Direct testimony
of
Dick Buckley

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF SOUTH DAKOTA

IN THE MATTER OF DETERMINING PRICES FOR UNBUNDLED NETWORK ELEMENTS (UNEs) IN QWEST CORPORATION'S STATEMENT OF GENERALLY AVAILABLE TERMS (SGAT)	)))))	**DOCKET NO. TC01-098**

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SOUTH DAKOTA PUBLIC UTILITIES COMMISSION

DIRECT TESTIMONY OF

DICK BUCKLEY

QWEST CORPORATION

OCTOBER 15, 2002

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TABLE OF CONTENTS

EXECUTIVE SUMMARY

My name is Dick Buckley and I am employed by Qwest Corporation as a Staff Advocate in Policy and Law. In my testimony, I describe the Loop Module (LoopMod) of Qwest's Integrated Cost Model (ICM). The purpose of LoopMod is to produce the investment for a subscriber loop and drop wire that can be used as a basis for developing costs for pricing decisions.

LoopMod is specifically designed to comply with the FCC's requirement of pricing based on total element long-run incremental cost (TELRIC). It develops investment by calculating what it would cost an efficient carrier to replace and operate the loop network today using currently available, forward-looking and efficient technology. Consistent with TELRIC, LoopMod uses the basic geographical design of the existing network and outside plant technology that meets industry-accepted network guidelines. The model is open and user-friendly, meaning it allows the user the ability to access and change numerous key inputs to the model. Over the last several years, the model has gone through extensive internal and external reviews. These reviews led to multiple modifications, including, for example, changes in the modeling of feeder plant and a new approach that permits identifying distribution investments on a more specific basis. Qwest has also disaggregated several inputs to the model, including inputs relating to drop lengths and the different methods for placing outside plant. In addition to these modifications, Qwest has routinely updated LoopMod to include current prices, changes in technology, recent line count data, and other information. The network-related principles that the model follows are:

1. The model assumes the use of efficient, forward-looking technology that is currently commercially available.
2. Demand and sizing are based on the current total quantity of loop customers. The total network approach provides economies that would not exist in a model that reflects only near-term demand and construction.
3. Consistent with the TELRIC goal of estimating the costs of building a replacement network, the methods LoopMod uses to place outside plant are selected based on conditions in the existing environments, with buildings, roads, and other structures assumed to remain in place.
4. In accordance with the FCC's pricing rules, plant utilization levels are based on best case, reasonable projections of the actual use of plant.

Based on these criteria, the model uses copper cables in certain areas because that design is the least-cost solution for building basic voice grade circuits. The model also utilizes integrated TR-303 Digital Loop Carrier where that technology is appropriate. Cables and systems are sized to accommodate the universe of demand (total potential unbundled loops), and there is recognition that to install cables, a new entrant or an incumbent local exchange carrier (ILEC) rebuilding the network will require several different types of placing methods.

Using these guidelines, the model complies with appropriate standards for engineering design and service quality and produces a level of investment that is appropriate for use in estimating the costs that should underlie the pricing of the unbundled loop. Therefore, LoopMod follows TELRIC principles and produces reliable results that should be relied upon for setting prices in South Dakota.

I. INTRODUCTION

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Dick Buckley. I am employed by Qwest Corporation as a Staff Advocate in Policy and Law. My business address is 1801 California St. #2040, Denver, Colorado.

Q. PLEASE DESCRIBE YOUR EDUCATION BACKGROUND AND EMPLOYMENT EXPERIENCE.

A. In 1978, I received a B.S. in Business Administration with an emphasis in Finance from the University of Northern Colorado. I joined Qwest (Mountain Bell) in 1980 in the Cost Rates and Regulatory Matters (CRRM) department as a Cost Analyst in the area of data and supplemental terminal products. In 1983, I assumed responsibility for non-recurring costing and for implementing the dual element non-recurring cost structure. In 1986, I moved into cost analysis of the local loop and assisted in the development of the Regional Loop Cost Analysis Program (RLCAP) and the current Qwest loop program, LoopMod. My present responsibilities include local loop cost modeling and analysis, as well as providing subject matter expert support on local loop costing in regulatory proceedings.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. The purpose of my testimony is to describe the Loop module (LoopMod) of Qwest's Integrated Cost model (ICM) and explain the modifications and updates to LoopMod that are included in the Version 2.1 release of LoopMod, the version Qwest is using in this docket. I also discuss the support and reasons for the input assumptions in LoopMod.

II. GENERAL

Q. PLEASE PROVIDE A GENERAL DESCRIPTION OF THE LOOPMOD MODULE.

A. LoopMod is an investment development program designed by Qwest. The purpose of LoopMod is to produce the investment for a subscriber loop and a drop wire that can be used to develop cost-based loop rates. The model is specifically designed to comply with the FCC's requirement of pricing based on total element long-run incremental cost (TELRIC). It develops investment by calculating what it would cost to replace and operate the loop network today using currently available, forward-looking, efficient technology. Consistent with TELRIC, LoopMod uses the basic geographical design of the existing network and outside plant technology that complies with the Qwest network guidelines. The model is open and user-friendly, meaning it allows the user the ability to access and change numerous key inputs to the model. Over the last several years, the model has gone through extensive internal and external reviews. These reviews led to multiple modifications, including, for example, changes in the modeling of feeder plant and a new approach that permits identifying distribution investments on a more specific basis. Qwest has also disaggregated several inputs to the model, including inputs relating to drop lengths and the different methods for placing outside plant. In addition to these modifications, Qwest has routinely updated LoopMod to include current prices, changes in technology, recent line count data, and other information. The network-related principles that underlie the model remain the same. The model still follows these network-related criteria:

1. The model assumes the use of efficient, forward-looking technology that is currently commercially available.
2. Demand and sizing are based on the current total quantity of loop customers. The total network approach provides economies that would not exist in a model that reflects only near-term demand and construction.
3. Consistent with the TELRIC goal of estimating the costs of building a replacement network, the methods LoopMod uses to place outside plant are selected based on conditions in the existing environments, with buildings, roads, and other structures assumed to remain in place.
4. In accordance with the FCC's pricing rules, plant utilization levels are based on best case, reasonable projections of the actual use of plant.

Q. PLEASE EXPLAIN FURTHER HOW LOOPMOD CALCULATES INVESTMENT.

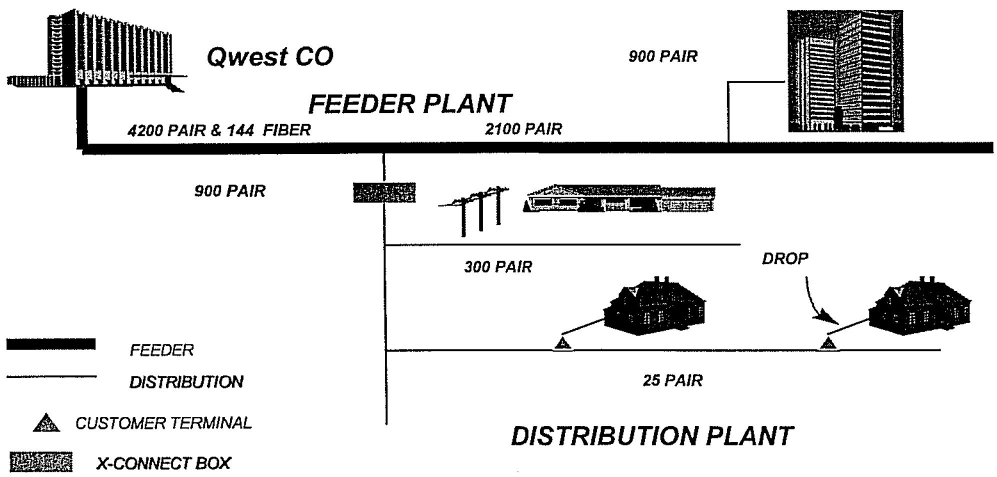
A. LoopMod calculates the investments for loops and drop wires based on standard engineering loop designs, vendor prices, and vendor placement cost estimates. These investments include the costs associated with the materials, construction, and engineering that are required to build loop plant from the central office to a subscriber. The investment amounts that the model uses are based primarily on data specific to South Dakota. For example, the quantity of lines in service, the prices charged by contractors for outside plant construction activities, and the distribution area data are unique to South Dakota. After LoopMod calculates the investment, the Integrated Cost Model (ICM) converts the results to monthly costs that can be used to set cost-based rates for the unbundled loop.

Q. WHAT ARE SOME OF THE KEY ASSUMPTIONS RELATING TO LOOPMOD'S NETWORK DESIGN?

A. The two key cost drivers in the network design that LoopMod uses to develop South Dakota-specific loop plant investment are: (1) distance and (2) population density. Feeder investments are affected directly by the distance from a serving central office (CO) to an end user. Longer distances require the placement of more feeder plant than shorter distances. Population density affects the type of outside plant and placement methods that can be used and also influences the selection of the distribution design for an area. The density of a Distribution Area (DA) is a function of the size of the serving area and the number of customers within the area. Higher density provides for greater economies of scale. For example, in feeder, higher density allows for the use of larger cables, while in distribution, higher density results in shorter cabling. Distance and density would be the primary cost drivers for a carrier building a replacement network, which is why LoopMod's emphasis on these factors in developing investment is appropriate and consistent with TELRIC.

Q. HOW DOES LOOPMOD SEGMENT THE DESIGN OF THE LOOP NETWORK?

A. Loop design is divided into two sections: feeder cable and distribution cable.



As shown in the diagram, feeder is the main facility leaving the central office. Feeder is typically a large copper cable or a fiber facility. If the facility is fiber, it is used to connect electronics at the central office with electronics at a location on the feeder route. Feeder cables are often placed within conduit and they are designed with periodic reinforcement in mind. Distribution plant consists of smaller cables that connect to the feeder plant at a Serving Area Interface (SAI) or cross-connect box. As the name implies, these cables distribute pairs from the feeder plant to the customer locations. In a majority of cases, distribution cables are buried in the ground through one of a few methods that can be used to bury cable. A small percentage of distribution cables are placed through the use of aerial plant, although the use of aerial plant has generally been declining in recent years. In addition to the SAI and the cables, distribution plant includes pedestals or customer terminals, drop or service wires and network interfaces. The terminals serve as a connection point between the distribution cables and the drop wire. The drop wire is the piece of distribution plant that runs directly to a customer's premises. The network interface device (NID) provides the connection between the drop and the inside wiring at a customer's premises.

Q. HOW DOES LOOPMOD DETERMINE AN APPROPRIATE FEEDER DESIGN?

A. The model employs a mix of copper and fiber facilities based on user-selected breakpoints. The breakpoints determine the distances at which the model transitions between technologies and placement assumptions. Each route in each wire center is analyzed to determine the amount of demand and the distance of demand from the serving central office. This approach in LoopMod is an enhancement from the average wire center group feeder designs used in earlier Qwest loop models. This route-specific information is used in conjunction with the breakpoint between copper and fiber to size the required electronics and cable facility. The design inputs determine the distances at which outside plant will be placed in underground conduit systems or, alternatively, buried in trenches. Underground conduit systems are the preferred method of placing feeder cable in higher density areas because they allow easier access for reinforcements. The model allows the user to differentiate between the costs for urban-buried placement and rural-buried placement. Feeder that is buried in urban areas typically is placed in the model through the use of the trenching methods that are appropriate for more densely populated areas (*e.g.*, cut and restore), while the model uses a greater degree of lower cost plowing techniques to place rural-buried feeder. After the feeder plant is calculated for each route, the model determines the quantity for each equipment type, the length by cable demand (fibers or pairs), and the placement method. Once all plant requirements are determined, the model applies the cable sizing factors to the demand to select cables with sufficient capacity to the serve the demand. The model then develops investments for the total feeder plant and divides the total investment by the working lines to determine an investment amount per line.

Q. HOW DOES THE MODEL DETERMINE DISTRIBUTION INVESTMENTS?

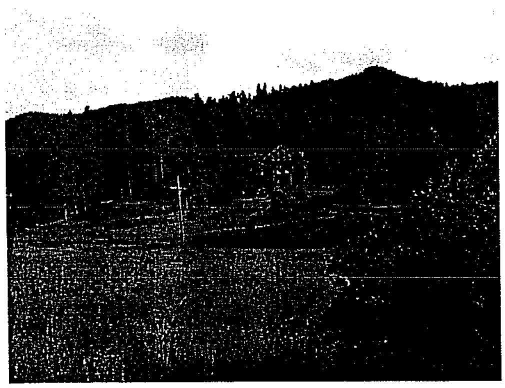
A. LoopMod uses distribution plant profiles that are based on the Qwest Network distribution architectures, which are industry-accepted architectures. The guidelines for these architectures conform to the industry "serving area concept" design. The distribution area is a concise geographic area. It has a single interface point, and it typically serves 200 to 600 locations. The distribution cabling is a single gauge and is free of multiple assignments. The primary pairs are permanently assigned to a location and are cut off beyond the assignment point. LoopMod incorporates five distribution designs or density groups.

