vector

2021—2031

gas distribution asset management plan update

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SECTION 01

Introduction

1 – Introduction

1.1 Executive summary

Today's energy environment is on the cusp of significant change with the move to electrify transport and process heat, all driven by decarbonisation. There is significant uncertainty around our future energy systems – including the role of natural gas in our transition, and the future of gas assets - which could support investment in new low emissions fuels, such as bio-fuels or hydrogen. Managing this future uncertainty requires us to be agile, to preserve optionality and to put customers at the centre of our asset management approach. We are seeing customers respond to this current uncertainty; we have already seen indications from customers that there may be less demand for new gas connections in the future.

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. The next six months will be instrumental to understand whether the forecasting assumptions for the capex and opex forecasts in this AMP update, including the impact of the change in our connections capital contributions policy change discussed in the AMP update, were consistent with our forecast assumptions. As we develop a better understanding over the next six month period about whether the assumptions for the expenditure forecasts require recalibration or not, we will take the opportunity to re-forecast our 10 year expenditures in December 2021 to account for any new relevant information that may invalidate the forecasts in this AMP update and provide this to the Commission for DPP reset purposes.

The Climate Change Commission's (CCC) draft advice to government has called for wide-reaching and lasting changes to the way our society operates. When it comes to decisions around our future energy infrastructure, we share the CCC's desire to avoid investments which lock in cost for future generations, but which may no longer deliver value. We also share their focus on leveraging 'co-benefits' for New Zealanders through our transition. Agility, managing uncertainty, and putting customers at the centre of our energy systems are core to our group-wide Symphony strategy. We must acknowledge the uncertainty ahead of us, particularly with a Government response to the CCC's advice not expected until the end of 2021, while ensuring we continue to deliver a safe, resilient, reliable and affordable network for our customers.

However what seems certain, is that New Zealand's gas industry will change, and the extent and pace of the change will be driven by New Zealand's emissions reduction pathway, our consequent policy trajectory, and customer choice.

We have recently changed our capital contributions policy for new customer connections to a full-recovery contribution. This, together with an anticipated softening in future residential growth (we have already begun to experience a change to our annual net residential connections with Housing New Zealand's policy of not installing reticulated natural gas and removing natural gas from its Auckland housing stock), has led to a situation where we are forecasting a decline in the growth rate for gas connections. Notably, this forecast does not take into account effects from any potential policy changes such as those recommended in the CCC's draft advice.

We note the final CCC recommendations on natural gas assets and how they are adopted by Government may have a material effect on our asset management strategy. The forecasts in this AMP do not reflect the impacts of possible changes brought about by the Government's response to the final CCC recommendations. This may invalidate the assumptions we have used to develop our forecasts in this AMP update.

1.2 AMP update purpose statement

This AMP update is intended to provide transparency to our customers, staff and stakeholders over the context in which we make investment decisions to deliver a safe, resilient, reliable and affordable network, and how our asset management practices support the decision-making process. 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 2021 to 30 June 2031. Consistent with Information Disclosure requirements, information is provided in this update to show material changes and updates to our asset management planning since 2020, when the last full Gas Distribution AMP (1 July 2020 – 30 June 2030) 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 25 June 2021. However, we note our desire to update this AMP ahead of its use for regulatory purposes by the Commerce Commission in light of the significant policy uncertainty existing at this time.

SECTION 02

Regulatory Update

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 CCC Draft Report recommendations for natural gas networks were a significant departure to the status quo environment. The Commission has recognised this uncertainty on natural gas policy in an Open Letter to stakeholders seeking feedback from interested parties. Vector will provide our recommendations for how to best manage this uncertainty for Part 4 in our submission to that consultation.

Vector has recently updated our capital contributions policy and there is significant uncertainty as to how much this will affect Vector's 10-year expenditure forecasts. We intend to re-publish our 10-year forecasts as we develop a better understanding around customer behaviour following the CCC Final Report and its application to reticulated natural gas pipelines and also any changes from our modelled assumptions around the new capital contribution policy. Therefore, we strongly recommend the Commission have an active dialogue around the third GPB DPP to ensure any recalibration adopts the most up-to-date information key expenditure inputs for the new price path period.

We note the final CCC recommendations on natural gas assets and how they are adopted by government may have a material effect on our asset management strategy. To the extent the Government adopts recommendations to change to the settings for natural gas that may invalidate the assumptions we have used to develop our forecasts for the AMP update.

SECTION 03

Decarbonisation and Climate Resilience

3 – Decarbonisation and Climate Resilience

Vector continues to engage with the CCC, 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, the passage of the Climate Change Response (Zero Carbon) Amendment Act 2019 and our own decarbonisation pathway to achieve net zero emissions by 2030, are some of the challenges and opportunities which we continue to navigate on behalf of our customers.

From a business perspective, these issues create new opportunities to apply innovation and technology to deliver services to customers. However, they also create risks that need to be assessed and managed. This is particularly relevant for the long-term investment in network infrastructure to ensure resilience and accommodate a future which will by necessity be based on a low carbon economy. Our role in this low carbon transition will include reducing our scope 1 and 2 emissions associated with operating and maintaining the network while working with gas suppliers and customers to explore scope 3 emissions reduction through lower emission alternatives to fossil fuel derived gas. In relation to our direct Scope 1 footprint, Vector is currently investigating methods to calculate natural gas escapes to the atmosphere, and will use this knowledge to adjust processes to avoid gas escapes as much as possible.

Vector's approach will be to focus on the issues of materiality to both the business and its stakeholders, improving its understanding of these issues and embedding the appropriate response through the business. Given the scale of the issues the business will look to collaborate and where appropriate partner with other organisations in its response.

CUSTOMER AFFORDABILITY IS A CRITICAL CONSIDERATION FOR OUR DECARBONISATION PATHWAY – AND OUR ASSET MANAGEMENT APPROACH.

Ensuring that our transition to net zero is equitable is a key priority for our decarbonisation pathway – and we support the CCC's proposed Equitable Transition Strategy to help ensure continued energy affordability for customers. The impact on affordability to customers needs to be a central consideration in how we manage our gas assets into the future, including to support decarbonisation. Residential customers currently use gas as an essential service for hot water heating, cooking and a range of appliances. Transitioning these uses to electricity would result in capital costs associated with structural changes which would be required to customers' homes. Analysis jointly commissioned by Vector has found that accounting for these capital costs – including appliance, labour and renovation costs, the true cost of transitioning a gas customer to electricity would be ~$2,000 (assuming that the customer uses gas for water heating and cooking) to ~$5,000 (if the customer uses gas water heating, cooking, and space heating).

The key considerations to achieving a managed transition and the most efficient net reduction in emissions from gas are timing – and focusing on the replacement fuel that is used in place of fossil fuel derived gas. Many of the costs mentioned above would be avoided by integrating a bio-methane fuel or green hydrogen.

For example, from a customer cost perspective, analysis jointly commissioned by Vector (in the report *Response to NZ Climate Change Commission's Draft Advice, Oakley Greenwood*) has found that transitioning natural gas to biomethane or hydrogen would be far more efficient, accounting for hidden customer costs and the cost of the fuel, than transitioning natural gas to electricity. Their analysis shows that households that need to spend more than ~$1,447 on new electric appliances (as a result of our transition from gas) and associated installation costs (plumbing, wiring, reinstatements etc) would be better off using renewable methane (at $17.60/GJ). If hydrogen costs fall to $2/kg then they would only have $344 to spend before the alternative – hydrogen – was more economical than electricity.

In addition to assessing impacts on residential and small commercial customers, Vector is also assessing the impact on larger industrial gas customers. We have spoken to a number of high-volume gas users on our network to better understand their needs. The value of optionality around alternative fuel substitutes to suit different applications, and of an incremental transition, have emerged as common themes from this consultation. Many of these customers reported that any significant changes in the cost of energy would have a significant impact on their business. We are concerned about these impacts – for both our gas customers, as well as the wider economic impact this could have.

Our initial analysis has found that concentrating cost allocation across a smaller group of industrial gas customers (who are unable to transition away from gas with hard-to-abate applications) would translate into a significant price increase for those customers who remain on the network.

There is an opportunity, however, to largely avoid the capital costs mentioned above, as well as the concentration of costs which would result from dramatically reducing the number of customers on the network, by the integration of new low emissions fuels with our existing infrastructure – such as a 20% mix of green hydrogen or bio-methane. This would have the additional benefit of avoiding increases to electricity costs which could be incurred by increasing peak demand through a transition of gas load to electricity, quickly.

THE FUTURE OF NATURAL GAS IN OUR DECARBONISATION PATHWAY.

As acknowledged by the CCC, some gas users – particularly high temperature process heat users – would need to continue relying on gas combustion into the future as there are currently no alternatives for some industry applications. Taking a view of our wider electricity system, the CCC has also foreseen a role for gas as electricity peaking generation, out to 2050. Ensuring that natural gas is available for these applications, however, requires continued investment for upstream supply, as well as in downstream infrastructure.

The uncertainty of the future asset life of gas networks changes the regulatory compact – on which gas network owners invest, assuming a return on and of capital over the asset's long life. Introducing a new stranded asset risk – whereby investment recovery cannot be assured in the long run – may under-incentivise asset owners to make the continued investment necessary for operational standards to be met, to ensure continued health and safety, and reliable future gas supply – which is needed for the Commission's own pathway. Vector is continuing to invest in its gas network to maintain a high standard of service for customers – including continued reliability, affordability, and customer choice. However, as we have stated in our submission responding to the CCC's draft advice there is a need for a new 'gas transition contract' between industry and Government, to replace the regulatory compact providing industry and customers with certainty, and to support an affordable transition to net zero.

