- BEFORE THE PUBLIC SERVICE COMMISSION OF UTAH -

IN THE MATTER OF THE PETITION OF QWESTCOPORATION FOR ARBITRATION OF AN INTERCONNECTION AGREEMENT WITH UNION TELEPHONE COMPANY d/b/a UNION CELLULAR Under Section 252 of the Federal Communications Act

DOCKET NO. 04-049-145

DPU Exhibit No. 1.0

REBUTTAL TESTIMONY

OF

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DEPARTMENT OF COMMERCE
STATE OF UTAH

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NON-CONFIDENTIAL VERSION

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I. IDENTIFICATION OF WITNESS

Q. PLEASE STATE YOUR NAME, BUSINESS ADDRESS AND POSITION WITH THE DIVISION OF PUBLIC UTILITIES.

A. My name is Paul M. Anderson. My business address is Heber M. Wells Building, 160 East 300 South, 4th Floor, Salt Lake City, Utah. I am employed as a Utility Technical Consultant for the State of Utah in the Division of Public Utilities (DPU). I am testifying on behalf of the DPU.

Q. PLEASE DESCRIBE YOUR EDUCATIONAL BACKGROUND, QUALIFICATIONS AND EMPLOYMENT EXPERIENCE.

A. I have a Bachelor of Science in Ceramic Engineering from the University of Utah (1971). I have had extensive Bellcore Technical training in the telecommunications industry. I have over 35 years experience in telecommunications from my employment at US WEST and various competitive local exchange carriers. I have a background in interoffice facility and switch planning, feeder and distribution planning and in economic cost studies. More detail is provided in DPU Exhibit 1.1.

II. PURPOSE OF TESTIMONY AND SUMMARY

Q. PLEASE STATE THE PURPOSE OF YOUR TESTIMONY.

A. The purpose of my testimony is to present the DPU's conclusions and recommendations regarding DPU's engineering and cost analysis of Union Telephone's submittal of a cost study to the Utah Public Service Commission to support an asymmetric reciprocal compensation rate for the transport and termination of local traffic by Union Telephone's wireless operation (Union Cellular).

This DPU analysis responds to the testimony of Union Cellular witnesses Jason Hendricks, Alan Hinman and Henry Jacobsen and Qwest witness Peter Copeland and focuses on three key disputed issues.

1. Total Element Long-Run Incremental Cost (TELRIC). Does the cost study modeled meets the FCC criteria contained in C.F.R. Title 47, Section 51.711 (b) which states:

> [Code of Federal Regulations]
> [Title 47, Volume 3, Parts 40 to 69]
> [Revised as of October 1, 2000]
> From the U.S. Government Printing Office via GPO Access
> [CITE: 47CFR51.711]
> (b) A state commission may establish asymmetrical rates for transport and termination of local telecommunications traffic only if the carrier other than the incumbent LEC (or the smaller of two incumbent LECs) proves to the state commission on the basis of a cost study using the forward-looking economic cost based pricing methodology described in Secs. 51.505 and 51.511, that the forward-looking costs for a network efficiently configured and operated by the carrier other than the incumbent LEC (or the smaller of two incumbent LECs), exceed the costs incurred by the incumbent

> LEC (or the larger incumbent LEC), and, consequently, that such that a higher rate is justified.

2. Traffic Sensitivity. Does cost study modeled meets the FCC's additional traffic-sensitive costs standard in Order, 18 FCC Rcd 18441 (Sept. 3, 2003)?

3. Cost Model. Are Union Cellular's cost study financial calculations, as presented, valid and are they correctly modeled to represent a forward-looking, state-of-the-art cellular network?

Q. PLEASE DESCRIBE THE DPU'S UNDERSTANDING OF HOW UNION CELLULAR'S NETWORK IS CONFIGURED.

A. Union Cellular has a Nortel GSM (**G**lobal **S**ystem for **M**obile communications) switch located in [redacted], Wyoming that serves areas of Utah, Colorado, Wyoming and Idaho. The GSM switch is collocated with one of its BSCs (**B**ase **S**tation **C**ontrollers) and its HLR/VLR (**H**ome **L**ocation **R**egister/**V**isitors **L**ocation **R**egister) data base equipment. The HLR is a central database that contains details of each mobile telephone subscriber that is authorized to use the GSM core network. It acts as a server for signal processing and OAM (**O**perations **A**dministration and **M**aintenance) functions. The VLR is a database that temporarily holds profiles of roaming users. The GSM cellular switch also shares the same building with Union Telephone's local tandem switch (DMS200/250), the [redacted] wire line end office switch (DMS 100) and Union Cellular's older TDMA (**T**ime **D**ivision **M**ultiple **A**ccess) wireless switch.

Union Cellular's backhaul facilities between their cell sites and the [redacted] central office are mostly microwave radio with some fiber facilities. Union Cellular connects to Qwest's access tandem switches through interoffice facilities that are either microwave radio or fiber. Union Cellular also has a base station controller (BSC) located in [redacted], Wyoming. Union Cellular's network is depicted in DPU Exhibit 1.2.

At last report, Union Cellular has about [redacted] Base Transceiver Stations (BTS) or cell sites. Most are stand alone structures while some are located on building roofs. A typical stand alone site is illustrated in DPU Exhibit 1.3 and further described below. Two small buildings are constructed on the site to house radio equipment and to house an emergency backup generator. A tower is built on a concrete pad to accommodate both cellular antennas and backhaul microwave radio dishes and all are connected to radio equipment in the equipment building with multiple coax cables. A propane fuel tank also sits on the site and all the facilities are surrounded by a chain link fence.

Figure 1 Wells Flat cell tower.

