeline criticality etc.

STEEL PIPELINES

Underground steel pipelines are protected from corrosion by means of pipe coatings and the use of cathodic protection (CP) systems. The average age of Vector's steel pipelines is approximately 35 years; the standard life for steel pipe is 60 years for MP pipelines and 70 years for IP pipelines. The overall condition of buried steel pipelines is good, and no programmed replacement of these pipelines is envisaged within the standard life of the asset. The replacement of steel pipelines is expected to continue to be of a corrective nature, targeting specific locations and addressing localized issues.

Where a steel pipeline is located in close proximity to a high voltage power network, hazardous voltages can occur on the pipeline in the event of a fault on the power network. The electrical hazards can be caused by Earth Potential Rise (EPR) where the pipeline is located in proximity to a power system earthing-current discharge point, or by Low Frequency Induction (LFI) where a steel pipeline runs parallel with a high voltage power line. To mitigate these risks Vector has developed an Electrical Hazard Management Plan (EHMP) in accordance with the requirements of AS/NZS 4853. The EHMP identifies and assesses all electrical hazards that present a threat to the integrity of Vector's steel pipelines or the safety of people in contact with the pipelines and includes assessment and inspection and test procedures.

In September 2022, the North Harbour Pipeline (which extended from Henderson to Albany) was formally reclassified as a distribution pipeline allowing it to be operated in accordance with the requirements of AS/NZS 4645. The pipeline was previously operated and maintained as a High Pressure (HP) pipeline (i.e. 35 bar MAOP) in accordance with the requirements of the Health and Safety in Employment (Pipelines) Regulations and AS 2885, although it actually operated at 19 bar as part of Vector's IP20 network. The reclassification of the pipeline as a distribution pipeline followed a review of the long-term demand forecast for the region which showed that at the lower operating pressure of 19 bar, the pipeline would still have sufficient capacity to meet the long-term demand forecast.

An inventory of critical spares and equipment items is held for Vector's networks; the items are owned by Vector and held on its behalf by its FSP, Omexom. The inventory includes items that are low volume (turnover) or high cost, or have long lead times for purchase, or are no longer produced (obsolete) or where the level of risk associated with not holding a spare is considered high. The general condition of the critical spares and equipment is adequate, however some of the equipment (e.g. drilling equipment) is at least 25 years old and its current condition reflects the relatively high level of service. Parts of Vector's drilling equipment has been replaced in FY23 with further plans to purchase the latest 'double block and bleed' equipment in FY24.

NYLON PIPELINES

Small quantities of nylon mains pipe were installed on Vector's network during the early 1980s, however all known sections of nylon mains pipe have since been replaced (with PE) or decommissioned. A small-bore (6mm) nylon piping system known as Flexigas was also used for a short period during the late 1980s however it quickly became obsolete due to the introduction of PE pipe; approximately 2.5km of 6mm nylon service pipe remains in use. The level of risk presented by Flexigas nylon pipe is considered to be low and Vector's replacement strategy has therefore been to replace Flexigas service pipes as a matter of course whenever this type of pipe is exposed during a fault response or planned work.

PIPE IN BUILDINGS

There are approximately 200 sites where Vector owns a gas service pipe that terminates within a building - typically at a Gas Measurement System (GMS) location or a meter room. Vector undertakes annual inspections of these sites to assess the condition and accessibility of the service pipe, and the adequacy of available ventilation and installed gas-tight conduits etc. The primary risk associated with pipe-in-buildings sites is an asset failure resulting in a gas-in-building event.

During FY20 Vector undertook a field-audit of all pipe-in-building sites to clarify the demarcation point between network and GMS assets at each site and undertake a condition assessment to identify any upgrade work required to mitigate any safety risks associated with the site. This work formed the basis of a pipe-in-building upgrade programme that has been ongoing since FY21 and is now scheduled for completion in FY25 (refer Section 7.5).

4.7.2 PRESSURE STATIONS

Management of our pressure station fleet is undertaken in accordance with Vector's asset strategy GAA004 Pressure stations. The strategies cover equipment at gate stations, DRS and service regulators.

Using the previously mentioned CBARM models, each DRS has been assessed based on four different failure modes; failed open, failed close, emission and third party interference. Further details of the methodology and results are provided in Vector's asset strategy report GAA-004 Pressure stations. The summary of the DRS current asset conditions is described in the table below.

RISK MATRIX YEAR 0 – TOTAL					
	C1	C2	C3	C4	Total
(0-2)	5	2	-	3	10
(2-4)	23	10	4	4	41
(4-5.5)	16	1	-	3	20
(5.5-6.5)	7	1	1	-	9
(6.5-7.5)	9	6	4	-	19
(7.5-8)	-	-	-	-	-
(8-10)	-	1	-	-	1
(10+)	-	-	-	-	-
Total	60	21	9	10	100

The current embedded risk of the entire DRS population is low. This risk is considered acceptable as the majority of the DRS population are in C1 and C2 categories (i.e. 81 DRSs) and the leading consequence of failure is supply interruption.

The forecast DRS asset HI and CI, without any intervention, at the end of this planning period and based on each DRSs current condition and specific individual deterioration rate are shown in the table below.

FUTURE RISK MATRIX – TOTAL					
	C1	C2	C3	C4	Total
(0-2)	-	-	-	-	-
(2-4)	9	4	1	3	17
(4-5.5)	17	6	2	4	29
(5.5-6.5)	13	2	1	1	17
(6.5-7.5)	5	2	1	2	10
(7.5-8)	3	1	-	-	4
(8-10)	9	4	4	-	17
(10+)	4	2	-	-	6
Total	60	21	9	10	100

The forecast 10-year values of HI comprise a number of HI category (10+) as a result of asset deterioration, across the entire DRS population. This forecast risk of the entire DRS population is considered significant with a number of DRS assets in HI category (10+) - i.e. assets at their end of life.

As described in section 7.5.2, Vector has a number of interventions over the 10-year planning period that will reduce the future forecast risk, as shown in the following matrix.

RISK MATRIX – AFTER INTERVENTION – TOTAL					
	C1	C2	C3	C4	Total
(0-2)	6	4	-	-	10
(2-4)	29	12	5	8	54
(4-5.5)	16	1	-	2	19
(5.5-6.5)	3	1	1	-	5
(6.5-7.5)	6	2	3	-	11
(7.5-8)	1	-	-	-	1
(8-10)	-	-	-	-	-
(10+)	-	-	-	-	-
Total	61	20	9	10	100

GATE STATIONS

HP equipment (pressure regulating equipment, custody transfer metering, etc.) within the gate station is owned, operated and maintained by the transmission company (First Gas Limited), whereas distribution system equipment (i.e. valves and pipework etc.) within the gate station is owned, operated and maintained as part of Vector's distribution networks.

These assets are the main supplies into the local distribution network and are critical to the overall supply system. Condition assessment form the basis of Vector's upgrade programme to address corrosion on pipe spools and equipment including pipe supports.

DISTRICT REGULATOR STATIONS

Vector has 101 DRS in service on its distribution network. The average age of the DRS population is 27 years; the standard life of a DRS is 35 years. The majority of DRS are installed aboveground and have a twin stream active/monitor/slam-shut (i.e. over-pressure protection) configuration.

DRS condition assessments are carried out on an ongoing basis to allow DRS upgrade priorities to be determined; the condition assessments cover the following general areas:

- Enclosure dimensions, amount below ground, enclosure type and ventilation provided;
- Confirmation that the reliefs valves are vented to a safe location;
- Inlet and outlet fire valves present and accessible;
- The condition of the enclosure and ease of access/egress; and
- The condition of DRS equipment – i.e. regulators, pipework, filter, relief valve, meter and corrector.

The ongoing DRS condition assessments and Vector's DRS CBARM model form the basis of Vector's DRS upgrade programme to address integrity issues, and the overall condition of the DRS population has shown a steady improvement over the period since the condition assessments were initiated in FY10. This approach will continue to ensure the integrity and condition of DRS's remain at a high standard.

SERVICE REGULATORS

Vector has 93 service regulators in service. The average age of the service regulators is 26 years, with the majority installed between the mid-1980s and the mid-1990s; the standard life for service regulators is 35 years. Existing service regulators are mostly installed in small pits below ground. However, all new service regulators are installed above ground. Service regulators are typically installed in situations where it is not possible (or considered impractical) to locate the GMS outside of the customer's premises. A service regulator is typically comprised of a small-capacity pressure regulator along with upstream and downstream isolation valves.

In some situations, underground service regulators can be affected by the ingress of water, silt or other debris that over time leads to corrosion and impaired regulator performance. This can result in gas escapes from corroded fittings and pipework and can allow unacceptable over-pressure gas into downstream systems (and venting gas to atmosphere). Following the recent replacement programme that targeted the replacement of higher risk service regulators, Vector's remaining below ground service regulators are inspected annually and two-yearly for above ground service regulators.

4.7.3 BELOW GROUND VALVES

Vector's strategy for underground valves is described in GAA006 Below ground valves.

Using the belowground valve CBARM model, each valve has been assessed based on two different failure modes – i.e. material failure and seizing. Further details of the methodology and results are provided in Vector's asset strategy report GAA006 Below ground valves. A summary of the current condition of the belowground valve population is described in the table below.

RISK MATRIX YEAR 0 – MAX					
	C1	C2	C3	C4	Total
(0-2)	283	1,420	1	-	1,704
(2-4)	81	615	30	2	728
(4-5.5)	25	350	90	6	471
(5.5-6.5)	13	359	87	26	485
(6.5-7.5)	-	16	6	2	24
(7.5-8)	-	2	1	-	3
(8-10)	1	11	8	6	26
(10+)	-	-	-	-	-
Total	403	2,773	223	42	3,441

The current embedded risk of the entire valve population is low. This risk is considered acceptable as the majority of the valve population are in C1 and C2 categories (i.e. 89%) and the leading consequence of failure is supply interruption.

The forecast valve asset HI and CI, without any intervention, at the end of this planning period and based on each valves' current condition and specific individual deterioration rate are shown in the table below.

FUTURE RISK MATRIX – MAX					
	C1	C2	C3	C4	Total
(0-2)	278	1,373	1	-	1,652
(2-4)	67	491	1	-	559
(4-5.5)	16	129	-	-	145
(5.5-6.5)	15	199	55	2	271
(6.5-7.5)	18	218	66	9	311
(7.5-8)	4	139	47	12	202
(8-10)	4	198	38	11	251
(10+)	1	26	15	8	50
Total	403	2,773	223	42	3,441

The forecast 10-year values of HI comprise a high number of HI category (8-10+) as a result of asset deterioration, as the population of the plug valves reaches its end of life. This forecast risk of the entire valve population is considered significant with a significant number of valves in HI category (8-10+) - i.e. assets at their end of life.

As described in section 7.5.3, Vector has a number of interventions over the 10-year planning period that will reduce the future forecast risk, as shown in the following matrix.

RISK MATRIX – FUTURE INTERVENTION – MAX					
	C1	C2	C3	C4	Total
(0-2)	278	1,381	22	8	1,689
(2-4)	67	491	1	-	559
(4-5.5)	16	129	-	-	145
(5.5-6.5)	15	199	55	2	271
(6.5-7.5)	18	218	65	9	310
(7.5-8)	4	138	46	12	200
(8-10)	4	196	34	11	245
(10+)	1	21	-	-	22
Total	403	2,773	223	42	3,441

LINE VALVES

The line-valve population is comprised predominantly of ball valves and plug valves with a small number of gate valves. The average age of the line valve population is 30 years; the standard life of valve assets is 35 years. In general valves are expected to last the lifetime of the network system to which they are connected, however valves will be replaced on an as required basis due to operational issues, leakage etc.

Plug valves were installed on Vector's network up until the mid-1980s; because of their design, plug valves require a higher level of maintenance which includes regular greasing to prevent the valve seizing and/or leaking. Ball valves have been used since the mid-1980s and are considered to be reliable and relatively maintenance free. Exact information on valve types (i.e. ball, plug etc.) installed on the network is not available (i.e. legacy valve information is not complete) however it is estimated that over 40% of mains valves are plug valves.

Mains and service valves are typically installed belowground. The majority are direct-buried and access to the valve is provided via a valve sleeve. In some cases (e.g. on larger diameter mains) valves are installed in pits or above ground. Aboveground valves that are installed at gate station and DRS sites are operated and maintained as part of the station equipment.

The principal operational risks for line-valves are lost valves (i.e. a valve cannot be located in the field due to road alterations or re-sealing etc.), seized plug valves (i.e. corrective maintenance procedures are unable to make a seized valve operable) and mis-aligned valve sleeves (i.e. the valve sleeve becomes mis-aligned due to ground movement etc thereby rendering the valve inoperable). Where lost valves or seized valves are confirmed, they are identified as such in Vector's asset database and a risk assessment carried out to determine if a replacement valve is required. Where the valve is assessed as being critical, it will be scheduled for replacement; where the valve is assessed as being non-critical, it will be classified as inoperable and transferred from a full-inspection maintenance plan to a safety-inspection maintenance plan.

The incidence of seized plug valves is expected to increase over time in line with the declining health index as indicated by the CBARM analysis described above. For this reason, a review of the maintenance strategy for plug valves will be undertaken during FY24 to determine if changes to plug valve maintenance cycles or maintenance practices are warranted in order to reduce the incidence of seized valves and improve the overall health index of the plug valve population.

In FY22, a plug valve replacement strategy targeting smaller diameter cast iron plug valves was initiated. This followed an incident where a 50NB cast iron plug valve failed as a result of being exposed to external forces (e.g. due to ground movement) over an extended period of time. The replacement programme targets the replacement of all smaller diameter (i.e. 50NB or smaller) plug valves where the valve body is known to be (or is likely to be) made from cast iron, and the valve is located within a higher risk area - e.g. located within the CBD.

AS/NZS 4645 requires adequate sectional isolation valves be installed to facilitate the safe operation of the gas distribution network. Vector uses network isolation modelling to determine the need for additional isolation valves in higher risk areas - e.g. CBD, large catchment areas etc. An ongoing programme to install additional isolation valves (including DRS fire valves) as identified by the isolation modelling is planned for the duration of the planning period.

4.7.4 SPECIAL CROSSINGS

Vector's strategy for special crossings is described in GAA-005 Special crossings.

Vector's special crossings utilise either a steel carrier pipe (60%) or a PE carrier pipe (40%).

Periodic detailed condition assessments have been completed for most of the steel special-crossings (detailed assessment of a small number of sites is currently not possible due to restricted physical access). The results of these assessments indicate that the majority of the crossings are in good or reasonable condition with a small number of sites requiring various levels of upgrade work to address corroded and/or poorly designed pipeline support brackets and damaged and/or loose bracket fixings etc. The sites requiring upgrade work have been prioritised and the higher priority sites have been scheduled over the next 10 years.

Condition assessments have also been carried out for all PE special crossings that can be observed and inspected. However, the majority of PE crossings are either buried in the road carriageway or enclosed within the bridge structure. Detailed condition assessments have not been carried out at these sites. However, regular safety inspections are completed.

All special crossing sites have safety measures installed where there is a risk of the public accessing the pipe attached to the crossing structure; the measures typically include safety barriers and/or warning signs. Ongoing risk assessments are carried out as part of routine special-crossing planned maintenance inspections to ensure the existing public-safety measures at that site, are adequate. A public-safety risk assessment is also carried out for any planned new special-crossing to ensure that appropriate public-safety measures are included in the special crossing design.

Vector's special crossings are located over creeks or rivers and in some cases attached to the outside of the bridge structure. During the Auckland Anniversary 2023 flooding and Cyclone Gabrielle of February 2023, no damage occurred to Vector's special crossings. However, to ensure these sites remain at a low risk from damage during future flooding events, Vector is planning to undertake a review of the current pipeline protection controls. This will ensure the potential pipeline damage is adequately mitigated should a future flooding event occur.

A five-year programme of work to replace all pipeline support brackets on the Auckland Harbour Bridge IP20 pipeline crossing and to recoat the entire pipeline commenced in FY18. The work was initiated due to the poor condition of the original support brackets and was proceeding to schedule but experienced delays due to Covid and is now expected to be completed in FY25.

Using the special crossings CBARM model, each crossing is assessed on two different failure modes: pipe and fixing failure. Further details of the methodology and results are provided in Vector's asset strategy report GAA-005 Special crossings. The summary of the special crossing current asset conditions is described in the table below.

RISK MATRIX YEAR 0 – MAX					
	C1	C2	C3	C4	Total
(0-2)	-	33	7	-	40
(2-4)	1	17	2	-	20
(4-5.5)	-	1	2	-	3
(5.5-6.5)	-	2	-	-	2
(6.5-7.5)	-	1	-	-	1
(7.5-8)	-	7	-	-	7
(8-10)	-	6	1	1	8
(10+)	-	-	-	-	-
Total	1	67	12	1	81

The current embedded risk of the entire special crossing population is low. This risk is considered acceptable as the majority of the special crossings population are in C1 and C2 categories (i.e. 68).

The forecast special crossing asset HI and CI, without any intervention, at the end of this planning period and based on each special crossing's current condition and specific individual deterioration rate are shown in the table below.

FUTURE RISK MATRIX – MAX					
	C1	C2	C3	C4	Total
(0-2)	-	14	-	-	14
(2-4)	1	28	8	-	37
(4-5.5)	-	8	1	-	9
(5.5-6.5)	-	-	2	-	2
(6.5-7.5)	-	1	-	-	1
(7.5-8)	-	-	-	-	-
(8-10)	-	3	-	-	3
(10+)	-	13	1	1	15
Total	1	67	12	1	81

The forecast 10-year values of HI comprise a relatively small number of HI category (10+) as a result of asset deterioration. This forecast risk of the entire special crossing population is considered moderate with a number of assets in HI category (8-10+) - i.e. assets at their end of life. As a result of this assessment, Vector has identified a targeted intervention programmes to mitigate this risk (refer to Section 6.2.6). The result of the interventions over the 10-year planning period will reduce the future forecast risk, as shown in the following matrix.

RISK MATRIX – AFTER INTERVENTION – MAX					
	C1	C2	C3	C4	Total
(0-2)	-	41	3	1	45
(2-4)	1	23	8	-	32
(4-5.5)	-	3	1	-	4
(5.5-6.5)	-	-	-	-	-
(6.5-7.5)	-	-	-	-	-
(7.5-8)	-	-	-	-	-
(8-10)	-	-	-	-	-
(10+)	-	-	-	-	-
Total	1	67	12	1	81

To further improve our CBARM model for special crossings, additional CBARM data is being collected for additional sites that will be added to the CBARM model in FY24 (refer to Section 4.8 for details on Vector's asset management improvements).

4.7.5 CORROSION PROTECTION EQUIPMENT

Vector's strategy for corrosion protection equipment is described in GAA401 Corrosion protection systems.

The majority of Vector's interconnected steel network is protected by impressed-current CP systems; the balance of the steel network (i.e. typically smaller standalone networks) are protected by sacrificial-anode CP systems. The CP systems comprise 9 transformer rectifiers and associated ground beds, 12 sacrificial-anode beds and approximately 1,000 CP test points.

The impressed-current CP (ICCP) systems have an average age of 30 years, and the sacrificial-anode CP systems have an average age of 29 years; the standard life of CP assets is 20 years. The condition of the overall CP system is considered adequate, and the performance requirements of AS 2832 are generally being met.

Additional CP test points have been installed over recent years to meet the test-point spacing requirements of AS 2832, however there is a need for the installation of further test points to address ongoing test-point spacing issues and to replace lost or damaged test-points; a 10-year programme to install additional CP test points is therefore planned for FY21 to FY30. In addition, there is an ongoing requirement to install interference test points on an as-required basis to allow joint monitoring (i.e. by the respective pipeline owners) of Vector's steel pipeline and other steel pipelines (e.g. Watercare's) to address any CP interference issues at points where the pipelines cross or are in close proximity to one another.

Although ICCP system ground beds are generally expected to last the lifetime of the network system to which they are attached, sacrificial-anode system anodes require replacement when the anodes have been consumed, or when the CP current requirement exceeds the capacity of the anode system. Replacement of the anodes is carried out as required based on an assessment of the performance of the relevant anode system.

The Otara ICCP system encompasses Vector's steel networks that stretch from East Tamaki to Otahuhu and from the Airport south to Papakura. This ICCP system is supported by a single ground-bed located in Otara and is currently running at its maximum output and is susceptible to minor isolation faults.

The replacement programme for Vector's CP assets includes an annual provision for the replacement of CP assets as required e.g. installation of surge diverters, installation of new ground beds or upgrade of existing ground beds, replacement of expired sacrificial anodes, installation or replacement of test points etc.

4.7.6 TELEMETRY EQUIPMENT

Vector's strategy for telemetry equipment is described in GAA501 Telemetry equipment.

The telemetry systems used by Vector to monitor its gas distribution networks comprise the Telenet Supervisory Control and Data Acquisition System (SCADA) system, and the Cello system. Telenet equipment is typically installed at gate station and DRS sites, and Cello equipment is typically installed at system extremity or other critical pressure-monitoring points.

The use of Telenet monitoring is considered for all DRS that are supplied from an MP7 or higher pressure system and where the DRS location provides a critical monitoring point for the associated pressure system/s, or where the DRS has a peak throughput in excess of 500 standard cubic metres per hour (scmh) or it supplies 1,000 ICPs or more. The use of Telenet monitoring is also considered for any system extremity point where the ability to monitor real-time system pressure data during a contingency event is critical. The use of the Cello monitoring is considered for all DRS sites and system extremity monitoring points where the availability of real time system pressure data is not considered to be critical, but where the availability of pressure data is considered vital for planning purposes.

The Telenet system employs two communication platforms - i.e. approximately half of the sites utilise Kingfisher Remote Telemetry Units (RTU) to monitor pressure, temperature and flow data and communicate with a master RTU by means of a digital radio transceiver. The balance of the Telenet sites utilise an electronic gas volume corrector to monitor pressure, temperature and flow data and communicate with the Vector base station by means of a General Packet Radio Service (GPRS) router utilising the Vector Communications Wireless Plus service. The Telenet data is passed from the Kingfisher master RTU and the GPRS base station to Vector's Power TG SCADA system from where it is archived in the PI archiving system.

The average age of the GPRS Telenet field equipment is approximately 11 years and it is in good condition. Intermittent performance issues have been encountered at some GPRS sites where a new corrector type has been installed however these are expected to be addressed through ongoing corrector-firmware upgrades.

The Cello system is comprised of Global System for Mobile Communication (GSM) remote data loggers that use short message service (SMS) messages for communication, and a receiving PC which has proprietary PMAC software and a GSM modem installed. In addition to the population of Cello units installed at permanent pressure-monitoring locations, a small population of Cello units is also used for temporary pressure-monitoring - e.g. for winter gauging purposes. The 15 minute time-stamped data is uploaded from the Cello unit to the PMAC base station once a day; data from permanent monitoring sites is then archived in the PI archiving system. The average age of the Cello units is approximately 5 years; the equipment is in good working order.

The Cello units operate on Vodafone's 2G network and although there currently doesn't appear to be no confirmed plans for Vodafone to shut its 2G network, it is considered likely at some time in the near future in order to free up capacity for other services (e.g. 5G) which has already occurred in other countries around the world. Vector is currently investigating options that will ensure all new remote data logger sites are connected to the 3G (or later) network and allow the existing population of remote data loggers to be progressively migrated to the alternative network within the next few years; this would entail upgrading or replacing the existing data logger units.

4.7.7 RISER ASSEMBLY

Vector's strategy for riser assembly is described in GAA007 riser valves.

Approximately 50% of all PRE on Vector's gas network are caused by service riser faults - i.e. riser pipe, riser valve or riser crimp faults. Riser valve faults are also a major cause of both planned and unplanned interruptions on the network. Typical riser valve faults are the valve passing gas when in the closed position, the valve leaking or the valve being inoperable (e.g. seized).

In order to mitigate the risks associated with riser valves, annual audits of approximately 1,000 riser valves have been undertaken over recent years initially targeting predominantly residential areas, and then more recently, targeting IP and larger size MP riser valves. The annual audit strategy has largely been effective; however, it can only identify faults that are present (or able to be detected) at the time of the audit. For this reason, from FY23 Vector aligned its planned service riser survey with the ongoing Vector AMS smart-meter rollout programme; any issues identified with the service riser and/or riser valve at the time of the meter swap are reviewed and prioritised for replacement based on the criticality of the asset.

Vector also undertakes annual inactive-service surveys that target services that have been inactive (i.e. live but inactive) for more than 5 years; the survey identifies any corrective maintenance that the riser and/or riser valve requires and assesses the need to remove the riser and/or isolate the service to mitigate the risk of third party damage.

4.8 Asset management maturity

Developing our asset management maturity is a key focus of continuous improvement for Vector. We review our asset management practices using the Commerce Commission's AMMAT. We use these reviews to inform our plans to improve our asset management practice.

As described in Section 3.3, our approach has matured progressively with our self-assessment improving year-on-year from an overall AMMAT score of 2.6 in RY16 to 2.8 in RY22.

Our latest AMMAT review (refer to Section 10.15) highlighted the good progress we are making in terms of formalising our asset management practices and improving our asset management practices. We recognise the importance of continuous improvement and that this process is ongoing, in our aim of achieving a target score of three on each AMMAT rating criteria. We will continue to improve our CBARM models, formalise our data and information systems to support these models and continue developing our suite of asset management standards.

SECTION 05

Governance, risk management and information management

5 – Governance, risk management and information management

5.1 Overview

This section provides an overview of Vector's governance and organisational structure, accountable for delivering effective and fit for purpose asset management planning. Fundamental to effective governance is a strong awareness and focus on risk management. Therefore, this section also includes an overview of our enterprise risk management framework, key risk practices and event management documentation with specific emphasis on high impact, low probability risks. Finally, our data and privacy management practices are covered, which includes a summary of information systems and our approach to cybersecurity. These elements are key enablers in ensuring Vector's asset management practice.

5.2 Governance and organisational structure

Vector's asset management governance and organisational structure is shown in Figure 5-1. This structure provides oversight and leads all aspects of our asset management practice.

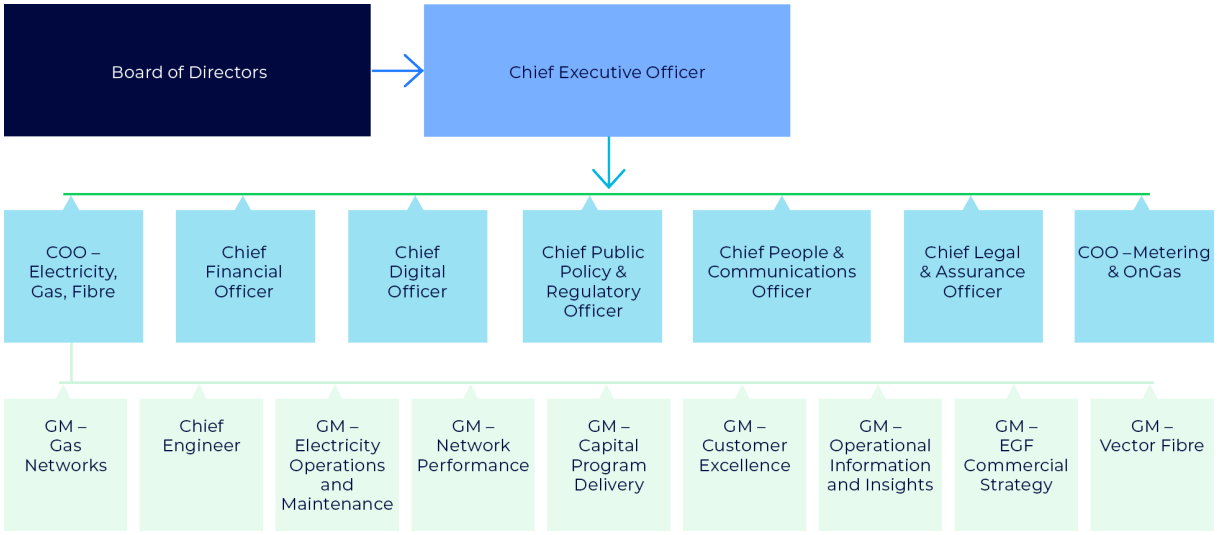


FIGURE 5-1: VECTOR'S ASSET MANAGEMENT GOVERNANCE AND ORGANISATIONAL STRUCTURE

Figure 5-1 pictorially represents the governance and organisational structure accountable for delivering effective and fit for purpose asset management planning for Vector's electricity, gas and fibre distribution businesses. An overview of the asset management accountabilities and responsibilities within three levels of this structure are set out below.

- **Board of Directors** – At the highest level, the Board of Directors operates under the Board Charter, and provides governance over all aspects of Vector's asset management practices on behalf of Vector's owners and the broader stakeholder community. The board exercises oversight of the objectives of asset management (refer Asset Management Systems), its strategic direction, investment approvals and the customer service level outcomes achieved by Vector's gas distribution network. Overall budgets, significant expenditures and asset investments are reviewed and approved at the board level.

  Vector's Board of Directors maintains its asset management oversight through the implementation of governing policy, a delegated authority framework, management reporting and periodic reviews including internal and external operational audits. The board also receives performance reporting against key service levels and regulatory reliability targets.

  Full details of Vector's board members, the executive leadership team and our corporate governance structure are available on our website.

- **Group Chief Executive** – Under the delegated authorities' framework, the approved strategic plan, approved annual budgets, and day-to-day operation of the business is the responsibility of the Group Chief Executive (GCE). The GCE maintains oversight of Vector's asset management practices, including effective risk management (both strategic and operational), service level outcomes, strategic direction and investment approvals. To assist with this oversight, the GCE receives performance reporting against key metrics and service levels which include reporting against regulatory reliability targets.

- **Chief Legal and Assurance Officer** – Under delegation from the board and the GCE, the Chief Legal and Assurance Officer is accountable for providing Vector's legal counsel as well as policy, frameworks and governance for enterprise risk and resilience, internal audit, health, safety and environment, compliance and privacy (via a dedicated Privacy Officer). Responsibility for the delivery of these functions at a business unit level is appropriately disseminated and delegated throughout the business through dedicated management functions and ownership models.

- **Chief Operating Officer – Electricity Gas & Fibre** – Under delegation from the board and the GCE, the Chief Operating Officer (COO) has full responsibility for Vector's gas asset management practice. This includes the establishment and enforcement of Vector's Asset Management Policy, the overall performance of Vector's gas distribution network, development and implementation of the approved AMP, and budgetary control within the delegated authorities' framework.
- **General Manager Gas Networks** – This role is accountable for asset management planning and delivery of Vector's gas distribution maintenance and annual capital programmes.
- **Chief Engineer** – Integral in strategic business model design and strategic business opportunities, this role works alongside project teams and executive sponsors to ensure Vector's electricity and gas networks and services are of the best practicable quality, delivered safely and effectively.
- **General Manager Electricity Operations and Maintenance** – Vector's field staff are managed through an outsourced contracting model. As such, the GM Electricity Operations and Maintenance is accountable for the contractual relationships and performance of field crews delivering our electricity maintenance programme. Work is centred around the delivery of maintenance plans in accordance with Vector standards and reactive response to outages.
- **General Manager Network Performance** – This role is accountable for future electricity network planning, capital and maintenance investment planning, and developing detailed electricity asset management plans and standards for all asset classes required to achieve Vector's asset management objectives.
- **General Manager Capital Programme Delivery** – This role is accountable for the delivery of the annual electricity capital programme, including project engineering, project management, and procurement and tendering of capital works.
- **General Manager Customer Excellence** – This role is accountable for providing the key link between asset management delivery and Vector's customers. The role leads our relationship with retailers and customers to ensure the relationship is continually strengthened and supported.
- **General Manager Information and Insights** – This role is accountable for managing Vector's electricity and gas distributions information and data assets. The role ensures information compliance with regulatory and privacy requirements and provides supporting business intelligence to inform operational decision making.
- **General Manager Commercial Strategy** – This role supports Vector's commitment to its asset management objectives and vision by driving key reliability and strategic initiatives.
- **General Manager Fibre** – This role is accountable for asset management planning and delivery for Vector's Fibre business.

The governance framework overarching each of these roles is defined by the Code of Conduct and Ethics – the Vector Way, Vector's Delegated Authority Framework (DAF), and position descriptions for each role. Vector's Board has delegated specific authorities to the GCE and authorised delegation of certain authorities to other levels of Vector's management. The limits and rules applied to delegations are prescribed in the DAF documentation and govern the authority to commit to transactions or expose Vector to a risk. A periodic audit of the DAF is undertaken to ensure ongoing compliance.

Vector's Enterprise Resource Planning (ERP) System, Systems Applications and Processes (SAP) is the primary management system used to implement the DAF. Financial delegations for approvals under the DAF for OPEX and CAPEX are set and managed within Vector's SAP system. A periodic audit of the DAF is undertaken to ensure ongoing compliance. The ERP system also provides control of asset management workflows, as well as the management of information that enables our asset management and project management practices.

5.3 Risk management

5.3.1 ENTERPRISE RISK POLICY AND FRAMEWORK

Risk management practices form an integral part of Vector's asset management processes. Vector's Risk Management Policy establishes clear principles which provide for a purpose-built flexible approach to the application of risk management across Vector.

Our activities in risk:

a) Create and protect value in our organisation;

b) Form an integral part of all organisational processes and decision-making;

c) Explicitly address uncertainty;

d) Are systematic, structured and timely;

e) Are customised to suit our organisational context and individual business activities;

f) Take into account human and cultural factors;

g) Are transparent and inclusive; and

h) Are dynamic and responsive to change.

The above principles form the basis of Vector's risk management approach allowing for the development of risk management objectives and a clear framework that is applicable across the Vector Group. Our Enterprise Risk Management (ERM) framework is based on the international standard for risk management, ISO 31000. It allows for a single, company-wide view of risk, aligning several profiles and contexts across Vector, to support the achievement of our strategic corporate objectives.

Vector's ERM framework (summarised below in Figure 5-2) is focused on understanding, monitoring and proactively treating the uncertainty and risks within the business. The management and tracking of identified risks and associated treatment plans is undertaken using Vector's ERM system - Active Risk Manager (ARM).

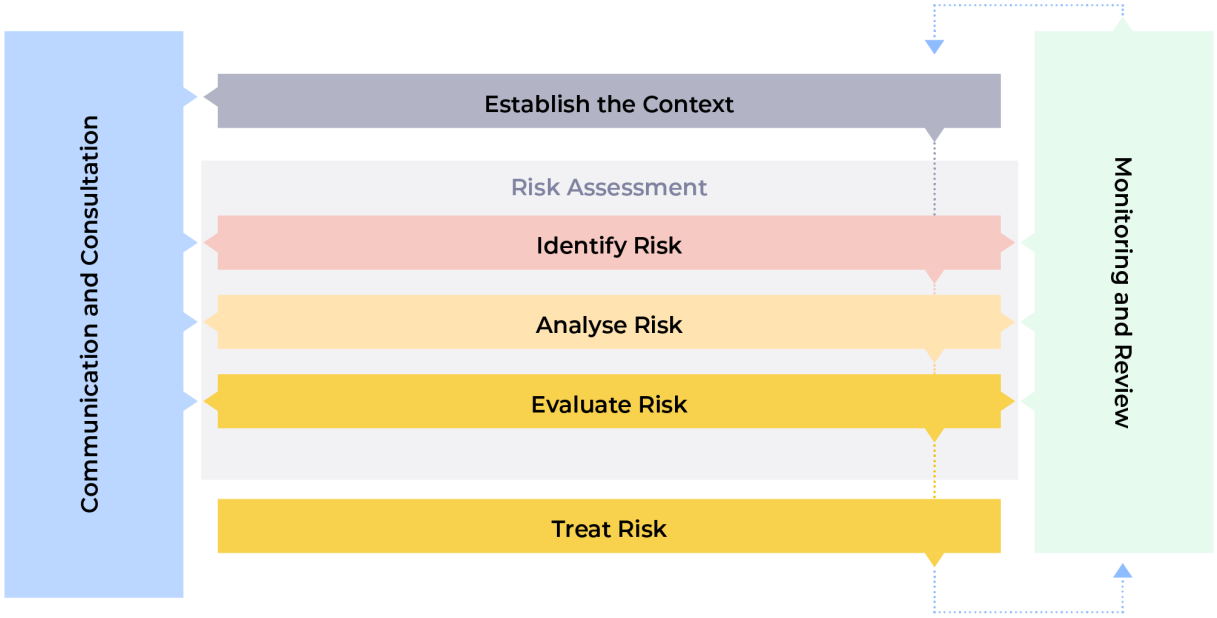


FIGURE 5-2: VECTOR'S ENTERPRISE RISK MANAGEMENT FRAMEWORK

Vector's risk management processes and tools are embedded within its business operations to drive consistent, effective, and accountable decision-making. Consistent with the "Three Lines Model", all Vector people are responsible for applying Vector's ERM framework within their individual roles to proactively identify, analyse, evaluate, and treat risks. This risk mindset has been implemented through:

- Awareness of risk management's value at operational, executive team and Board level;
- Embedding of risk assessments and discussions within key decision-making processes; and
- Continuous development through both internal and external reviews.

5.3.2 RISK PROFILES

Vector operates both a top-down and bottom-up approach to risk management.

At the top level, the board sets the risk appetite and strategic direction for the business. The board has established a Board Risk and Assurance Committee (BRAC)[9] which assists the board in fulfilling its responsibilities to protect the interests of shareholders, customers, employees and the communities in which Vector operates. The BRAC provides oversight of Vector's risk and assurance policies and practices, monitors risk performance concerning Vector's risk appetite and business objectives, provides guidance regarding the development of the ERM framework, and ensures rigorous processes for internal control and legal compliance.

Spanning across Vector's portfolio of businesses, Vector's Group Risk function is tasked with the ongoing development and implementation of the ERM framework and risk processes. In addition to monitoring the changing business landscape and macro-economic trends, this function integrates and works with all Vector business units to facilitate smart risk-based decision-making as well as consistent bottom-up risk analysis and evaluation of risk against Vector's risk appetite. These perspectives inform the development of the Group Key Risk Profile which provides both the board and executive team with a consolidated view of:

- The strategically focused risks which could have a significant impact on the long-term value and sustainability of Vector's business; and
- The material operational risks facing Vector as part of its business-as-usual activities which require significant oversight and control.

To inform the Vector Group key risk profile, business unit and operational risk profiles are developed based on the objectives and operating context specific to each business unit. Figure 5-3 shows the alignment of Vector's risk profiling structure.

[9] The BRAC contains at least three members of the board.

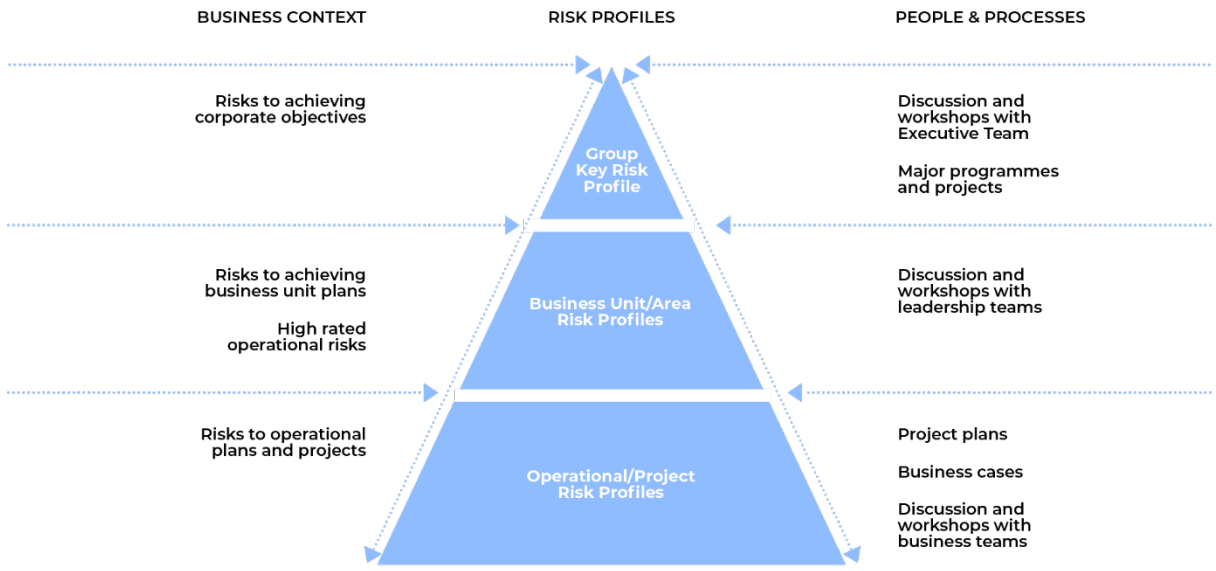


FIGURE 5-3: VECTOR'S RISK PROFILING STRUCTURE

5.3.3 GAS DISTRIBUTION RISK MANAGEMENT

The development of Vector's gas distribution risk profile incorporates the use of risk groupings. Eight risk groupings have been established within Vector's ERM system (refer Figure 5-4) to consolidate risk across the business unit. This approach avoids the use of siloed team risk registers which often either repeat risks across many registers or neglect them completely. The risk grouping approach also aids in the identification of risk and supports risk activities undertaken throughout the business, such as critical site reviews or High Impact, Low Probability assessments.