In the United Kingdom, where heating and hot water for buildings make up around 40% of the UK's total energy demand, and 20% of its total GHG emissions, the Net Zero Infrastructure Industry Coalition has called for a heat decarbonisation roadmap – which considers the whole infrastructure value chain from energy transmission, distribution and use and draws our key infrastructure components, timescales, challenges and requirements. In New Zealand, enabling a managed transition requires us to make similar considerations across the whole gas value stream – including both upstream considerations (ensuring that levels of upstream supply support the path of lowest emissions for industrial process heat users), and downstream (considering distribution infrastructure and customer impacts).

We look forward to continuing to engage with the government decision makers and wider industry stakeholders to navigate a balanced transition to a zero carbon future – which can ensure customer choice and affordability, avoid unnecessary cost, and can enable the most efficient net reduction in emissions.

SECTION 04

Network Performance

4 – Network Performance

This section reviews the key asset management service levels previously described in the 2020 AMP.

4.1 Response time to emergencies

For the period ending 30 June 2020, Vector's Response Time to Emergencies (RTE) within one hour and three hours response was 95.1% and 100%, respectively. 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. The slight drop in the RTE measure for RY20 compared to RY19 was due to the higher count of emergencies that occurred in RY20 compared to RY19 (i.e. 104 vs 89). This was compounded by the fact that 3 of the emergencies in RY20 occurred after hours during peak-hour traffic when the response crew was located on the opposite side of the city. This resulted in significant delays in the crew arriving on site and caused the 60 minute response target being missed by 8 minutes, 14 minutes and 45 minutes for these 3 events. In the case of the 45 minute delay, the emergency services had already made the site safe by the time the response crew arrived on site.

Table 4-1**Error! Reference source not found.** shows the comparison of RTE for the previous five years against Vector's target.

SERVICE LEVEL	RY16	RY17	RY18	RY19	RY20	TARGET	PERFORMANCE AGAINST TARGET
Proportion of RTE within one hour	95.6%	93.8%	98.1%	97.8%	95.1%	>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 2020, Vector's interruption rate performance was 8.8 interruptions per 100 km of pipeline length, below Vector's target of (less than) 17. Table 4-2**Error! Reference source not found.** shows the comparison of the interruption rate for the previous five years against Vector's target.

SERVICE LEVEL	RY16	RY17	RY18	RY19	RY20	TARGET	PERFORMANCE AGAINST TARGET
Interruption rate (interruptions per 100km of pipeline length)	11.6	11.1	8.9	9.0	8.8	<17	

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

For the year ending 30 June 2020, 82% of total unplanned interruptions were caused by third party damage, with the majority of the balance being caused by equipment failure; the split between third party damage and equipment-failure related interruptions was similar to that for the preceding year. Over recent years, the total count of unplanned interruptions and the count of interruptions caused by third party damage have trended downwards. This trend demonstrates that Vector's current maintenance programmes (i.e. for Reactive Maintenance (RM), Preventive Maintenance (PM), Corrective Maintenance (CM), third-party services and network protection) and asset renewal programmes (e.g. service regulator removal, riser valve audits etc.) are appropriate strategies to maintain our current network performance.

4.3 Number of poor pressure events

For the year ending 30 June 2020, Vector had two poor pressure events. This is below Vector's target of (less than) four events per annum. 4.3 shows the comparison of poor pressure events due to network causes for the previous five years against Vector's target.

SERVICE LEVEL	RY16	RY17	RY18	RY19	RY20	TARGET	PERFORMANCE AGAINST TARGET
Poor pressure events due to network causes	4	5	1	1	2	<4	

TABLE 4-3 NUMBER OF POOR PRESSURE EVENTS

Analysis of the two poor pressure events recorded for RY20 shows that one of the events was caused by a blockage on a 10mm PE service pipe, and the other event was caused by a service valve being inadvertently left partially closed after the valve was serviced; this was due to the valve-stop mechanism being faulty. Neither the RY20 events nor the poor pressure events that occurred during the previous RY periods were related to poor pressure on the mains network.

4.4 Public reported escapes

For the year ending 30 June 2020, Vector's Public Reported Escapes (PRE) performance was 20 PRE per 1,000 km of distribution system, below Vector's target of (less than) 38. 4.4 below shows the comparison of PRE for the previous five years against Vector's target.

SERVICE LEVEL	RY16	RY17	RY18	RY19	RY20	TARGET	PERFORMANCE AGAINST TARGET
PRE per 1000km	32	30	24	21	19	<38	

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

For the year ending 30 June 2020, approximately 50% of all PRE were related to service riser faults (i.e. riser valve, pipe or crimp joint); a further 27% of PRE were related to service pipe faults (i.e. service pipe or fitting) and 9% of PRE were related to mains pipe faults. The balance of PREs were related to District Regulator Station (DRS) and service regulator faults etc. Although there was a small increase in PRE related to riser faults and mains faults in RY20 compared to RY19, the overall makeup of the total PRE count is similar to that for recent RY periods. As with previous RY periods, the total PRE count for FY20 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.

4.5 Environmental breaches

For the year ending 30 June 2020, Vector had no environmental breaches, in line with Vector's target. 4.5 below shows the comparison of PRE for the previous five years against Vector's target.

SERVICE LEVEL	RY16	RY17	RY18	RY19	RY20	TARGET	PERFORMANCE AGAINST TARGET
PRE per 1000km	0	0	1	0	0	0	

TABLE 4-5 ENVIRONMENTAL BREACHES

SECTION 05

Network Development Planning

5 – Network Development Planning

This section discusses aspects that have led to key changes to Vector's network planning practices previously described in the 2020 AMP.

5.1 Gas connections

Vector utilises our pipeline data in conjunction with modelling based on consent statistics and other economic indicators to forecast connection growth. We also work closely with developers and consultants to understand their planned development activities and indicative timeframes for these.

It is vital for Vector to understand the timing and forecast of customer connection growth and its impact on the network in order to ensure a reliable, affordable and resilient gas network. A variety of political, economic and environmental factors impact on the long-term growth of the Auckland region and subsequently the region's infrastructure. As evidenced by the impacts of COVID-19 these factors can have significant and unexpected impacts on market growth. Instead of COVID-19 resulting in a downturn in growth, Auckland has experienced a significant increase in construction with 14,895 dwellings consented in Auckland for the year ending July 2020. The initial impact of this was that gas connections were trending upwards. However, Vector's updated customer contributions policy is forecast to reverse this trend, with developers that normally install gas in their subdivision developments signalling that they are unlikely to include reticulated gas going forward and individual customers choosing not to connect to gas, resulting in a decline in future gas connections.

We are forecasting reduced growth. During the forthcoming period we are expecting a shift in the take-up of reticulated natural gas across our customer segments. We have already begun to experience a change to our annual net residential connections with Housing New Zealand's policy of not installing reticulated natural gas and removing natural gas from its Auckland housing stock. This policy will continue with projections for the next three years seeing this trend accelerating.

The changes to our capital contribution policy will also have an impact on private developers reticulating sites with natural gas. We anticipate the impact will result in demand dropping off over the short term. We also note the current level of building activity for Auckland is forecast to level off into the next decade which is also affecting our connection growth forecast over the medium term. We are anticipating this trend to result in net residential connections growth declining for the foreseeable future.

At the same time, we are also forecasting Small Medium Enterprise (SME) to also accelerate their adoption of alternative forms of production processes and Industrial and Commercial (I&C) users to have positive growth, albeit marginal, through the planning period. The modest growth in this segment does reflect the limited substitution these types of users have for their energy intensive production processes.

Over the AMP update planning period, we are also forecasting the impact to affect changes to consumption patterns. At the segment level we are expecting segments such as residential customers to have negative consumption per ICP as they elect to use substitutes such as electrical heat pumps for their energy needs like space heating.

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

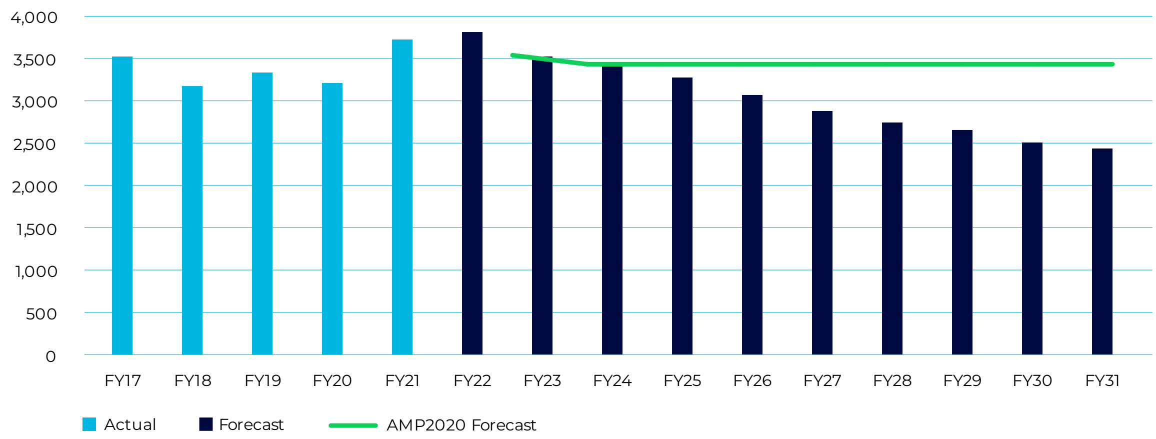

FIGURE 5-1 GAS CONNECTIONS – ACTUAL AND FORECAST

5.2 DRS capacity upgrade

Vector has developed the Condition Based Asset Risk Management (CBARM) model for the DRS assets, see section 6.1, which supports our proactive risk-based approach to asset replacement and maintenance prioritisation. The CBARM model takes into consideration the forecast capacities and the increasing load on the DRS assets against each DRS's capacity limiting component, to identify a specific capital work programme. The identified work programmme is aligned with Vector's strategy to reduce equipment failures and improve network resilience.