Density Group 1

Density Group 2

Density Group 3

Density Group 4



Density Group 5

These designs represent: (1) high rise buildings, (2) multi-building / multi-tenant scenarios, (3) single family with standard lot sizes, (4) single family with larger lots and (5) rural serving areas. Each individual South Dakota Distribution Area (DA) is mapped to one of the Density Group (DG) designs based on the size of the DA (area in square miles), the number of customer locations and information relating to the size and type of terminals included in the DA. The rules for mapping the DAs are:

1. All DAs are placed in DG3 as the default starting point.
2. If over 50% of the lines in the DA are in building terminals then the DA is set equal to a DG2.
3. If item 2 is true and the pairs per terminal are greater than 200 then the DA is set equal to a DG1.
4. If the density of a DA is less than 2,000 homes per square mile then the DA is set equal to a DG3.
5. If the density of a DA is less than 640 homes per square mile then the DA is set equal to a DG4.
6. If the density of a DA is less than 50 homes per square mile then the DA is set equal to a DG5.

The area information is also used to adjust the cable length data for the distribution designs that are lot-size oriented (DG3, DG4 and DG5). The adjusted distribution designs reflect, therefore, the unique density of each South Dakota DA. After the model processes each DA, it weights the DA investments together based on their proportionate share of total working lines. By using this weighting, the actual South Dakota-specific occurrence of distribution designs is reflected in the loop investments. The investments for the distribution plant are added to the feeder investments to determine the total outside plant investments. To arrive at the total investment for an unbundled loop, ICM also adds investments associated with outside plant terminations on the main distribution frame (MDF) at the central office and the land and buildings associated with the digital circuit equipment.

Q. WHAT ARE THE KEY INPUTS ASSOCIATED WITH THE MODEL?

A. There are numerous inputs that have an impact on the final investment developed by LoopMod, but three of the key cost drivers are:

- Cable placing activities;
- Structure sharing percentages; and
- Plant mix.

These inputs are discussed in detail later in my testimony. To some extent, these inputs are inter-related. It is essential, therefore, to be consistent in the assumptions underlying each of the inputs. In addition, the assumptions must reflect the reality of what costs a carrier would face if it were replacing the South Dakota telephone network in the world as it exists today - with buildings, houses, roads, and other structures still in place. A goal of TELRIC is to develop prices that replicate the prices that would exist in a competitive environment.[1] In a real-world competitive market, a carrier would be required to build a network by navigating the natural and man-made obstacles that are in the environment.

Q. HAS QWEST ATTEMPTED TO VALIDATE THE COST ESTIMATES THAT LOOPMOD PRODUCES?

A. Yes. The LoopMod inputs and results have been compared to various other studies of local loop investment in an effort to determine if they are within a range of reasonableness. The comparative investments are summarized below:

	Investment
Qwest TELRIC[2]	$1,350
LoopMod - Loop only	$1,271
BCPM Uncapped Loop Investments	$1,842
BCPM Capped Loop Investments	$1,366
HM 5.0a with modified inputs - Loop only	$1,344

This data provides evidence that Qwest's cost studies produce reasonable estimates of the average investment for a local loop. The HAI data has been developed using the HAI Model 5.0a with the model's default inputs revised to more closely reflect the Qwest default inputs utilized in the LoopMod program.

Q. HOW DOES THE CURRENT VERSION OF LOOPMOD DIFFER FROM THE EARLIER VERSIONS OF THE QWEST LOOP INVESTMENT PROGRAM?

A. The model includes changes such as simple updates of data (such as material prices, loop quantities), mechanical adjustments (sharing percentages, placement activities by Density Group), and changes to make the model more user friendly. These changes are discussed in detail later in my testimony. The most notable adjustments are listed below:

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[1] *See Implementation of the Local Competition Provisions in the Telecommunications Act of 1996*, First Report and Order, 11 FCC Rcd 15499, 15846 ¶ 679 (1996)

[2] This investment includes MDF in addition to the loop facilities.

- Updated user screens;
- Increased ability to vary inputs;
- User-adjustable sharing percentages;
- Updated investments and contract placement costs;
- Route-specific feeder modeling;
- State-specific distribution design weightings;
- Distribution designs adjusted to each DA;
- Buried placement cost by Density Group and Feeder location; and
- LoopMod controlled through the Integrated Cost Model.

III. PLACEMENT COSTS

Q. WHAT ARE CABLE PLACEMENT COSTS?

A. Cable placement costs are the costs of placing cable in the ground or on poles. These costs, along with the costs of splicing and other labor-related activities, are the single largest component of outside plant costs. On average, more than 60% of Qwest's total investment in buried cable is related to the cost of placing the cable.

Q. WHAT TYPES OF WORK ACTIVITIES ARE INVOLVED IN CABLE PLACEMENT?

A. Consistent with efficient engineering practices, LoopMod includes four methods for placing buried cable: trenching, plowing, boring, and cut & restore. Trenching involves digging a trench, placing the cable directly into the trench and back-filling the trench. The plowing method places cable by directly plowing it into the ground without digging a trench. Boring involves the use of equipment that literally bores through the ground and pulls the cable back through the opening in situations where, for example, cable must pass underneath a road, a sidewalk, or a yard. The advantage of directional boring is that it avoids the costs and disruption that arise from tearing up roads, sidewalks, yards, and other structures. Cut & restore involves placing cable by digging up roads, yards, and other surfaces and then restoring those surfaces after the cable has been placed.

In addition, LoopMod includes subcategories that further differentiate these activities. For trenching, LoopMod identifies different costs for trench & backfill, rocky trench and hand dig. For plowing, LoopMod includes different costs for standard plowing, rocky plowing and plowing with hydro/broadcast seed restoration. The cut & restore category has different costs for concrete, asphalt, and sod.

Q. WHAT DETERMINES WHICH TYPE OF PLACEMENT ACTIVITY WILL BE USED WHEN BUILDING OUTSIDE PLANT FACILITIES?

A. The primary determinant is typically density. For instance, if buried cable is being placed in a low-density area, along a county road with few obstacles, it is very likely that the construction crew can plow the cable. In a new subdivision, before curbs, gutters and landscaping are placed, trenching machines can be used for standard trench and backfill placement. When the density increases (e.g. a mature suburban neighborhood), placement activities such as boring avoid damaging streets, sidewalks and landscaping. If boring is not used, then cut & restore techniques must be used to repair areas disturbed during the trench work.

Q. HOW DOES LOOPMOD DEVELOP BURIED CABLE PLACEMENT COSTS?

A. LoopMod V2.1 first identifies the costs for the various activities that are involved in placing buried cables. The activity costs contained in the program are taken from the current network contracts with vendors who perform placement of buried plant in South Dakota. The model then develops an average cost for placing based on a user adjustable mix of the placing activities. To allow the model to reflect the impact that density has on the placement costs, each of the categories of buried plant (Density Group 1 (DG1), DG2, DG3, DG4, DG5, Feeder-Urban and Feeder-Rural) has its own placement activity matrix. This lets the user determine the percentage of trenching, boring, cut & restore asphalt, etc. that is reasonable for the associated density. The default values in LoopMod Version 2.1 are attached as Exhibit RJB-3 to my testimony.

Q. DID QWEST MAKE CERTAIN ASSUMPTIONS WHEN IT DERIVED THE PLACEMENT COSTS USED IN THE LOOPMOD MODEL?

A. Yes, Qwest assumed that the model should reflect the cost of:

1. extending service to all of its current South Dakota customers; and
2. using the type of cable placing techniques that an outside plant engineer would use to build a replacement network in South Dakota.

As the first assumption suggests, the model is designed to determine the forward-looking costs of all loops, not just those placed in any given year.

Q. HOW DO THESE ASSUMPTIONS AFFECT CABLE PLACEMENT COSTS?

A. In developing the forward-looking cost of a telecommunications network designed to serve all customers, the model must recognize the world as it currently exists. The model includes all the current lines in service so as to recognize the economies of scale that would be achieved by a single service provider. The model also uses the latest technologies and includes the efficiencies those technologies provide. The model also recognizes the methods required to place the new technologies and the need to size facilities in a way that makes economic sense. With respect to cable placement, most of the houses in Qwest's South Dakota service territory are in neighborhoods that are already developed and that have streets, driveways, fences, sprinkler systems and landscaping. A carrier that wishes to replace or build a new network to serve these households would need to negotiate around, through, or under these obstacles to place its cable facilities. This would require the use of special construction techniques, such as cut & restore asphalt or concrete, boring, cut & restore sod, and hand trenching. These techniques increase the cost of placing the cable. The Qwest TELRIC model was designed to reflect these realities of placing cable in developed neighborhoods. On the other hand, the model also includes the use of low cost placement, such as cable plowing, where the density allows the use of those methods. The plowing method of cable placement is used for 39.6% of the buried distribution cable distance (31.9% of the overall distribution cable distance).

Q. WOULD A FORWARD-LOOKING MODEL PRODUCE COSTS THAT ARE GREATER THAN THE HISTORICAL COSTS?

A. Not usually. The forward-looking cost of building facilities often will include some economies that were not available when a carrier originally built a network. For example, in a forward-looking network, the feeder routes are designed to meet the total current demand, plus a reasonable amount of growth. In contrast, from a historical perspective, feeder was placed to meet demand for up to five years, after which it had to be reinforced.

A forward-looking model, such as LoopMod, will not reflect these reinforcement costs, because the feeder can be sized to meet all current demand, plus reasonable growth. Similarly, the outside plant network design in the model reflects the optimal use of the latest electronic circuit equipment. This equipment often is less expensive than equipment that Qwest used in the past and has greater capabilities than some of the equipment currently in use in the Qwest network.

Despite these potential cost reductions, the forward-looking costs of a network contain some costs higher than historical costs, because labor is generally more expensive today than it was historically, as reflected on the company's books. Moreover, copper cable prices are commodity-driven rather than technology driven. In other words, the prices of cables are more likely to change based on the commodity cost of copper rather than technological changes in the cable itself. This is in contrast to the cost decreases or feature enhancements that technological innovations have brought to the computer (or network switching) industry. LoopMod attempts to reflect both the economies and diseconomies that would occur if the network were rebuilt. Inconsistent treatment of these various economies and diseconomies would lead to erroneous results.

Q. HOW ARE THESE ECONOMIES AND DISECONOMIES REFLECTED IN THE LOOPMOD?

A. The economies and diseconomies are reflected primarily through the treatment of four variables:

1. Loop lengths;
2. Feeder design;
3. Technology; and
4. Placement costs.

The purpose of the model will determine how it treats these variables. The variables will differ between a model used for an embedded analysis of the network and one that is used to determine the costs for a replacement network. For example, if a model is used to estimate the cost of adding new lines to the network, the loop lengths will be longer than those of the existing lines since growth tends to occur on the undeveloped outskirts of the service area. Most of the areas in close proximity to the central offices have been developed. Similarly, feeder routes are frequently reinforced as new lines are added to the network. A model designed to estimate the cost of adding new customers to the network would reflect the economies of building primarily in the undeveloped areas but would also include the higher costs associated with longer loops and feeder cables sized to serve only the new lines.

Conversely, a model designed to estimate the total cost of rebuilding the network, such as a TELRIC model, would have different characteristics. LoopMod contains the economies of the latest technologies and cables sized to serve the total demand. It also includes the universe of loop lengths, not just those being placed for the lines being added to the network. To maintain consistency of assumptions, though, LoopMod recognizes that placement costs will be different in mature, developed areas than in new growth areas.

The four variables above must be treated in a manner that is internally consistent in order for a cost model to produce meaningful results. For example, one cannot assume the cost to install plant in a new, undeveloped area while including the loop lengths for the existing customers in fully developed areas.

Q. HOW DOES FEEDER DESIGN DIFFER BETWEEN NEW CONSTRUCTION AND A COST MODEL THAT ASSUMES A TOTAL REBUILD OF THE NETWORK?

A. Feeder routes are frequently reinforced to meet growing demand. These reinforcements are designed to allow for approximately two to three years of additional growth. A new network would be built to account for all lines at once. Feeder routes could be designed and constructed once, eliminating the periodic reinforcement costs that occur in the existing network. Building one feeder system to serve all customers optimizes the economies of scale that can be achieved, reducing the cost per customer. LoopMod includes these economies in the feeder cable designs.

Q. HOW WOULD PLACEMENT COSTS VARY BETWEEN NEW CONSTRUCTION IN AN EXISTING NETWORK AND A COMPLETE REPLACEMENT OF THE NETWORK?

A. New "growth" distribution areas typically occur in undeveloped areas. In these areas, there are no roads, no sprinkler systems, no sidewalks, no landscaping, no fences, and, typically, no yards. As a result, placement of plant in these areas is less costly, and there is more opportunity to share structures. In existing developed areas, all these obstacles must be negotiated around or under or replaced when the construction is completed. Obviously, this significantly increases the costs of placing cable. LoopMod includes a percentage of aerial plant that is based on the amount of aerial plant that exists in the Qwest network today. The use of this amount of aerial plant is a conservative cost assumption since, as a percentage of total cable sheath mileage, the use of aerial plant is on the decline. This decline is due to both aesthetics concerns and the higher maintenance costs associated with aerial plant. Because aerial plant is more exposed to the elements than other types of plant, it is more susceptible to damage and wear and tear and therefore requires greater maintenance expenses. This is especially evident in events such as the April 2000 blizzard in western South Dakota, where over 1500 power poles were damaged or destroyed. If these higher maintenance expenses are properly accounted for in a cost model, they often result in aerial plant not being a least-cost approach, since the maintenance costs can outweigh the comparatively lower initial placement costs for this type of plant.

