

Independent Verification

Chorus Expenditure Forecast 2022 to 2024

Revision F

Project Number: CMPJ0262

December 2020

The sole purpose of this report and the associated services provided by CutlerMerz is to document the Independent Verification of the first Regulatory Period expenditure forecast prepared by Chorus.

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We derived the analysis in this report from information sourced from data and information available in the public domain and provided by Chorus during the course of the assignment. The passage of time, manifestation of latent conditions or impacts of future events may require re-examination, further data analysis, and re-evaluation of the findings, observations and conclusions expressed in this report.

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EXECUTIVE SUMMARY

Background

From 1 January 2022, Chorus, New Zealand's largest telecommunications infrastructure company will be subject to a new revenue path regulatory regime designed by the Commerce Commission. The regime is modelled on regulation applied to regulated electricity businesses and applies to Chorus' Fibre Fixed Line Access Services (FFLAS). The first regulatory period (RP1) will run until 31 December 2024.

The Commerce Commission has produced Fibre Input Methodologies (IMs) that provide the rules, requirements and processes that relate to how FFLAS will be regulated. The IMs require that Chorus submits an independent verification report along with its base capex proposal, connections capex proposal and with Individual Capex proposals, proportionate to the materiality and complexity of the proposal. For RP1 however, an independent verification report is not required. Notwithstanding, Chorus has voluntarily sought independent verification of capex and opex expenditure forecasts.

This report presents CutlerMerz' assessment of Chorus' capital and operating expenditure proposal for RP1.

Purpose of Independent Verification

The objective of independent verification is to determine whether the capex and opex forecasts reflect the efficient costs that a prudent operator would incur (**expenditure objective**) and reflects **good telecommunications industry practice**. Good telecommunications industry practice relates to the exercise of skills, diligence, prudence, foresight and economic management that an experienced asset owner would take in managing their assets.

As outlined in the IMs, independent verification is *appropriate when a certain level of judgement is required to provide assurance, for example in assessing the reasonableness of assumptions used in the development of expenditure forecasts or whether a capex proposal meets the expenditure objective and reflects good industry practice*¹.

The scope of the independent verification involved assessing whether the capex and opex forecasts met the expenditure objective, and good telecommunications industry practice, having regard to the assessment factors outlined in the IMs. We refer to this set of considerations collectively as "**the appropriate standard**". The CutlerMerz team was comprised of consulting engineers and economists with expertise in telecommunication fibre networks and regulated electricity networks. From this collective capability, we were able to apply an appropriate level of judgement across the forecast expenditure to assess whether the forecasts met the appropriate standard.

Meeting the expenditure objective

Chorus' aim in developing capex and opex forecasts was to achieve the appropriate standard.

It was evident from the information we reviewed, analysis we performed, and interviews we conducted with Chorus personnel, that over recent years, Chorus' priority has been to build a new fibre network to achieve the contractual parameters with the New Zealand Government.

During this time, Chorus was focussed on cost, schedule, performance and design of the fibre network. RP1 comes at a time where the construction of new fibre networks is in the later stages and consequently, the size of the new build investment is decreasing. Aside from existing physical infrastructure such as exchange buildings, the fibre network contains many new assets for which there is limited asset information and data to inform how the assets will perform over their lifetime.

Capital expenditure

The input methodologies describe three expenditure categories, base, connection and individual capex.

Base capex incorporates all forecast capital expenditure except for those with a high degree of uncertainty. Connections capex is associated with the connection of end-users to the communal fibre network. Individual capex covers large projects

¹ Fibre input methodologies, Final decisions – reasons paper, 13 October 2020, paragraph 7.177.3, page 645

and programmes greater than \$5 million where there is uncertainty in the cost, timing, or need for the project or programme.

Chorus has been preparing its proposal in parallel with development of the input methodologies and has not built these categories into its approach, other than to identify unit rates and volumes for connection types and to recognise the optionality provided by the individual capex mechanism. Accordingly, we have reviewed Chorus' entire capex proposal consistent with the higher (base capex) standard.

Table 1 presents our assessment of whether we have been able to verify if the sub-categories of the capex forecast meet the appropriate standard.

Table 1: Assessment by capital expenditure category

Expenditure category	Expenditure sub-category	Expenditure contribution	Expenditure verification assessment
Extending the Network	Augmentation	1.05%	We have verified that the forecast meets the appropriate standard.
	New Property Developments	2.10%	We have verified that the forecast meets the appropriate standard.
	UFB Communal	4.04%	We have verified that the forecast meets the appropriate standard.
Installations	Standard Installations	32.85%	We have verified that the forecast meets the appropriate standard.
	Standard Installations – IFRS 15 Customer Capex	8.22%	We have verified that the forecast meets the appropriate standard. Some issues with documentation of inputs within the model for the incentives component of customer retention capex were identified.
	Complex Installations	3.02%	We have verified that the forecast meets the appropriate standard.
IT and Support	Business IT – Customer Experience and Optimisation	1.30%	We have verified that the forecast meets the appropriate standard; however, whilst the projects are expected to be NPV positive a clear link to show the benefits will be delivered to customers was not provided; negative step changes in other expenditure areas to be clearly linked to this programme and/or business cases/other documentation to be developed to show external/non-financial benefits will be delivered to Chorus' customers.
	Business IT – Lifecycle and Compliance	2.00%	We have verified that the forecast meets the appropriate standard.
	Corporate	4.28%	We have verified that the forecast meets the appropriate standard. This assessment is dependent on the innovation capex programme being ring-fenced. The innovation capex should also be a focus area for the Commerce Commission in their pre-determination review of Chorus' submission. In particular, Chorus must show the Commission that innovation projects will not deliver Chorus savings during RP1 (other than savings already budgeted for in Chorus' submission) and that controls on using the ring-fenced allowance will prevent investment in projects that will not deliver net benefits to Chorus' customers.
	Network & Customer IT	7.78%	We have verified that the forecast meets the appropriate standard.
Network Capacity	Access	7.45%	We have verified that the forecast meets the appropriate standard. The Commission should review the take-up rate for Hyperfibre products over the period from March 2020 to the commencement of RP1 to confirm they are consistent with the forecast.

Expenditure category	Expenditure sub-category	Expenditure contribution	Expenditure verification assessment
	Aggregation	4.98%	We have verified that the forecast meets the appropriate standard. Minor issues were identified with the input assumptions, however, they do not materially affect the forecast expenditure.
	Transport	4.89%	We have verified that the forecast meets the appropriate standard. Minor issues were identified with the input assumptions; however, they do not materially affect the forecast expenditure.
Network Sustain and Enhance	Field Sustain	5.82%	We have verified that the forecast meets the appropriate standard.
	Field Sustain – Poles	0.32%	We have verified that the forecast meets the appropriate standard.
	Relocations	1.30%	We have verified that the forecast meets the appropriate standard.
	Resilience	4.91%	We have verified that the forecast meets the appropriate standard.
	Site Sustain	3.68%	We have verified that the forecast meets the appropriate standard; however, the forecast for building and infrastructure compliance represents a material increase from historic expenditure. The timing of the forecast expenditure should be reviewed by the Commission with consideration of actual expenditure incurred, against forecast expenditure, between the March 2020 forecast and the start of RP1.

In the period between our draft assessment and final assessment, Chorus has addressed the issues that resulted in a proportion of the expenditure forecast being unable to be verified at the draft assessment stage. Following the improvements and adjustments to the forecasts, we have now verified that the capex forecast prepared by Chorus meets the appropriate standard, as indicated in the table above.

Notwithstanding our verification of the forecast, due to the inherent uncertainty in components of the forecasts (e.g. customer take-up rates), we have identified areas of the capex forecast that we believe the Commission should focus on in its review (see Focus areas for the Commission below).

Operating expenditure

The Commerce Commission has not provided the rules, requirements and processes related to how opex will be regulated. We anticipate that the Commission's assessment of opex will closely model their approach for electricity businesses that they regulate. On this basis, we have considered the opex forecasts prepared by Chorus against an equivalent set of assessment factors in order to make an assessment as to whether the opex forecast would meet a corresponding opex appropriate standard.

Chorus' opex forecast approaches were significantly improved between the draft assessment and the final assessment. Notwithstanding the improvements to the forecast, it is noted that there is no documentation of the forecast outside that included within the models. To aid the review of the forecasts by stakeholders, including the Commerce Commission, we have recommended that further documentation should be prepared to explain the forecast.

We also noted that a bottom-up forecasting approach has been used. This method has been known to result in overstating opex requirements as efficiencies between opex categories are not necessarily accounted for. Due to this, regulators prefer to apply a top-down approach; however, as Chorus is transitioning from building a new fibre network to operating the network, base opex has not reached a steady state. Given Chorus' ongoing transition from build to operate, it is expected that the base opex would become clearer prior to the Commission's determination. Consequently, we recommend that the Commission review the opex forecasts with the benefit of additional actual expenditure to baseline the forecast for RP1.

Table 2 presents our assessment of whether we have been able to verify if the sub-categories of the opex forecast would

meet a corresponding opex appropriate standard.

Table 2: Assessment by operating expenditure category

Expenditure category	Contribution	Expenditure verification assessment
Network	35.18%	We have verified that the forecast meets the appropriate standard. However, further documentation should be prepared to explain the forecast.
Customer	14.57%	We have verified that the forecast meets the appropriate standard. However, further documentation should be prepared to explain the forecast.
Support	50.26%	We have verified that the forecast meets the appropriate standard. However, further documentation should be prepared to explain the forecast.

We have verified all forecasts for individual categories of opex meet the appropriate standard. However, Chorus has not yet clearly linked a step change in the opex forecasts to take into account the savings resulting from the Optimisation Capex investment. Although Chorus has included significant cost savings in the forecasts, as these are not clearly linked to the optimisation programme, we determined that until Chorus can provide a clear link, an additional opex reduction is required. Chorus' assessment of required benefits to justify the forecast Optimisation Capex indicates \$5m of opex savings during RP1 if all of the optimisation benefits are attributed to opex. Therefore, to assess the Optimisation Capex as meeting the appropriate standards (see above) we have determined that \$5m of the opex forecast, equal to the required negative opex step change, could not be verified. This equates to 0.8% of Opex during RP1.

As noted in the focus areas below, the \$5m amount that is not verified can be approved by the Commission if Chorus can provide sufficient evidence to demonstrate that the savings have already been incorporated into the opex forecasts (and in particular FTE reduction forecasts).

Focus areas for the Commission

We recommend that the Commission focus on the following areas of the forecast in their assessment of Chorus' proposal:

- There are two foundational models that drive the price and volume components across several expenditure categories. These are the Connections model and the Regulatory labour cost model. In our verification process, we have reviewed components of these models as they relate to the expenditure sub-category, however, we have not reviewed the models in their entirety. We suggest that the Commission give priority to the review of these models (Connections and Regulatory labour cost model) in their assessment of Chorus' forecast expenditure to validate the forecasts for customer growth.
- The FFLAS allocations in each category was out of the scope of our assessment. Our assessment considered whether the expenditure in aggregate met the appropriate standard; however, changes to the allocation of the expenditure to FFLAS and non-FFLAS have resulted in material changes to the forecast expenditure between the draft and final assessment. The FFLAS allocations should therefore be considered in detail.
- For the *Business IT - Customer Experience and Chorus Optimisation* capex forecast to be accepted, the benefits from this programme must be passed on to Chorus' customers. This could be in the form of a (negative) step-change in opex, a capex benefit (reduction in other capex programmes) or a customer benefit (such as reduced (non-Chorus) costs). At the time of the final assessment, a clear link to an opex step-change or other benefit had not been evidenced. As a placeholder we have withheld verification of \$5m of the opex forecast, which is equivalent to the opex reduction required for Chorus' customers to be guaranteed a benefit from this programme. The Commission should ensure that either customer benefits are identified and are reasonable and/or an appropriate negative step change is applied (or has already been incorporated into) the opex submission before approving the Customer Experience and Chorus Optimisation capex.
- Chorus is proposing a *Corporate* innovation allowance that will be ring fenced. Limited documentation was provided by Chorus for the investments that will be delivered using this allowance. As a result of this, the innovation capex should be a focus area for the Commerce Commission in their pre-determination review of Chorus' submission. In particular, the Commission should ensure that the innovation projects will not deliver Chorus savings during RP1 (other than savings already budgeted for in Chorus' submission) and that controls on using the ring-fenced allowance will prevent investment in uneconomic projects.

- The *Access Electronics* XGSPON volume forecast has a high level of uncertainty as it is dependent on the uptake of a new product (Hyperfibre) by end users. The volume forecasts are not based on actual uptake data as the product is only in the early stages of being released. The Commission should verify the volume forecast for Hyperfibre against actual uptake volumes closer to the time of the determination.
- Chorus is proposing a material increase in expenditure over recent historical levels for *Site Sustain* capex for property and infrastructure compliance. Chorus has claimed that expenditure in this category had been deferred to facilitate the construction of the fibre network. Based on the evidence reviewed, we believe an increase from historic levels is prudent in order to improve the health of the assets. However, as the timing of maintenance and replacement activities is discretionary, we recommend that the Commission review the timing of the proposed expenditure in more detail before approving an expenditure forecast. We suggest that the Commission review Chorus' tracking of actual expenditure against current forecasts during FY21 to determine whether Chorus is investing as planned in this area before the final determination.

1 INTRODUCTION

CutlerMerz has been commissioned by Chorus to undertake an Independent Verification of the effectiveness of the processes used to forecast the capital and operating expenditure for Regulatory Period 1 (RP1), covering the period from 1 January 2022 to 31 December 2024.

The purpose of this report is to assist the Commission with their assessment and consideration of Chorus' proposal, inter alia:

- It explains the overall approach to the verification and the extent of information/analysis prepared and provided by Chorus.
- It provides opinions on the capital expenditure forecasting approach against the assessment factors set out in the draft Input Methodologies.
- It highlights areas the Commission should investigate as part of its deliberations.

Our assessment has been based on extensive discussions with Chorus personnel during two site visits to Chorus' Wellington office in October 2019 and December 2019 and video conference workshops in January 2020, June 2020 and weekly progress meetings throughout the course of the review. A comprehensive review of the supporting documentation prepared by Chorus has also been conducted.

1.1 SCOPE

The scope of work for the Independent Verification was to:

- a. engage with Chorus in an independent manner;
- b. evaluate whether Chorus's proposed expenditure is consistent with the efficient costs of a prudent fibre services provider;
- c. produce a publicly available verification report (Final Report) covering the expenditure areas related to:
 - i. Extending the Network CAPEX:
 - a. Augmentation
 - b. New Property Developments
 - c. UFB Communal
 - ii. Installations CAPEX:
 - a. Standard Installations
 - b. Complex Installations
 - iii. IT and Support CAPEX:
 - a. Business IT
 - b. Corporate
 - c. Network & Customer IT
 - iv. Network Capacity CAPEX:
 - a. Access
 - b. Aggregation
 - c. Transport
 - v. Network Sustain and Enhance CAPEX:
 - a. Field Sustain
 - b. Relocations
 - c. Resilience
 - d. Site Sustain
 - vi. OPEX
 - a. Network OPEX
 - b. Customer OPEX
 - c. Support OPEX

For each expenditure area, a conclusion was required regarding the effectiveness of the process used to assemble the quantitative information that informs the proposal.

2 CONTEXT

2.1 BACKGROUND TO CHORUS

Chorus is New Zealand's largest telecommunications infrastructure company with responsibilities to build and maintain a telecommunication network predominantly made up of local exchanges, cabinets, and copper and fibre cables.

From 1 January 2022 Chorus' Fibre Fixed Line Access Services (FFLAS) will be subject to a new revenue path regulatory regime designed by the Commerce Commission. The regime is modelled on regulation applied to regulated electricity businesses with modifications to recognise Chorus' unique circumstances.

In recent years, Chorus' priority has been to build the new fibre network to achieve the contractual parameters with the New Zealand Government associated with cost, schedule, performance and design. As a result of the new build, the majority of the fibre network contains new assets. Whilst there are some similarities with the assets found in electricity networks (e.g. physical infrastructure), there is limited asset information and data to inform how many assets will perform over their lifetime.

The first regulatory period coincides with a period where Chorus is managing two networks, a fibre network and a legacy copper network. In many areas, there will be a transition to a fibre only network over the long-term. The requirement to manage two networks simultaneously creates a transitional peak in some areas (e.g. building space and energy). The construction of new fibre networks to achieve the contractual requirements is in the later stages and consequently, the size of the investment is decreasing.

Unlike traditional electricity utilities, Chorus faces competition from other providers' offerings such as fixed wireless access where alternative networks can be built to supply similar services in the same area. Chorus therefore needs to invest in products to attract and retain customers on their network.

2.2 TRANSITION TO A REGULATED UTILITY

When Chorus demerged from Telecom in 2011, the Telecommunications Act was amended, and a requirement was included for the Government to commence a review of the regulatory framework by 2016.

One of the key outcomes of the review was a requirement for the Commission to introduce a Building Block Model (BBM) regime for Chorus. Similar regimes have been used to regulate utilities in New Zealand, Australia and the UK, including in the electricity and gas industries.

The policy decision was to regulate FFLAS under a BBM regime, specifically excluding copper services. Copper will remain regulated under the existing framework in some geographic areas.

The development of new regulatory requirements has resulted in Chorus transitioning from a contractual framework (i.e. UFB agreements) to a revenue-controlled regime. The regulatory regime has additional obligations and requirements on Chorus, including the need to define and address:

- categories of capex,
- investment tests,
- assessment criteria,
- quality standards,
- incentive arrangements,
- cost allocation,
- escalation modelling,
- cost modelling,
- expenditure groupings,
- customer engagement,
- proposal governance.

The purpose of this regulatory regime is to promote the long-term benefit of end-users in FFLAS markets by promoting outcomes consistent with competitive markets (incentives to innovate, invest, improve efficiency, share efficiency benefits with consumers, limit excessive profits).

2.3 INPUT METHODOLOGIES

On 13 October 2020, the Commerce Commission released the *Fibre input methodologies: Main final decisions – reasons paper (Final IMs)*. The final IMs require Chorus to submit an independent verification report for the base capex and connections capex proposal.

However, for the first regulatory period, transitional arrangements have been proposed to account for the compressed timeframes. Under the proposed transitional arrangements, Chorus is not required to provide an independent verification report for the first regulatory period.

Chorus has decided that despite the transitional arrangements in the Final IMs, they will voluntarily provide an Independent Verification report to the Commerce Commission with their proposal.

The Commission in its Draft IMs reserved the right to seek their own external expert opinion of Chorus' base capex proposal for the first regulatory period².

2.4 PURPOSE AND ROLE OF THE INDEPENDENT VERIFIER

The Draft IM's outline the requirement for an Independent Verifier:

... a key aspect of our expenditure assessment approach is the use of a pre-application verification of proposed expenditure by an approved independent verifier. We will agree with the independent verifier what the focus of the independent verification will be in terms of applying proportionate scrutiny and the independent verifier may determine other areas of focus in order to assess capex against the expenditure objective. This pre-application verification process is intended to promote certainty for Chorus as to how its expenditure proposals are likely to be assessed, as well as to assist us to make the most effective use of the tight statutory timeframes for evaluating capex proposals, by highlighting which areas of a proposal we should focus on.³

In performing the independent verification, the Commission expects that the independent verifier will consider the expenditure objective and relevant assessment factors as part of the evaluation. Section 5 of this report provides details of the expenditure objective and assessment factors proposed in the IMs for the assessment of the expenditure forecasts.

The Commission noted in the draft IMs that the time frames for completing the IMs and PQ regulation created potential issues for Chorus and the Commission in meeting some of the requirements for a base capex proposal for the first regulatory period. Specifically, difficulties were identified in establishing the requirements for an independent verifier report. Chorus proposed arrangements to the Commission during the development of the IMs to address the concerns which included making the independent verification requirements voluntary for the first regulatory period.

The Commission decided that an independent verification report would not be required for the first regulatory period; however, reserved the right to seek external expert opinion on the capex proposal for RP1.

As indicated to the Commission during the development of the IMs, Chorus has voluntarily decided to have the proposed expenditure independently verified. Chorus has defined the terms of reference and scope of services for independent verification of the capital expenditure forecasts. This is provided in section 1.1.

Given Chorus' level of maturity with the preparation of a regulatory proposal, and the decision to voluntarily prepare and submit an Independent Verification report to the Commission as part of its first proposal, it was mutually agreed between Chorus and ourselves that the format and style of the report would be targeted towards identifying concerns with the forecasting approach being applied.

² Fibre Input Methodologies: Draft decision – reasons paper, 19 November 2019, paragraph 3.1850, page 488

³ Fibre Input Methodologies: Draft decision – reasons paper, 19 November 2019, paragraph 3.1622, page 440

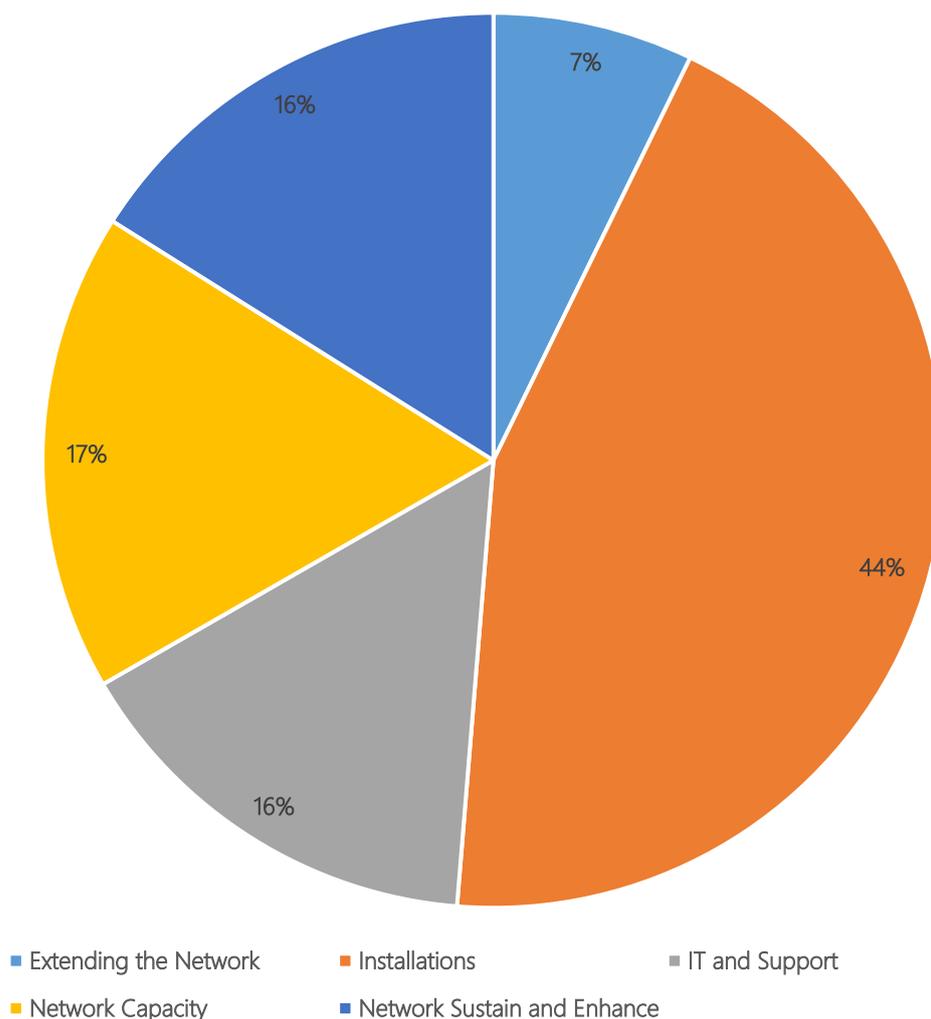
3 OVERVIEW OF CAPITAL EXPENDITURE FORECAST

Chorus has segregated the capital expenditure forecast into five high level categories:

- Extending the Network
- Installations
- IT and Support
- Network Capacity, and
- Network Sustain and Enhance

In aggregate, the capital expenditure forecast for the first 3 year regulatory period (RY22-RY24) amounts to \$983.3 million FFLAS (\$NZ real FY20) net of customer contributions. The proportion due to each of the capex categories to the total is shown in Figure 1.

Figure 1: Capital expenditure forecast by category (Source: CutlerMerz analysis of Chorus forecasting spreadsheets)



Within each high level category, sub-categories of expenditure contribute to the total forecast for that category. The following sections provide an overview of the sub-categories within each of the high level categories. This was used to apply the proportionate scrutiny principle to the forecast expenditure.

3.1 EXTENDING THE NETWORK

Extending the Network capex comprises investment in the extension of layer 0 and layer 1 assets within the Chorus network architecture. Investment in Extending the Network is forecast for the following streams:

- **Augmentation:** This funds reticulation of unserved infill addresses and associated network elements where required, including the replacement of faulty fibre and non-UFB NGA coverage extension
- **New Property Developments:** This funds new communal network associated with new residential, commercial,

and industrial developments

- **UFB Communal:** This funds Chorus' communal fibre contractual obligations with Crown Infrastructure Partners (CIP) for all phases of the UFB program (part funded by NZ Government)

Forecast capital expenditure in each of the sub-categories is shown in the table below.

Table 3: Sub-categories of the physical network capital expenditure FFLAS forecast

Extending the Network (NZ\$m real FY20 FFLAS only)	RY16*	RY17*	RY18*	RY19*	RY20	RY21	RY22	RY23	RY24
Augmentation	8.7	0.0	0.9	2.4	2.6	2.0	2.8	3.7	3.8
New Property Developments	27.4	32.3	32.7	34.0	17.6	7.3	6.3	6.9	7.4
UFB Communal	180.7	201.0	234.2	205.9	163.8	101.8	39.7		
Total	216.9	233.4	267.8	242.3	184.0	111.1	48.8	10.7	11.2

*Historical expenditure RY16-RY19 is presented as unallocated expenditure (inclusive of non-FFLAS expenditure) at nominal prices

3.2 INSTALLATIONS

Installations capex comprises the extension of the communal network to end-user premises/sites. Investment in the installations is forecast for the following streams:

- **Standard Installations:** This funds the connection of new standard installation customers to the Chorus fibre network and the provision of ONTs
- **Standard Installations – IFRS 15 Capex:** Under NZ IFRS 15 expenditure to incentivise and provision customer connections is capitalised.
- **Complex Installations:** This funds the connection of complex, point-to-point, and high cost customers to the network

Forecast capital expenditure in each of the sub-categories is shown in the table below.

Table 4: Sub-categories of the network electronics capital expenditure FFLAS forecast

Installations (NZ\$m real FY20 FFLAS only)	RY16*	RY17*	RY18*	RY19*	RY20	RY21	RY22	RY23	RY24
Standard Installations	205.7	250.2	270.8	260.7	244.9	198.7	142.8	104.2	76.1
Standard Installations – IFRS 15 Capex	0.0	32.3	50.2	34.7	27.4	34.1	29.9	26.5	24.5
Complex Installations	15.7	12.0	9.2	9.2	8.8	6.7	11.5	9.7	8.6
Total	221.5	294.5	330.3	304.7	281.1	239.6	184.1	140.5	109.1

*Historical expenditure RY16-RY19 is presented as unallocated expenditure (inclusive of non-FFLAS expenditure) at nominal prices

3.3 IT AND SUPPORT

IT and Support capex comprises investment in non-network IT systems. Investment in IT Capex is forecast for the following streams:

- **Business IT – Customer Experience & Optimisation:** This funds Business IT solutions required to improve the experience of customers and to optimise Chorus' operations to improve efficiency and productivity
- **Business IT – Lifecycle & Compliance:** This funds the upgrade, maintenance and replacement of Business IT solutions
- **Corporate:** This funds corporate IT infrastructure and optimisation, and innovation.
- **Network & Customer IT:** This funds development of new fibre service products for Chorus' customers and Chorus' Asset Management system

Forecast capital expenditure in each of the sub-categories is shown in the table below.

Table 5: Sub-categories of the information technology capital expenditure FFLAS forecast

IT and Support (NZ\$m real FY20 FFLAS only)	RY16*	RY17*	RY18*	RY19*	RY20	RY21	RY22	RY23	RY24
Business IT – Customer Experience & Optimisation	1.7	2.1	3.0	3.4	2.2	2.5	3.0	4.1	5.7
Business IT – Lifecycle & Compliance	3.9	6.4	12.2	16.2	9.7	12.3	6.2	8.4	5.2
Corporate	2.9	3.4	2.6	1.6	0.3	0.6	13.4	14.3	14.4
Network & Customer IT	44.0	46.1	38.8	34.6	28.4	17.6	25.8	24.8	25.8
Total	52.4	57.9	56.6	55.8	40.6	33.0	48.5	51.6	51.1

*Historical expenditure RY16-RY19 is presented as unallocated expenditure (inclusive of non-FFLAS expenditure) at nominal prices

3.4 NETWORK CAPACITY

Network Capacity capex comprises layer 2 assets within the Chorus network architecture. Investment in Network Capacity is forecast for the following streams:

- **Access:** This funds electronics at each Chorus Central Office for the Passive Optical Network, splitters in the Passive Optical Network and lifecycle replacement of ONTs at the end-user premises
- **Aggregation:** This funds aggregation switches and related equipment in Chorus' exchanges
- **Transport:** This funds transportation node electronics that enable the transport of high volumes of data over medium to long distances between aggregation switches

Forecast capital expenditure in each of the sub-categories is shown in the table below.

Table 6: Sub-categories of the other capital expenditure FFLAS forecast

Network Capacity (NZ\$m real FY20 FFLAS only)	RY16*	RY17*	RY18*	RY19*	RY20	RY21	RY22	RY23	RY24
Access	21.0	19.1	17.5	13.8	16.0	17.6	22.1	29.0	22.1
Aggregation	31.5	36.9	26.9	17.7	14.2	12.8	12.7	20.6	15.7
Transport	25.5	19.7	19.6	17.4	11.4	10.2	12.5	16.8	18.6
Total	78.0	75.8	64.0	48.9	41.5	40.6	47.4	66.4	56.4

*Historical expenditure RY16-RY19 is presented as unallocated expenditure (inclusive of non-FFLAS expenditure) at nominal prices

3.5 NETWORK SUSTAIN AND ENHANCE

Network Sustain and Enhance comprises the maintenance and management of Chorus' physical network assets.

- **Field Sustain:** This funds investment in the layer 0 infrastructure including poles and ducts, as well as replacement of layer 1 infrastructure
- **Field Sustain – Poles:** This funds the replacement and inspection (where capitalised) of poles used to support the aerial fibre network
- **Relocations:** This funds the relocation of Chorus' assets due to roadworks and when lines companies remove poles used by Chorus
- **Resilience:** This funds transport fibre capacity and robustness – additional fibre to meet capacity and availability targets in the transport network
- **Site Sustain:** This funds investment in infrastructure that houses Chorus' network electronics.

Forecast capital expenditure in each of the sub-categories is shown in the table below.

Table 7: Sub-categories of the other capital expenditure FFLAS forecast

Network Sustain and Enhance (NZ\$m real FY20 FFLAS only)	RY16*	RY17*	RY18*	RY19*	RY20	RY21	RY22	RY23	RY24
Field Sustain	13.6	16.4	23.5	23.6	7.8	11.1	18.6	19.1	19.5
Field Sustain – Poles**	7.2	13.9	21.2	17.7	1.1	1.1	1.1	1.0	1.1
Relocations	10.5	13.9	13.9	8.4	3.3	3.9	4.3	4.3	4.3
Resilience	0.6	2.1	3.0	2.5	15.7	29.7	21.9	13.0	13.4
Site Sustain	15.5	19.0	20.9	20.3	15.3	15.2	14.9	11.9	9.3
Total	47.3	65.2	82.5	72.5	43.1	61.1	60.8	49.3	47.5

*Historical expenditure RY16-RY19 is presented as unallocated expenditure (inclusive of non-FFLAS expenditure) at nominal prices

**Poles not separated in historic expenditure

4 OVERVIEW OF OPERATING EXPENDITURE FORECAST

Operating expenditure (opex) comprises expenditure categorised as an operating expense under accounting rules or categorised as opex within the regulatory framework.

Chorus has segregated the operating expenditure forecast into three high level categories:

- Customer
- Network, and
- Support

In aggregate, the operating expenditure forecast for the first 3 year regulatory period (FY22-FY24) amounts to \$599.2 million (real FY20) (refer Table 8). The contribution of each of the opex categories to the total is shown in Figure 2.

Figure 2: Operating expenditure forecast by category (Source: CutlerMerz analysis of Chorus allocation spreadsheet)

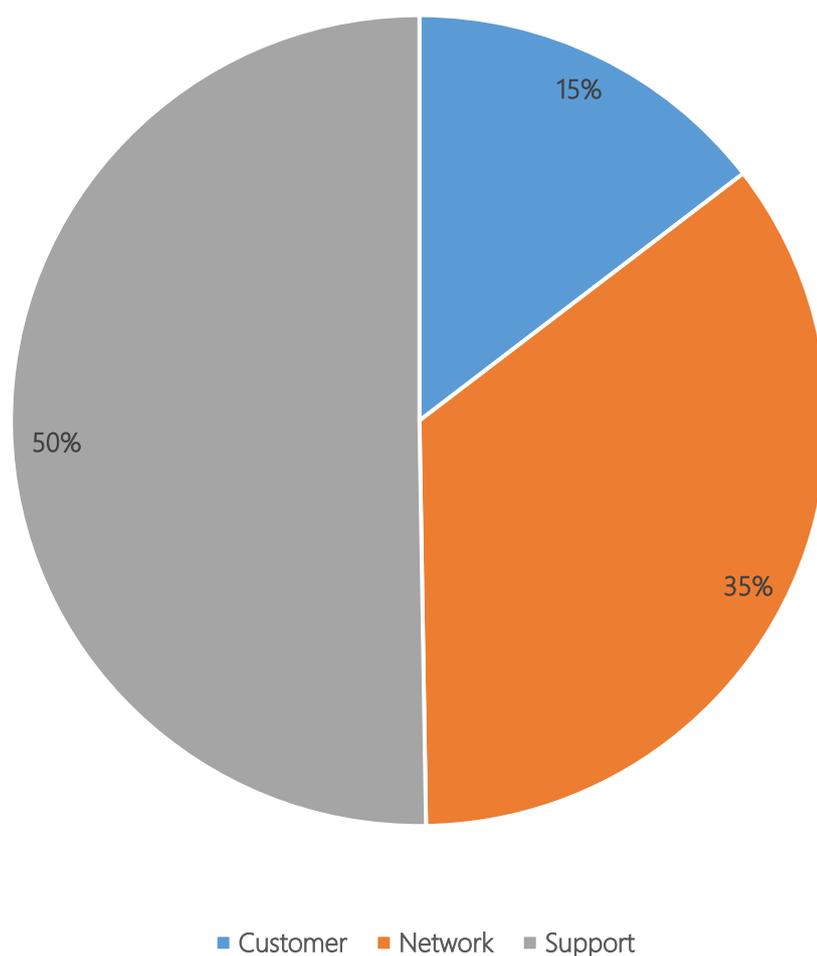


Table 8: Sub-categories of the operating expenditure FFLAS forecast

Operating expenditure (NZ\$m real FY20 FFLAS only)	RY16*	RY17*	RY18*	RY19*	RY20	RY21	RY22	RY23	RY24
Customer	83.1	57.9	36.6	33.5	25.0	27.4	30.0	29.0	28.3
Network	136.2	140.5	143.1	138.5	48.8	58.7	66.6	70.5	73.6
Support	160.3	143.7	133.3	127.9	96.8	100.2	103.6	99.5	98.1
Total	379.6	342.1	312.9	299.9	170.6	186.2	200.2	199.0	200.0

*Historical expenditure RY16-RY19 is presented as unallocated expenditure (inclusive of non-FFLAS expenditure) at nominal prices

Within each high level category, sub-categories of expenditure contribute to the total forecast for that category. The following sections provide an overview of the sub-categories within each of the high level categories. This was used to apply the proportionate scrutiny principle to the forecast expenditure.

4.1 CUSTOMER

Customer opex comprises opex related to:

- Product Sales and Marketing (PSM)
- CNO costs for customer operations
- Service desk
- IFRS 15 Capitalisation (service desk recoveries)

4.2 NETWORK

Network opex funds the operating expenses related to Chorus' fibre network that enables FFLAS products to be delivered to end-users. The major components of network opex are:

- **Reactive maintenance:** funding for correcting defects identified in the fibre network, copper network (FFLAS allocation to be confirmed) and physical sites.
- **Preventive maintenance:** maintenance of assets to prevent deterioration (excluding any amounts capitalised). Chorus only proposes preventive maintenance for buildings and structures during RP1 as the fibre network is relatively young and in good condition. Also includes the cost of the dial before you dig service (to ensure underground infrastructure is identified prior to excavation occurring).
- **Network land and buildings:** mostly electricity costs
- **Other network costs:** project opex, fibre charges, service company incentive payments, pole testing, water rates
- **Network System Operations:** Customer and Network Operations (CNO) labour costs (assure, provisioning, serco management and accommodation)
- **Recoverable maintenance:** mostly damage to the network which is partly recovered from the responsible party
- **Network leases:** lease costs for land/buildings/poles/etc. used by network assets
- **Capitalisation:** IFRS 15 capitalised opex

4.3 SUPPORT

Support opex comprises all opex that is not categorised as Network Opex or Customer Opex. Support Opex broadly covers the Corporate functions of Chorus. The main categories are:

- Board and CEO
- Finance (CFO)
- General Counsel (GCO)
- Corporate Relations (CR)
- People & Culture (P&C)
- Strategy and Business Operations (SBO)
- Elements of other functional units (CTO, CNO) that are not directly attributed to Network or Technology spend
 - All CTO labour
 - CNO asset management labour
- Capitalisation (reduction in opex)
- Self-insurance
- Corporate Leases

5 OVERVIEW OF APPROACH TO INDEPENDENT VERIFICATION

We have applied the Commerce Commission's evaluation criteria for *capital expenditure* as outlined in the draft Input Methodologies and detailed below.

As the Commerce Commission will not develop IMs for operating expenditure, the capital expenditure evaluation criteria has been applied. We expect the Commission's assessment of operating expenditure will be similar to that for capital expenditure.

5.1 EXPENDITURE OBJECTIVE

The capital expenditure objective is that capital expenditure reflects the efficient costs that a prudent fibre network operator would incur to deliver regulated FFLAS at appropriate quality, during the upcoming regulatory period and over the longer term.

The Commission will evaluate the capex proposal by considering whether the proposed expenditure meets the expenditure objective and reflects good telecommunications industry practice.