FIGURE 5-4: VECTOR'S ENTERPRISE RISK MANAGEMENT FRAMEWORK

5.3.4 GAS DISTRIBUTION RISK GROUPINGS

Risks are analysed and evaluated against Vector's risk criteria and then treated to modify the risk level if required. Risk treatment considers the level of risk tolerability which is informed by applicable legislation and industry standards (including the Health and Safety at Work Act and the Gas Act).

Vector's risk management processes are integrated into the asset investment process and the development of asset class strategies to ensure appropriate treatment plans (which supplement existing controls) are developed and prioritised. Maintenance standards are linked to asset risks through Failure Mode and Effects Analysis and corrective maintenance activities are prioritised using a Risk Based Approach (RBA). Asset investment considers asset condition and risk through the development of our CBARM model to ensure the health of Vector's asset portfolio remains acceptable.

In line with the Institute of Internal Auditors' Three Lines Model, Vector also operates an internal audit function that establishes an assurance programme to monitor risk management functions and applicable business processes. This independent and objective function conducts and coordinates audits and performance reviews to provide assurance and confidence in the effectiveness of the risk management framework and supporting activities.

5.3.5 HIGH IMPACT LOW PROBABILITY RISKS

Included in Vector's gas distribution risk management process is the identification and treatment of HILP risks. A dedicated risk grouping has been assigned to ensure HILP risks are easily identified and managed. Our risk processes require HILP risks to be treated the same way as other "high" risks and managed accordingly. This ensures that, regardless of likelihood, high-consequence events are appropriately considered.

Network resilience and the ongoing management of HILP risks is a priority for Vector with proactive investment allocated to manage future events. We undertake regular critical site reviews, monitor reference material and global trends, have developed comprehensive event and contingency management plans and have engaged a variety of experts to help influence our planning and management of HILP events.

Identification and management of HILP risks include consideration of both our internal and external operating environment. Figure 5-5 below provides a representation of HILP events influenced by a range of factors that require ongoing and evolving management to both prevent the occurrence and mitigate the impact so far as is reasonably practicable.

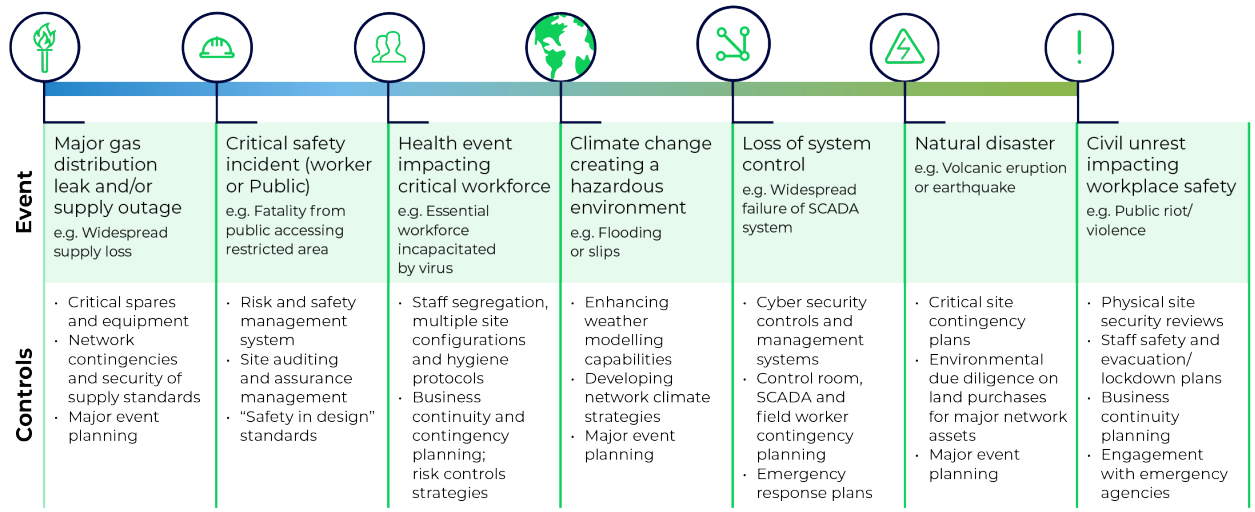


FIGURE 5-5: EXAMPLE OF HILP EVENTS

5.4 Event management and emergency response

Vector has developed a suite of documentation that defines our key event management plans and processes (detailed in Table 5-1). This documentation ensures Vector maintains coordinated and clear management protocols to respond to events efficiently and effectively.

TITLE	DESCRIPTION
Business Continuity Management (BCM) Policy	Formal representation of Vector's commitment to business continuity management, which forms an essential part of Vector's enterprise risk management function. Defines key business continuity management roles, responsibilities, accountabilities and reporting requirements. Approved by the Board, it is consistent with the following Standards: • AS/NZ 5050:2020 "Managing disruption-related risk" • ISO 31000:2018 "Risk management – Guidelines" • ISO 22301:2019 "Security and resilience - Business Continuity Management System – Requirements" • ISO 22313:2020 "Societal security – Business continuity management system – Guidance"
Crisis Management Plan	Provides the enterprise-wide framework and structure to assess and respond to any crisis-level incident or event affecting Vector, its customers and/or its employees, contractors and other stakeholders. Takes account of both the operational response and broader considerations including staff, customer and wider stakeholder engagement and support. Includes the Incident Management Guideline, which provides direction on how to categorise incidents - this categorisation determines the appropriate response team, response plan and escalation hierarchy. Annual crisis management exercises and regular planning reviews are undertaken to ensure usability to support continuous improvement of the plan.
Crisis Communications Plan	Standalone plan governing the communications and external relations approach and processes during a crisis, emergency or business continuity event.

TITLE	DESCRIPTION
Incident Response Plans	Individual business unit / team plans outlining the general procedures for assessing and responding to any disruptive events or incident (below crisis level) within a specific business area.
Emergency Response Guide	Ensures Vector is prepared for, and responds quickly to, any major incident that occurs or may occur on the gas distribution network. Describes the roles and responsibilities for staff during a major incident. Reviewed annually to ensure there is continuous improvement and a standardised approach to all operational incidents.
Business Continuity Plans	Individual business unit / team plans which identify the critical functions and services provided by a unit / team and outline the recovery procedures to be undertaken during a disruptive event to maintain or resume these functions.

TABLE 5-1: EVENT MANAGEMENT AND EMERGENCY RESPONSE

5.5 Privacy

Vector takes its obligations under the Privacy Act very seriously. The volume and potential sources of data which are required to effectively manage and operate the network continue to expand. For example, new network and customer devices generate increasingly important information about consumption patterns, faults, performance and resilience which enables us to manage the network more efficiently and effectively. Vector understands its legal obligations and also its "social licence" to use this information responsibly and therefore has taken a conservative view on all data which relates to our customers, their physical location or their property. Vector has established protocols which define how any sensitive data is required to be protected, managed, and used by approved personnel.

Our data governance programme takes a holistic view of how data is managed and governed and specifically considers privacy across all areas of our data. A number of roles exist which assist in Vector's adherence to privacy obligations (refer to Table 5-2).

FUNCTION	ACCOUNTABILITY
Privacy Officer	Setting policy and supporting privacy related activities or issues. Dealing with privacy breaches, including any reporting requirements. The Privacy Officer is a requirement under the Privacy Act 2020.
Enterprise Information Management	Development and implementation of the Group Data and Information policy. This function supports all aspects of information management and provides operational support to the privacy officer.
Cyber Security	Establishment of systems and processes for the protection of all data.
Operational Information Management	Operational management, quality assurance and improvement of data.
Data Owners	Accountable for ensuring appropriate processes and systems are in place for all sensitive data, and for implementing the requirements of data related policies and procedures.
Data Steward	Responsible for implementing the requirements of data related policies and procedures.

TABLE 5-2: PRIVACY FUNCTIONS AND ACCOUNTABILITIES

5.6 Asset Management Information Systems

5.6.1 ENABLING THE ASSET MANAGEMENT SYSTEM THROUGH INFORMATION SYSTEMS

The asset management information systems enable the asset management systems to achieve cyber-security and privacy outcomes, as well as the targeted customer experience. To achieve this, we have aligned our operational and supporting infrastructure systems with the IEC (International Electrotechnical Commission) network distribution reference model.

5.6.2 VECTOR'S ASSET INFORMATION MANAGEMENT FRAMEWORK

As shown in Figure 5-6 , the management of the network asset management information systems follows our Digital lifecycle framework to ensure the information systems are fit for purpose to support and enable the delivery of Network services.

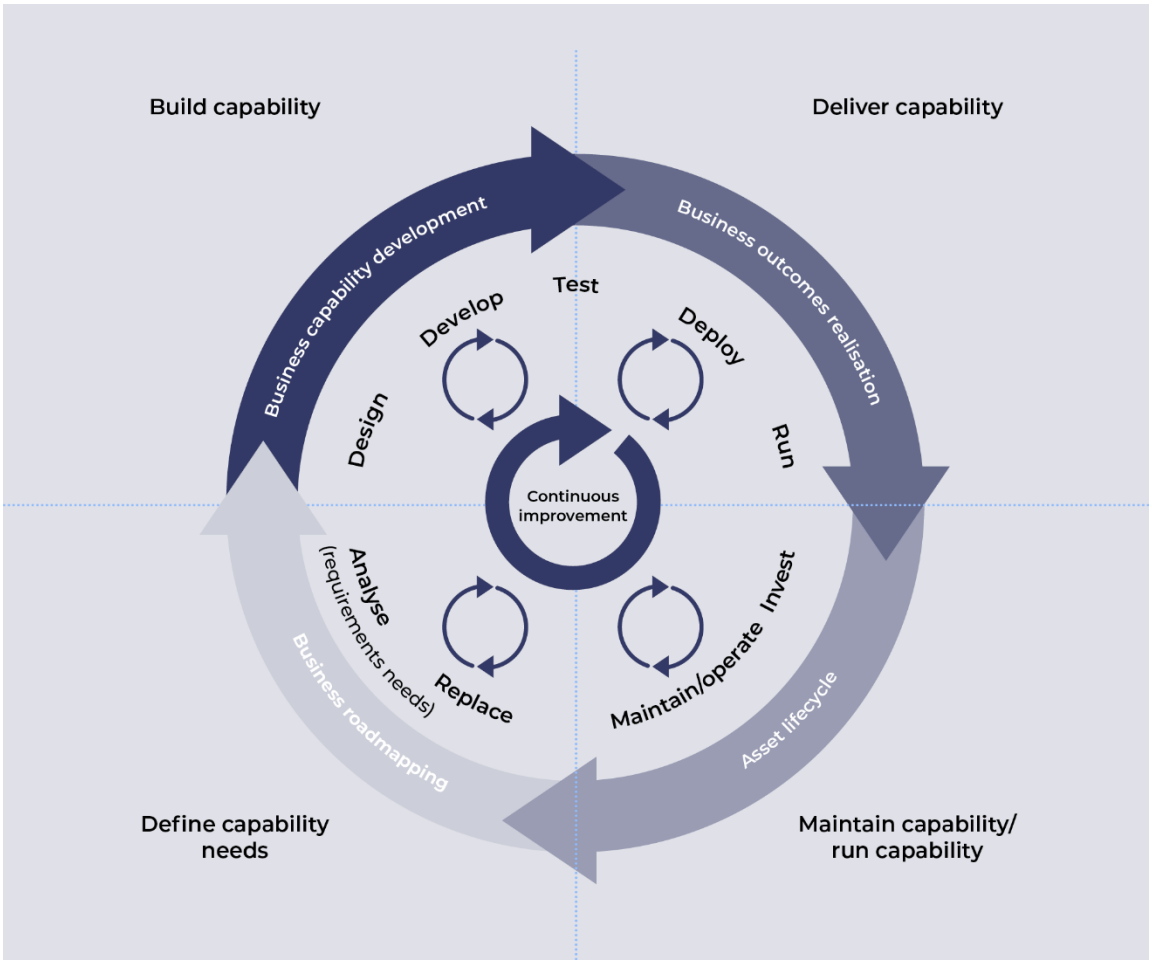


FIGURE 5-6: ASSET MANAGEMENT INFORMATION SYSTEMS

Vector has a suite of information systems that support its asset management practice. These, and other critical systems, are described below. The primary systems used by Vector to manage the operation and performance of its network assets, and the related financial and project management activities.

5.6.3 PRIMARY SYSTEMS

Many of Vector's information systems operate through an integration layer that extends across these systems and enables the reporting and data analytics that support Vector's asset management processes. The following table provides an overview of the primary systems and provides insight into how they support asset management.

PRIMARY SYSTEM	FUNCTIONAL OVERVIEW
SAP	SAP is Vector's ERP System. It contains records for all assets and is used for managing the asset lifecycle from procurement and operation to maintenance and disposal. SAP also provides financial management related to asset management and project management
GE Smallworld	This system provides the geographic, schematic and connectivity information used in managing Vector's network assets
ARC-GIS	This system provides geospatial visualisation and analytics tools
Siebel	Siebel is Vector's Customer Relationship Management system. This system is used for managing customer requests for new connections, QoS complaints management, and fault and outage management
Gentrack	Gentrack provides records for all connected ICP as well as their regulatory and market attributes. It is used to manage energy consumption, revenue assurance and interfaces with the Gas Industry registry
Data Analytics Layer	This is a bespoke integration layer that provides reporting, monitoring and associated analytics related to network assets. It is a critical source of information for most of Vector's asset management processes
Siemens Power TG	This is Vector's SCADA system and is used to monitor and control operations on the network as well provide data on network loading and other critical asset data
GE Power On	This is Vector's ADMS (Advanced Distribution Management System). This system is still in implementation phase 1 and will be replacing Siemens Power TG in RY 2024. It will be used to monitor and control operations on the network, and record and provide critical asset data
ARM	ARM is Vector's corporate risk management system. Under the Corporate Risk Policy all asset management risks are recorded, prioritised and managed through this system. A supporting system, Risk and Incident Management System (RIMS) is used to record any associated incidents

TABLE 5-3: OTHER IMPORTANT SYSTEMS

Vector uses a number of other information systems, computer models and computer-based tools in the management of is gas distribution assets. In particular:

- **OSIsoft PI:** is a real-time network performance management system that imports data from various corporate systems (e.g. SCADA – see above) and provides a permanent archive of historical network data. Data may be extracted for later analysis in Microsoft EXCEL;
- **Telenet SCADA:** is the telemetry systems used by Vector to monitor its gas distribution networks;
- **Forecast Scenario Model:** this is bespoke load forecasting model used in Vector's load forecasting practice (see Section 5.3). It is implemented in Microsoft EXCEL and draws data from other corporate systems and databases and third party sources; and
- **Synergi:** is a network modelling tool gathering inputs from Smallworld, Gentrack and the PI archiving system to enable modelling of the meshed gas network. Outputs are gas network flow, pressure profile and capacity margins;
- **Granular Customer Model and Database:** this is a bespoke model implemented as SQL Database that brings together all of Vector customer and energy information with information from third party sources (e.g. socioeconomics);
- **Scenario Model and Network Allocation Model:** this is a bespoke bottom-up customer load model implemented in Microsoft EXCEL to analyse the impact of future changes on network demand. It is used in Vector's network planning practice to forecast the yearly maximum demand for summer and winter periods at a feeder and zone substation level. It makes use of information from recorded historical demand data, the forecast scenario model and known step loads from large projects.

5.7 Information and data management

Vector has taken a coordinated approach to the management and governance of its information and data assets. The following five capabilities have been established reflecting the operational, strategic and governance overlaps across the disaggregated functions.

Enterprise Information Management: This function delivers and supports the information management program that manages the people, processes and technology that provides control over the structure, processing, delivery and usage of information required for management and business intelligence purposes. Providing compliance and governance frameworks applicable to both physical and electronic information.

Network Information Management: This function provides governance to the operational application of information and data management across the gas network's systems of record for assets and operational activities, through the development, execution and supervision of plans, policies, programs and practices that control, protect and enhance the value of data and information assets throughout their life cycles.

Data Platforms: A technical function, this team is responsible for the management and development of the data and analytics application platforms.

Business Intelligence: Primarily a technical function, this team provides the data integration, visualisation and reporting capability to the business.

Analytics & Insights: Provides the technical analytics capability and highly specialised business operational knowledge to support all core functions within the Networks business and to provide the research, advanced modelling and data science capability.

5.7.1 DATA GOVERNANCE

Vector's Group Data and Information Policy and Information Governance Framework are the foundations that set out the governance requirements and operating model for the information lifecycle (refer Figure 5-7). This covers both information in electronic and physical form, as well as disciplines for the process of creating, obtaining, transforming, sharing, protecting, documenting and preserving data. In preparing the policy and operating model, Vector has followed the principles and framework as set out in the Data Management Association's body of knowledge[10].

The Group Data and Information Policy is supplemented and supported where necessary by other operational and policy documents including our Privacy Principles and Cyber Security Policy.

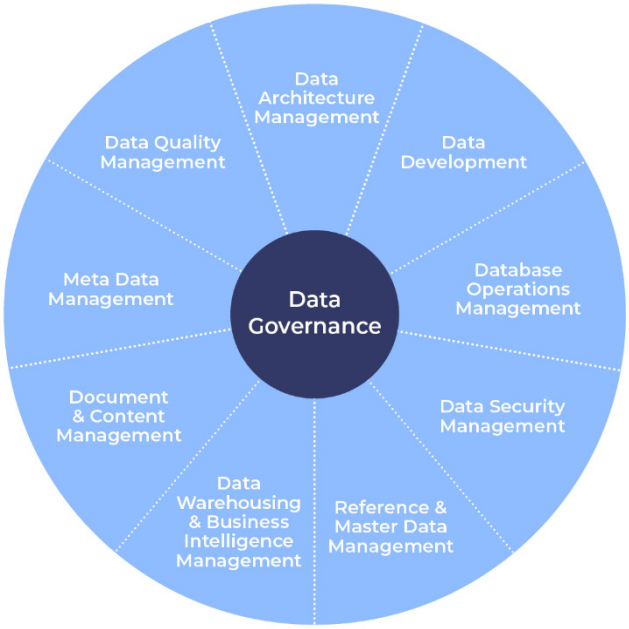


FIGURE 5-7: DATA MANAGEMENT ASSOCIATION FRAMEWORK

5.7.2 OPERATING MODEL

Vector's data and information management model is represented in the diagram below. Operationally, the Enterprise Information Management (EIM) function within the Digital Centre of Excellence provides capability horizontally across the different business units. Within each business unit, data stewards have been established to work with the defined data owners to ensure that business (i.e. operational) and governance requirements are met for each data set. The data stewards are trained and overseen by Enterprise Information Management.

Vector operates a virtual Information Governance Council responsible for setting and supporting the implementation of the Group Data and Information policy. This includes being the escalation point for data related events and advice on the treatment and usage of data. Importantly the Council is made up of core disciplines and functions from across the business that impact privacy and data management including, but not limited to, Enterprise Information Management, Privacy, Legal, Information Management and Data and Analytics. In addition, Cyber Security and Digital Architecture teams also provide subject matter expertise where required to support the Council in managing risk and maintaining good practice. In line with good governance and given the importance of strong data and information management in the success of our Symphony Strategy, the Council reports directly to Vector's Executive Team.

Operationally, Vector maintains a dedicated Networks Information Management team to perform the majority of the data activities as depicted in the box titled "Operations – Information Management" in Figure 5-8. This team is responsible for defining and ensuring the implementation of data standards, as well as managing the data within the System of Record for asset, asset performance, geo-spatial and customer data. Also, the team also manages regulatory reporting (including one off requests) as well as managing other third party data requests such as location information and asset information.

[10] DAMA-DMBOK, Data Management Body of Knowledge, Second Edition, DAMA International

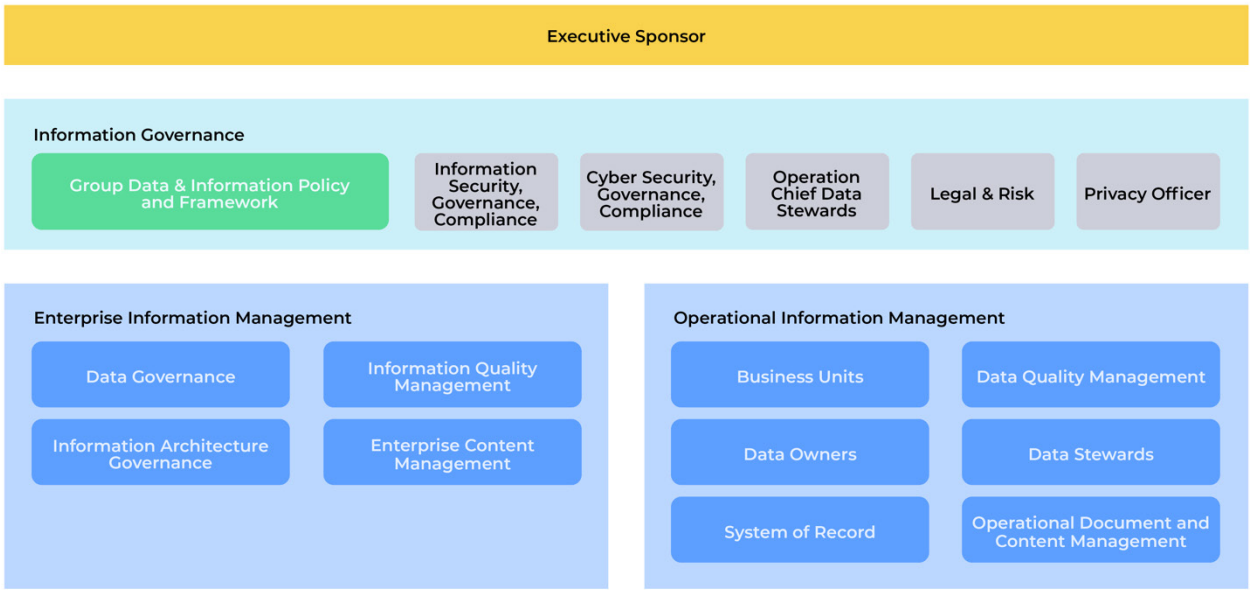


FIGURE 5-8: VECTOR'S DATA AND INFORMATION MANAGEMENT MODEL

5.7.3 DATA QUALITY AND OPPORTUNITIES FOR IMPROVEMENT

The Network Information Management function has an ongoing programme of work relating to the assurance and improvement of data that support the asset management practice described in the AMMAT (refer Section 10.15).

An ongoing focus remains on improving data, with the following key initiatives underway.

1. Improvement of customer connection, contact and address data.
2. Improved access to smart meter data from MEPs.
3. Improvement of faults and corrective maintenance data.
4. Enhancement of asset master data.

5.8 Cyber Security

In the context of our Asset Management Plan, our strategy regarding cyber security continues to be focused on addressing two key categories of risk:

1. The protection of critical network assets from unauthorised access that could result in disruptions to service or physical damage
2. Safeguarding and restricting access to any personal/customer data that is used for network management purposes

At the core of this focus is the protection of Vector people, processes, data and systems from cyber security risks. Our operating environment is one where the number, sophistication and impact of malicious cyber security threats continues to grow, and we have observed increased numbers of large-scale, well publicised breaches. Threat actors have also started using more legitimate tools in their operations, including native operating system files, IT software and penetration testing tools; all helping them in their efforts to stay under the radar; Increased attacks though the software supply chain as well as threats against cloud, IOT and mobile platforms as well as the use or sophisticated ransomware are more common. Threat actors are changing their initial access vectors as the digital attack surface and vulnerabilities shift.

As Vector continues its digital transformation journey, it also navigates these risks. Continuing to maintain an effective and mature security posture is a key priority and an area in which we continue to invest sufficiently to ensure we appropriately manage these cyber security risks.

We have continued to improve our ability to detect and prevent potential cyber security threats via our Security Operations Centre (SOC), which provides 24/7/365 monitoring of our Information Technology (IT) and Operational Technology (OT) environments, and our preventative and detective controls through ongoing initiatives such as network modernisation, user awareness and education, identity and management as well as external assurance. Execution of the Vector cyber security strategy and roadmap has resulted in advances such as the continuous development of security orchestration, while automation has resulted in reduction of manual effort and time required to remediate security incidents as well as streamlined identification, assessment, and remediation of vulnerabilities. The network modernisation initiative has progressed and will move Vector towards a zero-trust architecture with strong foundations in privileged and service management with identity lifecycle automation for security risk mitigation, operational efficiency and visibility.

The Vector cyber security team continues to work with key global tier-1 security providers to apply a global perspective to cyber security assurance and technology, as part of an integrated Cyber Security Operating Model. We're also continuing our engagement and contribution to key New Zealand industry security forums, across public and private sectors.

The management of risk associated with cyber security is an industry wide concern. The Vector cyber security team is now working to uplift cyber security capability across the industry, by bringing together key organisations to better protect themselves and promote security awareness. A cyber security risk can come from anywhere in the world, so collaboration between partners and industry participants will provide a greater understanding of threats through intelligence and access to technologies, resources, and processes.

Vector is working continuously to improve its security posture and secure Vector's assets in this dynamic threat landscape. We have key cyber security partnerships in place and intend to further strengthen our capabilities to improve protection against increasingly frequent and complex attacks.

SECTION 06

Our assets

6 – Our assets

This section of the AMP sets out Vector's gas distribution assets; the types and volumes of assets, their functional role and key statistics.

6.1 Network overview

Vector's gas network supply area is centred on the Auckland isthmus and extends from north of Wellsford to Tuakau in the south. The supply area is shown in Figure 6-1. Our network is the largest of the gas distribution businesses in New Zealand in terms of connected customers, gas delivered and network length.

FIGURE 6-1: VECTOR GAS NETWORK GEOGRAPHICAL AREA

Key statistics of Vector's network are given below.

Customer connections[11]	117,995
Distribution pipelines – includes mains and service pipes (km)[12]	6,957
Gate stations[13]	16
Pressure stations[14]	194
Peak load (m3/hour)[15]	99,289
Gas conveyed (PJ per annum)[16]	13.2

11 Source: Information Disclosure 2022 Schedule 9d(ii) (http://vector.co.nz/disclosures/gas-financial-and-network-information).

12 Source: Source: Information Disclosure 2022 Schedule 9c (http://vector.co.nz/disclosures/gas-financial-and-network-information). Includes mains and service pipe lengths.

13 Source: Vector's Geographical Information System (GIS).

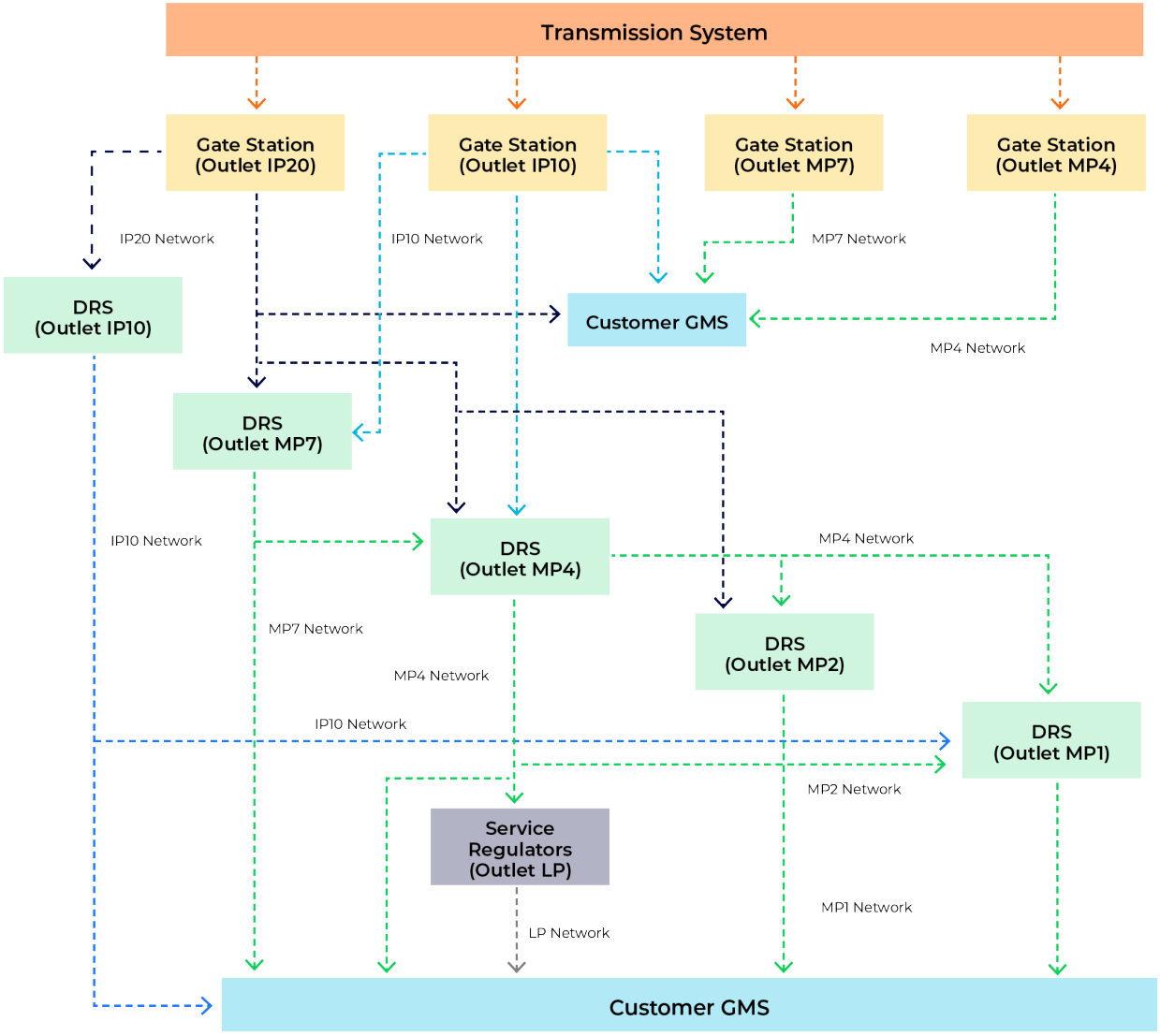
14 Source: Information Disclosure 2022 Schedule 9a (http://vector.co.nz/disclosures/gas-financial-and-network-information). Includes Vector's district regulating stations and service regulators.

15 Calculated by adding the coincident load of each network system for a calendar year. Measured as standard cubic metres per hour (scmh).

16 Source: Information Disclosure 2022 Schedule 9d(ii) (http://vector.co.nz/disclosures/gas-financial-and-network-information).

6.1.1 NETWORK CONFIGURATION

Vector takes bulk gas supply from the HP transmission systems (greater than 20 bar) operating across the North Island. The transmission systems operate at pressures ranging between approximately 50 and 80 bar and typically deliver gas to Vector's distribution systems at IP20, IP10, MP7 and MP4 pressure level (20 bar down to 4 bar). A schematic view is shown in the following Figure 6-2.



KEY:
IP = Intermediate Pressure MP = Medium Pressure LP = Low Pressure
DRS = District Regulator Station GMS = Gas Measurement System

FIGURE 6-2: VECTOR NETWORK CONFIGURATION

The IP systems tend to be radial in design, whereas the design of the majority of MP systems tends to be of a mesh nature, providing back-feed security to large numbers of residential and commercial loads. MP systems are often supplied from multiple DRSs thereby further increasing the SoS. Typical load profiles of the network and a map of Vector's large customers that have an impact of network operations, can be found in Section 10.4 and 10.9, respectively.

6.1.2 LOAD CHARACTERISTICS

The capacity of an individual pipeline is determined by the operating pressure, the diameter and the allowable pressure difference between inlet and outlet. Meshed distribution networks work on the same principle with the difference that pipelines are interconnected at several points and that such distribution networks can be fed at multiple points.

While this can result in large networks the advantage is that failure of one single asset does not compromise the entire network. Secondly, the size of the network ensures that organic load increases have minimal impact on the overall immediate impact on the network as the network pressures are continually rebalancing through the connectivity. Significant offtakes, particularly on the smaller networks, can significantly impact the performance of the network and these are modelled separately.

As the distribution networks expand and demand grows, certain parts of the networks, feeder mains, can develop large pressure drops that constrain delivery in downstream parts of the distribution systems. Each year, Vector prepares network pressure monitoring surveys and carries out distribution network analysis to identify any constraints and to reinforce networks to ensure operating pressures do not become insufficient.

DRSs have nominal outlet pressures which supply each discrete pressure system on the distribution network. System pressures in the network decrease in accordance with demand and the supply pressure. Under normal network operating arrangements, Vector's QoS standard stipulates the pressure at any point on the network shall be no less than 50% of its nominal pressure and no more than 10% above its maximum operating pressure. Further details of Vector's QoS standard can be found in Section 4.6.8.

Pressure drops on each pressure system need to be considered separately, due to the meshed nature of the network and the different characteristics, i.e. mix of residential, commercial and industrial customers, each system exhibits.

Vector uses individual system pressure profiles to illustrate the load characteristics of each network. These are based on system pressure data that Vector collects as part of its system pressure monitoring programme and an understanding of the relationship between pressure and flow.

The typical daily winter pressure profile for residential loads and load profile for commercial / industrial customers are illustrated in Section 10.4.

6.1.3 PEAK DEMAND AND ENERGY DELIVERED

Historical trends show gas demand (and sales volume) is primarily influenced by economic activities in an area, price and availability of substitute fuels (e.g. electricity, fuel oil etc.), marketing effort, population / household growth, socio-economic factors, climate, and the investment decisions made by large industrial and commercial gas consumers. In the short-term, gas demand is very sensitive to climatic conditions. A cold snap, for example, could drive up the demand for gas significantly. Conversely, a warm winter could result in a materially lower demand. Hence on a year-by-year basis, demand can vary significantly due to extreme weather conditions and normally represent only a small percentage of hours in a year.

The peak demand and the gas conveyed on the gas distribution network for the past six years is shown in the following graph (the individual demand forecasts for all gate stations on Vector's network are detailed in 10.5).

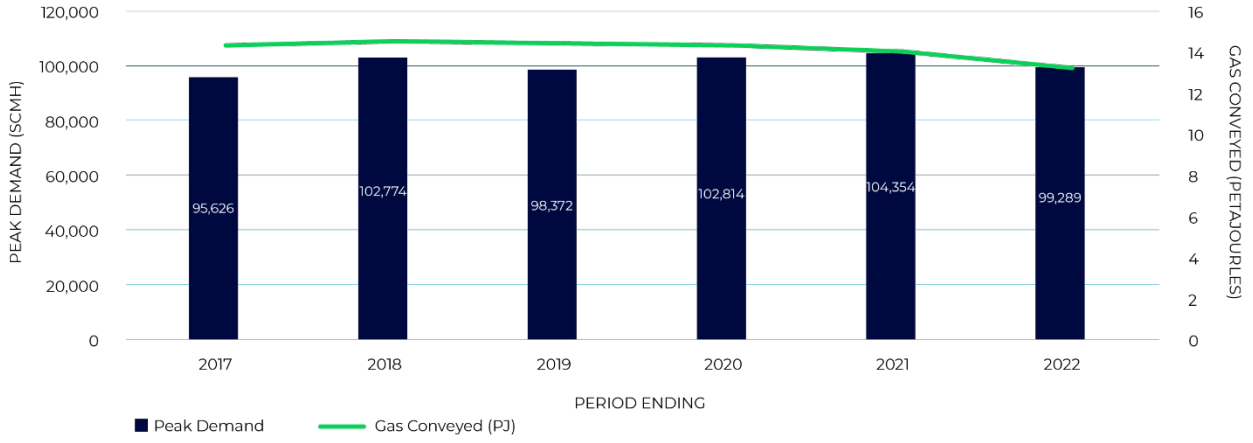


FIGURE 6-3: PEAK DEMAND AND GAS CONVEYED

The values reported above are the coincidental peak demands of all gate stations delivering supply to Vector's gas distribution networks.

Vector has a number of large customer sites at various locations in its network. Section 10.9 provides maps which indicate those customer sites with annual energy requirements in excess of 20 Terra Joule (TJ), and which hence have a significant impact on network operations and asset management.

6.2 Asset overview

Distribution networks extend from the outlet valve of the transmission gate station to the inlet valve on a consumer GMS. Distribution networks broadly contain the following six main categories of assets:

- Distribution pipelines (includes mains and service pipes);
- Pressure stations;
- Valves;
- Corrosion protection equipment;
- Monitoring and control equipment; and
- Special crossings.

6.2.1 DISTRIBUTION PIPELINES

Key statistics of the distribution pipeline assets are shown below.

PRESSURE LEVEL	MAINS PIPE (KM)	SERVICE PIPE (KM)	TOTAL	% OF TOTAL NETWORK
Intermediate Pressure (700 - 2,000kPa)	239	5	244	4%
MP (7 - 700kPa)	4,382	2,330	6,702	96%
LP (0 - 7kPa)	0	1	1	0%
Total	4,621	2,337	6,957	100%

MAINS PIPELINES

Vector's mains pipelines are operated in the IP range of 1,000 to 2,000kPa. The selection of these pressures has, in the majority of cases, historically been justified on an economic basis (considering gas volumes, transmission distances, delivery pressures etc). The IP pipelines are all constructed to a high technical standard of welded steel with all of them being protected against corrosion by CP, using either a system of sacrificial anodes or an impressed current installation.

The IP systems are generally the principal "backbone" systems of the distribution networks with laterals radiating from them to supply adjacent areas. The distribution assets which are used to directly supply gas consumers are constructed mostly of PE and operate in the MP range.

The figure below depicts the age profile of mains pipelines.

