IT'S HOW WE CONNECT

Telstra Corporation

Cost Allocation Framework for the ACCC Fixed Line Services Model

Framework and Model Guide

Version 1

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Public Version

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1 Introduction

This paper sets out the Cost Allocation Framework (**CAF**) developed by Telstra in preparation for the 2014 Fixed Services Review Final Access Determination (**FAD**) process.

The purpose of the CAF is to work as part of the ACCC Fixed Line Services Model (**FLSM**) to determine the revenue requirement for the set of regulated fixed line wholesale services – PSTN Originating Access and Terminating Access (**PSTN OA/TA**), Wholesale Line Rental (**WLR**), Local Carriage Service (**LCS**), Unconditioned Local Loop Service (**ULLS**), Line Sharing Service (**LSS**) and Wholesale ADSL (**WDSL**).

In addition to describing the CAF, this paper also provides a detailed documentation of calculations used in the estimation of the cost allocation factors, including the workings of the Excel model (**CAF Model**), as well as the engineering and other assumptions that underpin the model and input data used.

2 Overview of cost allocation within the FLSM

The calculation of cost allocators is a critical component of estimating regulated access pricing for declared services supplied by Telstra over its fixed line telecommunications network. Cost allocators are used to apportion annual costs for the relevant Asset Classes to services for which those costs are to be recovered. Annual costs are calculated using the FLSM, based on a building-block methodology (**BBM**).

The BBM, as employed within the FLSM, estimates the annual cost (or revenue requirement) for each relevant Asset Class as the sum of operating costs, capital costs (comprising return on capital and return of capital) and the cost of tax.[1]

In the previous FAD inquiry, the ACCC utilised the FLSM to estimate access prices based on a BBM pricing methodology.[2] The FLSM was subsequently revised to incorporate pricing for WDSL.[3]

The FLSM estimates an annual revenue requirement (using the BBM approach) for a number of Asset Classes that are relevant for the provision of regulated and unregulated fixed line services (the Fixed Line Services). In order to generate prices for each service, it is necessary to establish cost allocators to apportion the relevant shares of costs for each Asset Class among the different services.

In the 2011 FAD, specific fixed principles were set out with respect to cost allocation. These principles state:

> *In relation to the cost allocation factors used to allocate the revenue requirement to particular declared fixed line services, the fixed principles provisions specify that:*
>
> - *The allocation of the costs of operating the PSTN should reflect the relative usage of the network by various services.*
> - *Direct costs should be attributed to the service.*

[1] A public version of the FLSM used by the ACCC to determine prices for the set of regulated fixed line wholesale services (except for WDSL) in July 2011 is available at: <http://www.accc.gov.au/regulated-infrastructure/communications/fixed-line-services/fixed-line-services-final-access-determination-fad-2011/final-report>. The FLSM was subsequently revised to incorporate pricing for WDSL.
[2] ACCC, *Inquiry to make final access determinations for the declared fixed line services: Final Report*, July 2011.
[3] ACCC, *Public inquiry to make a final access determination for the Wholesale ADSL service: Final Report*, May 2013.

- *The cost allocation factors for shared costs should reflect causal relationships between supplying services and incurring costs.*

- *No cost should be allocated more than once to any service.*

- *The determination of cost allocation factors should reflect the principles above except where reliable information is not available to support the application of the principles.*

(Clause 6.14 of each of the FADs for the regulated fixed line services)

The annual costs are allocated on this same basis for any given Asset Class – that is, there is no differentiation made between capital costs and operating costs for a given Asset Class for the purposes of cost allocation.

Although the FLSM determines annual costs for each Asset Class, it only determines a revenue requirement and prices for a sub-set of the services that make use of these assets – namely, the set of regulated fixed line wholesale services for which the model is used to set price terms under the FAD.

This is a reasonable simplification for the purposes of designing a model such as the FLSM. In all cases, the Asset Classes within the FLSM are used by non-regulated services (either retail or non-regulated wholesale fixed line services or other services – such as mobile services) in addition to the regulated wholesale services, and it would significantly increase the model complexity (for little regulatory benefit) to fully calculate prices for these out-of-scope services.

Although it is not necessary (or sensible) to seek to fully incorporate non-regulated services into the FLSM, it is nevertheless critical and absolutely required that these additional services are fully considered and used in the context of estimating the allocation factors that will apply to the set of regulated fixed line wholesale services. This requirement to consider the full range of services that make use of a given Asset Class is the essence of a fully allocated cost framework, ensuring confidence that costs are neither over-recovered nor under-recovered.

3 Updating the FLSM Cost Allocation Framework

Telstra set out to develop a cohesive CAF and produce an Excel model (the **CAF Model**) that could be incorporated into the FLSM and replace the existing cost allocation worksheets.

As is the case with any modelling activity, developing a CAF inherently involves trade-offs between precision (and greater complexity and cost) and practicability (and the risk of over simplification and error). This trade-off is explicitly acknowledged in the Fixed Principles.

In developing the CAF, Telstra has focused on the practical application of the Fixed Principles, adopted and re-used existing modelling frameworks (where feasible) and ensured a consistent approach with the similar BBM-based access pricing regimes used by the ACCC, the AER and other Australian regulators.

In practice, Telstra sought to implement the following principles in developing the cost allocation model:

- The model employs a fully allocated cost framework. For each Asset Class, the total allocation of costs for the Asset Class across all platforms and services is equal to 1. Within the model, a check sheet confirms that the total allocation of costs for each Asset Class is equal to 1.

- To the greatest extent possible, specific Asset Class allocators are used, in which relevant data on the use of the particular Asset Class by different services are used to determine cost allocations. For five Asset Classes, a general allocator is used, in which an allocation is estimated for the regulated fixed line wholesale services based on those services allocations

that derive from the other Asset Class specific allocators. Ideally, no general allocators would be used. However, some Asset Classes require the use of a general allocator because the data required to estimate cost causal relationships for all the relevant service is not readily available.

- Different cost allocation approaches were adopted for different Asset Classes to reflect the different drivers of costs for different Asset Classes. Each Asset Class is also examined to determine whether or not cost drivers vary for different equipment and asset types that make up the overall Asset Class. Where necessary (and practicable), the framework employs different allocation approaches for different components of an Asset Class where logical differences in the cost drivers are identified.

- The ultimate output of the CAF Model is a set of cost allocators for the FLSM Asset Classes that apply to the FLSM services (the regulated fixed line wholesale services). These cost allocators are updated for each year over the period FY2014 to FY2019 based on the best available forecast data. Forecast allocators are based on demand forecasts provided by Telstra in response to the 2013 Building Block Model Record Keeping Rule (**BBM RKR**) request (**RKR Response**), as well as additional forecasts for services not captured by the RKR Response but prepared on a consistent basis. Where no forecast demand data is available, the latest, best available data is used as a basis for allocating future costs.

- Telstra has simplified the cost allocation process by only seeking to produce service-level cost allocators for Fixed Line Services – and in particular the regulated fixed line wholesale services. Where other, non-fixed line services make use of a given Asset Class, the allocation is generally made to a broad "other service" category, as there is no need (for the purposes of the FLSM) to determine the specific allocators for individual services within the "other service" category.

The implementation of these principles within the CAF and the CAF Model is set out in the following sections.

4 Implementing a Cost Allocation Framework for the FLSM

The model produces cost allocations for each Asset Class to the regulated fixed line wholesale services for each year over the period FY2014 to FY2019. The period FY2015 to FY2019 is consistent with the period for which Telstra was required to provide forecast data for the 2013 BBM RKR.

The model is a fully allocated cost framework and the calculated allocations for each Asset Class sum to 1 for each year.

The following steps are required to establish cost-reflective allocators for services within a fully-allocated cost framework:

- Understanding what assets (physical equipment) are contained in each Asset Class and the cost drivers of these assets;
- Determining the scope of services that make use of each Asset Class – this may include some or all of the Fixed Line Services (including regulated fixed line wholesale services) and "Other" services;
- Calculating cost-causal allocators on the basis of the identified cost drivers relevant to each Asset Class to the set of services that make use of those particular assets; and
- Producing outputs (allocation factors) for use in the FLSM.

The principles and broad approach underpinning each of these steps is set out below.

4.1 Examination of the Asset Classes within the FLSM

The FLSM estimates the annual revenue requirement for 22 Asset Classes. The Asset Classes represent the property, plant and equipment and other assets required for the provision of Telstra's regulated fixed line wholesale services (as well as being used in the provision of other fixed line voice and broadband services and other services).

Each Asset Class within the FLSM has been examined to determine the types of physical plant and equipment and other assets that make up the Asset Class. This information has then been used to determine the most appropriate cost-causal, usage-based allocator for the given Asset Class.

Where an examination of the plant and equipment within an Asset Class reveals two or more groups of assets that should be separately allocated on the basis of different cost drivers, these different groups were identified and separate cost allocation applied. For example, within the Switching Equipment Local Asset Class, two distinct groups of assets were identified – equipment for which costs are driven by the number of end-users connected to the equipment and equipment for which costs are driven by the number of call minutes that traverse the equipment. To then determine an overall allocation of cost for a particular Asset Class, the sub-group allocations were weighted by the relative value of their assets using the June 2013 Written Down Value (**WDV**) from Telstra's Asset Register.

The FLSM estimates the annual revenue requirement – using a building block approach – to service costs with respect to the following 22 Asset Classes:

- CA01 Ducts and Pipes
- CA02 Copper Cables
- CA03 Other Cables
- CA04 Pair Gain Systems
- CA05 CAN Radio Bearer Equipment
- CA06 Other CAN Assets
- CA07 Other Communications Plant and Equipment
- CA08 Network Land
- CA09 Network Buildings/Support
- CA10 Indirect Capital Assets
- CO01 Switching Equipment - Local
- CO02 Switching Equipment - Trunk
- CO03 Switching Equipment - Other
- CO04 Inter-exchange Cables
- CO05 Transmission Equipment
- CO06 Core Radio Bearer Equipment
- CO07 Other Communications Plant and Equipment
- CO08 Network Land
- CO09 Network Buildings/Support
- CO10 Indirect Capital Assets
- CO11 LSS Equipment
- CO12 Data Equipment

Asset Classes CA01 to CA10 are assets relevant to the Customer Access Network (**CAN**) – i.e. the customer access network (and associated infrastructure) that connects end-user premises to the PSTN. Asset Classes CO01 to CO12 are assets relevant to Telstra's Core and Inter-exchange networks and include infrastructure such as transmission equipment, broadband equipment (DSLAMs, BRAs, IGRs and other devices) and voice equipment (RSS, LAS, TNS and other switching equipment).

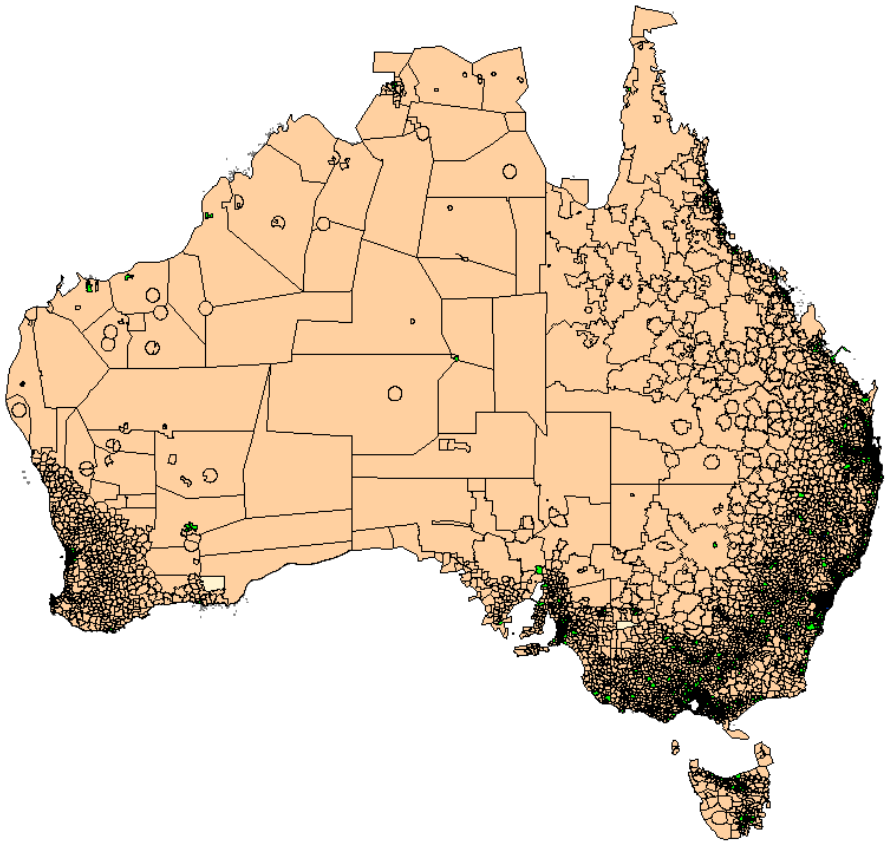
Overview of the fixed line network

As noted above, the Asset Classes within the FLSM represent the property, plant and equipment and other assets that comprise Telstra's fixed line telecommunications network. This network provides fixed line voice and broadband services to end-users throughout Australia, as well as allowing third parties to access these end-users (through the regulated fixed line wholesale services) and supply their own services.

The key "building block" of the fixed line network is the Exchange Service Area (**ESA**). An ESA is generally served from a local exchange building, which houses voice, broadband and other telecommunications equipment. The exchange building is connected to end-users' premises through a network of ducts, copper cables, optical fibre and other media referred to as the CAN. The local exchange buildings themselves, most of the equipment contained in those buildings, and the network of fibre optic cables that connect the buildings together is referred to as the Core network.

There are more than 5,000 local exchange buildings in Telstra's fixed line network, serving 5067 ESAs. Figure 1 illustrates the division of Australia into ESAs.

Figure 1. Exchanges Service Areas



ESAs can be categorised into several groupings based on factors such as geographic location and tele-density (number of end-user lines per square kilometre). A common categorisation used for regulatory purposes is Unconditioned Local Loop Service Bands (**ULLS Bands**).

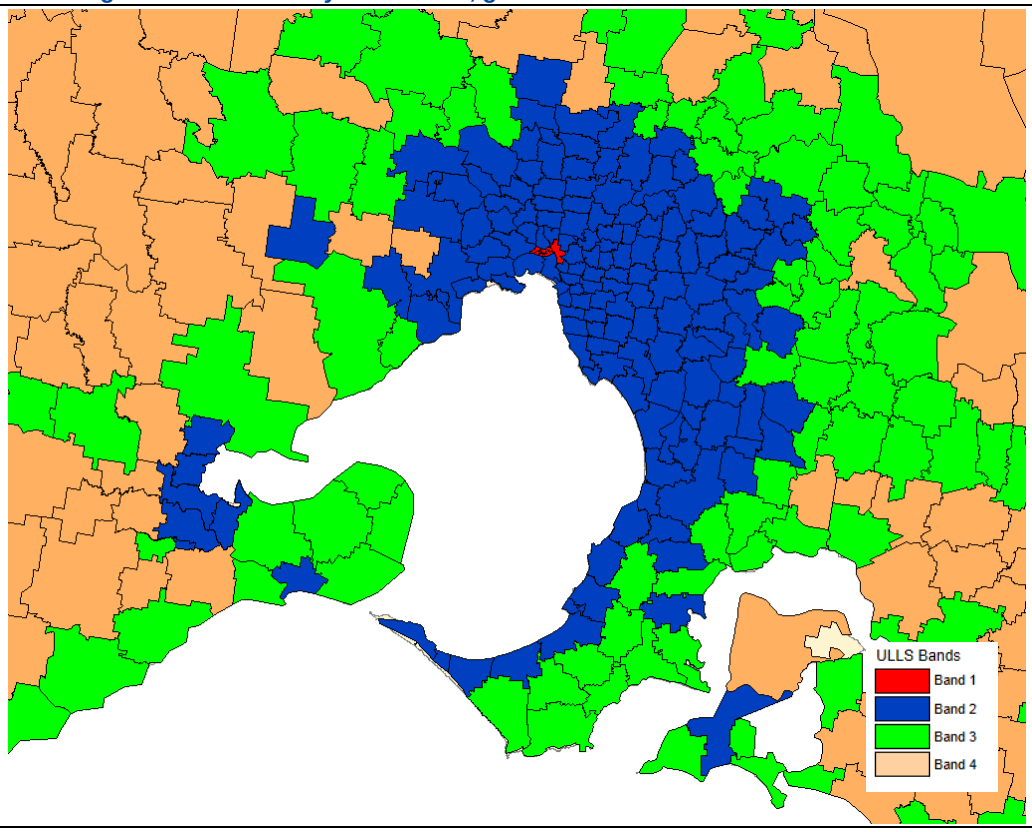
The following table sets out each ULLS Band, showing the geographic categorization, the number of ESAs and number of end-user services in operation (**SIOs**) in each Band. The table also sets out the average number of SIOs per ESAs.

Table 1 Breakdown of Exchange Service Areas

Band	Geography	Number of ESAs	Number of SIOs	Average SIOs/ESA
1	CBD	16	[redacted]	
2	Metropolitan	585		
3	Regional	749		
4	Rural	3,717		

The following figure illustrates the location of ESAs in the greater Melbourne area, by ULLS Band.

Figure 2. Exchanges Service Areas by ULLS Band, greater Melbourne area



Just as Telstra's fixed line network can be considered in terms of the CAN and the Core network elements, the FLSM categorises each of the 22 Asset Classes as either CAN or Core. The following two tables provide a brief outline of the key functionality/use of assets within each Asset Class and the approach adopted for allocating costs to the relevant services.