Q. WOULD A LARGE PERCENTAGE OF THE NETWORK REPLACEMENT CONSTRUCTION OCCUR IN NEW OR UNDEVELOPED AREAS?

A. The majority of the distribution construction would occur in developed areas if the network were completely replaced. However, the LoopMod default values conservatively reflect the amount of placing cost that LoopMod eliminates under the assumption that placement would occur in undeveloped or growth areas. This assumes that developers or other utilities will pay 20% of all placing costs for buried plant. Feeder plant placement would also be more likely to occur in developed areas in a network replacement. The percentage of lines that would be in undeveloped areas is dependent on the planning period and the growth rate assumed in the study and must be consistent with the other design assumptions.

Q. WHY ARE THE DIFFERENCES IN THE CHARACTERISTICS OF NEW LOOP CONSTRUCTION AND A REBUILD OF THE TOTAL NETWORK CRITICAL IN DETERMINING REASONABLE COSTS?

A. It is the interplay between all of these variables that determines the reasonableness of the cost estimates. If the assumptions are consistently applied, the resulting cost estimates will be reasonable. The loop lengths and feeder design assumptions in a cost model should reflect a rebuild of a total network to serve all Qwest customers in South Dakota. The cable placement costs must be consistent with these loop lengths and feeder design assumptions. In other words, if a study includes all of the customers with the associated shorter average loop lengths and the economies of larger cable sizes, then the study must include costs of placing plant in areas with streets, houses, and landscaping. The inputs must be consistent.

Q. HOW DOES LOOPMOD ACCOUNT FOR OBSTACLES ENCOUNTERED WHEN BUILDING FACILITIES IN DEVELOPED AREAS?

A. Qwest uses a combination of placement techniques to model the cost of building networks in developed areas. The ICM interface allows the user to vary these combinations as density changes. In rural areas, where less costly placement techniques such as plowing are often employed, the model allows the use of these methods.

Q. WHY IS PLOWING CABLE A LESS COSTLY PLACEMENT TECHNIQUE THAN OTHER PLACEMENT METHODS?

A. Plowing is less labor-intensive than normal trenching, since the plow opens the trench, lays the cable, and backfills the trench in one operation. Plowing is used where there are longer cable runs without obstacles.

Q. HOW DOES LOOPMOD CALCULATE PLACEMENT COSTS IN DEVELOPED URBAN AREAS?

A. In developed urban areas, LoopMod assumes the use of placing techniques, such as cut & restore sod, cut & restore concrete, cut & restore asphalt, boring, and hand digging. These activities reflect the placement difficulties that would exist in mature neighborhoods. The levels of the activities were derived through interviews with field engineers and confirmed through an analysis of Qwest's experience in the Omaha Broadband Trial discussed in some detail in Mr. Pappas's testimony. The technical trial in Omaha involved placement of a distribution network in mature neighborhoods. This provided real-world experience relating to what methods of placement activities would be required for a local exchange carrier to replace plant or a new entrant to build facilities in developed areas. In Omaha, the construction crews were forced to use directional boring to place over 65 percent of the new facilities in order to circumvent obstacles in mature areas. As the Omaha experience demonstrated, directional boring is appropriate when the cost of restoration, coupled with customer dissatisfaction due to property damage, outweighs the additional cost of using this placement technique. Qwest is not alone in employing this technique. Boring is a common method of placing cable in urban areas to avoid the high cost of restoration and the disruption that goes with it. Mr. Pappas provides further details of the Omaha project in his direct testimony.

Q. HAS QWEST GATHERED ANY OTHER INFORMATION THAT SUPPORTS THE ASSUMPTIONS REGARDING USE OF BORING TO PLACE CABLE IN DEVELOPED URBAN AREAS?

A. Yes. First, an article in the April 15, 1995 issue of America's Network (a periodical written for engineers and managers responsible for design, deployment, operation and maintenance of public network elements) estimated that in 1994, 25% of underground utility placement was done via trenchless methods. In addition, the article cited an AT&T project in Atlanta, Georgia in which Southern Boring, an AT&T subcontractor, placed 30,000 feet of underground cable using directional boring. The boring method was utilized because it avoided the "disruption and mess excavation would have caused." In discussing the Qwest (then U S WEST) Omaha broadband project, the article further stated that "directional boring may not completely replace other methods. Trenchers and vibratory plows also played a part in the Omaha project and will continue to do most of the work in ***unimproved areas free of utilities*** and where surface disturbance isn't a factor" (emphasis added). Second, representatives of Qwest conducted an interview of representatives of a cable television company in Bismarck, North Dakota. Their experience in conducting a rebuild of the outside plant provided insight and support for the mix of placement activities currently used in LoopMod. In the Bismarck rebuild, approximately 50% of the 220 miles of buried plant was placed using boring techniques. Third, over the last year and a half, I visited several sites where contractors for AT&T Broadband were upgrading and replacing cable plant. This work involved extensive use of hand-dig, missile, and directional boring techniques. In another example of the techniques that would be used in a replacement network, Qwest was required to place plant in two subdivisions in Arizona after the homes were built and landscaping was in. This was due to problems the developer experienced with the facilities-based CLEC who had initially built the distribution plant. The placement of Qwest's facilities required the use of directional boring, hand-digging and cut & restore sod. Directional boring allowed the construction crews to avoid damaging the existing power, CATV and telephony plant. Trenching and plowing would have entailed a far greater risk to that plant. An article in a recent construction trade magazine highlighted an Iowa firm that had completed projects for AT&T, McLeod, Qwest (then U S WEST) and other independent telecommunications companies. It stated that 60% of the underground work was done using directional boring. Finally, an article in the January 2001 issue of Utility Products Showcase stated that horizontal directional drilling plays a big role in telecommunications construction. The CEO of the North Carolina telecommunications construction firm highlighted in the article said that when placing facilities within cities, 50 percent or more of the work is done by directional boring.

Q. WHY SHOULD THIS COMMISSION ACCEPT THE PLACEMENT COSTS CONTAINED IN THE QWEST TELRIC MODEL?

A. The Commission should accept LoopMod's placement costs and selection of placement methods because:

- They are based on the costs that an efficient carrier would incur to place facilities; and
- They are consistent with the other assumptions used in the model.

Q. WOULD IT BE APPROPRIATE FOR THE COMMISSION TO USE A MODEL THAT REFLECTS ONLY THE CHARACTERISTICS OF NEW LOOPS AND DOES NOT RECOGNIZE THE HIGHER PLACEMENT COSTS ASSOCIATED WITH LAYING CABLE IN DEVELOPED NEIGHBORHOODS?

A. No. That approach would violate TELRIC principles, because it would address only the costs of new customers, not the costs for serving existing demand. In addition, a growth model that develops only the costs of adding lines to the existing network should generally produce higher loop costs than a total network or TELRIC model. The economies in a TELRIC model that are realized by serving the entire universe of loop customers do not exist for a growth model that focuses on a much smaller group of customers. It is clear that the costs calculated by a growth-only model do not represent the TELRIC costs for unbundled loops.

IV. SHARING

Q. WHAT IS MEANT BY THE TERM "SHARING" IN THE OUTSIDE PLANT ENVIRONMENT?

A. Sharing in this context refers to the sharing of cable placement costs among multiple utility companies. Structure includes poles for aerial cable, conduit systems for underground cable, and trench for buried cable. For instance, in South Dakota, Qwest owns poles on which the power company attaches some of its cables. In addition, Qwest attaches its cables to poles owned by the power company. Pole sharing agreements like these allow each company to avoid a portion of the costs of building pole structures and thereby reduce costs. In new subdivisions, where several facilities (cable television, telephone and power) are placed at the same time, there are times when it is possible to coordinate trenching activities and the placement of facilities among the different utility companies. Sharing is a viable tool in the limited circumstances where multiple providers are placing outside plant at the same time in the same area or where, in the case of poles, the structure is accessible at any time.

Q. IS STRUCTURE SHARING ALWAYS AN AVAILABLE OPTION?

A. No. For sharing to be feasible in placing buried cable, there must be a need for multiple providers to access a certain area at approximately the same time. In the TELRIC studies, the vast majority of the network is in areas that already have power and cable television. For those areas, a rebuild of the network will not involve sharing among multiple facility providers, since the other providers already have their facilities in place. The rebuilds in Omaha and Bismarck, mentioned earlier, yielded minimal trench sharing opportunities. In addition, there are certain placement techniques, such as plowing and boring, for which the placement of multiple cables simultaneously is not technically feasible or practical. While it is possible to plow in multiple cables at the same time this is usually done in long-haul applications with like facilities, not in distribution areas with cables for telephone, cable television, and power. The different facilities have varying slack requirements (excess cable needed to loop through terminals), which would make the use of a plow inefficient. Even pole lines have separation and clearance requirements that may preclude attachment to an existing structure.

Q. WHAT CHANGES DID QWEST MAKE TO THE LOOPMOD RELATING TO SHARING THE COSTS OF PLACING FACILITIES?

A. The ICM interface provides access to a structure sharing option that was added to LoopMod. This option gives the user the ability to specify the percentage sharing for aerial, underground, and buried. Within the buried environment, the sharing assumptions can be further refined to address each placement activity for Feeder-Urban, Feeder-Rural and distribution cable within Density Group 1, Density Group 2, Density Group 3, Density Group 4, and Density Group 5. The user can also adjust the amount of structure sharing for buried drops in Density Groups 3, 4, and 5.

Q. PLEASE SUMMARIZE THE SHARING INPUTS RECOMMENDED BY QWEST.

A. The summary below shows the percentage of the total cable plant placement costs that will be incurred by the telephone company based on the standard inputs. The costs that the telephone company does not bear because of the use of these percentages are assumed to be borne by other utility companies, such as power or cable television providers.

	Percent Incurred By Qwest
Aerial	50%
Underground	95%
Buried Feeder-Urban	80%
Buried Feeder-Rural	80%
Buried DG1	80%
Buried DG2	80%
Buried DG3	80%
Buried DG4	80%
Buried DG5	80%

The inputs that Qwest recommends assume that the opportunity to share will occur primarily in undeveloped areas where a developer will provide the trench at no cost to the company. In developed areas or areas where there is no developer, the company will bear the cost of trenching, and there will be little opportunity to share.

Q. IS IT APPROPRIATE TO ASSUME QWEST WOULD ALWAYS SHARE WITH OTHER TELECOMMUNICATIONS PROVIDERS?

A. No, assuming widespread structure sharing with other telecommunications providers is inconsistent with the other study assumptions. It is doubtful that any one company or any combination of companies will build a second ubiquitous telecommunications network. In fact, in many areas, it is doubtful that anyone will even build a land-based network. Despite this fact, AT&T has asked commissions in other jurisdictions to adopt a scenario in which, on average, three companies, including other telecommunications companies, would share the costs of placing the total network. AT&T's assumption is utterly unrealistic in the real world. Sharing with other telecommunications companies is at odds with the economies assumed in a TELRIC single provider network.

Q. TO WHAT EXTENT HAS QWEST ACTUALLY BEEN ABLE TO SHARE THE COSTS OF PLACING BURIED CABLE?

A. Based on data from Qwest's buried placement records, for the years 1998 to 2000, Qwest has been able to share trench for approximately 22.7% (6.4% in South Dakota) of the buried sheath footage placed. If one assumes that there are three utilities in the joint trench (with one third of the cost assigned to Qwest) the LoopMod input based on the South Dakota numbers would be 4.3% (1 -((1-.064)+(.064/3))). This compares to the 20% being utilized as the recommended input in the ICM. Qwest's actual experience reflects sharing in growth environments with new developments and, therefore, overstates the amount of sharing that reasonably can be expected in a TELRIC replacement rebuild of the entire network. The standard input of 20% used in LoopMod is a liberal estimate of the buried plant structure sharing that would occur in building a replacement network. Intervenors in other dockets have cited the " accelerated facilities based entry by CLECs"[3]

[3] HM5.2a_HIP.DOC, page 166

as justification for high levels of structure sharing. If the advent of additional facilities-based providers is interpreted as an opportunity to share trench in distribution plant, then there would need to be recognition of the adverse impact on the utilization of Qwest distribution facilities. As the provider of last resort, Qwest is obligated to build plant to every home. If a competitive entity is willing to share a trench in a subdivision, it must have an expectation of also selling services, which will reduce the use of Qwest distribution plant. Thus, if the assumption is made that Qwest's cost of placement will be lower because facilities based competitors will share the structure costs, it must also be assumed that there will be an offsetting increase in Qwest's costs due to decreased utilization levels in distribution cables.