The output from the CBARM modelling has been used to develop a more targeted and risk-based DRS capacity upgrade program for the 10-year planning period, to address any risk associated with operating the DRS assets over its design capacity. This has resulted in a decrease in the CAPEX forecast for DRS reinforcement provision, over the 10-year period – refer table below.

FORECAST INVESTMENT SUMMARY ($MILLION CONSTANT)

DESCRIPTION	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	TOTAL
DRS capacity upgrade	0.20	0.26	0.33	0.16	0.07	0.19	0.17	0.20	0.16	0.18	1.92
Total	**0.20**	**0.26**	**0.33**	**0.16**	**0.07**	**0.19**	**0.17**	**0.20**	**0.16**	**0.18**	**1.92**

5.3 Penlink Highway project

Vector's MP4 network in Whangaparaoa Peninsula is currently supplied from a single supply to an existing population of approximately 7,000 customers with increased commercial and industrial demand. The current network configuration is embedded with a potential risk associated with having only one 150mm PE MP4 gas main along Whangaparaoa Road, supplying the Whangaparaoa area which includes a significant number of residential, commercial and industrial consumers.

Vector has identified an opportunity to co-ordinate future planning with the NZTA Penlink Highway project and construct an alternative 150mm PE gas main to provide a second supply into the Whangaparaoa Peninsula. This investment will improve network resilience and allow for future commercial and industrial growth. In addition, this project enables future improvements by extending the MP4 network further south, allowing for future linking to the North Shore MP4 network. This increases network resilience and enables for future growth in the Northshore commercial and industrial areas.

The proposed new project will include the following;

- Construct a new MP4 150mm PE main alongside the proposed Weiti Toll Road for approximately 7km (i.e. the entire extent of the Penlink Project). This will include two new bridge crossings over State Highway 1 and the Weiti River.
- Construct a new MP4 150mm PE main along East Coast Road for approximately 6.5km. This new main will connect into the proposed Penlink 150mm PE pipeline (refer above) and will extend to the North Shore MP4 network at Glenvar Road, Long Bay.

The two projects are planned during FY23 to FY27, subject to the progress of the NZTA Penlink project – refer table below.

FORECAST INVESTMENT SUMMARY ($MILLION CONSTANT)

DESCRIPTION	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	TOTAL
NZTA Penlink Project (Motorway to Whangaparaoa)		1.0	1.5								2.5
NZTA Penlink to Glenvar road				0.5	1.0	1.3					2.8
Total		**1.0**	**1.5**	**0.5**	**1.0**	**1.3**					**5.3**

5.4 Waitoki / Whangaparaoa MP4

The Waitoki / Whangaparoa MP4 system supplies gas to Silverdale, Milldale, Orewa and the Whangaparaoa Peninsula and supplies approximately 7,000 customers. Due to the forecast increase in demand in the area and the proposed industrial developments in Silverdale, Vector has identified a Quality of Supply (QoS) risk associated with this MP4 network.

As shown in Appendix 4 - Report on forecast utilisation (Schedule 12B)**Error! Reference source not found.**, network modelling using the forecast demand during the planning period, results in the Minimum Operating Pressure (MinOP) dropping to 237kPa (59% of the Nominal Operating Pressure (NOP)) and an eventual breach of Vector's QoS standards. The high utilisation of the network may also limit the uptake of industrial loads in the Silverdale area.

The high-level reinforcement solution is to construct two new mains that will support the increasing industrial and commercial demands in the area, and connect to a higher-pressure point at the end of Highgate Parkway. This approach will improve system pressure and maintain the MinOP criteria during the planning period.

The following projects are proposed during the planning period:

- Tavern Road to East Coast Road Silverdale - Phase 1 (FY22): The scope of this project includes constructing a new main along Tavern and Forge Roads. The project comprises constructing approximately 300 metres of 100mm PE main from the end of Highgate Parkway, along Waterloo Road to Wainui Road and constructing approximately 750 metres of 150mm PE main along Tavern Road to East Coast Road.
- Milldale Motorway crossing (FY23): The scope of this project includes constructing a motorway crossing to connect the western and eastern sides of the network, which will improve the Security of Supply (SoS) by having a second supply from the DRS side (Milldale, west of motorway) to the highly developing area (Silverdale and Millwater, east of the motorway). This new crossing will also increase the network MinOP by 40kPa and maintain the QoS of a rapidly expanding network.
- Highgate Parkway to East Coast Road, Silverdale - Phase 2 (FY24): The scope of this project includes constructing a new main that supplies Silverdale along Brain Smith Drive and connect to a higher-pressure point at the end of Highgate Parkway. The project comprises constructing approximately 1.4km of 100mm PE from Highgate Parkway, along Brain Smith Drive, and crossing Hibiscus Coast Highway, to the corner of Goldwater Drive and East Coast Road.

FORECAST INVESTMENT SUMMARY ($MILLION CONSTANT)

DESCRIPTION	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	TOTAL
Tavern Road to East Coast Road Silverdale – Phase 1	0.61										0.61
Highgate Parkway to East Coast Road, Silverdale – Phase 2			0.72								0.72
Milldale Motorway crossing		0.25									0.25
Total	**0.61**	**0.25**	**0.72**								**1.58**

5.5 East Auckland MP4 networks

The East Auckland MP4 pressure system operates at a NOP of 400kPa. The total forecast demand during the planning period is estimated to exceed 12,000 scmh resulting in a MinOP of 230kPa (57% of the NOP). No constraints have been identified and the system pressure is not forecasted to fall below the MinOP criteria during this planning period. However, to support future commercial and industrial growth opportunities, and improve network security and resilience, Vector has identified a reinforcement strategy for the East Tamaki IP10/MP4 network.

This project aims to improve the SoS on the network by integrating the East Auckland MP4 network with two nearby networks (i.e. Manurewa North MP4 and Manurewa South MP4). Connecting the three proposed networks will increase the available capacity in a key industrial area and will substantially improve the SoS of major industrial loads which are currently supplied by two DRS's on Manurewa North MP4 network.

The proposed new project is planned in FY28 and will include:

- Constructing approximately 525 metres of MP4 100mm PE to connect the Manurewa North MP4 with East Auckland MP4 network.
- Constructing 3 metres of 100mm ST to connect the Manurewa North MP4 with the Manurewa South MP4 network – refer table below.

FORECAST INVESTMENT SUMMARY ($MILLION CONSTANT)

DESCRIPTION	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	TOTAL
East Auckland MP4 Merging							0.79				0.79
Total							**0.79**				**0.79**

5.6 East Auckland IP10 – pressure uprate

The East Auckland IP10 network modelling has indicated that the network in the East Tamaki area is forecast to be heavily utilised, and possibly at risk of breaching Vector's MinOp criteria within the 10-year planning period, due to the increasing demand on the network. Network modelling has indicated there will be a future breach of the MinOP in the East Auckland IP10 at Apirana Avenue DRS-00164 and a breach of the non-standard MinOP (1,200 kPa) at Harris Road DRS-00136 inlet.

As a result, system reinforcement is required to support future growth opportunities and improve network resilience. The following proposed project is planned in FY27:

- Uprate the existing IP10 pipeline, which is currently operating at 875kPa, below its reported maximum allowable operating pressure (MAOP) of 1,160kPa, to operate at a NOP of 1,000kPa – refer table below.

FORECAST INVESTMENT SUMMARY ($MILLION CONSTANT)

DESCRIPTION	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	TOTAL
East Auckland IP10 – pressure uprate									0.30		0.30
Total									**0.30**		**0.30**

5.7 Drury Hills Road

The Drury network system is supplied from the transmission system at one gate station located in Waihoehoe Road, Drury. This network system consists of two MP4 pressure systems; Drury CT and Drury NC. The two networks supply a mix of residential, commercial and industrial loads.

Due to the organic growth, the expected development in the region, i.e. New Town Drury and Drury South Crossing, and the forecast increase in industrial demand, the MP4 network is expected to breach Vector's QoS standard during the planning period. The Drury NC MP4 network is one of the most utilised network, it is currently operating at 60% of its NOP.

To address this potential issue, a project to increase the available remaining capacity in both networks and to mitigate the potential QoS breach and maintain the SoS in a highly developing industrial area, is proposed. The project comprises:

- Constructing approximately 1.3km of MP4 100mm PE main along Drury Hills Road, Drury to extend the existing main at the intersection of Waihoehoe Road and Drury Hills Road to the existing 100mm ST main at 50 Drury Hills Road – refer table below.

FORECAST INVESTMENT SUMMARY ($MILLION CONSTANT)

DESCRIPTION	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	TOTAL
Drury Hills Road			0.50								0.50
Total			**0.50**								**0.50**

SECTION 06

Lifecycle Asset Management

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 2020 AMP.

6.1 District Regulator Station upgrades

Vector's CAPEX work programme includes upgrading DRSs to address integrity and/or legacy compliance issues identified through periodic DRS condition assessments. The 2020 AMP CAPEX forecast for DRS rebuilds was based on undertaking one major DRS upgrade per year to address integrity related issues.

Vector has recently 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. The model also identifies the probability of failure and the monetised consequence of failure, which can be normalised across different asset types to identify the expenditure strategy across all asset types, the CBARM models for the remaining asset types is currently being developed.

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)	1		1		**2**
(2-4)	15	4	3	4	**26**
(4-5.5)	5	2		1	**8**
(5.5-6.5)	2			1	**3**
(6.5-7.5)	3	6	1		**10**
(7.5-8)					**0**
(8-10)	29	19	3	2	**53**
(10+)					
Total	55	31	8	8	**102**

The significant number of HI category (8-10) is a result of identifying obsolete slam shut equipment across the entire DRS population. Accordingly, Vector has identified a capital work programme to change the obsolete slam shuts (refer section 6.5). The remaining risk is considered acceptable as the majority of the DRS population are in C1 and C2 categories (i.e. 86 DRSs) and the leading consequence of failure is supply interruption.

