vector gas

2022–2032

gas distribution asset management plan update

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1 – Introduction

1.1 Executive summary

This Asset Management Plan update 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 strategy.

As we mentioned in our 2021 Asset Management Plan Update, we are in a period of energy systems transition, driven by decarbonisation, in which there is significant uncertainty around the role of natural gas in our transition, and the future of gas assets. We continue to manage this future uncertainty by remaining agile, working to preserve optionality, and by putting our customers at the centre of our asset management approach. We have developed our 10-year forward investment programme and operating costs for this AMP update with a very high level of uncertainty around the future environment.

We're pleased the Commerce Commission has acknowledged the transition to a low carbon economy, and the need to balance the objectives of Government, customers, and gas asset owners around the use of natural gas within credible emission reduction pathways. This is reflected in the next four-year DPP period in our ability to recover our long-term investment in gas network infrastructure. Accelerating our ability to recover costs now, lessens the risk of bigger price changes for gas customers further down the track.

1.2 AMP update purpose statement

In June 2020, we published a comprehensive Asset Management Plan, which is available on our website www.vector.co.nz. This 2022 Asset Management Plan update is structured to meet the disclosure requirements, and is limited to providing information on material changes to the 2021 AMP so that our customers, staff and stakeholders can understand the context in which we make investment decisions to deliver a safe, resilient, reliable and affordable network. Schedule 13 Report on Asset Management Maturity remains unchanged since the last published AMP.

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

1.3 AMP update planning period

This AMP update covers a 10-year planning period, from 1 July 2022 to 30 June 2032. Consistent with Information Disclosure requirements, information is provided in this update to show material changes and updates to our asset management planning since 2021, when the last Gas Distribution AMP update (1 July 2021 – 30 June 2031) was published. In particular the update contains updated 10-year capital investment and maintenance programmes for the gas distribution network.

1.4 Certification date

This AMP update was certified and approved by our Board of Directors on 29 June 2022.

2 – 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-run 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). The key element to the Commission's approach to administering Price-Quality regulation is to set prices consistent with a commitment to 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.

The next gas pipeline business (GPB) reset for both gas transmission and gas distribution pipelines is due to take effect from 1 October 2022. This will be the third five year recalibration of prices since the inception of Part 4 of the Commerce Act in 2010. The third reset is occurring at a time of increased uncertainty around New Zealand's climate change policy and direction for the future of natural gas, and its impact on Part 4 regulation for reticulated natural gas networks.

The Climate Change Commission (CCC) Report recommendations for natural gas networks were a significant departure to the status quo environment. The Government did not adopt the CCC's recommendation to ban new gas connections, however, there remains significant uncertainty around the future of natural gas. The Commission has recognised this uncertainty in its decision on the default price-quality path for GPBs from 1 October 2022 by proposing to introduce a mechanism to bring cashflows forward by accelerating depreciation in order to mitigate heightened asset stranding risk. Vector supports this approach, as outlined in our submission to the draft decision.

We also strongly recommend the Commission take further action to address uncertainty in the natural gas sector through its upcoming input methodologies review. 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 be considered in the current environment.

As New Zealand transitions to a net carbon zero economy, we encourage the Commission to work with stakeholders to support investigations into the potential distribution of alternative gasses such as Hydrogen.

3 – Decarbonisation and Climate Resilience

Vector continues to engage with its customers, industry stakeholders and Government decision makers as we progress our decarbonisation pathway, and we are cognisant of the increasing risks and opportunities posed by a changing environmental and social context. For example, the rapid urbanisation of Auckland, increasing storm events linked to climate change, and the passage of the Climate Change Response (Zero Carbon) Amendment Act 2019, are some of the challenges which we continue to navigate on behalf of our customers.

Vector splits the emissions of our gas distribution business according to the Greenhouse Gas Protocol, which divides emissions into three scopes.

- Scope 1: Emissions we directly control, such as methane leaks in our natural gas pipelines.
- Scope 2: Emissions from electricity consumption.
- Scope 3: Indirect emissions, such as downstream combustion of gas emissions.

Vector has set a science-based target to reduce 53.5% of its Scope 1 and 2 emissions (excluding electricity line losses) by 2030 based on a 2020 baseline.

As New Zealand has set a national emission reduction target of 50% by 2030, it is important that Vector adopts all low-cost abatement options, as any unabated emissions by 2030 will come at a cost to New Zealand society through government offsets.

3.1 Direct (Scope 1 and 2) emission reduction – fugitive methane leaks

Fugitive methane from Vector's natural gas pipelines is responsible for 12,074 tonnes of CO_2 in FY21. This is unsurprising as fugitive methane leaks are responsible for approximately 2.5% of New Zealand energy sector greenhouse gas emissions[1].

In FY21, Vector undertook a comprehensive study to model methane leaks on our network. The model created a fluid dynamics based, quasi-digital twin of the network, which enabled us to identify and quantify methane leaks. Furthermore, it enabled us to test various initiatives and identify those that have the largest impact, at the lowest cost.

EMISSION SOURCE	FY20	FY21
Pipe permeation	46	46
Leaks detected in systematic survey	10,736	6,054
Operational emission / maintenance	9	12
Third party damages	4,170	4,655
Public reported escapes	19	14
District regulator stations (DRS) (maintenance and operation)	762	667
Valves and fittings	626	626
Total	**16,368**	**12,074**

TABLE 3-1 SOURCES OF SCOPE 1 FUGITIVE EMISSIONS

The largest cause of fugitive emissions on the Vector network are due to those found on routine surveys. Leaks found from routine surveys are small leaks that go undetected during leakage survey cycles, leading to accumulated gas volume escape. During the year, Vector reduced its leakage survey cycle from two-yearly to annually, meaning that any leak found would have been leaking for an average of six months, assuming a gaussian distribution. Reducing the time between surveys has a significant impact on overall fugitive gas, with corresponding public health and safety benefits as the leaks are found sooner.

Third-party damages, especially on service pipes, is the second material emission source. While this trended up in FY21, the overall multi-year trend is downwards as detailed further in Section 4.2.

To understand and compare least-cost decarbonisation initiatives, we use the metric of $/tonne$CO_2$e abated.

[1] https://www.mbie.govt.nz/building-and-energy/energy-and-natural-resources/energy-statistics-and-modelling/energy-statistics/new-zealand-energy-sector-greenhouse-gas-emissions/

INITIATIVE	ANNUAL COST PER TONNE CO_2E	TOTAL CARBON ABATED (TONNES CO_2E)
Increasing from 2 yearly to annual surveying of gas pipelines (completed in FY22)	$10	5,660
Increasing from annual to 6 monthly surveying of gas pipelines	$83	2,290
Increasing from 6 monthly to quarterly surveying of gas pipelines	$210	1,380
Current Emissions Trading Scheme (ETS) Price	$85	
2030- ETS price based on Climate Change Commission recommendations to government	$140	

TABLE 3-2 DECARBONISATION ABATEMENT INITIATIVES

In line with our Group emissions reduction targets, we are running surveys of gas pipelines on an annual basis. There are also further health and safety co-benefits, and more details can be found in Section 4.5.

3.2 Climate Resilience

We prioritise climate risk as a critical risk for Vector with Board Risk and Assurance Committee oversight. We provide clear and transparent reporting of sustainability risks, opportunities, and metrics through our Annual Report and Task Force for Climate Related Financial Disclosures (TCFD).

In the context of this AMP, climate resilience refers to the ability of the network to anticipate, absorb, accommodate and recover from the weather events related to climate change. We consider the following to be key risks to the gas network:

- Increase in hot days, that limits field service operation due to health and safety risks, thus delaying maintenance and repair work.
- Increase in flood events: Both freshwater flooding from extreme rainfall, and coastal inundation during storm surges.

Initial geospatial information system mapping highlights that 17 of our district regulator stations (DRS) are in potential flood zones, of which 14 sit directly within flood plains. Unlike electrical infrastructure, gas infrastructure is more resilient to flood based impacts. The risk from flooding is taken into account by the Condition Based Asset Risk Management (CBARM) model that Vector has recently developed for its DRS assets. The model is used for prioritising the upgrade or replacement of DRS based on ongoing DRS condition assessments as well as inputs from environmental and other risk assessments which include the proximity of the DRS to flood-prone areas.

As the National Adaptation Plan, comes into force, we expect an increase in data availability, to better model, forecast and evaluate our climate-change induced asset exposure risks.

4 – Network Performance

This section reviews the key asset management service levels previously described in the 2021 AMP.

4.1 Response time to emergencies

For the period ending 30 June 2021, Vector's Response Time to Emergencies (RTE) within one hour and three hours response was 100%. Vector's target proportion of RTE within one and three hours is 80% and 100%, respectively. Vector's RTE targets were therefore met or exceeded.

During RY21 there were 117 emergency events compared to 102 events in RY20; a 15% increase. Despite this increase, Vector's RTE performance improved due to a review and geographically repositioning of our FSP emergency response crews, which resulted in faster response times across the Auckland region. In addition, due to Covid 19 lockdowns during RY21, there were less vehicles on the road, resulting in less congestion which improved our response times.

Table 4-1 shows the comparison of RTE for the previous five years against Vector's target.

SERVICE LEVEL	RY17	RY18	RY19	RY20	RY21	TARGET	PERFORMANCE AGAINST TARGET
Proportion of RTE within one hour	93.8%	98.1%	97.8%	95.1%	100%	>80%	●
Proportion of RTE within three hours	100%	100%	100%	100%	100%	100%	●

TABLE 4-1 RESPONSE TIME TO EMERGENCIES

4.2 Interruption rate

For the year ending 30 June 2021, Vector's interruption rate performance was 9.1 interruptions per 100 km of pipeline length, below Vector's target of (less than) 17.

During RY21 there were 620 interruptions compared to 601 in RY20; a 3% increase. The key contributor to the increase was planned interruptions which increased by 20 events and makes up 71% of all interruptions. Total unplanned interruptions were similar to that for the preceding year, where third party damage events make up 79% of all unplanned events.

Table 4-2 shows the comparison of the interruption rate for the previous five years against Vector's target.

SERVICE LEVEL	RY17	RY18	RY19	RY20	RY21	TARGET	PERFORMANCE AGAINST TARGET
Interruption rate (interruptions per 100km of pipeline length)	11.1	8.9	9.0	8.8	9.1	<17	●

TABLE 4-2 INTERRUPTION RATE PER 100 KM OF PIPELINE LENGTH

4.3 Number of poor pressure events

For the year ending 30 June 2021, Vector had three poor pressure events. This is below Vector's target of (less than) four events per annum.

Analysis of the three poor pressure events recorded for RY21 shows that one of the events was caused by a third party damage to a riser pipe which caused a blockage in the service pipe below ground. The other two events were due to service pipe fitting failures, where the fittings where blocked therefore restricting flow. Neither the RY21 events nor the poor pressure events that occurred during the previous RY periods were related to poor pressure on the mains network.

Table 4-3 shows the comparison of poor pressure events due to network causes for the previous five years against Vector's target.