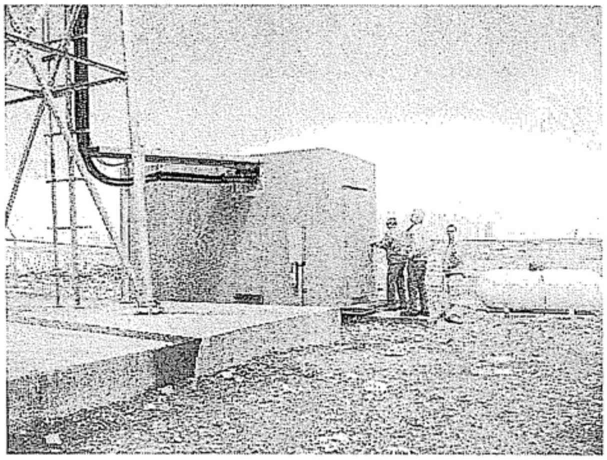

Figure 2 Wells Flat Cell building. Generator building hidden from view.

Q. PLEASE SUMMARIZE YOUR ANALYSIS OF UNION CELLULAR'S COST MODEL.

A. The DPU's analysis of Union Cellular's cost model was made to determine if the model accurately represented the cost to build a cellular network using TELRIC (**T**otal **E**lement **L**ong **R**un **I**ncremental **C**ost) cost principles which are forward looking including only those incremental costs that are considered usage or traffic sensitive (TS). During its investigation the DPU determined that in the development of the cost model, Union Cellular has used historical costs to estimate pricing for the GSM switch, base station controller and cell site construction. Though it appears to be a convenient way to price equipment and facilities, it does not reflect current forward looking costs as required by TELRIC principles. Furthermore, Union Cellular has used present and future demand to determine network costs rather than using current demand with a percentage growth as determined through the use of a fill factor as required in TELRIC pricing. Additionally, Union Cellular did not account for structure and facilities sharing with other companies in its pricing.

Furthermore, Union Cellular has not shown that the switch and transport costs contained in its proposed cost model do not include equipment that is also specifically used for the provision of other tariff and retail offerings that are unrelated to interconnection. It appears that Union Cellular has modeled its transport microwave radio costs based on what seems to be the retail prices of equivalent T-1s, as opposed to using local or tandem switch cost data, signaling data or network data.

The DPU believes that Union Cellular inappropriately included costing for equipment and facilities that are clearly non-traffic sensitive (NTS). Specifically, Union Cellular included costs for towers and antennas, buildings and power equipment and processor components in the GSM switch, base station controllers and data base registers that are definitely non-traffic sensitive.

And finally, it appears that Union Cellular inappropriately applies present worth factors to minutes of use (MOU) in both its termination and transport calculations and erroneously applies the same depreciation rate to all categories of plant, buildings and land.

In the following pages, I will present the facts that support the above conclusions by reviewing in more detail TELRIC costs, traffic sensitivity and Union Cellular's financial calculations.

III. TELRIC COSTS

Q. HAS THE DPU REVIEWED UNION CELLULAR'S PROPOSED COST MODEL TO DETERMINE IF IT MEETS THE FCC'S TELRIC COST METHOLODOGY?

A. The DPU conducted an in-depth analysis of Union Cellular's cost model to determine if the proposed costing techniques were consistent with the FCC's TELRIC principles. The criteria to develop costs is that costs must reflect an efficient, lowest cost network configuration using currently available technology and be based on the existing location of the incumbent LEC's wire centers. A forward-looking cost of capital and economic depreciation rates are to be used in calculating forward-looking costs of elements including interconnection. Factors that cannot be considered are embedded costs, retail costs such as marketing, billing and collection, opportunity costs, and revenues which subsidize other services.[1]

Q. WHAT COST MODEL DOES THE DPU CONSIDER TO BE APPROPRIATE FOR DEVELOPING TELRIC COSTS?

[1] FCC 47 CFR51.505.

A. The DPU has historically recommended and used the Commission amended and ordered HAI 5.2a cost model for land-line based ILEC companies. The model was developed for use in determining costs of Unbundled Network Elements (UNEs), Universal Service Funding (USF) requirements and the cost of carrier transport and interconnection. It uses ARMIS (**A**utomated **R**eporting **M**anagement **I**nformation **S**ystem) and NECA (**N**ational **E**xchange **C**arrier **A**ssociation) line count data and census block data to determine current demand and geographic locations of customers.

However, the HAI 5.2a cost model is not adaptable to and will not capture costs associated with a wireless network, such as the Union Cellular network. It does not model or contain algorithms pertaining to wireless elements such as wireless switch equipment, base station controllers, cell towers, antennas and base station equipment.

Even though HAI 5.2a is not equipped to model wireless costs, any model used must employ the same TELRIC principles as used by HAI 5.2a.

Union Cellular is advocating use of the proposed model developed by Jason Hendricks of GVNW. This model is an Excel spreadsheet that calculates transport and termination costs per minute of use using the *embedded* and projected cost of wireless switching, cell sites and radio equipment common in a modern wireless network. It does not build the wireless network from scratch as a true TELRIC model would.

However, with modifications, the DPU believes that this model could be used to develop TELRIC pricing for a cellular network if the inputs are valid and in alignment with HAI 5.2a principles and the assumptions regarding the inputs stand up to TELRIC standards. Currently many of HAI 5.2a critical pricing and sizing factors do not exist in the Union Cellular cost model.

Q. DOES UNION CELLULAR USE EMBEDDED COSTS TO DETERMINE PRICING FOR ITS SWITCH AND CELL SITES?

A. Yes. It appears as though Union Cellular uses switch costs that are taken from their GSM switch purchase in 2003. Although this cost is embedded, it does represent a modern efficient switch technology that is forward-looking. Although the switch is still current technically, the pricing may have increased or decreased in the last four years. The model should use an updated switch price.

Union Cellular also uses its existing embedded cell site costs to determine average cost per cell site to develop future cell site expenditures. This method may be a good approximation of what Union Cellular paid in the past, but violates TELRIC principals by not taking into account today's pricing as required in the FCC Code of Federal Regulations.[2]

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[2] FCC 47 CFR Ibid., Sec. 51.505 (d)(1)

Q. ARE COSTS FOR OTHER WIRELESS SERVICES EXCLUDED FROM UNION CELLULAR'S MODEL?

A. In the development of interconnection costs, Union Cellular has not provided data to show that switching and cell site components used to provide Union Cellular's wireless subscribers with additional vertical services (that are not related to transport and termination costs) have been excluded from the switching and cell site costs in their model. It appears that the switch costs include other offerings such as text messaging service, General Packet Radio Service (GPRS) data services, voice mail and custom calling services.