The forecast DRS asset HI and CI, at the end of this planning period and based on each DRSs current condition and specific individual deterioration rate are shown in the table below.

FUTURE FORECASTED – 10 YEAR					
	C1	C2	C3	C4	**Total**
(0-2)					
(2-4)		1	1	1	**3**
(4-5.5)	10	1	1	3	**15**
(5.5-6.5)	6	1	2	1	**10**
(6.5-7.5)	4	3			
(7.5-8)					
(8-10)	4	1			**5**
(10+)	31	24	4	3	**62**
Total	55	31	8	8	**102**

The forecasted 10-year values of HI comprise a significant number of HI category (10+) as a result of asset deterioration, combined with the previously mentioned obsolete slam shut equipment across the entire DRS population. As a result of this assessment, Vector has developed a targeted and risk-based DRS upgrade programme for the 10-year planning period; this has resulted in a decrease in the CAPEX forecast for DRS intervention over the 10-year period – see table below.

FORECAST INVESTMENT SUMMARY ($MILLION CONSTANT)

DESCRIPTION	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	TOTAL
DRS upgrades	0.37	0.23	0.24	0.24	0.27	0.31	0.17	0.36	0.35	0.34	2.88
Total	**0.37**	**0.23**	**0.24**	**0.24**	**0.27**	**0.31**	**0.17**	**0.36**	**0.35**	**0.34**	**2.88**

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

FUTURE FORECASTED RISK – AFTER INTERVENTION					
	C1	C2	C3	C4	**Total**
(0-2)			1		**1**
(2-4)	7	6		2	**15**
(4-5.5)	12	9	4	4	**29**
(5.5-6.5)	11	5	2	2	**20**
(6.5-7.5)	8	7	1		**16**
(7.5-8)	3	1			**4**
(8-10)	11	3			**14**
(10+)	2				**2**
Total	54	31	8	8	**101**

6.2 Special crossing upgrades

Detailed condition assessments of aboveground special crossing are undertaken annually where access to the pipeline allows. 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.

Although the average condition grading of all assessed aboveground special crossings has remained relatively flat over recent years (i.e. approximately 4.8 on a 7 point scale), the grading assessments vary significantly from site to site as well as within each of the four assessment areas (i.e. pipe, supports etc) at each site. For this reason a 10-year special-crossing upgrade programme has been developed that targets the upgrade of sites where any component of the crossing has a low condition grading; this has resulted in an uplift in the CAPEX forecast for special crossing upgrades over the 10-year planning period – refer table below.

FORECAST INVESTMENT SUMMARY ($MILLION CONSTANT)

DESCRIPTION	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	TOTAL
Special crossing upgrades	0.46	0.59	0.28	0.11	0.06	0.12	0.08	0.10	0.11	0.11	2.01
Total	**0.46**	**0.59**	**0.28**	**0.11**	**0.06**	**0.12**	**0.08**	**0.10**	**0.11**	**0.11**	**2.01**

6.3 Isolation valve installations

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

The focus of recent isolation-valve installation programmes has largely been on the installation of DRS inlet and outlet fire valves. However, with only a small number of DRS fire valves now outstanding, the focus going forward has turned to the installation of additional isolation valves on strategic pipelines - e.g. IP20 pipelines. Network-isolation modelling completed to date has identified critical sites where additional isolation valves should be installed to improve the safe operation of the network and improve the level of network resilience. An isolation valve upgrade programme has therefore been developed to facilitate this work; this has resulted in an uplift 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	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	TOTAL
Isolation valve installations	0.60	0.60	0.36	0.36	0.36	0.32	0.32	0.27	0.27	0.34	3.82
Total	**0.60**	**0.60**	**0.36**	**0.36**	**0.36**	**0.32**	**0.32**	**0.27**	**0.27**	**0.34**	**3.82**

6.4 Strategic valve placement

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.

To mitigate the risks related to inoperable isolation valves and to improve the level network resilience, Vector has developed a strategic valve replacement programme that 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 - e.g. due to its age or type. This has resulted in an uplift in the CAPEX forecast for the replacement of strategic isolation valves over the 10-year planning period – refer table below.

FORECAST INVESTMENT SUMMARY ($MILLION CONSTANT)

DESCRIPTION	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	TOTAL
Strategic valve placement		0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	2.25
Total		**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**2.25**

6.5 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; the majority of this equipment was installed in the 1990s.

A replacement programme has therefore been developed for the replacement of the obsolete equipment; the DRS sites with obsolete slam shuts have been prioritised based on a criticality assessment and have been scheduled for upgrade over the RY22 to RY29 period. This has resulted in an uplift in the CAPEX forecast for the replacement of obsolete DRS over-pressure protection equipment over the RY22 to RY29 period – refer table below.

FORECAST INVESTMENT SUMMARY ($MILLION CONSTANT)

DESCRIPTION	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	TOTAL
Replacement of obsolete slam-shuts	0.29	0.29	0.29	0.29	0.14	0.06	0.03	0.03			1.40
Total	**0.29**	**0.29**	**0.29**	**0.29**	**0.14**	**0.06**	**0.03**	**0.03**			**1.40**

6.6 Motorway crossing emergency valve installation

AS/NZS 4645 requires sectional isolation valves be installed to facilitate the safe operation of the gas distribution network. In order to meet this requirement and to improve the level of network resilience, Vector periodically undertakes network-isolation modelling to identify the need for additional isolation valves to improve the safe operation of the network and minimise the severity of outages - e.g. in the event of damage to the network from third party activities.

Recent analysis has identified a small number of locations where a strategic main (i.e. a higher capacity main) crosses beneath a motorway but has inadequate means of allowing the crossing to be swiftly isolated in the event of the pipe being damaged. An isolation-valve installation programme has therefore been developed to target the installation of additional isolation valves at the motorway-crossing sites identified; this has resulted in an uplift in the CAPEX forecast over the RY23 to RY25 period – refer table below.

FORECAST INVESTMENT SUMMARY ($MILLION CONSTANT)

DESCRIPTION	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	TOTAL
Motorway crossing emergency valve installation		0.04	0.25	0.30							0.58
Total		**0.04**	**0.25**	**0.30**							**0.58**

6.7 Stainless steel service-pipe replacement

The use of stainless-steel piping for aboveground service pipe connections on Vector's gas distribution network started in the mid-1990s; this was a time of high network growth and as a result, a relatively large number of aboveground stainless steel service connections were installed at that time.

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 are a small number of sites that require upgrade work to address poor condition, and 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 has therefore been developed to upgrade the sites identified as being in poor condition, and to replace the stainless-steel services where there is no wrapping installed on the belowground interface. The upgrade work to address the sites that are in poor condition will be undertaken during the RY22 period as these sites are considered to be higher risk; the upgrade work to replace the stainless steel services where there is no wrapping installed has been scheduled for later in the planning period (i.e. RY27 to RY31) as these sites are considered to be lower risk. This has resulted in an uplift in the CAPEX forecast over the RY22 and RY27 to RY31 periods – refer table below.

FORECAST INVESTMENT SUMMARY ($MILLION CONSTANT)

DESCRIPTION	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	TOTAL
Stainless steel service-pipe replacement	0.07					0.10	0.10	0.10	0.10	0.10	0.57
Total	**0.07**					**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.57**

6.8 DRS enclosure upgrades

A large proportion of Vector's older DRS have design elements that potentially could lead to poor H&S outcomes. For example, few of Vector's older DRS have purpose-designed traffic protection measures installed; where these DRS are located adjacent to busy roads, there is a real risk of the DRS sustaining significant damage as a result of vehicle impact, as has happened periodically.

In addition, a large proportion of older DRSs were designed with a low roof line in order to achieve a low DRS profile; in these cases, access to the DRS kiosk is typically provided by means of a small access door and a hinged roof which is propped up with a brace while personnel are working within the DRS. This has resulted in restricted workspaces and the need to have two people on site to open the heavy lid.

There are also a small number of open DRS (e.g. typically located within a gate station) where the lack of a roof has resulted in bad corrosion of some of the DRS equipment.

An upgrade programme has therefore been developed to target the upgrade of DRS sites that have inadequate traffic protection measures, or poor access facilities or inadequate weather protection measures; this has resulted in an uplift in the CAPEX forecast over the RY22 to RY31 periods – refer table below.

FORECAST INVESTMENT SUMMARY ($MILLION CONSTANT)

DESCRIPTION	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	TOTAL
DRS enclosure upgrades	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 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. Although the general condition of the spares and equipment is adequate, some of the equipment (e.g. pipeline drilling equipment) is at least 25 years old and its current condition reflects the relatively high level of service that it has had.

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

FORECAST INVESTMENT SUMMARY ($MILLION CONSTANT)

DESCRIPTION	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	TOTAL
Replace obsolete emergency equipment	0.27	0.12	0.12	0.12							0.63
Total	**0.27**	**0.12**	**0.12**	**0.12**							**0.63**

6.10 Maintenance programme

This section discusses aspects that have led to key changes to Vector’s asset maintenance practices previously described in the 2020 AMP.

6.10.1 SURVEY OF INACTIVE SERVICES

Vector has recently modified its service-pipe maintenance standards to require all inactive services (i.e. services that are live but not in use) that have been inactive for more than 5-years to be inspected on a 5-yearly cycle. This requirement was introduced following recent incidents involving third-party damage to inactive risers, and inactive risers being found in poor condition. The purpose of the inspection is to identify risks to the service pipe and riser (e.g. due to changes in land use etc) and initiate remedial measures where necessary - e.g. maintenance of the riser or riser-valve, or cut-off of the service etc. This has resulted in corresponding increases in both PM and CM OPEX forecasts throughout the planning period.

