Our Ref: M2008/26
Contact Officer: Kim Huynh

8 July 2008

Dr Tony Warren   cc: Paul McLachlan
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Public Policy & Communications   Regulatory Legal Group
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By facsimile: 02 9261 8390   **By facsimile: 02 9261 2401**

Dear Dr Warren

Telstra's ULLS Undertaking: Errors in the Telstra Efficient Access (TEA) Model

I write in regard to significant calculation and data errors which have been found during an audit of version 1.0 model of the Telstra Efficient Access (TEA). The TEA model was submitted in support of Telstra's unconditioned local loop service (ULLS) Undertaking lodged in March 2008.

There are two key types of errors discussed in this letter: calculation errors and data errors.

The calculation error arises through the SumIf function as used by Telstra in combination with 16 digit route identifiers (formed by combining two eight digit structure identifiers) in the Main Cable Module part of the TEA model. The effect of the error is that in testing which records to sum on a route identified by 16 digits, only the first 15 digits are tested in the Excel SumIf formula. This means that instead of a single route being summed – up to 10 routes can be summed for each of the 16 digit routes identified – effectively digit 16 is treated like a wildcard. This leads to significant double counting of data in several cases. It is notable that this error cannot

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lead to an understatement of the installed cables – only an overstatement of the network. We note that this error does not appear to occur in the Distribution Cable Module.

The second error appears to be a data structure point problem in the main and distribution modules where the shortest path is not identified and used. This means that there are multiple paths in the network. The attachment provides further explanation of this error. The ACCC suggests that Telstra properly review their Cable Plant data to ensure that this duplication does not occur.

Further detail and explanation of identified errors are set out in the attachment to this letter. The attachment focuses, by way of example, on the data supplied for the Blackburn ESA.

To properly assess any undertaking, it is essential that the ACCC is given information which is relevant and accurate. The ACCC notes that this is not the first error or potential error which has been identified in the TEA models lodged by Telstra in support of its ULLS undertakings. In January 2008, the ACCC wrote to Telstra and identified a malfunction in the TEA model relating to generating the default scenario in the TEA model. At that time, the ACCC formally requested that Telstra provide a model free of errors.[1] Further, it appears that the >15 digits 'SumIf' calculation issue is widely documented in publicly available material.[2]

As a result, the ACCC is concerned that:
(a) the model may contain other material errors;
(b) both the ACCC and access seekers may have spent significant amounts of time and money reviewing flawed models lodged in support of various Undertaking applications;
(c) the model cannot be properly relied upon in support of your Undertaking.

Unless Telstra can satisfy the ACCC that the TEA model is accurate and contains no material errors, the ACCC may have no alternative but to give the model little weight in conducting its assessment of the Undertaking.

The ACCC therefore requests that Telstra:

- notify the ACCC as to whether the ACCC is correct in its belief that the errors have occurred;
- provide a detailed explanation as to how these calculation and data errors have occurred and how they affect the data generated by the model;
- provide a detailed explanation as to how Telstra intends to address these errors;
- provide a revised version of the TEA model to show *only* the change in monthly charge after correcting all errors raised in the attached note (that is, the TEA model with no other changes to the default and other values); and

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[1]   Letter from ACCC to Telstra including s 152BT request – 3 January 2008
[2]   http://support.microsoft.com/kb/q158071/; http://en.allexperts.com/q/Excel-1059/Excel-sumif-concatenated-values-1.htm.

- confirm that the person who signs the final response to the ACCC has made reasonable inquiries and is not aware of any other known errors in the TEA model.

Given the significance of the concerns raised in this letter, the ACCC requires a preliminary or complete response from Telstra by **COB Tuesday, 15 July 2008**. If the responses indicate that the errors have occurred, the ACCC will inform interested parties of this, and supply a copy of your response to those parties. This will then allow access seekers to assess an accurate TEA model in the current consultation process.

Should you have any questions regarding this request, please contact me on (03) 9290 1864 or Kim Huynh on (03) 9290 1960.