We expect that the Commission will evaluate the opex proposal by considering whether the proposed expenditure meets a corresponding expenditure objective and reflects good telecommunications industry practice.

5.2 GOOD TELECOMMUNICATIONS INDUSTRY PRACTICE (GTIP)

The Input Methodologies⁴ defined Good telecommunications industry practice in relation to regulated FFLAS to mean:

the exercise of that degree of skill, diligence, prudence, foresight and economic management, as would reasonably be expected from a skilled and experienced asset owner engaged in the management of a fibre access network under comparable conditions. A decision on good telecommunications industry practice should take into account domestic and international best practice, including international standards and factors such as the size, age and technology of the relevant fibre network and domestic regulatory and market conditions, including applicable law.

5.3 FACTORS TO CONSIDER

The Input Methodologies⁵ outlined the following assessment factors that could be considered when evaluating whether a capex proposal has met the expenditure objective:

- a. whether the proposed capex complies with all applicable legal and regulatory obligations associated with the provision of PQ FFLAS;
- b. governance relating to proposed capex, including evidence that appropriate policies and processes have been applied;
- c. historic capital expenditure and consideration of historic rates of investment;
- d. quantitative or economic analysis related to the proposed capex, including sensitivity analysis and impact analysis undertaken;
- e. approach to forecasting capital expenditure, including models used to develop the capital expenditure forecasts;
- f. relevant financial information including evidence of efficiency improvements in proposed capex;
- g. competition effects, including specific information for categories of capital expenditure that have potential impacts on competition in PQ FFLAS and other telecommunications markets;
- h. the linkages between the proposed capex and quality, including the impact the capital expenditure would have on PQ FFLAS quality outcomes;
- i. consideration and analysis of alternatives to the proposed capex, including the impact of the alternatives on PQ

⁴ Fibre Input Methodologies: Main final decisions – reasons paper, 13 October 2020

⁵ Ibid.

FFLAS quality outcomes;

- j. the extent and effectiveness of consultation and engagement with stakeholders and the extent that feedback received has been incorporated into the capex proposal;
- k. procurement, resourcing, and deliverability of the proposed capex;
- l. common costs and benefits between PQ FFLAS, FFLAS classes and services that are not regulated FFLAS;
- m. fibre asset and fibre network information;
- n. mechanisms for controlling actual capital expenditure with respect to the proposed capex and achieving the PQ FFLAS quality outcomes;
- o. the extent of the uncertainty related to the:
 - i. need for the proposed capex;
 - ii. economic case justifying the proposed capex; and
 - iii. timing of the proposed capex;
- p. the extent that a risk-based approach has been applied;
- q. the impact that the proposed capex has on layer 1 PQ FFLAS;
- r. the dependency and trade-off between the proposed capex and related operating expenditure to ensure least whole-of-life cost for managing assets and cost-efficient solutions;
- s. the accuracy and reliability of data; and
- t. the reasonableness of the key assumptions, methodologies, planning and technical standards relied upon.

We have applied a subset of the above capex assessment factors for our assessment of opex.

5.4 THE APPROPRIATE STANDARD

The scope of the independent verification involved assessing whether the capex and opex forecasts met the expenditure objective, and good telecommunications industry practice, having regard to the assessment factors outlined in the IMs. We refer to this set of considerations collectively as “the appropriate standard”.

5.5 APPLICATION TO CHORUS EXPENDITURE FORECAST AT TIME OF REVIEW

5.5.1 Capital Expenditure

The assessment of the capital expenditure forecast has been made against Chorus’ determination of FFLAS capex at the time of the review. It is noted that there is ongoing consultation between the Commerce Commission and Chorus with regards to the inclusion of assets within the FFLAS category. We have not attempted to verify that the allocation of capital expenditure into FFLAS and non-FFLAS categories has been performed appropriately.

It is also noted that the expenditure forecasts subject to the draft assessment had been prepared prior to the release of the draft Input Methodologies.

There are other aspects of Chorus’ first proposal that have not yet been fully developed at the time of the review. In this respect, we note the following assessment factors have not been explicitly considered in this report (reference points to assessment factors noted in section 5.3):

- a. whether the proposed expenditure complies with all applicable legal and regulatory obligations associated with the provision of regulated FFLAS, including this (when made) and other relevant determinations;
- b. the potential impact of the proposed expenditure on actual or potential competition in any telecommunications market;
- d. the extent and effectiveness of consultation and engagement with stakeholders;
- f. mechanisms for controlling actual capital expenditure with respect to the proposed capex and achieving the quality outcomes;
- i. the impact that the proposed expenditure has on layer 1 regulated FFLAS.

5.5.2 Operating Expenditure

The assessment of the operating expenditure forecast has been made against Chorus’ determination of FFLAS opex at the time of the review. It is noted that there is ongoing consultation between the Commerce Commission and Chorus with

regards to the inclusion of assets within the FFLAS category. We have not attempted to verify that the allocation of expenditure into FFLAS and non-FFLAS categories has been performed appropriately.

It is also noted that the expenditure forecasts subject to the draft assessment had been prepared prior to the release of the draft Input Methodologies.

5.5.3 Draft and Final Assessment

The draft assessment was performed on the basis of Chorus' FY20 five year plan forecasts. After the draft assessment was provided to Chorus, a number of significant changes were made to the forecasts, the methodologies and the approaches used. These included changes in response to the findings in the draft assessment, standard business process updates and revisions due to major external events (including Covid-19 impacts on forecasts).

The final assessment used Chorus' FY21 five year plan forecasts. The FY21 forecasts will be used in the submission for RP1, with only minor revisions expected due to changes in requirements between November 2020 (confirmation of FY21 forecasts) and December 2020 (RP1 submission date).

The detailed assessments by expenditure area in the following sections of this report include the findings from the draft assessment and the findings of the final assessment. This shows the improvements that have been incorporated by Chorus in response to the draft assessment findings.

Chorus conducted a significant rearrangement of the categorisation of expenditure areas between the draft and final assessments. This included splitting and merging some expenditure areas and creating new categories in others. The final report aligns with the Chorus expenditure areas as at the final assessment, which also aligns with the expenditure areas in Chorus' submission to the Commerce Commission. The draft assessment sections of this report were aligned with the new categorisation retrospectively. This process required some editing of the draft assessment and therefore, the draft assessments in this final report reflect, as closely as practicable, the intended assessments at the time of the draft report.

5.5.4 Forecast Period for Assessment

The draft assessment phase of the verification was completed using Chorus' financial year forecasts, as this was the time period for which the models available at that time of the assessment were based on. Chorus' regulatory year is a calendar year, which resulted in a timing difference between subsequent expenditure forecasts.

The final assessment phase used updated models from Chorus that provided regulatory year outputs. These align with Chorus' submission to the Commerce Commission. This introduced a change in the time periods being assessed between the draft and final assessments.

Irrespective of timing changes, the review considered the appropriateness of the models over all forecast years (not just those within the assessment period) and the findings of the draft and final assessments are not dependent on the forecast values for any sub-period within the forecast. The forecast amounts are only used within this report to assess the materiality of issues identified and present an overall percentage of forecast expenditure that is verified.

The timings are summarised Table 9.

Table 9: Summary of regulatory time periods

Calendar Year	2021		2022		2023		2024		2025		2026	
Financial Year	FY21	FY22	FY23		FY24		FY25		FY26		FY27	
Regulatory Year	RY21		RY22		RY23		RY24		RY25		RY26	
Regulatory Period			RP1						RP2			
Draft Assessment		X	X	X	X	X	X	X				
Final Assessment			X	X	X	X	X	X				

5.5.5 Dollar Basis

Unless otherwise stated, all forecast values presented in this report are in New Zealand Dollars and are in real terms. The base year for real dollars is FY20, which aligns with the base year used in Chorus' submission.

Historic expenditures are presented in nominal New Zealand Dollars. This aligns with Chorus' presentation of historic expenditures in its submission.

5.6 ASSESSMENT FRAMEWORK

For each of the assessment factors we provide a status indicator which can be interpreted as outlined below:

Table 10: Status Indicators

Status	Interpretation
	A material issue has been identified. The approach, or assumptions, or both is likely to result in the forecast not meeting the expenditure objective and/or does not reflect good telecommunications industry practice.
	An issue has been identified. While the approach, or assumptions, or both may be reasonable, an opportunity has been identified that would improve the justification / robustness of the forecast. The forecast may meet the expenditure objective and reflect good telecommunications industry practice, but an improvement would result in a forecast that could be more easily assessed as meeting the expenditure objective and reflecting good telecommunications industry practice.
	No issues of note have been identified. The approach reflects good telecommunications industry practice and the forecast which has been developed using the approach, or assumptions, or both, could be expected to meet the expenditure objective.

The independent verification of each expenditure sub-category involved consideration of the assessment factors outlined in the IMs, together with the expenditure objective, and good telecommunications industry practice, as in Table 10 above, to determine whether the expenditure sub-category met the *appropriate standard*.

6 EXTENDING THE NETWORK

Extending the Network capex comprises investment in the extension of layer 0 and layer 1 assets within the Chorus network architecture. Investment in the extending the network is forecast for the following streams:

- **Augmentation:** This funds reticulation of unserved infill addresses and associated network elements where required, including the replacement of faulty fibre and non-UFB NGA coverage extension
- **New Property Developments:** This funds new communal network associated with new residential, commercial, and industrial developments
- **UFB Communal:** This funds Chorus' communal fibre contractual obligations with CIP for all phases of the UFB program (part funded by NZ Government)

Extending the network capex represents 7.19% of FFLAS Capex over RP1.

6.1 Augmentation

Augmentation capex represents 1.05% of FFLAS Capex over RP1.

6.1.1 Description of capital expenditure program

The programme funds the extension and enhancement of Chorus' fibre network. This includes:

1. UFB infill – reticulation of unserved infill addresses and associated network elements where required, also includes replacement of faulty fibre
2. Communal fibre access – post UFB2+ rollout to smaller communities that did not make the list for the existing UFB roll-out phases

6.1.2 Forecast expenditure

NZ\$m real FY20 FFLAS only	RY16**	RY17**	RY18**	RY19**	RY20	RY21	RY22	RY23	RY24	RP1 Total
Draft Assessment Capex				1.8	4.2	4.1	3.7	5.4	5.3	14.3
Final Assessment Capex	8.7	0.0	0.9	2.4	2.6	2.0	2.8	3.7	3.8	10.3

* Draft assessment capex is shown in financial years. Some allocations to this programme may have changed between the draft and final assessments.

** Historical expenditure RY16-RY19 is presented as unallocated expenditure (inclusive of non-FFLAS expenditure) at nominal prices

6.1.3 Assessment

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
Forecasting methodology	UFB Infill: Multiple inconsistent methodologies claimed ❌	UFB Infill ❌	UFB Infill: Price [FY20, FSA adjustment] ✅ x Quantity [FY20 run-rate, greenfield volumes adjustment] ✅	✅

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	<p>Price [historical]  x Quantity [historic % of connections * forecast connection volumes] </p> <p>Communal fibre access: Placeholder </p> <p>The methodology used for UFB Infill needs to be clarified due to inconsistent methodologies stated across different documents and during interviews. A model or other form of justification needs to be developed for communal fibre access.</p>	<p>Communal fibre access</p>	<p>Communal Fibre Access: Price [avg CPPP to be commercially viable]  x Quantity [FY20 run rate (customer requested), Chorus estimate (small towns)] </p> <p>Chorus has developed new models for the UFB Infill and Communal Fibre Access categories. The methodologies used in the models are reasonable.</p> <p>The draft assessment is retained for the other activities of Fibre Extension and Enhancement.</p>	
<p>Key assumptions</p>	<p>UFB infill:</p> <ul style="list-style-type: none"> Historic relationships between infill work and overall connections will persist Unit costs and mix of work required will remain unchanged <p>Communal fibre access:</p> <ul style="list-style-type: none"> There will be a sufficient number of economic business cases from Chorus' list of 232 'urban like' localities to utilise the allocated expenditure and/or alternative funding (such as from government, councils or other groups) to part fund the fibre roll-out will result in an economic business case for Chorus <p>Additional documentation of assumptions required.</p>	<p></p> <p>Documentation</p>	<p>UFB Infill:</p> <ul style="list-style-type: none"> No significant link between infill volumes and total connections Infill volumes are linked to the volume for greenfields as this is representative of the level of new property development The baseline for infill volumes is the FY20 run rate Infill volumes will be lower due to a reduction in the greenfields forecast, which is due to Covid-19 impacts on Chorus <p>The reduction in volumes due to Covid-19 impacts is significant and potentially overstated. However, this adjustment is consistent with Chorus' decision to model a relationship between infill and greenfields development, which is reasonable as both are driven by property development. Further, this results in a conservative forecast as it is a reduction in forecast expenditure.</p> <p>Communal Fibre Access:</p> <ul style="list-style-type: none"> There is a sufficient number of opportunities available for Chorus to complete UFB connections to four small towns each year that will be NPV positive <p>Chorus provided evidence that there are a significant number of small towns that are highly probable to have a CPPP low enough to be NPV positive.</p> <p>Chorus has incorporated additional documentation of key assumptions into the spreadsheet models used for forecasting. This includes listing sources for external information, explaining why certain values were selected and replacing hard-coded data with calculations within the models.</p> <p>The additional information incorporated into the models has addressed the concerns raised in the draft assessment.</p>	<p></p>

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
<p>Planning and technical standards</p>	<p>Planning and technical standards reviewed:</p> <ul style="list-style-type: none"> • DP 2585 UFB Coverage Extension • DP 2439 UFB Infill • Portfolio Plan – Fibre Cable • NGA Provisioning Task Handbook Volumes 1-4 • NGA Task Classification ND13060_v1.0 • Network Infrastructure Project Agreement (NIPA) (26/01/2017) <p>These documents outline in detail the steps that must be undertaken by service companies when connecting a premise to Chorus’ fibre network. Documents are still incomplete but a review and updating process is underway.</p> <p>Many of the DP/POD documents are only partially complete, such as having sections containing placeholder text stating what type of content is meant to go in the section. The Excel models that match these documents are also only partially complete with many hard-coded inputs without source information.</p> <p>The portfolio plan is a typical asset management plan (AMP) for the particular asset class. The details within the portfolio plan are consistent with our expectations for an AMP within an asset management system that meets or is aligned to the ISO55000 asset management standard. The portfolio plans provide the asset management approach that Chorus is implementing over the life of the assets. Whilst this provides assurance that Chorus is following recommended asset management processes, the portfolio plans provide limited insight into the details that sit behind the forecast expenditure proposed for RP1.</p>	<p> DP documents incomplete</p>	<p>Chorus is planning to update the DP documents after the 2020 five year plan is approved. Chorus has indicated that it will incorporate the feedback contained in the draft assessment with respect to all DP documents.</p> <p>The draft assessment is retained for this requirement.</p>	<p> DP documents incomplete</p>
<p>Reasonableness of models</p>	<p>UFB Infill:</p> <p>Multiple methodologies claimed but no clear model used. Separate claims that volume is a constant % of new connections; an increasing % of new connections; and uses a short term volume trend. However, forecast appears to actually be constant nominal expenditure with a step change between FY21 and FY22, which is not explained. It is unclear if there is any model used.</p> <p>This historical links between infill work and connection volumes may change as the fibre network becomes more established.</p>	<p> UFB infill</p>	<p>UFB Infill:</p> <p>Chorus has developed a new model for UFB Infill forecasting with all assumptions described and links provided to sources for all inputs. The methodology used is now clear.</p> <p>The model no longer assumes a relationship between infill work and connection volumes. Instead, Chorus has adopted greenfield volumes as a proxy for infill work. This is reasonable as both are linked to the level of new property development.</p> <p>The new model provided by Chorus provides the clarification of methodology that was the main issue identified during the draft assessment. The suggestion that a</p>	<p></p>

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	<p>More sophisticated modelling is required to have more confidence in the volume forecast. There is a chance that infill volumes may increase or decrease substantially from current volumes due to factors such as widespread exhaustion of existing capacity (volumes increase) or saturation of connections in established fibre areas (decrease volume) which is better answered by a detailed model. For example, Chorus could model infill requirements using connection forecasts and remaining capacity at each FFP and apply a Monte-Carlo type sensitivity analysis.</p> <p>Communal fibre access:</p> <p>There is no model for the \$3.6m of expenditure in this programme. Chorus has a list of 232 urban like communities that may be appropriate for a UFB type rollout as UFB2/2+ is winding down.</p> <p>It should be possible to show high level NPV estimates based on a few key characteristics for each of the 232 urban like communities whether it is likely at least \$3.6m of projects may be NPV positive without external funding.</p> <p>The spreadsheets contain large amounts of hard-coded data and the UFB Infill model in particular requires further work.</p>		<p>more detailed model could be applied to this expenditure still stands, but it is noted that the increase in model complexity may not be the best use of Chorus' resources given the relatively small amount of expenditure in this area.</p> <p>The updated Transport Fibre models have addressed the use of hard-coded data identified in the draft assessment and there is increased transparency in the costs used in the forecast.</p> <p>Communal Fibre Access:</p> <p>Chorus has developed a new model for communal fibre access which outlines the key assumptions used. Chorus also provided high-level estimates of the cost-per-premise-passed for 327 localities.</p> <p>The additional information provided by Chorus has addressed the issues identified in the draft assessment.</p>	
<p>Accuracy and reliability of data</p>	<p>Input data includes contractual obligations and historic cost and volume data that is obtained from Chorus' computer systems. This information is known with a high degree of accuracy.</p> <p>Input data is accurate and reliable.</p>		<p>The draft assessment is retained for this requirement.</p>	
<p>Procurement approach</p>	<p>All expenditure in this programme requires approval via Chorus' Capital Expenditure Governance process. This includes development of business cases followed by approval from the Chorus Capital Council (CCC) before a project can proceed.</p> <p>Works are undertaken by Chorus' service companies. The deliverability targets and service costs are incorporated into the contracts between Chorus and each service company. Unit rates for services that make up a POA connection paid by Chorus differ between service companies and geographic regions and were subject to market tender processes.</p>		<p>The draft assessment is retained for this requirement.</p>	

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	The procurement approach is reasonable. The CCC process encourages efficient selection of expenditure projects. Competitive tendering of work to service companies results in efficient pricing.			
Consideration of historic investment	Historic investment is a direct input for UFB infill programme. The remainder are forward looking and/or meet contractual requirements and service level targets. Historic investment is incorporated into the forecast approaches where appropriate.		The draft assessment is retained for this requirement.	
Consideration of options and alternative solutions	Alternative options only exist in limited circumstances for the transport fibre and UFB infill categories. There is no alternative to building communal fibre. Alternative options are not available for this programme.		The draft assessment is retained for this requirement.	
Relationship between proposed expenditure and quality outcomes	<input checked="" type="checkbox"/> Availability <input type="checkbox"/> Performance <input type="checkbox"/> Ordering <input checked="" type="checkbox"/> Provisioning <input type="checkbox"/> Switching <input checked="" type="checkbox"/> Faults <input type="checkbox"/> Customer service These programmes are for the construction of communal fibre networks. This expenditure directly enables Chorus to provision fibre access products to customers. The UFB infill programme also includes a minor fault component. As the quality outcome targets for availability, performance, provisioning and faults have not yet been established by the Commerce Commission, it cannot be determined whether the forecasts are sufficient to meet the RP1 targets. As a placeholder, Chorus would be expected to continue delivering to current performance levels, in which case the proposed expenditure, which maintains existing service levels in key areas (transport capacity and robustness), should be sufficient to continue delivering these outcomes. The proposed expenditure is expected to be sufficient to maintain current quality outcomes.		The draft assessment is retained for this requirement.	
Deliverability and feasibility of implementation	UFB Infill Resources should be available from the wind-down of the UFB rollout programmes. Additionally, Chorus will have provisioning targets that will require this investment to be undertaken in a timely manner. Therefore, deliverability risk is low.		Communal Fibre Access: Chorus provided additional evidence and workings indicating there is a high likelihood that there will be a sufficient quantity of 'urban-like' localities that meet the necessary requirements (including providing an NPV positive business case) to meet the volume targets included in the expenditure forecast. This included cost estimates for 327 localities.	

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	<p>Communal fibre access:</p> <p>There is a very high risk that this programme will not be delivered. Deliverability depends on Chorus having an economic business case for enough 'urban-like' localities to spend the budgeted amount. Deliverability may depend on the government providing funding for post UFB2+ fibre rollouts.</p> <p>This programme appears to be a contingent project, but does not meet the Commerce Commissions \$5m threshold to be considered individual capex⁶. To be provided an allowance for this expenditure as a base capex project, Chorus would have to provide a high level of confidence that there are enough sites that could be built if no external funding contribution is provided. Otherwise it is likely that the expenditure is contingent on receiving external funding for at least part of each site.</p> <p>The communal fibre access component is contingent on certain criteria being met and therefore has moderate deliverability and feasibility risks. The remainder of the augmentation programme is largely driven by contractual and regulatory obligations and must be delivered.</p>	 Communal fibre access	<p>The additional evidence provided by Chorus supports the communal fibre access program being both deliverable and feasible to implement. This does not fully mitigate the draft assessment findings as, if the criteria (an NPV positive business case and/or third party capital contribution) is not met the expenditure will not be incurred.</p> <p>The degree to which there is any benefit to Chorus from overstating the forecast (or under-delivering on volumes) is dependent on there being an incentive scheme in place that provides Chorus a benefit for capital expenditure underspend. In the absence of such a scheme (as is expected during RP1), Chorus will not benefit if no NPV positive business cases for communal fibre access are identified.</p> <p>The draft assessment is retained for the other activities of Fibre Extension and Enhancement.</p>	
Uncertainty within the proposed expenditure	<p>There is a low level of uncertainty for UFB infill fibre as this is driven by contractual obligations. There is a high level of uncertainty for communal fibre access as the project is contingent on certain criteria being met.</p> <p>There is a high level of uncertainty for the communal fibre access project.</p>	 Communal fibre access	<p>Communal Fibre Access:</p> <p>The uncertainty identified in the draft assessment is weighted towards the downside as Chorus is not required to invest in all NPV positive business cases so is not exposed to a risk of overspend. The additional information provided by Chorus indicates that there is a reasonable level of certainty that there will be sufficient opportunities to deliver the communal fibre access forecast expenditure during RP1.</p> <p>Chorus has provided sufficient evidence to indicate that the inherent uncertainty in this type of programme is being appropriately managed and that the forecasting process has used conservative assumptions to reduce uncertainty.</p>	

⁶ Draft capex IMs: 3.1592.1

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
			The draft assessment is retained for the other activities of Fibre Extension and Enhancement.	
Extent to which a risk-based approach has been applied	A risk-based approach has not been applied. A risk-based approach has not been applied. A risk-based model should be considered.	 Not applied	Chorus has indicated it will investigate whether appropriate risk-based forecasting approaches can be implemented for future planning cycles. The draft assessment is retained for this requirement.	 A risk-based approach has not been applied
Capex / opex dependency and trade-off and whole of lifecycle cost	There are no reasonable capex-opex trade-off opportunities for these programmes. This expenditure is to install network assets. There are no opex equivalent investments that meet the criteria required by this programme. No feasible capex / opex trade-offs available.		The draft assessment is retained for this requirement.	

6.1.4 Final Assessment Conclusion

In our opinion, the methods and input assumptions used to forecast the Augmentation capital expenditure would result in a forecast that reflects the efficient costs that a prudent fibre network operator would incur to deliver regulated FFLAS at appropriate quality, during the upcoming regulatory period and over the longer term, having regard to good telecommunications industry practice.

6.2 New Property Developments

New Property Developments capex represents 2.10% of FFLAS Capex over RP1.

6.2.1 Description of capital expenditure program

The programme funds the connection of new property developments (greenfield developments) to the Chorus fibre network. This does not include end user connections, network electronics, exchange shelf growth or infill growth.

6.2.2 Forecast expenditure

NZ\$m real FY20 FFLAS only	RY16**	RY17**	RY18**	RY19**	RY20	RY21	RY22	RY23	RY24	RP1 Total
Draft Assessment Capex	24.4	26.8	35.5	22.2	31.9	29.7	37.6	37.5	37.5	112.6
Final Assessment Capex***	27.4	32.3	32.7	34.0	17.6	7.3	6.3	6.9	7.4	20.6

* Draft assessment capex is shown in financial years. Some allocations to this programme may have changed between the draft and final assessments.

** Historical expenditure RY16-RY19 is presented as unallocated expenditure (inclusive of non-FFLAS expenditure) at nominal prices

*** Capex net of customer contributions

6.2.3 Assessment

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
Forecasting methodology	Price [YTD average, inflation increase only] ✓ x Quantity [Connections Model] ✓ The forecasting methodology is reasonable.	✓	Price [YTD average by lot type, inflation [Chorus CI] ✓ x Quantity [Connections Model] ✓ The forecasting methodology is reasonable.	✓
Key assumptions	The Connections model creates the greenfields quantity forecast with the following assumptions: <ul style="list-style-type: none"> Statistics NZ building consent forecast is a proxy for greenfield lots requiring a fibre connection Chorus greenfield win-rate remains unchanged 90% of building consents are for greenfield developments (does not change over time) Costs are best represented per greenfield lot and are not determined by number of greenfield developments and will not change over time 	Volume assumptions	Chorus has provided a rebuilt greenfields model that provides a higher level of detail of how the forecast is calculated. The forecast is primarily driven by the Connections model, which determines volumes. Explanations are provided for the assumptions used in the model and external sources are listed. The main calculation within the greenfields model is to apply the correct unit rate to different types of greenfield developments as per the Connections volume forecast. Additional assumptions in new greenfields model: <ul style="list-style-type: none"> The greenfields model applies the correct unit rate to different types of greenfield developments 	✓

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	<p>The key assumptions used by Chorus appear reasonable. It is reasonable that assumptions that carry a high degree of uncertainty are held constant at current levels unless there is evidence of a trend. Although building consent forecasts are volatile, Statistics NZ is a credible source and few reasonable alternatives exist that would perform better.</p> <p>However, the stated methodology fails to mention any factor used to convert consents issued and houses/lots constructed/sold to those requiring a fibre connection. The methodology also does not cover potential time lags between consent and construction of a fibre connection. An empirical assessment of the accuracy of the forecast approach is not provided. Volume calculations are not included in the model and are instead hardcoded as revenue amounts from the S&OP model.</p> <p>Additional clarification of some volume assumptions required.</p>		<ul style="list-style-type: none"> Where the Connections model does not provide the necessary level of granularity by dwelling type uses historical ratios from the past 18 months. The ratio of MDU connections to lots will remain constant over time There is a significant decrease in forecast volumes due to Covid-19 impacts, which is a result of changes in the Connections model <p>The additional information has addressed the issues raised in the draft assessment.</p>	
<p>Planning and technical standards</p>	<p>Planning and technical standards reviewed:</p> <ul style="list-style-type: none"> DP 2588 Greenfields DP 2701 UFB Greenfields NGA Provisioning Task Handbook Volumes 1-4 NGA Task Classification ND13060_v1.0 Portfolio Plan – Fibre Cable Portfolio Plan – Manholes and Ducts Network Infrastructure Project Agreement (NIPA) (26/01/2017) <p>The forecasting approach section of the DP documents could be more detailed. Some sections also appear incomplete.</p> <p>The portfolio plan is a typical asset management plan (AMP) for the particular asset class. The details within the portfolio plan are consistent with our expectations for an AMP within an asset management system that meets or is aligned to the ISO55000 asset management standard. The portfolio plans provide the asset management approach that Chorus is implementing over the life of the assets. Whilst this provides assurance that Chorus is following recommended asset management processes, the portfolio plans provide limited insight into the details that sit behind the forecast expenditure proposed for RP1.</p>	<p> Methodology documentation</p>	<p>Chorus is planning to update the DP documents after the 2020 five year plan is approved. Chorus has indicated that it will incorporate the feedback contained in the draft assessment with respect to all DP documents.</p> <p>The draft assessment is retained for this requirement.</p>	<p> Documents incomplete</p>

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
Reasonableness of models	<p>The model is reasonable, but the methodology leaves a few gaps that require clarifying (see Key Assumptions section above). The spreadsheets contain hard-coded inputs without sources.</p> <p>Hard-coded inputs need to be removed from the spreadsheets.</p>	<p> Hard-coded inputs</p>	<p>Chorus has provided a rebuilt greenfields model that provides a higher level of detail of how the forecast is calculated. The forecast is primarily driven by the Connections model, which determines volumes. The greenfields model applies the correct unit rate to different types of greenfield developments and where the Connections model does not provide the necessary level of granularity by dwelling type uses historical ratios from the past 18 months.</p> <p>The updated model removes the hard-coded inputs identified in the draft assessment and provides a higher level of transparency of the methodology used.</p> <p>The issues identified in the draft assessment have been addressed.</p>	<p></p>
Accuracy and reliability of data	<p>Input data is sourced from Chorus' systems (prices, historic work completed) and reputable sources (Statistics NZ)</p> <p>Input data is accurate and reliable.</p>	<p></p>	<p>The draft assessment is retained for this requirement.</p>	<p></p>
Procurement approach	<p>All expenditure in this programme requires approval via the Chorus' Capital Expenditure Governance process. This includes development of business cases followed by approval from the Chorus Capital Council (CCC) before a project can proceed.</p> <p>Works are undertaken by Chorus' service companies. The deliverability targets and service costs are incorporated into the contracts between Chorus and each service company. Unit rates for services that make up greenfields fibre paid by Chorus differ between service companies and geographic regions and were subject to market tender processes.</p> <p>Chorus must competitively bid for the opportunity to provide fibre to greenfields developments. However, this raises potential issues of Chorus cross-subsidising its greenfield developments with regulated revenues to push out competition. No information reviewed provided information about how Chorus will manage this conflict. It is also not yet clear how the Commerce Commission will treat greenfields fibre investment by Chorus.</p> <p>The procurement approach is reasonable. The CCC process encourages efficient selection of expenditure projects. Competitive tendering of work to service companies results in efficient pricing.</p>	<p></p>	<p>The draft assessment is retained for this requirement.</p>	<p></p>
Consideration of historic investment	<p>Historic expenditure is the basis of the assumptions from which the forecast is calculated.</p> <p>Historic investment has been considered.</p>	<p></p>	<p>The draft assessment is retained for this requirement.</p>	<p></p>

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
Consideration of options and alternative solutions	There are no alternatives to providing greenfields fibre. Chorus can opt to withdraw from this market and allow other businesses to provide connections to greenfield estates, but this is not considered a reasonable option. No alternative options.		The draft assessment is retained for this requirement.	
Relationship between proposed expenditure and quality outcomes	<input type="checkbox"/> Availability <input type="checkbox"/> Performance <input type="checkbox"/> Ordering <input checked="" type="checkbox"/> Provisioning <input type="checkbox"/> Switching <input type="checkbox"/> Faults <input type="checkbox"/> Customer service The construction of communal network is necessary to enable the customer connection and may be included within provisioning quality targets. However, as supplying fibre to greenfield developments is competitive it is unclear whether quality targets for regulated FFLAS will apply. Unclear whether quality targets for regulated FFLAS will apply.		The draft assessment is retained for this requirement.	
Deliverability and feasibility of implementation	The greenfield expenditure forecast is higher than current levels, but this coincides with the winding down of the UFB build so there should be sufficient resources available to deliver the forecast work. Deliverability and feasibility of implementation risk is low.		The draft assessment is retained for this requirement.	
Uncertainty within the proposed expenditure	There is moderate uncertainty due to risks that the forecast number of greenfield lots requiring connection during RP1 may change and the entry of a new competitor into the market for greenfield connections could result in a substantial reduction in Chorus' win rate. However, there is no reasonable way to reduce this uncertainty. Uncertainty has been managed appropriately.		The draft assessment is retained for this requirement.	
Extent to which a risk-based approach has been applied	A risk-based approach has not been applied. A risk-based approach has not been applied. A risk-based approach that includes a number of possible scenarios involving changes to underlying demand, Chorus' win-rate and other key variables to present a range of probable volumes over time may improve confidence in the forecast.	 A risk-based approach has not been applied	Chorus has indicated it will investigate whether appropriate risk-based forecasting approaches can be implemented for future planning cycles. The draft assessment is retained for this requirement.	 A risk-based approach has not been applied
Capex / opex dependency and trade-off	There is no opex alternative for this expenditure. No capex/opex trade-off opportunities.		The draft assessment is retained for this requirement.	

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
and whole of lifecycle cost				

6.2.4 Final Assessment Conclusion

In our opinion, the methods and input assumptions used to forecast the New Property Developments capital expenditure would result in a forecast that reflects the efficient costs that a prudent fibre network operator would incur to deliver regulated FFLAS at appropriate quality, during the upcoming regulatory period and over the longer term, having regard to good telecommunications industry practice.

6.3 UFB Communal

UFB Communal capex represents 4.04% of FFLAS Capex over RP1.

6.3.1 Description of capital expenditure program

The programme funds the extension and enhancement of Chorus' fibre network. This includes:

1. UFB1/2/2+ communal build – Chorus' communal fibre contractual obligations with CIP for all phases of the UFB program (part funded by NZ Government)

6.3.2 Forecast expenditure

NZ\$m real FY20 FFLAS only	RY16**	RY17**	RY18**	RY19**	RY20	RY21	RY22	RY23	RY24	RP1 Total
Draft Assessment Capex*	184.6	176.5	224.9	240.7	176.5	105.3	76.9	12.6		89.5
Final Assessment Capex	180.7	201.0	234.2	205.9	163.8	101.8	39.7			39.7

* Draft assessment capex is shown in financial years. Some allocations to this programme may have changed between the draft and final assessments.

** Historical expenditure RY16-RY19 is presented as unallocated expenditure (inclusive of non-FFLAS expenditure) at nominal prices

6.3.3 Assessment

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
Forecasting methodology	UFB1/2/2+ communal build: Price [CPPP, service company fixed price contracts] ✓ x Quantity [contractual] ✓	Green flag	The draft assessment is retained for this requirement	Green flag
Key assumptions	UFB1/2/2+ communal build: <ul style="list-style-type: none"> • Volumes are tied to the UFB contracts between Chorus and CIP • Limited unit cost decreases are included within service company contracts 	Green flag	The draft assessment is retained for this requirement	Green flag
Planning and technical standards	Planning and technical standards reviewed: <ul style="list-style-type: none"> • DP 2422 UF2 Communal POD • Portfolio Plan – Fibre Cable • NGA Provisioning Task Handbook Volumes 1-4 • NGA Task Classification ND13060_v1.0 	Orange flag DP documents incomplete	Chorus is planning to update the DP documents after the 2020 five year plan is approved. Chorus has indicated that it will incorporate the feedback contained in the draft assessment with respect to all DP documents. The draft assessment is retained for this requirement.	Orange flag DP documents incomplete

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	<ul style="list-style-type: none"> Congestion Free Networks – Technical Whitepaper (2016) Network Infrastructure Project Agreement (NIPA) (26/01/2017) <p>These documents outline in detail the steps that must be undertaken by service companies when connecting a premise to Chorus’ fibre network. Documents are still incomplete but a review and updating process is underway.</p> <p>Many of the DP/POD documents are only partially complete, such as having sections containing placeholder text stating what type of content is meant to go in the section. The Excel models that match these documents are also only partially complete with many hard-coded inputs without source information.</p> <p>The portfolio plan is a typical asset management plan (AMP) for the particular asset class. The details within the portfolio plan are consistent with our expectations for an AMP within an asset management system that meets or is aligned to the ISO55000 asset management standard. The portfolio plans provide the asset management approach that Chorus is implementing over the life of the assets. Whilst this provides assurance that Chorus is following recommended asset management processes, the portfolio plans provide limited insight into the details that sit behind the forecast expenditure proposed for RP1.</p>			
Reasonableness of models	<p>UFB1/2/2+ Communal Build:</p> <p>It is reasonable for the capex forecast of this programme to be aligned to Chorus’ contractual obligation with the NZ Government.</p>		The draft assessment is retained for this requirement.	
Accuracy and reliability of data	<p>Input data includes contractual obligations and historic cost and volume data that is obtained from Chorus’ computer systems. This information is known with a high degree of accuracy.</p> <p>Input data is accurate and reliable.</p>		The draft assessment is retained for this requirement.	
Procurement approach	<p>All expenditure in this programme requires approval via Chorus’ Capital Expenditure Governance process. This includes development of business cases followed by approval from the Chorus Capital Council (CCC) before a project can proceed.</p> <p>Works are undertaken by Chorus’ service companies. The deliverability targets and service costs are incorporated into the contracts between</p>		The draft assessment is retained for this requirement.	

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	<p>Chorus and each service company. Unit rates for services that make up a POA connection paid by Chorus differ between service companies and geographic regions and were subject to market tender processes.</p> <p>The procurement approach is reasonable. The CCC process encourages efficient selection of expenditure projects. Competitive tendering of work to service companies results in efficient pricing.</p>			
Consideration of historic investment	Historic capex is not relevant for this programme.		The draft assessment is retained for this requirement.	
Consideration of options and alternative solutions	Alternative options are not available for this programme.		The draft assessment is retained for this requirement.	
Relationship between proposed expenditure and quality outcomes	<p><input checked="" type="checkbox"/> Availability <input checked="" type="checkbox"/> Performance <input type="checkbox"/> Ordering <input checked="" type="checkbox"/> Provisioning <input type="checkbox"/> Switching <input type="checkbox"/> Faults <input type="checkbox"/> Customer service</p> <p>This programme is for the construction of communal fibre networks. This expenditure directly enables Chorus to provision fibre access products to customers. As the quality outcome targets for availability, performance and provisioning have not yet been established by the Commerce Commission, it cannot be determined whether the forecasts are sufficient to meet the RP1 targets. As a placeholder, Chorus would be expected to continue delivering to current performance levels, in which case the proposed expenditure, which maintains existing service levels in key areas (transport capacity and robustness), should be sufficient to continue delivering these outcomes.</p> <p>The proposed expenditure is expected to be sufficient to maintain current quality outcomes.</p>		The draft assessment is retained for this requirement.	
Deliverability and feasibility of implementation	The UFB programme has already fallen from its peaks and will continue to shrink during RP1. Therefore, there should be sufficient resources available, so deliverability risk is low.		The draft assessment is retained for this requirement.	
Uncertainty within the	There is a low level of uncertainty for UFB1/2/2+ communal fibre as this is driven by contractual obligations.		The draft assessment is retained for this requirement.	