V. PLANT MIX

Q. WHAT IS MEANT BY PLANT MIX?

A. Plant mix refers to the relative percentages of various facility supporting structures present in the loop outside plant. The supporting structures are poles, anchors, and guys for aerial cable, trench for direct buried cable, and conduit systems for underground cable. Conduit systems include the trench, the ducts, and the splicing chambers. Each structure has its own unique costs and appropriate application. Conduit systems are typically used in areas where there will be multiple cables and where access to those cables will be necessary in the future. Areas with high density, such as urban centers or the neighborhoods surrounding wire centers, are likely to have conduit systems rather than directly buried cables. Directly buried cables will be used in areas where it is likely that there will be a need for reinforcement. Examples of this are lower density feeder routes and distribution areas. Poles (aerial cable) were used throughout the network in the past, but are used much less frequently today. As I observed earlier, while aerial plant has a lower first cost for placement, it is subject to a higher incidence of maintenance problems due to its exposure to weather, rodents, and vandalism. Also, municipalities and homeowner groups are encouraging, and often requiring, the use of buried plant for aesthetic reasons.

Q. WHAT MIX IS UTILIZED IN THE QWEST LOOP STUDIES?

A. The LoopMod designs designate underground placement for all cable within certain distances of the central office. The distances vary by size of wire center. This reflects that density will decrease more rapidly in smaller wire centers than in larger wire centers. The distance breakpoints for underground to buried feeder cable are: Very Small wire centers - 1,000 feet, Small wire centers - 7,000 feet, Medium wire centers - 14,000 feet, and Large wire centers - 20,000 feet. Within the remaining plant mileage, LoopMod uses an aerial percentage input to split the cable between buried and aerial. The default input for aerial is 14%. Based on that input, if the model develops 1000 miles of buried copper cable beyond the underground breakpoint, 140 miles of that cable would be assumed to be aerial.

Q. WHAT SUPPORT DOES QWEST HAVE FOR THE DEFAULT AERIAL PERCENTAGE?

A. The aerial percentage is based on a Qwest-wide summary of cable sheath miles in service. The data is separated by type of placement (aerial, building, underground, buried and submarine) and by fiber versus copper. Data from an August 2001 report shows that aerial comprises 11.87% of the company-wide total sheath miles for aerial and buried cable. The comparable number for December 1996 was 14.5%, thus demonstrating that the use of aerial facilities is decreasing. For South Dakota, the August 2001 data shows that aerial cable was 4.26% of total cable sheath miles. While the change in the Qwest wide number from 1996 to 2001 is not dramatic , it still shows that the percentage of aerial cable is generally decreasing and that it is highly unlikely that a network rebuild would result in an increase in aerial plant.

VI. FILL FACTORS

Q. PLEASE BRIEFLY EXPLAIN WHAT FILL FACTORS ARE.

A. Fill factors, or utilization factors, are simply a relationship between the capacity of plant that will be provided or constructed and the amount of that plant that will be used. The feeder cable fill inputs to LoopMod are a maximum desired utilization at the point in time when the cable is placed. The cable or equipment selected will have the additional capacity associated with the fill or sizing factor as well as the additional capacity from selecting discrete cable and equipment sizes. For example, a location that has demand for 60 working pairs would select a 100 pair cable based on the following calculation. Demand (60 lines) divided by sizing factor (80%) equals 75 pair requirement. The next larger cable would be a 100 pair facility. The effective fill would actually be 60% (60 working lines divided by 100 available pairs). The methodology is the same with Digital Loop Carrier (DLC) equipment. The default sizing factor for both cable and DLC systems is 80%. The line cards for the DLC systems are sized using a 90% factor, as they can be more readily reinforced than cables and DLC systems.

Q. ARE DISTRIBUTION FILL FACTORS USED IN THE LOOPMOD PROGRAM?

A. LoopMod does not use fill factors in the standard distribution designs. The Qwest studies assume a certain network design, two pairs or three pairs for each living unit depending on where they are located (i.e., two pairs in rural and multi-family; three pairs in other areas). The distribution cable is sized to reflect this assumption. The program develops a total investment for each distribution area and then divides that by the number of working lines. Thus, the fill is implicit in the calculation. It is not an input. This approach is consistent with the practices of the engineers who design the company's network.

Q. COULD YOU REVISE THE DISTRIBUTION DESIGN IN THE MODEL IF YOU WANTED TO REFLECT A DIFFERENT LEVEL OF UTILIZATION THAN THAT CURRENTLY PRODUCED BY THE MODEL?

A. Although the ICM interface allows the user to size distribution facilities based on a desired fill, I would not recommend that approach to distribution design except for use in sensitivity tests. As I stated above, when engineers are designing distribution plant, they do not start with a desired fill. They work with a design criteria of X pairs per site. Cable is then sized based on the pairs per site, the number of homes passed and binder group integrity. The 25-pair binder groups of cable pairs are engineered to remain intact to facilitate splicing and branching of cable facilities. These binder groups are generally not broken up. The utilization levels are a result of the actual demand experienced in conjunction with the design. The levels are not an input to the process. By contrast, feeder plant is managed from a fill perspective. Feeder plant is designed to be reinforced periodically and is far more fungible or flexible in assignment. Distribution is designed to avoid reinforcement and is more geographically or customer specific.

Q. WOULD CHANGES IN THE FILL FACTOR USING THIS APPROACH SIGNIFICANTLY CHANGE THE COSTS PRODUCED BY THE MODEL?

A. No. Since the fill factor is only used to size cable, only the cost of that cable is affected. A 100 pair cable is not twice as expensive as a 50 pair cable. A 100 pair cable costs $1.34 per foot, only $0.36 more than the $0.98 cost of a 50 pair cable. Thus, increases in cable size do not have a one-for-one impact on the costs produced by a model.

Q. WHAT IS THE AVERAGE NUMBER OF ACCESS LINES IN USE PER RESIDENCE CURRENTLY IN SOUTH DAKOTA?

A. According to data from the Qwest Integrated Forecasting Tool (IFT), as of December 2001 there were 1.0891 working lines per residence. The additional 0.0891 lines per location are the result of situations where a customer requires a second, third or even fourth line. Thus, a three pair design allows the company to respond to demand for additional pairs, regardless of where the demand exists in a neighborhood, with a minimum of additional investment and without disruptive reinforcements. In addition to being economically efficient, building distribution plant in this fashion is consistent with the Qwest and the South Dakota Commission's goal to minimize held orders.

VII. CONCLUSION

Q. PLEASE SUMMARIZE YOUR TESTIMONY.

A. The loop module of the ICM program presented in this docket utilizes efficient network designs and data inputs based upon currently available technology. There are changes to input data (contractor placing, updated material prices), platform enhancements (user interfaces, increased access to variables) and program refinements (route specific feeder, state specific distribution weightings, disaggregated placing activities, disaggregated drop data). The model's underlying structure is based on valid engineering guidelines. The model develops a realistic estimate of the investment for an unbundled loop. It does this in a consistent fashion, recognizing the economies of forward-looking technologies and feeder cable sizing used in serving the universe of existing customer locations, while also including the placing costs that would be incurred in a rebuild of the existing network or would be faced by a new entrant. The model assumptions comply with the TELRIC guidelines concerning technology, access line demand and utilization levels. These inputs and assumptions are discussed in detail in Exhibit RJB-3 attached to this testimony. In addition, other program information (interface screens and help text) is discussed in my Exhibits RJB-1 and RJB-2.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes it does.

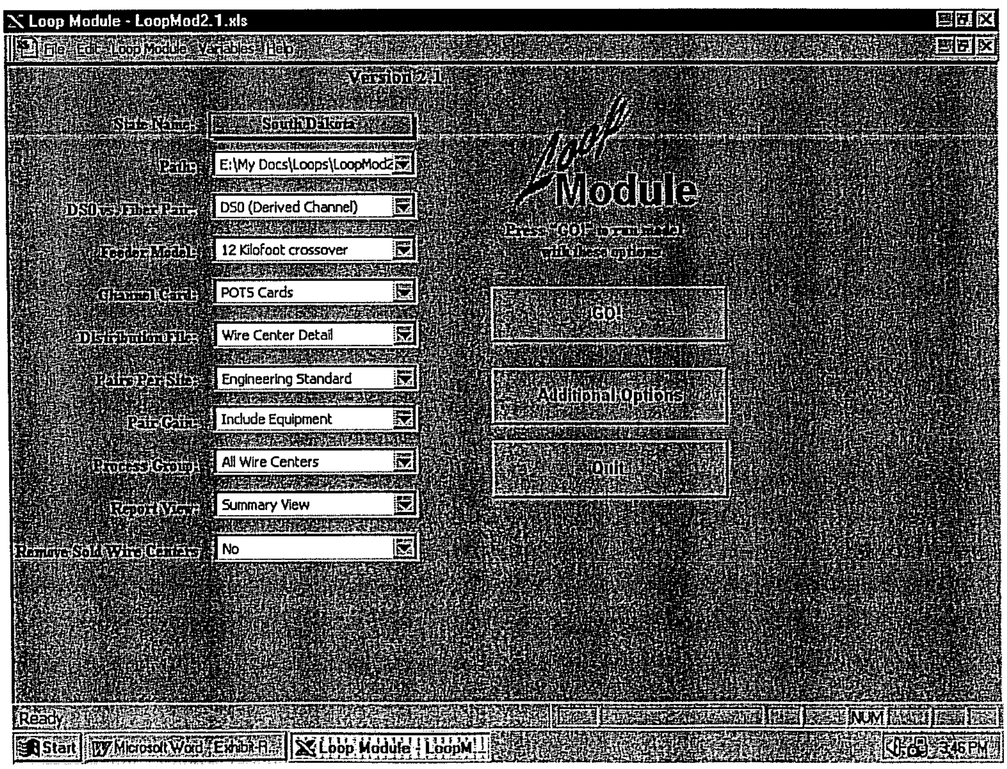
LoopMod Features Summary

The Loop Module (LoopMod) is the Qwest Corporation (formerly U S WEST) model that is designed to estimate the investments associated with the provision of the local loop and drop outside plant. The program uses Microsoft Excel spreadsheets that contain data on the designs and components of the network, the prices for those components and the labor necessary to install them. In addition there is data included as to the dispersion of customers utilizing these local loops.

The Qwest personal computer based loop costing programs were first developed in 1988 and have evolved over the years in order to reflect the current outside plant technologies and Qwest network guidelines. In addition to the normal updates that take place during the life of a model (prices, technology changes, line counts, etc.), LoopMod includes changes to the user interface that ease adjustments to the myriad of network inputs used by the model. Listed below are summaries of these changes and the rationale behind them.

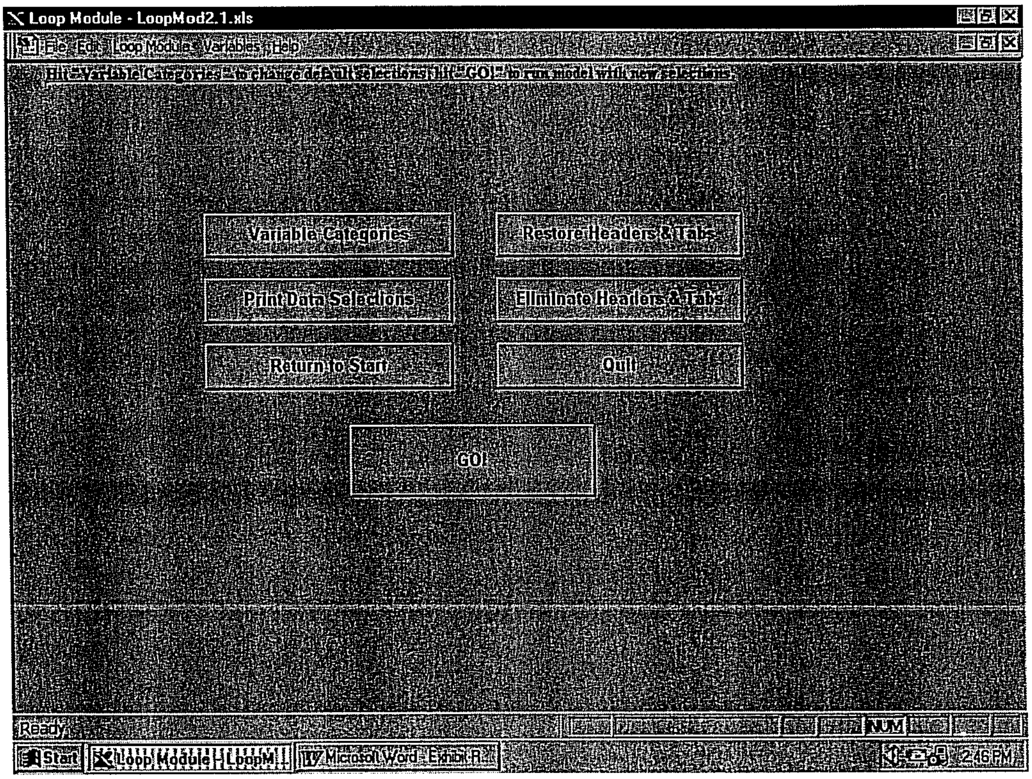
1. **Updated user screens.**
   Earlier versions of the loop programs required the user to "baby-sit" the program and hit a button at several points during the processing to reach a final result. These intermediate steps have been removed so that after the user makes the appropriate selections and starts the run, the program will process to completion. The Start screen or first screen that the user encounters contains all of the standard items that would be required for a typical loop and drop investment run. For most situations runs can be completed from this location in a matter of minutes. These selections are discussed detail in the attached "LoopMod V2.0 Default Values". Below are brief descriptions of each screen.