6.10.2 3-YEARLY SURVEY OF ALL STAINLESS SERVICES

Aboveground stainless-steel service connections are currently installed at approximately 230 locations throughout Vector's gas distribution network. Their use is typically confined to service connections to commercial and multi-storey buildings and other situations where a portion of the service pipe is required to traverse over a physical obstacle - e.g. a retaining wall etc.

Because stainless-steel service connections are installed aboveground, they are more prone to third party damage or other interference. Field audits of stainless-steel service connections have therefore been carried out periodically in the past to assess the condition of the service connection and to determine if it remains compliant. The results of these audits have shown that remedial work is typically required at a number of sites, and that the type and quantity of work required warranted the introduction of an ongoing 3-yearly audit programme. The introduction of a 3-yearly survey of stainless-steel service connections has resulted in corresponding increases in both PM and CM OPEX forecasts throughout the planning period.

6.10.3 DCVG SURVEY OF IP NETWORK

Vector's maintenance standards currently only require Direct Current Voltage Gradient (DCVG) surveys to be undertaken on the gas distribution network in certain situations - e.g. where significant civil works are being carried out in the vicinity of a steel pipeline, or as part of constructing a new steel pipeline or as a means of troubleshooting CP faults etc.

As a result, the coating defect data held for critical steel pipelines is fragmented, and minimal defect data is held for large sections of the Intermediate Pressure (IP) pipeline system which forms the backbone of the wider gas distribution network. To address this shortcoming, the relevant maintenance standards are being updated to require annual DCVG surveys to be carried out on sectors of the IP network that have been prioritised according to risk. The introduction of annual DCVG surveys has resulted in corresponding increases in both PM and CM OPEX forecasts throughout the planning period.

6.10.4 DCVG SURVEY OF THE WAITOKI IP20 PIPELINE

The Waitoki IP20 pipeline is a critical pipeline as it provides the sole supply for the approximately 7,000 gas service connections in the Whangaparaoa and Silverdale area. In 2010 a DCVG survey was carried out along the full length of the pipeline and identified 352 coating defects; another DCVG survey of a short section of the pipeline was carried out in December 2020 and identified further coating defects (i.e. in addition to the 2010 defects) along that section of pipeline. Because of the criticality of the pipeline and its coating-defect history, another DCVG survey of the full length of the pipeline is planned for RY22; this has resulted in corresponding increases in both PM and CM OPEX forecasts for the RY22 period.

6.10.5 SPECIAL CROSSING SURVEYS OF DIFFICULT TO ACCESS SITES

In order to undertake detailed inspections of some aboveground special crossings (e.g. a motorway crossing), special access solutions and/or access consents are sometimes required before the inspection can be carried out. Because of the complexities that are sometimes encountered when trying to arrange the necessary access solutions and consents, prolonged delays can result. This has been further compounded by the fact that Vector's special crossing inspection programme has been based on an annual inspection cycle which for a number of sites is impractical (i.e. due to the lead times required).

As a result, a number of special crossings that are difficult to access have never had a detailed maintenance inspection carried out on them. To address this, Vector's inspection cycles for some special crossings have been extended (e.g. 3-yearly) and the special crossing PM OPEX forecast has been increased for the duration of the planning period to allow for additional costs associated with the provision special access solutions (e.g. motorway closures etc).

6.10.6 HYDROGEN TRIAL PROGRAMME

Vector is participating in an industry-wide group that is evaluating the feasibility of undertaking a hydrogen trial programme; the programme includes a live trial on a nominated small network (location to be confirmed) to transition it from natural gas to hydrogen. The initial stages of the programme are scheduled to be completed in RY22 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 of the industry trial is to be borne by the individual gas distribution businesses that make up the industry group and be apportioned according to their respective customer-base size.

The longer term goals of the industry group include the transitioning of the gas distribution supply in Auckland region 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 RY22 industry trial, Vector will undertake its own programme of consumer equipment and network material assessments (RY23 to RY35) to facilitate the transition to a 20% hydrogen blend or 100% hydrogen as and when these become available. 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 an uplift in the OPEX forecast over the RY22 to RY31 periods – refer table below.

FORECAST INVESTMENT SUMMARY ($MILLION CONSTANT)

DESCRIPTION	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	TOTAL
Consumer and materials assessment (trial project)	0.16										0.16
Vector network survey		0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	5.54
Total	**0.16**	**0.62**	**0.62**	**0.62**	**0.62**	**0.62**	**0.62**	**0.62**	**0.62**	**0.62**	**5.70**

SECTION 07

Capital Expenditure Forecast

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 2020 AMP (disclosed in July 2020).

7.1 Capital expenditure forecast

The table below shows the forecast CAPEX during the planning period, broken down into the asset categories defined in the Commerce Commission's Gas Distribution Information Disclosure Amendments Determination 2012. The figures are presented in 2022 dollars.

The step change in expenditure that occurs after FY24 for the other reliability, safety and environment expenditure category is due to the completion of a number of improvement programmes in FY24 and FY25; these programmes include the installation of motorway-crossing emergency valves, replacement of obsolete emergency equipment, and installation of additional isolation points within the Auckland CBD.

FINANCIAL YEAR ($000)

2021 AMP UPDATE	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	TOTAL
Consumer connection	15,992	15,065	14,780	14,136	13,332	12,578	12,051	11,682	11,112	10,876	**131,605**
System growth	2,136	1,906	4,538	2,566	2,601	2,904	907	467	734	3,266	**22,025**
Asset replacement and renewal	5,121	3,645	3,260	2,981	2,662	2,561	2,345	2,564	2,532	2,475	**30,144**
Asset relocations	3,626	3,013	4,614	5,891	5,891	5,891	4,046	2,911	2,911	2,911	**41,704**
Quality of supply	1,377	872	204	654	51	0	805	0	845	0	**4,808**
Legislative and regulatory	0	0	0	0	0	0	0	0	0	0	**0**
Other reliability, safety and environment	1,397	1,579	1,226	800	369	330	330	279	279	351	**6,941**
Non-network asset	3,354	2,642	1,861	2,260	2,899	4,000	2,620	1,860	2,042	2,272	**25,810**
Total CAPEX	**33,002**	**28,722**	**30,482**	**29,288**	**27,803**	**28,264**	**23,106**	**19,765**	**20,455**	**22,149**	**263,038**

7.2 Comparison to previous AMP

The section highlights the significant changes to the 2020 disclosed expenditure forecasts. The figure below shows the difference between the 2021 and 2020 AMP expenditure forecasts, with the following table breaking down the variance by expenditure categories. For reference purposes, Vector has escalated to 2022 prices using an inflation factor of 1.95%.

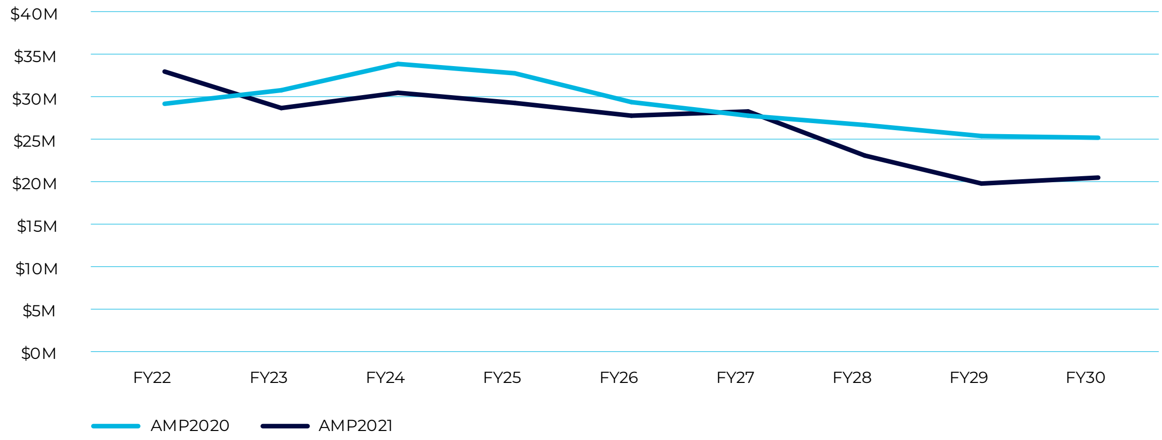

FIGURE 7-1 AMP MOVEMENT 2020 V 2021

FINANCIAL YEAR ($000)

2020/2021 AMP VARIANCE	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	TOTAL
Consumer connection	(1,337)	(1,958)	(2,269)	(2,912)	(3,717)	(4,470)	(4,997)	(5,366)	(5,936)	**(32,964)**
System growth	546	(313)	(530)	(1,554)	679	110	(1,298)	(276)	(413)	**(3,048)**
Asset replacement and renewal	1,981	501	128	376	211	319	104	323	291	**4,233**
Asset relocations	846	(1,795)	(1,507)	(230)	(230)	1,666	989	(146)	(146)	**(554)**
Quality of supply	355	478	151	(1)	(1)	0	805	(663)	663	**1,787**
Legislative and regulatory	0	0	0	0	0	0	0	0	0	**0**
Other reliability, safety and environment	1,340	741	1,170	743	313	274	274	223	223	**5,301**
Non-network asset	58	306	(560)	96	1,138	2,525	553	267	574	**4,957**
Total CAPEX	**3,789**	**(2,039)**	**(3,416)**	**(3,484)**	**(1,609)**	**424**	**(3,570)**	**(5,638)**	**(4,745)**	**(20,288)**

7.3 Explanation of major capital expenditure variances

This section highlights the significant changes in CAPEX over the 9-year period for which the 2020 AMP and 2021 AMP update overlap. The key changes include:

- Customer connection forecast expenditure is reduced significantly ($33m) resulting from a lower reticulation and connection forecast to reflect the impact from the change in Vector's customer contribution policy.
- A reduction of $3m in system growth to reflect a lower demand forecast from reduced customer connections ($8m), that is partially offset by a provision for reinforcement projects to align with AT's Whangaparaoa Penlink project ($5.4m).
- A $4m increase in asset replacement and renewal expenditure to maintain target performance levels that is attributed to an increase in special crossings replacement ($1.4m), a new strategic valve replacement programme ($2m) and stainless steel service pipe replacements ($0.5m), over the 10 year planning period.
- A $5m increase in other reliability, safety and environment quality of supply, that is attributed to various initiatives including a new provision for motorway crossing isolation valves ($0.6m), expenditure to remedy obsolete emergency equipment (0.6m) and installation of new network isolation valves ($2.7m).
- Asset relocation forecast is in line with last year's AMP, including provision for the Auckland Light Rail project.
- Non-network CAPEX has increased by $5m due to:
  - Increased investment in Cyber Security and Modernising IT/OT Network infrastructure and key system upgrades such as SAP, Siebel, and GIS. More detailed discovery on each of these upgrades has provided better certainty of the effort required and has resulted in increased forecast costs.
  - Increase in the property and leases that is largely resulting from changes in the timing of the office leases and deferral of the office refurbishment cost.