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
proposed expenditure				
Extent to which a risk-based approach has been applied	<p>A risk-based approach has not been applied.</p> <p>A risk-based approach has not been applied. A risk-based model should be considered..</p>	<p></p> <p>Not applied</p>	<p>Chorus has indicated it will investigate whether appropriate risk-based forecasting approaches can be implemented for future planning cycles.</p> <p>The draft assessment is retained for this requirement.</p>	<p></p> <p>A risk-based approach has not been applied</p>
Capex / opex dependency and trade-off and whole of lifecycle cost	<p>There are no reasonable capex-opex trade-off opportunities for these programmes. This expenditure is to install network assets. There are no opex equivalent investments that meet the criteria required by this programme.</p> <p>No feasible capex / opex trade-offs available.</p>	<p></p>	<p>The draft assessment is retained for this requirement.</p>	<p></p>

6.3.4 Final Assessment Conclusion

In our opinion, the methods and input assumptions used to forecast the UFB Communal capital expenditure would result in a forecast that reflects the efficient costs that a prudent fibre network operator would incur to deliver regulated FFLAS at appropriate quality, during the upcoming regulatory period and over the longer term, having regard to good telecommunications industry practice.

7 INSTALLATIONS

installations capex comprises the extension of the communal network to end-user premises/sites. Investment in the installations is forecast for the following streams:

- **Standard Installations:** This funds the connection of new standard installation customers to the Chorus fibre network, the provision of ONTs, and customer retention costs
- **Standard Installations – IFRS 15 Capex:** Under NZ IFRS 15 expenditure to incentivise and provision customer connections is capitalised.
- **Complex Installations:** This funds the connection of complex, point-to-point, and high cost customers to the network

Installations capex represents 44.10% of FFLAS Capex over RP1.

7.1 Standard Installations

Standard Installations capex represents 32.85% of FFLAS Capex over RP1.

7.1.1 Description of capital expenditure program

The programme funds the installation of fibre services to customers of the Chorus fibre network built as part of the UFB 1, UFB 2 and UFB2+ communal programmes. Standard Installations capex is demand driven by the volume of end customer orders received.

There are four key activities in Standard Installations capex:

1. Construction and commissioning of individual connections (referred to as SDU or Single-dwelling units)
 - includes the installation of duct, fibre and ONT (covered in network electronics management review) assets to enable the end customer to access fibre broadband.
2. Construction of network extensions to enable individual connections:
 - includes the extension of the fibre network to allow individual connections to be completed for connections in the following property types:
 1. Multi-dwelling unit (MDU)
 2. Right-of-way (ROW)
3. Fibre Access including:
 - a. Non-building access points (NBAP) (e.g. CCTV, bus shelters, ATM)
 - b. Non-UFB NGA network extensions (e.g. network extension build outside UFB areas)
4. Connection of GPON customers to Chorus' fibre network, including provision of ONTs at customer premises

IFRS 15 Capex is part of Standard Installations capex in Chorus' capex forecast structure. However, due to the significantly different forecast approaches used for IFRS 15 capex and that it was a separate capex segment during the draft assessment, it has been treated separately in this review.

7.1.2 Forecast expenditure

NZ\$m real FY20 FFLAS only	RY16**	RY17**	RY18**	RY19**	RY20	RY21	RY22	RY23	RY24	RP1 Total
Draft Assessment Capex*	173.5	229.2	250.7	279.4	238.0	215.4	138.9	84.1	68.9	291.9
Final Assessment Capex***	205.7	250.2	270.8	260.7	244.9	198.7	142.8	104.2	76.1	323.1

* Draft assessment capex is shown in financial years. Some allocations to this programme may have changed between the draft and final assessments.

** Historical expenditure RY16-RY19 is presented as unallocated expenditure (inclusive of non-FFLAS expenditure) at nominal prices

*** Capex (net of capital contributions)

7.1.3 Assessment

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
Forecasting methodology	<p>SDU: Price [current average unit rate adjusted for service desk costs over time] x Quantity [S&OP forecast] </p> <p>MDU: Price [current average] x Quantity [based on SDU forecast, adjusted using geographic data] </p> <p>ROW: Price [current average] x Quantity [based on SDU forecast, adjusted using geographic data] </p> <p>Fibre Access: Historical Run Rate </p> <p>ONT: Price [Nokia CY21 rates] x Quantity [S&OP Model connections forecast + replacements modelled on ONT age profile] </p> <p>A model is required for the Fibre Access forecast</p>	 Fibre Access	<p>Fibre Access (BAU Expenditure): Historic run rate </p> <p>Fibre Access (Smart Locations): Price [business case estimates] x Quantity [Connections forecast] </p> <p>Chorus has split the Fibre Access activity into three subcategories (two of which are for smart locations) and developed new models for these. The approaches used are reasonable given the uncertainty in this connection category.</p> <p>Other expenditures: Price [project dependent] x Quantity [project dependent] </p> <p>Chorus has added high-level cost estimates for three new expenditure areas (unbundling, Hyperfibre, WiFiONT and service company KPI payments). The methodologies used for these projects are reasonable and combined represent only a small minority of the Standard Installations capex.</p> <p>The draft assessment is retained for the SDU, MDU and ROW activities of Standard Installations.</p>	
Key assumptions	<p>Price and quantity assumptions (SDU, MDU, ROW):</p> <ul style="list-style-type: none"> Quantity of total connections is taken from the Connections model for the categories SDU, MDU and ROW (does not forecast at more detailed levels) All underlying costs (i.e. by connection type) are constant with the exception of 'service desk costs'. This is due to 	 Fibre Access	<p>Fibre access:</p> <ul style="list-style-type: none"> BAU fibre access expenditures will continue at FY20 levels Unit costs for smart location installations based on estimates used in business cases Volumes for smart location installations derived from connections forecast <p>The fibre access assumptions are clearly stated in the newly developed model.</p>	

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	<p>declining connection volumes sharing a largely fixed cost. However, an error is present in the calculation of this cost.</p> <ul style="list-style-type: none"> • Average connection cost will change over time due to change in the mix of connection types between cheaper and more expensive connection types • UFB1 connection mix starts at FY19 YTD actuals and will trend towards a greater proportion of 'SDU off MDU' connections for SDU type connections and greater proportion of large MDUs in MDU type connections. • UFB2 connection mix will remain unchanged at the FY19 YTD mix. • Long term uptake of fibre by premises passed is expected to be [Chorus CI]%. The price and quantity assumptions are reasonable approximations where more detailed knowledge of the premises that are expected to connect are not known. Limitations in Chorus' historical data collection reduce the ability to estimate the likely connection types of premises that have been passed by the network but are not yet connected. Where the network has not passed a premise there is not sufficient information from other sources to provide enough justification from diverging from recent observed connection type mixes. Based on this, the use of the recent mix of connection types as the basis for the RP1 forecast is not unreasonable. <p>Fibre access:</p> <ul style="list-style-type: none"> • Expenditure will initially increase (prior to RP1) and then hold constant in nominal terms (during RP1). <p>The fibre access assumptions are not well justified. Subject to the increases prior to RP1 being observed before the determination, the approach of constant nominal capex may be prudent. However, an upwards trend would indicate Chorus may fail to meet customer connection demand if a flat forecast is used. A more detailed model is required to provide assurance that the forecast is reasonable.</p> <p>Exclusions from the modelling on connections:</p> <ul style="list-style-type: none"> • Copper to fibre migration • New product 		<p>Other expenditures:</p> <ul style="list-style-type: none"> • The new expenditure areas added by Chorus rely on project specific assumptions • These assumptions are detailed in the models with sources and links to other spreadsheets provided. <p>The key assumptions for the other expenditures appear reasonable.</p> <p>The draft assessment is retained for the SDU, MDU and ROW activities of Standard Installations.</p>	

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	<ul style="list-style-type: none"> Current products Deals with the government for expansion of the network 			
<p>Planning and technical standards</p>	<p>Planning and technical standards reviewed:</p> <ul style="list-style-type: none"> NGA Provisioning Task Handbook Volumes 1-4 NGA Task Classification ND13060_v1.0 Fibre Connections POD - DP2593+DP2429+DP2433 <p>These documents outline in detail the steps that must be undertaken by service companies when connecting a premise to Chorus' fibre network.</p> <p>The documents outline methodologies and build processes.</p>		<p>Chorus will update the POD documents after the 2020 five year plan is approved.</p> <p>The draft assessment is retained for this requirement.</p>	
<p>Reasonableness of models</p>	<p>The use of a PxQ approach is reasonable for this category of capex. Chorus have a quantity model (the Connections model) that is used universally by the business and provides a consistent approach across expenditure areas so that the forecasts of all related capex/opex expenditure is internally consistent. The price component is also easily forecast (at a connection type level) due to the contractual arrangements between Chorus and its service companies.</p> <p>The model for the calculation of the change in mix of SDU connection types over time is an approximation and could be improved upon to derive a more robust forecast. For example, the change in mix of SDU connection types over time does not consider underlying populations of dwellings by type that have not been connected and the potential for saturation within an individual SDU connection type during RP1.</p> <p>The volume forecast for MDU and ROW extensions contains hard-coded values. While the stated methodology is reasonable, the model cannot be used to confirm the actual forecast aligns with the stated methodology.</p> <p>The approach for Fibre Access requires additional explanation and support. Chorus has documented that there are plans to develop a new PxQ model for Fibre Access that is more detailed.</p> <p>ONT:</p> <p style="padding-left: 20px;">The growth component is directly linked to the forecast for new connections. There is also a lifecycle replacement component based on age and trends in ONT failure rates.</p>	 MDU/ ROW volume forecast Fibre Access forecast	<p>The models have been improved, with hard-coded data removed and sources detailed. Additional documentation has been incorporated into the models, which has improved the transparency of the forecasts.</p> <p>Chorus has developed a new model for the Fibre Access category that includes documentation of the methodology used.</p> <p>The updates made by Chorus address the concerns raised in the Draft Assessment.</p>	

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	Hard-coded forecast volumes for the MDU and ROW forecast need to be replaced with workings. The model for Fibre Access requires additional explanation and support or to be replaced with a new model.			
Accuracy and reliability of data	The forecast change in mix over RP1 for SDUs contains an error in the calculation of Service Desk Costs. More detailed forecasting may be possible if Chorus had access to more data about premises that have not been connected. The data used as a basis of the forecast is accurate and reliable		Chorus has addressed the errors present in the Service Desk Costs calculation. The draft assessment is retained regarding the accuracy and reliability of all other data.	
Procurement approach	The majority of Standard Installations are undertaken by Chorus' service companies. The deliverability targets and unit costs are incorporated into the contracts between Chorus and each service company. Unit rates paid by Chorus for the same service differ between service companies and geographic regions and were subject to market tender processes. The procurement approach for Standard Installations is reasonable		The draft assessment is retained for this requirement.	
Consideration of historic investment	Historic investment is the basis of the starting point of the forecast. The forecast aligns with historic expenditure		The draft assessment is retained for this requirement.	
Consideration of options and alternative solutions	Chorus is obliged to connect customers to the fibre network. There are no reasonable alternative options that Chorus has not considered. Chorus can select between currently used GPON OLT cards and ONTs and new generation (but more expensive) XGSPON hardware. Chorus has opted to continue deploying GPON hardware while implementing a separate project to upgrade selectively where customers purchase a XGSPON product. This is covered by the XGSPON business case and modelling. Alternative options are not available.		The draft assessment is retained for this requirement.	
Relationship between proposed expenditure and quality outcomes	<input type="checkbox"/> Availability <input type="checkbox"/> Performance <input type="checkbox"/> Ordering <input checked="" type="checkbox"/> Provisioning <input type="checkbox"/> Switching <input type="checkbox"/> Faults <input type="checkbox"/> Customer service The construction of network extensions and the installation of the customer connection is necessary to enable the customer connection after the confirmation of the first order at a premise. It is expected that Chorus will have performance targets for the provisioning step during		The draft assessment is retained for this requirement.	

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	<p>RP1 that will require sufficient resources for the establishment of Standard Installations within the UFB1 and UFB2 areas.</p> <p>As the quality outcome targets for provisioning have not yet been established by the Commerce Commission, it cannot be determined whether the forecast unit costs (which determines the resources available to meet deliverability targets) are sufficient to meet the RP1 targets. As a placeholder, Chorus would be expected to continue delivering to current performance levels, in which case the current unit costs should be sufficient to continue delivering these outcomes.</p> <p>ONTs are necessary for Chorus to provision a service for a customer. Chorus must have available capacity to quickly provision services to new customers</p> <p>The proposed expenditure should enable Chorus to maintain existing quality outcomes for provisioning of new connections.</p>			
<p>Deliverability and feasibility of implementation</p>	<p>Chorus currently meets its service provisioning targets under existing connection volumes and prices. These targets are also included within the contracts Chorus has with its service companies.</p> <p>There is a low risk of deliverability and feasibility of the forecast expenditure as the volumes are lower than historic peaks during the UFB1 build phase. However, there is a moderate degree of uncertainty regarding the total volume of connection requests that Chorus will receive during RP1, which is at least in part dependent on the number of connections completed prior to the beginning of RP1. This uncertainty has been recognised by the Commerce Commission in the draft Capex IMs⁷ and it is expected that both fixed and variable connections capex forecasts will be included in the final determination for RP1. This Independent Verification does not cover the fixed + variable approach to connection volumes as this has not yet been incorporated by Chorus into the capex forecasts being verified.</p>	<p></p>	<p>The draft assessment is retained for this requirement.</p>	<p></p>

⁷ Fibre Input Methodologies: Draft decision – reasons paper, 19 November 2019, page 434, paragraph 3.1591

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	Low deliverability and feasibility of implementation risks.			
Uncertainty within the proposed expenditure	<p>There is a moderate level of uncertainty in the forecast volume for total connections during RP1. Connection volumes will be dependent on many factors, including the rate of uptake by premises passed by the network (faster uptake may result in more connections prior to RP1 reducing the pool of remaining premises to be connected during RP1) and overall uptake of fibre by premises passed (higher uptake will result in more connections to the fibre network).</p> <p>Due to a lack of available data from which to derive information about the likely connection type of premises passed but not yet connected and premises not yet passed, there is uncertainty as to the average unit cost of connections during RP1.</p> <p>Reasonable approaches have been taken to manage the uncertainty inherent in the forecast.</p>		The draft assessment is retained for this requirement.	
Extent to which a risk-based approach has been applied	<p>Risk-based forecasting methods have not been applied to the Standard Installations capex forecast.</p> <p>It is expected that the most significant source of uncertainty (total customer connection requests during RP1) will be managed by the Commerce Commission taking a fixed plus variable approach to Standard Installations during the determination as outlined in the draft Capex IMs.</p> <p>Although no risk-based approach has been taken, uncertainty of the forecast will be managed through the Commerce Commission's fixed + variable approach for connections expenditure.</p>		The draft assessment is retained for this requirement.	
Capex / opex dependency and trade-off and whole of lifecycle cost	<p>Construction of connection assets is capitalised. There is no capex-opex trade-off for this expenditure. The whole of lifecycle cost is determined by the planning and technical standards discussed above, which are derived from Chorus' contracts with Crown Infrastructure Partners (CIP)</p> <p>No capex/opex trade-off opportunities.</p>		The draft assessment is retained for this requirement.	

7.1.4 Final Assessment Conclusion

In our opinion, the methods and input assumptions used to forecast Standard Installations capital expenditure would result in a forecast that reflects the efficient costs that a prudent fibre network operator would incur to deliver regulated FFLAS at appropriate quality, during the upcoming regulatory period and over the longer term, having regard to good

telecommunications industry practice.

7.2 Standard Installations – IFRS 15 Customer Capex

IFRS 15 Customer Capex represents 8.22% of FFLAS Capex over RP1.

7.2.1 Description of capital expenditure program

The programme funds investment by Chorus to incentivise and provision customer connections to the fibre network. Incentives include cash incentives to RSPs and end users, modem credits. Provisioning costs include the costs incurred by Chorus to setup a customer, including truck-rolls and IT service desk support.

7.2.2 Forecast expenditure

NZ\$m real FY20 FFLAS only	RY16**	RY17**	RY18**	RY19**	FY20	FY21	FY22	FY23	FY24	RP1 Total
Draft Assessment Capex*			64.7	34.3	17.0	14.4	13.2	12.6	12.5	38.3
Final Assessment Capex	0.0	32.3	50.2	34.7	27.4	34.1	29.9	26.5	24.5	80.9

* Draft assessment capex is shown in financial years. Some allocations to this programme may have changed between the draft and final assessments.

**Historical expenditure RY16-RY19 is presented as unallocated expenditure (inclusive of non-FFLAS expenditure) at nominal prices

7.2.3 Assessment

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
Forecasting methodology	<p>Provisioning: From opex forecast [actual source and forecast methodology not clear] ❌</p> <p>Incentives: From opex forecast [actual source and forecast methodology not clear] ❌</p> <p>Capitalisation of the above opex is determined by Chorus' CAM. The CAM is out of scope of this review.</p> <p>It is unclear how the proposed forecast can be traced back to the opex forecast. Additional documentation is required to justify the methodology.</p>		<p>Chorus provided a model for customer retention capex and the source models referenced by it. One of the source models only relates to non-FFLAS expenditure and has not been included in the review.</p> <p>Some of the source models calculate both customer retention and non-customer retention costs and some opex costs. Only those costs eligible for IFRS15 are included in the customer retention capex aggregation.</p> <p>Onshore service desk: Price [labour rates model] ✅ x Quantity [forecast orders from PSM, estimates of time per task] ✅</p> <p>Offshore service desk: Price [current contract rates + FX + CPI] ✅ x Quantity [forecast orders from PSM, current call time per order, truck rolls from maintenance model] ✅</p> <p>Incentives: Base [FY21 bottom-up forecast] ✅ + Step [SME estimates] ✅ + Trend [included in step] ✅</p> <p>IT Provisioning: Capitalised Provisioning Costs ✅ x Percentage Customer Retention ✅</p>	

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
Key assumptions	<p>Not documented. Key assumptions are assumed to be contained within opex models, but traceability is difficult.</p> <p>Key assumptions are not documented.</p>		<p>The forecasting methodologies used in the models provided by Chorus are reasonable.</p> <p>Onshore service desk:</p> <ul style="list-style-type: none"> • Current percentage of orders managed onshore will not change • Estimates of work time per task are reasonable and have not changed since last reviewed and will not change in future. (Chorus notes that these same assumptions are used in the Labour Cost Model so cannot be changed in isolation). <p>Offshore service desk:</p> <ul style="list-style-type: none"> • Current percentage of orders managed offshore will not change • The contract with the offshore operator requires Chorus to [Chorus CI]. The model does consider the risk that [Chorus CI]. • [Chorus CI]. <p>Incentives:</p> <ul style="list-style-type: none"> • FY22 costs [Chorus CI] FY21 [Chorus CI] • [Chorus CI] over the following two years [Chorus CI] based on SME views • Some values are hard-coded into formulas. The source and in some cases intention of these inputs could not be confirmed. <p>IT Provisioning:</p> <ul style="list-style-type: none"> • The fibre customer retentions share of capitalised opex will rise over time as new connections growth slows and copper related shares decline • Other assumptions are captured in the Technology Opex review of the IFRS SD Recoveries model <p>The assumptions are reasonable for the service desk costs, but these make up a small percentage of customer retention capex.</p>	 Incentives

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
			Additional information should be provided for the Incentives step changes as the reasonableness of the reductions each year cannot be determined from the information provided.	
Planning and technical standards	We are not aware of any standards that apply to this programme. Not Applicable.		Chorus has added some documentation to the models but additional documentation of assumptions is still required in the incentives model. In written responses to the draft assessment, Chorus has documented the economic and commercial rationale of the customer incentives it provides. These include increasing consumer surplus and spreading fixed costs across a larger customer base. Additional documentation should be prepared for this expenditure. In particular, additional documentation of inputs into the incentives model is required. The response provided outlining the commercial and economic rationale of customer incentive expenditure should be developed into a formal document to be included in the submission.	
Reasonableness of models	The forecasts could not be traced back to a forecast model.		Onshore service desk: <ul style="list-style-type: none"> The model provided for review was reasonable and contained information about the methodology and sources of key assumptions. Offshore service desk: <ul style="list-style-type: none"> The model provided for review was reasonable and contained information about the methodology and sources of key assumptions. Incentives: <ul style="list-style-type: none"> Hard-coded assumptions are used in formulas without comments or links to sources IT Provisioning: <ul style="list-style-type: none"> This is the IFRS SD Recoveries model included in the Technology Opex review There are hard-coded and undocumented assumptions in the Incentives model.	 Incentives
Accuracy and reliability of data	The underlying data could not be determined. Data inputs need to be documented.		Input data into the models is from Chorus' main models (Labour Cost Model, Connections model, etc.) and sources are documented. The issues identified during the draft assessment have been addressed.	
Procurement approach	Provisioning: mostly outsourced to service companies and service desk providers Incentives: mostly in the form of subsidies/rebates paid to RSPs.		The draft assessment is retained for this requirement.	

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	The procurement approach is reasonable.			
Consideration of historic investment	It is unclear how historic investment has been incorporated into the forecast.		The models provided for this expenditure are largely based on current expenditure. Historical expenditure does not have a significant impact on the forecast as most volumes are driven by connections/orders, which are provided by PSM. Historic investment is not a useful predictor of this expenditure.	
Consideration of options and alternative solutions	There are no alternatives to provisioning costs as these must be incurred to meet obligations to connect customers to the fibre network. There are many alternative options available for incentivising customers to connect to the network. Chorus has trialled different approaches and is currently trialling direct cash incentives to customers. However, this testing does not appear to have been formally documented and analysis provided shows incentive costs are directed to maximise the resultant benefits. Chorus has trialled alternative options where they may be available.		Chorus provided a written response providing further background into the testing of alternative customer incentives. Chorus used sample/control group testing for some incentive offers. The data from this testing is not yet available but will be used to measure effectiveness of incentive offers and for refining future incentive offers. Chorus has had some difficulty attributing connections to incentives as Chorus has limited direct interaction with end-users. RSPs are in-between Chorus and the end-user and different RSPs apply different commercial strategies that complicate the assessment of incentive data. The draft assessment is retained for this requirement.	
Relationship between proposed expenditure and quality outcomes	<input type="checkbox"/> Availability <input type="checkbox"/> Performance <input checked="" type="checkbox"/> Ordering <input checked="" type="checkbox"/> Provisioning <input type="checkbox"/> Switching <input type="checkbox"/> Faults <input checked="" type="checkbox"/> Customer service Provisioning expenditure is necessary to provision services to new customers. This expenditure includes IT service desk support, which is a form of customer service. As the quality outcome targets for ordering, provisioning and customer service have not yet been established by the Commerce Commission, it cannot be determined whether the forecasts are sufficient to meet the RP1 targets. As a placeholder, Chorus would be expected to continue delivering to current performance levels, in which case the proposed expenditure, which is expected to maintain existing services, should be sufficient to continue delivering these outcomes. This proposed expenditure continues existing programmes and is expected to at least maintain existing quality outcomes.		The draft assessment is retained for this requirement.	
Deliverability and feasibility of implementation	The forecast is for declining expenditure, so deliverability risks are expected to be low. Low deliverability and feasibility risks.		The draft assessment is retained for this requirement.	

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
Uncertainty within the proposed expenditure	<p>This expenditure is closely tied to the forecast for new Standard Installations. As the connections forecast is uncertain due to a number of factors (see Standard Installations Capex section), this programme is also uncertain.</p> <p>Some of this expenditure is for incentive payments to encourage uptake of higher speed products. The volume of these incentives paid is dependent on underlying demand for the product and the size of the incentive to each customer. However, Chorus can be expected to meet the budgeted expenditure either through withdrawing incentives (if demand is too high) or increasing the individual incentive values (if demand is too low). Therefore, Chorus has a high level of control (and therefore certainty) over the expenditure.</p> <p>There is a high level of uncertainty for the provisioning component of this programme. However, this uncertainty is inherent in the programme and is not caused by Chorus' forecasting approach or other aspects of the procurement and delivery of this programme.</p>		The draft assessment is retained for this requirement.	
Extent to which a risk-based approach has been applied	<p>A risk-based approach has not been applied. The provisioning expenditure, which is most uncertain, may fall under the Commerce Commission's proposed fixed + variable approach for connections costs during RP1.</p> <p>Based on the assumption that the provisioning expenditure will be treated with fixed and variable components by the Commerce Commission a risk-based approach is not necessary.</p>		The draft assessment is retained for this requirement.	
Capex / opex dependency and trade-off and whole of lifecycle cost	<p>This review is limited to the capitalisation of certain opex items, which is an accounting requirement that is expected to be adopted by the Commerce Commission for the RP1 regulatory submission.</p> <p>Accounting standards require this expenditure be capitalised.</p>		The draft assessment is retained for this requirement.	

7.2.4 Final Assessment Conclusion

In our opinion, the methods and input assumptions used to forecast the Customer Retention capital expenditure would result in a forecast that reflects the efficient costs that a prudent fibre network operator would incur to deliver regulated FFLAS at appropriate quality, during the upcoming regulatory period and over the longer term, having regard to good telecommunications industry practice.

Some issues with documentation of inputs within the model for the incentives component of customer retention capex were identified.

7.3 Complex Installations

Complex Connections capex represents 3.02% of FFLAS Capex over RP1.

7.3.1 Description of capital expenditure program

The programme funds the connection of business customers and high cost residential customers to the Chorus fibre network. As these connections cost significantly more than Standard Installations, the customer may be required to make a contribution to the cost of the connection. Each connection is costed (and the amount payable by the customer calculated) individually based on the actual costs expected to be incurred to establish the connection.

Business Point-to-point (P2P) fibre connections are highly customisable and complex solutions tailored to specific business requirements. This programme includes designing these solutions, building lead-ins/network extensions and provisioning the connection. P2P lead ins cost more than the average NGA connection due to differences in the work required, and contractual differences with the respective service companies.

Customer Build High Cost Named Projects provide services to end customers beyond the end of existing reticulation (network does not reach them yet). This includes extending the network footprint and this cost is covered by the customer.

7.3.2 Forecast expenditure

NZ\$m real FY20 FFLAS only	RY16**	RY17**	RY18**	RY19**	RY20	RY21	RY22	RY23	RY24	RP1 Total
Draft Assessment Capex*	17.9	12.9	10.7	8.0	7.0	7.0	6.9	6.4	6.2	19.5
Final Assessment Capex***	15.7	12.0	9.2	9.2	8.8	6.7	11.5	9.7	8.6	29.7

* Draft assessment capex is shown in financial years. Some allocations to this programme may have changed between the draft and final assessments.

** Historical expenditure RY16-RY19 is presented as unallocated expenditure (inclusive of non-FFLAS expenditure) at nominal prices

***Capex net of customer contributions

7.3.3 Assessment

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
Forecasting methodology	Business Fibre: Price [historical average] ✓ x Quantity [Connections Model] ✓ Customer Build High Cost: Base [not stated] ✗ Step [not stated] ✗ Trend [not stated] ✗ The methodology used for Customer Build High Cost projects has not been documented.	Customer Build High Cost	Customer Build High Cost: Price [FY20 run rate] ✓ x Quantity [FY20 run rate] ✓ Chorus has documented a methodology inside a spreadsheet model for Customer Build High Cost projects. The draft assessment is retained for the Business Fibre activities of Complex Installations.	
Key assumptions	Business Fibre:	Docume	Business Fibre:	

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	<ul style="list-style-type: none"> Hard-coded inputs, sources not clear. Process not documented <p>Customer Build High Cost:</p> <ul style="list-style-type: none"> Sources and methodology not documented. <p>The assumptions underlying the forecasts require documenting. The reasonableness cannot be determined for assumptions that are not documented or do not have sources provided.</p> <p>The documentation and modelling also needs to make clear how customer contributions have been accounted for.</p>	<p>ntation</p>	<ul style="list-style-type: none"> Source data incorporated into spreadsheet model or sources stated Historic project cost data added to show calculation of prices Relevant Connections model outputs that drive volume forecasts now incorporated into the model spreadsheet <p>Customer Build High Cost:</p> <ul style="list-style-type: none"> Historic project cost data added to show calculation of prices Projects used for run-rate volume forecast included in model <p>Chorus has clarified that all customer contributions are excluded from the individual capital expenditure forecasts, which are prepared in gross terms (aligned to accounting treatment). Capital contributions are assessed in separate forecasts. The capex aggregation model accounts for the netting off of customer contributions and the final forecasts used for the expenditure proposal are net of customer contributions.</p> <p>The assumptions and methodology are now clearly articulated in the models and the treatment of customer contributions has been clarified.</p>	
<p>Planning and technical standards and other guiding documents</p>	<p>Planning and technical standards reviewed:</p> <ul style="list-style-type: none"> DP 2018 business fibre connections DP 2586 customer build high cost named project <p>Chorus is implementing a financial modelling template (tier 2 model) for each Decision Packet within this programme. This includes a formal review process and documentation of methodology and sources of inputs and assumptions. This information is also included in a standardised Portfolio Overview Document (POD). Both the models and the PODs are in the early stages of development and initial internal reviews by Chorus have in most cases already identified the missing information that has not yet been entered. Additional work is required to bring these up to a suitable level of quality and sophistication, but the underlying process is robust.</p> <p>No network architecture or other technical standards were reviewed for this programme.</p> <p>Documentation is started but incomplete.</p>	<p> Docu- mentation incomple- te</p>	<p>Chorus is planning to update the DP documents after the 2020 five year plan is approved. Chorus has indicated that it will incorporate the feedback contained in the draft assessment with respect to all DP documents.</p> <p>The draft assessment is retained for this requirement.</p>	<p> Docu- mentation incomple- te</p>
<p>Reasonableness of models</p>	<p>Business Fibre: The use of a PxQ approach is reasonable for this category of capex. Chorus have a quantity model (the S&OP model) that is used across the business and provides a consistent approach</p>	<p></p>	<p>Business Fibre: The hard-coded data in the model has been removed or had sources added. The changes have also confirmed the methodology used in the model aligns with other documentation.</p>	<p></p>

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	<p>across expenditure areas so that the forecasts of all related capex/opex expenditure is internally consistent. The price component is also easily forecast (at a connection type level) due to the contractual arrangements between Chorus and its service companies. However, the model reviewed had significant amounts of hard-coded inputs that were not documented, and it is not clear if those inputs align with the stated methodology.</p> <p>Hard coded values in models need to be linked or sources documented.</p> <p>The base-step-trend approach for Customer Build High Cost requires additional explanation and support.</p> <p>Customer Build High Cost forecast model needs significant work.</p>	<p>Hard-coded inputs Customer Build High Cost Model</p>	<p>Issues raised in the draft assessment have been addressed.</p> <p>Customer Build High Cost: A model has been developed for the Customer Build High Cost category that provides the necessary transparency of how the forecast is calculated. The methodology used appears reasonable. The use of the FY20 run-rate to calculate the forecast is conservative as the expenditure during FY20 is lower than in earlier years that may have alternatively been used.</p> <p>Chorus updated the forecast to include additional RCG (mobile backhaul), which is part of Customer Build High Cost, that was excluded from the initial forecast. The exclusion was due to an expectation that it would be made up by capital contributions and only the net amount was included in the earlier forecast. The capex is cancelled out by customer contributions so the inclusion does not have a net effect on the overall forecast.</p> <p>Issues raised in the draft assessment have been addressed.</p>	
<p>Accuracy and reliability of data</p>	<p>Historic cost data sourced from SAP records is reliable but the process for adjusting the raw data to obtain the 'SAP load' amount is not documented in the model. The SAP data also does not appear to be used within the forecast. Other inputs are not documented.</p> <p>Accuracy and reliability of input data unable to be determined due to lack of documentation and use of hard-coded inputs.</p>	<p> Input data hard coded and not documented</p>	<p>The calculation of average historic cost is now done within the model. Hard-coded data has been removed and external inputs now have sources listed. The 'SAP load' value is no longer a feature of the calculation.</p> <p>Improvements to documentation within the model have addressed the issues raised in the draft assessment.</p>	<p></p>
<p>Procurement approach</p>	<p>All expenditure in this programme requires approval via Chorus' Capital Expenditure Governance process. This includes development of business cases followed by approval from the Chorus Capital Council (CCC) before a project can proceed.</p> <p>Complex Installations are undertaken by Chorus' service companies. The deliverability targets and service costs are incorporated into the contracts between Chorus and each service company. Unit rates for services that make up complex installations paid by Chorus differ between service companies and geographic regions and were subject to market tender processes. Actual unit cost per POA connection will be dependent on the complexity of the connection and the length of network extensions required.</p> <p>The procurement approach is reasonable. The CCC process encourages efficient selection of expenditure projects. Competitive tendering of work to service companies results in efficient pricing.</p>	<p></p>	<p>The draft assessment is retained for this requirement.</p>	<p></p>

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
Consideration of historic investment	<p>Historic investment is the basis of the starting point of the forecast.</p> <p>The forecasting methodologies result in a forecast that is aligned to historic investment in this programme.</p>		The draft assessment is retained for this requirement.	
Consideration of options and alternative solutions	<p>Feasible alternative options to this investment are not expected to be available. Chorus is obliged to connect customers to its network. The additional costs incurred by Complex Installations are to be covered by the customer and the assessment of options for the establishment of each connection is ultimately the responsibility of the customer that will be paying for any additional costs.</p> <p>Alternative options do not apply to Chorus.</p>		The draft assessment is retained for this requirement.	
Relationship between proposed expenditure and quality outcomes	<p><input type="checkbox"/> Availability <input type="checkbox"/> Performance <input type="checkbox"/> Ordering <input checked="" type="checkbox"/> Provisioning <input type="checkbox"/> Switching <input type="checkbox"/> Faults <input type="checkbox"/> Customer service</p> <p>The construction of network extensions and the installation of the customer connection is necessary to enable the customer connection after the confirmation of the order at a premise that requires a PoA connection type. It is expected that Chorus will have performance targets for the provisioning step during RP1 that will require sufficient resources for the establishment of Standard Installations within the UFB1 and UFB2 areas, but it is not clear what targets will be set, if any, for Complex Installations.</p> <p>As the quality outcome targets for provisioning have not yet been established by the Commerce Commission, it cannot be determined whether the forecast expenditure will be sufficient to meet the RP1 targets.</p> <p>It is unclear if quality outcome targets will apply to Complex Installations.</p>		The draft assessment is retained for this requirement.	
Deliverability and feasibility of implementation	<p>There is a low risk of deliverability and feasibility of the forecast expenditure as the volumes are significantly lower than historic peaks (FY15). However, there is a moderate degree of uncertainty regarding the total volume of connection requests that Chorus will receive during RP1 and the effort required for each connection.</p> <p>Low deliverability and feasibility of implementation risk as overall connections expenditure is declining due to the completion of the UFB rollout freeing up resources both within Chorus and at service companies to complete this work.</p>		The draft assessment is retained for this requirement.	

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
Uncertainty within the proposed expenditure	<p>There is a moderate level of uncertainty in the forecast expenditure for Complex Installations during RP1. In particular, the Customer Build High Cost Named Project connection types have historically been volatile. Business fibre connections are more stable and show a strong declining trend over time. Business fibre connections are also higher volume, which reduces the risk of a few very high cost projects resulting in a significant increase in total program cost.</p> <p>The uncertainty for Chorus' net capex due to Complex Installations is low. Complex Installations have large customer contributions to the cost incurred by Chorus, so the net expenditure incurred by Chorus is low relative to the total capex incurred.</p> <p>As Complex Installations are mostly funded by the customer the uncertainty of the capex forecast, as relevant to Chorus' maximum allowable revenue during RP1, is low.</p>		The draft assessment is retained for this requirement.	
Extent to which a risk-based approach has been applied	<p>Risk-based forecasting methods have not been applied to the Complex Installations capex forecast.</p> <p>A risk-based approach has not been applied. Given the uncertainty in the number and complexity of projects that may occur during RP1, a risk-based approach that includes a range of possible scenarios to present a range of probable volumes over time may improve confidence in the forecast.</p>	 A risk-based approach has not been applied	<p>Chorus has indicated it will investigate whether appropriate risk-based forecasting approaches can be implemented for future planning cycles.</p> <p>The draft assessment is retained for this requirement.</p>	 A risk-based approach has not been applied
Capex / opex dependency and trade-off and whole of lifecycle cost	<p>Construction of connection assets is capitalised. There is no capex-opex trade-off for this expenditure. The whole of lifecycle cost is determined by the planning and technical standards discussed above, which are derived from Chorus' contracts with CIP.</p> <p>No capex/opex trade-off opportunities.</p>		The draft assessment is retained for this requirement.	

7.3.4 Final Assessment Conclusion

In our opinion, the methods and input assumptions used to forecast the Complex Installations capital expenditure would result in a forecast that reflects the efficient costs that a prudent fibre network operator would incur to deliver regulated FFLAS at appropriate quality, during the upcoming regulatory period and over the longer term, having regard to good telecommunications industry practice.

8 IT AND SUPPORT

IT and Support capex comprises investment in non-network IT systems. Investment in IT Capex is forecast for the following streams:

- **Business IT – Customer Experience & Optimisation:** This funds Business IT solutions required to improve the experience of customers and to optimise Chorus' operations to improve efficiency and productivity
- **Business IT – Lifecycle & Compliance:** This funds the upgrade, maintenance and replacement of Business IT solutions
- **Corporate:** This funds corporate IT infrastructure and corporate IT innovation and optimisation
- **Network & Customer IT:** This funds development of new fibre service products for Chorus' customers and Chorus' Asset Management system

IT and Support capex represents 15.37% of FFLAS Capex over RP1.

Note: Chorus' submission includes a single Business IT category that covers both Customer Experience & Optimisation and Lifecycle & Compliance. For the independent verification, Business IT has been split into two sub-categories that reflect the category structure at the time of the Draft Assessment.

8.1 Business IT – Customer experience and optimisation

Business IT – Customer Experience and Chorus Optimisation capex represents 1.30% of FFLAS Capex over RP1.

8.1.1 Description of capital expenditure program

The programme funds the IT solutions required to improve the experience of customers and to optimise Chorus' operations to improve efficiency and productivity. The individual projects that make up this programme are expected to be self-funding either through avoiding other capital expenditure, reducing operating expenditure or provide a net benefit to customers through improvements to customer experience that customers are willing to pay for.

Chorus does not define specific customer experience and optimisation initiatives in the forecast. Instead, Chorus estimates the potential quantum of NPV positive investments that may be available subject to deliverability and other business constraints.