Start screen



Additional Options Screen

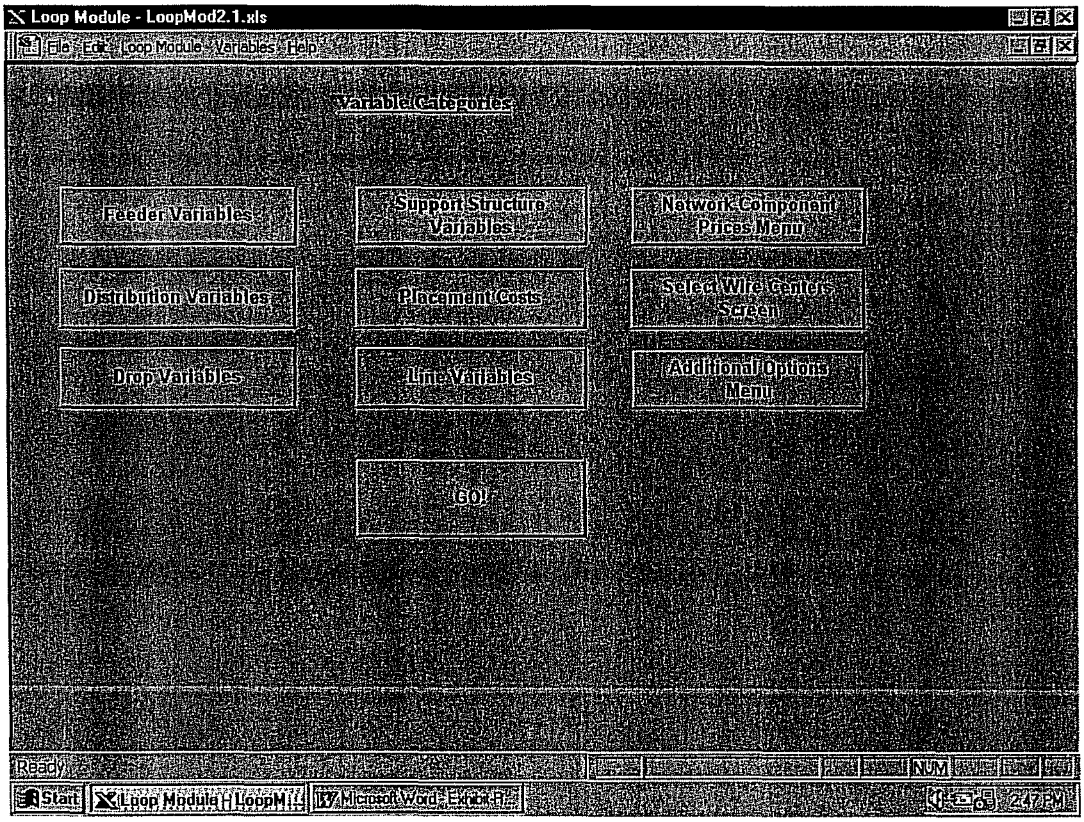
When a user wants to make more detailed adjustments, there is an "Additional Options" button that will take them to another screen. This screen contains options that allow the user to start the program processing, exit the program, return to the initial screen, restore or eliminate headers and tabs, print the data selections and select another screen for editing various inputs. This screen is used for making changes to default data included in standard runs.



After printing the data selections or making changes at the Variables Categories screen level the user can start the program processing from this location. If the "Return to Start" button is pressed a message box will come up with a warning that all non-default data will be overwritten. The user than has the option to cancel the return and run with the settings or continue with the return to start.

Variables Categories screen

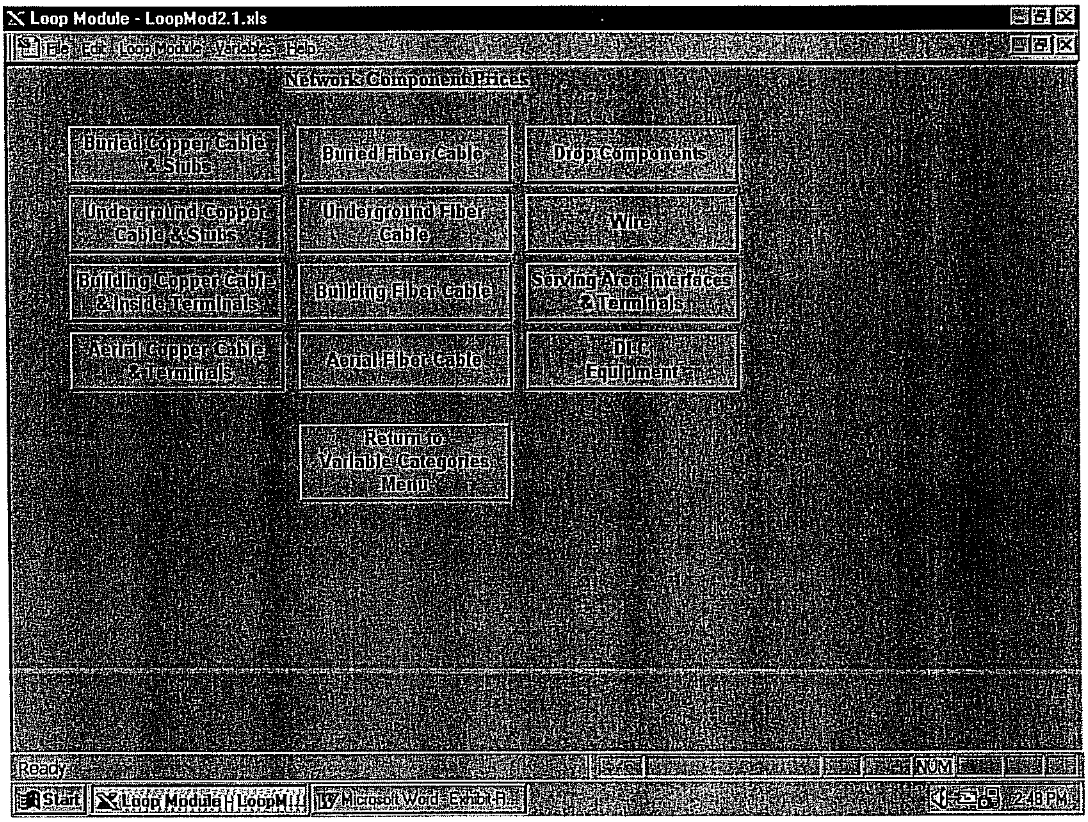
The Variables Categories screen is where the user will input the majority of the adjustments to the default settings. Input data such as cable and equipment prices, line counts, drop lengths, sharing percentages, and wire center lists are all accessible here.



Once the default inputs are adjusted to the levels desired by the user, the "GO" button can be pressed to run the program or the user can select the "Additional Options Menu" button to return to that screen.

Network Component Prices screen

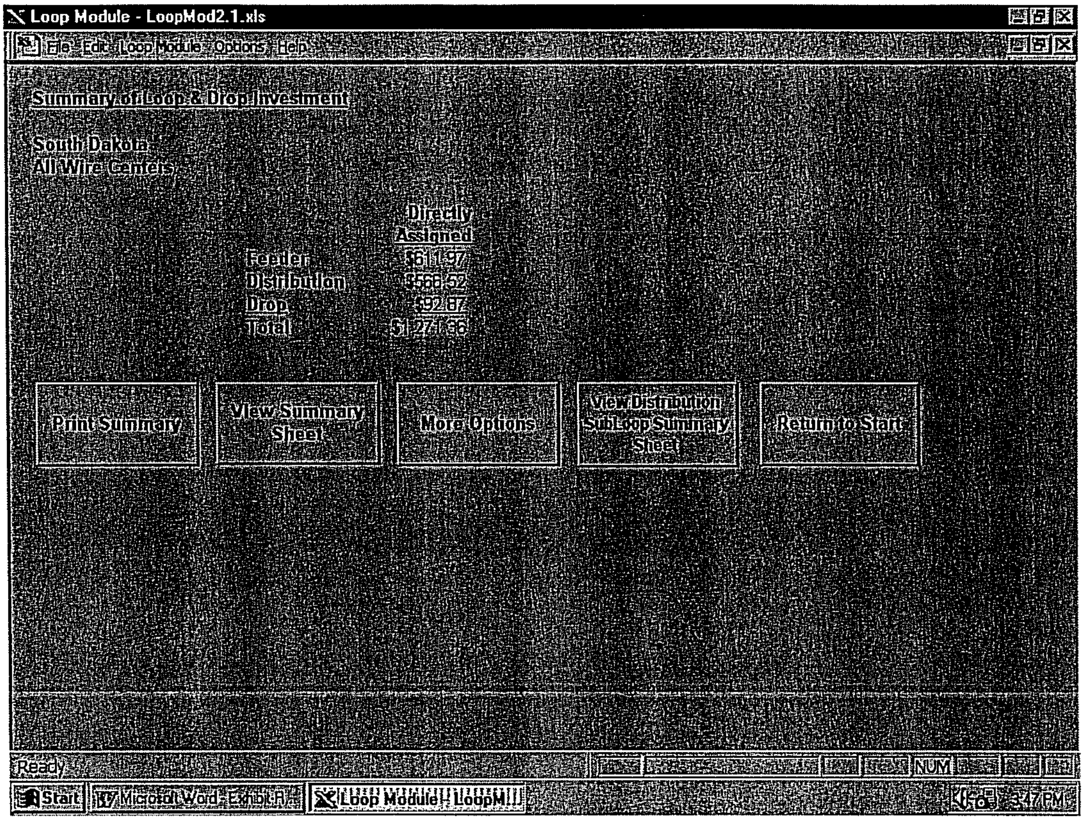
The Network Component screen is where the user will input the price adjustments to the default settings. Input data for cable and equipment prices are accessible through the various buttons on this screen.



Once the default inputs are adjusted to the levels desired by the user, the "Return to Variable Categories Menu" button would be pressed and the run could be initiated from that screen.

Results screen

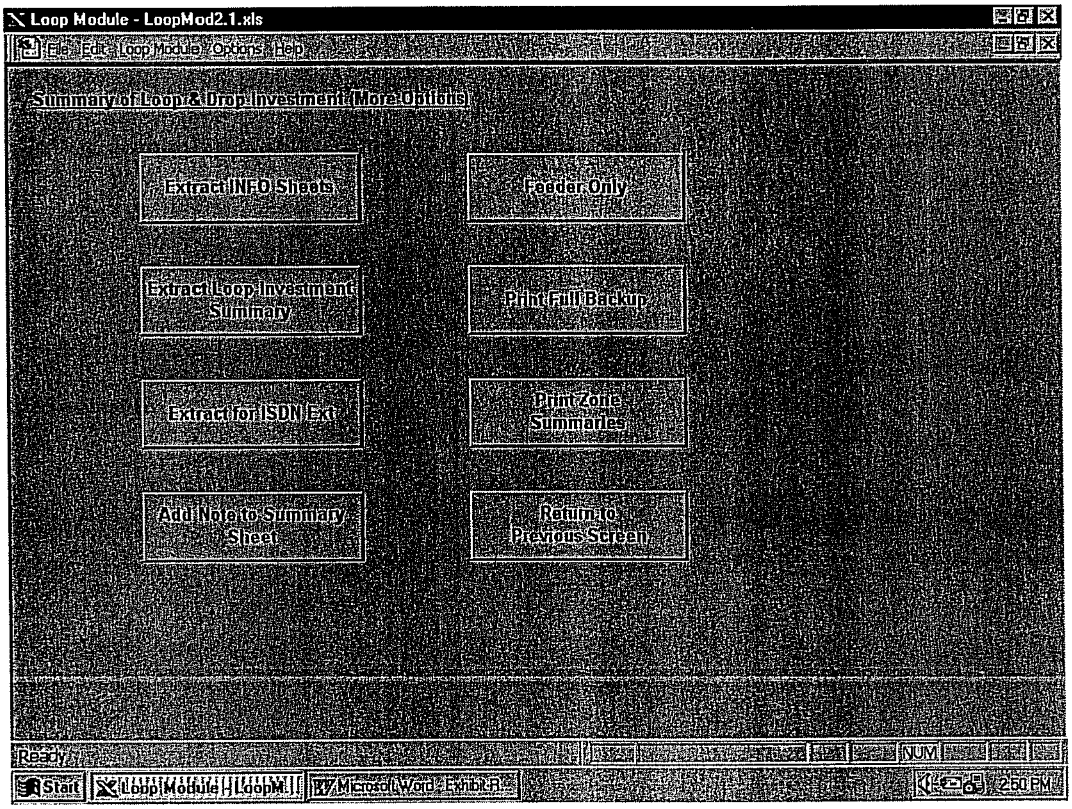
The results screen contains a summary of the loop and drop investments and buttons that enable the user to either view or print the more detailed investment summary sheet. It also contains the "More Options" button that takes the user to another screen with additional extract and printing options.