SERVICE LEVEL	RY17	RY18	RY19	RY20	RY21	TARGET	PERFORMANCE AGAINST TARGET
Poor pressure events due to network causes	5	1	1	2	3	<4	●

TABLE 4-3 NUMBER OF POOR PRESSURE EVENTS

4.4 Public reported escapes

For the year ending 30 June 2021, Vector's Public Reported Escapes (PRE) performance was 17 PRE per 1,000 km of distribution system, below Vector's target of (less than) 38.

During RY21 there were 118 PRE compared to 133 in RY20; an 11% decrease. An analysis of the PRE events in RY21 shows approximately 58% of all PRE were related to service riser faults (i.e. riser valve, pipe or crimp joint); a further 24% of PRE were related to service pipe faults (i.e. service pipe or fitting) and 14% of PRE were related to mains pipe faults. The balance of PREs were related to DRS and service regulator faults etc. As with previous RY periods, the total PRE count for FY21 continues to trend downwards when compared to previous FY periods. This trend demonstrates that Vector's current maintenance programmes (in particular preventive maintenance and corrective maintenance), and asset renewal programmes (e.g. pre-1985 Polyethylene (PE) pipeline replacement, riser valve audits etc.) are appropriate strategies to achieve ongoing network performance improvements.

Table 4.4 below shows the comparison of PRE for the previous five years against Vector's target.

SERVICE LEVEL	RY17	RY18	RY19	RY20	RY21	TARGET	PERFORMANCE AGAINST TARGET
PRE per 1,000km	30	24	21	19	17	<38	

TABLE 4-4 NUMBER OF PRE PER 1,000 KM OF DISTRIBUTION SYSTEM

4.5 Natural gas fugitive emissions (scope 1)

In support of the national efforts to reduce greenhouse gas (GHG) emissions, and more specifically methane (CH4) emissions which have more impact on climate change, it is critical for the gas industry to accurately define and quantify their methane emissions in order to support and actively contribute to the global and local emission reduction targets. Methane emissions management and reduction are a high priority for Vector which are being addressed by putting in place initiatives and programmes to reduce GHG emissions.

Vector has recently 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)[2], 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 European Technical Standard for Gas Infrastructure.

The new reporting methodology enables assets to be categorised into manageable coherent activity groups with similar emission characteristics. The aim is to build asset groups, in which the assets are expected to behave similarly with respect to different types of methane emissions activities (i.e. maintenance, damages, failures, etc.). This quantification method required us to split the gas network into groups of assets and corresponding categories of emissions that can be expected from these groups, to determine the Emission Factors (EFs) and the Activity Factors (AFs), for each group. These two factors, for each group, are then integrated into the defined categories to quantify total methane emissions.

A significant benefit of adopting this approach was it allowed 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 similar methodology, for consistent emission reporting across the other GDBs.

Vector has set an emissions reduction target of reducing Scope 1 and 2 emissions (excluding electricity line losses) by 53.5% by FY2030, using an FY20 baseline. The emissions reduction target is aligned with the methodology by the Science Based Target initiative (SBTi).

For the year ending 30 June 2021, Vector's Scope 1 fugitive emissions on the gas distribution network were 12,074 tonnes of CO_2 equivalent.

SERVICE LEVEL	ACTUAL					FORECAST				PERFORMANCE AGAINST TARGET
	RY17	RY18	RY19	RY20	RY21	RY22	RY24	RY27	RY30	
Scope 1 emissions in tonnes of carbon dioxide equivalent (tCO_2e)	15,851	25,328	12,607	16,368	12,074	10,358	9,396	7,352	7,022	

TABLE 4-5 NATURAL GAS FUGITIVE EMISSIONS (TONNES OF CO_2 EQUIVALENT)

As shown in Figure 4-1, Vector has already made a significant reduction of 26% in FY21 against the FY20 baseline, which is largely due to reductions in our leaks detected from our systematic surveys.

[2] refer to Marcogas WG_ME-485

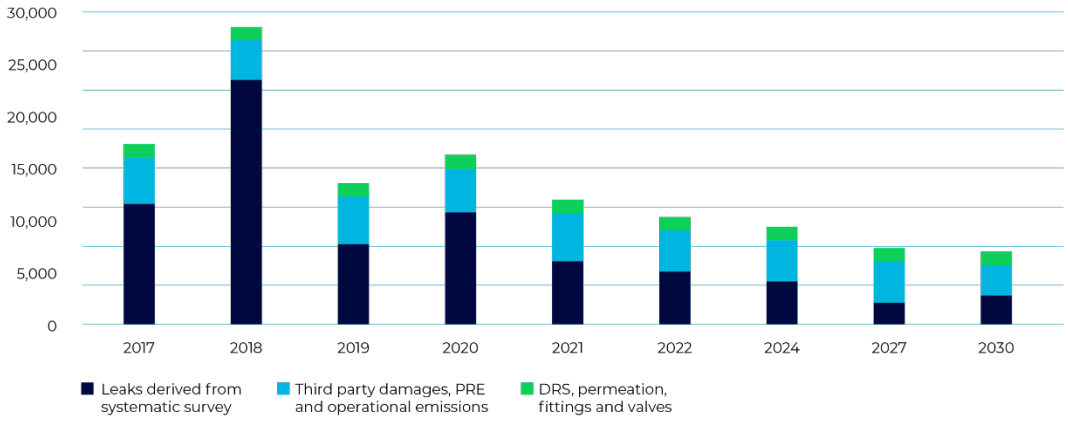

FIGURE 4-1 ESTIMATED FUGITIVE EMISSIONS – ACTUAL AND FORECAST

Note: The forecasted reductions in FY24 and FY27 are mostly due to the proposed increase in leakage surveying.

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 cost effective (refer to

Figure 4-2). The new leakage surveying initiative includes the deployment of a new surveying camera (with wider detection rage) 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). Refer to Section 6.14 for further details.

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 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 4.4.

PATHWAY TO OUR EMISSIONS TARGET (TONNES OF CO_2 EQUIVALENT)

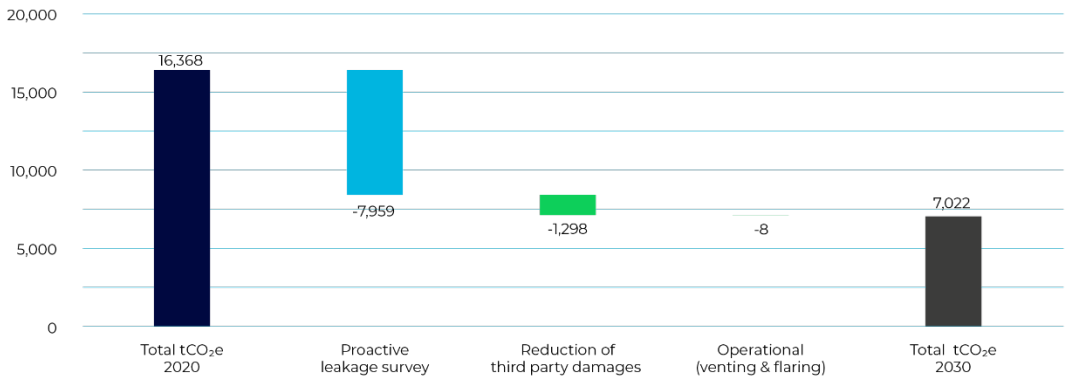

FIGURE 4-2 ESTIMATED EMISSION REDUCTION BY CATEGORY

Vector is currently and actively monitoring its GHG emissions and reviewing the available technologies and practices to reduce them in order to minimize its impact on the environment and retain affordable energy to our customers with the increasing ETS.

5 – Network Development Planning

This section discusses aspects that have led to key changes to Vector's network planning practices previously described in the 2021 AMP.

5.1 Gas connections

Vector's last gas AMP was submitted to the Commission in July 2021. The decision was made at that time to prepare a 'standard' AMP consistent with previous inputs, given there was significant uncertainty created by a number of factors including Covid implications, sustained high gas prices impacting industry and the Climate Change Commission's recommendations that could directly impact medium and longer term assumptions of critical inputs. In this AMP update, Vector has used the intervening period to undertake more detailed data analysis, desktop reviews and customer engagement to better understand customer drivers and trends. We note that in the recent Government's Emission Reduction Plan announcements that it did not adopt the CCC's recommendation to ban new gas connections, however, there remains significant uncertainty around the future of natural gas.

For the purposes of this AMP we have selected a scenario that more heavily weights 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.

The following graph shows the historical and 10-year forecast for the number of new customer connections.

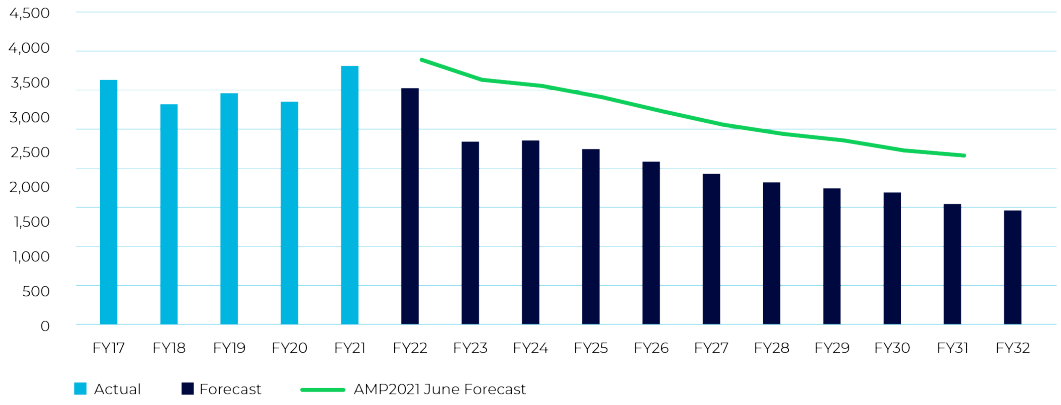

FIGURE 5-1 GAS CONNECTIONS – ACTUAL AND FORECAST

5.2 System growth

Based on the forecast decline in the number of connections shown in Figure 5-1, Vector has reviewed its capital expenditure relating to system growth. Accordingly, Vector has reduced system growth expenditure, primarily for residential developments, on the basis that these developments contribute over 70% of new connections on the network. Due to the high level of forecast uncertainty, additional monitoring sites at the extremities of the network has been allowed for in this AMP (refer Section 6.13) and an increase in reactive system growth expenditure, in order to maintain our system pressure performance levels. The key changes in the system growth expenditure include:

- A $4.9m reduction in expenditure relating to the re-scoping of the Penlink project
- The deferment of $6.2m for the Gilbert Rd to Alexander Cr Steel main extension (stage 2) which is now planned outside of the 10-year planning period ($2.1m) and a number of MP4 system pressure reinforcements in East Auckland, Glenvar and Remuera ($4.1)
- An increase of $2.5m for reactive system pressure reinforcement projects

Vector will continue to monitor network pressure trends and the remaining capacities of each network, and if the need re-emerges, the deferred projects will be reviewed in future AMPs. The changes from the June 2021 AMP are summarised in the below table.