8.1.2 Forecast expenditure

NZ\$m real FY20 FFLAS only	RY16**	RY17**	RY18**	RY19**	RY20	RY21	RY22	RY23	RY24	RP1 Total
Draft Assessment Capex*	1.0	2.4	2.6	6.8	3.7	4.5	6.6	5.6	5.0	17.2
Final Assessment Capex	1.7	2.1	3.0	3.4	2.2	2.5	3.0	4.1	5.7	12.8

* Draft assessment capex is shown in financial years. Some allocations to this programme may have changed between the draft and final assessments.

** Historical expenditure RY16-RY19 is presented as unallocated expenditure (inclusive of non-FFLAS expenditure) at nominal prices

8.1.3 Assessment

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
Forecasting methodology	<p>Optimisation: Estimate of available NPV positive investments with a budget/deliverability constraint applied. ✓</p> <p>The forecast expenditure is expected to be applied primarily to optimisation projects with few or no customer experience projects expected.</p> <p>The forecasting approach is reasonable subject to the risk of under delivery being held by Chorus and not customers (via the inclusion of a negative opex step change)</p>		<p>The draft assessment is retained for this requirement.</p>	
Key assumptions	<ul style="list-style-type: none"> Sufficient NPV positive projects will be available during RP1. Most benefits will be realised as reductions in opex and capex across the business, with some direct revenue benefits (via ARPU). Some value will be attributed to RSP, and some benefit will be attributed to Consumers. The relative mix of these value pools will be highlighted in accompanying documentation for RAB submission, and in detailed as part of any business case, applying the same model that Transpower have implemented for this type of expenditure. <p>The key assumption is reasonable subject to the risk of under delivery being held by Chorus and not customers (via the inclusion of a negative opex step change)</p>		<p>The draft assessment is retained for this requirement.</p>	
Planning and technical standards	<p>Planning and technical standards reviewed:</p> <ul style="list-style-type: none"> IT Asset Strategy Customer Experience and Optimisation POD <p>The documents outline the intent of the expenditure but do not provide a link to how benefits will be incorporated into Chorus' wider regulatory submission, in particular opex.</p>	 <p>Benefits, link to opex</p>	<p>Chorus has added analysis of the quantum of benefits that would be necessary to result in the optimisation expenditure being NPV positive. This is broken into three categories of capex savings, opex savings and customer side savings/benefits.</p> <p>The updates do not address which of the three benefit types (or combination of) are proposed to be included in the RP1 submission. Chorus has not yet clearly identified step changes elsewhere in the submission but there is an expectation that the savings already incorporated into the opex submission include benefits associated with the optimisation investment.</p> <p>The additional information and analysis in the Customer Experience and Optimisation POD is useful but does not address the need for there to be a direct line-of-sight to where the benefits (cost savings) are incorporated elsewhere in the RP1 submission. Chorus should incorporate this information into the POD if/when any step change is incorporated into the opex forecast or provide a clear link</p>	 <p>Link to opex</p>

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
			between the programme and savings already incorporated into the opex forecasts.	
Reasonableness of models	<p>There is no underlying model for the forecast.</p> <p>It is expected that the projects will deliver opex savings that will be included as a negative step change in the opex submission.</p> <p>Chorus must calculate the benefits that are needed for the programme to be economic (positive NPV) and incorporate these benefits into the submission. If benefits are opex, a negative step change must be included in the opex submission and this should be detailed and modelled within the optimisation submission. If non-financial or indirect financial benefits are expected, these must be proven through modelling.</p>	 Benefits modelling	<p>Chorus has added analysis of the quantum of benefits that would be necessary to result in the optimisation expenditure being NPV positive. This is broken into three categories of capex savings, opex savings and customer side savings/benefits.</p> <p>Chorus has followed the recommendation in the draft assessment to model the minimum benefits that would be required for the expenditure to be NPV positive.</p> <p>At the time of the final assessment Chorus has not included a reduction in expenditure in other parts of the RP1 submission. If/when an adjustment is made, it should be linked to the minimum benefits that have been calculated and a direct line-of-sight should be documented.</p>	 Link to opex
Accuracy and reliability of data	No input data used.		The draft assessment is retained for this requirement.	
Procurement approach	<p>All expenditure in this programme requires approval via Chorus' Capital Expenditure Governance process. This includes development of business cases followed by approval from the Chorus Capital Council (CCC) before a project can proceed. Only NPV positive projects will proceed, ensuring that customers benefit from optimisation investments</p> <p>The procurement approach is reasonable. The CCC process encourages efficient selection of optimisation projects.</p>		The draft assessment is retained for this requirement.	
Consideration of historic investment	<p>The forecast is significantly higher than historical investment in this programme. However, total forecast expenditure is small relative to total FFLAS capex, so deliverability risk is low.</p> <p>Due to previous investment and resourcing constraints at Chorus due to the focus on the UFB rollout it is reasonable to expect that there is a backlog of optimisation opportunities that supports an increase in expenditure in this area.</p> <p>The increase over historic investment in this programme is justified and is unlikely to result in deliverability risks.</p>		The draft assessment is retained for this requirement.	
Consideration of options and	There are no alternative options except to not invest in this programme. The individual projects have not yet been determined so alternative options for these are not yet able to be reviewed.		The draft assessment is retained for this requirement.	

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
alternative solutions	<p>Chorus is expected to be required or incentivised to invest in optimisation to reduce costs and lower product costs over the medium to long term.</p> <p>There are no alternative options that meet the requirement to invest in improving business productivity.</p>			
Relationship between proposed expenditure and quality outcomes	<p><input checked="" type="checkbox"/> Availability <input checked="" type="checkbox"/> Performance <input checked="" type="checkbox"/> Ordering <input checked="" type="checkbox"/> Provisioning <input checked="" type="checkbox"/> Switching <input checked="" type="checkbox"/> Faults <input checked="" type="checkbox"/> Customer service</p> <p>Customer experience projects will directly improve customer service outcomes. Business optimisation projects can improve all quality outcomes depending on the targeted business process being optimised. The projects may also enable Chorus to maintain existing quality outcomes at lower cost.</p> <p>The regulatory regime only requires Chorus to meet quality targets. If the expenditure would result in an exceedance (or further exceedance) of the quality targets this should only be as a by-product of other benefits from the programme, such as reduced opex.</p> <p>The forecast expenditure is expected to increase Chorus' quality outcomes. However, the primary reason for this expenditure is to improve productivity and reduce opex.</p>		The draft assessment is retained for this requirement.	
Deliverability and feasibility of implementation	<p>Subject to an opex step change being included to reduce the opex collected by Chorus during RP1, deliverability risks will be held by Chorus, not by customers, for the implementation of sufficient NPV positive optimisation projects to deliver the targeted savings.</p> <p>Deliverability risks will be borne by Chorus, not customers (via the expected inclusion of a negative opex step change).</p>		The draft assessment is retained for this requirement.	
Uncertainty within the proposed expenditure	<p>There is a high degree of uncertainty as specific optimisation projects have not yet been identified. However, Chorus has shown a successful track record of delivering positive NPV optimisation projects, albeit as a much smaller programme than that proposed during RP1.</p> <p>This programme is inherently uncertain due to the need to identify and successfully execute optimisation projects. High level modelling of opportunities and efficiency benchmarking against national and international peers may help to support the proposal.</p>	 Actual optimisation opportunities not known	Chorus has taken the recommendations in the draft assessment on notice. The draft assessment is retained for this requirement.	 Actual optimisation opportunities not known

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
Extent to which a risk-based approach has been applied	A risk-based approach has not been applied. However, the risks will be held by Chorus (subject to an opex step change being included for forecast optimisation savings) and not by customers Risk borne by Chorus (via the expected inclusion of a negative opex step change) so reasonable not to require risk-based modelling in the submission (although it may be useful for internal purposes).		The draft assessment is retained for this requirement.	
Capex / opex dependency and trade-off and whole of lifecycle cost	This programme is to take advantage of capex/opex trade-off opportunities that may existing within the IT space during RP1. Capex/opex trade-off is a key driver of this expenditure.		The draft assessment is retained for this requirement.	

8.1.4 Final Assessment Conclusion

In our opinion, the methods and input assumptions used to forecast the Customer Experience and Chorus Optimisation capital expenditure would result in a forecast that reflects the efficient costs that a prudent fibre network operator would incur to deliver regulated FFLAS at appropriate quality, during the upcoming regulatory period and over the longer term, having regard to good telecommunications industry practice.

In this assessment we note the need for the benefits from this programme to be passed on to Chorus' customers. This could be in the form of a (negative) step-change in opex, a capex benefit (reduction in other capex programmes) or a customer benefit (such as reduced (non-Chorus) costs). At the time of the final assessment, a clear link to an opex step-change or other benefit had not been evidenced. As a placeholder we have withheld verification of \$5m of the opex forecast, which is equivalent to the opex reduction required for Chorus' customers to be guaranteed a benefit from this programme. The Commission should ensure that either customer benefits are identified and are reasonable and/or an appropriate negative step change is applied (or has already been incorporated into) the opex submission before approving the Customer Experience and Chorus Optimisation capex.

8.2 Business IT – Lifecycle and compliance

Business IT – Lifecycle and Compliance capex represents 2.00% of FFLAS Capex over RP1.

8.2.1 Description of capital expenditure program

The programme funds the upgrade, maintenance and replacement of IT solutions required to ensure all systems remain supported by vendors and are fit for purpose and investment in new or upgraded systems to meet regulatory compliance requirements. The lifecycle projects are recurrent on 1-5 year timeframes and are forecastable with a high level of certainty. Most compliance requirements are known with a high degree of certainty due to the long timeframes usually applied to the process of changing regulatory requirements. However, some compliance requirements that may be introduced during RP1 are not yet, and cannot be, known today.

Chorus have defined 14 IT domains that cover the programme. The four most significant are:

1. Enterprise Applications
2. IT Infrastructure
3. Physical Inventory Management
4. Service Order Management

8.2.2 Forecast expenditure

NZ\$m real FY20 FFLAS only	RY16**	RY17**	RY18**	RY19**	RY20	RY21	RY22	RY23	RY24	RP1 Total
Draft Assessment Capex*	31.4	36.1	40.5	35.2	10.7	10.3	12.5	13.8	14.3	40.6
Final Assessment Capex	3.9	6.4	12.2	16.2	9.7	12.3	6.2	8.4	5.2	19.7

* Draft assessment capex is shown in financial years. Some allocations to this programme may have changed between the draft and final assessments.

** Historical expenditure RY16-RY19 is presented as unallocated expenditure (inclusive of non-FFLAS expenditure) at nominal prices

8.2.3 Assessment

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
Forecasting methodology	<p>Recurrent expenditure: Price [last update cost adjusted for special factors, average if historic not available]  x Quantity [product lifecycle] </p> <p>Compliance: annual allowance [not documented] </p> <p>All forecasts are at a company level and standard FFLAS allocation factors are applied.</p> <p>The compliance expenditure is not well documented, and a base-step-trend approach may be more appropriate.</p>	<p></p> <p>Compliance</p>	<p>All expenditure: Price [pricing model based on delivered projects]  x Quantity [identified projects] </p> <p>Chorus has developed a project cost estimation model which is applied to the identified projects that will be required during RP1.</p>	<p></p>

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
Key assumptions	<ul style="list-style-type: none"> Only very minor systems are allowed to run unsupported. Most replacement/upgrades in this program are driven by vendor support or are for security patching of systems. Historical expenditure is a reasonable indicator of future project costs. <p>The key assumptions are reasonable.</p>		<p>The draft assessment is retained for this requirement.</p>	
Planning and technical standards	<p>Planning and technical standards reviewed:</p> <ul style="list-style-type: none"> IT Lifecycle and Compliance POD ITD-12 - Service Order Management ITD-11 - Physical Inventory Management ITD-08 - IT Infrastructure ITD-06 - Enterprise Applications IT Asset Strategy IT Lifecycle capex 5YP dataset <p>Documents provide high level of detail of the programme.</p>		<p>Chorus has updated the IT Asset Strategy and IT Lifecycle and Compliance POD to include additional information in response to the issues raised in the draft assessment across all requirement categories.</p> <p>The draft assessment is retained for this requirement.</p>	
Reasonableness of models	<p>The underlying models for this programme were not reviewed. The review is based on the methodologies documented in the planning and technical standards provided.</p> <p>Bottom-up approach driven by vendor support of systems is a reasonable approach for this programme.</p> <p><i>Recurrent expenditure:</i> the forecast is a bottom-up assessment of standard product lifecycles and vendor support windows. Where same system has previously been upgraded/replaced, Chorus uses the same cost adjusted for issues in the past projects. Otherwise, an average project cost is used based on similar projects.</p> <p>The recurrent expenditure model is reasonable.</p> <p><i>Compliance:</i> annual allowance is applied for compliance updates to IT systems and exit costs from legacy systems. No allowances are included for large once-off compliance projects during RP1.</p> <p>The model used to calculate compliance expenditure is not documented. The basis for the forecast is not supported. Chorus should develop a model that includes historic expenditure on compliance, trends in compliance obligations and assessment of</p>	 Compliance Major projects	<p>Chorus has developed a new initiative/project pricing model that is being applied to all IT Lifecycle and Compliance initiatives/projects. The previous methods have been retained for identifying projects that will be required during RP1. The model is then used to determine the cost of each project based on a set of parameters that are known to affect the cost of delivering a project. The model is calibrated against delivered projects that have known costs, so the model is in effect a sophisticated way to apply historical average project costs.</p> <p>Chorus will calculate detailed forecasts for any project over \$3m. There are no projects that meet this criteria planned for RP1.</p> <p>Following an extension to the vendor support period for Chorus' SAP implementation, the SAP upgrade project has been removed from the RP1 forecast.</p> <p>The issues raised in the draft assessment have been addressed.</p>	

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	<p>whether major compliance obligations that could occur during RP1 would meet the Individual Project threshold and therefore could be treated separately.</p> <p>There are some significant individual projects, such as the SAP S/4 HANA upgrade, that are significant in size but are represented only by placeholder values. Individual business cases should be prepared for these. In the SAP case, there are multiple options available, such as continued use of the current SAP ERP with third party support, a basic 'technical' upgrade and coinciding the upgrade with business process changes through use of additional/new SAP modules and products.</p> <p>Additional modelling is required for major replacement/upgrade projects.</p>			
<p>Accuracy and reliability of data</p>	<p>Due to the recurrent nature of the programme and the large volume of small projects the accuracy and reliability of the data used to develop the forecast is high. Costs are based on previous upgrade costs adjusted for particular project difficulties. Although at an individual project level this approach is not likely to be accurate, over a large number of small projects the average cost is expected to be reasonably accurate.</p> <p>The exception is for major IT lifecycle projects, such as the SAP upgrade to S/4HANA, which is a large once-off system upgrade. Detailed business cases with cost assumptions and options analysis would be expected for such large projects that occur infrequently.</p> <p>Cost of major IT updates/upgrades are difficult to determine, and Chorus appears to be using placeholder values that may bear little resemblance to actual cost.</p>	<p> Major projects</p>	<p>Chorus has developed a new model that better estimates project costs using average costs for already delivered projects with similar characteristics. The SAP upgrade project is no longer planned to occur during RP1.</p> <p>The issues identified during the draft assessment have been addressed.</p>	<p></p>
<p>Procurement approach</p>	<p>All expenditure in this programme requires approval via Chorus' Capital Expenditure Governance process. This includes development of business cases for larger projects followed by approval from the Chorus Capital Council (CCC) before a project can proceed.</p> <p>The procurement approach is reasonable. The CCC process encourages efficient selection of IT lifecycle and compliance options.</p>	<p></p>	<p>The draft assessment is retained for this requirement.</p>	<p></p>
<p>Consideration of historic investment</p>	<p>Historic investment is a key driver of lifecycle replacements. As future compliance obligations are not yet known historic investment is used as a guide.</p>	<p></p>	<p>The draft assessment is retained for this requirement.</p>	<p></p>

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	<p>Total expenditure on lifecycle and compliance across Chorus (i.e. including non-FFLAS) is forecast to decrease significantly compared to historic and current expenditure levels.</p> <p>Historic investment is incorporated into the forecast.</p>			
<p>Consideration of options and alternative solutions</p>	<p>There are no alternative options to this programme. However, there may be alternative options for individual IT applications, such as upgrade, replace with another vendor or run unsupported, but due to the small size of the individual programs this level of assessment is not expected for the majority of the projects. More projects will have business cases prepared when the investment is due to occur but not multiple years beforehand.</p> <p>There are a number of large once-off IT system replacements/major upgrades forecast during RP1. Full business cases with options analysis should be developed for these to be included in the regulatory submission. These business cases should include at a minimum alternative options for the timing of the upgrade.</p> <p>Individual business cases with options analysis are required for large projects within Lifecycle and Compliance.</p>	<p> Business cases for large projects</p>	<p>The projects have been revised so there are no longer any large projects forecast to occur during RP1. The SAP upgrade will occur after RP1 and another large project has been clarified as being non-FFLAS.</p> <p>Chorus' new forecasting approach requires individual forecasts for projects with a value greater than \$3m.</p> <p>The issues identified during the draft assessment no longer apply.</p>	<p></p>
<p>Relationship between proposed expenditure and quality outcomes</p>	<p><input checked="" type="checkbox"/> Availability <input checked="" type="checkbox"/> Performance <input checked="" type="checkbox"/> Ordering <input checked="" type="checkbox"/> Provisioning <input checked="" type="checkbox"/> Switching <input checked="" type="checkbox"/> Faults <input checked="" type="checkbox"/> Customer service</p> <p>Lifecycle and compliance covers all IT systems and therefore all quality outcomes are dependent on continued investment in this programme.</p> <p>Continuing to lifecycle IT systems will contribute to maintaining current service levels and quality outcomes.</p>	<p></p>	<p>The draft assessment is retained for this requirement.</p>	<p></p>
<p>Deliverability and feasibility of implementation</p>	<p>The expenditure at a company level on IT Lifecycle and Compliance (inclusive of copper and non-FFLAS expenditure) is forecast to be lower than the historical average and therefore deliverability is not a concern.</p> <p>Low deliverability and feasibility of implementation risk.</p>	<p></p>	<p>The draft assessment is retained for this requirement.</p>	<p></p>
<p>Uncertainty within the proposed expenditure</p>	<p>The lifecycle component has a high degree of certainty due to its recurrent nature. Large less frequent recurrent projects, such as a major SAP update, are less certain. Compliance expenditure has high uncertainty as it is dependent on government and regulator actions.</p> <p>As the majority of the expenditure is recurrent lifecycle the overall programme has a low-modest level of uncertainty. Additional modelling and data analysis is required to support the less certain</p>	<p> Low frequency lifecycle projects</p>	<p>The SAP upgrade project has been removed from the RP1 forecast.</p> <p>The removal of the SAP upgrade project has reduced the level of uncertainty for this programme.</p>	<p></p>

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	aspects of the programme (see reasonableness of models section above).	Compliance		
Extent to which a risk-based approach has been applied	<p>A risk-based approach has not been applied.</p> <p>Risk-based approaches may be reasonable for some aspects of the recurrent lifecycle component and major projects where options may be present. Compliance requirements are not optional and must be met so risk-based approaches only apply to risk modelling of the uncertainty of new compliance requirements. Risk-based models could quantify the reduction in risks of a failure (including by cyber-attack) of an IT system by investing in an upgrade and compare this to the cost of the proposed investment.</p>	 Not applied	The draft assessment is retained for this requirement.	 Not applied
Capex / opex dependency and trade-off and whole of lifecycle cost	<p>There may be capex/opex trade-off opportunities when life cycle replacements of software coincide with availability of cloud and SaaS options. These do not appear to have been incorporated into Chorus' forecasting.</p> <p>Due to the close relationship between IT capex and opex the interaction of these components within the forecast needs to be documented in more detail and through modelling.</p>	 Not documented	<p>Chorus has updated the IT Strategy to show that capex and opex options for IT are being considered. This is largely focussed on ensuring cloud options are being considered when replacing IT assets.</p> <p>Chorus has incorporated capex and opex consideration more deeply in its IT strategy. This has not directly affected the forecast for RP1 but may influence investment decisions during the period.</p>	

8.2.4 Final Assessment Conclusion

In our opinion, the methods and input assumptions used to forecast the IT Lifecycle and Compliance capital expenditure would result in a forecast that reflects the efficient costs that a prudent fibre network operator would incur to deliver regulated FFLAS at appropriate quality, during the upcoming regulatory period and over the longer term, having regard to good telecommunications industry practice.

8.3 Corporate

Corporate capex represents 4.28% of FFLAS Capex over RP1.

8.3.1 Description of capital expenditure program

The programme funds corporate innovation and optimisation projects and corporate property and building costs. This includes:

- Innovation
- Optimisation (CNO FTE reduction adjustment)
- Corporate IT appliances (office equipment, phones, teleconference facilities and other similar items)

The majority of the investment in this category was not included in the draft assessment. The forecast related to Corporate IT appliances was included in the draft assessment as part of what is in the Final Assessment categorised as Site Sustain capex.

8.3.2 Forecast expenditure

NZ\$m real FY20 FFLAS only	RY16**	RY17**	RY18**	RY19**	RY20	RY21	RY22	RY23	RY24	RP1 Total
Draft Assessment Capex	1.3	4.4	2.4	1.7	0.2	0.2	0.2	0.6	0.6	1.4
Final Assessment Capex	2.9	3.4	2.6	1.6	0.3	0.6	13.4	14.3	14.4	42.1

* Draft assessment capex is shown in financial years. Some allocations to this programme may have changed between the draft and final assessments.

** Historical expenditure RY16-RY19 is presented as unallocated expenditure (inclusive of non-FFLAS expenditure) at nominal prices

8.3.3 Assessment

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
Forecasting methodology			<p>Innovation: top down overlay from 5 year plan ✘</p> <p>There was no forecasting methodology provided for innovation capex. However, Chorus intends this allowance to be ring-fenced and will make it a focus area for the commission. The reasonableness of this approach will depend on the controls that limit how Chorus may use this allowance.</p> <p>Optimisation (adjustment to CNO FTE reductions): Price [labour costs] ✔ x quantity [FTE reduction moderation] ✔</p> <p>The model includes a breakdown of the sources of the change to CNO FTE.</p> <p>Other: mixed, Price x Quantity, NPV business case, estimate (where historic not available) ✔</p>	<p>🚩</p> <p>Forecast methodology not provided</p>

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
			<p>The other expenditures are small relative to innovation capex. The forecasting methodology for these are reasonable.</p>	
Key assumptions			<p>Key assumptions were not provided for innovation capex. However, Chorus intends this allowance to be ring-fenced and will make it a focus area for the commission.</p> <p>Optimisation:</p> <ul style="list-style-type: none"> Increased effort from field and service desk resource to migrate late adopters to fibre than previously allowed for New products not previously anticipated and refined volume assumptions for business products and network migration volumes A higher level of change than previously anticipated. On review, some more aggressive assumptions required moderation (e.g. level of reduction in customer queries/social media support etc) <p>The key assumptions for the change to CNO FTE reductions are reasonable.</p>	 Key assumptions not provided
Planning and technical standards			<p>Other:</p> <ul style="list-style-type: none"> • DP 2426 Health and safety • DP 2012 Office Equipment & Phones • Portfolio Plan – Eng Services • Portfolio Plan – Property <p>The documents are largely complete and provide a good level of detail.</p> <p>There are no documents for innovation capex. Chorus did provide some written explanation of the optimisation adjustments but these are not formal documents. Assumptions are documented in the CNO forecast labour change spreadsheet model.</p> <p>Documentation is required to show how the benefits of the innovation investment will be passed on to customers. However, Chorus intends this allowance to be ring-fenced and will make it a focus area for the commission.</p>	 Innovation documentation
Reasonableness of models			<p>Models not provided for innovation capex</p> <p>Optimisation:</p> <p>A detailed model outlining the costs associated with the change in FTE forecast was provided. The model included documentation and a breakdown of the source of the FTE changes.</p>	 Model not provided

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
			<p>The model for optimisation is reasonable.</p> <p>Other:</p> <p>The forecasts for other components of Corporate IT and Support capex are from the model used for most of Site Sustain capex (part of Network Sustain and Enhance). The model includes a breakdown of expenditure by individual items, with links to sources provided for each or an explanation of how an estimate was derived.</p> <p>The modelling for other corporate capex is reasonable.</p>	
Accuracy and reliability of data			<p>There is insufficient modelling and data provided pertaining to innovation capex to make an assessment of the accuracy and reliability of data being used to forecast the expenditure.</p>	
Procurement approach			<p>All expenditure in this programme requires approval via Chorus' Capital Expenditure Governance process. This includes development of business cases followed by approval from the Chorus Capital Council (CCC) before a project can proceed. Only NPV positive projects will proceed, ensuring that customers benefit from optimisation investments</p> <p>The procurement approach is reasonable. The CCC process encourages efficient selection of optimisation projects.</p>	
Consideration of historic investment			<p>Innovation capex is a new expenditure area.</p> <p>The adjustments in the optimisation item are based on Chorus' historic and projected CNO staffing requirements.</p>	
Consideration of options and alternative solutions			<p>Innovation:</p> <p>There are no alternative options except to not invest in innovation. The individual projects have not yet been determined so alternative options for these are not yet able to be reviewed.</p> <p>Chorus is expected to be required or incentivised to invest in innovation to reduce costs and lower product costs over the medium to long term.</p> <p>There are no alternative options that meet the requirement to invest in improving business innovation.</p> <p>Optimisation:</p> <p>The alternative option considered was to retain the initial forecast for FTE reductions. This was rejected by Chorus for the reasons outlined in the key assumptions.</p>	

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
			The consideration of alternate CNO headcount forecasts is reasonable.	
Relationship between proposed expenditure and quality outcomes			<p>☒ Availability ☒ Performance ☒ Ordering ☒ Provisioning ☒ Switching ☒ Faults ☒ Customer service</p> <p>Innovation projects may directly improve all quality outcomes depending on the targeted innovation project. The projects may also enable Chorus to maintain existing quality outcomes at lower cost.</p> <p>The regulatory regime only requires Chorus to meet quality targets. If the expenditure would result in an exceedance (or further exceedance) of the quality targets this should only be as a by-product of other benefits from the programme, such as reduced opex.</p> <p>The adjustment in CNO FTE reductions will enable Chorus to maintain current quality outcomes that may have been impacted if the full reduction in FTE were retained.</p> <p>The forecast expenditure is expected to increase Chorus' quality outcomes.</p>	
Deliverability and feasibility of implementation			<p>Deliverability depends on innovation projects being identified that are economic to invest in.</p> <p>There is a high level of uncertainty that may affect deliverability. Chorus plans to manage this risk by ring-fencing the capex allowance for innovation capex, which will manage the risk of inefficient projects being invested in.</p>	
Uncertainty within the proposed expenditure			<p>There is a high degree of uncertainty as specific innovation projects have not yet been identified.</p> <p>This programme is inherently uncertain due to the need to identify and successfully execute optimisation projects. Chorus plans to manage this risk by ring-fencing the capex allowance for innovation capex, which will manage the risk of inefficient projects being invested in.</p>	
Extent to which a risk-based approach has been applied			<p>A risk-based approach has not been applied as individual projects are not yet identified. As these projects will deliver medium-long term benefits to Chorus' customers, there is a risk that the benefits will be lower than forecast. Chorus does have controls, such as the CCC, that will minimise the risk of poor project selection and the ring-fencing of the innovation capex will disincentivise investing in high risk projects that may be unlikely to deliver net benefits to customers or to divert the allowance to fund non-innovation related programmes.</p> <p>There is an expectation risk-based approaches will be applied to the individual projects that are selected to use the ring-fenced innovation capex. It is</p>	

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
			reasonable that a risk-based approach is not applied at this stage due to the actual innovation projects not being known.	
Capex / opex dependency and trade-off and whole of lifecycle cost			<p>Innovation capex must deliver net benefits to customers. This may include reductions in capex and/or opex. It is necessary that where short term cost savings are expected that these are included within Chorus' submission. Where long-term benefits are expected from innovation projects the Commerce Commission will need to take this investment into account when setting allowances in the relevant future regulatory periods.</p> <p>Capex/opex trade-off may be a key driver some projects included within innovation capex. However, the information provided by Chorus indicates that any savings will be in periods after RP1. The use of the ring-fenced innovation capex allowance by Chorus should be considered by the commission when setting allowances in RP2 and beyond.</p>	

8.3.4 Final Assessment Conclusion

In our opinion, the methods and input assumptions used to forecast the Corporate capital expenditure would result in a forecast that reflects the efficient costs that a prudent fibre network operator would incur to deliver regulated FFLAS at appropriate quality, during the upcoming regulatory period and over the longer term, having regard to good telecommunications industry practice.

This assessment is dependent on innovation capex being ring-fenced. The innovation capex should also be a focus area for the Commerce Commission in their pre-determination review of Chorus' submission. In particular, Chorus must show the Commission that innovation projects will not deliver Chorus savings during RP1 (other than savings already budgeted for in Chorus' submission) and that controls on using the ring-fenced allowance will prevent investment in uneconomic projects.

8.4 Network & Customer IT

Network & Customer IT capex represents 7.78% of FFLAS Capex over RP1.

8.4.1 Description of capital expenditure program

The programme funds the IT solutions required to support the development of fibre-based products and services. Product development requires the creation of new or modified systems or services to support the delivery of new product offerings to Retail Service Providers (RSPs). This includes the design and implementation of IT changes to enable the interact, fulfil, assure and bill processes that are delivered across IT platforms. The investments are initiated by the Products, Sales and Marketing (PSM) group and are primarily triggered through ideation, technical trials, and customer requests.

The programme also funds IT solutions for asset management. An investment in Asset Management Capabilities was added for the Final Assessment but was not present in the Draft Assessment.

There is a small component of recurrent application software replacement on 2 to 4-year cycles.

Chorus does not define specific product development initiatives beyond 12-18 months. Instead, Chorus assumes an overall work volume based on historical delivery, expected requirements and other drivers.

8.4.2 Forecast expenditure

NZ\$m real FY20 FFLAS only	RY16**	RY17**	RY18**	RY19**	RY20	RY21	RY22	RY23	RY24	RP1 Total
Draft Assessment Capex	40.7	46.9	52.4	46.7	18.2	20.5	23.4	23.9	23.6	70.9
Final Assessment Capex	44.0	46.1	38.8	34.6	28.4	17.6	25.8	24.8	25.8	76.5

* Draft assessment capex is shown in financial years. Some allocations to this programme may have changed between the draft and final assessments.

** Historical expenditure RY16-RY19 is presented as unallocated expenditure (inclusive of non-FFLAS expenditure) at nominal prices

8.4.3 Assessment

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
Forecasting methodology	Historical average expenditure with outliers removed at a Chorus level (copper + FFLAS + other)  The forecast methodology is reasonable subject to documentation being developed that provides evidence to support the key assumptions.		Asset management capability: Estimate per capability required  Chorus included additional capex to establish an asset management capability. Only an early estimate of the cost is known at this time. The draft assessment is retained for the other components of Network & Customer IT.	 AM Capability
Key assumptions	<ul style="list-style-type: none"> Expenditure will continue at historical levels 		Chorus has incorporated information about historical product development projects and project costs in the Product Development POD. This information	

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	<ul style="list-style-type: none"> The volume of product releases (fibre + copper) will continue at a constant level but with a greater fibre (and therefore FFLAS) share over time. Reduced expenditure during FY19 is due to deferral of new product development to FY20 and so it is reasonable to not include FY19 in the forecast calculation <p>Information provided by Chorus supports a continued pipeline of product development over the next few years and the experience with copper broadband indicates that product development is unlikely to drop after the fibre network becomes established. However, this information/data should be formally documented to support the proposed expenditure.</p> <p>Updating the forecast calculation with FY19 and FY20 data (once available) will increase the confidence that Chorus has not selectively removed FY19 to forecast higher expenditure.</p>		<p>supports there being a continued pipeline of product development projects and that this can be expected to persist into RP1 and beyond.</p> <p>Chorus' FY20 run-rate (which at the time of the final assessment covers the significant majority of the year) indicates that the assumption that catch-up on underspend during FY19 is correct and that historical average expenditure will be approximately the same once these two years are added to the calculation.</p> <p>Further, the FY20 run-rate expenditure shows the transition of copper product development expenditure to fibre product development has occurred and that total expenditure (copper + fibre) is stable (after averaging across FY19 and FY20).</p> <p>Chorus has addressed the issues raised in the draft assessment.</p>	
<p>Planning and technical standards</p>	<p>Planning and technical standards reviewed:</p> <ul style="list-style-type: none"> Product Development POD Product Consultation Overview Consumer Product Roadmap (September 2019) Chorus Product Consultation Roadmap IT Asset Strategy <p>The POD provides an outline of the programme and documentation of the forecast. Roadmap and consultation documents support the customer driven nature of product development at Chorus.</p>		<p>Asset Management Capability</p> <ul style="list-style-type: none"> Asset Management Review (AMCL report) <p>The draft assessment is retained for this requirement.</p>	
<p>Reasonableness of models</p>	<p>Exclusion of outlier years is not reasonable as this would result in deferred expenditure (all products will eventually be developed). However, as the excluded year is the most recent year and there is a reasonable expectation that the deferred expenditure will be incurred during the following year the approach used by Chorus is understandable. It is expected that, once FY20 expenditure is known, both FY19 and FY20 will be included in the forecast calculations. In the meantime, information needs to be provided explaining why the year is an outlier and that it should not be included in the average calculation.</p> <p>A list of potential/expected new products was provided to show there is a pipeline of work and no downward trend that may indicate a</p>		<p>Asset Management (AM) Capability:</p> <p>Chorus only has a high level estimate of AM capability costs broken down by capability. The capabilities were determined through an external review of Chorus' AM capabilities. These additional capabilities are necessary for Chorus to meet Good Telecommunications Industry Practice and there is sufficient justification in the external review report.</p> <p>The proposed expenditure for AM Capability does not appear unreasonable compared to the AM IT spending by similar businesses and it is reasonable that Chorus does not yet know the actual cost of this investment as the external</p>	 AM Capability

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	<p>saturation of fibre products. Experience from copper broadband product development indicates that product development is reasonably steady over the entire lifetime of the network, supporting Chorus' forecasting approach.</p> <p>Given the uncertainty inherent in this programme (new products can rarely be planned multiple years in advance) the approach of continuing historic expenditure is reasonable.</p>		<p>review recommendations are recent and Chorus has not yet gone to tender for these capabilities.</p> <p>Other:</p> <p>Chorus' FY20 run-rate (which at the time of the final assessment covers the significant majority of the year) indicates that the assumption that catch-up on underspend during FY19 is correct and that historical average expenditure will be approximately the same once these two years are added to the calculation.</p> <p>The draft assessment is retained for this requirement.</p>	
<p>Accuracy and reliability of data</p>	<p>The calculation of the forecast from the historical expenditure (using the historical average forecasting approach) was not replicable using the values in the POD. The POD contains the same total values during RP1 as the aggregation spreadsheet but with different timing. Alternative historical cost data was also provided with confirmation of the forecasting approach and historical averaging period, but the average of these values was different to the forecast.</p> <p>Data issues require rectification.</p>	<p> Data issues</p>	<p>Chorus has rectified the data issues.</p> <p>Chorus has addressed the issues raised in the draft assessment.</p>	<p></p>
<p>Procurement approach</p>	<p>Primarily (~90%) labour costs at market rates (external contractors) or internal staff time. Remainder is mostly direct software costs and a small hardware cost component. Forecasts assume increases in labour costs will be offset by productivity and efficiency improvements.</p> <p>All expenditure in this programme requires approval via Chorus' Capital Expenditure Governance process. This includes development of business cases followed by approval from the Chorus Capital Council (CCC) before a project can proceed.</p> <p>The procurement approach is reasonable. The CCC process encourages efficient selection of expenditure projects. Competitive tendering of work to service companies results in efficient pricing.</p>	<p></p>	<p>The draft assessment is retained for this requirement.</p>	<p></p>
<p>Consideration of historic investment</p>	<p>The forecast aligns with historic investment as the historical average forecasting approach is used.</p> <p>The forecast methodology is to continue to spend at historic levels.</p>	<p></p>	<p>The draft assessment is retained for this requirement.</p>	<p></p>
<p>Consideration of options and</p>	<p>The only alternative option is to not develop new products. This would prevent Chorus from meeting customer expectations and may impact some measures of customer service quality outcomes. As no specific new products are identified for RP1 (planning horizon is short-medium</p>	<p></p>	<p>The draft assessment is retained for this requirement.</p>	<p></p>

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
alternative solutions	term for product development) alternative options at a product level cannot be incorporated into the forecast. There are no reasonable alternatives to this expenditure.			
Relationship between proposed expenditure and quality outcomes	<input type="checkbox"/> Availability <input type="checkbox"/> Performance <input checked="" type="checkbox"/> Ordering <input type="checkbox"/> Provisioning <input type="checkbox"/> Switching <input type="checkbox"/> Faults <input type="checkbox"/> Customer service Product development IT investment is required to enable RSPs to order services from Chorus and for Chorus to bill customers for new products. The proposed expenditure forecast should enable Chorus to meet quality outcomes for ordering newly developed products.		<input checked="" type="checkbox"/> Availability <input type="checkbox"/> Performance <input checked="" type="checkbox"/> Ordering <input type="checkbox"/> Provisioning <input type="checkbox"/> Switching <input checked="" type="checkbox"/> Faults <input type="checkbox"/> Customer service Asset Management investment will contribute to Chorus' ability to manage its physical network, impacting fault rates and availability. Investment in this area will improve Chorus' quality outcomes relative to current levels. The proposed Asset Management Capability investment will improve quality outcomes relative to business as usual. The draft assessment is retained for product development IT.	
Deliverability and feasibility of implementation	The forecast is similar to historic expenditure and lower than the peak expenditure for this area (peak is expected to be FY20 and this may be exceeded in FY21). Subject to external effects, there is no significant deliverability risk for the Fibre Product Development forecast. Deliverability risk is low.		The draft assessment is retained for this requirement.	
Uncertainty within the proposed expenditure	The expenditure is largely driven by external requests for new products by RSPs and other stakeholders and is inherently uncertain. Some product developments have an internal Chorus driver and are more certain. However, the planning horizon for these investments is generally only 12-18 months. There is therefore a high level of uncertainty for individual fibre product development projects. This is offset by the high volume of small size individual projects that result in a stable level of expenditure over time and a low level of uncertainty.		The draft assessment is retained for this requirement.	
Extent to which a risk-based approach has been applied	A risk-based approach has not been applied. A risk-based approach is not used but as the actual products that will be developed during RP1 are not yet known a risk-based approach is unlikely to be feasible or any more reliable than a historical average forecast.		The draft assessment is retained for this requirement.	
Capex / opex dependency and trade-off and whole of lifecycle cost	There is no reasonable opex alternative to this expenditure. Workarounds for enabling new products without capital expenditure are likely to be inefficient and prone to errors. No capex/opex trade-off opportunities.		The draft assessment is retained for this requirement.	