Q. WHAT ARE THE DPU'S OTHER CONCERNS WITH THE INPUTS TO UNION CELLULAR'S COST MODEL?

A. Union Cellular has included investments for switch and cell site costs that not only cover current demand, as required in the HAI TELRIC model, but also cover total projected future demand, which is inconsistent with TELRIC requirements. TELRIC pricing methodology should only cover current demand plus a percentage of growth as defined in the Utah Public Service Commission Report and Order in Docket No. 01-049-85 issued May 5, 2003, page 16. Placement of future cell tower locations based on future demand is speculative and should not be included in a TELRIC cost model.

To account for growth, the HAI model does include an appropriate fill factor that sizes facilities covering current demand with a margin to account for short term growth and operating efficiency. Growth in the proposed Union Cellular cost model could be accommodated in the same manner. The DPU recommends a fill factor reflecting a growth rate of 10 percent as is used in the HAI model.

Q. DOES UNION CELLULAR'S COST MODEL INCLUDE THE OPTION FOR THE SHARING OF FACILITIES?

A. Union Cellular's cost model has not considered the effect of sharing facilities in its network with its other operations and with other carriers. However, the HAI model does include structure sharing factors that simulate the effect of sharing pole lines, conduit and trenches with other utilities. Union Cellular has stated that it shares equipment and antenna space at some of its cell sites with its own interoffice facilities. Additionally, Union Cellular also currently shares space at some sites with other carriers as shown in their data request response DPU DR 2-010. This sharing has not been accounted for in their cost model. To be TELRIC compliant, Union Cellular's model must utilize a structure sharing factor. Union Cellular may own most of its cell sites, but structure capacity sharing provides revenues to help offset its capital investment. Since revenues are not used in TELRIC models, an investment offset, such as a sharing factor, would be a correct way to model facility sharing.

Q. IF CELL TOWERS ARE DETERMINED TO BE NON-TRAFFIC SENSITIVE WILL THE OPTION FOR THE SHARING OF FACILITIES BE REQUIRED?

A. No, since for purposes of this model, structure sharing only concerns the sharing of cell site towers and buildings, not poles or conduits.

Q. ARE TRANSPORT COSTS DEVELOPED IN THE UNION CELLULAR COST MODEL USING TELRIC METHODOLOGY?

A. Union Cellular's cost model appears to use tariffed retail costs to arrive at "annual assumed microwave costs" for transport. Mr. Hendricks, on behalf of Union Cellular, does not say how he arrives at the cost per "T-1 worth of capacity." The Union Cellular cost model does not include any local switch or tandem switch cost data, signaling data or network data in its determination of transport costs.

In comparison, the methodology used in the HAI model, develops the transport costs by building the facility and switch investment from CCS (cent call seconds, or hundred call seconds) busy hour data, trunk port investment, fraction of direct routed interoffice traffic, fraction of tandem routed intra and inter LATA traffic and other traffic fractions such as inter-tandem and host-remote facilities.

Q. IN SUMMARY, DOES THE DPU BELIEVE THAT UNION CELLULAR'S COST MODEL ACCURATELY PRODUCES TELRIC PRICING AS

DEFINED BY THE FCC AND THE UTAH PUBLIC SERVICE COMMISSION?

A. No. The DPU is concerned with the exclusion of numerous elements of a TELRIC model from Union Cellular's cost model.. The following five issues are problematic:

1. Union Cellular's cost model uses embedded costs to model switch and cell site expenditures
2. Union Cellular has not shown that its switch and transport costs contained in its proposed cost model do not also include equipment that is specifically used for the provision of other retail offerings unrelated to interconnection.
3. Union Cellular's switch and cell site investment is not modeled for current demand only.
4. The model does not allow for the sharing of equipment and structure space at its cell sites.
5. The transport costs appear to be tariffed or retail rates.

IV. TRAFFIC SENSITIVITY

Q. HAS THE DPU REVIEWED UNION CELLULAR'S COST MODEL TO DETERMINE IF IT MEETS THE FCC'S TRAFFIC-SENSITIVE ADDITIONAL COST STANDARD?

A. Yes. In an attempt to better understand the functions of the elements included in Union Cellular's cost model, the DPU conducted an investigative field trip to [redacted], Wyoming, on April 10, 2007, visiting two of Union Cellular's BTS (Base Transceiver Station) sites and visiting its GSM switch and BSC (Base Station Controller) collocated with Union Telephone's local/tandem switch. The purpose was to observe the switching equipment and cellular radio equipment that Union Cellular is modeling, and also to determine what components or elements of Union Cellular's network should be considered to be sufficiently usage sensitive to be consistent with the FCC's traffic-sensitive additional cost standard.[3]

Q. WHAT DOES THE DPU BELIEVE THE CRITERIA IS FOR AN EQUIPMENT COMPONENT OR STRUCTURE COMPONENT TO BE CONSIDERED "TRAFFIC SENSITIVE?"

A. In the context of communications facilities, traffic sensitive or usage sensitive means that as usage or traffic increases there is a requirement for more expenditure in physical facilities to maintain a set degree of service quality without undue blocking of usage. Conversely, non traffic sensitive cost is defined as the cost unrelated to call volume but related to the number of subscribers seeking access. Facilities are put in place to accommodate a period of forecasted growth in usage that will provide an acceptable standard of service. Traditionally,

[3] Order, 18 FCC Rcd 18441 (Sept. 3, 2003)

the facility that is most dependent on usage or traffic has been those equipment components in the telephone network that are shared among all users and not dedicated to specific users.

An example of this in a landline network is a cable and pair assignment of copper wire on a distribution cable being NTS (non traffic sensitive) because it is a dedicated facility to a subscriber. Conversely, a subscriber carrier system is TS (traffic sensitive) because it shares the same facility copper pairs or fibers among many subscribers.