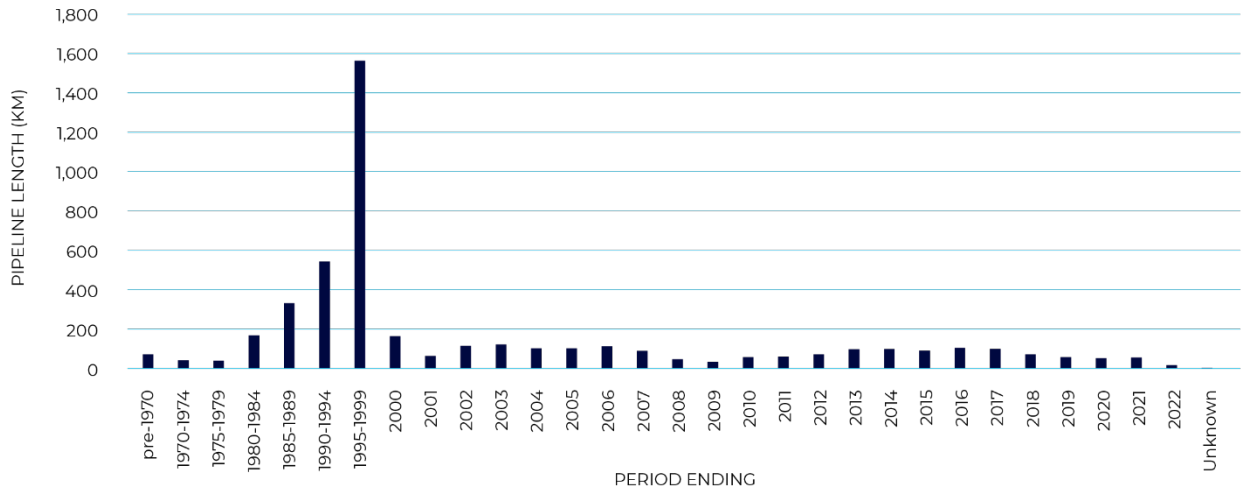


FIGURE 6-4: MAINS PIPELINES

SERVICE PIPELINES

Service pipelines provide the link between the gas mains in the street and the customer's gas meter and are comprised of a service pipe, riser and a riser valve. The outlet connection of the riser valve designates the end of Vector's distribution system. A service regulator is normally fitted downstream of the riser valve to regulate the gas pressure to the consumer meter-set and to downstream appliances / plant (in these cases the regulator is owned by GMS owners).

The figure below depicts the age profile of service pipelines.

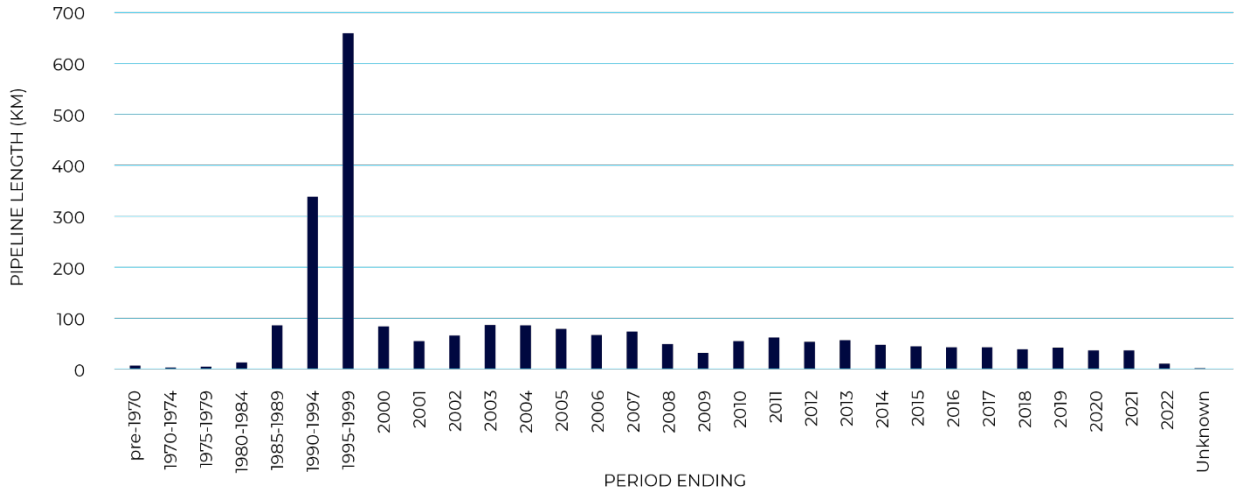


FIGURE 6-5: SERVICE PIPELINES

6.2.2 PRESSURE STATIONS

Pressure stations are those parts of a gas system that link two pipeline systems operating at different pressure levels. The station automatically reduces and regulates the gas pressure being supplied into the downstream pipeline system to which it is connected. Vector has three categories of pressure stations: gate stations, DRSs and service regulators.

GATE STATIONS

Where the pressure station is the link between the gas transmission system and a gas distribution network, it is known as a gate station. HP equipment (i.e. pressure regulating equipment and custody transfer metering etc) within the gate station is operated by First Gas Limited, whereas distribution system equipment (i.e. legacy check metering (where installed) and associated valves and pipework etc) within the gate station is operated as part of Vector's gas distribution networks. Key statistics of equipment owned by Vector but installed at gate stations is listed in Table 6-1.

GATE STATION NAME	ASSETS OWNED BY VECTOR
GS-00001-AK Alfriston	All facilities downstream of the Interconnection Point
GS-00002-AK Bruce McLaren	All facilities downstream of the Interconnection Point
GS-00003-AK Drury	All facilities downstream of the Interconnection Point
GS-00004-AK Hunua	All facilities downstream of the Interconnection Point
GS-00005-AK Kingseat	All facilities downstream of the Interconnection Point
GS-00006-AK Papakura	All facilities downstream of the Interconnection Point, including DRS DR-00170-AK equipment, structures and downstream distribution outlet pipework, and associated telemetry equipment.
GS-00007-AK Pukekohe	All facilities downstream of the Interconnection Point
GS-00008-AK Ramarama	All facilities downstream of the Interconnection Point
GS-00009-AK Tuakau	All facilities downstream of the Interconnection Point including DRS DR-00250-AK equipment, structures and downstream distribution outlet pipework, and associated telemetry equipment
GS-00010-AK Waikumete	All facilities downstream of the Interconnection Point, including associated telemetry equipment
GS-00013-AK Westfield	All facilities downstream of the Interconnection Point including DRS DR-00244-AK equipment, structures and downstream distribution outlet pipework, and associated telemetry equipment
GS-00016-AK Henderson	All facilities downstream of the Interconnection Point, including DRS DR-00177-AK equipment, structures and downstream distribution outlet pipework, and associated telemetry equipment
GS-00018-AK Wellsford	All facilities downstream of the Interconnection Point
GS-00020-AK Warkworth 2	All facilities downstream of the Interconnection Point, including DRS DR-00256-AK equipment, structures, and downstream distribution outlet pipework.
GS-00021-AK Waitoki	All facilities downstream of the Interconnection Point, including DRS DR-00254-AK equipment
GS-00023-AK Harrisville	All facilities downstream of the Interconnection Point.

TABLE 6-1: GATE STATIONS

DISTRICT REGULATING STATIONS

Where the pressure station is the link between two Vector gas pressure networks it is known as a DRS. DRSs are used to reduce the operating pressure from higher operating pressure systems to systems with lower operating pressures.

DRSs are strategically located within the distribution network such that a continuous and safe supply of gas is delivered to all connected customers. They are primarily used to reduce the higher pressures associated with 'high volume' mains, (i.e. those with an operating pressure of 1,900kPa, 1,000kPa and 700kPa), down to a more economical distribution pressure level of between 200kPa and 420kPa.

Generally, a DRS converts significant volumes of gas from one pressure to another and they are the source of supply to a significant number of consumers. The importance of DRSs in the supply networks means duplicate assets are often provided to deliver a reasonable level of security. This duplication also enables maintenance to take place without a loss of supply to customers.

The lower operating pressures provided by the DRS assets allows modern technology and materials to be used to provide a safe, assured, and economical gas supply to the areas where customers are situated.

A service regulator is used to regulate the flow and pressure of gas to individual customer premises. Where for practical reasons a regulator cannot be installed immediately adjacent the gas meter (i.e. as part of the GMS) it is installed at a location upstream from the GMS and in some cases, is owned and maintained by Vector.

Key statistics of the pressure station assets are shown below.

Number of gate stations	16
Number of DRSs and service regulators	194

The figure below depicts the age profile of pressure stations.

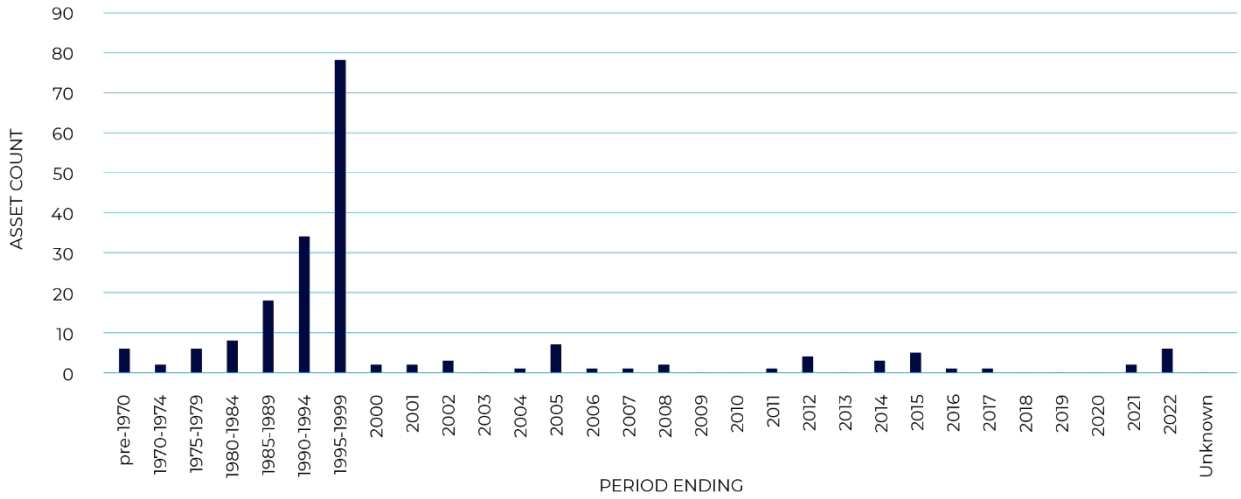


FIGURE 6-6: PRESSURE STATIONS

6.2.3 VALVES

LINE VALVES

Line valves are comprised of buried in-line mains and service valves (to isolate the flow of gas within the system) and blow down valves (to depressurise sections of the system in the event of an emergency). Valve types currently in use include ball valves, plug valves, gate valves and a relatively small number of other valve types. Although information on legacy valve types installed on Vector's is currently incomplete (i.e. it was not held in legacy Geographical Information System (GIS) (systems or asset databases), over 40% of mains valves installed on Vector's network are thought to be plug valves.

Key statistics of the line valves are shown below.

Number of IP line valves	641
Number of MP line valves	2,853
Number of LP line valves	2

The figure below depicts the age profile of line valves.

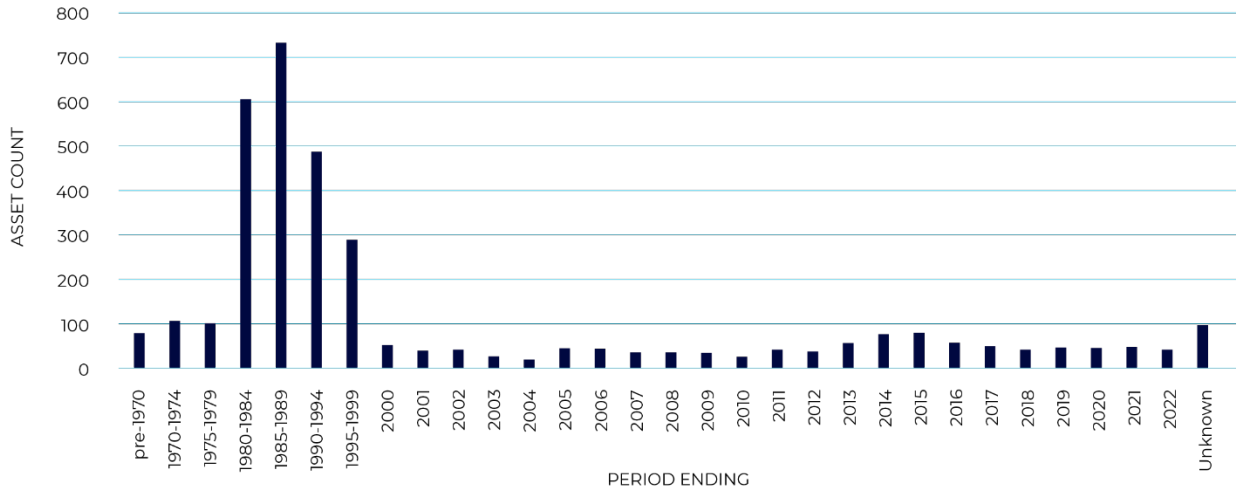


FIGURE 6-7: LINE VALVES

RISER VALVES

Aboveground riser valves are installed at every GMS; they are positioned immediately upstream of the GMS service-regulator to allow the GMS (and downstream pipework) to be isolated from the gas distribution network in the event of an emergency or for maintenance purposes. The riser valve population is comprised of 10mm risers (approximately 92%), 25mm risers (4%), 32mm risers (2%), 50mm risers (1%) and various other riser sizes (1%).

Information on riser valve types is currently not held, however based on installation-date information, approximately 95% of riser valves are thought to be ball valves with the balance being plug valves.

Prior to the introduction of ball valves in the late 1980s, plug type riser valves were used for all gas connections. Due to its mechanical design and the length of time in service, this type of valve has been found to be prone to seizing, leaking or passing gas when in a closed position. For this reason, past riser valve audits have targeted areas where plug valves were known to have been used. However, the results from more recent riser valve surveys have shown that only a small number of riser plug-valves have been found indicating that the population of small-diameter riser plug-valves that remain in service is now relatively small.

Key statistics of the riser valves are shown below.

Number of IP riser valves	256
Number of MP riser valves	108,472
Number of LP riser valves	601

The figure below depicts the age profile of riser valves.

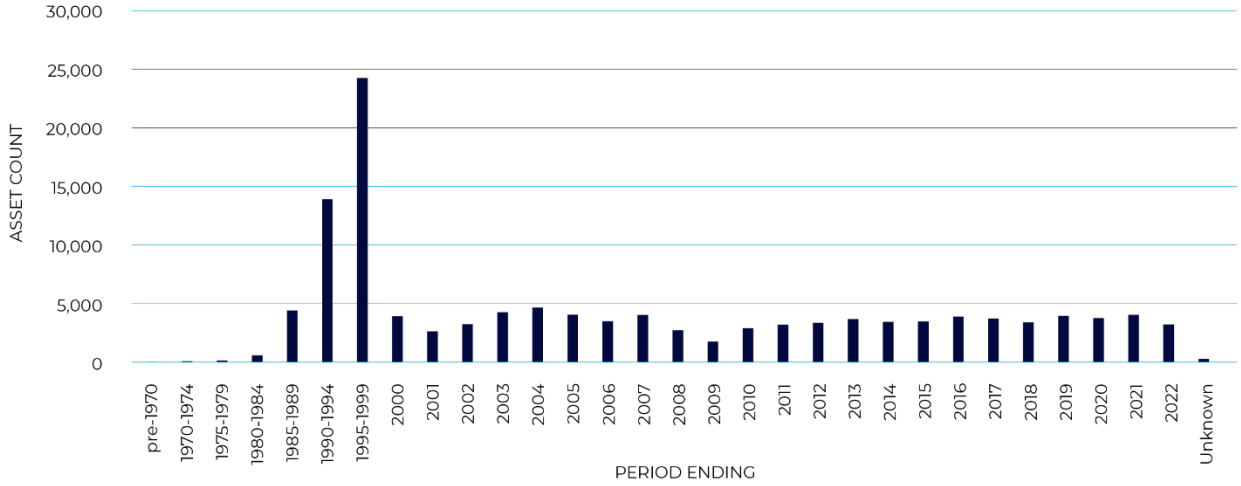


FIGURE 6-8: RISER VALVES

6.2.4 CORROSION PROTECTION EQUIPMENT

Below ground steel plant is protected against corrosion by the provision of protective coatings (e.g. high-density polyethylene) and the application of impressed current or sacrificial anode CP systems. Protective coatings are inspected whenever underground plant is exposed. CP test points are monitored on a periodic basis and maintained to ensure that the levels of protection being provided to the underground plant are kept within prescribed maximum and minimum levels.

The majority of Vector's interconnected steel network is protected by 9 impressed-current CP systems; the balance of the steel network (typically smaller standalone networks) are protected by sacrificial-anode CP systems.

Above ground steel or metallic plant is protected against corrosion by the provision of paint or other suitable protective coating e.g. wrapping. Periodic inspections are carried out to monitor the condition of protective coatings and pipeline support brackets etc.

Key statistics of the corrosion protection equipment are shown below.

Number of impressed current CP systems	18
Number of sacrificial-anode CP systems	9

The figure below depicts the age profile of corrosion protection equipment.

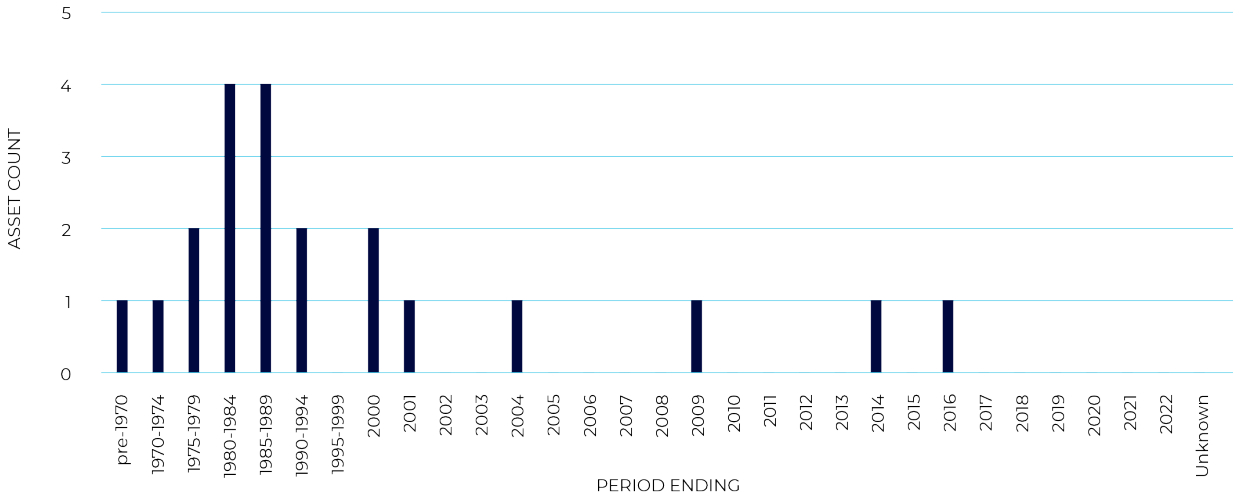


FIGURE 6-9: CATHODIC PROTECTION SYSTEMS

6.2.5 MONITORING AND CONTROL SYSTEMS

The telemetry systems used by Vector to monitor its gas distribution networks comprise the Telenet SCADA system, and the Cello system.

The Telenet system provides near real-time monitoring - i.e. it provides data refresh rates that range between 5 minutes and 30 minutes; approximately half of the Telenet sites utilise a radio communication platform and the balance utilise a GPRS communication platform. The Cello system provides 15-minute time-stamped monitoring data (typically pressure only) that is refreshed once a day. Communication between the Cello field sites and the base station is via the GSM network using SMS communication. Cello equipment is utilised at both permanent and temporary (e.g. winter gauging) monitoring sites.

Access to Telenet and permanent Cello site monitoring-data is provided via the PI archiving system. Access to the temporary Cello site monitoring-data is provided via a proprietary PMAC database.

The telemetry systems provide remote monitoring and alarming of critical inlet/outlet pressures, temperatures and flow rates, and corrected and uncorrected metering data. The telemetry system monitors data at gate stations, DRSs and major gas customer sites, and provides remote control facilities for the operation of the IP20 valves located at either end of the Auckland Harbour Bridge.

Key statistics of the telemetry systems are shown below.

Number of telenet monitoring sites	69
Number of permanent Cello monitoring sites	33

The figure below depicts the age profile of monitoring and control systems.

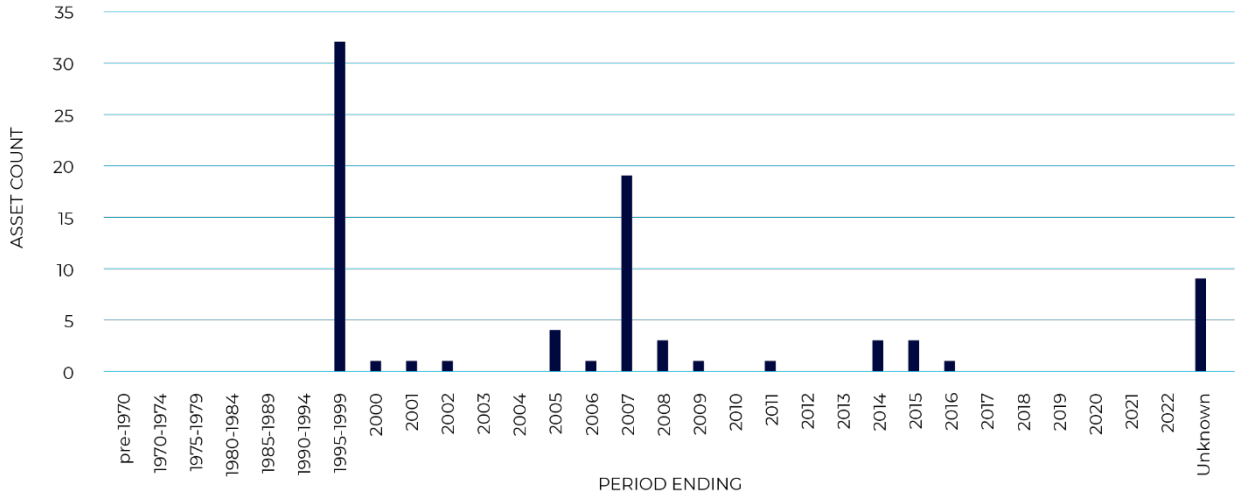


FIGURE 6-10: MONITORING AND CONTROL SYSTEMS

6.2.6 SPECIAL CROSSINGS

Special crossings are locations where a section of pipeline is installed aboveground in order to cross over a roadway, river or railway etc. They are typically installed where the installation of a belowground crossing is not practical.

Where the carrier pipe is PE, it is encased in a steel, Polyvinyl Chloride (PVC) or UV resistant PE duct in order to provide physical and ultraviolet protection to the carrier pipe. The duct is typically attached to the bridge structure by means of galvanised or stainless steel fittings. Where the carrier pipe is steel it is typically either painted or wrapped (to provide corrosion protection) and attached directly to the bridge structure by means of galvanised or stainless steel fittings.

Key statistics of the special crossings are shown below.

Number of IP special crossings	19
Number of MP special crossings	71

The figure below shows the age profile of special crossings.

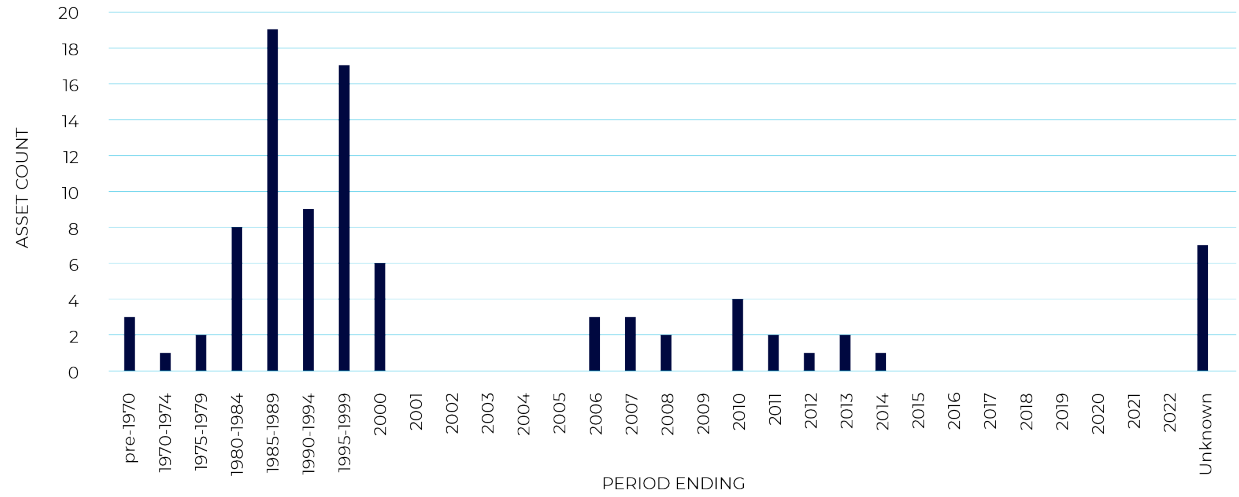


FIGURE 6-11: SPECIAL CROSSINGS

6.2.7 NON-NETWORK ASSETS

Vector implements and manages its information systems and their related infrastructure components according to an overall digital technical reference model. This ensures that each component has clear boundaries, which ensures that the technology used to support these components are "fit-for-purpose". It also helps ensure that Vector's information systems environment maintains a "separation of concerns" between its information systems and infrastructure. The technical reference model is shown in Figure 6-12.

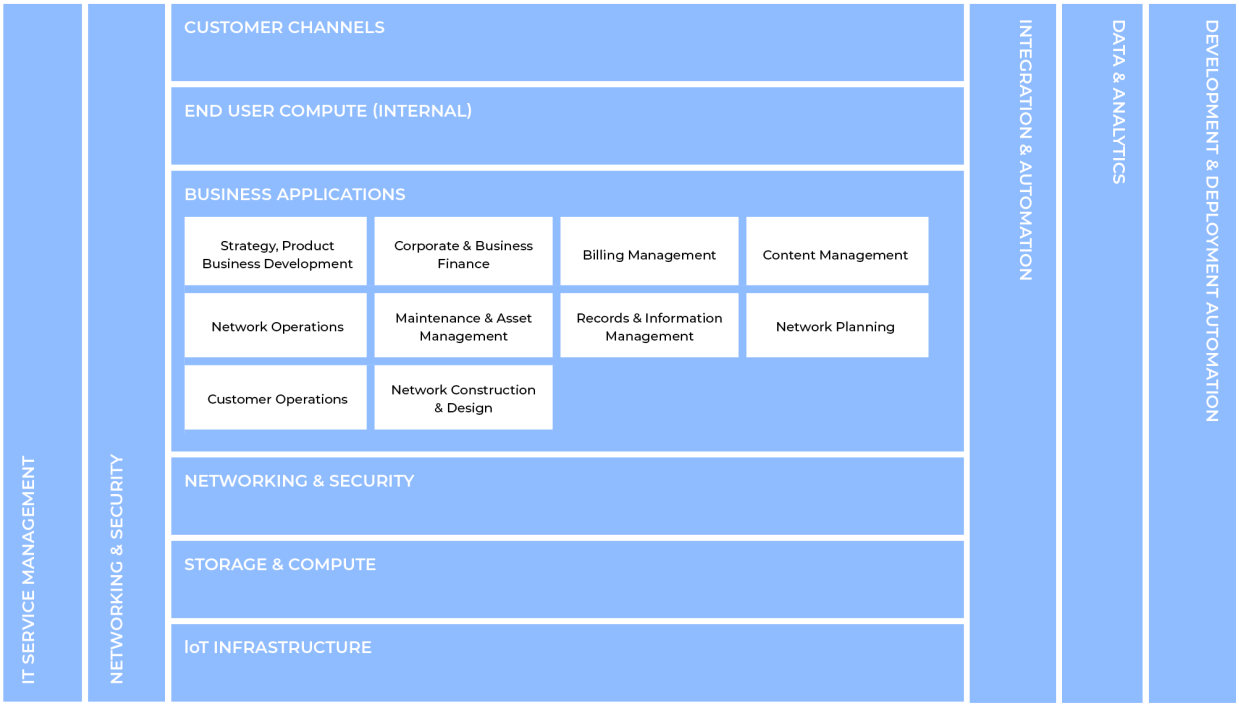


FIGURE 6-12: TECHNICAL REFERENCE MODEL

Vector's core network and supporting network information systems are used to manage data that is necessary for the effective day-to-day operation of its network and customer assets and the ongoing planning activities relating to those assets.

Figure 6-13 illustrates the relationship between Vector's business functions and processes, referred to as business process domains, and its core network related applications.

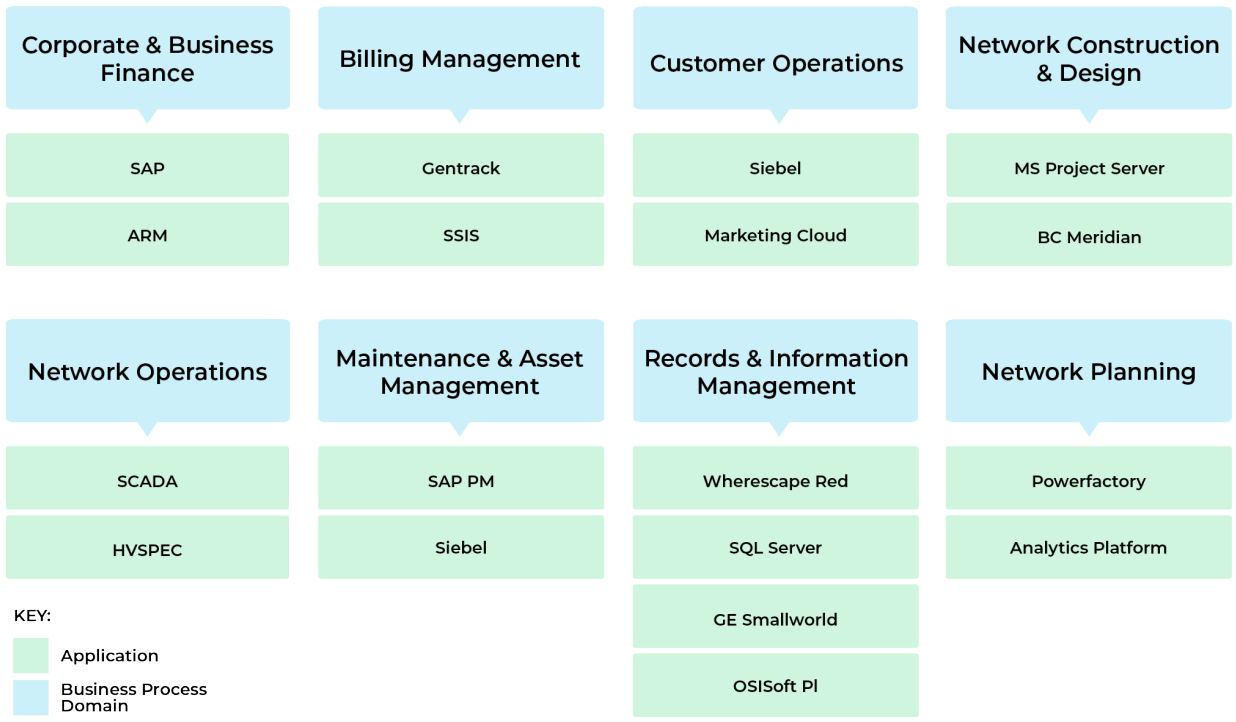


FIGURE 6-13: BUSINESS PROCESS DOMAINS AND CORE NETWORK RELATED APPLICATIONS

6.2.8 INFORMATION AND DATA

Vector's information systems are used to manage data that is necessary for the effective day-to-day operation of its network assets and the ongoing planning activities relating to those assets. The information can be divided into several entities as shown in the following Figure 6-14.

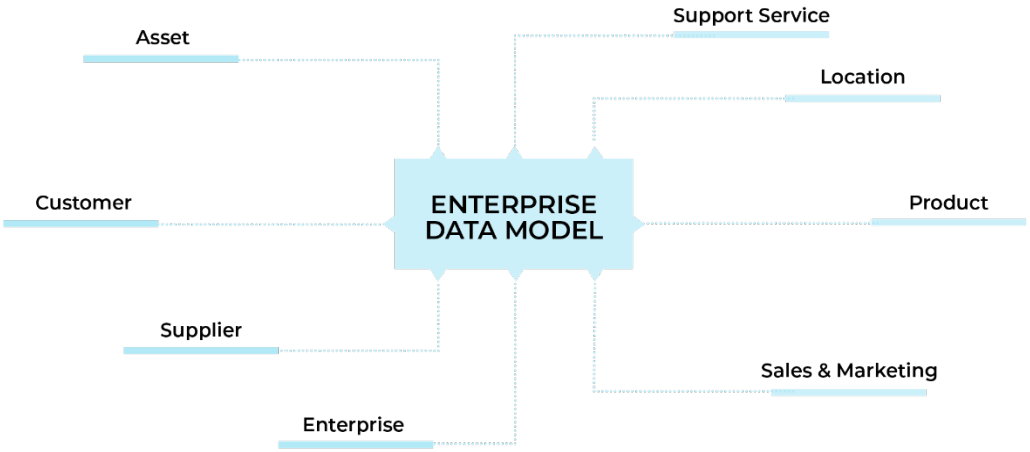


FIGURE 6-14:VECTOR NETWORK SYSTEMS ENTERPRISE DATA MODEL

The information entities above consist of multiple attributes and stored in source systems. The Entity->Attribute->Source System mapping is captured in Vector's Enterprise Data Model.

SECTION 07

Managing our asset's lifecycle

7 – Managing our assets lifecycle

This section sets out Vector's project proposals for the next 10-year period. These proposals will assist Vector in achieving service level targets through addressing the current or performance targets identified in Section 3 –and Appendix 10.3. The proposals are developed based on our asset management strategies (see Section 4.5).

The proposed projects are identified from the assessment of the possible viable options. Where applicable, options consider non-network solutions and innovations, and deferral of investment. The majority of proposed projects are subject to technical assessment, modelling and simulation, exclusion viability, financial feasibility and / or post investment risk assessment.

An investment summary table gives forecast expenditure on the project for the 10-year period in New Zealand dollars. The forecast annual expenditure is given in financial years and all amounts are shown in millions of dollars nominal to two decimal figures.

7.1 Network maintenance

7.1.1 OVERVIEW

Vector's network maintenance programmes are categorised as follows:

- Reactive maintenance
- Planned maintenance
- Corrective maintenance
- Third party services

Reactive maintenance is considered to encapsulate all maintenance activities that relate to the response, fault find, repair and restoration of supply, and the safeguarding of life and property (targets and measures for Vector's responses to Emergencies are detailed in Section 3.2). It primarily involves:

- Safety response and repair or replacement of any part of the network components damaged due to environmental factors or third party interference; and
- Remediation or isolation of unsafe network situations.

Planned maintenance covers activities defined through Vector's maintenance standards (see Section 10.2), and relates to the following:

- Provision of network patrols, leakage surveys, inspection and condition assessment tasks, sampling and maintenance service work;
- The coordination of shutdowns and decommissioning, and re-commissioning and restoration, along with the capture and management of all defined data; and
- In addition to routine periodic planned maintenance inspections, Vector also undertakes one-off surveys where necessary to assess risk and formulate mitigation plans - e.g. a pipe-in-buildings audit (refer Section 4.7.1). The OPEX forecast includes a provision to undertake these one-off field-surveys of all non-residential inactive service pipes (i.e. service pipes that are live but not in use) that have been inactive for a period of 5 years or more; this follows a recent incident where an inactive IP riser was damaged by a vehicle resulting in a major gas leak. The purpose of the survey is to assess the condition of the service pipe and associated riser pipe and evaluate risks from third party damage or property development etc; where the assessed risk warrants it, the inactive service will be scheduled to be cut-off.

Corrective maintenance catches the follow-up maintenance repair and component replacement requirements resulting from:

- Assets identified from planned inspections or service work to be in poor condition, requiring repair;
- Poor condition or unserviceable assets identified via one-off coordinated network surveys or identified through proximity capital works;
- Removal of graffiti, painting and repair of buildings and asset enclosures, removal of decommissioned assets, one-off type surveys and condition detection tasks outside of planned maintenance standards; and
- Coordination of shutdowns and associated restoration, along with the capture and management of all defined data.

Third party services maintenance activities describe third party directed requests such as the following:

- Issuing maps and site plans to indicate the location of network assets via the 'beforeUdig' service;
- Asset location services, including the marking out of assets, safe work practice site briefings, worksite observer, urgent safety checks, safety disconnections;
- Issuing close approach consents; and
- Disconnection and reconnection associated with customers' property movements and any concerns relating to non-compliance with gas regulations.

The overall performance of Vector's gas distribution network has remained within the service level and reliability targets set. This indicates that the current maintenance program is effective. As a result, the maintenance strategy for the following period is to continue with the programmes already initiated to ensure this performance endures. However, in some cases further improvements and programmes have been identified to maintain the current performance levels described in Section 3 –.

7.1.2 NETWORK MAINTENANCE FORECAST EXPENDITURE

Forecast investment summary ($million constant FY24)

DESCRIPTION	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	TOTAL
Reactive maintenance	2.52	2.52	2.52	2.52	2.52	2.52	2.52	2.52	2.52	2.53	25.17
Planned maintenance	1.63	1.74	1.58	1.96	1.75	1.85	1.81	1.86	1.81	1.90	17.90
Corrective maintenance	1.40	1.30	1.35	1.07	1.18	1.22	1.07	1.07	1.12	1.07	11.84
Third party services	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	8.28
Total	**6.38**	**6.39**	**6.28**	**6.37**	**6.27**	**6.42**	**6.22**	**6.27**	**6.28**	**6.32**	**63.19**

A typical breakdown of Vector's spend on planned and corrective maintenance and inspections across the primary asset categories is shown in the following table, reflected as a percentage of the value forecast in Schedule 11b.

DESCRIPTION	FY24 – FY33 ($M)	FY24 – FY33 (%)
Distribution pipelines	46.44	74%
Pressure stations	2.14	3%
Valves	7.21	11%
Corrosion protection systems	2.15	3%
Monitoring and control systems	0.98	2%
Special crossings	4.27	7%

7.1.3 HYDROGEN TRIAL PROGRAMME

Vector is participating in an industry-wide group that is evaluating the feasibility of undertaking a hydrogen trial programme. The programme includes a live trial on a small network to transition it from natural gas to hydrogen. The initial stages of the programme are scheduled to be completed in RY24 and will focus on undertaking consumer equipment assessments and network material assessments to develop a comprehensive understanding of how network materials and equipment connected to the network will be impacted by the introduction of hydrogen/hydrogen blends. The cost for the industry trial is to be borne by the individual gas distribution businesses that make up the industry group.

Following the completion of the RY24 industry trial, Vector has proposed its own programme of consumer equipment and network material assessments (RY25 to RY33) to facilitate the transition to a 20% hydrogen blend or 100% hydrogen, as and when these become feasible. The OPEX costs associated with this programme are related to undertaking surveys of Vector's network and consumer connections.

FORECAST SUMMARY ($MILLION CONSTANT FY24)

DESCRIPTION	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	TOTAL
Gas industry hydrogen blending trial (Firstgas project)	0.28	-	-	-	-	-	-	-	-	-	0.28
Vector network survey (consumer and materials assessment)	-	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	5.54
Total	**0.28**	**0.62**	**0.62**	**0.62**	**0.62**	**0.62**	**0.62**	**0.62**	**0.62**	**0.62**	**5.82**

7.2 Customer connections

7.2.1 CUSTOMER CONNECTION FORECAST

This AMP remains one that is characterised by very high uncertainty for the future of gas. Last year, Vector incorporated inputs into its forecast that reflected some of this uncertainty as well as observed and announced reductions to the long-term usage of gas. The current environment remains heavily uncertain with key decisions at the national level remaining outstanding. This includes the Government's Energy Transition Plan, which is due to be released late 2023 and the next tranche of the Emissions Reduction Plan – which we note has already received draft recommendations from the Climate Change Commission looking to ban new gas connections.

For this AMP we have opted not to make any major changes at this time as it would simply be speculative. We do wish, however, to flag up that there could be potentially large shifts in our next AMP as the future of gas in New Zealand is better understood and outlined in policy and commercial entities start to firm up their own emission reduction plans.

At a high level, our forecasts more heavily weight shorter term trends (last 3-5 years), incorporates the outcomes of now known programmes of decarbonisation work (i.e. Housing New Zealand's (Kainga Ora) removal of gas at their properties and other government agencies/entities moving to non-gas alternatives) and known exits of large industrial loads. We have also incorporated a declining factor for both throughput and connections to reflect a possible decarbonisation scenario for the New Zealand economy and a growing consumer preference for non-fossil fuel alternatives. Figure 7-1 shows the historical and 10-year forecast for the number of new customer connections. It should be noted that growth in network connections is forecast to continue to be positive.