Table 2. Description of FLSM Asset Classes – CAN Asset Classes

FLSM Asset Class	Asset Description
CAN Asset Classes	
CA01 Ducts and Pipes	The Ducts and Pipes (CA01) Asset Class contains Telstra's duct network assets. These assets are used predominantly to contain copper cables in the main and distribution stages of the CAN. The duct network also contains fibre optic cable, some HFC as well as third party services. The duct network is present in CBD, metropolitan and most regional areas. CA01 comprised [redacted] of the initial Regulatory Asset Base (**RAB**) value (i.e. the RAB value as at 1 July 2011).
CA02 Copper Cables	The Copper Cables (CA02) Asset Class contains Telstra's copper cable assets, which are Telstra's primary means of connecting end-users to the PSTN through the CAN, enabling the provision of fixed line access services – including ULLS, LSS, WLR (and retail basic access) – and associated voice and broadband services. CA02 comprised [redacted] of the initial RAB value.
CA03 Other Cables	The Other Cables (CA03) Asset Class contains CAN-based optical fibre cables (and associated infrastructure) used to provide FTTP services in Telstra's Velocity estates, South Brisbane and similar deployments. These assets are used to provide services to end-users (either retail or wholesale basic access). CA03 comprised [redacted] of the initial RAB value. Note: optical fibre cables within this asset class do not include optical fibre cables used to connect remote (or CAN-based) voice and DSLAM equipment - i.e. Pair Gain Systems such as CMUX units. These cables are recorded against CO04 Inter-exchange Cables.
CA04 Pair Gain Systems	The Pair Gain Systems (CA04) Asset Class contains remote voice equipment (pair gain systems), which provides voice functionality to end-users. These devices – generally CMUX units – can also facilitate the provision of broadband services to end-users with the installation of a collocated DSLAM device. These devices are not part of the CA04 Asset Class and are contained (along with other, exchange-based DSLAM equipment) in CO12 Data Equipment. CA04 comprised [redacted] of the initial RAB value. The costs associated with assets are allocated to WLR, Retail Basic Access services and ISDN services.
CA05 CAN Radio Bearer Equipment	The CAN Radio Bearer Equipment (CA05) Asset Class includes antennas, terminals and related equipment. Note: these assets are not related to mobile wireless assets. These assets are used in the provision of Retail Basic Access and WLR services. CA05 comprised [redacted] of the initial RAB value.
CAO6 Other CAN Assets	The Other CAN Assets (CA06) Asset Class contains Network Termination Units which are used by the fixed line access services (ULLS, WLR, Retail Basic Access, ISDN and Other DSL). CA06 comprised [redacted] of the initial RAB value.
CA07 Other Communications Plant and Equipment	The Other Communications Plant and Equipment (CA07) Asset Class is predominantly made up of CAN radio towers, used in conjunction with CA05 to supply retail basic access and WLR fixed line access services. CA07 comprised [redacted] of the initial RAB value.
CA08 Network Land	The Network Land (CA08) Asset Class contains the share of network land assets (which include freehold network land, structural land improvements, mains power connections, fencing, roads, paths, parking, drainage and landscaping) to accommodate the customer side of the Main Distribution Frame (**MDF**) – which is contained in CA09. This asset is required for the provision of the fixed line access services (i.e. WLR and ULLS). CA08 comprised [redacted] of the initial RAB value.
CA09 Network Buildings/Support	The Network Buildings/Support (CA09) Asset Class contains the share of aggregate network buildings and support assets designed to reflect the values and associated costs of the Customer side of the MDF within Telstra exchange buildings. This asset is required for the provision of the fixed line access services (i.e. WLR and ULLS). CA09 comprised [redacted] of the initial RAB value.
CA10 Indirect Capital Assets	The Indirect Capital Assets (CA10) Asset Class contains equipment related to motor vehicles and mechanical aids, but is predominantly IT – both software and hardware. CA10 is required for the provision of all regulated fixed line services and other services. CA10 comprised [redacted] of the initial RAB value.
CO01 Switching Equipment - Local	The Switching Equipment – Local (CO01) Asset Class contains voice aggregation devices (Remote Switching Stages (**RSS**), Remote Aggregation Units (**RAU**)) – including voice line cards, as well as local access switch (**LAS**) devices. The costs associated with these assets are driven by both the number of end-user services connected and the volume of voice minutes that traverse the equipment. This equipment is used for the provision of fixed line voice services. CO01 comprised [redacted] of the initial RAB value.

Table 3. Description of FLSM Asset Classes – Core Asset Classes

FLSM Asset Class	Asset Description
Core Asset Classes	
CO02 Switching Equipment - Trunk	The Switching Equipment – Trunk (CO02) Asset Class contains higher level switching equipment – principally used in the provision of STD, international, fixed to mobile and interconnect voice calls. The costs associated with these assets are driven primarily by the volume of voice minutes that traverse the equipment. This equipment is used for the provision of fixed line voice services. CO01 comprised [redacted] of the initial RAB value.
CO03 Switching Equipment - Other	The Switching Equipment –Other (CO03) Asset Class contains a minimal amount of miscellaneous other voice switching equipment, used for the provision of the fixed line voice services. CO03 comprised [redacted] of the initial RAB value.
CO04 Inter-exchange Cables	The Inter-exchange Cables Asset Class (CO04) contains the fibre optic cables that connect Telstra's exchange buildings and other telecommunications infrastructure. These assets include fibre cables used to connect remote voice switching and ADSL broadband hardware DSLAMs deployed in the CAN to the local exchange. These assets are used for the provision of the fixed line voice and broadband services, as well as for other services. CO04 comprised [redacted] of the initial RAB value.
CO05 Transmission Equipment	The Transmission Equipment (CO05) Asset Class contains predominantly SDH as well as PDH transmission equipment (as well as other transmission equipment used to support both PDH and SDH systems). These assets are used in the provision of fixed line voice and broadband services, as well as other services. CO05 comprised [redacted] of the initial RAB value.
CO06 Core Radio Bearer Equipment	The Core Radio Bearer Equipment (CO06) Asset Class contains core radio bearer equipment used to deliver transmission services (i.e. SDH and PDH-based services) in areas without fibre optic cable (CO04). These assets are generally used in regional and remote areas and support the provision of transmission services (and, in turn, those services that rely on Transmission Equipment). CO06 comprised [redacted] of the initial RAB value.
CO07 Other Communications Plant and Equipment	The Other Communications Plant and Equipment (CO07) Asset Class contains racks, ironworks and tie cables used in Telstra exchange buildings to support the provision of fixed line services, and other services – including use by third parties. CO07 comprised [redacted] of the initial RAB value.
CO08 Network Land	The Network Land (CO08) Asset Class is the value of network land assets (which include freehold network land, structural land improvements, mains power connections, fencing, roads, paths, parking, drainage and landscaping) – excluding that share allocated to CA08. These assets are required for the provision of the fixed line services and other services – including use by third parties. CO08 comprised [redacted] of the initial RAB value.
CO09 Network Buildings/Support	The Network Buildings/Support (CO09) Asset Class is the value of aggregate network buildings and support assets – less the share allocated to CA09. This asset is required for the provision of the fixed line services and other services – including use by third parties. CO09 comprised [redacted] of the initial RAB value.
CO10 Indirect Capital Assets	The Indirect Capital Assets (CO10) Assets Class contains equipment related to motor vehicles and mechanical aids, but is predominantly IT – both software and hardware. CO10 is required for the provision of the fixed line services and other services. CO10 comprised [redacted] of the initial RAB value.
CO11 LSS Equipment	The LSS Equipment (CO11) Asset Class is a service-specific asset class that contains all costs considered relevant to LSS (and no costs relevant to other services). It did not contribute to the initial RAB value (i.e. there are no assets attributed to the class, with all cost being operating expenditure).
CO12 Data Equipment	The Data Equipment (CO12) Asset Class contains equipment necessary to provide fixed line broadband services (specifically DSL broadband services), including the equipment and software required to route and aggregate DSL traffic. This equipment is used for the provision of the fixed line broadband services – specifically retail and wholesale ADSL and Other DSL services. CO12 comprised [redacted] of the initial RAB value.

4.2 Services that need to be considered in cost allocation

To establish a fully allocated cost framework for the FLSM Asset Classes, it is necessary to consider three types of services:

- **The set of regulated fixed line wholesale services** – ULLS, LSS, WLR, PSTN OA/TA, LCS and WDSL – these are services for which cost allocators are required for the FLSM.

- **The set of Fixed Line Services -** This includes the above listed regulated fixed line wholesale services, as well as:

    - Retail Basic Access (of which WLR is the wholesale resale equivalent);
    - Local, STD, International and fixed to mobile PSTN calling services;
    - ISDN access services (both ISDN Basic Access and ISDN Primary Rate);
    - ISDN voice services;
    - Retail ADSL services; and
    - Specialist business grade DSL services (i.e. SHDSL services).

- **Other Services -** This set of services will vary depending on the particular Asset Class. For some asset classes, 100% of the relevant costs are only attributable to one or more Fixed Line Services. However, for other Asset Classes, a proportion of the relevant costs are attributable to other services that make use of the particular asset. For example, HFC (cable broadband) and third party duct access make use of CA01 Ducts and Pipes and are allocated a usage-based share of these costs. Similarly, many services in addition to the Fixed Line Services make use of CO04 Inter-exchange Cable and CO05 Transmission Equipment, including mobile services, leased data services and dedicated data services, and a usage-based allocation of costs is calculated for these services.

Costs associated with the Asset Classes are either entirely attributable to one or more of the Fixed Line Services (including the regulated wholesale services) or are attributable to other services in addition to the Fixed Line Services. (The set of Asset Classes excludes assets that would not be attributable to any of the Fixed Line Services – for example, assets related to the mobile network radio infrastructure.)

Within the allocation model, where an Asset Class is determined to be used by services in addition to the Fixed Line Services, a two-stage allocation process is followed;

- first, costs associated with other services are estimated and allocated to determine the overall allocation for the Fixed Line Services;
- then individual allocations are calculated for the individual Fixed Line Services (which include the regulated fixed line wholesale services, which are the ultimate inputs to the FLSM).

The allocation model calculates allocation factors for the period FY2014 to FY2019. This requires the use of forecast data for the relevant services. Demand forecasts for the regulated fixed line wholesale services are as reported in the 2013 BBM RKR. For the remaining Fixed Line Services, corporate forecasts have been adopted, with adjustments made to ensure consistency with the BBM RKR forecasts and with the forecasts extended to cover the forecast period. (For further information on the forecast data for the Fixed Line Services, see Appendix A). For other services, the latest and best available information on usage has been used in the absence of corporate forecasts.

The following table sets out the allocation of costs to the regulated fixed line wholesale services, other fixed line services and other services for each Asset Class, as calculated by the CAF Model for FY2014. Consistent with a fully allocated cost framework, the total allocation for each Asset Class is 1.

Table 4. Summary of allocation factors for FLSM Asset Classes by service type, FY2014

Code	Asset Class	Allocation to regulated fixed line wholesale services	Allocation to other fixed line services	Allocation to other services	Total allocation
CAN Asset Class					
CA01	Ducts and Pipes	[redacted]			1.0000
CA02	Copper Cables				1.0000
CA03	Other Cables				1.0000
CA04	Pair Gain Systems				1.0000
CA05	CAN Radio Bearer Equipment				1.0000
CA06	Other CAN Assets				1.0000
CA07	Other Communications Plant and Equipment				1.0000
CA08	Network Land				1.0000
CA09	Network Buildings/Support				1.0000
CA10	Indirect Capital Assets				1.0000
Core Asset Class					
CO01	Switching Equipment - Local				1.0000
CO02	Switching Equipment - Trunk				1.0000
CO03	Switching Equipment - Other				1.0000
CO04	Inter-exchange Cables				1.0000
CO05	Transmission Equipment				1.0000
CO06	Core Radio Bearer Equipment				1.0000
CO07	Other Communications Plant and Equipment				1.0000
CO08	Network Land				1.0000
CO09	Network Buildings/Support				1.0000
CO10	Indirect Capital Assets				1.0000
CO11	LSS Equipment				1.0000
CO12	Data Equipment				1.0000

4.3 Calculating cost-causal allocators for each Asset Class

Cost-causal allocators are designed to reflect how different services impact on and determine the annual costs (which include capital and operating costs) of different Asset Classes. In the context of the FLSM Asset Classes, cost may be driven by a number of different factors, including for example:

- the number of services that make use of particular equipment, such as software that is licensed on a per-user basis or DSLAMs that are dimensioned on the basis of the number of end-user services that are connected;
- the volume of throughput (i.e. voice call minutes or megabits of data) for a particular piece of equipment – such as the number of voice call minutes that a PSTN switch is required to handle for different voice services;
- the volume or capacity that is required to be provisioned for a particular asset to support different services, such as the number of transmission links that are dedicated to different voice and data services; or

- the amount of physical space that different services are allocated with respect to a particular asset (e.g. buildings, ducts) – such as the route kilometres of duct space allocated to third party duct rental.

For some Asset Classes, it may be necessary to distinguish between different types of equipment/assets within a single class where costs with respect to those different equipment types would reasonably be considered to have different cost drivers. Further, even in cases where there is a consistent cost driver for a given Asset Class, it may be necessary to weight that driver depending on the particular service that is in use or the location of that service. For example, fixed line access service SIOs are an appropriate cost driver for CA02 Copper Cable Assets. However the geographic location of those SIOs will have a bearing on costs, with (generally longer) copper cable runs in rural areas likely to cost more than in CBD areas on a per SIO basis.

The above approach is employed where costs related to a particular Asset Class can be logically attributed to one or more services on the basis of available data. For Asset Classes (such as Indirect Assets) for which no logical cost driver could be attributed to one or more services, given available data, a general allocator was adopted – consistent with the current approach in the FLSM.

4.4 Producing outputs (allocation factors) for use in the FLSM

For the purposes of determining service prices in the FLSM, the necessary outputs from the allocation model are annual cost allocators in respect of each of the FLSM Asset Classes for the set of regulated fixed line wholesale services.

For ULLS, two allocators are produced, an allocator for ULLS Bands 1 to 3 and an allocator for ULLS Band 4. In effect these are separate services for the purposes of setting prices through the FLSM and therefore require separate allocators.

The following table sets out the allocation factors for the individual regulated fixed line wholesale services with respect to each Asset Class, as calculated by the CAF Model for FY2014.

Table 5. Summary of allocation factors for FLSM Asset Classes by service type, FY2014

Code	Asset Class	ULLS Band 1-3	ULLS Band 4	WLR	PSTN	LCS	LSS	WADSL	Total allocation to regulated fixed line wholesale services
CAN Asset Class									
CA01	Ducts and Pipes								
CA02	Copper Cables								
CA03	Other Cables								
CA04	Pair Gain Systems								
CA05	CAN Radio Bearer Equipment								
CA06	Other CAN Assets								
CA07	Other Communications Plant and Equipment								
CA08	Network Land								
CA09	Network Buildings/ Support								
CA10	Indirect Capital Assets								
Core Asset Class									
CO01	Switching Equipment - Local								
CO02	Switching Equipment - Trunk								
CO03	Switching Equipment - Other								
CO04	Inter-exchange Cables								
CO05	Transmission Equipment								
CO06	Core Radio Bearer Equipment								
CO07	Other Communications Plant and Equipment								
CO08	Network Land								
CO09	Network Buildings/ Support								
CO10	Indirect Capital Assets								
CO11	LSS Equipment								
CO12	Data Equipment								

5 Allocator Model Description

Consistent with the CAF, the allocator model uses a fully allocated cost methodology to determine the proportion of costs applicable with respect to each of the FLSM Asset Classes to each of the regulated fixed line wholesale services included in the FLSM.

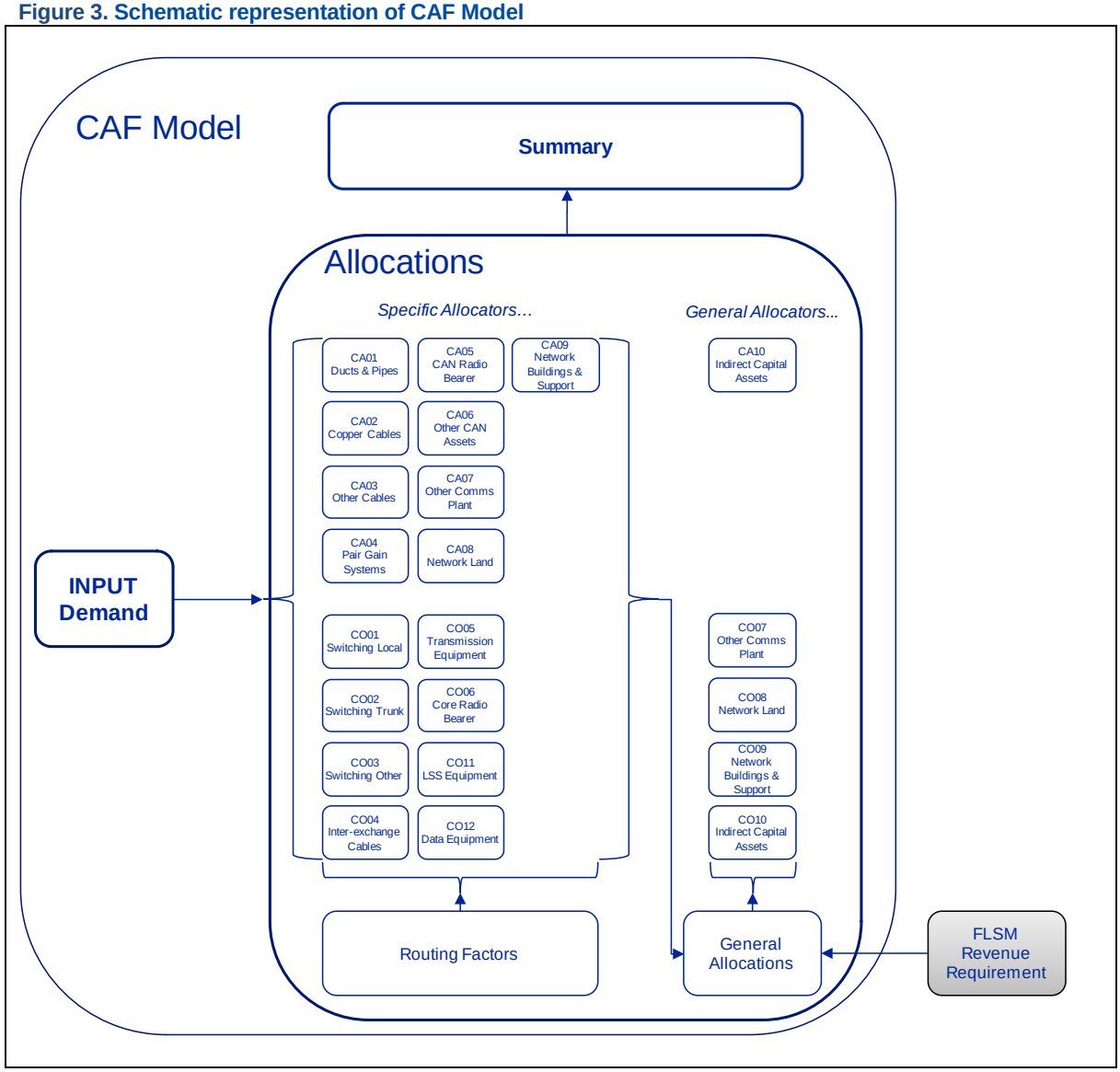
The following table sets out the worksheets within the CAF Model:

Table 6. List of worksheets in the CAF Model

Worksheet	Description
Cover page	An index of all worksheets in the model, providing links to each.
Summary	This sheet contains tables summarising the allocators for each Asset Class, for each service for each year of the regulatory period. These represent the necessary outputs from the model for use in the FLSM.
Allocations	This sheet sets out the calculated allocators to all services (the sets of regulated fixed line wholesale services, other Fixed Line Services and other services) for each Asset Class. The sheet also contains the routing factors used by the CAF in calculating cost allocators for each Asset Class.
INPUT Demand	This sheet contains the demand forecasts for the Fixed Line Services, which are used to calculate the forecast allocator factors.

The following diagram provides a visual representation of the data flows in the CAF Model:

Figure 3. Schematic representation of CAF Model



In broad terms, the CAF Model operates as follows:

- The calculations of the individual cost allocation factors are undertaken in the “Allocations” worksheet. For each FLSM Asset Class, either a Specific Allocator or a General Allocator is calculated.

- For the FLSM Asset Classes for which a Specific Allocator is calculated, inputs from the INPUT Demand worksheet and the Routing Factors table are used by each of the Specific Allocator calculations (in conjunction with other data specific to certain Asset Classes that is set out in the individual Asset Class allocator worksheets) to determine cost allocators for the regulated fixed line wholesale services.