Q. ARE COSTS TO PROVIDE COVERAGE IN A CALLING AREA CONSIDERED TRAFFIC SENSITIVE?

A. No. Mobile networks require a minimum of facilities that is not driven by the volume of calls that terminate or originate in their area.[4] These facilities are required to operate the network whether there is external incoming traffic or not. The coverage costs for subscribers to access the network therefore are not recovered through termination charges.

Q. HOW DOES "GROWTH JOB" FREQUENCY INDICATE THE LEVEL OF TRAFFIC SENSITIVITY OF A CLASS OF PLANT?

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[4] Kim, Moon-Soo, *The Criteria, Procedure, and Classification of Traffic-Sensitive and Non-Traffic-Sensitive Components: A Case of CDMA Mobile System*, ETRI Journal, Vol. 28, No.6, Dec., 2006.

A. The degree of traffic sensitivity can vary depending on the time frame being considered. A building that houses a central office switch, for example, can be considered strongly non-traffic sensitive when it exhausts equipment space after 50 years and a new building addition is required. On the other hand, radio equipment is designed to be expanded as access and traffic increase. What is needed, therefore, is a reasonable time frame to help determine the degree of traffic sensitivity. In my experience, the normal growth job interval for central office equipment is two years. This two-year time frame appears to be a reasonable interval to help judge the degree of traffic sensitivity of cellular components.

Q. WHAT CRITERIA HAS BEEN DEVELOPED TO DETERMINE THE DEGREE OF TRAFFIC SENSITIVITY OF CELLULAR COMPONENTS?

A. Three criteria[5] have been developed to determine the degree of traffic sensitivity of CDMA (**C**ode **D**ivision **M**ultiple **A**ccess) mobile system components:

- Function type – Mobile system components are classified into six functions:

1. Network access	NTS
2. Transmission	Mixed
3. Switching	TS
4. Signaling	TS
5. Powering	NTS

[5] Kim, Moon-Soo, Ibid.

6. OAM Mixed

Network access and powering are considered strongly NTS while signaling and switching are considered strongly TS. Transmission and OAM are somewhere in between.

- Investment requirement – Mobile system components can be classified according to whether additional investment is due to:

1. Usage TS
2. Coverage NTS

If the facility additions are required for coverage they would be strongly NTS. If they are required for usage they would be strongly TS.

- Main exhaust driver – Mobile system components can be classified according to what element is driving its exhaust. These elements consist of:

1. Minutes of Use (MOU) TS
2. Busy hour call attempts (BHCA) TS
3. Cell sites/sectors NTS
4. Facility exhaust Mixed
5. Number of managed facilities Mixed
6. Modernization NTS

MOU and BHCA are strongly TS because they are directly related to traffic or usage. The call management facilities that monitor and control the traffic are TS. The service cell or sector element, however, is strongly NTS since it provides users in the service use area with mobility guarantee and always-on access. Facility exhaust because of aging belongs in the mixed area of traffic sensitivity because some components are related to traffic management.

When components are considered to be mixed TS, where some of their functions are considered TS and some are not TS, the most accurate way to provide TS costs would be to separate what the sub-components that are TS cost and provide that data. Another method would be to apply an estimate or a weighted percentage of traffic sensitivity in the cost model as suggested by the supplemental surrebuttal testimony of Jason Hendricks where he describes a "Traffic Sensitive Factor" input.[6]

Q. WHAT COMPONANTS OF UNION CELLULAR'S NETWORK DID THE DPU EXAMINE TO DETERMINE THEIR DEGREE OF TRAFFIC SENSITIVITY?

A. The DPU first considered the cell towers, equipment and buildings at the base transceiver stations (BTS) sites which would be comparable in functionality to the loop facilities in a land line network. As described earlier in my summary, the BTS site generally has one cell tower and concrete pad, a building for radio and power equipment, a building for emergency generator housing, fencing for security, and a propane tank for fuel storage. The facilities mounted on the cell tower consist of a microwave radio antenna for a backhaul facility link back to the switch, three sets of cell antennas for three sector cell coverage, and coaxial

[6] Supplemental Surrebuttal Testimony of Jason P. Hendricks, Docket No. 04-049-145, Before the Public Service Commission of the State of Utah, August 11, 2006, lines 113-123.

cables to the building which houses the radio equipment. This building normally houses power plant equipment and batteries, a cabinet for cellular radio equipment, and rack mounted digital microwave equipment for the facility link back to the switch. If the facility back to the switch is fiber or copper the rack would contain fiber termination equipment or circuit equipment. The second building houses a propane-powered emergency generator as a backup for loss of commercial power. See again DPU Exhibit 1.3.

Cell Tower, Building Structure and Power Equipment

Cell tower sites are constructed for access to capture new subscribers to the cellular network and those roaming in the immediate area. They are located for maximum possible exposure and sized to accommodate radio equipment that can be grown to fill equipment space that is designed to last an economic building period which is the same as its depreciation life. In Union Cellular's case it should be [redacted] years. A normal growth job time frame for BTS (base transceiver station) buildings and towers may be more like twenty to thirty years which corresponds more closely to their economic or useful lives. With this time frame for growth expenditures the buildings and towers at the BTS appear to be strongly NTS.

The DPU disagrees with Union Cellular's witness, Henry Jacobsen when he testified that "TELRIC rules dictate that if facilities are TS, then the supporting structures are also considered to be TS."[7] The DPU has found no TELRIC rule that indicates supporting structures, including land, building, and towers, are TS because some of the equipment they house or connect with is TS. The DPU therefore believes that the cell tower, building structure and the land on which they are located are strongly NTS because they are designed to not require growth additions in the near future based solely on traffic considerations. Again, their primary purpose or function is to be there for Union Cellular's customers to have *access* to the cellular network.

The power equipment associated with BTS sites, including emergency back up generators, is engineered for the life for the facility and is therefore strongly NTS.