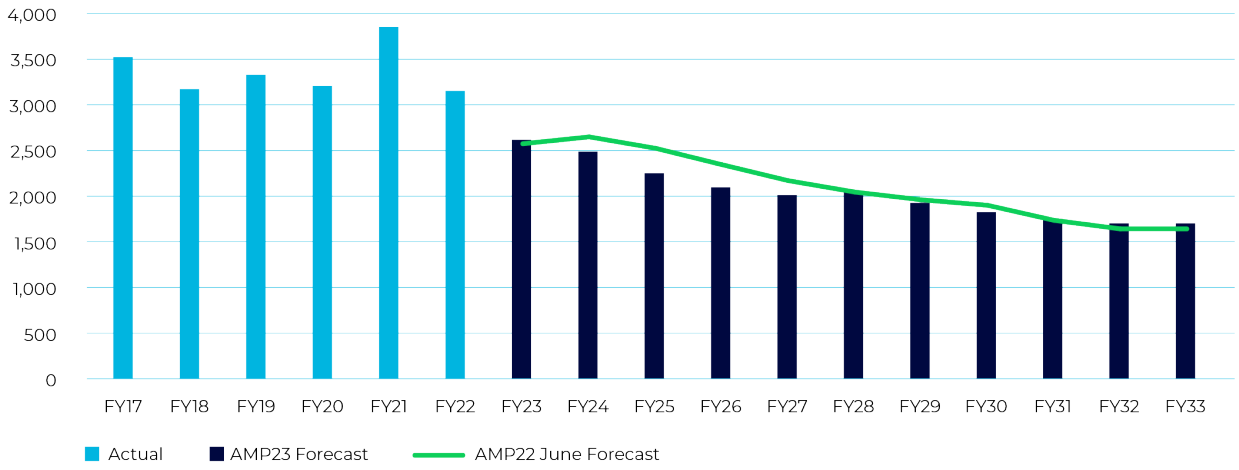


FIGURE 7-1: GROSS GAS CONNECTIONS

7.2.2 CUSTOMER CONNECTION FORECAST EXPENDITURE (GROSS)

Forecast investment summary ($million constant)

DESCRIPTION	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	TOTAL
Subdivision and mains extensions	1.11	1.11	1.11	1.05	1.07	1.00	0.94	0.90	0.88	0.88	10.05
Residential connections	9.86	8.85	8.17	7.77	7.88	7.36	6.95	6.65	6.45	6.45	76.38
Commercial connections	0.63	0.80	0.97	1.14	1.32	1.32	1.32	1.32	1.32	1.32	11.44
Total	**11.60**	**10.75**	**10.25**	**9.96**	**10.27**	**9.68**	**9.21**	**8.87**	**8.65**	**8.65**	**97.87**

7.3 System growth

System growth is driven by network demand exceeding the capacity of existing assets. These are generally caused by increases in new customer connections or increasing demand from existing connections (see Section 7.2.1).

Demand for new customer connections outside existing network boundaries is typically supplied through the development of new distribution pipelines and pressure stations. Where forecast demand within an existing network supply area could exceed the nominal capacity of the network assets, causing a breach in the existing network's operating criteria. Vector's approach to asset development is outlined in the Network Planning Strategy (see Section 4.6.2) and load forecasting process described in Section 4.6.7. In addition, a 'system pressure drops below acceptable levels' risk and SoS risk, and associated controls and treatment plans have been registered in Vector's risk management system. These risks have been assessed in accordance with Vector's risk management process, described in Section 5.3.

Vector has reforecast its system growth expenditure, primarily for residential developments, on the basis that these developments contribute over 80% of new connections on the network. In some cases, system growth projects have been reallocated to QoS to better reflect the primary driver for the project. Due to the high level of forecast uncertainty, additional monitoring sites at the extremities of the network has been allowed for during the planning period.

7.3.1 NORTH SHORE MP4

The North Shore MP4 pressure system operates at a NOP of 400kPa and supplies gas to the North Shore area bounded by the suburbs of Beachhaven, Devonport and Torbay. This network is identified as one of the heavy utilised networks (refer to Section 10.6) as it supplies a highly populated area with mix of commercial, residential and industrial loads.

It is anticipated that the forecasted organic growth in metropolitan Takapuna will result in a breach of Vector's QoS criteria during the planning period, resulting in the network demand exceeding the maximum design capacity. The vulnerability of the system is caused by the large distance between Devonport and DR-00046-AK in Council Terrace, which is its nearest point of supply. Modelling has identified a forecast pressure breach, starting with Devonport and progressively moving along the peninsular towards Takapuna as forecast gas load increases.

To mitigate the forecast breach of Vector's QoS standards, the following projects have been identified:

- Construct approximately 1.8km of 150mm PE MP4 pipeline to connect the existing 150mm PE/steel pipeline in Northcroft Road with the existing 150mm steel MP4 in southern Lake Road. The modelling of this proposed project confirms that it will maintain the minimum pressure in the network within Vector's standards (270kPa), with the forecasted demand until 2033.

Forecast investment summary ($million constant)

DESCRIPTION	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	TOTAL
Construct 1.8km of 150mm PE-MP4 pipeline along Lake Road.	-	-	-	0.92	1.27	-	-	-	-	-	2.19
Total	**-**	**-**	**-**	**0.92**	**1.27**	**-**	**-**	**-**	**-**	**-**	**2.19**

7.3.2 DRURY AND RAMARAMA MP4

The Drury MP4 network system is supplied from the transmission system at one gate station located in Waihoehoe Road. The MP4 networks supply a mix of residential, commercial and industrial loads. Within the same region; the Ramarama MP4 pressure system operates at a NOP of 400kPa. The Ramarama network system is supplied from the transmission system at one gate station located near Ararimu Road, and it supplies gas to a few small commercial customers and two large industrial consumers.

Due to the organic growth and the expected development in the region, i.e. New Town Drury and Drury South Crossing, the forecast demand of the two networks is expected to exceed the networks' designed capacity, resulting in a breach of Vector's QoS standards. The integration of the two networks in the region will, additionally, reduce the SoS risk in the area.

To supply the future demands, mitigate the potential QoS breach and maintain the SoS, Vector plans to link the Drury MP4 and Ramarama MP4 gas distribution pressure systems, into one interconnected network. This will reinforce the heavily constrained Drury MP4 pressure system by connecting with additional points of supply. The proposed linking is achieved with the following projects:

- Upgrade the Ramarama delivery point in FY24; and
- Construct approximately 1.3km of 150mm PE MP4 mains extension to link Ramarama MP4 with Drury MP4, along Great North Road in FY26.

Forecast investment summary ($million constant)

DESCRIPTION	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	TOTAL
Integration of the Drury MP4 and Ramarama MP4	0.32	-	0.63	-	-	-	-	-	-	-	0.96
Total	**0.30**	**-**	**0.60**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**0.96**

7.3.3 WAITOKI / WHANGAPAROA MP4

The Waitoki / Whangaparoa MP4 system supplies gas to Silverdale, Milldale, Orewa and the Whangaparaoa Peninsula and supplies approximately 7,000 customers. Due to the forecast increase in demand in the area and the proposed industrial developments in Silverdale, Vector has identified a capacity risk associated with this MP4 network. The high utilisation of the network is also limiting the uptake of industrial loads in the Silverdale area.

The high-level reinforcement solution is to construct a new main that supplies Silverdale along Brain Smith Drive and connect to a higher-pressure point at the end of Highgate Parkway. The project comprises constructing approximately 1.4km of 100mm PE from Highgate Parkway, along Brain Smith Drive, and crossing Hibiscus Coast Highway, to the corner of Goldwater Drive and East Coast Road. The new mains will support the increasing industrial and commercial demands in the area and connect to a higher-pressure point at the end of Highgate Parkway. This approach will improve system pressure and maintain the MinOP criteria during the planning period.

Forecast investment summary ($million constant)

DESCRIPTION	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	TOTAL
Highgate Parkway to East Coast Road, Silverdale – Phase 2	-	-	-	-	-	0.82	-	-	-	-	0.82
Total	-	-	-	-	-	0.82	-	-	-	-	0.82

7.3.4 NETWORK MESHING

Provision for network meshing has been allowed for during the planning period, to supply any unforeseen future growth. This allowance will mitigate potential, unexpected breaches in network capacity. The network meshing provision will include road crossings between pipelines and/or small extensions to provide additional capacities, as needed during the planning period. Previously installed MP4 meshing projects have proven to significantly improve network pressure and compare very favourable to other more expensive solutions.

Forecast investment summary ($million constant)

DESCRIPTION	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	TOTAL
Network meshing	0.21	0.21	0.21	0.21	0.21	0.21	0.53	0.53	0.53	0.53	3.36
Total	0.21	0.21	0.21	0.21	0.21	0.21	0.53	0.53	0.53	0.53	3.36

7.3.5 DRS UPGRADES

Provision is made for the upgrading of DRS's that exceed their design capacity. DRS upgrades to address capacity issues are critical to avoid maloperation of DRS's due to operation beyond their design capacity. Failure to address the capacity constraint could lead to local network capacity issues, resulting in a loss of supply.

Forecast investment summary ($million constant)

DESCRIPTION	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	TOTAL
DRS capacity upgrades capacity issues	0.28	0.21	0.26	0.21	0.17	0.17	0.17	0.17	0.17	0.17	2.01
Total	0.28	0.21	0.26	0.21	0.17	0.17	0.17	0.17	0.17	0.17	2.01

7.4 Quality of supply

Vector's planning strategy ensures that the QoS and SoS targets are maintained across the network. Broadly speaking QoS addresses network pressure issues, both current and forecast, while SoS addresses the level of redundancy or the degree of meshing across the network, both are critical to the resilience and reliability of the network.

The QoS criteria (refer Section 4.6.8) describes the level to which the network is designed to deliver the accepted reliability levels. Subject to these levels being delivered network reliability is determined by the performance of the network assets.

Forecast of the QoS constraints and potential SoS risks are reviewed annually, to ensure the scheduling of the adequate reinforcement solutions. The timing of the solution is scheduled to ensure that the reliability and resilience of the network are not compromised.

Recently, after the unprecedented weather events in the region, Vector has identified several projects that will significantly improve the reliability and resilience of the network and reduce the impact (measured by impacted customers) of any major event, e.g. land slide, third party damages, etc.

Additionally, the identified projects will improve our service levels by reducing the overall interruption number and time for planned and unplanned interruptions.

To mitigate the potential QoS breach and maintain the SoS, the following projects have been identified:

- Milldale motorway crossing: additional main supply to the Whangaparāoa peninsula providing security of supply to >2,000 customers. The project is planned for FY24;
- Wattle Downs: 1 km of PE main providing additional supply to >900 customers, the project is planned for FY25;
- Dairy Flat highway bridge crossing: the proposed crossing will integrate a single fed network to the North Shore MP4 network, providing security of supply to >200 customers, the project is planned for FY27;
- Smales Rd: 0.5 km of PE main providing security of supply to >200 customer, the project is planned for FY29; and

Forecast investment summary ($million constant)

DESCRIPTION	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	TOTAL
Milldale Motorway crossing	0.29	-	-	-	-	-	-	-	-	-	0.29
Network reliability improvements (Security of supply)	-	0.53	-	0.38	-	0.47	-	-	-	-	1.38
Total	**0.29**	**0.53**	**-**	**0.38**	**-**	**0.47**	**-**	**-**	**-**	**-**	**1.66**

7.5 Asset replacement and renewal

The safe and reliable operation of the network relies upon renewal and replacement of assets together with a sound maintenance regime. We undertake regular meetings with our FSPs to discuss the progress of maintenance programmes and proactively discuss potential issues to ensure the maintenance programme is effective in improving or maintaining service levels. Vector's ultimate aim for operations and maintenance is to meet the service level targets set out in Section 3 – This includes ensuring asset safety and any associated environmental requirements are met.

Projects or programmes are initiated to address gaps in service level targets that are either already apparent or are forecast in the next 5-10 years.

This section provides details on all the asset replacement and renewal projects proposed for the next 10-year period for the continued safe and reliable operation of the network. Programmes of work have been created where expenditure is planned across a number of years.

Vector's forecast expenditure for planned and corrective maintenance and inspections is set out in Schedule 11b in Section 10.11 as part of the disclosure Report on Forecast OPEX. Asset replacement and renewal is forecast in Schedule 11a in Section 10.10 as part of the disclosure Report on Forecast CAPEX.

7.5.1 DISTRIBUTION PIPELINES

The works programme covered in this section is in line with Vector's asset strategy for this asset type, strategy document GAA002 Distribution pipelines.

TARGETED REPLACEMENT OF HIGH PRIORITY MP PRE-1985 PE PIPE

Overseas research indicates that much of the PE pipe manufactured and used for gas networks from the 1960s through the early 1980s may be susceptible to premature brittle-like failures when subjected to stress intensification - these failures represent a potential public safety hazard.

Vector's gas distribution network currently includes approximately 77km of PE mains that were installed in 1984 or before - approximately 41% operate at MP4, 32% at MP2, and 17% at MP1. Incidents of brittle-like failure have occurred on Vector's network and the probability of failure is anticipated to rise with time due to factors such as installation, operating and environmental conditions – e.g. the use of PE squeeze offs during construction and repair.

Recent analysis of pre-85 PE PREs on Vector's network shows that the rate of pre-85 PE failures is significantly higher than the rate of failures on the whole of the Auckland network. The analysis also shows that the PRE rate for MP4 pre-85 PE systems is significantly higher than that for MP1 and MP2 systems. Vector has therefore adopted a strategy of targeted pre-85 PE mains and service pipeline replacement initially targeting higher priority areas. Priorities have been based on risk factors which include PRE history, operating pressure, pipe diameter, pipeline criticality, and proximity to business areas, hospitals etc.

Another option being explored to reduce the risks associated with pre-1985 PE pipeline, is to identify any section of pre-1985 pipeline that has been duplicated with a more recent type of pipe. As these sections are identified, the viability of decommissioning the pre-1985 PE pipeline and transferring any service connections to the adjacent pipeline will be assessed. This strategy will also be augmented by the adoption of other risk mitigating measures - e.g. the avoidance of applying squeeze-offs on pre-1985 PE pipes where possible, and the use of pipe reinforcement fittings at pre-1985 PE squeeze-off locations. The performance of these pipelines will continue to be closely monitored.

The planned programme of pre-85 PE pipeline replacement work aligns with Vector's asset management policy and in particular a commitment to prevent harm to the public through the management of its assets over their entire lifecycle. The work programme also aligns with Vector's service level objectives and will improve overall network performance (as measured against service level targets) by reducing the number of unplanned interruptions and the number of PREs.

A 'Pre-1985 PE pipe' risk with associated controls and treatment plans has been registered in Vector's risk management system and been assessed in accordance with Vector's risk management process described in Section 5.3. The planned programme of pre-85 PE pipeline replacement work forms part of the treatment plan that has been developed for this risk.

Forecast investment summary ($million constant)

DESCRIPTION	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	TOTAL
Targeted replacement of high priority MP pre-1985 PE pipe	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	12.75
Total	**1.27**	**1.27**	**1.27**	**1.27**	**1.27**	**1.27**	**1.27**	**1.27**	**1.27**	**1.27**	**12.75**

PIPE-IN-BUILDINGS REPLACEMENT

Vector carries out annual planned maintenance inspections at sites where a gas service pipe terminates within a building, normally at a GMS location; the purpose of the inspection is to assess the condition and accessibility of the service pipe, and the adequacy of available ventilation and installed gas-tight conduits etc. The primary risk associated with pipe-in-buildings sites is an asset failure resulting in a gas-in-building event.

During FY20, Vector's database of pipe-in-building sites was found to be out of date and so a search of Gas Registry ICP data was made to identify additional sites that needed to be added to the master list based on available meter-location information. A field survey of all confirmed and potential pipe-in-building sites was undertaken during FY20; the primary objectives of the audit were to confirm if the sites were pipe-in-building sites, confirm site location details, clarify the demarcation point between network and GMS assets and undertake a condition assessment of the site to identify any upgrade work required to mitigate any safety risks associated with the site.

The results of the field survey formed the basis of a 5-year programme of work to carry out site upgrades at higher priority pipe-in-building sites; the programme still has 2 years to run - i.e. FY24 and FY25. The upgrades typically involve service pipe and GMS configuration changes to mitigate the risk of a gas-in-building event occurring; this typically entails relocating the GMS to a suitable outdoors location and reconfiguring the upstream and downstream pipework as required.

The planned programme of pipe-in-building upgrade work aligns with Vector's asset management policy and in particular a commitment to prevent harm to the public through the management of its assets over their entire lifecycle. A 'Gas pipes into and/or under buildings' risk with associated controls and treatment plans has been registered in Vector's risk management system and been assessed in accordance with Vector's risk management process described in Section 5.3. The planned programme of pipe-in-building upgrade work forms part of the treatment plan that has been developed for this risk.

Forecast investment summary ($million constant)

DESCRIPTION	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	TOTAL
Pipe-in-buildings replacement	0.13	0.12	-	-	-	-	-	-	-	-	0.24
Total	**0.13**	**0.12**	-	-	-	-	-	-	-	-	**0.24**

UNSPECIFIED ASSET SAFETY AND COMPLIANCE REPLACEMENT

Periodically sections of mains and service pipeline will be identified that need to be replaced (on an as required basis) due to safety or compliance issues. Examples include pipes located under buildings, or pipes of non-compliant material specification. An ongoing programme for the replacement of these assets as they are identified is planned to ensure that H&S and compliance risks are mitigated. The projected cost for this programme is based on historical expenditure.

The planned programme of work aligns with Vector's asset management policy and in particular a commitment to prevent harm to the public through the management of its assets over their entire lifecycle. The work programme also aligns with Vector's service level objectives and will improve overall network performance (as measured against service level targets) by reducing the number of unplanned interruptions and the number of PREs.

Forecast investment summary ($million constant)

DESCRIPTION	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	TOTAL
Unspecified asset replacement and renewal	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	2.17
Total	**0.22**	**0.22**	**0.22**	**0.22**	**0.22**	**0.22**	**0.22**	**0.22**	**0.22**	**0.22**	**2.17**

7.5.2 PRESSURE STATIONS

The works programme covered in this section is in line with Vector's asset strategy for this asset type, strategy document GAA004 Pressure stations.

DRS UPGRADES TO ADDRESS COMPLIANCE AND INTEGRITY ISSUES

Vector has developed a CBARM model for its DRS assets. The model uses inputs from the ongoing DRS condition assessments as well as inputs from environmental risk assessments and other risk factors (e.g. consequences of failure and asset criticality assessments). In general, the model utilises all available data (i.e. operational, condition assessment and

geographical) to plot a matrix of two key outputs (Health Index HI and Criticality Index CI) that drive the required intervention strategies.

As a result of this assessment, Vector has developed a targeted and risk-based DRS upgrade programme for the 10-year planning period – see table below. The programme aligns with Vector's service level objectives and will improve overall network performance (as measured against service level targets) by reducing the risk of unplanned interruptions and poor pressure events associated with a DRS failure. The work programme also aligns with Vector's asset management policy and in particular a commitment to prevent harm to the public through the management of its assets over their entire lifecycle.

The scope of the upgrade can range from the replacement of individual components to the complete refurbishment or rebuild of the DRS. Where an upgrade of a DRS is required for integrity reasons, the design capacity of the DRS will be reviewed to determine if a capacity upgrade is also warranted.

A 'Regulator station failure' risk with associated controls and treatment plans has been registered in Vector's risk management system and been assessed in accordance with Vector's risk management process described in Section 5.3. The planned programme of work to address integrity and/or compliance issues forms part of the treatment plan that has been developed for this risk and includes the following specific projects:

- Vector's population of DRSs includes some older equipment of which the long term supply of replacement parts cannot be guaranteed. These comprise of approximately 60 over-pressure protection slam-shut units and 16 Terval Regulators. Spare parts are currently kept in stock so the risk of immediate replacement supply issues is low. However, to completely mitigate the supply failure and supply risk, a 10-year replacement programme has been developed to replace the obsolete equipment; and
- DR-00255-AK is a belowground (i.e. pit mounted) DRS located in Wainui Road, Silverdale and one of two DRSs that supply the Whangaparaoa/Orewa region. The DRS has a number of integrity issues - i.e. the DRS enclosure is considered to be a confined space with restricted physical access; the clearances between the DRS equipment and the enclosure walls and floor are minimal; and the enclosure regularly experiences water ingress during wet weather which is accelerating the decline in condition of the DRS. To resolve these issues Vector is planning to relocate the DRS above ground in FY24 which is incorporated in the table below.

Forecast investment summary ($million constant)

DESCRIPTION	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	TOTAL
DRS upgrades to address compliance and integrity issues	0.44	0.48	0.37	0.38	0.38	0.38	0.38	0.38	0.38	0.38	3.96
Total	**0.44**	**0.48**	**0.37**	**0.38**	**0.38**	**0.38**	**0.38**	**0.38**	**0.38**	**0.38**	**3.96**

SERVICE REGULATORS

Approximately 93 service regulators remain in service on Vector's network; approximately 25% are installed belowground. In some situations, belowground service regulators can be affected by the ingress of water, silt or other debris which can result in gas escapes from corroded fittings and pipework and can allow unacceptable over-pressure gas into downstream systems.

To mitigate the remaining higher risk service regulators Vector undertook a programme to have them removed or relocated aboveground which has now been completed. Service regulator replacement candidates were prioritised according to maintenance history, fault reports or an assessment of other risk factors - e.g. the presence of steel outlet pipework without CP, the service regulator location relative to buildings, roadways etc. Vector's as below ground service regulators are inspected annually and two-yearly for above ground service regulators and no further replacement expenditure has been allowed for during the planning period.

7.5.3 VALVES

The following sections set out the project proposals for distribution valves. The works programme covered in this need's requirement is in line with Vector's asset strategy for this asset type, strategy document GAA301 Valves.

STRATEGIC VALVE REPLACEMENT PROGRAMME

Over 40% of isolation valves installed on Vector's gas network are believed to be plug valves. Plug valves were installed on the gas network up to the late 1980s at which time they were superseded by ball valves. Because of their design, plug valves are prone to seizing; this can compromise Vector's ability to sectionalise the network during an emergency event. Where repeated attempts to unseize a valve are unsuccessful, the valve is classed as inoperable; currently there are approximately 45 valves that are inoperable due to the valve being seized.

Some types of plug valve are manufactured from cast iron material and in certain situations (e.g. when subjected to prolonged mechanical stress due to ground movement) small diameter cast iron plug valves (i.e. 50NB or smaller) have been found to be prone to fracture.

To mitigate the risks related to inoperable isolation valves and small-diameter plug valves located in higher risk areas, Vector has refined its strategic valve replacement programme. The programme now targets the replacement of critical isolation valves that are currently inoperable (or where there is a real risk that the valve could become inoperable over time) and the replacement of smaller diameter plug valves located in higher risk areas - e.g. CBD districts.

As the CBARM analysis shows (refer 0), the HI of the valve population (without any intervention) is projected to deteriorate over the 10-year period as the population of plug valves approaches its end of life. To allow for this, additional CAPEX spend has been forecast for the end of the period for the reactive replacement of increasing numbers of inoperable valves.

Forecast investment summary ($million constant)

DESCRIPTION	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	TOTAL
Strategic valve replacement programme	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.47	0.47	0.47	3.63
Total	**0.32**	**0.32**	**0.32**	**0.32**	**0.32**	**0.32**	**0.32**	**0.47**	**0.47**	**0.47**	**3.63**

RISER ASSEMBLY REPLACEMENT

Approximately 50% of all PRE on Vector's gas network are caused by service riser faults - i.e. riser pipe, riser valve or riser crimp faults. Riser valve faults are also a major cause of both planned and unplanned interruptions on the network. In addition to the valve leaking, typical riser valve faults include the valve passing gas when in the closed position, and the valve being inoperable (e.g. seized).

In order to mitigate the risks associated with riser valves, annual audits of approximately 1,000 riser valves have been undertaken over recent years initially targeting predominantly residential areas. More recently, the valve audits have targeted IP and larger size MP riser valves due to a noticeable increase in the number of faults that were being reported for larger sized steel risers.

The annual audit strategy has largely been effective. However, it can only identify faults that are present (or able to be detected) at the time of the audit. For this reason, Vector has aligned its planned service riser survey with the ongoing Vector AMS smart-meter rollout programme; any issues identified with the service riser and/or riser valve at the time of the meter swap are reviewed and prioritised for replacement based on the criticality of the asset.

Forecast investment summary ($million constant)

DESCRIPTION	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	TOTAL
Riser assembly replacement	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	2.36
Total	**0.24**	**0.24**	**0.24**	**0.24**	**0.24**	**0.24**	**0.24**	**0.24**	**0.24**	**0.24**	**2.36**

7.5.4 CORROSION PROTECTION EQUIPMENT

The following sections set out the project proposals for distribution valves. The works programme covered in this needs requirement is in line with Vector's asset strategy for this asset type, strategy document GAA401 Corrosion protection systems.

REPLACEMENT OF CP ASSETS AS REQUIRED

AS/NZS 4645 requires all buried steel pipelines to be provided with CP to give long term protection against corrosion in accordance with AS 2832 (Cathodic protection of metals). Where CP system assets fail (e.g. sacrificial anodes, CP test points etc) due to age or third party damage etc, new or upgraded CP assets may be required to ensure that the CP performance criteria of AS 2832 are met.

An ongoing programme of CP asset replacement or upgrade is required to ensure that CP assets can be replaced or upgraded on an as-required basis so that the level of CP protection on Vector's steel pipelines continues to meet the performance criteria of AS 2832. The planned programme of work aligns with Vector's asset management policy and in particular a commitment to maximise the value that Vector's assets deliver across their entire lifecycle through good practice asset management and risk management.

A 'Steel systems without CP' risk with associated controls and treatment plans has been registered in Vector's risk management system and been assessed in accordance with Vector's risk management process described in Section 5.3. The planned programme of CP asset replacement or upgrade forms part of the treatment plan that has been developed for this risk.

Forecast investment summary ($million constant)

DESCRIPTION	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	TOTAL
Replacement of CP assets as required	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.81
Total	**0.08**	**0.08**	**0.08**	**0.08**	**0.08**	**0.08**	**0.08**	**0.08**	**0.08**	**0.08**	**0.81**

INSTALLATION OF ADDITIONAL CP TEST POINTS AND ANODES

Analysis of Vector's CP test point spacing has shown that on some sections of Vector's network the test point spacing may not meet the requirements of AS 2832.1 Cathodic protection of metals. In particular the test point spacing in some suburban and high-rise areas does not meet the 500m spacing requirement stipulated in AS 2832.1, and in some cases there is no test point installed at the end of the pipeline. This is a legacy issue and is often due to the original test point being destroyed or lost as a result of street works. A 5-year programme (FY21 to FY25) to install additional CP test points on Vector's network to meet the requirements of AS 2832.1 is planned.

The planned programme of work aligns with Vector's asset management policy and in particular a commitment to maximise the value that Vector's assets deliver across their entire lifecycle through good practice asset management and risk management.

A 'Steel systems without CP' risk with associated controls and treatment plans has been registered in Vector's risk management system and been assessed in accordance with Vector's risk management process described in Section 5.3.

Forecast investment summary ($million constant)

DESCRIPTION	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	TOTAL
Installation of additional CP test points and anodes	0.13	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.39
Total	**0.13**	**0.03**	**0.03**	**0.03**	**0.03**	**0.03**	**0.03**	**0.03**	**0.03**	**0.03**	**0.39**

INSTALLATION OF MINITRANS REMOTE MONITORING EQUIPMENT

The transformer rectifier (TR) units currently installed on Vector's impressed current cathodic protection (ICCP) systems have no means of generating warnings or alerts of power failures or faults; in the event that the CP system is tripped due to an electrical fault, the fault will not be discovered until the next scheduled visit.

In order to provide the TRs with remote monitoring and alarm facilities, the installation of MiniTrans remote monitoring equipment at all 9 TRs is planned. This will allow the output of the TRs to be monitored by the system and automatically adjusted when environmental conditions change and will enable immediate notifications of CP system power failures or faults to be generated. The system will also allow the TR to be controlled remotely (i.e. from the field via a smart phone) for routine CP monitoring or DCVG survey purposes thereby significantly reducing travel time to and from the TR. In addition, the system provides constant data-logging of the CP system enabling AC interference or changes in current requirements to be readily identified.

The planned programme of work aligns with Vector's asset management policy and in particular a commitment to maximise the value that Vector's assets deliver across their entire lifecycle through good practice asset management and risk management.

A 'Steel systems without CP' risk with associated controls and treatment plans has been registered in Vector's risk management system and been assessed in accordance with Vector's risk management process described in Section 5.3.

Forecast investment summary ($million constant)

DESCRIPTION	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	TOTAL
Installation of MiniTrans remote monitoring equipment	-	-	-	-	0.23	-	-	-	-	-	0.23
Total	**-**	**-**	**-**	**-**	**0.23**	**-**	**-**	**-**	**-**	**-**	**0.23**

7.5.5 TELENET/SCADA EQUIPMENT

The following sections set out the project proposals for distribution valves. The works programme covered in this needs requirement is in line with Vector's asset strategy for this asset type, strategy document GAA501 Telemetry equipment.

TELENET UPGRADES TO ADDRESS INTEGRITY ISSUES

The average age of Kingfisher Telenet equipment is 20 years and the average age of GPRS Telenet equipment is 11 years. Although a Kingfisher RTU refurbishment programme to replace aging Kingfisher RTU equipment and upgrade radio communication systems was completed in FY20, an ongoing programme for the reactive replacement of failed ancillary equipment (e.g. powder coated steel cabinets, power supplies, transducers etc.) due to age and/or environmental factors is required to ensure that telemetry-system downtime is minimised.

The planned programme of work will reduce Telenet system down-time and improve Vector's ability to monitor and respond to poor pressure events. The programme aligns with Vector's service level objectives and will improve overall network performance (as measured against service level targets) by reducing the number of poor pressure events.

A 'Gas distribution SCADA system failure' risk with associated controls and treatment plans has been registered in Vector's risk management system and been assessed in accordance with Vector's risk management process described in Section 5.3. The planned programme of work forms part of the treatment plan that has been developed for this risk.

Forecast investment summary ($million constant)

DESCRIPTION	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	TOTAL
Telenet upgrades to address integrity issues	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.76
Total	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.76

REPLACEMENT OF 2G AND 3G CELLO MONITORING UNITS

The availability of real-time and historical system-pressure monitoring data is a valuable resource for both operational and network planning purposes. Approximately 65% of Vector's DRS stations have permanent inlet and outlet pressure-monitoring, and 50% of pressure systems have permanent system-extremity pressure monitoring at one or more locations.

Remote data loggers have been identified as a cost-effective pressure monitoring solution where real-time pressure, volume and temperature data is not required. Vector's remote data loggers (cello) records 15-minute time-stamped pressure data which is critical for network planning purposes and provides real-time alarm notifications for threshold breaches which are critical for operational purposes.

All of Vector's existing population of Cello units operate on Vodafone's 2G network however new models currently available are compatible with both the 2G and 3G networks, and future models are expected to support NB-IoT and Cat M1 comms technology.

A programme has been scheduled in FY24 to replace existing population of cellos with new generation 4G/5G capability units due to redundancy plans made by the 2G and 3G network operator. As part of the replacement, an upgrade to the supporting software will form part of the project. The current supporting software PMAC does not support NB-IoT and Cat M1 comms and has started showing signs of deterioration. PMAC developers have confirmed that the software will not be supported and they have advised users to consider upgrading the software as a priority.

Forecast investment summary ($million constant)

DESCRIPTION	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	TOTAL
Replacement of 2G and 3G Cello units	0.47	-	-	-	-	-	-	-	-	-	0.47
Total	**0.47**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**0.47**

7.5.6 SPECIAL CROSSINGS

The following sections set out the project proposals for special crossings. The works programme is in line with Vector's asset strategy for this asset type, strategy document GAA-005 Special crossings.

REPLACEMENT OF AUCKLAND HARBOUR BRIDGE IP20 PIPELINE SUPPORT BRACKETS

During FY18 a five-year programme (FY18 to FY22) was initiated to replace all the original roller bracket assemblies that were fitted to the IP20 pipeline installed on the Auckland Harbour Bridge.

Previous planned maintenance inspections of the pipeline had identified integrity issues with a significant proportion of the original pipeline-support brackets. The 200mm steel pipeline was constructed in 1983 and utilises approximately 170 pipeline support brackets along its length. The original pipeline-support design incorporated heat-shrink sleeves fitted to the pipe at each bracket location, and pipeline rollers which incorporated a urethane rubber layer on the outer contact surface. Over time the rollers and the rubber heat-shrink sleeves have sustained damage due to the axial-movement of the pipe (e.g. due to thermal expansion) against the rollers; to minimise ongoing damage to the pipeline and the pipeline support brackets, a programme to upgrade all the original pipeline roller bracket assemblies was undertaken.

The upgrade programme has experienced some delays mainly because of Covid and is due to be completed during FY25; the bracket upgrade work is being carried out in conjunction with the re-coating of the pipeline which is being managed as OPEX work.

The planned programme of work to upgrade the Auckland Harbour Bridge pipeline brackets aligns with Vector's asset management policy and in particular a commitment to maximise the value that Vector's assets deliver across their entire lifecycle through good practice asset management and risk management.

An 'Aboveground gas pipeline crossings' risk with associated controls and treatment plans has been registered in Vector's risk management system and been assessed in accordance with Vector's risk management process described in Section 5.3. The planned programme of work to upgrade the Auckland Harbour Bridge pipeline brackets forms part of the treatment plan that has been developed for this risk.

Forecast investment summary ($million constant)

DESCRIPTION	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	TOTAL
Replacement of Auckland Harbour Bridge IP20 pipeline support brackets	0.32	0.32	-	-	-	-	-	-	-	-	0.63
Total	**0.32**	**0.32**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**0.63**

SPECIAL CROSSING UPGRADE PROGRAMME

Detailed condition assessments of aboveground special crossing are undertaken 3-yearly or 5-yearly depending on the accessibility of the crossing. The assessment targets four areas of the crossing - i.e. the pipeline, pipe supports, fixings and ground penetrations; the overall condition grading of the special crossing site is the average of the four assessments. The output from the condition assessments forms the basis of a 10-year special-crossing upgrade programme which targets the upgrade of sites where any component of the crossing has a low condition grading. Using the CBARM model, each crossing

has been assessed based on two different failure modes; pipe and fixing failure. Further details of the methodology and results are provided in Vector's asset strategy report GAA-005 Special Crossings.

As a result of the CBARM modelling, a 10-year programme of work has been developed. This aligns with Vector's asset management policy and in particular a commitment to maximise the value that Vector's assets deliver across their entire lifecycle through good practice asset management and risk management.

In addition to the CBARM modelling, an 'Aboveground gas pipeline crossings' risk with associated controls and treatment plans has been registered in Vector's risk management system and been assessed in accordance with Vector's risk management process described in Section 5.3. The programme of work to replace pipeline support brackets and bracket-fixings etc. forms part of the treatment plan that has been developed for this risk.

Forecast investment summary ($million constant)

DESCRIPTION	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	TOTAL
Special crossing upgrade programme	0.38	0.36	0.34	0.22	0.25	0.17	0.17	0.17	0.17	0.17	2.38
Total	**0.38**	**0.36**	**0.34**	**0.22**	**0.25**	**0.17**	**0.17**	**0.17**	**0.17**	**0.17**	**2.38**

7.6 Other reliability, safety and environment

ISOLATION VALVE INSTALLATIONS

AS/NZS 4645 requires sectional isolation valves be installed to facilitate the safe operation of the gas distribution network; AS/NZS 4645 also requires fire valves to be installed on all DRS inlet and outlet supply lines.

Vector has implemented an ongoing isolation valve installation programme to target the installation of additional isolation valves on strategic pipelines - e.g. IP20 pipelines. The programme utilises the output from network-isolation modelling to identify critical sites where additional isolation valves should be installed to improve the safe operation of the network and improve the level of network resilience.

The network isolation studies completed to date have identified a number of sites where additional isolation valves are required. These have been prioritised and scheduled according to risk.

The programme of work to install additional isolation valves aligns with Vector's service level objectives and will improve overall network performance (as measured against service level targets) by limiting the severity of outages due to third party damage thereby reducing the number of unplanned interruptions. The work programme also aligns with Vector's asset management policy and in particular a commitment to prevent harm to the public through the management of its assets over their entire lifecycle.

An 'Inability to isolate gas supply' risk with associated controls and treatment plans has been registered in Vector's risk management system and been assessed in accordance with Vector's risk management process described in Section 5.3. The programme of work to install additional isolation valves forms part of the treatment plan that has been developed for this risk.

STRATEGIC SPARES AND EQUIPMENT

Vector maintains a stock of critical spares and equipment so that the repair of a network fault is not hindered by the lack of availability of required parts or equipment. Although the general condition of the spares and equipment is adequate, some of the equipment (e.g. pipeline drilling equipment) is at least 25 years old and its current condition reflects the relatively high level of service that it has had.

Because of its age, there is a risk of this equipment becoming obsolete and for replacement parts and fittings becoming difficult to source. To address this risk, Vector has developed a replacement programme for its pipeline drilling equipment; the availability of this equipment is crucial for making hot-tap connections and carrying out stoppling operations on steel pipelines. This upgrade programme has resulted in an uplift in the CAPEX forecast over the RY22 to RY25 periods – refer table below.

NEW SYSTEM PRESSURE MONITORING SITES

As described in previous AMPs, a number of CAPEX network reinforcement projects have either been reduced or deferred outside the planning period. Although the risk of pressure breaches resulting from these changes is considered low risk, additional network monitoring is planned to support any reactive reinforcement initiatives that might be required.

DECARBONISATION – ADDITIONAL LEAKAGE SURVEYS AND PURGING COMPRESSORS

As described in Section 3.4, Vector has identified that increasing the leakage survey frequency is the most cost-effective measurement to reduce GHG emissions and increase the overall network performance. Accordingly, Vector is planning to change its leakage survey cycle from 1-yearly to 6-monthly in FY24 and further to 3-monthly in FY27. The proposed changes would require additional surveying vehicles and equipment (i.e. leakage detection equipment) to adequately cover the entire network at the new planned cycles.

In FY25, Vector is planning to introduce equipment that captures natural gas from large purging operations. This equipment extracts and compresses the gas from the proposed decommissioned pipeline and reintroduces it back into the network, therefore avoiding the release of natural gas to atmosphere.

NEW PIPELINE WARNING SIGNS

As described in Section 7.1, Vector operates a network protection programme to support and reduce the number of third party damages on our assets. To support the reduction in third party damage events (refer Section 3.2.3) and help improve public and third party awareness, Vector plans to install additional pipeline warning signs across its strategic pipelines operating in high growth areas.

Forecast investment summary ($million constant)

DESCRIPTION	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	TOTAL
Isolation valves installations - supply isolation	0.24	0.43	0.37	0.47	0.31	0.58	0.25	0.33	0.35	0.21	3.53
Replacement of critical spares and equipment as required	0.43	0.0	-	-	0.34	-	-	-	-	-	0.77
New system pressure monitoring sites	-	0.03	0.03	-	-	-	-	-	-	-	0.07
Decarbonisation - 12 month to 6 month survey	0.31	-	-	-	-	-	-	-	-	-	0.31
Decarbonisation - 6 month to 3 month survey	-	-	-	0.18	-	-	-	-	-	-	0.18
Decarbonisation - purging compressor	-	0.23	-	-	-	0.23	-	-	-	-	0.46
New pipeline warning signs	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.53
Total	**1.03**	**0.74**	**0.46**	**0.71**	**0.71**	**0.86**	**0.31**	**0.38**	**0.40**	**0.26**	**5.85**

7.7 Asset relocations

One of Vector's objectives when planning projects and compiling the capital budget is to identify the need to relocate Vector assets when reasonably required by customers and third parties. Vector is obliged to relocate its assets in the road reserve by Sections 33, 34 and 36 of the Gas Act 1992, Section 54 of the Government Roading Powers Act 1989 and by the specific terms of licences or easements under Sections 34 and 35 of the New Zealand Railways Corporation Act 1981.