- For the FLSM Asset Classes for which a General Allocator is calculated, the CAF Model applies the weighted average allocator for a particular service across the Asset Class group (i.e. the CAN Asset Classes or the Core Asset Classes) to a particular Asset Class. For a given service, the results of the calculated specific allocators (for the group of CAN Asset Classes or Core Asset Classes) are multiplied by the Revenue Requirement for each matching CAN or Core Asset Class allocators taken as inputs from the FLSM (outside the CAF Model). The results for each service are then divided by the aggregate revenue requirement for the CAN or Core Asset Classes to determine the General Allocator.

- The results of the individual Asset Class specific and general allocators are then tabulated by year for each service (at the top of the Allocations worksheet). These annual tabulations include a “check” function that tests that, for each year, the sum of allocations for a given Asset Class equals one.

- The relevant allocators are then linked to the Summary worksheet for inclusion in the FLSM.

- The INPUT Demand worksheet sets out the forecast demand estimates for each of fixed line services used in the CAF Model. Where the service is either a fixed line access service (Retail Basic Access, WLR, ISDN-BRI & ISDN-PRI, ULLS and LSS) or a fixed line broadband service (Retail ADSL, WDSL and Other DSL), forecast demand is measured in SIOs. For the fixed line voice services (PSTN local calls, PSTN national STD, PSTN international, PSTN fixed to mobile, PSTN OA/TA, PSTN LCS and ISDN voice) the forecast demand is measured in terms of Minutes of Use (MOU).

- The Routing Factors table within the Allocations worksheet is used to determine which fixed line voice and broadband services are allocated costs for each Asset Class. For fixed line access services as well as for fixed line broadband services the routing factor for a given Asset Class will be set at either “1” or “0” (indicated as “-”). Where the routing factors are applied to fixed line voice services, the calculated routing factor may be “1”, “0” or some other positive number, calculated in the separate Routing Factor Model (see Appendix B). Routing factors for the fixed line voice services will vary depending on the estimated relative load the particular service places on an Asset Class, as calculated by the separate Routing Factor Model.

The following sections detail the allocation process for each of the FLSM Asset Classes.

5.1 CAN FLSM asset classes – Asset Class Specific Allocators

As set out above, specific Asset Class allocators are determined for nine out of ten of the CAN asset classes. Most of the CAN Asset Class allocators are calculated in the same manner. The most important driver of costs in the CAN is the number of SIOs, and, while some Asset Classes contain equipment which is used by specific types of services, total SIOs have been used for those asset classes which have specific allocators calculated.

The CAN Asset Classes for which a specific allocator is calculated are:

- CA01 Ducts and Pipes
- CA02 Copper Cables
- CA03 Other Cables
- CA04 Pair Gain Systems
- CA05 CAN Radio Bearer Equipment
- CA06 Other CAN Assets
- CA07 Other Communications Plant and Equipment
- CA08 Network Land
- CA09 Network Buildings/Support

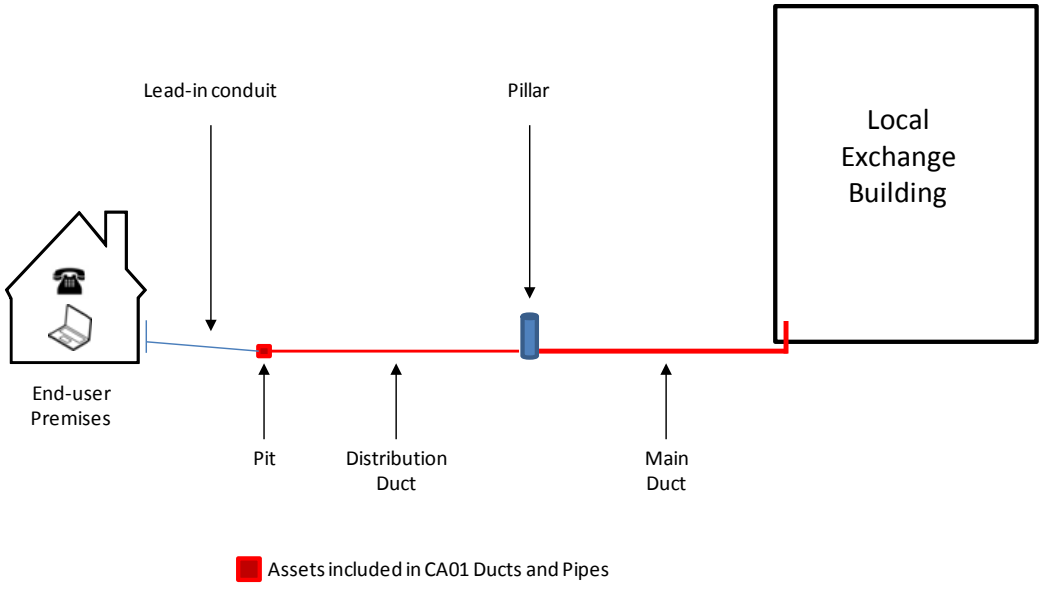
The following sections set out the approach used in calculating the cost allocations for each of these Asset Classes.

5.1.1 CA01 Ducts and Pipes

Ducts and pipes are predominantly used for the provision of fixed line access services to end-users. In addition, these assets are also used by Telstra for the provision of other services and by third parties through the leasing of space within Telstra's duct infrastructure.

The following figure illustrates the location of the CA01 Ducts and Pipes Asset Class assets with the CAN.

Figure 4. Indicative representation of CA01 Ducts and Pipes assets within the fixed line network



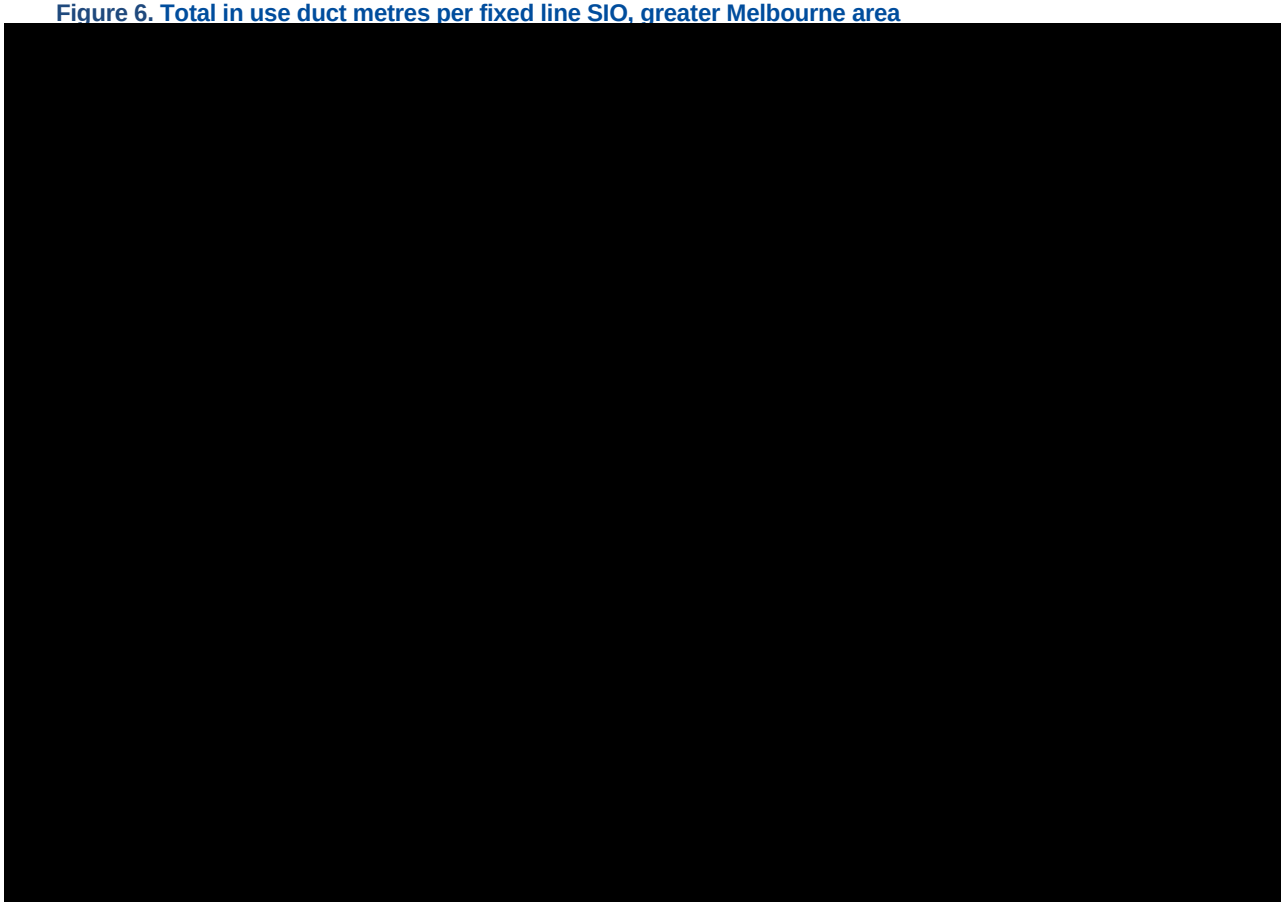
The costs associated with CA01 assets are primarily driven by the distance the duct network is required to cover (i.e. the kilometres of ducts required to provide services) and the geographic location of the duct infrastructure. The per SIO cost is then impacted by the number of services that make use

the duct network in different areas. Note, a “duct kilometre” is the total notional distance covered by a given length of duct and the sub ducts and conduits contained within it. For example, if a one kilometre length of duct ran between point A and point B, and within that duct there were two sub ducts that also ran between A and B, then the total duct kilometres between A and B would be three.

The following figures show the length of installed duct (in metres) per fixed line services SIO, by ESA throughout Australia (Figure 5) and for the greater Melbourne area (Figure 6).

Figure 5. Total in use duct metres per fixed line SIO

Figure 6. Total in use duct metres per fixed line SIO, greater Melbourne area



As can be seen in the above figure, in ESAs closer to the centre of Melbourne (i.e. Band 1 CBD ESAs), the number of duct metres per fixed line access service is relatively low (between 0 and 40 metres per SIO), whereas in general terms, further from the CBD and major metropolitan areas, the number of duct metres per SIO increases significantly.

Comparing Figure 2 (breakdown of ESAs by ULLS Band in the greater Melbourne area) and Figure 6 illustrates the high correlation between the length of duct assets per fixed line SIO and ULLS Bands. Band 1 and Band 2 areas generally exhibiting a shorter average duct length per fixed line SIO than for Band 3 and Band 4 areas.

Allocation of costs for the Ducts and Pipes Asset Class to Fixed Line Services and Other Uses

To reflect the above factors within the cost allocation calculation, a two-part allocation process is used. First, costs with respect to the Ducts and Pipes Asset Class are allocated to either Fixed Line Services or other uses by geographic area (ULLS band). Second, the proportion of costs allocated to Fixed Line Services is further disaggregated to individual services – including the regulated ULLS and WLR services.

The allocation logic for CA01 can be expressed as follows for a given year:

$$\text{CA01} = \sum_{Band=i}^{4} Fixed\ Services_i + Other_i = 1$$

Where

- $Fixed\ Services_i = \sum_{Service=j}^{J} \frac{Service\ Demand_{j,i}}{Service\ Demand_{J,i}} \times Fixed\ Services\ Duct\ KMs_i$:
    - $Service\ Demand_{j,i}$ is forecast demand for a given Fixed Line Service *j* in ULLS Band *i* multiplied by the Routing Factor for *j* with respect to CA01;
    - $Fixed\ Services\ Duct\ KMs_i$ is the proportion of duct kilometres used by Fixed Line Services in ULLS Band (see further Table 8); and
- $Other_i$ is the allocation of costs for CA01 to other, non Fixed-Line Services for ULLS Band *i.*

To determine the overall proportion of duct use by the fixed line services ($Fixed\ Services_i$) and Other Services ($Other_i$), information on the sum of route kilometres of duct infrastructure for each ULLS band is determined.

As noted above, the sum of duct kilometres is determined by summing total kilometres used for Telstra's Fixed Line Services (i.e. ducts in which there is copper cable or fibre optic cable present), Telstra's Other Services (i.e. HFC) and third party services (i.e. Telstra Wholesale Duct Rental Services and use by NBN Co). For each ULLS band, the proportion of aggregate duct kilometres used by either Fixed Line Services or Other Services (the sum of other Telstra services and third party services) is then calculated.

This data is sourced from Telstra's Physical Network Plant Inventory (**TPNI**) database as at April 2014 and from Telstra Wholesale.

The following tables set out the number and distribution of aggregate duct kilometres in use by Telstra copper and optical fibre (Fixed Line Services) and in use by other services (including Duct Access services) by ULLS band as at April 2014.

Table 7. Aggregate duct kilometres by ULLS Band, in use by Fixed Line Services and Other Services, April 2014

	Band 1	Band 2	Band 3	Band 4	All Bands
Fixed Line Services					
Other					

Table 8. Proportion of aggregate duct kilometres by ULLS Band, in use by Fixed Line Services and Other Services, April 2014

	Band 1	Band 2	Band 3	Band 4	All Bands
Fixed Line Services					
Other					

The allocation model uses the current share of duct usage as between Fixed Line Services and Other Services for the purposes of allocating costs to Other Services over the forecast period (FY2014 to FY2019). The TPNI information used to allocate costs to Other Services (and, implicitly, to the set of Fixed Line Services) is the best available data on the use of the duct network. At this time, Telstra has not estimated forecasts for duct use by Other Services to determine a trend or change in the allocation value for future periods beyond FY2014.

Allocation of costs for the Ducts and Pipes Asset Class to individual Fixed Line Services

The second step is to apportion the estimated share of CA01 costs attributable to the set of Telstra's Fixed Line Services to individual fixed line services (including the regulated ULLS and WLR services). This is done using the share of aggregate SIOs for ULLS, WLR/Retail Basic Access, ISDN and Other DSL.

The CAF Model initially estimates the share of individual fixed line services for each ULLS Band. Two further steps are required to estimate allocators for WLR and ULLS for use in the FLSM:

- In order to estimate a WLR allocator, the sum of the individual ULLS Band allocators for WLR/Retail Basic Access Lines is multiplied by the proportion of WLR/Retail Basic Access services which are WLR. This approach is used to ensure the per SIO cost allocation for retail and wholesale basic access is equivalent in each year. The overall allocator for the two services only varies based on the total number of SIOs for each service, rather than the distribution of SIOs between the two services in any given year. This approach is used as WLR is simply a resale Retail Basic Access Service and so there is no reasonable basis for the two services having a different per SIO allocation of costs.
- For ULLS, the allocators for ULLS Bands 1 to 3 are summed, with ULLS in Band 4 kept separate.

The calculated allocations to ULLS and WLR SIOs for costs related to the Ducts and Pipes Asset Class are set out in the following table.

Table 9. Calculated allocations of cost for CA01 Ducts and Pipes to regulated fixed line wholesale services – ULLS and WLR

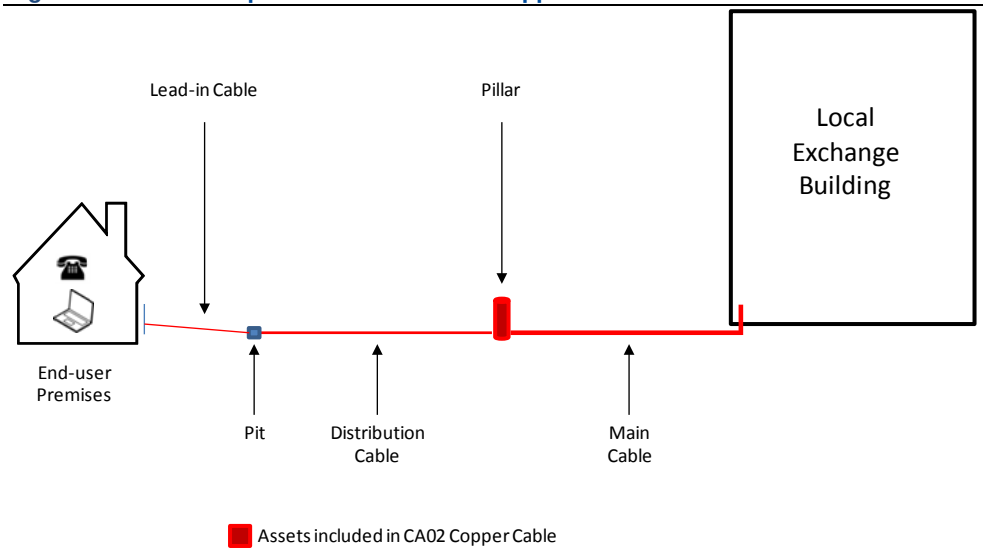
	ULLS Bands 1-3	ULLS Band 4	WLR
FY2014	[redacted]		
FY2015			
FY2016			
FY2017			
FY2018			
FY2019			

5.1.2 CA02 Copper Cable

Copper cable assets are used for the provision of Telstra's Fixed Line Services – generally connecting end-user premises to exchange-based voice and broadband equipment (operated either by Telstra or a third party accessing an unbundled line service).

The following figure illustrates the location of CA02 Copper Cable Asset Class assets within the CAN.

Figure 7. Indicative representation of CA02 Copper Cable assets within the fixed line network



The drivers of costs for the Copper Cable Asset Class are the number of end-user premises connected to the CAN (impacting on the overall volume of copper cable required), and the geographic distribution of SIOs (impacting on the length of copper cable required per end-user premises).

As for CA01, the distribution of CA02 assets and the relative cost of these assets on a per SIO basis varies significantly by geography. The following figures show the length of copper cable (in metres) per fixed line services SIO, by ESA throughout Australia (Figure 8) and for the greater Melbourne area (Figure 9).

Figure 8. In use Copper Cable pair metres per fixed line SIO

Figure 9. In use Copper Cable pair metres per fixed line SIO by ESA, greater Melbourne area

The following table sets out the total number of route kilometres of copper cable by ULLS band, as well as the proportion of installed copper kilometres by ULLS band. This data was extracted from Telstra's NPAMs database as at April 2014. The table also shows, for comparison, the share of aggregate fixed line access SIOs (ULLS, WLR, Retail Basic Access, ISDN and Other DSL) by ULLS Band.

Table 10. Installed copper cable pairs (total and share) and share of aggregate fixed line access service SIOs, by ULLS band

ULLS Band	Installed Copper Cable Pairs (Route KMs)	% Installed Copper Cable Pairs (Route KMs) by ULLS Band	% Aggregate Fixed Line Access Services SIOs by ULLS Band
Band 1			
Band 2			
Band 3			
Band 4			

From the above table, it is clear that although the distribution of copper cable pairs and Fixed Line Services SIOs by ULLS band is similar, there is a disproportionately greater aggregate distance of copper cable in rural (ULLS Band 4) areas, compared to SIOs. This bias reflects (predominantly) the longer average length of copper cable assets in regional and rural areas compared to metropolitan and CBD areas. As a result, the per SIO cost with respect to the Copper Cable Asset Class is likely to be greater in ULLS Band 4 than in ULLS bands 1 to 3.