Cellular Radio Frequency (RF) Unit

The radio antennas and cables attached to the cell towers are primarily there for access and coverage and their exhaust is driven by cell site/sector limitations and they are therefore strongly NTS. However, the radio equipment located in the cell site building can be grown to accommodate increased traffic. The DPU therefore believes that the radio equipment is strongly TS.

Backhaul Facilities

In Union Cellular's case backhaul facilities are mostly microwave radio and some fiber optic cable. These facilities are required because of usage and exhaust based on MOUs. The backhaul microwave radio equipment and circuit equipment or

[7] Testimony of Henry D. Jacobsen, Docket No. 04-049-145, Before the Public Service Commission of the State of Utah, March 15, 2007, lines 147-148.

fiber termination equipment can be upgraded to increase capacity. The associated microwave antennas are NTS. In the case of fiber facilities, the fiber itself and any related conduit structure is strongly NTS. The DPU believes that the radio/fiber termination equipment portions of the backhaul facilities are TS.

The DPU then considered the cellular equipment located at the switching or central office location.

Base Station Controller (BSC)

The BSC controls one or multiple cell sites' radio signals, thus reducing the load on the switch and performs radio signal management functions for base transceiver stations, managing functions such as frequency assignment and handoff. The BSC is there for access and required for coverage but its exhaust is based on BHCA data. The BSC can grow through the addition of shared ports similar to ports on the GSM switch. The DPU concludes that the BSC is classified as mixed traffic sensitivity consistent with previously cited authority.[8] Although there is a proposal of adding another BSC in late 2007, the DPU believes this growth is to accommodate broader geographical coverage and not increased traffic.

GSM Switch Components

The GSM switch in Union Cellular's network provides processing and switching functions and some operations and maintenance (OAM) functions. The GSM

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[8] Kim, Moon-Soo, op. cit., page 783

switch is required for usage and its exhaust driver is mostly BHCA data. The switch shares line ports among subscribers and more ports are required with increased traffic. The port capacity can be increased with growth jobs prior to exhaust. The DPU believes that the GSM switch processor should be considered non TS, mixed TS in its OAM functions and TS in its port functions.

Home Location Register (HLR) and Visiting Location Register (VLR)

The HLR is a central database that contains details of each mobile telephone subscriber that is authorized to use the GSM core network. It acts as a server for signal processing and OAM functions. The VLR is a database that temporarily holds profiles of roaming users. The DPU believes that the HLR equipment is strongly TS in its signaling functions but mixed TS in its transmission and OAM functions. Overall these two databases are required to originate and deliver arriving mobile calls and their memory can be expanded through growth jobs.

Transport Facilities

Transport Facilities, as defined here, are those facilities that carry traffic between Qwest and Union Cellular. The transport rates that Union Cellular charges Qwest for transporting traffic originating outside of Union Cellular's territory should be based on the cost of the same TS equipment as discussed above in backhaul facilities whether it be a microwave radio or fiber medium. The DPU believes that the radio/fiber termination equipment portions of the transport facilities are strongly TS.

Q. DID THE DPU ATTEMPT TO VERIFY ITS CONCLUSIONS ABOUT THE TRAFFIC SENSITIVITY OF CELLULAR RADIO COMPONENTS?

A. In DPU Data Request 4.4 the DPU asked for evidence of growth jobs since 2003, (when the GSM switch was installed), until September, 2007. The data that was received in answer to the request showed no evidence of growth jobs for switch ports, HLR/VLR memory expansion, cellular radios at BTS sites, or backhaul microwave. There was evidence of a BSC upgrade in 2005. This lack of growth data evidence over the past four years would lead one to believe that all cellular equipment components at Union Cellular are not TS. Certainly, a case for traffic sensitivity due to frequent growth augmentations can not be made from the information received from Union Cellular.

There is not much published analysis on traffic sensitivity of cellular components. Therefore, the DPU has conducted its own analysis and compared it to the work of Moon-Soo Kim, (as referenced earlier), to reach its conclusions and recommendations.

The following table is a summary of Union Cellular's network components the DPU considered and which the DPU recommends as being either TS or NTS.

Component	DPU Recommendation
Cell Tower, Building, Power Equipment	NTS
Cellular Radio Antennas and cables	NTS
Radio/Fiber Termination Equipment	TS
BSC (Processor)	NTS
BSC (Ports)	TS
GSM Switch (Processor)	NTS
GSM Switch (Ports)	TS
HLR/VLR	TS
Backhaul Transport Facilities (Termination Equipment)	TS
Backhaul Transport Fiber/Conduit	NTS

V. UNION CELLULAR'S MODEL

Q. ARE THERE OTHER CONCERNS THAT THE DPU HAS WITH UNION CELLULAR'S COST MODEL.

A. Yes. Union Cellular's model calculates the transport and termination costs by summing the present worth of each year's return on rate base and yearly expense costs over the economic life [redacted] of the switch and dividing it by the total of present values of the minutes of use over the same period. This calculation appears to be invalid for the following reasons.

1. Minutes do not inherently decrease over time and should not be associated with present value factors that calculate the time value of money. A minute today is a minute ten years from now. The way Union Cellular uses present value on MOU would mean that a minute today changes to 24 seconds ten years from now.

2. If one looks at it mathematically simplified, when present value factors are applied to the cost as well as the MOUs, both the numerator and the denominator are multiplied by the same number and those numbers appear to cancel out. The Cost/MOU fraction looks like this:

$$\frac{\cancel{PVF}}{\cancel{PVF}} \times \frac{Cost}{MOU}$$

where PVF is the present value factor, Cost is the termination or transport costs and MOU are the termination or transport minutes of use. The present value factors don't actually cancel out since this is the summation of a series of factors divided by a summation of a series of factors. The point is that the cost/MOU for each year should only be multiplied by the PVF and not divided by it at all. Otherwise, the use of present value factors in this model becomes almost meaningless.