The majority of relocations generally occur when infrastructure projects are initiated by road or rail corridor managers, e.g. Auckland Council or Auckland Transport (AT), New Zealand Transport Agency (NZTA) and to a lesser extent KiwiRail. The process and funding of such relocation works is governed by the relevant Acts as listed above.

The timing and scope of relocation projects are driven by customers and third parties and their project timing and schedule. The expenditure profile below is based on our knowledge of asset relocation projects and incorporates our best indicator of CAPEX spend for the 10 year AMP period.

Forecast investment summary ($million constant)

DESCRIPTION	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	TOTAL
Relocations	3.35	3.35	3.35	3.35	3.35	3.35	3.35	3.35	3.35	3.35	33.46
Total	**3.35**	**3.35**	**3.35**	**3.35**	**3.35**	**3.35**	**3.35**	**3.35**	**3.35**	**3.35**	**33.46**

7.8 Non-network assets

7.8.1 INFORMATION SYSTEMS, PROCESSES AND DATA

The Vector digital strategy has evolved to reflect the changing nature of our business, the wider energy landscape, and new digital technologies. Vector leverages smart digital platforms, optimised to deliver business outcomes across six key value streams: Customer Operations, Records & Information Management, Network Operations, Maintenance & Asset Management, Network Construction Design and Network Planning. The platforms are heavily focused on enabling Vector to significantly reduce the cost of complex, customised legacy platform migration and lifecycle maintenance due to the development of best in class micro services and the associated reduction in core system complexity.

CUSTOMER OPERATIONS

Customer operations is focused on utilising digital technology and platforms to improve the customer's experience by providing them with frictionless interactions and touchpoints throughout the end to end customer lifecycle, leading to a significantly reduced cost to serve and improve customer experiences.

By investing in enhanced customer engagement capabilities, Vector will ensure that it can meet changing customer expectations for service providers and deliver best in class utility services at a lower cost. This spans customer needs from self-service to estimation.

RECORDS &INFORMATION MANAGEMENT

Records & Information Management is focused on utilising core capabilities to enable other value streams from a records perspective. This includes risk models, fault records, the network model and the core PI asset management system.

MAINTENANCE AND ASSET MANAGEMENT

Maintenance and Asset Management is focused on core digital capabilities to enhance and enable planned maintenance and construction across the network. This includes maintenance and inspection, work scheduling, construction and design, field recording & design, and work dispatch. Condition data captured from the field is used to help prioritise and drive the maintenance and construction work.

NETWORK CONSTRUCTION & DESIGN

The actual build of capital works projects must be supported by several systems. This stream focuses on providing underlying capability to track and plan work as well as the asset and procurement tools needed to have assets where and when they are needed;

NETWORK PLANNING

This value stream is focussed on utilising digital capabilities to enable effective project planning, compliance management, construction supervision and network calculations. It addresses the questions of where and when to build capacity into the network.

7.8.2 PLATFORM ARCHITECTURE

NETWORKS PLATFORM REFERENCE MODEL

Vector implements and manages its digital systems according to an overall Reference Model (refer Figure 7-2). This is comprised of the business process domains that are in turn supported by the underlying technology components of the technology reference model. Over the 10-year period this reference architecture will be utilised to deliver ongoing enhancements and improvements towards the achievement of our business objectives for our core businesses.

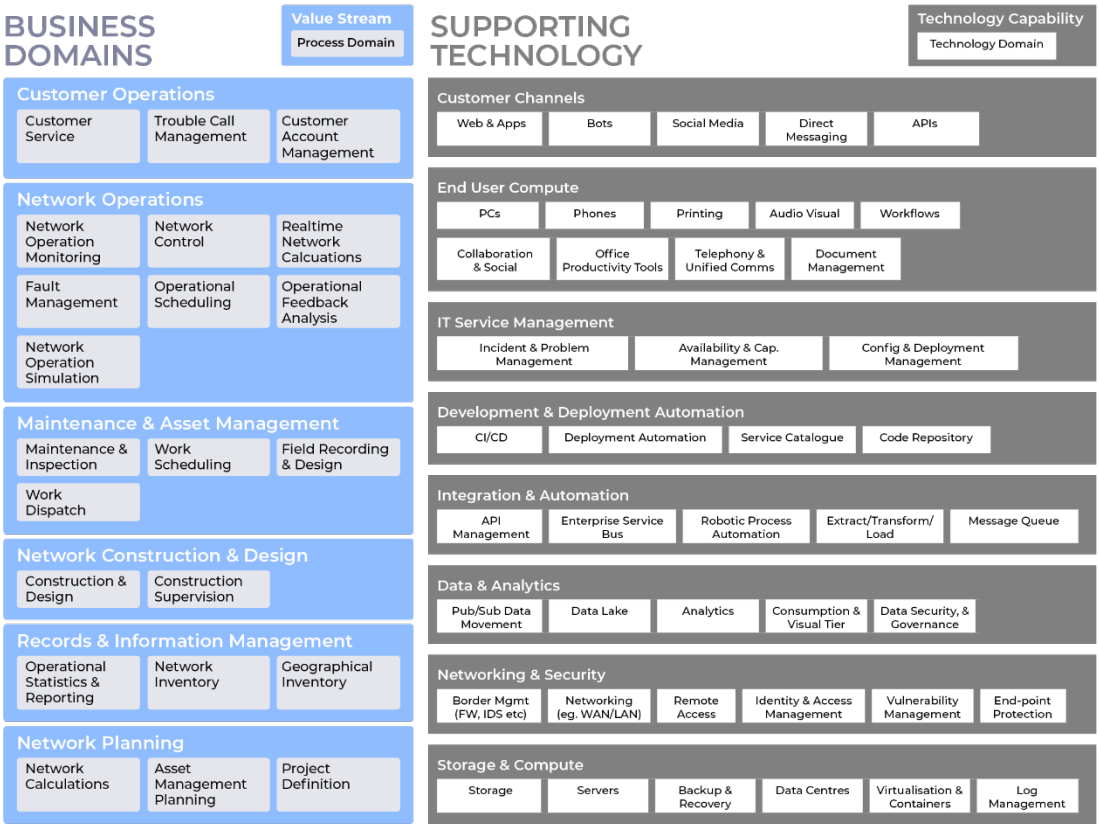


FIGURE 7-2:VECTOR REFERENCE MODEL

7.8.3 NON-NETWORK CAPEX

Digital investments support the technology required to execute our Symphony strategy. The proposed investment in the upcoming years in non-network digital systems, processes and information management will ensure Vector has the capability and tools required to deliver on our Asset Management Objectives. Through the AMP period we continue to invest in a modernised network and lifecycle management that will both replace aged platforms and leverage new technology delivered by modernised systems.

Forecast investment summary ($million constant)

DESCRIPTION	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	TOTAL
Non-network CAPEX	3,667	3,217	2,273	2,502	3,318	2,543	1,824	1,684	1,452	1,116	23,595
Total	3,667	3,217	2,273	2,502	3,318	2,543	1,824	1,684	1,452	1,116	23,595

7.8.4 NON-NETWORK OPEX

Non-network OPEX provides the support services required to ensure the network business can operate as an effective, well-governed business and includes the following expenditure categories:

- System Operations and Network expenditure captures direct system and network support costs that are required to deliver on the CAPEX and maintenance plans and includes a share of expenditure related to the resource shared between Vector's Electricity and Gas Distribution businesses; and
- Business Support expenditure includes a share of health and safety, public policy & regulatory, legal & risk management, finance, human resources, digital and marketing costs incurred at Vector Group level. The Gas Distribution business benefits from economies of scale with Vector providing shared support across its group of businesses.

Proposed expenditure summary ($million constant FY24)

DESCRIPTION	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	TOTAL
System operations and network support	3.91	4.12	4.14	4.14	4.14	4.14	4.14	4.14	4.14	4.14	41.15
Business support	6.73	6.73	6.73	6.73	6.73	6.73	6.73	6.73	6.73	6.73	67.26
Total	10.64	10.85	10.87	10.87	10.87	10.87	10.87	10.87	10.87	10.87	108.41

SECTION 08

Delivering our plan

8 – Delivering our plan

8.1 Overview

This Chapter provides an overview of the processes used to manage the delivery of our capital works and maintenance works programmes. It provides an overview of our Programme Delivery process that enables us to consistently deliver our work safely, to quality, cost efficiency, and to schedule.

CAPITAL WORKS DELIVERY

Capital Delivery is the delivery of the annual capital works programme including engineering, project management, pricing, financial control, and governance.

CAPITAL PROJECT GOVERNANCE

Vector has a well-defined and embedded process for identifying network project needs, and capital justification to achieve its business objectives and reduce network risk. Our network investment planning and project delivery follows an approval process. The process is governed by the Delegated Authority Framework. Our SAP workflow mirrors the approval process for budget applications. A Capital Expenditure Justification (CEJ), essentially a business case, together with a detailed cost estimate, are developed to demonstrate prudence and efficiency of expenditure and that the governance process has been followed.

Project progress is recorded and monitored using an enterprise-wide project management tool and undergoes a monthly review. Exception reporting is provided to the Executive and Board monthly, covering; HSE, performance against schedule, financial performance, issues, challenges, and risks. HSE and risk are also reported through to the Board using our risk software application known as ARM. Risks are escalated to the Board Risk Committee as required.

Monthly reviews of each project are carried out by the Senior Project Manager and Vector's FSP to ensure that projects are going to plan and identify issues, constraints, and challenges. The performance of projects in delivery is also reviewed through these meetings.

Approvals are required before any commitment is made. Approvals are governed by Vector's Delegated Authority Framework.

The capital works delivery process includes five primary stages: Risk assessment and Project identification, Scoping, Feasibility assessment, Procurement, and Delivery (Construction, Commissioning and Closeout). Table 8-1 provides an overview of the processes undertaken under each of these phases.

PHASE	ACTIVITY OVERVIEW
Identification of network risk and the need for a project or program	• Network risk, network need requirement and options analysis • Project prioritisation • Establish base cost estimate • Needs statement • Recommendation for inclusion in AMP
Scoping	• Development of initial (preliminary) project scope • Cost estimation • Assessment of alternate project options • Determination of key project risks • Procurement analysis (identification of long lead time items) • Prepare Development Funding Application (CEJ)
Feasibility	• Identification and assessment of project-specific risks/issues • Surveying and/or Geotech investigation, flood risk assessment etc. • Early Contractor Investigations • Design concepts development and review • Safety in Design (SID) • Finalise project scope • Detailed design • Cost estimation and detailed materials list • Early procurement (long lead time items only) • Prepare Full Funding Application (CEJ) – Business case
Procurement	• Preparation of contract documentation

Delivery	• Cost, Schedule, and Quality performance monitoring • Risk and issues management • Construction • Commissioning • Handover / Project close

TABLE 8-1: PROJECT LIFECYCLE DELIVERABLES

8.1.1 PROCUREMENT

The majority of the gas distribution equipment required for Vector's capital, customer and maintenance delivery programmes is sourced by the approved FSPs for installation. Equipment is sourced by the FSP's, to Vector's specifications, with the cost passed through to Vector when the item is installed. When non-standard equipment is purchased for the first time it goes through a management of change process to evaluate technical, commercial, and operational benefits and risks before being deployed.

Procurement of the works is through our Multi Utility Services Agreement (MUSA) contract using our FSPs for all maintenance and capital works.

8.1.2 CUSTOMER INITIATED CAPITAL PROJECTS – CUSTOMER DELIVERY TEAM

The Customer Delivery team delivers customer-initiated capital projects such as subdivisions and commercial connections. We use an outsourced delivery model where our FSPs design and deliver the works. With around 30 customer-initiated projects per year, the FSPs knowledge of the local network is critical in delivering these smaller, short-duration capital projects effectively.

Within Vector we have a team of customer advisors that administer the project delivery and maintain the interface with the customer and liaise with the Gas Networks team.

The MUSA capital works job sheet provides a simple and well-understood contract engagement that reduces the administrative costs associated with tendering works while ensuring we demonstrate value for money through comparison with similar recent works and standard negotiated rates.

RESOURCE SCHEDULING

The priority of customer-initiated projects is generally governed by when the client contracts Vector to deliver the works. FSP resource levelling and outage scheduling are then used to fine-tune delivery scheduling.

FEASIBILITY AND DETAILED DESIGN

The gas network design of projects delivered by the Customer Delivery Team consist mostly of distribution designs that includes MP4 PE networks. These designs do not require a multi-disciplinary approach and its singularity of design is ideally suited for design by our FSPs, with technical approval by Vector.

DELIVERY

Vector relies on two FSPs for the delivery of all customer-initiated works.

Vector's customer advisors use our Customer Management application, Siebel, to monitor project progress through the various delivery stages. Change control of projects within the Customer Delivery team is generally through a client agreed variation.

Our FSPs commission equipment being brought onto the network to ensure it complies with our standards and can be operated and maintained safely. Once complete they update Vector's information systems and hand the installation to Vector.

8.1.3 MAJOR CAPITAL PROJECTS – GAS NETWORKS TEAM

Major capital projects are works identified from an assessment of network risks and a high level assessment of solutions. The projects are then ranked, included, and scheduled in the AMP for capital delivery. Major capital projects are delivered by the Gas Networks team.

We use a mixture of in-house project managers (PM) and contracted project managers to manage the delivery of projects. This enables us to closely match capability and capacity.

To generate competitive tension while ensuring that we maintain extremely high quality and safety standards, we tender works through two closed contracting groups.

To help our contractors manage their workflow we provide a forward works view looking out 18 months in six-month horizons. Additionally, all our major projects are published on the Auckland Council's Forward Works viewer to help identify synergies across electricity, gas, fibre, and other utility projects.

RESOURCING AND SCHEDULING

Resourcing and scheduling of major projects is managed by the Vector Senior Project Manager and the FSP's Senior Project Manager. The FSP is responsible for resourcing and scheduling of projects once agreed with Vector's Senior Project Manager.

SCOPE OF WORKS AND DESIGN

The delivery of major capital projects is initiated when a scope of works and project brief are delivered by Vector's Asset Engineer's or Specialists to Vector's Senior Project Manager. The project is then reviewed in a meeting attended by key stakeholders e.g. the project owner (the scope author), the Vector Senior PM, along with Vector Gas and FSP team members as appropriate.

The scope of works and technical safety in design are discussed to ensure clarity and provide opportunity for implementation of lessons learned. Once completed, the project brief is signed and issued for pricing and delivery.

PRICING

Depending on the nature and scale of a project, we have the option to price or tender projects via our FSPs. Some major projects maybe tendered via NZS 3910 contracts. Generally, we allow six weeks for the contractor to prepare their offer. The pricing/tender period will increase or decrease depending on the complexity of the works and/or the volume of tenders in progress.

FSP pricing is reviewed via a meeting attended by key stakeholders e.g. the project owner (the scope author), the Vector Senior PM, along with Gas Networks and FSP team members as appropriate.

FSP tenders are reviewed privately by the project owner (the scope author), the Vector Senior PM, along with Vector Gas team members as appropriate.

NZS 3910 tenders are controlled by the PMO and once the contractor's offer is received, a PM leads a team that assesses the offer. The non-priced sections of the offer are assessed before the PM is provided with the priced information. This ensures we focus on the quality of the solution before we consider the price. Once an offer has been selected, we engage the contractor using a modified NZS 3910 contract.

DELIVERY

Our project managers have an active role in every step of the delivery of their projects. Our project delivery model is based around the PMI delivery framework. Additional support is provided through an internal team, including HSE, procurement, engineer to contract, RMA, quantity survey and risk specialists.

Projects are reviewed by the Gas Networks Team and FSP on a monthly basis. This includes project programmes and financial forecasting. The Vector Senior PM leads the reviews.

Financial performance is also tracked monthly by the PMO.

COMMISSIONING

When a project is complete and commissioned a final site over walkover and inspection is held. The FSP will update all relevant Vector systems and provide a completion package with all the necessary documentation. The general quality of the works is also checked, and "snag" lists compiled as necessary. Once all outstanding issues have been resolved the project is formally handed over to Vector. A lessons learnt session is held and the project brief review is completed.

8.2 Maintenance works delivery

8.2.1 FIELD SERVICE MODEL

Vector uses Omexom to undertake maintenance activities on Vector's behalf.

Omexom operate under the MUSA. The scope of the gas maintenance contract is to deliver the planned, corrective, third party services and reactive maintenance works programmes, based on the requirements set by our suite of maintenance standards.

The MUSA contract defines the responsibilities, obligations, and Key Performance Indicators (KPIs) to complete scheduled works. Vector maintains a library of maintenance standards which Omexom must comply with when performing their duties.

The delivery of all these maintenance activities is closely monitored monthly to ensure the agreed annual target volumes are achieved. Extensive monthly feedback is obtained on actual versus planned progress, KPI performance, causality and issues impacting progress or performance, new risks, action plans and focal points for the coming months.

The overall effectiveness of the programme is evaluated by contract KPI performance and the roll-up to Vector's corporate performance metrics, of which environmental compliance, public, employee and contractor safety are the core measures.

Standard rates and allocations for prescribed activities are reviewed on an annual basis. Out of cycle rate increases or new rates arising from changes to standards, legislative requirements or other special circumstances are negotiated and managed using the contract change management process.

8.2.2 GOVERNANCE – REPORTING AND APPROVALS

Performance against the annual budgets is closely monitored, with formalised change management procedures in place. Regular reports monitor:

- Health, safety, and environmental issues;
- Monthly overall expenditure against budget; and
- Performance metrics.

Implementation of the AMP requires decisions to be made by both the board and management at all levels, reflecting their functional responsibilities and level of Delegated Financial Authorities (DFAs), as set under the Vector governance rules. Functional responsibilities define the role of each staff member in the organisation. The DFAs specify the level of financial commitment that individuals can make on behalf of the company.

8.3 Investment prioritisation process

The key objectives of asset management, as stated in Vector's Asset Management Policy, relate to safety, reliability and the environment (see Section 4.1) with performance against these objectives captured by the service level metrics (see Section 3 –). By using a robust portfolio prioritisation process, Vector aims to ensure that the investment required to meet these objectives and targeted service levels is efficient, bringing the greatest total benefit to our customers. This is also an important step towards achieving best industry practice in asset management principles, prescribed in ISO 55000.

The planning process is described below and is undertaken yearly as part of Vector's annual budgeting cycle.

- **Project proposals:** Once the need for a project has been identified, project proposals are created. The need of the projects is underpinned by customer needs, asset conditions and risks, network performance and strategies. Project proposals are prepared by Vector's subject matter experts;
- **Preliminary investment plan:** Project proposals are peer reviewed to ensure consistency of project proposals before incorporation into the preliminary investment plan. In this preliminary plan, projects are staggered to account for the realistic volume of work that can be undertaken in each year. This uses engineering judgement to take into consideration resources available for delivery including the construction and procurement capabilities available. Any synergies and interdependencies between projects are highlighted and incorporated into the preliminary plan;
- **Portfolio prioritisation:** The preliminary investment plan is assessed against the resource and financial constraints, and where appropriate prioritised considering the key business objectives. The business objectives of a project proposal are expressed based in terms of improvements to service level metrics or in terms of risk mitigation;
- **Draft investment plan:** Once projects have been through the prioritisation process, the draft investment plan is formed. This plan is reviewed and approved by the executive management team. The risk associated with projects that have not formed part of the draft investment plan following optimisation is highlighted and acknowledged; and
- **Final Investment Plan:** Following consideration and approval by the executive management team, the final investment plan is reviewed and approved by the Board.

8.4 Resource requirements and constraints

Vector has a MUSA with two key contractors, and they are known as our Field Service Providers. We provide project guidance to our FSPs in monthly meetings where we disclose the upcoming programmes of work. It is our expectation that the FSPs manage their resources to meet this pipeline of work.

Typically, Vector uses the MUSA as the contract mechanism for delivering projects including the civil works.

Designs for all delivery projects are reviewed and approved by Vector. Further internal engineering support is provided by Vector's Asset Engineers and Specialists. At any time during the delivery of these projects, Vector may engage specialist consultants to assist. For example, consultants are used to:

- Compile, submit and facilitate resource consents;
- Define the scope associated with the removal of hazardous material such as asbestos;
- Mechanical engineering peer reviews;
- Route assessment and design; and
- Undertake geotechnical studies.

SECTION 09

Expenditure forecast

9 – Expenditure forecast

9.1 Overview

This section describes the CAPEX and OPEX forecasts for the gas distribution network assets for the next 10-year planning period based on the investment proposals outlined in Section 7 –. It includes context for key assumptions and provides a high-level comparison with the forecast included in the 2022 AMP (disclosed in June 2022), highlighting how our investment plan has evolved over the last year.

The CAPEX and OPEX forecasts presented in this section align with Vector's planning process and financial year (FY) reporting period 1 July to 30 June. All figures presented are in 2024 dollars (note: Section 7 – figures are in 2023 dollars). The regulatory disclosure forecast, shown in Section 10.10 and Section 10.11, are presented in both constant and nominal dollars, as per the Information Disclosure requirements.

9.2 Capital expenditure forecast

Table 9-1 shows the forecast CAPEX during the planning period, broken down into the asset categories defined in the Commerce Commission's Gas Distribution Information Disclosure Amendments Determination 2012. The figures are presented in 2024 dollars.

Note: Network equipment expenditure ($1.6m) that was previously categorised as asset replacement and renewal has been reallocated to non-network to better reflect the nature of the expenditure. Network equipment in the previous AMP forecast has also been recategorized ($1.0m) for the purpose of comparing our expenditure to last year, shown in Table 9-2.

AMP2023 ($'000)	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	TOTAL
Consumer connection	11,601	10,755	10,246	9,959	10,265	9,679	9,208	8,867	8,646	8,646	97,872
System growth	816	420	1,106	1,341	1,650	1,207	699	699	699	699	9,336
Asset replacement and renewal	4,069	3,500	2,939	2,830	3,087	2,778	2,778	2,935	2,935	2,935	30,786
Asset relocations	3,346	3,346	3,346	3,346	3,346	3,346	3,346	3,346	3,346	3,346	33,464
Quality of supply	288	526	0	378	0	473	0	0	0	0	1,665
Legislative and regulatory	0	0	0	0	0	0	0	0	0	0	0
Other reliability, safety and environment	294	513	455	524	363	628	306	378	398	263	4,123
Non-network asset	3,667	3,217	2,273	2,502	3,318	2,543	1,824	1,684	1,452	1,116	23,595
Total CAPEX	**24,081**	**22,278**	**20,365**	**20,882**	**22,029**	**20,653**	**18,161**	**17,910**	**17,476**	**17,005**	**200,840**

TABLE 9-1 AMP 2023 CAPEX FORECAST (FINANCIAL YEAR, $'000 CONSTANT FY24)

9.2.1 CAPEX FORECAST VARIANCE TO PREVIOUS AMP

The forecast CAPEX during the next 10-year planning period is broken down into the key asset categories defined in the Commerce Commission's Gas Distribution Information Disclosure Amendments Determination 2012. Figure 9-1 shows the difference between the 2023 and 2022 AMP (adjusted for actual inflation, and alignment of network equipment to non-network asset) expenditure forecasts year on year, with Table 9-2 breaking down the variance by expenditure categories.

AMP MOVEMENT 2023 V 2022

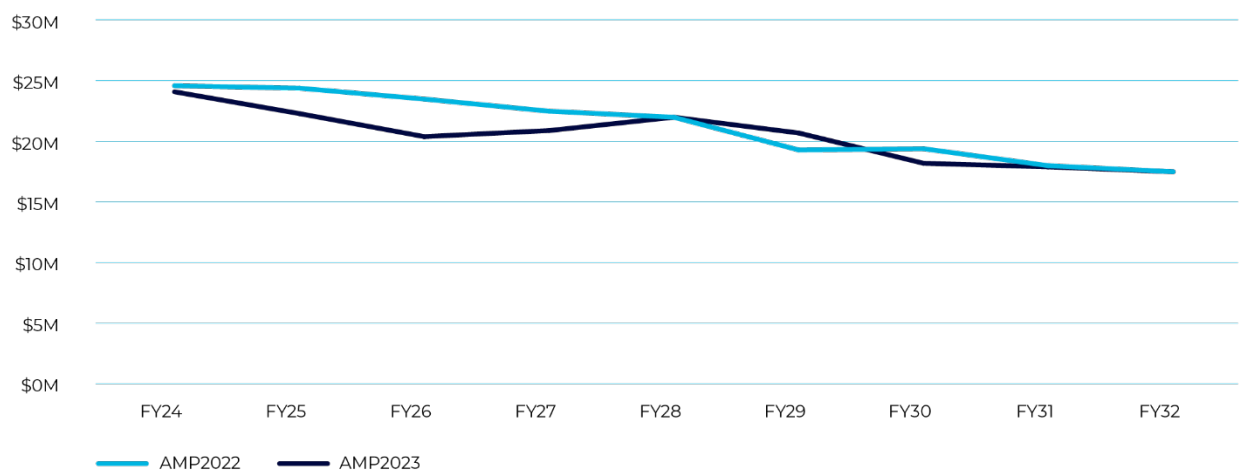


FIGURE 9-1: AMP 2023 VARIANCE TO AMP2022 CAPEX FORECAST (FINANCIAL YEAR, $'M CONSTANT FY24)

2023/2022 AMP[17] VARIANCE ($'000)	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	TOTAL
Consumer connection	(3,124)	(3,420)	(2,996)	(2,372)	(1,420)	(1,564)	(1,722)	(1,210)	(1,018)	(18,848)
System growth	(509)	(1,321)	95	(400)	(1,120)	476	(368)	(31)	(31)	(3,210)
Asset replacement and renewal[18]	608	(21)	(483)	(493)	(14)	67	(137)	168	211	(94)
Asset relocations	190	190	190	190	190	190	190	190	190	1,708
Quality of supply	7	526	0	378	0	473	0	0	0	1,384
Legislative and regulatory	0	0	0	0	0	0	0	0	0	0
Other reliability, safety and environment	58	64	62	64	60	66	59	60	61	554
Non-network asset	2,273	1,892	17	985	2,363	1,684	710	769	607	11,301
Total CAPEX	**(497)**	**(2,092)**	**(3,115)**	**(1,649)**	**58**	**1,393**	**(1,269)**	**(54)**	**19**	**(7,205)**

TABLE 9-2: AMP 2023 VARIANCE TO AMP2022 CAPEX FORECAST TABLE (FINANCIAL YEAR, $'000 CONSTANT FY24)

9.2.2 EXPLANATION OF MAJOR NETWORK CAPEX VARIANCES

Key changes in network CAPEX over the 9 years for which the 2022 AMP and 2023 AMP overlap are as follows:

- A significant reduction in customer connection expenditure ($19m) largely driven by a reduction in reticulation and connection activities, and to a lesser extent a lower average residential connection cost due to a higher proportion of standard connection that is at lower cost compared to non-standard connections.
- System growth expenditure is forecast to be $3m lower than previous year to due to a more targeted approach to address specific network constraints, and a removal of two future proofing ducts project to reflect a lower risk in demand profile from a lower connection forecast.
- Asset integrity expenditure, including asset replacement forecast and other reliability, safety and environment forecast are largely in line with last year ($0.5m higher).
- Asset relocation is $1.7m higher as a result of an adjustment to the long term forecast base rate due to a higher inflation rate applied to the historical expenditure that forms the average cost base.
- Quality of supply forecast is $1.4m higher attributed to 3 projects identified over the planning period to improve the reliability of network and minimise customer outages that could result from storms, land slips or third party damages.

[17] AMP2022 forecast expenditure is adjusted based on actual inflation.

[18] Network equipment in AMP2022 is recategorized into the non-network category to better reflect the nature of the expenditure and to be consistent with the AMP2023 for the purposes of the variance comparison.

9.2.3 EXPLANATION OF MAJOR NON-NETWORK CAPEX VARIANCES

Key changes in non-network CAPEX over the 9 years for which the 2022 AMP and 2023 AMP overlap are as follows:

- An increase in core digital investment of $6.4m for infrastructure and application life cycle management, data centre relocation, continuation of the network modernisation programme and retiming of some investments during the planning period.
- An increase in network digital expenditure of $3.5m for PI and core gas telemetry system upgrades, data platform & data insights work to support optimisation and other smaller investment increases for customer self-service and OT network security.
- An $1.1m increase in property and leases.

9.3 Operating expenditure forecast

Table 9-3 shows the forecast OPEX during the planning period, broken down into the asset categories defined in the Commerce Commission's Gas Distribution Information Disclosure Amendments Determination 2012. The figures are presented in 2024 dollars.

2023 AMP ($'000)	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	TOTAL
Service interruptions and emergencies	2,516	2,516	2,516	2,516	2,516	2,516	2,516	2,516	2,516	2,526	25,173
Routine and corrective maintenance and inspection	3,860	3,874	3,760	3,858	3,752	3,902	3,702	3,756	3,759	3,796	38,018
Asset replacement and renewal	0	0	0	0	0	0	0	0	0	0	0
System operations and network support	3,909	4,120	4,140	4,140	4,140	4,140	4,140	4,140	4,140	4,140	41,147
Business support	6,726	6,726	6,726	6,726	6,726	6,726	6,726	6,726	6,726	6,726	67,258
Total OPEX	**17,011**	**17,236**	**17,142**	**17,240**	**17,134**	**17,284**	**17,084**	**17,138**	**17,141**	**17,187**	**171,597**

TABLE 9-3: OPEX FORECAST (FINANCIAL YEAR, $'000 CONSTANT FY24)

9.3.1 OPEX FORECAST VARIANCE TO PREVIOUS AMP

The forecast OPEX during the next 10-year planning period is broken down into the key asset categories defined in the Commerce Commission's Gas Distribution Information Disclosure Amendments Determination 2012. Figure 9-2 shows the difference between the 2023 and 2022 AMP expenditure forecasts year on year, with Table 9-4 breaking down the variance by expenditure categories.

AMP MOVEMENT 2023 V 2022

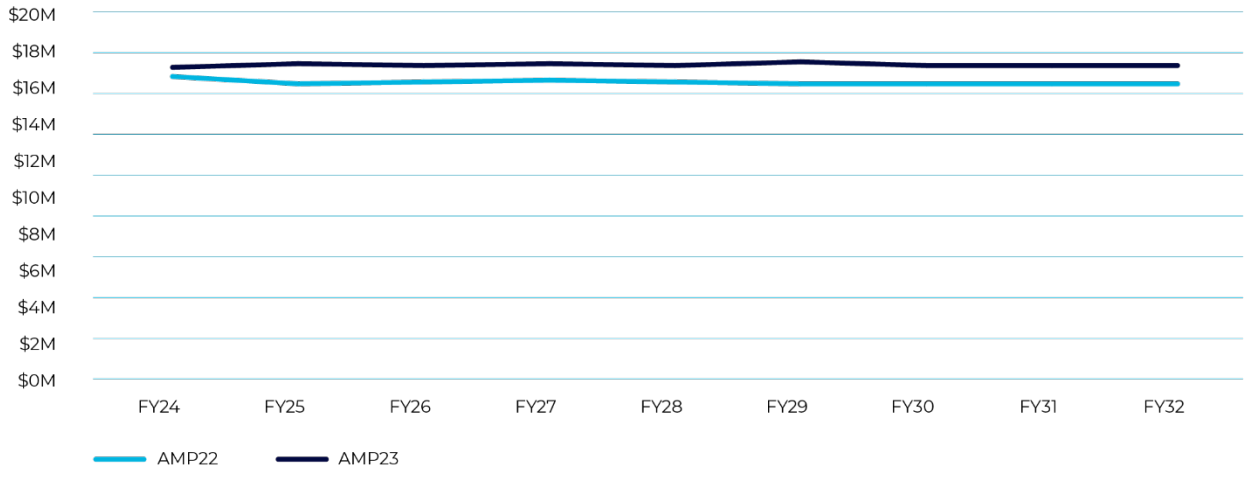


FIGURE 9-2: AMP 2023 VARIANCE TO AMP2022 OPEX FORECAST (FINANCIAL YEAR, $'M CONSTANT FY24)

2023/2022 AMP VARIANCE ($'000)	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	TOTAL
Service interruptions and emergencies	(43)	(43)	(43)	(43)	(43)	(43)	(43)	(43)	(43)	(388)
Routine and corrective maintenance and inspection	(44)	(291)	(154)	(158)	(76)	(332)	(153)	(200)	(221)	(1,629)
Asset replacement and renewal	0	0	0	0	0	0	0	0	0	0
System operations and network support	435	120	100	100	100	100	100	100	100	1,258
Business support	(883)	(883)	(883)	(883)	(883)	(883)	(883)	(883)	(883)	(7,947)
Total OPEX	**(536)**	**(1,096)**	**(979)**	**(984)**	**(901)**	**(1,158)**	**(979)**	**(1,026)**	**(1,047)**	**(8,706)**

TABLE 9-4: AMP 2023 VARIANCE TO AMP2022 OPEX FORECAST TABLE (FINANCIAL YEAR, $'000 CONSTANT FY24)

9.3.2 EXPLANATION OF MAJOR NETWORK OPEX VARIANCES

Key changes in network OPEX over the 9 years for which the 2022 AMP and 2023 AMP overlap are as follows:

- A $1.6m increase in routine and corrective maintenance for additional below ground safety inspections and an increase in valve maintenance and disconnection activities; and
- A $0.4m increase due to reactive response activities.

9.3.3 EXPLANATION OF MAJOR NON-NETWORK OPEX VARIANCES

Key changes in non-network OPEX over the 9 years for which the 2022 AMP and 2023 AMP overlap are as follows:

- An increase in business support costs due to an increase in maintenance hardware and software services for GIS, SAP, Siebel, cyber security services, and digital subscriptions ($5.1m);
- An increase in administration costs, largely relating to insurance and director fees ($0.6m), computer expenses for cloud integration ($1.4m) and other administration cost of ($0.4m);
- A new provision for purchasing smart gas meter data ($0.5m); and offset by
- A decrease of $1.3m in system operations and network support costs.

9.4 Inputs and assumptions

This section outlines key inputs and assumptions used for the forecast expenditure in the AMP planning period. Estimates for projects and programmes for the first few years in the AMP period receive a higher level of scrutiny during the compilation of estimates and thus have a higher level of accuracy than projects in the latter years.

9.4.1 NETWORK CAPITAL EXPENDITURES

SPECIFIC PROJECTS

The requirement to invest capital for specific individual projects is either borne out of large customer connection requests, asset relocations triggered by third party infrastructure projects, asset condition and failure risks and network system reinforcement requirement for security of supply.

Vector has extended the use of Condition Based Asset Risk Management (CBARM) modelling to include pipeline assets to support and prioritise asset replacement requirements over the 10-year forecast horizon.

The CBARM models are based on the principles and calculation methodologies outlined in the OFGEM DNO Common Methodology and tailored to reflect Vector's operational environment. The models incorporate Vector's input data such as historical failure rates, to predict the volume of assets that will need to be replaced and thus the level of investment needed to manage each of the asset classes. Historical actual costs are used as the basis for the unit cost applied in the forecast expenditure.

The assumptions and processes that build up the reinforcement expenditure are detailed in Section 10.4. It is initiated by an annual assessment of the customer peak loading on all pressure systems and district stations. Any capacity shortfalls and breaches of our security of supply standard are identified through network constraint modelling and solutions are assessed and proposed through investment option analysis.

Cost estimation for specific capital projects involves site inspections to determine constraints and risks. From this, a scope is compiled with a relatively detailed project estimate. The cost estimate is built with a bottom-up approach using a standardised cost estimating for materials and plant, standard rates for internal staff time writing and standard agreed rates for external commissioning support and contracted project management.

PROGRAMMES OF WORK

Forecasting for volumetric programmes of work applies to most of Vector's customer connection expenditure and investment relating to Vector's distribution assets.

The forecast for customer connections volumes is supported by data from the Auckland Forecasting Group (AFG). The cost estimates for customer connections are based on an average cost using historical data.

For distribution assets, Vector has continued with the use of CBARM models for asset classes including pipelines, district stations, valves and special crossings.

9.4.2 NETWORK DIGITAL ASSUMPTIONS

Given the fast-changing landscape, the uncertainty in investments increases with time. There is reasonable certainty for the investments in the initial 18-24 months with less certainty beyond that. The investment forecasts provided are based on current knowledge based upon projects being currently undertaken and market conditions. Vector has a standard quarterly planning process that reviews investments, reprioritises as required and follows a business case process to proceed with investments.

Key assumptions in our forecasts include support for all existing platforms is provisioned thus not requiring unexpected replacement. Specifically, current SAP version support will continue through to 2027. In addition, cybersecurity threats will remain at a level where current investment forecasts are sufficient to protect Vector systems and respond to incidents within the IT domain. Investment forecasts do assume increased investment in OT Cybersecurity controls as the number of sensors and devices connecting to the OT network increases.

9.4.3 PROPERTY AND LEASES

The mitigation of risks associated with COVID-19 has been the major impact on the assumptions in the lease and property forecasts. Larger warehousing arrangements for increased stock holding to minimise the impact on the supply chain has been assumed. Also, no significant changes have been made to the forecasts for the expected Head Office move in RY24 as operating costs are expected to be in line with current levels of spend. Relevant capital expenditure related to the Head Office move has been included in the CAPEX forecast.

9.4.4 OPERATING EXPENDITURES

To a large extent, the network operating expenditure relates to a programme of planned maintenance work driven by a suite of maintenance standards and associate corrective maintenance. To this end, our planned maintenance network operating expenditure forecast has been constructed bottom-up, taking into consideration the various activity unit rates, frequencies and the quantum of activities.

We have constructed the non-network operating expenditure forecast primarily based on the existing operating structure with modifications for known changes and excludes one-off transitional type cost items. Further, in certain instances, we have relied on historical averages to form a baseline view, where we believe forecasting the expenditure items with a reasonable degree of accuracy is challenging.

SECTION 10

Appendices

10 –Appendices

10.1 Appendix A – Glossary of Terms

ADMS	Advanced Distribution Management System
AMMAT	Asset management maturity assessment tool
AMP	Asset management plan
ARM	Active risk manager
BCM	Business continuity management
CAIDI	Customer average interruption duration index
CAPEX	Capital expenditure
CBARM	Condition based asset risk management
CIV	Customer isolation valve
CMS	Customer management system
COO	Chief operating officer
CP	Cathodic protection
DAF	Delegated authorities framework
DFA	Delegated financial authority
DPP	Gas distribution services default price-quality price path determination
DRS	District regulating station
EHMP	Electrical hazard management plan
EPR	Earth potential rise
ERP	Enterprise resource planning
FSA	Formal safety assessment
FSP	Field service provider
GCE	Group chief executive
GIS	Geographical information system
GMS	Gas measurement system
GNS	Gas network standard
GPRS	General packet radio service
GSM	Global system for mobile communication
HILP	High impact, low probability
HP	High pressure
ICP	Installation control point
IP	Intermediate pressure
ISO 55001	International standard for asset management
IT	Information technology
km	Kilometre
LP	Low pressure
MAOP	Maximum allowable operating pressure
MinOp	Minimum operating pressure
MP	Medium pressure
MUSA	Multi utility service agreement
NOP	Nominal operating pressure

NZS	New Zealand standard
PDF	Project delivery framework
PE	Polyethylene
PJ	Peta joule
PRE	Public reported escape
PVC	Polyvinyl chloride
QoS	Quality of supply
RBA	Risk Based Approach
RIMS	Risk and incident management system
RTE	Response time to emergencies
RTU	Remote Telemetry Unit
SAIDI	System average interruption duration index
SAIFI	System average interruption frequency index
SAP	Systems applications and processes (Vector's corporate enterprise resource planning system)
SCADA	Supervisory control and data acquisition system
scmh	Standard cubic metres per hour
SoS	Security of supply
SMS	Short message service (communications)

10.2 Appendix B – Key Asset Strategies and Standards

Vector has a set of asset strategies and standards that together define Vector's approach to Asset Management. An overview of the key policies and standards are set out below.