FORECAST INVESTMENT SUMMARY ($MILLION CONSTANT)

DESCRIPTION	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	TOTAL
System growth	1.31	1.18	1.55	0.90	1.55	2.47	0.65	0.95	0.65	0.65	11.85
Total	**1.31**	**1.18**	**1.55**	**0.90**	**1.55**	**2.47**	**0.65**	**0.95**	**0.65**	**0.65**	**11.85**

5.3 Quality of Supply

Based on the forecast decline in the number of connections shown in Figure 5-1, Vector has reviewed its capital expenditure relating to quality and security of supply projects. Accordingly, Vector has reduced its capital expenditure for all quality and security of supply driven projects. This approach considers retaining only critical projects that may have a significant impact on the network resilience and the security of supply for major consumers, while deferring projects with less potential impact with lower risk on network security and resilience. The key changes in the quality of supply expenditure include a reduction of $4.17m due to the deferment of a number of projects in East Auckland and Dairy Flat highway - refer to the below table.

FORECAST INVESTMENT SUMMARY ($MILLION CONSTANT)

DESCRIPTION	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	TOTAL
Quality of supply	0.30	0.25	-	-	-	-	-	-	-	-	0.55
Total	**0.30**	**0.25**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**0.55**

6 – Lifecycle Asset Management

This section discusses aspects that have led to key changes to Vector's asset life-cycle management practices previously described in the 2021 AMP Update.

6.1 Regulator Stations

6.1.1 GATE STATIONS

High pressure equipment (e.g. pressure regulating equipment, custody transfer metering, etc.) installed within gate stations is owned, operated and maintained by the transmission company (FirstGas Limited), whereas distribution system equipment (i.e. check-metering where installed, and associated valves and pipework etc.) within the gate station is owned, operated and maintained as part of Vector's gas distribution networks.

A review of the partially completed 5-year gate station upgrade programme which targeted the replacement of the existing pipeline support systems was recently undertaken and concluded that the condition of the pipeline support systems did not warrant a full replacement programme, and that the risk could instead be managed reactively by means of the ongoing 6-monthly maintenance inspections.

The planned replacement of the remainder of the gate station pipeline support systems has therefore been deferred until beyond the 10- year planning period; this will achieve CAPEX savings over the planning period without impacting network performance.

FORECAST INVESTMENT SUMMARY ($MILLION CONSTANT)

DESCRIPTION	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	TOTAL
Gate station upgrades	-	-	-	-	-	-	-	-	-	-	0.00
Total	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**0.00**

6.1.2 DISTRICT REGULATOR STATIONS

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.

The Health Index (HI) score of each DRS has been calculated based on the condition and operational data and then forecasted over the next ten years, based on asset specific deterioration 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 banded in four groups based on their relative Consequence of Failure (CoF). Each asset (DRS) is placed in a CI Band, based on the relative magnitude of the overall CoF of the entire DRS asset, and compared to the average overall CoF for all assets in the same HI asset category.

The four CI bands are:

- C1 – 'Low' criticality
- C2 – 'Average' criticality
- C3 – 'High' criticality
- C4 – 'Very High' criticality

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 - CURRENT YEAR 0 – TOTAL					
	C1	C2	C3	C4	Total
(0-2)	5	1	-	2	8
(2-4)	23	11	3	5	42
(4-5.5)	15	1	1	3	20
(5.5-6.5)	8	1	1	-	10
(6.5-7.5)	8	6	4	-	18
(7.5-8)	-	-	-	-	-
(8-10)	1	1	-	-	2
(10+)	-	-	-	-	-
Total	60	21	9	10	100

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.

RISK MATRIX - FUTURE YEAR 10 – TOTAL					
	C1	C2	C3	C4	Total
(0-2)	-	-	-	-	-
(2-4)	9	3	1	3	16
(4-5.5)	17	6	1	4	28
(5.5-6.5)	13	3	2	1	19
(6.5-7.5)	5	2	1	2	10
(7.5-8)	2	1	-	-	3
(8-10)	9	4	4	-	17
(10+)	5	2	-	-	7
Total	60	21	9	10	100

The forecasted 10-year values of HI comprise a significant number of HI category (8-10) and (10+) as a result of asset deterioration across the entire DRS population. This has resulted in a significant increase in the consequent financial risk of those two categories. 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.

A review of DRS upgrades that were scheduled to be completed throughout the planning period was recently undertaken to identify opportunities to reduce the overall spend on DRS upgrades by increasing the OPEX spend where appropriate to defer CAPEX costs. The review identified two non-critical DRS that were scheduled for upgrade during the planning period, but which could be decommissioned with minimal risk to network performance. The decommissioning of these two DRS is expected to be completed during FY22 and will achieve moderate CAPEX savings over the planning period.

FORECAST INVESTMENT SUMMARY ($MILLION CONSTANT)

DESCRIPTION	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	TOTAL
DRS upgrades	0.28	0.24	0.25	0.27	0.31	0.30	0.16	0.34	0.29	0.25	2.70
Total	**0.28**	**0.24**	**0.25**	**0.27**	**0.31**	**0.30**	**0.16**	**0.34**	**0.29**	**0.25**	**2.70**

The result of the identified, above, interventions, over the 10-year planning period, will reduce the future forecast risk to acceptable levels, as following.

RISK MATRIX – AFTER INTERVENTION – TOTAL					
	C1	C2	C3	C4	Total
(0-2)	4	2	-	1	7
(2-4)	28	12	3	7	50
(4-5.5)	15	1	1	2	19
(5.5-6.5)	8	2	1	-	11
(6.5-7.5)	6	3	4	-	13
(7.5-8)	-	-	-	-	-
(8-10)	-	-	-	-	-
(10+)	-	-	-	-	-
Total	61	20	9	10	100

6.1.3 SERVICE REGULATORS

Belowground service regulators can be susceptible to 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 this risk, Vector has had an ongoing service regulator removal programme targeting the removal (or relocation aboveground) of a small number of higher priority belowground service regulators each year.

Recent audits have confirmed that there are approximately 20 belowground service regulators still in service on Vector's gas distribution network; this population is significantly less than what was originally estimated based on available records at the time. Of the remaining population of belowground service regulators, a small number are deemed to be of a higher risk - e.g. due to the presence of aging downstream steel-network and its unknown CP status. The service regulator removal programme has therefore been scaled down to target the removal of the remaining small number of higher-risk service regulators; this will achieve significant CAPEX savings over the planning period.

FORECAST INVESTMENT SUMMARY ($MILLION CONSTANT)

DESCRIPTION	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	TOTAL
Service Regulator replacements	0.08	-	-	-	-	-	-	-	-	-	0.08
Total	**0.08**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**0.08**

6.1.4 REPLACEMENT OF OBSOLETE SLAM-SHUTS

Vector's population of DRSs currently utilise approximately 100 Pietro Fiorentini over-pressure protection slam-shut units that have recently become obsolete; a replacement programme was therefore developed for the replacement of the obsolete equipment.

A recent review of the planned slam-shut replacement programme confirmed that there was a low probability of failure for the population of slam-shut units due to the periodic maintenance that is carried out on them. In the unlikely event that that there was a failure, the risk of the downstream network breaching service level targets was considered low due to the safety features that are built into the standard twin-stream active/monitor configuration employed on most of Vector's DRSs. As a result, the planned slam-shut replacement programme has been scaled back, and four replacement slam-shut units will be purchased during FY23 and held as emergency stock and used for the reactive replacement of faulty units as required.

FORECAST INVESTMENT SUMMARY ($MILLION CONSTANT)

DESCRIPTION	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	TOTAL
Replacement of obsolete slam -shuts	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	-	-	0.60
Total	**0.08**	**0.08**	**0.08**	**0.08**	**0.08**	**0.08**	**0.08**	**0.08**	**-**	**-**	**0.60**

6.1.5 WAINUI DRS UPGRADE

DR-0255-AK is a belowground (i.e. pit mounted) DRS located in Wainui Road, Silverdale. Up until recently it was the sole supply for the Whangaparaoa MP4 pressure system which encompasses Whangaparaoa, Orewa and Silverdale and surrounding areas. This DRS has a number of integrity issues and because of its criticality to the Whangaparaoa MP4 network, a complete re-build of the DRS was planned for FY23. However, a second DRS has recently been commissioned adjacent to the Wainui DRS. This second DRS provides a backup supply to the Whangaparaoa MP4 network and thereby allows the integrity issues at the Wainui DRS to be managed as part of the ongoing DRS upgrade programme. This item has therefore been removed from the CAPEX forecast for the 10-year planning period.

FORECAST INVESTMENT SUMMARY ($MILLION CONSTANT)

DESCRIPTION	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	TOTAL
Wainui DRS Upgrade	-	-	-	-	-	-	-	-	-	-	-
Total	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

6.2 Special crossing upgrades

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 (see section 6.1.2), 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. The summary of the special crossing current asset conditions is described in the table below.

RISK MATRIX - CURRENT YEAR 0 – TOTAL					
	C1	C2	C3	C4	**Total**
(0-2)	-	37	7	-	**44**
(2-4)	1	13	2	-	**16**
(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 forecast forecasted special crossing 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.

RISK MATRIX - FUTURE YEAR 10 – TOTAL					
	C1	C2	C3	C4	**Total**
(0-2)	-	15	-	-	**15**
(2-4)	1	29	8	-	**38**
(4-5.5)	-	6	1	-	**7**
(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 forecasted 10-year values of HI comprise a significant number of HI category (10+) as a result of asset deterioration across the entire special crossings population. This has resulted in a significant increase in the consequent financial risk >$1m for (10+) category.

A recent review of the upgrade programme was carried out and resulted in some sites being re-prioritised due to revised condition gradings or for other reasons; this has resulted in a small uplift in the CAPEX forecast for special crossing upgrades over the 10-year planning period – refer table below.

FORECAST INVESTMENT SUMMARY ($MILLION CONSTANT)

DESCRIPTION	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	TOTAL
Special crossing upgrades	0.34	0.39	0.31	0.29	0.17	0.17	0.16	0.16	0.16	0.16	2.30
Total	**0.34**	**0.39**	**0.31**	**0.29**	**0.17**	**0.17**	**0.16**	**0.16**	**0.16**	**0.16**	**2.30**

The result of the identified, above, interventions, over the 10-year planning period, will reduce the future forecast risk to acceptable levels, as following.