Once the user is done, the return to start button can be used to start the process over with a different set of selections.

More Options Screen

This screen contains various extract buttons to create files for retention of outputs or further analysis. There are also print buttons to backup or lower level results summaries. The "Add Note" button is useful in sensitivity tests for linking results with changes to inputs.



When the user is finished here "Previous Sheet" will return the user to the results screen. From there the user can return to the Start screen and quit the program or make additional runs.

2. **Increased input variability**

The variables sheet shown above allows the user a mechanized means of adjusting a variety of inputs that were previously less accessible. Sharing, for instance, can now be accessed through a button on this sheet, as can drop lengths, cable sizing factors, aerial percentages, and the mix of placement activities. There is no longer a need to modify formulas in underlying spreadsheets to make these sorts of adjustments.

3. **Structure Sharing**

Structure sharing is now an input variable for aerial structure, underground structure, and buried structure. Within buried the user can vary the percent sharing on feeder-urban, feeder-rural, and distribution designs DG1, DG2, DG3, DG4 and DG5. The structure sharing percentages represent the percentage of investment USWC will avoid through sharing of the construction costs for poles, conduit systems or trench. For example, if the Telephone Company is assumed to be responsible for 80% of the cost of trenching for a buried cable, the sharing input for that situation would be 20%.

From an actual application perspective, the aerial and underground structure ratios are reduced by the sharing percentages. The buried structure sharing, because of the variety of activities involved, is a more complex calculation. For example, certain portions are not subject to sharing, lay cable in particular. Consequently, the sharing percentage will apply only to the activities, which can actually be shared.

4. **Placing cost data**

The latest data from the currently negotiated contracts has been incorporated into the development of cost information for the various placing activities for buried plant. This information is used for both cable and drop placements.

5. **Disaggregation of placing cost by density**

The mix of buried plant placing activities can now be varied at a distribution Density Group level. In addition the mix can be set differently for urban feeder versus rural feeder. This allows the user to take advantage of lower cost placing methods, such as plowing or cut & restore sod, where density would allow it while still reflecting the costs of placing plant in mature, higher density neighborhoods. The higher density areas would likely require the use of techniques such as directional boring or cut & restore of asphalt or concrete

6. **Feeder modeling**

The feeder parameters under the Variable Categories menu address cable sizing factor, aerial percentages, mix of placement activities, and sharing percentages. In the feeder model selection box there is an option entitled "Custom Model". This option will allow the user to adjust such inputs as the cross-over points between copper and Digital Loop Carrier (DLC), between underground and buried placement (for either fiber or copper), and between urban and rural placement mix for buried facilities. This screen also provides the user the ability to adjust sizing factors for DLC systems and channel units and to set parameters for distance zones.

7. **Fill variable distribution design**

The default distribution design reflects particular "pairs per site" type cable sizing. If the user wishes to place cable with a different utilization level, there is an option available that will drive the cable sizing to the desired fills. The calculations underlying the design is that in a pairs per site type design the engineer would allow for 2 or 3 pairs at each site (home) the cable passes. This drives the sizing of the cable, e.g., after passing the 8th home in a 3 pair design the cable would move from a 25 (with 24 pairs used) to a 50 pair. The 9th home would be assigned pairs 26, 27 and 28 in the 50 pair cable.

In a fill type design the fill percentage will drive the number and fraction of pairs required at each site. For instance, with a 66% fill as each home is passed the design would assume 1 working pair and ½ non-working pair. The net effect of this is that a 25 pair cable will now serve more homes than it did in the 3 pair design. The length of the trench does not change, but the size of the facility within it does. This provides a saving on material (a 25 pair cable is about 75% of the cost of a 50 pair cable) but does not have an impact on the placing or structure cost.

8. **Drop length data by Density Group**

Drops are utilized in Density Group 3, 4 & 5. One of the primary differences between the three designs is lot size. Drop length would logically vary with lot size. To better tie drops to the designs, a length can be input for each of the three designs. Length can also be input separately for aerial versus buried. This provides drop data that more accurately reflects the density differences from one state to another.

9. **Unit Calculation for Density Groups**

The density group Unit or divisor calculation is based on the number of additional lines and the percentage of idle dedicated lines. Idle dedicated lines are those lines that are primaries at a location and consequently left assigned even when a location is temporarily vacant. An example of this would be an apartment that may be unoccupied for 2 months. It would cause extra labor activity and administrative problems to use that primary pair for another renters additional line demand. It is more efficient to leave it idle and available for the next renter in that unit. The additional line demand would be met with pairs designed for that purpose. In the Unit calculation the designed number of units (400 homes in a subdivision for instance) is adjusted to reflect both the downward effect on utilization of idle dedicated as well as the upward effect of additional line take. The additional line percentage is based on the number of additional lines divided by the total number of residential lines.

10. **Cost Calculations**

The final results from LoopMod are at the investment level. To maintain consistency with the other Qwest models, the investment outputs are converted to monthly costs within the Integrated Cost Model (ICM). This provides for consistent output format for the various components of complete cost studies and allows the study analyst the ability to make sensitivity runs more easily.

Help screen data from LoopMod V2.1

The following information is also available through the Help menus while running LoopMod.

Start Screen

State Name
Displays the state for which the investments are`run.

Path
Establishes the computer path on which the program will run.

DS0 Vs Fiber Pair
Selection will determine the whether investments are calculated on a DS0 or Fiber pair basis.

Feeder Model
Selection will determine the feeder design.

Channel Card
Selection will determine the Remote Terminal Channel Unit cost used in the study.

Distribution File
This selection will determine the Distribution Group file to be used.

Pairs Per Site
This selection will allow the user to select 1 pair per site, 2 pair per site or Engineering Standard distribution designs. It also allows the user to select Custom and build a set of fill driven designs.

Pair Gain
Selection will include or exclude the pair gain equipment investments.

Process Group
Selection will determine which Wire Centers (or group of Wire Centers) will be included in the results.

Report View
This selection will determine the level of detail in the output.

GO!
This selection runs the program.

Additional Options
This selection takes the user to the Additional Options screen.

Quit
Selecting this option will terminate the program. No user changes will be saved.

Feeder Model (Option on Start Screen)

Default Feeder Model is 12 Kilofoot Crossover for fiber

12 Kilofeet Crossover is the point at which fiber replaces copper in the feeder.

Custom Model will allow changes to:

Copper / Fiber Crossovers
Copper Underground / Buried Crossovers
Fiber Underground / Buried Crossovers
Urban / Rural Crossovers
DLC Card and System Fills
"Distance Zones" Definitions

Distribution File (Option on Start Screen)

Default is Wire Center Detail

Distribution Area Detail
Each Distribution Area will be individually processed (same result as Wire Center Detail)

Wire Center Detail
The Distribution Areas have been condensed to speed up processing. One condensed Distribution Area representing each Distribution Group will be processed (same result as Distribution Area Detail)

Custom
Takes user to DAAnalyze.mdb. This is a Microsoft Access database that contains the network distribution area (DA) data and the criteria used in mapping DAs to Density Groups

Note on Distribution Groups:

There are five Distribution Groups modeled in LoopMod:
- DG 1 - High Rise buildings (structures with a single entrance facility)
- DG2 - Multi-building/Multi-tenant
- DG3 - Single family Serving Area Concept with standard lot size
- DG4 - Single family Serving Area Concept with large lot size
- DG5 - Very low density

Pairs Per Site (Option on Start Screen)

Default is Engineering Standard.

Engineering Standard
Designs are 2 pairs per site for DG1 and DG2, 3 pairs per site for DG3 and DG4, and 2 pairs per site for DG5.

1-Pair per Site
This selects a set of designs that are 1 pair per site for all Distribution Groups.

2-Pairs per Site
This selects a set of designs that are 2 pairs per site for all Distribution Groups.

Custom Model
This option will allow the user to select a fill level for distribution cable sizing for each Distribution Group. The fills approximate pairs per site based on one worker per location (33% = 3 pairs per site, 50% = 2 pairs per site.)

Process Group (Option on Start Screen)

Default is All Wire Centers

All Wire Centers
Includes all Wire Centers in the state

Specific Wire Centers
Includes only the Wire Centers selected by the user. The user must go to the "Select Wire Center" menu option or variable category

MSA Zone 1
Includes all Wire Centers in the predetermined MSA Zone 1 for the state

MSA Zone 2
Includes all Wire Centers in the predetermined MSA Zone 2 for the state

MSA Zone 3
Includes all Wire Centers in the predetermined MSA Zone 3 for the state

Report View (Option on Start Screen)

Default is Summary View

Summary View
All of the Wire Centers selected will be averaged and displayed once.

Detail View
Each Wire Centers selected will have it's own investment displayed.

Additional Options Screen

Variable Categories
This selection takes the user to the Variable Categories screen (input edits).

Print Data Selections
This option will print the variable selections identified on the Data sheet.

Return to Start
This option will display a dialog box advising the user that returning to Start will erase any variable changes that have been made to the options presented on the Variables screen below. The user can choose to continue on to the Start screen or remain on the Additional Options screen.

Restore Headers & Tabs
Select this option when access is required to the background worksheets.

Eliminate Headers & Tabs
This option returns the program to its default condition of hidden headers and tabs.

Quit
Selecting this option will terminate the program. No user changes will be saved.

GO!
This selection runs the program.

Variable Categories Screen

Feeder Variables
This option will display all of the variables concerned with Feeder.

Distribution Variables
This option will display all of the variables concerned with Distribution.

Drop Variables
This option will display all of the variables concerned with Drop.

Support Structure Variables
This option will display all of the variables concerned with Support Structure ratios.

Placement Costs
This option provides the opportunity to change the placement activity costs for buried cable (45C) and buried fiber (845C).

Line Variables
This option will display all of the variables concerned with Line counts.

Network Component Prices Menu
Selecting this button will take the user to the Network Component Prices screen. It provides the opportunity to change all material investments including copper cables, load coils, fiber, stubs, pedestals, inside terminals, cross-connects (SAIs), and digital loop carrier systems. Defaults are the network based unit investments by state. English descriptions are located to the right of the data.

Select Wire Centers Screen
This will take the user to a screen that will display all of the Wire Centers available for processing.

Return to Additional Options Screen
Select this button to return to the Additional Options screen.

Feeder Variables Screen

"Distance Zones" Boundaries (Feeder Only!)
This option will create up to 8 Zones within each Wire Center that are based on distance from the Central Office. Pressing the "Feeder Sections" button will take the user to FeederMod.xls – the Feeder pre-processor. The user can then define the "Distance Zones" and create the custom feeder model.

Pressing this button will automatically set the Feeder Model variable on the Start Screen to "Custom".

The "Distance Zones" should be created for Distribution to match the ones created for Feeder.

Feeder Fill Information
Feeder Fill for Copper Cable is the Copper Cable sizing factor. The default is 80%

Feeder Fill for Fiber Cable is the Fiber Cable sizing factor. The default is 100%.

Aerial Feeder Percentages
Determines the amount of Aerial Copper will be used instead of Buried Copper.
The Default is 14%.

Placement Activities and Sharing Percentages
This option provides the opportunity to change the placement activity percentages. The feeder placement activity percentages are segmented by Urban and Rural. The total activity percentage must total 100% for both Urban and Rural feeder!

Sharing percentages for each activity can be specified. The default is 20%.

Distribution Variables Screen

Distance Zone Boundaries- (Distribution Only!)
This option will create up to 8 Zones within each Wire Center that are based on distance from the Central Office. Enter the Upper Limit (outer edge) of each Zone. The last Zone must have an Upper Limit of 999,999! The "Distance Zones" should be created for Feeder to match the ones created for Distribution.

Aerial Distribution Percentages
The user must return to start and select "Custom Model" under Pairs per Site to adjust the Aerial Distribution Percentage

Placement Activities and Sharing Percentages
This option provides the opportunity to change the placement activity percentages. The distribution placement activities are broken out by the five Distribution Groups The total activity percentage must total 100% for each Distribution Group!

Sharing percentages for each activity can be specified. The default is 20%.

Distribution Group Mix
This option is the same as selecting a custom distribution file. It will take you to DAAnalyze.mdb.

Drop Variables Screen

Drops only occur in Distribution Groups 3, 4, and 5. Distribution Groups 1 and 2 are served by an entrance facility to the building.

Sharing Percentages by Distribution Groups for Drops
The default sharing percentage is 20%. This assumes that 20% of the cost of the drop trench will be avoided.

Average Aerial and Buried Drop Lengths
Average drop lengths are input for Aerial and Buried drops in Distribution Groups 3, 4, and 5. The defaults are 70 feet for DG3, 200 feet for DG4, and 300 feet for DG5.

Support Structure Ratios Screen

The U S West Factors Group provides the support structure ratios. Multiplying the structure ratio times the investment for the associated copper or fiber cable account develops the investments for poles and conduit.

Factor 1-52
This is the ratio of pole investment (1C) to aerial cable investment (52C).