ASSET CLASS	PIPELINES
Strategies	GAA0002 Pipelines
Equipment Specifications	GNS-0029 Specification for polyethylene pipe GNS-0030 Specification for polyethylene fittings GNS-0031 Specification for polyethylene to steel transition fittings GNS-0033 Specification for steel pipe GNS-0034 Specification for steel pipe coating GNS-0035 Specification for steel fittings and flange components GNS-0036 Specification for steel punch tees GNS-0037 Specification for stainless steel tube and fittings GNS-0038 Specification for ducts and sleeves GNS-0048 Specification for repair clamps GNS-0050 Specification for polyethylene to steel transition risers GNS-0055 Specification for under pressure fittings
Maintenance and Operations Standards	GNS-0018 Network protection GNS-0019 Leakage survey GNS-0020 Odourisation system maintenance GNS-0021 Service pipe inspectionsGNS-0024 System pressure monitoring GNS-0069 Pressure uprating without decommissioning GNS-0093 Defining the end of the network
Planning & Design and Construction Standards	GNS-0002 Piping system design GNS-0007 Class location GNS-0064 Construction of steel pipe systems GNS-0065 Construction of plastic pipe systems GNS-0066 Purging GNS-0067 Hot tapping and flow-stopping GNS-0068 Steel non-destructive testing and inspection GNS-0072 Plastic pipe insertion

ASSET CLASS	PRESSURE STATIONS
Strategies	GAA0004 Pressure stations
Equipment Specifications	GNS-0039 Specification for filters GNS-0044 Specification for pressure regulators GNS-0045 Specification for meters GNS-0049 Specification for pressure gauges
Maintenance Standards	GNS-0012 Maintenance of gate and district regulating stations GNS-0073 Service regulator maintenance
Planning & Design and Construction Standards	GNS-0001 Design of district regulating stations GNS-0056 Construction of district regulating stations

ASSET CLASS	VALVES
Strategies	GAA0006 Belowground valves GAA0007 Riser assembly
Equipment Specifications	GNS-0032 Specification for polyethylene ball valves GNS-0040 Specification for steel ball valves GNS-0041 Specification for riser assembly GNS-0042 Specification for butterfly valves GNS-0047 Specification for valve boxes
Maintenance Standards	GNS-0013 Valve maintenance
Planning & Design and Construction Standards	GNS-0057 Construction of valve installations

ASSET CLASS	CORROSION PROTECTION SYSTEMS
Strategies	GAA0003 Corrosion protection systems
Equipment Specifications	GNS-0051 Specification for corrosion protection wrapping materials GNS-0052 Specification for anodes GNS-0054 Specification for insulating joints
Maintenance Standards	GNS-0014 Maintenance of above ground coating systems GNS-0015 Maintenance of below ground corrosion protection systems
Planning & Design and Construction Standards	GNS-0003 Design of above ground coatings for steel assets GNS-0004 Design of below ground corrosion protection systems GNS-0058 Construction of above ground corrosion protection systems GNS-0059 Construction of below ground corrosion protection systems

ASSET CLASS	TELEMETRY EQUIPMENT
Strategies	GAA0001 Telemetry equipment
Equipment Specifications	GNS-0046 Specification for Telenet equipment
Maintenance Standards	GNS-0016 Telenet maintenance
Planning & Design and Construction Standards	GNS-0005 Design of Telenet systems GNS-0060 Construction of Telenet systems

ASSET CLASS	SPECIAL CROSSINGS
Strategies	GAA0005 Special crossings
Equipment Specifications	Covered in above asset categories
Maintenance and Operations Standards	GNS-0095 Maintenance of special crossings
Planning & Design and Construction Standards	Covered in above asset categories

ASSET CLASS	GENERAL
Strategies	Not applicable
Equipment Specifications	GNS-0043 Specification for asset identification markers
Maintenance/Operations Standards	GNS-0011 Continuing surveillance GNS-0017 Asset repair GNS-0022 Decommissioning of assets GNS-0070 Gas leak investigation GNS-0071 Material and equipment failures GNS-0078 Maintenance of critical spares and equipment GNS-0080 Personnel qualificationGNS-0082 Auditing GNS-0083 Gas safety and operating plan GNS-0084 Technical records management GNS-0085 Management of change GNS-0087 Asset condition grading
Planning & Design and Construction Standards	GNS-0008 Pressure classification and operating ranges GNS-0009 Distribution system analysis GNS-0062 Pressure testing GNS-0063 As-built field recording GNS-0074 Gas distribution quality of supply criteria GNS-0086 Gas distribution forecast utilisation GNS-0089 Gas distribution model building GNS-0096 Safety in design GNS-0098 Gas distribution emissions reporting methodology

HEALTH, SAFETY AND ENVIRONMENT KEY REQUIREMENTS
HSEMS01 HSEMS Overview
HSEMS02 Strategy, Leadership and Behaviour
HSEMS03 Training and Competence
HSEMS04 Engagement, Participation and Consultation
HSEMS05 Contractor Management
HSEMS06 Emergency Management
HSEMS07 Wellness and Fitness to Work
HSEMS08 Risk Management
HSEMS09 Incident Management
HSEMS10 Audits, Reviews and Performance Reporting
HSEMS11 Operational Control
HSEMS12 Project Management
HSEMS13 Legal Compliance
HSEMS14 Document, Data and Record Management
HSEMS15 Action Management

GAS DISTRIBUTION OPERATING STANDARDS
UCO004 Networks Event Management and Investigation
GNS-0081 Gas distribution network performance indicator data capture
GNS-0083 Gas safety and operating plan
GEG-0001 Earthquake event guide
GEG-0002 Intermediate pressure pipeline event guide
GEG-0003 Gas emergency response event guide

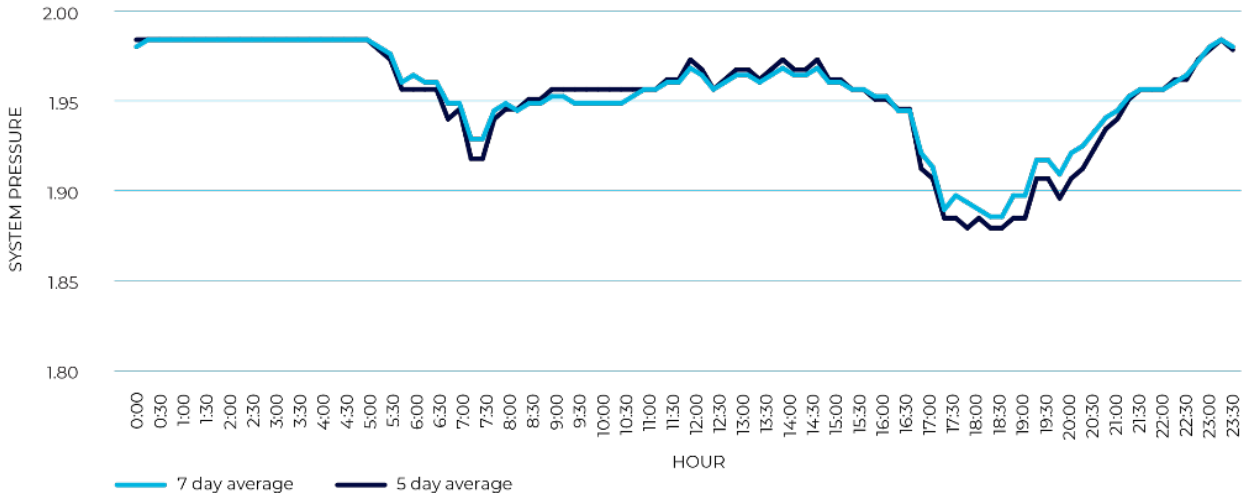
10.3 Appendix C – Asset Management Metrics

CLASSIFICATION	METRIC	FY18	FY19	FY20	FY21	FY22
Interruptions	Number of planned interruptions on the network (Class B)	357	389	423	443	427
Interruptions	Number of unplanned interruptions on the network (Class C)	38	36	32	38	35
Interruptions	Number of unplanned interruptions caused by third party damage (Class I)	195	181	146	139	158
Interruptions	Number of unplanned outage events (interruptions that affect more than 5 ICPs)	6	5	1	3	2
Interruptions	Number of unplanned outage events caused by third party damage (interruptions that affect more than 5 ICPs)	4	4	1	3	1
Reliability	SAIDI - Based on the total number of interruptions	1,013	1,110	1,316	745	952
Reliability	SAIDI - Class B (planned interruptions on the network)	386	392	767	390	468
Reliability	SAIDI - Class C (unplanned interruptions on the network)	220	379	137	149	267
Reliability	SAIDI - Class I (unplanned interruptions caused by third party damage)	407	339	412	206	217
Reliability	SAIFI - Based on the total number of interruptions	7.2	7.6	6.5	6.2	6.5
Reliability	SAIFI - Class B (planned interruptions on the network)	4.3	4.0	4.7	4.2	4.3
Reliability	SAIFI - Class C (unplanned interruptions on the network)	0.6	0.4	0.3	0.5	0.4
Reliability	SAIFI - Class I (unplanned interruptions caused by third party damage)	2.4	3.1	1.6	1.6	1.7
Reliability	CAIDI - Based on the total number of interruptions	140	147	201	119	147
Reliability	CAIDI - Class B (planned interruptions on the network)	90	97	165	94	108
Reliability	CAIDI - Class C (unplanned interruptions on the network)	360	873	419	302	652
Reliability	CAIDI - Class I (unplanned interruptions caused by third party damage)	172	110	264	130	127
System Condition and Integrity	Number of third party damage events per 1000 km	49	46	41	45	47
System Condition and Integrity	Leak detected by system survey per 1000 km	8.5	3.3	3.8	1.8	2.8
System Condition and Integrity	Number of non-compliant odour tests	0	0	0	0	0
Customer Service	Number of complaints per average total of customers	0.0012	0.0010	0.0010	0.0010	0.0010
Consumer Service	Number of telephone calls to emergency numbers answered within 30 seconds per total number of calls	78%	78%	91%	91%	79%
Customer Service	Number of emergencies	103	89	102	117	104
Customer Service	Average call response time (hours)	0.58	0.61	0.61	0.61	0.65

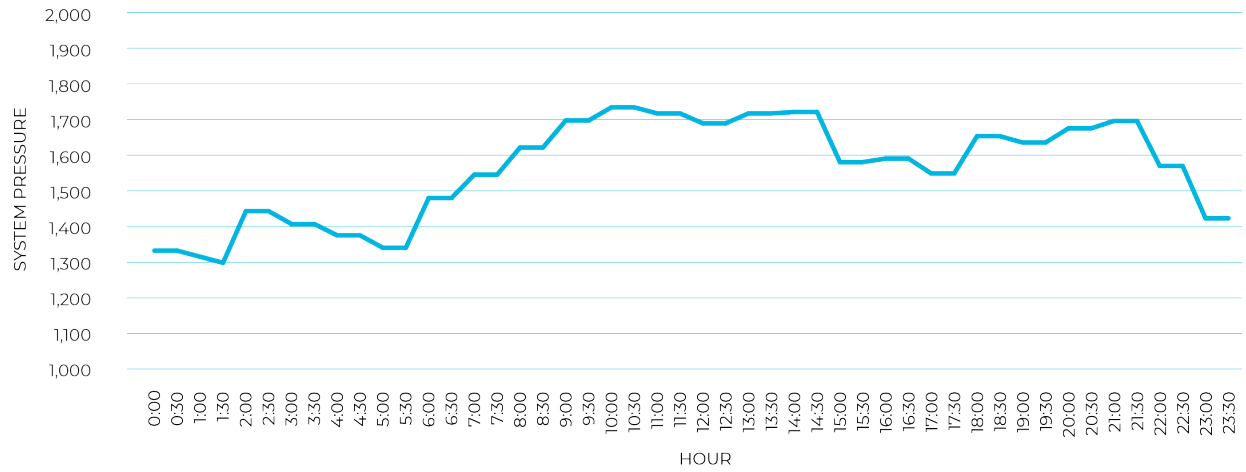
10.4 Appendix D – Typical Load Profiles

The typical daily winter pressure profile for residential loads and load profile for commercial/industrial customers are illustrated in the following figures. Residential load typically has two peaks whereas the commercial and industrial load is more consistent for the whole day.

TYPICAL DAILY PRESSURE PROFILE RESIDENTIAL – WINTER



TYPICAL DAILY PRESSURE PROFILE COMMERCIAL/INDUSTRIAL – WINTER



Demand curves for specific industrial consumers are far more variable - conforming closely to the nature of the customer's business. A typical industrial load curve is therefore not a meaningful concept.

A measure of load diversity is achieved with residential customers providing peaks in the morning and early evening, with the commercial and industrial load filling in the trough between these peaks. The mix of customer types within a distribution network, and their location, influences the size and duration of the peaks.

10.5 Appendix E – Load Forecast

	ACTUAL (SCMH)				FORECAST (SCMH)												ANNUAL GROWTH	TOTAL GROWTH
NETWORK SYSTEM	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032		
Alfriston	146	133	112	112	118	96	107	107	107	107	107	107	107	107	107	107	1.1%	11.3%
Central Auckland Network System (co-incident)	79,915	84,412	79,601	84,128	87,082	81,350	79,210	80,019	80,825	81,632	82,439	83,248	84,232	85,466	86,701	87,939	0.8%	8.1%
Drury Gate Station (co-incident)	2,200	2,236	2,466	2,106	1,961	1,859	1,930	1,940	1,951	1,961	1,971	1,981	1,992	2,002	2,012	2,022	0.9%	8.8%
Harrisville	3,613	3,516	3,788	3,572	3,183	3,569	4,140	4,140	4,140	4,140	4,140	4,140	4,140	4,140	4,140	4,140	1.6%	16.0%
Hunua (Vector)	625	619	648	618	881	877	707	711	715	720	724	728	732	736	740	745	-1.5%	-15.1%
Kingseat	8	8	20	11	8	8	5	5	5	5	5	5	5	5	5	5	-3.9%	-39.1%
Pukekohe	647	657	870	615	685	606	683	697	710	723	737	750	764	777	791	804	3.3%	32.7%
Ramarama	352	350	376	363	373	369	449	465	481	496	512	528	544	560	575	591	6.0%	60.2%
Tuakau	4,066	3,723	6,294	4,971	4,403	3,324	3,324	3,324	3,324	3,324	3,324	3,324	3,324	3,324	3,324	3,324	0.0%	0.0%
Waitoki	1,767	4,773	1,768	3,823	2,998	4,707	3,391	3,610	3,829	4,048	4,267	4,486	4,705	4,924	5,143	5,362	1.4%	13.9%
Warkworth	2,287	2,348	2,429	2,497	2,663	2,525	2,883	2,958	3,032	3,107	3,182	3,257	3,331	3,406	3,480	3,555	4.1%	40.8%
Wellsford	No data																	
Total	**95,626**	**102,774**	**98,372**	**102,814**	**104,354**	**99,289**	**96,829**	**97,976**	**99,119**	**100,263**	**101,407**	**102,554**	**103,875**	**105,447**	**107,019**	**108,595**	**0.9%**	**9.4%**

10.6 Appendix F – System Pressure Modelling Register

		BASE YEAR			10 YEAR FORECAST19		
PRESSURE SYSTEM	NOMINAL OPERATING PRESSURE (NOP) (KPA)	FLOW (SCMH)	MIN. OPERATING PRESSURE (KPA)	PROPORTION OF NOP	FLOW (SCMH)	MIN. OPERATING PRESSURE (KPA)	PROPORTION OF NOP
Broadway Park MP2	200	39	199	100%	42	198	99%
Bruce Maclaren IP10	1000	2,264	945	90%	2,447	939	89%
Central Auckland IP20	1900	81,350	1387	73%	87,925	1381	66%
Central Auckland MP4	400	31,384	290	72%	34,166	288	67%
Central Auckland MP7	700	6,685	644	92%	7,226	634	91%
Conifer Grove MP2	200	182	189	94%	210	186	93%
Drury NC MP4	400	1,717	315	79%	1,775	315	78%
East Auckland IP10	1000	6,806	685	69%	7,357	570	57%
East Auckland MP4	400	10,450	275	69%	11,296	241	60%
Glendene MP4	400	205	395	99%	237	310	78%
Harrisville MP7	700	3,569	464	66%	4,206	431	62%
Herd Road MP4	400	7	400	100%	8	400	100%
Holloway Place MP4	400	460	398	100%	530	397	99%
Landsford Crescent MP2	200	67	176	88%	77	175	87%
Mangere Bridge MP4	400	77	395	99%	89	395	99%
Manukau MP2	200	270	152	76%	311	143	72%
Manurewa IP10	1000	1,060	850	85%	1,145	845	85%
Manurewa North MP4	400	2,879	285	71%	3,101	248	62%
Manurewa South MP4	400	750	385	96%	810	378	95%
Monahan MP1	35	58	30	86%	67	29	84%
North Shore MP4	400	13,937	232	58%	15,820	289	72%
Pakuranga MP4	400	10	400	100%	12	399	100%
Panmure MP1	35	43	30	86%	50	29	83%
Papakura MP4	400	267	334	84%	304	318	80%
Penrose MP2	200	1,180	169	85%	1,284	164	82%
Puhinui MP4	400	42	398	100%	49	398	100%
Pukekohe IP10	1000	653	995	100%	898	992	99%
Pukekohe MP4	400	652	389	97%	896	381	95%
Ramarama MP4	400	376	261	65%	449	235	60%
South Auckland MP7	700	2,388	637	91%	2,581	626	89%
Te Atatu MP4	400	418	381	95%	482	377	94%
Totara Heights MP1	100	446	69	66%	514	62	60%
Tuakau IP20	1900	3,326	1679	88%	3,326	1,679	88%
Tuakau MP7	700	1,027	617	88%	1,027	617	88%

		BASE YEAR			10 YEAR FORECAST19		
PRESSURE SYSTEM	NOMINAL OPERATING PRESSURE (NOP) (KPA)	FLOW (SCMH)	MIN. OPERATING PRESSURE (KPA)	PROPORTION OF NOP	FLOW (SCMH)	MIN. OPERATING PRESSURE (KPA)	PROPORTION OF NOP
Universal Drive MP4	400	82	395	99%	95	393	98%
Waitoki IP20	1900	4,707	1,596	85%	5,248	1534	81%
Whangaparaoa MP4	400	3,956	286	72%	5,030	325	81%
Warkworth IP20	1900	950	1200	63%	1,520	950	50%
Warkworth MP4	400	1,713	330	83%	2,740	316	79%
Wattle Downs & Wiri MP4	400	884	343	86%	1,019	323	84%

10.7 Appendix G – AMP Information Disclosure Compliance

INFORMATION DISCLOSURE DETERMINATION REQUIREMENT	AMP SECTION REFERENCE
Contents of the AMP	
3. The AMP must include the following:	
3.1. A summary that provides a brief overview of the contents and highlights information that the GDB considers significant;	Executive Summary and Section 1 –
3.2. Details of the background and objectives of the GDB's asset management and planning processes; and	Section 1 – and Section 4.2
3.3. A purpose statement which:	
(a) makes clear the purpose and status of the AMP in the GDB's asset management practices. The purpose statement must also include a statement of the objectives of the asset management and planning processes;	Section 1 – and Section 4 –
(b) states the corporate mission or vision as it relates to asset management;	Section 1 –
(c) identifies the documented plans produced as outputs of the annual business planning process adopted by the GDB;	Section 4.4 and Section 8 –
(d) states how the different documented plans relate to one another, with particular reference to any plans specifically dealing with asset management; and	Section 4.4 and 8 –
(e) includes a description of the interaction between the objectives of the AMP and other corporate goals, business planning processes and plans.	Section 1 and Section 4 –
3.4. Details of the AMP planning period, which must cover at least a projected period of 10 years commencing with the disclosure year following the date on which the AMP is disclosed.	Foreword
3.5. The date that it was approved by the directors.	Foreword
3.6. A description of each of the legislative requirements directly affecting management of the assets, and details of:	Section 4.4.1
(a) how the GDB meets the requirements; and	Section 4.4.1
(b) the impact on asset management.	Section 4.4.1 and Section 4.5
3.7. A description of stakeholder interests (owners, consumers, etc) which identifies important stakeholders and indicates:	Section 2 –
(a) how the interests of stakeholders are identified;	Section 2 –
(b) what these interests are;	Section 2 –

INFORMATION DISCLOSURE DETERMINATION REQUIREMENT	AMP SECTION REFERENCE
(c) how these interests are accommodated in asset management practices; and	Section 2 –
(d) how conflicting interests are managed.	Section 2.2
3.8. A description of the accountabilities and responsibilities for asset management on at least 3 levels, including-	
(a) governance—a description of the extent of director approval required for key asset management decisions and the extent to which asset management outcomes are regularly reported to directors;	Section 5.2
(b) executive—an indication of how the in-house asset management and planning organisation is structured; and	Section 5.2
(c) field operations—an overview of how field operations are managed, including a description of the extent to which field work is undertaken in-house and the areas where outsourced contractors are used.	Section 5.2 and Section 8 –
3.9. All significant assumptions-	
(a) quantified where possible;	Section 1 –, 7 – and 9 –
(b) clearly identified in a manner that makes their significance understandable to interested persons, including-	Section 1 –, 7 – and 9 –
(c) A description of changes proposed where the information is not based on the GDB's existing business;	Section 1 –, 7 – and 9 –
(d) the sources of uncertainty and the potential effect of the uncertainty on the prospective information; and	Section 1 –, 7 – and 9 –
(e) the price inflator assumptions used to prepare the financial information disclosed in nominal New Zealand dollars in the Report on Forecast Capital Expenditure set out in Schedule 11a and the Report on Forecast Operational Expenditure set out in Schedule 11b.	Section 10.16
3.10. A description of the factors that may lead to a material difference between the prospective information disclosed and the corresponding actual information recorded in future disclosures.	Section 1 –
3.11. An overview of asset management strategy and delivery.	Section 4 – and Section 8 –
3.12. An overview of systems and information management data.	Section 5.7 and 10.15
3.13. A statement covering any limitations in the availability or completeness of asset management data and disclose any initiatives intended to improve the quality of this data.	Section 5.7
3.14. A description of the processes used within the GDB for:	
(a) managing routine asset inspections and network maintenance;	Section 7.1

INFORMATION DISCLOSURE DETERMINATION REQUIREMENT	AMP SECTION REFERENCE
(b) planning and implementing network development projects; and	Section 4.5 and Section 8 –
(c) measuring network performance.	Section 3 –
3.15. An overview of asset management documentation, controls and review processes.	Section 4.4, Section 4.5.4 and 10.15
3.16. An overview of communication and participation processes.	Section 4 –, Section 8 – and Section 10.15
3.17. The AMP must present all financial values in constant price New Zealand dollars except where specified otherwise.	Compliant
3.18. The AMP must be structured and presented in a way that the GDB considers will support the purposes of AMP disclosure set out in clause 2.6.2 of the determination.	Compliant
ASSETS COVERED	
4. The AMP must provide details of the assets covered, including-	
4.1. A map and high-level description of the areas covered by the GDB, including the region(s) covered; and	Section 6.1 and Section 10.9
4.2. A description of the network configuration, including-	
(a) A map or maps, with any cross-referenced information contained in an accompanying schedule, showing the physical location of:	Section 6.1 and Section 10.9
(i) All main pipes, distinguished by operating pressure;	Section 10.9
(ii) All ICPs that have a significant impact on network operations or asset management priorities, and a description of that impact;	Section 10.9
(iii) All gate stations;	Section 10.9
(iv) All pressure regulation stations; and	Section 10.9
(b) if applicable, the locations where a significant change has occurred since the previous disclosure of the information referred to in subclause 4.2(a), including-	N/A
(i) a description of the parts of the network that are affected by the change; and	N/A
(ii) a description of the nature of the change.	N/A
NETWORK ASSETS BY CATEGORY	
5. The AMP must describe the network assets by providing the following information for each asset category-	

INFORMATION DISCLOSURE DETERMINATION REQUIREMENT	AMP SECTION REFERENCE
5.1. pressure;	Section 6.2
5.2. description and quantity of assets;	Section 6.2
5.3. age profiles; and	Section 6.2
5.4. a discussion of the results of formal risk assessments of the assets, further broken down by subcategory as appropriate. Systemic issues leading to the premature replacement of assets or parts of assets should be discussed.	Section 4.7 and Section 7 –
6. The asset categories discussed in clause 5 should include at least the following:	
6.1. the categories listed in the Report on Forecast Capital Expenditure in Schedule 11a(iii); and	Section 6.2
6.2. assets owned by the GDB but installed at gate stations owned by others.	Section 6.2
SERVICE LEVELS	
7. The AMP must clearly identify or define a set of performance indicators for which annual performance targets have been defined. The annual performance targets must be consistent with business strategies and asset management objectives and be provided for each year of the AMP planning period. The targets should reflect what is practically achievable given the current network configuration, condition and planned expenditure levels. The targets should be disclosed for each year of the AMP planning period.	Section 3 – and Section 10.3
8. Performance indicators for which targets are defined in clause 7 must include–	
8.1. the DPP requirements required under the price quality path determination applying to the regulatory assessment period in which the next disclosure year falls;	Section 3 – and Section 10.3
8.2. consumer oriented indicators that preferably differentiate between different consumer types;	Section 3 – and Section 10.3
8.3. indicators of asset performance, asset efficiency and effectiveness, and service efficiency, such as technical and financial performance indicators related to the efficiency of asset utilisation and operation; and	Section 3 – and Section 10.3
8.4. the performance indicators disclosed in Schedule 10b of the determination.	Section 3 – and Section 10.3
9. The AMP must describe the basis on which the target level for each performance indicator was determined. Justification for target levels of service includes consumer expectations or demands, legislative, regulatory, and other stakeholders' requirements or considerations. The AMP should demonstrate how stakeholder needs were ascertained and translated into service level targets.	Section 3 – and Section 10.3
10. Targets should be compared to historic values where available to provide context and scale to the reader.	Section 3 – and Section 10.3
11. Where forecast expenditure is expected to materially affect performance against a target defined in clause 7, the target should be consistent with the expected change in the level of performance.	N/A
NETWORK DEVELOPMENT PLANNING	
12. AMPs must provide a detailed description of network development plans, including–	

INFORMATION DISCLOSURE DETERMINATION REQUIREMENT	AMP SECTION REFERENCE
12.1. A description of the planning criteria and assumptions for network development;	Section 4.5, Section 4.6 and Section 5.3
12.2. Planning criteria for network developments should be described logically and succinctly. Where probabilistic or scenario-based planning techniques are used, this should be indicated and the methodology briefly described; and	Section 4.5, Section 4.6 and Section 5.3
12.3. The use of standardised designs may lead to improved cost efficiencies. This section should discuss:	
(a) the categories of assets and designs that are standardised; and	Section 4.6.3 and Section 10.2
(b) the approach used to identify standard designs.	Section 4.5
12.4. A description of the criteria used to determine the capacity of equipment for different types of assets or different parts of the network.	Section 4.5 and Section 4.6
12.5. A description of the process and criteria used to prioritise network development projects and how these processes and criteria align with the overall corporate goals and vision.	Section 8.1 and Section 8.3
12.6. Details of demand forecasts, the basis on which they are derived, and the specific network locations where constraints are expected due to forecast increases in demand:	Section 4.5, Section 10.5, Section 10.6 and Section 10.13
(a) explain the load forecasting methodology and indicate all the factors used in preparing the load estimates;	Section 4.5, Section 4.6 and Section 6.1
(b) provide separate forecasts to at least system level covering at least a minimum five-year forecast period. Discuss how uncertain but substantial individual projects/developments that affect load are taken into account in the forecasts, making clear the extent to which these uncertain increases in demand are reflected in the forecasts; and	Section 6.1, Section 7.3 and Section 10.5
(c) identify any network or equipment constraints that may arise due to the anticipated growth in demand during the AMP planning period.	Section 7.3, Section 10.5 and Section 10.6
12.7. Analysis of the significant network level development options identified and details of the decisions made to satisfy and meet target levels of service, including-	
(a) the reasons for choosing a selected option for projects where decisions have been made;	Section 7.3
(b) alternative Options assessment for projects that are planned to start in the next five years; and	Section 7.3
(c) consideration of planned innovations that improve efficiencies within the network, such as improved utilisation, extended asset lives, and deferred investment.	Section 7.3
12.8. A description and identification of the network development programme and actions to be taken, including associated expenditure projections. The network development plan must include-	

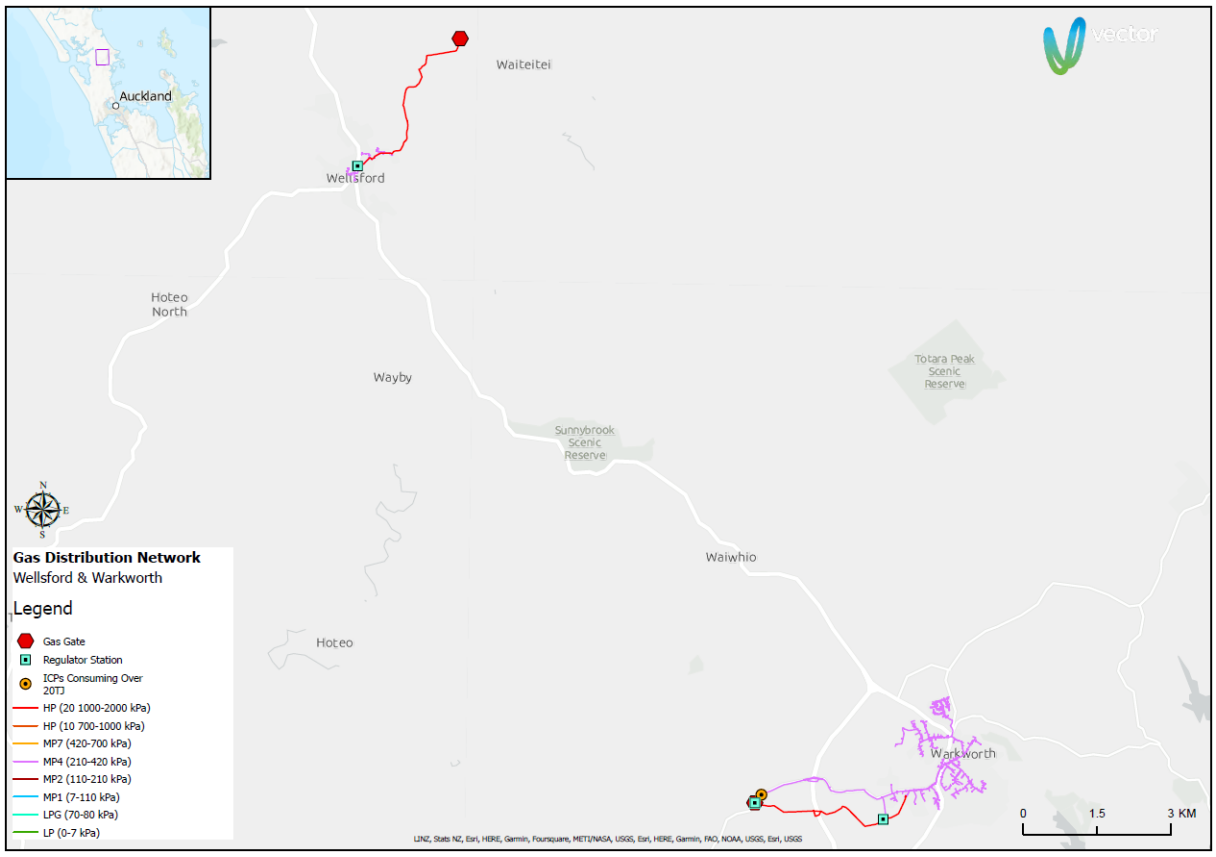
INFORMATION DISCLOSURE DETERMINATION REQUIREMENT	AMP SECTION REFERENCE
(a) a detailed description of the material projects and a summary description of the non-material projects currently underway or planned to start within the next 12 months;	Section 7.3
(b) a summary description of the programmes and projects planned for the following four years (where known); and	Section 7.3
(c) an overview of the material projects being considered for the remainder of the AMP planning period.	Section 7.3
LIFECYCLE ASSET MANAGEMENT PLANNING (MAINTENANCE AND RENEWAL)	
13. The AMP must provide a detailed description of the lifecycle asset management processes, including–	
13.1. The key drivers for maintenance planning and assumptions;	Section 4.5, Section 4.6 and Section 4.7
13.2. Identification of routine and corrective maintenance and inspection policies and programmes and actions to be taken for each asset category, including associated expenditure projections. This must include-	Section 4.5, Section 4.6 and Section 7.5
(a) the approach to inspecting and maintaining each category of assets, including a description of the types of inspections, tests and condition monitoring carried out and the intervals at which this is done;	Section 7.1 and Section 10.2
(b) any systemic problems identified with any particular asset types and the proposed actions to address these problems; and	Section 4.7 and Section 7 –
(c) budgets for maintenance activities broken down by asset category for the AMP planning period;	Section 7.1
13.3. Identification of asset replacement and renewal policies and programmes and actions to be taken for each asset category, including associated expenditure projections. This must include-	
(a) the processes used to decide when and whether an asset is replaced or refurbished, including a description of the factors on which decisions are based, and consideration of future demands on the network and the optimum use of existing network assets;	Section 4.5, Section 4.6 and Section 4.7
(b) a description of innovations that have deferred asset replacements;	Section 7 –
(c) a description of the projects currently underway or planned for the next 12 months;	Section 7.5 and Section 10.8
(d) a summary of the projects planned for the following four years (where known); and	Section 7.5
(e) an overview of other work being considered for the remainder of the AMP planning period; and	Section 7.5
13.4. The asset categories discussed in clauses 13.2 and 13.3 should include at least the categories in clause 6.	Compliant
NON-NETWORK DEVELOPMENT, MAINTENANCE AND RENEWAL	
14. AMPs must provide a summary description of material non-network development, maintenance and renewal plans, including–	

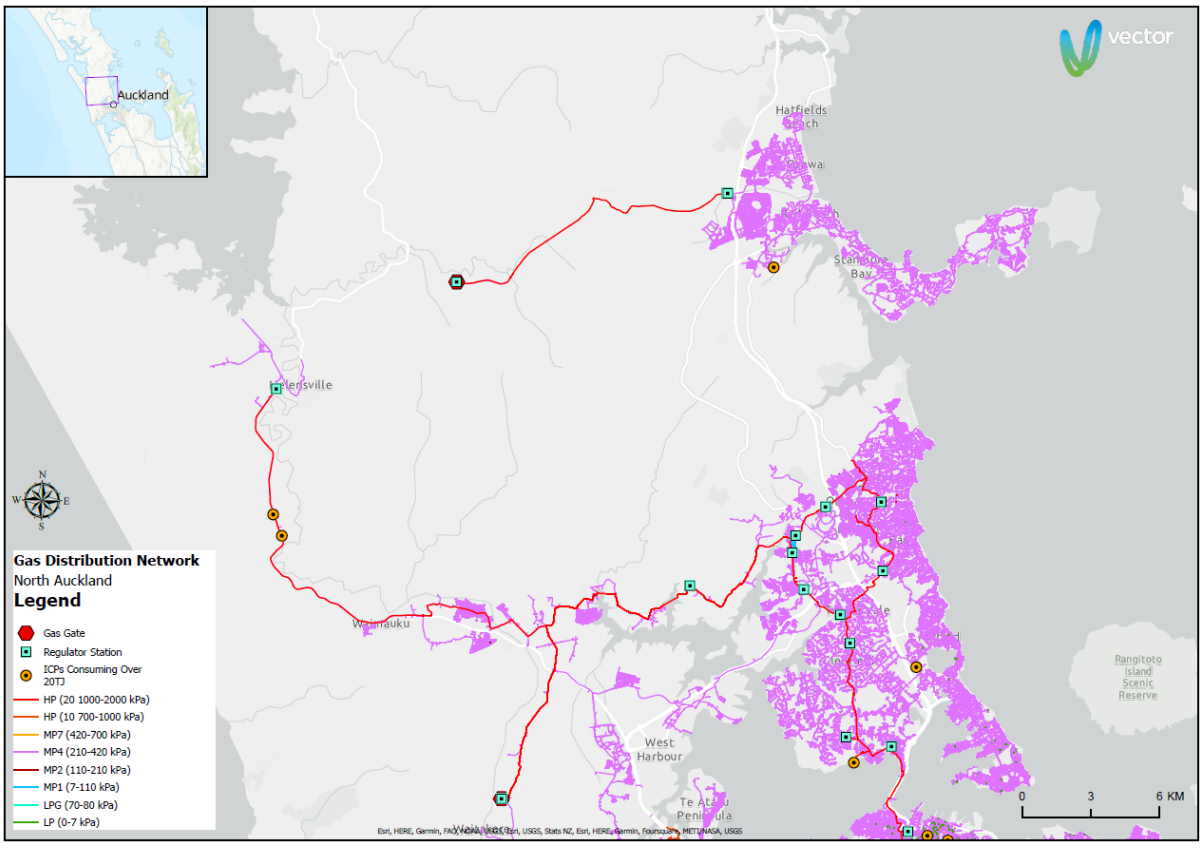
INFORMATION DISCLOSURE DETERMINATION REQUIREMENT	AMP SECTION REFERENCE
14.1. a description of non-network assets;	Section 6.2
14.2. development, maintenance and renewal policies that cover them;	Section 5.6 and 6.2
14.3. a description of material capital expenditure projects (where known) planned for the next five years; and	Section 7.8
14.4. a description of material maintenance and renewal projects planned (where known) for the next five years.	Section 7.8
RISK MANAGEMENT	
15. AMPs must provide details of risk policies, assessment, and mitigation, including–	Section 5.3
15.1. Methods, details and conclusions of risk analysis;	Section 5.3
15.2. Strategies used to identify areas of the network that are vulnerable to high impact low probability events and a description of the resilience of the network and asset management systems to such events;	Section 4.5 and Section 5.3
15.3. A description of the policies to mitigate or manage the risks of events identified in clause 15.2; and	Section 5.3
15.4. Details of emergency response and contingency plans.	Section 5.4
EVALUATION OF PERFORMANCE	
16. AMPs must provide details of performance measurement, evaluation, and improvement, including–	
16.1. A review of progress against plan, both physical and financial;	Section 9.2, Section 9.3 and Section 10.8
16.2. An evaluation and comparison of actual service level performance against targeted performance-	Section 3 -
16.3. An evaluation and comparison of the results of the asset management maturity assessment disclosed in the Report on Asset Management Maturity set out in Schedule 13 against relevant objectives of the GDB's asset management and planning processes.	Section 4.8
16.4. An analysis of gaps identified in clauses 16.2 and 16.3. Where significant gaps exist (not caused by one-off factors), the AMP must describe any planned initiatives to address the situation.	Section 4.8 and Section 5.7.3
CAPABILITY TO DELIVER	
17. AMPs must describe the processes used by the GDB to ensure that-	
17.1. The AMP is realistic and the objectives set out in the plan can be achieved; and	Section 8 -
17.2. The organisation structure and the processes for authorisation and business capabilities will support the implementation of the AMP plans.	Section 8 -