RISK MATRIX – AFTER INTERVENTION – TOTAL					
	C1	C2	C3	C4	Total
(0-2)	-	42	3	1	46
(2-4)	1	23	8	-	32
(4-5.5)	-	2	1	-	3
(5.5-6.5)	-	-	-	-	-
(6.5-7.5)	-	-	-	-	-
(7.5-8)	-	-	-	-	-
(8-10)	-	-	-	-	-
(10+)	-	-	-	-	-
Total	1	67	12	1	81

6.3 Auckland Harbour Bridge Support bracket replacement

In FY18, a 5-year upgrade programme (FY18 to FY22) was initiated to replace all of the pipeline support brackets on the IP20 pipeline that is installed on the Auckland Harbour Bridge. The pipeline was constructed in 1983 and forms a critical link in Vector's IP20 network. Stages 1 to 3 and parts of Stage 4 of the pipeline bracket upgrade programme were completed on schedule over the FY18 to FY21 period. However, the latter part of the programme has been impacted by Covid19 disruptions and by the technical challenges that the central sections of the pipeline crossing have presented. In particular, bespoke bracket designs had to be developed and tested and special access solutions have had to be developed to enable the central section of the pipeline to be accessed and for the brackets to be installed safely.

To accommodate the additional complexities that the latter stages of the programme have presented and to allow the remaining stages of the programme to be coordinated with the ongoing Bridge maintenance work programmes that are carried out on behalf of the Auckland Harbour Bridge Authority, the upgrade programme has been extended to include FY23 to FY27; this has resulted in a an uplift in the CAPEX forecast for the Auckland Harbour Bridge bracket replacement over the 10-year planning period – refer table below.

FORECAST INVESTMENT SUMMARY ($MILLION CONSTANT)

DESCRIPTION	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	TOTAL
Auckland Harbour Bridge Support bracket replacement	0.25	0.25	0.24	0.24	0.24	-	-	-	-	-	1.21
Total	**0.25**	**0.25**	**0.24**	**0.24**	**0.24**	**-**	**-**	**-**	**-**	**-**	**1.21**

6.4 Asset safety and compliance provisions

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 has been implemented to ensure that H&S and compliance risks are mitigated; the projected cost for this programme has been based on historical expenditure.

A recent review of this programme found that in some cases replacement programmes have now been implemented for asset types that were previously managed under this reactive budget provision (e.g. nylon service pipe replacement, pipe-in-building replacement, riser valve replacement). This has allowed this budget provision to be reduced which has resulted in a decrease in the CAPEX forecast for the asset safety and compliance provision over the 10-year planning period – refer table below.

FORECAST INVESTMENT SUMMARY ($MILLION CONSTANT)

DESCRIPTION	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	TOTAL
Asset safety and compliance provisions	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	1.00
Total	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**1.00**

6.5 Isolation valve installations

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. This programme now also covers the installation of additional isolation points within the Auckland CBD, and the installation of additional isolation valves at motorway crossings where required. These two items were previously identified separately in the 10-year CAPEX forecast.

A review of the isolation valve installation programme was recently undertaken to ensure that those installations that provided the highest risk mitigation were prioritised appropriately and for the lower priority installations to be deferred until later in the planning period or beyond. The installation of outlet fire valves at two critical DRS sites and the installation of an additional isolation valve in the vicinity of the Auckland Hospital to improve options for maintaining supply to the Hospital during a contingency event, were given the highest priority and will be undertaken in the early part of the planning period. The less critical installations will be undertaken in the latter part of the planning period or in the following period. This has resulted in a decrease in the CAPEX forecast for the installation of additional isolation valves over the 10-year planning period – refer table below.

FORECAST INVESTMENT SUMMARY ($MILLION CONSTANT)

DESCRIPTION	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	TOTAL
Isolation valve installations	0.26	0.21	0.37	0.32	0.41	0.27	0.50	0.22	0.28	0.30	3.14
Total	**0.26**	**0.21**	**0.37**	**0.32**	**0.41**	**0.27**	**0.50**	**0.22**	**0.28**	**0.30**	**3.14**

6.6 Strategic valve replacement

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 50 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.

Defining these two criteria in the valve CBARM model, each valve has been assessed based on two different failure modes: Seizing and material failure. Further details of the methodology and results are provided in Vector's asset strategy report GAA-006 Below ground valves asset strategy. The summary of the valves current asset conditions is described in the table below.

RISK MATRIX - CURRENT YEAR 0 – TOTAL					
	C1	C2	C3	C4	Total
(0-2)	1,072	2,624	1	-	3,697
(2-4)	184	300	90	3	577
(4-5.5)	12	308	207	16	543
(5.5-6.5)	188	353	225	44	810
(6.5-7.5)	-	15	8	2	25
(7.5-8)	-	-	1	1	2
(8-10)	-	6	11	6	23
(10+)	-	-	-	-	-
Total	1,456	3,606	543	72	5,677

The forecasted valves 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.

RISK MATRIX - FUTURE YEAR 10 – TOTAL					
	C1	C2	C3	C4	Total
(0-2)	916	1,750	1	-	2,667
(2-4)	123	817	1	-	941
(4-5.5)	160	181	-	-	341
(5.5-6.5)	190	264	195	5	654
(6.5-7.5)	61	255	141	18	475
(7.5-8)	2	182	70	20	274
(8-10)	4	133	117	20	274
(10+)	-	24	18	9	51
Total	1,456	3,606	543	72	5,677

The forecasted 10-year values of HI comprise a significant number of HI category (8-10) and (10+) as a result of asset deterioration across the entire valve population. However, this has resulted in only a slight increase, compared to other assets, in the consequent financial risk as the leading risk for deterioration is seizing which is not considered a major or catastrophic risk (has low financial or HSE consequences, since the network can be isolated from other points).

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. The CAPEX forecast for the replacement of strategic isolation valves over the 10-year planning period remains unchanged – refer table below.

FORECAST INVESTMENT SUMMARY ($MILLION CONSTANT)

DESCRIPTION	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	TOTAL
Strategic valve placement	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	2.50
Total	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**2.50**

The result of the identified, above, interventions, over the 10-year planning period, will reduce the future forecast risk to acceptable levels, as following.

RISK MATRIX – AFTER INTERVENTION – TOTAL					
	C1	C2	C3	C4	Total
(0-2)	916	1,750	29	11	2,706
(2-4)	123	817	1	-	941
(4-5.5)	160	181	-	-	341
(5.5-6.5)	190	264	195	5	654
(6.5-7.5)	61	255	138	18	472
(7.5-8)	2	182	68	20	272
(8-10)	4	133	112	18	267
(10+)	-	24	-	-	24
Total	1,456	3,606	543	72	5,677

6.7 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. Since FY17, annual riser valve audits have instead 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. It is anticipated that the initial audit of the IP and larger size MP population of service risers will be completed during FY24.

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. The ongoing riser valve audit programme will therefore be augmented by a riser assembly replacement programme that proactively targets the replacement of higher-risk riser assemblies based on the age of the riser, or known riser valve type etc. This has resulted in an uplift in the CAPEX forecast for the riser assembly replacement over the 10-year planning period - refer table below (note that the uplift in this forecast is partially offset by a reduction in the asset safety and compliance provision forecast).

FORECAST INVESTMENT SUMMARY ($MILLION CONSTANT)

DESCRIPTION	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	TOTAL
Riser assembly replacement	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	3.36
Total	**0.34**	**0.34**	**0.34**	**0.34**	**0.34**	**0.34**	**0.34**	**0.34**	**0.34**	**0.34**	**3.36**

6.8 Nylon service pipe replacement

Vector's gas distribution network includes approximately 200 nylon service pipe connections which are comprised predominantly of a small-bore (i.e. 8mm outside diameter) piping system known as Flexigas. The Flexigas system was approved for use by the Energy Safety Service in the 1980s from which time it was used by Vector to a limited extent for MP4 service pipe connections. In the 1990s the Energy Safety Service withdrew its approval to install Flexigas following isolated instances of rodents chewing through nylon installation-pipework.

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. However, the annual cost of reactively replacing nylon services year-on-year has increased in part due to the increasing development activity that is underway, and in part due to the type location where these types of service were installed historically - e.g. difficult access and/or high reinstatement costs.

This work has previously been funded from the asset safety and compliance provision budget, however because of the increasing costs related to nylon service replacement a separate nylon service pipe replacement budget item has been included in the CAPEX forecast - refer table (note that the this forecast is partially offset by a reduction in the asset safety and compliance provision forecast).

FORECAST INVESTMENT SUMMARY ($MILLION CONSTANT)

DESCRIPTION	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	TOTAL
Nylon service pipe replacement	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	1.00
Total	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**1.00**

6.9 Stainless steel service-pipe replacement

Vector's current installation standards stipulate that stainless-steel pipe should only be installed aboveground, but where it must be installed belowground (e.g. at the transition from PE to stainless-steel) it should be wrapped to provide protection against corrosion. Recent audits of stainless-steel services have confirmed that there is a relatively large count of older sites (i.e. predating the current installation standard) where there is no wrapping installed at the belowground transition.

An upgrade programme had therefore been scheduled for later in the planning period (i.e. RY27 to RY31) to replace the stainless-steel services where there is no wrapping installed on the belowground interface. A review of the planned replacement programme was recently undertaken and confirmed that the incidence of corrosion on stainless steel service pipes was low, and that the planned replacement programme wasn't warranted at this stage. The planned replacement programme has therefore been deferred until beyond the planning period on the basis that any corrosion issues on stainless steel service pipe will be managed reactively. This has resulted in a decrease in the CAPEX forecast for the replacement of stainless steel service pipe over the 10-year planning period – refer table below.

FORECAST INVESTMENT SUMMARY ($MILLION CONSTANT)

DESCRIPTION	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	TOTAL
Stainless steel service pipe replacements	-	-	-	-	-	-	-	-	-	-	-
Total	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

6.10 Obsolete emergency 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. To avoid the risk of its aging pipeline drilling equipment becoming obsolete and for replacement parts and fittings becoming difficult to source, Vector had developed a replacement programme for the drilling equipment. In addition to the drilling equipment replacement programme, the CAPEX forecast also included a small ongoing annual provision for the replacement of other critical spares and equipment items.

A review of the replacement programme was recently undertaken and found that the replacement of some components of the drilling equipment was not critical within the early part of the planning period, and that some of the budget should instead be reallocated to the purchase of a new Street Evaluating Laser Methane Assessment (SELMA) camera. This camera will increase the capability of the existing SELMA leakage survey vehicle and allow gas assets located some distance from the road carriageway (e.g. service pipes, riser valves etc) to be included in routine leakage surveys.

The planned drilling equipment replacement programme was therefore modified to allow for the purchase of the SELMA camera in FY22 and for the purchase of drilling equipment over the RY23 to RY26 period. The review also found that the existing small ongoing annual budget provision for the replacement of strategic spares was seldom used and should therefore be discontinued and that the purchase of other critical spares should be made from the same budget provision as the drilling equipment. These changes have resulted in a small uplift in the CAPEX forecast for the replacement of obsolete drilling equipment over the 10-year planning period – refer table below.

FORECAST INVESTMENT SUMMARY ($MILLION CONSTANT)

DESCRIPTION	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	TOTAL
New drilling equipment	0.27	0.12	0.12	0.12	-	-	-	-	-	-	0.64
Total	**0.27**	**0.12**	**0.12**	**0.12**	**-**	**-**	**-**	**-**	**-**	**-**	**0.64**

6.11 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 10 TRs was planned for in FY22. However, a recent review of the planned CAPEX found that the deployment of MiniTrans TR monitoring equipment was not considered to be critical at this time and this project has therefore been deferred until later in the planning period – refer table below.

