Attachment 1

DESIGNATION OF CONFIDENTIAL INFORMATION

I hereby certify that the information designated as confidential in the attached response(s) is protected by _____ (name of company) as confidential or financial information:

SIGNATURE: _____

TITLE: _____

ADDRESS: _____

_____

TELEPHONE: _____

FAX: _____

On a separate sheet of paper, please list the responses designated confidential. For data set forth on tables, please list the responses designated confidential by table number and column letter. Please submit a statement of the reasons for withholding the information from the public record, and the facts on which those reasons are based.

Outside Plant Structure Cost Tables

Approved by OMB
3060-0870
Expires 06/30/99

I. Underground Cable Structure Cost

Company Name:

Specific or Project Authorization Number:

Geographic Region (City or Town, State):

	A CLLI Codes	B Total Project Cost ($)	C Density (lines/sq. mile)	D Conduit Placement Method (#)	E Conduit Depth (# of inches)	F Conduit Cost ($/foot)	G Innerduct Frequency (%)	H Innerduct Material Cost* ($/foot)	I Manhole Capacity (ducts/hole)	J Manhole Cost ($/hole)	K Manhole Spacing (feet/hole)
1											
2											
3											
4											
5											

Description of Conduit Placement Method

1	
2	
3	

* Please enter in column H per foot innerduct material cost if innerduct for fiber is installed with conduit and per foot conduit cost in column F excludes innerduct material cost.

II. Buried Cable Structure Cost

Company Name:

Specific or Project Authorization Number:

Geographic Region (City or Town, State):

	A CLLI Codes	B Total Project Cost ($)	C Density (lines/sq. mile)	D Cable Depth: Copper (# of inches)	E Cable Depth: Fiber (# of inches)	F Structure Cost: Cost for One Cable ($/foot)	G Structure Cost: Incremental Cost for a 2nd Cable ($/foot)
1							
2							
3							
4							
5							

Cable Cost Tables

Approved by OMB
3060-0870
Expires 06/30/99

III. Copper Cable Cost

Company Name:

Specific or Project Authorization Number:

Geographic Region (City or Town, State):

	A	B	C	D	E	F	G	H
	CLLI Codes	Total	Density	Cable Size	Cable Gauge	Cable Cost		
		Project Cost				Underground	Aerial	Buried
		($)	(lines/sq. mile)	(# of pairs)		($/foot)	($/foot)	($/foot)
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

IV. Fiber Cable Cost

Company Name:

Geographic Region (City or Town, State):

Specific or Project Authorization Number:

	A	B	C	D	E	F	G
	CLLI Codes	Total	Density	Cable Size	Cable Cost		
		Project Cost			Underground	Aerial	Buried
		($)	(lines/sq. mile)	(# of strands)	($/foot)	($/foot)	($/foot)
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							

Chart 1
CLLI Codes for Samples of ILEC Central Offices

Density Zone	BellSouth	Ameritech	U S West	Pacific Bell and Nevada Bell	Southwestern Bell
1	WNRDMSSU	AMSAMIMN	BLSSIDMA	EURKNV11	JSVLARMA
1	NWTNGAHD	CRTSMIMN	AGLRCOMA	KYBRCA11	BRCYKSRE
1	MNSNFLMA	STWTIN01	CKCYMTMA	WANACA11	BRNSKSPA
1	CYTNALMA	WTRMMIMN	FRPLCOMA	SHSHCA11	IDBLOKHA
1	SALNLAMA	BRLDMIMN	GLLPNMFW	SNARCA11	ALSNTXAL
1	ARCDLABW	ENGDMIMN	HRSNNENW	SNLCCA11	GLDSTXGS
1	EUTWALMA	MCHGMIMN	PTGNAZEL	ALGHCA11	MRTHTXMA
1	CDKYFLMA	CHNGMICR	HVLDMNHL	PSKNCA11	IRANTXIR
1	LEVLLASN	KWNWMIMN	GNTRMNGA	EKCKCA11	OGLSTXOG
1	YSCLLAMA	SAXNWI11	GRNRNDBC	BAKRNV11	ALLWOKMA
1	WKISLAMA	RPBLMIMN	WGLCMTMA	FLVYNV12	SPSTXSB
1	DNCNMSMA	CHMPMIMN	CMPBMNCA	LTWLNV13	SKDMTXSK
2	EDBHSCMA	LESLMIMN	GRNVIAAB	VRCYNV12	JSVLARDE
2	GNVLGAMA	BRVIOH42	ARTSNMMA	THCYCA01	CRSPARMA
2	LXTNMSMA	NSVLIN01	BEVRUTMA	TMLSCA12	CNWYARMY
2	CNHMTNMA	BYFDWI11	AVONCOMA	LEBCCA12	CLEVOKMA
2	NWLDNCCE	STBYWI11	BLCNAZMA	GRNDCA13	AUSTTXLT
2	PLMYTNMA	NFDMWI11	PINEAZMA	TRUCCA12	AUSTTXBE
2	BYVLKYMA	MMNCILMM	MDRSOR52	CYCSCA11	MDLKTXML
2	CLMNALFA	MINKILMK	ORCLAZMA	FRNLNV11	PCRKTXPC
2	NWHNKYMA	ELWDILEW	DECLIDMA	LKBRCA11	SWANTXHE
2	ACMENCMA	MRCCIN01	CYDNIAAE	MRDNCA11	BUNATXBU
2	BLZNMSMA	MNTNILMT	EGGVIACO	LOLTCA11	EVDLTXEV
2	EPPSLAMA	FRSTILFO	NPLNOR62	HLVLCA11	PTISTXSP
3	CLMTNCMA	LPERMILP	LBLKWA01	LGRDCA11	HTSPARCO
3	AIKNSCMA	STCHMIMN	SHRDWYMA	ARVNCA11	HTSPARRO
3	DLLSGAES	CATNMICT	ELKHNENW	AUBNCA11	HTSPARLA
3	CHTGTNSE	IRWDMIMN	BISBAZMA	ARNLCA11	BETNTXBE
3	MYVLKYMA	SSMRMIMN	GLOBAZMA	CNVYCA11	AUSTTXCU
3	CRBNKYMA	WKFDMIMN	CMVRAZMA	DYTNNV11	AUSTTXMF
3	BOAZALMA	BDFRIN01	RDMDOR01	MSBHCA11	AUSTTXBC
3	LBJTKYMA	BARBWI01	SLCYNMMA	AUBNCA01	MCLSOKMA
3	ALVLALMA	MRTTOH37	CTWDAZMA	RNMRCA11	SNANTXLS
3	CRBHNCCE	CAIRILCF	FRMTNENW	CLPTCA11	REFGTXRF
3	PTSLLAMA	KRLDOH25	GRMSIACO	BRWLCA11	BYSDTXBY
3	SVNHGASI	UNGVWI11	JNCYOR51	LSBNCA12	CYPRTXCY
4	SPBGSCBS	CLVYILCV	TWFLIDMA	JCSNCA01	HTSPARNA
4	SSVLNCMA	GLCRILGC	GDYRAZCW	LCFRCA11	HNTNKSNA
4	FYVLGASG	OFLNILMQ	LVLDCOMA	HMCYCA11	SALNKSTA
4	SMYRTNMA	PLNWMIMN	RPCYSDCO	ELYNV01	TULSOKF1
4	MRBOTNMA	SBNDIN03	MNSPCOMA	SNVYNV11	FTWOTXBB
4	ANTNALMT	CLCYILCG	CLSPCO32	MRBACA11	NBRNTXNB
4	MAVLTNMA	WLVLOH53	NGLSAZMA	AVLNCA11	TULSOKSA
4	KNVLTNYH	TOROOH53	NGLSAZMA	FLSMCA12	AUSTTXLW
4	GDSDALMT	KNKKILKK	PHNXAZ81	LOMSCA11	FTWOTXBE
4	LNBHNCMA	STRTWI11	WDBNOR59	SUISCA11	WYTTMOOR
4	PLQMLAMA	BRFDOH44	CFTNCONM	EURKCA01	VDORTXRO

Chart 1
CLLI Codes for Samples of ILEC Central Offices

Density Zone	BellSouth	Ameritech	U S West	Pacific Bell and Nevada Bell	Southwestern Bell
4	MDSNMSES	PRBGOH14	WDBNOR59	NAPACA01	HSTNTXSH
5	NSVLTNHH	BLVLILAD	LSALNMWR	FRSNCA14	WCHTKSAH
5	SNLVGAMA	NENHWI11	TCSNAZSO	FRVLCA11	KSCYKSPA
5	RLGHNCSI	PNTCMINR	TEMACOMA	BKFDCA14	KSCYKSOL
5	CHRLNCTH	LKORMILO	BOISIDNW	SPRKNV12	CRCHTXFB
5	HBSDFLMA	MTCLMINR	ALBQNMRR	RENONV15	KSCYMO20
5	MNDRFLLO	SBNDIN04	BLDRCOMA	SNLOCA01	SPFDMOTU
5	BRHMALCH	LEMTILLE	NGLSAZ03	RCKLCA11	SNANTXWE
5	WPBHFLGR	RMVLILRM	DLTHMNME	CRCYNV01	FTWOTXLW
5	MLBRFLMA	LRTPOH75	EUGNOR53	CLBSCA11	TYLRTXSO
5	DREWMSMA	LKZRILLZ	PLGVUTMA	RTPKCA11	LTRKARSW
5	JCSNMSMB	OLFLOH23	ORCYOR18	IGNCCA12	SPRNTXSO
5	WLMGNCWI	PRSDWI11	SMNRWA01	INVGNV11	HSTNTXWE
6	PTSLFLSO	GDRPMIEP	OMAHNEFO	PCFCCA11	LTRKARCA
6	PANLGAMA	LVPKILRN	ALBQNMNO	ORNGCA11	WCHTKSNW
6	CLMASCSU	JFVLIN01	SXCYIAMS	SCRMCA13	KSCYKSLE
6	CHTGTNBR	HGLDINHL	PHNXAZSO	SNMCCA11	KSCYMO21
6	BRHMALCP	GARYINGM	CLSPCOPV	RNSDCA11	SNANTXBA
6	BRHMALEL	MYHGOH44	CLSPCOEA	RSMGCA11	FTWOTXAX
6	HNVIALMT	PLPKILPP	KEWTMNKE	SAGSCA11	AUSTTXFA
6	KNVLTNMA	JOLTILJW	DRVYAZNO	MSVJCAAT	AUSTTXTW
6	KNVLTNBE	JOLTILJO	BYRDNMMA	CLBSCA50	SNANTXSL
6	JCSNMSRW	HMWDILHO	LKOSOR62	SNFRCA11	HSTNTXNE
6	MOBLALOS	MILWWI38	BOISIDMA	VLLJCA01	HSTNTXSA
6	NWORLAAR	LKFRILLF	PTLDOR02	FRFDCA01	WDBOTXWB
7	CHMBGAMA	WRRNMITL	SPKNWAFA	SCRMCA02	LTRKARMO
7	ATLNGAIC	PEORILPB	GLDLAZMA	NHLDCA11	KSCYKSJO
7	CHRLNCCA	RACNWI01	KRNSUTMA	CRNDCA11	KSCYKSCB
7	CHTGTNBR	ECLVOHEA	STPLMNEM	SPRKNV11	AUSTTXHO
7	BRHMALMT	WHNGINWT	CLSPCOMA	CNPKCA01	TULSOKRI
7	BRHMALWL	HMNDINHW	ENWDCOMA	WNCKCA11	FTWOTXGL
7	NSVLTNST	LGRCILLG	PHNXAZCA	OKLDCA13	TULSOKWO
7	LSVLKYTS	HCHLILHH	PHNXAZSE	LSANCA29	TULSOKTB
7	LSVLKYBR	SMMTILSM	PHNXAZSY	RENONV02	FTWOTXWA
7	KNNRLAHN	TOLDOH47	PTLDOR17	MLPSCA11	HSTNTXGP
7	JCSNMSCP	MRGVILMG	KENTWAOB	RCMDCA11	HSTNTXBA
7	NWORLASK	WLMTILWI	DESMIAWS	FRMTCA11	HSTNTXOU
8	ATLNGAPP	DTRTMIRV	LKWDCOTC	LSANCA15	STLSMO07
8	NWORLACA	MILWW127	MPLSMNPI	ELMNCA01	STLSMO03
8	MMPHTNMA	LKWDOH52	SLKCUTMA	SNGBCA01	STLSMO06
8	MIAMFLAL	CHCGILSC	PTLDOR13	SHOKCA01	DLLSTXRI
8	MIAMFLWM	CLEVOH42	DNVRCOSE	COLACA01	WCHTKSAM
8	BRHMALFS	CHCGILST	DNVRCOSO	LSANCA34	DLLSTXLA
8	FTLDFLCY	CLHGOH32	SLKCUTSO	LSANCA23	AUSTTXGR
8	MIAMFLNM	OKLWILOL	DNVRCOEA	SNFCCA17	SNANTXDI
8	MIAMFLNM	CICRILCT	BLTNMNCE	ALBYCA11	FTWOTXED
8	NWORLACA	SKOKILSK	STTLWA03	HYWRCA11	HSTNTXMO