Yours sincerely

Robert Wright
General Manager
Compliance and Regulatory Operations
Communications Group

Errors in Telstra Efficient Access (TEA) Model

[Telstra has claimed confidentiality over the blacked-out material the ACCC has used in this attachment. Telstra claims that:

1. a full version of this attachment can only be accessed by people who have signed the version of Telstra's TEA model confidentiality undertaking that gives them access to the TEA model, version 1.0; and

2. an altered version of this attachment using simulated data can only be accessed by people who have signed the version of Telstra's TEA model confidentiality undertaking that gives them access to the TEA model, version 1.01, which contains simulated single ESA data.]

1. Summary

Two calculation and data errors in the engineering modules of version 1.0 of the Telstra Efficient Access (TEA) model:

1. there is a calculation error in the main cable calculations which causes the cable demands to be wrongly calculated in some instances. This means that cable and duct placements are over estimated in the model; and

2. there are duplicate and non-shortest-path routes contained in the data. As a result, the model places more cable than is necessary for an efficient, shortest-path network.

2. Calculation error

A calculation error has been detected in the *Main-Collapsed* worksheet of the *Eng-Main-Engine-v1.0.xls* Excel workbook, which is the main cable module for the engineering calculations.

The cumulative 0.40 gauge cable demand is calculated in the *Main-Collapsed* worksheet based on sections identified in the *Main-Detail* worksheet that require 0.40 gauge cable. The SumIf function in Excel is used to calculate cable demands in the *Main-Collapsed* worksheet. The way cable demand information is identified and summarised in the *Main-Collapsed* worksheet is by use of a 'lookup key' that combines the code for the 'current structure' and the code for the 'next structure', as the *Main-Collapsed* worksheet should have optimised routes (i.e. sequences of current structure and next structure). The lookup keys comprise of 16 digits. The maximum size of lookup keys that can be used with the SumIf function is 15 digits. Excel only recognises the 15 leftmost digits of the lookup key. The last digit is treated as a 'wild card' digit, meaning that sections whose lookup keys differ only by the last digit are treated as the same section.

To explain the nature of the error, some samples of the Blackburn (BLBN) Exchange Service Area (ESA) data have been extracted below.

Figure 1 is an extract of the records for BLBN in the *Main-Detail* worksheet:[1]

Figure 1: Blackburn Main Cables Extract – *Main-Detail* worksheet:
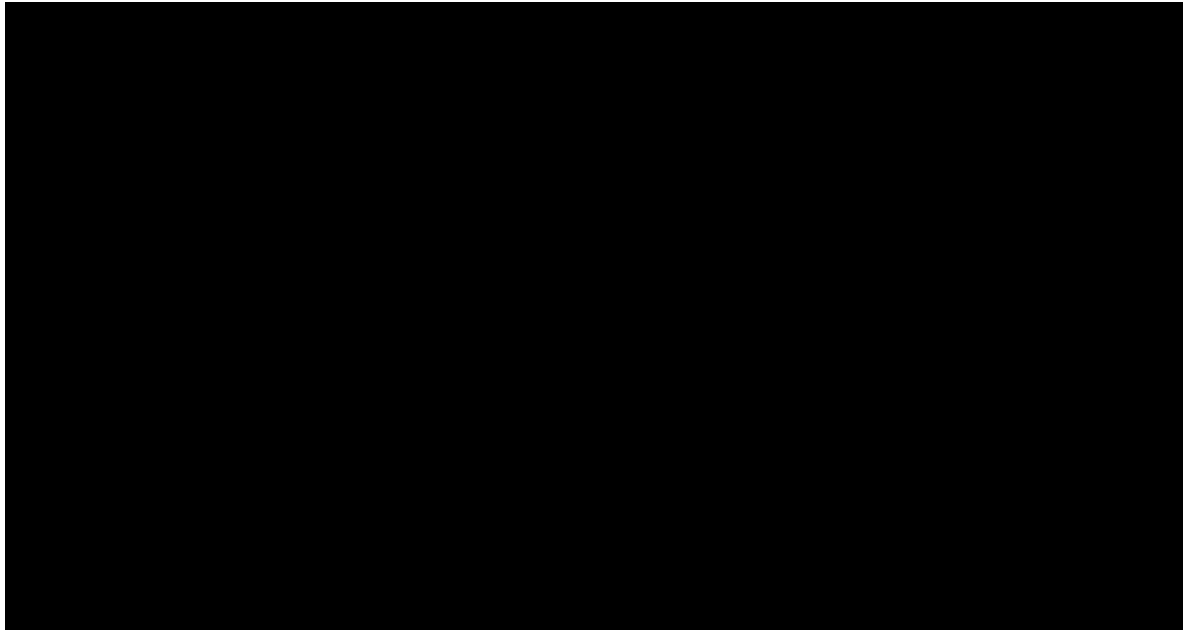
This extract shows every row that contains the structure number "20556231" as the 'current structure number'. Figure 1 also features two additional columns that show the cable segment demand for segments with the current structure number "20556231" and next structure number "20556232" and the cable segment demand for segments with the current structure number "20556231" and next structure number "20556232".