FORECAST INVESTMENT SUMMARY ($MILLION CONSTANT)

DESCRIPTION	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	TOTAL
Installation of MiniTrans remote monitoring equipment	-	-	-	-	-	0.20	-	-	-	-	0.20
Total	**-**	**-**	**-**	**-**	**-**	**0.20**	**-**	**-**	**-**	**-**	**0.20**

6.12 Replacement of 2G Cello monitoring devices

Cello data loggers have been identified as a cost-effective pressure monitoring solution where real-time pressure, volume and temperature data is not required. The Cello units operate on Vodafone's 2G network and although there currently doesn't appear to be any firm 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) as has already occurred overseas. In line with this trend, new data logger models are now compatible with NB-IoT and Cat M1 comms technology.

In anticipation of the impending retirement of the 2G network, an upgrade programme to migrate the existing data logger monitoring system from the 2G network to a NB-IoT or Cat M1 platform was scheduled for FY23 to FY26. A recent review of the programme found that as there were still no firm plans in place to retire the 2G network, the migration programme should be rescheduled for the FY25 to FY27 period – refer table below.

FORECAST INVESTMENT SUMMARY ($MILLION CONSTANT)

DESCRIPTION	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	TOTAL
Replacement of 2G Cello monitoring devices	-	-	0.16	0.16	0.16	-	-	-	-	-	0.47
Total	**-**	**-**	**0.16**	**0.16**	**0.16**	**-**	**-**	**-**	**-**	**-**	**0.47**

6.13 Pressure Monitoring

As described in section 5.2, a number of major 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, the proposed CAPEX increase for the duration of the planning period is as below table.

FORECAST INVESTMENT SUMMARY ($MILLION CONSTANT)

DESCRIPTION	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	TOTAL
New system pressure monitoring sites	-	-	0.03	0.03	-	-	-	-	-	-	0.06
Total	**-**	**-**	**0.03**	**0.03**	**-**	**-**	**-**	**-**	**-**	**-**	**0.06**

6.14 Decarbonisation – leakage survey vehicles

As described in section 4.5, 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 camaras e.g. SELMA) to adequately cover the entire network at the new planned cycles.

The proposed changes are forecasted to reduce the overall GHG emissions by approximately 8,000 tCO_2e. This significant reduction is critical to achieve Vector's decarbonisation targets, referred to in section 3.1. The proposed CAPEX increase for the duration of the planning period is shown in the following table.

FORECAST INVESTMENT SUMMARY ($MILLION CONSTANT)

DESCRIPTION	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	TOTAL
Decarbonisation - 12 month to 6-month survey	-	0.30	-	-	-	-	-	-	-	-	0.30
Decarbonisation - 6 month to 3-month survey	-	-	-	-	0.30	-	-	-	-	-	0.30
Total	**-**	**0.30**	**-**	**-**	**0.30**	**-**	**-**	**-**	**-**	**-**	**0.60**

6.15 Maintenance programme

This section discusses aspects that have led to key changes to Vector's asset maintenance practices previously described in the 2021 AMP.

6.15.1 SERVICE DISCONNECTIONS

Disconnections - standard

When a gas consumer wishes to have their service connection cut-off and decommissioned, Vector charges the Retailer a nominal fee to undertake the disconnection. Over the recent period, the 12-month rolling average number of disconnections carried out has increased and the average disconnection cost has increased by approximately 10%. The annual budget provision for standard service disconnections has therefore been increased during the planning period to cover the increase in the number of requests being received and the increase in the average service cut-off costs.

Disconnections - from surveys

This corrective maintenance activity relates to the service disconnections (i.e. for safety reasons) that arise from the periodic surveys that Vector undertakes - e.g. riser valve survey, inactive service survey etc. The forecast is based on historical spend; this has resulted in a small decrease in the service disconnections from surveys forecast over the 10-year planning period – refer table below.

FORECAST SUMMARY ($MILLION CONSTANT)

DESCRIPTION	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	TOTAL
Service Disconnections - Standard	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	6.3
Service disconnections from surveys	0.08	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.53
Total	**0.71**	**0.68**	**0.68**	**0.68**	**0.68**	**0.68**	**0.68**	**0.68**	**0.68**	**0.68**	**6.83**

6.15.2 LEAKAGE SURVEY - SELMA

Vector has recently modified its leakage survey maintenance standard to require CBD areas to be surveyed on a 6-monthly cycle (i.e. previously surveyed annually) and the remainder of the network to be surveyed on an annual cycle (i.e. previously surveyed 2-yearly). The principle driver for this change was to achieve a material reduction in PRE levels. This has resulted in an uplift in the preventive maintenance forecast for SELMA leakage surveys over the 10-year planning period – refer table below.

In addition, as highlighted in section 4.5, Vector intends to reduce leakage survey cycles which is the most cost-effective method to reduce GHG emissions, and further improve the overall network performance by earlier detection of faults and defects.

FORECAST SUMMARY ($MILLION CONSTANT)

DESCRIPTION	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	TOTAL
Leakage Survey - SELMA	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	1.77
Decarbonisation - 12 month to 6 month survey		0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	1.44
Decarbonisation - 6 month to 3 month survey					0.16	0.16	0.16	0.16	0.16	0.16	0.96
Total	**0.18**	**0.34**	**0.34**	**0.34**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**4.17**

6.15.3 CORROSION PROTECTION OF SPECIAL CROSSINGS

Where possible, larger corrective maintenance tasks (e.g. recoating of the pipeline) are carried out in conjunction with planned CAPEX work (e.g. support bracket replacement). A number of special crossing sites have been identified that require corrective maintenance work to be carried out (e.g. repainting) that cannot be deferred until CAPEX upgrade work is required; the corrective maintenance work at these sites has been scheduled for FY23.

A recent review of the planned CAPEX upgrade programme for special crossings resulted in some sites being re-prioritised due to revised condition gradings or for other reasons. This has impacted the timing of the planned corrective maintenance at these sites and resulted in a small uplift in the corrective maintenance forecast for special crossings over the 10-year planning period – refer table below.

FORECAST SUMMARY ($MILLION CONSTANT)

DESCRIPTION	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	TOTAL
Corrosion protection of special crossings	0.29	0.26	0.22	0.24	0.20	0.20	0.20	0.20	0.20	0.20	2.20
Total	**0.29**	**0.26**	**0.22**	**0.24**	**0.20**	**0.20**	**0.20**	**0.20**	**0.20**	**0.20**	**2.20**

6.15.4 AUCKLAND HARBOUR BRIDGE

The repainting of the IP20 pipeline installed on the Auckland Harbour Bridge is being carried out in conjunction with the pipeline support bracket upgrade programme; this programme was scheduled to be completed during FY22. However, the final stages of the upgrade programme have been delayed due to the impacts of Covid19 as well as the need to develop special access solutions to enable the central sections of the pipeline to be accessed. This has resulted in the programme being extended to FY27 – refer table below.

FORECAST SUMMARY ($MILLION CONSTANT)

DESCRIPTION	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	TOTAL
Auckland Harbour Bridge	0.15	0.15	0.12	0.12	0.12	-	-	-	-	-	0.64
Total	**0.15**	**0.15**	**0.12**	**0.12**	**0.12**	**-**	**-**	**-**	**-**	**-**	**0.64**

6.15.5 BELOWGROUND CORROSION PROTECTION

Ongoing planned DCVG surveys are now detecting a relatively large number of coating defects that need to be investigated and in a growing number of cases, repairs made to the coating. The coating damage is typically caused by third party damage incidents that have occurred over the life of the pipe and in some cases by the deterioration of the coating due to its age. This has resulted in a small uplift in the corrective maintenance forecast for belowground corrosion protection over the 10-year planning period – refer table below.

FORECAST SUMMARY ($MILLION CONSTANT)

DESCRIPTION	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	TOTAL
Belowground corrosion protection	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	1.90
Total	**0.19**	**0.19**	**0.19**	**0.19**	**0.19**	**0.19**	**0.19**	**0.19**	**0.19**	**0.19**	**1.90**

6.15.6 VALVE CORRECTIVE MAINTENANCE

Vector's valve maintenance standard has recently been updated to include an alternative type of maintenance inspection for valves that have been classified as non-critical. The safety inspection is designed to ensure that the valve lid is still visible and is not causing a nuisance. It is anticipated that this additional option will allow valve maintenance costs for non-critical valves to be reduced going forward. This has resulted in a small decrease in the corrective maintenance forecast for valves over the 10-year planning period – refer table below.

FORECAST SUMMARY ($MILLION CONSTANT)

DESCRIPTION	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	TOTAL
Valve corrective maintenance	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	2.30
Total	**0.23**	**0.23**	**0.23**	**0.23**	**0.23**	**0.23**	**0.23**	**0.23**	**0.23**	**0.23**	**2.30**

6.15.7 DRS REPAINTING AND REFURBISHMENT

This is a corrective maintenance activity that entails the abrasive blast-cleaning and recoating of critical DRS; typically one site is targeted per year. The forecast is based on historical spend which has resulted in a small decrease in the DRS repainting and refurbishment forecast over the 10-year planning period – refer table below.

FORECAST SUMMARY ($MILLION CONSTANT)

DESCRIPTION	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	TOTAL
DRS repainting and refurbishment	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.22
Total	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**	**0.22**

6.15.8 NORTH HARBOUR PIPELINE

Vector has recently undertaken a review to determine the future requirements for the North Harbour high-pressure pipeline. The review found that the pipeline pressure rating can be lowered from high pressure (i.e. 34 bar) to distribution pressure (i.e. 20 bar) which would provide adequate capacity to supply the long term (2050) forecast organic growth scenarios. A formal change control request is being developed and it is anticipated that the downrating of the pipeline can be finalised prior to the beginning of FY23. This has resulted in the forecast for all North Harbour pipeline related OPEX expenditure being removed from the forecast for the 10-year planning period – refer table below.

FORECAST SUMMARY ($MILLION CONSTANT)

DESCRIPTION	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	TOTAL
North Harbour pipeline	-	-	-	-	-	-	-	-	-	-	-
Total	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

6.15.9 DRS DISMANTLES AND REMOVALS

This activity relates to the decommissioning and removal of redundant DRS, typically to avoid CAPEX upgrade costs over the planning period. The forecast is based on historical spend; this has resulted in a small decrease in the DRS dismantles and removals forecast over the 10-year planning period – refer table below.

FORECAST SUMMARY ($MILLION CONSTANT)

DESCRIPTION	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	TOTAL
DRS dismantles and removals	-	-	0.04	-	-	0.04	-	-	-	-	0.08
Total	**-**	**-**	**0.04**	**-**	**-**	**0.04**	**-**	**-**	**-**	**-**	**0.08**

6.15.10 RISER VALVE SURVEYS

Annual riser valve survey

This activity relates to the preventive and corrective maintenance work (excluding decommissioning) associated with the annual riser valve surveys. The costs of undertaking the survey and completing the associated corrective maintenance work have risen over time; this has resulted in an uplift in the OPEX forecast for annual riser valve surveys over the 10-year planning period – refer table below.