Chart 1
CLLI Codes for Samples of ILEC Central Offices

Density Zone	BellSouth	Ameritech	U S West	Pacific Bell and Nevada Bell	Southwestern Bell
8	NWORLAMC	EVTNILLEV	STTLWA05	MTVWCA11	HSTNTXSU
8	NWORLABM	CHCGILLA	DESMIADT	SNJSCA21	HSTNTXJA
9	MIAMFLGR	MDSNWI11	DNVRCOCH	WLANCA01	HSTNTXSU
9	NWORLAMA	MILWWI13	MPLSMNFR	LSANCA10	HSTNTXJA
9	MIAMFLME	CLMBOH11	MPLSMNDT	CLCYCA11	KSCYMO05
9	- - -	CHCGILED	DNVRCOMA	LSANCA11	DLLSTXRO
9	- - -	CHCGILDO	STPLMNMK	HLWDCA01	HSTNTXWA
9	- - -	CHCGILLR	- - -	SNFCCA05	KSCYMO55
9	- - -	CHCGILID	- - -	SNFCCA14	- - -
9	- - -	CHCGILSU	- - -	LSANCA12	- - -
9	- - -	CHCGILLW	- - -	LSANCA06	- - -
9	- - -	CHCGILRP	STTLWA06	SNFCCA05	- - -
9	- - -	CHCGILMO	- - -	SNFCCA01	- - -
9	- - -	CHCGILIR	- - -	SNFCCA04	- - -

Chart 1
CLLI Codes for Samples of ILEC Central Offices

Density Zone	Bell Atlantic	NYNEX	Sprint	GTE	Aliant
1	WNGTMDWG	CTLRMEYA	BCTNWAXX	PTMOIAXP	WSTRNEXL
1	SMISMDSI	MNSNMEBL	CHRCTXXA	NILEWAXX	HRDYNEXL
1	ENDVPAEN	DNFTMECA	MGVLKSXA	LNBOIAXO	ONGNEXL
1	AUSTPAAU	VNBOMEBC	PLPNTXXA	MSCLNMXC	CATNNEXL
1	BRNDWVBY	GNVLMENE	BTFLORXX	GRNYMNXG	JNSNNEXL
1	TNGRVATG	RKWDMEYA	ARTNORXA	STPSWAXA	STCYNEXL
1	- - -	KNVYNYKV	LGRNWYXC	WLCYTXXA	TBRKNEXL
1	- - -	WVVYNHMR	JNBOTXXA	LONDTXXA	CRBONEXL
1	- - -	NSFRNHMA	SHROTXXA	HLBONMXB	GFTNNEXL
1	- - -	THFRMEBJ	LFNTKSXA	KMBRMNXK	BOCKNEXL
1	- - -	PSBGNHMA	BNDCKSXA	STVLMOXA	OCTVNEXL
1	- - -	SRTNVTAR	CYVLKSXA	ELYNILXC	BURRNEXL
2	FETNDEFE	CHLMMAST	MDVWVAXA	RCKTIAXO	BLWDNEXL
2	TRPDMDTR	WLLFMAMA	TRLKWAXX	BLCYWIXA	DWTTNEXL
2	FYCYPAFC	WSBGMALE	BDMDNVXS	PRRVIDXX	WLBRNEXL
2	SLRNMDSL	CNTRNHSH	FLATTXXA	CHMYNMXC	BRNRNEXL
2	UNBRMDUB	PTNMNYPX	WASHVAXA	AURRMNXA	FRBRNEXL
2	BCTWMDBT	OKHMMARU	GRMDNJXW	ADLNCAXF	CRSCNEXL
2	CGVLVACL	STNVNYST	LKWHTXXA	FLLCKYXA	FRTHNEXL
2	THPLVATP	DXTRMEMA	MBTNWAXX	BORNTXXA	JUNTNEXL
2	WNTRVAWG	LYMENHYA	DLPTWAXA	JNLKCAXF	SYRCNEXL
2	LDVYPALV	BRFDVTBC	ADAROHXA	STRWILXA	BNNTNEXL
2	CNCTVACI	WLTWVTLA	WDLDNCXA	DSWLVAXA	NHWKNEXL
2	GFTNWVBC	CNWYMASH	NRBRMOXA	LGTVPAXL	EMWDNEXL
3	SEFRDESF	VYHVMAED	BLVLPAXB	BSVLSCXA	WYMRNEXL
3	WOCYMDBA	STBRMAPI	SLGRTNXA	CRLBNMXA	- - -
3	HRLCMDHL	PRVNMAWI	MDBROHXA	BRZLINXB	- - -
3	FSBGMDFS	RODLNYRD	OXFRNJXW	BRDYTXXA	- - -
3	WLVLMDWL	WRCSNYUC	BLCYTNXA	LTFDKYXA	- - -
3	FLWTWVFW	MEDNNYPA	LGVYNJXJ	MTMSPAXM	- - -
3	MTHPWVTN	GSPTNYGP	NLVLTXXA	GVRSNVXF	- - -
3	FYVLWVMP	NWPTMEMA	BUVLTNXA	STLNNVXF	- - -
3	WRTNVAWR	SGTNMEYA	PRKRPAXP	BUDATXXA	- - -
3	VNHSNJVH	BOTNMAMA	SWNSNCXB	TRARIAXO	- - -
3	YNVLPAYO	WSPTMADR	HVLCNCXA	WTFRPAXW	- - -
3	DRVRVADR	RTLDMAMA	BYCYORXA	NRWLOHXA	- - -
4	SLBRMDSB	BZBYMAPE	GNWDSCXC	TSVLALXA	HSNGNEXL
4	CHASMDCH	LENXMAWA	MDWYTNXA	BOVNTXXA	WAHONEXL
4	WDRFMDWD	SCTTMAFP	MOISFLXA	SSVLSCXA	LNCLNEXA
4	WMFRNJ01	NBFDMASM	FLVWMOXA	KNWCWAXB	HBRNNEXL
4	WMNSMDWM	MNCHMASU	HGBRNJXJ	HSPRCAXF	GENVNEXL
4	DMSCMDDE	LCPTNYLK	CHESNJXJ	VTVLCAXA	WVRLNEXL
4	INDIPAIN	MDPTNYMP	HMPNNJXJ	DSKNCAXF	LNCLNEXS
4	HNWTWVWE	CLCTNYCC	LSVGNVXU	DLRITXXA	DVCYNEXL
4	MDLDPAMI	NWFNNYMA	KGPTTNXC	TAFTCAXF	HSNGNEXL
4	CHSKVACD	MRMCMACE	MRCYNCXA	BWLGOHXA	LNCLNEXA
4	PTMOVAHF	WNWBMAMA	ELCYNCXA	GRBRVAXB	WAHONEXL

Chart 1
CLLI Codes for Samples of ILEC Central Offices

Density Zone	Bell Atlantic	NYNEX	Sprint	GTE	Aliant
4	NWNWVAYK	ESSXMASP	KDHLNCXA	HURNOHXA	PWCYNEXL
5	HCKSDEHC	MYNRMAWA	MLFRINXA	SMTRSCXA	- - -
5	BLARMDPL	OOBHMEPO	MTVLPAXM	MSKGMIXM	- - -
5	EDWDMDEG	WHVRNYWH	TLHSFLXH	EKHTINXA	- - -
5	SHNDPASH	ACTNMAMA	PTCTFLXA	VENCFLXS	- - -
5	DNVLNJRK	SBDGMAMA	IONAFLXA	WLBOSCXC	- - -
5	SUCCNJSU	MLFRMAWA	TLHSFLXD	HDSNFLXA	- - -
5	CHTNWVLE	BNGRMEPA	JHCYTNXA	JHTWPAXW	- - -
5	MNVLWVMO	FYVLNYFV	WLBGPAXW	LXTNKYXC	- - -
5	OSMLPAES	CLNCNYBA	BRSTTNXA	HRSHPAXH	- - -
5	CHSKVADC	AMHRNYMP	MNFDOHXA	WIVLORXA	- - -
5	HMPNVADC	NGFLNYWO	RTMNOHXA	FLTNILXA	- - -
5	CLHGVACO	JHCYNYJC	SLBNOHXA	HLBOORXB	- - -
6	TLVLDETV	NCHLMAGR	LSVGNVXI	TRCNNMXB	LNCLNEXL
6	OXHLMDOH	WLMGMAMA	OSSEMNXO	PLANTXXK	LNCLNEXB
6	CYVLMDCK	BURLMABE	TLHSFLXB	LFYTINXB	LNCLNEXD
6	DOVRNJD01	GLCSMAEL	FTMBFLXA	FHSDFLXA	- - -
6	NTCNNJ01	AMSBMAPL	OCALFLXC	CRWDFLXA	- - -
6	GLLYPAGL	WLHMMASP	MFTWPAXM	INRKFLXX	- - -
6	MONSPAMO	CMLSNYON	KLLNTXXC	BRAROKXB	- - -
6	CHRLPACH	NWBRNYNW	CSLBFLXA	MNSSVAXA	- - -
6	OKLDNJ01	RYEENYRY	CPCRFLXA	BRAROKXA	- - -
6	HMPNVAQN	SYRCNYGS	KGWDTXXA	TULTORXA	- - -
6	HMPNVAAB	MRBOMAMA	WRRNOHXA	BYTWTXXA	- - -
6	HMPNVAWD	GNDLMASU	WRRNOHXG	SYVNOHXB	- - -
7	PIVLMDPK	BLMTMALE	LSVGNVXL	PLANTXXB	- - -
7	HYVLMDRI	GNBGNYFV	LSVGNVXK	LXTNKYXD	- - -
7	DNDLMDDPK	TRTWNYTT	LSVGNVXR	IRNGTXXE	- - -
7	WORNNJWO	NYCRNYSS	LSVGNVXM	SMNLFLXA	- - -
7	MTCLNJMC	NWTNMAWA	ALSPFLXA	SLSPFLXA	- - -
7	ASLDPAAL	FRMNMAVN	FTWBFLXA	DNDNFLXA	- - -
7	FRDSNJFR	PTCHNYPC	LSVGNVXT	GRLDTXXA	- - -
7	EDSNNJED	LRMTNYLA	LSVGNVXH	CRTNTXXD	- - -
7	BLLVPABE	PTLDMEFO	WNPKFLXA	SWTHFLXA	- - -
7	PTMOVAHS	ALBYNYWA	- - -	PRANVAXB	- - -
7	VRBHVAIL	ALBYNYSS	- - -	BVTNORXB	- - -
7	NWNWVAHV	WSVLNYNC	- - -	TGRDORXA	- - -
8	WASHDCWL	WTTWMAWC	LSVGNVXG	IRNGTXXA	- - -
8	WASHDCGG	PLVWNYPV	TLHSFLXA	ERIEPAXM	- - -
8	WASHDCBK	GRCYNYGC	MTLDFLTC	IRNGTXXG	- - -
8	WASHDCAC	NYCRNYND	LSVGNVXB	WLCRFLXA	- - -
8	CLWDNJCW	BFLONYBA	- - -	WSSDFLXA	- - -
8	SORGNJSO	NYCQNYFR	PRRGILXL	- - -	- - -
8	NRFLVABS	MMRNNYMA	DSPLILXL	- - -	- - -
8	PITBPAWS	NYCXNYCI	- - -	- - -	- - -
8	PITBPAEL	HCVLNYHV	- - -		- - -
8	TRENNJTE	WDMRNYFR	- - -	DRHMNCXA	- - -