Allocation approach

In order to reflect the geographic variation in the costs for the CA02 Copper Cable Asset Class, the allocation of costs to fixed line services is weighted based on the ULLS Band of each SIO. The following equations set out the calculation of allocators for the Copper Cable Asset Class in a given year, as calculated by the CAF Model:

$$\text{CA02} = \sum_{Band=i}^{4} Fixed\ Services_i = 1$$

Where

- $Fixed\ Services_i = \sum_{Service=j}^{J} \frac{Service\ Demand_{j,i}}{Service\ Demand_{J,i}} \times Fixed\ Services_i$ and $Service\ Demand_{j,i}$ is forecast demand for a given fixed line service *j* in ULLS Band *i* multiplied by the Routing Factor for *j* with respect to CA02.

The overall allocation to Fixed Line Services within each ULLS Band (*Fixed Services*$_i$) is calculated by the proportion of installed copper cable pair kilometres in a given Band. Within each ULLS Band, costs are allocated to the Fixed Line Services on the basis of SIOs. Costs are allocated to ULLS (separately for each ULLS band), WLR & Retail Basic Access, ISDN and Other DSL services.

Consistent with the approach used for CA01 Ducts and Pipes, in order to generate an allocator for ULLS Bands 1-3, the individual Band allocators for ULLS are added for those bands. To generate a WLR allocator, the sum of the individual ULLS Band allocators for WLR/Retail Basic Access Lines is multiplied by the share of WLR services.

The calculated allocations to ULLS and WLR SIOs for costs related to the Copper Cable Asset Class are set out in the following table:

Table 11. Calculated allocations of cost for CA02 Copper Cable to regulated fixed line wholesale services – ULLS and WLR

	ULLS Bands 1-3	ULLS Band 4	WLR
FY2014	[redacted]		
FY2015			
FY2016			
FY2017			
FY2018			
FY2019			

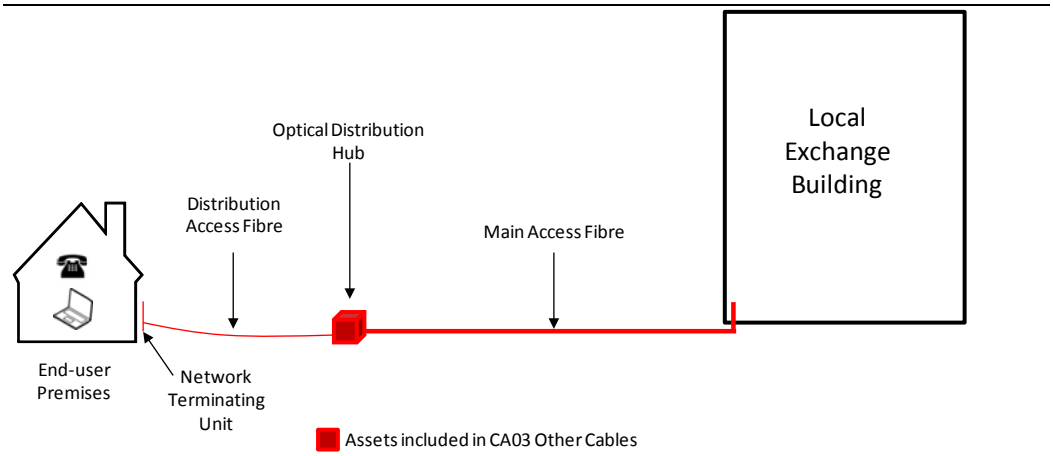
5.1.3 CA03 Other Cables, CA04 Pair Gain Systems, CA05 CAN Radio Bearer Equipment, CA06 Other CAN Assets

The CAN Asset Classes CA03 to CA06 are other cable and CAN access assets also used for the connection of end-users to voice and broadband equipment. Specifically:

- **CA03 Other Cables** are CAN fibre optic cables and joints (and associated equipment) used for the provision of FTTP-based fixed line access services, such as are present in Telstra's Velocity estates and the South Brisbane area. CA03 does not include fibre optic cable used to connect remote broadband and voice devices (e.g. CMUX units) to the local exchange; these fibre optic cables are included in the CO04 Inter-exchange Cable Asset Class.

The following figure illustrates the location of CA03 Other Cables within the CAN.

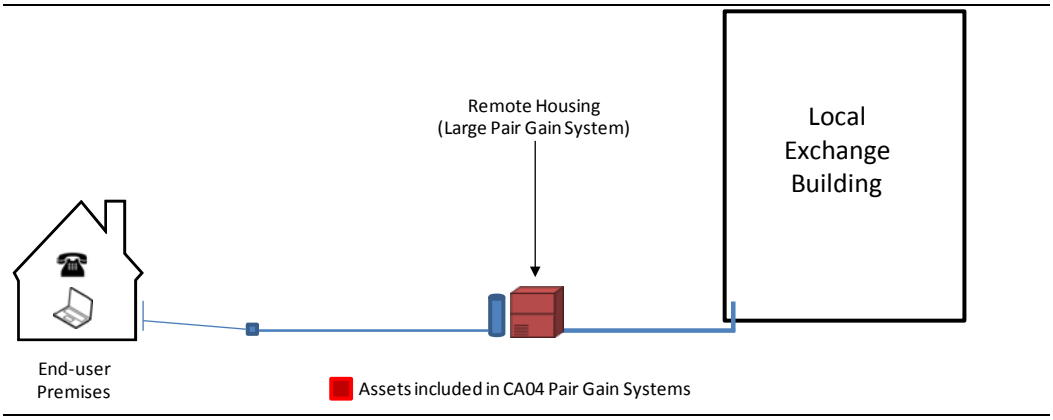
Figure 10. Indicative representation of CA03 Other Cables assets within the fixed line network



- **CA04 Pair Gain Systems** are predominantly the remote housing, devices and associated equipment used for supplying fixed line access services and fixed line voice services to end-users. These devices – generally CMUX units – can also facilitate the provision of broadband services to end-users with the installation of a collocated DSLAM device. These devices are not part of the CA04 Asset Class and are contained (along with other, exchange-based DSLAM equipment) in CO12 Data Equipment.

  The following figure illustrates the location of CA04 Pair Gain Systems within the CAN.

Figure 11. Indicative representation of CA04 Pair Gain Systems assets within the fixed line network



- **CA05 CAN Radio Bearer Equipment** contains the High Capacity Radio Concentrator (HCRC) equipment used for the provision of fixed wireless PSTN voice services in rural and remote areas.
- **CA06 Other CAN Assets** is chiefly made up of Network Termination Units. This equipment is located at customer premises.

Allocation approach

As noted above, the same allocation approach is used for CA03 to CA06. As for CA01 Ducts and Pipes and CA02 Copper Cable, the cost drivers for these asset classes are the number of fixed line SIOs. However, unlike CA01 and CA02, the allocation model does not weight the allocation of costs to

services on the basis of SIOs by taking into account the geographic distribution of the asset class equipment with respect to the distribution of SIOs. Although CA03, CA04 and CA05 are located in specific geographic areas, the per SIO cost is not considered likely to vary materially by geography (i.e. the location of a given SIO within the footprint of the asset class equipment) – unlike for CA01 and CA02. CA06 is widely distributed across all areas of the CAN with costs considered to be consistent on a per SIO basis for all areas. The significantly lower relative value of these asset classes (compared to CA01 and CA02) in terms of the FLSM RAB (and annual costs) is also a factor in seeking a simpler allocation approach.

The following equations set out the calculation of allocators for the CA03 Other Cables Asset Class in a given year, as calculated by the CAF Model:

$$\text{CA03} = \sum_{Service=j}^{J} \frac{Service\ Demand_j}{Service\ Demand_J} = 1$$

Where

- $Service\ Demand_j$ is the forecast demand for a Fixed Line Service *j* that makes use of CA03 (as indicated in the Routing Factor table). Fixed Line Services can be supplied over copper, fibre, radio or satellite links, however not all fixed line access services can be supplied over all access types. Some of the Asset Classes are only used by a subset of fixed line access services, for example, CAN Radio Bearer Equipment is only used by retail PSTN basic access and WLR services. The fixed line access services that make use of CA03 to CA06 are set out in the table below.

Table 12. Fixed Line access services use of CA03 to CA06

Asset Class	PSTN Retail access	ISDN Basic Access	ULLS	WLR
CA03 Other cables	✓			✓
CA04 Pair gain systems	✓	✓		✓
CA05 CAN Radio Bearer Equipment	✓			✓
CA06 Other CAN assets	✓	✓	✓	✓

Importantly, ULLS and Other DSL (not shown above) can only be supplied over copper cables that connect exchange based equipment directly to end-user premises, and so no costs are allocated to ULLS (or Other DSL) with respect to CA03, CA04 and CA05.

The calculated allocations to ULLS and WLR SIOs for costs related to the CA03 to CA06 are set out in the following table. For CA03, CA04 and CA05 there is no allocation of costs to ULLS, because these Asset Classes are not used to supply the ULLS.

Table 13. Calculated allocations of cost for CA03, CA04, CA05 and CA06 to regulated fixed line wholesale services – ULLS and WLR

	CA03 Other Cables	CA04 Pair Gain Systems	CA05 CAN Radio Bearer	CA06 Other CAN assets		
	WLR	WLR	WLR	ULLS Bands 1-3	ULLS Band 4	WLR
FY2014	[redacted]					
FY2015						
FY2016						
FY2017						
FY2018						
FY2019						

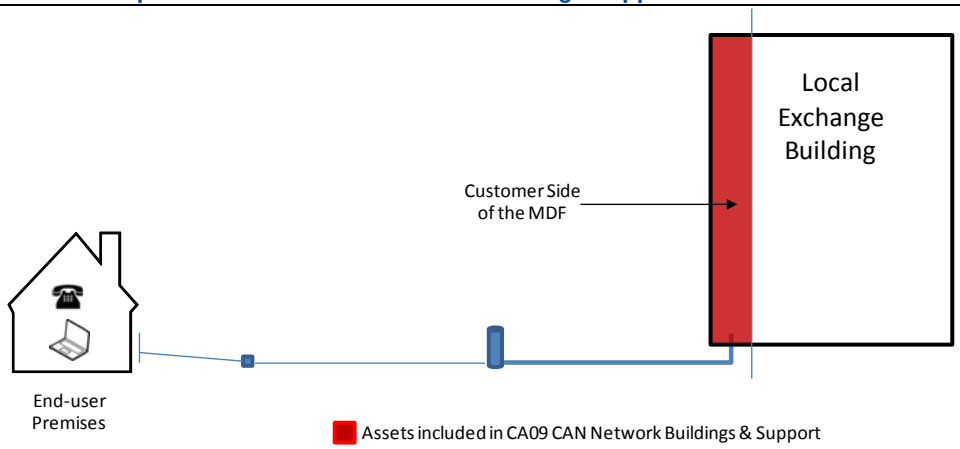
5.1.4 CA07 CAN Other Communications Plant and Equipment, CA08 Network Land and CA09 Network Buildings/Support

The final three CAN asset classes for which an Asset Class specific allocator is calculated are CA07 CAN Other Communications Plant and Equipment, CA08 Network Land and CA09 Network Buildings/Support:

- **CA07 Other Communications Plant and Equipment** contains radio communications equipment used in conjunction with CA05 for the provision of fixed-wireless retail PSTN basic access and WLR services.
- **CA08 Network Land and CA09 Network Buildings/Support** are Asset Classes that were determined by the ACCC at the time the RAB was set. Telstra's asset register does not distinguish between land and buildings used to support the provision of CAN (access) services and core (voice and data) services. Therefore the ACCC split the value of these assets into a CAN and core component. The portion of the asset value allocated to CA08 and CA09 is intended to reflect the part of network buildings (exchanges) and associated land that supports the customer side of the MDF. The remaining value of network land and buildings (which implicitly reflects all other parts of the exchange building and associated land) is captured in the core Asset Classes – CO08 and CO09.

The following figure illustrates the location of the CA09 CAN Network Buildings/Support assets with the CAN. Note, "MDF" in the diagram refers to the Main Distribution Frame, which is the infrastructure in local exchange buildings that connects customer side infrastructure (e.g. copper cables that run from the exchange building to the end-user premises) to equipment side infrastructure (e.g. interconnect cables that connect to Telstra and/or third party equipment situated in the exchange building that is used to supply voice, broadband and other services).

Figure 12. Indicative representation of CA09 Network Buildings/Support assets within the fixed line network



Allocation approach

Costs associated with these Asset Classes are allocated to the Fixed Line Services on the basis of SIOs. As an example, the following equation sets out the calculation of allocators for the CA07 Asset Class in a given year, as calculated by the CAF Model:

$$\text{CA07} = \sum_{Service=j}^{J} \frac{Service\ Demand_j}{Service\ Demand_J} = 1$$

Where

- $Service\ Demand_j$ is the forecast demand for a Fixed Line Service *j* that makes use of CA03 (as indicated in the Routing Factor table).

Although other services in addition to the fixed line services make use of network land and buildings, because CA08 and CA09 are designed to only reflect the costs of supporting the customer-side of the MDF (which is exclusively used for connecting fixed line access services), allocation of costs is based on SIOs for the Fixed Line Services.

The calculated allocations to ULLS and WLR SIOs for costs related to the CA07 to CA09 are set out in the following table.

Table 14. Calculated allocations of cost for CA07, CA08 and CA09 to regulated fixed line wholesale services – ULLS and WLR

	CA07 Other Comms Plant			CA08 CAN Network Land			CA09 CAN Network Buildings		
	ULLS Bands 1-3	ULLS Band 4	WLR	ULLS Bands 1-3	ULLS Band 4	WLR	ULLS Bands 1-3	ULLS Band 4	WLR
FY2014	[redacted]								
FY2015									
FY2016									
FY2017									
FY2018									
FY2019									

5.1.5 General Allocator to apply to CA10 CAN Indirect Capital Assets

The CA10 Indirect Assets Asset Class contains equipment related to motor vehicles and mechanical aids, but is predominantly IT – both software and hardware. Unlike the other CAN Asset Classes, a general allocator, rather than an asset class specific allocator, is used to allocate costs to the regulated wholesale fixed line services.

A general allocator derives an allocation for each of the regulated fixed wholesale services based on the proportion of costs they are allocated from the specific allocators for (in this case) the other CAN Asset Classes.

The rationale for using a general allocator is where there is no logical, direct causal relationship that can be practically calculated between the particular asset class and the relevant services.

The methodology used to calculate the CAN general allocator follows what the ACCC describes as the 'revenue share approach':[4]

- Step 1: The total annual revenue requirement for all CAN Asset Classes excluding CA10 Indirect Capital Assets is calculated for each year within the FLSM.
- Step 2: The total annual revenue requirement for all CAN Asset Classes excluding CA10 Indirect Capital Assets allocated to each regulated fixed line wholesale service using CAN assets is calculated for each year.
- Step 3: The annual revenue requirement for each service calculated in Step 2 is divided by the total annual revenue requirement calculated in Step 1 to obtain a general cost allocation factor to apply to CA10 for each service for each year.

This approach allocates the CA10 Indirect Capital Assets Asset Class to FLSM services which use the CAN in the same proportion as the revenue requirement calculated in Step 1 is allocated to services. A similar approach is used to calculate a general allocator for the core Asset Classes.

The calculated allocations to ULLS and WLR SIOs for costs related to the CA10 Indirect Asset Class are set out in the following table.

Table 15. Calculated allocations of cost for CA10 Indirect Capital Assets to regulated fixed line wholesale services – ULLS and WLR

	ULLS Bands 1-3	ULLS Band 4	WLR
FY2014	[redacted]		
FY2015			
FY2016			
FY2017			
FY2018			
FY2019			

5.2 Core FLSM Asset Classes – specific asset class allocators

As set out above, specific Asset Class allocators are determined for 8 out of the 12 core Asset Classes. The core Asset Classes contain equipment used for the provision of voice and DSL broadband services to end-users, as well as the supporting infrastructure needed to house and operate this equipment and transmit data and voice signals throughout the network.

[4] ACCC, *Discussion Paper – FADs for fixed line services*, April 2011, section 10.3.8.

The following core Asset Classes have asset specific allocators:

- CO01 Switching Equipment - Local
- CO02 Switching Equipment - Trunk
- CO03 Switching Equipment - Other
- CO04 Inter-exchange Cables
- CO05 Transmission Equipment
- CO06 Core Radio Bearer Equipment
- CO11 LSS Equipment
- CO12 Data Equipment

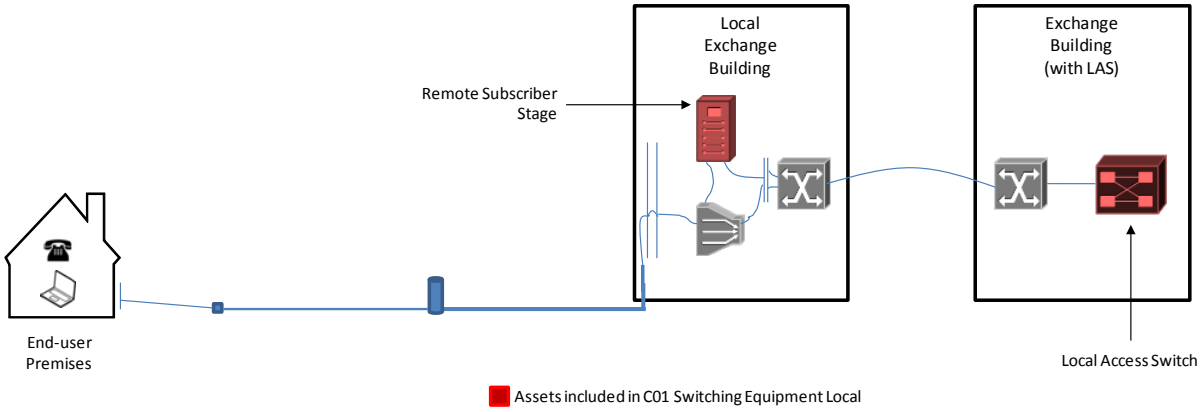
5.2.1 CO01 Switching Equipment – Local

The CO01 Switching Equipment - Local Asset Class comprises PSTN equipment used for the provision of voice (PSTN and ISDN) calls. This includes the Remote Subscriber Stage (**RSS**) devices – used to aggregate end-user copper pairs – Local Access Switch (**LAS**) devices – used to control and direct voice calls – and software and other control infrastructure.

It is important to note the Switching Equipment Local Asset Class within the FLSM RAB does not include exchange building assets or ancillary assets such as power supplies and air-conditioning. These general purpose facilities were included in the Analysis Model's asset class of the same name (within the FLSM these assets are part of the CO07, CO08 and CO09 Asset Classes).

The following figure illustrates the location of the CO01 Switching Equipment Local assets within the Core network.

Figure 13. Indicative representation of CO01 Switching Equipment Local assets within the fixed line network



The Switching Equipment Local Asset Class is used for the provision of fixed line access services – specifically the retail PSTN basic access and WLR services, as well as the ISDN Basic Access Service – and fixed line voice services, including local calling services (retail and LCS wholesale services), PSTN interconnection services (PSTN OA and TA) as well as other PSTN and ISDN voice services. The Switching Equipment Local Asset Class is not used for the provision of unbundled services (ULLS or LSS), broadband services or other services.

Allocation approach

In calculating the allocation factors that apply to the relevant Fixed Line Services with respect to the Switching Equipment Local Asset Class, the following steps were undertaken:

1. Splitting the Asset Class into like equipment types on the basis of the underlying cost driver – either SIOs or call volumes (measured by aggregate minutes of use).

