REPORT

Prepared For:

Telstra Corporation Limited

ULLS Supplemental Commentary

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INTRODUCTION

1. This report contains information that is confidential to Telstra Corporation Limited ("Telstra").

2. I have been asked by Telstra to provide brief supplemental comments on the use of "uplift" factors in the calculation of trench and cable distances in TSLRIC models of access networks. My observations encompass factors that have been used in two local-exchange cost proxy models in the United States.

UPLIFT FACTORS

HCPM

3. The FCC's Hybrid Cost Proxy Model (HCPM) provides for user-specified factors to adjust cable distances.[1]

4. In the HCPM the initially calculated cable distances in the feeder plant are adjusted by several factors in order to account for the extent and variability of the terrain within each cluster area. In clusters where the terrain slopes more than 12%, uplift factors of 1.05 to 1.20 are applied to the calculated distances.[2]

5. The HCPM allows the user to specify two road factors -- one for distribution network distances and a second for feeder network distances – to adjust the distances initially calculated between network nodes and subscriber locations. The model's authors refer to the empirical values obtained by Love *et al.* for suggested values of the factors.[3] As noted in my earlier report, the Love *et al.* empirical study obtained distance multipliers of 1.16 to 1.35 for a Cartesian distance metric. For rectilinear distance, a multiplier ranges from 0.95 to 1.05.[4]

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[1] C. A. Bush, D. M. Kennet, J. Prisbrey and W. W. Sharkey, Federal Communications Commission and Vaikunth Gupta, Panum Telecom, LLC, "Computer Modeling of the Local Telephone Network", October 1999, p. 24.

2 When the minimum slope in the area exceeds a 12% trigger value, an uplift factor of 1.10 is applied. When the maximum slope in the area exceeds a 30% trigger value, an uplift factor of 1.05 is applied. When both triggers are exceeded, an uplift factor of 1.20 is applied. Bush *et al.,* p. 24.

[3] Love, R.F., J.G. Morris and G.O. Wesolowsky, (1988), "Mathematical Models of Travel Distances," in *Facilities Location: Models and Methods.* Amsterdam: North Holland, Tables 10.1, 10.2.

[4] Bush *et al.,* p. 24, footnote 28. Input values are tabulated in Table 16 (feeddist.prm).

HAI MODEL

6. The HAI Model, Release 5.0a, provides for several types of uplift factors that adjust the costs of distribution and feeder cable and trench length.[5]

7. In the HAI Model, feeder distances are measured using a rectilinear metric that is oriented to the four cardinal compass point directions.[6] In default mode, the model assumes right-angle routing to accommodate natural obstacles, property boundaries, and the like that cause some degree of rerouting. A user option permits the model to "steer" feeder routes within each quadrant of a wire center away from the compass coordinates and instead toward the preponderant location of main clusters. When this option is used, a user-determined multiplier adjusts the amount of cable distance. The default value of the uplift factor is 1.27 – the weighted average right-angle routing distance at a 45-degree angle.[7]

8. The HAI model uses four parameters to incorporate the effect of placing buried cable in rock conditions. These parameters treat the effects of difficult soil conditions – surface texture, rock depth threshold, hard rock, and soft rock – as multipliers of placement costs. When an area's conditions exceed a trigger level, the corresponding multiplier is applied to standard per-foot placement costs.

9. Alternatively, the HAI model documentation notes that the typical response to difficult soil conditions is often to simply route cable around those conditions. In the model this effect can be reflected in an uplift factor applied to the standard distance calculation. The model's distribution distance multiplier is defined as the amount of extra distance required to route distribution and feeder cable around difficult soil conditions, expressed as a multiplier of the distance calculated for normal situations.[8] In illustrative calculations, the HAI model uses the various individual uplift parameters for difficult soil and sets the distance multiplier to 1.0.

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[5] HAI Consulting, "HAI Model Release 5.0a, Model Description", revised: February 16, 1998.

[6] HAI, p. 7, footnote 10.

[7] HAI Consulting, "HAI Model Release 5.0a Inputs Portfolio", January 27, 1988, §2.7.8, p. 37.

[8] HAI, Inputs Portfolio, §2.7.1, p. 34.