In summary, the present value factor should only apply to the numerator which is the cost part of the fraction. At the bottom of the Summary Tab, Mr. Hendricks shows a proof of the rates derived from the model. When he calculates the revenues using the derived termination and transport rates he also applies the present worth factor to these revenues. This is invalid when he has already applied the present worth factors in the derivation of these rates. When the present worth factors are removed from both the MOU and the revenue requirement calculations, the proof will stand.

3. The MOU should grow over time, not decrease. Union Cellular has assumed a total growth over the [redacted] years of [redacted] percent and applied it in the first year. When the PVF is applied to MOUs it appears to decrease the MOU value over time. The DPU believes that removing the initial projection of total growth rate applied in the first year, and applying yearly growth rates adjusted for the compounding effect to both the termination and transport MOUs over time, gives us a better representation of the MOU growth.

Q. DOES MIXING THE DEPRECIATION RATES FOR BUILDINGS, TOWERS, CIRCUIT AND SWITCHING EQUIPMENT IN UNION CELLULAR'S COST MODEL PRESENT A PROBLEM?

A. Yes. To properly calculate the return on rate base, equipment and facilities should be separated by economic life and handled separately in computing depreciation before combining and applying present worth factors.

Q. CAN THE TRAFFIC SENSITIVITY FACTORS IN UNION CELLULAR'S COST MODEL BE USED EFFECTIVELY TO APPROXIMATE THE TRAFFIC SENSITIVE PORTION OF EQUIPMENT OR FACILITIES THAT IS CONSIDERED TO BE MIXED SENSITIVITY?

A. Perhaps. If components that are mixed traffic sensitivity can be quantified by their traffic sensitive parts, a percentage could be applied to the total cost to provide an estimate for traffic sensitivity. The DPU has no way to sort out the cost of equipment it believes is TS which is included in Union Cellular's total equipment costs. Union Cellular must allocate those costs accordingly from their cost data before a percentage TS or actual TS cost can accurately be determined.

Q. DID THE DPU ADJUST THE UNION CELLULAR MODEL TO APPLY REVISIONS THAT THE DPU CONSIDERS CRITICAL?

A. Yes. But no assumptions were made considering percentage of TS because of the inaccessibility of data regarding the breakdown of costs into the components that the DPU considers traffic sensitive. The DPU did not adjust the combined depreciation rates that Union Cellular used in its model. The Land and Building facilities, which have longer lives than the equipment, were not considered by the DPU as being traffic sensitive and therefore, would not affect the results. The [redacted] year life used for radio and switching equipment are considered an acceptable approximation.

The following adjustments were made in the DPU analysis:

1. The present value calculations were changed to apply the present value factor only to the costs and not to MOUs.
2. The number of cell sites or base transceiver stations (BSC) was limited to [redacted] to consider only present costs.

3. Union Cellular's termination and transport growth rate of [redacted] percent was applied to the termination and transport MOU figures yearly and adjusted for the compounding effect.
4. In lieu of using an actual cost breakdown between TS and non-TS components, the DPU used TS factors to look at the range of transport and termination costs per MOU derived by using 100 percent TS for both switch and cell site costs and zero percent TS for both switch and cell site costs using the DPU modified model. The cost per MOU for termination and transport ranged from just over [redacted] per minute where all costs are TS, which is Union Cellular's position, to less than [redacted] where all costs are NTS, which is much closer to Qwest's position.

From the data presented by Union Cellular, 58 percent of the cell site cost is attributed to equipment and, not knowing how the equipment is broken down by radios, antennas, power, etc, a reasonable DPU estimate, based on my experience, would be 15 to 20 percent of the equipment cost is TS. This TS equipment would include cellular radios, backhaul microwave radio termination equipment or fiber termination equipment. It would *exclude* antennas and power equipment such as power plant, batteries, emergency engine and propane fuel storage equipment. The DPU estimates that 17 percent of the cost of the equipment at the cell site will be TS, and therefore a TS factor for cell sites would be 10 percent of total cell site costs (17 percent of 59 percent).

The TS factor for switching equipment is broadly estimated to be 50 percent based on the non-TS of the processors in the GSM switch, base station controllers and HLR/VLR data units and allowing for the fact that the switching ports or "spigots" in both the switch and BSC are shared with all customers and considered TS. A copy of the DPU revised model using the traffic sensitive factors for switch and cell site facilities mentioned above is shown in DPU Exhibit 1.4.

VI. RESPONSE TO QWEST TESTIMONY

Q. HAVE YOU REVIEWED THE TESTIMONY OF QWEST WITNESS PETER COPELAND?

A. Yes.

Q. WHAT COMMENTS OR OBSERVATIONS DO YOU HAVE ABOUT THE METHODOLOGY HE USED IN HIS ANALYSIS OF UNION CELLULAR'S MODEL?

A. Peter Copeland approached the determination of traffic sensitivity in Union Cellular's model a little differently than the DPU. He looked more at capacity issues at Union Cellular than at actual theoretical TS of individual components. He questioned whether any of the installed capacity ever exhausts over the study period. This is a valid question, and I attempted to determine the answer for a similar condition when I asked Union Cellular for evidence of growth jobs in the cellular network since the GSM switch was installed in 2003.

Q. HOW DO YOUR RECOMMENDATIONS COMPARE TO THOSE OF MR. COPELAND?

A. Although we approached the analysis differently, the end results were very similar.

Q. WHAT AREAS OF AGREEMENT DOES YOUR ANALYSIS HAVE WITH THE TESTIMONY OF PETER COPELAND?

A. We both concurred that, of the components of the BTS, the radios would be considered traffic sensitive. The DPU also considered the backhaul radio equipment as traffic sensitive.

In the switch analysis, we both determined that there are components in the switch that can be considered traffic sensitive. The DPU determined that the ports or "spigots" on the switch and BSC were traffic sensitive and the HLR/VLR were traffic sensitive. Mr. Copeland determined that the trunk ports were the only equipment on the switch that was traffic sensitive.