8.4.4 Final Assessment Conclusion

In our opinion, the methods and input assumptions used to forecast the Product Development capital expenditure would result in a forecast that reflects the efficient costs that a prudent fibre network operator would incur to deliver regulated FFLAS at appropriate quality, during the upcoming regulatory period and over the longer term, having regard to good telecommunications industry practice.

9 NETWORK CAPACITY

Network Capacity capex comprises layer 2 assets within the Chorus network architecture. Investment in Network Capacity is forecast for the following streams:

- **Access:** This funds electronics at each Chorus Central Office for the Passive Optical Network, splitters in the Passive Optical Network and lifecycle replacement of ONTs at the end-user premises
- **Aggregation:** This funds aggregation switches and related equipment in Chorus' exchanges
- **Transport:** This funds transportation node electronics that enable the transport of high volumes of data over medium to long distances between aggregation switches

Network Capacity capex represents 17.32% of FFLAS Capex over RP1.

9.1 Access

Access capex represents 7.45% of FFLAS Capex over RP1.

9.1.1 Description of capital expenditure program

This programme funds access equipment that enables the connection of GPON customers to Chorus' fibre network. This includes OLT ports in the Chorus Central Office and splitters in FFPs. Chorus also has a significant individual project to enable XGSPON products which requires replacement of OLT cards for customers that request the product.

9.1.2 Forecast expenditure

NZ\$m real FY20 FFLAS only	RY16**	RY17**	RY18**	RY19**	RY20	RY21	RY22	RY23	RY24	RP1 Total
Draft Assessment Capex*	23.0	25.1	26.8	16.2	15.7	3.3	18.4	16.1	13.3	47.8
Final Assessment Capex	21.0	19.1	17.5	13.8	16.0	17.6	22.1	29.0	22.1	73.2

* Draft assessment capex is shown in financial years. Some allocations to this programme may have changed between the draft and final assessments.

** Historical expenditure RY16-RY19 is presented as unallocated expenditure (inclusive of non-FFLAS expenditure) at nominal prices

9.1.3 Assessment

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
Forecasting methodology	XGSPON: Price [Nokia CY21 rates] ✓ x Quantity [business case model] ✓ OLT: Price [Nokia CY21 rates] ✓ x Quantity [UFB2 rollout models, NGA connections forecast (additional cards) and transport traffic forecast (uplink card capacity)] ✓	🚩	Chorus has retained the forecasting methodology reviewed in the draft assessment but adjusted the price component used to include unit rate decreases for hardware during RP1. The draft assessment is retained for this requirement.	🚩

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	<p>Splitter: Price [Avg unit rates + current install cost escalated by 2% p.a. labour index] ✓ x Quantity [connections growth forecast] ✓</p> <p>Other: Price [coded rates] ✓ x Quantity [S&OP forecasts, Planning forecasts, Other...] ✓</p> <p>The forecasting methodologies used by Chorus for this programme are reasonable.</p>			
Key assumptions	<ul style="list-style-type: none"> • NGA new connections will align with the Connections forecast before and during RP1 • Traffic growth will align with the Transport Model forecast before and during RP1 • Ratio of ports/cards/uplinks/chassis for OLT hardware will remain unchanged • Nokia hardware unit rates will [<p style="text-align: center;">Chorus CI]</p> • Splitter hardware unit rates will [<p style="text-align: center;">Chorus CI]</p> • Additional OLT uplink cards are added when capacity utilisation reaches 60% <p>The key assumptions are reasonable. However, there may be an expectation that [<p style="text-align: center;">Chorus CI]</p> will continue into the next Nokia contract revision (after CY21).</p>	<p></p> <p>Flat unit rate needs to be justified</p>	<p>Chorus has updated the forecast [<p style="text-align: center;">Chorus CI]</p> Chorus has addressed the issues raised in the draft assessment.</p>	<p></p>
Planning and technical standards	<p>Planning and Technical Standards reviewed:</p> <ul style="list-style-type: none"> • Portfolio Plan – Access Electronics (11/10/2019) • NGA Provisioning Task Handbook (Volumes 1-4) v3.1 (ND0563) • Congestion Free Networks – Technical Whitepaper (2016) • Network Infrastructure Project Agreement (NIPA) (26/01/2017) • CADS0046 Network Availability Standard V0.2.pdf (01/07/2017) <p>The documents provide an adequate level of documentation outlining the assets and the methodologies used for forecasting.</p>	<p></p>	<p>The draft assessment is retained for this requirement.</p>	<p></p>

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
Reasonableness of models	<p>OLT:</p> <p>Shelves/Cards: The basis of the forecast is the quantity of shelves required; cards are fixed at the current multiple of cards per shelf. The shelves growth forecast is based on the NGA connections forecast, which determines the number of ports required. The uplink capacity is based on the transport traffic forecast. While these forecasting approaches are appropriate, the sources need to be fully documented. UFB2 OLT quantities are taken from Chorus' UFB2 planning models which align with contractual requirements.</p> <p>ISAM FD Replacement: a large amount of expenditure is forecast for replacement of ISAM shelves. This significant amount of expenditure requires the support of a business case that justifies the timing of the replacement. There may be an opportunity to defer this expenditure until after RP1.</p> <p>Splitters:</p> <p>Splitter installations are closely linked to the forecast number of new connections.</p> <p>Other broadband network operators use detailed spatial modelling to forecast quantities of Access capex components that are required rather than using historical ratios and network level connection forecasts. Chorus could adopt more detailed modelling to provide a higher degree of certainty that the expenditure forecast is prudent and efficient.</p> <p>XGSPON:</p> <p>The XGSPON business case is supported by a detailed NPV model that shows the additional revenue generated from selling XGSPON products to customers and additional small/medium business connections from having these products will offset the lifecycle cost of installing XGSPON access electronics.</p> <p>The approach used for forecasting XGSPON expenditure is reasonable.</p>	<p> Spatial based forecasting not used</p>	<p>Chorus currently considers spatial based forecasting to be too difficult to implement while still in the roll-out phase. Chorus will reconsider its modelling approach closer to the end of the roll-out phase.</p> <p>The draft assessment is retained for this requirement.</p>	<p> Spatial based forecasting not used</p>
Accuracy and reliability of data	<p>The historic data used within the model is accurate and reliable as it can be readily accessed from Chorus' systems. This includes average requirements for splitters, shelves and line cards.</p>	<p></p>	<p>The draft assessment is retained for this requirement.</p>	<p></p>

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	<p>Nokia and other unit rates are well known for the current contract period but may change after the next renegotiation in CY21.</p> <p>Forecast data is inherently uncertain. In particular, there is a high degree of uncertainty for how many NGA connections there will be during RP1.</p> <p>The historical data used to build the forecast is accurate and reliable.</p>			
Procurement approach	<p>The core driver of this expenditure is the S&OP connections forecast. This forecast is approved by the Chorus executive. Major projects within Access capex also require approval from the Chorus executive.</p> <p>All hardware is purchased under contract from Chorus' technology providers. The majority of the electronics are sourced from Nokia under the terms of the contracts previously negotiated between Chorus and Nokia. [</p> <p style="text-align: right;">Chorus CI].</p> <p>This expenditure programme requires approval from Chorus' executive which applies an additional level of scrutiny. Historically Chorus has been incentivised to minimise expenditure due to capital constraints and this extends to lowering the cost of supplier contracts. The continued use of historical costs indicates an efficient procurement approach will be maintained.</p>		The draft assessment is retained for this requirement.	
Consideration of historic investment	<p>Historic ratios of assets (such as cards to shelves) is a key determinant of the forecast. Aggregate historical expenditure is not a significant forecast input as most of the expenditure is driven by growth and expansion of the network and historical expenditure is not a good predictor of this.</p> <p>It is not expected that historic investment must be considered in detail when forecasting this expenditure category.</p>		The draft assessment is retained for this requirement.	
Consideration of options and	<p>Chorus has not considered alternative options for this expenditure. However, for the access capex related to provisioning new services there are limited alternative options available. Chorus can select</p>	 Options not	The draft assessment is retained for this requirement.	 Options not

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
alternative solutions	<p>between currently used GPON OLT cards and ONTs and new generation (but more expensive) XGSPON hardware. Chorus has opted to continue deploying GPON hardware while implementing a separate project to upgrade selectively where customers purchase a XGSPON product. This is covered by the XGSPON business case and modelling.</p> <p>As there are few (if any) feasible alternative options it is reasonable that options analysis has not been completed for these components of the Access capex programme.</p> <p>Chorus has not sufficiently considered alternative options, such as deferral, for the replacement of ISAM FD shelves. This is a replacement project and no clear case has been made for why this should occur during RP1.</p> <p>Chorus must provide justification of the ISAM FD Replacement project due to the significant cost and apparent opportunities to defer the expenditure.</p>	considered for ISAM FD replacement project		considered for ISAM FD replacement project
Relationship between proposed expenditure and quality outcomes	<p><input checked="" type="checkbox"/> Availability <input checked="" type="checkbox"/> Performance <input type="checkbox"/> Ordering <input checked="" type="checkbox"/> Provisioning <input type="checkbox"/> Switching <input type="checkbox"/> Faults <input checked="" type="checkbox"/> Customer service</p> <p>Splitters and available OLT ports are necessary for Chorus to provision a service for a customer. Chorus must have available capacity to quickly provision services to new customers.</p> <p>Adequate capacity on OLTs, including uplink capacity, is necessary to ensure the availability and performance of fibre services.</p> <p>The XGSPON project will enable additional products for customers, which is expected to increase customer satisfaction by ensuring the network is capable of meeting customer demands for high speed broadband products.</p> <p>As the quality outcome targets for availability, performance, provisioning and customer service have not yet been established by the Commerce Commission, it cannot be determined whether the forecast expenditure is sufficient to meet the RP1 targets.</p> <p>Based on the information reviewed there is no evidence to indicate the proposed expenditure forecast will prevent Chorus from meeting quality outcome targets that may be set by the Commerce Commission.</p>		The draft assessment is retained for this requirement.	
Deliverability and feasibility	The majority of Access capex is for hardware and software. This is supplied by Chorus' major technology partner (Nokia) with significant		The draft assessment is retained for this requirement.	

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
of implementation	<p>production resources so there is a negligible risk of the required hardware not being available. The labour component is provided by Chorus' service companies under contract and work levels are forecast to be similar to historical work, which has been successfully delivered.</p> <p>Deliverability and feasibility of implementation risks are very low.</p>			
Uncertainty within the proposed expenditure	<p>Most of the expenditure in this category is driven by new NGA connections. There is a moderate level of uncertainty in the forecast volume for total connections during RP1. Connection volumes will be dependent on many factors, including the rate of uptake by premises passed by the network (faster uptake may result in more connections prior to RP1 reducing the pool of remaining premises to be connected during RP1) and overall uptake of fibre by premises passed (higher uptake will result in more connections to the fibre network).</p> <p>There is a high level of uncertainty for the XGSPON expenditure as it is dependent on demand and willingness-to-pay by end users for high speed fibre products. The cost of the project is also dependent on the spatial distribution of customers that purchase XGSPON products. More widespread spatial distribution will require more OLTs to be upgraded with XGSPON capable line cards.</p> <p>Due to the dependence on new customer connections to drive the majority of the expenditure there is a high level of uncertainty. However, this uncertainty is inherent in the programme and cannot be removed through additional modelling. The risk will be mitigated partially by the Commerce Commission proposed 'fixed + variable' approach to be applied to connections related expenditure during RP1.</p>	<p>  XGSPON uptake</p>	The draft assessment is retained for this requirement.	<p>  XGSPON uptake</p>
Extent to which a risk-based approach has been applied	<p>XGSPON: High and low scenarios have been tested to show that the business case is robust to changes in input assumptions. All other: risk-based approaches have not been applied.</p> <p>Due to the uncertainty in some of the forecast drivers, in particular new customer connections, a risk-based forecasting approach would increase confidence in the forecast. The use of scenario analysis in the XGSPON modelling is reasonable.</p>	<p></p>	Chorus has indicated it will investigate whether appropriate risk-based forecasting approaches can be implemented for future planning cycles. The draft assessment is retained for this requirement.	<p> Not applied</p>
Capex / opex dependency and trade-off	<p>There are few opportunities for capex-opex trade-offs in Access capex. Replacement of some devices may be deferred, and higher maintenance costs incurred. However, most of the expenditure in this programme is driven by growth and not by lifecycle replacement.</p>	<p></p>	The draft assessment is retained for this requirement.	<p></p>

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
and whole of lifecycle cost	Further inclusion of capex-opex trade-off opportunities is not expected for this programme.			

9.1.4 Final Assessment Conclusion

In our opinion, the methods and input assumptions used to forecast the Access capital expenditure would result in a forecast that reflects the efficient costs that a prudent fibre network operator would incur to deliver regulated FFLAS at appropriate quality, during the upcoming regulatory period and over the longer term, having regard to good telecommunications industry practice.

In this assessment we note that the *Access Electronics* XGSPON volume forecast has a high level of uncertainty as it is dependent on the uptake of a new product (Hyperfibre) by end users. The volume forecasts are not based on actual uptake data as the product is only in the early stages of being released. The Commission should verify the volume forecast for Hyperfibre against actual uptake volumes closer to the time of the determination.

9.2 Aggregation

Aggregation capex represents 4.98% of FFLAS Capex over RP1.

9.2.1 Description of capital expenditure program

The programme funds the electronics in the aggregation space required to supply fibre-based products and services. This includes switches, line cards, the chassis that the electronics are housed in, and software updates.

9.2.2 Forecast expenditure

NZ\$m real FY20 FFLAS only	RY16**	RY17**	RY18**	RY19**	RY20	RY21	RY22	RY23	RY24	RP1 Total
Draft Assessment Capex*	23.2	33.8	32.9	14.9	12.7	11.9	13.9	11.3	10.9	36.1
Final Assessment Capex	31.5	36.9	26.9	17.7	14.2	12.8	12.7	20.6	15.7	49.0

* Draft assessment capex is shown in financial years. Some allocations to this programme may have changed between the draft and final assessments.

** Historical expenditure RY16-RY19 is presented as unallocated expenditure (inclusive of non-FFLAS expenditure) at nominal prices

9.2.3 Assessment

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
Forecasting methodology	Fibre Capability (Growth): Price [current USD price, adjusted by exchange rate forecast]  x Quantity [bottom up forecast by switch driven by traffic growth]  Other (Lifecycle, software and misc.): Based on Assessment [Not Stated] 	 Basis of lifecycle, software and misc.	The draft assessment is retained for this requirement.	 Basis of lifecycle, software and misc.
Key assumptions	Fibre Capability: <ul style="list-style-type: none"> Switch prices will [Chorus CI]. Aggregation switch investment is driven by connection volumes and traffic per user growth Historic traffic per user growth rates will continue into the future 	 Basis of assumptions	Fibre Capability: <ul style="list-style-type: none"> USD to NZD exchange rate from forward price quotes by major banks Some modelling on regional variation of growth rates was done by Chorus. The result was a 3.3% increase in the Capex of the aggregation model over five years. This was not considered a material change so no change to model methodology was implemented. <p>Chorus has addressed hard-coded and unsourced values in the model. The modelling of regional variation provides sufficient justification for not proceeding with a significant increase in model complexity to implement regional variation in traffic growth forecasts. The modelling completed by Chorus indicates that the</p>	 Other

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	<ul style="list-style-type: none"> The traffic growth rate will be identical in all parts of the network Labour overheads are [Chorus CI]% of hardware costs Chorus must maintain a congestion free network and can meet contractual and compliance requirements for this through maintaining link utilisation rates under levels proposed in the Congestion Free Whitepaper <p>The aggregation forecast model contains undocumented hardcoded assumptions in addition to the assumptions listed above. For example, justification is not provided for the labour overhead rate or USD to NZD exchange rates. The assumption that traffic growth will be the same across all parts of Chorus' fibre network is not realistic, the other assumptions are reasonable.</p> <p>Other: Forecasts for other components of the programme (excluding Fibre Capability) are not documented and are hard-coded into the model. A significant portion of programme expenditure is the lifecycle component of 'Ethernet Aggregation Coverage and Capacity', which nominally covers the copper aggregation network but has a high FFLAS allocation. Only the total value of this is provided with no information about the forecasting approach.</p>		<p>forecasts produced are conservative and would be higher if traffic growth variation was modelled.</p> <p>Other:</p> <ul style="list-style-type: none"> Ethernet Aggregation Coverage and Capacity, which made up the majority of the Other category at the time of the draft assessment, has been reallocated to be 100% non-FFLAS. The remaining expenditures are based on historic expenditure, but no evidence of the historic cost is included in the spreadsheet and values are hard-coded. <p>The draft assessment is retained for the Other component of the Fibre Aggregation programme.</p>	
<p>Planning and technical standards</p>	<p>Planning and technical standards reviewed:</p> <ul style="list-style-type: none"> Portfolio Plan – Aggregation and Transport (08/2019) Congestion Free Networks – Technical Whitepaper (2016) Network Infrastructure Project Agreement (NIPA) (26/01/2017) Capacity Management Plan – 7450 ESS and 7950 XRS – Release 8.2 (2014) Project Brief, Scope and Project Management Plan – Project 71880 – Fibre Aggregation SR-S Introduction (1/10/2019) <p>The documents provide an adequate level of documentation outlining the assets and the methodologies used for forecasting.</p>		<p>The draft assessment is retained for this requirement.</p>	
<p>Reasonableness of models</p>	<p>The aggregation model produces a bottom-up forecast of the switches and cards that Chorus will require to meet customer and traffic growth</p>		<p>Some modelling on regional variation of growth rates was done by Chorus. The result was a 3.3% increase in the Capex of the aggregation model over five years.</p>	

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	<p>on the fibre network. The model only deals with augmentation, lifecycle forecasts are hard-coded from other sources and are not documented within the model or supporting documents.</p> <p>The model starts with the number of available ports and free card slots at each aggregation switch and current traffic as at February 2019. The traffic is grown using rates from Chorus' Bandwidth Growth Model and the cost of new switches and cards incurred when usage thresholds are met.</p> <p>Although the model is bottom up, the growth rates used for traffic volumes are the same across all switches. As the network is still in the late build phase, significant differences in traffic growth would be expected between mature and newly built areas of the network that would require unique growth rates to be applied.</p> <p>A significant portion of the programme is due to a small number of very high cost switches. Due to the significant cost of these switches (approx. NZ\$[Chorus C1]k each), more detailed modelling would provide a higher level of confidence in the forecast. The assumptions used by Chorus (in particular the use of a single network traffic growth rate) are more appropriate where limited to high volume/low cost electronics.</p> <p>However, the high growth rates of >40% p.a. for fibre traffic used by Chorus (and which are similar in magnitude to international examples) mean that there is a very low likelihood that the forecast expenditure on switches and cards could be avoided rather than only deferred. The high growth rates also mean that any deferral benefit would be small (deferral of over five years is not possible).</p> <p>The forecast could be improved by including spatial information, such as connections growth, within the traffic growth forecast for each aggregation switch.</p>	<p>Traffic growth does not incorporate spatial information</p>	<p>This was not considered a material change so no change to model methodology was implemented.</p> <p>The modelling of regional variation provides sufficient justification for not proceeding with a significant increase in model complexity to implement regional variation in traffic growth forecasts. The modelling completed by Chorus indicates that the forecasts produced are conservative and would be higher if traffic growth variation was modelled.</p>	
<p>Accuracy and reliability of data</p>	<p>The data used as the basis of the aggregation growth forecast includes current traffic by aggregation switch, current capacity of aggregation electronics assets and contracted hardware prices with Nokia. These values are known with a high degree of accuracy and reliability.</p> <p>Input data is sourced from Chorus systems and is accurate and reliable.</p>		<p>The draft assessment is retained for this requirement.</p>	

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
Procurement approach	<p>Chorus has an existing contractual relationship with Nokia, the hardware vendor for aggregation electronics. These contracts set out the unit rates for hardware [</p> <p style="text-align: right;">Chorus C].</p> <p>The procurement approach is reasonable.</p>		<p>The draft assessment is retained for this requirement.</p>	
Consideration of historic investment	<p>The lifecycle component of aggregation capex is expected to be based on historical expenditure and asset lifetimes. However, the forecasting approach for this expenditure is not documented.</p> <p>Consideration of historic investment is expected within lifecycle expenditure, but this is not documented.</p>	 Not included in documentation	<p>The large lifecycle cost item raised in the draft assessment has been reallocated to non-FFLAS as it relates to copper aggregation.</p> <p>As there is no longer any significant lifecycle expenditure included in the FFLAS forecast, the issue raised in the draft assessment is no longer relevant.</p>	
Consideration of options and alternative solutions	<p>There are no reasonable alternatives to investing in the growth and lifecycle replacement of aggregation electronics due to Chorus' contractual and compliance requirements to maintain a congestion free network. There may be some opportunities to adjust the timing of investment in aggregation electronics, but the high growth rates for fibre traffic mean that deferral benefits are low.</p> <p>Chorus did investigate options to use different capacity switches. The most common switch capacities currently available are 1G, 10G and 100G. Due to the exponential growth rates for fibre traffic, networks transition over time to higher capacity switches, which is more efficient than purchasing higher volumes of lower capacity switches. Chorus' has determined 10G switches are optimal for RP1, whereas Chorus was using 1G switches during the UFB build. This assessment relied on high-level modelling of costs. Detailed modelling of 1G or 100G switches was not completed but the results of the high level modelling indicate it would be unlikely lower capacity switches would be economically optimal.</p> <p>The only feasible alternative options have been considered by Chorus.</p>		<p>The draft assessment is retained for this requirement.</p>	
Relationship between proposed	<p><input checked="" type="checkbox"/> Availability <input checked="" type="checkbox"/> Performance <input type="checkbox"/> Ordering <input type="checkbox"/> Provisioning <input type="checkbox"/> Switching <input type="checkbox"/> Faults <input type="checkbox"/> Customer service</p>		<p>The draft assessment is retained for this requirement.</p>	

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
expenditure and quality outcomes	<p>Sufficient capacity on aggregation links is necessary for Chorus to meet its congestion free network obligations. By being congestion free, the aggregation network will contribute positively to performance targets such as frame delay and frame loss. Aggregation electronics in many network locations contribute to path diversity which improves the availability of fibre services.</p> <p>As the quality outcome targets for availability and performance have not yet been established by the Commerce Commission, it cannot be determined whether the forecast expenditure is sufficient to meet the RP1 targets. However, probable performance targets are expected to be met by Chorus maintaining a congestion free network. Availability targets may require additional transport links and route diversity, which may necessitate additional aggregation switches if the quality targets are set sufficiently high. The forecast expenditure would be expected sufficient to continue delivering to current performance levels.</p> <p>The expenditure forecast is sufficient to maintain current quality outcomes given the forecast traffic growth.</p>			
Deliverability and feasibility of implementation	<p>The majority of aggregation electronics expenditure is for hardware. This is supplied by a large multinational company (Nokia) with significant production resources so there is a negligible risk of the required hardware not being available. The labour component is provided by Chorus' service companies under contract and work levels are forecast to be similar to historical work, which has been successfully delivered.</p> <p>Deliverability may require planned outages of fibre services for affected customers. Depending on Chorus' tracking against availability targets in some POI areas some aggregation investments may need to be deferred. However, in most cases Chorus is expected to have adequate quality target flexibility to undertake the planned outages necessary for this programme.</p> <p>Deliverability and feasibility of implementation risks are very low.</p>		<p>The draft assessment is retained for this requirement.</p>	
Uncertainty within the proposed expenditure	<p>The main source of uncertainty for this programme comes from exchange rate risk. Aggregation electronics hardware is priced in USD and this makes up the majority of the programme costs. A large deviation in the exchange rate would materially change the cost of the programme.</p>	 Traffic growth	<p>Some modelling on regional variation of growth rates was performed by Chorus. The result was a 3.3% increase in the Capex of the aggregation model over five years. This was not considered a material change so no change to model methodology was implemented.</p> <p>The modelling of regional variation provides sufficient justification for not proceeding with a significant increase in model complexity to implement regional</p>	

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	<p>There is also uncertainty from the forecast traffic growth rate. If the growth rate is higher than forecast additional expenditure may be required to ensure a congestion free network. If the forecast is lower than expected, Chorus may have an opportunity to defer some of the capacity growth, but the high growth rates for fibre traffic mean that deferral will be short lived. Therefore, uncertainty due to the traffic forecast is most likely to result in increased expenditure during RP1 rather than decreased expenditure.</p> <p>Uncertainty may also be caused by spatial differences in traffic growth rates. The aggregation forecast model applies a single growth rate across the country. However, if growth is higher in POI areas where switches are nearing capacity (but not forecast to exceed capacity during RP1) then additional switches would be required. If the trigger points for expensive SR-2 switches are met, this could result in a material increase in expenditure, even if the network wide traffic growth rate matches the forecast used in the model.</p> <p>Uncertainty due to the importance of the traffic growth rate and the spatial distribution of traffic growth as well as a small number of high cost electronics that make up a large portion of the expenditure. There may be opportunities to manage the uncertainty through more detailed modelling.</p>		<p>variation in traffic growth forecasts. The modelling completed by Chorus indicates the uncertainty caused by the simplified forecasting approach is not material.</p>	
<p>Extent to which a risk-based approach has been applied</p>	<p>A risk-based forecasting approach has not been applied.</p> <p>Opportunities to include risk-based modelling that considers changes to the traffic growth rate and risks of network congestion.</p>	<p> Not applied</p>	<p>Chorus provided additional information about the forecasting approach to indicate a risk-based approach is incorporated into the forecast.</p> <ul style="list-style-type: none"> “A risk-based approach is implicit in our modelling construct. We have an agreed risk profile in the growth models. Underlying assumption is at least 30% per annum traffic growth with potential unforecast large traffic spikes e.g. Netflix arrival, games like Fortnite and Call of Duty or Covid-19 lock downs. For Internodal and POLT uplinks the capacity utilization threshold for increases is [CI]%. The max utilisation we are allowed is [CI]% (contractual and statutory). A [CI]% increment threshold with a [CI]% max allows us to absorb up to a [CI]% traffic spike without breaching [CI]%. Handover links are modelled at [CI]% threshold since RSPs control this and their historic behaviour has been to run their networks [Chorus CI]. The ability to absorb large increases becomes more important over time as overall traffic levels climbs from the current 3Tbs to 9+Tbs.” 	<p></p>

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
			Chorus' modelling includes headroom if traffic growth is higher than expected. The high growth rates for traffic mean that the opportunities to defer aggregation capacity growth are limited as any overinvestment in capacity will become utilised within a short period of time. Based on this, there are limited forecasting benefits from increasing the complexity of the traffic modelling to include further risk-based calculations.	
Capex / opex dependency and trade-off and whole of lifecycle cost	There is no opex alternative to aggregation electronics growth expenditure. There may be limited opportunities to reduce lifecycle replacement capex through additional opex for maintaining existing electronics. No capex/opex trade-offs to consider.		The draft assessment is retained for this requirement.	

9.2.4 Final Assessment Conclusion

In our opinion, the methods and input assumptions used to forecast the Aggregation capital expenditure would result in a forecast that reflects the efficient costs that a prudent fibre network operator would incur to deliver regulated FFLAS at appropriate quality, during the upcoming regulatory period and over the longer term, having regard to good telecommunications industry practice.

Minor issues were identified with the input assumptions, however, they do not materially affect the forecast expenditure.

9.3 Transport

Transport capex represents 4.89% of FFLAS Capex over RP1.

9.3.1 Description of capital expenditure program

The programme funds the electronics in the transport space required to supply fibre-based products and services. This includes electronics for the extension of the transport network to support UFB2 areas, installation of additional links for transport redundancy, lifecycle replacement of transport electronics, growth within existing transport links and software updates for the transport electronics. This excludes the installation of transport fibre and other physical network components.

9.3.2 Forecast expenditure

NZ\$m real FY20 FFLAS only	RY16**	RY17**	RY18**	RY19**	RY20	RY21	RY22	RY23	RY24	RP1 Total
Draft Assessment Capex*	21.2	19.2	20.3	18.5	10.0	10.6	11.4	12.5	16.2	40.1
Final Assessment Capex	25.5	19.7	19.6	17.4	11.4	10.2	12.6	16.8	18.7	48.1

* Draft assessment capex is shown in financial years. Some allocations to this programme may have changed between the draft and final assessments.

** Historical expenditure RY16-RY19 is presented as unallocated expenditure (inclusive of non-FFLAS expenditure) at nominal prices

9.3.3 Assessment

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
Forecasting methodology	<p>Methodology as observed/described in:</p> <ul style="list-style-type: none"> <i>Final- 5YP_Transport(FY20-FY24) - Sept19 Mgt review.xlsx</i> <i>Portfolio Plan - Aggregation and Transport draft.pdf</i> <p>Regional Backhaul: Price [current USD hardware plus NZD labour costs] x Quantity [high-level modelling] + Buffer [\$50k/driver p.a.] Placeholder </p> <p>Lifecycle: high level modelling [assumptions not stated] </p> <p>Growth: Price [estimated link cost by complexity] x Quantity [expected new routes] </p> <p>Other: Placeholder [misc. items and contractual obligations] </p> <p>Multiple issues with methodology identified.</p>	<p>Multiple issues</p>	<p>Price [Hardware + services + FX + discount + inflation, hardware prices from price cards, estimates based on similar products/services where prices not yet known] x Quantity [bottom-up estimates] </p> <p>Chorus has rebuilt the Transport capex forecast model and now follows a consistent methodology. There are a small number of items where prices are not yet known. These are clearly flagged, and brief explanations are provided.</p> <p>The model includes links to the bottom-up estimates for quantities, but these have not been reviewed.</p>	
Key assumptions	Some USD price cards are used in the Transport forecast model, but sources are not provided. Justification is not provided for NZD labour		<p>Model revisions:</p> <ul style="list-style-type: none"> Price cards are now included in the model 	

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	<p>and overhead costs where applied. In many cases prices are hard coded into formulas with no clear link to rate cards.</p> <p>Other assumptions:</p> <ul style="list-style-type: none"> • Hardware unit rates will remain unchanged in USD terms • The USD will weaken against the NZD between now and the end of RP1 • All non-hardware costs will remain unchanged in NZD terms • Buffer amount of \$50k is required each year for each type of electronics and is independent of actual expenditure <p>Multiple issues with key assumptions, including lack of documentation, hard-coded inputs and unjustified use of a buffer amount.</p>	<p>Hard-coded inputs without sources</p> <p>Buffer</p>	<ul style="list-style-type: none"> • Service costs are mostly judgement based and assumed to represent current costs. • Buffer amounts are no longer used. • The model still assumes no change in unit rates other than due to inflation. • Chorus’ standard FX forecasts are used. These are based on rates provided by major banks. • There are a range of assumptions underpinning the various equipment quantity forecasts, but it is primarily driven by Chorus’ traffic and connections forecasts. <p>Chorus has addressed the key issues identified in the draft assessment. Explanations or links to external sources have been provided for all hard-coded values.</p> <p>The model is transparent in how the service costs are applied and without other data judgement based estimates may be used. However, it would be preferable if Chorus could provide evidence in the model to support the estimates, such as examples of costs incurred on similar past projects that align with the service cost values used in the model.</p>	<p>Service cost evidence</p>
<p>Planning and technical standards</p>	<p>Planning and technical standards reviewed:</p> <ul style="list-style-type: none"> • Portfolio Plan – Aggregation and Transport (08/2019) • Congestion Free Networks – Technical Whitepaper (2016) • Network Infrastructure Project Agreement (NIPA) (26/01/2017) • CADS0046 Network Availability Standard V0.2.pdf (01/07/2017) <p>The documents provide an adequate level of documentation outlining the assets and the methodologies used for forecasting.</p>		<p>The draft assessment is retained for this requirement.</p>	
<p>Reasonableness of models</p>	<p>The model used for forecasting transport capex contains large amounts of hard-coded values and traceability is low. Most project capex forecasts are placeholders and some of these are for several millions of dollars during RP1.</p> <p>While there is some certainty in the unit rates, sources are not provided for the values used and, in some cases, the included rate cards in the model do not appear to be used with hard-coded values used instead.</p>	 <p>Incomplete model</p>	<p>Chorus has rebuilt the forecast model for Transport capex. The new model is now laid out in a logical fashion and contains a reasonable level of documentation. Hard-coded data has been removed or explanations/sources added. Bottom-up forecast models for the quantities of some electronics have been linked to inside the model.</p> <p>Chorus has not undertaken any additional modelling to support the 1,000 premise threshold for route diversity.</p>	

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	<p>In general, quantities used in PxQ forecasts are not justified. The exception is new transport routes for robustness, which follows chorus' internal requirement to provide route diversity for fibre areas with over 1,000 premises. The documentation provided to support the 1,000 premise threshold appears reasonable but does not include detailed modelling to show that this is an appropriate level to ensure that current availability targets/obligations in the NIPA are met. Chorus' current availability obligations are at a 'POI Area' level and therefore modelling, thresholds and investment at this level would be expected to ensure that each POI Area meets the availability target without overinvestment.</p> <p>Model is incomplete as it contains large amounts of hard-coded data without sources or documentation.</p>		<p>The key issues identified in the draft assessment have been addressed. The premise threshold for route diversity is not considered a significant issue.</p>	
<p>Accuracy and reliability of data</p>	<p>Most of the input data into the transport forecast model is not documented or traceable. Therefore, the accuracy and reliability of the data is low.</p> <p>Low reliability of data due to limited documentation and traceability of model input data.</p>	<p> Documentation Sources</p>	<p>Chorus has rebuilt the Transport capex forecast model.</p> <p>The rebuilt model addresses the issues identified in the draft assessment.</p>	<p></p>
<p>Procurement approach</p>	<p>Chorus has an existing contractual relationship with Nokia, the hardware vendor for transport electronics used in the metro and national core networks.</p> <p>[Chorus CI].</p> <p>Chorus also uses Huawei hardware for regional and access networks. Huawei equipment is low cost but does not provide the same level of capacity and features required in metro networks, so has been limited to use in regional and access networks.</p> <p>Procurement approach is reasonable.</p>	<p></p>	<p>The draft assessment is retained for this requirement.</p>	<p></p>
<p>Consideration of historic investment</p>	<p>Historic investment is assumed to be an input into the forecast for the lifecycle replacement component of transport electronics. However, traceability of the forecast drivers is very low, and no clear link can be observed.</p>	<p> Traceability</p>	<p>Chorus provided updated models that improve the transparency of the forecast.</p> <p>Issues raised in the draft assessment have been addressed.</p>	<p></p>

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	Unable to determine extent of consideration of historic investment.			
Consideration of options and alternative solutions	<p>There are no reasonable alternatives to investing in the growth and lifecycle replacement of transport electronics due to Chorus' contractual and compliance requirements to maintain a congestion free network and meet network availability targets. There may be some opportunities to adjust the timing of investment in transport electronics, but the high growth rates for fibre traffic mean that deferral benefits are very low.</p> <p>No alternative options.</p>		The draft assessment is retained for this requirement.	
Relationship between proposed expenditure and quality outcomes	<p><input checked="" type="checkbox"/> Availability <input checked="" type="checkbox"/> Performance <input type="checkbox"/> Ordering <input type="checkbox"/> Provisioning <input type="checkbox"/> Switching <input checked="" type="checkbox"/> Faults <input type="checkbox"/> Customer service</p> <p>Sufficient capacity on transport links is necessary for Chorus to meet its congestion free network obligations. By being congestion free, the transport network will contribute positively to performance targets such as frame delay and frame loss. Transport electronics in many network locations contribute to path diversity which improves the availability of fibre services.</p> <p>As the quality outcome targets for availability and performance have not yet been established by the Commerce Commission, it cannot be determined whether the forecast expenditure is sufficient to meet the RP1 targets. However, probable performance targets are expected to be met by Chorus maintaining a congestion free network. Availability targets may require additional transport links and route diversity, which may necessitate additional transport electronics if the quality targets are set sufficiently high.</p> <p>It is unclear based on the transport forecast model whether quality targets would be met by the forecast expenditure and more sophisticated modelling is required.</p> <p>The forecast Expenditure forecast model does not provide direct evidence that quality outcomes will be maintained.</p>	<p></p> <p>No direct evidence that availability or performance targets will be met</p>	<p>Chorus has indicated it is investigating modelling options that may link the proposed expenditure to quality outcomes.</p> <p>The draft assessment is retained for this requirement.</p>	<p></p> <p>No quantitative modelling to show that availability or performance targets will be met</p>
Deliverability and feasibility of implementation	<p>The majority of transport electronics expenditure is for hardware. This is supplied by large multinational companies (Nokia, Huawei) with significant production resources so there is a negligible risk of the required hardware not being available. The labour component is provided by Chorus' service companies under contract and work levels</p>		The draft assessment is retained for this requirement.	

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	<p>are forecast to be similar to historical work, which has been successfully delivered.</p> <p>Deliverability may require planned outages of fibre services for affected customers. Depending on Chorus' tracking against availability targets in some POI areas some aggregation investments may need to be deferred. However, in most cases Chorus is expected to have adequate quality target flexibility to undertake the planned outages necessary for this programme.</p> <p>Deliverability and feasibility of implementation risks are very low.</p>			
Uncertainty within the proposed expenditure	<p>The main source of uncertainty for this programme comes from exchange rate risk. Transport electronics hardware is priced in USD and this makes up the majority of the programme costs. A large deviation in the exchange rate would materially change the cost of the programme.</p> <p>There is also uncertainty from the forecast traffic growth rate. If the growth rate is higher than forecast additional expenditure may be required to ensure a congestion free network. If the forecast is lower than expected, Chorus may have an opportunity to defer some of the capacity growth, but the high growth rates for fibre traffic mean that deferral will be short lived. Therefore, uncertainty due to the traffic forecast is most likely to result in increased expenditure during RP1 rather than decreased expenditure.</p> <p>There is a significant amount of uncertainty due to the lack of transparency and clarity in the expenditure forecast model.</p>	<p> Documentation, clarity and transparency of model</p>	<p>The updated model clarifies the exchange rate assumptions that are used, removed hard-coded values and added additional information about assumptions.</p> <p>Chorus' model improvements have addressed most of the uncertainty that is due to a lack of transparency in the model. The remaining uncertainty, which is mostly related to exchange rate risk, can be managed by Chorus.</p>	<p></p>
Extent to which a risk-based approach has been applied	<p>A risk-based forecasting approach has not been applied.</p> <p>Given the uncertainty in the traffic forecast a risk-based approach may be appropriate.</p>	<p> Not applied</p>	<p>Chorus has indicated it will investigate whether appropriate risk-based forecasting approaches can be implemented for future planning cycles.</p> <p>The draft assessment is retained for this requirement.</p>	<p> Not applied</p>
Capex / opex dependency and trade-off and whole of lifecycle cost	<p>There is no opex alternative to transport growth capex. There may be limited opportunities to reduce lifecycle replacement capex through additional opex for maintaining existing electronics.</p> <p>No capex/opex trade-off opportunities for this programme.</p>	<p></p>	<p>The draft assessment is retained for this requirement.</p>	<p></p>

9.3.4 Final Assessment Conclusion

In our opinion, the methods and input assumptions used to forecast the Transport capital expenditure would result in a forecast that reflects the efficient costs that a prudent fibre

network operator would incur to deliver regulated FFLAS at appropriate quality, during the upcoming regulatory period and over the longer term, having regard to good telecommunications industry practice.