2. Determining routing factors (allocation weights) to apply to minutes of use that apply to different voice service calling types to reflect the different intensity with which a minute of different call types make use of the Asset Class.

3. Calculating the allocation factors for the relevant Fixed Line Services.

The allocation logic for CO01 can be expressed as follows for a given year:

$$\text{CO01} = \alpha\left(\sum_{Service=k}^{K}\frac{Service\ Demand_k}{Service\ Demand_K}\right) + (1-\alpha)\left(\sum_{Service=j}^{J}\frac{Service\ Demand_j}{Service\ Demand_J}\right) = 1$$

Where

- *α* is the proportion of the CO01 Asset Class for which cost is determined by the number of end-user services (basic access SIOs) and $(1-\alpha)$ is the (remaining) proportion of the Asset Class for which cost is determined by the level of usage of connected end-users (i.e. minutes of use).

- $Service\ Demand_k$ is forecast demand for a given fixed line access service *k* multiplied by the Routing Factor for *k* with respect to CO01.

- $Service\ Demand_j$ is forecast demand for a given fixed line voice service *j* multiplied by the Routing Factor for *j* with respect to CO01.

The three steps completed in determining the allocator for CO01 are described in further detail below.

Splitting the Asset Class based on underlying cost driver

As noted above, a review of the types of equipment and assets that make up the Switching Equipment Local Asset Class indicates that there are two distinct groups that differ on the basis of their respective underlying logical cost driver: equipment used to connect end-users to the PSTN at the local Telstra exchange (e.g. RSS equipment, which takes a copper pair that in turn is connected (via the CAN) to the end-user's premises) and equipment that switches and controls voice calls within the PSTN (LAS equipment and related infrastructure).

The different equipment within the Asset Class can be categorised by its cost driver – ports and line cards being driven by the number of SIOs, and switching/control and related equipment and software being driven by the volume of calls (i.e. the use of the service).

[redacted] of the value of assets within the class (based on the written down value recorded in Telstra's Asset Register as at June 2013) can be characterised as "port" assets, with the remaining [redacted] of assets classified as "use" assets:

Table 16. Makeup of CO01 Switching Equipment - Local asset value by equipment type

Group	% of 2013 WDV
LOCAL SWITCH "PORT"	[redacted]
LOCAL SWITCH "USE"	

Based on this analysis, the model allocates just over one third of costs for CO01 to fixed line access services based on forecast SIOs, with the remaining costs allocated to fixed line voice services based on forecast volumes of minutes of use. The allocation of costs to individual fixed line voice services is determined by the proportion of total fixed line voice minutes for a given service, and the routing factor for that service that applies to the CO01 Switching Equipment - Local Asset Class (see below).

Determining Routing Factors

A given minute of voice traffic (MoU) for different fixed line voice services will transit the network in different ways and place greater strain on assets used in the provision of the voice service. For example, a local call (equivalent for retail calls and LCS calls) is estimated to make use of (on average) [redacted] LAS devices per call, whereas a PSTN OA/TA call is estimated to only makes use of a single LAS per call. As a result, a simple allocation of costs to voice services based on their share of aggregate minutes of use would likely not reasonably reflect the actual share of the cost burden for each of those services. To reflect the different cost-causal relationship minutes of use from different voice services can have, routing factors are calculated for each fixed line voice service.

The approach taken and the data used for the calculation of the routing factors are set out in Appendix B. The following table sets out the routing factors for the fixed line voice services with respect to CO01.

Table 17. Calculated Routing factors for fixed line voice services with respect to the CO01 Asset Class

	PSTN local calls	PSTN national STD	PSTN international	PSTN fixed to mobile	PSTN OA/TA	LCS	ISDN Voice
CO01 – Switching Equipment - Local	[redacted]						

From the above, the routing factors indicate that a given minute of retail local call or LCS traffic will be allocated [redacted] times costs of an equivalent minute of PSTN OA/TA traffic. This reflects the fact that, on average, a local PSTN call (either retail or LCS) will make greater use of the equipment within the CO01 asset class than a PSTN OA/TA call. The engineering logic behind these (and the other fixed line voice services routing factors) is set out in Appendix B.

Calculation of the allocation factors for the relevant Fixed Line Services

The calculated allocations to WLR, PSTN OA/TA and LCS for costs related to CO01 Switching Equipment - Local are set out in the following table.

Table 18. Calculated allocations of cost for CO01 Switching Equipment Local to regulated fixed line wholesale services – WLR, PSTN OA/TA and LCS

	WLR	PSTN OA/TA	LCS
FY2014	[redacted]		
FY2015			
FY2016			
FY2017			
FY2018			
FY2019			

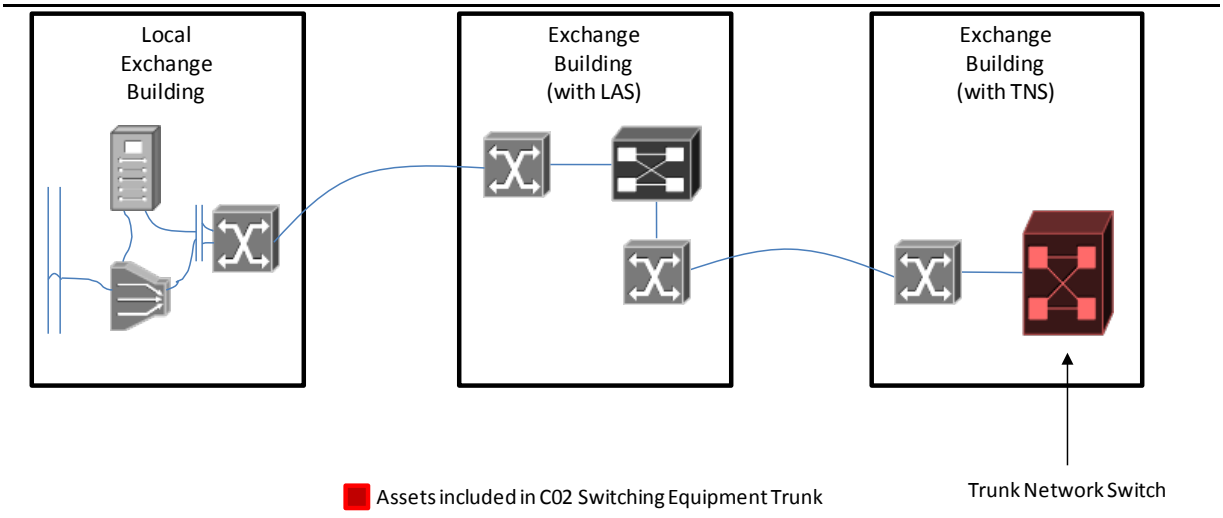
5.2.2 CO02 Switching Equipment – Trunk and CO03 Switching Equipment – Other

The CO02 Switching Equipment - Trunk Asset Class comprises switching equipment and control software used to provide fixed line voice services. The switches within CO02 are higher-order transit switches used in the network to control calls between local switches – such as is the case for STD calls – and are also generally used to interconnect to other fixed line and mobile networks operated by

Telstra and third parties. The CO03 Switching Equipment - Other Asset Class contains miscellaneous equipment used to support the provision of fixed line voice services.

The following figure illustrates the location of the CO02 Switching Equipment - Trunk assets within the Core network.

Figure 14. Indicative representation of CO02 Switching Equipment - Trunk assets within the fixed line network



Costs associated with CO02 are allocated to the fixed line voice services on the basis of MoU, weighted by routing factors reflecting the relative intensity with which a given minute of traffic from each service makes use of the asset class.

The allocation logic for CO02 can be expressed as follows for a given year:

$$\text{CO02} = \sum_{Service=j}^{J} \frac{Service\ Demand_j}{Service\ Demand_J} = 1$$

Where

- $Service\ Demand_j$ is forecast demand for a given fixed line voice service *j* multiplied by the Routing Factor for *j* with respect to CO02.

The allocation of costs with respect to CO03 is done on the same basis as for CO02. The routing factors for the fixed line voice services for CO02 (and CO03) are set out below:

Table 19. Calculated Routing factors for fixed line voice services with respect to CO02 and CO03 Asset Classes

	PSTN local calls	PSTN national STD	PSTN international	PSTN fixed to mobile	PSTN OA/TA	LCS	ISDN Voice
CO02 – Switching Equipment - Trunk & CO03 – Switching Equipment - Other	[redacted]						

The calculated allocations to PSTN OA/TA and LCS for costs related to CO02 Switching Equipment - Trunk and CO03 Switching Equipment - Other are set out in the following table:

Table 20. Calculated allocations of cost for CO02 Switching Equipment - Trunk and CO03 Switching Equipment - Other to regulated fixed line wholesale services – PSTN OA/TA and LCS

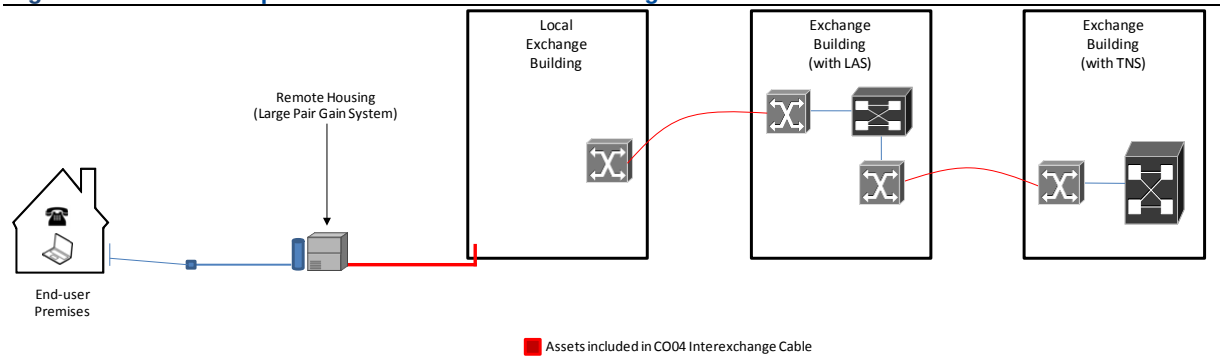
	PSTN OA/TA	LCS
FY2014	[redacted]	
FY2015		
FY2016		
FY2017		
FY2018		
FY2019		

5.2.3 CO04 Inter-exchange Cables

Inter-exchange cables are the optical fibre cables that connect Telstra's exchange buildings and are used to transmit data (including voice signals) throughout the network. It should be noted that CO04 also includes fibre optic cables that may otherwise be considered part of the CAN, as they are used to connect CAN-based voice and broadband equipment (e.g. Large Pair Gain Systems (LPGS) and CAN-based DSLAMs) to the local exchange.

The following figure illustrates the location of the CO04 Inter-exchange Cable assets within the Core network.

Figure 15. Indicative representation of CO04 Inter-exchange Cable assets within the fixed line network



Inter-exchange cables are used for the provision of voice and broadband fixed line services, as well as other services. In addition to direct use by individual services, inter-exchange cables also act as the physical media to transport data via transmission systems (see CO05).

Calculating cost drivers of inter-exchange cables at a service platform level

The primary cost driver of inter-exchange cables is the length of the optical fibre cables required to deliver particular services.

The allocation logic for CO04 can be expressed as follows for a given year:

$$\mathrm{CO04} = Fixed\ Voice + ADSL + CO05\ Transmission + Other = 1$$

Where

- $Fixed\ Voice = Fixed\ Voice\ \times \left(\sum_{Service=k}^{K} \frac{Service\ Demand_k}{Service\ Demand_K}\right)$, with $Fixed\ Voice$ the proportion of CO04 allocated to the fixed line voice services, and $Service\ Demand_k$ is forecast demand for a given fixed line voice service *k* multiplied by the Routing Factor for *k* with respect to CO04.

- $ADSL = ADSL\ \times \left(\sum_{Service=j}^{J} \frac{Service\ Demand_j}{Service\ Demand_J}\right)$, with $ADSL$ the proportion of CO04 allocated to the fixed line voice services, and $Service\ Demand_j$ is forecast demand for a given fixed line broadband service *j* multiplied by the Routing Factor for *j* with respect to CO04.

- $CO05\ Transmission$, is the proportion of CO04 allocated to support the transmission equipment that makes up the CO05 asset class. The allocation factors calculated for CO05 are used to allocate costs to the relevant services for this proportion of CO04.

- *Other* is the proportion costs with respect to CO04 allocated to services other than the fixed line voice and fixed line broadband services and the transmission equipment Asset Class.

Information on the use of inter-exchange cable by length of connection is sourced from Telstra's Network Decision Support Database (NDSD) which is itself a compilation of data from the Transmission Recording and Control (TRAC) system. The NDSD reports provide information on the number of fibre-kilometres in use by different service types and transmission platforms.

By using fibre-kilometres, rather than cable kilometres, the allocator is able to reflect differences in the scale or capacity required for different services. For example, if a cable that is 3 km in length, contains two fibres that are used to connect a CAN DSLAM to a DSLAM hub at the local exchange, then ADSL would be reported as having used 6 fibre-kilometres, whereas if a mobile base station utilised a single fibre over the same distance, it would be recorded as 3 fibre-kilometres.

Within the NDSD data, use of inter-exchange cable is identified as being used for the purposes of:

- **Shared Data –** where identified fibres are used by the Telstra's IP core networks which is a common infrastructure shared by a number of data and IP services. The core networks are made up of IP routers/switches which are interconnected with optical fibre links. Examples include the Routed Data Network, Telstra Internet Direct, Ethernet Data Network and Multi-Service Edge networks. The core networks supports IP voice, fixed and wireless broadband including ADSL services.
- **Dedicated Data** – where identified fibres are exclusively used for a specific data service. Examples are fibres used for ADSL (e.g. fibres connecting CAN DSLAMs to the local exchange), BigPond Cable, Business Grade DSL (Symmetric), DataVault, Digital Video Network, IP WAN, IP MAN/Ethernet, Wholesale Transmission, Private Lines, Global IP&D, Dial Connect, Megalink and NBN.
- **Mobiles** – where identified fibres are exclusively used for mobile services, such as fibres connecting a mobile base station to the nearest local exchange.
- **PSTN** - where identified fibres are exclusively used for PSTN (including ISDN) voice services. Examples include optical fibres that connect pair gain systems to the local exchange.
- **Transmission** (infrastructure) – where identified fibres are exclusively used by Telstra's SDH and PDH transmission networks.

The following table sets out the proportion of aggregate fibre-kilometres for each of these service platforms as reported in NDSD as at December 2013:

Table 21. Allocation of Inter-exchange Cable Assets to Service Platforms by fibre-KMs

Service Platform	Proportion of fibre-KMs
Shared Data	[redacted]
Dedicated Data	
Mobiles	
PSTN	
Transmission	

Both Shared Data and Dedicated Data include usage by ADSL services (in addition to other data services). In order to determine the share of ADSL usage within these two categories, further analysis is required to disaggregate these service platforms.

Shared Data

As noted above, Shared Data represents the use of inter-exchange cable by Telstra's various IP Core networks. Data from NDSD are used to identify the number of fibre-kilometres used by each of these networks, as set out in the following table:

Table 22. Allocation of Inter-exchange Cable Assets to Networks comprising the Shared Data service platform, by fibre-KMs

Network	Proportion of fibre-KMs within Shared Data	Proportion of fibre-KMs (total)
BigPond Broadband Core (BPBB)	[redacted]	
Ethernet Aggregation Network (EAN)		
Multi-Service Edge (MSE)		
Routed Data Network (RDN)		
Telstra Internet Direct (TID)		
Total		

To determine the share of fibre-kilometres used for individual service types (including ADSL) that make use of these networks, usage information for services with respect to each network is summed, weighted by the respective network's share of Shared Data fibre-kilometres, to provide an overall set of service type allocators for the Shared Data service platform. The usage information used includes data throughput and/or ports in use depending on the particular network involved. The following table sets out the overall cost allocation to service types for the Shared Data service platform.

Table 23. Allocation of Inter-exchange Cable Assets to service types that make use of the Shared Data service platform, by fibre-KMs

Service Type	Proportion of Shared Data
ADSL	[redacted]
Mobile	
Other DSL (SHDSL)	
Frame Relay / ATM	
Network Computing Services (Hosting)	
HFC	
Telstra Wholesale Internet	
Other	

Dedicated Data

As set out above, the Dedicated Data service platform refers to data services (broadly defined) for which individual optical fibres are identified as being used exclusively for a particular service type. The identification of specific service types to individual optical fibres is recorded within NDSD. The following table sets out the allocation of fibre kilometres within the Dedicated Data service platform.

Table 24. Allocation of Inter-exchange Cable Assets to service types that make use of the Dedicated Data service platform, by fibre-KMs

Service Type	Proportion of Shared Data
IP MAN/Ethernet	[redacted]
ADSL	
Third party dedicated services	
HFC	
IP WAN	
DDN	
Digital Video Network	
Other Services	

Overall allocation of Inter-exchange Cable Assets to service types

Following the further disaggregation of Shared Data and Dedicated Data, an overall allocation of fibre kilometres to the ADSL services can be determined:

$$ADSL\ Share = (share\ of\ Shared\ Data) + (share\ of\ Dedicated\ Data)$$
$$= [redacted] + [redacted]$$
$$= [redacted]$$

The following platform allocations are calculated for the CO04 Asset Class:

Table 25. Allocation of Inter-exchange Cable Assets to PSTN, ADSL & Other Services and Transmission Equipment

ADSL	PSTN	Other	Transmission Equipment
[redacted]			

Calculating cost allocators for individual services

In order to determine allocators for the Fixed Line Services – and in particular the regulated fixed line wholesale services - further analysis is necessary to disaggregate the relevant service platform allocators to the individual service level.

The PSTN category applies exclusively to fixed line voice services, with allocation of costs based on forecast minutes of use, weighted by routing factors reflecting the different intensities of usage for different voice services. The routing factors that apply for CO04 are the same as those estimated to apply to CO05 Transmission Equipment. Details of the engineering assumptions and methods used to calculate routing factors are set out in Appendix B. The routing factors for the fixed line voice services for CO04 Inter-exchange Cables are set out below:

Table 26. Calculated Routing factors for fixed line voice services with respect to the CO04 Asset Class

	PSTN local calls	PSTN national STD	PSTN international	PSTN fixed to mobile	PSTN OA/TA	LCS	ISDN Voice
CO04 Inter-exchange Cable	[redacted]						

For fixed line broadband services, the share of CO04 Inter-exchange Cable costs allocated to the ADSL platform is further disaggregated to retail and wholesale ADSL services on the basis of forecast SIOs. Other DSL services – business grade, specialist DSL services that make use of SHDSL technology – are not included in this allocation. Costs with respect to these services are included in the Other category as these services are classified as non-DSL data for the purposes of the NDSD/NECTAR allocation process.

The Transmission category is also relevant, as the Fixed Line Services are among the services that make use of Transmission Equipment. As the Transmission category simply represents the use of inter-exchange cables by the SDH and PDH transmission networks, the CO05 Transmission Equipment allocators are used to allocate this proportion of the overall CO04 cost pool.

The calculated allocations to PSTN OA/TA, LCS and WDSL for costs related to CO04 Inter-exchange Cable are set out in the following table.