Annual survey of inactive services

This activity relates to the preventive and corrective maintenance work (excluding decommissioning) associated with the annual surveys of inactive services. The costs of undertaking the survey and completing the associated corrective maintenance work have risen over time; this has resulted in an uplift in the OPEX forecast for annual surveys of inactive services over the 10-year planning period – refer table below.

Riser re-crimping

Leaking crimp joints are a significant cause of service-riser related PRE faults with the predominant cause of crimp leaks on 10 mm risers being the type of crimp applied to the joint - i.e. a single crimp vs double-crimps. Vector will therefore undertake a proactive programme of corrective maintenance work during FY23 and FY24 to target the re-crimping of populations of service risers that are known to be at a higher risk of crimp failure.

FORECAST SUMMARY ($MILLION CONSTANT)

DESCRIPTION	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	TOTAL
Annual riser valve survey	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.80
Annual survey of inactive services	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	1.00
Rise re-crimping survey	0.82	0.82									1.64
Total	**1.00**	**1.00**	**0.18**	**0.18**	**0.18**	**0.18**	**0.18**	**0.18**	**0.18**	**0.18**	**3.44**

6.15.11 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 up to three nominated small network (locations to be confirmed) to transition it from natural gas to hydrogen. The initial stages of the programme are scheduled to be completed in RY23 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.

The longer-term goals of the industry group include the transitioning of the gas distribution supply in New Zealand to a 20% hydrogen blend during the 2030 to 2035 period, and the stepwise conversion of the transmission system to 100% hydrogen from 2035.

Following the completion of the RY23 industry trial, Vector has proposed its own programme of consumer equipment and network material assessments (RY24 to RY35) 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. This hydrogen evaluation programme has resulted in a small uplift in the OPEX forecast over the 10-year planning period – refer table below.

FORECAST SUMMARY ($MILLION CONSTANT)

DESCRIPTION	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	TOTAL
Gas industry hydrogen blending trial (Firstgas project)	0.20										0.20
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	**0.20**	**0.62**	**0.62**	**0.62**	**0.62**	**0.62**	**0.62**	**0.62**	**0.62**	**0.62**	**5.74**

7 – Capital Expenditure Forecast

This section describes the capital expenditure forecasts for the gas distribution network assets for the next 10-year planning period and provides a comparison with the 10-year forecast prepared and disclosed in the 2021 AMP (disclosed in July 2021). The CAPEX 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 2023 dollars (note: Section 5 and 6 figures are in 2022 dollars).

7.1 Capital expenditure forecast

The table below shows the forecast CAPEX during the next 10 year planning period, broken down into the asset categories defined in the Commerce Commission's Gas Distribution Information Disclosure Amendments Determination 2012.

FINANCIAL YEAR ($000, CONSTANT FY23)

2022 AMP UPDATE	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	TOTAL
Consumer connection	14,175	13,890	13,371	12,490	11,631	11,022	10,605	10,310	9,505	9,115	116,115
System growth	1,383	1,250	1,643	954	1,643	2,612	689	1,007	689	689	12,558
Asset replacement and renewal	3,740	3,264	3,322	3,227	3,135	2,925	2,556	2,749	2,610	2,570	30,098
Asset relocations	3,449	2,977	2,977	2,977	2,977	2,977	2,977	2,977	2,977	2,977	30,246
Quality of supply	318	265	0	0	0	0	0	0	0	0	583
Legislative and regulatory	0	0	0	0	0	0	0	0	0	0	0
Other reliability, safety and environment	562	670	553	501	752	286	530	233	300	318	4,705
Non-network asset	5,612	867	1,121	1,998	1,113	901	810	1,050	863	796	15,131
Total CAPEX	**29,239**	**23,184**	**22,987**	**22,148**	**21,252**	**20,724**	**18,167**	**18,327**	**16,944**	**16,465**	**209,437**

7.2 Comparison to previous AMP

The section highlights the significant changes to the 2021 disclosed expenditure forecasts. The figure below shows the difference between the 2022 and 2021 AMP expenditure forecasts, with the following table breaking down the variance by expenditure categories. For reference purposes, Vector has escalated to 2023 prices using an inflation factor of 5.97%.

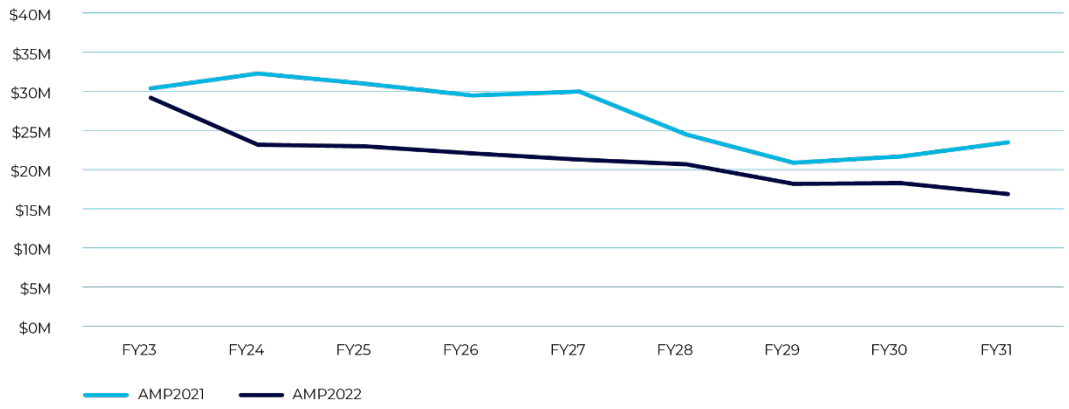

FIGURE 7-1 AMP MOVEMENT 2021 V 2022

FINANCIAL YEAR ($000, CONSTANT FY23)

2021/2022 AMP VARIANCE	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	TOTAL
Consumer connection	(1,790)	(1,774)	(1,610)	(1,638)	(1,699)	(1,749)	(1,775)	(1,466)	(2,020)	(15,520)
System growth	(636)	(3,559)	(1,077)	(1,802)	(1,435)	1,651	193	229	(2,772)	(9,208)
Asset replacement and renewal	(124)	(190)	163	407	421	440	(161)	66	(12)	1,010
Asset relocations	256	(1,912)	(3,265)	(3,265)	(3,265)	(1,311)	(108)	(108)	(108)	(13,085)
Quality of supply	(606)	49	(693)	(54)	0	(854)	0	(895)	0	(3,053)
Legislative and regulatory	0	0	0	0	0	0	0	0	0	0
Other reliability, safety and environment	(1,112)	(629)	(295)	110	402	(64)	234	(63)	(72)	(1,488)
Non-network asset	2,813	(1,105)	(1,274)	(1,074)	(3,126)	(1,876)	(1,161)	(1,114)	(1,545)	(9,463)
Total CAPEX	**(1,199)**	**(9,120)**	**(8,051)**	**(7,316)**	**(8,701)**	**(3,763)**	**(2,778)**	**(3,350)**	**(6,529)**	**(50,807)**

7.3 Explanation of major capital expenditure variances

This section highlights the significant changes in CAPEX over the 9-year period for which the 2021 AMP and 2022 AMP update overlap. The key changes include:

- Customer connection forecast expenditure is reduced ($16m) resulting from a lower reticulation ($6m) and a lower residential/commercial connection forecast ($11m) to reflect the anticipated residential and business response, and the Government's recent Emission Reduction Plan announcement which is its formal response to support to the direction of the Climate Change Commission recommendations.
- A reduction of $9m in system growth corresponds a lower demand forecast from reduced customer connections in residential areas ($4m) and reduced scope for the AT Whangaparaoa Penlink project ($5m).
- Overall asset replacement and renewal expenditure is $1m higher and is in-line with a higher inflation experienced compared to AMP2021 forecast (7.4% vs 2.0% for FY22). There is reallocation of expenditure to increase riser valve assembly proactive replacement ($0.3m) offsetting against by the removal of stainless steel replacement and gate station upgrades, and a reduced scope in the replacement of the obsolete regulators.
- Asset relocation has reduced by $13m, largely driven by excluding Auckland light rail project ($12m) due to uncertainty associated with the project, its timing and route options.
- A reduction of $3m in quality of supply expenditure relating the cancellation of low risk security reinforcement projects including Dairy Flat, East Auckland MP4 and Motions Road.
- A reduction of $1.5m in other reliability, safety and environment expenditure largely driven by rescopes for the network isolation valve improvements projects ($1.5m) and Wainui DRS upgrade ($0.3m), as well as removal of the Haven Road security improvement project ($0.4m). This is offset against a new provision for decarbonation survey ($0.7m).
- A decrease in non-network capex of $9m due to SaaS (Software as a service) configuration costs ($4.1m) moving from capex to opex due to a change in accounting standards, the completion of some large lifecycle management projects and lower Cyber costs ($3.3m), partially offset by an increase in property and lease costs.

8 – Operational Expenditure Forecast

This section describes the operational expenditure forecasts for the gas distribution network assets for the next 10-year planning period and provides a comparison with the 10-year forecast prepared and disclosed in the 2021 AMP (disclosed in July 2021).

8.1 Operational expenditure forecast

The table below shows the forecast OPEX during the planning period, broken down into the asset categories defined in the Commerce Commission's Gas Distribution Information Disclosure Determination 2012. The figures are presented in 2023 dollars.

AMP 2022 OPEX FORECAST (FINANCIAL YEAR, $'000 CONSTANT FY23)

2022 AMP Update	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	Total
Service interruptions and emergencies	2,377	2,377	2,377	2,377	2,377	2,377	2,377	2,377	2,377	2,377	**23,770**
Routine and corrective maintenance and inspection	3,676	3,667	3,444	3,466	3,556	3,533	3,431	3,410	3,417	3,400	**35,000**
System operations and network support	3,760	4,175	4,075	4,075	4,075	4,075	4,075	4,075	4,075	4,075	**40,535**
Business support	5,615	5,615	5,615	5,615	5,615	5,615	5,615	5,615	5,615	5,615	**56,154**
Total Opex	15,428	15,834	15,511	15,533	15,623	15,601	15,499	15,478	15,485	15,468	**155,459**

8.2 Comparison to previous AMP

The section highlights the significant changes to the 2021 disclosed expenditure forecasts. The figure below shows the difference between the 2021 and 2022 AMP expenditure forecasts, with the following table breaking down the variance by expenditure categories. For reference purposes, Vector has escalated to AMP 2021 prices using an inflation factor of 3.98%.