It can be seen that there is one instance of the structure point "20556231" leading to structure point "20556232" on the way to the BLBN exchange. It can also be seen that there are 12 instances of the structure point "20556231" leading to structure point "20556233" on the way to the BLBN exchange.

When the cable segment demands are summed, they indicate that there is a demand of 100 cable pairs in the direction "20556231" to "20556232" and 3,400 cable pairs in the direction "20556231" to "20556233". These are the cable demands that should appear in the *Main-Collapsed* worksheet.
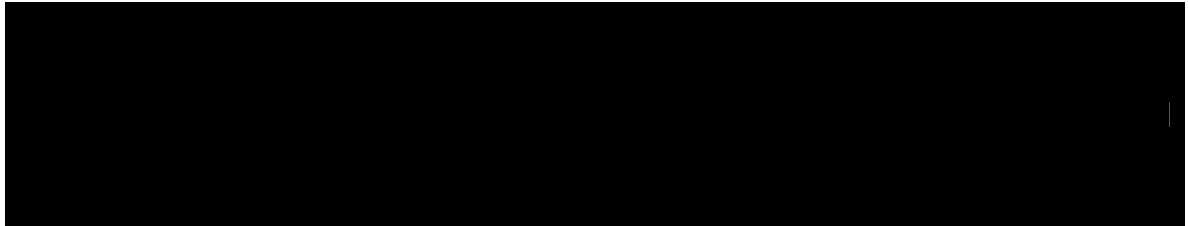
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[1] Telstra, *Main-Detail* worksheet of the *Eng-Main-Engine-v1.0.xls* Excel workbook, TEA Model, version 1.0.

Figure 2 is an extract of the records for BLBN in the *Main-Collapsed* worksheet:[2]

Figure 2: Blackburn Main Cables Extract – *Main-Collapsed* worksheet:

This extract shows that the calculated cable demand is 3,500 cable pairs in both cases. As seen in Figure 1, this data is incorrect in both cases.

The Excel formula used to calculate the cumulative .40 gauge cable demand segment in the *Main-Collapsed* worksheet is:

=SUMIF('Main-Detail'!$L:$L,$C230&$D230,'Main-Detail'!V:V)

Column L of the *Main-Detail* worksheet contains the 16-digit lookup keys that are concatenations of the 'current structure number' and the 'next structure number' for each row. The SumIf function compares what is in column L of the *Main-Detail* worksheet with the concatenation of the 'current structure number' and the 'next structure number' in each row of the *Main-Collapsed* worksheet. The Excel SumIf function only recognises the leftmost 15 digits of the lookup key. The last digit is a 'wild card' digit, which allows the lookup key to match all other lookup keys whose first 15 digits match.

In the example, the lookup keys in Figure 1 match as equal when calculated in Figure 2:

- 2055623120556232
- 2055623120556233

This means that for the cable segment "20556231" to "20556232", the actual demand for cable pairs is exceeded by 3,400 cable pairs and for the cable segment "20556231" to "20556233", the actual demand for cable pairs is exceeded by 100 cable pairs.

In addition, the excess length of main cables in the model is likely to mean that the length of main conduits, the number of joints at mergers and the number of pairs terminating at the ESA are overestimated.

In the BLBN main cable data, there are at least 26 instances of different values that are taken to be the same value by Excel in the SumIf function. This means that cable and duct placements are over estimated in the model..