SECTION 08

Operational Expenditure Forecast

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 2020 AMP (disclosed in July 2020).

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 2022 dollars.

FINANCIAL YEAR ($000)

2021 AMP UPDATE	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	TOTAL
Service interruptions and emergencies	2,251	2,251	2,251	2,251	2,251	2,251	2,251	2,251	2,251	2,251	**22,515**
Routine and corrective maintenance and inspection	3,455	3,317	3,276	3,003	3,078	3,186	2,973	3,033	3,248	3,014	**31,584**
System operations and network support	3,271	3,730	3,730	3,730	3,730	3,730	3,730	3,730	3,730	3,730	**36,836**
Business support	5,222	5,222	5,222	5,222	5,222	5,222	5,222	5,222	5,222	5,222	**52,216**
Total Opex	**14,198**	**14,520**	**14,478**	**14,206**	**14,281**	**14,389**	**14,176**	**14,236**	**14,451**	**14,216**	**143,151**

8.2 Comparison to previous AMP

The section highlights the significant changes to the 2020 disclosed expenditure forecasts. The figure below shows the difference between the 2020 and 2021 AMP expenditure forecasts, with the following table breaking down the variance by expenditure categories. For reference purposes, Vector has escalated to AMP 2020 prices using an inflation factor of 1.98%.

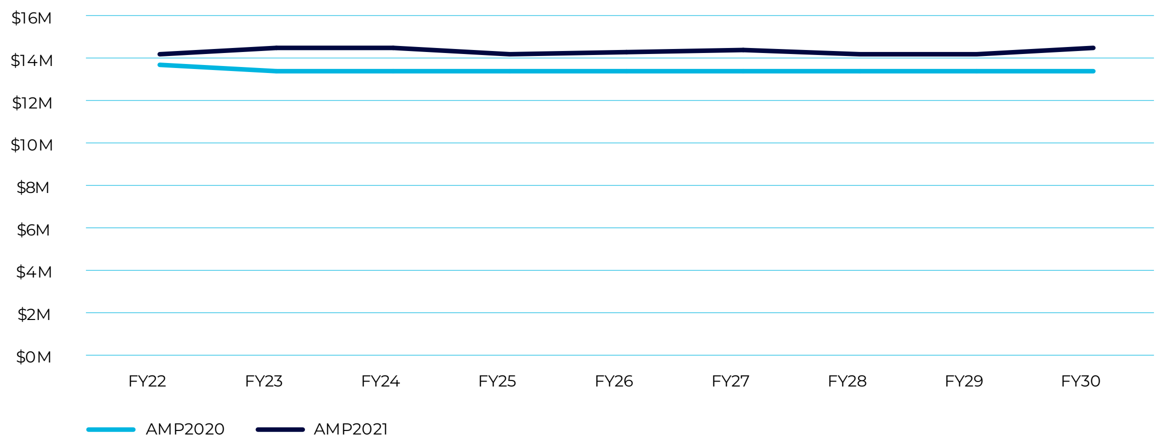

FIGURE 8-1 AMP MOVEMENT 2020 V 2021

FINANCIAL YEAR ($000)

2020/2021 AMP VARIANCE	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31
Service interruptions and emergencies	(81)	(81)	(81)	(81)	(81)	(81)	(81)	(81)	(81)	**(728)**
Routine and corrective maintenance and inspection	305	438	394	120	193	299	84	143	355	**2,333**
Asset replacement and renewal	0	0	0	0	0	0	0	0	0	**0**
System operations and network support	249	708	708	708	708	708	708	708	708	**5,911**
Business support	36	36	36	36	36	36	36	36	36	**324**
Total OPEX	**509**	**1,100**	**1,057**	**783**	**856**	**962**	**747**	**806**	**1,018**	**7,840**

8.3 Explanation of major operational expenditure variances

This section highlights the significant changes in OPEX over the 9-year period for which the 2020 AMP and 2021 AMP update overlap. The key changes include:

- A reduction of $0.7m in service interruption and emergencies expenditure due to a lower number of third party faults on the network.
- A $5.9m increase in system operations and network support expenditure due to the industry hydrogen blending project and hydrogen feasibility studies on Vector's network.
- A $2.3m increase in routine and corrective maintenance and inspection that are attributed to:
  - An increase in proactive network surveys to assess asset condition on mains and service pipes, special crossings and inactive service pipes.
  - An increase in corrosion protection for pipes over bridges and an increase in expenditure to address defects found on belowground pipelines that require repair.

SECTION 09

Appendices

9 – Appendices

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

Company Name	**Vector Limited**
AMP Planning Period	**1 July 2021 – 30 June 2031**

SCHEDULE 11a: REPORT ON FORECAST CAPITAL EXPENDITURE

This schedule requires a breakdown of forecast expenditure on assets for the current disclosure year and a 10 year planning period. The forecasts should be consistent with the supporting information set out in the AMP. The forecast is to be expressed in both constant price and nominal dollar terms. Also required is a forecast of the value of commissioned assets (i.e., the value of RAB additions)

GDBs must provide explanatory comment on the difference between constant price and nominal dollar forecasts of expenditure on assets in Schedule 14a (Mandatory Explanatory Notes).

This information is not part of audited disclosure information.

sch ref		*Current Year CY*	*CY+1*	*CY+2*	*CY+3*	*CY+4*	*CY+5*	*CY+6*	*CY+7*	*CY+8*	*CY+9*	*CY+10*
8	for year ended	**30 Jun 21**	**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**
9	**11a(i): Expenditure on Assets Forecast**	**$000 (nominal dollars)**										
10	Consumer connection	15,982	15,902	15,179	15,155	14,766	14,192	13,658	13,347	13,197	12,804	12,782
11	System growth	2,974	2,085	1,884	4,566	2,631	2,717	3,095	986	518	829	3,767
12	Asset replacement and renewal	3,471	5,085	3,670	3,339	3,111	2,831	2,778	2,595	2,893	2,915	2,905
13	Asset relocations	3,072	3,602	3,033	4,726	6,148	6,265	6,390	4,477	3,286	3,352	3,419
14	Reliability, safety and environment:											
15	Quality of supply	142	1,368	878	209	682	55	-	891	-	973	-
16	Legislative and regulatory	33	-	-	-	-	-	-	-	-	-	-
17	Other reliability, safety and environment	455	1,384	1,586	1,253	833	392	357	365	315	321	411
18	**Total reliability, safety and environment**	630	2,752	2,464	1,462	1,515	447	357	1,256	315	1,294	411
19	**Expenditure on network assets**	26,129	29,426	26,230	29,248	28,171	26,452	26,278	22,661	20,209	21,194	23,284
20	Expenditure on non-network assets	1,428	3,308	2,641	1,892	2,341	3,060	4,308	2,879	2,084	2,333	2,649
21	**Expenditure on assets**	27,557	32,734	28,871	31,140	30,512	29,512	30,586	25,540	22,293	23,527	25,933
22												
23	*plus* Cost of financing	233	266	234	291	254	254	278	196	160	176	248
24	*less* Value of capital contributions	9,009	21,634	20,035	24,341	23,298	22,918	22,886	18,623	16,877	16,862	19,913
25	*plus* Value of vested assets	-	-	-	-	-	-	-	-	-	-	-
26	**Capital expenditure forecast**	18,781	11,366	9,070	7,090	7,468	6,848	7,978	7,113	5,576	6,841	6,268
27												
28	Assets commissioned	18,089	11,364	9,032	7,093	7,529	6,709	8,206	7,113	5,578	6,842	6,267
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 21**	**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**
32		**$000 (in constant prices)**										
33	Consumer connection	15,982	15,598	14,693	14,416	13,787	13,003	12,268	11,754	11,394	10,838	10,607
34	System growth	2,941	2,045	1,824	4,343	2,457	2,489	2,780	868	447	702	3,126
35	Asset replacement and renewal	3,471	4,988	3,552	3,176	2,905	2,594	2,495	2,285	2,498	2,467	2,411
36	Asset relocations	3,072	3,533	2,936	4,496	5,740	5,740	5,740	3,943	2,837	2,837	2,837
37	Reliability, safety and environment:											
38	Quality of supply	142	1,342	850	199	637	50	-	785	-	824	-
39	Legislative and regulatory	33	-	-	-	-	-	-	-	-	-	-
40	Other reliability, safety and environment	455	1,358	1,535	1,192	778	359	321	321	272	272	341
41	**Total reliability, safety and environment**	630	2,700	2,385	1,391	1,415	409	321	1,106	272	1,096	341
42	**Expenditure on network assets**	26,096	28,864	25,390	27,822	26,304	24,235	23,604	19,956	17,448	17,940	19,322
43	Expenditure on non-network assets	1,428	3,245	2,556	1,800	2,186	2,804	3,870	2,535	1,799	1,975	2,198
44	**Expenditure on assets**	27,524	32,109	27,946	29,622	28,490	27,039	27,474	22,491	19,247	19,915	21,520
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 21	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
Difference between nominal and constant price forecasts		$000										
Consumer connection		-	304	486	739	979	1,189	1,390	1,593	1,803	1,966	2,175
System growth		33	40	60	223	174	228	315	118	71	127	641
Asset replacement and renewal		-	97	118	163	206	237	283	310	395	448	494
Asset relocations		-	69	97	230	408	525	650	534	449	515	582
Reliability, safety and environment:												
Quality of supply		-	26	28	10	45	5	-	106	-	149	-
Legislative and regulatory		-	-	-	-	-	-	-	-	-	-	-
Other reliability, safety and environment		-	26	51	61	55	33	36	44	43	49	70
Total reliability, safety and environment		-	52	79	71	100	38	36	150	43	198	70
Expenditure on network assets		33	562	840	1,426	1,867	2,217	2,674	2,705	2,761	3,254	3,962
Expenditure on non-network assets		-	63	85	92	155	256	438	344	285	358	451
Expenditure on assets		33	625	925	1,518	2,022	2,473	3,112	3,049	3,046	3,612	4,413