Factor 4-5
This is the ratio of conduit investment (4C) to underground cable investment (5C).

Factor 4-85
This is the ratio of conduit investment (4C) to underground fiber cable investment (85C).

Line Variables Screen

The line variables address the percentages of additional lines per location and the percentage of idle primary lines. The net of these two numbers is used to calculate the working lines per density group design.

Additional Lines
The additional line quantity represents the current additional lines in service.

Idle Dedicated
The idle dedicated percentage represents the number of primary lines left assigned that are not working. This could be due to churn (vacant apartments, non-occupied houses) or losses to competition where facilities are in place.

Network Components Screen

Buried Copper Cable & Stubs
This option provides the opportunity to change buried copper cable and stub prices. These prices include material investments, and splicing and engineering costs. Placement costs are not included. They are developed from the Placement Costs and Placement Percentages. The Account Code (Field Reporting Code) is 45C.

Underground Copper Cable & Stubs
This option provides the opportunity to change underground copper cable, stub, and load coil prices. These prices include material investments, and splicing, engineering and placing costs. The Account Code (Field Reporting Code) is 5C.

Building Copper Cable & Inside Terminals
This option provides the opportunity to change building copper cable and inside terminal prices. These prices include material investments, and splicing, engineering and placing costs. The Account Code (Field Reporting Code) is 62C.

Aerial Copper Cable & Terminals
This option provides the opportunity to change aerial copper cable and terminal prices. These prices include material investments, and splicing, engineering, and placing costs. The Account Code (Field Reporting Code) is 52C.

Buried Fiber Cable
This option provides the opportunity to change buried fiber cable prices. These prices include material investments, and splicing and engineering costs. Placement costs are not included. They are developed from the Placement Costs and Placement Percentages. The Account Code (Field Reporting Code) is 845C.

Underground Fiber Cable
This option provides the opportunity to change underground fiber cable prices. These prices include material investments, and splicing, engineering, and placing costs. The Account Code (Field Reporting Code) is 85C.

Building Fiber Cable
This option provides the opportunity to change building fiber cable prices. These prices include material investments, and splicing, engineering, and placing costs. The Account Code (Field Reporting Code) is 862C

Aerial Fiber Cable
This option provides the opportunity to change underground fiber cable prices. These prices include material investments, and splicing, engineering, and placing costs. The Account Code (Field Reporting Code) is 852C.

Drop Components
This option provides the opportunity to change drop component prices. These prices include material investments, protector and termination labor, and mobilization costs. The drop components are provided for two pair buried drop, three pair buried drop and aerial drop. The Account Codes (Field Reporting Codes) are 35C for Buried Drop and 42C for Aerial Drop.

Wire
This option provides the opportunity to change the wire price. This price includes material investments, splicing, engineering, and placing costs. C-Wire is a coarse gauge, high tensile strength, single pair facility used for long runs in low-density areas. The Account Code (Field Reporting Code) is 3C.

Serving Area Interfaces & Terminals
This option provides the opportunity to change Serving Area Interface (SAI), pedestal, and encapsulated terminal prices. These prices include material investments, splicing, engineering and placing costs. The SAI is the cross-connect between the feeder cable and the distribution cable. There is one SAI assumed in each design for Distribution Groups 2, 3, 4, and 5. The Account Code (Field Reporting Code) is 45C.

DLC Optic Equipment
This option provides the user the ability to change prices for fiber optic based Digital Loop Carrier system components. The prices are engineered, furnished and installed for the central office terminals, remote terminals, and channel units. The Account Code (Field Reporting Code) is 257C.

Return to Variable Categories Screen
Select this button to return to the Additional Options screen.

Select Wire Centers Screen

This screen lists all of the Wire Centers that are available to process. All of the Wire Centers that will be processed in the current run have an 'X' in the "Selected?" column.

To Add a Wire Center - Place an 'X' in the "Selected?" column next to the Wire Center desired.

To Remove a Wire Center – Remove the 'X' from the "Selected?" column

Summary of Loop & Drop Investment (Summary View)

After running the model with the "Summary View" option selected, the following options are available.

Print Summary
This selection will print a one-page summary of the investments by Account Code and list the Average Loop Length, Number of Loops, Average Feeder Fill, and Percent Digital Loop Carrier. Summary will also itemize the inputs used in this run: Feeder Model, Distribution Group Mix, and Pairs per Site.

View Summary Sheet
This selection allows user to review investment summary.

More Options
This option provides the user with multiple presentation formats and outputs for the cost summary. See "Summary of Loop & Drop Investment (More Options)".

Return to Start
This option will send the user to the Start screen where a new run can be originated or the program can be exited. There is no option from Start to return to the "Summary of Loop & Drop Investment".

Summary of Loop & Drop Investment (More Options)

Extract INFO sheets
Allows the Data, INV, FeederInvestments, DistributionDetail, and Equipment-Investment sheets to be retained in a file in the LoopMod\OUTPUT\ directory for further use.

Extract Loop Investment Summary
Copies the Loop & Drop Investment summary to a file in the LoopMod\OUTPUT\ directory.

Extract for ISDN Ext.
The ISDN Extension cost is the difference between the investments developed with a DLC system using POTS card and the costs developed with an ISDN card. This option will copy the summaries of those two separate runs to a file, ZISDNSUM, where the difference is calculated and summarized.

Add Note to Summary Sheet
This option will create a NOTE box on the summary sheet where the user can add documentation for each specific investment run. Also see "Note Sheet" below.

Feeder Only
This option will zero out the distribution investments and provide a Feeder Only investment summary sheet. This activity is not reversible.

Print Full Backup
This option will print the entire backup documentation required. (Approximately 50 pages)

Print Zone Summaries
This option will print one-page investment summaries for each of the "Distance Zones". This summary of investments is by Account Code and also lists the Average Loop Length, Number of Loops, Average Feeder Fill, and Percent DLC. The summary will also itemize the inputs used in this run: Feeder Model, Distribution File, and Pairs per Site.

Previous Sheet
This option will return the user to "Summary of Loop & Drop Investment" screen.

Summary of Loop & Drop Investment (Detail View)

After running the model with the "Detail View" option selected, the following options are available.

Print Summary
This selection will print the investments by Account Code and list the Average Loop Length, Number of Loops, Average Feeder Fill, and Percent Digital Loop Carrier for each Wire Center. Summary will also itemize the inputs used in this run: Feeder Model, Process Group, and Pairs per Site.

Extract Wire Center Summary
Copies the Loop & Drop Investments for each Wire Center to a file in the LoopMod\OUTPUT\ directory.

Return to Start
This option will send the user to the Start screen where a new run can be originated or the program can be exited. There is no option from Start to return to the "Summary of Loop & Drop Investment".

Qwest Corporation
Docket No. TC01-098
Exhibit to Testimony of
Dick Buckley
Exhibit RJB-3

LOOP MODULE

VERSION 2.1

Default Values

South Dakota

Qwest Corporation

October 15, 2002

LOOP MODULE DEFAULT VALUES

Table of Contents

1. Overview

This section of the Loop Module User Manual includes descriptions of the inputs available to the users and the default values assigned to them. Also included is the source of the data that was used to establish these values. The data is based on the TELRIC economic guidelines. Thus, where current activities are reflective of what would be experienced within the TELRIC structure, that information will be included. Conversely, if the forward-looking equipment/activities/designs are not being implemented on a widespread basis, subject matter experts were consulted to develop an estimate of the appropriate values.

As new or additional data is gathered it will be included in this document.

2. Distribution Fill

Description: The data included under the distribution fill header is used to calculate the divisor used in each distribution design. The two values are for Idle Dedicated and Additional Lines percentages. The calculation is the design number of housing units plus the net of the idle dedicated percent and the additional lines percent. For example 400 homes plus (12% additional minus 4% idle dedicated) or 400 homes plus 8% or 432 working lines. The investment for the distribution area will then be divided by the 432 working lines. In addition the user has the ability to set utilization levels that will impact the pairs per site routine. Different fills will adjust where cables taper (e.g. 50 pair spliced to a 25 pair). The result is differing footages of the various cables as the total sheath footage will remain the same. The Idle Dedicated and Additional Line percentages can only be edited in the Loop Module. They are not in the ICM edit screens.

Default values:

Distribution Fill	Percentages
Idle Dedicated	4.00%
Additional Lines	8.91%

Density Group Specific	
	Percentages
DG1	50%
DG2	50%
DG3	33%
DG4	33%
DG5	50%

Support: The idle dedicated percentage is calculated by subtracting the additional lines from working and assigned lines, then subtracting working lines from assigned lines and dividing the result by the assigned lines. This information is provided by network from the Utilize database. The additional line percentage is developed from data out of the IFT database. The IFT reports show in-service quantities for products and services. The default input fills are based on Qwest network guidelines of two pairs per site in multi-family and low density and three pairs per site for single family residential.

3. Feeder Fill

Description: The feeder fill is the factor by which feeder cable capacity is increased above the size needed to serve a given quantity of demand in order to provide spare pairs for breakage, line administration, and some amount of growth.

Default values:

Feeder Fill for Copper Cable

	Percent
	80%

Support: The effective fill factor that is generated is typically less than the corresponding input feeder fill factor. This is due to discrete cable sizes that will result in a selected cable providing more pairs than the calculation requires.

4. Average Drop Lengths

Description: The drop wire is the facility that extends from the nearest distribution terminal to the customer's premises. The lengths for that facility are broken out by aerial versus buried and by distribution density group. Only density groups 3, 4 and 5 use drops. Density groups 1 and 2 would utilize an entrance facility as opposed to a drop wire.

Default values:

Average Aerial and Buried Drop Lengths

	Lengths
Aerial Drop Length - Density Group 3	70
Aerial Drop Length - Density Group 4	200
Aerial Drop Length - Density Group 5	300
Buried Drop Length - Density Group 3	70
Buried Drop Length - Density Group 4	200
Buried Drop Length - Density Group 5	300

Support: The drop lengths are a function of the lot size. These are Qwest wide default lengths. When applied to the state specific mix of density groups they produce a statewide average drop length of approximately 110 to 120 feet. Surveys of existing drops in eight Qwest states have produced an average of approximately 143 feet. This average is conservative as it caps drops which exceed a certain length.

5. Placement Costs

Description: The placement costs are the contracted costs for various activities involving placement of buried plant. The placement costs are added to the cost of buried cable on a per cable foot basis. The cost added is a weighted average of the costs of each activity. This weighting is unique to each distribution density group and to urban and rural feeder. The weightings are discussed below in the Placement Percentages section.

Default values:

Placement Costs	Costs
2" Directional Bore	$9.17
4" Directional Bore	$12.63
Cut & Restore Asphalt	$11.83
Lay Cable	$0.67
Plow Cable	$1.30
Plow Cable - Rocky	$8.89
Missile	$8.05
Restore Sod / Gravel	$2.36
Fiber Trench	$2.13
Hydro Mulch	$3.52
Cut & Restore Concrete	$14.96
Trench Cable - Hand	$4.36
Trench Cable - Rocky	$9.06
Trench Cable - Standard	$1.47

Support: The costs for the various activities are drawn from the latest contracts the Network department has for placement of buried plant. Where a state has multiple contractors the number is a weighted average of the different prices. The weighting is based on the number of lines in the areas served by each contractor. Where there are variations on a single activity (e.g. plow - 24", 30' & 36"), those prices are weighted together based on their occurrence.

6. Placement Percentages

Description: The placement percentages are used to weight together the various activities involving placement of buried plant. The cost added to the buried cable is based on this weighting. The weighting is unique to each distribution density group and to urban and rural feeder.

Default values:

Placement Percentages - Distribution

	DG1	DG2	DG3	DG4	DG5
Trench & Backfill	20%	25%	25%	30%	3%
Rocky Trench	5%	5%	5%	2%	0%
Plow	0%	0%	0%	28%	91%
Rocky Plow	0%	0%	0%	0%	4%
Cut & Restore Concrete	15%	10%	5%	3%	0%
Hand Dig Trench	5%	5%	5%	4%	0%
Bore Cable	20%	30%	45%	20%	0%
Cut & Restore Asphalt	20%	10%	10%	6%	2%
Cut & Restore Sod	15%	15%	5%	7%	NA
Hydro Mulch	NA	NA	NA	NA	0%

Placement Percentages - Feeder

	Urban	Rural
Trench & Backfill	30%	3%
Rocky Trench	5%	0%
Plow	0%	91%
Rocky Plow	0%	4%
Cut & Restore Concrete	15%	0%
Hand Dig Trench	5%	0%
Bore Cable	10%	0%
Cut & Restore Asphalt	20%	2%
Cut & Restore Sod	15%	NA
Hydro Mulch	NA	0%

Support: The activity percentages are a mix of placement methods that would be used to replace the existing network as well as grow it during the current feeder planning period. The percentages are based on the growth rates and interviews with outside plant engineers who were responsible for cable rehab work. The question to the engineers was phrased to address the type of activities that they would expect to use when cable placement is done in mature, existing areas. Data was also drawn from Qwest experience in placing plant for the Broadband trial in Omaha, NE. In addition, a citywide CATV rebuild in one of the Qwest states provided support to the utilization of boring in mature areas.