Minor issues were identified with the input assumptions; however, they do not materially affect the forecast expenditure.

10 NETWORK SUSTAIN AND ENHANCE

Network Sustain and Enhance comprises the maintenance and management of Chorus' physical network assets.

- **Field Sustain:** This funds investment in the layer 0 infrastructure including poles and ducts, as well as replacement of layer 1 infrastructure
- **Field Sustain – Poles:** This funds the replacement and inspection (where capitalised) of poles used to support the aerial fibre network
- **Relocations:** This funds the relocation of Chorus' assets due to roadworks and when lines companies remove poles used by Chorus
- **Resilience:** This funds transport fibre capacity and robustness – additional fibre to meet capacity and availability targets in the transport network
- **Site Sustain:** This funds investment in infrastructure that houses Chorus' network electronics.

Network Sustain and Enhance capex represents 16.02% of FFLAS Capex over RP1.

10.1 Field Sustain

Field Sustain capex represents 5.82% of FFLAS Capex.

10.1.1 Description of capital expenditure program

The programme funds the renewal and replacement of Chorus network assets. This is broken into four main areas:

1. **Lifecycle – Cable:** renewal/replacement of fibre cable and transport equipment
2. **Lifecycle – Equipment:** renewal/replacement of legacy transport equipment (zero allocation to FFLAS during RP1)
3. **Maintain Service:** renewal/replacement/rehabilitation of cables, ducts and manholes that have failed, or are at imminent risk of failure and are so degraded a permanent repair cannot be completed. Also includes third party driven overhead to underground (OHUG) conversions.
4. **Projects:** Specific projects to sustain or maintain the network. During RP1 there are no specific projects that require FFLAS capex.

10.1.2 Forecast expenditure

NZ\$m real FY20 FFLAS only	RY16**	RY17**	RY18**	RY19**	RY20	RY21	RY22	RY23	RY24	RP1 Total
Draft Assessment Capex*	11.3	14.0	18.2	29.7	7.2	8.5	12.1	11.7	11.7	35.4
Final Assessment Capex	13.6	16.4	23.5	23.6	7.8	11.1	18.6	19.1	19.5	57.2

* Draft assessment capex is shown in financial years. Some allocations to this programme may have changed between the draft and final assessments.

** Historical expenditure RY16-RY19 is presented as unallocated expenditure (inclusive of non-FFLAS expenditure) at nominal prices

10.1.3 Assessment

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
Forecasting methodology	<p>Lifecycle – Cable: Price [individual project costs] x Quantity [strategic: 15 years for 80% replacement of identified deteriorating cable types]</p> <p>Maintain Service:</p> <p>Maintain service: Price [historical average] ✓ x Quantity [historical trend] ✓</p> <p>OHUG: known third party plans + historical run-rate ✓</p> <p>Rehabilitation: Price [estimated cost per activity] ✓ x Quantity [estimated elements requiring rehab] ✗</p> <p>The quantity component of Maintain Service – Rehabilitation requires more detail. The other methodologies applied are reasonable.</p>	<p>✗</p> <p>Maintain Service - Rehabilitation</p>	<p>Maintain Service – Rehabilitation: Price [estimated cost per activity] ✓ x Quantity [assessment of current and expected fault rates] ✓</p> <p>Chorus has provided an updated model that clarifies the source for the fibre rehabilitation quantity forecast.</p> <p>The draft assessment is retained for the other activities of Network Sustain.</p>	<p>✓</p>
Key assumptions	<p>Lifecycle – Cable:</p> <ul style="list-style-type: none"> Chorus have a model for the eventual replacement of 80% of the identified deteriorating cables within 15 years. This assumes that the increased/increasing signal noise on these cable types will become problematic on most of these cables within this period, either due to continued deterioration of the cable or increase traffic on the cable exhausting the lowered optical budget. Partly driven by decisions made by Spark to enable the sharing of costs for replacing shared cables (the detailed model that determines the cables to be replaced during RP1 and the size and scope of the 15 year program was not reviewed). <p>Lifecycle – Cable assumptions are reasonable but more detailed assessments and modelling of cable deterioration would benefit the case for replacement.</p> <p>Maintain Service:</p> <ul style="list-style-type: none"> The drivers of reactive work (maintain service) will be constant over RP1 Proactive repairs (rehabilitation) will be limited to high fault FFPs that have high utilisation rates. Most FFP faults are fibre breakages caused by mistakes during the connection of customers that have resulted in challenging installation of fibre in FFPs. Limiting the proactive program to FFPs with 	<p>✗</p> <p>Inconsistent time periods</p>	<p>Maintain Service</p> <ul style="list-style-type: none"> Chorus provided evidence to support a limited trial for fibre rehabilitation and calculations to show the necessary frequency of faults that justify rehabilitation expenditure and the number of assets that currently exceed that fault rate. The forecast volumes during RP1 require that the trial (in FY21) is successful and that additional assets exhibit the required fault rate. <p>The evidence provided by Chorus, which included breakeven analysis for proactive rehabilitation and the current number of assets meeting the breakeven criteria is sufficient to support the volumes included in the forecast.</p> <p>The draft assessment is retained for the other activities of Network Sustain.</p>	<p>✓</p>

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	<p>high utilisation rates means that future interaction with the FFP should be low due to most customers already being connected, so rehabilitation benefits will not be unwound due to future interaction.</p> <ul style="list-style-type: none"> Proactive repairs will only proceed if a trial shows that the rehabilitation is economically efficient. The rate of OHUGs and physical network faults requiring maintenance over time will be steady <p>Maintain Service assumptions are reasonable.</p>			
<p>Planning and technical standards</p>	<p>Planning and technical standards reviewed:</p> <ul style="list-style-type: none"> DP 6015 Fibre Lifecycle DP 6102 Transport Lifecycle - Sustain DP 2444 Rehab - Fibre DP 2445 Maintain Service Fibre DP 2341 Lifecycle Replacements DP 2702 Roadwork DP 2706 1.8GHz DMR Clearance for LTE DP 2420 Copper to fibre migration DP 2013 Netmap Gold Record DP 2569 Rehab, Renewal & Line Balancing DP 2570 Maintain Service Portfolio Plan – Fibre Cable <p>Many DP documents are incomplete.</p> <p>The portfolio plan is a typical asset management plan (AMP) for the particular asset class. The details within the portfolio plan are consistent with our expectations for an AMP within an asset management system that meets or is aligned to the ISO55000 asset management standard. The portfolio plans provide the asset management approach that Chorus is implementing over the life of the assets. Whilst this provides assurance that Chorus is following recommended asset management processes, the portfolio plans provide limited insight into the details that sit behind the forecast expenditure proposed for RP1.</p>	<p> Documents incomplete</p>	<p>Chorus is planning to update the DP documents after the 2020 five year plan is approved. Chorus has indicated that it will incorporate the feedback contained in the draft assessment with respect to all DP documents.</p> <p>The draft assessment is retained for this requirement.</p>	<p> Documents incomplete</p>

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
Reasonableness of models	<p>The model for Maintain Service (Rehabilitation) does not provide sufficient detail to justify the expenditure. The project is implied to be necessary to reduce faults by addressing high fault assets proactively. The expenditure should therefore be justified through a reduction in (reactive) fault costs/service quality improvement. The quantity of rehabilitated assets should be linked to a forecast of the number of FFPs that will exhibit the required recurrence of faults to produce a positive NPV.</p> <p>The detailed model supporting the Lifecycle – Cable component of the programme was not reviewed. The documentation supporting this project indicates there is a strong case for proceeding to ensure that quality targets are maintained.</p> <p>Models contain hard coded and undocumented inputs. This issue has been picked up by some of Chorus’ internal review notes for the models and is expected to be addressed before the regulatory submission.</p> <p>Maintain Service (rehabilitation) model should be tied to benefits and quality outcomes. Other models representing the vast majority of programme capex appear reasonable but there are some cases of hard-coded inputs that need to be removed and replaced with documented/linked input data.</p>	 Maintain Service - Rehabilitation	<p>Maintain Service – Rehabilitation: Chorus provided analysis to support proceeding with a trial in FY21. This included breakeven analysis for proactive rehabilitation and the current number of assets meeting the breakeven criteria. The volumes included in RP1 assume the trial is successful and additional assets exhibit the required level of fault rates for rehabilitation to be economic.</p> <p>The evidence provided by Chorus addresses the issues identified in the draft assessment.</p> <p>General: models have been updated to remove hard-coded values and replace them with formulas, add links to sources or add explanations for how values were selected.</p> <p>Instances of hard-coded values in models identified in the draft assessment have been addressed.</p>	
Accuracy and reliability of data	<p>Most input data appears to come from Chorus’ internal systems and is expected to be accurate and reliable. However, where input data is not documented its reliability cannot be determined.</p> <p>Reliability/accuracy of hard-coded input data without sources listed cannot be determined.</p>	 Hard-coded data Sources not clear	<p>Models have been updated to remove hard-coded values and replacement them with formulas, add links to sources or add explanations for how values were selected.</p> <p>Instances of hard-coded values in models identified in the draft assessment have been addressed.</p>	
Procurement approach	<p>All expenditure in this programme requires approval via Chorus’ Capital Expenditure Governance process. This includes development of business cases followed by approval from the Chorus Capital Council (CCC) before a project can proceed.</p> <p>Business cases are developed for all transport fibre replacement projects >\$50k.</p> <p>Works are undertaken by Chorus’ service companies. The deliverability targets and service costs are incorporated into the contracts between Chorus and each service company. Unit rates for services paid by</p>		<p>The draft assessment is retained for this requirement.</p>	

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	<p>Chorus differ between service companies and geographic regions and were subject to market tender processes.</p> <p>The procurement approach is reasonable. The CCC process encourages efficient selection of expenditure projects. Competitive tendering of work to service companies results in efficient pricing.</p>			
Consideration of historic investment	<p>The programme components are based on new expenditure items or were halted/deferred during the UFB1 build.</p> <p>Historic investment has been considered where appropriate.</p>		The draft assessment is retained for this requirement.	
Consideration of options and alternative solutions	<p>Alternative options do not exist for third party driven expenditure. The Lifecycle – Cable component of the programme is driven by quality targets and decisions by Spark (on shared cables). There are also few credible alternatives to replacing degraded cables.</p> <p>Credible alternative options unlikely to be available.</p>		The draft assessment is retained for this requirement.	
Relationship between proposed expenditure and quality outcomes	<p><input checked="" type="checkbox"/> Availability <input checked="" type="checkbox"/> Performance <input type="checkbox"/> Ordering <input type="checkbox"/> Provisioning <input type="checkbox"/> Switching <input checked="" type="checkbox"/> Faults <input type="checkbox"/> Customer service</p> <p>Most of the expenditure in this programme is for reactive addressing of physical network faults. This directly contributes to fault restoration time and network availability quality targets. The remainder of the expenditure is for proactively addressing potential sources of faults, which will reduce the incidence of faults and increase network availability. The Lifecycle – Cable component of the programme will also improve network performance by reducing performance impacts caused by optical losses in degraded fibre cables.</p> <p>This expenditure is primarily to improve Chorus' quality outcomes (faults, performance), but modelling has not been done to show the benefit and whether additional quality improvement is required.</p>	<p></p> <p>Links to quality outcomes not modelled</p>	<p>The model for Maintain Service is based on the number of 'customers protected' which creates a direct link to quality outcomes. The number of customers protected is an approximation based on a transition of all customers and faults from copper to fibre and a lower average fault rate for fibre. However, the expenditure is not directly linked to Chorus' quality outcomes or the expected quality targets that will be set for RP1.</p> <p>Chorus has linked the expenditure to a quality outcome but does not provide detailed evidence to support the assumptions used. It is not clear from the model whether the proposed forecast is expected to increase, decrease or maintain current quality outcomes. For this reason the draft assessment has been retained.</p>	
Deliverability and feasibility of implementation	<p>Expenditure in this programme is increasing but should be easily deliverable as the main UFB build winds down. The increase is in part due to a change in focus from build to maintain.</p> <p>Deliverability and feasibility of implementation risks are low.</p>		The draft assessment is retained for this requirement.	
Uncertainty within the proposed expenditure	<p>There is some risk that Lifecycle – Cable expenditure may need to be bought forward if cables deteriorate faster than expected. However, the impact during RP1 would not be expected to be large and could be addressed by reprioritising which cables are replaced first. Some cable replacements are driven by Spark and Chorus may be required to</p>	<p></p> <p>Level of work depends</p>	<p>Chorus agrees with the draft assessment and has taken note of the issues raised.</p> <p>The draft assessment is retained for this requirement.</p>	<p></p> <p>Level of work depends</p>

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	<p>bring forward expenditure to gain efficiencies of cost sharing with Spark.</p> <p>Maintain Service (OHUG): there is a high level of uncertainty as this expenditure is driven by third-party requests. However, this capex is mostly funded through capital contributions, so the overall uncertainty on Chorus' net capex is very low.</p> <p>The Maintain Service (Rehabilitation) project is dependent on a trial project showing that proactive rehabilitation of FFPs is economic. If the trial indicates that the project is uneconomic the expenditure will not be incurred. However, this would be expected to result in increase reactive expenditure during RP1, offsetting some of the expenditure reduction.</p> <p>Uncertainty is high across a number of components of this programme. However, some of this uncertainty is offset by third-party contributions to the cost (OHUGs, roadworks) that reduces the impact on Chorus' net capex.</p>	nt on external factors		nt on external factors
Extent to which a risk-based approach has been applied	<p>A risk-based approach has not been applied to this programme.</p> <p>It is unclear if there is a risk-based assessment included in the detailed modelling for the Lifecycle – Cable component of the programme.</p> <p>A risk-based approach has not been applied. Risk-based approaches that could be considered include incorporating failure rates and the risks/consequences of failure into forecasts for replacement before functional failure and decisions to repair or replace assets that have failed in a non-catastrophic (i.e. repairable) manner.</p>	<p> Not applied</p>	<p>Chorus has indicated it will investigate whether appropriate risk-based forecasting approaches can be implemented for future planning cycles.</p> <p>The draft assessment is retained for this requirement.</p>	<p> Not applied</p>
Capex / opex dependency and trade-off and whole of lifecycle cost	<p>This programme has capex-opex and capex-capex trade-offs due to its inclusion of proactive and reactive repairs of network faults. However, economic modelling of the net benefits of this expenditure does not appear to have been undertaken.</p> <p>Modelling does not cover capex-opex trade-offs despite these being a result of the expenditure.</p>	<p> Not considered</p>	<p>Chorus has indicated it will review the assumptions currently used for copper maintenance and update the fibre models to use the same methodology.</p> <p>The draft assessment is retained for this requirement.</p>	<p></p>

10.1.4 Final Assessment Conclusion

In our opinion, the methods and input assumptions used to forecast the Field Sustain capital expenditure would result in a forecast that reflects the efficient costs that a prudent fibre network operator would incur to deliver regulated FFLAS at appropriate quality, during the upcoming regulatory period and over the longer term, having regard to good telecommunications industry practice.

10.2 Field sustain – Poles

Poles capex represents 0.32% of FFLAS Capex over RP1.

10.2.1 Description of capital expenditure program

This programme of work relates to forecast expenditure to replace existing poles where they have been assessed as reaching end of life. Poles are identified as end of life through an ongoing testing programme (related operating expenditure).

The network poles capex programme is made up of three activities:

1. Proactive replacement of poles that have failed testing and are end of life
2. Reactive replacement of poles that have failed reactively. Mostly caused by car vs pole (~85 pa)
3. Capitalised pole inspections and testing (where the testing contributes to the establishment of a database of pole life information for long-term use by Chorus)

10.2.2 Forecast expenditure

NZ\$m real FY20 FFLAS only	RY16**	RY17**	RY18**	RY19**	RY20	RY21	RY22	RY23	RY24	RP1 Total
Draft Assessment Capex*	6.3	7.9	19.8	22.6	5.0	4.8	4.0	3.2	3.3	10.5
Final Assessment Capex	7.2	13.9	21.2	17.7	1.1	1.1	1.1	1.0	1.1	3.1

* Draft assessment capex is shown in financial years. Some allocations to this programme may have changed between the draft and final assessments.

** Historical expenditure RY16-RY19 is presented as unallocated expenditure (inclusive of non-FFLAS expenditure) at nominal prices

10.2.3 Assessment

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
Forecasting methodology	<p>Replacement: Price [service company contracts with adjustment for [forecast inspection outcomes]  Chorus CI]]  x Quantity </p> <p>Inspection: Initial testing of all Chorus poles will be complete by RY21 so no capitalised pole tests will be included in RP1 (all retesting is classified as opex)</p> <p>The forecasting approach is reasonable.</p>		The draft assessment is retained for this requirement.	
Key assumptions	<ul style="list-style-type: none"> • During RP1 50% of pole replacements will be in UFB areas. Chorus' allocation to FFLAS is similar between UFB and non-UFB areas. 	 Transition to	<p>Chorus has updated the pole test failure assumptions with actual data as some yellow tagged poles are now being retested.</p> <p>Chorus will revise its pole test failure forecasts annually as more data is collected. The average test failure rate also differentiates between poles that were</p>	

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	<ul style="list-style-type: none"> Chorus is working through a backlog of risky poles that require replacement created by the initial test and tag program. Chorus will reach a steady-state of 2.5% of poles replaced per annum by RP2. The unit rates paid by Chorus to service companies are the same for both proactive and reactive pole replacements. <p>Chorus's expectation that it will reach a steady state does not align with observed industry practice and is also not backed up by modelling. Pole age profiles (a proxy for condition and therefore replacement requirements) are generally not flat due to the uneven nature of initial rollouts of aerial networks. More commonly replacement volumes follow cycles with peaks and troughs. Chorus should prepare a sufficiently detailed pole replacement/failure model that incorporates as much information about the individual poles as is available. For poles not yet tested this will be limited to age and geographic location. Tested poles will have test results available and verified pole characteristic information.</p>	steady state	<p>previously tagged as yellow or green, with higher failure rates for yellow tagged poles. During RP1 retesting will transition to poles that were green tagged in the initial test and tag programme so the test failure rate is expected to decline.</p> <p>Chorus' forecast for RP1 is based on best available data and the assumptions for a decline in test failure rates as more green tagged poles are re-tested is reasonable. Our assessment that poles rarely reach a steady state level remains but this has a minimal impact on volumes during RP1 and over time the forecasts for later years (RP2 and beyond) will be updated with actual test data that will replace the default assumption of a steady-state replacement rate.</p>	
Planning and technical standards	<p>Planning and technical standards reviewed:</p> <ul style="list-style-type: none"> Chorus Proactive Pole Tag, Test, and Replacement Process (ND0312, v2.0) Pole Installation and Administration (ND0316, v1.5) Standard Operating Procedure – Reactive Poles using iTools (NDF192, v1.3) Poles: Chorus Performance Specification (ND0343, V3.1) DP 2437 and DP 2703 Network poles POD <p>Chorus has developed planning and technical documents for poles with similar quality and content of pole asset operators in the electricity distribution industry.</p>		The draft assessment is retained for this requirement.	
Reasonableness of models	<p>There are hardcoded inputs in the models and sources and supporting information for assumptions are not provided.</p> <p>The forecast for pole test failures is very simplistic. Total expenditure on pole replacements is relatively small and the same sophistication of modelling as that undertaken by electricity networks is not expected. However, there is room for improvement.</p>	 Replace ment quantity	<p>Chorus has incorporated additional information into the model to improve the accuracy of the forecast. Chorus has also noted aspirations to increase the sophistication of the pole replacement model.</p> <p>Though there still remain opportunities to improve the forecast modelling, the current level of sophistication is reasonable given the level of expenditure.</p>	

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	Opportunity to improve the forecast through additional detail in the quantity forecast.			
Accuracy and reliability of data	<p>Chorus is currently undertaking an initial test and tag programme of its pole population. Until this is complete the quality of the condition information known about each pole is low. Data prior to 2016 is very poor quality so historical trend analysis and degradation modelling is not possible until better data is collected.</p> <p>The accuracy of the unit costs for pole replacement is high as pole replacement unit rates are contained in contracts between Chorus and the service companies that undertake the work. The only uncertainty is due to changes when the FSA contracts are repriced and geographic distribution of required pole replacements (as there are small price differences across regions).</p> <p>The reliability of the data requires the majority completion of the initial test and tag programme. Also, due to the uneven effect of condition deterioration in poles, at least two data points are needed per pole (to show deterioration rate) to have confidence in the data. However, this will take time and is not an issue that Chorus can address in the short term.</p>	<p> Testing programme not yet complete</p> <p>Only one data point for most poles tested</p>	<p>Additional data is now available, with a limited number of yellow tagged poles having been retested. That information has been incorporated into the model as an updated pole test failure rate for FY20, which also determines the forecast failure rates during RP1.</p> <p>The incorporation of actual data into the forecast test failure rates has provided additional accuracy to the forecast. Although further data points will improve accuracy further, the additional data that has been used provides a sufficient level of confidence in the forecast.</p>	
Procurement approach	<p>All expenditure in this programme requires approval via Chorus' Capital Expenditure Governance process. This includes development of business cases followed by approval from the Chorus Capital Council (CCC) before a project can proceed.</p> <p>Works are undertaken by Chorus' service companies. The deliverability targets and service costs are incorporated into the contracts between Chorus and each service company. Unit rates for services paid by Chorus differ between service companies and geographic regions and were subject to market tender processes. Service companies must follow the procedures outlined in Chorus documentation (see Planning and technical standards above)</p> <p>The procurement approach is reasonable. The CCC process encourages efficient selection of expenditure projects. Competitive tendering of work to service companies results in efficient pricing.</p>		The draft assessment is retained for this requirement.	
Consideration of historic investment	Chorus is effectively resetting its pole management practices, which has created a divergence from previous investment patterns. The forecast is now determined by the test and tag programme.		The draft assessment is retained for this requirement.	

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	<p>Historic investment is not a good predictor due to changes to Chorus' pole management practices. The new practices align closely to best practice by electricity networks.</p>			
<p>Consideration of options and alternative solutions</p>	<p>Chorus has not considered alternative options to pole replacement, such as staking of poles. Chorus' unit cost for pole replacement is significantly lower than pole replacement costs in industries where pole staking is widely used (electricity distribution) due to the smaller poles used by Chorus (telecommunications assets are generally lighter than electrical assets so require less pole strength and therefore smaller, cheaper poles). However, the alternative option of pole staking should be investigated further by Chorus as it may be appropriate in some circumstances.</p> <p>Chorus has not considered different inspection frequencies (which would result in changes to the proactive and reactive replacement volumes) or test failure (and therefore replacement) criteria. However, the inspection frequencies and test failure criteria used by Chorus align with approaches used by electricity distribution networks. In particular, the testing programme has been developed with consideration of detailed testing by PowerCo, the second largest pole owner in New Zealand.</p> <p>Chorus should consider alternative options such as staking. Although Chorus has not modelled alternative inspection frequencies and test failure criteria the current practices are based on extensive testing and align with industry practice in the NZ electricity distribution industry.</p>	<p> Staking not considered</p>	<p>Chorus provided an assessment of the option to stake rather than replace poles. Due to the small poles used by Chorus the unit rate for replacement is significantly lower than for electricity network pole replacements, for which staking is a common practice. Chorus' analysis showed that it was uneconomic to stake telecommunication poles.</p> <p>The analysis of pole staking economics has addressed the issues raised in the draft assessment.</p>	<p></p>
<p>Relationship between proposed expenditure and quality outcomes</p>	<p><input checked="" type="checkbox"/> Availability <input checked="" type="checkbox"/> Performance <input type="checkbox"/> Ordering <input type="checkbox"/> Provisioning <input type="checkbox"/> Switching <input checked="" type="checkbox"/> Faults <input type="checkbox"/> Customer service</p> <p>The proactive replacement of poles before failure will reduce the probability of a fault caused by unassisted pole failures. Pole replacement is also required following a fault caused by a pole failure. Having resources available for responding to pole break faults will decrease the time to restore regulated FFLAS services after a fault.</p> <p>As the quality outcome targets for availability and faults have not yet been established by the Commerce Commission, it cannot be determined whether the forecast proactive replacement and resource availability for reactive replacement are sufficient to meet the RP1 targets. Chorus has not quantified the expected availability benefits of its proactive replacement program and has not provided an</p>	<p> Quality targets not modelled</p>	<p>The draft assessment is retained for this requirement.</p>	<p></p>

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	<p>assessment of fault response times for reactive pole replacements (that resulted in a service outage).</p> <p>Increased pole replacement is expected to improve quality outcomes for faults. However, the quality improvements have not been modelled and Chorus may be replacing more poles than necessary to meet quality targets.</p>			
Deliverability and feasibility of implementation	<p>The proposed replacement volumes are lower than current pole replacement volumes and lower than the replacements expected during the two years prior to the beginning of RP1. There may be a risk of the higher volumes prior to RP1 not being completed resulting in a backlog that will require higher volumes than forecast during RP1.</p> <p>Deliverability and feasibility of implementation risks are low.</p>		The draft assessment is retained for this requirement.	
Uncertainty within the proposed expenditure	<p>Replacement of a pole is determined after testing. While over a large population of poles the number of test failures is reasonably steady, a sufficient number of test failures are required for the forecast expenditure to be met.</p> <p>During RP1 most proactive replacements will be due to retesting of yellow tagged poles found during the initial tag and test program. The volume of poles yellow tagged during the current program (which is not yet complete) will be a key driver of the number of poles retested during RP1.</p> <p>There is not enough Chorus data to yet determine what percentage of yellow tagged poles will fail the test, which introduces additional uncertainty. Chorus does not yet have sufficient data to determine pole degradation rates.</p>		The draft assessment is retained for this requirement.	
Extent to which a risk-based approach has been applied	<p>A risk-based approach has not been applied.</p> <p>Chorus should develop a risk-based model to determine optimal replacement volumes. As this expenditure is primarily for the mitigation of risk (safety and reliability risks from an unassisted pole failure) a risk-based model would be appropriate whereby forecast volumes are determined by the number of poles where the expected risk is greater than the cost of replacement.</p>	 Not applied	Chorus has indicated it will investigate whether appropriate risk-based forecasting approaches can be implemented for future planning cycles. The draft assessment is retained for this requirement.	 Not applied
Capex / opex dependency and trade-off	<p>There is a significant capex-opex trade-off opportunity between pole inspection and testing and pole replacement. Chorus also has the option of replacing more poles proactively to minimise asset failures</p>		The draft assessment is retained for this requirement.	

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
and whole of lifecycle cost	<p>and the associated faults or to minimise expenditure and defer replacement but incur heightened asset failures and faults.</p> <p>Chorus has adopted a pole inspection regime from the electricity sector and follows the ECP34 requirements. However, Chorus is not bound to follow ECP34 and can adopt a lower inspection frequency.</p> <p>Chorus has conducted a thorough investigation before setting its pole inspection and replacement management plan. However, a capex/opex trade-off has not been included in the RP1 forecast modelling.</p>	Not modelled		Not modelled

10.2.4 Final Assessment Conclusion

In our opinion, the methods and input assumptions used to forecast the Field Sustain – Poles capital expenditure would result in a forecast that reflects the efficient costs that a prudent fibre network operator would incur to deliver regulated FFLAS at appropriate quality, during the upcoming regulatory period and over the longer term, having regard to good telecommunications industry practice.

10.3 Relocations

Relocations capex represents 1.30% of FFLAS Capex.

10.3.1 Description of capital expenditure program

The programme funds relocation of Chorus' assets caused by:

- **Roadworks:** relocations driven by third party requests, mainly from councils and NZTA
- **OHUG:** third party driven overhead to underground (OHUG) conversions, mostly due to lines companies undergrounding the power network and decommissioning poles leased by Chorus. Also referred to as Copper to Fibre migration.

10.3.2 Forecast expenditure

NZ\$m real FY20 FFLAS only	RY16**	RY17**	RY18**	RY19**	RY20	RY21	RY22	RY23	RY24	RP1 Total
Draft Assessment Capex*	10.5	9.5	17.1	9.3	8.7	7.9	8.2	8.2	8.2	24.7
Final Assessment Capex***	10.5	13.9	13.9	8.4	3.3	3.9	4.3	4.3	4.3	12.8

* Draft assessment capex is shown in financial years. Some allocations to this programme may have changed between the draft and final assessments.

** Historical expenditure RY16-RY19 is presented as unallocated expenditure (inclusive of non-FFLAS expenditure) at nominal prices

***Capex net of customer contributions

10.3.3 Assessment

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
Forecasting methodology	<p>Roadworks: Price [FY15-18 average unit rate + FSA adjustment] ✓ x Quantity [CY18, no change over time] ✓</p> <p>OHUG: known third party plans + historical run-rate ✓</p> <p>The forecasting methodologies are reasonable.</p>		<p>Roadworks: Price [FY20 average + FSA adjustment] ✓ x Quantity [FY20 run rate, adjustment for a significant project and step change in government roading investment, otherwise no change over time] ✓</p> <p>The roadworks forecasting methodology has been updated due to exogenous changes and to reflect issues raised in the draft assessment for the key assumptions requirement.</p>	
Key assumptions	<p>Roadworks:</p> <ul style="list-style-type: none"> • CY18 volumes are representative of typical annual volumes of requests • FY15-18 average costs are representative of normal costs for roadworks projects 	 Inconsistent time periods	<p>Roadworks:</p> <ul style="list-style-type: none"> • Model updated to use consistent time periods. • FY20 costs are representative of average costs going forward, with adjustments for FSA changes • FY20 volumes are representative of volumes that can be expected in during RP1 	

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	<ul style="list-style-type: none"> Forecast is for upfront funding of works that will be recovered (in whole or part depending on the authority requesting the works) following the works. The forecast recovery is not included within this programme <p>It is not clarified why a three year average is used for price, but a single year is used for quantity. A longer time period would be expected to be a more reliable forecast unless there are clear outliers identified by Chorus. This assumption requires further justification.</p> <p>OHUG:</p> <ul style="list-style-type: none"> The rate of OHUGs over time will be steady 		<ul style="list-style-type: none"> There will be a step change in Chorus roadworks expenditure due to an increase in government roading expenditure. The percentage increase in Chorus' expenditure will be roughly equal to the percentage increase in the government's expenditure. <p>Chorus has aligned the time periods used for price and quantity. FY20 costs are reasonable as these are linked to FSA contracts. FY20 volumes are similar to FY19 volumes which indicates that underlying volumes are relatively stable and the FY20 is a reasonable base year.</p> <p>The approach used for the government's increase in roading expenditure is reasonable.</p>	
<p>Planning and technical standards</p>	<p>Planning and technical standards reviewed:</p> <ul style="list-style-type: none"> DP 2436 Roadworks - fibre driven DP 2420 Copper to fibre migration <p>Many DP documents are incomplete.</p> <p>The portfolio plan is a typical asset management plan (AMP) for the particular asset class. The details within the portfolio plan are consistent with our expectations for an AMP within an asset management system that meets or is aligned to the ISO55000 asset management standard. The portfolio plans provide the asset management approach that Chorus is implementing over the life of the assets. Whilst this provides assurance that Chorus is following recommended asset management processes, the portfolio plans provide limited insight into the details that sit behind the forecast expenditure proposed for RP1.</p>	 Documents incomplete	<p>Chorus is planning to update the DP documents after the 2020 five year plan is approved. Chorus has indicated that it will incorporate the feedback contained in the draft assessment with respect to all DP documents.</p> <p>The draft assessment is retained for this requirement.</p>	 Documents incomplete
<p>Reasonableness of models</p>	<p>Models contain hard coded and undocumented inputs. This issue has been picked up by some of Chorus' internal review notes for the models and is expected to be addressed before the regulatory submission.</p> <p>There are some cases of hard-coded inputs that need to be removed and replaced with documented/linked input data.</p>		<p>Models have been updated to remove hard-coded values and replacement them with formulas, add links to sources or add explanations for how values were selected.</p> <p>Instances of hard-coded values in models identified in the draft assessment have been addressed.</p>	
<p>Accuracy and reliability of data</p>	<p>Most input data appears to come from Chorus' internal systems and is expected to be accurate and reliable. However, where input data is not documented its reliability cannot be determined.</p>		<p>Models have been updated to remove hard-coded values and replacement them with formulas, add links to sources or add explanations for how values were selected.</p>	

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	Reliability/accuracy of hard-coded input data without sources listed cannot be determined.	Hard-coded data Sources not clear	Instances of hard-coded values in models identified in the draft assessment have been addressed.	
Procurement approach	All expenditure in this programme requires approval via Chorus' Capital Expenditure Governance process. This includes development of business cases followed by approval from the Chorus Capital Council (CCC) before a project can proceed. Business cases are developed for all transport fibre replacement projects >\$50k. Works are undertaken by Chorus' service companies. The deliverability targets and service costs are incorporated into the contracts between Chorus and each service company. Unit rates for services paid by Chorus differ between service companies and geographic regions and were subject to market tender processes. The procurement approach is reasonable. The CCC process encourages efficient selection of expenditure projects. Competitive tendering of work to service companies results in efficient pricing.		The draft assessment is retained for this requirement.	
Consideration of historic investment	The roadworks component of the programme is based on historic expenditure.. Historic investment has been considered where appropriate.		The draft assessment is retained for this requirement.	
Consideration of options and alternative solutions	Alternative options do not exist for third party driven expenditure. Credible alternative options unlikely to be available.		The draft assessment is retained for this requirement.	
Relationship between proposed expenditure and quality outcomes	<input checked="" type="checkbox"/> Availability <input checked="" type="checkbox"/> Performance <input type="checkbox"/> Ordering <input type="checkbox"/> Provisioning <input type="checkbox"/> Switching <input checked="" type="checkbox"/> Faults <input type="checkbox"/> Customer service Most of the expenditure in this programme is for responding to outside requests. This does not directly relate to quality outcomes. However, if the network is not relocated Chorus may be unable to provide any services. This expenditure is to respond to outside requests and does not directly relate to quality outcomes.		The draft assessment is retained for this requirement.	

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
Deliverability and feasibility of implementation	Expenditure in this programme is increasing but should be easily deliverable as the main UFB build winds down. The increase is in part due to a change in focus from build to maintain. Deliverability and feasibility of implementation risks are low.		The draft assessment is retained for this requirement.	
Uncertainty within the proposed expenditure	Roadworks: there is a high level of uncertainty as this expenditure is reactive and driven by third-party requests, mostly from NZTA and councils. Only a portion of the cost is funded through customer contributions so the uncertainty on Chorus' net capex is moderate. OHUG: there is a high level of uncertainty as this expenditure is driven by third-party requests. However, this capex is mostly funded through capital contributions, so the overall uncertainty on Chorus' net capex is very low. Uncertainty is high across this expenditure. However, some of this uncertainty is offset by third-party contributions to the cost that reduces the impact on Chorus' net capex.	 Level of work dependent on external factors	Chorus agrees with the draft assessment and has taken note of the issues raised. The draft assessment is retained for this requirement.	 Level of work dependent on external factors
Extent to which a risk-based approach has been applied	A risk-based approach has not been applied to this programme. A risk-based approach has not been applied. Risk-based approaches that could be considered include incorporating failure rates and the risks/consequences of failure into forecasts for replacement before functional failure and decisions to repair or replace assets that have failed in a non-catastrophic (i.e. repairable) manner.	 Not applied	Chorus has indicated it will investigate whether appropriate risk-based forecasting approaches can be implemented for future planning cycles. The draft assessment is retained for this requirement.	 Not applied
Capex / opex dependency and trade-off and whole of lifecycle cost	This programme has capex-opex and capex-capex trade-offs due to its inclusion of proactive and reactive repairs of network faults. However, economic modelling of the net benefits of this expenditure does not appear to have been undertaken. Modelling does not cover capex-opex trade-offs despite these being a result of the expenditure.	 Not considered	Chorus has indicated it will review the assumptions currently used for copper maintenance and update the fibre models to use the same methodology. The draft assessment is retained for this requirement.	

10.3.4 Final Assessment Conclusion

In our opinion, the methods and input assumptions used to forecast the Relocations capital expenditure would result in a forecast that reflects the efficient costs that a prudent fibre network operator would incur to deliver regulated FFLAS at appropriate quality, during the upcoming regulatory period and over the longer term, having regard to good telecommunications industry practice.

10.4 Resilience

Resilience capex represents 4.91% of FFLAS Capex over RP1.

10.4.1 Description of capital expenditure program

The programme funds the extension and enhancement of Chorus' transport fibre capacity and robustness, i.e. additional fibre to meet capacity and availability targets in the transport network.

10.4.2 Forecast expenditure

NZ\$m real FY20 FFLAS only	RY16**	RY17**	RY18**	RY19**	RY20	RY21	RY22	RY23	RY24	RP1 Total
Draft Assessment Capex*	0.9	0.4	3.9	2.1	2.6	4.6	12.2	13.4	13.4	38.9
Final Assessment Capex	0.6	2.1	3.0	2.5	15.7	29.7	21.9	13.0	13.4	48.2

* Draft assessment capex is shown in financial years. Some allocations to this programme may have changed between the draft and final assessments.