11a(ii): Consumer Connection

		Current Year CY	CY+1	CY+2	CY+3	CY+4	CY+5
	for year ended	30 Jun 21	30 Jun 22	30 Jun 23	30 Jun 24	30 Jun 25	30 Jun 26
*Consumer types defined by GDB**		**$000 (in constant prices)**					
Mains Extensions/Subdivisions		4,322	2,334	2,334	2,334	2,215	2,069
Service Connections - Residential		10,892	11,373	10,468	10,191	9,681	9,043
Service Connections - Commercial		768	1,891	1,891	1,891	1,891	1,891
Customer Easements		-	-	-	-	-	-
** include additional rows if needed*							
Consumer connection expenditure		15,982	15,598	14,693	14,416	13,787	13,003
less Capital contributions funding consumer connection		5,503	15,686	14,776	14,497	13,866	13,076
Consumer connection less capital contributions		10,479	(88)	(83)	(81)	(79)	(73)

11a(iii): System Growth

	Current Year CY	CY+1	CY+2	CY+3	CY+4	CY+5
Intermediate pressure						
Main pipe	-	683	-	-	-	-
Service pipe	-	-	-	-	-	-
Stations	-	197	254	323	159	610
Line valve	-	-	-	-	-	-
Special crossings	-	-	-	-	-	-
Intermediate Pressure total	-	880	254	323	159	610
Medium pressure						
Main pipe	2,827	1,165	1,570	4,020	2,298	1,879
Service pipe	-	-	-	-	-	-
Stations	-	-	-	-	-	-
Line valve	-	-	-	-	-	-
Special crossings	-	-	-	-	-	-
Medium Pressure total	2,827	1,165	1,570	4,020	2,298	1,879

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	114	-	-	-	-	-
101	Other assets (other than above)	33	-	-	-	-	-
102	**Other network assets total**	114	-	-	-	-	-
103							
104	**System growth expenditure**	2,941	2,045	1,824	4,343	2,457	2,489
105	*less* Capital contributions funding system growth	-	-	-	-	-	-
106	**System growth less capital contributions**	2,941	2,045	1,824	4,343	2,457	2,489
107							
108							

109		*Current Year CY*	*CY+1*	*CY+2*	*CY+3*	*CY+4*	*CY+5*
	for year ended	**30 Jun 21**	**30 Jun 22**	**30 Jun 23**	**30 Jun 24**	**30 Jun 25**	**30 Jun 26**
110	**11a(iv): Asset Replacement and Renewal**						
111	**Intermediate pressure**	**$000 (in constant prices)**					
112	Main pipe	119	-	-	-	-	-
113	Service pipe	-	-	-	-	-	-
114	Stations	625	858	615	621	628	413
115	Line valve	185	-	248	248	248	248
116	Special crossings	774	1,172	636	333	159	115
117	**Intermediate Pressure total**	1,703	2,030	1,499	1,202	1,035	776
118	**Medium pressure**						
119	Main pipe	1,151	2,085	1,413	1,413	1,413	1,413
120	Service pipe	90	246	132	83	83	83
121	Station	187	308	308	308	204	204
122	Line valve	-	-	-	-	-	-
123	Special crossings	42	-	-	-	-	-
124	**Medium Pressure total**	1,470	2,639	1,853	1,804	1,700	1,700
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	32	101	96	66	66	66
Cathodic protection systems	34	196	82	82	82	30
Other assets (other than above)	232	22	22	22	22	22
Other network assets total	298	319	200	170	170	118
Asset replacement and renewal expenditure	3,471	4,988	3,552	3,176	2,905	2,594
less Capital contributions funding asset replacement and renewal	-	-	-	-	-	-
Asset replacement and renewal less capital contributions	3,471	4,988	3,552	3,176	2,905	2,594

11a(v): Asset Relocations

*Project or programme**						
	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-
** include additional rows if needed*						
All other projects or programmes - asset relocations	3,072	3,533	2,936	4,496	5,740	5,740
Asset relocations expenditure	3,072	3,533	2,936	4,496	5,740	5,740
less Capital contributions funding asset relocations	3,506	3,438	2,747	4,206	5,370	5,370
Asset relocations less capital contributions	(434)	95	189	290	370	370

11a(vi): Quality of Supply

	Current Year CY	*CY+1*	*CY+2*	*CY+3*	*CY+4*	*CY+5*
for year ended	**30 Jun 21**	**30 Jun 22**	**30 Jun 23**	**30 Jun 24**	**30 Jun 25**	**30 Jun 26**
*Project or programme**	**$000 (in constant prices)**					
	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-
** include additional rows if needed*						
All other projects or programmes - quality of supply	142	1,342	850	199	637	50
Quality of supply expenditure	142	1,342	850	199	637	50
less Capital contributions funding quality of supply	-	-	-	-	-	-
Quality of supply less capital contributions	142	1,342	850	199	637	50

169	**11a(vii): Legislative and Regulatory**						
170	*Project or programme*						
171		-	-	-	-	-	-
172		-	-	-	-	-	-
173		-	-	-	-	-	-
174		-	-	-	-	-	-
175		-	-	-	-	-	-
176	** include additional rows if needed*						
177	All other projects or programmes - legislative and regulatory	33	-	-	-	-	-
178	**Legislative and regulatory expenditure**	33	-	-	-	-	-
179	*less* Capital contributions funding legislative and regulatory	-	-	-	-	-	-
180	**Legislative and regulatory less capital contributions**	33	-	-	-	-	-
181	**11a(viii): Other Reliability, Safety and Environment**						
182	*Project or programme**						
183		-	-	-	-	-	-
184		-	-	-	-	-	-
185		-	-	-	-	-	-
186		-	-	-	-	-	-
187		-	-	-	-	-	-
188	** include additional rows if needed*						
189	All other projects or programmes - other reliability, safety and environment	455	1,358	1,535	1,192	778	359
190	**Other reliability, safety and environment expenditure**	455	1,358	1,535	1,192	778	359
191	*less* Capital contributions funding other reliability, safety and environment	-	-	-	-	-	-
192	**Other Reliability, safety and environment less capital contributions**	455	1,358	1,535	1,192	778	359
193							
194	**11a(ix): Non-Network Assets**						
195	**Routine expenditure**						
196	*Project or programme**						
197		-	-	-	-	-	-
198		-	-	-	-	-	-
199		-	-	-	-	-	-
200		-	-	-	-	-	-
201		-	-	-	-	-	-
202	** include additional rows if needed*						
203	All other projects or programmes - routine expenditure	486	1,604	1,046	1,052	1,377	1,442
204	**Routine expenditure**	486	1,604	1,046	1,052	1,377	1,442
205	**Atypical expenditure**						
206	*Project or programme**						
207		-	-	-	-	-	-
208		-	-	-	-	-	-
209		-	-	-	-	-	-
210		-	-	-	-	-	-
211		-	-	-	-	-	-
212	** include additional rows if needed*						
213	All other projects or programmes - atypical expenditure	942	1,641	1,510	748	809	1,362
214	**Atypical expenditure**	942	1,641	1,510	748	809	1,362
215							
216	**Expenditure on non-network assets**	1,428	3,245	2,556	1,800	2,186	2,804

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

Company Name **Vector Limited**
AMP Planning Period **1 July 2021 – 30 June 2031**