Table 27. Calculated allocations of cost for CO04 Inter-exchange Cable to regulated fixed line wholesale services – PSTN OA/TA, LCS and WDSL

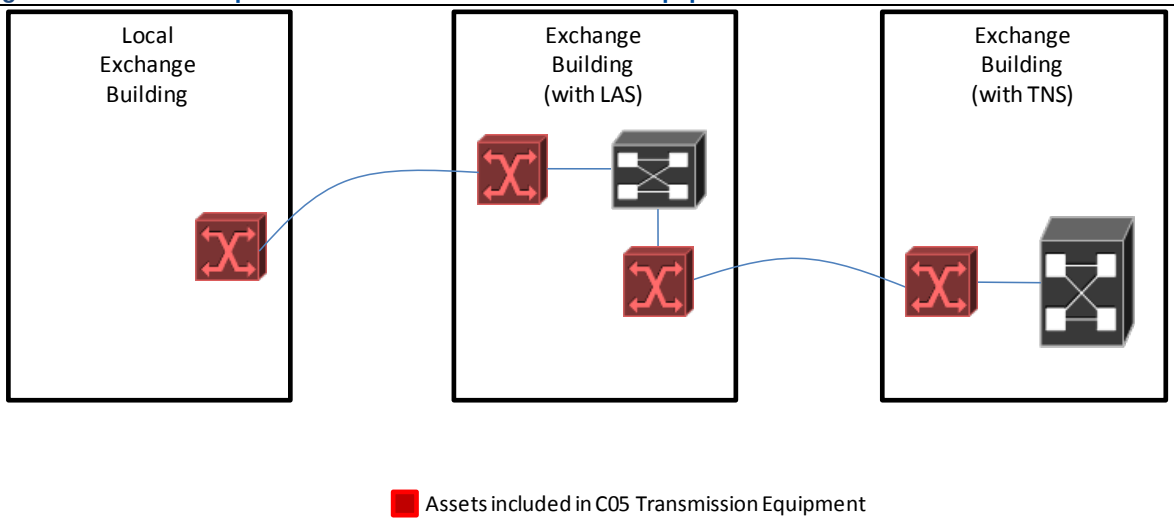
	PSTN OA/TA	LCS	WDSL
FY2014	[redacted]		
FY2015			
FY2016			
FY2017			
FY2018			
FY2019			

5.2.4 CO05 Transmission Equipment

The Transmission Equipment Asset Class contains a mix of SDH transmission equipment, PDH transmission equipment and other transmission equipment – including synching clocks and control devices. SDH and PDH equipment consists of multiplexers that aggregate multiple digital streams into a single larger stream and is used as one means of sending data throughout Telstra's network. SDH transmission equipment is more modern and prevalent in Telstra's network, and is capable of aggregating and sending greater quantities of data more efficiently than PDH equipment.

The following figure illustrates the location of the CO05 Transmission Equipment assets within the Core network.

Figure 16. Indicative representation of CO05 Transmission Equipment assets within the fixed line network



Almost [redacted] of the value of assets within the class (based on the written down value recorded in Telstra's Asset Register as at June 2013) are SDH assets, with [redacted] PDH assets and the remaining assets accounting for around [redacted] of the total asset value.

Table 28. Makeup of CO05 Transmission Equipment asset value by equipment type

Type of Transmission Equipment	% of 2013 Written Down Value
SDH	[redacted]
PDH	
OTHER	

It should be noted that the assets contained within the Transmission Equipment Asset Class are limited to the electronic equipment (including switches, aggregation devices, synchronising devices and service ports) used to operate transmission services. The Transmission Equipment Asset Class does not contain the underlying fibre optic cable over which SDH and PDH transmission operate. These fibre cable assets are recorded in the CO04 Inter-exchange Cable Asset Class.

The services that utilise Transmission Equipment – i.e. those platforms that make use of Telstra's SDH and PDH transmission assets – include fixed line voice services, fixed line broadband services as well as other services, including mobile services, shared and specialist data services and leased line services.

Allocation of costs between Fixed Line Services and other services

In order to calculate cost allocators for the relevant regulated fixed line wholesale services with respect to CO05, a similar approach is adopted as for CO04, with an initial allocation made to the set of fixed line voice services and fixed line broadband services – with remaining costs allocated to other services – and individual allocators for fixed line services then calculated as a share of the initial allocation.

The allocation logic for CO05 can be expressed as follows for a given year:

$$\mathrm{CO05} = \propto (Fixed\ Voice_{SDH} + ADSL_{SDH} + Other_{SDH}) + \beta(Fixed\ Voice_{PDH} + ADSL_{PDH} + Other_{PDH}) + (1 - \propto - \beta)\left(\frac{\propto Fixed\ Voice_{SDH} + \beta Fixed\ Voice_{PDH}}{\propto + \beta} + \frac{\propto ADSL_{SDH} + \beta ADSL_{PDH}}{\propto + \beta} + \frac{\propto Other_{SDH} + \beta Other_{PDH}}{\propto + \beta}\right) = 1$$

Where

- $\propto$ is the proportion of the CO05 Asset Class comprising SDH transmission equipment.
- β is the proportion of the CO05 Asset Class comprising PDH transmission equipment.
- Then, for SDH (the equivalent expressions hold for PDH)
    - $Fixed\ Voice_{SDH} = Fixed\ Voice_{SDH} \times \left(\sum_{Service=k}^{K} \frac{Service\ Demand_k}{Service\ Demand_K}\right)$, with $Fixed\ Voice_{SDH}$ the proportion of CO05 SDH equipment cost allocated to the fixed line voice services, and $Service\ Demand_k$ is forecast demand for a given fixed line voice service *k* multiplied by the Routing Factor for *k* with respect to CO05.
    - $ADSL_{SDH} = ADSL_{SDH} \times \left(\sum_{Service=j}^{J} \frac{Service\ Demand_j}{Service\ Demand_J}\right)$, with $ADSL_{SDH}$ the proportion of CO05 SDH equipment cost allocated to the fixed line broadband services, and $Service\ Demand_j$ is forecast demand for a given fixed line broadband service *j* multiplied by the Routing Factor for *j* with respect to CO05.
    - $Other_{SDH}$ is the proportion costs with respect to CO05 SDH equipment allocated to services other than the fixed line voice and ADSL services.
- Note, allocations to services with respect to non-SDH or PDH equipment (the proportion of SO05 given by $(1 - \propto - \beta)$) are determined for fixed voice, ADSL and other services as the weighted average of the individual service allocation with respect to SDH and PDH equipment.

The process for determining the initial allocation of costs to the set of relevant Fixed Line Services and other services is set out below.

The cost causal relationship between these services and transmission equipment can be calculated by reference to the number of transmission links each service (or service platform) utilises, adjusted to reflect the different sized links that are utilised by different services.

Determining the number of transmission links used by different services

Transmission systems are made up of individual links that either connect to a service (known as an input or output link) or an infrastructure link which connects to other transmission equipment, but not to service equipment. In order to determine a logical, cost causal allocator for services that make use of the CO05, network information on the identity of the services and service platforms associated with each input/output link for the SDH and PDH transmission networks has been extracted.

Data on the quantity, use and size of transmission links is extracted from half-yearly reports of the Telstra's NDSD which is itself a compilation of data from the TRAC system. These reports list all SDH and PDH transmission links in use in the network, recorded against the equipment they are connected to (for example PSTN switches, mobile base stations, DSLAMs and other data equipment), as well as recording the bandwidth capacity of the link (such as 2Mbps, 155Mbps and so on).

The NDSD reports directly indicate whether or not a given SDH or PDH transmission link is connected to PSTN equipment, however in order to determine the number of links used for DSL services, further analysis is required. The NDSD reports set out the share of links utilised by dedicated data services – in which links are used exclusively by a particular data and IP service, such as Telstra data and IP services, ADSL, BigPond Cable, Business Grade DSL (Symmetric), DataVault, Digital Video Network, IP WAN, IP/Ethernet MAN, Wholesale Transmission Capacity, Private Lines, Global IP&D, Dial Connect, Megalink and NBN – as well as shared data. Shared data links are used by the Telstra IP core network which is a common infrastructure shared by a number of data and IP services. The Telstra IP core network is the network interconnecting the IP routers, the Ethernet Aggregation Nodes and the Multi-Service Edge nodes. This core network supports IP voice, fixed and wireless broadband including ADSL, BigPond Cable – which constitute the core data transit network.

ADSL services utilise a share of both dedicated data and shared data transmission links. To determine the share of dedicated and shared data that is utilised by ADSL services, allocators from the NECTAR model are used to split the dedicated and shared data platform results.

Converting transmission links to a common base

As noted above, transmission links can be a variety of capacities – from smaller 2Mbps links that will typically be used for the provision of fixed line voice services, to larger 155Mbps and greater capabilities that may be used for fixed line broadband and other services. As different services can be expected to have a different mix of transmission link capacities, it is necessary to re-base the link information to ensure an equitable comparison.

For this model, all links are re-based by converting higher capacity links to 2Mbps equivalents. Essentially this means dividing higher capacity links by 2. However, in practice, due to data overheads, the number of 2Mbps-equivalents in a higher capacity link is slightly less than this. The following table sets out the 2Mbps-equivalents for a range of common transmission link capacities.

Table 29. Sample conversion factors for different capacity transmission links to 2Mbps-equivalents

Sample transmission link bandwidth (Mbit/s)	Conversion to 2 Mbps equivalents
2	1
34	16
45	21
140	63
155	63
622	256
2,500	1,008
10,000	4,032

For the purposes of determining cost-causal allocators for the regulated fixed line wholesale services, it is necessary to determine the proportion of transmission links utilised for the supply of fixed line voice services and fixed line broadband services, with links used for other purposes separated. The following tables set out the proportion of aggregate 2Mbps-equivalent links attributable to a service for fixed line broadband services (ADSL data) and fixed line voice services (PSTN) as well as other

services (non-ADSL data and Mobile services) based on NDSD reports. The first table sets out the share of links for SDH services, and the second table sets out the share of links for PDH services.

Table 30. Distribution of 2Mbps-equivalent transmission links by Service Platform – SDH Transmission

SDH	Nov 11	Mar 12	Sep 12	Mar 13	Nov 13
ADSL					
Non-ADSL Data					
Mobiles					
PSTN					

Table 31. Distribution of 2Mbps-equivalent transmission links by Service Platform – PDH Transmission

PDH	Nov 11	Mar 12	Sep 12	Mar 13	Nov 13
ADSL					
Non-ADSL Data					
Mobiles					
PSTN					

Based on the above data, Telstra has estimated the following service platform allocators for fixed line broadband services, fixed line voice services and other services for the SDH and PDH equipment within the Transmission Equipment Asset Class.

Table 32. Allocations of Transmission Equipment Asset Class to DSL, PSTN and Other service types

	DSL	PSTN	Other
SDH			
PDH			

The basis for the above allocators is the most recent NDSD report (November 2013).

Allocation of costs to individual fixed line services

In order to generate cost allocators in respect of CO05 Transmission Equipment for the individual Fixed Line Services (and, in particular, the regulated fixed line wholesale services), the proportion of costs allocated to DSL and PSTN service types for the SDH and PDH transmission platforms are further allocated on the basis of forecast demand for the relevant services.

For fixed line broadband services, the share of CO05 Transmission Equipment cost allocated to the DSL platform is further disaggregated to retail and wholesale ADSL services on the basis of forecast SIOs. Other DSL services – business grade, specialist DSL services that make use of SHDSL technology – are not included in this allocation. Costs with respect to these services are included in the Other category as these services are classified as non-DSL data for the purposes of the NDSD/NECTAR allocation process.

For fixed line voice services, allocation of costs is based on forecast minutes of use SIOs, weighted by routing factors reflecting the different intensities of usage for different voice services in respect of transmission equipment.

Details of the engineering assumptions and methods used to calculate routing factors for the fixed line voice services in respect of CO05 are set out in Appendix B. The routing factors for the fixed line voice services for CO05 Transmission Equipment are set out below:

Table 33. Calculated Routing factors for fixed line voice services with respect to the CO05 Asset Class

	PSTN local calls	PSTN national STD	PSTN inter-national	PSTN fixed to mobile	PSTN OA/TA	LCS	ISDN Voice
CO05 Transmission Equipment	[redacted]						

Once service-specific allocators are calculated for SDH and PDH equipment, the weighted average of these allocators are then used to allocate the remaining equipment value in the Asset Class. The calculated allocations to PSTN OA/TA, LCS and WDSL for costs related to CO05 Transmission Equipment are set out in the following table.

Table 34. Calculated allocations of cost for CO05 Transmission Equipment to regulated fixed line wholesale services – PSTN OA/TA, LCS and WDSL

	PSTN OA/TA	LCS	WDSL
FY2014	[redacted]		
FY2015			
FY2016			
FY2017			
FY2018			
FY2019			

5.2.5 CO06 Core Radio Bearer Equipment

CO06 Core Radio Bearer Equipment contains assets used to support the SDH and PDH transmission network in regional and remote areas. These assets are used in place of fibre optic cables.

Given that these assets are primarily used to support the transmission systems, and the relatively small contribution CO06 makes to the value of the RAB, the allocators calculated for CO05 Transmission Equipment are used to allocate the annual costs attributable to CO06 to the relevant services.

The calculated allocations to PSTN OA/TA, LCS and WDSL for costs related to CO06 Core Radio Bearer Equipment are set out in the following table.

Table 35. Calculated allocations of cost for CO06 Core Radio Bearer Equipment to regulated fixed line wholesale services – PSTN OA/TA, LCS and WDSL

	PSTN OA/TA	LCS	WDSL
FY2014	[redacted]		
FY2015			
FY2016			
FY2017			
FY2018			
FY2019			

5.2.6 CO11 LSS Equipment

The CO11 LSS Equipment Asset Class was created in the July 2011 FLSM to account for the costs attributable to the LSS, facilitating the estimation of a regulated access price through the FLSM.

The Asset Class is designed to reflect 100% of the relevant costs for LSS and has no costs attributable to other services. As such, 100% of the costs in CO11 are allocated to LSS. Additionally, as CO11 is designed to include all relevant costs for LSS, LSS does not receive an allocation from other Asset Classes, including those Asset Classes for which a general allocator is used (such as CO10 Indirect Capital Assets).

The calculated allocations to PSTN OA/TA, LCS and WDSL for costs related to CO06 Core Radio Bearer Equipment are set out in the following table.

Table 36. Calculated allocations of cost for CO11 LSS Equipment to regulated fixed line wholesale services – LSS

	LSS
FY2014	1
FY2015	1
FY2016	1
FY2017	1
FY2018	1
FY2019	1

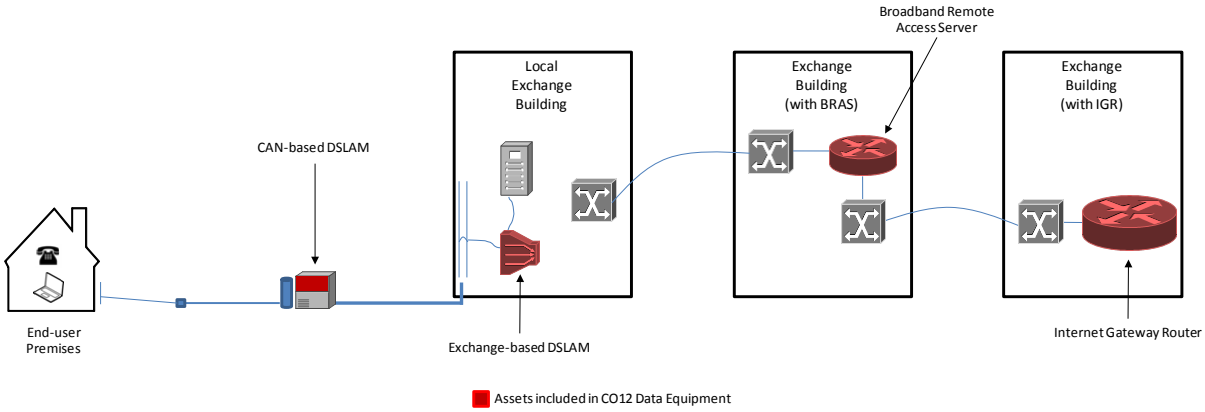
5.2.7 CO12 Data Equipment

The Data Equipment Asset Class contains equipment necessary to provide fixed line broadband services (specifically DSL broadband services), including the equipment and software required to route and aggregate DSL traffic appropriately. Examples of this equipment includes IP routers and switches, DSLAMs (ISAMs, ASAMs etc.) and data network software.[5] Importantly, the Data Equipment Asset Class does not contain equipment used by non-ADSL data services, such as ISDN.

The following figure illustrates the location of the CO12 Data Equipment assets within the Core network.

[5] This Asset Class was introduced by the ACCC in the version of the FLSM used in the 2013 WDSL FAD inquiry. For further detail on the steps taken by the ACCC to determine the list of assets to be added to the FLSM under the Data Equipment asset class, refer to the Draft report - FAD for wholesale ADSL - public version.pdf *section 4.2.1 Establishing which assets are used in providing wholesale ADSL services*.

Figure 17. Indicative representation of CO12 Data Equipment assets within the fixed line network



Allocation of costs

The primary cost driver of assets within the Asset Class is the number of SIOs. For example, the size and cost of a DSLAM is proportional to the number of end-users that are required to be served from it. Similarly, network control and other software is generally costed on a per-user license basis.

Cost allocators for the fixed line broadband services are calculated on the basis of forecast SIOs for retail and wholesale ADSL services, as well as for Other DSL services.

The allocation logic for CO12 can be expressed as follows for a given year:

$$\text{CO12} = \sum_{Service=j}^{J} \frac{Service\ Demand_j}{Service\ Demand_J} = 1$$

Where

- $Service\ Demand_j$ is forecast demand for a given fixed line broadband service *j* multiplied by the Routing Factor for *j* with respect to CO12.

The calculated allocations to WDSL for costs related to CO12 Data Equipment are set out in the following table.

Table 37. Calculated allocations of cost for CO12 Data Equipment to regulated fixed line wholesale services – WDSL

	WDSL
FY2014	[redacted]
FY2015	
FY2016	
FY2017	
FY2018	
FY2019	

5.3 Core FLSM Asset Classes – general allocators

As for the CAN FLSM Asset Classes, for some Core FLSM Asset Classes there is insufficient data available to practically determine a fully allocated cost allocation for the respective Asset Classes. Consistent with the CA10 Indirect Capital Assets, the core indirect asset class (CO10) also requires the use of a general allocator.