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CLLI Codes for Samples of ILEC Central Offices

Density Zone	Bell Atlantic	NYNEX	Sprint	GTE	Aliant
8	GLLDPAGN	LNBHNYLB	- - -	- - -	- - -
8	NRFLVABS	SYRCNYSU	- - -	- - -	- - -
9	WASHDCMT	NYCXNYKB	- - -	STTLWAWB	- - -
9	WASHDCGT	NYCMNYTH	- - -	- - -	- - -
9	WASHDCLL	NYCXNYTR	- - -	- - -	- - -
9	NBRGNJNB	BSTNMAFR	- - -	- - -	- - -
9	CFPKKNJCS	EBSTMASA	- - -	- - -	- - -
9	FTLENJLE	BSTNMABO	- - -	- - -	- - -
9	PITBPADT	CMBRMAWA	- - -	- - -	- - -
9	JRCYNJBR	CMBRMA01	- - -	- - -	- - -
9	UNCYNJ02	BITNMAWI	- - -	- - -	- - -
9	PHLAPAMK	NYCKNYRA	- - -	- - -	- - -
9	PHLAPALO	NYCKNYTY	- - -	- - -	- - -
9	PHLAPADE	NYCKNY77	- - -	- - -	- - -

Chart 1
CLLI Codes for Samples of ILEC Central Offices

Density Zone	Cincinnati Bell	Frontier	SNET	Citizens
1	- - -	ALXNIAXO	- - -	RDVYAZXC
1	- - -	SHBGIAXO	- - -	LEPPAZXC
1	- - -	NEMHIAXO	- - -	LKCHAZXC
1	- - -	PNAPALXA	- - -	TOYIAZXC
1	- - -	CHRYALXA	- - -	ALPIAZXC
1	- - -	FNBGALXA	- - -	CRPNNMXC
1	- - -	IONAMNXI	- - -	RADLCAXF
1	- - -	ECHNMNXE	- - -	RBVYNVXG
1	- - -	SFTNILXE	- - -	PBPONMXC
1	- - -	PTERMNXP	- - -	CDVLCAXF
1	- - -	STLEMNXS	- - -	HOWLUTXB
1	- - -	CTHRALXA	- - -	HRLNCAXF
2	ALXNKYAL	DWCYIAXO	KENTCT00	PLCDCAXF
2	WLTNKYWL	TRYNIAXO	LBNNCT00	PNTPAZXC
2	WLTWKYWT	VIRQWIXA	LYMECT01	OKRNCAXF
2	GLCOKYGC	WLMGNYXA	WASHCT00	CSCDIDXC
2	RELYOHRE	ASFKNYXA	LKVLCT00	UVLONYXF
2	WRSWKYWR	LKWDPAXL	MDSNCT02	SPVLAZXC
2	ALXNKYAL	NWGDPAXN	GSHNCT00	TNPHNVXB
2	BTLRKYBR	WRBGPAXW	HGNMCT00	MTMRWVXA
2	FLMOKYFM	LROYNYXA	CRNWCT00	JNVLCAXF
2	NWVLOHNE	FAMTINXA	NRFLCT00	HNBLNYXA
2	HMLTOHHT	NPLSNYXA	SHRNCT00	CSTVNYXB
2	SVMLOHSM	SNMNILXA	WDSTCT00	FHNCNYXA
3	SHNDOHSH	BRKLMIXI	GRNBCT00	EKGVCAXI
3	BURLKYBN	LKVLMNXL	WNSTCT00	RIVSCAXF
3	NWMDOHNR	INTRPAXI	NMFRCT00	BMBGNYXA
3	UNINKYAC	CIVLWIXA	DPRVCT00	KGMNAZXE
3	- - -	DNSVNYXA	EHTNCT00	WRBONYXA
3	- - -	ARTNMNXA	GRTWCT00	WLLSNVXF
3	- - -	WLKLNYXA	BTHNCT00	MYCKORXA
3	- - -	WRSWNYXA	CNTYCT00	KGMNAZXC
3	- - -	CCVLNYXA	CLMACT00	ELKONVXF
3	BETHOHBE	FLNGILXA	LTFDCT00	NWBLNYXA
3	HRSNOHHR	JNVLMNXJ	THSNCT00	OTVLNYXA
3	INDPKYIN	WDWRIAXO	STSPCT00	SNBRNYXA
4	CNCNOHSP	HPJTNYXB	MDTWCT00	PNTPAZXB
4	GRSBOHGR	FTDDIAXC	NHVNCT00	PNTPAZXA
4	LVLDOHLO	MTGMNYXA	DRHMCT001	TLMNCAXF
4	HMTNOHHM	VCTRNYXA	BLTCCT00	APLCNYXA
4	WCHSOHWC	CANDNYXA	NINTCT00	BRDBNYXA
4	TBSCOHTO	CHESNYXA	ESSXCT00	CHTRCAXF
4		BCPTNYXA	LDYRCT00	MOABUTXC
4	GSHNOHGS	MYBKNYXA	MDLBCT00	TRMNUTXC
4	- - -	LGVLNYXA	MDSNCT01	LHCYAZXC
4	WLBGOHWB	SHWNWIXA	CLTNCT00	JHTWNYXA
4	BATVOHBA	FRTNNYXA	BRLNCT00	HMPTNYXA

Chart 1
CLLI Codes for Samples of ILEC Central Offices

Density Zone	Cincinnati Bell	Frontier	SNET	Citizens
4	MMTPOHMM	WSHVNYXA	SFFDCT00	STATNYXA
5	FTTHKYFT	- - -	WPNGCT00	SDNYNYXB
5	- - -	- - -	STTNCT00	SCTWNYXA
5	- - -	- - -	ORNGCT00	- - -
5	- - -	- - -	MNCHCT00	- - -
5	- - -	- - -	HNTNCT00	- - -
5	- - -	- - -	WSPTCT00	- - -
5	MLFROHMF	- - -	FRTNCT00	- - -
5	- - -	- - -	NWLNCT02	- - -
5	- - -	- - -	SMFRCT02	- - -
5	- - -	- - -	FRFDCT00	- - -
5	- - -	- - -	WNDSCT00	- - -
5	- - -	- - -	BLFDCT00	- - -
6	CNCNOHWD	APVYMNXA	EHRTCT02	EXGVCAXJ
6	FRFDOHFF	BRVLMNXA	CRWLCT00	MDVWCAXF
6	CNCNOHNS	FAPTNYXB	WTFDCT00	MDTWNYXA
6	STBROHSB	ROCHNYXK	DARNCT00	BLFDWVXA
6	MTHTOHMH	ERCHNYXA	BRPTCT03	- - -
6	MTGMOHMO	ROCHNYJE	NGTCCT00	- - -
6	LKPKKYLP	ROCHNYXF	DRBYCT00	- - -
6	FLRNKYFL	ROCHNYXJ	BRFRCT00	- - -
6	CNCNOHHP	ROCHNYXD	OGNWCT00	- - -
6	GLDLOHGD	ROCHNYXG	DNBRCT00	- - -
6	EVDLOHEV	BITNNYXA	ENFDCT01	- - -
6	RILTOHCS	GSHNNYXA	NWNTCT00	- - -
7	NRWDOHNW	ROCHNYXC	NRWLCT02	- - -
7	CNCNOHHW	ROCHNYXD	WSHNCT00	- - -
7	CNCNOHPH	ROCHNYXH	NWBRCT00	- - -
7	- - -	ROCHNYXE	NRWLCT03	- - -
7	- - -	- - -	SMFRCT01	- - -
7	- - -	- - -	WTRBCT00	- - -
7	- - -	- - -	WHFRCT01	- - -
7	- - -	- - -	- - -	- - -
7	- - -	- - -	- - -	- - -
7	CNCNOHNS	- - -	- - -	- - -
7	CVTNKYCN	- - -	- - -	- - -
7	- - -	- - -	- - -	- - -
8	CNCNOHAV	- - -	BRPTCT01	- - -
8	- - -	- - -	NWHNCT03	- - -
8	- - -	- - -	HRFRCT03	- - -
8	- - -	- - -	- - -	- - -
8	- - -	- - -	- - -	- - -
8	- - -	- - -	- - -	- - -
8	- - -	- - -	- - -	- - -
8	- - -	- - -	- - -	- - -
8	- - -	- - -	- - -	- - -
8	- - -	- - -	- - -	- - -

Chart 1
CLLI Codes for Samples of ILEC Central Offices

Density Zone	Cincinnati Bell	Frontier	SNET	Citizens
8	- - -	- - -	- - -	- - -
8	- - -	- - -	- - -	- - -
9	CNCNOHWS	ROCHNYXB	- - -	- - -
9	- - -	- - -	- - -	- - -
9	- - -	- - -	- - -	- - -
9	- - -	- - -	- - -	- - -
9	- - -	- - -	- - -	- - -
9	- - -	- - -	- - -	- - -
9	- - -	- - -	- - -	- - -
9	- - -	- - -	- - -	- - -
9	- - -	- - -	- - -	- - -
9	- - -	- - -	- - -	- - -
9	- - -	- - -	- - -	- - -
9	- - -	- - -	- - -	- - -

APPENDIX D

DESCRIPTION OF PROPOSED METHODOLOGY FOR ESTIMATING OUTSIDE PLANT COSTS

I. Cost of Copper Cable

A. 24-Gauge Aerial Copper Cable

1. We propose to modify by using the Huber methodology[1] the regression equation for estimating the cost of 24-gauge aerial copper cable developed by Gabel and Kennedy in the NRRI Study by using ordinary least squares (OLS).[2] The modified equation for estimating the cost of 24-gauge aerial copper cable is as follows:[3]

$$Y = 1.022443 + .009691X_1 + .065833X_2$$

t-statistics:	18.878	57.382	.400
F-statistic:	1668.33		
# of observations:	255		

where:

Y = cost per foot for 24-gauge aerial copper cable;
X_1 = number of copper cable pairs for 24-gauge aerial copper cable;
X_2 = 1 if two or more cables are placed at the same location, 0 otherwise.

2. We propose three adjustments to the modified equation for estimating the cost of 24-gauge aerial copper cable.[4] First, we propose to adjust downward by 15.2 percent the regression coefficient for the number of copper pairs to reflect the superior bargaining power of the non-rural LECs in comparison to the companies in the RUS data. Second, we propose to add a loading of 10 percent to the material and labor cost of the cable (net of LEC

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[1] We discuss the rationale for using the Huber methodology rather than OLS in this Further Notice, section V.B.2.b.ii.

[2] The regression equation developed by using OLS is set forth in the NRRI Study at 58, Table 2-16.

[3] The original regression equations for copper and fiber cable in the NRRI Study provide the intercept and the slope coefficients in terms of one thousand feet of cable. Because the synthesis model requires cost estimates for copper and fiber cable in terms of cost per foot, we set forth the intercept and the slope coefficients in this equation and the other equations for copper and fiber cable in this appendix in terms of one foot of cable. Accordingly, the cost estimates derived from these equations are measured in dollars per foot.

[4] We discuss the rationale for these proposed adjustments in this Further Notice, section V.B.2.b.ii.

engineering and splicing costs) to approximate the cost of LEC engineering. Finally, we propose to add a loading of 9.4 percent for splicing costs.