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[2]   Telstra, *Main-Collapsed* worksheet of the *Eng-Main-Engine-v1.0.xls* Excel workbook,
      TEA Model, version 1.0, 3 March 2008.

This error is only present in the main cable calculations and does not occur in the Distribution module.

3. Cable data

The cable data does not show only shortest paths, as claimed by Telstra. This is an issue that affects both the main cable and distribution modules.

To explain the nature of the problem, some samples of the BLBN ESA data have been extracted below.

Figure 3 is an extract of the records for BLBN in the *Main-Detail* worksheet:[3]

Figure 3: Blackburn Main Cables Extract – *Main-Detail* worksheet:
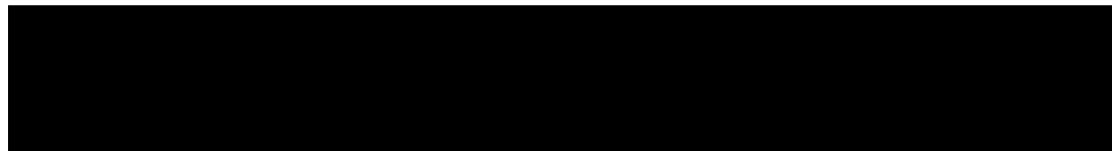
Row two of Figure 3 shows that the shortest path from structure point "20556231" to the exchange is via structure point "20556233" and has a length of 2241m. However, the first row in Figure 3 also shows a path from structure point "20556231" to the exchange via structure point "20556232" with length 2477m.

In a shortest path network, this second longer path should not be used. However, the main cable module places a cable in this direction (see row 12 of Figure 1). Even if the calculation error is corrected, the Main Cable module would place cable and ducts to accommodate a demand of 100 cable pairs in this direction.

This is an example of a cable segment that has demand in both directions. In the BLBN data, there are 80 instances (out of 5,958 records) where there are bi-directional entries. Some of these entries refer to the same physical segment. There should be no such entries in shortest-path data.

Further, in a shortest-path description, each structure point should have a unique next structure point on the shortest path to the exchange. In the BLBN data, there are 31 instances (out of 5,958 records) where a structure point has two different next structure points.

The examples above show that there are duplicate paths in the Main Cable data. This leads to the module placing more cable than is necessary.
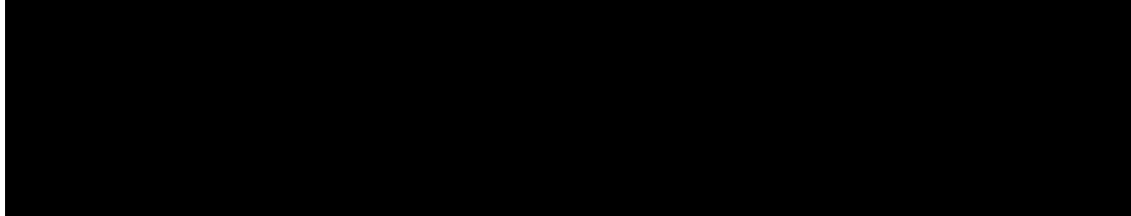
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[3] Telstra, *Main-Detail* worksheet of the *Eng-Main-Engine-v1.0.xls* Excel workbook, TEA Model, version 1.0.

This is an issue in the Distribution data as well. Figure 4 shows an extract of the Distribution Area data for BLBN:[4]

Figure 4: Blackburn Distribution Area Extract

This extract shows that current structure number "20556984" has two possible next structure numbers: "20556985" and "20556983". In the BLBN Distribution Area data, there are 158 instances (out of 16,123 records) where a structure point has two different next structure points. This shows that the data is not shortest-path data only.

The extract also shows that structure point "20556984" is in two different distribution areas: "P71" and "CA13". This should not occur in an efficient, shortest-path network. In all 158 instances of duplicate paths in the BLBN data, the relevant structure point is listed in two different distribution areas.

This problem arises because the basic data has not been effectively preprocessed, before it is entered into the model, to include only shortest-path entries. Telstra should ensure that the data is fully preprocessed before it is entered into the Access database.

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[4] Telstra, *Distribution-Detail* worksheet of the *Eng-Dist-Engine-v1.0.xls* Excel workbook, TEA Model, version 1.0.