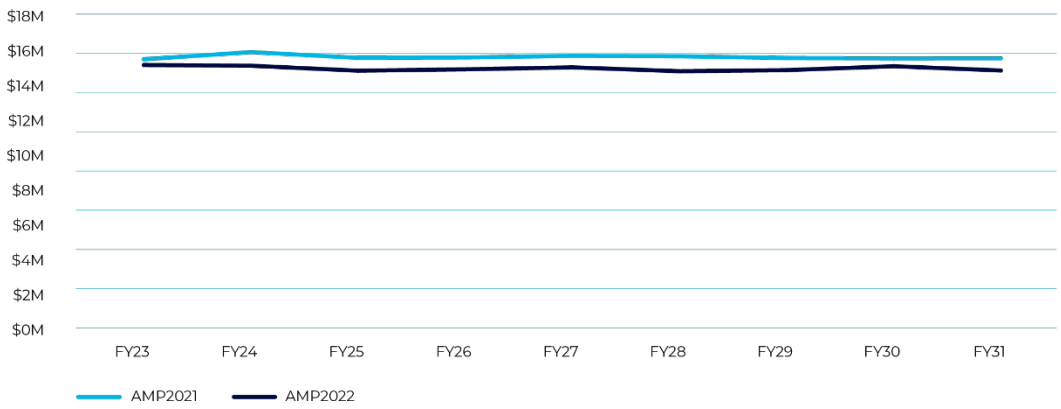

FIGURE 8-1 AMP MOVEMENT 2021 V 2022

AMP 2022 VARIANCE TO AMP 2021 OPEX FORECAST (FINANCIAL YEAR, ($'000 CONSTANT FY23)

2021/2022 AMP Variance	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	Total
Service interruptions and emergencies	36	36	36	36	36	36	36	36	36	**323**
Routine and corrective maintenance and inspection	227	261	321	265	243	442	277	33	284	**2,351**
Asset replacement and renewal	0	0	0	0	0	0	0	0	0	**0**
System operations and network support	(118)	297	197	197	197	197	197	197	197	**1,559**
Business support	186	186	186	186	186	186	186	186	186	**1,674**
Total OPEX	330	780	740	684	662	861	696	452	703	**5,907**

8.3 Explanation of major operational expenditure variances

This section highlights the significant changes in OPEX over the 9-year period for which the 2021 AMP and 2022 AMP update overlap. The key changes include:

- A $2.3m increase in routine and corrective maintenance due to increase in disconnection activity and work related to the decarbonisation of the Gas network.
- A $1.5m increase in system operations and network support expenditure due to increased professional fees for regulatory work with the Gas Working Group.
- A $1.6m increase in business support largely due to increased corporate allocation of SaaS (Software as a service) costs due to change in accounting treatment, partially offset by lower other corporate cost allocation.

9 – Appendices

9.1 Appendix 1 - Forecast capital expenditure (Schedule 11a)

Company Name	**Vector Limited**
AMP Planning Period	**1 July 2022 – 30 June 2032**

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													
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 22**	**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**
9	**11a(i): Expenditure on Assets Forecast**		**$000 (nominal dollars)**										
10		Consumer connection	15,388	14,096	14,427	14,370	13,794	13,103	12,664	12,429	12,325	11,590	11,337
11		System growth	1,800	1,350	1,275	1,733	1,033	1,816	2,945	792	1,181	824	840
12		Asset replacement and renewal	4,670	3,715	3,386	3,566	3,562	3,527	3,358	2,993	3,283	3,180	3,193
13		Asset relocations	3,931	3,427	3,090	3,197	3,285	3,351	3,418	3,486	3,556	3,627	3,699
14		Reliability, safety and environment:											
15		Quality of supply	-	316	275	-	-	-	-	-	-	-	-
16		Legislative and regulatory	-	-	-	-	-	-	-	-	-	-	-
17		Other reliability, safety and environment	446	556	694	592	551	845	328	620	278	365	394
18		**Total reliability, safety and environment**	446	872	969	592	551	845	328	620	278	365	394
19		**Expenditure on network assets**	26,235	23,460	23,147	23,458	22,225	22,642	22,713	20,320	20,623	19,586	19,463
20		Expenditure on non-network assets	1,105	5,535	892	1,196	2,189	1,244	1,026	942	1,245	1,043	982
21		**Expenditure on assets**	27,340	28,995	24,039	24,654	24,414	23,886	23,739	21,262	21,868	20,629	20,445
22													
23	*plus*	Cost of financing	208	245	177	191	185	190	207	152	164	149	148
24	*less*	Value of capital contributions	15,570	17,508	18,576	19,418	18,212	18,565	19,650	16,795	17,285	16,168	16,026
25	*plus*	Value of vested assets	-	-	-	-	-	-	-	-	-	-	-
26		**Capital expenditure forecast**	11,978	11,732	5,640	5,427	6,387	5,511	4,296	4,619	4,747	4,610	4,567
27													
28		Assets commissioned	12,612	11,725	5,631	5,401	6,454	5,350	4,476	4,617	4,748	4,610	4,569
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 22**	**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**
32			**$000 (in constant prices)**										
33		Consumer connection	15,388	13,301	13,033	12,546	11,720	10,914	10,342	9,951	9,674	8,919	8,553
34		System growth	1,800	1,274	1,152	1,513	878	1,513	2,405	634	927	634	634
35		Asset replacement and renewal	4,670	3,506	3,059	3,113	3,026	2,938	2,742	2,396	2,577	2,447	2,409
36		Asset relocations	3,931	3,234	2,791	2,791	2,791	2,791	2,791	2,791	2,791	2,791	2,791
37		Reliability, safety and environment:											
38		Quality of supply	-	298	248	-	-	-	-	-	-	-	-
39		Legislative and regulatory	-	-	-	-	-	-	-	-	-	-	-
40		Other reliability, safety and environment	446	525	627	517	468	704	268	496	218	281	297
41		**Total reliability, safety and environment**	446	823	875	517	468	704	268	496	218	281	297
42		**Expenditure on network assets**	26,235	22,138	20,910	20,480	18,883	18,860	18,548	16,268	16,187	15,072	14,684
43		Expenditure on non-network assets	1,105	5,223	806	1,044	1,860	1,036	838	754	977	803	741
44		**Expenditure on assets**	27,340	27,361	21,716	21,524	20,743	19,896	19,386	17,022	17,164	15,875	15,425
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 22	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
Difference between nominal and constant price forecasts		$000										
Consumer connection		-	795	1,394	1,824	2,074	2,189	2,322	2,478	2,651	2,671	2,784
System growth		-	76	123	220	155	303	540	158	254	190	206
Asset replacement and renewal		-	209	327	453	536	589	616	597	706	733	784
Asset relocations		-	193	299	406	494	560	627	695	765	836	908
Reliability, safety and environment:												
Quality of supply		-	18	27	-	-	-	-	-	-	-	-
Legislative and regulatory		-	-	-	-	-	-	-	-	-	-	-
Other reliability, safety and environment		-	31	67	75	83	141	60	124	60	84	97
Total reliability, safety and environment		-	49	94	75	83	141	60	124	60	84	97
Expenditure on network assets		-	1,322	2,237	2,978	3,342	3,782	4,165	4,052	4,436	4,514	4,779
Expenditure on non-network assets		-	312	86	152	329	208	188	188	268	240	241
Expenditure on assets		-	1,634	2,323	3,130	3,671	3,990	4,353	4,240	4,704	4,754	5,020

		Current Year CY	CY+1	CY+2	CY+3	CY+4	CY+5
11a(ii): Consumer Connection	for year ended	30 Jun 22	30 Jun 23	30 Jun 24	30 Jun 25	30 Jun 26	30 Jun 27
*Consumer types defined by GDB**		$000 (in constant prices)					
Mains Extensions/Subdivisions		3,323	2,035	1,701	1,701	1,572	1,447
Service Connections - Residential		10,889	9,696	9,762	9,275	8,578	7,897
Service Connections - Commercial		1,176	1,570	1,570	1,570	1,570	1,570
Customer Easements		-	-	-	-	-	-
* include additional rows if needed							
Consumer connection expenditure		15,388	13,301	13,033	12,546	11,720	10,914
less Capital contributions funding consumer connection		10,701	12,163	12,767	12,550	11,786	10,976
Consumer connection less capital contributions		4,687	1,138	266	(4)	(66)	(62)
11a(iii): System Growth							
Intermediate pressure							
Main pipe		-	-	-	-	-	-
Service pipe		-	-	-	-	-	-
Stations		765	254	244	244	244	244
Line valve		-	-	-	-	-	-
Special crossings		-	-	-	-	-	-
Intermediate Pressure total		765	254	244	244	244	244
Medium pressure							
Main pipe		1,033	1,020	908	1,269	634	1,269
Service pipe		-	-	-	-	-	-
Stations		-	-	-	-	-	-
Line valve		-	-	-	-	-	-
Special crossings		-	-	-	-	-	-
Medium Pressure total		1,033	1,020	908	1,269	634	1,269

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	2	-	-	-	-	-
101		Other assets (other than above)	-	-	-	-	-	-
102		**Other network assets total**	2	-	-	-	-	-
103								
104		**System growth expenditure**	1,800	1,274	1,152	1,513	878	1,513
105	*less*	Capital contributions funding system growth	1,200	1,386	1,448	1,838	1,122	1,923
106		**System growth less capital contributions**	600	(112)	(296)	(325)	(244)	(410)
107								
108								
109			*Current Year CY*	*CY+1*	*CY+2*	*CY+3*	*CY+4*	*CY+5*
		for year ended	**30 Jun 22**	**30 Jun 23**	**30 Jun 24**	**30 Jun 25**	**30 Jun 26**	**30 Jun 27**
110	**11a(iv): Asset Replacement and Renewal**							
111		**Intermediate pressure**	**$000 (in constant prices)**					
112		Main pipe	-	-	-	-	-	-
113		Service pipe	-	-	-	-	-	-
114		Stations	437	357	313	320	346	378
115		Line valve	531	248	248	248	248	248
116		Special crossings	488	581	636	537	523	403
117		**Intermediate Pressure total**	1,456	1,186	1,197	1,105	1,117	1,029
118		**Medium pressure**						
119		Main pipe	2,362	1,547	1,199	1,199	1,199	1,199
120		Service pipe	488	433	433	433	433	433
121		Station	286	189	109	99	-	-
122		Line valve	-	-	-	-	-	-
123		Special crossings	-	-	-	-	-	-
124		**Medium Pressure total**	3,136	2,169	1,741	1,731	1,632	1,632
125		**Low Pressure**						
126		Main pipe	-	-	-	-	-	-
127		Service pipe	-	-	-	-	-	-
128		Line valve	-	-	-	-	-	-
129		Special crossings	-	-	-	-	-	-
130		**Low Pressure total**	-	-	-	-	-	-

Other network assets							
Monitoring and control systems	56	96	66	222	222	222
Cathodic protection systems	22	55	55	55	55	55
Other assets (other than above)	-	-	-	-	-	-
Other network assets total	78	151	121	277	277	277
Asset replacement and renewal expenditure	4,670	3,506	3,059	3,113	3,026	2,938
less Capital contributions funding asset replacement and renewal	-	-	-	-	-	-
Asset replacement and renewal less capital contributions	4,670	3,506	3,059	3,113	3,026	2,938

11a(v): Asset Relocations

*Project or programme**						
	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-