7. Sharing Percentages

Description: The sharing percentages are a recognition that there will be a reduction in placing costs due to either trench provided by a land developer or multiple facility providers using the same poles, trenches or conduit systems. The impact of these two scenarios is decidedly different. With trench provided by a developer, the only cost experienced by the facility provider is the cost of laying the cable in the open trench. With multiple facility providers using a common structure, the question of sharing becomes more complicated. Poles for instance, may be jointly owned or they may be accessed through the use of attachment fees. One constitutes a capital investment, while the other is an annual expense..

Default values:

Sharing Percentages

	Percentage
Aerial - Poles	50%
Underground- Conduit	5%
Buried - Urban Feeder	20%
Buried - Rural Feeder	20%
Buried - Distribution Density Group 1	20%
Buried - Distribution Density Group 2	20%
Buried - Distribution Density Group 3	20%
Buried - Distribution Density Group 4	20%
Buried - Distribution Density Group 5	20%

Support: The sharing percentages are an estimate of the portion of the structure cost that will be avoided through a mix of jointly owned structure and developer provided trenching. Certain work activities, such as actually laying a cable in the trench would not be reduced or shared, even if there are multiple facilities in a trench. The percentages are based on historical data, access line growth rates, and the opinions of outside plant subject matter experts.

8. Network Component Prices

Description: The sections below detail the various components that are used in each of the network categories (cables, terminals, DLC, etc.).

8.1 Buried Copper Cable and Stubs

Description: The cost per foot for buried copper cables, including material, supply, engineering, and splicing. Placing for buried is discussed in sections 6 and 7. The cable stub costs are on a per cable basis for a 30 foot stub.

Default values:

Buried Copper Cables & Stubs	Cost
25 pair - 22 gauge	$0.88
50 pair - 22 gauge	$1.14
100 pair - 22 gauge	$1.63
200 pair - 22 gauge	$2.59
300 pair - 22 gauge	$3.65
400 pair - 22 gauge	$4.69
600 pair - 22 gauge	$7.05
25 pair - 24 gauge	$0.75
50 pair - 24 gauge	$0.98
100 pair - 24 gauge	$1.34
200 pair - 24 gauge	$2.07
300 pair - 24 gauge	$2.81
400 pair - 24 gauge	$3.63
600 pair - 24 gauge	$5.12
900 pair - 24 gauge	$7.47
1200 pair - 24 gauge	$9.63
1800 pair - 24 gauge	$14.04
600 pair - 26 gauge	$5.12
900 pair - 26 gauge	$7.47
1200 pair - 26 gauge	$9.63
1800 pair - 26 gauge	$14.04
50 pair - 24 gauge - stub	$169.23
100 pair - 24 gauge - stub	$191.14
300 pair - 24 gauge - stub	$330.04
400 pair - 24 gauge - stub	$389.15
600 pair - 24 gauge - stub	$528.44
900 pair - 24 gauge - stub	$651.19

Support: The cable material costs are provided by the Qwest network organization. They are based on the latest prices Qwest is paying for these components.

8.2 Underground Copper Cable and Stubs

Description: The cost per foot for underground copper cables, including material, supply, engineering, placing and splicing. Underground structure is discussed in sections 3. The cable stub costs are on a per cable basis for a 30 foot stub.

Default values:

Underground Copper Cables & Stubs	Cost
25 pair - 22 gauge	$1.63
25 pair - 24 gauge	$1.50
50 pair - 22 gauge	$1.90
100 pair - 22 gauge	$2.38
200 pair - 22 gauge	$3.34
300 pair - 22 gauge	$4.40
400 pair - 22 gauge	$5.44
50 pair - 24 gauge	$1.74
100 pair - 24 gauge	$2.09
200 pair - 24 gauge	$2.82
300 pair - 24 gauge	$3.56
400 pair - 24 gauge	$4.38
600 pair - 24 gauge	$6.15
900 pair - 24 gauge	$8.19
1200 pair - 24 gauge	$9.91
1800 pair - 24 gauge	$15.29
600 pair - 26 gauge	$5.16
900 pair - 26 gauge	$6.90
1200 pair - 26 gauge	$8.06
1800 pair - 26 gauge	$11.36
2400 pair - 26 gauge	$14.13
3000 pair - 26 gauge	$17.49
3600 pair - 26 gauge	$20.52
4200 pair - 26 gauge	$31.35
900 pair - 24 gauge - stub	$312.91

Support: The cable material costs are provided by the Qwest network organization. They are based on the latest prices Qwest is paying for these components.

8.3 Building Copper Cable and Inside Terminals

Description: The cost per foot for building copper cables, including material, supply, engineering, placing and splicing. The inside terminals and connecting block costs are on a per item basis.

Default values:

Building Copper Cables & Inside Terminals

	Cost
25 pair - 24 gauge	$2.02
50 pair - 24 gauge	$2.26
100 pair - 24 gauge	$2.61
600 pair - 24 gauge	$6.40
900 pair - 24 gauge	$9.01
50 pair - Inside Terminal	$631.36
100 pair - Inside Terminal	$672.91
600 pair - Inside Terminal	$3,711.77
900 pair - Inside Terminal	$5,535.08
50 pair - Connecting Block	$88.39

Support: The cable and terminal material costs are provided by the Qwest network organization. They are based on the latest prices Qwest is paying for these components.

8.4 Aerial Copper Cable and Terminal

Description: The cost per foot for aerial copper cables, including material, supply, engineering, placing and splicing. The terminal costs are on a per item basis.

Default values:

Aerial Copper Cables & Terminal	Cost
25 pair - 24 gauge	$1.19
12 pair terminal	$91.74
50 pair - 22 gauge	$2.90
100 pair - 22 gauge	$3.37
200 pair - 22 gauge	$4.27
300 pair - 22 gauge	$5.27
400 pair - 22 gauge	$6.29
600 pair - 22 gauge	$8.63
900 pair - 22 gauge	$11.56
50 pair - 24 gauge	$1.35
100 pair - 24 gauge	$1.89
200 pair - 24 gauge	$2.93
300 pair - 24 gauge	$4.48
400 pair - 24 gauge	$5.28
600 pair - 24 gauge	$6.62
900 pair - 24 gauge	$8.73

Support: The cable and terminal material costs are provided by the Qwest network organization. They are based on the latest prices Qwest is paying for these components.

8.5 Buried Fiber Cable

Description: The cost per foot for buried fiber cables, including material, supply, engineering, and splicing. Placing for buried cables is discussed in sections 6 and 7.

Default values:

Buried Fiber Cables	Cost
2 fiber cable	$1.73
4 fiber cable	$1.78
6 fiber cable	$1.83
12 fiber cable	$1.98
24 fiber cable	$2.29
36 fiber cable	$2.67
48 fiber cable	$2.99
72 fiber cable	$3.66
96 fiber cable	$4.46
144 fiber cable	$5.90
216 fiber cable	$7.87

Support: The cable and terminal material costs are provided by the Qwest network organization. They are based on the latest prices Qwest is paying for these components.

8.6 Underground Fiber Cable

Description: The cost per foot for underground fiber cables, including material, supply, engineering, placing, and splicing. Underground structure is discussed in sections 3.

Default values:

Underground Fiber Cables	Cost
2 fiber cable	$1.06
4 fiber cable	$1.10
6 fiber cable	$1.14
12 fiber cable	$1.27
24 fiber cable	$1.51
36 fiber cable	$1.74
48 fiber cable	$1.96
72 fiber cable	$2.47
96 fiber cable	$2.98
144 fiber cable	$4.01
216 fiber cable	$5.53

Support: The cable material costs are provided by the Qwest network organization. They are based on the latest prices Qwest is paying for these components.

8.7 Building Fiber Cable

Description: The cost per foot for building fiber cables, including material, supply, engineering, placing, and splicing. No structure cost is included, as the duct or raceway would be provided by the building owner.

Default values:

Building Fiber Cable	Costs
12 fiber cable	$1.94
24 fiber cable	$2.18

Support: The cable material costs are provided by the Qwest network organization. They are based on the latest prices Qwest is paying for these components.

8.8 Drop Wire, NID and Placement

Description: The cost per foot for the drop wire, cost per foot for the placing, the labor for the placing of the protector and the termination of the wires, the cost for the protector material, and the trip or mobilization charge.

Default values:

Drop Wire	Costs
Buried 2 pair Drop -	
Placing per foot under 100 feet	$0.85
Placing per foot over 100 feet	$0.76
Protector & Termination Labor	$31.79
Drop material	$0.09
Protector material	$14.87
Mobilization	$40.15
Buried 3 pair Drop -	
Placing per foot under 100 feet	$0.85
Placing per foot over 100 feet	$0.76
Protector & Termination Labor	$31.79
Drop material	$0.11
Protector material	$14.87
Mobilization	$40.15
Aerial 2 pair Drop -	
Aerial Drop per foot	$61.43
Protector & Termination Labor	$31.79
Drop material	$0.28
Protector material	$14.87

Support: The drop material and placement costs are from the latest contracts Qwest has with outside vendors for the provision of drop facilities. The mobilization charge is adjusted to reflect the placement of multiple drops per visit as would be likely in a scorched node or network rebuild scenario.

8.9 Serving Area Interfaces and Terminals

Description: The cost per item for Serving Area Interfaces (SAI) or cross-connect boxes and distribution terminals or pedestals. The SAI is the connection point between feeder cables and distribution cables and provides flexibility in assignment of pairs. The terminals are the connection point between distribution cables and the drops.

Default values:

SAIs and Terminals	Costs
10 pair pedestal terminal	$70.83
12 pair encapsulated splice terminal	$57.02
600 pair SAI	$2,239.47
1200 pair SAI	$3,366.97
1800 pair SAI	$4,623.32
2700 pair SAI	$5,985.10
Splice Closure	$39.64

Support: The SAI and terminal costs are provided by the Qwest network organization. They are based on the latest prices Qwest is paying for these components.

8.10 C Rural Wire

Description: The cost per wire foot for C-Rural Wire, including material, supply, engineering, and placing.. C Wire is a high tensile, single pair facility that is used in low density or rural applications.

Default values:

C- Rural Wire	Costs
1 pair wire	$0.62

Support: The wire material costs are provided by the Qwest network organization. They are based on the latest prices Qwest is paying for these components.

8.11 Fiber Optic Equipment

Description: The cost for central office and remote channel and terminal equipment for the fiber based Digital Loop Carrier systems. The costs include material, supply and installation.

Default values:

Fiber Optic Equipment	Costs
1344 Line Remote Terminals	
C.O. Terminal	$17,166.55
Remote Terminal	$86,050.76
Quad POTS Channel Unit	$285.19
Quad ISDN Channel Unit	$950.67
672 Line Remote Terminals	
C.O. Terminal	$8,583.28
Remote Terminal	$55,850.55
Quad POTS Channel Unit	$285.19
Quad ISDN Channel Unit	$950.67
32 Line Remote Terminals	
C.O. Terminal (HDT)	$30,238.61
Remote Terminal	$23,476.41
Quad POTS C.O. Channel Unit	$263.05
ISDN C.O. Channel Unit	$319.32
Quad POTS Remote Channel Unit	$296.73
ISDN Remote Channel Unit	$319.31
96 Line Remote Terminals	
C.O. Terminal 1 (1st RT)	$6,808.80
C.O. Terminal 2 (Additional RTs)	$4,383.88
Remote Terminal	$32,110.00
Quad POTS Channel Unit	$161.79
Quad ISDN Channel Unit	$884.87
192 Line Remote Terminals	
C.O. Terminal 1 (1st RT)	$11,192.67
C.O. Terminal 2 (Additional RTs)	$4,383.88
Remote Terminal	$33,021.34
Quad POTS Channel Unit	$161.79
Quad ISDN Channel Unit	$884.87

Support: The system costs are provided by the Qwest network organization. They are based on the latest prices Qwest is paying for these components.

9. Additional Options

Description: There are several options on the first screen, which are essentially driven by the type of study being done. For instance, the Process Group option allows the user to select All Wire Centers, Specific Wire Centers or one of three MSA zone wire center groups. Two items, though, are Qwest defaults that are used across all studies. These selections are Feeder Model and Pairs Per Site. The Feeder Model selection allows the user to select the 12 kilofoot standard shift from physical copper to a Digital Loop Carrier or build a custom feeder model. The Pairs Per Site allows the user to select the number of pairs engineered to each living unit.

Default values:

Feeder Model - 12 kilofeet

Pairs Per Site - Engineering Standard (2 pairs for DG1, 2 & 5; 3 pairs for DG3 & 4)

Support: The 12 kilofoot crossover is based on guidelines from the Qwest network group. The objective is to minimize facility cost as well as assure that all plant will support both voice and advanced (xDSL) services. The Engineering Standard Pairs Per Site selection is supported, once again, by network guidelines to furnish enough facilities to allow for timely response to customer requests for service, while minimizing construction expenditures.

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 14th day of October, 2002, the foregoing **Direct Testimony of Dick Buckley and three exhibits** was filed and served upon the following parties as follows:

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