SCHEDULE 11b: REPORT ON FORECAST OPERATIONAL EXPENDITURE

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

sch ref												
7		*Current year CY*	*CY+1*	*CY+2*	*CY+3*	*CY+4*	*CY+5*	*CY+6*	*CY+7*	*CY+8*	*CY+9*	*CY+10*
8	for year ended	**30 Jun 21**	**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**
9	**Operational Expenditure Forecast**	**$000 (in nominal dollars)**										
10	Service interruptions, incidents and emergencies	2,239	2,251	2,290	2,334	2,379	2,426	2,475	2,524	2,575	2,626	2,679
11	Routine and corrective maintenance and inspection	2,949	3,455	3,374	3,396	3,174	3,317	3,502	3,333	3,469	3,789	3,585
12	Asset replacement and renewal	-	-	-	-	-	-	-	-	-	-	-
13	**Network opex**	5,188	5,706	5,664	5,730	5,553	5,743	5,977	5,857	6,044	6,415	6,264
14	System operations and network support	3,032	3,271	3,794	3,866	3,942	4,019	4,099	4,181	4,265	4,350	4,437
15	Business support	4,903	5,222	5,312	5,413	5,518	5,627	5,739	5,854	5,971	6,090	6,212
16	**Non-network opex**	7,935	8,493	9,106	9,279	9,460	9,646	9,838	10,035	10,236	10,440	10,649
17	**Operational expenditure**	13,123	14,199	14,770	15,009	15,013	15,389	15,815	15,892	16,280	16,855	16,913
18		*Current year CY*	*CY+1*	*CY+2*	*CY+3*	*CY+4*	*CY+5*	*CY+6*	*CY+7*	*CY+8*	*CY+9*	*CY+10*
19	for year ended	**30 Jun 21**	**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**
20		**$000 (in constant prices)**										
21	Service interruptions, incidents and emergencies	2,239	2,208	2,208	2,208	2,208	2,208	2,208	2,208	2,208	2,208	2,208
22	Routine and corrective maintenance and inspection	2,949	3,388	3,253	3,212	2,945	3,019	3,124	2,916	2,974	3,185	2,955
23	Asset replacement and renewal	-	-	-	-	-	-	-	-	-	-	-
24	**Network opex**	5,188	5,596	5,461	5,420	5,153	5,227	5,332	5,124	5,182	5,393	5,163
25	System operations and network support	3,032	3,207	3,657	3,657	3,657	3,657	3,657	3,657	3,657	3,657	3,657
26	Business support	4,903	5,120	5,120	5,120	5,120	5,120	5,120	5,120	5,120	5,120	5,120
27	**Non-network opex**	7,935	8,327	8,777	8,777	8,777	8,777	8,777	8,777	8,777	8,777	8,777
28	**Operational expenditure**	13,123	13,923	14,238	14,197	13,930	14,004	14,109	13,901	13,959	14,170	13,940
29	**Subcomponents of operational expenditure (where known)**											
30	Research and development	-	-	-	-	-	-	-	-	-	-	-
	Insurance	299	284	289	294	300	306	312	318	325	331	338
32												
33		*Current year CY*	*CY+1*	*CY+2*	*CY+3*	*CY+4*	*CY+5*	*CY+6*	*CY+7*	*CY+8*	*CY+9*	*CY+10*
34	for year ended	**30 Jun 21**	**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**
35	**Difference between nominal and real forecasts**	**$000**										
36	Service interruptions, incidents and emergencies	-	43	82	126	171	218	267	316	367	418	471
37	Routine and corrective maintenance and inspection	-	67	121	184	229	298	378	417	495	604	630
38	Asset replacement and renewal	-	-	-	-	-	-	-	-	-	-	-
39	**Network opex**	-	110	203	310	400	516	645	733	862	1,022	1,101
40	System operations and network support	-	64	137	209	285	362	442	524	608	693	780
41	Business support	-	102	192	293	398	507	619	734	851	970	1,092
42	**Non-network opex**	-	166	329	502	683	869	1,061	1,258	1,459	1,663	1,872
43	**Operational expenditure**	-	276	532	812	1,083	1,385	1,706	1,991	2,321	2,685	2,973

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

Company Name	**Vector Limited**
AMP Planning Period	**1 July 2021 – 30 June 2031**

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.

7					**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.	-	-	96.30%	3.70%	-	4	8.72
16	Intermediate Pressure	Line valve	IP line valves	No.	-	2.02%	79.50%	3.88%	14.60%	3	0.78
17	Intermediate Pressure	Special crossings	IP crossings	No.		-	80.00%	20.00%	-	3	14.14
18	Medium Pressure	Main pipe	MP PE main pipe	km	-	0.42%	1.94%	97.64%	-	3	0.22
19	Medium Pressure	Main pipe	MP steel main pipe	km	-	-	100.00%	-	-	3	-
20	Medium Pressure	Main pipe	MP other main pipe	km	-	100.00%	-	-	-	3	100.00
21	Medium Pressure	Service pipe	MP PE service pipe	km	-	0.23%	99.77%	-	-	3	0.12
22	Medium Pressure	Service pipe	MP steel service pipe	km	-	-	100.00%	-	-	-	-
23	Medium Pressure	Service pipe	MP other service pipe	km	-	-	100.00%	-	-	3	-
24	Medium Pressure	Stations	Medium pressure DRS	No.	-	-	100.00%	-	-	4	5.41
25	Medium Pressure	Line valve	MP line valves	No.	-	2.53%	77.68%	6.95%	12.85%	3	-
26	Medium Pressure	Special crossings	MP special crossings	No.	-	6.06%	63.64%	30.30%	-	3	14.14
27	Low Pressure	Main pipe	LP PE main pipe	km	-	-	13.61%	86.39%	-	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	-	-	10.06%	89.94%	-	3	-
31	Low Pressure	Service pipe	LP steel service pipe	km	-	100.00%	-	-	-	3	-
32	Low Pressure	Service pipe	LP other service pipe	km	-	-	-	-	-	N/A	-
33	Low Pressure	Line valve	LP line valves	No.	-	-	40.00%	-	60.00%	3	-
34	Low Pressure	Special crossings	LP special crossings	No.	-	-	-	-	-	N/A	-
35	All	Monitoring and control systems	Remote terminal units	No.	-	-	14.71%	85.29%	-	4	27.05
36	All	Cathodic protection systems	Cathodic protection	No.	-	4.76%	61.90%	33.33%	-	3	5.78

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

Company Name **Vector Limited**

AMP Planning Period **1 July 2021 – 30 June 2031**

SCHEDULE 12b: REPORT ON FORECAST UTILISATION

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

sch ref

7 **Forecast Utilisation of Heavily Utilised Pipelines**

sch ref	Region	Network	Pressure system	Nominal operating pressure (NOP) (kPa)	Minimum operating pressure (MinOP) (kPa)	Total capacity at MinOP (scmh)	Remaining capacity at MinOP (scmh)	Unit	Utilisation *Current Year CY* y/e 30 Jun 21	 *CY+1* y/e 30 Jun 22	 *CY+2* y/e 30 Jun 23	 *CY+3* y/e 30 Jun 24	 *CY+4* y/e 30 Jun 25	 *CY+5* y/e 30 Jun 26	Comment
11	Auckland	Auckland Central	North Shore MP4	400	200	14,277	217	scmh	14,060	14,161	14,263	14,341	14,450	14,550	Remaining capacity at MinOP is available in the Devonport area. Stated pressure assumes planned network reinforcements at CY+2; MinOP is still observed in the Devonport area until full comprehensive reinforcement is made in CY+2.
12								kPa	230	226	297	294	293	291	
13	Auckland	Whangaparaoa CT	Whangaparaoa MP4	400	200	2,660	214	scmh	2,446	4,330	4,752	4,895	5,041	5,193	Stated pressure assumes planned network reinforcements at CY+1 & CY+2, the increase is due to the planned reinforcements in section 5.4 and the increase in CY+3 is due to the reinforcement in section 5.3
14								kPa	335	237	245	278	271	265	
15								scmh							
16								kPa							
17								scmh							
18								kPa							

19 * *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.*

21 **Disclaimer for supply enquiries**

22 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.

24 **Notes and assumptions**

25 1. A 'heavily utilised' pressure system is a pressure system where the modelled flow rate, at system peak during 2020, 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%.

27 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.

29 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 North Shore MP4 network system is based on an average annual growth rate of 0.72% and for Whangaparaoa MP4 is based on annual growth of 3.2% plus confirmed industrial loads in CY+1. The stated growth rate extrapolates trends across historical actuals, which include the flows most recently observed during 2020.

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. 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.

30 10. Due to resource constraints, the network models used to compile Schedule 12b are updated on a 3-year rolling cycle, forecast and validation of some models may not have been updated since 2019.

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

Company Name	**Vector Limited**
AMP Planning Period	**1 July 2021 – 30 June 2031**

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

7 **12c(i) Consumer Connections**

8 **Number of ICPs connected in year by consumer type**

sch ref		*Current year CY*	*CY+1*	*CY+2*	*CY+3*	*CY+4*	*CY+5*
10	*Consumer types defined by GDB*	**30 Jun 21**	**30 Jun 22**	**30 Jun 23**	**30 Jun 24**	**30 Jun 25**	**30 Jun 26**
11	Residential	3,593	3,624	3,336	3,247	3,085	2,882
12	Commercial	122	179	179	179	179	179
13							
14							
15							
16	**Total**	3,715	3,803	3,515	3,427	3,264	3,061
17							

18 **12c(ii): Gas Delivered**

sch ref		*Current year CY*	*CY+1*	*CY+2*	*CY+3*	*CY+4*	*CY+5*
19		**30 Jun 21**	**30 Jun 22**	**30 Jun 23**	**30 Jun 24**	**30 Jun 25**	**30 Jun 26**
20	Number of ICPs at year end (at year end)	116,525	118,893	120,673	122,364	124,343	126,118
21	Maximum daily load (GJ per day)	56,511	64,272	64,631	64,631	64,631	64,631
22	Maximum monthly load (GJ per month)	1,509,992	1,557,463	1,564,397	1,564,397	1,564,397	1,564,397
23	Number of directly billed ICPs (at year end)	-	-	-	-	-	-
24	Total gas conveyed (GJ per annum)	14,166,829	14,391,538	14,892,459	15,030,863	15,168,403	15,303,941
25	Average daily delivery (GJ per day)	38,813	39,429	40,801	41,068	41,557	41,929
26							
27	Load factor	78.18%	77.00%	79.33%	80.07%	80.80%	81.52%

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) March 2021 PPI (Producer Price Index-outputs) forecast up to June 2025. 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)

1. 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) March 2021 PPI (Producer Price Index-outputs) forecast up to June 2025. Thereafter, we have assumed a long-term inflation rate of 2.00%.

The LCI forecast is 2%, 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 Michael Buczkowski, 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

25 June 2021

Date

vector