** include additional rows if needed*

All other projects or programmes - asset relocations	3,931	3,234	2,791	2,791	2,791	2,791
Asset relocations expenditure	3,931	3,234	2,791	2,791	2,791	2,791
less Capital contributions funding asset relocations	3,669	2,972	2,565	2,565	2,565	2,565
Asset relocations less capital contributions	262	262	226	226	226	226

11a(vi): Quality of Supply

	Current Year CY	*CY+1*	*CY+2*	*CY+3*	*CY+4*	*CY+5*
for year ended	**30 Jun 22**	**30 Jun 23**	**30 Jun 24**	**30 Jun 25**	**30 Jun 26**	**30 Jun 27**
*Project or programme**	**$000 (in constant prices)**					
	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-

** include additional rows if needed*

All other projects or programmes - quality of supply	-	298	248	-	-	-
Quality of supply expenditure	-	298	248	-	-	-
less Capital contributions funding quality of supply	-	-	-	-	-	-
Quality of supply less capital contributions	-	298	248	-	-	-

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	446	525	627	517	468	704
	Other reliability, safety and environment expenditure	446	525	627	517	468	704
less	Capital contributions funding other reliability, safety and environment	-	-	-	-	-	-
	Other Reliability, safety and environment less capital contributions	446	525	627	517	468	704

11a(ix): Non-Network Assets

Routine expenditure

	*Project or programme**						
		-	-	-	-	-	-
		-	-	-	-	-	-
		-	-	-	-	-	-
		-	-	-	-	-	-
		-	-	-	-	-	-
	** include additional rows if needed*						
	All other projects or programmes - routine expenditure	124	3,004	380	203	676	409
	Routine expenditure	124	3,004	380	203	676	409

Atypical expenditure

	*Project or programme**						
		-	-	-	-	-	-
		-	-	-	-	-	-
		-	-	-	-	-	-
		-	-	-	-	-	-
		-	-	-	-	-	-
	** include additional rows if needed*						
	All other projects or programmes - atypical expenditure	981	2,219	426	841	1,184	627
	Atypical expenditure	981	2,219	426	841	1,184	627
	Expenditure on non-network assets	1,105	5,223	806	1,044	1,860	1,036

9.2 Appendix 2 - Forecast operational expenditure (Schedule 11B)

Company Name	**Vector Limited**
AMP Planning Period	**1 July 2022 – 30 June 2032**

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

		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 22**	**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**
	Operational Expenditure Forecast	**$000 (in nominal dollars)**										
	Service interruptions, incidents and emergencies	2,209	2,377	2,451	2,514	2,571	2,623	2,675	2,729	2,783	2,839	2,896
	Routine and corrective maintenance and inspection	3,481	3,676	3,781	3,641	3,749	3,923	3,977	3,939	3,993	4,082	4,143
	Asset replacement and renewal	-	-	-	-	-	-	-	-	-	-	-
	Network opex	5,690	6,053	6,232	6,155	6,320	6,546	6,652	6,668	6,776	6,921	7,039
	System operations and network support	3,434	3,760	4,305	4,309	4,408	4,497	4,587	4,678	4,772	4,867	4,965
	Business support	5,186	5,615	5,791	5,938	6,075	6,196	6,320	6,447	6,575	6,707	6,841
	Non-network opex	8,620	9,375	10,096	10,247	10,483	10,693	10,907	11,125	11,347	11,574	11,806
	Operational expenditure	14,310	15,428	16,328	16,402	16,803	17,239	17,559	17,793	18,123	18,495	18,845

		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 22**	**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**
		$000 (in constant prices)										
	Service interruptions, incidents and emergencies	2,209	2,286	2,286	2,286	2,286	2,286	2,286	2,286	2,286	2,286	2,286
	Routine and corrective maintenance and inspection	3,481	3,535	3,526	3,312	3,333	3,420	3,398	3,300	3,280	3,287	3,270
	Asset replacement and renewal	-	-	-	-	-	-	-	-	-	-	-
	Network opex	5,690	5,821	5,812	5,598	5,619	5,706	5,684	5,586	5,566	5,573	5,556
	System operations and network support	3,434	3,616	4,015	3,919	3,919	3,919	3,919	3,919	3,919	3,919	3,919
	Business support	5,186	5,400	5,400	5,400	5,400	5,400	5,400	5,400	5,400	5,400	5,400
	Non-network opex	8,620	9,016	9,415	9,319	9,319	9,319	9,319	9,319	9,319	9,319	9,319
	Operational expenditure	14,310	14,837	15,227	14,917	14,938	15,025	15,003	14,905	14,885	14,892	14,875
	Subcomponents of operational expenditure (where known)											
	Research and development	-	-	-	-	-	-	-	-	-	-	-
	Insurance	354	354	366	375	383	391	399	407	415	423	432

		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 22**	**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**
	Difference between nominal and real forecasts	**$000**										
	Service interruptions, incidents and emergencies	-	91	165	228	285	337	389	443	497	553	610
	Routine and corrective maintenance and inspection	-	141	255	329	416	503	579	639	713	795	873
	Asset replacement and renewal	-	-	-	-	-	-	-	-	-	-	-
	Network opex	-	232	420	557	701	840	968	1,082	1,210	1,348	1,483
	System operations and network support	-	144	290	390	489	578	668	759	853	948	1,046
	Business support	-	215	391	538	675	796	920	1,047	1,175	1,307	1,441
	Non-network opex	-	359	681	928	1,164	1,374	1,588	1,806	2,028	2,255	2,487
	Operational expenditure	-	591	1,101	1,485	1,865	2,214	2,556	2,888	3,238	3,603	3,970

9.3 Appendix 3 - Report on asset condition (Schedule 12a)

Company Name	**Vector Limited**
AMP Planning Period	**1 July 2022 – 30 June 2032**

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.	-	-	95.12%	4.88%	-	4	3.52
16	Intermediate Pressure	Line valve	IP line valves	No.	-	2.62%	93.23%	2.00%	2.15%	3	0.36
17	Intermediate Pressure	Special crossings	IP crossings	No.	-	-	72.22%	27.78%	-	3	16.25
18	Medium Pressure	Main pipe	MP PE main pipe	km	-	0.41%	1.45%	98.14%	-	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	-	0.22%	99.78%	-	-	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	3.52
25	Medium Pressure	Line valve	MP line valves	No.	-	2.66%	80.55%	3.01%	13.77%	3	0.36
26	Medium Pressure	Special crossings	MP special crossings	No.	-	7.69%	46.15%	46.15%	-	3	16.25
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	-	-	12.34%	87.66%	-	3	-
31	Low Pressure	Service pipe	LP steel service pipe	km	-	-	100.00%	-	-	N/A	-
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.	-	-	10.14%	89.86%	-	4	24.51
36	All	Cathodic protection systems	Cathodic protection	No.	-	4.55%	68.18%	27.27%	-	3	3.32

9.4 Appendix 4 - Report on forecast utilisation (Schedule 12B)

Company Name	**Vector Limited**
AMP Planning Period	**1 July 2022 – 30 June 2032**

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

Forecast Utilisation of Heavily Utilised Pipelines

Utilisation

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	*Current Year CY* y/e 30 Jun 22	*CY+1* y/e 30 Jun 23	*CY+2* y/e 30 Jun 24	*CY+3* y/e 30 Jun 25	*CY+4* y/e 30 Jun 26	*CY+5* y/e 30 Jun 27	Comment
Auckland	Auckland Central	AU North Shore MP4	400	200	14,167	35	scmh	14,054	14,180	14,307	14,436	14,566	14,697	The pressure increase in CY+5 is due to the major reinforcement of constructing a new 150mm PE MP4 pipeline in CY+5.
							kPa	252	251	248	246	245	290	
Auckland	Warkworth	WW Warkworth IP20	1,900	950	1,050	100	scmh	950	1007	1067	1131	1199	1271	CY was modelled based on the lowest recorded supply pressure at the gate station (1,400 kPa). FirstGas has increased the supply pressure to 1,500 kPa. In CY+1 following the supply pressure increase, the system will not reach the 60% limits of NOP. The Warkworth IP20 system is only supplying one IP20/MP4 DRS which requires only two bar differential pressure, therefore at MinOP of 600 kPa, there will be no supply
							kPa	1150	1240	1220	1185	1115	1050	
							scmh							
							kPa							
							scmh							
							kPa							

** 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.*

Disclaimer for supply enquiries

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

Notes and assumptions

1. A 'heavily utilised' pressure system is a pressure system where the modelled flow rate, at system peak during 2021, 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 1.009%. The stated growth rate extrapolates trends across historical actuals, which include the flows most recently observed during 2021.
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 updated since 2019.
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.

9.5 Appendix 5 - Report on forecast demand (Schedule 12c)

Company Name	**Vector Limited**
AMP Planning Period	**1 July 2022 – 30 June 2032**

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 22**	*CY+1* **30 Jun 23**	*CY+2* **30 Jun 24**	*CY+3* **30 Jun 25**	*CY+4* **30 Jun 26**	*CY+5* **30 Jun 27**
Residential	3,300	2,490	2,507	2,382	2,203	2,028
Commercial	78	136	136	136	136	136
Total	3,378	2,626	2,643	2,518	2,339	2,164

12c(ii): Gas Delivered

	Current year CY **30 Jun 22**	*CY+1* **30 Jun 23**	*CY+2* **30 Jun 24**	*CY+3* **30 Jun 25**	*CY+4* **30 Jun 26**	*CY+5* **30 Jun 27**
Number of ICPs at year end (at year end)	118,209	118,741	119,290	119,714	119,959	121,129
Maximum daily load (GJ per day)	57,146	58,905	58,971	58,642	58,183	57,525
Maximum monthly load (GJ per month)	1,446,633	1,509,999	1,511,692	1,503,242	1,491,493	1,474,617
Number of directly billed ICPs (at year end)	-	-	-	-	-	-
Total gas conveyed (GJ per annum)	13,161,923	13,616,006	13,631,266	13,555,075	13,449,128	13,296,959
Average daily delivery (GJ per day)	36,060	37,304	37,244	37,137	36,847	36,430
Load factor	75.82%	75.14%	75.14%	75.14%	75.14%	75.14%

9.6 Appendix 6 - Mandatory explanatory notes on forecast information (Schedule 14a)

(In this Schedule, clause references are to the Gas Distribution Information Disclosure Determination 2012 – as amended and consolidated 3 April 2018.)

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)

1. In the box below, comment on the difference between nominal and constant price capital expenditure for the current disclosure year and the 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 September 2017. We have used PPI as the capital expenditure inflator.

Vector has used the NZIER (New Zealand Institute of Economic Research) February 2022 PPI (Producer Price Index-inputs) forecast up to June 2026. 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)

2. In the box below, comment on the difference between nominal and constant price operational expenditure for the current disclosure year and the 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 September 2017. 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 2026. 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 June 2026. Thereafter, we have assumed a long-term inflation rate of 2.00%, which is based on a 10-year New Zealand average to June 2020

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

9.7 Appendix 7 - 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 2.6.3, 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 2022

Date

vector gas