Q. WHAT AREAS OF DISAGREEMENT DOES YOUR ANALYSIS HAVE WITH THE TESTIMONY OF PETER COPELAND?

A. The DPU determined that the treatment of the minutes of use (MOU) with the present value factors was inappropriate, while Mr. Copeland was not concerned with Union Cellular's discounting of MOU projections.

VII. CONCLUSION

Q. HAVING REVIEWED UNION CELLULAR'S COST MODEL, QWEST'S POST SURREBUTTAL TESTIMONY AND CONDUCTED YOUR OWN EXTENSIVE INVESTIGATION AND REVIEW, WHAT DOES THE DPU RECOMMEND?

A. The DPU does not see a compelling public interest or Company reason for the Commission to approve asymmetric transport and termination charges based on Union Cellular's present cost model. There are flaws as outlined above that need to be corrected in the model before it can be considered to represent a TELRIC cost model using only traffic sensitive additional costs. The DPU believes that some TS additional costs exist, (as shown in Table 1), but cannot separate those costs into TS factor percentages to determine their significance for calculating termination and transport rates that are much different than rates already in effect. And once again, Union Cellular must move away from using embedded costs to model switching and cell site costs and incorporate those costs that are consistent with what a least-cost, most-efficient, forward-looking cellular network would be.

Q. DOES THIS COMPLETE YOUR TESTIMONY?

A. Yes it does. Thank you.

04-049-145 Qwest-Union

Members

To: Anderson, Paul
To: Assay, Bruce
To: Coleman, Casey
To: Dethlefs, Thomas
To: Ginsberg, Michael
To: Mecham, Stephen
To: Monson, Greg
To: Oman, Erle
To: Schmid, Patricia
To: Scholl, Laura
To: Thompson, Melissa
To: White, Constance
To: Woody, James

VIII. DPU EXHIBITS

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DPU Exhibit 1.4	DPU Revised Cost Model	38

Exhibit 1.1 – Qualifications

- Bachelor of Science, Engineering Degree, University of Utah, 1971

- Extensive BELLCORE TECHNICAL training in the telecommunications industry.

- NARTE Certified Engineer (National Association of Radio and Telecommunications Engineers) while employed at US WEST.

- Over 30 years experience in the telecommunication industry. Extensive background in facility and switch planning, designed SONET/digital transmission systems for interoffice facilities, developed and analyzed long range incremental cost studies, facilitated and developed local loop integrated planning.

- Instrumental in the development and direction of fiber based Broadband strategies, and the establishment of survivability and diversity for the US WEST switch and facility network. Over 7 years experience engineering and constructing backbone fiber rings for MCI using Sonet self-healing fiber optic ring design. Scheduled and managed construction jobs, obtained permits and worked with customers and contractors on site surveys for building entrance and riser cable designs.

- Monitored and initiated modernization strategies for US West's interoffice facility and switch network for Utah, Idaho and Montana. Provided Company direction for orderly economic network evolution; includes making recommendations to high level managers.

- Translated customer needs to technical requirements and analyzed future emerging technologies and network elements.

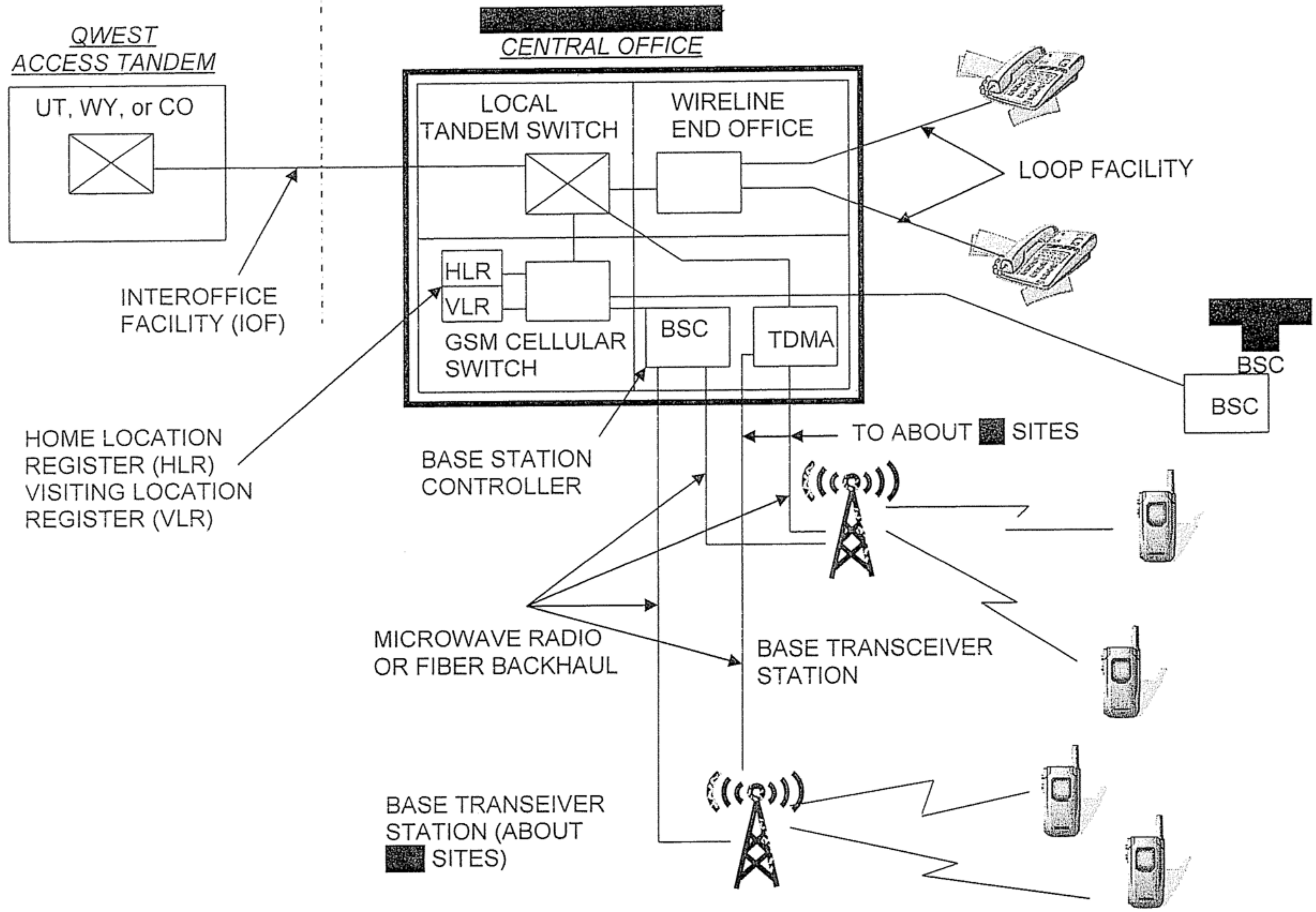
- Prepared, and tracked capital and expense operating budget for facility and switch projects through approval, co-ordination and completion of the project.