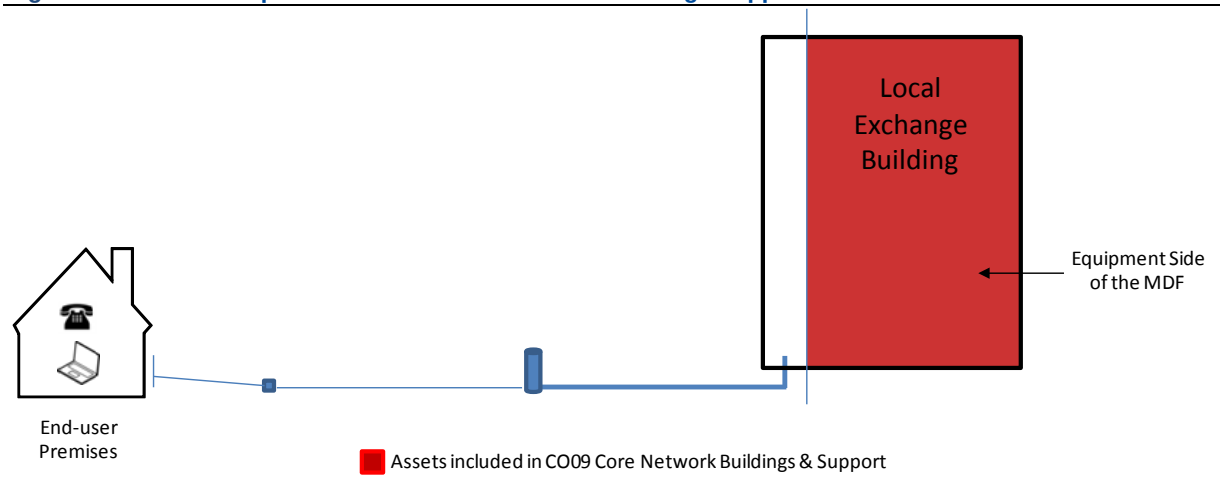
In addition to Indirect Assets, the CO07 Other Communications Plant and Equipment, CO08 Network Land and CO09 Network Buildings/Support also require the use of a general allocator to estimate cost allocations to the regulated fixed line wholesale services. However, a direct asset class specific allocation is calculated for these Asset Classes with respect to their use by third parties.

5.3.1 CO07 Other Communications Plant and Equipment, CO08 Network Land and CO09 Network Buildings/Support

The Core Asset Classes, CO07 Other Communications Plant and Equipment, CO08 Network Land and CO09 Network Buildings/Support represent the fixed line network exchange buildings (and associated land) and exchange building equipment – including power and air-conditioning equipment, equipment racks and cable infrastructure, and other supporting infrastructure – that are used by all fixed line services as well as many other services.

The following figure illustrates the location of the CO09 Networks Buildings/Support assets within the Core network.

Figure 18. Indicative representation of CO09 Network Buildings/Support assets within the fixed line network



These assets, in addition to being used to support Telstra to supply retail and wholesale services, are also accessed and used by third parties; including by access seekers using equipment space in conjunction with the unbundled wholesale access services (ULLS and LSS) through the TEBA service as well as by NBN Co.

The use of these facilities in the supply of a broad range of Telstra services, as well as their use by third parties, impacts on the estimation of cost allocators. A mixed-allocation approach is adopted, whereby costs with respect to these asset classes attributable to third party access are calculated, with the remaining costs allocated to individual fixed line services on the basis of a general allocator. In order to allocate cost with respect to these Asset Classes to third party access, as well as Telstra services, it is not possible to simply use a general allocator. A specific allocator is required for third party access in order to allocate an appropriate (cost-reflective) amount of the costs for the Asset Classes, such that the general allocator is then only applied to the remaining costs for each Asset

Class. This ensures that both Telstra services and third party access services fairly share the overall costs of these Asset Classes.

Estimating a Third Party Access Allocator

In order to distinguish use of Telstra's exchange buildings by third parties (i.e. TEBA use and NBN use) from the use of these building to support Telstra-supplied services, data on rack-space by exchange was used. A report from Telstra's MITS database sets out information on the aggregate number of Telstra equipment racks in each exchange building, as well as information on the number of racks in each exchange installed by third parties.

The aggregate number of racks in exchanges by ULLS Band is set out in the following table:

Table 38. Number of Racks Installed by use, by ULLS Band

	Telstra Racks	Third Party Racks	Total Racks
Band 1	[redacted]		
Band 2			
Band 3			
Band 4			
All Exchanges			

As a group, the costs associated with the CO07, CO08 and CO09 Asset Classes can be expected to vary by geographic location. Metropolitan exchanges are typically larger and more complex than regional and rural exchange buildings – with more sophisticated power, fire management, cabling and air-conditioning infrastructure. Similarly, the land value associated with CBD and metropolitan exchanges is significantly greater than for more remote locations.

In order to capture this geographic variation in costs for these Asset Classes, Telstra has relied on a detailed, exchange-level valuation of exchange buildings and associated land assets prepared by PwC in 2006. The PwC analysis assessed more than 70% of Telstra's exchange buildings (over 3,600 exchanges) to determine estimates of land and building values.

The following figures show the valuation of network land and exchange buildings, by ESA throughout Australia (Figure 19) and for the greater Melbourne area (Figure 20).

Figure 19. Estimated Land and Building value by ESA (2006)

Figure 20. Estimated Land and Building value by ESA, greater Melbourne area (2006)

The PwC valuation data have been used to determine the relative value of exchanges and land, by ULLS Band. The following tables show the distribution aggregate value for exchange land, exchange buildings, and a combination of land and buildings by ULLS Band.

Table 39. Share of aggregate assessed value for land, buildings and the combination of land and buildings, by ULLS

ULL Band	Telstra Exchange Land valuation	Telstra Exchange Building Valuation	Combined Land and Building Valuation
Band 1			
Band 2			
Band 3			
Band 4			

As can be seen in the above table, the distribution of value for the Asset Classes varies significantly by ULLS Band, and differs from the observed distribution of total racks. In order to reflect this geographic variation in the asset value per in-use rack (and therefore variation in the cost per in-use rack), the allocation of costs to third party use of the Asset Classes is calculated by weighting the proportion of total racks used by third parties in each ULLS Band by the proportion of asset value estimated for that band. The measure of value used in the calculation is the combined land and buildings valuation.

The following table sets out the calculated share of costs attributable to third party use of the CO07, CO08 and CO09 by ULLS Band.

Table 40. Allocation of costs related to CO07, CO08 and CO09 allocated to third party access by band

ULL Band	Share of total costs allocated to third-party access
Band 1	[redacted]
Band 2	
Band 3	
Band 4	
All Exchanges	

Based on the above analysis, [redacted] of costs for these Asset Classes are allocated to third party access services, with the remaining costs to be recovered from Telstra supplied services. In order to estimate the share of these costs attributable to individual services, and specifically the regulated fixed line wholesale services, a general allocator is used.

Calculating a General Allocator in respect of CO07, CO08 and CO09

A general allocator is used to allocate costs associated with the Asset Classes, CO07 Other Communications Plant and Equipment, CO08 Network Land, and CO09 Network Buildings/Support, in respect of the regulated fixed line wholesale services.

Each regulated fixed line wholesale service receives an allocation of the above costs based on the proportion of costs allocated using the Specific Allocators in respect of the Primary Core FLSM Asset Classes. For the purpose of the explanation below, the following Core asset classes are grouped and referenced as the Primary Core asset classes:

- CO01 Switching Equipment – Local
- CO02 Switching Equipment – Trunk
- CO03 Switching Equipment – Other
- CO04 Inter-exchange Cables
- CO05 Transmission Equipment
- CO06 Core Radio Bearer Equipment
- CO12 Data Equipment

As described above in section 5.1.5, the methodology used to calculate the Core Primary General Allocator follows what the ACCC describes as the 'revenue share approach':[6]

- Step 1: The total annual revenue requirement for Primary Core asset classes is calculated for each year.
- Step 2: The total annual revenue requirement for all Primary Core asset classes for each FLSM service using Core assets is calculated for each year.
- Step 3: The annual revenue requirement for each service calculated in Step 2 is divided by the total annual revenue requirement calculated in Step 1 to obtain the cost allocation factor for each service for each year.

[6] ACCC, *Discussion Paper – FADs for fixed line services*, April 2011, section 10.3.8.

This approach allocates the costs associated with asset classes CO07, CO08 and CO09 to FLSM services which use the Core in the same proportion as the revenue requirement calculated in Step 1 is allocated to services.

5.3.2 CO10 Indirect Capital Assets

A second general allocator is used to allocate costs associated with the asset class CO10 Indirect Capital Assets. This asset class contains equipment related to motor vehicles and mechanical aids, but is predominantly IT – both software and hardware.

Each FLSM service receives an allocation of the Indirect Asset costs based on the proportion of costs allocated using the specific allocators.

As described above, the methodology used to calculate the Core Secondary General Allocator follows what the ACCC describes as the 'revenue share approach':[7]

- Step 1: The total annual revenue requirement for all Core Asset Classes (excluding CO10 Indirect Capital Assets and CO11 LSS Equipment) is calculated for each year.

- Step 2: The total annual revenue requirement for all Core Asset Classes (excluding CO10 Indirect Capital Assets and CO11 LSS Equipment) for each FLSM service using Core assets is calculated for each year.

- Step 3: The annual revenue requirement for each service calculated in Step 2 is divided by the total annual revenue requirement calculated in Step 1 to obtain the cost allocation factor for each service for each year.

This approach allocates the CO10 Indirect Capital Assets Asset Class to FLSM services which use the Core in the same proportion as the revenue requirement calculated in Step 1 is allocated to services.

[7] ACCC, *Discussion Paper – FADs for fixed line services*, April 2011, section 10.3.8.

Appendix A - Fixed Line Services Demand Forecasts

This section sets out Telstra's explanation of how it has forecasted demand for the Fixed Line Services, used in the calculation of allocators within the CAF Model.

This worksheet presents the forecast demand for the period FY2014 to FY2019 for the Fixed Line Services, as set out in the following table:

Table 41. List of Fixed Line Services used within the Allocation Model

Service	Service Type	Description	Unit
PSTN Retail access	Fixed line access service	A line rental telephone service which allows a Telstra end-user to connect to Telstra's PSTN.	SIO
PSTN local calls	Fixed line voice service	PSTN calls within the same Standard charging zone, or to an adjoining Standard charging zone.	MOU
PSTN national STD calls	Fixed line voice service	PSTN calls are long distance calls made within Australia i.e. calling a fixed line outside of the local Call Charging Zone.	MOU
PSTN international calls	Fixed line voice service	Direct dial telephone service for overseas calls.	MOU
PSTN fixed to mobile	Fixed line voice service	A call that originates on any of Telstra's fixed networks and terminates on an Australian mobile on any of the Australian mobile networks.	MOU
PSTN OA/TA *or Fixed Originating Access Service (FOAS) / Fixed Terminating Access Service (FTAS)*	Regulated fixed line wholesale service	Fixed Originating Access Service – An access service for the carriage of telephone calls (i.e. voice, data over the voice band) to a POI from end-customers assigned numbers from the geographic number ranges of the Australian Numbering Plan and directly connected to the access provider's network. For the avoidance of doubt, the service also includes a service for the carriage of telephone calls from customer equipment at an end-user's premises to a point of interconnection, or potential point of interconnection, located at or associated with a local switch and located on the outgoing trunk side of the switch. Fixed Terminating Access Service - An access service for the carriage of telephone calls (i.e. voice, data over the voice band) from a POI to end-customer assigned numbers from the geographic number ranges of the Australian Numbering Plan and directly connected to the access provider's network. For the avoidance of doubt, the service also includes a service for the carriage of telephone calls from a POI to end-customer assigned numbers directly connected to the access provider's network. The service also includes a service for the carriage of telephone calls from a POI, or potential POI, located at or associated with a local switch and located on the incoming trunk side of the switch to customer equipment at an end-user's premises.	MOU
Local Carriage Service (LCS)	Regulated fixed line wholesale service	A service for the carriage of telephone calls from customer equipment at an end-user's premises to separately located customer equipment of an end-user in the same standard zone. However, the local carriage service does not include services where the connectivity between the end-user and the carrier or carriage service provider's network is provided in whole or in part by means of a Layer 2 bitstream service that is supplied by an NBN corporation.	MOU
ISDN-BRI	Fixed line access service	Integrated Services Digital Network (Basic Rate service) - the integration of both analog or voice data together with digital data over the same network. ISDN Basic Rate service provides	SIO

Service	Service Type	Description	Unit
		two digital phone lines with two numbers as standard.	
ISDN-PRI	Fixed line access service	Integrated Services Digital Network - Primary Rate service (ISDN 102030) - Telstra's ISDN Primary Rate Access service and can provide 10, 20 and 30 digital channels respectively over one 2 Megabit connection (either copper or fibre). Additional (channels) can be added in multiples of 10. Each digital channel can transmit data at 64 Kbps, and channels can be used simultaneously for greater speeds up to 2 Mbps.	SIO
ISDN voice calls	Fixed line voice service	A voice call that originates on any of Telstra's Integrated Services Digital Network.	MOU
Unconditioned Local Loop Service (ULLS)	Regulated fixed line wholesale service	The unconditioned local loop service is the use of unconditioned communications wire between the boundary of a telecommunications network at an end-user's premises and a point on a telecommunications network that is a potential point of interconnection located at or associated with a customer access module and located on the end-user side of the customer access module.	SIO
Line Sharing Service (LSS)	Regulated fixed line wholesale service	The line sharing service is the use of the non-voiceband frequency spectrum of unconditioned communications wire (over which wire an underlying voiceband PSTN service is operating) between the boundary of a telecommunications network at an end-user's premises and a point on a telecommunications network that is a potential point of interconnection located at, or associated with, a customer access module and located on the end-user side of the customer access module.	SIO
Wholesale Line Rental (WLR)	Regulated fixed line wholesale service	The WLR service is a line rental telephone service which allows an end-user to connect to a carrier or carriage service provider's public switched telephone network.	SIO
TOTAL SIOs	Fixed line access services	The total number of Telstra retail and wholesale Voice SIO where the end-user takes only voice provided by a Telstra PSTN switch and no DSL Service is provided on that line by any carrier.	SIO
Other DSL	Fixed line broadband service	A very small subset of services supplied over the PSTN. They are specialist business DSL services (such as single pair high-speed digital subscriber line ("SHDSL").	SIO
ADSL Retail	Fixed line broadband service	A high-speed broadband service that uses the copper wires in an active phone line to connect to the Internet.	SIO
ADSL Wholesale	Regulated fixed line wholesale service	An internet-grade, best efforts point to point service for the carriage of communications in digital form between a point of interconnection and an end-user network boundary that: (a) is supplied by means of Asymmetric Digital Subscriber Line (ADSL) technology over a twisted metallic pair that runs from the end-user network boundary to the nearest upstream exchange or RIM or CMUX; and (b) uses a static layer 2 tunnelling protocol (L2TP) over a transport layer to aggregate communications to the point of interconnection.	SIO

Forecasting process

Forecasts for the regulated fixed line wholesale services (as well as for key fixed line access and broadband services) were prepared as part of Telstra's response to the BBM RKR, lodged in November 2014. In order to comply with the BBM RKR, Telstra was required to (among other things):

- Provide forecast data for demand (operating expenditure and capital expenditure) for the period from FY2014 to FY2019. The requirement to provide forecast data for a six year period (at a disaggregated and highly detailed level) is necessarily a complex task. Given the uncertainties with any forecasting process, Telstra's business forecast horizon is generally [redacted]. The longer range forecasts have therefore involved making further assumptions about demand and expenditure, and extrapolating existing and expected trends, over a longer period of time than occurs for the purposes of Telstra's internal business planning.

- Ensure forecasts were consistent (across products, and for opex and capex) with respect to assumptions on the deployment of the NBN. The particular set of NBN forecasts used for the basis of preparing the BBM RKR forecasts was prepared by Telstra's Finance group, in consultation with Telstra Wholesale and Telstra's Products and Marketing group between March and June 2013. As such, the forecasts for NBN rollout (and the estimated flow-on impact to the relevant Fixed Line Services) are based on NBN Co's publically announced roll-out schedule at that time. Subsequent amendments to the planned roll-out schedule and other proposed changes to the NBN have not been taken into account.

As set out in table 41, the CAF Model requires forecast demand figures for a number of services that were not included as part of the BBM RKR Return. In order to prepare these forecasts, Telstra has relied to the greatest extent possible on the corporate planning process – modifying these forecasts where necessary to ensure consistency with the NBN and other assumptions that underpin the BBM RKR forecasts, and to extend the forecasts beyond the corporate planning horizon to accommodate the forecast requirements of the ACCC. In broad terms, corporate forecasts for fixed line services not included in the BMM RKR were re-based to ensure internal consistency with the BBM RKR forecasts.

Appendix B - Calculation of Routing Factors

Routing factors are used to allocate weights to different services on the basis that a given unit of use for two services is considered to have different impacts on the cost of the network asset in question. For example, a given minute of voice traffic (MoU) for different fixed line voice services will transit the network in different ways and place greater strain on assets used in the provision of the voice service. A minute of local call traffic (equivalent for retail calls and LCS calls) will on average use a different number of local switching elements than a minute of PSTN OA/TA voice traffic. As a result, a simple allocation of costs to voice services based on their share of aggregate minutes of use would likely not reasonably reflect the actual share of the cost burden for each of those services. To reflect the different cost-causal relationship between MoU and different voice services, routing factors are calculated for each fixed line voice service.

The routing factors are used during the calculation of allocators for CO01 Switching Equipment – Local, CO02 Switching Equipment – Trunk, CO03 Switching Equipment – Other, CO04 Inter-exchange Cables, CO05 Transmission Equipment and CO06 Core Radio Bearer Equipment.

To estimate routing factors for these asset classes in respect of the relevant services, a separate Routing Factor Model was developed, the outputs of which are used in the Routing Factors worksheet of the CAF Model.

The Routing Factor Model consists of several worksheets feeding into the final calculations in the sheet OUTPUT-Routing Factors.

Table 42. List of worksheets in the Routing Factors Model

File	Worksheet	Description
Routing Factors	OUTPUT-Routing Factors	This sheet calculates the routing factors for Transmission, Core Radio Bearer, Local Switching and Trunk Switching asset classes.
	Summary by LAS	This sheet calculates the weighted dispersion for each LAS node.
	Data	This sheet contains the dispersion data and applies the classification for each LAS node.
	LAS Classification	This sheet contains the classifications for each LAS node.
	SIO Table	This sheet contains the table of SIOs per state summarised from the CAN RKR.

The basis of the routing factor calculations is the call dispersion data for each LAS. This data contains the percentage of calls from each LAS to each other LAS, and allows the calculation of the average dispersion of calls for each state and type of call. The weighted dispersion for each fixed line call type is then calculated using the average dispersion for each type of call and the usage of service types per geography. The routing factor for each call type is then calculated as the sum of the usage of geographic links in the network.

Dispersion Data

The main input to the calculation of the routing factors is the dispersion data, which is a summary of the percentage of calls between each LAS. This data contains records for each originating LAS with the percentage of calls terminating at each other LAS. These records are classified according to geographic location of both the originating and terminating LAS.