3. After making these adjustments, we obtain the following equation for the cost of 24-gauge aerial copper cable, Y^{Adj}:

$$Y^{Adj} = (1.022443 + .009691(1 - \text{buy power discount } \%)X_1 + .065833X_2)(1 + \text{splicing } \% + \text{LEC engineering } \%)$$

$$= (1.022443 + .009691(1 - .152)X_1 + .065833X_2)(1 + .094 + .10)$$

$$= (1.022443 + .009691(.848)X_1 + .065833X_2)(1.194)$$

$$= (1.022443 + .008218X_1 + .065833X_2)(1.194).$$

4. We use this equation to estimate the proposed input values for the cost of 24-gauge aerial copper cable. We do this for each cable pair size by substituting into this equation the number of cable pairs, X_1. At the same time, we substitute into this equation a value of 0 for X_2 to estimate the cost for one cable when only one cable is placed. We use a value of 0 for X_2 because the value of the coefficient for this variable, .065833, is not statistically significant. In addition, the synthesis model does not use a different cable cost if the feeder or distribution portion of network it builds requires more than one cable. For example, we estimate the cable costs for a 25-pair 24-gauge aerial copper cable as follows:

$$Y^{Adj} = (1.022443 + (.008218)(25) + (.065833)(0))(1.194)$$

$$= \$1.47 \text{ per foot.}$$

B. 24-Gauge Underground Copper Cable

5. We propose to modify by using the Huber methodology the regression equation for estimating the cost of 24-gauge underground copper cable developed by Gabel and Kennedy in the NRRI Study by using OLS.[5] The modified equation for estimating the cost of 24-gauge underground copper cable is as follows:

$$Y = 1.732609 + .015938X_1 - .000004X_1^2$$

t-statistics:	5.002	15.578	−6.893
F-statistic:	504.21		
# of observations:	80		

[5] The regression equation developed by using OLS is set forth in the NRRI Study at 60, Table 2-19.

where:

Y	=	cost per foot for 24-gauge underground copper cable;
X_1	=	number of copper cable pairs for 24-gauge underground copper cable;
X_1^2	=	the mathematical square of the number of copper cable pairs for 24-gauge underground copper cable.

6. We propose to use the same three adjustments proposed for the cost of 24-gauge aerial copper cable, with one exception.[6] We propose to reduce by 16.3 percent the value of the coefficient for the number of copper cable pairs to reflect the superior buying power that non-rural LECs may have in comparison to the RUS LECs, based on the analysis in the NRRI Study. We also include in the equation loadings for splicing and LEC engineering costs of 9.4 percent and 10 percent, respectively, because the RUS data do not include these costs. After making these adjustments, we obtain the following equation for the cost of 24-gauge underground copper cable, Y^{Adj}:

$$Y^{Adj} = (1.732609 + .015938(1 - \text{buy power discount } \%)X_1 - .000004X_1^2)(1 + \text{splicing } \% + \text{LEC engineering } \%)$$

$$= (1.732609 + .015938(1 - .163)X_1 - .000004X_1^2)(1 + .094 + .10)$$

$$= (1.732609 + .015938(.837)X_1 - .000004X_1^2)(1.194)$$

$$= (1.732609 + .013340X_1 - .000004X_1^2)(1.194).$$

7. We use this equation to estimate the proposed input values for the cost of 24-gauge underground copper cable. We do this for each cable pair size by substituting into this equation the number of cable pairs, X_1, and the mathematical square of the number of cable pairs, X_1^2. For example, we estimate the cable costs for a 50-pair 24-gauge underground copper cable as follows:

$$Y^{Adj} = (1.732609 + (.013340)(50) - (.000004)(50^2))(1.194)$$

$$= \$2.85 \text{ per foot.}$$

C. 24-Gauge Buried Copper Cable

8. We propose to modify by using the Huber methodology the regression equation for estimating the cost of 24-gauge buried copper cable and structure developed by

[6] We discuss the rationale for these proposed adjustments in this Further Notice, section V.B.2.b.ii.

Gabel and Kennedy in the NRRI Study by using OLS.[7] The modified equation for estimating the cost of 24-gauge buried copper cable and structure is as follows:

$$Y = 1.500999 + .010652X_1 - .503644X_2 + .733031X_3 + .570136X_4$$

t-statistics:	5.012	80.735	−4.777	3.175	1.911
F-statistic:	1660.57				
Observations:	1,131				

where:

Y = cost per foot for 24-gauge buried copper cable and buried copper cable structure;
X_1 = number of copper cable pairs for 24-gauge buried copper cable;
X_2 = 1 if two or more cables are placed at the same location, 0 otherwise;
X_3 = combined bedrock and soil type indicator;
X_4 = 1 if buried cable is installed in density zone 2;[8] 0 if such cable is installed in density zone 1.[9]

9. We propose to modify this equation to estimate the cost of 24-gauge buried copper cable. The dependent variable in this equation, Y, represents the per foot labor and material cost for both cable and outside plant structure. To estimate the labor and material cost for the cable only, we derive a new equation that explains the variation in labor and material costs for a copper cable alone. We derive this new equation by using the value of only the fixed cost of buried copper cable reflected in the intercept or constant term in the modified buried cable and structure equation and only the variable and coefficient in this equation that primarily explain the variation in cable costs.

10. We use as the intercept in the new buried cable equation the value of only the fixed cost of buried copper cable reflected in the intercept in the modified buried cable and structure equation. The value of the intercept in the modified buried cable and structure equation, 1.500999, represents the fixed cost for both buried copper cable and buried copper cable structure in density zone 1. Of this amount, we assume that $.80 represents the fixed cost for one sheath of buried copper cable. This value roughly approximates the preliminary value that the Commission staff developed for the smallest buried copper cable size for the workshop on cable costs and the value that HAI uses as a default for the smallest buried copper cable size.

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[7] The regression equation developed by using OLS is set forth in the NRRI Study at 41, Table 2-7.

[8] Density zone 2 is a geographic region that has between 6 and 100 lines per square mile.

[9] Density zone 1 is a geographic region that has between 0 and 5 lines per square mile.

11. We use as the independent variable in the new buried cable equation the independent variable that indicates the number of copper cable pairs in the modified buried cable and structure equation, X_1. We also use as the coefficient of X_1 in the new buried cable equation the coefficient of X_1 in the modified buried cable and structure equation, .010652. We include this variable and this coefficient in the new buried cable equation because they primarily explain the variation in cable costs. We do not use as independent variables in the new buried cable equation those in the modified buried cable and structure equation that indicate whether two or more cables are placed at the same location, soil and rock type, and whether a buried cable is installed in density zone 2, *i.e.*, variables X_2, X_3, and X_4. We do not include these variables in the new buried cable equation because these variables and their coefficients primarily explain the variation in structure costs.

12. By using the estimate of the fixed cost for a sheath of copper cable $.80, the variable that indicates the number of copper cable pairs, X_1, and the coefficient of this variable, .010652, and assuming that buried copper cable cost is a linear function of X_1, we obtain the following equation for the labor and material cost of buried copper cable, Y^C:

$$Y^C = .800000 + .010652X_1.$$

13. We propose to make the same three adjustments to this equation that we made above to the equation for 24-gauge aerial cable.[10] That is, we adjust downward by 15.2 percent the value of the coefficient for the number of copper pairs to reflect the superior buying power that non-rural LECs may have in comparison to the RUS LECs. We also include in the equation loadings for splicing and LEC engineering costs of 9.4 percent and 10 percent, respectively, because the RUS cable costs do not include these costs. After making these adjustments, we obtain the following equation for the cost of 24-gauge buried copper cable, $Y^{C\,Adj}$:

$$\begin{aligned} Y^{C\,Adj} &= (.80000 + .010652(1 - \text{buy power discount } \%)X_1)(1 + \text{splicing } \% + \text{LEC engineering } \%) \\ &= (.800000 + .010652(1 - .152)X_1)(1 + .094 + .10) \\ &= (.800000 + .010652(.848)X_1)(1.194) \\ &= (.800000 + .009033X_1)(1.194). \end{aligned}$$

14. We use this equation to estimate the proposed input values for the cost of 24-gauge buried copper cable. We do this for each cable pair size by substituting into this equation the number of cable pairs, X_1. For example, we estimate the cable costs for a 300-pair 24-gauge buried copper cable as follows:

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[10] We discuss the rationale for these proposed adjustments in this Further Notice, section V.B.2.b.ii.

$$Y^{C\ Adj} = (.800000 + (.009033)(300))(1.194)$$

$$= \$4.19 \text{ per foot.}$$

D. 26-Gauge Aerial Copper Cable

15. We propose to calculate the cost of 26-gauge aerial copper cable from the proposed cost of 24-gauge aerial copper cable by applying a discount factor to the proposed cost of 24-gauge aerial copper cable. We propose to use the following OLS regression equation to estimate the discount factor used to derive the cost of 26-gauge aerial copper cable:

$$Y = 1.055209 + .000074X_1 + .094595X_2$$

t-statistics:	65.165	3.651	2.184
F-statistic: 44.383			
Observations: 40			

where:

Y = the ratio of 24-gauge aerial copper cable cost per foot to 26-gauge aerial copper cable cost per foot;
X_1 = number of pairs of aerial copper cable;
X_2 = 1 if the number of aerial copper cable pairs is 900 or greater; 0 otherwise.

16. We estimate the proposed cost for 26-gauge aerial copper cable for each cable pair size by first determining the discount factor for each cable size. We do this by substituting into this equation the number of cable pairs, X_1, and a value of 1 or 0 into the dummy variable that indicates whether the cable size is 900 pairs or greater, X_2. The reciprocal of the number derived from this procedure for each cable pair size is the discount factor. We then multiply the discount factor for each cable size by the proposed 24-gauge aerial copper cable costs for each cable size. For example, we estimate the cable costs for a 25-pair 26-gauge aerial copper cable by first estimating the discount factor for this cable size as follows:

$$Y = 1.055209 + (.000074)(25) + .094595(0)$$

$$= 1.06.$$

The discount factor is the reciprocal of 1.06 or .94 (1 divided by 1.06). We then multiply this factor, .94, by the proposed cost for 25-pair 24-gauge aerial copper cable, $1.47 per foot. The proposed cost for a 25-pair 26-gauge aerial copper cable is $1.38 per foot.

E. 26-Gauge Underground Copper Cable

17. We propose to calculate the cost of 26-gauge underground copper cable from the proposed cost of 24-gauge underground copper cable by applying a discount factor to the proposed cost of 24-gauge underground copper cable. We propose to use the following OLS regression equation to estimate the discount factor used to derive the cost of 26-gauge underground copper cable:

$$Y = 1.067986 + .000030X_1 + .147755X_2$$

t-statistics:		47.076	1.154	2.700
F-statistic:	19.926			
Observations:	39			

where:

Y = the ratio of 24-gauge underground copper cable cost per foot to 26-gauge aerial copper cable cost per foot;
X_1 = the number of pairs of underground copper cable;
X_2 = 1 if the number of underground copper cable pairs is 900 or greater; 0 otherwise.

18. We estimate the proposed cost for 26-gauge underground copper cable for each cable pair size by first determining the discount factor for each cable size. We do this by substituting into this equation a value of 1 or 0 into the dummy variable that indicates whether the cable size is 900 pairs or greater, X_2. At the same time, we substitute into this equation a value of 0 for the number of cable pairs, X_1, because the value of the coefficient for this variable, .000030, is not statistically significant. The reciprocal of the number derived from this procedure for each cable pair size is the discount factor. We then multiply the discount factor for each cable size by the proposed 24-gauge underground copper cable costs for each cable size. For example, we estimate the cable costs for a 50-pair 26-gauge underground copper cable by first estimating the discount factor for this cable size as follows:

$$Y = 1.067986 + (.000030)(0) + .147755(0)$$

$$= 1.07.$$

The discount factor is the reciprocal of 1.07 or .93 (1 divided by 1.07). We then multiply this factor, .93, by the proposed cost for 50-pair 24-gauge underground copper cable, $2.85 per foot. The proposed cost for a 50-pair 26-gauge underground copper cable is $2.65 per foot.

F. 26-Gauge Buried Copper Cable

19. We propose to calculate the cost of 26-gauge buried copper cable from the proposed cost of 24-gauge buried copper cable by applying a discount factor to the proposed cost of 24-gauge buried copper cable. We propose to use the following OLS regression equation to estimate the discount factor used to derive the cost of 26-gauge buried copper cable:

$$Y = 1.113615 + .000174X_1 - .00000005X_1^2$$

t-statistics:		45.146	3.927	−3.679
F-statistic:	7.711			
Observations:	41			

where:

Y = the ratio of 24-gauge buried copper cable cost per foot to 26-gauge buried copper cable cost per foot;
X_1 = number of pairs for buried copper cable;
X_1^2 = the mathematical square of the number of pairs for buried copper cable.