- Planned and engineered local access feeder and distribution cable facilities for Utah. Planned and engineered structure reinforcements such as underground conduit and pole line facilities. Analyzed feeder routes to allocate cable pairs to distribution points. Conducted plant rehabilitation studies to determine areas to be upgraded. Developed construction budget ($20M).

- Received the following recognition and awards: (1) *Network Stars Award for Contributions to Excellence*, N&TS, 1990, (2) *Volunteer of the Year Award*, Salt Lake City School District, 1992, (3) *On-The-Spot Award*, LATA Network Planning, 1992 and (4) *Award of Excellence*, Brooks Fiber Communications, 1997.

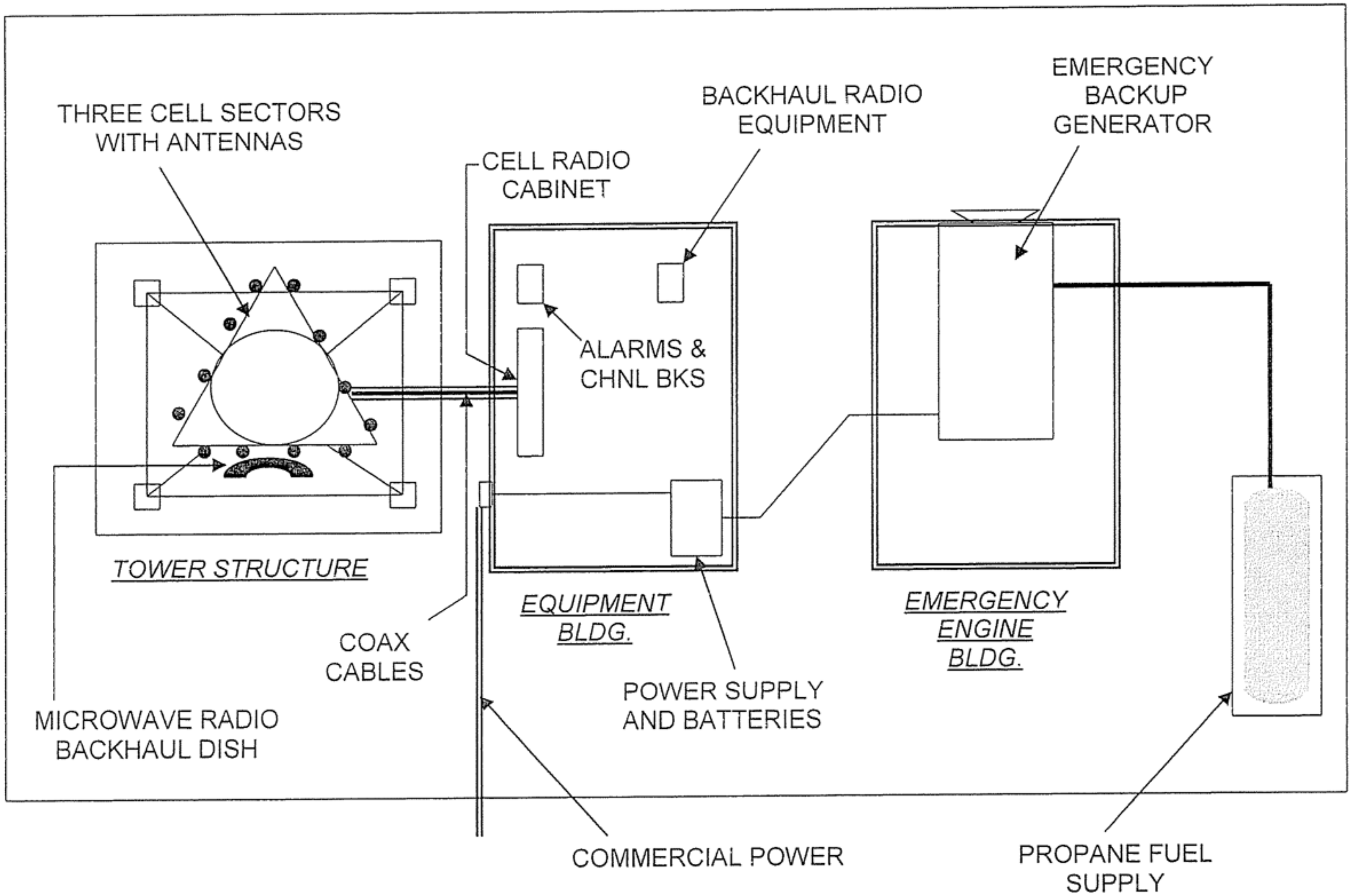
DPU EXHIBIT 1.2

UNION CELLULAR'S NETWORK



DPU EXHIBIT 1.3

TYPICAL BASE TRANSCEIVER STATION (BTS)



DOCKEY 04-049-145

ANDERSON
PREFILED REBUTTAL TESTIMONY
FOR THE DIVISION OF PUBLIC UTILITIES

DPU EXHIBIT 1.4

NON-CONFIDENTIAL

CONFIDNETIAL VERSION IS SUBJECT TO THE APPLICABLE PROTECTIVE ORDER

10/12/2007