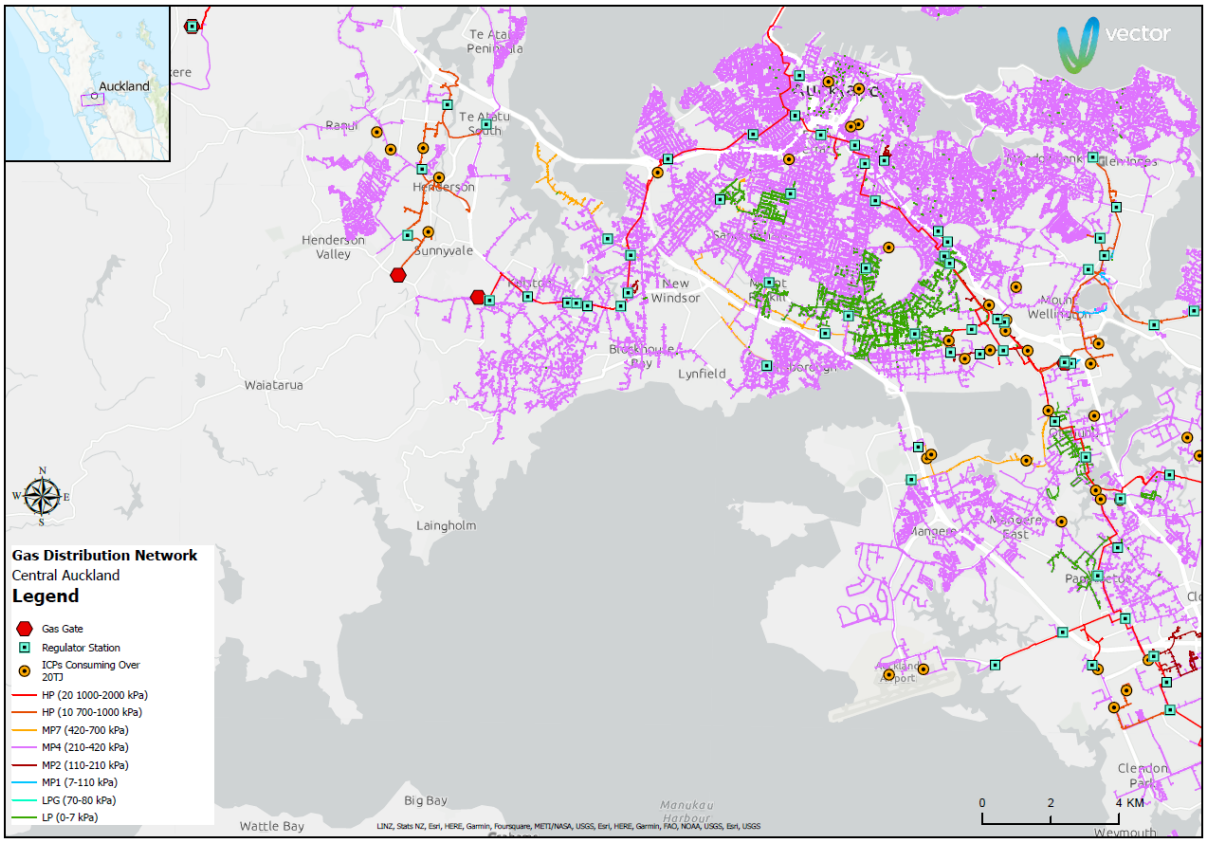
10.8 Appendix H – Significant Changes From 2022 AMP

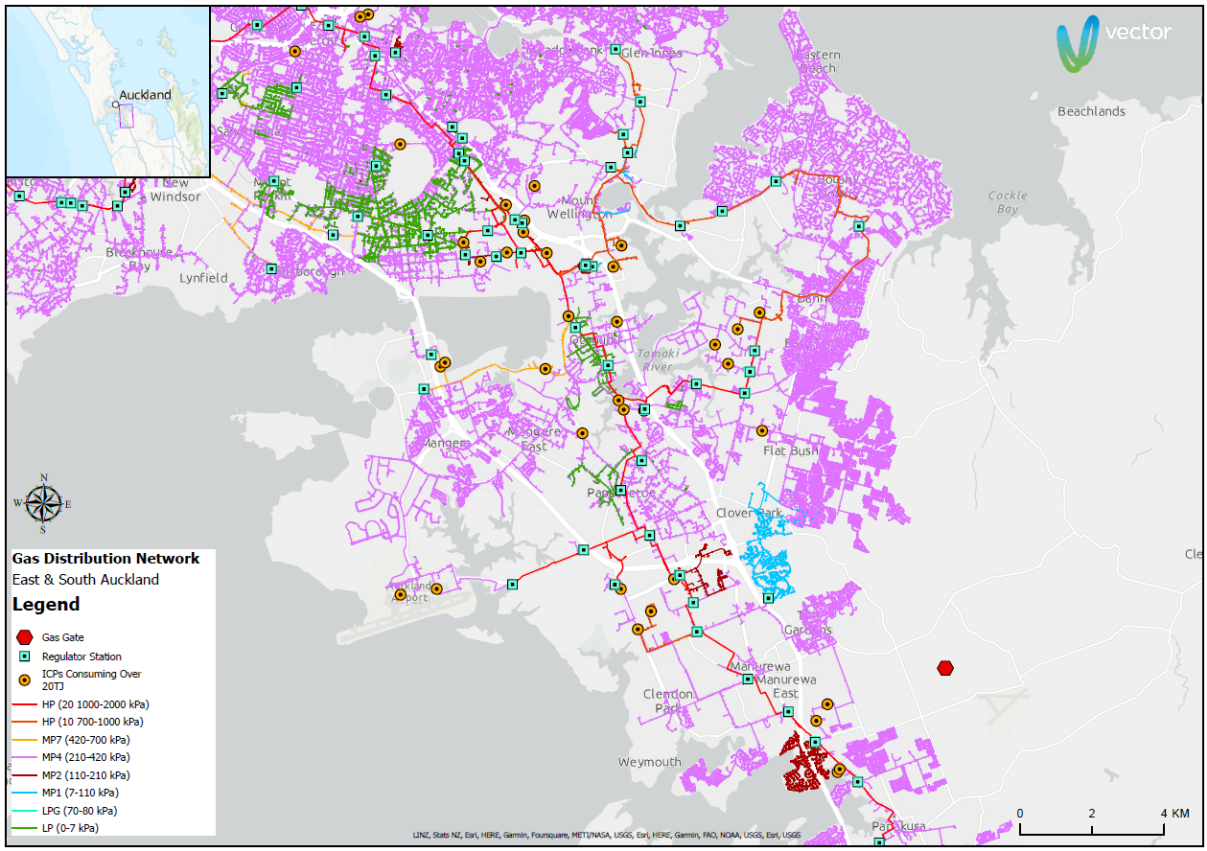
2023 AMP SCHEDULE DATE	PROJECT AND PROGRAMME DESCRITPION	2022 AMP SCHEDULE DATE	REASON FOR CHANGE
FY24	Replacement of 2/3G Cello monitoring devices	FY27	Project brought forward
-	Service regulator replacement	FY23	Project completed
-	AT Penlink Project – Bridges (3) duct provision only	FY26	Project removed
-	East Auckland IP10 pressure upgrade	FY30	Project removed
-	Pollen Street, Ponsonby 100mmST Rehab	FY23	Project completed
-	KiwiRail Paerata Station	FY25	Project removed
-	AT Stancombe – New Link Road, Flat Bush (Shared trench)	FY23	Project removed
-	AIAL Terminal Integration	FY23	Project removed
FY25/FY29	Decarbonisation – Zevac Compressors equipment	-	New project
FY24	Installation of 2 x Anode beds	-	New project
Programme	Installing new pipeline warning signs	-	New project
FY25/FY27/FY29	Network reliability improvements (Security of Supply)	-	New project

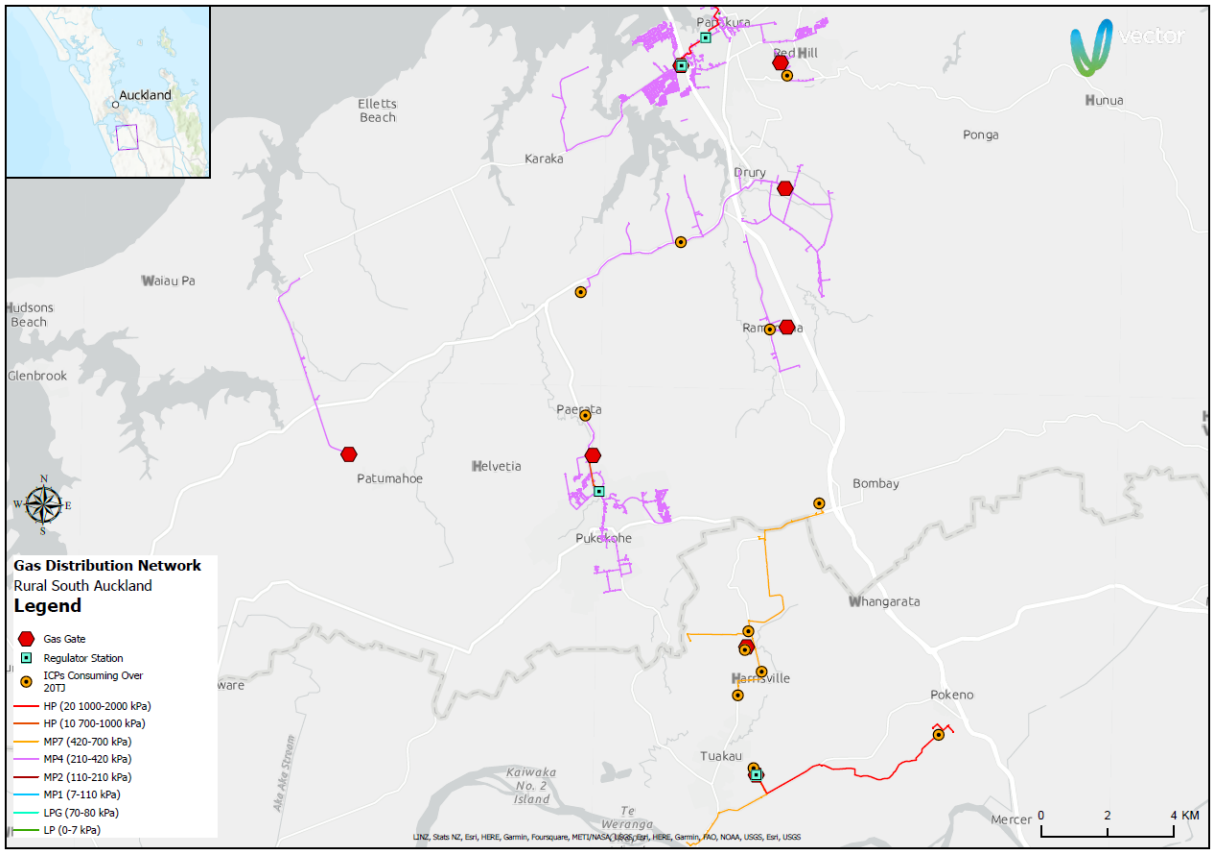
10.9 Appendix I – Gas Distribution Maps






Auckland
vector
Te Atatu Peninsula
Te Atatu South
Ranui
Henderson
Henderson Valley
Sunnyvale
New Windsor
Blockhouse Bay
Lynfield
Waiatarua
Laingholm
Glen Innes
Mount Wellington
Mangere East
Clendon Park
Big Bay
Wattle Bay
Manukau Harbour
Weymouth
0 2 4 KM
Gas Distribution Network
Central Auckland
Legend
Gas Gate
Regulator Station
ICPs Consuming Over 20TJ
HP (20 1000-2000 kPa)
HP (10 700-1000 kPa)
MP7 (420-700 kPa)
MP4 (210-420 kPa)
MP2 (110-210 kPa)
MP1 (7-110 kPa)
LPG (70-80 kPa)
LP (0-7 kPa)


Auckland
vector
Beachlands
Cockle Bay
New Windsor
Blockhouse Bay
Lynfield
Mount Wellington
Glen Innes
Tamaki River
Mangere
Mangere East
Flat Bush
Clover Park
Manurewa
Manurewa East
Clendon Park
Weymouth
Papakura
0 2 4 KM
Gas Distribution Network
East & South Auckland
Legend
Gas Gate
Regulator Station
ICPs Consuming Over 20TJ
HP (20 1000-2000 kPa)
HP (10 700-1000 kPa)
MP7 (420-700 kPa)
MP4 (210-420 kPa)
MP2 (110-210 kPa)
MP1 (7-110 kPa)
LPG (70-80 kPa)
LP (0-7 kPa)


Auckland
Papakura
Red Hill
Elletts Beach
Karaka
Drury
Ponga
Hunua
Waiau Pa
Hudsons Beach
Glenbrook
Patumahoe
Helvetia
Pukekohe
Bombay
Whangarata
Harrisville
Pokeno
Tuakau
Kaiwaka No. 2 Island
Te Weranga
Mercer
Gas Distribution Network
Rural South Auckland
Legend
Gas Gate
Regulator Station
ICPs Consuming Over 20TJ
HP (20 1000-2000 kPa)
HP (10 700-1000 kPa)
MP7 (420-700 kPa)
MP4 (210-420 kPa)
MP2 (110-210 kPa)
MP1 (7-110 kPa)
LPG (70-80 kPa)
LP (0-7 kPa)
0
2
4 KM

10.10 Appendix J – Report on Forecast Capital Expenditure (Schedule 11a)

Company Name	**Vector Limited**
AMP Planning Period	**1 July 2023 – 30 June 2033**

SCHEDULE 11a: REPORT ON FORECAST CAPITAL EXPENDITURE

This schedule requires a breakdown of forecast expenditure on assets for the current disclosure year and a 10 year planning period. The forecasts should be consistent with the supporting information set out in the AMP. The forecast is to be expressed in both constant price and nominal dollar terms. Also required is a forecast of the value of commissioned assets (i.e., the value of RAB additions)
GDBs must provide explanatory comment on the difference between constant price and nominal dollar forecasts of expenditure on assets in Schedule 14a (Mandatory Explanatory Notes).
This information is not part of audited disclosure information.

sch ref			*Current Year CY*	*CY+1*	*CY+2*	*CY+3*	*CY+4*	*CY+5*	*CY+6*	*CY+7*	*CY+8*	*CY+9*	*CY+10*
8		for year ended	**30 Jun 23**	**30 Jun 24**	**30 Jun 25**	**30 Jun 26**	**30 Jun 27**	**30 Jun 28**	**30 Jun 29**	**30 Jun 30**	**30 Jun 31**	**30 Jun 32**	**30 Jun 33**
9	**11a(i): Expenditure on Assets Forecast**		**$000 (nominal dollars)**										
10		Consumer connection	14,172	11,536	11,134	10,961	10,943	11,505	11,065	10,737	10,546	10,489	10,698
11		System growth	682	796	427	1,161	1,446	1,815	1,353	800	816	832	849
12		Asset replacement and renewal	4,463	4,042	3,621	3,141	3,108	3,455	3,172	3,235	3,487	3,557	3,628
13		Asset relocations	1,814	3,324	3,461	3,576	3,673	3,747	3,822	3,898	3,976	4,056	4,137
14		Reliability, safety and environment:											
15		Quality of supply	52	286	544	-	416	-	540	-	-	-	-
16		Legislative and regulatory	-	-	-	-	-	-	-	-	-	-	-
17		Other reliability, safety and environment	258	292	530	485	575	406	715	355	449	481	324
18		**Total reliability, safety and environment**	310	578	1,074	485	991	406	1,255	355	449	481	324
19		**Expenditure on network assets**	21,441	20,276	19,717	19,324	20,161	20,928	20,667	19,025	19,274	19,415	19,636
20		Expenditure on non-network assets	4,223	3,616	3,304	2,413	2,727	3,688	2,883	2,109	1,986	1,746	1,369
21		**Expenditure on assets**	25,664	23,892	23,021	21,737	22,888	24,616	23,550	21,134	21,260	21,161	21,005
22													
23	*plus*	Cost of financing	200	189	175	173	189	213	193	161	161	159	155
24	*less*	Value of capital contributions	11,025	15,513	15,724	15,712	15,672	16,300	15,955	15,717	15,643	15,654	15,917
25	*plus*	Value of vested assets	-	-	-	-	-	-	-	-	-	-	-
26		**Capital expenditure forecast**	14,839	8,568	7,472	6,198	7,405	8,529	7,788	5,578	5,778	5,666	5,243
27													
28		Assets commissioned	15,878	7,829	6,277	6,338	7,126	8,750	7,769	5,579	5,779	5,666	5,244
29													
30			*Current Year CY*	*CY+1*	*CY+2*	*CY+3*	*CY+4*	*CY+5*	*CY+6*	*CY+7*	*CY+8*	*CY+9*	*CY+10*
31		for year ended	**30 Jun 23**	**30 Jun 24**	**30 Jun 25**	**30 Jun 26**	**30 Jun 27**	**30 Jun 28**	**30 Jun 29**	**30 Jun 30**	**30 Jun 31**	**30 Jun 32**	**30 Jun 33**
32			**$000 (in constant prices)**										
33		Consumer connection	14,172	10,976	10,175	9,694	9,423	9,712	9,158	8,712	8,389	8,180	8,180
34		System growth	682	757	390	1,027	1,245	1,532	1,120	649	649	649	649
35		Asset replacement and renewal	4,463	3,846	3,309	2,778	2,676	2,917	2,625	2,625	2,774	2,774	2,774
36		Asset relocations	1,814	3,163	3,163	3,163	3,163	3,163	3,163	3,163	3,163	3,163	3,163
37		Reliability, safety and environment:											
38		Quality of supply	52	272	497	-	358	-	447	-	-	-	-
39		Legislative and regulatory	-	-	-	-	-	-	-	-	-	-	-
40		Other reliability, safety and environment	258	278	484	429	495	343	592	288	357	375	248
41		**Total reliability, safety and environment**	310	550	981	429	853	343	1,039	288	357	375	248
42		**Expenditure on network assets**	21,441	19,292	18,018	17,091	17,360	17,667	17,105	15,437	15,332	15,141	15,014
43		Expenditure on non-network assets	4,223	3,441	3,019	2,134	2,348	3,113	2,386	1,711	1,580	1,362	1,047
44		**Expenditure on assets**	25,664	22,733	21,037	19,225	19,708	20,780	19,491	17,148	16,912	16,503	16,061
45	**Subcomponents of expenditure on assets (where known)**												
46		Research and development	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

		Current Year CY	CY+1	CY+2	CY+3	CY+4	CY+5	CY+6	CY+7	CY+8	CY+9	CY+10
for year ended		30 Jun 23	30 Jun 24	30 Jun 25	30 Jun 26	30 Jun 27	30 Jun 28	30 Jun 29	30 Jun 30	30 Jun 31	30 Jun 32	30 Jun 33
Difference between nominal and constant price forecasts		$000										
Consumer connection		-	560	959	1,267	1,520	1,793	1,907	2,025	2,157	2,309	2,518
System growth		-	39	37	134	201	283	233	151	167	183	200
Asset replacement and renewal		-	196	312	363	432	538	547	610	713	783	854
Asset relocations		-	161	298	413	510	584	659	735	813	893	974
Reliability, safety and environment:												
Quality of supply		-	14	47	-	58	-	93	-	-	-	-
Legislative and regulatory		-	-	-	-	-	-	-	-	-	-	-
Other reliability, safety and environment		-	14	46	56	80	63	123	67	92	106	76
Total reliability, safety and environment		-	28	93	56	138	63	216	67	92	106	76
Expenditure on network assets		-	984	1,699	2,233	2,801	3,261	3,562	3,588	3,942	4,274	4,622
Expenditure on non-network assets		-	175	285	279	379	575	497	398	406	384	322
Expenditure on assets		-	1,159	1,984	2,512	3,180	3,836	4,059	3,986	4,348	4,658	4,944

	Current Year CY	CY+1	CY+2	CY+3	CY+4	CY+5
for year ended	30 Jun 23	30 Jun 24	30 Jun 25	30 Jun 26	30 Jun 27	30 Jun 28
11a(ii): Consumer Connection						
*Consumer types defined by GDB**	$000 (in constant prices)					
Mains Extensions/Subdivisions	3,445	1,049	1,049	1,049	998	1,012
Service Connections - Residential	9,844	9,332	8,371	7,730	7,349	7,453
Service Connections - Commercial	883	595	755	915	1,076	1,247
Customer Easements	-	-	-	-	-	-
* include additional rows if needed						
Consumer connection expenditure	14,172	10,976	10,175	9,694	9,423	9,712
less Capital contributions funding consumer connection	8,508	10,810	10,214	9,749	9,476	9,767
Consumer connection less capital contributions	5,664	166	(39)	(55)	(53)	(55)
11a(iii): System Growth						
Intermediate pressure						
Main pipe	-	-	-	-	-	-
Service pipe	-	-	-	-	-	-
Stations	186	263	195	244	195	161
Line valve	-	-	-	-	-	-
Special crossings	-	-	-	-	-	-
Intermediate Pressure total	186	263	195	244	195	161
Medium pressure						
Main pipe	496	494	195	783	1,050	1,371
Service pipe	-	-	-	-	-	-
Stations	-	-	-	-	-	-
Line valve	-	-	-	-	-	-
Special crossings	-	-	-	-	-	-
Medium Pressure total	496	494	195	783	1,050	1,371

92		**Low Pressure**						
93		Main pipe	-	-	-	-	-	-
94		Service pipe	-	-	-	-	-	-
95		Line valve	-	-	-	-	-	-
96		Special crossings	-	-	-	-	-	-
97		**Low Pressure total**	-	-	-	-	-	-
98		**Other network assets**						
99		Monitoring and control systems	-	-	-	-	-	-
100		Cathodic protection systems	-	-	-	-	-	-
101		Other assets (other than above)	-	-	-	-	-	-
102		**Other network assets total**	-	-	-	-	-	-
103								
104		**System growth expenditure**	682	757	390	1,027	1,245	1,532
105	*less*	Capital contributions funding system growth	893	827	1,032	1,025	896	871
106		**System growth less capital contributions**	(211)	(70)	(642)	2	349	661
107								
108								
109			*Current Year CY*	*CY+1*	*CY+2*	*CY+3*	*CY+4*	*CY+5*
		for year ended	**30 Jun 23**	**30 Jun 24**	**30 Jun 25**	**30 Jun 26**	**30 Jun 27**	**30 Jun 28**
110	**11a(iv): Asset Replacement and Renewal**							
111		**Intermediate pressure**	**$000 (in constant prices)**					
112		Main pipe	701	-	-	-	-	-
113		Service pipe	-	-	-	-	-	-
114		Stations	707	417	457	353	360	360
115		Line valve	-	298	298	298	298	298
116		Special crossings	869	656	636	318	209	233
117		**Intermediate Pressure total**	2,277	1,371	1,391	969	867	891
118		**Medium pressure**						
119		Main pipe	1,188	1,409	1,409	1,409	1,409	1,409
120		Service pipe	547	224	224	224	224	224
121		Station	62	120	109	-	-	-
122		Line valve	240	-	-	-	-	-
123		Special crossings	-	-	-	-	-	-
124		**Medium Pressure total**	2,037	1,753	1,742	1,633	1,633	1,633
125		**Low Pressure**						
126		Main pipe	-	-	-	-	-	-
127		Service pipe	-	-	-	-	-	-
128		Line valve	-	-	-	-	-	-
129		Special crossings	-	-	-	-	-	-
130		**Low Pressure total**	-	-	-	-	-	-

131	**Other network assets**						
132	Monitoring and control systems	99	519	72	72	72	72
133	Cathodic protection systems	50	203	104	104	104	321
134	Other assets (other than above)	-	-	-	-	-	-
135	**Other network assets total**	149	722	176	176	176	393
136							
137	**Asset replacement and renewal expenditure**	4,463	3,846	3,309	2,778	2,676	2,917
138	*less* Capital contributions funding asset replacement and renewal						
139	**Asset replacement and renewal less capital contributions**	4,463	3,846	3,309	2,778	2,676	2,917
140							

11a(v): Asset Relocations

142	*Project or programme**						
143							
144							
145							
146							
147							
148	** include additional rows if needed*						
149	All other projects or programmes - asset relocations	1,814	3,163	3,163	3,163	3,163	3,163
150	**Asset relocations expenditure**	1,814	3,163	3,163	3,163	3,163	3,163
151	*less* Capital contributions funding asset relocations	1,624	3,123	3,123	3,123	3,123	3,123
152	**Asset relocations less capital contributions**	190	40	40	40	40	40
153							

11a(vi): Quality of Supply

			Current Year CY	*CY+1*	*CY+2*	*CY+3*	*CY+4*	*CY+5*
154								
155		for year ended	**30 Jun 23**	**30 Jun 24**	**30 Jun 25**	**30 Jun 26**	**30 Jun 27**	**30 Jun 28**
156								
157	*Project or programme**		**$000 (in constant prices)**					
158								
159								
160								
161								
162								
163	** include additional rows if needed*							
164	All other projects or programmes - quality of supply		52	272	497	-	358	-
165	**Quality of supply expenditure**		52	272	497	-	358	-
166	*less* Capital contributions funding quality of supply							
167	**Quality of supply less capital contributions**		52	272	497	-	358	-
168								

11a(vii): Legislative and Regulatory

	Project or programme						
	** include additional rows if needed*						
	All other projects or programmes - legislative and regulatory						
	Legislative and regulatory expenditure	-	-	-	-	-	-
	less Capital contributions funding legislative and regulatory						
	Legislative and regulatory less capital contributions	-	-	-	-	-	-

11a(viii): Other Reliability, Safety and Environment

	*Project or programme**						
	** include additional rows if needed*						
	All other projects or programmes - other reliability, safety and environment	258	278	484	429	495	343
	Other reliability, safety and environment expenditure	258	278	484	429	495	343
	less Capital contributions funding other reliability, safety and environment						
	Other Reliability, safety and environment less capital contributions	258	278	484	429	495	343

11a(ix): Non-Network Assets

Routine expenditure

	*Project or programme**						
	** include additional rows if needed*						
	All other projects or programmes - routine expenditure	2,698	1,634	1,709	1,057	1,283	324
	Routine expenditure	2,698	1,634	1,709	1,057	1,283	324

Atypical expenditure

	*Project or programme**						
	** include additional rows if needed*						
	All other projects or programmes - atypical expenditure	1,525	1,807	1,310	1,077	1,065	2,789
	Atypical expenditure	1,525	1,807	1,310	1,077	1,065	2,789
	Expenditure on non-network assets	4,223	3,441	3,019	2,134	2,348	3,113

10.11 Appendix K – Report on Forecast Operational Expenditure (Schedule 11b)

Company Name	**Vector Limited**
AMP Planning Period	**1 July 2023 – 30 June 2033**

SCHEDULE 11b: REPORT ON FORECAST OPERATIONAL EXPENDITURE

This schedule requires a breakdown of forecast operational expenditure for the disclosure year and a 10 year planning period. The forecasts should be consistent with the supporting information set out in the AMP. The forecast is to be expressed in both constant price and nominal dollar terms.
GDBs must provide explanatory comment on the difference between constant price and nominal dollar operational expenditure forecasts in Schedule 14a (Mandatory Explanatory Notes).
This information is not part of audited disclosure information.

sch ref													
7			*Current year CY*	*CY+1*	*CY+2*	*CY+3*	*CY+4*	*CY+5*	*CY+6*	*CY+7*	*CY+8*	*CY+9*	*CY+10*
8		for year ended	**30 Jun 23**	**30 Jun 24**	**30 Jun 25**	**30 Jun 26**	**30 Jun 27**	**30 Jun 28**	**30 Jun 29**	**30 Jun 30**	**30 Jun 31**	**30 Jun 32**	**30 Jun 33**
9	**Operational Expenditure Forecast**		**$000 (in nominal dollars)**										
10	Service interruptions, incidents and emergencies		2,563	2,516	2,599	2,666	2,728	2,782	2,838	2,895	2,952	3,012	3,083
11	Routine and corrective maintenance and inspection		3,395	3,860	4,001	3,984	4,181	4,149	4,401	4,258	4,407	4,499	4,634
12	Asset replacement and renewal		-	-	-	-	-	-	-	-	-	-	-
13	**Network opex**		5,959	6,376	6,600	6,650	6,909	6,931	7,239	7,153	7,359	7,510	7,717
14	System operations and network support		3,349	3,909	4,255	4,387	4,487	4,577	4,669	4,762	4,857	4,954	5,053
15	Business support		7,647	6,726	6,947	7,127	7,290	7,436	7,585	7,737	7,891	8,049	8,210
16	**Non-network opex**		10,996	10,635	11,202	11,513	11,778	12,013	12,254	12,499	12,749	13,004	13,264
17	**Operational expenditure**		16,955	17,011	17,802	18,164	18,687	18,944	19,492	19,651	20,108	20,514	20,981
18			*Current year CY*	*CY+1*	*CY+2*	*CY+3*	*CY+4*	*CY+5*	*CY+6*	*CY+7*	*CY+8*	*CY+9*	*CY+10*
19		for year ended	**30 Jun 23**	**30 Jun 24**	**30 Jun 25**	**30 Jun 26**	**30 Jun 27**	**30 Jun 28**	**30 Jun 29**	**30 Jun 30**	**30 Jun 31**	**30 Jun 32**	**30 Jun 33**
20			**$000 (in constant prices)**										
21	Service interruptions, incidents and emergencies		2,563	2,418	2,418	2,418	2,418	2,418	2,418	2,418	2,418	2,418	2,428
22	Routine and corrective maintenance and inspection		3,395	3,709	3,723	3,613	3,707	3,606	3,751	3,558	3,610	3,613	3,648
23	Asset replacement and renewal		-	-	-	-	-	-	-	-	-	-	-
24	**Network opex**		5,959	6,128	6,141	6,032	6,126	6,025	6,169	5,976	6,028	6,031	6,076
25	System operations and network support		3,349	3,757	3,959	3,979	3,979	3,979	3,979	3,979	3,979	3,979	3,979
26	Business support		7,647	6,464	6,464	6,464	6,464	6,464	6,464	6,464	6,464	6,464	6,464
27	**Non-network opex**		10,996	10,221	10,423	10,443	10,443	10,443	10,443	10,443	10,443	10,443	10,443
28	**Operational expenditure**		16,955	16,349	16,565	16,475	16,568	16,467	16,612	16,419	16,471	16,474	16,518
29	**Subcomponents of operational expenditure (where known)**												
30	Research and development		-	-	-	-	-	-	-	-	-	-	-
	Insurance		471	-	467	482	495	506	516	526	537	548	559
32													
33			*Current year CY*	*CY+1*	*CY+2*	*CY+3*	*CY+4*	*CY+5*	*CY+6*	*CY+7*	*CY+8*	*CY+9*	*CY+10*
34		for year ended	**30 Jun 23**	**30 Jun 24**	**30 Jun 25**	**30 Jun 26**	**30 Jun 27**	**30 Jun 28**	**30 Jun 29**	**30 Jun 30**	**30 Jun 31**	**30 Jun 32**	**30 Jun 33**
35	**Difference between nominal and real forecasts**		**$000**										
36	Service interruptions, incidents and emergencies		-	98	181	248	309	364	419	476	534	593	656
37	Routine and corrective maintenance and inspection		-	150	278	370	474	542	650	700	797	886	986
38	Asset replacement and renewal		-	-	-	-	-	-	-	-	-	-	-
39	**Network opex**		-	248	459	618	783	906	1,070	1,177	1,331	1,479	1,641
40	System operations and network support		-	152	296	408	509	598	690	783	879	976	1,075
41	Business support		-	262	483	663	826	972	1,121	1,273	1,427	1,585	1,746
42	**Non-network opex**		-	414	779	1,071	1,335	1,571	1,811	2,056	2,306	2,561	2,821
43	**Operational expenditure**		-	662	1,237	1,689	2,118	2,477	2,881	3,233	3,637	4,040	4,462

10.12 Appendix L – Report on Asset Condition (Schedule 12a)

Company Name	**Vector Limited**
AMP Planning Period	**1 July 2023 – 30 June 2033**

SCHEDULE 12a: REPORT ON ASSET CONDITION

This schedule requires a breakdown of asset condition by asset class as at the start of the forecast year. The data accuracy assessment relates to the percentage values disclosed in the asset condition columns. Also required is a forecast of the percentage of units to be replaced in the next 5 years. All information should be consistent with the information provided in the AMP and the expenditure on assets forecast in Schedule 11a.

sch ref

					Asset condition at start of planning period (percentage of units by grade)						
8	**Operating Pressure**	**Asset category**	**Asset class**	**Units**	**Grade 1**	**Grade 2**	**Grade 3**	**Grade 4**	**Grade unknown**	**Data accuracy (1–4)**	**% of asset forecast to be replaced in next 5 years**
9	Intermediate Pressure	Main pipe	IP PE main pipe	km	-	-	-	-	-	N/A	-
10	Intermediate Pressure	Main pipe	IP steel main pipe	km	-	-	100.00%	-	-	3	-
11	Intermediate Pressure	Main pipe	IP other main pipe	km	-	-	-	-	-	N/A	-
12	Intermediate Pressure	Service pipe	IP PE service pipe	km	-	-	-	-	-	N/A	-
13	Intermediate Pressure	Service pipe	IP steel service pipe	km	-	-	100.00%	-	-	3	-
14	Intermediate Pressure	Service pipe	IP other service pipe	km	-	-	-	-	-	N/A	-
15	Intermediate Pressure	Stations	Intermediate pressure DRS	No.	-	-	93.90%	6.10%	-	4	6.21
16	Intermediate Pressure	Line valve	IP line valves	No.	-	4.24%	90.77%	2.42%	2.57%	3	0.91
17	Intermediate Pressure	Special crossings	IP crossings	No.	-	-	68.42%	26.32%	5.26%	3	10.64
18	Medium Pressure	Main pipe	MP PE main pipe	km	-	0.39%	1.44%	98.18%	-	3	0.21
19	Medium Pressure	Main pipe	MP steel main pipe	km			100.00%			3	-
20	Medium Pressure	Main pipe	MP other main pipe	km	-	-	-	-	-	N/A	-
21	Medium Pressure	Service pipe	MP PE service pipe	km	-	0.21%	99.79%	-	-	3	0.11
22	Medium Pressure	Service pipe	MP steel service pipe	km	-	-	100.00%	-	-	3	-
23	Medium Pressure	Service pipe	MP other service pipe	km	-	-	100.00%	-	-	3	-
24	Medium Pressure	Stations	Medium pressure DRS	No.	-	-	100.00%	-	-	4	6.21
25	Medium Pressure	Line valve	MP line valves	No.	0.03%	4.18%	84.28%	4.94%	6.56%	3	0.91
26	Medium Pressure	Special crossings	MP special crossings	No.		6.41%	38.46%	37.18%	17.95%	3	10.64
27	Low Pressure	Main pipe	LP PE main pipe	km	-	-	50.70%	49.30%	-	3	
28	Low Pressure	Main pipe	LP steel main pipe	km	-	-	-	-	-	N/A	-
29	Low Pressure	Main pipe	LP other main pipe	km	-	-	-	-	-	N/A	-
30	Low Pressure	Service pipe	LP PE service pipe	km	-	-	12.37%	87.63%	-	3	-
31	Low Pressure	Service pipe	LP steel service pipe	km	-	-	100.00%	-	-	3	-
32	Low Pressure	Service pipe	LP other service pipe	km	-	-	-	-	-	N/A	-
33	Low Pressure	Line valve	LP line valves	No.	-	-	100.00%	-	-	3	-
34	Low Pressure	Special crossings	LP special crossings	No.	-	-	-	-	-	N/A	-
35	All	Monitoring and control systems	Remote terminal units	No.	-	-	15.94%	84.06%	-	4	23.97
36	All	Cathodic protection systems	Cathodic protection	No.	-	9.09%	59.09%	31.82%	-	3	10.16

10.13 Appendix M – Report on Forecast Utilisation (Schedule 12b)

Company Name **Vector Limited**
AMP Planning Period **1 July 2023 – 30 June 2033**

SCHEDULE 12b: REPORT ON FORECAST UTILISATION

This Schedule requires a breakdown of current and forecast utilisation (for heavily utilised pipelines) consistent with the information provided in the AMP and the demand forecast in schedule S12c.

sch ref

7 **Forecast Utilisation of Heavily Utilised Pipelines**

sch ref	Region	Network	Pressure system	Nominal operating pressure (NOP) (kPa)	Minimum operating pressure (MinOP) (kPa)	Total capacity at MinOP (scmh)	Remaining capacity at MinOP (scmh)	Unit	Utilisation: *Current Year CY* y/e 30 Jun 23	*CY+1* y/e 30 Jun 24	*CY+2* y/e 30 Jun 25	*CY+3* y/e 30 Jun 26	*CY+4* y/e 30 Jun 27	*CY+5* y/e 30 Jun 28	Comment
11	Auckland	Auckland Central	AU North Shore MP4	400	200	14167	232	scmh	285	265	245	1045	1040	1025	The pressure increase in CY+3 is due to the major reinforcement of constructing a new 150mm PE MP4 pipeline in CY+3.
12								kPa	225	222	218	291	290	289	
13								scmh							
14								kPa							
15								scmh							
16								kPa							
17								scmh							
18								kPa							
19								scmh							
20								kPa							
21								scmh							
22								kPa							
23								scmh							
24								kPa							
25								scmh							
26								kPa							
27								scmh							
28								kPa							
29								scmh							
30								kPa							

31 * *Current year utilisation figures may be estimates. Year 1–5 figures show the utilisation forecast to occur given the expected system configuration for each year, including the effect of any new investment in the pressure system.*

33 **Disclaimer for supply enquiries**

The information in this table contains modelled estimates of utilisation and capacity at lowest pressure point in the network. Any interested party seeking to invest in supply from Vector's distribution networks should contact their retailer and confirm availability of capacity.

36 **Notes and assumptions**

1. A 'heavily utilised' pressure system is a pressure system where the modelled flow rate, at system peak during 2022, is greater than or equal to 500 scmh, and its utilisation (pressure drop) is greater than or equal to 40% from the nominal operating pressure (NOP). The utilisation of a pressure system is calculated using the formula: [1 – (system minimum pressure/nominal operating pressure)] *100%; the pressure values are considered based on the stimulated corresponding flow rates.
2. The remaining capacity of a 'heavily utilised' pressure system is obtained by examining the modelled flows at various extremity points in each pressure system, and the level at which the minimum operating pressure (MinOP) is reached. Vector's security standards set the MinOP at 50% of the rated pressure (which equates to approximately 82% of the pipeline capacity) for a pressure system (based on standard operating pressures). The minimum modelled flow rate, analysed at one extremity point, is used to calculate the remaining capacity of the entire pressure system being studied.
3. A forecast model of a pressure system is obtained by applying either its forecast flow rate or an annual growth rate in each forecast year; and scaling its loads evenly to give the system total flow. The resulting minimum system pressure is simulated on this basis.
4. The forecast system flow for the Central Auckland network system is based on an annual growth rate of 0.8%. The stated growth rate extrapolates trends across historical actuals, which include the flows most recently observed during 2022.
5. Stated annual growth rates are averaged across a 10-year planning period. Owing to seasonality factors influencing the forecasting model the discrete forecast system flows may not mirror the 10-year averaged growth rate incrementally.
6. Schedule 12b provides a snapshot in time of the pressure system capacity, at the date of its preparation, and it should be noted that the figures will change over time. Schedule 12b is provided on the basis that it be used for consumer guidance only.
7. The capacity limits specified in Schedule 12b for each 'heavily utilised' pressure system, highlight only the most constrained part of the pressure system. At that specific location the MinOP is lowest; in reality more capacity may be available at other locations within the pressure or network system.
8. Consumers considering using gas or wanting more capacity should always contact Vector to confirm availability. In these cases, Vector will prepare a dedicated model that will provide an accurate assessment of available gas capacity at the specified location.
9. The network models used to compile Schedule 12b are updated on a 3 year rolling cycle, meaning that the model update, forecast and validation of some models may not have been up to date.
10. It has been assumed that the load forecasting documented in the AMP is correct, and that all assumptions and risks associated with this forecasting have been reviewed and approved as part of a separate exercise associated with signing off the AMP.