20. We estimate the proposed cost for 26-gauge underground copper cable for each cable pair size by first determining the discount factor for each cable size. We do this by substituting into this equation the number of cable pairs, X_1, and the mathematical square of the number of cable pairs, X_1^2. The reciprocal of the number derived from this procedure for each cable pair size is the discount factor. We then multiply the discount factor for each cable size by the proposed 24-gauge buried copper cable costs for each cable size. For example, we estimate the cable costs for a 300-pair 26-gauge buried copper cable by first estimating the discount factor for this cable size as follows:

$$\begin{aligned} Y &= 1.113615 + (.000174)(300) - (.000000047)(300^2) \\ &= 1.113615 + .052200 + .004230 \\ &= 1.17. \end{aligned}$$

The discount factor is the reciprocal of 1.17 or .85 (1 divided by 1.17). We then multiply this factor, .85, by the proposed cost for 300-pair 24-gauge buried copper cable, $4.19 per foot. The proposed cost for a 300-pair 26-gauge buried copper cable is $3.56 per foot.

II. Cost of Fiber Cable

A. Aerial Fiber Cable

21. We propose to modify by using the Huber methodology the regression equation for estimating the cost of aerial fiber cable developed by Gabel and Kennedy in the NRRI Study by using OLS.[11] The modified equation for estimating the cost of aerial fiber cable is as follows:

$$Y = .959272 + .035058X_1 + 1.127687X_2$$

t-statistics:	27.239	40.608	7.476
F-statistic:	830.58		
# of observations:	168		

where:

Y = cost per foot for aerial fiber cable;
X_1 = number of strands in aerial fiber cable;
X_2 = 1 if two or more cables are placed at the same location, 0 otherwise.

22. We propose three adjustments to the modified equation for estimating the cost of aerial fiber cable.[12] First, we propose to adjust downward by 33.8 percent the regression coefficient for the number of fiber strands, to reflect the superior bargaining power of non-rural LECs. Second, we tentatively conclude that we should add a loading of 10 percent to the material and labor cost of the cable (net of LEC engineering and splicing costs) to approximate the cost of LEC engineering. Finally, we tentatively conclude that we should add a loading for splicing costs of 4.7 percent to the material and labor cost of the cable (net of LEC engineering and splicing costs).

23. After making these adjustments, we obtain the following equation for the cost of aerial fiber cable, Y^{Adj}:

$$Y^{Adj} = (.959272 + .035058(1 - \text{buy power discount } \%)X_1 + 1.127687X_2)(1 + \text{splicing } \% + \text{LEC engineering } \%)$$

$$= (.959272 + .035058(1 - .338)X_1 + 1.127687X_2)(1 + .047 + .10)$$

$$= (.959272 + .035058(.662)X_1 + 1.127687X_2)(1.147)$$

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[11] The regression equation developed by using OLS is set forth in the NRRI Study at 59, Table 2-18.

[12] We discuss the rationale for these proposed adjustments in this Further Notice, section V.B.2.c.

$$= \quad (.959272 + .023208X_1 + 1.127687X_2)(1.147).$$

24. We use this equation to estimate the proposed input values for the cost of aerial fiber cable. We do this for each cable size by substituting into this equation the number of strands in the fiber cable, X_1. At the same time, we substitute into this equation a value of 0 for X_2 to estimate the cost for one cable when only one cable is placed.[13] We use a value of 0 for X_2 because the synthesis model does not use a different cable cost if the feeder or distribution portion of network it builds requires more than one cable. For example, we estimate the cost of a 60-strand aerial fiber cable as follows:

$$Y^{Adj} = (.959272 + (.023208)(60) + (1.127687)(0))(1.147)$$

$$= \$2.70 \text{ per foot.}$$

B. Underground Fiber Cable

25. We propose to modify by using the Huber methodology the regression equation for estimating the cost of underground fiber cable developed by Gabel and Kennedy in the NRRI Study by using OLS.[14] The modified equation for estimating the cost of underground fiber cable is as follows:

$$Y = 2.096959 + .030226X_1.$$

t-statistics:	19.683	17.232
F-statistic:	296.94	
# of observations:	128	

where:

Y = cost per foot for underground fiber cable;
X_1 = number of strands in underground fiber cable.

26. We propose three adjustments to this equation.[15] First, we propose to adjust downward by 27.8 percent the regression coefficient for the number of fiber strands, to reflect the superior bargaining power of non-rural LECs. Second, we tentatively conclude that we should add a loading of 10 percent to the material and labor cost of the cable (net of LEC engineering and splicing costs) to approximate the cost of LEC engineering. Finally, we tentatively conclude that we should add a loading for splicing costs of 4.7 percent to the

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[13] The value of the coefficient for X_2, 1.127687, is statistically significant.

[14] The regression equation developed by using OLS is set forth in the NRRI Study at 61, Table 2-20.

[15] We discuss the rationale for these proposed adjustments in this Further Notice, section V.B.2.c.

material and labor cost of the cable (net of LEC engineering and splicing costs).

27. After making these adjustments, we obtain the following equation for the cost of underground fiber cable, Y^{Adj}:

$$
\begin{aligned}
Y^{Adj} = \quad & (2.096959 + .030226(1 - \text{buy power discount } \%)X_1)(1 \\
& + \text{splicing } \% + \text{LEC engineering } \%) \\
= \quad & (2.096959 + .030226(1 - .278)X_1)(1 + .047 + .10) \\
= \quad & (2.096959 + .030226(.722)X_1)(1.147) \\
= \quad & (2.096959 + .021823X_1)(1.147).
\end{aligned}
$$

28. We use this equation to estimate the proposed input values for the cost of underground fiber cable. We do this for each size of fiber cable by substituting into this equation the number of fiber strands, X_1 For example, we estimate the cost of a 72-strand underground fiber cable as follows:

$$
\begin{aligned}
Y^{Adj} = \quad & (2.096959 + (.021823)(72))(1.147) \\
= \quad & \$\ 4.21 \text{ per foot.}
\end{aligned}
$$

C. Buried Fiber Cable

29. We propose to modify by using the Huber methodology the regression equation for estimating the cost of buried fiber cable and structure developed by Gabel and Kennedy in the NRRI Study by using OLS.[16] The modified equation for estimating the cost of buried fiber cable and structure is as follows:

$$Y = 1.141649 + .037893X_1 + .128555X_2 + .256692X_3 + .825424X_4 + .024891X_5$$

t-statistics: 4.166 25.167 1.046 1.097 3.151 .215
F-statistic: 138.33
# of observations: 707

where:

Y = cost per foot for buried fiber cable and buried fiber cable structure;
X_1 = number of buried fiber cable strands;
X_2 = water value indicator;

[16] The regression equation developed by using OLS is set forth in the NRRI Study at 49, Table 2-10.

X_3 = combined bedrock and soil type indicator;
X_4 = 1 if fiber buried cable is installed in density zone 2; 0 if such cable is installed in density zone 1;
X_5 = 1 if two or more cables are placed at the same location, 0 otherwise.

30. We propose to modify this equation to estimate the cost of buried fiber cable. The dependent variable in this equation, Y, represents the per foot labor and material cost for both cable and outside plant structure. To estimate the labor and material cost for the cable only, we derive a new equation that explains the variation in labor and material costs for a fiber cable alone. We derive this new equation by using the value of only the fixed cost of buried fiber cable reflected in the intercept or constant term in the modified buried cable and structure equation and only the variable and coefficient in this equation that primarily explain the variation in cable costs.

31. We use as the intercept in the new buried cable equation the value of only the fixed cost of buried fiber cable reflected in the intercept in the modified buried cable and structure equation. The value of the intercept in the modified buried cable and structure equation, 1.141649, represents the fixed cost for both buried fiber cable and buried fiber cable structure in density zone 1. Of this amount, we assume that $.60 represents the fixed cost for one sheath of fiber cable.

32. We use as the independent variable in the new buried cable equation the independent variable that indicates the number of fiber cable strands in the modified buried cable and structure equation, X_1. We also use as the coefficient of X_1 in the new buried cable equation the coefficient of X_1 in the modified buried cable and structure equation, .037893. We include this variable and this coefficient in the new buried cable equation because they primarily explain the variation in cable costs. We do not use as independent variables in the new buried cable equation those in the modified buried cable and structure equation that indicate the presence of a high water table, soil and rock type, whether a buried fiber cable is installed in density zone 2, and whether two or more cables are placed at the same location, *i.e.*, variables X_2, X_3, X_4, and X_5. We do not include these variables in the new buried cable equation because these variables and their coefficients primarily explain the variation in structure costs.

33. By using the estimate of the fixed cost for a sheath of fiber cable $.60, the variable that indicates the number of fiber cable strands, X_1, and the coefficient of this variable, .037893, and assuming that buried fiber cable cost is a linear function of X_1, we obtain the following equation for the labor and material cost of buried fiber cable, Y^C:

$$Y^C = .600000 + .037893X_1.$$

34. We also propose three adjustments to the proposed equation.[17] First, we propose to adjust downward by 27.8 percent the regression coefficient for the number of fiber strands, to reflect the superior bargaining power of non-rural LECs. Second, we tentatively conclude that we should add a loading of 10 percent to the material and labor cost of the cable (net of LEC engineering and splicing costs) to approximate the cost of LEC engineering. Finally, we tentatively conclude that we should add a loading for splicing costs of 4.7 percent to the material and labor cost of the cable (net of LEC engineering and splicing costs).

35. After making these adjustments, we obtain the following equation for the cost of buried fiber cable, $Y^{C\ Adj}$:

$$
\begin{aligned}
Y^{C\ Adj} = \quad & (.60000 + .037893(1 - \text{buy power discount } \%)X_1)(1 + \\
& \text{splicing } \% + \text{LEC engineering } \%) \\
= \quad & (.600000 + .037893(1 - .278)X_1)(1 + .047 + .10) \\
= \quad & (.600000 + .037893(.722)X_1)(1.147) \\
= \quad & (.600000 + .027359X_1)(1.147).
\end{aligned}
$$

36. We use this equation to estimate the proposed input values for the cost of buried fiber cable. We do this for various sizes of fiber cable by substituting into this equation the number of fiber strands, X_1. For example, we estimate the cost of an 18-strand buried fiber cable as follows:

$$
\begin{aligned}
Y^{C\ Adj} = \quad & (.600000 + (.027359)(18))(1.147) \\
= \quad & \$1.25 \text{ per foot.}
\end{aligned}
$$

III. Structure Costs

A. Aerial Structure

37. In the NRRI Study, Gabel and Kennedy developed the following regression equation[18] to estimate the cost of 40-foot, class four poles:[19]

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[17] We discuss the rationale for these proposed adjustments in this Further Notice, section V.B.2.c.

[18] *See* NRRI Study at 52, Table 2-12.

[19] The intercept and the slope coefficients in this regression equation are set forth in terms of dollars per pole. Accordingly, the cost estimates derived from this equation are measured in dollars per pole.

$$Y = 310.645 + 49.99036X_1 + 112.5506X_2 + 66.07799_3$$

t-statistics:	9.233	.204	2.233	2.101

F-statistic: 3.51
Observations: 19

where:

Y = cost per pole for a 40-foot, class four pole;
X_1 = soil surface texture indicator value;[20]
X_2 = water indicator value;[21]
X_3 = bedrock indicator value.[22]

38. We propose to use this equation to develop proposed input values for the labor and material cost for a 40-foot, class four pole. We develop separate pole cost estimates for normal bedrock, soft bedrock, and hard bedrock. By successively substituting values of 0, 1, and 2 into the bedrock indicator variable in this equation, X_3, we obtain cost estimates for normal bedrock, soft bedrock, and hard bedrock, respectively. When we develop these cost estimates, we assume that the soil surface texture is normal and that there is no high water table in the geographic area where the pole is placed. We reflect these assumptions in the calculation of pole costs by substituting values of 0 into the soil surface texture variable, X_1, and the water indicator variable, X_2. For example, for a 40-foot, class four pole placed in hard bedrock, we estimate the pole cost as follows:

$$Y = 310.645 + 49.99036(0) + 112.5506(0) + 66.07799(2)$$

$$= 310.645 + 132.16$$

$$= \$442.81 \text{ per pole.}$$

39. We propose to add to these estimated pole costs estimates for the cost of anchors, guys, and other materials that support the poles, because the data from which the regression equation for pole costs is developed do not include these costs. Gabel and Kennedy developed separate cost estimates for anchors, guys and other pole-related items for rural, urban, and suburban areas by: (1) estimating the probability that a particular asset is

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[20] The value of the variable that indicates soil surface texture ranges from 0 for normal soil, to 1 for soft soil, to 3 for hard soil. *See* NRRI Study at 16 and 46, Table 2-8.