** Historical expenditure RY16-RY19 is presented as unallocated expenditure (inclusive of non-FFLAS expenditure) at nominal prices

10.4.3 Assessment

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
Forecasting methodology	Specialised models [Robustness / Resilience report and estimating spreadsheet] 		The draft assessment is retained for this requirement	
Key assumptions	<ul style="list-style-type: none"> Robustness: assumptions contained within robustness model (not reviewed) Capacity: assumptions not documented, fibre cable utilisation and demand forecast to be used. Currently only a high level model. Projects invested in should have business case and be economic, will go thorough CCC. <p>Additional documentation of assumptions required.</p>	 Documentation	Chorus has incorporated additional documentation of key assumptions into the spreadsheet models used for forecasting. This includes listing sources for external information, explaining why certain values were selected and replacing hard-coded data with calculations within the models. The additional information incorporated into the models has addressed the concerns raised in the draft assessment.	
Planning and technical standards	Planning and technical standards reviewed: <ul style="list-style-type: none"> DP 2430 Transport Fibre Robustness Portfolio Plan – Fibre Cable 	 DP documents	Chorus is planning to update the DP documents after the 2020 five year plan is approved. Chorus has indicated that it will incorporate the feedback contained in the draft assessment with respect to all DP documents. The draft assessment is retained for this requirement.	 DP documents

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	<ul style="list-style-type: none"> Congestion Free Networks – Technical Whitepaper (2016) Network Infrastructure Project Agreement (NIPA) (26/01/2017) <p>These documents outline in detail the steps that must be undertaken by service companies when connecting a premise to Chorus’ fibre network. Documents are still incomplete but a review and updating process is underway.</p> <p>Many of the DP/POD documents are only partially complete, such as having sections containing placeholder text stating what type of content is meant to go in the section. The Excel models that match these documents are also only partially complete with many hard-coded inputs without source information.</p> <p>The portfolio plan is a typical asset management plan (AMP) for the particular asset class. The details within the portfolio plan are consistent with our expectations for an AMP within an asset management system that meets or is aligned to the ISO55000 asset management standard. The portfolio plans provide the asset management approach that Chorus is implementing over the life of the assets. Whilst this provides assurance that Chorus is following recommended asset management processes, the portfolio plans provide limited insight into the details that sit behind the forecast expenditure proposed for RP1.</p>	incomplete		incomplete
Reasonableness of models	<p>Robustness: Given the specific nature of each transport fibre investment (each project is large and unique), it is appropriate to use a model specific to modelling network availability targets. The detailed model has not been reviewed.</p> <p>Capacity: Using fibre cable utilisation and demand forecast will produce an estimate for this programme that is consistent with Chorus’ customer and traffic forecasts and therefore align with other major capex areas.</p> <p>The spreadsheets contain large amounts of hard-coded data.</p>		<p>Chorus has provided updated models that include documentation of key assumptions and an explanation of the processes used to determine the routes requiring expenditure. The models use distance estimates and \$/metre estimates based on local geology to provide reasonable bottom-up estimates of cost for each fibre route.</p> <p>The updated models have addressed the use of hard-coded data identified in the draft assessment and there is increased transparency in the costs used in the forecast.</p>	
Accuracy and reliability of data	<p>Input data includes contractual obligations and historic cost and volume data that is obtained from Chorus’ computer systems. This information is known with a high degree of accuracy.</p> <p>Input data is accurate and reliable.</p>		The draft assessment is retained for this requirement.	
Procurement approach	All expenditure in this programme requires approval via Chorus’ Capital Expenditure Governance process. This includes development of		The draft assessment is retained for this requirement.	

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	<p>business cases followed by approval from the Chorus Capital Council (CCC) before a project can proceed.</p> <p>Works are undertaken by Chorus' service companies. The deliverability targets and service costs are incorporated into the contracts between Chorus and each service company. Unit rates for services that make up a POA connection paid by Chorus differ between service companies and geographic regions and were subject to market tender processes.</p> <p>The procurement approach is reasonable. The CCC process encourages efficient selection of expenditure projects. Competitive tendering of work to service companies results in efficient pricing.</p>			
<p>Consideration of historic investment</p>	<p>Forward looking and/or meeting contractual requirements and service level targets.</p> <p>Historic investment is incorporated into the forecast approaches where appropriate.</p>		<p>The draft assessment is retained for this requirement.</p>	
<p>Consideration of options and alternative solutions</p>	<p>Alternative options only exist in limited circumstances for transport fibre.</p> <p>Alternative options are not available for this programme.</p>		<p>The draft assessment is retained for this requirement.</p>	
<p>Relationship between proposed expenditure and quality outcomes</p>	<p><input checked="" type="checkbox"/> Availability <input checked="" type="checkbox"/> Performance <input type="checkbox"/> Ordering <input type="checkbox"/> Provisioning <input type="checkbox"/> Switching <input checked="" type="checkbox"/> Faults <input type="checkbox"/> Customer service</p> <p>This expenditure directly enables Chorus to provision fibre access products to customers. Transport upgrades enable Chorus to maintain/improve the availability of fibre services and the performance of those services.</p> <p>As the quality outcome targets for availability, performance, and faults have not yet been established by the Commerce Commission, it cannot be determined whether the forecasts are sufficient to meet the RP1 targets. As a placeholder, Chorus would be expected to continue delivering to current performance levels, in which case the proposed expenditure, which maintains existing service levels in key areas (transport capacity and robustness), should be sufficient to continue delivering these outcomes.</p> <p>The proposed expenditure is expected to be sufficient to maintain current quality outcomes.</p>		<p>The draft assessment is retained for this requirement.</p>	

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
Deliverability and feasibility of implementation	Expenditure increases significantly during RP1. However, this coincides with the wind down of UFB2/2+, which will make resources available for this programme. Therefore, the deliverability risk is low. The resilience programme is largely driven by contractual and regulatory obligations and must be delivered.		The draft assessment is retained for this requirement.	
Uncertainty within the proposed expenditure	There is a low level of uncertainty for resilience capex as this is driven by contractual obligations.		The draft assessment is retained for this requirement.	
Extent to which a risk-based approach has been applied	A risk-based approach has not been applied. A risk-based approach has not been applied. A risk-based model should be considered as these projects directly impact availability of services and this benefit (reduction in availability risk) could be quantified (similar to the concept of unserved energy in electricity distribution).	 Not applied	Chorus has indicated it will investigate whether appropriate risk-based forecasting approaches can be implemented for future planning cycles. The draft assessment is retained for this requirement.	 A risk-based approach has not been applied
Capex / opex dependency and trade-off and whole of lifecycle cost	There are no reasonable capex-opex trade-off opportunities for this programmes. This expenditure is to install network assets. There are no opex equivalent investments that meet the criteria required by this programme. No feasible capex / opex trade-offs available.		The draft assessment is retained for this requirement.	

10.4.4 Final Assessment Conclusion

In our opinion, the methods and input assumptions used to forecast the Resilience capital expenditure would result in a forecast that reflects the efficient costs that a prudent fibre network operator would incur to deliver regulated FFLAS at appropriate quality, during the upcoming regulatory period and over the longer term, having regard to good telecommunications industry practice.

10.5 Site Sustain

Site Sustain capex represents 3.68% of FFLAS Capex.

10.5.1 Description of capital expenditure program

The programme funds the building and engineering services infrastructure required to support the physical network and network electronics. This includes:

- Corporate office accommodation fit outs and office equipment
- Space, power and cooling capacity in Spark buildings hosting the Chorus network equipment
- Building row space and engineering service capacity in Chorus sites
- Enhancement of Chorus owned buildings to reduce dependency on Spark sites
- Maintaining aged buildings, structures and sites

The major capex items within this programme (in order of share of RP1 capex) are:

1. Property and infrastructure compliance – Renewal and growth of buildings, tracks, towers, security systems, fire protection and other for Chorus' 2,602 tenures and associated structures/buildings and 1,317 radio sites.
2. Engineering services – AC power plant, DC power plant and air conditioning systems to supply electricity to, and remove waste heat from, network electronics and other equipment in buildings and huts
3. Other – UCLL collocation, alternative sites, accommodation, health and safety, office equipment, recording of property and buildings in Chorus' geographic information system

10.5.2 Forecast expenditure

NZ\$m real FY20 FFLAS only	RY16**	RY17**	RY18**	RY19**	RY20	RY21	RY22	RY23	RY24	RP1 Total
Draft Assessment Capex*	11.5	17.7	18.1	22.9	8.8	13.4	15.0	15.4	15.4	45.8
Final Assessment Capex	15.5	19.0	20.9	20.3	15.3	15.2	14.9	11.9	9.3	36.2

* Draft assessment capex is shown in financial years. Some allocations to this programme may have changed between the draft and final assessments.

** Historical expenditure RY16-RY19 is presented as unallocated expenditure (inclusive of non-FFLAS expenditure) at nominal prices

10.5.3 Assessment

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
Forecasting methodology	Property and infrastructure compliance: multiple approaches – asset manager forecast requirements (tenancies)  , external assessments of		The draft assessment is retained for this requirement.	

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	required build activity (Chorus structures) ✓, obsolescence (fire and security) ✓ Engineering services: Price [historic average unit rate] ✓ x Quantity [age based replacement forecast] ✓ Other: mixed, Price x Quantity, NPV business case, estimate (where historic not available) ✓ The forecasting methodologies are reasonable.			
Key assumptions	Assumptions vary across the wide range of different expenditures included within this programme. Some of the key assumptions are: <ul style="list-style-type: none"> • Current unit costs are efficient and are unlikely to change materially between now and the end of RP1 • Age of obsolescence/replacement (for assets using this to determine replacement volumes) is reasonable and required to meet compliance and safety outcomes • Building works identified by Chorus, external parties and/or service companies cannot be deferred beyond RP1 and will result in increased costs due to degradation if deferred. • Pre-RP1 expenditure is constrained by Chorus' available capital. This constraint has created a back-log of work, but critical work can and will be completed (to prevent avoidable degradation of other parts of buildings and structures that would increase total cost of ownership) Key assumptions are reasonable.		The draft assessment is retained for this requirement.	
Planning and technical standards	Planning and technical standards reviewed: <ul style="list-style-type: none"> • DP 2182 Chorus Alternative Sites • DP 2183 Spark Exchange Equipment ROWs • DP 2347 UCLL Co Lo Infrastructure • DP 2562 Engineering Services • DP 2592 Corporate Property • DP 2426 Health and safety • DP 2012 Office Equipment & Phones • Portfolio Plan – Eng Services 		The draft assessment is retained for this requirement.	

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	<ul style="list-style-type: none"> Portfolio Plan – Property <p>The documents are largely complete and provide a good level of detail.</p> <p>The portfolio plan is a typical asset management plan (AMP) for the particular asset class. The details within the portfolio plan are consistent with our expectations for an AMP within an asset management system that meets or is aligned to the ISO55000 asset management standard. The portfolio plans provide the asset management approach that Chorus is implementing over the life of the assets. Whilst this provides assurance that Chorus is following recommended asset management processes, the portfolio plans provide limited insight into the details that sit behind the forecast expenditure proposed for RP1.</p>			
Reasonableness of models	<p>The models used are generally reasonable. However, issues were found for building and infrastructure compliance and premium colocation.</p> <p>The forecast for building and infrastructure compliance is considerably higher than current expenditure. For an established utility or other large business this type of expenditure would be expected to be steady with a trend driven by the age profile and condition of its buildings and structures. Although the underlying driver of this increase is an external review of Chorus’ building works requirements, the current low level of expenditure may indicate that this has a large discretionary component. Questions may also be raised whether Chorus is allowing buildings to become degraded (and increasing total lifecycle cost) to meet internal capital and budgeting requirements that could be considered inefficient. Chorus should develop additional modelling to show whether deferral of the expenditure increase beyond RP1 can be achieved without increasing total lifecycle building maintenance costs.</p> <p>Issues were found for <i>building and infrastructure compliance</i>. Other models are reasonable.</p>	 <p>Building and infrastructure compliance</p>	<p>Chorus is in the process of updating the model for building and infrastructure compliance. A partial model was provided indicating changes in approach and inclusion of additional detail. The model includes a breakdown of expenditure by individual items, with links to sources provided for each or an explanation of how an estimate was derived. The model covers both opex and capex, which indicates that the forecasts for both incorporate the interdependencies of the two expenditure types.</p> <p>Chorus has provided additional modelling that indicates a greater level of detail has been incorporated into the calculation of the forecast. However, the findings of the draft assessment, in particular whether the models calculate an efficient level of expenditure, still stand.</p> <p>The evidence provided indicates the processes and procedures followed by Chorus are reasonable, but an assessment of the efficiency of the significant increase in expenditure on building and infrastructure compliance requires a deeper review of the source files that feed into the model included in the review.</p>	
Accuracy and reliability of data	<p>The accuracy of data used to support the forecast is high. This includes an external review of Chorus’ building maintenance requirements, which drives a large portion of the forecast. Chorus has also used historic average unit rates for building/structure maintenance activities and engineering services.</p> <p>Data is accurate and reliable.</p>		<p>The draft assessment is retained for this requirement.</p>	

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
Procurement approach	<p>All expenditure in this programme requires approval via Chorus' Capital Expenditure Governance process. This includes development of business cases followed by approval from the Chorus Capital Council (CCC) before a project can proceed.</p> <p>Works are mostly undertaken by Chorus' service companies. The deliverability targets and service costs are incorporated into the contracts between Chorus and each service company. Unit rates for services that make up property and engineering paid by Chorus differ between service companies and geographic regions and were subject to market tender processes.</p> <p>The procurement approach is reasonable. The CCC process encourages efficient selection of expenditure projects. Competitive tendering of work to service companies results in efficient pricing.</p>		<p>The draft assessment is retained for this requirement.</p>	
Consideration of historic investment	<p>Historic investment is not a major input into the capex forecasts for this programme. Historic unit rates are used for some components of the program, but quantities are not based on historic quantities.</p> <p>Historic investment has been considered.</p>		<p>The draft assessment is retained for this requirement.</p>	
Consideration of options and alternative solutions	<p>Alternative options have not been considered for this programme. Different alternative options are available for the separate components of this programme, but for some of the programme alternatives may not exist. Potential alternative options include deferring expenditure and incurring higher maintenance opex costs or bringing expenditure forward, replacement of degraded buildings with new structures or leased premises.</p> <p>Additional options could be considered within some areas of the programme.</p>	 <p>Potential alternate options not considered</p>	<p>Chorus provided business case for current and completed projects showing that options and alternative solutions are considered as a standard practice when developing business cases. Alternative solutions are only considered on a project-by-project basis at the business casing stage and are not prepared for broad-based expenditure programmes included in the RP1 submission.</p> <p>Chorus has shown evidence that alternative solutions are considered and the downward pressure on expenditure of this is incorporated into current expenditure levels. Given the nature of the proposed expenditure, with no individually identifiable projects, the evidence provided is reasonable and the Commerce Commission's review should focus on the extent of the increase in forecast expenditure relative to current expenditure levels.</p>	
Relationship between proposed expenditure and quality outcomes	<p><input checked="" type="checkbox"/> Availability <input type="checkbox"/> Performance <input type="checkbox"/> Ordering <input type="checkbox"/> Provisioning <input type="checkbox"/> Switching <input checked="" type="checkbox"/> Faults <input type="checkbox"/> Customer service</p> <p>The works undertaken by this programme indirectly enable the supply of FFLAS services. In some cases, where buildings and structures are significantly deteriorated, this programme may improve Chorus' ability to respond to faults caused by network electronics failures and improve network availability. Extremely deteriorated buildings could cause failures of network electronics if maintenance included in this</p>		<p>The draft assessment is retained for this requirement.</p>	

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	<p>programme is not undertaken (for example a leaking roof causing water damage to electronics).</p> <p>This expenditure is unlikely to directly affect Chorus' quality outcomes unless the forecast is reduced to very low levels. The forecast should be sufficient to prevent increases in faults and reduced network availability.</p>			
<p>Deliverability and feasibility of implementation</p>	<p>The building and infrastructure compliance component of the programme includes a significant increase in expenditure over current levels. However, this work is mostly outsourced to appropriate trade professionals so deliverability risks should be low. Chorus has prepared a long list of building issues that require repair so there is a low likelihood of not having enough work to use the allocated budget.</p> <p>Deliverability and feasibility risks are low, and any challenges are expected to be managed by service companies.</p>	<p></p>	<p>The draft assessment is retained for this requirement.</p>	<p></p>
<p>Uncertainty within the proposed expenditure</p>	<p>There is a low level of uncertainty for engineering services. The 'other' category is made up of a large number of small and unrelated projects, which spreads the uncertainty risk.</p> <p><i>Building and infrastructure compliance:</i> The current expenditure on building and infrastructure compliance indicates that this expenditure is largely discretionary and easily deferred. If this is the case, there is a risk that Chorus could choose not to spend the proposed forecast and defer this expenditure beyond RP1. There is also a possibility that the identified priority 1 works are more urgent than assumed, and that other priority 1 works may be identified before the end of RP1, which would require significantly more expenditure than proposed by Chorus.</p> <p>There is some uncertainty in building and infrastructure compliance component of the programme.</p>	<p> Building and infrastructure compliance</p>	<p>The draft assessment is retained for this requirement.</p>	<p></p>
<p>Extent to which a risk-based approach has been applied</p>	<p>A risk-based approach has not been applied.</p> <p>A risk-based approach has not been applied. A risk-based approach that considers the risks of reduced property maintenance and refurbishment on business operations could be applied to Property and Infrastructure Compliance. Engineering Services could also follow a risk-based approach involving possible scenarios involving changes to underlying demand and other key variables to present a range of probable volumes over time.</p>	<p> Not applied</p>	<p>Chorus has indicated that an informal risk-based approach is applied to this Expenditure Area. Work is required to document the approach and methodology.</p> <p>The draft assessment is retained for this requirement.</p>	<p> Not applied</p>

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
<p>Capex / opex dependency and trade-off and whole of lifecycle cost</p>	<p>There is a capex-opex trade-off between major upgrades of buildings and structures and ongoing minor maintenance. It is expected that major upgrades will lower long-term maintenance requirements. New and improved assets included within the engineering services component of this programme would be expected to be more energy efficient and reduce electricity costs. In general, Chorus has not made a clear link between the proposed building and engineering services capex and related opex costs.</p> <p>The business case for Chorus Alternate Sites (included within 'Other' but mostly complete prior to RP1) includes a large opex reduction resulting in a positive NPV for the capex project. It is expected that this opex saving will be included in a transparent way in Chorus' opex proposal, such as by having a negative step change.</p> <p>The relationship between this programme and the opex submission must be modelled and documented.</p>	<p> Links between opex and capex not documented</p>	<p>Chorus is in the process of updating the model for building and infrastructure compliance. A partial model was provided indicating changes in approach and inclusion of additional detail. The model covers both opex and capex, which shows that the forecasts for both incorporate the interdependencies of the two expenditure types.</p> <p>Chorus has provided additional evidence that capex/opex trade-offs are incorporated into the forecast but documentation of this is not yet developed. The draft assessment findings have been retained.</p>	<p> Links between opex and capex not documented</p>

10.5.4 Final Assessment Conclusion

In our opinion, the methods and input assumptions used to forecast the Site Sustain capital expenditure would result in a forecast that reflects the efficient costs that a prudent fibre network operator would incur to deliver regulated FFLAS at appropriate quality, during the upcoming regulatory period and over the longer term, having regard to good telecommunications industry practice.

In this assessment we note that Chorus is proposing a material increase in expenditure over recent historical levels for Site Sustain capex for property and infrastructure compliance. Chorus has claimed that expenditure in this category had been deferred to facilitate the construction of the fibre network. Based on the evidence reviewed, we believe an increase from historic levels is prudent in order to improve the health of the assets. However, as the timing of maintenance and replacement activities is discretionary, we recommend that the Commission review the timing of the proposed expenditure in more detail before approving an expenditure forecast. We suggest that the Commission review Chorus' tracking of actual expenditure against current forecasts during FY21 to determine whether Chorus is investing as planned in this area before the final determination.

11 OPERATING EXPENDITURE

The Operating Expenditure section is arranged in the three major categories used in Chorus' submission

- **Customer Opex:** This funds opex for the product sales and marketing functions, non-capitalised service desk costs and some CNO costs.
- **Network Opex:** This funds opex for the operation and maintenance of the physical network and is closely related to Physical Network Capex
 - **Leases:** Leases is a sub-category of network opex. As lease forecasts are significantly different to the rest of Network Opex, the assessment of Leases has been documented separately to the remainder of Network Opex. The leases assessment also covers a small amount of corporate leases that are categorised as Support Opex.
- **Support Opex:** This funds all other opex not included in the other categories.

11.1 Customer Opex

Customer opex represents 14.57% of FFLAS opex over RP1.

11.1.1 Description of operating expenditure program

Customer opex is comprised of the following main categories:

- Product Sales and Marketing (PSM)
- CNO costs for customer operations
- Service desk
- IFRS 15 Capitalisation (service desk recoveries)

Service desk and IFRS 15 capitalisation are included within Customer Opex but are based on models assessed in the equivalent capex section of this report. These are covered briefly in the assessment below, but for additional detail see Section 7.2.

11.1.2 Forecast expenditure

NZ\$m real FY20 FFLAS only	RY16*	RY17*	RY18*	RY19*	RY20	RY21	RY22	RY23	RY24	RP1 Total
Final Assessment Opex	83.1	57.9	36.6	33.5	25.0	27.4	30.0	29.0	28.3	87.3

* Historical expenditure RY16-RY19 is presented as unallocated expenditure (inclusive of non-FFLAS expenditure) at nominal prices

11.1.3 Assessment

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
Forecasting methodology	<p>Proposed: Base [current normalised for once-off costs] ✓ + Step [TBC] ✓ + Trend [TBC, potentially adjustments for complexity, productivity, labour and other cost escalations] ✓</p> <p>The proposed forecasting methodology will be applied at a Chorus level (i.e. FFLAS and non-FFLAS expenditure) and the FFLAS allocation is proposed to be calculated using weighted connections.</p> <p>Current: Base [FY20 budget] ✓ + Adjustments [CPI, revenue growth, zero or other hard-coded] ✗</p> <p>Capitalisation: NZ IFRS Accounting Rules [forecast within Chorus' capex programmes] ✓</p> <p>The proposed approach of using Base-Step-Trend is reasonable. Chorus is still in the process of developing the forecast and has placeholder forecasts that mostly establish the base using FY20 forecasts and apply some form of trend increase. However, the application of trend adjustments in the current spreadsheets is not explained/documented and in many cases hard-coded from other sources.</p>	<p>Proposed forecast methodology not yet implemented</p>	<p>Bottom up cost estimate [inputs vary by expenditure area, mostly follow a base-step-trend approach with minimal use of step changes] ✓</p> <p>Service desk: Derived from capex forecast models for service desk costs ✓</p> <p>Chorus has used a standard opex forecasting template for PSM forecasts. Each item has a unique calculation but the assumptions behind each are detailed in the models.</p>	<p>✓</p>
Key assumptions	<p>Key assumptions for the proposed forecasting methodology:</p> <ul style="list-style-type: none"> Step changes and trend adjustments are able to incorporate changes in headcount and other major business changes as the UFB build programme winds down <p>The assumptions are reasonable but will require justification in the supporting documentation for the Support Opex forecast. Although Base-Step-Trend is a top down method, where significant opex steps are required detailed business cases may still be required, which will have their own key assumptions and supporting business case documentation.</p>	<p>Proposed</p>	<p>Most of the assumptions relate to individual cost forecasts. These are documented in the models.</p> <p>The most significant component of Customer Opex is labour costs, which include most of PSM and the Customer Operations portion of CNO. Labour costs for Customer opex refer to the central Regulatory Labour Cost Model. The Regulatory Labour Cost Model was not included in the review, but overview documents relating to Chorus' forecasting of labour costs were provided.</p> <p>Key assumptions included in the Regulatory Labour Cost Model:</p> <ul style="list-style-type: none"> Chorus headcount will reduce following the completion of the UFB build Headcount reductions will affect most parts of the business Although the salary cost reductions have been forecast, the costs that will be incurred to enable these reductions, including redundancy costs, have not yet been forecast or included in the RP1 forecasts. <p>Most other costs are forecast using current run rate with an annual adjustment.</p> <p>The key assumptions are reasonable. There is a reasonable level of documentation of minor assumptions in the spreadsheets.</p>	<p>✓</p>

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
Policies and planning standards	No policies and planning standards were available for review. No documentation	 No documentation	Chorus has included additional documentation within the Customer Opex models. No standalone documentation is planned at this time. The documentation within the models adds transparency to the forecast, but given the large amount of expenditure in this programme standalone documentation should also be developed.	
Reasonableness of models	The model for the proposed Base-Step-Trend approach has not yet been developed. Therefore, its reasonableness cannot be determined. However, the information detailing how Chorus intends to approach the forecast indicates the approach is reasonable. Chorus has existing bottom-up models that are expected to broadly align with the Base-Step-Trend approach. These models mostly follow a base-step-trend approach but with more focus on the build-up of individual line items. The step and trend components are not present in all cases and hard-coded values have been used in some models making it difficult to determine what assumptions have been applied. The values in these models also do not directly align with the values in the opex analysis and allocation spreadsheets but are broadly similar. The proposed Base-Step-Trend model is still in development so cannot be reviewed.	 Base-Step-Trend model not yet developed	Chorus has used forecasting spreadsheets for each area of Customer Opex. These spreadsheets have assumptions listed for all the assumptions that have been made. Some forecasts, such as labour costs, are inserted directly into the template spreadsheets with the source stated. The models used are reasonable.	
Accuracy and reliability of data	The main input into the forecast is the 'base' year expenditure for Customer Opex. The base year data for the forecast is itself a forecast of FY20 expenditure. Until the actual expenditure for the base year is known there will be additional uncertainty in the forecast. Chorus' final forecast for the submission will use actual FY20 expenditure as the base which will be accurate and reliable. The data to be used as the base of the forecast (FY20 actual expenditure) will be accurate and reliable		For forecasts using a base-step-trend approach, Chorus is now using actual data for the first 6 months of FY20 to establish the "base". Any items that are one-off in nature have been adjusted for. As Chorus is now using actual expenditure to establish the base the issue identified in the draft assessment is addressed.	
Procurement approach	This programme is made up of many different costs that are managed by the responsible divisions. The majority of Customer Opex is personnel costs, which are determined by Chorus' staffing strategy. Chorus applies productivity targets to each division and team, requiring managers to efficiently manage expenditure and achieve reductions where possible. Chorus has shown this 'management overlay' reduction against historic budgets indicating that managers are efficiently managing expenditure.		The draft assessment is retained for this requirement.	

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	<p>There are a number of large items within Customer Opex, such as marketing expenditure. Information about specific procurement approaches for these were not provided.</p> <p>The procurement approach for Customer Opex is reasonable</p>			
<p>Consideration of historic investment</p>	<p>The proposed Base-Step-Trend approach puts significant weight on historic expenditure.</p> <p>Because of additional business support costs incurred during the main UFB build phase and recent restructurings to reduce costs, Chorus has determined that FY20 is the most appropriate base year for forecasting. As FY20 is expected to have a lower level of expenditure than previous years (at a Chorus level, the FFLAS share is increasing which results in FFLAS expenditure growing) it is an appropriate starting position. However, accurate forecasting will not be possible until actual FY20 expenditure is known.</p> <p>The forecast aligns with historic expenditure.</p>		<p>The draft assessment is retained for this requirement.</p>	
<p>Consideration of options and alternative solutions</p>	<p>There are no alternative options for most of the expenditure included in Customer Opex. Chorus is incentivised to efficiently manage its expenditure in this area.</p> <p>Alternative options are not available.</p>		<p>The draft assessment is retained for this requirement.</p>	
<p>Relationship between proposed expenditure and quality outcomes</p>	<p><input type="checkbox"/> Availability <input type="checkbox"/> Performance <input type="checkbox"/> Ordering <input type="checkbox"/> Provisioning <input type="checkbox"/> Switching <input type="checkbox"/> Faults <input checked="" type="checkbox"/> Customer service</p> <p>Customer Opex is necessary to provide customer service. Customer opex funds Chorus' Product, Sales and Marketing, which among other things provides information to customers, and service desk functions. The forecast methodology ensures that business support services will be maintained at current levels, which will enable other programmes to deliver quality outcomes.</p> <p>The proposed expenditure is expected to be sufficient for Chorus to continue to operate its fibre network. This enables other programmes to provide quality outcomes to customers.</p>		<p>The draft assessment is retained for this requirement.</p>	
<p>Deliverability and feasibility of implementation</p>	<p>The forecast expenditure on this programme uses existing Chorus resources and some outsourced services. As the current forecast indicates there will not be any significant increase in Customer Opex the deliverability and feasibility of implementation risk is low.</p> <p>Low deliverability and feasibility of implementation risks.</p>		<p>The draft assessment is retained for this requirement.</p>	

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
Uncertainty within the proposed expenditure	<p>Customer Opex has a low level of uncertainty. The majority of the expenditure is for internal staff. Staff headcount and salaries are generally stable and easily forecast, but with some variability in the opex cost due to changes in capitalisation of staff time due to major capital projects. Business restructurings may result in significant changes, but these are usually driven by achieving an improvement in productivity or quality outcomes. Some business support costs are flexible, such as marketing, but are necessary to achieve business goals such as achieving connections targets.</p> <p>Base-Step-Trend is an appropriate forecasting methodology for this type of expenditure and is used widely in similar industries both within New Zealand and overseas.</p> <p>The level of uncertainty is low.</p>		The draft assessment is retained for this requirement.	
Extent to which a risk-based approach has been applied	<p>A risk-based approach has not been applied. A risk-based approach is unlikely to be feasible as Customer Opex has an indirect effect on most risks.</p> <p>Risk-based forecasting approaches are unlikely to be feasible for this type of expenditure.</p>		The draft assessment is retained for this requirement.	
Capex / opex dependency and trade-off and whole of lifecycle cost	<p>Chorus has included a capex programme for IT optimisation which is expected to reduce produce savings for the business and improvements in delivery of FFLAS services. The current forecast for Customer Opex does not appear to include any step changes or other adjustments for productivity improvements from the optimisation investment.</p> <p>Chorus has not detailed where opex savings from optimisation capex are included in the forecasts across the opex programmes.</p>	 Optimisation step changes	<p>Chorus has not yet clearly linked any step changes related to Optimisation Capex into the opex forecasts. Analysis of minimum expected benefits has been included in the Optimisation Capex POD document.</p> <p>The draft assessment is retained for this requirement.</p>	 Optimisation step changes

11.1.4 Final Assessment Conclusion

In our opinion, the methods and input assumptions used to forecast the Customer operating expenditure would result in a forecast that reflects the efficient costs that a prudent fibre network operator would incur to deliver regulated FFLAS at appropriate quality, during the upcoming regulatory period and over the longer term, having regard to good telecommunications industry practice.

11.2 Network Opex

Network Opex represents 35.18% of FFLAS opex over RP1.

11.2.1 Description of operating expenditure program

Network opex funds the operating expenses related to Chorus' fibre network that enables FFLAS products to be delivered to end-users. The major components of network opex are:

- **Reactive maintenance:** funding for correcting defects identified in the fibre network, copper network (FFLAS allocation to be confirmed) and physical sites.
- **Preventive maintenance:** maintenance of assets to prevent deterioration (excluding any amounts capitalised). Chorus only proposes preventive maintenance for buildings and structures during RP1 as the fibre network is relatively young and in good condition. Also includes the cost of the dial before you dig service (to ensure underground infrastructure is identified prior to excavation occurring).
- **Network land and buildings:** mostly electricity costs
- **Other network costs:** project opex, fibre charges, service company incentive payments, pole testing, water rates
- **Network System Operations:** Customer and Network Operations (CNO) labour costs (assure, provisioning, serco management and accommodation)
- **Recoverable maintenance:** mostly damage to the network which is partly recovered from the responsible party
- **Network leases:** lease costs for land/buildings/poles/etc. used by network assets
- **Capitalisation:** IFRS 15 capitalised opex

11.2.2 Forecast expenditure

NZ\$m real FY20 FFLAS only	RY16*	RY17*	RY18*	RY19*	RY20	RY21	RY22	RY23	RY24	RP1 Total
Final Assessment Opex	136.2	140.5	143.1	138.5	48.8	58.7	66.6	70.5	73.6	210.8

* Historical expenditure RY16-RY19 is presented as unallocated expenditure (inclusive of non-FFLAS expenditure) at nominal prices

11.2.3 Assessment (excl. Leases)

Note: Forecasts for leases have been assessed separately. See Section Assessment – Leases 11.2.4 below.

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
Forecasting methodology	<p>Chorus' current forecast for Network Opex is based on a bottom up forecast. Unlike other areas of opex, a bottom-up forecast is likely to be retained for the majority of the expenditure.</p> <p>Reactive maintenance: Price [service company contracts] <input checked="" type="checkbox"/> x Quantity [historical fault rate] <input checked="" type="checkbox"/></p>	<input checked="" type="checkbox"/>	<p>Preventive maintenance: Average of three approaches [condition assessment (C4 + C5) x unit rate], [condition assessment (all levels) x maintenance rate x unit rate], [average of FY20 run-rate and FY20 forecast] <input checked="" type="checkbox"/></p> <p>Other network costs: Bottom-up calculation from capex projects <input checked="" type="checkbox"/> service company incentive payments [[Chorus CI] % payout rate] <input checked="" type="checkbox"/></p> <p>The draft assessment is retained for this requirement.</p>	<input checked="" type="checkbox"/>

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	<p>Preventive maintenance: Price [historical average] ✓ x Quantity [external assessment] ✓</p> <p>Network land and buildings (mostly Electricity): Price [electricity forward contracts, trend] ✓ x Quantity [current consumption + trend growth] ✓</p> <p>Other network costs: Base [FY19 expenditure, expected incentive payout rates] ✓ + Step [IT innovation] ✓ + Trend [Efficiency] ✓</p> <p>Network System Operations: Base [FY19 expenditure, expected incentive payout rates, labour model PxQ] ✓ + Step [IT (billing changes), severances] ✓ + Trend [Efficiency (nil inflation for some line items)] ✓ - Capitalised Costs [labour model] ✓</p> <p>Recoverable maintenance: Price [service company prices with annual increase] ✓ x Quantity [Maintenance model] ✓</p> <p>Passthrough (water rates): Price [current rates plus trend growth] ✓ x Quantity [current assets plus known revaluations] ✓</p> <p>BAU network technology: Bottom-up contract prices (mostly Nokia NOC contract) ✓</p> <p>Short descriptions are provided for most of the BAU network technology line items, which are mostly contractual and therefore known with a high degree of certainty.</p> <p>The use of bottom-up forecasting approaches for Network Opex is reasonable given the significant changes occurring in the network (wind-down of the UFB build) and the resulting structural changes in network opex as Chorus transitions from the build phase to the maintain phase. The high level methodologies for each area are reasonable (specific issues with the details of the methodologies were identified but are covered in the Reasonableness of Models section below).</p>			
<p>Key assumptions</p>	<p>There are a large number of assumptions across the varied components of this expenditure. However, most are not documented as the forecast models for Network Opex are in an early stage of development. The most critical assumptions that have been identified are:</p> <ul style="list-style-type: none"> • Current rates of network faults (including faults caused by third parties) will persist 	<p> Documentation</p>	<p>A selection of the key assumptions from the updated Network Opex models are presented below.</p> <p>Reactive maintenance/recoverable maintenance:</p> <ul style="list-style-type: none"> • Historical fault rate is representative of future fault rate for variable faults and is efficient • Fixed faults are relatively constant per cabinet area i.e. no material change with number of customers 	<p></p>

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	<ul style="list-style-type: none"> It is not economic to proactively maintain the fibre network until after RP1 FY19 is an efficient base year No major decommissioning of the copper network, which would result in a large reduction in electricity consumption, will occur before or during RP1 <p>Whilst the Cost Allocation Methodology (CAM) is out of scope of this review, it is driving a large portion of the forecast FFLAS Network Opex growth before and during RP1.</p> <p>The core assumptions are not unreasonable but supporting documentation that includes evidence of reasonableness is required. Assumptions require documenting.</p> <p>The key assumptions for BAU Network Technology are:</p> <ul style="list-style-type: none"> Default contract renegotiation price adjustment is CPI unless there is a known change in price Continued use of cloud/SaaS Current levels of outsourcing will persist [Chorus CI] No net increase in platforms/products (new platforms/products offset by legacy decommissioning) <p>During interviews, Chorus personnel stated there is a low correlation between the UFB build and BAU Network Technology Opex. This is not currently supported in the documentation provided for review.</p> <p>Continuing current practices for outsourcing and cloud/SaaS is consistent with a base-step-trend type approach.</p>		<ul style="list-style-type: none"> Average price is consistent with history, historic prices older than 12 months are not considered due to a new contract meaning old data should not be used A predominantly reactive approach is adopted for fibre faults. <p>Planned maintenance:</p> <ul style="list-style-type: none"> Condition reports indicate maintenance requirements <p>Network land and buildings: the electricity model has been modified and assumptions have been adjusted:</p> <ul style="list-style-type: none"> A review into the causal allocator is expected to be incorporated into the next iteration of the FFLAS electricity forecast. Spark PSTN removal will be complete by the end of 2024, which will increase the burden of electricity fixed costs to FFLAS The underlying downward trend in electricity consumption from 2017-2019 will continue (after adjusting for changes to cabinets, PSTN and Hyperfibre) <p>Other network costs:</p> <ul style="list-style-type: none"> Service company incentives will have an [Chorus CI] % payout rate <p>Chorus has included additional documentation within the models that explains the key assumptions that have been used.</p> <p>The key assumptions and in-model documentation is reasonable.</p>	
Policies and planning standards	<p>Planning and technical standards reviewed:</p> <ul style="list-style-type: none"> Chorus Proactive Pole Tag, Test, and Replacement Process (ND0312, v2.0) <p>There are no planning or technical standards documents for the majority of Network Opex.</p> <p>No documentation for the majority of the expenditure.</p>	 Documentation	<p>Chorus has included additional documentation within the Network Opex models. No standalone documentation is planned at this time.</p> <p>The documentation within the models adds transparency to the forecast, but given the large amount of expenditure in this programme standalone documentation should also be developed.</p>	
Reasonableness of models	<p>Reactive maintenance:</p>		<p>Reactive maintenance/recoverable maintenance:</p>	