10.14 Appendix N – Report on Forecast Demand (Schedule 12c)

Company Name	**Vector Limited**
AMP Planning Period	**1 July 2023 – 30 June 2033**

SCHEDULE 12c: REPORT ON FORECAST DEMAND

This schedule requires a forecast of new connections (by consumer type), peak demand and energy volumes for the disclosure year and a 5 year planning period. The forecasts should be consistent with the supporting information set out in the AMP as well as the assumptions used in developing the expenditure forecasts in Schedule 11a and Schedule 11b and the capacity and utilisation forecasts in Schedule 12b.

sch ref

12c(i) Consumer Connections

Number of ICPs connected in year by consumer type

Consumer types defined by GDB	*Current year CY* **30 Jun 23**	*CY+1* **30 Jun 24**	*CY+2* **30 Jun 25**	*CY+3* **30 Jun 26**	*CY+4* **30 Jun 27**	*CY+5* **30 Jun 28**
Residential	2,555	2,428	2,178	2,011	1,912	1,939
SME	27	24	24	24	24	24
Commercial	28	28	41	54	67	81
Industrial	-	-	1	2	3	4
Total	2,610	2,480	2,244	2,091	2,006	2,048

12c(ii): Gas Delivered

	Current year CY **30 Jun 23**	*CY+1* **30 Jun 24**	*CY+2* **30 Jun 25**	*CY+3* **30 Jun 26**	*CY+4* **30 Jun 27**	*CY+5* **30 Jun 28**
Number of ICPs at year end (at year end)	118,727	119,378	119,792	120,054	120,230	120,449
Maximum daily load (GJ per day)	51,902	51,938	50,742	49,395	48,871	48,108
Maximum monthly load (GJ per month)	1,379,266	1,380,237	1,348,446	1,312,652	1,298,729	1,278,446
Number of directly billed ICPs (at year end)	-	-	-	-	-	-
Total gas conveyed (GJ per annum)	13,159,588	13,532,108	13,518,614	13,283,432	12,930,613	12,793,939
Average daily delivery (GJ per day)	36,054	36,973	37,037	36,393	35,426	34,956
Load factor	79.51%	81.70%	83.54%	84.33%	82.97%	83.40%

10.15 Appendix O – Asset Management Maturity (Schedule 13)

Company Name	**Vector Limited**
AMP Planning Period	**1 July 2023 – 30 June 2033**
Asset Management Standard Applied	

SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY

This schedule requires information on the GDB'S self-assessment of the maturity of its asset management practices.

Question No.	Function	Question	Score	Evidence—Summary	User Guidance	Why	Who	Record/documented Information
3	Asset management policy	To what extent has an asset management policy been documented, authorised and communicated?	3	Vector's Asset Management Policy has been reviewed in January 2023, authorised by our Chief Operating Officer - Electricity, Gas, Fibre. The document is part of the controlled document management system and reviewed periodically.		Widely used AM practice standards require an organisation to document, authorise and communicate its asset management policy (eg, as required in PAS 55 para 4.2 i). A key pre-requisite of any robust policy is that the organisation's top management must be seen to endorse and fully support it. Also vital to the effective implementation of the policy, is to tell the appropriate people of its content and their obligations under it. Where an organisation outsources some of its asset-related activities, then these people and their organisations must equally be made aware of the policy's content. Also, there may be other stakeholders, such as regulatory authorities and shareholders who should be made aware of it.	Top management. The management team that has overall responsibility for asset management.	The organisation's asset management policy, its organisational strategic plan, documents indicating how the asset management policy was based upon the needs of the organisation and evidence of communication.
10	Asset management strategy	What has the organisation done to ensure that its asset management strategy is consistent with other appropriate organisational policies and strategies, and the needs of stakeholders?	2	Good asset management is practiced implicitly based on the policies and strategies which are approved by Vector's Board. The Board also approves the asset management plans and associated budget.		In setting an organisation's asset management strategy, it is important that it is consistent with any other policies and strategies that the organisation has and has taken into account the requirements of relevant stakeholders. This question examines to what extent the asset management strategy is consistent with other organisational policies and strategies (eg, as required by PAS 55 para 4.3.1 b) and has taken account of stakeholder requirements as required by PAS 55 para 4.3.1 c). Generally, this will take into account the same polices, strategies and stakeholder requirements as covered in drafting the asset management policy but at a greater level of detail.	Top management. The organisation's strategic planning team. The management team that has overall responsibility for asset management.	The organisation's asset management strategy document and other related organisational policies and strategies. Other than the organisation's strategic plan, these could include those relating to health and safety, environmental, etc. Results of stakeholder consultation.
11	Asset management strategy	In what way does the organisation's asset management strategy take account of the lifecycle of the assets, asset types and asset systems over which the organisation has stewardship?	3	Asset class (asset fleet) strategies have been prepared and reviewed for all primary asset classes. Lifecycle cost and service implications are adequately considered in maintenance and replacement decisions. Asset strategies are reviewed on an annual basis. This is an ongoing program of work with the opportunity to improve and integrate the results with Vector's Condition Based Asset Risk Management (CBARM) models.		Good asset stewardship is the hallmark of an organisation compliant with widely used AM standards. A key component of this is the need to take account of the lifecycle of the assets, asset types and asset systems. (For example, this requirement is recognised in 4.3.1 d) of PAS 55). This question explores what an organisation has done to take lifecycle into account in its asset management strategy.	Top management. People in the organisation with expert knowledge of the assets, asset types, asset systems and their associated life-cycles. The management team that has overall responsibility for asset management. Those responsible for developing and adopting methods and processes used in asset management	The organisation's documented asset management strategy and supporting working documents.
26	Asset management plan(s)	How does the organisation establish and document its asset management plan(s) across the life cycle activities of its assets and asset systems?	3	Asset management plans (AMP) are documented, implemented and maintained with alignment to asset management strategies and cover all asset life cycle activities (documented in the form of header class strategies, standards covering planning, design, equipment selection, operation, maintenance, inspection, testing and decommissioning.)		The asset management strategy need to be translated into practical plan(s) so that all parties know how the objectives will be achieved. The development of plan(s) will need to identify the specific tasks and activities required to optimize costs, risks and performance of the assets and/or asset system(s), when they are to be carried out and the resources required.	The management team with overall responsibility for the asset management system. Operations, maintenance and engineering managers.	The organisation's asset management plan(s).

Company Name	**Vector Limited**
AMP Planning Period	**1 July 2023 – 30 June 2033**
Asset Management Standard Applied	

SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

Question No.	Function	Question	Score	Evidence—Summary	User Guidance	Why	Who	Record/documented Information
27	Asset management plan(s)	How has the organisation communicated its plan(s) to all relevant parties to a level of detail appropriate to the receiver's role in their delivery?	3	The AMP is communicated to all stakeholders including employees and Field Service Providers (FSPs). The organisation, end to end process, Vector's Delegated Financial Authorities (DFA) and works programmes are all set up to deliver the works effectively. The AMP is also published on the Vector web site. Monthly meetings are held to ensure effective delivery of the AMP.		Plans will be ineffective unless they are communicated to all those, including contracted suppliers and those who undertake enabling function(s). The plan(s) need to be communicated in a way that is relevant to those who need to use them.	The management team with overall responsibility for the asset management system. Delivery functions and suppliers.	Distribution lists for plan(s). Documents derived from plan(s) which detail the receivers role in plan delivery. Evidence of communication.
29	Asset management plan(s)	How are designated responsibilities for delivery of asset plan actions documented?	3	The AMP outlines the key roles responsible for its delivery. Vector's delegated authorities framework and policy, and position descriptions for each role further define the roles and authorities. Key tasks and responsibilities are allocated to team members who report on progress against plan on a monthly basis.		The implementation of asset management plan(s) relies on (1) actions being clearly identified, (2) an owner allocated and (3) that owner having sufficient delegated responsibility and authority to carry out the work required. It also requires alignment of actions across the organisation. This question explores how well the plan(s) set out responsibility for delivery of asset plan actions.	The management team with overall responsibility for the asset management system. Operations, maintenance and engineering managers. If appropriate, the performance management team.	The organisation's asset management plan(s). Documentation defining roles and responsibilities of individuals and organisational departments.
31	Asset management plan(s)	What has the organisation done to ensure that appropriate arrangements are made available for the efficient and cost effective implementation of the plan(s)? (Note this is about resources and enabling support)	3	Vector has a process to optimise proposed projects to improve cost effective delivery. Post Investment Reviews of large projects are undertaken. Regular meetings with FSPs are held to identify any potential resource constraints for capital and maintenance programmes. Specialised resources are employed as required such as the RMA specialist.		It is essential that the plan(s) are realistic and can be implemented, which requires appropriate resources to be available and enabling mechanisms in place. This question explores how well this is achieved. The plan(s) not only need to consider the resources directly required and timescales, but also the enabling activities, including for example, training requirements, supply chain capability and procurement timescales.	The management team with overall responsibility for the asset management system. Operations, maintenance and engineering managers. If appropriate, the performance management team. If appropriate, the performance management team. Where appropriate the procurement team and service providers working on the organisation's asset-related activities.	The organisation's asset management plan(s). Documented processes and procedures for the delivery of the asset management plan.
33	Contingency planning	What plan(s) and procedure(s) does the organisation have for identifying and responding to incidents and emergency situations and ensuring continuity of critical asset management activities?	3	Event management processes and contingency plans are in place for emergency events, business continuity, supply restoration, response to natural disasters, health, safety and environmental events. Regular reviews of incidents and or events are conducted weekly, in addition to an annual emergency exercise that is performed to test response preparedness.		Widely used AM practice standards require that an organisation has plan(s) to identify and respond to emergency situations. Emergency plan(s) should outline the actions to be taken to respond to specified emergency situations and ensure continuity of critical asset management activities including the communication to, and involvement of, external agencies. This question assesses if, and how well, these plan(s) triggered, implemented and resolved in the event of an incident. The plan(s) should be appropriate to the level of risk as determined by the organisation's risk assessment methodology. It is also a requirement that relevant personnel are competent and trained.	The manager with responsibility for developing emergency plan(s). The organisation's risk assessment team. People with designated duties within the plan(s) and procedure(s) for dealing with incidents and emergency situations.	The organisation's plan(s) and procedure(s) for dealing with emergencies. The organisation's risk assessments and risk registers.

Company Name	**Vector Limited**
AMP Planning Period	**1 July 2023 – 30 June 2033**
Asset Management Standard Applied	

SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

Question No.	Function	Question	Score	Evidence—Summary	User Guidance	Why	Who	Record/documented Information
37	Structure, authority and responsibilities	What has the organisation done to appoint member(s) of its management team to be responsible for ensuring that the organisation's assets deliver the requirements of the asset management strategy, objectives and plan(s)?	3	As defined in the AMP, the COO - Electricity Gas & Fibre has overall responsibility for Vector's Network Asset Management. The GM's of Gas Networks, Chief Engineer, Field Services, Capital Programme Delivery, Customer Excellence and Commercial Strategy all report to the COO and with appropriate authorities for delivering various parts of the asset management policy and plan. External Field Services Providers have a good understanding of their roles in the delivery of asset management strategy, objectives and plans.		In order to ensure that the organisation's assets and asset systems deliver the requirements of the asset management policy, strategy and objectives responsibilities need to be allocated to appropriate people who have the necessary authority to fulfil their responsibilities. (This question, relates to the organisation's assets eg, para b), s 4.4.1 of PAS 55, making it therefore distinct from the requirement contained in para a), s 4.4.1 of PAS 55).	Top management. People with management responsibility for the delivery of asset management policy, strategy, objectives and plan(s). People working on asset-related activities.	Evidence that managers with responsibility for the delivery of asset management policy, strategy, objectives and plan(s) have been appointed and have assumed their responsibilities. Evidence may include the organisation's documents relating to its asset management system, organisational charts, job descriptions of post-holders, annual targets/objectives and personal development plan(s) of post-holders as appropriate.
40	Structure, authority and responsibilities	What evidence can the organisation's top management provide to demonstrate that sufficient resources are available for asset management?	3	In addition to our internal asset management and engineering capability, Vector utilises external FSP's and consultants to supplement internal resources to help deliver on its AMP. Specialist consultants provide advice on resource consents, pipeline route assessment and engineering analysis.		Optimal asset management requires top management to ensure sufficient resources are available. In this context the term 'resources' includes manpower, materials, funding and service provider support.	Top management. The management team that has overall responsibility for asset management. Risk management team. The organisation's managers involved in day-to-day supervision of asset-related activities, such as frontline managers, engineers, foremen and chargehands as appropriate.	Evidence demonstrating that asset management plan(s) and/or the process(es) for asset management plan implementation consider the provision of adequate resources in both the short and long term. Resources include funding, materials, equipment, services provided by third parties and personnel (internal and service providers) with appropriate skills competencies and knowledge.
42	Structure, authority and responsibilities	To what degree does the organisation's top management communicate the importance of meeting its asset management requirements?	3	Service Levels and KPI's are set and monitored across the organisation through readily accessible team charters and dashboards. In addition, monthly reporting, quarterly team updates and strong engagement with programme delivery and service providers ensure that there is a strong focus on the delivery of asset management requirements. "All Hands" sessions have been introduced quarterly to convey the asset management objectives to the wider EGF team.		Widely used AM practice standards require an organisation to communicate the importance of meeting its asset management requirements such that personnel fully understand, take ownership of, and are fully engaged in the delivery of the asset management requirements (eg, PAS 55 s 4.4.1 g).	Top management. The management team that has overall responsibility for asset management. People involved in the delivery of the asset management requirements.	Evidence of such activities as road shows, written bulletins, workshops, team talks and management walk-abouts would assist an organisation to demonstrate it is meeting this requirement of PAS 55.
45	Outsourcing of asset management activities	Where the organisation has outsourced some of its asset management activities, how has it ensured that appropriate controls are in place to ensure the compliant delivery of its organisational strategic plan, and its asset management policy and strategy?	3	Maintenance, design and planning standards have been developed which together, with the controls established in the commercial contracts with the service providers, ensure that the KPI's established are being monitored and deficiencies addressed. Maintenance information is collected and stored in SAP-PM. The requirements and performance expectations are communicated through well-established communications mechanisms. Dedicated field assessors provide assurance against these standards.		Where an organisation chooses to outsource some of its asset management activities, the organisation must ensure that these outsourced process(es) are under appropriate control to ensure that all the requirements of widely used AM standards (eg, PAS 55) are in place, and the asset management policy, strategy objectives and plan(s) are delivered. This includes ensuring capabilities and resources across a time span aligned to life cycle management. The organisation must put arrangements in place to control the outsourced activities, whether it be to external providers or to other in-house departments. This question explores what the organisation does in this regard.	Top management. The management team that has overall responsibility for asset management. The manager(s) responsible for the monitoring and management of the outsourced activities. People involved with the procurement of outsourced activities. The people within the organisations that are performing the outsourced activities. The people impacted by the outsourced activity.	The organisation's arrangements that detail the compliance required of the outsourced activities. For example, this this could form part of a contract or service level agreement between the organisation and the suppliers of its outsourced activities. Evidence that the organisation has demonstrated to itself that it has assurance of compliance of outsourced activities.

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

Question No.	Function	Question	Score	Evidence—Summary	User Guidance	Why	Who	Record/documented Information
48	Training, awareness and competence	How does the organisation develop plan(s) for the human resources required to undertake asset management activities - including the development and delivery of asset management strategy, process(es), objectives and plan(s)?	2	An HR strategy is in place to align competencies and human resources with Vector's AMP and strategy. Core competencies are identified in the job design process and included in our job profiles / position descriptions. HR Plans for monitoring succession, development and availability of resources by encouraging on-the-job learning, through financial support for formal learning and the investment of time and energy into the career development framework for our employees, thus solidifying the bond between employee and the organisation.		There is a need for an organisation to demonstrate that it has considered what resources are required to develop and implement its asset management system. There is also a need for the organisation to demonstrate that it has assessed what development plan(s) are required to provide its human resources with the skills and competencies to develop and implement its asset management systems. The timescales over which the plan(s) are relevant should be commensurate with the planning horizons within the asset management strategy considers e.g. if the asset management strategy considers 5, 10 and 15 year time scales then the human resources development plan(s) should align with these. Resources include both 'in house' and external resources who undertake asset management activities.	Senior management responsible for agreement of plan(s). Managers responsible for developing asset management strategy and plan(s). Managers with responsibility for development and recruitment of staff (including HR functions). Staff responsible for training. Procurement officers. Contracted service providers.	Evidence of analysis of future work load plan(s) in terms of human resources. Document(s) containing analysis of the organisation's own direct resources and contractors resource capability over suitable timescales. Evidence, such as minutes of meetings, that suitable management forums are monitoring human resource development plan(s). Training plan(s), personal development plan(s), contract and service level agreements.
49	Training, awareness and competence	How does the organisation identify competency requirements and then plan, provide and record the training necessary to achieve the competencies?	3	The competency requirements and associated training requirements e.g. Certificate of Competence (CoC) are well established for safety critical activities across both FSP's and Vector. Individuals when recruited have their competency assessed against the job skill requirements. Training needs are identified and agreed. Training achieved is recorded in Vector's learning management system. Individual succession and development plans have been developed and is supported through ongoing professional development. A qualifications register is maintained which identifies CoC expiry dates and any refresher training required.		Widely used AM standards require that organisations to undertake a systematic identification of the asset management awareness and competencies required at each level and function within the organisation. Once identified the training required to provide the necessary competencies should be planned for delivery in a timely and systematic way. Any training provided must be recorded and maintained in a suitable format. Where an organisation has contracted service providers in place then it should have a means to demonstrate that this requirement is being met for their employees. (eg, PAS 55 refers to frameworks suitable for identifying competency requirements).	Senior management responsible for agreement of plan(s). Managers responsible for developing asset management strategy and plan(s). Managers with responsibility for development and recruitment of staff (including HR functions). Staff responsible for training. Procurement officers. Contracted service providers.	Evidence of an established and applied competency requirements assessment process and plan(s) in place to deliver the required training. Evidence that the training programme is part of a wider, co-ordinated asset management activities training and competency programme. Evidence that training activities are recorded and that records are readily available (for both direct and contracted service provider staff) e.g. via organisation wide information system or local records database.
50	Training, awareness and competence	How does the organization ensure that persons under its direct control undertaking asset management related activities have an appropriate level of competence in terms of education, training or experience?	3	The competency requirements and associated training requirements are well established for all persons carrying out asset management related activities across both FSP's and Vector. These are assessed regularly and the currently monitored.		A critical success factor for the effective development and implementation of an asset management system is the competence of persons undertaking these activities. organisations should have effective means in place for ensuring the competence of employees to carry out their designated asset management function(s). Where an organisation has contracted service providers undertaking elements of its asset management system then the organisation shall assure itself that the outsourced service provider also has suitable arrangements in place to manage the competencies of its employees. The organisation should ensure that the individual and corporate competencies it requires are in place and actively monitor, develop and maintain an appropriate balance of these competencies.	Managers, supervisors, persons responsible for developing training programmes. Staff responsible for procurement and service agreements. HR staff and those responsible for recruitment.	Evidence of a competency assessment framework that aligns with established frameworks such as the asset management Competencies Requirements Framework (Version 2.0); National Occupational Standards for Management and Leadership; UK Standard for Professional Engineering Competence, Engineering Council, 2005.
53	Communication, participation and consultation	How does the organisation ensure that pertinent asset management information is effectively communicated to and from employees and other stakeholders, including contracted service providers?	3	Effective two-way communication channels are in place for staff and other stakeholders in the form of group presentations / meetings (electricity, gas and fibre), internal comms video updates, dashboards, reporting, standards, meetings and additional information on Vector's web site. In addition, the FSPs have direct access to a suite of controlled technical standards and pertinent systems, such as Infonet, CMS, GIS and SAP. The effectiveness of these are reviewed and monitored regularly. Monthly operational meetings are held with the FSPs to review the delivery of the annual plans and identify any areas for improvement.		Widely used AM practice standards require that pertinent asset management information is effectively communicated to and from employees and other stakeholders including contracted service providers. Pertinent information refers to information required in order to effectively and efficiently comply with and deliver asset management strategy, plan(s) and objectives. This will include for example the communication of the asset management policy, asset performance information, and planning information as appropriate to contractors.	Top management and senior management representative(s), employee's representative(s), employee's trade union representative(s); contracted service provider management and employee representative(s); representative(s) from the organisation's Health, Safety and Environmental team. Key stakeholder representative(s).	Asset management policy statement prominently displayed on notice boards, intranet and internet; use of organisation's website for displaying asset performance data; evidence of formal briefings to employees, stakeholders and contracted service providers; evidence of inclusion of asset management issues in team meetings and contracted service provider contract meetings; newsletters, etc.

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

Question No.	Function	Question	Score	Evidence—Summary	User Guidance	Why	Who	Record/documented Information
59	Asset Management System documentation	What documentation has the organisation established to describe the main elements of its asset management system and interactions between them?	2	The AMP is approved by the Board and widely communicated to internal and external stakeholders, including FSPs. In addition, a comprehensive set of asset class strategies, design, maintenance and operating standards have been established and are reviewed regularly. Enhancements to Vector's asset management framework and system is underway.		Widely used AM practice standards require an organisation maintain up to date documentation that ensures that its asset management systems (ie, the systems the organisation has in place to meet the standards) can be understood, communicated and operated. (eg, s 4.5 of PAS 55 requires the maintenance of up to date documentation of the asset management system requirements specified throughout s 4 of PAS 55).	The management team that has overall responsibility for asset management. Managers engaged in asset management activities.	The documented information describing the main elements of the asset management system (process(es)) and their interaction.
62	Information management	What has the organisation done to determine what its asset management information system(s) should contain in order to support its asset management system?	2	Asset Management Systems have been developed but are evolving further. This includes further collection and analysis of fault and asset data and improving the utilisation of SAP for asset lifecycle information. Data assurance processes exist to ensure the data is accurate and complete and has been signed off by the GM Operational Insights and Information.		Effective asset management requires appropriate information to be available. Widely used AM standards therefore require the organisation to identify the asset management information it requires in order to support its asset management system. Some of the information required may be held by suppliers. The maintenance and development of asset management information systems is a poorly understood specialist activity that is akin to IT management but different from IT management. This group of questions provides some indications as to whether the capability is available and applied. Note: To be effective, an asset information management system requires the mobilisation of technology, people and process(es) that create, secure, make available and destroy the information required to support the asset management system.	The organisation's strategic planning team. The management team that has overall responsibility for asset management. Information management team. Operations, maintenance and engineering managers	Details of the process the organisation has employed to determine what its asset information system should contain in order to support its asset management system. Evidence that this has been effectively implemented.
63	Information management	How does the organisation maintain its asset management information system(s) and ensure that the data held within it (them) is of the requisite quality and accuracy and is consistent?	2	Controls have been developed to govern the data quality in Vector's asset management systems. However, there are still gaps in the data and more work is needed to improve this in time. A comprehensive data standard is being developed to ensure quality and consistency of asset master data throughout its lifecycle. Data assurance processes exist to ensure the data is accurate and complete.		The response to the questions is progressive. A higher scale cannot be awarded without achieving the requirements of the lower scale. This question explores how the organisation ensures that information management meets widely used AM practice requirements (eg, s 4.4.6 (a), (c) and (d) of PAS 55).	The management team that has overall responsibility for asset management. Users of the organisational information systems.	The asset management information system, together with the policies, procedure(s), improvement initiatives and audits regarding information controls.
64	Information management	How has the organisation's ensured its asset management information system is relevant to its needs?	3	A broad range of network operations and asset management data is available through PowerBI dashboards, Web GIS and SAP PM for all staff and stakeholders. A dedicated Operational Information and Insights team has been established to ensure that information and data align with asset management requirements and user needs.		Widely used AM standards need not be prescriptive about the form of the asset management information system, but simply require that the asset management information system is appropriate to the organisations needs, can be effectively used and can supply information which is consistent and of the requisite quality and accuracy.	The organisation's strategic planning team. The management team that has overall responsibility for asset management. Information management team. Users of the organisational information systems.	The documented process the organisation employs to ensure its asset management information system aligns with its asset management requirements. Minutes of information systems review meetings involving users.

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

Question No.	Function	Question	Score	Evidence—Summary	User Guidance	Why	Who	Record/documented Information
69	Risk management process(es)	How has the organisation documented process(es) and/or procedure(s) for the identification and assessment of asset and asset management related risks throughout the asset life cycle?	3	Processes of identification and assessment of asset related risks across the asset lifecycle are defined by the Network Risk Management Process document. Supporting systems such as Active Risk Manager (ARM) are used to assess and document asset related risks throughout the lifecycle as defined by the process.		Risk management is an important foundation for proactive asset management. Its overall purpose is to understand the cause, effect and likelihood of adverse events occurring, to optimally manage such risks to an acceptable level, and to provide an audit trail for the management of risks. Widely used standards require the organisation to have process(es) and/or procedure(s) in place that set out how the organisation identifies and assesses asset and asset management related risks. The risks have to be considered across the four phases of the asset lifecycle (eg, para 4.3.3 of PAS 55).	The top management team in conjunction with the organisation's senior risk management representatives. There may also be input from the organisation's Safety, Health and Environment team. Staff who carry out risk identification and assessment.	The organisation's risk management framework and/or evidence of specific process(es) and/ or procedure(s) that deal with risk control mechanisms. Evidence that the process(es) and/or procedure(s) are implemented across the business and maintained. Evidence of agendas and minutes from risk management meetings. Evidence of feedback in to process(es) and/or procedure(s) as a result of incident investigation(s). Risk registers and assessments.
79	Use and maintenance of asset risk information	How does the organisation ensure that the results of risk assessments provide input into the identification of adequate resources and training and competency needs?	3	Risk assessments are used to support asset management decisions associated with asset management strategies and plans, and the prioritisation and allocation of resources, budget and activities. The influence of risk management is well documented in Vector's asset strategy documentation.		Widely used AM standards require that the output from risk assessments are considered and that adequate resource (including staff) and training is identified to match the requirements. It is a further requirement that the effects of the control measures are considered, as there may be implications in resources and training required to achieve other objectives.	Staff responsible for risk assessment and those responsible for developing and approving resource and training plan(s). There may also be input from the organisation's Safety, Health and Environment team.	The organisations risk management framework. The organisation's resourcing plan(s) and training and competency plan(s). The organisation should be able to demonstrate appropriate linkages between the content of resource plan(s) and training and competency plan(s) to the risk assessments and risk control measures that have been developed.
82	Legal and other requirements	What procedure does the organisation have to identify and provide access to its legal, regulatory, statutory and other asset management requirements, and how is requirements incorporated into the asset management system?	3	The business has a Legal, Regulatory and HSQE team that advises the business of its obligations and monitors compliance. Regulatory changes are assessed and corresponding changes are made to business operating procedures and practices. In addition, Vector's asset management is also subject to external audit e.g. asset management system audits.		In order for an organisation to comply with its legal, regulatory, statutory and other asset management requirements, the organisation first needs to ensure that it knows what they are (eg, PAS 55 specifies this in s 4.4.8). It is necessary to have systematic and auditable mechanisms in place to identify new and changing requirements. Widely used AM standards also require that requirements are incorporated into the asset management system (e.g. procedure(s) and process(es))	Top management. The organisations regulatory team. The organisation's legal team or advisors. The management team with overall responsibility for the asset management system. The organisation's health and safety team or advisors. The organisation's policy making team.	The organisational processes and procedures for ensuring information of this type is identified, made accessible to those requiring the information and is incorporated into asset management strategy and objectives
88	Life Cycle Activities	How does the organisation establish implement and maintain process(es) for the implementation of its asset management plan(s) and control of activities across the creation, acquisition or enhancement of assets. This includes design, modification, procurement, construction and commissioning activities?	3	A suite of technical standards form the basis of Vector's control and management of its network assets. These are supported by the AMP, a maintenance plan and good project and operations management. The effective management of associated projects, budgets and high level work plans are monitored against the expectations established in the AMP.		Life cycle activities are about the implementation of asset management plan(s) i.e. they are the "doing" phase. They need to be done effectively and well in order for asset management to have any practical meaning. As a consequence, widely used standards (eg, PAS 55 s 4.5.1) require organisations to have in place appropriate process(es) and procedure(s) for the implementation of asset management plan(s) and control of lifecycle activities. This question explores those aspects relevant to asset creation.	Asset managers, design staff, construction staff and project managers from other impacted areas of the business, e.g. Procurement	Documented process(es) and procedure(s) which are relevant to demonstrating the effective management and control of life cycle activities during asset creation, acquisition, enhancement including design, modification, procurement, construction and commissioning.

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

Question No.	Function	Question	Score	Evidence—Summary	User Guidance	Why	Who	Record/documented Information
91	Life Cycle Activities	How does the organisation ensure that process(es) and/or procedure(s) for the implementation of asset management plan(s) and control of activities during maintenance (and inspection) of assets are sufficient to ensure activities are carried out under specified conditions, are consistent with asset management strategy and control cost, risk and performance?	3	A suite of maintenance standards are in place. In addition, a standards improvement register and assurance (audit) process is in place.		Having documented process(es) which ensure the asset management plan(s) are implemented in accordance with any specified conditions, in a manner consistent with the asset management policy, strategy and objectives and in such a way that cost, risk and asset system performance are appropriately controlled is critical. They are an essential part of turning intention into action (eg, as required by PAS 55 s 4.5.1).	Asset managers, operations managers, maintenance managers and project managers from other impacted areas of the business	Documented procedure for review. Documented procedure for audit of process delivery. Records of previous audits, improvement actions and documented confirmation that actions have been carried out.
95	Performance and condition monitoring	How does the organisation measure the performance and condition of its assets?	2	Service levels, asset condition and performance information are consistently gathered and reviewed. Various BI reports have been created to monitor key performance indicators and actions based on condition and performance information. Vector has also adopted a condition based risk management approach to its asset management with the support of information from SAP PM to form the leading indicators used to improve the asset management strategy and plans.		Widely used AM standards require that organisations establish implement and maintain procedure(s) to monitor and measure the performance and/or condition of assets and asset systems. They further set out requirements in some detail for reactive and proactive monitoring, and leading/lagging performance indicators together with the monitoring or results to provide input to corrective actions and continual improvement. There is an expectation that performance and condition monitoring will provide input to improving asset management strategy, objectives and plan(s).	A broad cross-section of the people involved in the organisation's asset-related activities from data input to decision-makers, i.e. an end-to end assessment. This should include contactors and other relevant third parties as appropriate.	Functional policy and/or strategy documents for performance or condition monitoring and measurement. The organisation's performance monitoring frameworks, balanced scorecards etc. Evidence of the reviews of any appropriate performance indicators and the action lists resulting from these reviews. Reports and trend analysis using performance and condition information. Evidence of the use of performance and condition information shaping improvements and supporting asset management strategy, objectives and plan(s).
99	Investigation of asset-related failures, incidents and nonconformities	How does the organisation ensure responsibility and the authority for the handling, investigation and mitigation of asset-related failures, incidents and emergency situations and non conformances is clear, unambiguous, understood and communicated?	3	Vector has an investigation process in place and clear responsibilities defined. This is managed in line with Vector's HSE management system and is supported by our Risk and Incident Management and Active Risk Manager systems. Incidents are reported as defined by Vector's Incident Management Process. Major events are investigated systemically, risk assessed and appropriate mitigation plans are developed. Ownership of the actions are defined and followed up and reported on.		Widely used AM standards require that the organisation establishes implements and maintains process(es) for the handling and investigation of failures incidents and non-conformities for assets and sets down a number of expectations. Specifically this question examines the requirement to define clearly responsibilities and authorities for these activities, and communicate these unambiguously to relevant people including external stakeholders if appropriate.	The organisation's safety and environment management team. The team with overall responsibility for the management of the assets. People who have appointed roles within the asset-related investigation procedure, from those who carry out the investigations to senior management who review the recommendations. Operational controllers responsible for managing the asset base under fault conditions and maintaining services to consumers. Contractors and other third parties as appropriate.	Process(es) and procedure(s) for the handling, investigation and mitigation of asset-related failures, incidents and emergency situations and non conformances. Documentation of assigned responsibilities and authority to employees. Job Descriptions, Audit reports. Common communication systems i.e. all Job Descriptions on Internet etc.
105	Audit	What has the organisation done to establish procedure(s) for the audit of its asset management system (process(es))?	3	Vector has an established audit procedure. External and internal audits, and reviews on asset management practices are carried out on a regular basis. Field work carried out by contractors is sample audited.		This question seeks to explore what the organisation has done to comply with the standard practice AM audit requirements (eg, the associated requirements of PAS 55 s 4.6.4 and its linkages to s 4.7).	The management team responsible for its asset management procedure(s). The team with overall responsibility for the management of the assets. Audit teams, together with key staff responsible for asset management. For example, Asset Management Director, Engineering Director. People with responsibility for carrying out risk assessments	The organisation's asset-related audit procedure(s). The organisation's methodology(s) by which it determined the scope and frequency of the audits and the criteria by which it identified the appropriate audit personnel. Audit schedules, reports etc. Evidence of the procedure(s) by which the audit results are presented, together with any subsequent communications. The risk assessment schedule or risk registers.

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

Question No.	Function	Question	Score	Evidence—Summary	User Guidance	Why	Who	Record/documented Information
109	Corrective & Preventative action	How does the organisation instigate appropriate corrective and/or preventive actions to eliminate or prevent the causes of identified poor performance and non conformance?	3	Actions arising from audits, investigations, asset performance reviews, risks and legal compliance are captured in various systems and registers. Formal investigation processes are in place for major events. Root cause analysis and condition and performance reviews are being completed when needed but there is room to improve.		Having investigated asset related failures, incidents and non-conformances, and taken action to mitigate their consequences, an organisation is required to implement preventative and corrective actions to address root causes. Incident and failure investigations are only useful if appropriate actions are taken as a result to assess changes to a businesses risk profile and ensure that appropriate arrangements are in place should a recurrence of the incident happen. Widely used AM standards also require that necessary changes arising from preventive or corrective action are made to the asset management system.	The management team responsible for its asset management procedure(s). The team with overall responsibility for the management of the assets. Audit and incident investigation teams. Staff responsible for planning and managing corrective and preventive actions.	Analysis records, meeting notes and minutes, modification records. Asset management plan(s), investigation reports, audit reports, improvement programmes and projects. Recorded changes to asset management procedure(s) and process(es). Condition and performance reviews. Maintenance reviews
113	Continual Improvement	How does the organisation achieve continual improvement in the optimal combination of costs, asset related risks and the performance and condition of assets and asset systems across the whole life cycle?	2	Continuous improvement processes exist for the ongoing improvements to Vector's technical standards. Internal action registers are also in place to capture improvements associated risks, audits and asset performance reviews, included in the asset strategy and monthly reports. Optimisation improvements across risk, cost and performance will improve with improved data and reporting, currently underway.		Widely used AM standards have requirements to establish, implement and maintain process(es)/procedure(s) for identifying, assessing, prioritising and implementing actions to achieve continual improvement. Specifically there is a requirement to demonstrate continual improvement in optimisation of cost risk and performance/condition of assets across the life cycle. This question explores an organisation's capabilities in this area—looking for systematic improvement mechanisms rather that reviews and audit (which are separately examined).	The top management of the organisation. The manager/team responsible for managing the organisation's asset management system, including its continual improvement. Managers responsible for policy development and implementation.	Records showing systematic exploration of improvement. Evidence of new techniques being explored and implemented. Changes in procedure(s) and process(es) reflecting improved use of optimisation tools/techniques and available information. Evidence of working parties and research.
115	Continual Improvement	How does the organisation seek and acquire knowledge about new asset management related technology and practices, and evaluate their potential benefit to the organisation?	3	Vector participates in a number of national and international working groups to identify new asset management technologies and practices but there is room to improve.		One important aspect of continual improvement is where an organisation looks beyond its existing boundaries and knowledge base to look at what 'new things are on the market'. These new things can include equipment, process(es), tools, etc. An organisation which does this (eg, by the PAS 55 s 4.6 standards) will be able to demonstrate that it continually seeks to expand its knowledge of all things affecting its asset management approach and capabilities. The organisation will be able to demonstrate that it identifies any such opportunities to improve, evaluates them for suitability to its own organisation and implements them as appropriate. This question explores an organisation's approach to this activity.	The top management of the organisation. The manager/team responsible for managing the organisation's asset management system, including its continual improvement. People who monitor the various items that require monitoring for 'change'. People that implement changes to the organisation's policy, strategy, etc. People within an organisation with responsibility for investigating, evaluating, recommending and implementing new tools and techniques, etc.	Research and development projects and records, benchmarking and participation knowledge exchange professional forums. Evidence of correspondence relating to knowledge acquisition. Examples of change implementation and evaluation of new tools, and techniques linked to asset management strategy and objectives.

10.16 Appendix P – Mandatory Explanatory Notes on Forecast Information (Schedule 14a)

1. This schedule requires GDBs to provide explanatory notes to reports prepared in accordance with clause 2.6.6.
2. This schedule is mandatory-GDBs must provide the explanatory comment specified below, in accordance with clause 2.7.2. This information is not part of the audited disclosure information, and so is not subject to the assurance requirements specified in section 2.8.

Commentary on difference between nominal and constant price capital expenditure forecasts (Schedule 11a)

3. In the box below, comment on the difference between nominal and constant price capital expenditure for the current disclosure year and 10 year planning period, as disclosed in Schedule 11a.

BOX 1: COMMENTARY ON DIFFERENCE BETWEEN NOMINAL AND CONSTANT PRICE CAPITAL EXPENDITURE FORECASTS

Vector has used a capital expenditure inflator based on the model used by the Commerce Commission in its DPP price reset on 1 October 2022. We have used PPI as the capital expenditure inflator.

Vector has used the NZIER (New Zealand Institute of Economic Research) February 2023 PPI (Producer Price Index-inputs) forecast up to June 2027. Thereafter, we have assumed a long-term inflation rate of 2.00%.

The constant price capital expenditure forecast is inflated by the above-mentioned index to convert to a nominal price capital expenditure forecast

Commentary on difference between nominal and constant price operational expenditure forecasts (Schedule 11b)

4. In the box below, comment on the difference between nominal and constant price operational expenditure for the current disclosure year and 10-year planning period, as disclosed in Schedule 11b.

BOX 2: COMMENTARY ON DIFFERENCE BETWEEN NOMINAL AND CONSTANT PRICE OPERATIONAL EXPENDITURE FORECASTS

Vector has used an operational expenditure inflator based on the model used by the Commerce Commission in its DPP price reset on 1 October 2022. We have used an inflator which is a mix of Producer Price Index (PPI) and Labour Cost Index (LCI). The weighting between PPI (40%) and LCI (60%) as per the Commission's model.

Vector has used the NZIER (New Zealand Institute of Economic Research) February 2022 PPI (Producer Price Index-inputs) forecast up to June 2027. Thereafter, we have assumed a long-term inflation rate of 2.00%.

Vector has used the NZIER (New Zealand Institute of Economic Research) February 2022 LCI (Labour Cost Index) forecast up to March 2027. Thereafter, we have assumed a long-term inflation rate of 2.00%.

The constant price operational expenditure forecast is inflated by the above-mentioned index to convert to a nominal price operational expenditure forecast.

10.17 Appendix Q – Certificate for Year Beginning Disclosures

Schedule 17 Certification for Year-beginning Disclosures

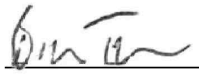
Clause 2.9.1

We, Bruce Turner and Paul Hutchison, being directors of Vector Limited certify that, having made all reasonable enquiry, to the best of our knowledge:

a) The following attached information of Vector Limited prepared for the purposes of clauses 2.6.1, 2.6.6 and 2.7.2 of the Gas Distribution Information Disclosure Determination 2012 in all material respects complies with that determination.

b) The prospective financial or non-financial information included in the attached information has been measured on a basis consistent with regulatory requirements or recognised industry standards.

c) The forecasts in Schedules 11a, 11b, 12a, 12b and 12c are based on objective and reasonable assumptions which both align with Vector Limited's corporate vision and strategy and are documented in retained records.



Director

Director

29 June 2023

Date