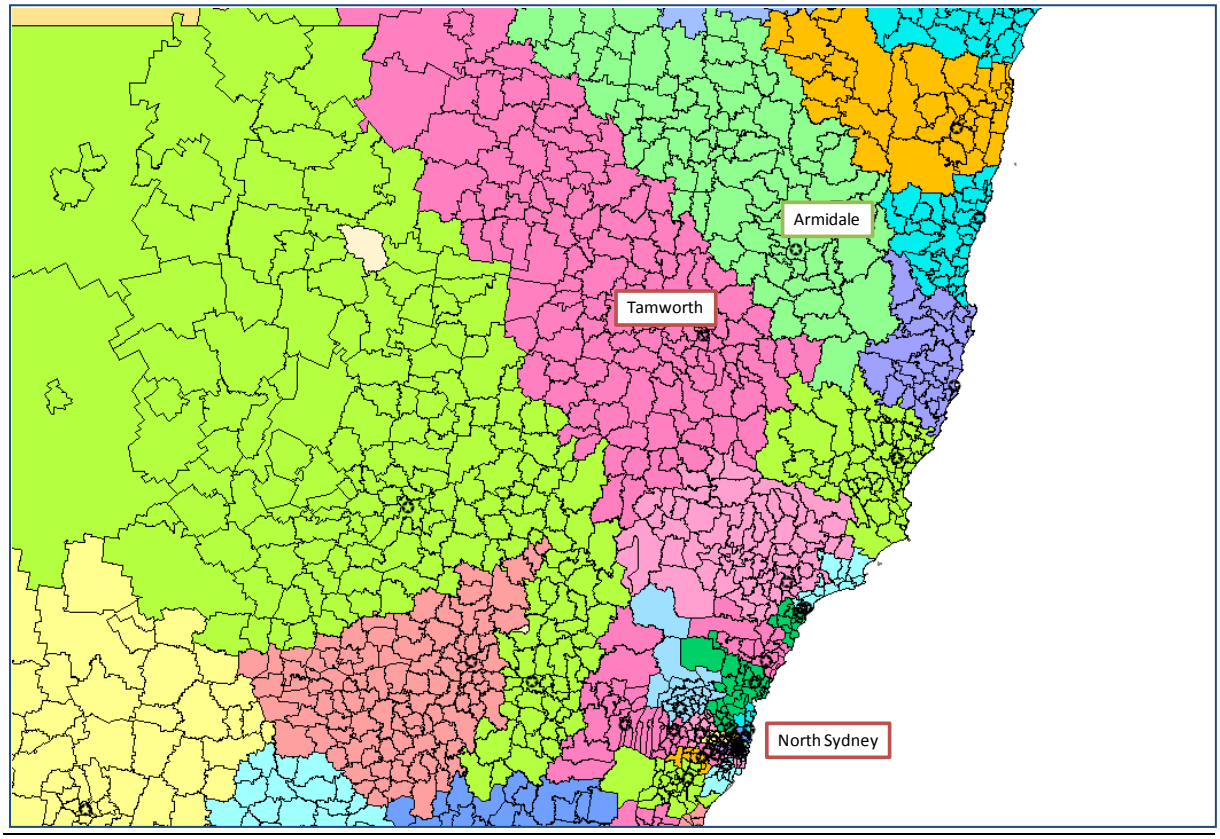
Table 43. Example dispersion data

Originating Node	Originating Node Name	Originating Node State	Terminating Node ID	Terminating Node Name	Terminating Node State	Originating area	Terminating area	Dispersion	Type
ADLJ	Armidale	NSW	ADLJ	Armidale	NSW	NORTH WEST NSW	NORTH WEST NSW	[redacted]	NON-METRO Local LAS
ADLJ	Armidale	NSW	TAMG	Tamworth	NSW	NORTH WEST NSW	NORTH WEST NSW		NON-METRO Local Zone
ADLJ	Armidale	NSW	NSNA	North Sydney	NSW	NORTH WEST NSW	SYD NORTH		NON-METRO Other Zone METRO
ADLJ	Armidale	NSW	MIDE	Middle Ridge	QLD	NORTH WEST NSW	SOUTH EAST QLD		NON-METRO Interstate NON-METRO
...									

The sample extract of the data in Table 43 shows that [redacted] of call traffic originating at the LAS in Armidale, NSW terminates at the same LAS – these are local calls within the LAS. Another [redacted] of calls originating in Armidale terminate in the neighbouring LAS in Tamworth – these are local calls within the Zone. The next largest proportion of calls originating in Armidale terminates in the North Sydney LAS – these calls would be STD calls within the same State. The final example row illustrates the proportion of calls which terminate at a particular LAS in QLD – these are STD calls terminating in another State.

Figure 21 below illustrates the many ESAs which may feed traffic to the LAS. For example, the [redacted] of calls within Armidale LAS could originate in any of the 79 ESAs highlighted in pale green. Similarly, the [redacted] of calls from Armidale LAS to Tamworth LAS, could originate anywhere in the Armidale LAS and terminate at any of the 126 ESAs feeding into the Tamworth LAS.

Figure 21. Example dispersion data



Each dispersion record is classified according to the originating and terminating area, and this Type is used in determining the usage of geographic links in the network.

Table 44. List of Call Geography Categories

Type	Description
NON-METRO Local LAS	Regional call within a LAS (Local)
NON-METRO Local Zone	Regional call terminating in a neighbouring LAS (Local)
NON-METRO Other Zone METRO	Regional call terminating in a LAS located in the metropolitan region of the same State (STD)
NON-METRO Interstate NON-METRO	Regional call terminating in a LAS located in a regional area of a different State (STD)
NON-METRO Other Zone NON-METRO	Regional call terminating in a LAS located in a non-neighbouring regional LAS of the same State (STD)
NON-METRO Interstate METRO	Regional call terminating in a LAS located in the metropolitan region of a different State (STD)
METRO Local LAS	Metropolitan call within a LAS (Local)
METRO Other Zone METRO	Metropolitan call terminating in a neighbouring LAS (Local)
METRO Other Zone NON-METRO	Metropolitan call terminating in a LAS located in a regional area of the same State (STD)
METRO Local Zone	Metropolitan call terminating in a non-neighbouring LAS within the same metropolitan area (Local)
METRO Interstate METRO	Metropolitan call terminating in a LAS located in the metropolitan region of a different State (Local)
METRO Interstate NON-METRO	Metropolitan call terminating in a LAS located in the regional area of a different state (Local)

For example, calls within the Armidale LAS area were classified as NON-METRO Local LAS. The calls from Armidale LAS to Tamworth LAS were classified as NON-METRO Local Zone, as these LAS's are adjacent, while the calls from Armidale LAS to North Sydney LAS were classified as NON-METRO Other Zone METRO – an STD call from a regional area to the metropolitan area of the same state.

The dispersion data was summarised per LAS and then averaged for each State by Type as shown in the following table.

Table 45. Average Dispersion per Call Geography

State	NON-METRO Local LAS	NON-METRO Other Zone NON-METRO	NON-METRO Interstate NON-METRO	NON-METRO Other Zone METRO	NON-METRO Interstate METRO	NON-METRO Local Zone	METRO Other Zone NON-METRO	METRO Interstate NON-METRO	METRO Local LAS	METRO Local Zone	METRO Other Zone METRO	METRO Interstate METRO
ACT	[redacted]											
NSW												
NT												
QLD												
SA												
TAS												
VIC												
WA												
Total												

Table 46. Average Dispersion per Call Location

State	NON-METRO	METRO
ACT	[redacted]	
NSW		
NT		
QLD		
SA		
TAS		
VIC		
WA		
Grand Total		

Table 47. Average Dispersion by SIO Distribution per Call Location

State	SIO Distribution	NSW/WA	Other	NSW/WA NON-METRO	NSW/WA METRO	OTHER NON-METRO	OTHER METRO
ACT	[redacted]						
NSW							
NT							
QLD							
SA							
TAS							
VIC							
WA							
Grand Total							

Note that each row sums to 1. This is because each of the values in a row represents the proportion of each type of call geography in each state, and nationally. Note also, that there are no Non-Metro originating calls in ACT – the entirety of the ACT is classified as Metropolitan. Additionally, all of the Northern Territory and Tasmania are classified as Regional so all calls originate from a Non-Metro area.

Tables 45 and 46 show the usage of particular call geography categories by type of call. For example, a local call could present as one of the following types:

- Non-Metro Local LAS (originates and terminates within the same regional LAS);
- Non-Metro Local Zone (terminates in a neighbouring regional LAS);
- Metro Local LAS (originates and terminates within the same metro LAS);
- Metro Local Zone (terminates in a neighbouring metro LAS); or
- Metro Other Zone Metro (terminates in a non-neighbouring LAS within the same metropolitan area).

The classification is used to determine the types of equipment which the call must traverse to reach its destination.

Table 48. Service Type per Call Geography – Local, STD and LCS

	NON-METRO Local LAS	NON-METRO Other Zone NON-METRO	NON-METRO Interstate NON-METRO	NON-METRO Other Zone METRO	NON-METRO Interstate METRO	NON-METRO Local Zone	METRO Other Zone NON-METRO	METRO Interstate NON-METRO	METRO Local LAS	METRO Local Zone	METRO Other Zone METRO	METRO Interstate METRO
PSTN local calls	1					1			1	1	1	
PSTN national STD		1	1	1	1		1	1				1
LCS	1					1			1	1	1	

Table 49. Service Type per Call Geography – International, Fixed to mobile and OTA

	F2M NON-METRO	F2M METRO	OTA NON-METRO	OTA METRO	INTL NSW/WA NON-METRO	INTL NSW/WA METRO	INTL OTHER NON-METRO	INTL OTHER METRO
PSTN international					1	1	1	1
PSTN fixed to mobile	1	1						
PSTN OA/TA			1	1				

The weighted dispersion is then calculated as the sum-product of the average dispersion per call geography and the service type per call geography.

Table 50. Weighted Dispersion per Service Type per Call Geography – Local, STD and LCS

	NON-METRO Local LAS	NON-METRO Other Zone NON-METRO	NON-METRO Interstate NON-METRO	NON-METRO Other Zone METRO	NON-METRO Interstate METRO	NON-METRO Local Zone	METRO Other Zone NON-METRO	METRO Interstate NON-METRO	METRO Local LAS	METRO Local Zone	METRO Other Zone METRO	METRO Interstate METRO
PSTN local calls												
PSTN national STD												
LCS												

Table 51. Weighted Dispersion per Service Type per Call Geography – International, Fixed to mobile and OTA

Weighted dispersion of calls per service type	F2M NON-METRO	F2M METRO	OTA NON-METRO	OTA METRO	INTL NSW/WA NON-METRO	INTL NSW/WA METRO	INTL OTHER NON-METRO	INTL OTHER METRO
PSTN international								
PSTN fixed to mobile								
PSTN OA/TA								

The matrix of usage of transmission links and type of switching equipment per call geography, as seen in Tables 51 and 52, and the weighted dispersion per call geography, are then used to calculate the average usage for each transmission link and each type of switching equipment.

The geography of a call will determine which transmission links and which types of switching equipment are touched and the usage matrix summarises this. For example, a Non-Metro Local LAS call (which is a local call), will pass from the originating LE to the originating POC, then to the LAS, then from the LAS to the terminating POC, and on to the terminating LE. This call will traverse 4 transmission links and make use of equipment at the LAS. On the other hand a Metro Other Zone call will not pass through a POC, rather it will travel from the originating LE to the LAS, then to the TNS, then to the terminating LAS and on to the terminating LE. This call will traverse 4 transmission links and make use of switching equipment at 2 LAS locations and 1 TNS location.

Table 52. Usage per Call Geography– Local, STD and LCS

	NON-METRO Local LAS	NON-METRO Other Zone NON-METRO	NON-METRO Interstate NON-METRO	NON-METRO Other Zone METRO	NON-METRO Interstate METRO	NON-METRO Local Zone	METRO Other Zone NON-METRO	METRO Interstate NON-METRO	METRO Local LAS	METRO Local Zone	METRO Other Zone METRO	METRO Interstate METRO
Transmission												
LE to POC (for non-metro)	1.00	1.00	1.00	1.00	1.00	1.00						
POC to LAS (for non-metro)	1.00	1.00	1.00	1.00	1.00	1.00						
LE to LAS (for metro)							1.00	1.00	1.00	1.00	1.00	1.00
LAS to LAS										1.00		
LAS to TNS		1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
TNS to TNS			1.00		1.00			1.00				1.00
TNS to LAS		1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
LAS to POC (for non-metro)	1.00	1.00	1.00			1.00	1.00	1.00				
POC to LE (for non-metro)	1.00	1.00	1.00			1.00	1.00	1.00				
LAS to LE (for metro)				1.00	1.00				1.00	1.00	1.00	1.00
Switching												
LAS	1.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.00	2.00	2.00	2.00
TNS		1.00	2.00	1.00	2.00	1.00	1.00	2.00			1.00	2.00

Table 53. Usage per Call Geography– Local International, Fixed to mobile and OTA

	F2M NON-METRO	F2M METRO	OTA NON-METRO	OTA METRO	INTL NSW/WA NON-METRO	INTL NSW/WA METRO	INTL OTHER NON-METRO	INTL OTHER METRO
Transmission								
LE to POC (for non-metro)		1.00	1.00		1.00		1.00	
POC to LAS (for non-metro)		1.00	1.00		1.00		1.00	
LE to LAS (for metro)	1.00			1.00		1.00		1.00
LAS to LAS								
LAS to TNS	1.00	1.00		1.00	1.00	1.00	1.00	1.00
TNS to TNS							1.00	1.00
TNS to LAS								
LAS to POC (for non-metro)								
POC to LE (for non-metro)								
LAS to LE (for metro)								
Switching								
LAS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TNS	1.00	1.00		1.00	1.00	1.00	2.00	2.00

Figure 22, illustrates examples of how a call may be routed. The red line follows the transit of a NON-METRO Local LAS call within the Armidale LAS area. It will be transported from the Local Exchange to a PoC, then to the LAS, then back out to another PoC and to the Local Exchange of the terminating end.

Similarly, the blue line follows the path of a regional call to another LAS area – LE to PoC, to LAS, then to the TNS in the capital city, and back to the terminating LAS, the PoC and the final Local Exchange.

Figure 22. Example call routing

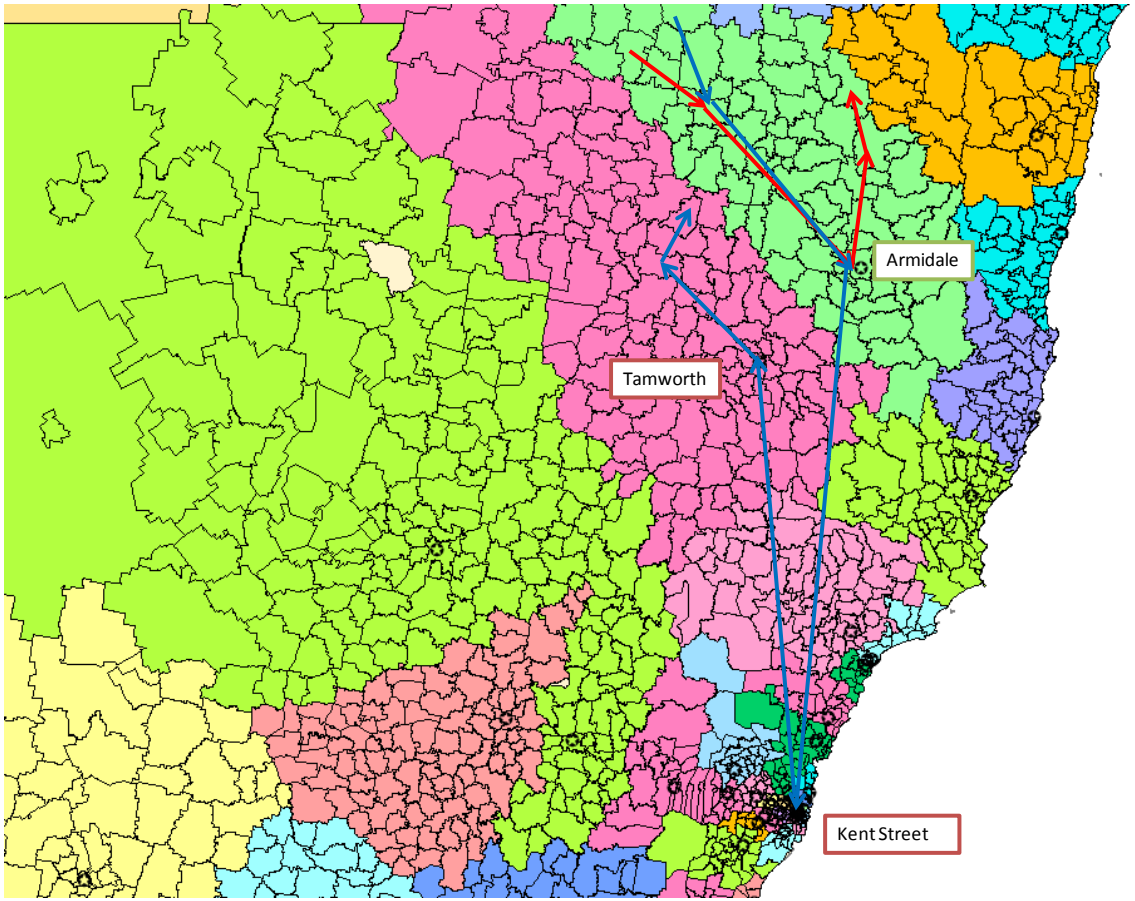


Table 54. Usage of Transmission links and Switching Equipment by Service Type and Routing Factors for Transmission, Core Radio Bearer and Switching Equipment

	PSTN local calls	PSTN national STD	PSTN international	PSTN fixed to mobile	PSTN OA/TA	LCS
LE to POC (for non-metro)	[redacted]					
POC to LAS (for non-metro)						
LE to LAS (for metro)						
LAS to LAS						
LAS to TNS						
TNS to TNS						
TNS to LAS						
LAS to POC (for non-metro)						
POC to LE (for non-metro)						
LAS to LE (for metro)						
Transmission = SUM ALL						
Core Radio Bearer = LE-PoC + PoC-LE						
Switching Equipment - Local						
Switching Equipment - Trunk						

Glossary

Term	Definition
ACCC	The Australian Competition and Consumer Commission
ADSL	Asymmetric Digital Subscriber Line
AGVC	Aggregated Virtual Circuit service
BBM	Building Block Model
BBM RKR	Building Block Model Record Keeping Rule
CAF	Cost Allocation Framework
CAF Model	Cost Allocation Framework model. A detailed documentation of calculations used in the estimation of cost allocation factors, including the workings of the Excel model
CAN	Customer Access Network
CBD	Central Business District
CMUX	Customer Multiplexer
DSLAM	Digital Subscriber Line Access Multiplier
ESA	Exchange Service Area
FAD	Final Access Determination
FLSM	Fixed Line Services Model
FTTP	Fibre-To-The-Premises
HFC	Hybrid Fibre-Coaxial
IAD	Interim Access Determination
ISDN	Integrated Services Digital Network
LAS	Local Access Switch
LCS	Local Carriage Service
LSS	Line Sharing Service
MDF	Main Distribution Frame
MoU	Minute of use
NDSD	Network Decision Support Database
PDH	Plesiochronous Digital Hierarchy
PoC	Point of Contact
PSTN	Public Switched Telephone Network
PSTN OA/TA	PSTN Originating Access and Terminating Access

RAU	Remote Aggregation Units
RIM	Remote Integrated Multiplexer
RKR Response	Response to the BBM RKR
RSS	Remote Subscriber Stage
SDH	Synchronous Digital Hierarchy
SIO	Service in Operation
STD	Subscriber Trunk Dialling
TEM	Telstra Economic Model
TPNI	Telstra Physical Network Plant Inventory
TRAC	Transmission Recording and Control
TW	Telstra Wholesale business unit
ULLS	Unconditioned Local Loop Service
ULLS Bands	Unconditioned Local Loop Service Bands
WDSL	Wholesale ADSL service – covers both ADSL and ADSL2+ services
WDV	Written Down Value
WLR	Wholesale Line Rental service