[21] The value of the variable for the water indicator ranges from 0 for the absence of a high water table, to 1 for the presence of a high water table. *See* NRRI Study at 16 and 46, Table 2-8.

[22] The value of the variable that indicates bedrock type ranges from 0 for normal rock, to 1 for soft rock, to 2 for hard rock. These bedrock types are at a depth of 48 inches. *See* NRRI Study at 16 and 44, Table 2-8.

used; (2) calculating the per unit cost of each asset from the RUS data; (3) multiplying the per unit cost for each asset by the probability that it is used (4); and summing the weighted costs.[23] They estimated that the cost for anchors, guys, and other pole-related items is $32.98 in rural areas, $49.96 in suburban areas, and $60.47 in urban areas. We propose to add these estimated costs to the cost estimates we derived above for poles to obtain proposed input values for aerial structure. For example, we add $32.98, $49.96, and $60.47 to the estimated cost for a 40-foot, class four pole placed in hard bedrock, $442.81, to obtain per pole costs (inclusive of costs for poles, anchors, guys, and other pole-related items) of $475.79, $492.77, $503.28 in rural, suburban, and urban areas, respectively.

40. We also tentatively add to these estimated pole costs an estimate for the cost of LEC engineering, which is not reflected in the data from which Gabel and Kennedy derived cost estimates for poles and anchors, guys, and pole-related materials. We tentatively conclude that we should add a loading of 10 percent to the material and labor cost (net of LEC engineering costs) for poles, anchors, guys, and other pole-related items to approximate the cost of LEC engineering.[24] For example, adding a loading of 10 percent for LEC engineering costs to the estimated per pole costs for 40-foot, class four poles placed in hard bedrock (inclusive of costs for poles, anchors, guys, and other pole-related items) of $475.79, $492.77, and $503.28 in rural, suburban, and urban areas yields per pole costs (inclusive of costs for poles, anchors, guys, and other pole-related items and LEC engineering) of $523.36, $542.04, and $553.61 in rural, suburban, and urban areas, respectively.

41. In order to obtain proposed input values that can be used in the model, we must convert the estimated pole costs into per foot costs for each of the nine density zones. For purposes of this computation, we propose to use for density zones 1 and 2 the per pole cost that we have estimated for rural areas, based on the NRRI Study; for density zones 3 through 7 the per pole cost for suburban areas; and for density zones 8 and 9 the per pole cost for urban areas. We then divide the estimated cost of a pole by the estimated distance between poles. We propose to use the following values for the distance between poles: 250 feet for density zones 1 and 2; 200 feet for zones 3 and 4; 175 feet for zones 5 and 6; and 150 feet for zones 7, 8, and 9. For example, for a 40-foot, class four pole placed in hard bedrock in density zone 9, we divide into the estimated per pole cost (inclusive of costs for poles, anchors, guys, and other pole-related items and LEC engineering), $553.61, the average distance between poles for density zone 9, 150 feet per pole, to obtain a proposed per foot cost for aerial structure of $3.69.

B. Underground Structure

42. We propose to use the Huber methodology with RUS data to develop a

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[23] *See* NRRI Study at 55, Table 2-14.

[24] We discuss the rationale for this proposed adjustment in this Further Notice, section V.C.2.a.

regression equation for estimating the cost of underground structure. Based on this methodology and these data, we obtain the following equation[25] for estimating the cost of underground structure:[26]

$$Y = 1.560572 + 4.487123X_1$$

t-statistics: 17.104 2.212
F-statistic: 4.89
Observations: 235

where:

Y = cost per foot for underground cable structure;
X_1 = combined bedrock and soil type indicator.[27]

43. We propose to use this equation to develop proposed input values for the labor and material cost for underground cable structure. We develop separate underground structure cost estimates for normal bedrock, soft bedrock, and hard bedrock for density zones 1 and 2.[28] By successively substituting values of 0, 1, and 2 into the combined bedrock and soil type indicator variable in this equation, X_1, we obtain cost estimates for normal bedrock, soft bedrock, and hard bedrock, respectively. In developing these cost estimates, we assume that the soil surface texture is normal in the geographic area where the underground structure is installed. We reflect this assumption in the calculation of underground structure costs by using a value of 0 for the soil surface texture in the combined bedrock and soil type indicator variable, X_1. For example, for underground structure placed in hard bedrock in density zone 1 or 2, we estimate the underground structure cost as follows:

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[25] Gabel and Kennedy did not publish in the NRRI Study a regression equation for estimating the cost of underground structure. This regression equation was developed after publication of the NRRI report.

[26] The intercept and the slope coefficient in this regression equation are set forth in terms of dollars per foot. Accordingly, the cost estimates derived from this equation are measured in dollars per foot.

[27] The combined bedrock and soil type variable is the sum of separate variables for surface soil texture and bedrock type at a depth of 36 inches. *See* NRRI Study at 45, Table 2-8. The value of the variable that indicates surface soil texture ranges from 0 for normal soil, to 1 for soft soil, to 3 for hard soil. *See* NRRI Study at 16 and 46, Table 2-8. The value of the variable that indicates bedrock type ranges from 0 for normal rock, to 1 for soft rock, to 2 for hard rock at a depth of 36 inches. *See* NRRI Study at 16 and 44, Table 2-8. Accordingly, the value of the variable for the combined bedrock and soil type indicator ranges from 0 where there are normal surface soil texture and normal bedrock at a depth of 36 inches to 5 where there are hard surface soil texture and hard bedrock at a depth of 36 inches.

[28] This regression equation is developed using underground structure cost data for density zones 1 and 2. The variable representing the density zone of the geographic area in which the underground structure costs are incurred is not statistically significant at any standard level of significance.

$$Y = 1.560572 + 4.487123(2)$$

$$= 1.560572 + 8.974246$$

$$= \$10.53 \text{ per foot.}$$

44. We propose to add a loading of 10 percent to these underground structure cost estimates for the cost of LEC engineering, because LEC engineering costs are not reflected in the RUS data from which the regression equation for underground cable structure is developed.[29] For example, by adding a loading of 10 percent for LEC engineering costs to the estimated cost for underground cable structure placed in hard bedrock in density zone 1 or 2, the proposed cost estimate rises from $10.53 to $11.58 per foot.

45. We are able to develop directly from this equation cost estimates for underground cable structure only for density zones 1 and 2, because the regression equation is based on RUS data for companies that operate only in these two density zones. We tentatively conclude that we should derive cost estimates for density zones 3 through 9 by extrapolating from the estimates for density zone 2. We further tentatively conclude that we should perform this extrapolation based on the growth rate in the BCPM and HAI default values for underground and buried structure. This proposed extrapolation methodology is composed of five steps.

46. First, we calculate separately for the BCPM and HAI default values for underground structure costs and buried structure costs the natural logarithm growth rate[30] from one density zone to the next highest density zone, *e.g.*, going from density zone 2 to density zone 3, from density zone 3 to density zone 4, etc. For example, the BCPM default cost for buried structure for distribution cable is $1.73 per foot for normal rock in density zone 2 and $2.48 per foot in density zone 3. The natural logarithm growth rate between these two density zones is 35.93 percent. BCPM has default underground structure costs for distribution cable of $3.04 per foot for normal rock in density zone 2 and $3.66 per foot in density zone 3. The natural logarithm growth rate for these underground cable structure costs going from density zone 2 to density zone 3 is 18.65 percent.

47. Second, starting with density zone 2, we calculate the average of the natural logarithm growth rates of the BCPM and HAI default values for underground structure costs

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[29] We discuss the rationale for this proposed adjustment in this Further Notice, section V.C.2.b.

[30] A logarithm is the power to which a base must be raised to attain a particular number. A logarithm is known as a natural logarithm when e is the base. e is an irrational number that has the value 2.71828. *See* Alpha C. Chiang, *Fundamental Methods of Mathematical Economics*, 280-300 (2nd Edition 1974). To calculate the natural logarithm growth rate of structure costs going from one density zone to the next highest density zone, we first divide the per foot cost for the higher density zone by the per foot cost for the lower density zone, then we calculate the natural logarithm for this quotient.

and buried structure costs from one density zone to the next highest density zone. For example, for BCPM default costs for normal rock, the natural logarithm growth rate for buried structure going from density zone 2 to density zone 3 is 35.93 percent. For HAI default costs for normal rock, the natural logarithm growth rate for buried cable structure going from density zone 2 to density zone 3 is 0 percent. Therefore, the average of the natural logarithm growth rates for BCPM and HAI default values for buried structure in normal rock between density zones 2 and 3 is 17.96 percent.

48. Third, we calculate the average of the average of the natural logarithm growth rates for the BCPM and HAI default values *i.e.*, the "grand average growth rate," for buried structure costs and underground structure costs from one density zone to the next highest density zone, starting with density zone 2. For example, for normal rock, the average of the natural logarithm growth rates for the BCPM and HAI default values for buried structure costs between density zones 2 and 3 is 17.96 percent. For normal rock, the average of the natural logarithm growth rates of the BCPM and HAI default values for underground structure costs between density zone 2 and 3 is 9.33 percent. Therefore, for normal rock, the average of the average of the natural logarithm growth rate of the BCPM and HAI default values for buried cable structure costs and underground cable structure costs going from density zone 2 to density zone 3 is approximately 13 percent.

49. Fourth, we calculate the natural exponential value,[31] *i.e.*, the inverse of the natural logarithm, for each grand average growth rate calculated in step three of the methodology. For example, for normal rock, the average of the average of the natural logarithm growth rate of the BCPM and HAI default values for buried cable structure costs and underground cable structure costs from density zone 2 to density zone 3 is approximately 13 percent. The natural exponential value of this 13 percent growth rate is approximately 1.14.

50. Fifth, we multiply the natural exponential value for each grand average growth rate from one density zone to the next highest density zone by the estimated structure costs for the lower of these two density zones. For example, for normal rock in density zone 2, the underground structure cost that we estimate using the modified results of the Gabel and Kennedy regression analysis is $1.72, including LEC engineering. For normal rock, the natural exponential value for the grand average growth rate associated with going from density zone 2 to density zone 3 is 1.14. Thus, for normal rock in density zone 3, the extrapolated cost estimate for underground structure is $1.72 per foot times 1.14, or $1.96.

C. Buried Structure

51. We tentatively conclude that we should use the modified equation proposed for estimating the cost of 24-gauge buried copper cable and structure to estimate the cost of

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[31] An exponent is an indicator of the power to which a variable is raised. The natural exponential value is calculated by raising e, the base of the natural logarithm, to the power of a number. *Id.*

buried structure.[32] This equation has the following form:

$$Y = 1.500999 + .010652X_1 - .503644X_2 + .733031X_3 + .570136X_4$$

t-statistics:	5.012	80.735	−4.777	3.175	1.911
F-statistic:	1660.57				
Observations:	1,131				

where:

Y = cost per foot for 24-gauge buried copper cable and buried copper cable structure;
X_1 = number of copper cable pairs for 24-gauge buried copper cable;
X_2 = 1 if two or more cables are placed at the same location, 0 otherwise;
X_3 = combined bedrock and soil type indicator;[33]
X_4 = 1 if buried cable is installed in density zone 2; 0 if such cable is installed in density zone 1.

52. After modifying this equation, we propose to use it to develop proposed input values for the cost of buried structure. The dependent variable in this equation, Y, represents the per foot labor and material cost for both buried cable and buried structure. To estimate the labor and material cost for the buried structure only, we derive a new equation that explains only the variation in labor and material costs for buried structure alone. We derive this new equation by using the value of only the fixed cost of buried structure reflected in the intercept or constant term in the modified buried cable and structure equation and only the variables and coefficients in this equation that primarily explain the variation in buried structure costs.