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	<p>The forecast is derived from Chorus’ maintenance model. Whilst documentation is not available, from interviews with Chorus personnel, we understand that the stated model uses historical fault rates for the fibre network with growth in expenditure due to expansion of the fibre footprint. Whilst this may be reasonable, additional information would be necessary to support the use of a stable fault rate, the time period used to determine the fault rate and whether any subset of reactive maintenance (i.e. failures of a particular network asset) exhibit noticeable trends.</p> <p>The modelling approach appears reasonable; however, the underlying model was not reviewed. Documentation should be prepared to support the efficiency of the proposed expenditure.</p> <p>Preventive maintenance:</p> <p>Calculated from FY19 actual with an adjustment for the Dial B4U Dig service</p> <p>The forecast spreadsheet calculates property maintenance using RY19 expenditure with a minor adjustment, which does not align with the methodology described elsewhere that the building and structure maintenance is based on an assessment of maintenance requirements.</p> <p>Network land and buildings:</p> <p>Basic model that forecasts the components of electricity prices and includes data from forward contracts for the wholesale electricity component until 2022, after which the price is flat. The forecast for electricity consumption is for a constant increase. Allocation between FFLAS and non-FFLAS is on the basis of [Chorus CI].</p> <p>The model is sufficient for a basic forecast, but a more accurate forecast could be developed with additional information, such as equipment installation and decommissioning forecasts (where wattage rating is known). For RP1 most of the forecast uncertainty will come from electricity spot price fluctuations (most of RP1 is beyond the available contract length in the forward market) so additional model complexity will not provide significant improvements in certainty.</p>	<p>Documentation</p>	<p>Chorus have overhauled the maintenance model. The model methodology is reasonable and analysis of historic fault rates, which is a key driver of the forecast, is shown in the model. The model contains documentation of the approaches and assumptions used</p> <p>Chorus has addressed the issues identified for reactive maintenance in the draft assessment.</p> <p>Planned maintenance:</p> <p>The template workbook provided for the draft assessment did not contain the underlying documentation and calculations. Chorus provided another workbook that has a high level of detail of how the forecast is calculated. Chorus have used three approaches and taken the average. The increase in expenditure that would be forecast if the condition assessments were used has been lowered by including FY20 expenditure in the calculation.</p> <p>The model used by Chorus is reasonable and includes a good level of detail.</p> <p>Network land and buildings:</p> <p>The electricity model has been improved and now includes additional information that improves the accuracy of the forecast. Documentation has been included in the model.</p> <p>Chorus determined that forecasting down to lower levels of detail is not practical at this point in time.</p> <p>The changes made by Chorus improve the accuracy of the model.</p> <p>Other network costs:</p> <p>Chorus has recalculated project opex using a bottom-up build. Each area of project opex is calculated using a specific approach. Most of these are run-rate, related to capex volumes or capex expenditure. The model contains documentation of the approaches used.</p> <p>A model has been provided for service company incentive payments which assumes [Chorus CI] during RP1.</p> <p>BAU network technology:</p> <p>Chorus provided three example tier 3 models that feed into the BAU opex model. These show the detailed assumptions behind the forecasts for Chorus’ biggest technology service suppliers. The models contain documentation of assumptions and sources.</p>	

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	<p>Other network costs:</p> <p>Based on FY19 expenditure. Some step changes included (links to other spreadsheets that were not reviewed) but not documented.</p> <p>Documentation required to determine the reasonableness of step changes.</p> <p>Network systems operations:</p> <p>Mostly labour costs taken from Chorus' Labour Model (not reviewed). A large portion of the labour costs are capitalised so not included in opex.</p> <p>The forecast is driven by the labour model which was not reviewed.</p> <p>Recoverable maintenance:</p> <p>The underlying forecast is from Chorus' Maintenance Model (which was not reviewed). During interviews Chorus stated that fibre network damage is increasing with growth in the length of the network and constant rates of damage, but this is not documented and could not be verified with the data in the Recoverable Maintenance model.</p> <p>Documentation required to confirm the methodology used in the underlying model.</p> <p>BAU Network Technology:</p> <p>Contracted costs with adjustments when each contract expire are included. Short descriptions are provided for each contract (over 250 contracts included in the model) but the values were hardcoded, so calculation formulas were not reviewed. The model includes reductions for overlays and glide path targets.</p> <p>The model for BAU Opex is reasonable. Chorus may reconsider including the glide path reduction during RP1 as productivity savings should be incentivised through the incentive regime that will be part of the regulatory structure during RP1.</p> <p>The models appear reasonable; however, some calculations are from spreadsheets that were not reviewed, and documentation has not yet been developed to explain the forecasts or the models. The forecast</p>		<p>The examples provided have a good level of detail and show that documentation of assumptions is available.</p> <p>Other expenditure categories:</p> <p>Chorus has not provided any additional information for the final assessment.</p> <p>The draft assessment is retained for the other categories of network opex.</p> <p>The additional models and documentation within the models has addressed the issues raised in the draft assessment.</p>	

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	<p>template spreadsheets are somewhat difficult to navigate and documentation explaining how the forecasts were calculated would be helpful and may be an alternative to making changes to the spreadsheets.</p>			
<p>Accuracy and reliability of data</p>	<p>Historic cost data is assumed to be from Chorus' systems and reliable; however, it is not well documented which introduces uncertainty. Other data is taken from other models with original sources and changes made to the data not documented.</p> <p>BAU Network Technology opex input data includes contractual obligations and historic cost and volume data that is obtained from Chorus' computer systems. This information is known with a high degree of accuracy.</p> <p>Accuracy and reliability of input data unable to be determined for some parts of Network Opex due to lack of documentation.</p>	<p> Input data not documented</p>	<p>The models provided by Chorus have sources and links for input data. Documentation is provided within the model explaining the use of input data.</p> <p>The issues identified in the draft assessment have been addressed.</p>	<p></p>
<p>Procurement approach</p>	<p>All maintenance work (including pole testing) is undertaken by service companies contracted to Chorus. The unit rates paid to service companies are contained within the contracts and were set by competitive tender. Most maintenance opex is reactive so volumes are not driven by procurement decisions.</p> <p>Chorus uses forward contracts to partially hedge exposure to wholesale electricity prices and has incorporated this into its forecasting. Volumes are determined by the power consumption of the equipment required to operate the network, which Chorus has little control over.</p> <p>Procurement approaches are not applicable to council rates as these are not negotiable or avoidable.</p> <p>Where a regulated network operates under an incentive scheme structure the historical opex used to determine the base level of opex for the following period can be assumed to be efficient (subject to benchmarking against peers to determine whether the business is operating at the efficient frontier). Prior to RP1 Chorus has been required to efficiently manage its opex costs, including Network Opex, due to financing constraints imposed by lenders and the need to divert expenditure towards capex for the UFB build. This indicates that Chorus has been exposed to incentives to operate efficiently despite not having a regulatory framework that includes incentive schemes to</p>	<p></p>	<p>The draft assessment is retained for this requirement.</p>	<p></p>

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	<p>promote efficiency of opex. This is evidence to support the procurement approaches and efficiency of current Network Opex.</p> <p>The procurement approach is reasonable. Chorus has been incentivised to efficiently manage opex which supports the efficiency of current procurement approaches.</p>			
<p>Consideration of historic investment</p>	<p>Historic investment is the basis of the starting point of the forecast across all components of Network Opex.</p> <p>The forecasting methodologies result in a forecast that is aligned to historic investment in this programme.</p> <p>BAU Network Technology:</p> <p>The forecast is largely based on current contract rates, of which the majority (79%) are fixed costs.</p> <p>During recent years Chorus has had dual operating costs in some areas due to the ongoing structural and functional separation from Spark. This is where Chorus is paying Spark for a service while also setting up and transferring business processes to a Chorus run system. Chorus is required to separate most functions from Spark to meet obligations included in the agreements between Chorus and the Crown. Most of these additional costs will be removed before the base year (FY20) used for the RP1 forecast so will not result in an overstatement of forecast BAU Network Technology opex. However, the rate of cost decline observed over the last few years will not continue.</p> <p>Historic investment is incorporated into the forecast approaches for BAU Network Technology.</p>		<p>The draft assessment is retained for this requirement.</p>	
<p>Consideration of options and alternative solutions</p>	<p>BAU Network Technology:</p> <p>Alternative options for BAU Network Technology opex are mostly in the form of insourcing vs outsourcing or capex vs 'as-a-service' models. The underlying works required by Chorus have limited alternatives and are necessary to operate the fibre network.</p> <p>Alternative options have not been explicitly considered within the BAU Network Technology forecast for RP1, but have been</p>	 Other	<p>For the RP1 submission Chorus plans to update fibre maintenance costs for the reductions arising from Fibre maintenance CAPEX.</p> <p>The draft assessment is retained for this requirement.</p>	 Other

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	<p>considered when contracts were originally entered into. Chorus has shown that insourcing and outsourcing options were considered for the major contracts such as the Network Operations Centre when they were originally negotiated. There is unlikely to have been a significant change in the market in the last few years that would change the ranking of options since the contracts were established. Furthermore, Chorus has been incentivised to manage costs and optimise between alternative options available.</p> <p>Chorus has assumed the current level of cloud and use of ‘as-a-service’ arrangements will continue. Any further substitution between capex and opex during RP1 will be undertaken by Chorus responding to the various incentive schemes that are expected to be in operation during RP1.</p> <p>Alternative options have been considered during the establishment of major contracts within BAU Network Technology opex.</p> <p>Other:</p> <p>Chorus has not considered alternative options for this expenditure. There may be trade-off opportunities between proactive maintenance, reactive maintenance and asset replacement capex programs that could be investigated. Although there is no indication that Chorus’ proposed mix of these options is not optimal, neither is there any evidence provided to indicate that it is optimal.</p> <p>Alternative options have not been considered. Alternative options are expected to be limited to trade-offs between different maintenance approaches and there is no indication that the proposed approach used by Chorus is not optimal. However, Chorus could include an assessment of alternative options within the relevant capex and opex documentation.</p>			
<p>Relationship between proposed expenditure and quality outcomes</p>	<p><input checked="" type="checkbox"/> Availability <input type="checkbox"/> Performance <input type="checkbox"/> Ordering <input type="checkbox"/> Provisioning <input type="checkbox"/> Switching <input checked="" type="checkbox"/> Faults <input type="checkbox"/> Customer service</p> <p>The majority of Network Opex is related to maintenance of the network. Reactive maintenance is necessary to repair faults in a timely manner and meet availability targets. Preventive maintenance can also reduce the incidence of faults, although Chorus’ FFLAS expenditure in</p>	<p> Other</p>	<p>Chorus has included commentary relating network maintenance to quality outcomes.</p> <p>Although additional documentation has been included in the models, there is no direct, quantitative link to quality outcomes. The draft assessment is retained for this requirement.</p>	<p> Other</p>

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	<p>this area is limited to buildings and structures during RP1, which may only indirectly influence faults of fibre network components.</p> <p>Chorus currently takes a reactive only approach to fibre network maintenance. As the network ages, this approach may result in increasing rates of faults that could result in availability and fault quality outcomes declining. Chorus has not provided any modelling to indicate whether fault rates are expected to increase by the end of RP1, but given the very young age of the network it is not expected that this will become a significant issue.</p> <p>It is expected that Chorus will have performance targets for availability and faults during RP1, but these have not yet been set by the Commerce Commission. Chorus has existing requirements under the NIPA for network availability that are expected to be a minimum quality outcome during RP1.</p> <p>As the quality outcome targets for availability and faults have not yet been established by the Commerce Commission, it is not yet possible to determine whether the forecast expenditure will be sufficient to meet the RP1 targets.</p> <p>Maintaining a reactive only approach to fibre network maintenance may result in a decrease in quality outcomes due to increasing faults as the network ages. However, quality targets have not yet been set so it cannot be determined whether the proposed expenditure is sufficient to achieve the quality targets.</p> <p>BAU Network Technology:</p> <p><input checked="" type="checkbox"/> Availability <input checked="" type="checkbox"/> Performance <input checked="" type="checkbox"/> Ordering <input checked="" type="checkbox"/> Provisioning <input checked="" type="checkbox"/> Switching <input checked="" type="checkbox"/> Faults <input checked="" type="checkbox"/> Customer service</p> <p>BAU Network Technology opex is critical to all aspects of Chorus' business and has an indirect effect on all quality outcomes. Efficient expenditure in this area is necessary to achieve quality outcomes across all categories. Particular areas affected are availability, performance, switching and faults which are dependent on the Network Operations Centre.</p> <p>As most services covered by Technology Opex are outsourced, delivery of outcomes is determined by the service providers and Chorus' role is limited to setting the clauses of the contracts and negotiating acceptable contract prices. If Chorus aggressively targets price</p>	<p> BAU network technology</p>		<p> BAU network technology</p>

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	<p>reductions, there is an expectation that the suppliers will require reductions to the quality targets contained in the contracts.</p> <p>As the RP1 quality outcome targets have not yet been established by the Commerce Commission, it cannot be determined whether the forecast Technology Opex is sufficient to meet the RP1 targets. As the expenditure forecast is based on current expenditure it is expected that Chorus will maintain current quality outcomes (subject to changes in other capex and opex programmes).</p> <p>The proposed BAU Network Technology expenditure is expected to be sufficient to maintain current quality outcomes.</p>			
<p>Deliverability and feasibility of implementation</p>	<p>There is a low risk of deliverability and feasibility of the forecast expenditure as the work is outsourced and/or uses existing internal resources.</p> <p>AA significant portion of Network Opex is outsourced and deliverability of the service is the responsibility of the service provider. The remainder of Technology Opex expenditure covers existing staff costs.</p> <p>Low deliverability and feasibility of implementation risk.</p>		<p>The draft assessment is retained for this requirement.</p>	
<p>Uncertainty within the proposed expenditure</p>	<p>As the maintenance component of this programme is reactive or driven by third party damage there is a moderate level of uncertainty. The actual maintenance required during RP1 may be significantly lower or higher than forecast depending on deterioration rates of assets and unforeseeable external events (such as major storms). Other components of Network Opex, such as electricity consumption, are reasonably certain and forecastable. There is no uncertainty for passthrough costs such as rates. The forecast for these is only a placeholder as actual expenses incurred during RP1 will be added to Chorus' maximum allowable revenue.</p> <p>Preventive maintenance is to address a back-log of maintenance tasks on Chorus' buildings and structures. If the identified maintenance tasks become more urgent, additional maintenance expenditure may be required. As there is a backlog and the forecast only covers a portion of the medium and low priority maintenance tasks it is unlikely the actual expenditure will be lower than forecast.</p> <p>BAU network technology opex has a low level of uncertainty as most of the opex is fixed in nature and subject to contracts with outsourced service providers</p>		<p>The draft assessment is retained for this requirement.</p>	

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	<p>The reactive nature of a large amount of this expenditure introduces uncertainty. The forecasting approaches are based on observed historic maintenance requirements which is a reasonable method for managing this uncertainty.</p>			
<p>Extent to which a risk-based approach has been applied</p>	<p>A risk-based approach has not been applied. A risk-based approach may be possible for aspects of Network Opex as components, such as maintenance and asset inspection, can reduce the number of failures and associated risks. Typically, businesses do not apply risk-based approaches to opex forecasts, but risks are incorporated into work practices and planning of maintenance and inspection programmes that may then result in a step change to parts of the opex forecast.</p> <p>Chorus' pole inspection and replacement process incorporates New Zealand Electricity industry best practice for risk management of poles. However, this falls short of a quantified risk forecasting approach that optimises for expenditure and risk. Chorus has not included preventive maintenance for fibre network assets but has included such maintenance for buildings and structures. However, the factors influencing this expenditure is an identified back-log of work and cost control rather than an assessment based on risk.</p> <p>Risk-based approaches could be further incorporated into components of the programme and influence the forecast.</p>	<p> A risk-based approach has not been applied</p>	<p>Sensitivity analysis has been built into the maintenance model. This has allowed Chorus to consider different periods for determining fault rates and the effect on forecast expenditure.</p> <p>Given the limited data available for performing risk calculations due to the relatively young age of the fibre network the sensitivity analysis used by Chorus is reasonable to address this requirement. More detailed risk-based analysis of maintenance expenditure may be expected for future forecasts.</p>	<p></p>
<p>Capex / opex dependency and trade-off and whole of lifecycle cost</p>	<p>Chorus has included a capex programme for IT optimisation which is expected to produce savings for the business and improvements in delivery of FFLAS services. The current forecast for Network Opex does not appear to include any step changes or other adjustments for productivity improvements from the optimisation investment.</p> <p>Chorus has not detailed where opex savings from optimisation capex are included in the forecasts across the opex programmes.</p> <p>BAU Network Technology opex:</p> <p>Capex/opex trade-offs are available through the substitution of capex for cloud and 'as-a-service' offerings. Chorus has assumed that the current use of these services will continue with no further substitution included in the RP1 submission. In some cases Chorus is also limited by legal obligations from using cloud services (most of which are based on overseas data centres) due to requirements to keep certain data within New Zealand. Chorus will be incentivised to use capex substitution</p>	<p></p>	<p>Chorus has not yet clearly linked any step changes related to Optimisation Capex into the opex forecasts. Analysis of minimum expected benefits has been included in the Optimisation Capex POD document.</p> <p>Savings from preventive maintenance CAPEX are referenced in the maintenance model (i.e. Copper offsets network degradation and Fibre has some savings to be built into the final RP1 submission).</p> <p>The draft assessment is retained for this requirement.</p>	<p> Optimisation step changes</p>

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	where economically efficient during RP1 through the incentive schemes that will operate and productivity improvements due to this will be shared with customers during future regulatory periods. This is consistent with Chorus' technology capex programmes, which also assume no change to substitution between capex and opex.			

11.2.4 Assessment – Leases

Note: to avoid duplication this assessment covers both Network Leases and Corporate Leases. Both network and corporate leases are forecast by Chorus with the same model and methodology and the assessment is equally applicable to both categories. Corporate Leases are categorised as Support opex and are not included in the forecast expenditure table for Network opex.

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
Forecasting methodology	Base [current leases adjusted for one-offs] + Step [expiring leases and new leases due to network build] + Trend [efficiency adjustment for corporate leases and reduction in Spark leases] Base-Step-Trend is appropriate for this expenditure as it is for forecasting purposes effectively opex which is commonly forecast using this approach. Lease costs tend to be stable over time and contracts tend to be long term with well-defined payment schedules.		Chorus has now built a model that follows the methodology that was provided for the draft assessment. The draft assessment is retained for this requirement.	
Key assumptions	Models have not yet been developed so assumptions are not available to review Chorus is in the process of forecasting the capitalised value of leases. However, significant effort is still required, especially in regard to FFLAS allocation.		<ul style="list-style-type: none"> Existing lease contracts will continue for the remainder of the contract period All leases have annual inflation increases New leases/contract renewals are individually forecast New pole leases use current per pole prices and forecasts of the number of poles leased <p>The assumption that all leases have annual inflation increases may incorrectly forecast the cost of some leases. Chorus has identified the risk and it is expected to be fixed in the next iteration of the model. Based on information provided, the assumption is correct for the majority of leases, and in particular the larger value leases.</p>	 Inflation
Planning and technical standards	No planning or technical standards for leases have been reviewed.		Chorus is not planning to develop any standalone documentation for the leases forecast. Documentation of the methodology and assumptions that have been made are contained in the new leases model.	

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	Documentation of the approach used for forecasting IFRS 16 leases is required.		The documentation in the model is sufficient to support the expenditure forecast. Some commentary about the forecast will be needed in the submission documents but a standalone document may not be necessary.	
Reasonableness of models	The proposed methodology is reasonable, but models have not yet been developed. Chorus must also determine how adjustments in the value of leases (as opposed to the value of lease obligations) will be incorporated into the forecast for capex. The reasonableness of the models cannot be fully determined until the models have been developed.		Chorus has developed a model for forecasting lease costs. The model follows the methodology provided for the draft assessment. The model represents actual lease costs, most of which are known with a high degree of certainty, during the RP1 period and beyond. The model contains a good level of documentation and provides transparency of how the forecast is calculated. The issues identified in the draft assessment have been addressed.	
Accuracy and reliability of data	Chorus' current lease obligations are well known. The accuracy and reliability of lease information will improve following Chorus' implementation of the SAP Real Estate module, which will increase the visibility of leases. The accuracy and reliability of lease information is high and will improve further once an additional SAP module is installed.		The draft assessment is retained for this requirement.	
Procurement approach	From an operational perspective, leases are treated as opex. A review of the procurement approach for opex items has not been included in this review. Chorus' procurement approach for leases has not been reviewed.		Chorus' leases are individually negotiated with the relevant counterparty. In many cases Chorus does not have choice in lease providers or the cost of alternatives is very high (for example, where electricity poles are used alternative options are limited to new pole networks or undergrounding the network). The majority of Chorus' leases are with Spark and are a legacy of Chorus' separation from Telecom NZ. Chorus has been transitioning away from leasing Spark sites where it is economic to do so. Chorus has also faced internal funding pressures to reduce costs that incentivises efficient procurement of lease agreements. Chorus has provided evidence that efficient procurement practices have been followed.	
Consideration of historic investment	The proposed forecast methodology is closely aligned to historic expenditure. The forecast is expected to be closely aligned to historic expenditure.		The draft assessment is retained for this requirement.	
Consideration of options and	This review is limited to the capitalisation of leases under IFRS 16, which is an accounting requirement that is expected to be adopted by the Commerce Commission for the RP1 regulatory submission.		The draft assessment is retained for this requirement.	

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
alternative solutions	<p>Consideration of alternative options to leasing, such as lease vs buy, consolidation and location is not covered by this review. Furthermore, such options analysis is commonly limited to where major investment decisions are made, such as an opportunity to purchase a site and are done at an individual project level. Chorus has not included any property purchase business cases in its draft RP1 capex submission.</p> <p>There are no alternatives to following accounting standards.</p>			
Relationship between proposed expenditure and quality outcomes	<p><input type="checkbox"/> Availability <input type="checkbox"/> Performance <input type="checkbox"/> Ordering <input type="checkbox"/> Provisioning <input type="checkbox"/> Switching <input type="checkbox"/> Faults <input type="checkbox"/> Customer service</p> <p>Leased property and assets are present across Chorus' network and directly or indirectly affect all business operations. However, the expenditure in this programme is not expected to have a significant impact on any quality outcomes.</p> <p>Leases do not directly affect quality outcomes. Access to (leased or owned) property and assets is necessary for delivery of fibre services.</p>		The draft assessment is retained for this requirement.	
Deliverability and feasibility of implementation	<p>Leases do not require significant effort or internal resources to enter.</p> <p>The risk of deliverability and feasibility of implementation is low.</p>		The draft assessment is retained for this requirement.	
Uncertainty within the proposed expenditure	<p>The majority of the lease forecast is highly certain due to the use of long-term contracts with defined payments. Where leases are due to expire or where new leases are required the terms of the new/renewed leases are not yet known but as the market is competitive with multiple providers (property owners) uncertainty is minimised.</p> <p>The level of forecast uncertainty is low.</p>		The draft assessment is retained for this requirement.	
Extent to which a risk-based approach has been applied	<p>A risk-based approach has not been applied. As there may be uncertainty of the terms of new leases, some risk-based modelling is appropriate. Risk-based modelling of changes in the value of leases (under IFRS 16) may be appropriate depending on the approach Chorus takes to forecasting this. However, as IFRS 16 changes in lease value are an accounting measure this will not have any effect on maximum allowable revenue or customer bills.</p> <p>Risk-based modelling methods are appropriate for expiring and new leases given uncertainty in the terms of new leases.</p>		<p>Chorus has indicated it will investigate whether appropriate risk-based forecasting approaches can be implemented for future planning cycles.</p> <p>The draft assessment is retained for this requirement.</p>	 Not applied

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
Capex / opex dependency and trade-off and whole of lifecycle cost	This review is limited to the capitalisation of leases under IFRS 16, which is an accounting requirement that is expected to be adopted by the Commerce Commission for the RP1 regulatory submission. Accounting standards require most leases be capitalised.		The draft assessment is retained for this requirement.	

11.2.5 Final Assessment Conclusion

In our opinion, the methods and input assumptions used to forecast the Network operating expenditure would result in a forecast that reflects the efficient costs that a prudent fibre network operator would incur to deliver regulated FFLAS at appropriate quality, during the upcoming regulatory period and over the longer term, having regard to good telecommunications industry practice.

11.3 Support Opex

Support opex represents 50.26% of FFLAS opex over RP1.

11.3.1 Description of operating expenditure program

Support opex comprises all opex that is not categorised as Network Opex or Customer Opex. Support Opex broadly covers the Corporate functions of Chorus. The main categories are:

- Board and CEO
- Finance (CFO)
- General Counsel (GCO)
- Corporate Relations (CR)
- People & Culture (P&C)
- Strategy and Business Operations (SBO)
- Elements of other functional units (CTO, CNO) that are not directly attributed to Network or Technology spend
 - All CTO labour
 - CNO asset management labour
- Capitalisation (reduction in opex)
- Self-insurance
- Corporate Leases (see Section 11.2.4 for assessment of Corporate Leases)

11.3.2 Forecast expenditure

NZ\$m real FY20 FFLAS only	RY16*	RY17*	RY18*	RY19*	RY20	RY21	RY22	RY23	RY24	RP1 Total
Final Assessment Opex	160.3	143.7	133.3	127.9	96.8	100.2	103.6	99.5	98.1	301.1

* Historical expenditure RY16-RY19 is presented as unallocated expenditure (inclusive of non-FFLAS expenditure) at nominal prices

11.3.3 Assessment

Note: this assessment excludes corporate leases. Corporate Leases have been assessed with Network Leases as they follow a shared methodology. See Section 11.2.4 for assessment of Corporate Leases.

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
<p>Forecasting methodology</p>	<p>Proposed: Base [current normalised for once-off costs] ✓ + Step [TBC] ✓ + Trend [TBC, potentially adjustments for complexity, productivity, labour and other cost escalations] ✓ + Passthrough [TBC, possibly audit fees and regulatory levies] ✓</p> <p>The proposed forecasting methodology will be applied at a Chorus level (i.e. FFLAS and non-FFLAS expenditure) and the FFLAS allocation is proposed to be calculated using weighted connections.</p> <p>Current: Base [FY20 budget] ✓ + Adjustments [CPI, revenue growth, zero or other hard-coded] ✗</p> <p>The proposed approach of using Base-Step-Trend is reasonable. Chorus is still in the process of developing the forecast and has placeholder forecasts that mostly establish the base using FY20 forecasts and apply some form of trend increase. However, the application of trend adjustments in the current spreadsheets is not explained/documented and in many cases hard-coded from other sources.</p>	<p>Proposed forecast methodology not yet implemented</p>	<p>Labour: central Regulatory Labour Cost Model ✓</p> <p>IFRS SD Recoveries: BAU Opex [BAU Opex model] ✓ x Provisioning related % [estimated] ✓</p> <p>Self-insurance: projection of self-insurance costs from a major insurance company ✓</p> <p>All other: Bottom up cost estimate [inputs vary by expenditure area, mostly follow a base-step-trend approach with minimal use of step changes] ✓</p> <p>Chorus has provided models that use a standard template. Each item has a unique calculation but the assumptions behind each are detailed in the models.</p>	<p>✓</p>
<p>Key assumptions</p>	<p>Key assumptions for the proposed forecasting methodology:</p> <ul style="list-style-type: none"> Financing constraints, UFB contract expectations and government subsidy levels and previous transformation projects show that the current level of expenditure is efficient Once-off costs in the base year are not recurrent so should be removed from base year expenditure to calculate a normalised base. This requires that there is not a steady level of non-forecastable once-off costs similar to the ones removed. Step changes and trend adjustments are able to incorporate changes in headcount and other major business changes as the UFB build programme winds down <p>The assumptions are reasonable but will require justification in the supporting documentation for the Support Opex forecast. Although Base-Step-Trend is a top down method, where significant opex steps are required detailed business cases may still be required, which will have their own key assumptions and supporting business case documentation.</p>	<p>✓</p>	<p>Most of the assumptions relate to individual cost forecasts. These are documented in the models.</p> <p>The most significant component of Support Opex is labour costs. Labour costs for Support opex refer to the central Regulatory Labour Cost Model. The Regulatory Labour Cost Model was not included in the review, but overview documents relating to Chorus' forecasting of labour costs were provided.</p> <p>Key assumptions included in the Regulatory Labour Cost Model:</p> <ul style="list-style-type: none"> Chorus headcount will reduce following the completion of the UFB build Headcount reductions will affect most parts of the business Although the salary cost reductions have been forecast, the costs that will be incurred to enable these reductions, including redundancy costs, have not yet been forecast or included in the RP1 forecasts. <p>The capitalisations model relies on estimates for the percentage of individual cost elements that are provisioning related. Chorus does not record the necessary data to calculate the actual shares that should be capitalised for each. The estimates are usually either 100% (cost is clearly related only to provisioning) or 33% (partially provisioning related). There are a few other estimates.</p> <p>Most other costs are forecast using current run rate with an annual adjustment.</p>	<p>✓</p>

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
			The key assumptions are reasonable. There is a reasonable level of documentation of minor assumptions in the spreadsheets.	
Policies and planning standards	No policies and planning standards were available for review. No documentation	 No documentation	Chorus has included additional documentation within the Support Opex models. No standalone documentation is planned at this time. The documentation within the models adds transparency to the forecast, but given the large amount of expenditure in this programme standalone documentation should also be developed.	
Reasonableness of models	The model for the proposed Base-Step-Trend approach has not yet been developed. Therefore, its reasonableness cannot be determined. However, the information detailing how Chorus intends to approach the forecast indicates the approach is reasonable. Chorus has existing bottom-up models that are expected to broadly align with the Base-Step-Trend approach. These models mostly follow a base-step-trend approach but with more focus on the build-up of individual line items. The step and trend components are not present in all cases and hard-coded values have been used in some models making it difficult to determine what assumptions have been applied. The values in these models also do not directly align with the values in the opex analysis and allocation spreadsheets but are broadly similar. Models were not reviewed for the CTO labour resources, but summary forecasts included in the Opex Analysis and Opex Allocation spreadsheets were reviewed. The proposed Base-Step-Trend model is still in development so cannot be reviewed.	 Base-Step-Trend model not yet developed	Chorus has used template forecasting spreadsheets for each area of Support Opex. These spreadsheets have assumptions listed for all the assumptions that have been made. Some forecasts, such as labour costs, are inserted directly into the template spreadsheets with the source stated. Labour: The models for individual labour categories (CTO, CNO) are extracts of the central Regulatory Labour Cost Model. This model was not reviewed, but the general methodology of the Regulatory Labour Cost Model is reasonable. Only the portion of CNO labour related to asset management is included within Support opex. The remaining CNO labour costs are allocated to Customer and Network opex. IFRS SD Recoveries: The model is transparent and shows the assumptions that have been made. The estimates for the percentage of each cost that is provisioning related appear reasonable but short descriptions justifying each percentage selected would improve the transparency of the forecast. Self-insurance: The self-insurance forecast is from an assessment of likely costs by an insurance company. There is no Chorus model for this forecast. The models used are reasonable.	
Accuracy and reliability of data	The main input into the forecast is the 'base' year expenditure for Support Opex. The base year data for the forecast is itself a forecast of FY20 expenditure. Until the actual expenditure for the base year is known there will be additional uncertainty in the forecast. Chorus' final		For forecasts using a base-step-trend approach, Chorus is now using actual data for the first 6 months of FY20 to establish the "base". Any items that are one-off in nature have been adjusted for.	

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	<p>forecast for the submission will use actual FY20 expenditure as the base which will be accurate and reliable.</p> <p>The data to be used as the base of the forecast (FY20 actual expenditure) will be accurate and reliable</p>		<p>As Chorus is now using actual expenditure to establish the base the issue identified in the draft assessment is addressed.</p>	
Procurement approach	<p>This programme is made up of many different costs that are managed by the responsible divisions. The majority of Support Opex is personnel costs, which are determined by Chorus' staffing strategy.</p> <p>Chorus applies productivity targets to each division and team, requiring managers to efficiently manage expenditure and achieve reductions where possible. Chorus has shown this 'management overlay' reduction against historic budgets indicating that managers are efficiently managing expenditure.</p> <p>There are a number of large items within Support Opex, such as marketing expenditure. Information about specific procurement approaches for these were not provided.</p> <p>The procurement approach for Support Opex is reasonable</p>		<p>The draft assessment is retained for this requirement.</p>	
Consideration of historic investment	<p>The proposed Base-Step-Trend approach puts significant weight on historic expenditure.</p> <p>Because of additional business support costs incurred during the main UFB build phase and recent restructurings to reduce costs, Chorus has determined that FY20 is the most appropriate base year for forecasting. As FY20 is expected to have a lower level of expenditure than previous years (at a Chorus level, the FFLAS share is increasing which results in FFLAS expenditure growing) it is an appropriate stating position. However, accurate forecasting will not be possible until actual FY20 expenditure is known.</p> <p>The forecast aligns with historic expenditure.</p>		<p>The draft assessment is retained for this requirement.</p>	
Consideration of options and alternative solutions	<p>There are no alternative options for most of the expenditure included in Support Opex. Chorus is incentivised to efficiently manage its expenditure in this area.</p> <p>Alternative options are not available.</p>		<p>The draft assessment is retained for this requirement.</p>	
Relationship between proposed expenditure	<p><input checked="" type="checkbox"/> Availability <input checked="" type="checkbox"/> Performance <input checked="" type="checkbox"/> Ordering <input checked="" type="checkbox"/> Provisioning <input checked="" type="checkbox"/> Switching <input checked="" type="checkbox"/> Faults <input checked="" type="checkbox"/> Customer service</p> <p>Support Opex is necessary to provide network services. Expenditure in this area is necessary to run the business and network, which enables a</p>		<p>The draft assessment is retained for this requirement.</p>	

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
and quality outcomes	<p>base level of quality outcomes, but does not directly contribute to achieving quality outcomes. The forecast methodology ensures that business support services will be maintained at current levels, which will enable other programmes to deliver quality outcomes.</p> <p>The proposed expenditure is expected to be sufficient for Chorus to continue to operate its fibre network. This enables other programmes to provide quality outcomes to customers.</p>			
Deliverability and feasibility of implementation	<p>The forecast expenditure on this programme uses existing Chorus resources and some outsourced services. As the current forecast indicates there will not be any significant increase in Support Opex the deliverability and feasibility of implementation risk is low.</p> <p>Low deliverability and feasibility of implementation risks.</p>		The draft assessment is retained for this requirement.	
Uncertainty within the proposed expenditure	<p>Support Opex has a low level of uncertainty. The majority of the expenditure is for internal staff. Staff headcount and salaries are generally stable and easily forecast, but with some variability in the opex cost due to changes in capitalisation of staff time due to major capital projects. Business restructurings may result in significant changes, but these are usually driven by achieving an improvement in productivity or quality outcomes. Some business support costs are flexible, such as marketing, but are necessary to achieve business goals such as achieving connections targets.</p> <p>Base-Step-Trend is an appropriate forecasting methodology for this type of expenditure and is used widely in similar industries both within New Zealand and overseas.</p> <p>The level of uncertainty is low.</p>		The draft assessment is retained for this requirement.	
Extent to which a risk-based approach has been applied	<p>A risk-based approach has not been applied. A risk-based approach is unlikely to be feasible as Support Opex has an indirect effect on most risks.</p> <p>Risk-based forecasting approaches are unlikely to be feasible for this type of expenditure.</p>		The draft assessment is retained for this requirement.	
Capex / opex dependency and trade-off and whole of lifecycle cost	<p>Chorus has included a capex programme for IT optimisation which is expected to produce savings for the business and improvements in delivery of FFLAS services. The current forecast for Support Opex does not appear to include any step changes or other adjustments for productivity improvements from the optimisation investment.</p>	 Optimisation step changes	<p>Chorus has not yet clearly linked any step changes related to Optimisation Capex into the opex forecasts. Analysis of minimum expected benefits has been included in the Optimisation Capex POD document.</p> <p>The draft assessment is retained for this requirement.</p>	 Optimisation step changes

Requirement	Draft Assessment	Draft Finding	Final Assessment	Final Finding
	Chorus has not detailed where opex savings from optimisation capex are included in the forecasts across the opex programmes.			

11.3.4 Final Assessment Conclusion

In our opinion, the methods and input assumptions used to forecast the Support operating expenditure would result in a forecast that reflects the efficient costs that a prudent fibre network operator would incur to deliver regulated FFLAS at appropriate quality, during the upcoming regulatory period and over the longer term, having regard to good telecommunications industry practice.

12 APPENDICIES

APPENDIX A. MAPPING OF DECISION PACKETS TO REPORT SECTIONS

Extending the Network		Installations		IT and Support		Network Capacity		Network Sustain and Enhance	
2439	UFB Infill	2018	Business Fibre Connections	2594	Customer Experience & Chorus Optimisation	2600	UFB 2 - layer 2 Access Equipment	2013	Netmap Gold Record
2585	Non UFB NGA Coverage Extension	2586	Customer Build High Cost Named Project	2602	IT Lifecycle & Compliance	2991	Growth Fibre Layer 2 Access	2054	Fixed Network New Capability
2588	Greenfields	9102	Bespoke connections	2012	Office Equipment & Phones	9105	Lifecycle ONTs [manual split from DP 2705]	2341	Lifecycle Replacements
2701	UFB Greenfield	2006	Business Connect, Narrowband / Baseband	2426	Health and safety	2989	Growth - Fibre Aggregation	2437	Network Poles - fibre
2422	UFB 2 Communal build	2429	UFB2/2+ connections	2592	C2 Accommodation	7412	Copper Aggregation Capability	2444	Rehab - Fibre
2434	UFB2+ Communal Build	2537	Customer retention costs (fibre)	9103	Innovation	7413	Ethernet Aggregation Coverage & Capacity	2445	Maintain Service Fibre
		2593	UFB 1 - Connections	9104	Optimisation	9100	Aggregation obsolescence	2569	Rehab, Renewal & Line Balancing
		2705	UFB Layer 2 - ONT	2594	Customer Experience & Chorus Optimisation	2021	Regional Backhaul, Legacy	2570	Maintain Service
				2595	Fibre Product Development	2425	Regional Backhaul, NGN	2703	Network Poles
				2602	IT Lifecycle & Compliance	2441	L2 Transport Capability	2706	1.8GHz DMR Clearance for LTE
				9101	AM capability	2443	UFB2 Transport	6015	Fibre Lifecycle
						2584	Fibre Capability	2420	Copper to Fibre Migration (OHUG)
								2436	Roadworks - fibre driven
								2702	Roadwork
								2430	UFB 2 Transport robustness
								2440	NFM Physical network – fibre
								2442	Transport Robustness
								2180	Property & Infrastructure Compliance
								2182	Chorus Alternative Sites
								2183	Spark Exchange Equipment ROWs

Extending the Network		Installations		IT and Support		Network Capacity		Network Sustain and Enhance	
								2184	Premium Colocation
								2347	UCLL Co Lo Infrastructure
								2562	Engineering Services

APPENDIX B. INFORMATION RELIED ON [entire list Chorus CI]