53. We use as the intercept in the new buried structure equation the value of only the fixed cost of buried fiber structure reflected in the intercept in the modified buried cable and structure equation. The intercept in the modified buried cable and structure equation, 1.500999, measures the fixed labor and material cost for both buried copper cable and buried copper cable structure in density zone 1. We tentatively concluded above that the fixed cost for buried copper cable reflected in the intercept is approximately $.80. Accordingly, the

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[32] *See* Appendix D, section I.C. *supra.*

[33] The combined bedrock and soil type variable is the sum of separate variables for surface soil texture and bedrock type at a depth of 36 inches. *See* NRRI Study at 45, Table 2-8. The value of the variable that indicates surface soil texture ranges from 0 for normal soil, to 1 for soft soil, to 3 for hard soil. *See* NRRI Study at 16 and 46, Table 2-8. The value of the variable that indicates bedrock type ranges from 0 for normal rock, to 1 for soft rock, to 2 for hard rock at a depth of 36 inches. *See* NRRI Study at 16 and 44, Table 2-8. Accordingly, the value of the variable for the combined bedrock and soil type indicator ranges from 0 where there are normal surface soil texture and normal bedrock at a depth of 36 inches to 5 where there are hard surface soil texture and hard bedrock at a depth of 36 inches.

fixed labor and material cost for buried cable structure in density zone 1 is $1.500999 minus $.80 or $.70.

54. We use as the independent variables in the new buried structure equation the independent variables in the modified buried cable and structure equation that indicate soil and rock type, and whether a buried cable is installed in density zone 2, *i.e.*, variables X_3 and X_4. We also use as the coefficients of X_3 and X_4 in the new buried structure equation the coefficients of X_3 and X_4 in the modified buried cable and structure equation, .733031 and .570136, respectively. We include these variables and these coefficients in the new buried structure equation because they primarily explain the variation in structure costs. We do not use as an independent variable in the new buried structure equation the variable in the modified buried cable and structure equation that indicates whether two or more cables are placed at the same location, X_2. This variable and its coefficient also primarily explain the variation in structure costs. We do not include this variable in the new buried structure equation, however, because the synthesis model does not use a different structure cost if the feeder or distribution portion of the network it builds requires more than one cable.[34] Nor do we use as an independent variable in the new buried structure equation the variable that indicates the number of copper cable pairs in the modified buried cable and structure equation, X_1. We do not include this variable in the new buried structure equation because this variable and its coefficient primarily explain the variation in cable costs.

55. By using the estimate of the fixed cost for buried cable structure in density zone 1, $.70, the variables that indicate soil and rock type, and whether a buried cable is installed in density zone 2, X_3 and X_4, and the coefficients of these variables, .733031 and .570136, and assuming that buried cable structure cost is a linear function of X_3 and X_4, we obtain the following equation for the labor and material cost for buried cable structure, Y^S:

$$Y^S = .700000 + .733031X_3 + .570136X_4.$$

56. We use this equation to develop proposed input values for the labor and material cost for buried structure. By successively substituting values of 0, 1, and 2 into the combined bedrock and soil type indicator variable in this equation, X_3, and a value of 0 into the dummy variable for density zone, X_4, we obtain cost estimates for normal bedrock, soft bedrock, and hard bedrock, respectively, in density zone 1. By successively substituting values of 0, 1, and 2 into X_3 and a value of 1 into X_4, we obtain cost estimates for normal bedrock, soft bedrock, and hard bedrock, respectively, in density zone 2. In developing these cost estimates, we assume that the soil surface texture is normal in the geographic area where the buried structure is installed. We reflect this assumption in the calculation of buried structure costs by using a value of 0 for the soil surface texture in the combined bedrock and soil type indicator variable, X_3. For example, for buried structure placed in soft bedrock in density zone 1, we estimate the buried structure cost as follows:

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[34] The coefficient for this variable, −.503644, is statistically significant.

$$Y^S = .700000 + .733031(1) + .570136(0)$$

$$= \$1.43 \text{ per foot.}$$

57. We tentatively conclude that we should add a loading of ten percent for LEC engineering costs, because these costs are not reflected in the RUS data from which the regression equation for buried cable and buried cable structure costs is developed.[35] For example, we add a loading of 10 percent for LEC engineering costs to the estimated costs for buried structure placed in soft bedrock in density zone 1, $1.43 per foot, to obtain a proposed cost estimate of $1.57.

58. We are able to develop directly from the regression equation cost estimates for buried structure only in density zones 1 and 2, because the RUS data is for companies that operate only in those density zones. We tentatively conclude that we should derive cost estimates for density zones 3 through 9 by extrapolating from the estimates for density zone 2. We further tentatively conclude that we should perform such extrapolation based on the same method proposed for extrapolating the cost of underground structure, as described above.

[35] We discuss the rationale for this proposed adjustment in this Further Notice, section V.C.2.c.

IV: Proposed Cost Breakdown for 7200 Pair Indoor SAI

		Sprint Proposal				Sprint Total	HAI Proposal			HAI Total	FCC Proposal			FCC Total
			Material		# of hours		Material		# of hours		Material		# of hours	
1	**Building Entrance Splice**		Units	Cost	@ 64.45/hr		Units	Cost	@ 55.00/hr		Units	Cost	@ 60.00/hr	
	purchase 1 splice case	material	1	150.22		150.22	1	150.22		75.11	1	150.22		150.22
	1 splice setup	labor			2	128.9		@50%	2	55.00			2	120.0
	splice 3100 pairs joined	labor	100 pairs/hr		31	1997.95	300 pairs/hr		10.3 @50%	284.17	250 pairs/hr		12.4	744.0
					Subtotal	$ 2,277			Subtotal	$ 414			Subtotal	$ 1,014
2	**Protection (1)**													
	purchase 31 ea. 100 pair protector	material	31	662.19		20527.89	31	200		6200	31	400		12400
	place 31 protector units	labor			2	128.9			2	110			2	120
	terminate 3100 feeder tie pairs	labor	@ 60 prs/hr		51.7	3332.065								0
					Subtotal	$ 23,989			Subtotal	$ 6,310			Subtotal	$ 12,520
3	**Place Feeder Blocks**													
	purchase 124 ea. 66 M1-50 blocks		124	8.76		1086.24				0				
	place 124 ea. 66 M1-50 blocks	10 min/blk			20.7	1334.115				0				
	punch down 3100 feeder pairs	60 prs/hr			51.7	3332.065	400 prs/hr		7.8	426	200 prs/hr		15.5	930
					Subtotal	$ 5,752			Subtotal	$ 426			Subtotal	$ 930
4	**Place Cross Connects**	124 hrs: 2480 x-c @ 3 min ea				$ 7,992	2.6 hrs 3100x-c @ 3 sec ea			$ 142	25.8 hrs 3100 x-c @ 30 sec. Ea			$ 4,067
5	**Place Distribution Blocks**													
	purchase 164 ea. 66 M1-50 Block	material	164		at 8.76/hr	1436.64	164 ea @ 6.00			984	164 ea @ 6.00			984
	place 164 ea 66M1-50 blocks	labor	27.3 hrs @ 10 min /block			1759.485	2.7 hrs @ 1 min/ block			148.5	2.7 hrs @ 1 min/ block			148.5
	punch down 4100 distribution pair	labor	68.3 hrs @ 60 prs/ hr			4401.935	10.3 hrs @ 400 prs /hr			566.5	20.5 hrs @ 200 prs /hr			1230
					Subtotal	$ 7,598			Subtotal	$ 1,699			Subtotal	$ 2,363
6	**Place 41 ea 100 pair distr. Tie Cables**	8.2 hrs @ 12 min/cable				$ 528	3.4 hrs @ 5 min/cable			$ 187	3.4 hrs @ 5 min/cable			$ 187
7	**Distribution Splice**													
	purchase 1 Splice cable	1 ea @ 150.22				155.22	1 ea @ 50%			75.11	1 ea @ 50%			75.11
	1 splice setup	2 hrs@ 64.45				128.9	2 hrs@ 50%			55	2 hrs@ 50%			60
	splice 4100 pairs joined	41 @ 100 prs/hr				2642.45	13.7 hrs @ 300 prs/hr @50%			376.75	16.4 hrs @ 250 prs/hr @50%			492
					Subtotal	$ 2,927			Subtotal	$ 507			Subtotal	$ 627
	Total				Sprint	$ 51,063			HAI	$ 9,685			FCC	$ 21,708

Note: Totals are rounded to nearest dollar.

APPENDIX E

DESCRIPTION OF PROPOSED METHODOLOGY FOR ESTIMATING SWITCHING COSTS

1. Switch Cost Data. The depreciation rate reports filed by LECs contain information on Bell Operating Companies' (BOCs') digital switches that were reported as installed between 1983 and 1995 in the states specified, with certain exceptions. To increase the reliability of analysis using these data, the proposed methodology removes the following switches from the data set: (1) switches for which there were no lines of capacity, such as those functioning solely as tandem switches; (2) switches with fewer than 1,000 lines of capacity; and (3) switches that were deemed to be "outliers" because of unusually high or low per-line costs. The following procedure was used to identify outliers: (A) if there was a gap of 20 percent or more between the per-line cost of a switch and the next lower, or higher, cost switch, that switch [and any others with lower, or higher, per-line cost] were excluded; (B) a low-priced switch that failed test A nevertheless was retained in the data set if a switch with that per-line cost would have passed test A in a previous year; (C) a high-priced switch that failed test A was retained in the data set if a switch with that per-line cost would have passed test A in a subsequent year. In addition, a small number of switches associated with apparent inconsistencies in the studies were not included in the set. In particular, for several locations in California, switches that were at the same location, but had different capacities, types, and year of installation, were reported as having the same per-line costs. These anomalies were judged to be the results of averaging by the respondent, and the switches in these locations were excluded from the data set.

2. In addition to the removal of the above outliers, the sample was restricted to the period following the divestiture of AT&T, and to those switch types that could clearly be identified as either host or remote switches. These included the DMS-100, DMS-100 remote, DMS-10, 5ESS, 5ESS remote, and EWSD switch types. In total these restrictions removed about 600 observations from a data set of nearly 3,600 observations. Thus, after exclusions, the data set compiled by the Commission in conjunction with Gabel and Kennedy and the Bureau of Economic Analysis (BEA) of the Department of Commerce consisted of 3,023 switches. In order to estimate the costs associated with the purchase and installation of new switches, and exclude the costs associated with upgrading switches, we propose to remove those switches installed more than three years prior to the reporting of their associated book-value costs. The three-year restriction resulted in the removal of 2,102 observations. The depreciation data included in the data set selected by the Commission includes the remaining 921 observations.

3. The reports made to RUS by rural telephone companies contain information on the 181 digital switches installed in 1995 and 1996. To increase the reliability of analysis using these data, we propose to remove the following observations from the data set: (1) observations containing information on switching equipment classified as upgrades to existing equipment and (2) observations containing information on switches reported as having no

attached lines. These exclusions result in the removal of 42 observations. The RUS data included in the data set we select includes the remaining 139 observations.

4. Combined, the data set we propose includes 1,060 observations, 921 from the depreciation information and 139 from the RUS information. The RUS information includes a variable identifying switches as either hosts or remotes. The depreciation information does not. Therefore, an additional variable uniquely identifying switches as host switches or remote switches was added to the data set. Where data classifications were deemed unreasonable, we propose to reclassify the switch types. For example, switches identified as DMS-100 and 5ESS switches which terminated less than 2,000 customers and cost in the neighborhood of $500,000 were reclassified as remote switches. These classifications identified approximately 56% of the switches included in the combined data set as remotes.

5. Regression Formulation. The proposed regression employed is of the form:

$$\text{Cost} = a_1 + a_2*\text{Lines} + a_3*\text{Host} + a_4*(1/\text{Time}) + a_5*\text{Lines}*(1/\text{Time}) + a_6*\text{Host}*(1/\text{Time}) + e$$

where time takes on the value of 1 in 1985, 2 in 1986...15 in 1999. Regression results, including estimated coefficient values (in 1997 dollars), are:

$$\text{Cost} = \underset{(91{,}160)}{96{,}610} - \underset{(35.40)}{13.09}*\text{Lines} - \underset{(521{,}700)}{299{,}800}*\text{Host} + \underset{(838{,}300)}{1{,}262{,}000}*(1/\text{Time}) + \underset{(298.5)}{1{,}399}*\text{Lines}*(1/\text{Time}) + \underset{(3{,}949{,}000)}{8{,}288{,}000}*\text{Host}*(1/\text{Time})$$

Robust (heteroscedasticity adjusted) standard errors in parenthesis. Regression R-squared = 0.78.

Proposed estimates, identified using the regression equation, for the fixed cost of host and remote switches and for the per-line cost of all switches (in 1997 dollars) are, respectively:

$$\text{Host Fixed Cost} = a_1 + a_3 + a_4*(1/\text{Time}) + a_6*(1/\text{Time})$$
$$\text{Remote Fixed Cost} = a_1 + a_4*(1/\text{Time})$$
$$\text{Per-line Cost} = a_2 + a_5*(1/\text{Time})$$

In estimating switch costs for 1999, the regression results (with time defined as 15) were converted into 1999 values using actual inflation between 1997 and 1998 and projected inflation between 1998 and 1999. Estimates for 1999, in 1999 dollars, identified using the regression equation, for the fixed cost of host and remote switches and for the per-line cost of all switches are, respectively:

$$\text{Host Fixed cost} = (1+\text{inflation}_{1998})*(1+\text{inflation}_{1999})*(a_1 + a_3 + a_4*(1/15) + a_6*(1/15))$$
$$\text{Remote Fixed Cost} = (1+\text{inflation}_{1998})*(1+\text{inflation}_{1999})*(a_1 + a_4*(1/15))$$
$$\text{Per-line Cost} = (1+\text{inflation}_{1998})*(1+\text{inflation}_{1999})*(a_2 + a_5*(1/15))$$

The inflation rate for 1998 is measured by the gross-domestic-product chain-type price index as published monthly by the Bureau of Economic Analysis of the U.S. Department of Commerce in the Survey of Current Business. The projected inflation rate for 1999 is reported in The Economic and Budget Outlook: Fiscal Years 2000-2009, published by the Congressional Budget Office. Inserting these inflation rates, the fixed cost of a host switch, the fixed cost of a remote switch, and the per-line cost for host or remote switches (in 1999

dollars) are, respectively:

Host Fixed cost = $(1.01)*(1.021)*(a_1 + a_3 + a_4*(1/15) + a_6*(1/15))$
Remote Fixed Cost = $(1.01)*(1.021)*(a_1 + a_4*(1/15))$
Per-line Cost = $(1.01)*(1.021)*(a_2 + a_5*(1/15))$

Inserting the coefficients from the regression analysis, the fixed cost of a host switch, the fixed cost of a remote switch, and the per-line cost for host or remote switches (in 1999 dollars) are, respectively:

Host Fixed cost = (1.01)*(1.021)*(96.610 - 299.800 + 1.262.000*(1/15) + 8.288.000*(1/15)) = 447.000
Remote Fixed Cost = (1.01)*(1.021)*(96.610 + 1.262.000*(1/15)) = 186.400
Per-line Cost = (1.01)*(1.021)*(-13.09 + 1.399*(1/15)) = 83

APPENDIX F

DESCRIPTION OF PROPOSED METHODOLOGY FOR ESTIMATING EXPENSES

1. Data Sources used in Regression Analysis. The use of multiple variables in the estimation process required that various data sources be used to determine the common support service expense model inputs. Because the reporting requirements and number of company study areas were different among the reports used, it was necessary to reconcile the data for 1996 expenses, access lines, and dial equipment minutes, as described below.

1996 Expenses

Data Source: ARMIS, 43-01 Report, "Subject to Separations" Column.

Study Areas (SAs) reconciled:

Total SAs from ARMIS 43-01 Report: 127

Less:

SAs combined to agree with access line data in ARMIS 43-08: (8)

Study Area(s)	Combined with
PNID	MSID
CTRH and CTWC	CTUP
COCA	GTCA
GNCA	GTOR
COVA	GTVA
COTX	GTTX
PRCC	PRPR

SAs removed (because not in NECA Tier I reporting): (28)
(ALPA, ALWR, COIA, COSI, COMO, COCM, COEM, GTGO, COPA, COQS, COIN, COIL, COWA, GLIL, COKY, CONC, COSC, CONM, COAL, GLMI, GLIN, CENC, CEVA, CEIL, UTMO, UTTX, UTOR, UTWA)

SAs used in analysis: 91

Access Lines

Data Source: ARMIS, 43-08 Report, Table III,
Column (dj) "Total Switched Access Lines", and
Column (dm) "Total Access Lines (Switched and Special)"

Study Areas (SAs) reconciled:

Total SAs from ARMIS 43-08 Report:: 115

Less:

SAs combined to agree with ARMIS expense data and NECA usage data: (5)

Study Area(s)	Combined with
NYNY (Conn)	NYNY (New York)
CBTC (IN & KY)	CBTC (Ohio)
LTNE (IA & KS)	LTNE (Nebraska)

SAs removed (because not in NECA Tier I reporting): (19)
[ALPA, ALWR, GTNW, GTSO, COSO(AL, IN, MI), COTM, COAT, UTIM, CEVA, CEIL, UTMO(IA, KS, MS), CETO, UTTX, UTNW(OR, WA)]

SAs used in analysis: **91**

Dial Equipment Minutes

Data Source: NECA filed statistics on network usage by carrier

Study Areas reconciled:

Total SAs per NECA data filing: 104

Less:

SAs combined to agree with access line data: (9)

Study Area(s)	Combined with:
GNCA	GTOR
COCA	GTCA
PNID	MSID
CBTC (KY)	CBTC (Ohio)
CTRH & CTWC	CTUP
PRCC	PRPR
COTX	GTTX
COVA	GTVA

SAs removed (because not in ARMIS reporting): (4)
(GA Alltel Telecom, COTM, Micronesian Tel, Citizens Utilities DBA Citizens of Tennessee)

SAs used in analysis: **91**

2. Adjustments for Non-Supported Services. This section reviews the methodology that was used to adjust the proposed estimates for corporate operations and customer operations expenses by removing those costs in ARMIS that should not be included in the estimated cost of providing supported services.

(a) Marketing. The data used to adjust ARMIS marketing expenses was based on a study done by Economics and Technology, Inc. This study analyzed data from companies providing basic telephone service to apportion marketing expenses between supported and non-supported services.[1] This analysis attributed an average of 95.6 percent of marketing costs to non-supported customers or activities, such as vertical and new services. Based on this analysis, we propose to include 4.4 percent of the regression coefficient for marketing expenses as the base input value for ARMIS 43-08, Account 6610.

(b) Other Non-Supported Services. Adjustments were also made to remove from the proposed expense estimates costs related to coin operations and collection, published directory, access billing, interexchange carrier office operation, and service order processing, because these activities are not necessary to provide supported services. Because these services were not specifically identified within the ARMIS 43-08 data used for the regression estimates, it was necessary to estimate the percentage of expenses attributable to these services through another publicly available data source. This was accomplished by using information from a time trend analysis of average ARMIS 43-04 expense data for five years (1993-1997),[2] which separately identifies these services. First, we calculated the ratio of expenses attributable to non-supported activities to the total expenses in ARMIS 43-04 that represent the activities reported in the ARMIS 43-08 subaccounts. Applying these ratios, percentage reductions were then made to the portion of the average regression coefficients for that subaccount. For example, the 1996 ARMIS 43-08 Customer Services Subaccount represents 73 percent of the expenses reported in the Service Expense Account 6620. The total average expenses for non-supported customer services including Coin Collection and Administration, Carrier Access Billing, and Other Customer Services based on the time trend analysis were estimated as 12.46 percent of the total expenses reported in ARMIS 43-04 for those services that would be included in the ARMIS 43-08 Customer Services Subaccount 6623. The Service Expense Account 6620 coefficient was then reduced based on the adjusted sub-account. The following table shows the calculations used to exclude expenses for non-supported services.

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[1] *See* Further Comments of the National Cable Television Association Inc., *CC Docket 96-45 Federal State Joint Board on Universal Service* (Appendix 3A).

[2] *See* Letter from Chris Fentrup, MCI-Worldcom to Magalie Roman Salas, FCC, dated January 15, 1999.

APPENDIX F

NON-PLANT SPECIFIC CORPORATE AND CUSTOMER OPERATIONS EXPENSES

Accounts	Marketing 6610	Adjusted 6610 (4.4% of Exp)	Service Exp 6620	Call Completion 6621 (7% of 6620)	Number Services 6622 (20% of 6620)	Adjustment for Public Directory (-30.95%) -0.30952381 (Based on Avg 1993-1997 ARMIS 43-04 Calculations)	Adjusted 6622 Number Services (69.05%) 0.69047619	Customer Service 6623 (73% of 6620)	Adjustment for Coin, Aces Billing & Other (-12.46%) -0.12462908 (Based on Avg 1993-1997 ARMIS 43-04 Calculations)	Adjusted 6623 Customer Services (87.54%) 0.87537092	Adjusted 6620 Service Expenses	Corp Ops 6700	Other PP&E 6510	Network Ops 6530	Totals Total Lines 1.76E+08	Percent USF/Total
1996 ARMIS 43-08																
Total Expenses	3625031000		8512865000									9885866000	40708000	6339952000		
Average Expense Per Line	20.63327927		48.45429487									56.26926612	0.231705476	36.08631215		
Average Monthly Expense/Line	1.71943994		4.037857905									4.68910551	0.01930879	3.007192679	13.4729	Avg
Regression CoeffsSpecification 1:	7.1876	0.3162544	17.2779	1.209453	3.45558	-1.069584286	2.385995714	12.612867	-1.571930012	11.04093699	14.6363857	34.2361	0.8383	18.4469	68.47394	
Regression Coeffs.Specification 2:	6.6493	0.2925692	15.5229	1.086603	3.10458	-0.960941429	2.143638571	11.331717	-1.412261466	9.919455534	13.14969711	33.2887	0.9481	16.7293	64.40837	
Monthly Expense Spec 1	0.598966667	0.026354533	1.439825	0.10078775	0.287965	-0.089132024	0.198832976	1.05107225	-0.130994168	0.920078082	1.219698809	2.853008333	0.069858333	1.537241667	5.706162	0.42353
Monthly Expense Spec 2	0.554108333	0.024380767	1.293575	0.09055025	0.258715	-0.080078452	0.178636548	0.94430975	-0.117688455	0.826621295	1.095808092	2.774058333	0.079008333	1.394108333	5.367364	0.39838
Regression Coeffs Avgs.	6.91845	0.3044118	16.4004	1.148028	3.28008	-1.015262857	2.264817143	11.972292	-1.492095739	10.48019626	13.8930414	33.7624	0.8932	17.5881	66.44115	
Average of 2 Specifications	0.5765375	0.02536765	1.3667	0.095669	0.27334	-0.084605238	0.188734762	0.997691	-0.124341312	0.873349688	1.15775345	2.813533333	0.074433333	1.465675	5.536763	0.41096

Calculation of Net Productivity and Inflation Adjustments 1997	-0.03888
Calculation of Net Productivity and Inflation Adjustments 1998	-0.038571

PROPOSED EXPENSE INPUT ADJUSTMENTS

Accounts	Model Spec 1	Model Spec 2	Models Average	1997* Adjusted Avg Expenses	1998** Adjusted Avg Expenses
6610 Marketing	$ 0.03	$ 0.02	$ 0.03	$ 0.02	$ 0.02
6620 Service Expense	$ 1.22	$ 1.10	$ 1.16	$ 1.11	$ 1.07
6700 Exec, Planning , G & A	$ 2.85	$ 2.77	$ 2.81	$ 2.70	$ 2.60
6510 Other PP&E	$ 0.07	$ 0.08	$ 0.07	$ 0.07	$ 0.07
6530 Network Operations	$ 1.54	$ 1.39	$ 1.47	$ 1.41	$ 1.35
TOTAL EXPENSES	$ 5.71	$ 5.37	$ 5.54	$ 5.32	$ 5.12

* 4th Quarter to 4th Quarter 1997 GDP-PI 2.1120% minus Productivity 6.0% (X-Factor 6.5% - .5% Consumer Dividend on Price Caps) = (-3.888%)

** 4th Quarter to 4th Quarter 1998 GDP-PI 2.1429% minus Productivity 6.0% (X-Factor 6.5% - .5% Consumer Dividend on Price Caps) = (-3.8571%)